GREAT BASIN LAND & WATER STUDY

Issues and Opportunities for Acquiring Water from Willing Sellers to Increase Walker Lake Inflows

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Finally, on behalf of GBLW, I accept full responsibility for any errors in or omissions from this report, notwithstanding all of the excellent advice and assistance noted above.

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Issues and Opportunities for Acquiring Water from Willing Sellers to Increase Walker Lake Inflows

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1.0 Introduction

Walker Lake is one of only a handful of large, perennial, freshwater terminal lakes found in the arid high-desert along the western edge of the Great Basin in the rain shadow of the Sierra Nevada. Fed by the interstate (California-Nevada) Walker River system, Walker Lake has been declining in volume and elevation, and increasing in salinity, ever since the advent of irrigated agriculture and associated upstream diversions in the mid-1800s. Salinity levels currently exceed 15,000 mg/l and threaten the Lake's ecological collapse; its demise is all but assured absent timely, significant, and sustained increases in inflows.

This report is part of a study initiated in the fall of 2005 by Great Basin Land & Water (GBLW), a Nevada-based non-profit organization specializing in land and water acquisitions for at-risk freshwater environments in the Great Basin and other western regions.[1] Our primary goal was to advance the near-term prospects for acquiring water from willing sellers to serve as the principal means for increasing Walker Lake inflows via the voluntary, market-based recapture of previously-appropriated supplies. In furtherance of this objective, GBLW and/or its contractors undertook the following principal tasks:

- Compiled an extensive record of recent market-based sales of land, water, and related interests in key areas of the Basin;
- Analyzed the historic yields of surface water rights allocated to lands within the boundaries of the Walker River Irrigation District;
- Assessed recent trends in irrigated lands using Geographic Information System (GIS) analyses;
- Initiated research into a host of legal and other issues involved in efforts to acquire (from willing sellers) and transfer (to Walker Lake) both water rights and related property interests;
- Surveyed other western environmental water transaction programs for lessons and insights on critical issues and for their potential application to the Walker Lake situation;

[1]Funding and authorization for a *Great Basin Land and Water Study* was provided by the 2005 Omnibus Federal Appropriations Act. This *Study* has been administered by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) in Reno, Nevada, and was directed by David Yardas as a principal GBLW consultant. The views expressed in this report and all associated work products are those of GBLW and/or its contractors and should not be interpreted as representing the opinions or policies of NRCS, USDA, or others.

- Reviewed numerous prior public reports and studies relating to Walker Lake and its watershed;

- Consulted extensively with a broad range of interests, including parties to the recently-terminated Walker Basin mediated settlement negotiations as well as principals involved in the University of Nevada's newly-established Walker Basin Project;[2] and

- Based on all of the above, developed a proposed framework for a long-term portfolio of acquisition alternatives that could, at least potentially, succeed in meeting Walker Lake's needs for additional freshwater inflows.

This report summarizes our principal analyses and findings in accordance with the above tasks and efforts, and includes a series of stand-alone appendices which provide additional details on many of the topics discussed. At the same time, this report – especially its final "framework" section – remains very much a work-in-progress due to the complexity of the Basin's water rights and water management systems, the dearth of prior experience with environmentally-oriented water transfers, the developmental nature of recently-authorized public acquisition efforts, and the lack of public information on a host of issues and topics. We welcome all comments and criticisms, and we accept full responsibility for all errors and omissions.

* * *

The recent demise of mediated settlement talks and the looming return to litigation raise many concerns about the future of Walker Lake and the ability of all involved to avoid years, if not decades, of protracted conflict. At the same time, the recent provision of $95 million in federal acquisition and related funding to the University of Nevada, the Walker River Paiute Tribe, and the U.S. Fish and Wildlife Service suggests that some very significant quantities of water and related interests *will* be acquired from willing sellers in the very near future. For those and other acquisitions to function optimally over time – for Walker Lake, and for the entire Walker Basin – mutually-beneficial and cooperative efforts among all parties of interest will be needed. To this end, we urge timely initiation of one or more cooperative "pilot projects" based on, or adapted from, the alternatives discussed in this report; continued development, implementation, and refinement of the above-authorized programs; and, with luck, successful negotiation of a comprehensive federal-tribal-interstate water settlement based on these and related efforts.

Towards the end of 2000, the *Report of Findings* of the Walker River Basin Advisory Committee investigated a host of options and alternatives for providing "a greater and more consistent inflow of water to Walker Lake." As a foundation for this *Study*, we have attempted to build on the Advisory Committee's acquisition-related assessments, and on their conclusion that "the means are at hand…to define and achieve a win-win solution" for the Lake and its watershed; what's really needed is simply "the resolve to do so." We whole-heartedly agree, and we sincerely hope that this report will help in the collective search for that resolve today.

[2] From March-December 2006 GBLW also served as an advisor to the University of Nevada's initial planning process pursuant to P.L. 109-203, Section 208(a), November 2005 (**Appendix G**).

2.0 The Walker Lake Basin: An Overview

The Walker Lake Basin (**Plate 2-I**) is located in east-central California and west-central Nevada immediately south of the Carson River basin and north of the Mono Lake basin.[3] In California, the Basin is divided into two main forks – the East and West Walker Rivers – with tributaries and headwaters located high in the Sierra Nevada in northern Mono County, California.

The West Walker River -- the larger of the two forks -- flows north and east from its headwaters into California's Antelope Valley near the communities of Walker and Coleville, CA. Below Antelope Valley, the West Walker continues north past Topaz Lake Reservoir, an off-stream reservoir that straddles the California-Nevada state line,[4] flowing into and through a small portion of Douglas County, NV before entering into Hoye Canyon in Lyon County, NV and entering the Smith Valley near the towns of Smith and Wellington, NV. From there the West Walker enters Wilson Canyon, where diversions from the River are made via canal and tunnel to serve lands in the "Tunnel Section" of the southern Mason Valley. The West Walker emerges from Wilson Canyon at the southern end of Mason Valley, and from there flows north to its confluence with the East Walker River near Yerington, the county seat of Lyon County, NV.

The East Walker River flows in a generally north-easterly direction from its headwaters into and through the Bridgeport Valley (and Bridgeport Reservoir) in California. Below Bridgeport Reservoir, the East Walker River flows into Nevada, and from there through the East Walker River Canyon to its confluence with the West Walker River in the southern Mason Valley.

The Main Walker River flows north through the Mason Valley to its northernmost point near Wabuska.[5] From there the Main Walker River turns abruptly east, then south, as it enters the Walker River Indian Reservation, and continues downstream into Weber Reservoir (which straddles the Lyon-Mineral County line), past the Reservation community of Schurz, and on to its terminus at Walker Lake.

2.1 Water Management Infrastructure

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[3]The terms *Walker Lake Basin*, *Walker River Basin*, and *Walker Basin* are used interchangeably throughout this study. In general, however, we prefer *Walker Lake Basin* because the Lake's condition reflects, to a large extent, everything that happens upstream. In any event, a number of sources provide helpful and sometimes detailed overviews of the Basin. The Walker River Atlas (California Department of Water Resources 1992 is particularly informative, but see also the final report of the Walker River Basin Advisory Committee (2000); the series of reports done by Randy Pahl for the Nevada Division of Water Planning between 1993 and 2000; and a forthcoming publication by Saxon Sharpe et. al. (Desert Research Institute, in review, 2007). The purpose of this section is not to repeat these descriptions, but merely to provide a basic orientation and context for the acquisition-related discussions which follow.

[4] Topaz Lake Reservoir includes the former Alkali Lake, a "natural reservoir site" (California Department of Water Resources 1992, page 55). Water is diverted into storage through the Topaz Lake Intake Canal near the Reservoir's upstream (southern) end, and returns to the West Walker River via releases from storage into the canal/tunnel system near the Reservoir's downstream (northern) end.

[5] Historically, during very wet conditions, the Walker River could overflow into the Carson River basin through the Adrian Valley near Wabuska.

In the Walker Lake Basin, water is managed and manipulated – stored, released, diverted, conveyed, applied, drained, pumped, bypassed, seeped, returned, spilled, and evaporated -- for one predominant purpose: to provide irrigation water supplies to more than 145,000 acres of water-righted farmland.[6]

As noted above, major storage facilities include Bridgeport Dam on the upper East Walker; Topaz Lake Dam on (adjacent to) the upper West Walker; and Weber Dam on the lower main Walker River. About half-a-dozen small Sierran lakes are also managed in conjunction with decreed water rights for irrigation water supply purposes (see Walker River Atlas, Chapter 2, Table 1). Bridgeport Reservoir (completed in 1924) and Topaz Lake Reservoir (completed in 1921 and expanded in 1937) are owned and managed by the Walker River Irrigation District (WRID), which was established in 1919 in order to see them built. Weber Dam is owned and operated by the U.S. Bureau of Indian Affairs on behalf of the Walker River Paiute Tribe. BIA financed and constructed the Dam (completed in 1935) as part of the federal Walker River Indian Irrigation Project.

Water is diverted directly out of the Walker River and its tributaries at more than 70 points of diversion (POD's) system-wide. Diversion works such as weirs, flumes, and river pumps serve a network of main ditches, laterals, and sub-laterals and provide water to individual users as well as assorted ditch companies.[7] **Table 2-A** and **Plates 2-II** and **2-III** provide provisional summaries of the most important ditches and pumps based on Decree C-125 as well as the work done by Pahl (2000b), however additional work is needed to ensure that all information is current, reflects post-Decree consolidation and/or modernization efforts, and aligns with the additional information presented in **Table 4-C** (diversions) and **Table 6-E** (ditch assessments).

Groundwater is also an important source of irrigation water supply in the Walker River basin, particularly in the Smith and Mason Valleys, where most irrigation well permits have been issued to supplement surface-water rights. The Nevada Department of Conservation and Natural Resources indicates that there are "about 100 well sites in the Smith Valley and about 200 well sites in the Mason Valley" where annual pumpage for irrigation purposes is likely to be significant.[8] At present there are approximately 64 active groundwater permits and more than

[6] Recreation has also become an important use at several upstream reservoirs, especially at Topaz Lake and at several smaller Sierran reservoirs with decreed storage rights (see Walker River Atlas, Chapter 2, Table 1). The referenced total of 145,000 water-righted acres includes at least 110,850 acres with natural flow rights under Decree C-125 (see Pahl, 1999b), and approximately 34,400 acres of so-called New Lands with primary storage rights allocated by the Walker River Irrigation District. The total does not include any additional acreage associated with state-certificated primary groundwater rights nor state-issued tailwater rights; nor approximately 21,380 additional acres of uncertain designation which are included in the basis for budgetary assessments by the U.S. Board of Water Commissioners (see USBWC 2005, which lists 132,232 acres as the 2005-06 assessment basis).

[7] In addition to individual users, Decree C-125 adjudicates natural flow diversion rights to the Antelope Valley Mutual Water Company (in Antelope Valley) and to the Mickey, Fox, and Greenwood Ditch Companies (in Mason Valley). Storage rights are also adjudicated to the Walker River Irrigation District.

[8] Annual withdrawals from these wells averaged about 103,000 AF/year from 1994-2004, with a combined single-year maximum of more than 155,000 AF (**Table 2-F**). In addition, "approximately 485 domestic use wells contribute about 1,000 acre-feet of ground-water pumpage annually in Smith Valley [and a]pproximately 910

350 certificated rights in the Nevada portion of the Walker River basin, and approximately 100 applications to transfer existing groundwater rights. The majority of these rights are used for irrigation, stock water, recreation, and commercial purposes, however a growing number are also being converted to municipal and quasi-municipal purposes.[9]

Finally, at the farm level, water management technologies and methods vary from conventional flood irrigation of hay and pasture to the use of computerized low-pressure sub-surface drip irrigation and chemical management systems to irrigate onions, garlic, and other "higher value" crops.[10]

2.2 Water Management and Administration

The Walker River's developed water system is managed and administered by a number of entities. All natural flow rights under the Walker River Decree are administered by the Chief Deputy Commissioner of the U.S. Board of Water Commissioners (USBWC), who serves as federal water master for the system. Diversions into and releases from Bridgeport and Topaz Lake Reservoirs are administered by the federal water master in close coordination with the Walker River Irrigation District. Daily surface water diversions are managed at each point of diversion by "ditch riders"(or "tenders") employed by the respective ditch users (or companies), and by "river riders" employed by the federal water master.[11] The Walker River Paiute Tribe and/or the U.S. Bureau of Indian Affairs manage and administer all on-reservation water supplies, while the federal water master ensures that flows at the Wabuska gage are sufficient to meet the Tribe's decreed diversion rights. Finally, individual water users manage their own groundwater pumping pursuant to permits issued by the Nevada State Engineer in Nevada, and as overlying landowners in California. **Appendix G-1** includes additional background on water management and operations in the Walker River basin.

2.3 Irrigated Acres

The Walker River basin features six major agricultural water use areas: *Bridgeport Valley* and the *East Walker area* on the East Walker River; *Antelope Valley* and *Smith Valley* on the West

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domestic use wells contribute about 2,000 acre-feet of ground water pumpage annually in Mason Valley." See Gallagher (2005), Executive Summary, pages 3-4.

[9] A. Stroud, personal communication, April 2007.

[10] Though beyond the scope of this Study, an up-to-date inventory of both conveyance and on-farm irrigation technologies and improvements would be extremely useful in evaluating the potential for improved conveyance and on-farm irrigation efficiencies in the Walker River basin.

[11] Daily diversions are recorded on hand-written order cards by the individual ditch and river riders. Pahl (2000b) reports that since 1989 "the Federal Water Master's office has entered daily diversions (in cfs) into an electronic database from which a number of printouts can be generated," however this may not be the case today due to staffing and resource constraints (Jim Shaw, personal communication, January 2007). In any event, while the U.S. Geological Survey maintains a basinwide network of approximately 60 "active" surface water monitoring sites (as well as numerous groundwater and evapo-transpiration sites), only two sites in the lower reaches of the system allow for remote, real-time monitoring of surface water *diversions*. See http://nevada.ugsg.gov/walker/data/htm.
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Walker River; *Mason Valley* on the East, West, and Main Walker Rivers; and the *Schurz* (Reservation) area on the Main Walker River. **Appendix G-2** includes summary profiles for each area.

Estimates of both irrigated acres and riparian-wetland acres for each are above are presented in **Table 2-B** and **Figure 2-1** for six sample years over the 16-year period 1986-2002. These estimates are based primarily on a GIS analysis of late-summer satellite imagery undertaken by the Desert Research Institute as part of this Study (Desert Research Institute, June 2006), though we have included an assumption of 20,000 acres for the Bridgeport Valley which was not part of DRI's analysis due to funding and other constraints.[12] Based on the forgoing, total irrigated acres for the basin as a whole varied from a low of approximately 80,000 acres to a high of nearly 100,000 over this fairly-recent 16-year period.[13]

2.4 Surface Water Diversions

An important series of public reports on water supplies and irrigation diversions in the Walker River basin were complied by the (now-defunct) Nevada Division of Water Planning (NDWP) as part of the Nevada Water Basin Information and Chronology Series from 1993-2000. (See NDWP and Pahl citations in the attached reference list.) Most of the information in these reports was compiled directly from USGS, Walker River Irrigation District, and/or federal water master records, and we have relied upon them extensively throughout the course of this Study, supplemented by other public reports and information when available.[14]

Table 2-C, adapted from Pahl (2000a), summarizes the average annual surface water budget for the Walker River basin based on 1926-1995 conditions. Of note, total "headwater" inflows average 326,300 AF/year, while additional "net local inflows" – *including return flows from prior upstream diversions* – added 126,100 AF/year, and the resulting estimate of total average basin-wide inflows was 452,400 AF/year. Thus, on average, approximately 450,000 AF/year were available on average (a) for diversion and re-diversion to satisfy all adjudicated water rights *and* (b) for diversion or use to address all other needs and claims, including those of Walker

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[12] According to Pahl (1999b) there are a total of 26,429 decreed acres the Bridgeport Valley. Of these, 2,660 acres are decreed to WRID and are thought to be used in conjunction with Bridgeport Reservoir storage. Of the 23,769 decreed acres remaining, Pahl (2000a, page 17) assumes that 20,000 acres were actually irrigated, on average, from 1926 to 1995. An alternative estimate of 24,000-26,000 irrigated acres was provided by the retired U.C. Agricultural Extension agent for the Bridgeport area, who noted that some 6,000-7,000 acres of riparian habitat are also sustained by the associated irrigation diversions. He described the entire Valley as working a bit "like a sponge," i.e., filling up slowly during the irrigation season and then "drying out all winter long." (Richard Delmas, personal communication, January 2007.)

[13] Note that the estimated basin-wide maximum of about 100,000 irrigated acres is substantially less than the 145,000 acres of water rights noted previously.

[14] For purposes of this Study we had hoped to obtain copies of, or at least access to and/or preliminary results from, the hydrologic simulation model and input data files that were developed as part of the "structured mediation" related to C-125 litigation from 2002 to 2006. Though mediation efforts ended officially towards the end of 2006, that information remains confidential per the terms of the mediation agreement as of early 2007; repeated requests to obtain it have not been successful.

Lake.[15] Over the same time period, basin-wide irrigation diversions averaged 369,000 AF/year, accounting for more than 80 percent of the available supply and indicating that downstream diversions are supported in part by return flows from prior upstream diversions. In any case, of the remaining 20 percent, roughly 13,500 AF/year were "consumed" via evaporation and changes in storage at the three major upstream reservoirs; the balance -- 69,900 AF/year, on average – was the River's average inflow to Walker Lake, which lost approximately 5.35 million AF in volume over the 70-year period due to an excess of evaporation over inflow.[16]

The annual averages reported above for basin-wide inflows and diversions should also be understood in conjunction with year-to-year variations in supply. For example, from the mid-1920's to the mid-1990's, headwater inflows into the basin (i.e., surface water inflows above Bridgeport and Antelope Valleys) varied from as little as 81,000 AF/year to as much as 805,000 AF/year, an order-of-magnitude difference.[17] Over the same time period, basin-wide surface water irrigation diversions (exclusive of Bridgeport Valley and Schurz-area diversions) ranged from as little as 93,000 AF/year to as much as 450,000 AF/year.

Annual estimates of surface water diversions by sub-area for the period 1931-1995 are summarized in **Table 2-D** (adapted from the NDWP Diversion Database). Of note, these data include estimates for all types of diverted surface water -- decreed natural flow, storage, and flood waters – which are not broken out separately due to concerns with the underlying data.[18] **Table 2-E** and **Figure 2-2** provide summary statistics from Meyers (2001a) for average diversions *by type* in the Smith, Mason, and East Walker areas over the same period of time. Based on these data, approximately 40% of all surface water diversions across sub-areas (i.e.,

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[15] This analysis ignores the important effects of groundwater withdrawals and induced recharge on surface water flows, both of which increased substantially over the period of record, especially in the Smith and Mason Valleys. Meyers (1997, 2001a-c) provides detailed analysis and discussion of these issues, and reaches an important conclusion: saving Walker Lake will require both "the transfer of existing surface water rights…and the curtailment of groundwater pumping." (Meyers 1997, page 32)

[16] This analysis assumes average Lake surface evaporation rates of about 4.1 feet per year, however USGS currently estimates that Lake surface evaporation rates may be closer to 6.0 feet per year (http://nevada/usgs.gov/walker/presentations/PublicLands3-06.pdf). At least part of this difference can most likely be explained by a greater role for local groundwater inflows (and outflows) to the Lake than has previously been assumed, however additional studies are needed to confirm these and/or other factors.

[17] Nevada State Water Plan, Table 4-3 (http://water.nv.gov/Water%20Planning/wat-plan/pt1-sec4.pdf)

[18] "The most difficult problem yet to be addressed involves the proper identification of Decree, Flood and Storage diversions. The identification of these diversion types in the handwritten records has been inconsistent over the years, depending on the record keepers at the time. In some cases, correcting the data was relatively straightforward and the Division of Water Planning made these changes prior to entering the data into our database. However, there are numerous years for which the Division did not have the necessary information upon which to base any corrections. For these years, the data were entered as shown on the handwritten records. A considerable amount of work will be needed to adjust all of the data so that the 3 water types are properly segregated in the database. At this point, it is uncertain whether or not a proper segregation of the historic data is critical for future projects (such as modeling). For these reasons, the data presented in this report are aggregated total monthly diversions (total of Decree, Flood, Storage) with no breakdowns between the 3 water types." Pahl (2000b), page 8.

92,100 AF/year out of 231,000 AF/year) consisted of storage water (29%) or flood water (11%) diversions.

2.5 Groundwater Withdrawals

In addition to surface water diversions, groundwater withdrawals in the Smith and Mason Valleys have grown in importance since at least the 1960's, however annual pumpage reports were not complied by the State of Nevada until the mid-1990's and totalizing flow meters were not required on all wells until early 2000. Over the 11-year period 1994-2004, groundwater pumpage in these areas averaged more than 103,000 AF/year, ranging from a low of about 52,000 AF/year to a high of more than 155,000/year AF (**Table 2-F, Figure 2-3**).

It is important to note that both annual estimates of irrigated acreage and the amount of surface water diverted for irrigation purposes vary in proportion with the availability of surface water supplies, including stored waters when available; and that the inflow-acreage relationship in particular is complicated by the use of supplemental groundwater, which generally increases as available streamflows decrease. These relationships are discussed in detail by Tracy and Minor (2001), who used historic and estimated data to develop predictive relationships for future diversions and acres based on anticipated future streamflow conditions.

2.6 Water Rights and "Over-allocation"

Water rights in the Walker River basin are discussed in detail in **Section 3**. In general, however, they include a complex and intertwined mix of natural flow diversion rights adjudicated to individual users, ditch companies, and the Walker River Paiute Tribe under the Walker River Decree; decreed rights to storage at Bridgeport and Topaz Reservoirs, which were adjudicated to WRID and then allocated by the District to individual users within WRID boundaries to supplement decreed natural flow diversion rights *and* to bring "New Lands" (lands without decreed natural flow rights) into production; state-certificated groundwater rights (both primary and supplemental) in Nevada; overlying groundwater rights in California; flood, surplus, or "excess" waters allocated to individual users by the federal Water Master and/or appropriated by WRID through water rights certificates issued by the Nevada State Engineer; and state-certificated flood/surplus water rights issued to the Nevada Department of Wildlife on behalf of Walker Lake.

The total commitment (or potential demand) represented by the above collection of rights substantially exceeds available supplies in all but the wettest of years. For example, the sum of all adjudicated natural flow diversion rights under Decree C-125 *alone* represents a total maximum potential diversion demand of more than 720,000 AF/year; yet as noted above, the amount actually available for diversion, *including* return flows, averages only about 450,000 AF/year. From this comparison one might easily conclude that the basin's surface waters are overcommitted by about 38 percent on average. This tracks reasonably well with estimates provided by Sharpe et. al. (in review, 2007), who state that "only 84% of agricultural rights can be satisfied…during an average snowpack year (when snowpack equals 100% of normal);" and that "it requires a year of 130% of normal snowpack to provide enough water to satisfy the full allocation of water rights to farmers in the basin." Other estimates are even more sobering:

Meyers (2001), for example, states that "[i]t is not possible to quantify the amount of over-appropriation, but it is clear that to meet all water rights throughout the irrigation season would require at least four times as much runoff from the basin as is naturally available." Yet several additional factors should be noted.

First, most water rights in the Walker River system are based on the concept of prior appropriation, under which later (more junior) rights will only be satisfied to the extent that available supplies are sufficient to satisfy earlier (more senior) rights. Second, apart from priorities, actual demands for irrigation water will not be constant over the course of a week, a month, or an irrigation season, but instead will vary considerably depending on weather, crop needs, and many other factors. Actual demands are thus unlikely to reach their maximum potential values over time, and when necessary available supplies are administered "in priority" to ensure that supplies and demands remain in balance.

On the other hand, the mere existence of a water right – even a very junior right – can lead to unrealistic demands or expectations vis a vis the real capabilities of the system. There are, moreover, many additional demands and/or needs for water in the Walker River system that were not addressed by Decree C-125, yet the amount of water available to satisfy those needs remains comparatively fixed over time.[19] Finally, with minor exception, the ecological needs of Walker Lake, as well as the in-stream needs of the Walker River, its segments, and its tributaries, have been largely ignored when it comes to determining how much water is available to satisfy existing rights.[20] On balance, the fact that Walker Lake lost 5.35 *million* AF in volume over the 70-year period 1926-1995 suggests that, however qualified, the waters of the Walker basin are substantially over-allocated and only their partial re-capture, through voluntary or involuntary means, will address and resolve that problem over time.

[19] The regional effects of global climate change are expected to result in warming temperatures and reduced snowpack throughout the Sierra Nevada region. If, however, total precipitation remains unchanged or even increases, the implications for Walker Lake could be both beneficial (e.g., increased flood flows) and detrimental (e.g., increased groundwater pumping). While beyond the scope of this Study, these and other effects will be critically important to the future of the Lake and the entire Walker basin, and should be a top priority for research and analysis by the University of Nevada and others in the future.

[20] As discussed in Section 3, a certificated water right for 795.2 cfs "not to exceed" 575,870 AF/year was issued by the State of Nevada to the Nevada Department of Fish and Game (now NDOW) for use at Walker Lake in 1983, yet its very junior (1970) priority makes it of little use or value except as partial protection against even later appropriations by others. Also in the mid 1990's, reservoir operations under California licenses at Bridgeport and Topaz Lake were conditioned to ensure "full compliance" with Section 5937 of the California Fish and Game Code, including the maintenance of minimum storage pools and minimum in-stream flows immediately downstream of those dams.

3.0 Walker Lake

Walker Lake is one of only a handful of large, perennial, freshwater terminal lakes found in the arid high desert regions of the western United States.[21] Lying at the downstream end of the interstate (Nevada-California) Walker River, this contemporary remnant of ancient Lake Lahontan continues to decline from late-19th century conditions due to the cumulative effects of upstream diversions and depletions, primarily for irrigated agriculture.[22] **Figure 3-A,** from Carroll et. al. (2005), illustrates these effects by comparing actual and reconstructed Lake elevation and total dissolved solids (TDS) levels over for the period 1872-2001, i.e., both with (actual) and without (reconstructed) upstream irrigation diversions.[23]

Based on average annual recorded (residual) inflows of about 85,000 AF/year over the 50-year period 1918-68, Rush (1974) predicted that Walker Lake would continue to shrink in size, and grow in salinity, until a new equilibrium condition between reduced inflows and outflows (Lake surface evaporation) was achieved. At that point, the Lake's elevation would have declined to about 3,896 feet above mean sea level (AMSL), with a corresponding surface area of 25,000 acres, a volume of about 600,000 AF, and salinity levels of more than 50,000 mg/l.[24] About two decades later, Meyers (1997) predicted a 50-year decline to 840,000 AF at elevation 3904 AMSL and a depth of 25 feet "if current conditions are allowed to continue with no additional inflow."

As of March 7, 2007, Walker Lake's surface elevation had declined to about 3937.3 feet AMSL while total volume stood at 1,850,000 AF; and total dissolved solids (TDS) had increased to about 15,000 milligrams per liter (mg/l).[25] Persistent increases in TDS concentrations over time

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[21] While natural high-desert terminal lakes are both rare and ecologically unique, the Sierra Nevada/Great Basin interstate region includes Walker, Pyramid, and Summit Lakes in Nevada as well as Mono Lake in California. These lakes lie at the downstream ends of closed or "endorheic" basins, and have no natural outflows beyond evaporation.

[22] Milne (1987) concludes that the 1987 surface elevation of Walker Lake would have *exceeded* the 1908 elevation of 4078 feet had upstream irrigation not been developed. Meyers (1997) estimates that upstream irrigation has increased inflow salinity by about 12 times and decreased inflows to one-third of their 1882 value, and that it would take about 8,500 years to reach current salinity levels "naturally" (in the absence of upstream irrigation). Instead, over the past 123 years, the Lake's surface elevation has dropped more than 150 feet (from 1882 through April 2005); its volume has declined by more than 7.2 million AF; and its total dissolved solids concentration has increased from about 2,500 mg/l to more than 15,000 mg/l. See also Pahl (1994), and Sharpe et. al. (in review, spring 2007).

[23] According to Sharpe et. al. (in review, 2007), "[t]he paleo-environmental record indicates that the hydrology of Walker Lake changed dramatically over time, although the timing and duration of lake high- or low-stand events are not well defined. Past hydrology was influenced by climate and likely changes in the course of the Walker River. Walker Lake fluctuated from fresh and deep to very shallow and saline. Conflicting evidence exists as to if and when the lake completely desiccated…[however the] record over the last 30,000 years shows that many species enter and leave the lake ecosystem with regularity. This suggests that species die off when conditions are unfavorable and colonize when conditions are favorable."

[24] As summarized by Pahl (1994).

[25] USGS provisional data for Walker Lake elevation and volume on 3/7/07, site no. 10288500, Walker Lake near Hawthorne, Nevada (see http://waterdata.usgs.gov/nv/nwis/inventory/?site_no=10288500; and estimated TDS of

and corresponding reductions in oxygen levels have adversely affected the health, structure, and composition of the Lake's freshwater ecosystem. Species of particular concern include the federally-listed Lahontan cutthroat trout (LCT) and its principal food source, the native tui-chub, whose survival in the Lake is increasingly at risk as TDS levels approach the assumed critical threshold of 16,000 mg/l.[26] In addition to serving as important indicator species for the overall health of the Walker basin's aquatic freshwater environments, both LCT and tui chub constitute major food sources for fish-eating birds which migrate along the eastern flank of the Sierra Nevada, including the common loon and the American white pelican. Unless reversed, Walker Lake's ongoing decline will result in both localized and far ranging impacts.

3.1 How much water does Walker Lake need?

Numerous studies have attempted to quantify how much additional inflow Walker Lake might need to reach a more ecologically healthy, sustainable, and resilient equilibrium condition. The answer depends very much on how one defines such a condition, and upon a host of variables and uncertainties related to current and future "baseline" inflows as a function of hydrologic and climatic conditions; upstream demands for both surface water and groundwater; local groundwater inflows; and net evaporation demands.[27] In addition, of course, what the Lake ultimately needs will depend upon the efficiency and effectiveness of measures (such as acquisitions from willing sellers) that are undertaken to restore and protect Walker Lake, the Walker River, and the Walker River basin in the future. The following examples illustrate some of these challenges.

- In 1992, the California Department of Water Resources[28] estimated that "water right purchases sufficient to yield an average of 60,000 to 85,000 acre-feet per year at the lake would be needed to achieve the proposed management goal of maintaining the lake at close to or slightly above its present elevation."

- In 1993, the Nevada Division of Water Planning estimated average annual Lake-surface evaporation losses at approximately 155,000 AF/year, while inflows from all sources

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14,999 mg/l on 3/7/07 based on average results for 10 sites/samples analyzed by the Nevada State Health Laboratory (John Heggeness, personal communication, April 2007).

[26] Tracy (2001b) summarizes numerous findings related to LCT survival at various TDS levels, including laboratory experiments in which complete mortality resulted at 16,000-16,150 mg/l (pp. 26-28). Even sub-lethal TDS levels were found to cause negative physiological effects (e.g., kidney degeneration) and affected the survival of species upon which trout depend (e.g., zooplankton, tui chub). While Walker Lake differs from the laboratory in many ways (e.g., natural springs and seeps might provide some degree of refuge from average TDS levels), LCT populations in Walker Lake today are sustained by regular plantings of hatchery-reared stock due to deteriorating water quality conditions as well as insufficient river flows and physical barriers to migration associated with upstream water diversions throughout much of the Walker River system.

[27] USGS currently estimates that Lake surface evaporation rates are closer to 6.0 AF/acre than the 4.1 AF/acre assumed in most prior studies (http://nevada/usgs.gov/walker/presentations/PublicLands3-06.pdf). At least part of the difference can likely be explained by a greater role for local groundwater inflows (and outflows) to the Lake than has previously been assumed, however additional studies are needed to confirm these and/or other factors.

[28] Walker River Atlas, page 90.

(including the Walker River, Lake surface precipitation, local surface inflows, and groundwater) averaged about 122,000 AF/year, all over the period 1961-90. The resulting annual deficit averaged about 33,000 AF/year, i.e., what it would have taken to halt the Lake's ongoing decline during this period (but not enough to restore it to a higher, less saline level).

- Pahl (1994) describes a 1994 letter from the Nevada Department of Wildlife letter to the Walker Lake Working Group (Sevon 2/14/94) which concluded that an additional 29,000 to 48,000 AF per year would need to flow into Walker Lake to meet two different objectives: first, what it would take to sustain a 1994 elevation of 3,954 feet as "the lowest acceptable level at which Walker Lake could support a Lahontan cutthroat trout fishery;" and second, what it would take to sustain an elevation of 3,970 feet "to support a trophy trout fishery" as Walker Lake did in 1986.

- Public Resource Associates (1994) summarized an analysis undertaken by Myers (1994; see also Second Edition, 1997) which looked at both restoration and maintenance needs for Walker Lake based on then-current conditions (~2.2 million AF total volume, with "normal" or baseline inflows averaging about 90,000 AF/year) versus a return to conditions that existed back in 1983 (total volume 3.0 million AF) or 1953 (total volume 4.0 million AF). The analysis concluded that a return to 1983 conditions could be achieved by increasing "normal" inflows to the Lake by about 150,000 AF/year over an initial 8-year period, after which above-baseline flow increases of about 62,000 AF/year would suffice to maintain those conditions over time. (Alternatively, with increased inflows of 150,000 AF/year it would take ~19 years to reach the 1953 target volume, after which those increases could be reduced to maintenance levels of about 75,000 AF/year.) Simply maintaining Walker Lake at 1994 levels would require an additional 45,000 AF/year.[29]

A 1995 USGS study (Thomas 1995) estimated that additional inflows of about 47,000 acre-feet per year would be needed to stabilize Walker Lake around an elevation of 3,964 feet AMSL, representing an average TDS concentration of about 10,000 mg/l. This additional inflow requirement is consistent with estimates of evaporation (approximately 150,000 AF/year depending on Lake surface area) and inflow (104,000-107,000 AF/year) reported by Sharpe et. al. (in review, spring 2007).

- Grenier (2000) profiles several potential solutions based on the stated assumption that the "minimum additional flows needed [for Walker Lake] = 45,000 AF." While no reference is provided for this estimate, it matches the minimum cited in Meyers 1994 study (see discussion above). Grenier also makes clear that Walker Lake's needs must be considered in conjunction with, at a minimum, the unresolved water rights claims of the Walker River Paiute Tribe, including recognition of some 13,000 AF of rights to store water in Weber Reservoir and an additional 9,372 AF/year of junior "flood water" rights

[29] Meyers (1997, p. 32) notes that current figures for average inflow to the lake [~90,500 AF from all sources; p. 3] "are probably not correct" as they include several "back-to-back 100-year flows" which are unlikely to occur again. While "a meaningful estimate is impossible," his "educated guess" is that the current mean flow to the lake is closer to the mode of less than 50,000 af per year."

(i.e., 26.25 cfs with a 1933 priority in addition to the Tribe's "priority one" water right under the Walker River decree for 26.25 cfs with an 1859 priority, both over a 180-day irrigation season).[30] She goes on to note that "[t]he Tribe is asking for water rights for 10,000 acres of land;" this would equate to approximately 45,000 AF/year based on the effective duties implied by the Tribe's decreed "priority one" diversion rights.[31]

- In 2000, the Nevada Division of Water Planning (Pahl 2000a) developed and published an average annual surface water budget for the Walker River basin covering the period 1926-1995. Their analysis suggested that net outflows from Walker Lake (primarily from lake-surface evaporation) exceeded net inflows by an annual average of approximately 76,400 AF (i.e., a deficit of 5.35 million acre feet over the 70-year period).[32] While the average deficit of 76,400 AF/year probably exceeds the amount that would be needed to restore Walker Lake to something less than its 1926 condition (depending on future hydrologic conditions and numerous other factors), it is indicative of the fundamental disequilibrium between inflows and outflows that persists for Walker Lake today.

- Late in 2001, the U.S. Bureau of Land Management completed work on an Administrative Draft Environmental Impact Statement (ADEIS) which evaluated a number of strategies for increasing inflows to Walker Lake. While the ADEIS is not available for public review,[33] several associated studies provide valuable insights. Tracy et. al. (2001b) describe the "purpose and needs" of the ADEIS to include "obtaining water and water rights from willing sellers to: (a) assure that the lake reaches a level where the long-term average TDS concentration is approximately 10,000 mg/l; (2) use for a possible settlement of the United States water rights claims[34] in a negotiated settlement; and (3) provide sufficient instream flow in the Walker River to establish a self-sustaining population of Lahontan cutthroat trout in Walker Lake." Their assessment goes on to state that "the increase in stream flow required to stabilize Walker Lake at an elevation of 3964 feet AMSL" – presumably the long-term average Lake level needed to meet objective (1) above for Walker Lake – "is estimated to be 50,000 acre-feet/year."

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[30] These figures are reportedly based on the California-Nevada Interstate Compact for the Walker River Basin, which was never ratified by Congress.

[31] Grenier indicates that the Tribe might be willing to accept a monetary settlement in lieu of water (at least in part), however "the amount cannot be determined without first determining the PIA" (Practicably Irrigable Acres) associated with those acres. (A PIA determination is generally used to quantify water rights claims on lands reserved by the federal government for Indian Trust purposes.)

[32] See **Table 2-C**. As discussed in that section, these estimates ignore the potential contributions of localized surface and groundwater inflows, which together are estimated to contribute another ~15,000 AF/year to total Walker Lake inflows.

[33] The ADEIS was "suspended" around the end of 2001 prior to the initiation of mediated settlement talks, which began in 2002 and concluded in 2006, but has never been released for public review. (Dan Jacquet, BLM Community Liason, personal communication, December 2006)

[34] The United States' claims are primarily on behalf of the Walker River Paiute Tribe but also include the Bridgeport Paiute Indian Colony, the Yerington Paiute Tribe, and other federal assets and interests; see **Appendix E** and related profiles in Sharpe et. al. (in review, spring 2007).

The ADEIS reportedly adopts this 50,000 AF/year objective as the minimum amount of additional water needed (above existing average inflows) to meet the above-stated purposes and needs.[35]

- Finally, a 2005 analysis undertaken by the Desert Research Institute[36] finds that approximately 99,100 AF of "senior" water rights would need to be acquired from willing sellers and transferred to Walker Lake in order to meet a long-term average TDS objective of 10,000 mg/l *and* to ensure that maximum TDS concentrations remained below a 16,000 mg/l threshold.[37] (**Figure 3-B**) DRI's analysis includes two additional scenarios – acquisition of a comparable quantity of "junior" water rights, and acquisition of a 50-50 mix of junior and senior rights – but neither succeeds in keeping TDS levels below the 16,000 mg/l threshold over time. On balance, these results suggest that inflows to Walker Lake will need to increase by more than 50,000 AF/year on average, and that accomplishing this will require the acquisition (from willing sellers) of approximately twice that amount of water rights (i.e., a composite reduction of approximately 100,000 AF in baseline surface water diversions and groundwater pumping).[38]

Considering all the above, meeting Walker Lake's needs will clearly be sensitive to future hydrologic conditions, just as differences in hydrology in the past have had markedly different effects on both Lake levels and salinity (e.g., high runoff years in the 1980's and 1990's led to temporary but significant improvements in TDS levels during those years). Nevertheless, with

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[35] Saxon Sharpe, personal communication, January 2005. Implicit in this "minimum" objective is the assumption that all stated purposes and needs can be satisfied through delivery of an additional 50,000 AF/year to Walker Lake in conjunction with other settlement components (e.g., economic development funds, riparian habitat restoration, etc.). The ADEIS reportedly also looks at a "50+50" (or 100,000 AF/year) combined inflow/delivery objective in the event that "wet water" is needed to meet other settlement needs beyond the minimum additional inflows required for Walker Lake.

[36] Carroll et. al., September 2005. The analysis used DRI's Walker Basin Systems Model (WBSM) to evaluate anticipated changes to Walker Lake inflows, elevation, storage, and TDS concentrations over an 88-year simulation period (2000-2087). Initial conditions were based on actual conditions as of the end of 1998, and future hydrology was assumed to mimic historic hydrology over the years 1923-2003. DRI was in the process of updating this analysis towards the end of 2006 to account for (a) increased initial TDS levels at Walker Lake and (b) the authority provided by section 208(a) of P.L. 103-109 which currently limits acquisitions (from willing sellers) of water and related interests by the University of Nevada to water use areas "in the Walker River Basin, Nevada."

[37] The WBSM model utilizes a "composite" proxy for water rights in each major water use area that is based on historic surface water diversions (all types) and groundwater pumping as a function of historic hydrology (i.e., surface water diversions tend to increase, and groundwater use tends to decrease, as headwater inflows increase). In these simulations, composite diversions vary from as little as 295,500 AF/year (dominated by groundwater) to a high of 399,500 AF/year (dominated by surface water), and average approximately 359,100 AF/year. "Senior" water rights are classified as those rights associated with "dry year" agriculture, i.e., lands that remain irrigated and in production even when surface supplies are scarce; and once acquired, the consumptive use portion of senior rights is assumed to be transferable directly to the Wabuska gage. See Langsdale (2001) and Tracy (2001b) for details.

[38] A subsequent DRI analysis (June 2006) looked at potential acquisition increments of 10,000 AF and found that, depending on priorities, anywhere from 48-57% of the water rights acquired (based on historic irrigation diversions) would be "lost" to some combination of consumptive use or other "change of use" limitations, downstream diversions, and both stream channel and groundwater losses.

TDS levels approaching 16,000 mg/l today, and with long-term trends unabated, it is surely unwise to assume that hydrology alone can or will keep Walker Lake out of trouble.

Accordingly, an ideal set of objectives for restoring and protecting Walker Lake would include (a) an initial "improvement" period that features substantial increases in *annual* inflows over and above current baseline levels for a specified number of years (e.g., 75,000 AF/year over an initial 15-year improvement period);[39] and (b) a long-term sustainable "maintenance level" increase in average surface water inflows of *at least* 50,000 AF/year, representing total surface and groundwater inflows of approximately 150,000 AF/year *in perpetuity*. (Even then it could well take 50 years or more for TDS levels to return to 10,000-12,000 mg/l on a long-term sustainable basis.)

Based on the DRI model results reported above, a long-term increased inflow objective of 50,000 AF/year would require acquisition of approximately 99,100 AF/year (or about 28%) of average annual surface and groundwater diversions (as modeled) depending on the "efficiency" with which water can actually be acquired, transferred, and conveyed to Walker Lake.[40] These are, we believe, ambitious but achievable objectives for protecting and restoring Walker Lake, and for doing so in ways that will help the Walker River while addressing a host of community and settlement-related needs, *provided* that acquisition efforts are initiated soon and are structured and implemented in ways that maximize individual choice, programmatic flexibility, and creative opportunities for all.[41] **Section 7** discusses these and related factors in building towards an overall acquisition framework.

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[39] Sharpe et. al. (in review, 2007, page 20) describe average baseline inflows of approximately 104,000-107,000 AF/year, including (a) Walker River stream flows of 76,000 AF/year over the period 1939-1993, (b) local surface water inflows of about 3,000 AF/year, (c) estimated local groundwater inflows of 11,000 AF/year, and (d) surface precipitation of 14,000-17,000 AF/year depending on Lake surface area. Meyers (1997) uses a comparable baseline and recommends an 8-year improvement period involving 150,000 AF/year of additional Walker Lake inflows; our example assumes approximately half that amount each year, on average, over twice as many years.

[40] See also **Section 6**, which presents similar findings from the final report of the Walker River Basin Advisory Committee (2000) relating to overall acquisition efficiency (i.e., expected increases in inflows vs. the amount of water, or water rights, acquired). Other things being equal, we would expect this "efficiency" to increase with the amount of water acquired, however we are unaware of any studies which might assess this factor.

[41] For example, the Palo Verde Irrigation District's long-term rotational land fallowing program (described in **Appendix F**) anticipates the annual fallowing of up to 29% of the total District acreage in any year.

4.0 Water Rights Overview

There are four main types of water rights in the Walker River system: federally-decreed natural flow direct diversion rights; federally-decreed and state-licensed surface storage rights which have been allocated to individual lands by the Walker River Irrigation District; state-certificated flood rights and/or federal allocations of excess water; and state-issued groundwater rights.[42]

4.1 Decreed Natural Flow Direct Diversion Rights

The oldest water rights in the Walker River system are for the direct diversion of the natural flows (including return flows) of the Walker River and its tributaries as set forth in Decree C-125, the federal Walker River Decree. Issued initially in 1919 as Decree 731 and then re-adjudicated by the federal District Court in 1936, Decree C-125 was issued in final amended form in 1940. The Decree identifies the specific rights of individual users and companies and includes the following information for each individual right:

- The owner(s) of record as of 1936;
- The name of the stream from which water is diverted;
- The priority date indicating when irrigation was first established (1859 to 1930's applications);
- The amount of water in cubic feet per second (CFS) to which the owner is entitled at the point of diversion from the natural stream course;
- The number of irrigated (water righted) acres; and
- A legal description (by alloquent parts or land patent) of the land "to which the appropriated waters have been conducted or applied to a beneficial use" (Decree C-125, page 11).

It should be noted that, where the legally-described acreage is larger than the number of acres irrigated (as is typically the case), the Decree makes clear that "the land to be irrigated…is understood [to be] the number of acres specifically set forth under the heading 'No. of acres irrigated'." (Decree C-125, Paragraph II.) **Appendix E** includes some additional discussion on this issue.

[42] Meyers (2001, Table 12) catalogues more than 112 cfs of "tailwater rights" including approximately 70 cfs in the Artesia Basin portion of Smith Valley, 43 cfs elsewhere in Smith Valley, and 10 cfs in Mason Valley. These rights are described as "rights to water downstream from various ditches that are administered by the Nevada State Engineer rather than the federal Water Master" and "may depend on return flows from fields that do not return to the Walker River." Curiously, neither WRID nor the federal Water Master would confirm the existence of these rights (Ken Spooner and Jim Shaw, personal communication, January 2007). Other types of water rights which are not generally transferable include spring rights, geothermal rights, non-consumptive rights for mining and milling (e.g., gravel washing operations), stock water rights, and domestic use rights.

The final amended Decree designates three irrigation seasons in the Walker River basin during which natural flow rights may be exercised. For upstream users in the Bridgeport Valley (East Walker) and above Antelope Valley (West Walker above Coleville), the decreed irrigation season lasts from March 1 through September 15, or 199 days. For downstream users on the Walker River Indian Reservation, the decreed irrigation season lasts for a total of 180 consecutive days. For everyone else -- i.e., for users on the East Walker below Bridgeport Dam, and in the Antelope, Smith and Mason Valleys – the decreed irrigation season lasts from March 1 through October 31, or 245 days.[43] Reasonable flows are also supplied to adjudicated rights holders for domestic and stock-watering purposes during the non-irrigation season.[44]

Under the Decree, natural flow diversion rights were generally based upon maximum diversion rates of either 1.2 or 1.6 CFS per 100 irrigated acres over the specified irrigation season.[45] While these rights are expressed as rates of flow (CFS) per irrigated acre at the point of diversion rather than as volume (AF) per acre at the farm headgate, the term "duty" is, in fact, used in a variety of documents including the Decree itself, the U.S. Board of Water Commissioner's 1953 Rules and Regulations, the Walker River Irrigation District's water rights ledger cards, and groundwater permits issued by the Nevada State Engineer.

Decree C-125 is administered by the United States Board of Water Commissioners (USBWC), a six-person board appointed by the federal District Court "to act as a water master or board of commissioners to apportion and distribute the waters of the Walker River, its forks and tributaries in the State of Nevada and the State of California."[46] The Chief Deputy Water Commissioner serves as federal Water Master and oversees daily operation of the system in accordance with the Decree; he has the following principal responsibilities:

- Determining the daily water right priority to be served based on anticipated inflows, anticipated return flows (from prior upstream diversions), and daily diversion demands;

- Regulating the diversion of water from the Walker River stream system at all points of diversion,[47] including coordination with river riders (under his employ), ditch riders

[43] While a longer decreed irrigation season makes sense for downstream (warmer) use areas, it is not clear why the lowest (warmest) water use area in the basin ended up with the shortest decreed irrigation season.

[44] The Decree, pp. 63B-64, states expressly that "water shall not be stored in [Bridgeport or Topaz Lake Reservoirs] so as to deprive the parties…of stock water or water for domestic purposes." According to the federal water master, any landowner with decreed water rights who also owns livestock has stock water rights under the decree, however those rights only exist during the non-irrigation season. (During the irrigation season, stock water needs must be satisfied from decreed natural flow rights or other sources.) Jim Shaw, personal communication, January 2007.

[45] These duties can be inferred from the Decree but are generally confirmed in the U.S. Board of Water Commissioner's 1953 "Rules and Regulations for the Distribution of Water of the Walker River Stream System Under the Provisions of Paragraph 15 of Decree in Equity, No. C-125." The comparable duty for the natural flow diversion rights of the Walker River Paiute Tribe is 1.25 cfs per 100 irrigated acres.

[46] United States Board of Water Commissioners 1996, Section 1.1(n)

[47] The federal water master's administrative jurisdiction ends at the point of diversion from the natural stream system; accordingly, he administers diversions based on the associated diversion rights but apparently without

(working for individual ditches), the Walker River Irrigation District, and/or individual water users;

- Determining and controlling inflows to and discharges from Bridgeport and Topaz Lake Reservoirs in accordance with the Decree and California license conditions;
- Monitoring river flows and reservoir storage levels; and
- Maintaining records of all decreed water rights, including any changes to those rights as to ownership, point of diversion, or manner or place of use.

The USBWC's *1953 Rules and Regulations for the Distribution of Water* provide the basic guidelines for water distribution under Decree C-125 and divide the Walker River basin into six administrative divisions for that purpose. **Plate 4-I** includes the legally-described places of use for all natural flow water rights adjudicated by Decree C-125, as well as the boundaries of the USBWC's six administrative divisions.

Table 4-A, derived from Pahl (September 1999), provides a summary of decreed natural flow diversion rights for the principal sub-areas of the Walker River basin. Based on this compilation and subject to available supplies, actual demands, and the daily designation of priorities, up to 1,575 CFS of natural flows could potentially be diverted at any time during the decreed irrigation to serve up to 110,852 decreed acres of irrigated land.[48] Taken at face value, these decreed natural flow rights thus represent a maximum *potential* (or theoretical) diversion of more than 720,000 AF/year; yet from 1931 to 1995, recorded diversions from *all* surface sources including natural flows, storage water, and flood waters averaged less than 350,000 AF/year, with maximum annual diversions approaching 500,000 AF/year in only nine out of 65 years.[49]

4.2 Surface Storage Rights

Decree C-125 also designates surface storage rights for the Walker River system. Primary among these are storage rights for Bridgeport and Topaz Lake Reservoirs, which were adjudicated to the Walker River Irrigation District.[50] Specifically, Decree C-125 provides for the diversion of up to 42,000 AF for storage at Bridgeport Reservoir during the non-irrigation season (November 1 through the end of February), plus up to 15,000 AF of additional "refill rights" at

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regard to their subsequent conveyance or ultimate place of use. See **Appendix E** for additional discussion on this issue.

[48] The 2005 Budget Statements of the U.S. Board of Water Commissioners (for the year ending June 30, 2006) use *132,232 acres* as the "basis" for annual assessments. We have not been able to determine what accounts for the 21,380-acre difference between this figure and the acreage total derived by Pahl.

[49] Based on Pahl (January 2000, Table 4) but including 50,000 AF/year for the Bridgeport Valley (per Pahl 2000(a)) and an average of 15,000 AF/year within the Walker River Indian Reservation (based on recorded diversion data for the period 1998-2006).

[50] Weber Reservoir, the other major storage reservoir in the system, was constructed by the U.S. Bureau of Indian Affairs as part of the Walker River Indian Irrigation Project. Completed in 1937, the Reservoir does not have recognized storage rights under Decree C-125.

any time that there is sufficient water to serve all other decreed rights, including domestic and stock watering uses. At Topaz Lake Reservoir, the Decree provides for the diversion of up to 50,000 AF for storage during the non-irrigation season, plus up to 35,000 AF of additional "refill rights" at any time under the same conditions as above. These rights were also incorporated into and/or conditioned by licenses issued by the California State Water Resources Control Board.[51]

The storage rights adjudicated to WRID under Decree C-125 were subsequently distributed by the District to lands within its boundaries, which are illustrated in **Plate 4-II** below.[52] This was done for two basic classes of lands. First, all lands with decreed natural flow diversion rights with priorities of 1874 or later received an "original apportionment"[53] which sought to equalize diversion "duties" for the sum of natural flows plus storage at up to 3.21 or 4.28 AF/acre (i.e., 1.2 or 1.6 CFS per 100 acres over a 135-day diversion period).[54] According to WRID data, these supplemental storage rights included approximately 28,930 acres as of October 2000. (Lands with natural flow priorities of 1873 or earlier – approximately 16,490 acres within District boundaries – do not receive any supplemental storage water.)

The second class of allocated storage rights went to lands *without* decreed natural flow diversion rights. For these lands, a "primary" (non-supplemental) storage duty of up to 1.54 or 2.06 AF/acre was used based on the above diversion rates but limited to a 65-day diversion period. These "New Land" allocations are assumed to provide less than half of the water needed to support conventional irrigation demands, and thus are used either for non-conventional purposes or are supplemented by groundwater or by "flood" or "excess" water when available (see below). According to WRID data, approximately 34,370 acres of New Lands have primary storage allocations as of 2000.[55]

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[51] SWRCB permits were actually incorporated into the Decree; see Appendix C, footnotes 2 and 3, for California storage license details.

[52] "Said Walker River Irrigation District may distribute such water so stored in said reservoirs to the lands in the District entitled thereto, in accordance with their respective rights." Decree C-125, paragraph VIII, page 65.

[53] Ken Spooner, WRID general manager, personal communication, February 2006. Throughout this report, the terms *apportioned*, *distributed*, and *allocated* are all used to describe the same essential function: WRID's post-decree allocation (or apportionment, or distribution) of decreed storage rights to lands within its boundaries.

[54] According to a 1933 study of the Walker River Irrigation District, "[r]eservoir water [was] apportioned to lands to fill out a fixed duty per acre, after deducting that portion of the duty supplied by the natural stream flow. *** District benefits were [then] assessed in proportion to the assumed amount of storage water required above river flow to fill out a stated water duty. Two duties were set, i.e., 3.2076 acre feet per acre for low lands and 4.2768 acre feet per acre for high lands. The average delivery for each year of [priority under] the decree was then estimated. The storage requirement was determined by subtracting from the stated duty the estimated amount which would be received from river flow." (University of Nevada 1933, pp 5 and 27) While the 135-day figure is not discussed, it can be calculated directly by comparing the above-stated duties to the decreed diversion rates of 0.012 and 0.016 CFS per acre. The above-stated duties also appear on "provisional" water rights ledger cards issued by WRID to individual landowners. See **Appendix C** for further discussion on these issues.

[55] The "original apportionment" of storage rights included more than 30,000 additional New Land acres; these were "stripped" in the early 1930's following WRID's default on reservoir construction bonds and as a condition for a federal Reconstruction Finance Corporation loan. For a concise history, see Public Resource Associates (1994), pp. 12-15; for additional background, see University of Nevada (1933).

Tables 4-B and **4-C** provide different but similar summaries of water righted acres within WRID boundaries disaggregated by type and sub-area (both tables) and by major diversion ditch (Table 4-C only).

Based on research conducted as part of this Study, it appears that WRID's post-decree allocation of decreed storage rights is actually an ongoing (annual) process, at least where New Lands are involved. Moreover, what many consider to be individually-owned property rights are probably better thought of as a kind of "revocable license," with the actual storage rights retained by WRID in the reservoirs in which they were adjudicated. This could have important implications for the acquisition and transfer of New Land storage rights in particular, and is discussed in more detail in **Sections 5-7** as well as **Appendix E**. In any event, according to Meyers (2001), diversions of storage water (both types) averaged nearly 66,000 AF/year over the period 1931-1995.

4.3 Flood Water Rights/Allocations

In the vernacular of the Walker basin, "flood waters" exist not only during periods of actual flooding but at "any time during the irrigation season when flows exceed demand." (Advisory Committee report, page 6-17) The USBWC's 1953 *Rules and Regulations* provide for these waters to be distributed as follows:

> "If at any time the Chief Deputy Water Commissioner determines that there is more water available in the stream than is required to fill the rights of all of the vested users including the rights of the Walker River Irrigation District and others similarly situated to store water, then he shall prorate the *excess water* (emphasis added) to all users in proportion to the rights already established."

According to information developed by Meyers (2001), diversions of "flood water" between 1931 and 1995 averaged more than 26,000 AF/year. We suspect, but have not been able to confirm, that the vast majority of these diversions went to New Lands, either directly or indirectly (through increased diversions into storage), because "excess water" does not exist, by definition, unless the rights of all vested users, including those with allocated supplemental storage rights, have been satisfied.

In 1976 the Nevada State Engineer issued two certificates of appropriation to WRID for the diversion of flood or surplus water. These state-recognized diversion rights appear to involve the same "excess water" as is described in the USBWC's 1953 *Rules and Regulations*.[56] They include (a) 491.2 CFS with a 1919 priority not to exceed 89,612 AF per season (i.e., May 1 to July 31) from the West Walker River at the California-Nevada state line for the irrigation of up to 38,617 acres of land;[57] and (b) 349.1 CFS with a 1969 priority not to exceed 63,688 AF per season (again May 1 to July 31) from the East and Main Walker Rivers for the irrigation of up to

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[56] **Appendix E** includes excerpts from WRID's testimony in hearings before the Nevada State Engineer which make this point directly.

[57] Permit 5528 and Certificate 8859, issued October 15, 1976

35,000 acres.[58] **Plate 4-III** illustrates the permitted areas of use. While both certificates were issued "with the understanding that the total duty of water shall not exceed 4.0 acre-feet per/acre/season from any and/or all sources," neither the Decree nor the 1953 *Rules and Regulations* have been modified accordingly; yet the federal Water Master administers the system today in accordance with these certificates.[59]

A third certificate of appropriation for flood waters was issued by the Nevada State Engineer to the Nevada Division of Wildlife (NDOW) in 1983. This permit was issued for 795.2 CFS with a 1970 priority "but not to exceed 575,870 acre feet per annum" (i.e., January 1 to December 31) for use at Walker Lake "to help maintain the lake at a stable level to support public use for recreation and improve water quality and quantity to sustain and help prevent the loss of the fishery in Walker Lake."[60] This appropriation was subject not only to existing rights but to future appropriations for municipal or industrial (M&I) purposes. Its late priority and junior status vis a vis both state-issued WRID certificates above suggests that it's principal value may be in its confirmation under Nevada law that water which flows to Walker Lake constitutes a beneficial use of water, and/or in preventing the subsequent appropriation of additional flood waters for non-M&I purposes.

4.4 Groundwater Rights

Groundwater plays an important role in the Smith and Mason Valleys, where it is used both as a primary source of supply and to supplement other supplies that are limited by priority or right (e.g., comparatively junior natural flow rights, primary storage allocations). In recent years groundwater has also played an important role in the pre-irrigation of higher-valued onion and garlic crops. Finally, groundwater rights have become an important part of Lyon County's "will serve" water rights dedication process for residential, municipal, and industrial development purposes.

In the Nevada portion of the Walker River basin, groundwater rights are administered by the Nevada State Engineer in accordance with the doctrine of prior appropriation (first in time, first in right); except for small domestic wells, which may use up to 1,800 gallons per day without a permit, groundwater cannot be extracted for use without a state-issued permit or certificate. These certificates may be issued for either primary or supplemental uses, but are generally limited to a combined or "co-mingled" water duty of 4.0 AF/acre per season from all sources. Curiously, neither WRID nor the federal Water Master ensures compliance with this "total duty" limitation – that, they indicate, remains the State Engineer's responsibility.[61]

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[58] Permit 25017 and Certificate 8860, issued October 15, 1976

[59] Jim Shaw, personal communication, January 2007. Mr. Shaw indicated that he generally defers to WRID for the distribution of surplus water due to the existence of these state-issued certificates.

[60] Permit 25792 and Certificate 10860, issued December 28, 1983. According to press accounts, the figure of 575,870 acre-feet was based on estimated inflows to the Lake during the very wet winters of 1982-83. (*Walker Lake is guaranteed surplus water*, by Helen McInnis, Mason Valley News, ~December 1983)

Groundwater basins in Smith and Mason Valleys, the Whiskey Flat-Hawthorne (Walker Lake) area, and the Nevada portion of the Antelope Valley have all been "designated" by the Nevada State Engineer and are closed to further appropriation for irrigation purposes.[62] These and other groundwater basin boundaries are illustrated in **Plate 4-IV**.

In the California portion of the basin, no comparable state-issued permits or certificates are required. In general, under California law, an overlying landowner's groundwater use is limited only by the amounts reasonably necessary for beneficial use. As discussed further in **Section 5**, these "overlying rights" to groundwater could have important implications for any future water acquisitions from the Bridgeport or Antelope Valleys.

Groundwater rights in the Walker Lake basin are dominated by irrigation uses in the Smith and Mason Valleys but also include commercial, domestic, industrial, mining & milling, municipal, recreation, stock water, and "other" uses. Table 6.7 of the Walker River Basin Advisory Committee Report, derived from the Nevada Division of Water Resources water rights database as of August 1999, indicates that the "face value" of irrigation uses accounted for 202,623 AF (or roughly 80 percent) of the 253,046 AF of total committed groundwater rights in the Nevada portion of the basin. Pahl (June 1999, Table 3) reports a slightly higher annual groundwater "duty" of 210,485 AF for irrigation uses in Nevada as of April 1995, plus an additional 3,240 AF in California (Antelope Valley and above; data source unknown). Both reports acknowledge that these totals include both primary and supplemental rights,[63] and that actual usage is likely to be significantly less than the committed total in any particular year. The Nevada State Engineer's office estimates that actual groundwater withdrawals in the Smith and Mason Valleys averaged 103,200 AF/year over the period 1994-2004, ranging from a low of 51,800 AF in 1995 to a high of 147,300 AF in 2001 and again in 2002. (**Table 2-D** and **Figure 2-2** in **Section 2** provide year-to-year summaries for each valley.)

4.5 Decree C-125: A Comprehensive Adjudication?

Decree C-125 would appear to represent a comprehensive adjudication of the waters of the Walker River stream system, at least among the many parties to the underlying litigation (United

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[61] Ken Spooner and Jim Shaw, personal communication, January 2007. This has resulted in a situation where at least three entities – the Nevada State Engineer, the Federal water master, and WRID -- have overlapping responsibilities for the same basic resource, yet no single entity has responsibility for ensuring that it is managed and administered in a comprehensive or even coordinated manner. Moreover, while groundwater pumps in the basin are now comprehensively metered, and while groundwater withdrawals are monitored "after the fact" approximately twice per year (Tom Gallagher, personal communication, July 2006), the Nevada State Engineer still does not have access to the required surface water diversion data that would make comprehensive surface and ground water monitoring (let alone administration) possible on a regular, real-time basis.

[62] <u>See</u> Orders 823, 1125, 1126, and 1178 of the Nevada State Engineer.

[63] Meyers (2001a, page 44) notes that "[t]here are many potential problems associated with the determination of whether a well is supplemental as well as the permitted acreage and duty. This is because many original permits (and certificates) have been abrogated. In some cases many permits now exist where one originally existed. The certificated rights may have changed. In some cases, several permits have summed acreage which together they may not exceed. In other cases, one permit may be partially full and partially supplemental. The type of notation on the permits or certificates has [also] changed with time."

States vs. Walker River Irrigation District et. al.). For example, Paragraph XI states plainly that "[e]ach and every party to this suit…is forever enjoined and restrained from claiming any rights in or to the waters of the Walker River and/or its branches and/or its tributaries, except the rights set up and specified in this decree…" As discussed further in **Appendix E**, this language would appear to cast a shadow over the two certificates of appropriation for surplus waters issued by the Nevada State Engineer to WRID in 1976, and potentially over any state-issued groundwater rights which are derived, directly or indirectly, from the basin's surface waters. At the same time, it must be acknowledged that Decree C-125 fails to address a number of important issues, including the following:[64]

- Although it adjudicates water rights in both Nevada and California, Decree C-125 is not an interstate allocation of the waters of the Walker River because neither state was a party to the Decree;

- It does not address groundwater use, the physical interconnections between ground and surface waters, nor rights perfected under state law by persons who are not successors in interest to parties holding rights under the Decree;

- No provision was made for storage rights in Weber Reservoir on the Walker River Indian Reservation even though that Reservoir had been completed by the time the final Decree (including modifications to the Tribe's adjudicated rights) was issued in 1940;

- Decree C-125 does not address any lands below the Walker River Indian Reservation, hence surface water use in the Hawthorne area (such as Cottonwood Creek M&I use) is not covered;

- It does not provide any details concerning how storage water in Bridgeport or Topaz Lake Reservoirs are to be distributed, apart from specifying that they may be distributed by WRID "to the lands in the District entitled thereto, in accordance with their respective rights" (paragraph X, page 65); and

- Finally, as was common during that era, the Decree includes no provisions for the protection of instream beneficial uses anywhere in the basin, including Walker Lake, the Walker River, and its branches and tributaries.

Taken together, the above uncertainties and shortcomings have contributed to Walker Lake's steady decline, and in recent years have given rise to renewed litigation (and associated mediation efforts, now failed) by and on behalf of the Walker River Paiute Tribe as well as Walker Lake and other basin interests. While acquisitions from willing sellers will be critical to resolving these problems outside the courtroom, they will remain a challenge for all concerned unless and until a more comprehensive settlement of these and other issues can be reached.[65]

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[64] Adapted from Pahl (September 1999) and California Department of Water Resources (1992)

[65] Many of these issues were addressed in the Walker River section (Article VII) of the California-Nevada Interstate Compact, which was enacted by the California and Nevada legislatures in 1970-1971 but never ratified by the United States Congress. (See Department of Water Resources (1992), pages 67-70 and Appendix 1.)

5.0 Changes to Existing Rights

This section summarizes the principal requirements under state and federal law for proposed changes in the place, manner, and/or purpose of use (and/or diversion) of established water rights in the Walker Lake basin, with particular focus on transfers to the lower Walker River and Walker Lake. **Appendix D** (History of Water Right Transfers) and **Appendix E** (Legal Analysis of Water Rights and Transfers) provide numerous additional details on many of the issues discussed.

5.1 Overview

The substantive and procedural requirements for changing the manner, place, and/or purpose of diversion and/or use of established water rights in the Walker Lake basin will depend on the specific type of right proposed for transfer as well as its existing and proposed place of diversion and/or use. Thus, for example, proposed transfers of decreed natural flow rights will generally be governed by the adopted rules and regulations of the U.S. Board of Water Commissioners under Decree C-125, with initial deference to the laws and procedures of the State in which the existing use occurs; proposed transfers of allocated storage rights to new locations *within* WRID boundaries will be governed by the adopted rules and regulations of the District; and proposed transfers of state-permitted groundwater rights in Nevada will be governed by the specific change requirements of Nevada water law.

It should be noted that there is very little experience in the Basin with proposed transfers to environmental purposes generally, and to Walker Lake and the lower Walker River in particular. We have, as such, drawn on past experience with more conventional transfers as well as experience beyond the Basin in order to infer, where possible, what rules are likely to apply to transfers to Walker Lake in the future. Ultimately, however, only the sustained pursuit of individual proposals will, with time, clarify many of the uncertainties discussed below.

5.2 Decreed Natural Flow Rights

The federal District Court retains jurisdiction over all changes or modifications to Decree C-125, including changes to the rights adjudicated thereby. In 1996, *Administrative Rules and Regulations* were finalized by the Court on behalf of the United States Board of Water Commissioners (USBWC) and established formal requirements for such changes "with certain exceptions."[66] These exceptions are for (a) changes sought to be made for the Walker River Indian Reservation to a point or points above the Reservation boundaries; (b) changes that are entirely within the boundaries of the Reservation; and (c) changes involving storage waters adjudicated to WRID which are entirely within the boundaries of the District (see below).

[66] The 1996 *Rules and Regulations* clarify the terms, conditions, and procedures by which parties to the Walker River Decree, with certain exceptions, "shall be entitled to change the manner, means, place, or purpose of use or the point of diversion of [waters of the Walker River] or any thereof in the manner provided by law, so far as they may do so without injury to the rights of other parties hereto, as the same are fixed hereby." *Preface*, page 1, quoting from paragraph X of the Walker River Decree.

Apart from these exceptions, the 1996 *Rules and Regulations* set forth the basic requirements for seeking changes to rights adjudicated by the Decree, including requirements for filing (Article III), notice (Article IV), agency proceedings (Article V), agency decisions (Article VI), judicial review (Article VII), trial de novo (Article VIII), and intervention (Article IX). Highlights include the following:

- Applicants within the State of Nevada must file change applications initially with the Nevada State Engineer, and applicants within the State of California must file change applications initially with the California State Water Resources Control Board (SWRCB), in each case on such forms and in such a manner as may be required by those agencies;[67]

- Notice of change applications submitted in proper form must be published within 90 days of filing a total of 5 times over 4 consecutive weeks in a newspaper of general circulation in the county where the change is to occur; in Mono County, California, Douglas County, Nevada, and Lyon County, Nevada; and as otherwise may be required by the law of the state where the change is to occur;

- Copies of change applications must be forwarded to the USBWC, the agency of the other state, the U.S. District Attorney for the District of Nevada, the Walker River Paiute Tribe, the Nevada Department of Wildlife, and any person holding a water right adjudicated under the Walker River Decree who has filed a written request for special notice of all change applications pursuant to the 1996 *Rules and Regulations;*

- Each change application must include the date of filing; name and address of applicant; name of the affected water source; location of the existing (present) and new (proposed) point of diversion, place of use, and manner of use; the quantity of water involved; the purpose for which the application has been filed; and such other information as may be necessary to permit a complete understanding of the proposed change;

- Except as otherwise provided, all proceedings before an agency with respect to a change application must be in accordance with the practice and procedures of that agency; protests may be filed in accordance with Nevada or California law; and the agency must prepare a full and complete administrative record, a copy of which must be filed with the agency of the other state and with the USBWC;

- The USBWC may participate as a party in all such proceedings, and in any case must provide the relevant state agency with its comments and recommendations in timely fashion;

- The responsible state agency must approve or reject a change application within one year after the date of initial filing, but may postpone its decision (a) for up to two additional years upon written authorization by the applicant or in the case of a contested

[67] The 1996 *Rules and Regulations* provide only limited guidance on the question of potential interstate changes (i.e., from points upstream in California to points downstream in Nevada); these are discussed below.

application, or (b) for an indeterminate amount of time "for good cause shown" pending the conclusion of an action filed in any court which may affect the allocation and distribution of the waters of the Walker River;

- All state agency decisions, orders, and reports must be submitted to the Court in the Walker River Action, and the Court will conduct a "de novo" review of all agency decisions regarding change applications which recommend modification of the Walker River Decree; the Court may receive such additional material evidence as it determines appropriate, and the agency decision, report, or order will not take effect unless and until the Court finally approves it and enters an order modifying the Walker River Decree accordingly;

- Any party to an agency proceeding is entitled to petition for judicial review thereof, as may other entities or individuals upon a showing of good cause as to why they were not a party to the original state agency proceedings; and

- The court may affirm an agency decision, remand the case for further proceedings, or reverse or modify the decision if it would impair existing rights under the Walker River Decree, adversely affect some public interest, or prejudice substantial rights of a petitioner.

Several of the above points bear emphasis. First, the 1996 *Rules and Regulations* delegate the initial function of considering water rights transfer applications to the state agency in which the transfer is taking place, subject to review (including modification or remand) and approval by the federal District Court. In effect, the Decree incorporates Nevada and California law as the federal rule of decision for determining change of use applications within the boundaries of each respective state, and for use by the Court in reviewing state agency decisions and approving petitions for modifying the Decree.

If, however, an application for transfer involves *both* Basin states – such as a prospective transfer from the Antelope or Bridgeport Valleys in California to Walker Lake in Nevada -- it appears that the federal District Court has exclusive jurisdiction to consider such transfers, and that the applicant should therefore come directly to it.[68]

In any event, the responsible state agency may defer taking action on any change application where an action has been filed in court which may affect the allocation and distribution of the waters of the Walker River. The pendency of <u>U.S.</u> v. <u>WRID</u> (C-125c) in the Federal District Court in Reno is such a court action, and could potentially result in the indefinite deferral of action or decision on a change application filed in either state.

[68] As discussed in **Appendix E**, an interstate apportionment of the waters of the Walker River could help to resolve a number of potential hurdles regarding prospective interstate transfers. Either way, however, the 1996 *Rules and Regulations* require that copies of all change applications must be provided to "the agency of the other state." Thus, for a proposed interstate transfer (if not otherwise) it would be prudent to consult with each state agency as well as the USBWC and others prior to filing an application directly with the federal Court, and thereby seek their guidance and input on matters of procedure and substance alike.

Care should also be taken to ensure compliance with the specific procedural requirements of the relevant state agencies, even though the 1996 *Rules and Regulations* are generally as stringent as (if not more stringent than) the respective state requirements. This is particularly true for proposed temporary changes (of one year or less) under Nevada and California law: while both states have streamlined procedures for such changes, there is no distinction between "temporary" and "permanent" transfers under the 1996 *Rules and Regulations*. Accordingly, the more burdensome federal requirements will tend to govern all proposed changes under the Decree.

The 1996 *Rules and Regulations* also make clear that a proposed change will not be approved by the Court if it impairs existing rights, adversely affects some public interest, or prejudices the rights of a petitioner. These substantive considerations are generally consistent with, though somewhat less detailed than, the basic requirements of Nevada and California law, summarized as follows:

- Under Nevada law, the State Engineer may not approve a transfer which conflicts with existing rights or with protectible interests in existing domestic wells, or which threatens to prove detrimental to the public interest;[69] nor may the proposed change adversely affect the cost of water for other holders of rights within an irrigation district, nor lessen the efficiency of the district in the delivery or use of water. In addition, the applicant must demonstrate his/her financial ability and reasonable expectation to apply the water to the intended beneficial use, with reasonable diligence; and the State Engineer may require the filing of such evidence as he may deem necessary to a full understanding of the rights involved.

- Under California law, a post-1914 appropriator may change the point of diversion, place of use, or purpose of use from that specified in an existing permit or license subject to approval by the State Water Resource Control Board, which must determine that the change will not injure any other appropriator or lawful water user. In addition, applications for temporary changes are limited to the amount of water consumptively used (or stored), must not injure any legal user of the water, and cannot unreasonably affect fish, wildlife, or other instream beneficial uses. For longer-term changes, the Board may approve such an application if the change would not result in *substantial* injury to any legal user of water, and would not unreasonably affect fish, wildlife, or other instream beneficial uses. Long term transfers must also comply with provisions of the California Environmental Quality Act (CEQA).

In order to comply with the non-injury provisions of both state and federal law, proposed water transfers will generally be limited to that portion of the right that was previously consumed by crops and/or otherwise irretrievably lost to beneficial use over some recent historic period. This "consumptive use" limitation is particularly important where, as in the Walker Basin, return flows may constitute a significant portion of total available supply. Moreover, while California law in particular seeks to encourage the transfer of conserved water, return flow dependencies

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[69] The relevant public interest criteria are described in section IX of **Appendix E**.

and no-injury considerations will tend to limit the actual potential for conservation-based transfers in the Walker River system.[70]

Depending on the circumstances involved, a proposed transfer may also be conditioned or modified by the relevant state agency and/or the federal court to address channel conveyance losses; to ensure ongoing deliveries to other rights holders on a common ditch system; and/or to address cost and efficiency issues within the Walker River Irrigation District.

Finally, it should be noted that the 1996 *Rules and Regulations* provide for federal District Court review of *any* state agency decision that recommends modification of the Walker River Decree, irrespective of whether any party files a formal request for judicial review of that decision. A decision of the Nevada State Engineer/SWRCB approving a change in place of use to Walker Lake and/or the lower Walker River would be considered a "recommended modification" of the Decree and would require court review (and ultimately approval) before it could take effect.

5.3 Storage Rights

As discussed in **Section 4**, storage waters adjudicated to WRID under Decree C-125 have been allocated by the District to individual lands within its boundaries. These allocated storage rights fall into two basic categories: those which supplement decreed natural flow rights with priorities of 1874 or later; and those which are used as a primary (non-supplemental) source of supply on so-called New Lands, i.e., lands which do not have decreed natural flow rights.

As noted above, the USBWC's 1996 *Rules and Regulations* contain an explicit exception for proposed changes involving storage waters adjudicated to WRID:

> "Any change in the point of diversion and/or place of use of storage waters adjudicated to [WRID], which change is entirely within the boundaries of the [District], shall be made pursuant to adopted rules and regulations of the governing body of said District. *This exception shall not apply to any transfer outside the present boundaries of the [District]* nor shall [it] apply should there be a change in the authority given the [District] under Nevada law." (Section 2.4; emphasis added)

Rules and regulations governing the distribution and use of water within the District were last officially revised in 1986. These are currently being "updated and clarified," however as of March 2007 they were undergoing legal review and were not yet available to the public.[71] Thus, at least for now, Regulation No. 7 of the 1986 rules provides for the transfer of storage water within District boundaries *on an annual basis* as follows:

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[70] The general rule is that junior appropriators have vested rights in the continuation of stream conditions as they existed at the time of their respective appropriations, and that subsequent to such appropriations they may successfully resist all proposed changes in points of diversion and use of water from that source which in any way materially injures or adversely affects their water rights. (See **Appendix E**, section VI.)

[71] Ken Spooner, WRID General Manager, personal communication, 9/15/06 and 3/19/07.

> "The temporary transfer of storage water is an accepted practice and endorsed by the Walker River Irrigation District and it is allowable to assign the use of storage water to which such owner is entitled to any other land owner within the District having use for such water, upon such terms as the parties may mutual agree upon, provided the assignments shall be for one season only. No such assignment shall be in effect until approved by the Board of Directors…"
>
> "The temporary transfer of storage water to a parcel of land that has exceeded the duty of water originally allocated to said parcel will not be allowed."
>
> "The temporary transfer of storage water to be used on non-water right land is prohibited."[72]

Regulation No. 7 also makes clear that the District will serve, in effect, as a clearinghouse for such transfers – i.e., "a signup list will be provided at the District Office for those wishing to transfer storage water or for those in need of additional water" but the District will not collect fees nor otherwise be involved in any such agreements between willing sellers and buyers.

WRID personnel also provided the following additional insights concerning the *permanent* transfer of storage water within District boundaries, which are not discussed in the 1986 rules and regulations:[73]

- Any petition to permanently transfer stored water within the boundaries of the District must, at a minimum, be to non-water righted lands (to avoid the potential for "stacking"), serve beneficial use in compliance with permits, and not be injurious to other water right holders;

- In addition, the water right must stay in the same hydrographic basin and must be taken from the same reservoir; and

- Supplemental storage rights cannot be transferred.

Plate 4-II in **Section 4** sets forth the boundaries of the Walker River Irrigation District and demonstrates quite clearly that future transfers of storage water to Walker Lake (and/or the lower Walker River) will be to a point or place "outside the present boundaries of the District." Accordingly, any such changes will need to follow not the District's internal rules and regulations (though it would make sense to do so where possible) but the procedural and substantive requirements set forth in the USBWC's 1996 *Rules and Regulations*, discussed above. Still, several issues remain.

First, the current ownership status of storage rights is not entirely clear. For New Lands, as discussed in **Section 4**, primary allocations of storage water appear to be made by WRID through

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[72] Regulation No. 7 does not make clear whether it includes both primary and supplemental storage water or primary (New Land) storage water only.

[73] Ken Spooner, op. cit.; see also **Appendix D**.

an annual licensing process that confers a limited right of use (but not a property right) to individual landowners; accordingly, it appears that these allocations could be revoked, withheld, or otherwise adjusted annually by WRID.[74] For supplemental storage rights, however, the "non-severance doctrine" (**Appendix E**) suggests that these allocations are, in effect, property rights owned by individual landowners and cannot be severed and transferred separate from the decreed natural flow rights that they supplement. This differential treatment of primary and supplemental rights would seem to be consistent with the District's own internal requirement that supplemental storage rights cannot be transferred, as noted above.

Second, as discussed in **Appendix E**, the provenance of primary storage rights allocated to non-decreed New Lands may be suspect under the plain language of the Decree. This may be more of a factor in the decision to acquire (or not acquire) such rights in the first place, however it could also affect their ability to be transferred to other places and purposes.

Third, changes to allocated storage rights could affect diversions and uses in Nevada (at the existing and/or proposed places of use) as well as storage operations in Bridgeport Reservoir (California) and/or Topaz Lake Reservoir (primarily California). Thus, at a minimum, proposed changes to primary storage rights intended to benefit Walker Lake will likely involve an interstate transfer of water under the Decree and should be handled as such in accordance with the discussion above.

Based on the above, it would be prudent to approach the prospective transfer (and even acquisition) of *primary* storage water with caution. It might, for example, be appropriate to seek to transfer, or assign, a landowner's annual interest in their primary storage allocation to the lower Walker River and Walker Lake, just as under internal rules it is allowable for landowners to seek to assign to others the use of storage water to which such owner is entitled (see above). But irrespective of whether a change request is made directly to the federal Court or initially to the appropriate state agency or agencies, it seems clear that it will have to be done *in cooperation with WRID* (i.e., as applicant or co-applicant). Moreover, because it is unlikely that such a request could be processed within the annual term of the license in question, some longer-term commitment (e.g., a 10-year agreement with WRID) would probably have to be part of that application. To the extent, however, that such primary rights continue to be owned by WRID and have not attached to the existing place of use for more than the year in question, the entire amount of the right will be eligible for transfer from storage to Walker Lake (i.e., not limited to the historic consumptive use component).[75]

For the reasons discussed above, transfers of *supplemental* storage water probably do not require WRID's affirmative cooperation, though of course such cooperation would be desirable. In any case, a change application involving a supplemental storage right should include the decreed

[74] "At the regular meeting of the Board of Directors on the seventh day of March each year, the Board of Directors may…increase or decrease the benefits theretofore apportioned to any landowner or may apportion benefits to land upon which no benfits have theretofore been apportioned…" (WRID 1986, Section XVI)

[75] Under Nevada law (see NRS 533.444), a primary storage right could be "attached" to the land at either the existing or proposed place of use through issuance of a secondary permit by the Nevada State Engineer; however WRID's concurrence would still be needed in order to make such application.

natural flow right that it supplements (or vice-versa); and the composite transferable interest will be limited to the recent historic consumptive use portion of the composite right in question.

5.4 State-Permitted Rights

Transfers of state-permitted groundwater rights (issued only in Nevada[76]) will be governed by the change requirements of Nevada water law, as generally discussed above. For primary groundwater rights, change criteria will include no injury to other rights holders, no impact on protectible interests in domestic use (permit-exempt) wells, and no detrimental threats to the public interest. Transfers of supplemental groundwater rights from one supplemental use to another have sometimes been allowed, however in general they will not be approved in "designated" portions of the Walker River system if there is a potential for increased groundwater withdrawals as a consequence.[77]

In general, neither primary nor supplemental groundwater rights are likely to be appropriate sources of water for the long-term protection or augmentation of flows in the Walker River or at Walker Lake. Primary groundwater rights may, however, be of value for restoring and maintaining riparian parcels; for re-vegetating retired farmlands; and/or as potential assets for future sales, exchanges, or trades. Accordingly, acquired supplemental groundwater rights should either be retired (in order to take pressure off the basins' groundwater resources generally) or if possible banked or credited for use as offsets against any programmatic groundwater impacts attributable to other transfers. For primary groundwater rights, some significant portion should be retired and/or credited against any future groundwater impacts associated with program-wide acquisitions and transfers; and the balance should be retained and utilized for related program purposes, and/or banked for future M&I use (which could help to provide revenues for ongoing acquisitions and stewardship).

In various rulings the Nevada State Engineer has recognized the interconnected nature of surface diversions and groundwater pumping in the Nevada portion of the Walker River Basin. These interconnections cast a shadow over the validity of state-issued groundwater permits vis a vis the comprehensive adjudication of surface waters purportedly set forth in the Walker River Decree. In addition, as discussed in **Section 4**, there is no meaningful coordination between the office of the Nevada State Engineer and either WRID or the federal Water Master when it comes to administering or enforcing state-imposed limits on total combined surface and groundwater use in conjunction with the exercise of supplemental groundwater rights. It is unclear how these issues might affect future proposed transfers of state-issued groundwater rights.

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[76] As noted in Section 4, there is no state regulation of groundwater in the California portions of the Walker River Basin. Accordingly, if and when transfers of decreed surface water rights are pursued from these areas, it will be important to ensure that acquisition agreements include either non-irrigation covenants and/or prohibitions against using groundwater to replace the acquired rights. (This could also be done as an approval condition at the time of transfer.)

[77] "Under most circumstances, the supplemental underground water cannot be changed without a corresponding change in the surface water, i.e., both the surface water and the underground water must move together or, in some circumstances the surface water may be moved if the underlying supplemental groundwater is withdrawn." Nevada State Engineer, Ruling 5501; see also **Appendix E**.

The State of Nevada has also issued two certificates of appropriation for surplus waters to the Walker River Irrigation District. Questions concerning the status of these rights vis a vis the federal water master's authority to allocate "excess water" under the USBWC's 1953 *Rules and Regulations* are discussed in **Section 4** and **Appendix E**. For present purposes, taking WRID's state-certificated rights at face value, it *may* be possible with WRID's cooperation to transfer some portion of these rights under provisions of Nevada law directly to Walker Lake and/or the lower Walker River, even though they have apparently been used by others in the past.[78]

5.5 Agreements to Facilitate Individual Changes

Given all of the uncertainties noted above, it is difficult to develop a clear set of guidelines for future transfers of water rights intended to benefit Walker Lake. To some extent, these will simply be a matter of making the first acquisition(s) and then setting up and pursuing the first proposed transfer(s), ideally in consultation with all of the involved parties. Various studies are likely to be needed, with experts engaged to develop detailed water rights maps,[79] establish consumptive use amounts, and otherwise address the many substantive issues noted above. Protests are all but assured, but eventually (hopefully) negotiations will ensue and/or a decision will be reached by the relevant state agency, at which point the federal District Court will have its say where decreed water rights are involved. It will undoubtedly be a long and difficult process, yet with time a basic template (or series of templates) will be developed that should help to facilitate submission, evaluation, and approval of future transfer proposals.

With this kind of process in mind, the following agreements and consultations are recommended for discussion and development as early in the acquisition and/or transfer review and approval process as possible:

- Wheeling/conveyance agreements with the Walker River Paiute Tribe and the U.S. Bureau of Indian Affairs, unless transfers are to be made to and subsequently administered at a point downstream of Weber Dam and the Tribe's points of diversion;[80]

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[78] It may also be possible to benefit Walker Lake indirectly by simply reducing demands for flood or excess water in conjunction with the acquisition and transfer of primary storage water, subject to the cautions enumerated above. <u>See</u>, e.g., Grenier (2000), Component #3 -- Maximize Flood Water Reaching Walker Lake.

[79] As discussed in **Appendix D**, an extensive amount of mapping was done prior to the issuance of Decree C-125 and its precursors, yet the final Decree does not include any maps which illustrate (for example) the location of decreed water rights within the legally-described acreage. In addition, per the Decree, storage rights adjudicated to the Walker River Irrigation District have been distributed by the District under internal rules to lands within its boundaries, and thus only the District and individual landowners have maps which illustrate the location of these allocated rights. For these and other reasons, extensive mapping and survey work will probably be needed in conjunction with the processing of future change applications under state and federal law.

[80] In theory, because the Tribe is a party to the Decree, if and when such changes were approved by the federal Court the Tribe would be bound by them. In practice, however, this would likely result in the Tribe's opposition to (and litigation on) virtually all proposed transfers to Walker Lake; and it certainly would not respect their sovereign status. Thus, just as cooperative agreements with WRID (and others) are recommended, so too are voluntary wheeling or conveyance agreements with the Tribe.

- Adaptive management and/or water banking agreements for acquired storage rights with WRID, USFWS, NDOW, WRPT, and possibly others (see **Section 7** for discussion of a possible Walker Basin Storage Water Bank);

- Reimbursement assurance agreement(s) with USBWC, WRID, and ditch companies where applicable;[81]

- Advance consultations with NRCS for all lands enrolled under farm bill conservation program agreements to ensure that reimbursements relating to the early termination of or non-compliance with funded practices and agreements are resolved at close of escrow);[82] and

- Provision of up to one year of transitional irrigation supplies (not to exceed 4.0 AF/acre) prior to or in conjunction with the transfer of acquired rights to assist in the re-vegetation of retired farmlands with native grasses and shrubs.[83]

Finally, specific language for the proposed place, manner, and purpose of use for transfers to Walker Lake should be developed in consultation with the office of the Nevada State Engineer prior to the submission of change applications. Examples can be drawn, however, from Application 25792, approved 12/28/83, wherein "[t]he place of use is described as Walker Lake downstream from Schurz, Nevada, where the water [will be] used to help maintain the Lake at a stable level to support public use for recreation and improve water quality and quantity to sustain and help prevent loss of the fishery in Walker Lake;" and from Application 70649, approved 3/5/04, wherein "[t]he proposed place of use is within the natural boundary of the Walker River, Weber Reservoir, and Walker Lake" for the purpose of "wildlife and public recreation."[84]

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[81] WRID indicates that its current assessments are approximately $15.00 per acre per year for some 79,000 acres +/- assessed (Ken Spooner, personal communication, January 2007); in 2005-06, the USBWC's assessment rate was $2.50 per acre applied to a basis of 132,232 acres (USBWC budget statement for the year ending June 30, 2006); and information supplied by WRID indicates that annual ditch company assessments vary from $0.20 per acre to as much as $13.50 per acre (Ken Spooner, personal communication, January 2007). Note: several ditch companies assess on a *per-share* basis.

[82] These issues are probably best handled at the time of acquisition (i.e., at close of escrow) rather than as part of the change application process. (**Appendix G-3** provides a summary of farm bill programs and individual landowner agreements within Lyon, Mineral, and Mono Counties from 1998-2005.)

[83] **Section 6** includes discussion of these and related issues. Uncertainties related to the long-term success of affirmative re-vegetation efforts indicate that these and other prescriptions should become a focal point for applied research on acquired lands under the University of Nevada's Walker Basin Project. Additionally, for lands to be retained by landowners under a temporary land fallowing or water acquisition agreement, re-vegetation, soil stabilization, and weed/dust management measures should remain a landowner responsibility, with associated cost reimbursements provided for as part of the acquisition agreement.

[84] Remarks accompanying the approval of Application 70649 also indicate that "Weber Reservoir may be used as a regulating reservoir to facilitate delivery of this water to Walker Lake."

6.0 Acquisition Alternatives and Considerations

Efforts to acquire water from willing sellers in the Walker Lake basin will depend upon many important factors over time. **Sections 4** and **5** of this report discuss some of the most important features of existing water rights in the Basin that could affect their ability to improve Walker Lake inflows, including the change-of-use requirements of both state and federal law. At some point, however, water rights will have to be acquired (or at least optioned) before these or other uncertainties can be fully resolved, and potentially before many other unknowns are addressed. This section explores some acquisition alternatives and other considerations given the current state of public information as well as the need to pursue some individual "case studies" in order to address and resolve at least some of these uncertainties.

6.1 Walker River Basin Advisory Committee Report Summary

The Final Report of the Walker River Basin Advisory Committee (2000) provides an excellent overview of many potential water acquisition alternatives within the Walker River basin.[85] Prefaced by the assumption that a single entity would be responsible for all water rights purchases, their survey (pp. 6-23 through 6-27) includes the following:

- Direct purchase of water rights: The purchasing entity would acquire water rights from willing sellers.

- Direct purchase of water rights and related interests: The entity would acquire water rights from willing sellers, together with the land to which those rights are appurtenant and other property interests (e.g., houses, buildings, and other improvements). The purchasing entity would be responsible for managing, and potentially for disposing of, acquired lands and related interests.

- Permanent or conditional transfer of federal or state held water rights: The entity would seek agreements to acquire water rights from federal or state agencies on a permanent or conditional basis. (Conditional acquisitions would recognize potential future needs.) Water rights held by the United States on behalf of the Hawthorne Ammunition Depot are cited as a potential federal source; water rights held by the Nevada Department of Wildlife on behalf of the Mason Valley Wildlife Management Area are cited as a potential state source.

- Purchase of water from other purveyors: The entity would seek agreements to purchase water from various purveyors, such as the Walker River Irrigation District, ditch companies, or municipalities. (Water rights issued to the City of Yerington which

[85] The final Advisory Committee report discusses a variety of possible measures beyond willing-seller acquisitions that might help to increase Walker Lake inflows, including phreatophyte management, flood water management, Walker Lake management, and agricultural conservation. Tracy et. al. (2001a) provide additional insights into the potential benefits and costs of other non-acquisition measures, including Lake desalination, water importation, water conservation, and cloud seeding. While it remains possible that some of these alternatives could help to improve Walker Lake inflows to some extent, acquisitions (including purchases) from willing sellers remain a cornerstone improvement strategy and are the fundamental focus of this report.

provide, by agreement, for the disposal of treated sewage effluent via land application within the Mason Valley Wildlife Management Area are cited as one such example.)

- Purchase and management of groundwater rights: The entity would acquire existing groundwater rights from willing sellers, and would then manage those rights to benefit Walker Lake to the extent allowed by law and available funding.

- Exchange of land and/or water rights: The entity would seek agreements with private, state, or federal owners of land and/or water rights whereby acquired land and/or water rights could be exchanged in furtherance of goals established by the purchasing entity.

- Donation of water rights: The entity would acquire water rights from willing donors via donation or bequest.

- Leasing of water rights: The entity would lease water rights from willing lessors on a recurrent, intermittent, or single event basis. Unless renewed, leased water rights would revert back to the owner at the end of the lease term.

In reviewing this list, the Report reaches an important early conclusion: "Of these methods, direct purchase is anticipated to be the most permanent and reliable long-term means of securing additional water for Walker Lake." Donations, in particular, are not expected to play a major role; and while leasing and conditional transfers might offer short-term flexibility and lower costs per acre-foot initially, "administrative costs and annual lease payments could eventually be higher than costs associated with outright purchase."

The Report then turns to an examination of four potential alternative programs for the direct purchase of water rights (including water and related interests) whose common assumed goal is to increase Walker Lake inflows by "an arbitrarily defined block of 5,000 acre-feet per year." (As discussed in Section 3, this quantity represents approximately 10 percent of estimated long-term acquisition needs.) Major features of these four program alternatives (pp. 6-28 through 6-35) can be summarized as follows:

- Unstructured water rights acquisition: emphasis would be placed on acquiring, from willing sellers, "any type of water right from any location in the Walker River Basin."

- Structured water rights acquisition: emphasis would be placed on acquiring, from willing sellers, specific types of water rights from specific locations within the Walker River Basin. Criteria that might be used to structure the acquisition process could include early date of priority; single source of water rights; land productivity; ground water proximity to the Walker River; high ditch losses; links to local land use planning; substitution of rights; and purchase of flood water rights.

- Retention of core areas: emphasis would be placed on limiting impacts to core areas of high value farmlands, achieved in large part by acquiring water rights from willing sellers from locations outside the core areas (though the ability to exchange water rights and lands is also recommended to “allow for the willing participation of parties throughout the Walker River Basin”).

- Maximize benefits to Walker Lake: emphasis would be placed on acquiring all types of water rights from willing sellers in the lower (north) end of Mason Valley, “reducing conveyance losses [and] impacts on (or by) downstream users.”

In each of these alternatives it is assumed that the purchasing entity would conduct “most or all” of the acquisitions at issue; would manage acquired water rights “in accordance with established policies, state law, Decree C-125 or applicable court directive, any supplemental arrangement that may be agreed to with the seller, and whatever supplemental plans the entity may establish;” and that acquisitions would occur on a “first-come, first served basis” until program goals were met or available funds exhausted.

Table 6-A provides a summary of some of the potential advantages and disadvantages of “structured” versus “unstructured” acquisitions as discussed in the Advisory Committee Report. In addition to these qualitative factors, the Report (Table 6.11) makes a number of quantitative estimates of projected acquisition costs, including both expected purchase and administrative costs[86] on an average per-AF basis and associated yield factors (i.e., the percentage of acquired rights likely to be approved for transfer to Walker Lake and their associated conveyance or delivery efficiencies). These factors are reproduced in **Table 6-B**, however the estimated direct acquisition costs (i.e., $500 per AF paid to willing sellers) are probably low based on the more recent market sales information collected as part of this Study, which are summarized in **Tables 6-C** and **6-D** (see also **Appendix B**).

6.2 Western Environmental Water Transaction Report Summary

The expected scope and duration of water acquisitions sufficient to restore and protect Walker Lake[87] suggests that affirmative stewardship efforts, appropriate institutions, and community support will be important to long-term success. With these factors foremost in mind, Great Basin Land & Water commissioned a review of environmentally-oriented water acquisition efforts in other western states for insights into how such concerns have been addressed elsewhere. This review, attached as **Appendix F**, includes the following key findings:

- Depleted terminal lake systems require solutions that focus initially on improving total inflows (i.e., reducing consumptive use), after which timing and delivery considerations can be “fine tuned” as issues of River health and Lake-River connectivity rise in relative importance;

[86] Administrative costs are assumed to include the costs of analyzing the water right(s) to be purchased; contract development costs; costs associated with changes to accommodate management to benefit Walker Lake; and potential costs associated with the legal defense of such changes.

[87] As discussed in **Section 3**, an assured long-term increase in average inflows of ~50,000 AF/year will be needed to meet long-term TDS management objectives at Walker Lake. Depending on the “efficiency” with which acquired supplies can be transferred and delivered to the Lake, this increase in terminal inflows will likely equate to a 25-30 percent reduction (via willing seller acquisitions) in average upstream irrigation diversions. Based on the Stillwater experience noted above, a sustained effort over 25-30 years could be needed to meet these long-term objectives.

- Pilot projects – i.e., acquisition efforts that are initially limited in scope and duration – can provide crucial problem-solving experience while building community support and confidence for more expansive and permanent efforts;

- Funding for acquisitions should ideally be provided in increments that match both experience and implementation capacity; and the relationship between the price paid for short-term (pilot-scale) vs. long-term or permanent acquisitions should be structured so as not to bias one form of participation over another;

- Pursuing acquisition alternatives with an eye towards natural hydrologic variation may provide important opportunities for minimizing acquisition and community costs while continuing to meet long-term acquisition objectives;

- Innovative or "complex" transactions (i.e., trades, exchanges, and/or the banking and re-operation of stored water) can help to match solutions to needs at both the environmental and community levels, however such arrangements may work best after experience with more conventional transactions has been gained; and

- Institutional arrangements can take a variety of forms but two basic variants are most common: either a single (often community-based) entity acquires, owns, and manages all land and water assets; or two separate organizations work in tandem to (a) acquire land and water assets initially and (b) own and manage acquired assets over time.

Potential application of many of these concepts to the Walker Basin setting has already been discussed or will be later within this report.

6.3 Direct Purchase and Term Agreements

We generally agree with the Walker River Basin Advisory Committee's conclusion that "direct purchase" of water rights (i.e., purchase of land, water, and/or related interests in fee) will be the most permanent and reliable long-term means of securing additional water for Walker Lake. While the following discussion is based upon that basic assumption, in the short term, we strongly urge implementation of two additional approaches:: 1) development of one or more "interim" strategies involving the temporary (typically annual) leasing and/or banking of storage water, and/or the temporary fallowing of irrigated lands in the lower reaches of the system, to help restore Walker Lake inflows and thereby reduce currently-critical TDS levels as direct purchase efforts begin to unfold; 2) a conservation-oriented pilot program (and/or series of demonstration projects) should be established with the goal of understanding the potential for water conservation *and* associated water transfer opportunities in other parts of the system. (These and other program development or "framework" suggestions are discussed further in **Section 7**.)

For direct purchases from willing sellers, an acquisition strategy could include the identification of core agricultural areas (e.g., the most productive lands or desired greenbelt areas) as well as other areas of special concern (e.g., riparian zone lands), in order to identify areas in which future acquisitions would be limited. However, given the current lack of public information over the precise location of water rights in the Walker Basin, it could be years before such information is available in a form that would allow those analyses to be conducted.[88] Moreover, in similar situations elsewhere, it has been difficult for individual landowners and communities to reach agreement over which lands and/or water rights should be "protected" from acquisition and which, in turn, should be "targeted."[89] Further, current TDS levels in Walker Lake are sufficiently high that that immediate action is needed to improve inflows. For these reasons, near-term acquisition efforts should move forward expeditiously, while ongoing program development and regulatory compliance efforts seek to ensure that land exchanges, conservation easements, and other market-oriented tools are developed to address the above concerns as soon as possible.[90]

6.4 Current Acquisition Funding Authority

Much, of course, will depend upon the constraints and limitations imposed by available funding authority. Thus, over the next 3-5 years, direct purchase of water rights to benefit Walker Lake will most likely be dominated by the University of Nevada's *Walker Basin Project*, a $70 million federally-funded initiative to "acquire from willing sellers land, water appurtenant to land, and related interests in the Walker River Basin, Nevada." (Public Law 109-103, Title II, Section 208(a); see Appendix G-4.) Authorized late in 2005, the core purposes of this program include (a) establishing and operating an agricultural and natural resources center to undertake research, restoration, and educational activities in the Walker River Basin; and (b) environmental restoration in the Walker River Basin, with a focus on Walker Lake.

The *Walker Basin Project* is currently in its early planning phases[91] though a variety of research efforts are also underway (see **Appendix G-6**). For purposes of this discussion, it is important to

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[88] **Appendix A** provides a GIS-based analysis of irrigated lands in the Walker Lake basin over the period 1986-2002. Completed by the Desert Research Institute (DRI) for GBLW as part of this Study, the information described in DRI's report will become part of a more comprehensive basin-wide database of water rights, irrigated lands, and associated demographic, economic, and property information as part of the University of Nevada's Walker Basin Project. (See, e.g.., **Section 7** and **Appendix G-6**). Early resistance to at least some of what DRI researchers are trying to accomplish suggests that it will probably be a number of years (at least) before this kind of information is available in a form that would allow it to be used for the purposes discussed in this section.

[89] For example, a "reverse" Land Evaluation and Site Assessment (LESA) process was undertaken by NRCS and others at the Newlands Reclamation Project in the mid-1990's with the goal of identifying preferred areas for water acquisitions from willing sellers to benefit the Stillwater National Wildlife Refuge and other Lahontan Valley Wetlands. Over the course of several years, these efforts were not able to resolve disagreements between different community factions over the designation of appropriate (or inappropriate) lands or areas, nor could it resolve individual landowner concerns over being excluded (at least potentially) from future water sales opportunities. (Peggy Hughes, NRCS, personal communication, February 2007.)

[90] Land sales and exchanges have been used successfully as part of the USFWS' Water Rights Acquisition Program (WRAP) at Stillwater. While some "core" lands have been retired as part of that Program, marketplace realities have generally coaxed out less productive and generally peripheral Project lands in ways that have contributed, along with more flexible water delivery scheduling and other factors, to improved conveyance efficiencies over time. (Richard Grimes, USFWS Realty Specialist, personal communication, October 2006.)

note that the authorization to acquire land, water appurtenant to land, and related interests includes the following specific limitations (emphases added):

- It limits acquisitions from *willing sellers* to portions of the Walker River Basin *in Nevada;* and
- It directs the University to make acquisitions *which the University determines* will be most beneficial to the purposes of the program.

The fundamental importance of *willing sellers* cannot be overstated: no matter what kind of "structure" the University or stakeholders might wish to impose upon the program, its success will depend above all on the voluntary participation of willing sellers. In addition, due to the *in Nevada* limitation, potential acquisitions from willing sellers in the California portions of the basin (principally Bridgeport Valley and Antelope Valley) are not currently authorized as part of this program. Finally, because Section 208(b) of Title II of P.L. 109-103 includes a separate $10 million appropriation to the Walker River Paiute Tribe to develop a "water lease and purchase program" for willing sellers *within* the Walker River Indian Reservation, it can be assumed that the University's acquisition efforts will focus on potential willing sellers in the Mason Valley, Smith Valley, and East Walker River water use areas *only*.[92]

Finally, under the above authorization the University is charged with determining which acquisitions will be most beneficial to the fulfillment of authorized purposes. Subject to the above constraints, the University will have broad discretion to select among "offered" water rights by type, bundle, priority, or location; to determine whether land and/or related interests should also be acquired in furtherance of program objectives; and to otherwise pursue both individual and aggregate acquisitions based on these and other factors of interest.[93]

6.5 Property Specific Acquisition Considerations

Perhaps the best way to embrace the goals and concerns of an acquisition strategy while retaining the overall flexibility (and other advantages) of an "open" or unstructured program is to develop a set of "considerations" that can be used to evaluate specific acquisitions from prospective willing sellers. Our suggested list includes the following:

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[91] See **Section 7**. As noted previously, GBLW served as a contract advisor to the University's "Task 1" planning process from April to December 2006.

[92] **Section 7** describes the Tribe's water lease-purchase program authorization as well as prior land fallowing initiatives and current planning efforts. While the University will not be directly involved in acquiring water or land within Reservation boundaries, it will need to enter into an agreement with the Walker River Paiute Tribe to ensure that acquired waters can and will be conveyed to and through Weber Reservoir to Walker Lake.

[93] Pending the completion of NEPA and other regulatory compliance, we assume that the University will generally limit its acquisition focus to "direct purchases" only, and will not pursue annual land fallowing or other interim arrangements (though the affiliated research program may well be involved in those efforts). It also appears that system improvement measures (e.g., canal lining or automation) cannot be pursued as part of the University's acquisition efforts because potential savings would come from water that is not "appurtenant to land."

- *Current Ownership:* A complete understanding of "who owns what and where" needs to be developed in order to identify potential willing sellers with clear title.

- *Deliverable Quantity:* Water rights considered for acquisition should have a very good chance of improving inflows to Walker Lake, ideally in the near-term (i.e., even prior to formal transfer) but especially over the long-term (once a transfer has been approved). This is probably best seen as a long-term program goal, as it may take a number of "deals" to develop a thorough understanding of all the variables at play to be able to make such determinations with certainty in advance.

- *Fair Price:* Most prospective willing sellers will want some sense of the price they might obtain for the water rights they wish to sell. While it may be possible to negotiate such prices in advance, in general it will be best to pursue agreements with willing sellers wherein price is determined by means of an independent "fair market value" appraisal undertaken in accordance with federal acquisition standards.[94] At the same time, acquisition agreements (e.g., options) could be structured so that a prospective seller can simply withdraw from the transaction if, in the end, the independently appraised value does not meet his or her needs or expectations.

- *Walker Lake Proximity:* Water rights whose existing place of use is comparatively close to Walker Lake (e.g., the lower Mason Valley area) will generally have a better chance of improving inflows to the Lake than those which are used in more distant locations due to the combined effects of physical conveyance losses and the potential for intervening diversions.

- *Complete Farm Acquisition:* During the early stages of acquisition program development it will generally be most advantageous to seek to acquire decreed natural flow rights together with any appurtenant supplemental storage rights or other rights ("bundles" of water rights) along with the lands to which they are appurtenant in order to preserve maximum flexibility in their eventual transfer, retirement, re-sale, or other appropriate disposition.[95] Decreed natural flow rights will generally involve the least amount of long-term acquisition risk because they are expressly adjudicated by Decree C-125; however considerable "due diligence" regarding chain of title, historic diversions and use, and many other factors would still have to be conducted during the acquisition screening process. Supplemental storage rights and supplemental groundwater rights would only be acquired in conjunction with the base rights that they supplement, while primary storage allocations (to New Lands) may involve particularly high acquisition risks until questions about their provenance can be resolved (**Appendix E**), and/or until

[94] Independent appraisals based on federal acquisition standards will also help to ensure that acquisition prices reflect ongoing marketplace realities.

[95] Individual landowners in the Walker River system typically own a mixture, or "bundle," of decreed natural flow diversion rights of varying priorities along with supplemental storage rights, primary storage allocations, and state-certificated groundwater rights (some primary, most supplemental). For the University, acquiring land along with appurtenant water rights will also afford the greatest opportunities for undertaking applied research as part of the Walker Basin Project's Agricultural and Natural Resources Center.

WRID cooperation in their acquisition and transfer is assured. Finally, primary groundwater rights may have value as trade or re-sale assets, and/or as potential sources of transitional irrigation supplies for the re-vegetation of retired farmlands, however they generally will not be appropriate for direct use in improving Walker Lake inflows.[96]

- *Seniority of Right(s):* In general, a more "senior" right (e.g., a decreed natural flow diversion right of priority 1873 or earlier that does not include supplemental storage) will be more reliable, and thus a better long-term investment, than a more "junior" right that includes or depends upon other supplemental sources. (**Appendix C** provides an analysis of water rights yields for both decreed natural flow and allocated storage rights in the WRID service area.) Yet if the latter rights can be acquired as a bundle (see above) it may be possible to realize comparable flow improvement benefits at lower overall cost. One way or another, it will be important to consider potential indirect benefits (such as reduced demands for flood or "excess water" when New Land storage allocations are involved) as part of any prospective acquisition, along with potential adverse impacts from the exercise of other retained or transferred rights.[97]

- *History of Use:* In order to avoid injury to other rights holders, transfers of acquired rights will generally be limited to their historic consumptive use, i.e., that portion of the right within the amount historically diverted that has not been available to others in the form of seepage, return flows, or other diversionary losses. (While some acquired rights may provide benefits to Walker Lake without transfer, in most cases it will be necessary to complete a transfer in order to maximize assured inflows and protect acquired rights over time.) A demonstrated history of water diversion and use over the past 5-10 years will help to provide assurance that real benefits can be realized with time, and a right that is served independently (or at the end of a ditch or lateral system) will generally be preferable to rights that are served in conjunction with, and/or in between, other users.[98]

- *Related Objectives:* Ideally, acquired rights will serve a number of companion objectives, such as reducing or eliminating conveyance bottlenecks or enabling closures of laterals at perimeter locations over time (and in both cases improving overall conveyance efficiencies for lands that continue to be irrigated). Lands suitable for applied research as part of the University of Nevada's *Walker Basin Project* (e.g., stabilization or remediation of previously-irrigated lands; on-farm water conservation opportunities related to alternative crops, practices, and technologies; site-specific interactions between ground and surface waters; and determination of conveyance loss, consumptive use, and

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[96] As discussed in **Appendix E**, state-certificated groundwater rights may include other acquisition risks to the extent that ground water and surface water supplies are physically inter-connected.

[97] In Nevada, increased reliance on supplemental groundwater rights generally will not be allowed in conjunction with the transfer of decreed surface water rights; however primary groundwater rights (and/or other rights) could potentially be used to replace acquired surface water rights, in which case ground-surface water interactions must be evaluated before net effects are understood.

[98] In 2004 the Nevada State Engineer conditioned a proposed transfer from the Mason Valley Wildlife Management Area to Walker Lake to ensure that a substantial portion (45%) of the rights at issue would continue to be diverted "in priority" to meet the conveyance needs of remaining ditch users. (See discussion in **Section 7**.)

return flow factors) will also be desirable attributes. Finally, lands and water rights that might be acquired and co-managed to serve multiple purposes, such as riparian/floodplain protection or even the partial restoration of stream flows, would provide important opportunities for leveraging funds across programs and purposes.[99]

- *Conservation Program Commitments:* Some irrigated lands in the Walker Lake basin include conservation or other improvements funded by one or more Farm Bill (USDA) conservation program contracts. If water acquisitions are likely to impact those improvements (e.g., through early termination or non-compliance with associated contract provisions), reimbursements and/or penalties to USDA may have to be paid. (**Appendix G-3** provides an overview of these program commitments as they currently exist in the Walker basin.) At a minimum, these cost/reimbursement factors should be discussed in advance with NRCS (the administering federal agency) and ultimately included and addressed in all final acquisition agreements.[100]

6.6 Stewardship Needs and Retired Farmlands

Where water acquisitions anticipate the retirement of previously-irrigated farmlands, a number of physical concerns are likely to result. These include the potential for increased soil erosion, dust, and the spread of noxious weeds. To address these concerns, appropriate stewardship measures (and/or research related thereto) should be developed and included as integral components of the Walker Basin water acquisition and transfer process.

For lands that will be permanently retired, these concerns can be addressed in-part by ensuring that water acquisition agreements allow for the establishment of appropriate replacement vegetation *before* soils dry out and organic materials blow away. A series of experiments conducted on previously irrigated farmlands in Fallon, Nevada during the mid-1990's suggest that provision of "transitional" irrigation water will be critical to the success of such efforts.[101] Transitional irrigation water can likely be provided in a number of ways, such as by temporarily reserving some or all of the appurtenant water right(s) or by temporarily acquiring and transferring other water rights to the subject parcel from other locations.[102] Ideally, such

[99] This includes $10m provided to the USFWS under P.L. 109-103 (Title II, Section 208(c)) for riparian restoration activities in the Walker River basin.
[100] These and other encumberances and liens will generally be paid by the seller to ensure that, at close of escrow, the buyer acquires title "free and clear" subject to agreed-upon encumberances (e.g., recorded easements).

[101] USDA-NRCS Plant Materials Trial, Naval Air Station, Fallon, Nevada, Final Report, July 1998. The study found that, in general, a minimum of about ½ acre foot (approximately one irrigation cycle) was needed to establish both grasses and transplanted shrubs on abandoned farmlands in the Fallon area, and that appropriate physical and/or chemical treatments to control invasive weeds were also needed. Other noteworthy findings included the following: transplanted shrubs were generally more successful than direct seeding; "island plantings" could provide "one possible way to include shrubs in re-vegetation while keeping costs down;" establishment "may be improved by increased irrigations in conjunction with weed control strategies;" and coordination between the landowner and the irrigation district "is important in order to receive irrigation water at the planting site as quickly as possible after transplant installation." (pp. 20-27)

arrangements will be in place *before* appurtenant water rights are transferred; and NRCS recommends "a requirement that one year of irrigation water remain with the abandoned farmland prior to removal of water rights."[103]

For lands that will only be taken out of production for a limited period of time (e.g., 1-3 years under a rotational fallowing scheme) it may be necessary to ensure that there is an appropriate cover crop in place at the outset of the fallowing period, either as part of the acquisition/transfer arrangement or as an effective condition thereon. Alternatively, the fallowing program enrollment agreement could require implementation of certain weed and dust control measures (or their functional equivalents), ensure that no grazing will be allowed on fallowed lands, and provide for appropriate monitoring, reporting, and associated cost-reimbursements.[104]

For the Walker River Basin in particular, the newly-established Great Basin Plant Materials Center in Fallon, Nevada will be an important source for plant materials (particularly native species) which are best suited to the harsh, arid conditions of the western Great Basin; and for technologies, methods, and expertise concerning the successful re-vegetation of previously-irrigated farmlands.[105] This entire issue area should also become a focal point for applied research on acquired lands, and/or for research projects to be undertaken with other cooperating landowners, as part of the University of Nevada's Walker Basin Project.

6.7 O&M Agreements

Finally, when water is acquired for transfer to Walker Lake it will generally be necessary to ensure that all associated fees and assessments are paid to the U.S. Board of Water Commissioner (currently $2.50 per water righted acre under Decree C-125)[106], the Walker River Irrigation District (currently $15.00 per water righted acre within WRID boundaries),[107] and the

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[102] Several of these methods have been used by the U.S. Fish and Wildlife Service to address interim land stewardship needs as part of the Water Rights Acquisition Program at the Stillwater National Wildlife Refuge in Fallon.

[103] Ibid., page 27. It should be noted that even early assurance of transitional irrigation supplies does not guarantee long-term success. Indeed, the referenced study acknowledges that "[n]o conclusions can be made for long-term success… without continued observations. Many introduced and native species seeded in the 3-8" precipitation areas of Nevada produce good seedling stands, [however] most plants perish within a 10-year period due to the arid climate…To determine the success of permanent establishment, transplants should be observed for a minimum of 4 growing seasons [because] unadapted transplants may grow well for two or three growing seasons, then die out." (Transplants in the study were observed for only 2 growing seasons – page 26.)

[104] See, for example, Exhibit F to the Imperial Irrigation District's 2003-2004 "Agreement for Fallowing Land" (November 2003).

[105] The Great Basin Plant Materials Center was established 2006 as a cooperative venture of the Natural Resources Conservation Service (NRCS) and the University of Nevada, Reno's Newlands Field Laboratory in Fallon, Nevada; see http://www.nv.nrcs.usda.gov/Great_Basin_PMC.html.

[106] See U.S. Board of Water Commissioners 2005b.

[107] Ken Spooner, personal communication, May 2006. The current charge of $15.00 per acre is apparently an across-the-board assessment, i.e., applied equally to all water righted lands. According to Regulation No. 3 of the

relevant ditch companies (variable by ditch; see **Table 6-E**). In some states, a water right “exit fee” (i.e., a negotiated lump-sum payment) has been used both to satisfy this need and to provide the involved district or company with additional working capital for purposes of improved water rights monitoring or the like (**Appendix F**). In other cases, a long-term agreement between the involved district and the acquisition entity (or ultimate rights holder) has sufficed.

Taken together, the above considerations may not yield simple or obvious answers for any particular offer or prospective acquisition; they merely seek to ensure that a consistent set of questions are asked of all prospective offers in advance, and that improved Walker Lake inflows will be the most likely result over time.

District’s 1986 Rules and Regulations, “the basis for annual charges for surface water is per acre of water right land [including] storage, decree and state permit [and] the basis for the annual charge for storage water is per acre foot of storage to which lands benefits have been apportioned.”

7.0 Proposed Acquisition Framework

This section describes our recommendations and proposed framework for a diversified portfolio of willing-seller acquisitions and associated measures intended to improve Walker Lake inflows in the near term and on a sustainable basis over time. It begins with a brief discussion of preferred portfolio components; reviews existing programs for the role(s) that they might play in furtherance of such efforts; and then suggests several additional components which could help to meet both near-term and longer-term needs.

A number of assumptions are common to virtually all program components discussed below. They include the following:

- Acquisitions will take place from willing sellers only;
- Walker Lake's needs are both immediate and substantial, and efforts to address them will only become more costly and challenging over time;
- Water rights that meet certain basic criteria (e.g., clear title, priority, reasonable price, a demonstrated history of water diversion and use) should be investigated thoroughly, acquired (as warranted), and then adaptively managed over time;
- Transfers of acquired waters under the provisions of state and federal law will be needed to maximize long term benefits for Walker Lake, however in a number of cases it may be possible to realize at least some interim benefits as well;
- Conveyance of acquired waters to and through the Walker River Indian Reservation will raise issues common to virtually all acquisitions and transfers undertaken on behalf of Walker Lake; and
- Cooperation among diverse interests, including the Walker River Paiute Tribe, the Walker River Irrigation District, the federal water master, public agencies, and private entities, will provide the greatest assurance of long-term success .

In addition, while progress can, and hopefully will, be made towards restoring Walker Lake under the reach of existing programs and authorities, a comprehensive, basin-wide water settlement remains desirable as the foundation for resolving ongoing litigation, re-building trust, and developing and implementing many of the initiatives which follow.

7.1 Principal Elements

A "portfolio approach" to acquisitions can help to address both immediate and long-term needs while pursuing acquisitions from prospective willing sellers, addressing uncertainties, adapting solutions to needs, and improving the available base of public information for long-term decision support. For the Walker River system, the main portfolio elements proposed herein include the following:

- A sustained program of fee purchases of water rights, together with lands and related interests when necessary to serve as the foundation for permanent increases in Walker Lake inflows over a multi-decade timeframe if necessary;

- Pilot and other limited-term initiatives such as water leasing, storage water banking, and rotational land fallowing to provide substantial increases in Walker Lake inflows over an intermediate (1-10 year) timeframe;

- Efficiency and conservation initiatives (i.e., improved system efficiency, on-farm water conservation, and the expanded use of conservation easements) to be undertaken on an experimental basis to evaluate and demonstrate their potential for improving and sustaining Walker Lake inflows over time;

- Applied research and modeling to resolve uncertainties in the acquisition/transfer process, including site-specific and sub-regional determinations of consumptive use, surface-groundwater connectivity, and conveyance losses by ditch and River reach;

- Community-based stewardship of acquired lands and waters, including adaptive management of acquired water supplies to address the long-term integration of Walker Lake, Walker River, and associated land-based needs; and

- Comprehensive monitoring and integrated administration of acquired and transferred rights as well as continued surface water diversions and groundwater withdrawals.

In addition, as part of a comprehensive settlement, community benefit funds should be provided and used to address socioeconomic issues involved with the transition of a significant share of water use in the basin from agricultural to environmental purposes.

7.2 Existing Programs & Authorities

Currently authorized programs are capable of addressing at least some of the elements listed above. They include approximately $88 million (out of $200 million originally appropriated) in available Desert Terminal Lakes funding as of the end of 2006; the University of Nevada's $70 million Walker Basin Project; and a $10 million program for leasing or purchasing water rights on the Walker River Indian Reservation.

7.2.1 Desert Terminal Lakes

In 2002 the United States Congress appropriated $200 million "to remain available until expended…to provide water to at-risk natural desert terminal lakes."[108] Subsequent legislative amendments clarified that a major focus of these funds was to improve Walker Lake inflows, however the original authority prohibited their use for "the purchase or lease of water rights." Additional amendments and earmarks overcame these limitations in part and obligated

[108] P.L. 107-171, Farm Security and Rural Investment Act of 2002, Section 2507.

approximately $112 million for a variety of purposes, including those discussed further below. (**Appendix G-4** provides a summary of the original 2002 legislation and subsequent amendments through the end of 2005.) As of December 2006, approximately $88 million of the original $200 million remained available for use at Walker, Pyramid, and/or Summit Lakes in Nevada subject to the water rights lease/ purchase bar noted above.

The remaining Desert Terminal Lakes (DTL) funds could prospectively be used anywhere in the Walker River basin; however, absent further legislative amendment, the prohibition against leasing or purchasing water rights will continue to limit associated water acquisition efforts to those which might "provide water" by other means, such as through land fallowing agreements with willing landowners or by reducing water demands through conservation-oriented infrastructure improvements. Moreover, because of the many intervening diversions and the nature of water rights in the Walker River system, such efforts will generally be limited – again absent further legislative amendment -- to the downstream portions of the basin (i.e., the Walker River Indian Reservation and the lower Mason Valley area), where water conserved by other means can actually make it to Walker Lake.

Mindful of these limitations, the Lahontan Basin Area Office of the U.S. Bureau of Reclamation (which administers DTL funds on behalf of the U.S. Secretary of the Interior) sought to develop and implement two important and somewhat inter-related agreements during 2003 and early 2004:

- A renewable annual fallowing agreement with the Walker River Paiute Tribe that would involve willing sellers (lessors) of land within the Walker River Indian Reservation, with the associated water savings to be made available for Walker Lake; and

- An infrastructure improvement agreement with the Nevada Department of Wildlife (NDOW) that would improve water management at the Mason Valley Wildlife Management Area (MVWMA), with conserved water to be made available for Walker Lake.

As discussed below, the land fallowing agreement between Reclamation and the Tribe was nearly completed in 2004, however a number of problems led to its demise just prior to the onset of the 2004 irrigation season and frustrated similar efforts in 2005 as well. Late in 2005, a $10 million federal appropriation derived from the original DTL program gave the Tribe an opportunity to develop and administer its own on-Reservation water rights lease/purchase program; those efforts are ongoing today.

The infrastructure improvement agreement between NDOW and USBR was finalized in March 2004. (**Appendix G-5** provides a summary of the agreement.) In addition to the specific improvements set forth therein, the agreement includes two components of particular relevance to Walker Lake. First, during its initial year (2004), the Wildlife Management Area could not fully utilize its decreed surface water rights[109] due to related construction activities; accordingly,

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[109] Total water usage based on decreed water rights (only) at the MVWMA averaged approximately 13,300 AF/year over the 8-year period 1995-2002 (see Appendix G-5 as well as Attachment A to the *Cooperative Agreement between the Nevada Department of Wildlife and the U.S. Bureau of Reclamation* dated March 18, 2004).

that portion of the rights not needed in 2004 was transferred, for one irrigation season, to Walker Lake, subject to a stipulated agreement to overcome protests and associated approval conditions imposed by the Nevada State Engineer.[110] Second, for all future years, NDOW agreed to a "best efforts" provision under which it would "increase its discharge of water into Walker River for purposes of increasing deliveries to Walker Lake…consistent with proper management of MVWMA;" this included a qualified commitment to contribute "between 2,500 and 3,500 acre feet of water per year in 3 out of 5 years running."[111]

Looking ahead, and mindful of the above experiences, there would appear to be several potential opportunities for using some portion of remaining DTL funds "as authorized" in ways that would result in improved Walker Lake inflows. Our recommendations are that:

- A longer-term (multi-year) land fallowing initiative be developed with the Walker River Paiute Tribe which leverages and complements the Tribe's own water lease/purchase program development efforts (see below);

- Conservation and infrastructure improvements (or "rehabilitation and betterment" efforts) be made within the Walker River Indian Irrigation Project which can be coordinated with any such land-fallowing initiative;

- Monitoring and improvement (if justified) of NDOW's 2004 "best efforts" commitments be carried out relating to water use at and/or discharges from the Mason Valley Wildlife Management Area;

- Rotational fallowing agreements be developed and implemented with willing landowners in the lower portions of the Mason Valley; and

- Water conservation and infrastructure improvement initiatives be implemented in other parts of the basin (see discussion under Efficiency and Conservation, below).

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[110] Permit 70649 dated March 5, 2004. Approval conditions included the stipulation that "whenever any of the water rights changed by this permit are in priority, the flow rate allowed by the Walker River Decree…shall be administered so that 55%...remains in the stream and 45%...is diverted at the existing point of diversion into the applicable ditches." In addition, the State Engineer clarified that "the permit does not take effect until the Walker River Decree is modified." (See cover letter to NDOW dated 3/5/04.) Finally, the underlying stipulation agreement also clarified that the applicant (NDOW) would be responsible for "reaching agreement with the Walker River Tribe and the Bureau of Indian Affairs concerning [the] sharing of transportation losses from the weir [i.e., the existing point of diversion] to and through Weber Reservoir." Stipulation for Protest Dismissal Without Prejudice In the Matter of Change Application No. 70649, signed March 3, 2004. (See **Appendix G-5** for additional discussion.)

[111] *Cooperative Agreement* between NDOW and USBR, Section 7 and Attachment A. Rather than seeking to transfer conserved water directly to Walker Lake over the long-term, NDOW apparently intends to divert water under its decreed rights and then discharge any savings back to the Walker River under a secondary discharge permit.

7.2.2 University of Nevada's Walker Basin Project

Section 208(a) of P.L. 109-103 (November 2005) directed the Secretary of the Interior to provide up to $70 million to the University of Nevada to acquire, from willing sellers, land, water appurtenant to land, and related interests in the Walker River Basin, Nevada; and to establish and administer an agricultural and natural resources center to undertake research, restoration, and educational activities in the Walker River Basin relating to innovative agricultural water conservation, cooperative programs for environmental restoration, and fish and wildlife habitat restoration.

In 2006 the University of Nevada established its Walker Basin Project in accordance with the above authority and funding.[112] In doing so, the University expressly reserved not less than 80% of the funds provided ($56 million) for acquisitions from willing sellers and for related acquisition purposes, including stewardship and management costs, applied research on acquired lands, legal representation, and payment of fees and transaction costs.[113] At the same time, the University reserved not more than 20% of the funds provided ($14 million) for programmatic research as well as initial and ongoing planning, regulatory compliance, and project management and coordination. Considering all of the above, and acknowledging many uncertainties,[114] we estimate that approximately $40-50 million of the original $70 million will be available for real property acquisition purposes (i.e., for making payments directly to willing sellers and for related due diligence costs).

The University's Walker Basin Project is very much an evolving effort, and by early 2007 a number of initial planning and implementation steps had been completed. These included:

- Formation and convening of an Executive Steering Committee;
- Hiring of a Program Coordinator and an Acquisition Coordination firm;
- Establishment of an internal Acquisitions Review Committee;
- Creation of a Stakeholder Advisory Committee;
- Completion of a preliminary conceptual acquisition plan; and
- Initiation of a $10.1 million package of programmatic research projects.

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[112] The University of Nevada-Reno administers the system-wide program and receives funds pursuant to a "prime" contract with, and individual task orders approved by, the U.S. Bureau of Reclamation.

[113] Final Report on Task 1 to Accomplish Objectives Mandated in H.R. 2419, Section 208 -- Walker Basin Project, Executive Steering Committee, Nevada System of Higher Education, December 12, 2006.

[114] Transaction costs for individual acquisitions, including all necessary due diligence, are likely to be substantial, as are the costs of filing and completing change applications before the appropriate state agency (or agencies) and the federal district court, particularly during in the early years of the program.

While discussions related to several potential acquisitions are currently underway, the overall contours of the program and the completion of individual transactions will have to await completion of required regulatory compliance (due to the provision of federal funds) under the National Environmental Policy Act (NEPA) and related federal authorities. It may, therefore, be somewhat premature to speculate on how the program will actually unfold; however several general observations can be made.

First, the University program can in some ways be thought of large-scale "pilot" or demonstration project, i.e., one that will pursue acquisitions (from willing sellers) of water, land, and related interests in the Nevada portions of the basin while undertaking programmatic research (e.g., development of a computer-based model for improved decision support for the Walker River basin as a whole) as well as applied research on acquired lands (and/or potentially on parcels owned by other cooperating landowners) with the goal of addressing key questions of interest and concern to the overall acquisition effort. Given the many uncertainties associated with Walker basin water rights discussed in **Sections 4-6** of this report, the concurrent pursuit of both acquisitions and research seems prudent and well-suited to addressing the challenges that will undoubtedly accompany efforts to change the place, manner, and purpose of use of those rights in order to benefit Walker Lake over time.[115]

The initial list of Walker Basin Research Projects (**Appendix G-6**) provides an important and useful starting point for a variety of sub-basin and basin-wide investigations.[116] Equally important, however, will be applied studies in specific areas, on acquired lands, or, as noted above, on parcels with cooperating landowners who may not wish to participate in acquisition efforts directly, which together can help to improve the public's understanding of the Walker River system while addressing program development needs in several areas. Our recommendation is that UNR completes:

- analysis of diversions, deliveries, and groundwater withdrawals as well as estimation of consumptive use by farm, area, or reach;
- development of innovative agricultural water conservation experiments, as discussed further below;
- experiments related to the rehabilitation and maintenance of fallowed and retired farm lands;
- monitoring and quantification of ground-surface water interactions; and

[115] For example, the Nevada State Engineer can order hydrologic studies in conjunction with the evaluation of proposed water rights change applications, and the research component of the University program would be well-suited to undertaking such studies in conjunction with acquired rights.

[116] Analysis of the expected future effects of global warming on basin hydrology, water rights, and especially Walker Lake inflows should also be included in the "decision support" element of the programmatic research portfolio summarized in **Appendix G-6**.

- monitoring and quantification of ditch and channel losses (along with analysis of potential system improvements where applicable, e.g., ditch lining and/or consolidation of diversion works).

Improved and integrated monitoring of surface water diversions and groundwater withdrawals will be needed to implement many of the above suggestions. While this may only be possible on an incremental basis initially (e.g., as individual lands are acquired and/or as water rights change applications are pursued), in section 7.3.5 we also offer some suggestions towards a more comprehensive basin-wide program of improved water rights administration and monitoring.

For many of these efforts it will be desirable, at least initially, for the University to acquire title to land as well as appurtenant water rights and potentially other interests. As discussed in **Section 6**, there can also be real advantages to acquiring both water and land during the early stages of the program. These considerations suggest that the agricultural and natural resources center required by section 208(a)(1)(B) should be established not only as a "virtual" collection of affiliated departments and individuals who share a common interest in the Walker Lake basin (as is apparently envisioned at present), but as a locally-based center that holds and actively manages land and water assets while providing research and other local employment opportunities, thereby demonstrating both investment in and long-term commitment to the Walker Lake basin as a whole.

Finally, it will be important to ensure that the University's acquisition efforts are closely coordinated with other federally-funded initiatives in the basin, including the riparian and channel restoration efforts authorized by section 208(c) of P.L. 109-103 as well as those being conducted by the U.S. Geological Survey in the lower reaches of the basin. In addition, whenever possible, cooperative efforts with WRID, individual ditch companies, the federal water master, and the Walker River Paiute Tribe should be pursued.

7.2.3 Walker River Paiute Tribe's Water Lease/Purchase Program

As noted above, a land fallowing agreement between the U.S. Bureau of Reclamation and the Walker River Paiute Tribe was nearly finalized in the spring of 2004, with provisions for possible renewal in 2005 (see **Appendix G-7**); yet the agreement collapsed just prior to the onset of the 2004 irrigation season due to a number of interrelated factors, including challenging timelines, high threshold enrollment requirements, the difficulties of assuring deliveries to remaining irrigators, and uncertainties related to assumed on-reservation conveyance losses. These and/or other problems continued into 2005, when Reclamation's efforts were supplanted by an amendment to the 2002 Desert Terminal Lakes program which provided up to $10 million for the Tribe to develop an on-Reservation water lease and purchase program of its own (P.L. 109-103, section 208(b); see also **Appendix G-4**).

By mid-2006, the Tribe and Reclamation had entered into an "annual funding agreement" which set forth activities to be performed by the Tribe in developing its on-Reservation water lease/purchase program. Tasks for Phase 1 (i.e., first six months through December 2006) included establishing a program office and hiring a program coordinator; updating existing lands records to reflect current activity and water usage; researching lands, water rights, and related

NEPA requirements; reviewing 2004 and 2005 fallowing programs efforts for insights into what worked (and what didn't), including internal issues; developing a communication outreach plan to keep landowners and tribal members informed; and identifying proposed future (Phase 2) tasks and budgets.[117] Finally, by early 2007, the Tribe had initiated efforts towards possible implementation of a leasing/fallowing program during the 2007 irrigation season -- one that would be modeled, to a large extent, on the proposed 2004 program, and one that would be implemented concurrent with repair and construction activities at Weber Dam.[118] If successful, this program will not only help to improve Walker Lake inflows during a dry water year, but it will build crucial experience among Tribal administrators and community members alike in implementing a large-scale on-Reservation land fallowing program.

The above efforts represent some important steps forward in developing a more comprehensive portfolio of acquisition-based initiatives intended to restore and protect Walker Lake. To sustain crucial momentum, our recommendation is that a portion of remaining DTL funds be used on a cost-share basis to match and leverage the funds available to the Tribe under section 208(b), either concurrent with Tribal outlays (particularly in the case of prospective fee purchases) or as a way to extend the duration of any multi-year leasing initiative (and including, where possible, fee purchases as well). Coordination of all such efforts with planned repairs at Weber Dam (in 2007 and/or after) will be critically important, as will coordination with any future efforts related to repairs and improvements to diversion and conveyance facilities within the Walker River Indian Irrigation Project.

Over time, and especially in the context of an overall water settlement, consideration should be given to expanding the reach of the Tribe's water lease/purchase efforts to include acquisitions from willing sellers located above the current Reservation boundaries, particularly if doing so would help to satisfy Tribal claims in conjunction with the assured delivery of acquired waters to Walker Lake.[119]

7.3 Potential New Programs

The programs discussed above provide the essential foundation upon which future acquisition efforts will build. This section discusses several possible new initiatives that would, ideally, help to support, leverage, and expand upon those important foundational efforts.

7.3.1 Establish a Walker Basin Storage Water Banking or Leasing Program

As discussed in **Section 4**, approximately 63,300 acres within WRID boundaries (out of 79,900 total water righted acres) receive storage water derived from the District's decreed storage rights

[118] See, for example, Application 75337 with the Nevada State Engineer, filed February 14, 2007. This application proposes to temporarily transfer of up to 9,370 AF of the Tribe's natural flow diversion rights from "irrigation as decreed" to "wildlife and conservation" in the Walker River "from Little Dam to its terminus at Walker Lake."

[119] The Tribe, in turn, would presumably want to resolve issues related to the ownership of the beds and banks of Walker Lake as well as other issues in exchange for any such crediting.

in Bridgeport and Topaz Lake Reservoirs. Approximately 28,930 acres include both decreed natural flow rights and supplemental storage, and approximately 34,380 acres of "New Lands" have storage-only allocations.[120] Over the period 1931-1995, total diversions of stored water within WRID averaged approximately 66,000 AF/year, while associated diversions of "flood" or "surplus" water averaged approximately 26,000 AF/year.[121]

Taken together, these quantities suggest a potential for acquisitions that could address a substantial portion of Walker Lake's needs while focusing on insufficient "partial-duty" water rights generally associated with peripheral or lesser quality lands.[122] The potential ability to physically "bank" storage water, and to adaptively manage it over time in ways that would best address both environmental and irrigation system needs, makes both temporary and permanent storage water acquisitions especially attractive as complements to the steady, incremental, long-term acquisition of decreed natural-flow rights.

WRID has itself proposed a form of storage water leasing/banking to the U.S. Bureau of Reclamation as recently as 2005 and/or 2006.[123] While the details of the District's proposal(s) remain confidential, our general understanding is that it sought funding to (a) acquire allocated storage water from willing sellers on an annual basis, (b) retain (i.e., bank) that water in storage during the irrigation season, (c) release water from the bank for conveyance to Walker Lake at suitable times during the non-irrigation season in order to minimize both downstream diversions and associated channel losses,[124] and (d) administer the overall program. While the proposal that follows undoubtedly differs from that (or those) proposed by WRID, the District's leadership on this issue bodes well for the long-term potential of these concepts.

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[120] Both types of land may also have state-permitted groundwater rights, both primary and supplemental.

[121] <u>See</u> **Table 2-E**. We assume herein that the vast majority of storage and flood water diversions serve lands with "storage only" allocations due to the insufficient water duties associated with those allocations (e.g., "only 48% of a full water duty" according to Grenier (2000, page 1)), and because demands for water associated with decreed natural flow rights (including those with supplemental storage) would need to be fully satisfied before "excess water" could exist.

[122] The key assumption here is that demands for supplemental flood waters would decline as primary storage water is acquired. If possible, these and any other potential *indirect* benefits should be firmed up when acquired rights are transferred, perhaps as part of a proportionate allocation agreement with WRID. In any case, Grenier (2000, page 6) notes that relative priorities can be used as a rough guide when identifying "prime" versus "marginally productive" lands (and all lands with apportioned storage rights have either relatively junior natural flow rights or no natural flow rights at all). "Lands with senior rights were the first lands irrigated, and farmers naturally selected the best lands first. Lands with junior rights were only brought into production after the best lands were already being used. Although some lands with junior water rights produce excellent crops, it generally takes more water to do so because these lends tend to be bench lands."

[123] Ken Spooner, WRID General Manager, May 2006. Mr. Spooner indicated that WRID's proposal is confidential but of "general public knowledge," and that it would in any case be contingent on the settlement of related litigation.

[124] A singular goal of minimizing channel losses in order to maximize inflows to Walker Lake could end up being detrimental to the health of the Walker River. For example, Rood et. al. (2003) discuss how integrated stream flow management helped to promote riparian habitat and species recovery along the lower Truckee River *and* at its terminus in Pyramid Lake; see also USFWS (2003), pp. 32-34. As discussed further below, annual releases from storage should be managed as part of an integrated and "adaptive" flow management framework that addresses concurrently the ecological needs of Walker Lake, the Walker River, and other parts of the basin

Insofar as we can determine, WRID remains the owner of the "primary" storage water that has been allocated to New Lands on a recurrent annual basis. (**Sections 4** and **5** discuss these issues in detail, as does **Appendix E**.) Thus, while important questions remain, for purposes of this discussion we assume that future transfers of primary storage allocations to the Walker River and/or Walker Lake will require the affirmative cooperation and approval of the District.[125]

As envisioned herein, a Walker Basin Storage Water Bank (the "Bank") would be established for the purpose of storing, re-regulating, releasing, and conveying acquired storage waters for the benefit of Walker Lake. All storage water allocations to New Lands (i.e., primary storage rights allocated to non-decreed lands within WRID boundaries) would be eligible for participation in the Bank.[126] It would include two basic components: (1) a temporary "lease pool" derived from the annual (and/or multi-year) leasing of primary storage rights; and (2) a permanent "purchase pool" derived from primary storage rights that have been acquired in fee and that are assigned to the Bank on a permanent or long-term basis pursuant to agreement with WRID.[127] In this manner, both immediate and long-term needs could be addressed over time, while the individual preferences of willing sellers are respected (i.e., some might only wish to lease; others might prefer to sell). Acquired storage water from both sources would also be combined and co-managed every year.

For the temporary lease pool, primary storage rights would be acquired (leased) from willing sellers on a year-to-year basis via an annual market-based solicitation (i.e., sealed bid, reverse auction, etc.).[128] WRID would be funded to manage and administer the Bank, and to solicit and acquire rights under the temporary lease pool. (This part of the program might also include an annual schedule of the amounts to be leased over a 10-15 year period, along with incentive payments to WRID whenever those targets are attained.) For the permanent purchase pool, primary storage rights would be acquired in fee by others, such as the University of Nevada, and would either be assigned (donated) or sold to the Bank at cost. As noted above, the District

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[125] Whether acquired storage rights are "banked" or simply stored and released in the conventional manner, the District will most likely need to be the applicant (or at least a co-applicant) on petitions to change the manner and place of use of such water to the Walker River/Walker Lake.

[126] As discussed further in **Appendix E**, supplemental storage rights probably cannot be severed and transferred independent of the rights that they supplement. If, however, it should be determined that this is not the case, then it would make sense to include those supplemental rights in a future phase of the Bank.

[127] An agreement with WRID would ensure, among other matters, that acquired storage water would be assigned to the Bank in order to benefit Walker Lake, and would be accounted for separately from other stored water for the duration of each acquisition (i.e., single year, multi year, or permanent).

[128] **Appendix B** includes two recent examples of permanent sales of storage water at $274 and $500 per AF *in perpetuity*;. Annual lease rates would amount to some fraction of these values, and an annual market-based solicitation could help to ensure consistency between the price paid for annual leases and the price paid for permanent fee acquisitions while avoiding many "cost justification" issues that will otherwise likely arise. In any event, important questions as to the timing of payments that will be made to willing sellers (and/or WRID) and the actual release of banked water to benefit Walker Lake will have to be addressed as part of the banking program.

would agree to make assignments to the Bank, in effect reserving that portion of water in storage based on the total amounts acquired relative to the total annual storage water allocation.[129]

WRID would consult with the Walker River Paiute Tribe, state and federal agencies, and others on a regular (perhaps monthly) basis in order to adaptively manage the storage and release of banked supplies in a manner most beneficial to Walker Lake and the Walker River system.[130] Cooperation with and funding for the U.S. Geological Survey would also help to ensure that comprehensive monitoring of all banked supplies would be included as part of their ongoing study efforts in the Basin.[131]

Due to the interstate nature of the storage rights in question, WRID would work with appropriate entities, such as the Walker River Paiute Tribe or the Walker Basin Trust proposed later in this section, to prepare and submit both temporary and permanent change applications (for leased and purchased rights, respectively) either directly to the federal court or for concurrent consideration by the Nevada State Engineer and the California State Water Resources Control Board.[132] These applications would seek approval for changes in both "interim" reservoir operations (due to banking), and from their existing place and purpose of use (irrigation within WRID boundaries) to their new proposed place and purpose of use (water quantity and quality improvement at Walker Lake for fish, wildlife, habitat, and recreation purposes). Notice should be provided to the Nevada Department of Wildlife and the California Department of Fish and Game (in addition to all others required to receive notice under state and federal change rules) to obtain their evaluation that banking operations would not injure any other legal water user nor unreasonably affect fish, wildlife, or other instream beneficial uses. In addition, it may be appropriate to seek secondary permits from the Nevada State Engineer for all permanent transfers of acquired water upon conveyance to Walker Lake (i.e., following release from the Bank). Ultimately, of course, the federal District Court will have to approve of any and all such changes prior to their taking effect under Decree C-125; accordingly, early consultations with the U.S. Board of Water Commissioners (and especially the Chief Deputy Commissioner) are strongly encouraged.

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[129] Because the interests acquired remain appropriated in storage and have not otherwise "attached" to the land, consumptive use limitations would not apply (see discussion, **Appendix E)**. The "bankable" interest might, however, be adjusted to account for the actual yield of storage water over time relative to the face value of the interest acquired (**Appendix C**), and/or to account for a proportionate sharing of reservoir losses or spills.

[130] This would include continued full compliance with Section 5937 of the California Fish and Game Code for all reservoir operations (i.e., diversions into, releases from, and maintenance of minimum pools at Bridgeport and Topaz Lake Reservoirs). In addition, if of interest to NDOW, it might be possible to arrange for the delivery of water from the Bank directly to the Mason Valley Wildlife Management Area in exchange for assignment and transfer of an equivalent share of the MVWMA's decreed natural flow water rights to Walker Lake. A Walker Basin Trust, discussed below, would be an appropriate forum for all such consultations.

[131] There is some concern that funding for USGS' research and monitoring in the Walker Basin will only last through the end of FY08.

[132] As discussed in **Section 5**, changes to allocated storage rights *within* WRID boundaries are subject only to the District's approval in accordance with internal rules and regulations. Changes of those rights to locations *outside of* WRID boundaries (such as proposed transfers of storage water to the lower Walker River and/or Walker Lake) will ultimately require approval by the federal district court.

We are hopeful that WRID will come to support at least an initial pilot program that can help to build knowledge, experience, and confidence among the various parties involved with the banking of storage water. Any such program would probably have to be implemented in conjunction with the fallowing or retirement of lands currently served by the acquired storage rights.[133] U.S. Bureau of Reclamation approval will also be required,[134] and agreements will be needed with the Walker River Paiute Tribe and/or the Bureau of Indian Affairs to ensure that banked waters will be conveyed into and through Weber Reservoir and on into Walker Lake.[135] Finally, based on experience gained through a pilot project approach, it may be appropriate to seek state and/or federal legislative, administrative, and/or court authorization and approval of a longer-term storage water banking program that appropriately streamlines the change application process and that facilitates the use of multi-year leases and other targeted improvements.[136]

Storage water banking will not be easy, and the above suggestions are intended to stimulate discussions as much as to suggest that there is only one way to establish such a program. Yet the potential benefits of storage water banking suggest that it could be well worth the headaches involved. Accordingly, we urge WRID to make public its 2005-2006 water leasing proposal(s) or any updated version(s) thereof, and to support at least a pilot-scale water banking initiative that makes appropriate use of available Desert Terminal Lakes funding.[137]

7.3.2 Improve System Efficiency and Conservation

Water efficiency and conservation initiatives would seem to have great promise in terms of their potential for stretching available water supplies in what is, after all, the driest state in the nation.

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[133] The fallowing or retirement of lands to which acquired waters are appurtenant would help to ensure that the water acquired from individual irrigators will not simply be replaced by increased reliance on other available sources (e.g., groundwater). See **Section 6** for specific suggestions related to the maintenance and stewardship of fallowed lands.

[134] These approvals would include environmental documentation (e.g., an Environmental Assessment of the proposed pilot program) as well as detailed justification of associated administrative costs (e.g., for staff and legal counsel in preparing and finalizing acquisition agreements with individual farmers; for applications, notices, and protests; for complying with and/or enforcing any land fallowing or groundwater pumping limitations; for reservoir accounting and operations; and for payments to participating farmers).

[135] Agreements with the Tribe/BIA should include and address associated storage and pass-through operations at Weber Dam; diversion forbearance at Canals 1 and 2 downstream of Weber Dam; on-Reservation channel losses and associated monitoring efforts; and the need to avoid interference with approved repairs at Weber Dam.

[136] For example, AB 296 (Bobzien, March 2007) would have allowed for the lease of an agricultural water right for wildlife purposes for a period of up to 10 years under the provisions of NRS Chapter 533. It might also make sense to explore the potential for including a credit storage mechanism in order to store and re-manage the consumptive use portion of natural flow rights acquired from willing sellers in the upstream (California) portions of the Basin. These and other changes would likely require the approval of both states, as well as that of the U.S. District Court pursuant to the Walker River Decree.

[137] This *might* require removal of the water rights purchase/lease bar on (at least) that portion of remaining DTL funds. Alternatively, an agreement with WRID might be structured to eliminate the outright purchase or lease of water rights -- e.g., the District could be paid an annual fee for agreeing to forgo the use of banked storage water, and for entering into contracts with individual users who would agree to forgo their annual storage allocations.

Moreover, the federal water master's regulatory focus on decreed diversion rate duties rather than water righted acres per-se suggests that opportunities may exist for "partial duty" transfers that may not be possible in other contexts. Yet the no-injury requirements of Nevada's water transfer laws, the unique features and needs of a terminal lake system, and the substantial dependence on return flows in the Walker River basin combine to limit the potential for using such measures in efforts to restore and protect Walker Lake. In fact, at least one prior study concluded that on-farm water conservation efforts could actually end up *reducing* Walker Lake inflows over time.[138]

Efforts to acquire and transfer conserved water through on-farm initiatives and/or system investments should thus be undertaken initially on an experimental or "pilot" scale with the goal of determining whether, and under what conditions, water could be conserved and transferred without impacting other rights holders and without actually making matters worse for Walker Lake.[139] The 2004 infrastructure improvement program at the Mason Valley Wildlife Management Area (discussed above) suggests that improvements are possible on both counts, particularly when they occur in the lower reaches of the system. NRCS-administered conservation program agreements might also provide valuable insights in this regard, however to our knowledge there have been no efforts to-date to ensure that Walker Lake or even the Walker River will benefit from water conserved under such agreements.[140] Conservation easements might also be used to help to "keep the basin green" while freeing up conserved water consistent with market-based principles; however the problems noted above will continue to be a factor in terms of improving (and not diminishing) Walker Lake inflows.

In developing any such program, initial priority should be given to projects designed to test (a) the potential "system savings" associated with specific conveyance (ditch and lateral) and associated monitoring improvements, including potential water savings that do not involve "water rights appurtenant to land" (a specific limitation of the University of Nevada's Walker Basin Project, though not of the original DTL authorization); and to (b) potential reductions in diversions associated with on-farm water conservation measures via conservation easements and/or water conserving crops, with the goal of keeping lands in limited (alternative crop) production. In all cases, however, a co-equal priority must be to determine the potential for transferring conserved water (or at least the consumptive use portion thereof) to the lower Walker River and Walker Lake. No large-scale conservation or efficiency-based program should be pursued unless/until the latter potential has been confirmed.

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[138] Tracy et. al. (January 2001, Chapter 6) explain how improved efficiencies via on-farm water conservation could actually lead to *decreased* Walker Lake inflows. Whether this would be true of "off-farm" efficiency improvements (e.g., reducing conveyance losses via ditch lining or automation) remains to be seen; in general, however, if there is no ability to acquire and transfer the associated conservation "savings" they will generally be lost to diversion by downstream appropriators, particularly those with comparatively junior rights.

[139] It might, for example, be possible to transfer that portion of conserved water that was previously lost to crop or phreatophyte consumption, evaporation, or seepage into an isolated aquifer (etc.) but this would likely depend on case-specific particulars. Even if found to be lawful, water conserved and transferred in this manner would likely end up being very expensive on a cost-per-AF basis.

[140] As discussed in **Appendix F**, NRCS generally leaves to participating landowners the task of ensuring compliance with state water laws.

A cooperative effort between the University of Nevada, the Bureau of Reclamation, and NRCS might be an ideal way to structure and implement an initial pilot-scale program.[141] In many cases there should be no need to acquire lands (or related non-water interests) as part of this effort: water conservation pilots would simply be funded as part of appropriate "conservation agreements" under which all water savings (to the extent allowed by law) would be dedicated to in-stream purposes. Alternatively, or in addition, a Walker Basin Trust (discussed below) could help to design and implement this program, taking primary responsibility for the development of water conservation and related land stewardship easements, including agreements relating to the permanent protection of "core" agricultural lands, riparian lands, and other properties of interest.

7.3.3 Complete Additional Fee Acquisitions

At this point it is uncertain to what extent existing programs (e.g., the University's Walker Basin Project and the Walker Tribe's lease/purchase program) will focus on acquisitions *in fee* as the essential long-term foundation for ensuring permanent increases in Walker Lake inflows. Even if they do, recent market sales (**Appendix B**) combined with anticipated transaction costs and other demands for authorized funds suggest that current efforts and funding will not be sufficient to meet Walker Lake's long-term needs.[142] Thus, additional funding and additional fee acquisitions will be needed to achieve those objectives over time.

Depending on progress under the University's Walker Basin Project, additional fee acquisitions could be pursued as a simple extension of those efforts; however doing so might suggest that fee acquisitions from willing sellers in the California portions of the basin would not be pursued, which would not be consistent with a basin-wide approach to what is, after all, a basin-wide problem.[143] Alternatively, a new acquisition entity or program could be authorized and funded to focus on long-term fee acquisitions only, leaving annual, term, and other non-fee options to others.

The joint federal-state-tribal program of water right acquisition for the Lahontan Valley Wetlands in Fallon, Nevada provides some valuable insights concerning any such long-term efforts.[144] There, purchases of water and related interests by the U.S. Fish and Wildlife Service

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[141] This could be done via existing programs and funding, and/or through a new farm bill authorization.

[142] If, for example, direct acquisition costs end up averaging $1,000/AF, and $50 million remains available for this purpose under the current University of Nevada authorization, up to 50,000 AF could be acquired directly from willing sellers as part of this program. As discussed in **Section 2**, approximately half of this total (or about 25,000 AF/year) might eventually be transferred to Walker Lake in the form of permanently increased inflows, representing about half of the Lake's estimated long-term needs. Alternatively, if direct acquisition costs end up averaging $1,500/AF and only $45 million is available for that purpose, then only ~30,000 AF could be acquired and ~15,000 AF of permanently increased inflows would result. Either way, substantial additional funding will be required to permanently address Walker Lake's long-term increased inflow needs.

[143] One possible option for ensuring basin-wide participation in a comprehensive interstate settlement would be to include annual mitigation and restoration surcharges on all diversions of water in the California portions of the basin in lieu of acquisitions of water directly from those areas; funds derived from such surcharges could then be used to support future downstream acquisition efforts and related stewardship and management needs.

and others have been underway since 1989,[145] and by no means has the program been without challenges or controversy. Nevertheless, persistence has paid off: the acquisition program is now nearly half-way towards its long-term fee-purchase goal of 75,000 acre-feet, and the Refuge is now the largest single "irrigator" in the federal Newlands Project. Purchases from willing sellers[146] at appraised value have led generally (though not always) to acquisitions from the periphery of the project, and market forces have tended to coax out more marginal, unproductive lands. These factors have resulted in a least two important efficiency gains for the Project: several high-loss laterals have been closed, and water orders for the Refuge can be scheduled (and re-scheduled) with much greater flexibility than is typical for conventional irrigators. Other important lessons include the following:

- Buy for permanence, then use land exchanges, temporary water leases, and other creative strategies to adjust and fine tune the program when needed;
- Maintain a positive community presence, and treat all prospective sellers fairly and consistently;
- Be patient – acquiring water rights is a business, and year-to-year variations in the water rights marketplace are inevitable;
- Build on the experience gained from each individual transaction; and above all,
- Know what you're buying!

It is worth noting that the U.S. Fish and Wildlife Service's longstanding presence in and commitment to the Fallon community has helped to ensure that communication goes in both directions, and that any problems (or perceived problems) are dealt with directly. For example, prospective sellers know exactly where to go and with whom to inquire about the possibility of selling their rights; and Service representatives attend all irrigation district board meetings and have personal relationships with board members and staff. While care must be taken to avoid making inappropriate comparisons between the Stillwater (and/or other) acquisition experiences and the particulars of the Walker River basin, the concepts of physical presence, long-term commitment, and sustained community involvement all seem right on the mark.

An alternate and sometimes complementary approach involves using non-governmental entities to function as "intermediaries" between government and/or Tribal principals and prospective willing sellers. A noteworthy example (see also **Appendix F**) is the role that Great Basin Land

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[144] This discussion is based primarily on information provided by Richard Grimes, Realty Manager, Stillwater National Wildlife Refuge. <u>See</u> **Appendix F** for discussion of other western environmental water transaction initiatives.

[145] A series of Environmental Assessments guided water acquisition efforts from 1989-1994. A Final Environmental Impact Statement and Record of Decision for the current program was issued on November 4, 1996, including water acquisitions by the USFWS (for the Stillwater NWR), the U.S. Bureau of Indian Affairs (for the Fallon Indian Reservation), and the State of Nevada (for Carson Lake).

[146] The program considers "offers to sell" from prospective willing sellers; it does not solicit purchases directly.

& Water has played for nearly a decade under the 1995 Truckee River Water Quality Settlement Agreement. Under the WQSA, the United States, the Pyramid Lake Paiute Tribe, the cities of Reno and Sparks, and Washoe County agreed to resolve water quality litigation by improving instream flows through a $24 million program of willing-seller acquisitions; and the principals have contracted with GBLW to assist in implementing the WQSA by locating and working with potential willing sellers, entering into option agreements, contracting for appraisals, performing all necessary due diligence, and, at closing, assigning purchase rights to the ultimate owner. The results have been significant: nearly 4,600 AF of Truckee River water rights have been acquired in fee from willing sellers through more than 53 individual transactions involving approximately $12 million in fair market value payments.

7.3.4 Create A Local Land & Water Trust Organization

As noted above, acquisitions from willing sellers intended to benefit Walker Lake already have been or are being pursued by the U.S. Bureau of Reclamation, the University of Nevada (working primarily though not exclusively through a third-party acquisition coordinator), the Walker River Irrigation District, and the Walker River Paiute Tribe.[147] Considering these potentially disparate efforts, what might make sense going forward is to look for an appropriate institutional arrangement to ensure that they are effectively coordinated, while leaving each entity free (more or less) to pursue their own unique piece of the overall acquisition portfolio.

Though not a perfect fit, the most promising institutional model of those surveyed in **Appendix F** may be Oregon's Deschutes River Conservancy (DRC). Founded in 1996, the DRC was established as a non-profit corporation and brought together state, federal, tribal, and local governments along with private stakeholder representatives to address water quality and quantity concerns throughout the Deschutes River Basin. The DRC, governed by a 19-member board that includes 9 members representing private interests and 10 members representing public (governmental) interests, was established and authorized by Congress and receives both federal appropriations and non-federal tax-exempt funding. Since its inception, the DRC has purchased and leased water rights; established a water bank that is used for both environmental and irrigation purposes; facilitated the retirement of agricultural lands consistent with environmental and community needs; and funded and implemented water conservation projects. The main disadvantage of the DRC's status is that, as a non-profit corporation, it has no taxing or municipal bonding authority.[148]

Whether a comparable entity – perhaps a *Walker Basin Trust* -- makes sense for the Walker River basin is difficult to assess, though the history of the DRC suggests that the various entities involved recognized that "they collectively had a problem that could best be solved collectively" (**Appendix F**, page 53). The DRC also works by consensus, which requires substantial good-will among all of the parties involved (and absent which there may be *no* institutional form that

[147] In addition, the federal Bureau of Land Management served previously as lead agency for environmental compliance activities under the U.S. Department of the Interior's Walker River Basin Project.

[148] The final report of the Walker Basin Advisory Committee (2000) proposed establishment of a Walker River Conservancy District under Nevada law (or potentially as a bi-state entity). While such an entity would have taxing and municipal bonding authority among other desirable attributes, we were not able to find any examples thereof in our review of western environmental transaction programs (**Appendix F**).

is likely to succeed when it comes to integrating and addressing both environmental and community needs). Either way, a Congressionally-authorized entity comparable to the DRC would only be likely through some form of federal-tribal-interstate water settlement, the chances for which remain uncertain at this time.

To the extent that a Walker Basin Trust could be established, it would make sense to consider the following functions for inclusion therein:

- Coordinating acquisition efforts among the various principals involved, primarily as a sounding board but potentially including consensus-based measures as well;

- Working with the University of Nevada's Walker Basin Project and its Stakeholder Advisory Committee to ensure that both programmatic and applied research efforts make sense;

- Developing and overseeing integrated programs and policies relating to the re-vegetation and stabilization of fallowed and retired farmlands;

- Guiding the development of GIS-based decision support capabilities specific to the protection of core agricultural lands, riparian lands, and other lands of concern or special interest;

- Establishing and overseeing a "land bank" for sales, trades, and exchanges involving properties acquired under the various water acquisition efforts noted above when such properties are no longer needed for the primary purposes of those programs;

- Developing, executing, holding, and enforcing the terms of conservation easement agreements with willing landowners;

- Facilitating efforts to adaptively manage acquired water rights and transferred supplies for the benefit of Walker Lake and the Walker River system; and

- Establishing a groundwater mitigation bank from acquired primary groundwater rights with the potential for their partial re-sale to future M&I users.

Finally, if and when some form of federal-tribal-interstate water settlement begins to take shape, the following additional arrangements should be considered in conjunction with the above:

- A Community Benefits Agreement could be used to address and resolve any adverse community (i.e., socio-economic) impacts associated with the fallowing or retirement of agricultural lands while avoiding the myriad risks and pitfalls associated with damage mitigation approaches;[149]

[149] Of the various programs surveyed in **Appendix F**, only two – both large-scale, long-term land fallowing programs in California -- include socio-economic mitigation and/or community improvement provisions. Of those, the Imperial Irrigation District's mitigation program (established in 2003) remains substantially bogged-down due to impact quantification and payment disputes between IID and San Diego; and the Palo Verde improvement program

- Walker Lake could be included as part of the National Wildlife Refuge System, and/or restored as part of the Walker River Indian Reservation, with post-restoration management undertaken in perpetuity by the U.S. Fish and Wildlife Service as an integral component of the National Wildlife Refuge system based on the prior consent of the Walker River Paiute Tribe;[150] and

- Water rights acquired in fee and transferred to Walker Lake could be permanently assigned to the Walker River Paiute Tribe in exchange for the Tribe's commitment to (a) accept those rights in partial settlement of its outstanding water claims and (b) manage them in perpetuity on behalf of Walker Lake.

7.3.5 Improve Water Rights Administration & Monitoring

As discussed in **Sections 4** and **5** of this report, there is a troubling lack of coordination among jurisdictional entities in the Walker River system when it comes to monitoring and administering state-permitted groundwater rights, flood water rights, and both decreed natural flow and allocated storage rights. As acquisitions occur, and as change applications are submitted to and processed by the relevant jurisdictional entities, comprehensive and coordinated monitoring and administration will be imperative to ensuring that (a) those who acquire and transfer water are actually getting what they paid for (subject to approval conditions imposed by the relevant authorities), and (b) remaining rights holders continue to receive the water to which they are lawfully entitled. To this end, we recommend timely development and implementation of at least the following measures:

- The U.S. Geological Survey, in consultation with the USBWC, WRID, relevant ditch authorities, and the University of Nevada should be funded to undertake a comprehensive study of the potential for and cost of installing and maintaining real-time diversion monitoring capabilities at all significant *points of diversion* on the Walker River stream system, and at locations on all associated diversion ditches sufficient for the quantification of conveyance losses across the relevant range of flows. This study should also identify associated data management needs and costs for storing, processing, and summarizing diversions and deliveries at key locations on both a remote real-time and ongoing (historic) basis, and in a manner that will be accessible and useful to the federal water master, WRID, the relevant regulatory authorities, and the public. In addition, potential opportunities for improved efficiencies via the rehabilitation of diversion works, consolidation of diversions, canal and ditch lining and automation, and related measures should be evaluated and quantified where possible.

(established at more-or-less the same time) has yet to get off the ground. A Community Benefits Agreement approach would seek to focus on the "benefits" side of the equation and would thus avoid, if successful, the problems noted above.

[150] A similar arrangement was developed for the Anaho Island National Wildlife Refuge under the 1990 Truckee-Carson Pyramid Lake Water Rights Settlement Act. See P.L. 101-618, Section 210(b); and the March 1992 Memorandum of Understanding between the U.S. Fish and Wildlife Service and the Pyramid Lake Paiute Tribe.

- Following this evaluation, a comprehensive, federally-funded program of integrated surface and groundwater monitoring and administration should be developed and implemented by the Nevada State Engineer in cooperation with the federal water master and WRID, focusing on the Nevada portions of the basin exclusive of the Walker River Indian Reservation.[151] The principal goal of this program would be to give meaning, on a real time basis, to state-issued permits which limit combined surface water deliveries and supplemental groundwater withdrawals to a maximum of 4.0 AF/acre per season from all sources.

- Finally, the Walker Basin simulation model that was developed at considerable public expense for purposes of the mediated settlement of litigation (now concluded) should be released with documentation for public use and improvement in conjunction with the above efforts and in support of ongoing efforts to reach an overall Walker Basin settlement.[152]

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[151] As a sovereign entity, the Walker River Paiute Tribe has jurisdiction over groundwater withdrawals within the exterior boundaries of the Walker River Indian Reservation, at least to the extent that such withdrawals do not conflict with the Walker River Decree. If a federal-tribal-interstate water settlement is reached, it could presumably establish limits on annual groundwater withdrawals (e.g., 4.0 AF/acre in combination with all other sources) within the exterior Reservation boundaries, provided that comparable limits are established and enforced on groundwater withdrawls in the upstream portions of the basin. In California, where groundwater remains unregulated, such limits could be implemented through establishment of local groundwater management districts under California law.

[152] In September 2006, GBLW organized a briefing for researchers at the University of Nevada-Reno and the Desert Research Institute to learn more about the Walker River system simulation model developed by Natural Resources Consulting Engineers (NRCE) under contract with the U.S. Bureau of Indian Affairs as part of the structured mediation. A schematic of the model was provided by NRCE for that meeting, however efforts to secure the public release of the model (and/or of key inputs and results) were not successful due, we understand, to the ongoing objection of one or more mediation parties.

8.0 Tables, Figures, and Exhibits

TABLES

FIGURES

EXHIBITS

Table 2-A

Walker Lake Basin
Principal Ditches and Points of Diversions
Provisional Summary, April 2007

ANTELOPE VALLEY
Alkali Ditch
Big Slough Ditch
Carney Ditch
Goodnough-West Ditch
Hardy Ditch
Harney Ditch
Little Antelope
Main Canal
Powell Ditch
Rickey Ditch
Swauger Ditch

SMITH VALLEY
Burbank Ditch
Colony Canal
Fulstone-Lower Ditch
Fulstone-Upper Ditch
Gage Peterson ditch
Plymouth Canal
River Simpson Consolidated Canal
Saroni Canal
West Walker Ditch

EAST WALKER CANYON
Dreyer East Ditch
Dreyer West Ditch
East Walker River Ranch (12)
Fryer Ranch ditches (5)
Ravenelle Ranch East Ditch
Ravenelle Ranch West Ditch
Sceirine Ranch ditches (5)

RESERVATION
Canal 1
Canal 2

EAST MASON VALLEY
Baker Snyder Ditch
Day-Pitchfork Ranch
Fox
Greenwood Ditch
Hall Ditch
High Ditch
Hilbun Ditch
Howard
Mickey
Nelson

WEST MASON/TUNNEL SECTION
D. & G.W. Ditch
Kelly Alkali Ditch
Lee Sanders Ditch
Tunnel Ditch
West Side Canal

MAIN MASON VALLEY
Campbell Ditch
Consolidated Nichol-Merritt Ditch
Dairy Ditch
Gold Hill Ditch
Joggles Ditch
McLeod Ditch
Sciarani
Spragg Woodcock Ditch
Sprague Alcorn & Burley (SAB) Ditch
West Hyland Ditch

MASON PUMPS
B.P. Belcher Pump
Martin Pump
P.P. Perumean Pump
W.P. Williams Pump

Source: Appendix D; see also Plate 2-II

Table 2-B

Walker Lake Basin Study

GIS-Based Estimates of Irrigated Lands and Riparian/Wetland Vegetation -- Selected Years, 1986-2002

	1986	1992	1995	1998	2000	2002	6-Year Average
Irrigated (acres)							
Bridgeport Valley**	*20,000*	*20,000*	*20,000*	*20,000*	*20,000*	*20,000*	*20,000*
East Walker	5,108	2,731	4,990	3,979	4,033	3,248	4,015
Antelope Valley	12,272	11,402	12,365	11,576	13,046	12,729	12,232
Smith Valley	19,446	13,554	17,562	18,002	18,843	17,306	17,452
Mason Valley	35,853	29,963	33,412	37,503	39,459	33,641	34,972
Reservation Lands	2,495	2,245	2,574	2,847	2,815	2,155	2,522
Total	95,176	**79,896**	90,903	93,907	**98,197**	89,079	91,193
WRID (East Walker, Smith, Mason)	60,408	46,248	55,965	59,484	62,335	54,195	56,439
Riparian/Wetland (acres)							
Bridgeport Valley	n/a	n/a	n/a	n/a	n/a	n/a	n/a
East Walker	3,156	3,001	2,863	3,466	2,924	2,631	3,007
Antelope Valley	3,089	2,973	2,524	3,102	2,468	2,545	2,783
Smith Valley	5,259	2,659	3,165	4,401	2,358	2,012	3,309
Mason Valley	10,707	5,828	7,518	7,912	6,507	6,129	7,434
Reservation Lands	6,075	2,890	4,613	4,476	3,918	3,045	4,169
Total	28,286	17,350	20,683	23,357	18,176	16,361	20,702
Precipitation Index (inches)	47.3	24.6	40.8	43.5	34.6	29.4	36.7
Image dates	8/30/86	7/29/92	8/7/95	8/31/98	7/27/00	8/18/02	n/a

Source: DRI June 2006, page 2, Table 4, and Appendix A

*** From Pahl (2000a, page 17): assumed average of 20,000 irrigated acres, 1926-1995*

Table 2-C

Walker River Basin
Average Annual Surface Water Budget, 1926-1995
(AF/year unless otherwise specified)

		Walker River Basin above Walker Lake		Walker Lake
Inflows				
River Inflow to Headwater Areas				
Upper East Walker & Tributaries		130,600		
Upper West Walker & Tributaries		195,700		
Subtotal, River Inflows			326,300	69,900
Net Local Inflow (incl. return flows)				
Upper West Walker (CA)		-		
Antelope Valley (CA)		55,800		
Smith Valley		23,900		
Bridgeport Valley (CA)		28,100		
East Walker Area		21,800		
Mason Valley		22,300		
Schurz Area		(25,800)		
Subtotal, Local Inflows			126,100	14,000
Total Inflows			452,400	83,900
Outflows				
River Outflow to Walker Lake		69,900		
			69,900	-
Irrigation Diversions				
Upper West Walker Area (CA)		4,500		
Antelope Valley (CA)		64,700		
Smith Valley		69,900		
Bridgeport Valley (CA)		50,000		
East Walker Area		20,400		
Mason Valley		136,500		
Schurz Area		23,000		
Subtotal, Irrigation Diversions			369,000	-
Net Evaporation				
Topaz Lake Reservoir		5,800		
Bridgeport Reservoir		4,300		
Weber Reservoir		2,500		
Subtotal, Net Evaporation			12,600	160,300
Change in Storage				
Topaz Lake Reservoir		400		
Bridgeport Reservoir		500		
Weber Reservoir		n/a		
Subtotal, Change in Storage			900	(76,400)
Total Outflows			452,400	83,900
Net Reduction in Surface Flows (= River Outflow - Inflow)			(256,400)	

(attributed to irrigation consumptive use, reservoir evaporation, discharges to groundwater, and other losses

Total Change in Storage 1926-1995 (= Annual Change in Storage * 70 years) (5,348,000)

Source: Pahl 2000(a) Tables 11-1, 12-1

Table 2-D
Summary of Annual Diversions by Sub-Area, 1931-1995 (acre-feet)

Year	Antelope Valley - West Walker River	Antelope Valley - Tributaries	Smith Valley - West Walker River	East Walker Area - Above 10293050	East Walker Area - Between 10293050 and 10293500	Mason Valley - West Walker River	Mason Valley - East Walker River	Mason Valley - Walker River	TOTAL
1931			21,520	1,940	5,189	8,502	13,311	13,222	63,684 *
1932			62,304			26,908	50,323	71,058	210,593 *
1934			31,616	1,524	6,889	9,385	23,476	29,924	102,814 *
1935			57,158		12,758	25,026	49,662	60,652	205,256 *
1936			64,540		16,165	29,909	56,346	65,746	232,706 *
1937			62,209			29,738	55,563	66,770	214,280 *
1938			66,497			37,040	56,689	67,054	227,280 *
1939			58,135	2,422	12,581	19,640	42,125	50,034	184,937 *
1940			83,083	4,678	15,526	19,662	53,360	60,696	237,005 *
1941			80,817	1,568	16,209	23,098	57,040	73,151	251,883 *
1942			81,119		17,372	21,815	63,884	76,485	260,675 *
1943	66,328		76,645		17,439	23,890	57,903	68,150	310,355 *
1944	58,650		75,380	6,692	14,889	19,352	45,680	64,983	285,626 *
1945	84,539		74,463		17,052	21,951	55,498	76,870	330,373 *
1946	80,981		77,401		20,622	24,376	60,925	82,923	347,228 *
1947	60,669	334	72,480	3,990	17,436	21,129	44,288	62,901	283,227
1948	45,192	1,009	53,949	5,240	11,709	17,728	35,518	55,565	225,910
1949	54,702	1,966	68,277	4,994	12,384	18,985	39,419	53,745	254,472
1950	55,011	2,741	71,987	5,236	14,534	22,456	46,078	71,211	289,254
1951	70,002	2,826	81,467	6,777	18,735	25,243	58,510	92,546	356,106
1952	98,811	5,426	100,520	3,910	22,341	33,075	74,606	91,673	430,362
1953	72,934	2,613	88,827	8,041	17,949	26,672	60,080	82,590	359,706
1954	57,969	2,504	82,948	6,077	18,086	24,524	53,347	71,353	316,808
1955	56,933	1,214	53,215	4,889	11,268	17,196	34,887	57,554	237,156
1956	88,192	3,333	100,456		14,819	30,394	70,169	92,583	399,946 *
1957	63,000	2,961	82,609	4,704	18,782	26,135	61,199	75,923	335,313
1958	82,991	5,302	103,802	4,067	24,287	33,450	75,631	103,322	432,852
1959	49,586	2,041	62,743	4,515	13,225	17,603	41,663	60,825	252,201
1960	51,319	1,859	30,323	3,747	8,434	10,069	22,795	40,650	169,196
1961	44,743	1,905	19,582	2,872	5,230	6,642	12,677	28,590	122,241
1962	70,043	3,056	80,817	8,024	15,080	20,045	56,548	73,300	326,913
1963	62,683	2,450	82,991	8,284	15,131	20,517	56,177	72,763	320,994
1964	43,062	1,073	62,072	5,683	12,766	16,817	37,640	58,010	237,123
1965	78,076	2,333	92,616	7,974	16,816	26,102	63,819	87,572	375,307
1966	57,769	3,009	73,444	6,207	16,707	19,020	42,641	64,631	283,427
1967	69,017	4,808	90,608	10,196	19,708	28,233	70,047	94,899	387,515
1968	53,331	3,026	65,318	5,637	12,532	18,826	39,277	61,557	259,504
1969	90,633	5,369	105,029	10,498	13,754	31,161	74,964	90,427	421,835
1970	65,353	2,364	89,024	8,314	17,694	23,267	56,127	72,562	334,704
1971	69,220	2,499	93,238	8,214	18,579	24,293	64,517	85,915	366,476
1972	68,513	3,175	70,380	6,152	17,282	20,155	48,967	68,194	302,819
1973	69,976	1,219	98,285	9,087	18,775	24,699	63,825	79,947	365,812
1974	94,375	2,957	119,142	9,296	21,284	28,132	74,081	90,868	440,135
1975	77,638	2,993	101,748	8,611	20,733	26,607	69,790	82,279	390,399
1976	43,361	1,499	43,973	3,334	12,269	12,855	26,493	41,149	184,932
1977	30,506	1,058	16,513	1,847	4,953	5,867	12,307	20,672	93,723
1978	84,442		116,593	9,719	19,836	28,623	80,844	109,945	450,002 *
1979	69,561	200	90,324	6,427	15,401	25,771	63,959	85,403	357,046
1980	86,214		118,584	11,421	25,383	30,779	76,924	99,571	448,876 *
1981	49,377		55,530	6,605	15,435	17,458	39,354	59,395	243,155 *
1982	92,516		117,147	12,354	25,040	27,165	71,521	91,765	437,508 *
1983	84,625		110,890	7,375	23,197	26,420	66,389	83,956	402,852 *
1984	75,587		102,331	9,575	24,232	26,958	65,504	88,144	392,331 *
1985	59,407		59,219	6,925	19,146	19,990	48,169	71,911	284,767 *
1986	88,814		101,163	8,807	23,842	28,451	72,473	102,000	425,550 *
1987	47,011		40,840	4,876	14,219	13,065	31,754	43,474	195,239 *
1988	43,990		22,596	2,371	6,186	7,954	15,044	31,619	129,760 *
1989	66,141		45,992	4,573	8,724	14,211	32,615	57,995	230,251 *
1990	49,710		24,227	2,632	5,696	9,029	14,035	36,217	141,546 *
1991	53,396		29,182	2,667	5,654	9,734	15,015	36,152	151,800 *
1992	38,845		14,400	1,850	4,438	4,510	8,299	23,751	96,093 *
1993	69,313		60,952	5,616	12,856	18,488	48,824	82,218	298,267 *
1994	39,877		29,051	2,500	6,896	8,093	17,500	36,776	140,693 *
1995	88,744		85,100	7,133	16,904	24,262	60,457	95,449	378,049 *
Average	65,541	2,535	71,178	5,901	15,230	21,237	49,352	67,957	284,763

Source: Pahl 2000(b), Table 4; * = missing sub-basin data

Table 2-E

Smith and Mason Valleys
Diversions of Natural Flow, Storage, and Flood Waters by Sub-Area, 1931-95

	Natural AF/year	**Storage** AF/year	**Flood** AF/year	**Total** AF/year
Average Diversions				
East (all)	40,023	22,043	7,422	69,488
Main Mason	55,076	9,975	3,195	68,246
Smith	30,765	27,499	13,208	71,472
Tunnel	12,663	6,426	2,339	21,428
	138,527	65,943	26,164	230,634
Pct of Total by Type				
East (all)	58%	32%	11%	100%
Main Mason	81%	15%	5%	100%
Smith	43%	38%	18%	100%
Tunnel	59%	30%	11%	100%
	60%	29%	11%	100%
Pct of Total by Area				
East (all)	29%	33%	28%	30%
Main Mason	40%	15%	12%	30%
Smith	22%	42%	50%	31%
Tunnel	9%	10%	9%	9%
	100%	100%	100%	100%

	Decree	*Decree plus Storage (infrd)*	*Storage Only*	*Total*
Water Righted Acres				
East (all)	12,760	12,760	11,175	23,935
Main Mason	21,001	21,001	7,913	28,914
Smith	8,905	8,905	11,886	20,791
Tunnel	3,134	3,134	3,525	6,659
	45,800	45,800	34,499	80,299

Source: Meyers 2001 Tables 6, 10, 11

Table 2-F

Summary of Estimated Annual Ground-Water Pumpage 1994-2004
Smith and Mason Valleys, Nevada
(All Values in Acre-Feet)

Year	Smith Valley	Mason Valley	Combined
1994	33,204	122,001	155,205
1995	10,340	41,427	51,767
1996	17,249	51,302	68,551
1997	15,901	43,264	59,165
1998	13,391	39,645	53,036
1999	16,957	48,856	65,813
2000	29,579	83,888	113,467
2001	31,313	116,016	147,329
2002	32,518	114,809	147,327
2003	30,959	101,512	132,471
2004	32,805	108,495	141,300
Average AF/year	24,020	79,201	103,221
Committed AF/year	60,009	168,216	228,225
No of Well Sites	100	200	300
Domestic AF/year	1,000	2,000	3,000
No of Well Sites	485	910	1,395

Source: Gallagher 2005

Table 4-A
Walker River Basin
Decree C-125 Natural Flow Diversion Rights Summary

Sub-Area	C-125 Diversion Rights (cfs)	C-125 Acres (acres)	Average Diversion Rate per 100 acres (cfs)	Irrigation Season (days)	*Calculated* AF/day per cfs	*Calculated* Maximum Diversion (AF/year)	Max Ann Duty (AF/acre)	Notes
Above Antelope Valley (CA)	36.130	2,089	1.730	199	1.9835	14,261	6.83	West Walker & tributaries
Antelope Valley (CA)	256.190	15,958	1.605	245	1.9835	124,497	7.80	West Walker plus Lost Canyon, Mill, Rodriquez Creeks
subtotal	292.320	18,047				138,759		
Bridgeport Valley (CA)	377.370	23,769	1.588	199	1.9835	148,954	6.27	East Walker & Tributaries (non-WRID)
Bridgeport Valley (CA-submerged)	41.920	2,660	1.576	199	1.9835	16,547	6.22	East Walker & Tributaries (WRID submerged)
subtotal	419.290	26,429				165,501		
Smith Valley (North)	40.030	3,545	1.129	245	1.9835	19,453	5.49	North of W Walker River (Artesia Basin)
Smith Valley (South)	114.484	8,015	1.428	245	1.9835	55,634	6.94	South of W Walker River
subtotal	154.514	11,560				75,087		
Upper East Walker (CA/NV)	63.980	4,076	1.570	245	1.9835	31,092	7.63	Above 10293050 plus Frying Pan, Murphy, Sweetwater Creeks
Lower East Walker	56.117	3,520	1.594	245	1.9835	27,270	7.75	Below 10293050 plus Bodie, Rough Creeks
subtotal	120.097	7,596				58,362		
East Mason Valley	140.858	10,964	1.285	245	1.9835	68,451	6.24	East Walker River
West Mason Valley	49.560	3,101	1.598	245	1.9835	24,084	7.77	West Walker River
Main Mason Valley	372.398	31,056	1.199	245	1.9835	180,970	5.83	Main Walker (below confluence)
subtotal	562.816	45,121				273,505		
Walker Lake Valley	26.250	2,100	1.250	180	1.9835	9,372	4.46	WRIR below Wabuska
subtotal	26.250	2,100				9,372		
Walker Basin Totals	1,575.287	110,852				720,585		
Above Bridgeport/Coleville	1.200	100	1.200	199	1.9835	473.66	4.74	March 1 - September 15
	1.600	100	1.600	199	1.9835	631.55	6.32	
Below Bridgeport/Coleville	1.200	100	1.200	245	1.9835	583.15	5.83	March 1 - October 31
	1.600	100	1.600	245	1.9835	777.53	7.78	
Walker River Paiute Tribe	26.250	2,100	1.250	180	1.9835	9,372.04	4.46	180 consecutive days

Source: Pahl 1999b, Tables 3-4

Table 4-B
Walker River Irrigation District
Water-Righted Acreage within WRID Boundaries
by type (in acres)

	Total Water Rights *Reported*	Total Water Rights *Sum*	Decree Only	Decree plus Supplemental Storage	*Subtotal, All Decree*	Primary Storage (New Land)	Notes
West Walker	20,563	20,710	3,100	5,790	*8,890*	11,820	State Line to Wilson Canyon (Smith Valley North & South)
East Walker	24,134	23,930	4,380	8,380	*12,760*	11,170	State Line to Confluence (E Walker Canyon + E Mason Valley)
Tunnel Section	6,982	6,660	1,560	1,570	*3,130*	3,530	Wilson Canyon to Confluence (West Mason Valley)
Main Walker	28,227	28,480	7,440	13,190	*20,630*	7,850	Below Confluence (Main Mason Valley)
	79,906	79,780	16,480	28,930	*45,410*	34,370	

Percent of total (by sub-area and total)

	Decree Only	Decree plus Supplemental Storage	*Subtotal, All Decree*	Primary Storage (New Land)
West Walker	15%	28%	*43%*	57%
East Walker	18%	35%	*53%*	47%
Tunnel Section	23%	24%	*47%*	53%
Main Walker	26%	46%	*72%*	28%
	21%	36%	*57%*	43%

Source: "Presented by WRID at a forum hosted by Senator Reid, March 28, 1994" (adapted from Walker Basin Advisory Committee Final Report, Table 6.3)

Table 4-C
Walker River Diversion Ditches
within WRID Boundaries

	C-125 Diversion Rights (cfs)	C-125 Acres (acres)	New Land Acres (acres)	Total Acres (acres)	Average Diversions (AF/year)
East Walker (all)					
Baker Snyder	2.92	292	108	399	971
East Walker	45.83	2,772	4,629	7,401	5,486
Fox	39.16	2,885	849	3,734	8,850
Fox-Mickey	-	-	-	-	14,993
Greenwood	27.43	2,158	1,060	3,218	5,578
Hall	24.07	1,587	1,994	3,581	4,763
Hall Daniels	-	-	-	-	3,065
High	6.28	n/a	972	-	1,188
Hilbun	7.60	420	154	574	757
Howard	-	-	-	-	261
Mickey	19.20	1,592	776	2,368	4,568
Nelson	1.68	105	174	279	470
Upper East	15.24	950	461	1,411	3,351
	189.41	12,761	11,176	22,965	54,301
West Walker/Smith Valley					
Burbank	4.49	376	85	461	1,188
Colony	36.93	2,565	4,809	7,374	7,865
Gage Peterson	14.60	918	112	1,030	3,698
Lower Fulstone	5.05	315	220	535	404
Plymouth	21.26	1,736	2,248	3,984	5,969
River Simpson	12.55	871	382	1,253	2,951
Saroni	11.47	751	3,106	3,857	3,845
Upper Fulstone	3.75	235	327	562	752
West Walker	14.31	1,138	597	1,735	3,136
	124.41	8,905	11,886	20,791	29,808
W Walker/Tunnel Section (Mason Valley)					
D&GW	8.62	541	830	1,371	2,152
Kelly Alkali	1.02	637	566	1,203	1,829
Lee Sanders	2.32	160	160	320	1,057
Tunnel	26.70	1,542	1,817	3,359	6,369
West Side Canal	4.06	254	152	406	1,375
	42.72	3,134	3,526	6,660	12,782
Main Walker (Mason Valley below confluence)					
Campbell	63.14	4,889	2,784	7,673	14,019
Con. Campbell	-	-	-	-	12,664
Dairy	-	-	-	-	397
Joggles	57.53	4,856	478	5,334	9,611
McLeod	5.80	650		650	1,583
Nichol Merritt	55.15	4,413	1,014	5,427	11,667
Con. Nichol Merritt	-	-	-	-	11,914
River Pump(s)	0.75	-	235	235	70
SAB	36.70	2,584	945	3,529	6,359
Sciarani	-	-	-	-	959
Spragg	12.38	995	1,228	2,223	3,638
West Hyland	36.90	2,614	1,231	3,845	8,153
	268.35	21,001	7,913	28,914	81,034
Total, All Areas	624.89	45,801	34,500	79,329	177,925

Source: Meyers (2001), Tables 5, 7, and 9

Table 6-A: Advantages and Disadvantages of Structured vs. Unstructured Acquisition Programs

Alternative	*Advantages*	*Disadvantages*
Unstructured Program	Largest potential market No willing sellers automatically excluded Greater likelihood of early success in seeing water rights change hands? Likelihood that market will encourage offers of poorest quality lands and lowest priority water rights?	Only some rights transferable? Greater likelihood of reduced delivery efficiencies? Increased potential for viable protests?
Structured Program	Ability to selectively target water rights? Higher proportion of acquired rights transferable to Walker Lake? Potential for increased delivery efficiencies? Potential for protecting core agricultural lands leading to reduced impacts to local economy and protection of agricultural character? Reduced potential for viable protests?	Limits participation from potential willing sellers Uncertain process for establishing structured priorities Substantial time and costs for pre-acquisition planning Still no assurance that transfers won't be protested
Core Area Retention	Subset of "Structured"	
Maximize Benefit to Walker Lake	Highest potential transfer and delivery efficiencies Increased assurance that acquired water will be deliverable to Walker Lake	Inherent focus on most productive agricultural lands? Other "Structured"

Adapted from Walker River Basin Advisory Committee, A Report of Findings (February 2000)

Table 6-B

Walker River Basin Advisory Committee Final Report
Potential Acquistion Alternatives

Alternative	Estimated Purchase Cost (February 2000) per acre *inferred*	Estimated Purchase Cost (February 2000) per AF	Estimated Administrative Costs Percent *inferred*	Estimated Administrative Costs Surcharge	Total per AF	Estimated Yield Factors Transfer Approval	Estimated Yield Factors Conv. Loss *all*	Estimated Yield Factors Add'l Inflow AF *inferred*	Estimated Need Acq Need AF	Estimated Need Total Cost $
Unstructured Program	$ 2,000	$ 500	50%	$ 250	$ 750	65%	50%	5,000	15,385	$ 11,538,462
Structured Program	$ 2,200	$ 550	55%	$ 300	$ 850	70%	55%	5,000	12,987	$ 11,038,961
Core Area Retention	$ 1,800	$ 450	44%	$ 200	$ 650	60%	45%	5,000	18,519	$ 12,037,037
Maximum Benefit to Lake	$ 2,400	$ 600	33%	$ 200	$ 800	80%	60%	5,000	10,417	$ 8,333,333

Source: Walker River Basin Advisory Committee: A Report of Findings, February 2000, Table 6.11

Table 6-C

Recorded Water Right, Farm, and Land Sales in the Mason Valley, Nevada

Weighted averages for the periods 1999-2006 and 2005-2006

	1999-2006			2005-2006		
Mason Valley	*#*	*per acre*	*per AF*	*#*	*per acre*	*per AF*
Water Right Sales						
Primary GW	14	$ -	$ 1,649	14	$ -	$ 1,649
Supplemental GW	3	-	746	2	-	674
Farm Sales						
Large (>50 acres)	35	$ 2,255	$ 564	6	$ 2,880	$ 720
Small (<50 acres)	11	6,973	1,743	3	11,009	2,752
Pumpwater	4	2,838	709	1	6,137	1,534
Land Sales	31	$ 600	$ -	15	$ 2,207	$ -
Farm-Land Value Pairs	4	$ 2,840	$ 710	2	$ 4,801	$ 1,200
Total Sales	102			43		

Source: Appendix B. Farm sales data based on gross farm acres rather than net irrigated acres; and calculated $/AF based on assumed average conversion rate of 4.0 AF/acre.

Table 6-D

Recorded Water Right, Farm, and Land Sales in the Smith Valley, Nevada

Weighted averages for the periods 1999-2006 and 2005-2006

	1999-2006			2005-2006		
Smith Valley	*#*	*per acre*	*per AF*	*#*	*per acre*	*per AF*
Water Right Sales						
Groundwater	29	$ -	$ 1,555	15	$ -	$ 1,263
Storage (WRID)	2	-	407	2	-	407
Farm Sales						
Large (>50 acres)	29	$ 4,376	$ 1,094	8	$ 6,740	$ 1,685
Small (<50 acres)	14	14,985	3,746	9	17,216	4,304
Pumpwater	12	2,815	2,815	4	4,769	1,192
Land Sales	52	$ 4,896	$ -	13	$ 8,442	$ -
Farm-Land Value Pairs	5	$2,399	$600	1	$ 3,646	$912
Total Sales	143			52		

Source: Appendix B. Farm sales data based on gross farm acres rather than net irrigated acres; and calculated $/AF based on assumed average conversion rate of 4.0 AF/acre.

Table 6-E

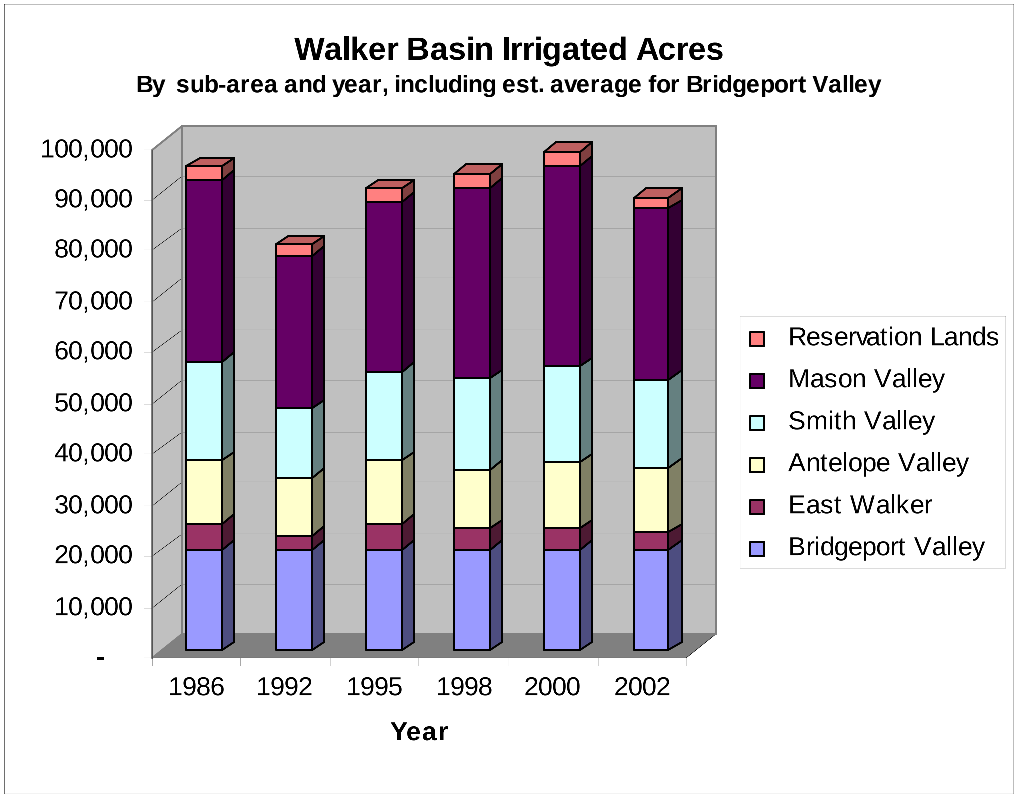
Walker Lake Basin, Nevada
Ditch Company Annual Assessments, 2007

Ditch Company	Acreage	Shares	Annual Assessments Per acre	Per share	Total
Campbell Ditch Co.	7,800		$ 5.50		$ 42,900
Nichol Merrit	5,610		4.50		25,245
Saroni Canal	3,959		10.00		39,590
High Ditch	948		7.00		6,636
S.A.B. Ditch Co.	4,383		2.50		10,958
Joggles Ditch Co.	4,068		2.00		8,136
West Hyland Ditch Co.	5,026		2.50		12,565
Baker Snyder	400		a		-
East Walker	7,360		a		-
Fox	4,023		4.50		18,104
Greenwood	2,870		4.50		12,915
G&H	7,000		0.50		3,500
Hall	3,190		5.50		17,545
Hilbun	782		0.20		156
Howard	2		a		-
Nelson	643		b		-
Mickey	2,213		5.00		11,065
Upper E. Walker	1,440		a		-
E. River Pumps	26		a		-
Burbank	430		4.70		2,021
Colony	7,097		4.50		31,937
Gage Peterson	1,070		b		-
Plymouth	3,942		b		-
River Simpson	2,127		4.70		9,997
West Walker	1,670		b		-
Lower Fulstone	470		b		-
Upper Fulstone	562		4.70		2,641
W. Walker Pumps	123		c		-
D&GW		123		$ 25.00	3,075
Kelly Alkali	1,004		a		-
Lee Sanders	316		b		-
Tunnel		12		$ 450.00	5,400
Valley Vista Ranch LLC	406		a		-
Nordyke Quail	200		d		-
Dairy	480		a		-
McLeod	453		a		-
Sciarani	485		a		-
Spragg	1,846		13.50		24,921
River Pump	502		a		-
NDOW @ Weir	533		a		-
	85,459	135	$ -	$ -	$ 289,306

Key: a = "no ind. assmnts"; b = no entry; c = "TBD"; d = "break bills down"

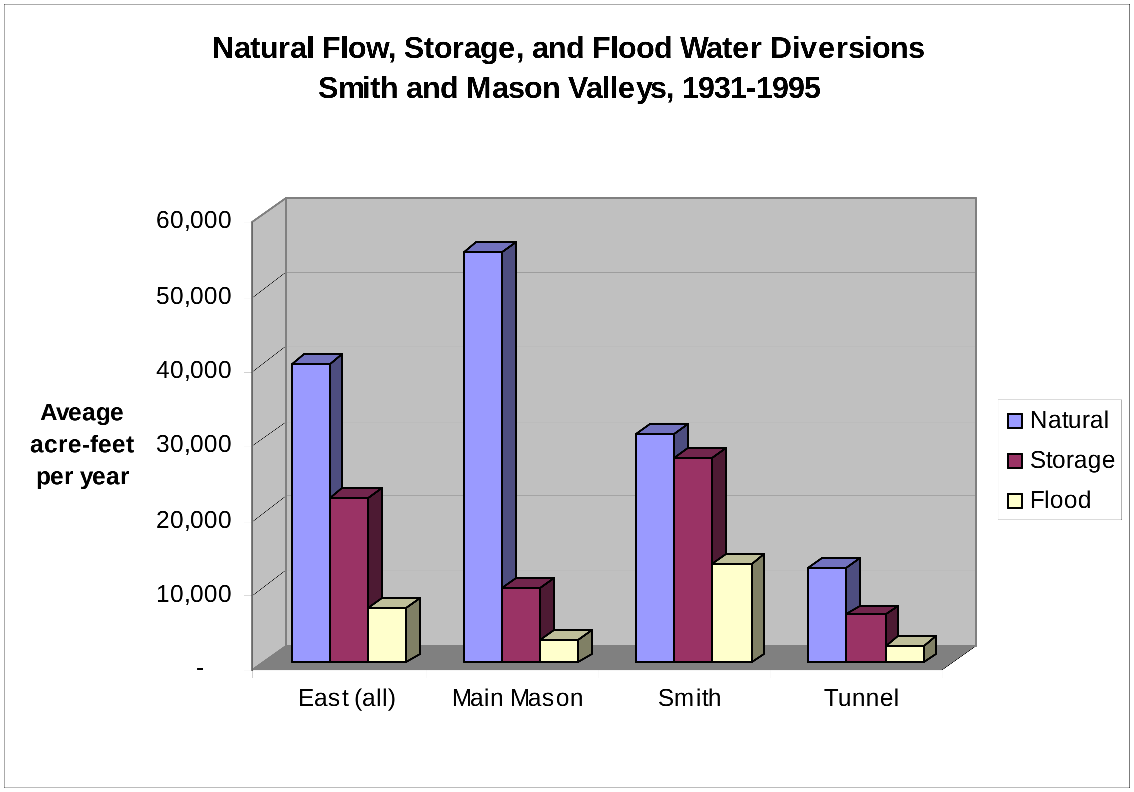
Source: Walker River Irrigation District, February 1, 2007

Figure 2-1



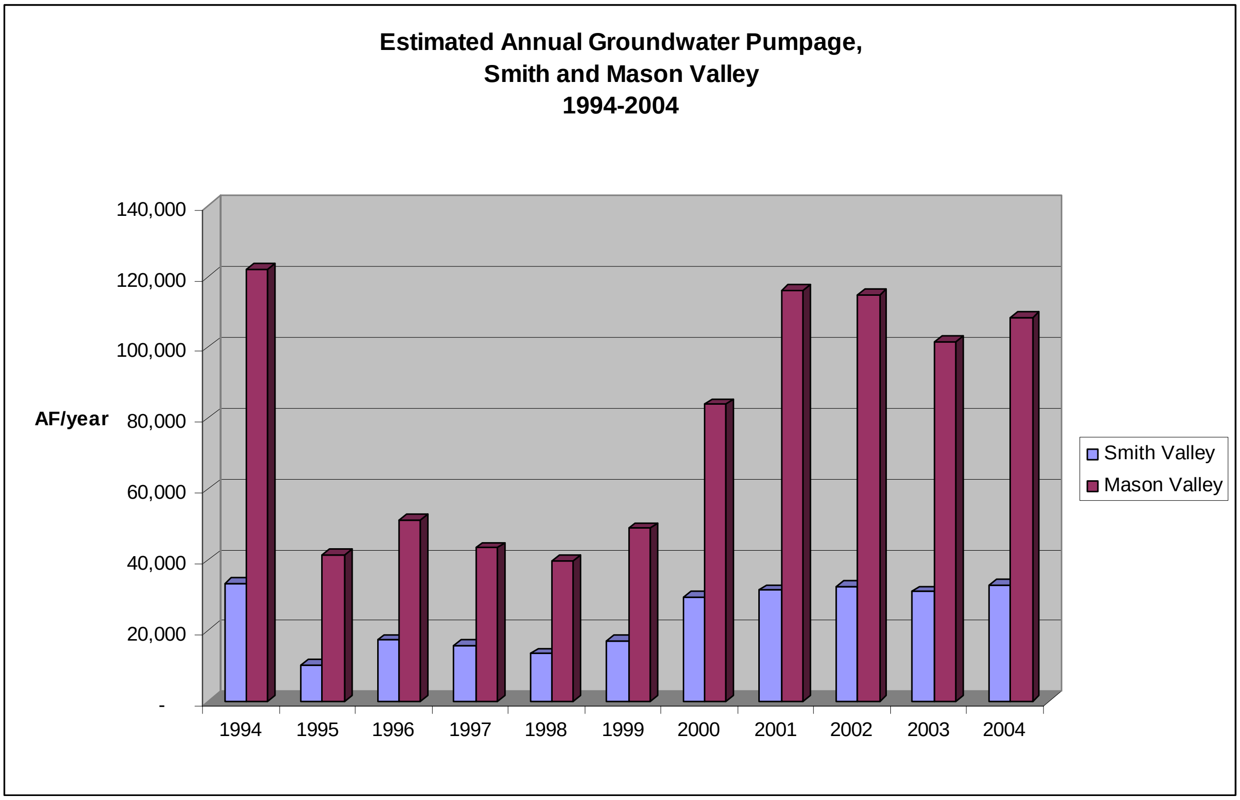
Source: Table 2-B

Figure 2-2



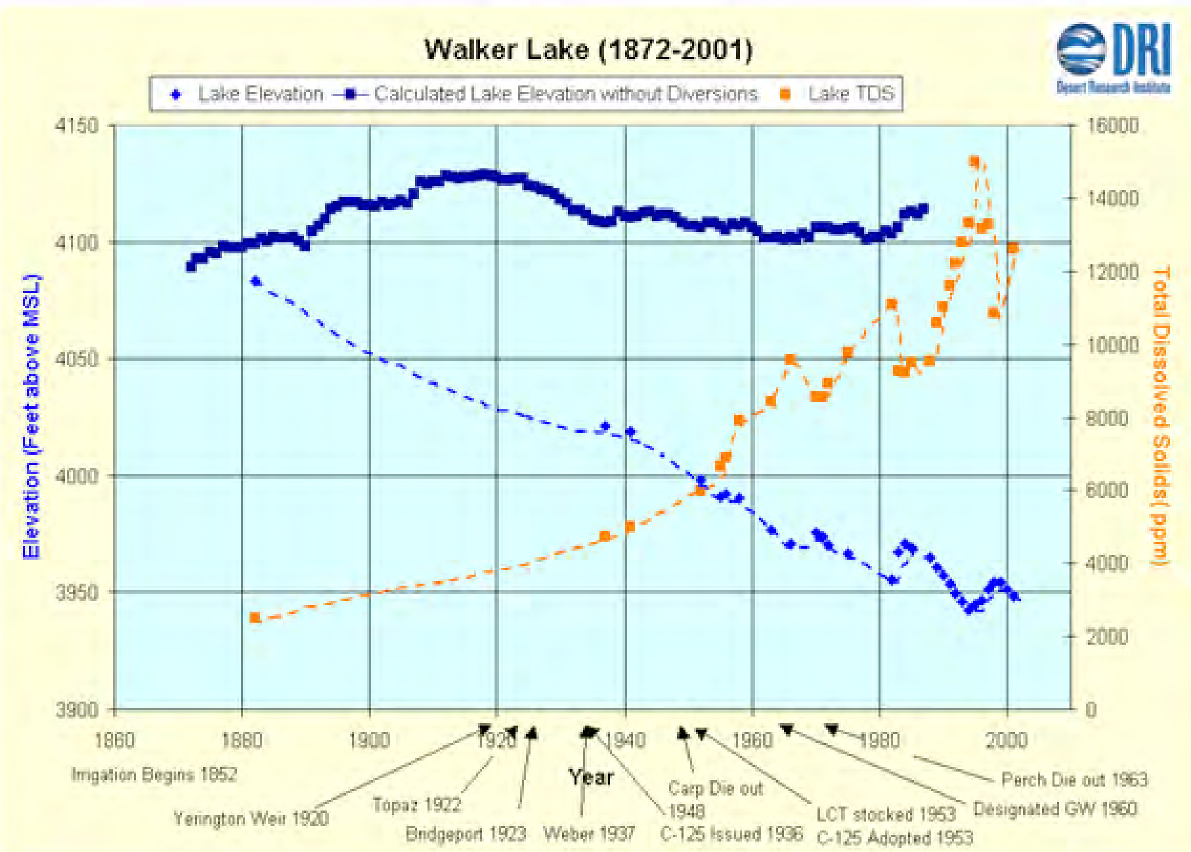
Source: Table 2-E

Figure 2-3



Source: Table 2-F

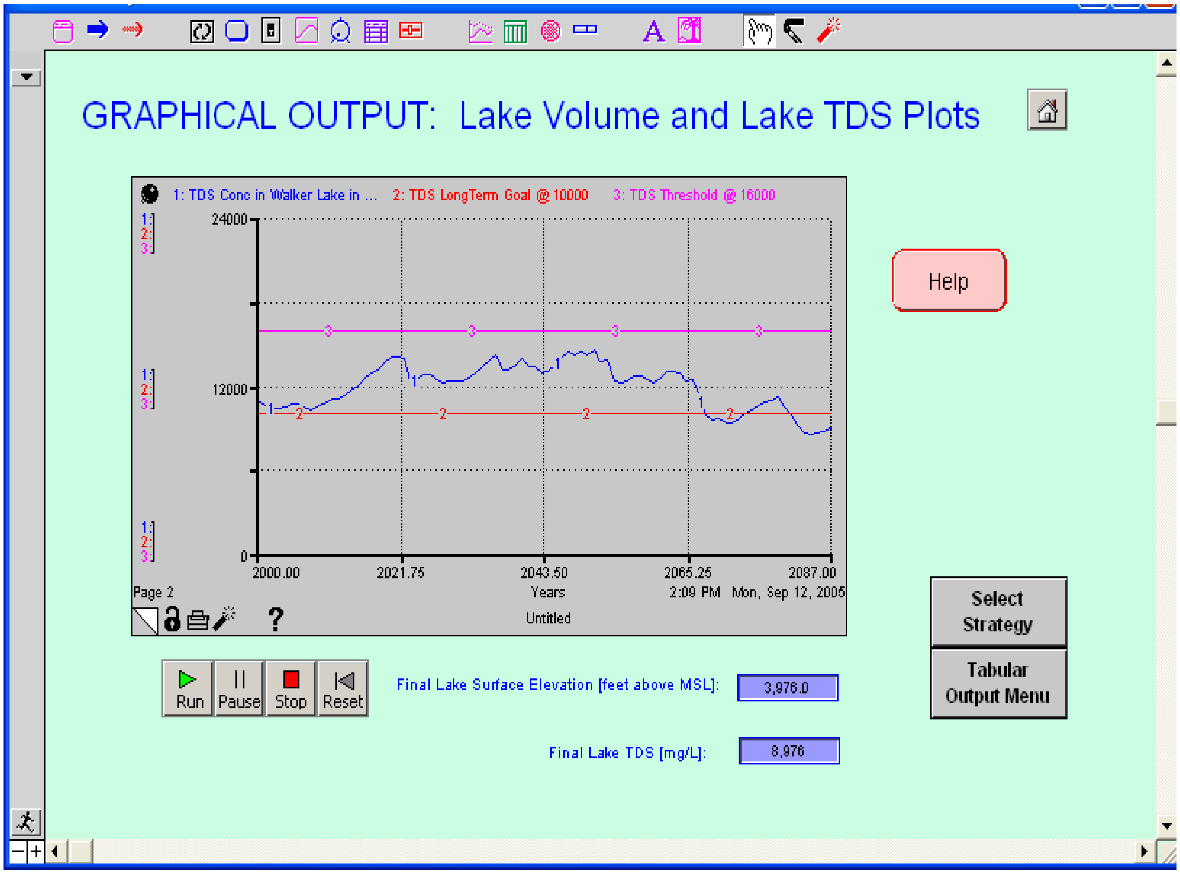
Figure 3-1
Lake Elevations (Actual vs. Reconstructed)
and Actual TDS Concentrations



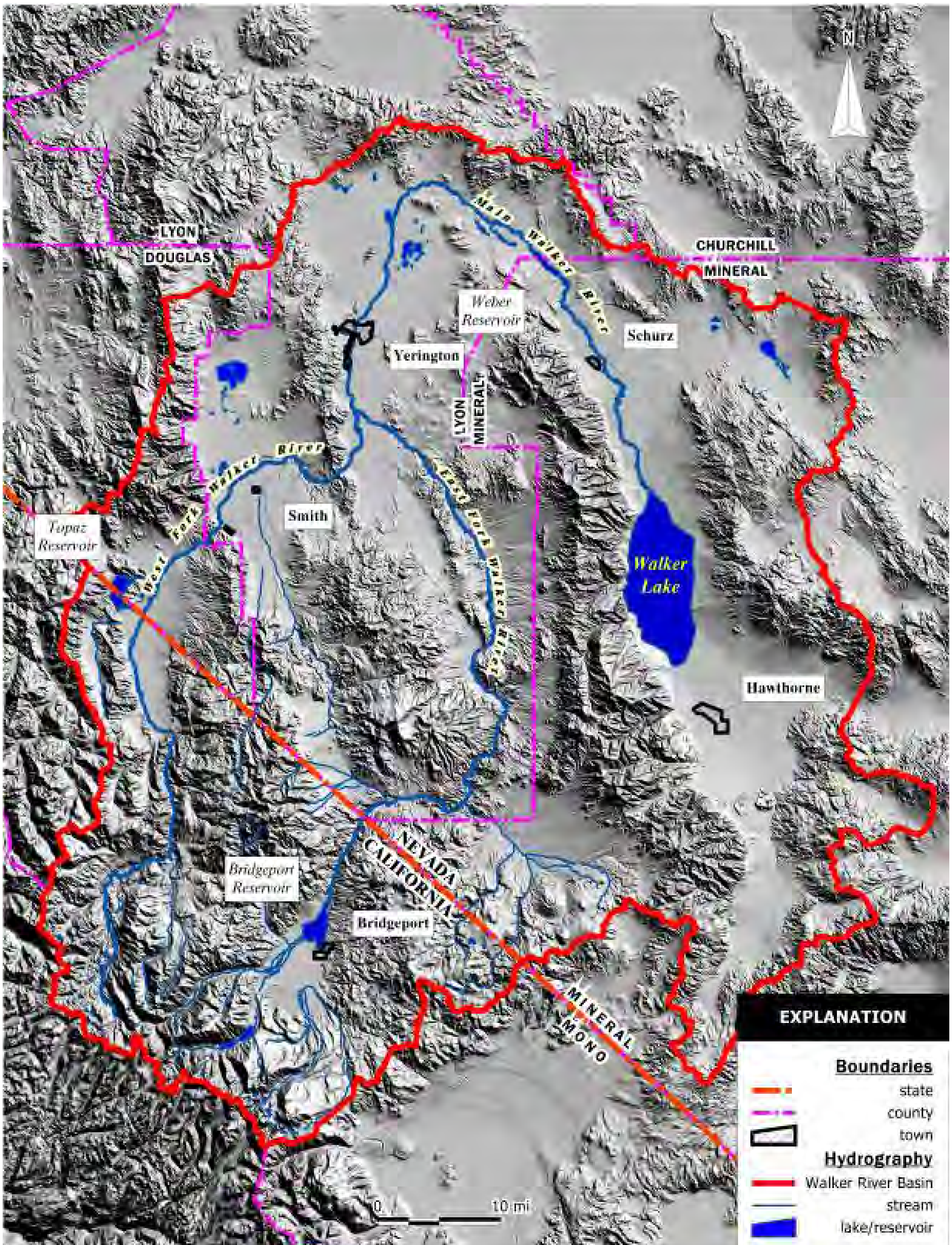
Source: Carroll et. al. (2005)

Figure 3-2
Walker Basin Simulation Model
Desert Research Institute

Simulated Results of Purchasing 99,083 AF of Senior Water Rights

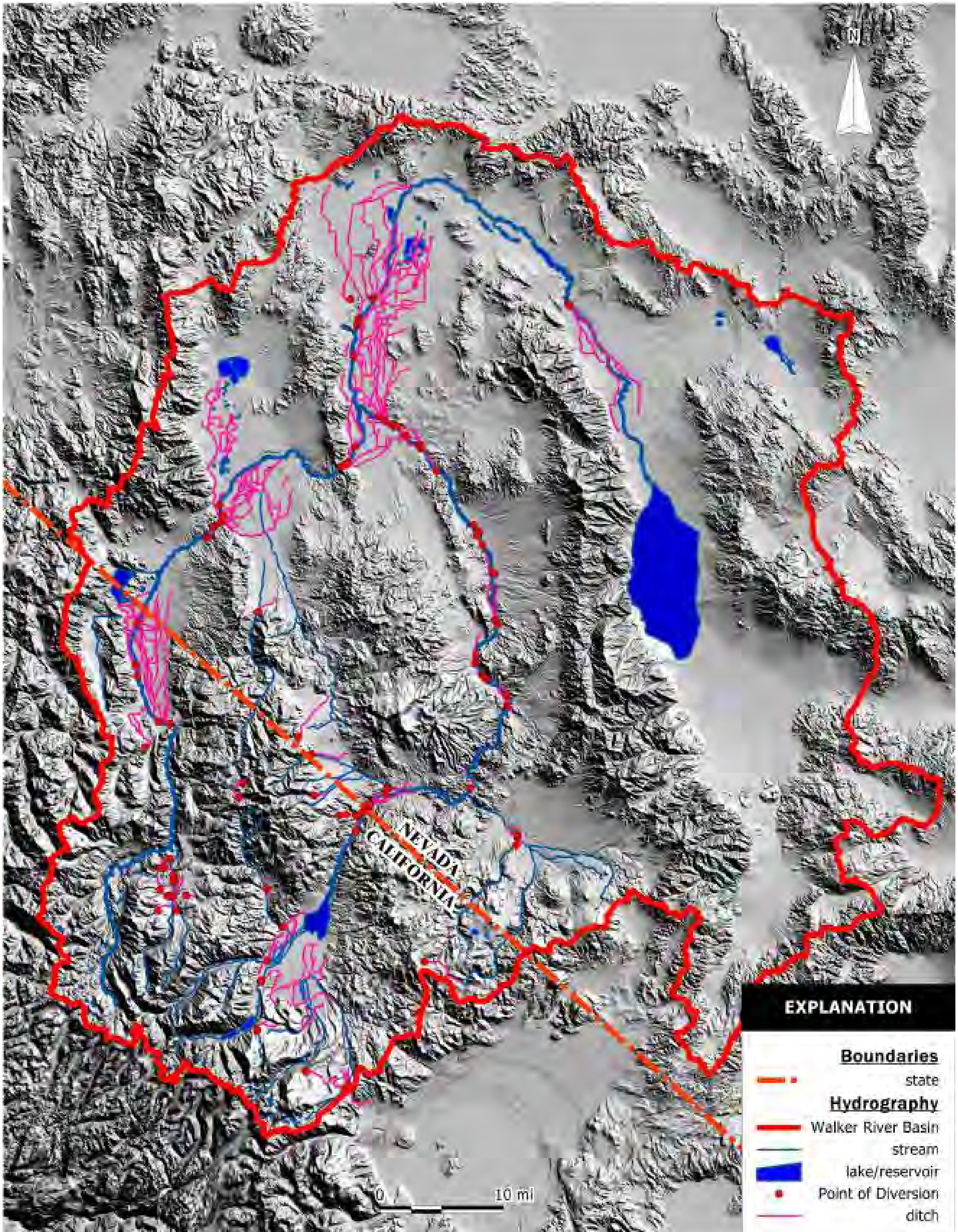


Source: Carroll et. al. 2005



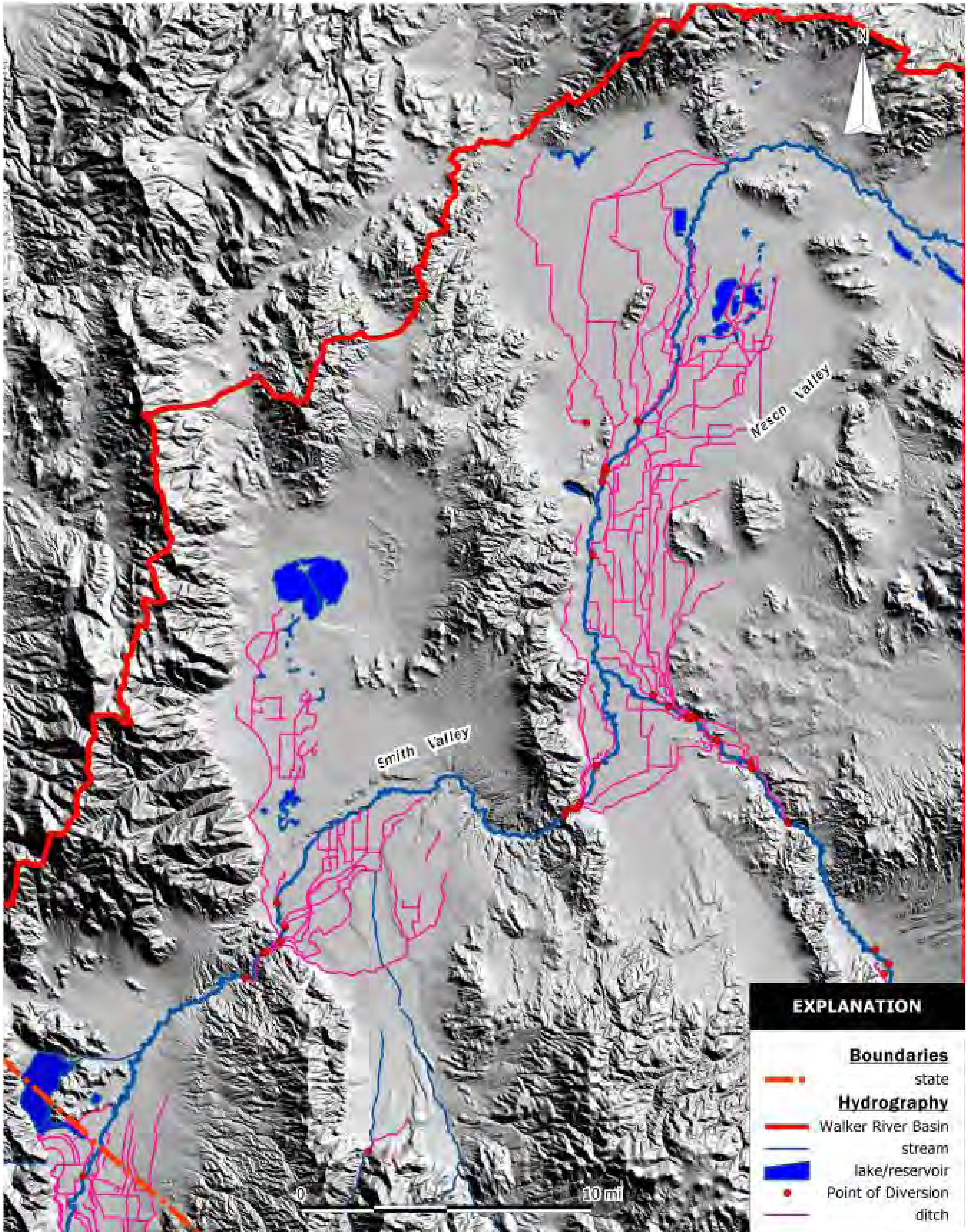
Great Basin Land & Water

PLATE 2-1 Walker River Basin Overview
West -Central Nevada/ California



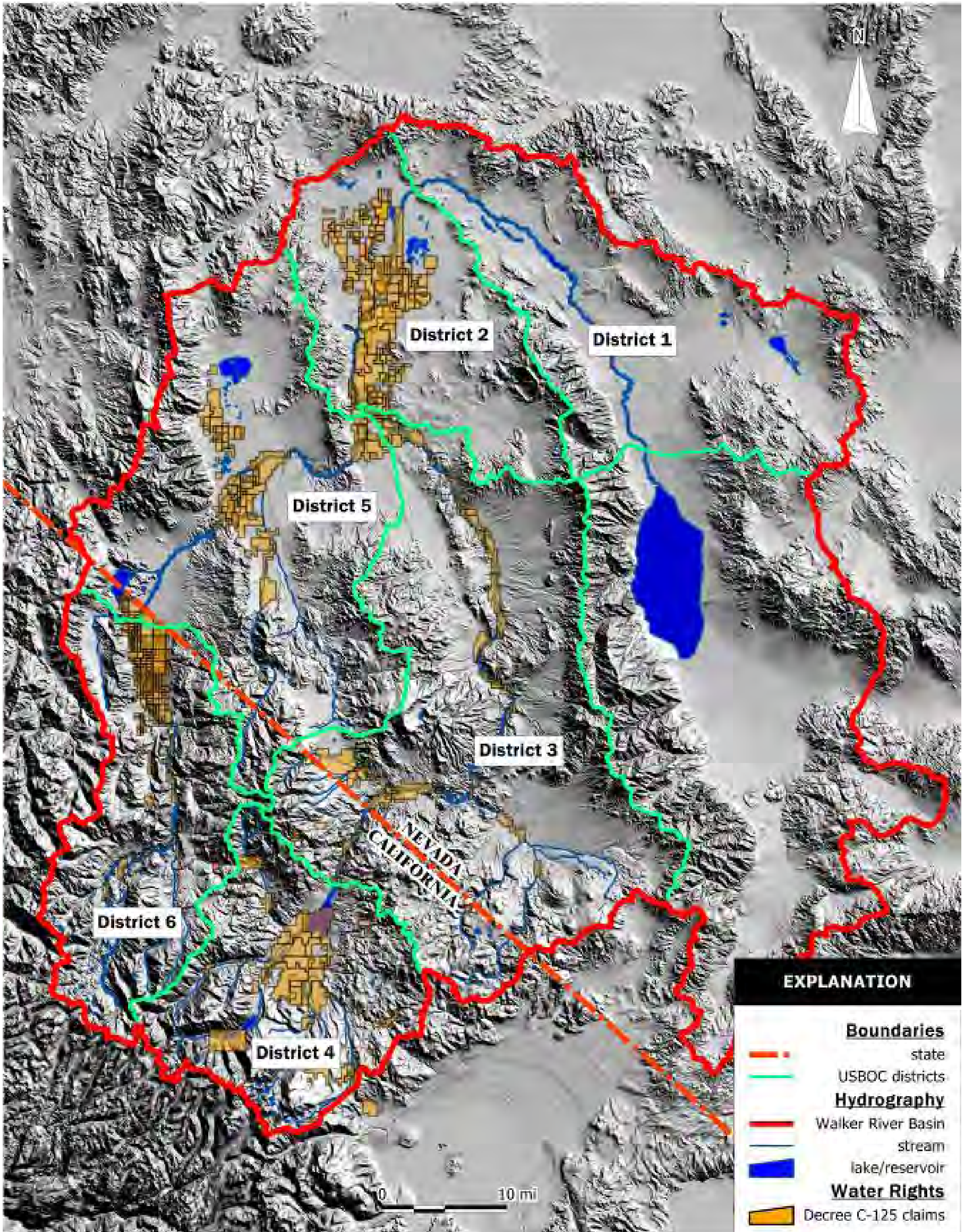
Great Basin Land & Water

PLATE 2-II Points of Diversion and Ditches in the Walker River Basin



Great Basin Land & Water

PLATE 2-III Points of Diversion and Ditches in the Mason and Smith Valleys



Great Basin Land & Water

PLATE 4-1 Decree C-125 Water Right Claims and US Board of Commisioners District Boundaries

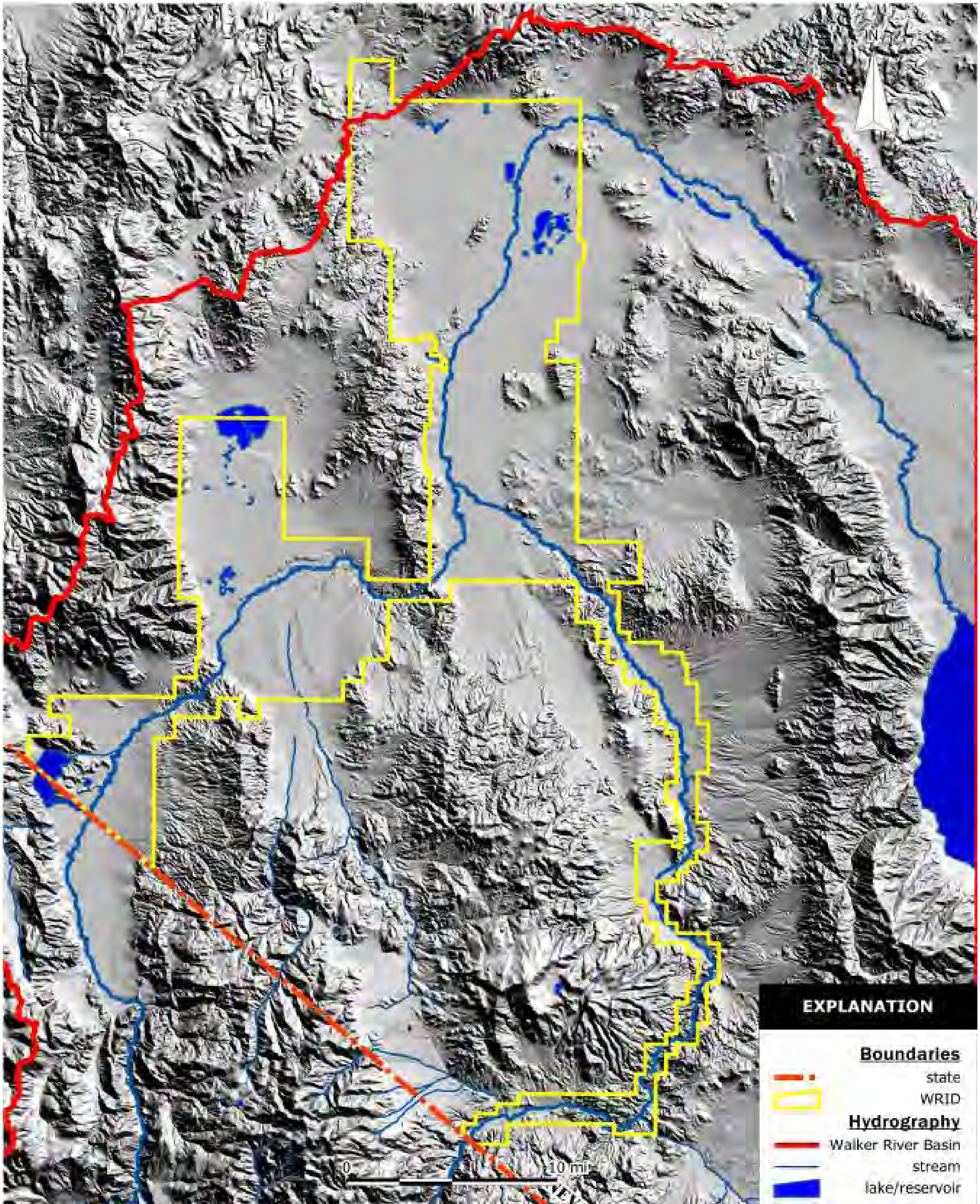


PLATE 4-II Walker River Irrigation District Boundary

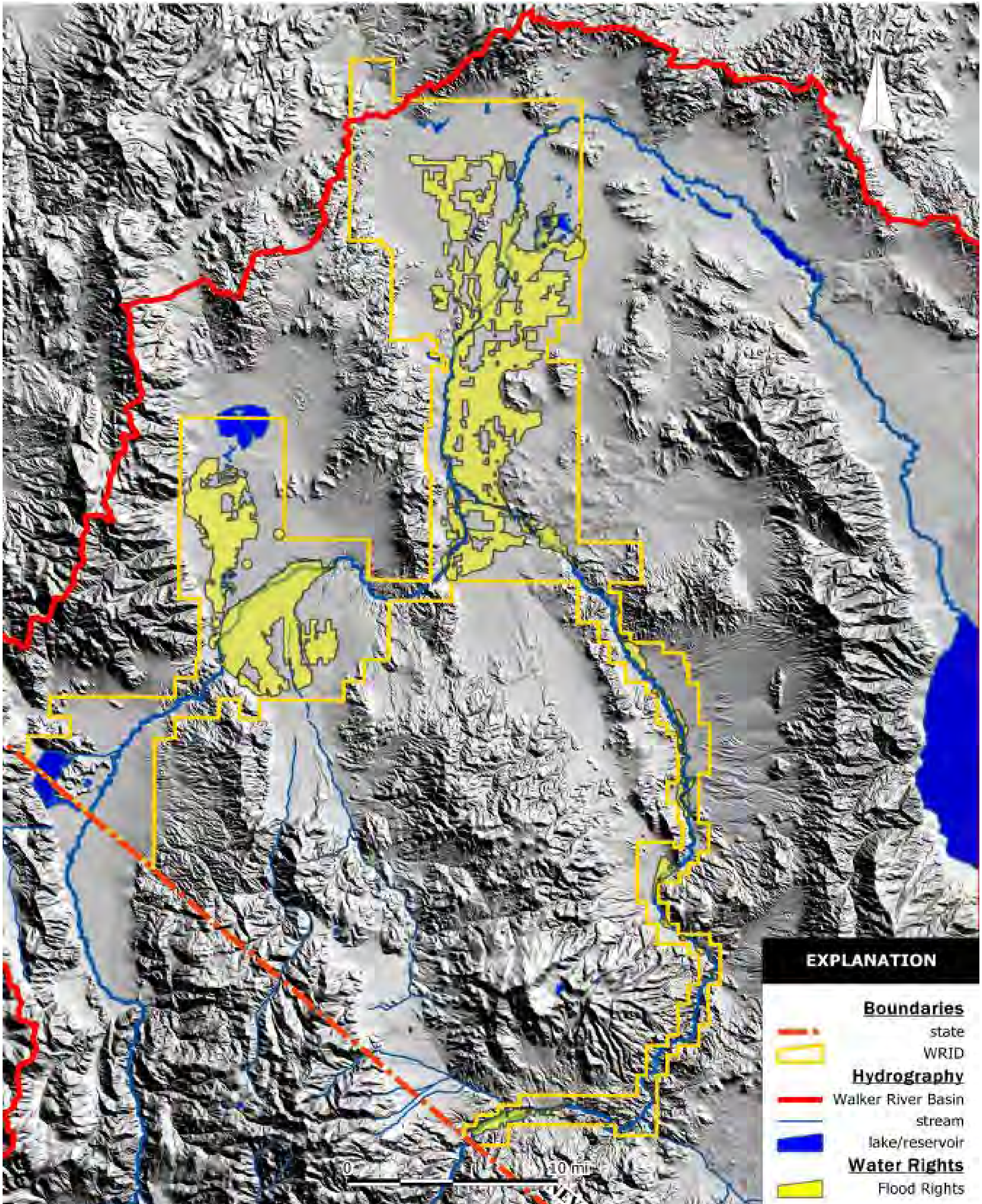


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PLATE 4-III NDWR Permits 5528 and 25017 for
Flood Water Rights (WRID)

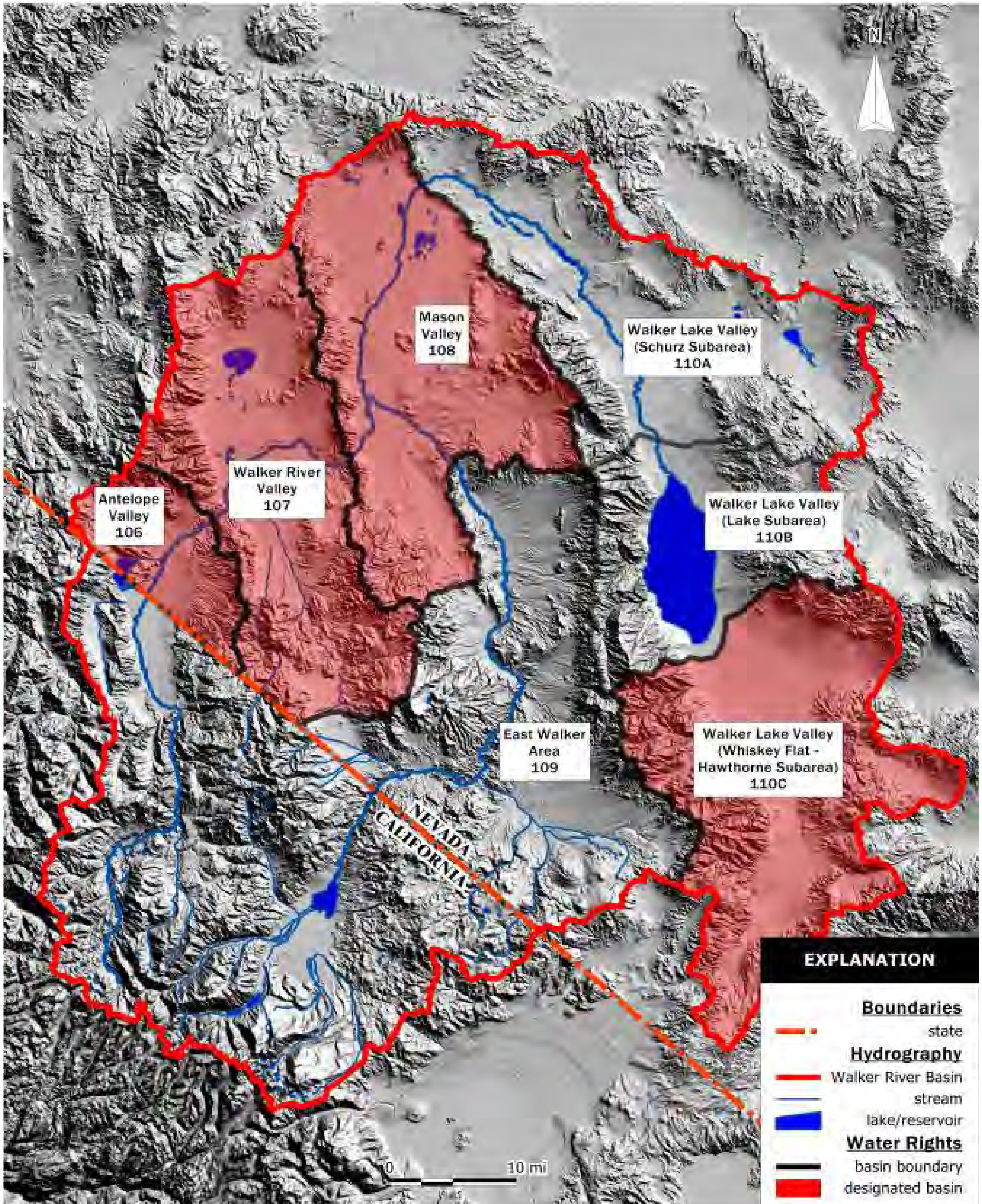

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PLATE 4-IV NDWR Groundwater Basin Boundaries

Exhibit Notes

The plates in this report were prepared by Mr. Andrew E. Stroud, Water Rights Specialist, Western Engineering and Surveying Services, Carson City, Nevada using a variety of software and data sources (see also **Appendix D**). Vector data layers were compiled and digitized using Autocad R2000 Map 4 in State Plane Nevada West NAD 83 (feet) projection. The reference layer was the Public Land Survey System (PLSS) that was created from the BLM Geographic Coordinate Data Base (GCDB) flat files. Political boundaries (state, counties, municipal, WRID) were reconciled to the GCDB base. The WRID boundary and the flood water right areas were taken from the Permit 5528 Proof of Beneficial Use maps, on file at NDWR. Ditches and Points of Diversion were digitized using the 1994 USGS Digital Orthoquads (DOQ) and USFSA NAIP 2006 aerial photography. The Decree C-125 claim boundaries were individually located by legal descriptions as described in the decree tabulations and also reconciled to the GCDB base. The hydrography data layer was taken from the USGS 250k Digital Line Graphs (DLG). Hydrographic divisions (basin boundaries and USBOC divisions) were compiled in part from watershed boundaries generated in Arcview 3.3 using the Hydrographic Delineator module and the 10m digital elevation data, and also by digitizing of boundaries from numerous USGS 7½‘ topographic quadrangle maps (DRG). Data layers were exported from Autocad into Mapinfo MIF coverages and imported into Manifold 7.1 by Western Engineering and Surveying Services in Carson City. The hillshading backdrop was created using the USGS 10m digital elevation data from the USGS Seamless Data Distribution website:
http://seamless.usgs.gov/website/seamless/viewer.php
and reprojected using Global Mapper 7.

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APPENDICES

A. GIS Study of Trends in Irrigated Lands

B. Recent Market Sales of Water, Land, and Related Interests

C. Yield Analysis of Surface Water Rights

D. History of Water Right Transfers

E. Legal Analysis of Water Rights and Transfers

F. Western Environmental Water Transactions Survey

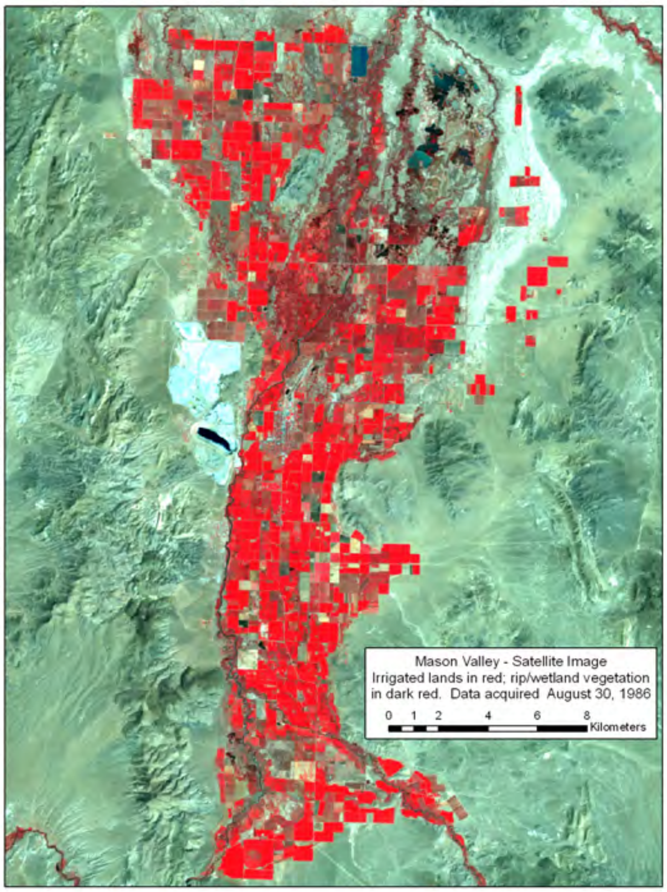
G. Additional Information

APPENDIX A

Great Basin Land and Water (GBLW)
Walker Lake Basin Study

GIS Study of Irrigated Lands in the Walker Lake Basin

FINAL REPORT
June, 2006



Submitted by:
Desert Research Institute
Division of Earth and Ecosystem Sciences
Nevada System of Higher Education

Great Basin Land and Water (GBLW) Walker Lake Basin Study

GIS Study of Irrigated Lands in the Walker Lake Basin
Performed by Desert Research Institute

Introduction

This report describes the work performed by DRI under contract with GBLW entitled "Walker Lake Basin Study", a geographic information systems (GIS) study of irrigated lands in the Walker Lake basin (Figure 1). Work commenced on the project December 19, 2005. A DRI project team consisting of Tim Minor, Scott Bassett, Chris Kratt and Jamie Trammel was assembled in December and has produced a quantitative assessment of irrigated lands and riparian/wetland vegetation in the Walker Lake Basin.

The objective of this study was to develop a time series of irrigated land estimates for five sub-regions of the Walker Lake Basin. The time series spanned 16 years and consisted of six different dates of Landsat Thematic Mapper (TM) imagery. Using image processing and GIS software, aerial estimates of irrigated land (including irrigated pastureland), riparian/wetland vegetation, and non-irrigated vegetation were derived using remote sensing vegetation indices that differentiate healthy, high chlorophyll, and high water content vegetation from background soils and senesced vegetation. Estimates were tabulated and summarized by year of satellite acquisition, by entire basin, and by sub-region. These acreage estimates were then compared to precipitation and stream gage information to analyze the relationship between water availability and water distribution through irrigation, as well as the spatial extent of riparian/wetland vegetation from dry to wet years. The results of the project are described within this report.

Data Acquisition

A total of six Landsat TM images spanning 16 years were acquired from three different sources for the project. Four images were readily available from an existing archive of DRI Landsat satellite imagery: August 30, 1986; July 29, 1992; August 7, 1995; and August 31, 1998. One image was acquired from the Global Land Cover Facility (GLCF) for the date July 27, 2000. The final image was purchased from the U.S. Geological Survey (USGS), with an acquisition date of August 18, 2002. All images were acquired during the late summer months (late July or August) to ensure a snapshot of actively irrigated fields and pastures within the study area, as well as riparian/wetland vegetation along water courses that are receiving available water.

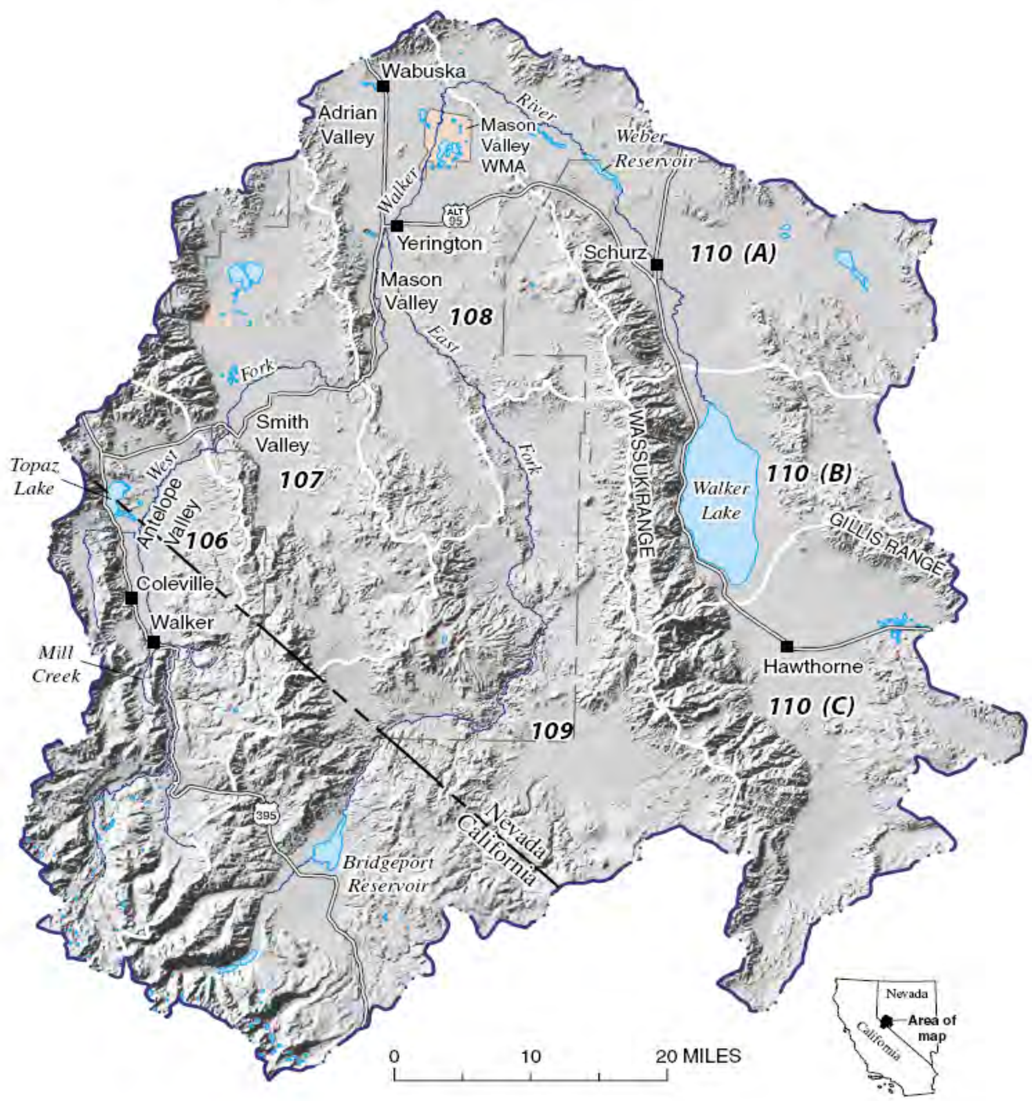


Figure 1. Walker Lake basin study area (from USGS website http://nevada.usgs.gov/walker, Hydrology of the Walker River Basin).

Attempts to locate a digital or analog map delineating the specific Walker River Irrigation District were unsuccessful; therefore a decision was made by DRI and GBLW to manually define five principal sub-regions within the Walker basin using stream gage location information. The five sub-regions are Antelope Valley (both the California side and the Nevada side), Smith Valley, Mason Valley, Walker River Indian Reservation, and East Walker River. Digitized stream gage locations were acquired by DRI from the USGS to assist with the delineation of the sub-regions. DRI also used a USGS map of the Walker Basin recently acquired by GBLW personnel to help in the delineation of the sub-regions. Figure 2 shows the five sub-regions identified in the Walker Lake basin, overlaid on top of a false color composite Landsat TM image.

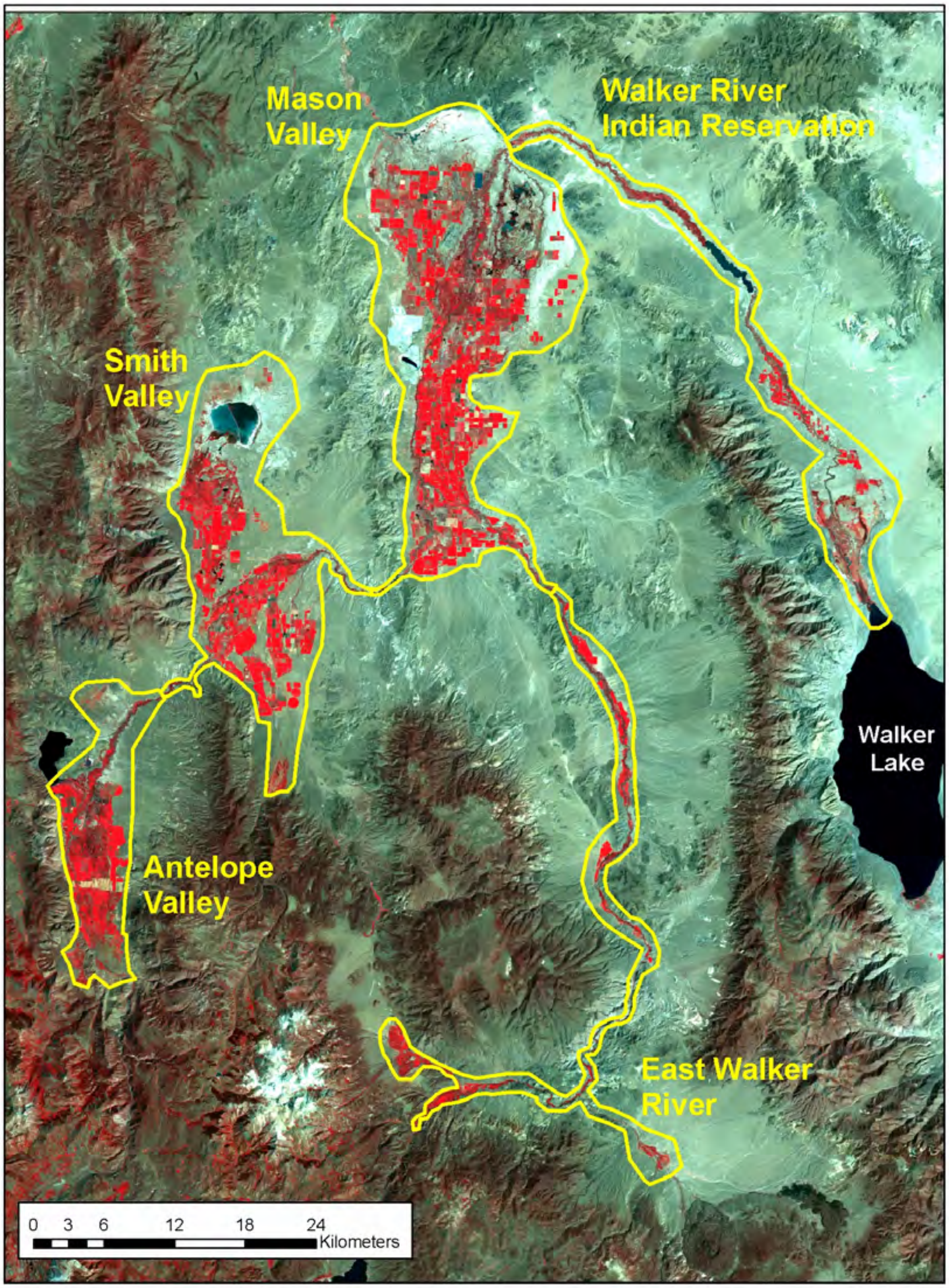


Figure 2. Walker Lake Basin study area sub-regions overlaid on false-color composite Landsat TM satellite image acquired August 30, 1986.

Daily precipitation data (measured as liquid from snow and rain) were acquired from the Historical Climate database at DRI's Western Regional Climate Center (WRCC) for eight climate stations located within the Walker Lake Basin (www.wrcc.dri.edu). The locations of the climate stations used in the study are shown in Figure 3. Precipitation data were acquired for each year leading up to the acquisition date of each of the Landsat TM images used in the study.

Daily discharge data were acquired from the USGS for eight gaging stations located throughout the upper flow systems of the basin (www.waterdata.usgs.gov/nwis/rt). The locations of the gaging stations used in the study are shown in Figure 3. Discharge data were acquired for each year leading up to the acquisition date of each of the satellite images used in the study.

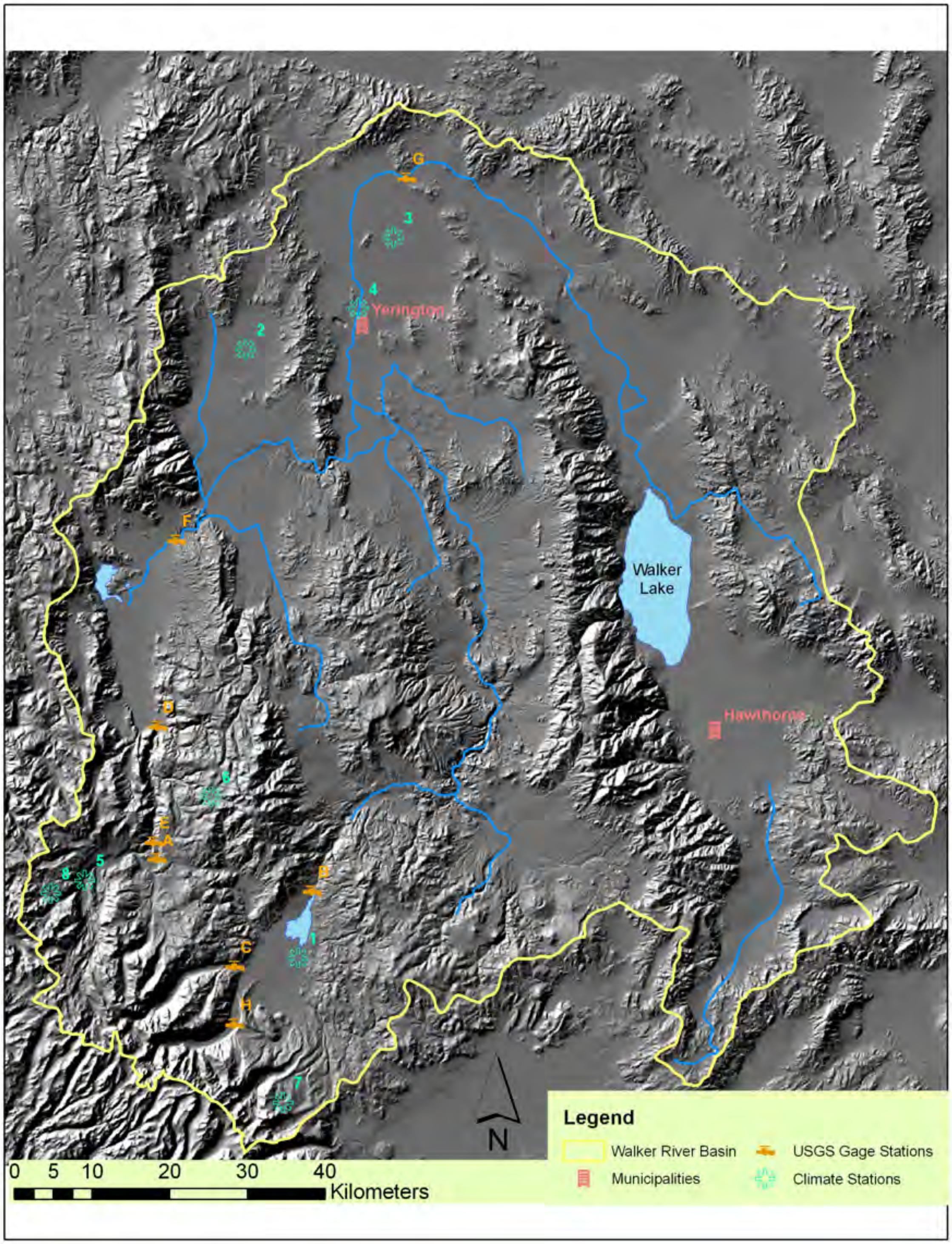


Figure 3. Locations of climate stations and gaging stations in the Walker Lake Basin used to aggregate liquid estimates and discharge for the basin. Tables 1 and 2, below, list the corresponding names of the gaging and climate stations identified in Figure 3, respectively.

Table 1. Corresponding names of USGS gaging station IDs in Figure 3.

STATION NAME	SITE ID
USGS 10295500 L WALKER R NR BRIDGEPORT, CA	A
USGS 10293000 E WALKER R NR BRIDGEPORT, CA	B
USGS 10291500 BUCKEYE CREEK NEAR BRIDGEPORT, CA	C
USGS 10296500 W WALKER R NR COLEVILLE, CA	D
USGS 10296000 W WALKER R BLW L WALKER R NR COLEVILLE, CA	E
USGS 10297500 W WALKER R AT HOYE BRIDGE NR WELLINGTON, NV	F
USGS 10301500 WALKER R NR WABUSKA, NV	G
USGS 10290500 ROBINSON C AT TWIN LKS OUTLET NR BRIDGEPORT, CA	H

Table 2. Corresponding names of climate station IDs in Figure 3.

STATION NAME	Site ID	Elevation (ft)
Bridgeport	1	5,517
Smith6N	2	5,300
Wabuska	3	4,530
Yerington	4	4,510
Leavitt Meadows	5	7,085
Lobdel Lake	6	5,081
Virginia Lake Ridge	7	5,123
Sonora Pass	8	8,417

Data Processing and Analysis

A. Initial Image Processing

All six Landsat TM images were brought into GIS and image processing software (ArcGIS version 9.1 and ENVI version 4.2, respectively) and geometrically co-registered within a one pixel root mean square (RMS) error (28.5 meters), using the orthorectified 2000 image as a master image. False color composites for each year of data were created and displayed in ArcGIS. Using manual editing techniques, the boundaries for each of the five sub-regions were drawn on the false color image data electronically, ensuring that all irrigated lands were covered in all sub-regions. The vector data set indicating the sub-regions was then converted to a raster data file and imported into ENVI to be used as a mask for the subsequent Normalized Difference Vegetation Index (NDVI) threshold mapping task to be performed on each image.

Each of the six Landsat TM images were converted to NDVI images using the following equation in ENVI:

$$(NIR-Red)/(NIR+Red)$$

Where NIR = Landsat TM near-infrared channel 4; Red = Landsat TM red channel 3

NDVI is a ratio of shortwave infrared (near-infrared) and red reflectance that provides a convenient, rapid estimate of the amount and an indication of health of vegetation in a remotely sensed image. NDVI measurements minimize the effects of topography and atmosphere (Holben and Justice, 1981), require no prior knowledge of ground conditions, and are sensitive to the amount of photosynthetically active vegetation present (Myneni *et al.*, 1992; Tucker, 1979). Computationally, NDVI measures the deviation of a vegetated pixel relative to a soil baseline (Huete and Tucker, 1991).

NDVI threshold analysis was then performed on each of the six NDVI images, identifying the optimum value of NDVI that indicated high biomass (both irrigated lands and riparian/wetland vegetation) in the five sub-regions. The threshold values were kept low enough to ensure that even partially irrigated fields and fields with new growth or row crops (if any) were captured in the NDVI thresholding process. A binary image for each year of data was then created, with a value of 255 assigned to all NDVI pixels above the threshold value, and a value of 0 assigned to all pixels below the threshold.

B. GIS Riparian/Wetland and Non-irrigated Layer Development

The resultant NDVI threshold results and the false color composite Landsat TM images were imported into ArcGIS where riparian/wetland vegetation and non-irrigated vegetation (non-irrigated vegetation was defined as urban areas, residential neighborhoods, and upland vegetation) were manually delineated to create vector polygon data layers representing the location and extent of these features. Care was taken to ensure that pastures completely surrounded by riparian/wetland vegetation polygons were not included in this data layer. The purpose of this task was to separate the riparian/wetland vegetation from the irrigated cropland and pastureland, as the NDVI results derived from the Landsat TM images were not able to automatically separate these two land cover types using image processing threshold techniques.

C. Image Processing Mask Development

The completed riparian/wetland and non-irrigated vector data layers (ArcGIS shapefiles) were subsequently imported back into ENVI to complete the image processing phase of the project. The vector files were imported into ENVI and used to create masks that were applied to the NDVI threshold results for each year. First the riparian/wetland and non-irrigated masks were applied to the NDVI data sets with an “off” setting, that is, in the subsequent processing of the dataset any NDVI pixels found in the riparian/wetland or non-irrigated masked areas would be eliminated. The resultant data set would therefore only contain NDVI pixels that represented irrigated lands. Next, the riparian/wetland and non-irrigated masks were applied in the “on” setting, sequentially, so that the resultant data products would represent only those NDVI pixels found in the riparian/wetland areas and non-irrigated vegetation features, respectively. The end products were three NDVI binary images representing, respectively, irrigated lands, riparian/wetland vegetation, and non-irrigated vegetation.

D. Final GIS Analysis

The three NDVI binary image files were exported to ArcGIS as rasters. In ArcGIS, the raster values of 0 and 255 were reclassified to NoData and 1 so that the ArcGIS software could then determine the number of NDVI pixels (values of 1) found in each of the five sub-regions of the Walker Lake Basin using a zonal statistics function. This function calculated the number of NDVI pixels and their area in m^2 for the three rasters by sub-region. Table 3, for example, shows the irrigated lands area calculations for 1986 in m^2. The area calculations were converted to hectares and acres for the final tables.

Table 3. Area, in m^2, for the amount of irrigated land found in each sub-region of the Walker basin for the Landsat TM acquisition date August 30, 1986.

SUB_REGION	AREA
Mason Valley	145,094,000.00
Walker River Indian Reservation	10,098,700.00
Smith Valley	78,694,800.00
Antelope Valley	49,665,000.00
East Walker River	20,672,600.00

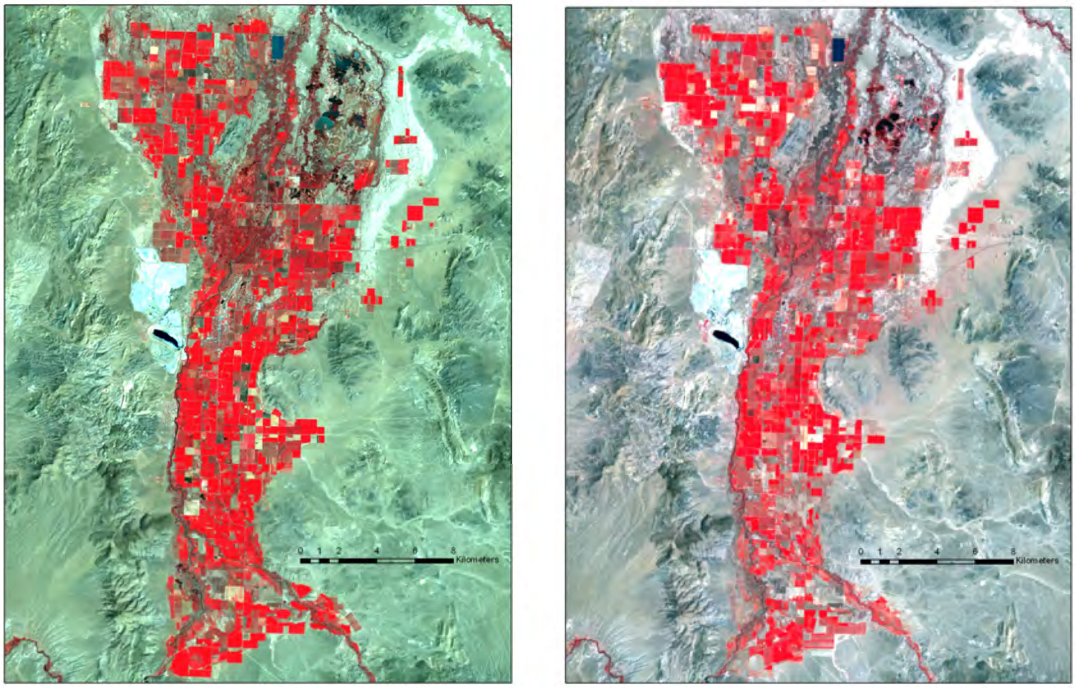
E. Hydrologic Data Analysis

The acquired precipitation data represented measurements (in inches) at daily intervals for the year previous to each of the six Landsat TM acquisition dates. The daily measurements were summed to produce monthly precipitation amounts for the year preceding each of the satellite image acquisition dates.

The daily flows at each USGS gaging station were summarized to present the average flow (in cubic feet per second (cfs)) by month. A hydrograph for the average monthly flows for the water year prior to each satellite image's date was created to aid the interpretation of irrigation results.

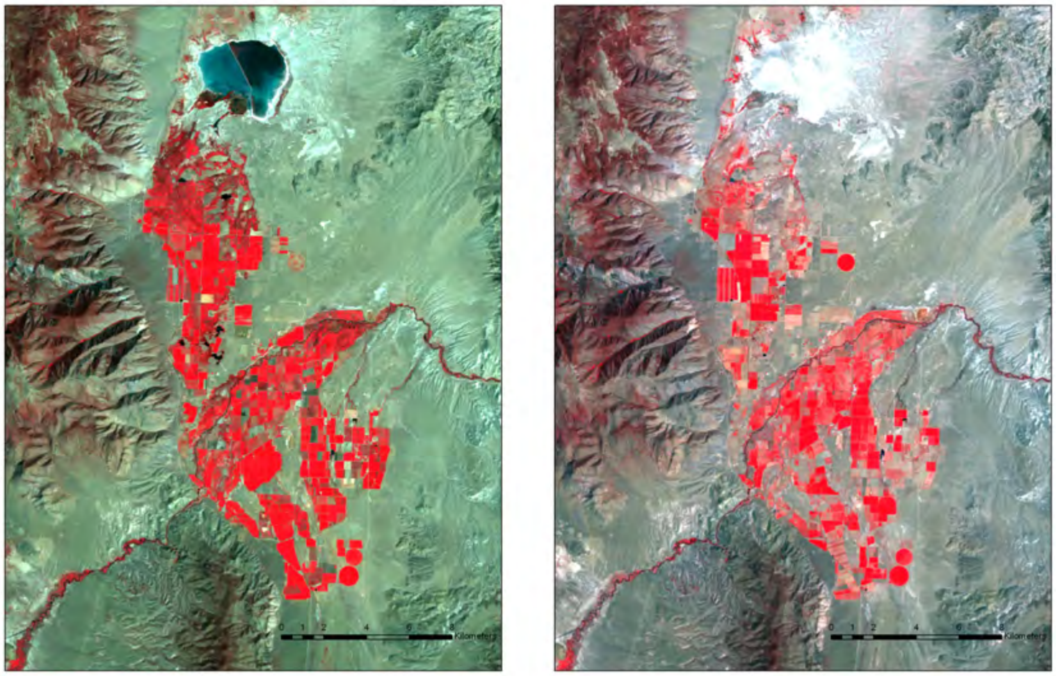
Results

Figures 4 shows the differences seen in the Landsat satellite imagery between a relatively wet year, 1986, and a relatively dry year, 1992, for Mason Valley. Irrigated fields and pastures are bright red in color, darker reds reflect riparian and wetland vegetation. Gray/green, yellow, and pale pink tones indicate fallow fields. Figure 5 shows the differences between the 1986 and 1992 images for Smith Valley. Using the NDVI thresholding technique and masking operations described above, the bright red pixels were classified as irrigated fields and pastures, while the darker red pixels were classified as riparian/wetland vegetation. Healthy, growing vegetation found in urban areas and residential neighborhoods, such as lawns, parks, and cemeteries, were classified separately as non-irrigated vegetation.



A. B.

Figure 4. Landsat TM satellite images of Mason Valley. Irrigated lands in bright red; riparian/wetland vegetation in dark red. (A.) Image acquired August 30,1986. (B.) Image acquired July 29, 1992.



A. B.

Figure 5. Landsat TM satellite images of Smith Valley. Irrigated lands in bright red; riparian/wetland vegetation in dark red. (A.) Image acquired August 30,1986. (B.) Image acquired July 29, 1992.

Appendix A contains all of the final estimates of irrigated lands, riparian/wetland vegetation, and non-irrigated vegetation found in each of the sub-regions of the Walker Basin study area for each year that the analysis was conducted, and the totals of all the sub-regions for each year.

Appendix B contains all of the precipitation and discharge results for all of the years preceding each Landsat acquisition, in graphic form. Precipitation is aggregated by month for each climate station for each year, and graphed as a line. Precipitation is also shown by total inches for each climate station, for each year, and graphed as a bar chart. Discharge is aggregated by month for each year, and graphed as a line.

Using the data in these appendices, Table 4 was constructed to show the relationship between precipitation and estimated acres of irrigated land and riparian/wetland vegetation. Precipitation from the Sonora Pass climate station, the climate station with the highest elevation of the eight used in this study, was aggregated for each year leading up to each of the six Landsat satellite acquisition dates. The other two columns in the table represent the total aggregated acres of irrigated lands and riparian/wetland vegetation estimated using the six late summer satellite images and image processing techniques.

Table 4. Comparison between total annual precipitation (in inches) found at Sonora Pass climate station for the year preceding each Landsat satellite acquisition, and amount of irrigated land and riparian/wetland vegetation (in acres) estimated for each year.

Year	Precip (inches)	Irrigated Land (acres)	Riparian/Wetland Veg (acres)
1986	47.3	75175.54	28286.39
1992	24.6	59895.63	17350.05
1995	40.8	70903.28	20683.29
1998	43.5	73906.68	23356.73
2000	34.6	78196.84	18176.00
2002	29.4	69078.60	16361.14

Figure 6 shows the hydrograph of aggregated discharge for each month in the year leading up to each of the Landsat satellite acquisition dates, based on the USGS gaging station near Coleville, just south of Antelope Valley on the West fork of the Walker River.

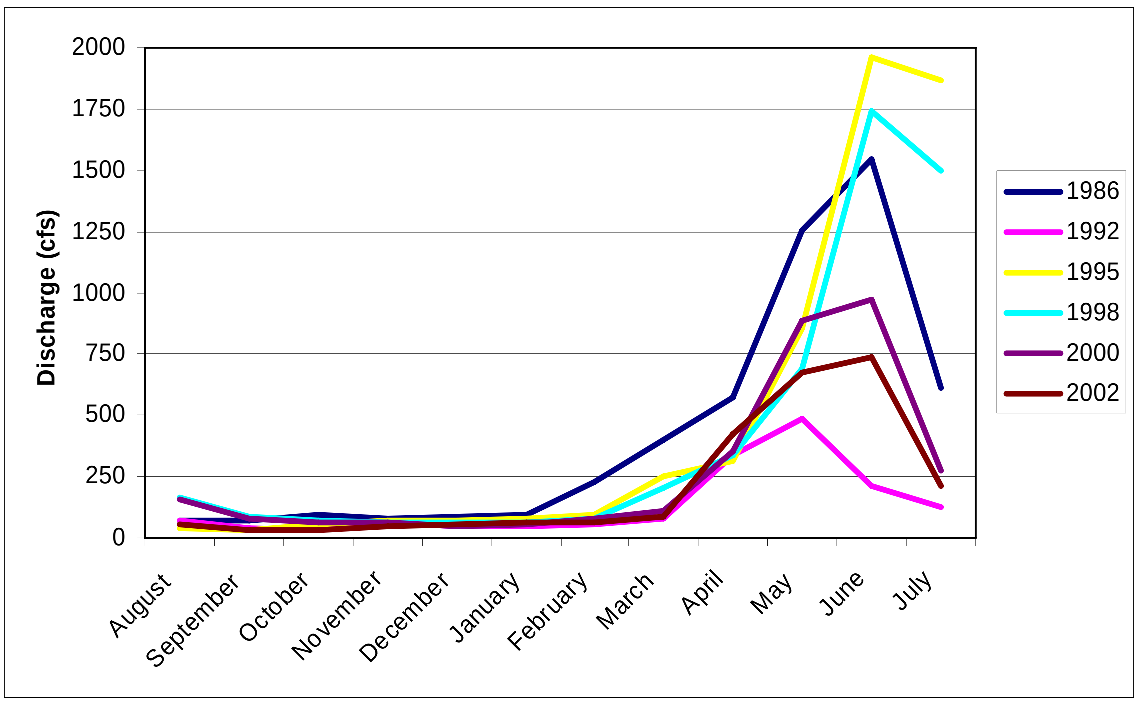


Figure 6. Hydrograph for the year prior to each Landsat scene acquisition for the USGS gaging station 10296500, West of Walker River near Coleville, California, which corresponds to gaging station D in Figure 3 (discharge in cubic feet per second (cfs)). The hydrograph values for each year were summarized to reflect monthly averages. The graph legend associates the line color to the Landsat image acquisition year.

Discussion

An examination of Table 4 shows a consistent trend between precipitation (potential available water) and the estimated amount of irrigated lands in the Walker Lake Basin for five of the six years observed; as precipitation increases, so does the estimate of irrigated land, and as precipitation decreases, irrigated land does as well. The one anomalous year is 2000, when, as the amount of precipitation decreases from 43.5 inches in 1998 to 34.6 in 2000, the amount of estimated irrigated land actually increases by more than 4,000 acres from 1998 to 2000. The relationship between precipitation and riparian/wetland vegetation estimates is consistent throughout the entire time series, i.e., the amount of estimated riparian/wetland vegetation rises and falls as the amount of precipitation increases and decreases.

Regression analysis was performed using precipitation from Table 4 as the independent variable, and estimated irrigated lands as the dependent variable. Using all six years of data, a relatively low coefficient of determination (R^2) of 0.50 was observed. Regression analysis was then performed on just five years of data from Table 4, omitting precipitation and irrigated land estimates from 2000, the "anomalous" year. An R^2 value of 0.85 was obtained, indicating a much stronger correlation between irrigated lands and precipitation. The results of this regression model were then used to examine the predicted versus observed irrigated lands, in an attempt to determine if there was a trend in the amount of irrigated lands from 1986 to 2002 (excluding 2000) that could be explained by factors other than annual precipitation. Figure 7 illustrates the relationship between predicted and actual irrigated lands for the five years observed.

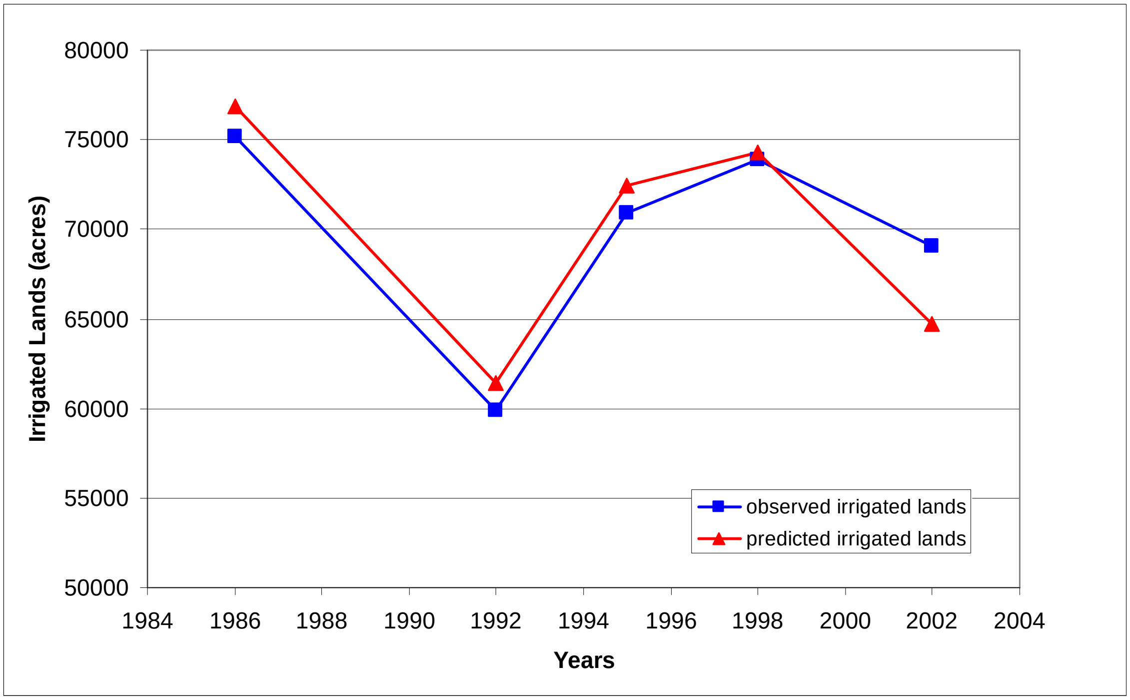


Figure 7. Predicted versus observed irrigated lands (acres) for years 1986, 1992, 1995, 1998, and 2002 of the Landsat TM time series. Regression model based on the equation predicted irrigated lands = (precipitation + 65.7)/ 0.00147.

The differences between predicted and observed values were very small for years 1986, 1992, 1995, and 1998, when observed irrigated land values were slightly less than the regression model results. Only in year 2002 did the observed irrigated land values exceed what the model predicted. Figure 7, when compared to Table 4, shows that both predicted and actual irrigated lands are highly dependent on precipitation. To determine if there could be other possible factors contributing to the predicted values of irrigated lands, the differences between predicted and observed irrigated lands for each year were divided by the observed values to calculate the relative contribution of precipitation to the model. In the first four years used in the model, between 97.5% and 99.5% of the model results could be explained by precipitation. In year 2002, 93.7% of the model results could be explained by precipitation. Therefore, when evaluating these data for a trend, it is obvious, given the years observed, that precipitation is the dominant factor in determining whether irrigated lands in the Walker Lake Basin have increased or decreased. These results should be used cautiously, however, as they are probably not statistically defensible given the insufficient sample size and degrees of freedom. To properly assess the trend in irrigated land development in the basin, it would be necessary to develop many more time steps, i.e., analyze many more satellite images, perhaps as many as three per year for each year of the time series, in order to develop a statistically valid relationship between irrigated lands, hydrology, and other factors.

An assessment of the relationship between discharge and the amount of irrigated land does not aid in determining why irrigated lands increased in 2000. Furthermore, the hydrograph and peak discharges depicted in Figure 6 and their trends do not follow the trend in irrigated land area as closely as precipitation. For example, peak discharges recorded just south of Antelope Valley were greater in 1995 and 1998 than in 1986; these measurements are not consistent with the trend observed in precipitation recorded at the Sonora Pass climate station.

When analyzing the estimates derived in this study, users must be cognizant of the potential errors of omission and commission that will be introduced in any remote sensing based study. In this study the appropriate NDVI threshold for irrigated lands and riparian/wetland vegetation was chosen for each acquisition date independently based on an iterative technique; the threshold was determined by looking at how well each iterative value included all healthy, active vegetation in each sub-region, while minimizing the inclusion of fields that were not being irrigated and upland vegetation. Some commission errors were introduced in this technique, as fields not being irrigated may have healthy vegetation present due to late seasonal rainfall or summer convective (thunderstorms) precipitation. Errors of omission will be inevitable as well, because if the NDVI threshold is not set low enough, some fields with irrigated crops, as well as unhealthy or sparse riparian/wetland vegetation will be excluded from the analysis. One way to minimize the propagation of these errors is to have a rigorous accuracy assessment (field checking) performed in the study area. A comprehensive field component was not included in this study due to budget constraints.

DRI did perform some limited field checking during the project, primarily to validate distinctions between riparian/wetland vegetation and irrigated lands. The objective of this effort was to improve the accuracy of the riparian/wetland mask developed for the study, and reduce the omission errors related to the erroneous inclusion of irrigated pastureland in the riparian/wetland mask. While analyzing the image data, several large areas adjacent to known irrigated fields in the Antelope Valley region were interpreted as riparian/wetland vegetation based on NDVI values. Subsequent field checking conducted by DRI personnel, however, revealed that these areas had cattle and horses grazing on them. The areas appeared to be receiving water from ditches near the adjacent irrigated fields. These areas were therefore taken out of the riparian/wetland mask and treated as irrigated land, in this case as irrigated pastureland. Based on these observations DRI personnel went back and reevaluated other areas first classified as riparian/wetland to determine whether they were in fact irrigated. This effort greatly improved the overall accuracy of the irrigated land and riparian/wetland estimates, especially irrigated pastureland.

Conclusions

The time series of six dates does show a strong relationship between irrigation area and precipitation, however, more information would be required to develop a statistically defensible conclusion. The data, as presented here, supports the need for more in depth research into the relationship between irrigation land area, climatic factors, and socioeconomic influences. The year 2000 anomaly may be described by socioeconomic factors such as crop selection or supplementing water demand with groundwater resources. Climatic factors may have also contributed. The small precipitation increase recorded during June of 2000 (see Figure B5), probably due to convective storms, may have lead to increased biomass amounts within irrigated fields. A similar anomaly would have to occur in other years to clearly identify the cause of the anomalous condition. Further research with more time steps, combined with a more vigorous field analysis component as well as an examination of historical records, would likely improve the ability of decision makers to definitively state what caused the increase and decrease in irrigated lands observed during the time series.

Acknowledgements

DRI would like to thank Great Basin Land and Water (GBLW) for funding this study.

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Appendix A.

The following tables represent the final estimates of irrigated lands, riparian/wetland vegetation, and non-irrigated vegetation found in each of the sub-regions of the Walker basin study area for each year that the analysis was conducted, and the totals of all the sub-regions for each year.

Tables A1 through A6 show the calculated amount of irrigated land for each respective year of analysis conducted, broken down by sub-regions into m^2, acres and hectares, then summed for all sub-regions. Tables A7 through A12 show the calculated amount of riparian/wetland vegetation estimated for each year of analysis, broken down by sub-regions into m^2, acres, and hectares, then summed by sub-region. Tables A13 through A18 show the calculated amount of non-irrigated vegetation (to include some upland vegetation, small residential neighborhoods, and the lawns, parks, cemeteries, and golf courses found in and around Yerington), estimated for each year of analysis, broken down by sub-regions into m^2, acres, and hectares, then summed by sub-region.

Table A1. Estimated irrigated lands for 1986.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	14,5094,000.00	35,853.45	14,509.40
Walker River Indian Reservation	10,098,700.00	2,495.44	1,009.87
Smith Valley	78,694,800.00	19,445.88	7,869.48
Antelope Valley	49,665,000.00	12,272.47	4,966.50
East Walker River	20,672,600.00	5,108.30	2,067.26
Total	304,225,100.00	75,175.54	30,422.51

Table A2. Estimated irrigated lands for 1992.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	121,257,000.00	29,963.21	12,125.70
Walker River Indian Reservation	9,086,640.00	2,245.35	908.66
Smith Valley	54,849,600.00	13,553.61	5,484.96
Antelope Valley	46,142,300.00	11,401.99	4,614.23
East Walker River	11,053,900.00	2,731.47	1,105.39
Total	242,389,440.00	59,895.63	24,238.94

Table A3. Estimated irrigated lands for 1995.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	135,214,000.00	33,412.06	13,521.40
Walker River Indian Reservation	10,417,100.00	2,574.12	1,041.71
Smith Valley	71,072,700.00	17,562.42	7,107.27
Antelope Valley	50,037,800.00	12,364.59	5,003.78
East Walker River	20,194,200.00	4,990.09	2,019.42
Total	286,935,800.00	70,903.28	28,693.58

Table A4. Estimated irrigated lands for 1998.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	151,770,000.00	37,503.13	15,177.00
Walker River Indian Reservation	11,521,800.00	2,847.09	1,152.18

Smith Valley	72,850,700.00	18,001.77	7,285.07
Antelope Valley	46,846,500.00	11,576.00	4,684.65
East Walker River	16,101,200.00	3,978.69	1,610.12
Total	299,090,200.00	73,906.68	29,909.02

Table A5. Estimated irrigated lands for 2000.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	159,686,000.00	39,459.21	15,968.60
Walker River Indian Reservation	11,391,800.00	2,814.97	1,139.18
Smith Valley	76,254,000.00	18,842.74	7,625.40
Antelope Valley	52,797,100.00	13,046.43	5,279.71
East Walker River	16,323,000.00	4,033.49	1,632.30
Total	316,451,900.00	78,196.84	31,645.19

Table A6. Estimated irrigated lands for 2002.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	136,140,000.00	33,640.87	13,614.00
Walker River Indian Reservation	8,721,940.00	2,155.23	872.19
Smith Valley	70,034,600.00	17,305.90	7,003.46
Antelope Valley	51,510,500.00	12,728.50	5,151.05
East Walker River	13,144,600.00	3,248.10	1,314.46
Total	279,551,640.00	69,078.60	27,955.16

Table A7. Estimated riparian/wetland vegetation for 1986.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	43,330,300.00	10,707.13	4,333.03
Walker River Indian Reservation	24,586,000.00	6,075.32	2,458.60
Smith Valley	21,283,400.00	5,259.23	2,128.34
Antelope Valley	12,501,300.00	3,089.13	1,250.13
East Walker River	12,770,200.00	3,155.58	1,277.02
Total	114,471,200.00	28,286.39	11,447.12

Table A8. Estimated riparian/wetland vegetation for 1992.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	23,583,700.00	5,827.65	2,358.37
Walker River Indian Reservation	11,694,800.00	2,889.84	1,169.48

Smith Valley	10,762,300.00	2,659.42	1,076.23
Antelope Valley	12,029,400.00	2,972.52	1,202.94
East Walker River	12,143,100.00	3,000.62	1,214.31
Total	70,213,300.00	17,350.05	7,021.33

Table A9. Estimated riparian/wetland vegetation for 1995.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	30,426,100.00	7,518.44	3,042.61
Walker River Indian Reservation	18,666,300.00	4,612.54	1,866.63
Smith Valley	12,809,200.00	3,165.22	1,280.92
Antelope Valley	10,215,700.00	2,524.35	1,021.57
East Walker River	11,585,100.00	2,862.74	1,158.51
Total	83,702,400.00	20,683.29	8,370.24

Table A10. Estimated riparian/wetland vegetation for 1998.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	32,018,900.00	7,912.03	3,201.89
Walker River Indian Reservation	18,112,400.00	4,475.66	1,811.24
Smith Valley	17,811,800.00	4,401.38	1,781.18
Antelope Valley	12,552,500.00	3,101.79	1,255.25
East Walker River	14,025,900.00	3,465.87	1,402.59
Total	94,521,500.00	23,356.73	9,452.15

Table A11. Estimated riparian/wetland vegetation for 2000.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	26,334,800.00	6,507.46	2,633.48
Walker River Indian Reservation	15,854,300.00	3,917.68	1,585.43
Smith Valley	9,543,940.00	2,358.36	954.39
Antelope Valley	9,988,240.00	2,468.14	998.82
East Walker River	11,834,500.00	2,924.36	1,183.45
Total	73,555,780.00	18,176.00	7,355.57

Table A12. Estimated riparian/wetland vegetation for 2002.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	24,801,200.00	6,128.50	2,480.12
Walker River Indian Reservation	12,321,000.00	3,044.58	1,232.10

Smith Valley	8,141,180.00	2,011.73	814.12
Antelope Valley	10,299,300.00	2,545.01	1,029.93
East Walker River	10,648,600.00	2,631.32	1,064.86
Total	66,211,280.00	16,361.14	6,621.13

Table A13. Estimated non-irrigated vegetation for 1986.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	6,509,370.00	1,608.50	650.94
Walker River Indian Reservation	5,685.75	1.40	0.57
Antelope Valley	38,988.00	9.63	3.90
Total	6,554,043.75	1,619.53	655.41

Table A14. Estimated non-irrigated vegetation for 1992.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	3,240,880.00	800.84	324.09
Walker River Indian Reservation	6,498.00	1.61	0.65
Smith Valley	735,899.00	181.84	73.59
Antelope Valley	266,418.00	65.83	26.64
Total	4,249,695.00	1,050.12	424.97

Table A15. Estimated non-irrigated vegetation for 1995.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	3,484,550.00	861.05	348.46
Walker River Indian Reservation	68,229.00	16.86	6.82
Smith Valley	30,053.30	7.43	3.01
Antelope Valley	336,272.00	83.09	33.63
Total	3,919,104.30	968.43	391.92

Table A16. Estimated non-irrigated vegetation for 1998.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	3,305,050.00	816.69	330.51
Smith Valley	146,205.00	36.13	14.62
Antelope Valley	398,815.00	98.55	39.88
Total	3,850,070.00	951.37	385.01

Table A17. Estimated non-irrigated vegetation for 2000.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	3,305,050.00	816.69	330.51
Smith Valley	146,205.00	36.13	14.62
Antelope Valley	398,815.00	98.55	39.88

Total	3,850,070.00	951.37	385.01

Table A18. Estimated non-irrigated vegetation for 2002.

SUB_REGION	AREA	ACRES	HECTARES
Mason Valley	2,194,700.00	542.32	219.47
Smith Valley	178,695.00	44.16	17.87
Antelope Valley	333,835.00	82.49	33.38
Total	2,707,230.00	668.97	270.72

Appendix B.

The figures in this appendix depict graphs of precipitation and discharge characteristics for parts of the Walker River Basin. The graphs are separated into three groups for readability and as an aid in understanding the water distribution characteristics within the Basin. The first group (section B.1) depicts the precipitation as a monthly average for the year preceding Landsat scene acquisition. The second group (section B.2) portrays graphically the total amount of precipitation for the thirteen month time period preceding Landsat scene acquisition. The third group (section B.3) shows the discharge for selected USGS gaging stations within the Walker Lake Basin. Graphs appearing in each of the sections contain a start and end month of July or August, which corresponds to one year prior to the Landsat image acquisition start and end months.

B.1. Average Monthly Precipitation

Figures B1-B6 show the amount of liquid water contained within precipitation accumulated at eight climate stations located within the Walker Lake Basin. Each numeric identifier relates to an alphanumeric description contained in Table 2 of the report. The spatial location of each climate station is depicted on the map in Figure 3. Total monthly precipitation was determined by summing the reported daily precipitation at each climate station.

Figure B1. Average monthly precipitation graph by climate station from August 1, 1985 to August 31, 1986.

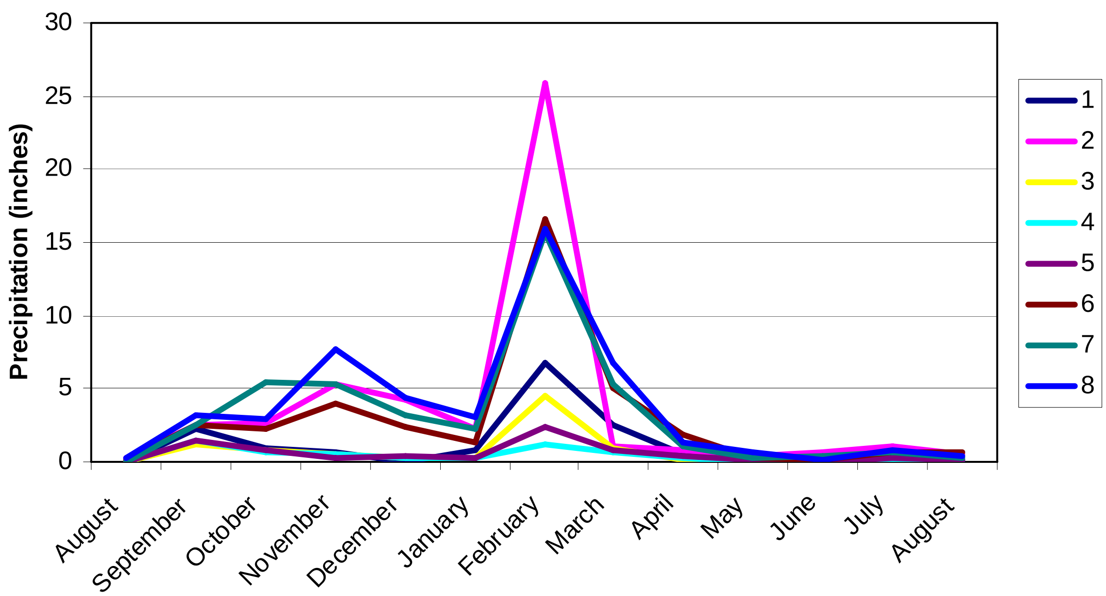


Figure B2. Average monthly precipitation graph by climate station from July 1, 1991 to July 31, 1992.

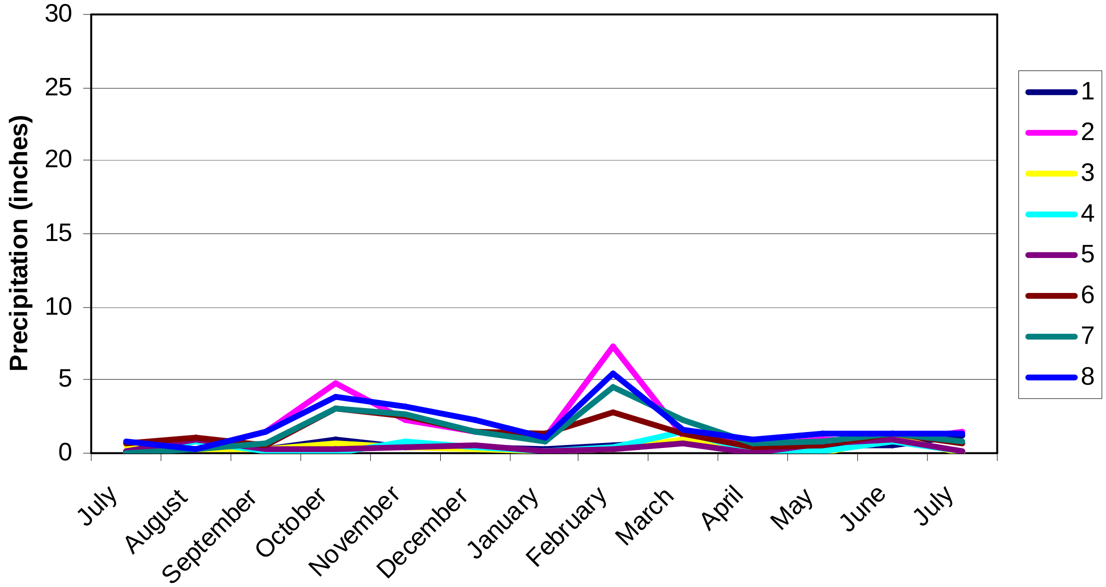


Figure B3. Average monthly precipitation graph by climate station from August 1, 1994 to August 31, 1995.

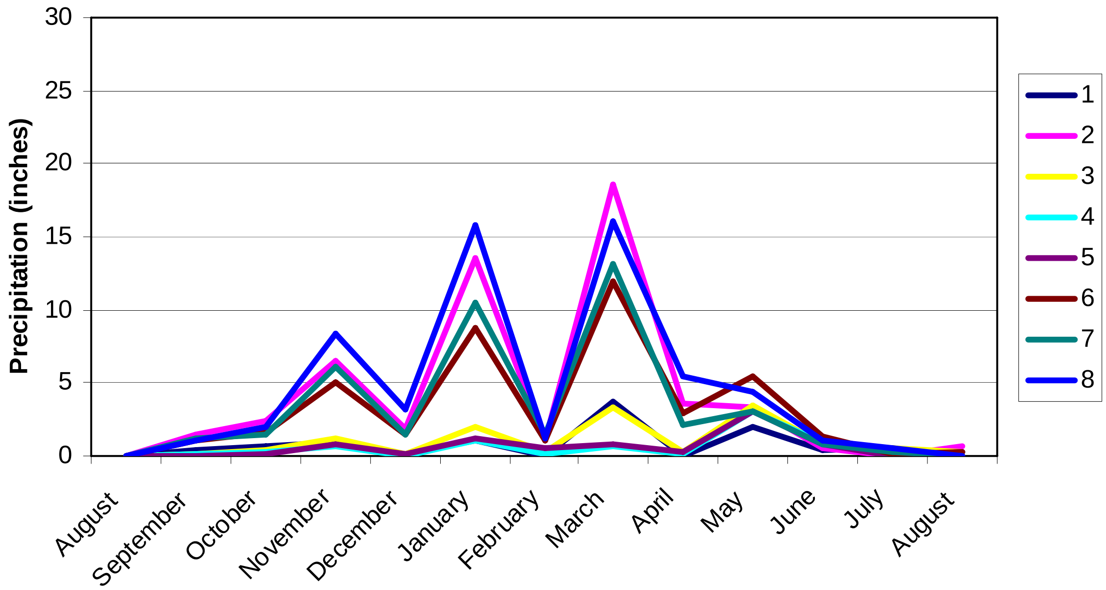


Figure B4. Average monthly precipitation graph by climate station from August 1, 1997 to August 31, 1998.

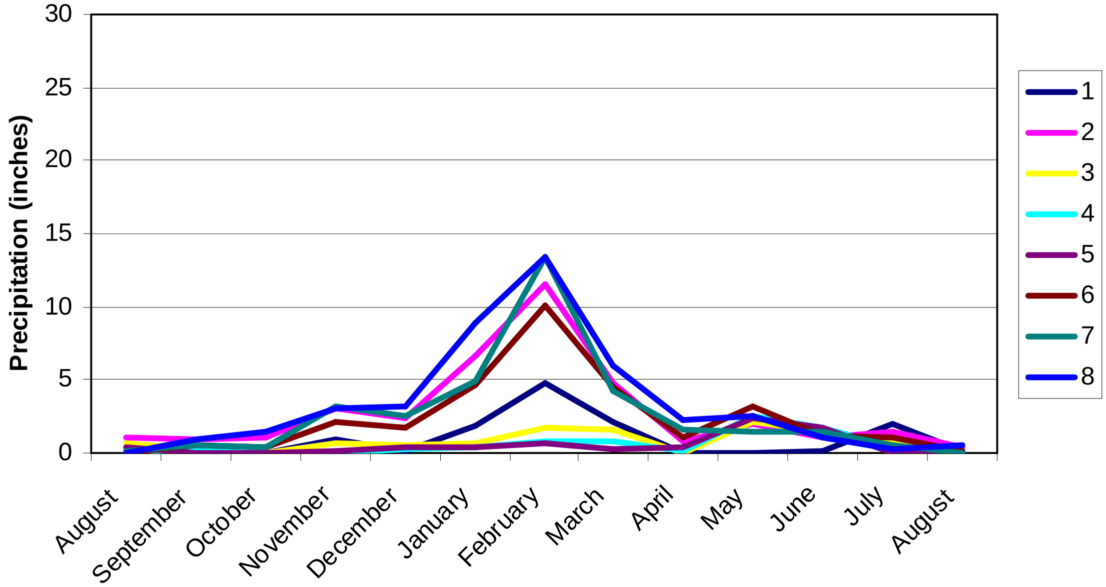


Figure B5. Average monthly precipitation graph by climate station from July 1, 1999 to July 31, 2000.

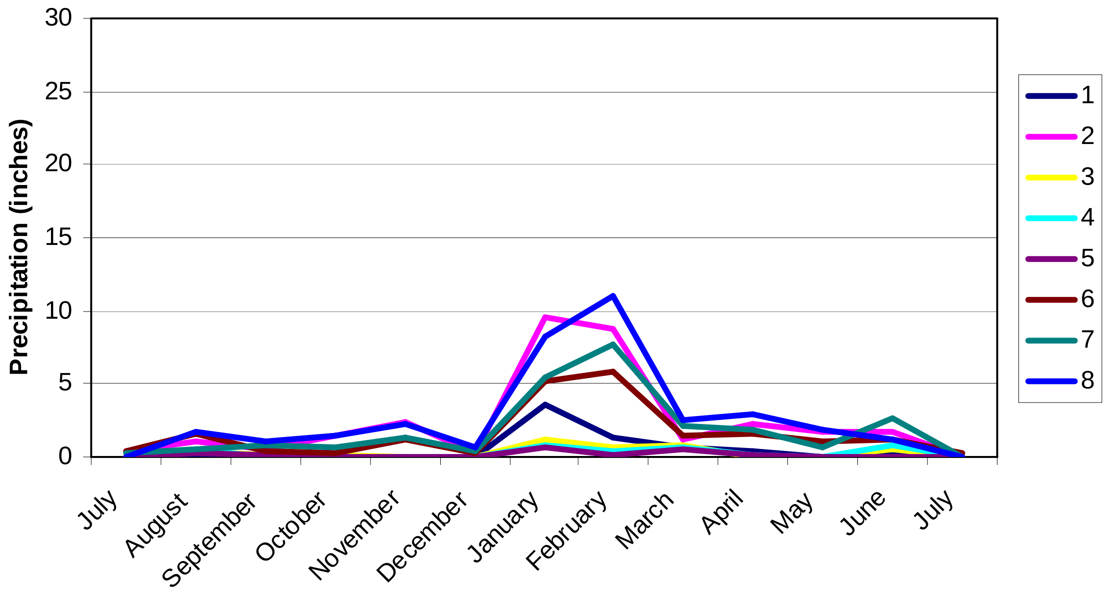
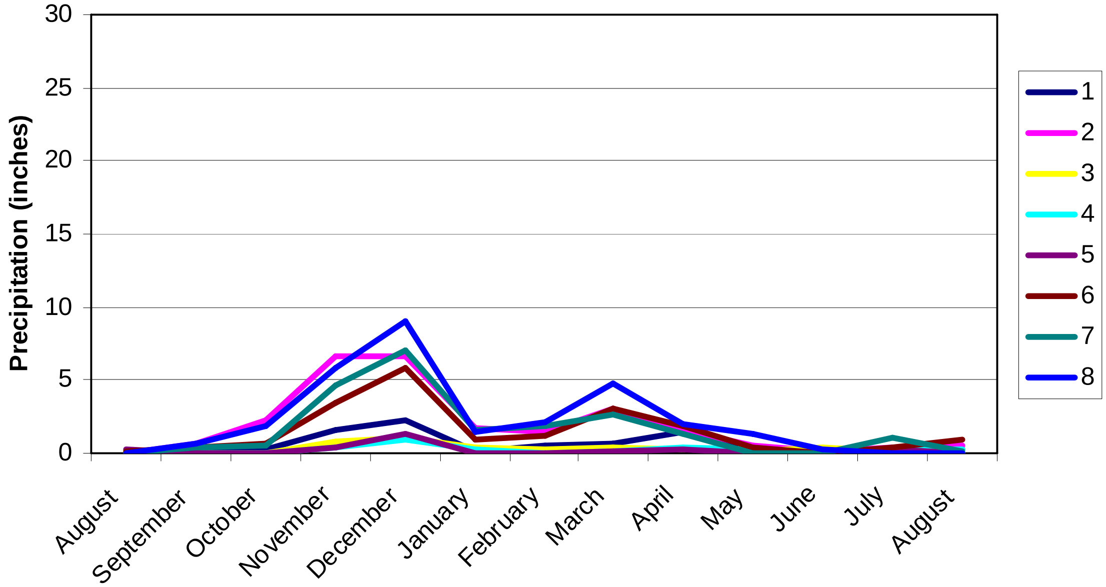


Figure B6. Average monthly precipitation graph by climate station from August 1, 2001 to August 31, 2002.



B.2. Total Prior Year Precipitation

Figures B7-B12 displays the total amount of liquid water contained within precipitation accumulated at eight climate stations located within the Walker Lake Basin. Each numeric identifier relates to an alphanumeric description contained in Table 2 of the report. The spatial location of each climate station is depicted in Figure 3. Total prior year precipitation was determined by summing the reported daily precipitation at each climate station for the thirteen month time period prior to Landsat scene acquisition.

Figure B7. Total prior year precipitation graph by climate station from August 1, 1985 to August 31, 1986.

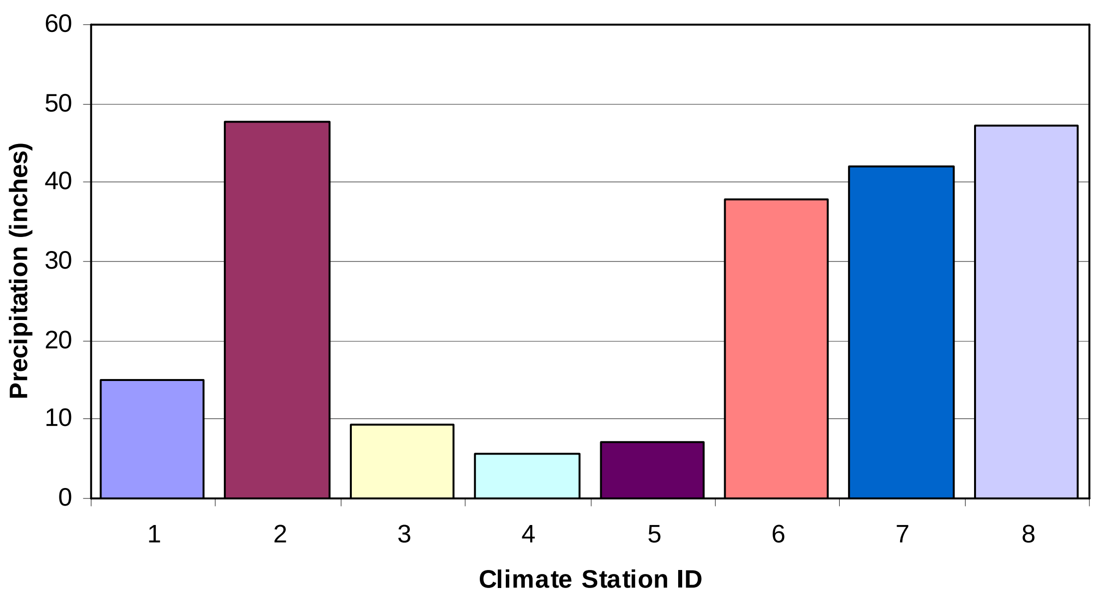


Figure B8. Total prior year precipitation graph by climate station from July 1, 1991 to July 31, 1992.

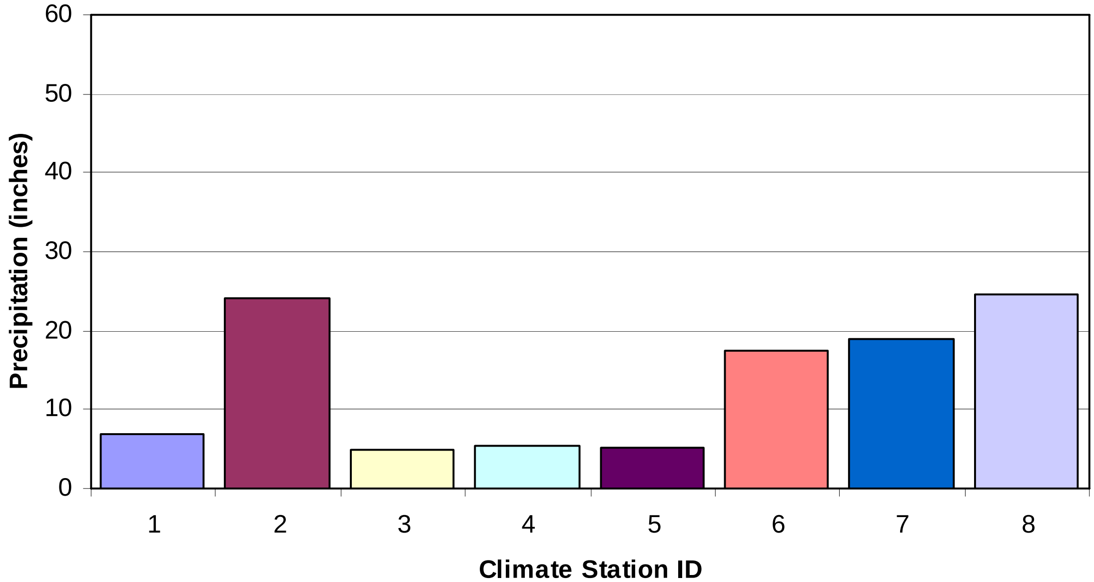


Figure B9. Total prior year precipitation graph by climate station from August 1, 1994 to August 31, 1995.

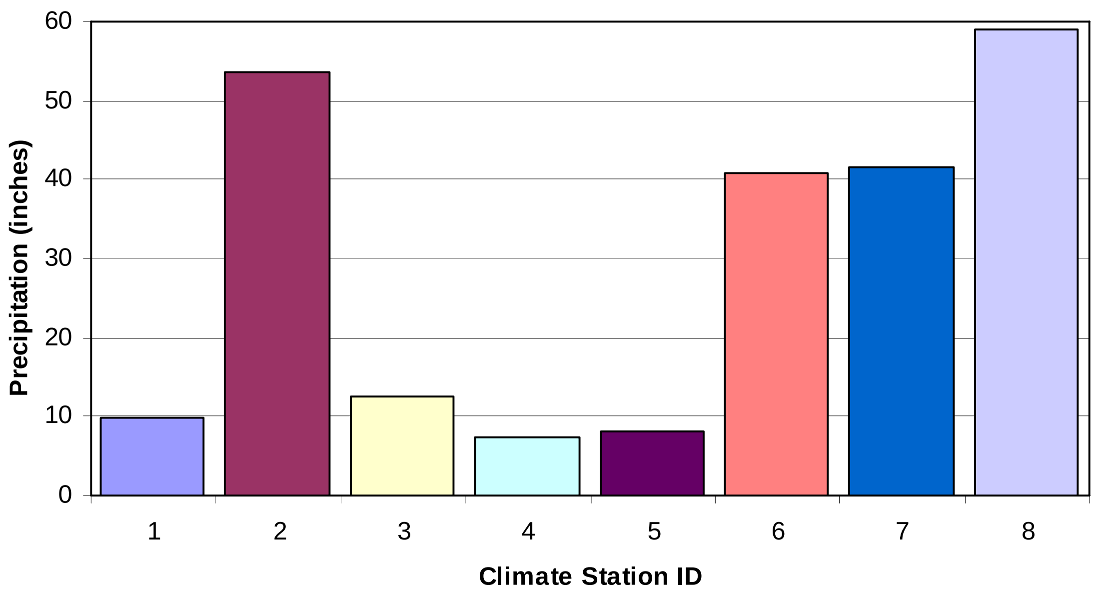


Figure B10. Total prior year precipitation graph by climate station from August 1, 1997 to August 31, 1998.

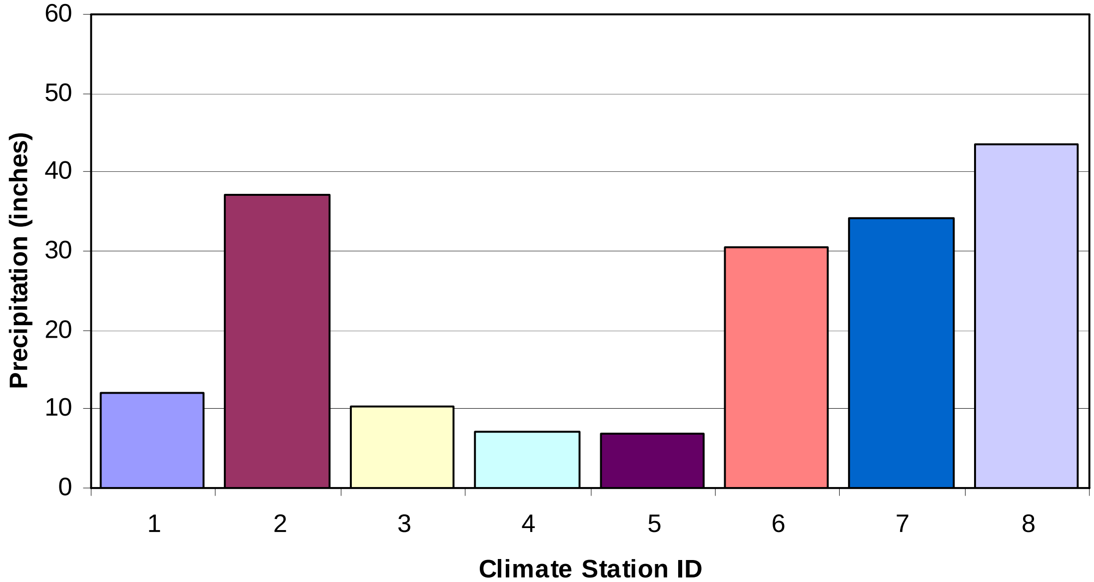


Figure B11. Total prior year precipitation graph by climate station from July 1, 1999 to July 31, 2000.

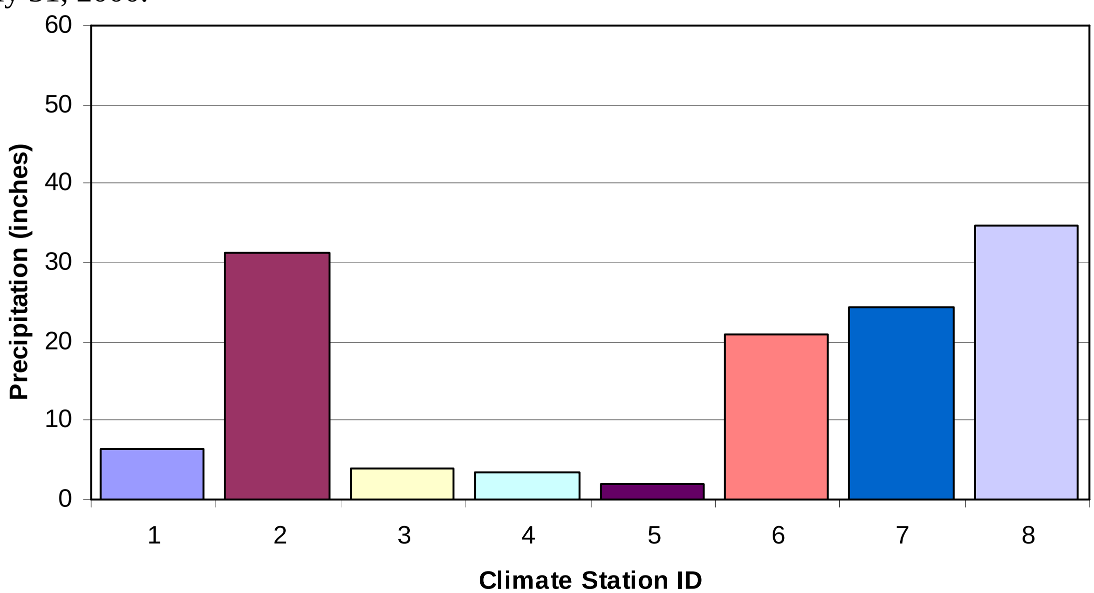
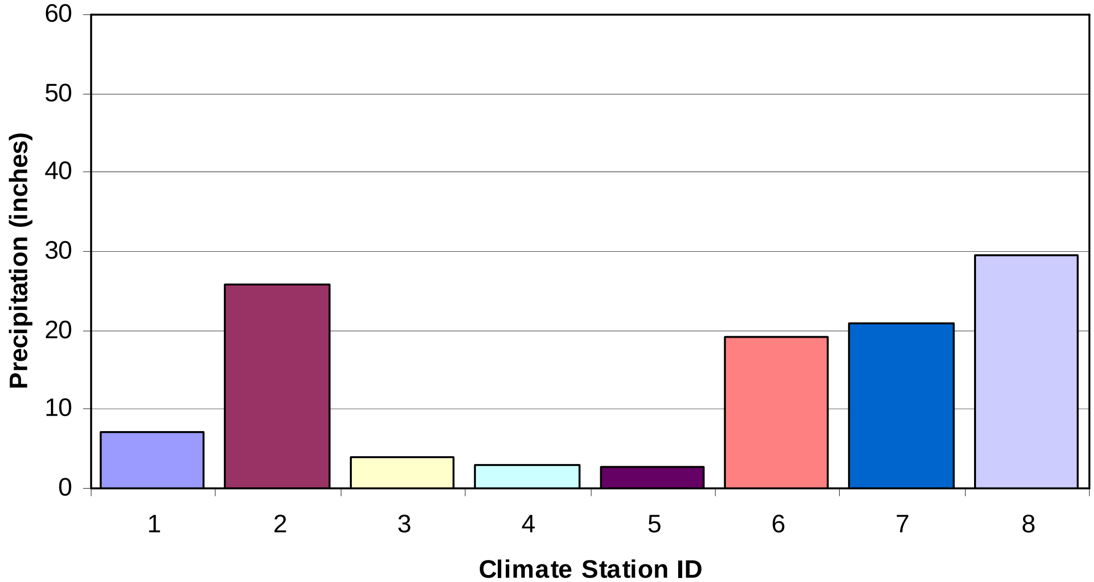


Figure B12. Total prior year precipitation graph by climate station from August 1, 2001 to August 31, 2002.



B.3. Average monthly discharge

Figures B13-B18 displays the average monthly discharge at eight USGS gaging stations located within the Walker Lake Basin. Each numeric identifier relates to an alphanumeric description contained in Table 1 of the report. The spatial location of each gaging station is depicted on the map in Figure 3. Average monthly discharge was computed from daily discharge measurements taken at each gaging station for the thirteen month time period prior to Landsat scene acquisition.

Figure B13. Average monthly discharge graph by gaging station from August 1, 1985 to August 31, 1986.

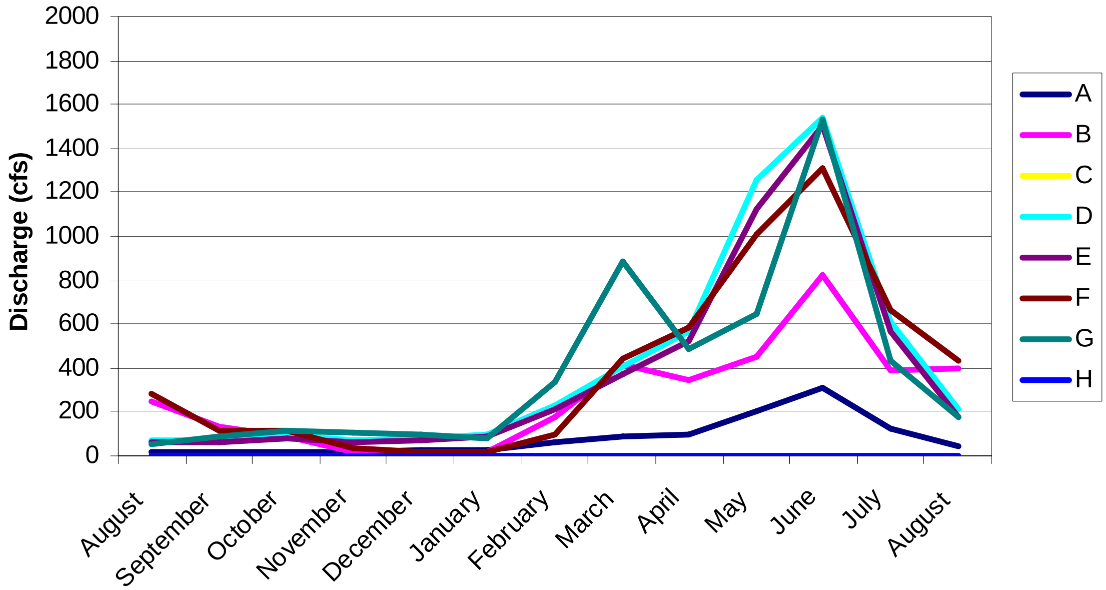


Figure B14. Average monthly discharge graph by gaging station from July 1, 1991 to July 31, 1992.

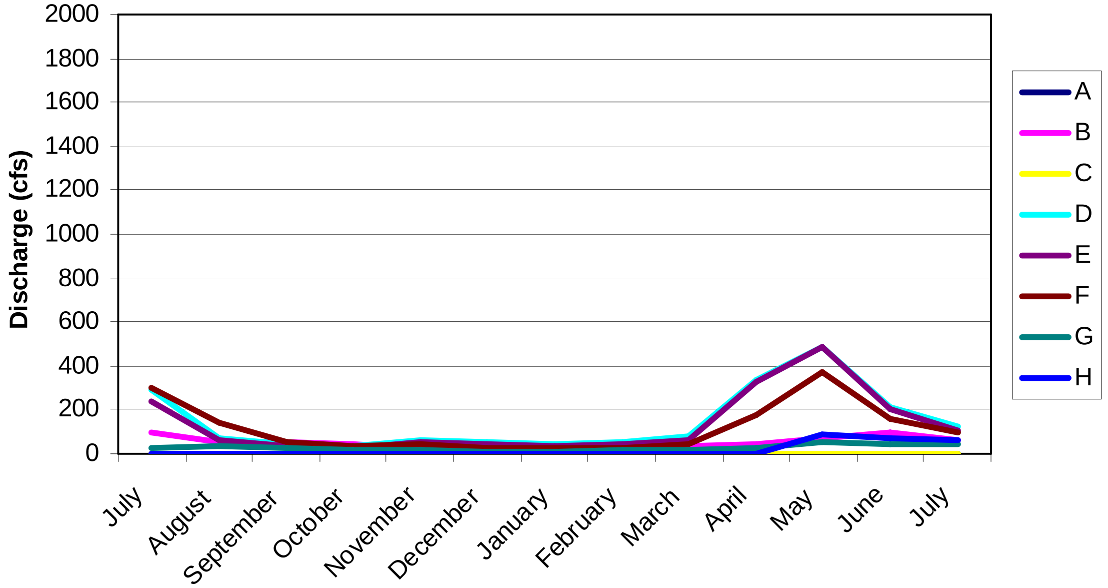


Figure B15. Average monthly discharge graph by gaging station from August 1, 1994 to August 31, 1995.

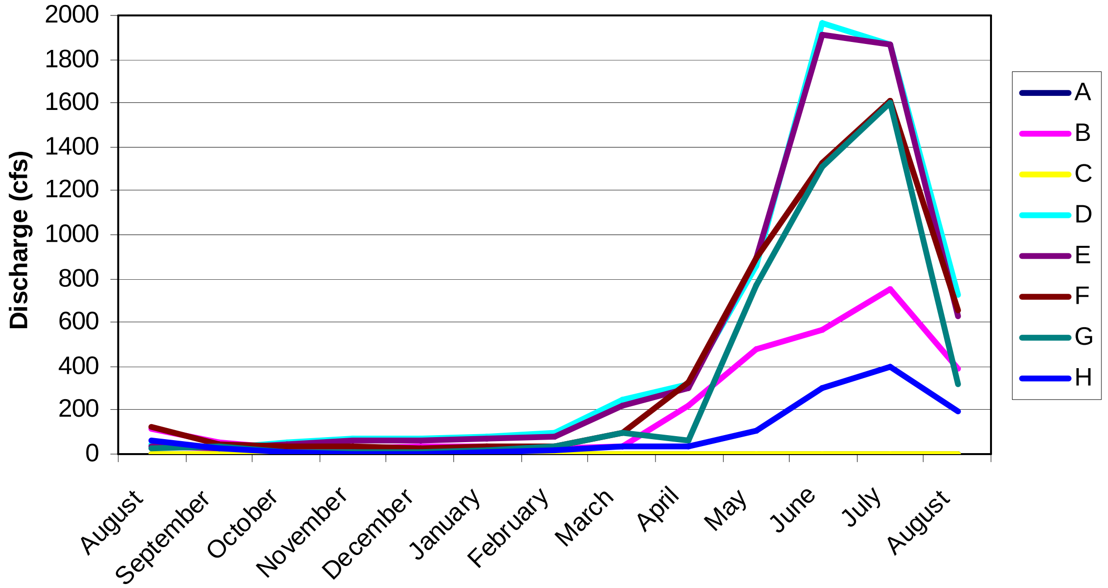


Figure B16. Average monthly discharge graph by gaging station from August 1, 1997 to August 31, 1998.

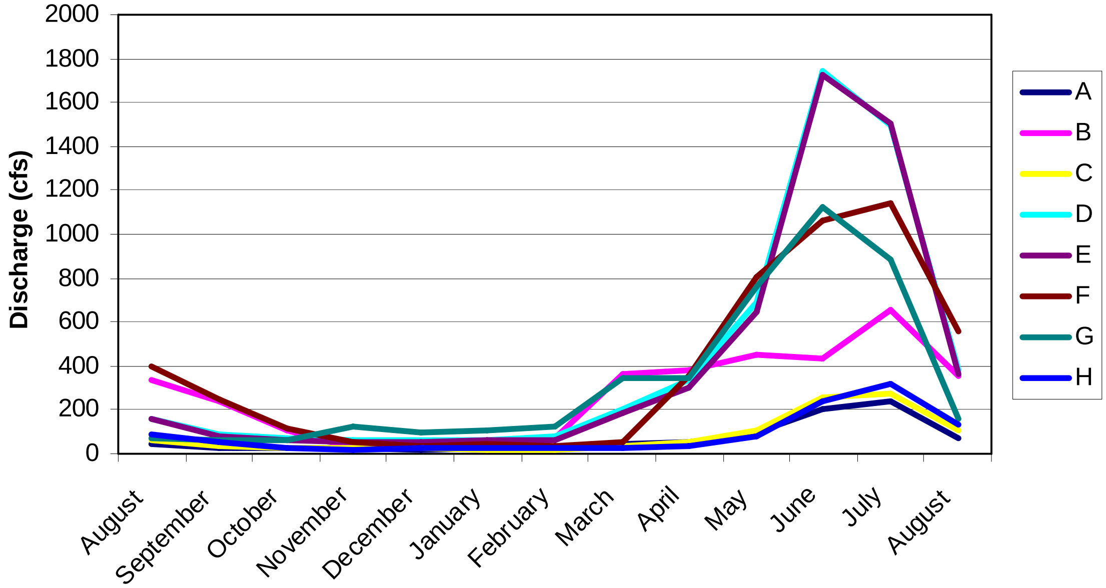


Figure B17. Average monthly discharge graph by gaging station from July 1, 1999 to July 31, 2000.

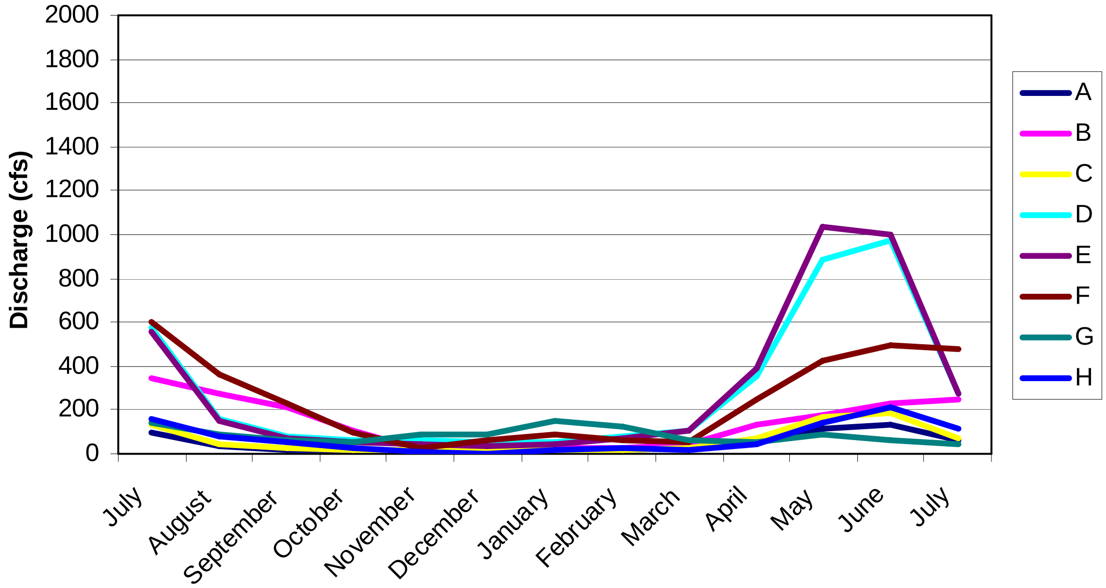
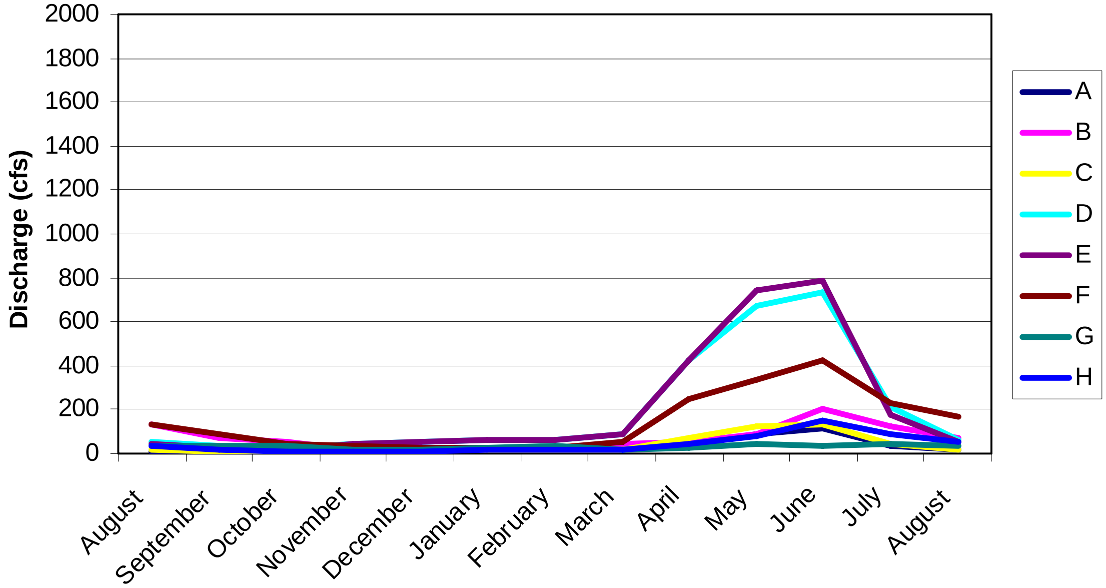


Figure B18. Average monthly discharge graph by gaging station from August 1, 2001 to August 31, 2002.



APPENDIX B

RECENT SALES OF WATER, LAND, AND RELATED INTERESTS IN THE SMITH AND MASON VALLEYS, NEVADA

Many are interested in how much it might cost to acquire water from willing sellers in the Walker River basin. There are, of course, standard methods employed by certified appraisers, marketplace lenders, public institutions, and non-profit organizations alike that can help to discern "market value" based on appropriate comparisons to recent sales of similar property interests.[1] The underlying premise of the "sales comparison" approach is that the market value of a particular property interest will be directly related to the sale prices of comparable, competitive property interests.[2]

As part of this Study, GBLW compiled publicly-available market sales data – the same foundation of information that a certified appraiser would utilize – for a total of 245 recorded real-property transactions between willing sellers and willing buyers of water rights (only), vacant (dry) lands, and entire farms (including water rights, lands, and improvements) in the Smith and Mason Valleys over the 93-month (nearly 8-year) period January 1999 through October 2006.[3] These data suggest that there is already an active market (or markets) for water and related interests in the region, and that buyers have acquired these interests for many reasons including farm consolidation, prospective future development, and water speculation (among others).

Sales data for the *Smith Valley* (143 transactions) were organized into three basic categories (and subcategories when appropriate) in order to best summarize the information at hand. These categories are as follows:

- Water Rights: sales of water rights (only) including primary or non-supplemental groundwater (29 sales) and stand-alone (New Land) storage (2);

- Farms: sales of entire farms utilizing a mixture of water rights types[4] including larger farms (29 @ 50 acres or more), small farms (14 @ 50 acres or less), and "pumpwater" farms (11 farms reliant solely on groundwater, located primarily north of Artesia Lake, with most sales involving a single buyer); and

- Lands: 52 transactions involving vacant, non-water righted lands.

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[1] Appraisers may actually use several different methods to estimate the value of a property, including (1) the sales comparison approach, (2) the cost approach, and (3) the income capitalization approach.

[2] Where public acquisition funds are involved, appraisals for specific properties will be undertaken in compliance with the *Uniform Appraisal Standards for Federal Land Acquisition* (see, for example, http://www.usdoj.gov/enrd/land-ack/yb2001.pdf) subject to both general and specific limiting conditions.

[3] These data also supplement a similar compilation by GBLW of market sales data for the Smith and Mason Valleys covering the period 1995-1998 (Western Property Analysts 1999, unpublished)

[4] We were not able to disaggregate these data by type based on the public information currently available.

Sales data for the Mason Valley (102 transactions) were similarly organized into appropriate categories and subcategories as follows:

- Water Rights: sales of water rights (only) including primary or non-supplemental groundwater (14 sales) and supplemental groundwater (3), with most sales involving a single buyer;

- Farms: sales of entire farms including large farms (35 @ 50 acres or more), small farms (11 @ 50 acres or less), and pumpwater farms (4 sales of farms reliant solely on groundwater); and.

- Lands: 31 transactions involving vacant, non-water righted lands.

Tables 1 and 2 below summarize the above data by area, category, and subcategory (where feasible) for the entire 8-year period (1999-2006) and for the most recent two-year period (2005-2006); a complete listing of individual transactions is also appended. The more recent sales data are thought to better reflect current and/or near-future market conditions, however the market has also cooled off considerably in recent months. The average market value for water in each area over the appropriate period(s) of time can then be inferred directly from "water only" sales, and indirectly from "land and water" sales by comparing whole-unimproved farm sales with land (only) sales.[5] An example of the latter method would be as follows:

Acres	Water Rights	Buildings	Sale Date	Sale Price	Sale Price Per Acre	Est. Water Value/Ac.	Est. Water Value/AF.
80	Yes	No	6/10/1999	$120,000	$1,500		
						$1,325	$331
80	No	No	6/6/2000	$14,000	$175		

The summaries presented in the attached tables indicate that, in recent years (2005-06), sales of non-supplemental groundwater rights in the Smith and Mason Valley averaged between $1,250/AF and $1,650/AF. By comparison, supplemental groundwater rights (Mason Valley only) sold for an average of about $700/AF, while sales of stand-alone storage rights (Smith Valley only) went for about $400/AF on average. Where entire farms have been sold, effective average prices per acre-foot (including land and improvement values) have varied from $700/AF to $1,700/AF for large farms; from $2,700/AF to $4,300/AF for small farms; and from $1,200/AF to $1,500/AF for pumpwater farms. Finally, when similar farm and dry-land sales are compared to one another, the implied average water right values range from $900/AF to $1,200/AF.

[5] The different sales categories also represent different sub-markets and care must be taken to distinguish between them accordingly (e.g., sales of primary groundwater rights have generally included both agricultural and municipal buyers, while sales of large farms with a mixture of water rights have generally been limited to agricultural buyers).

It should be noted that this analysis is focused on fee-simple sales in the Smith and Mason Valleys, which are thought to bracket market conditions for the basin as a whole but which do not include information relating to annual or term-based sales (such as annual leases of land and water for alfalfa, onions, and garlic). Anecdotal reports suggest that annual farm lease rates currently range from about $125/acre for alfalfa to about $300/acre for onions and garlic, with the latter typically grown for 1-2 year periods in rotation with alfalfa.

By comparison, the proposed (but never implemented) 2004 fallowing program on the Walker River Indian Reservation included negotiated one-year enrollment prices of $600/acre, plus an additional $300/acre premium as an incentive for "whole lateral" enrollments. These prices were expressly understood to include crop re-establishment costs (as the responsibility of the seller) at approximately $240/acre; and they also apparently reflected such unique additional factors as the absolute seniority of the Tribe's water rights; the Reservation's proximity to Walker Lake; the Tribe's concurrent agreement to convey through Weber Reservoir, and to forbear the subsequent diversion of, waters conserved at the Mason Valley Wildlife Management Area in 2004; and the risks and uncertainties associated with river channel and reservoir losses between the northern Reservation boundary and Walker Lake.

It is also interesting to note that the observed market value of farms in the Smith Valley generally exceeded those in the Mason Valley over the period studied. While many factors may account for this difference, the single most important may be the Smith Valley's relative proximity to the rapidly-growing Minden-Gardnerville-Carson Valley area. In general, the Smith Valley area has begun a transition from an agricultural area towards a bedroom-community type economy, though it is doubtful that near-term growth will approach the pace found in those areas in recent years.

Note also that adjustments have *not* been made for the "time value of money" in this analysis (i.e., a dollar in 1999 would have been worth more than a dollar in 2006 due to the combined effects of inflation and interest). Thus, the reported averages tend to understate market values based on today's (2006) dollars, though the difference is more significant for the entire 8-year period than for the more recent two-year period.

Finally, the above data are based on circumstances that existed at particular points in time, not only monetarily but in terms of general economic conditions, the market for agricultural products, regional growth and development, and other factors. Thus, while market conditions have generally cooled off over the past year, the underlying data indicate that "real" prices and values have generally increased with time, and it is likely that they will continue to do so in the future.[6]

[6] Both water-related litigation and large-scale water acquisition efforts for the protection of Walker Lake could influence future market prices depending on their scope, structure, and other factors.

Table 1

Recorded Water Right, Farm, and Land Sales in the Mason Valley, Nevada						
Weighted averages for the periods 1999-2006 and 2005-2006						
	1999-2006			2005-2006		
Mason Valley	#	*per acre*	*per AF*	#	*per acre*	*per AF*
Water Right Sales						
Primary GW	14	$ -	$ 1,649	14	$ -	$ 1,649
Supplemental GW	3	-	746	2	-	674
Farm Sales						
Large (>50 acres)	35	$ 2,255	$ 564	6	$ 2,880	$ 720
Small (<50 acres)	11	6,973	1,743	3	11,009	2,752
Pumpwater	4	2,838	709	1	6,137	1,534
Land Sales	31	$ 600	$ -	15	$ 2,207	$ -
Farm-Land Value Pairs	4	$ 2,840	$ 710	2	$ 4,801	$ 1,200
Total Sales	102			43		
Note: farm sales data based on gross farm acres rather than net irrigated acres;						
and calculated $/AF based on assumed average conversion rate of 4.0 AF/acre						

Table 2

Recorded Water Right, Farm, and Land Sales in the Smith Valley, Nevada						
Weighted averages for the periods 1999-2006 and 2005-2006						
	1999-2006			2005-2006		
Smith Valley	#	*per acre*	*per AF*	#	*per acre*	*per AF*
Water Right Sales						
Groundwater	29	$ -	$ 1,555	15	$ -	$ 1,263
Storage (WRID)	2	-	407	2	-	407
Farm Sales						
Large (>50 acres)	29	$ 4,376	$ 1,094	8	$ 6,740	$ 1,685
Small (<50 acres)	14	14,985	3,746	9	17,216	4,304
Pumpwater	12	2,815	2,815	4	4,769	1,192
Land Sales	52	$ 4,896	$ -	13	$ 8,442	$ -
Farm-Land Value Pairs	5	$2,399	$600	1	$ 3,646	$912
Total Sales	143			52		
Note: farm sales data based on gross farm acres rather than net irrigated acres;						
and calculated $/AF based on assumed average conversion rate of 4.0 AF/acre						

MASON VALLEY WATER RIGHT SALES

Ref. No. MWR-	Seller	Buyer	Document Number	Sale Date	Water Rights Acre Feet Primary	Water Rights Acre Feet Supplemental	Permit No.	Certificate No.	Sale Price	Price Per Acre Foot
1	James T. Ammons	Peavine Leasing	340007	01/07/05	260.000		57254		$ 552,500	$ 2,125
2	Richard H. Holbrook	Lewis A. Ewert	374526	11/11/05	190.800		71092		$ 238,500	$ 1,250
3	Joseph W. Tibbals	Yerington Ventures	372490	12/01/05	54.540			5074	$ 190,890	$ 3,500
4	Joseph W. Tibbals	Mason Water LLC	372489	12/01/05	125.460			5074	$ 376,380	$ 3,000
5	Mason Water LLC	Teresa M. Aguila	374315	01/17/06	4.040			5074	$ 16,160	$ 4,000
6	Mason Water LLC	Carolyn Kates	374314	01/17/06	6.960			5074	$ 27,840	$ 4,000
7	Joseph W. Tibbals	Patricia L. Riley	376981	01/20/06	87.500			5074	$ 350,000	$ 4,000
8	John Cooper	Sunrise Ranch	379469	02/27/06	316.800	39.000		9624	$ 190,080	$ 534
9	David Little	Lawrence B. Masini	378078	03/23/06	672.240		65209-11/70112		$ 1,008,360	$ 1,500
10	David Little	Lawrence B. Masini	378077	03/23/06	1,327.760		378076		$ 1,991,640	$ 1,500
11	Juan Tiscareno	TPKW Family LP	378428	03/29/06	7.960			5727	$ 23,880	$ 3,000
12	Juan Tiscareno	TPKW Family LP	378429	03/29/06	4.040			5727	$ 12,120	$ 3,000
13	Gary M. Hanson	Circle Barn N Ranch	379481	04/04/06	166.000			11424	$ 332,000	$ 2,000
14	Sunrise Ranch LLC	Mike Bobrick	384507	06/14/06	6.312		66887		$ 15,250	$ 2,416
	Primary -- sum or weighted average 1999-06				3,230.412				$ 5,325,600	$ 1,649
	Primary -- sum or weighted average 2005-06				3,230.412				$ 5,325,600	$ 1,649
15	Joseph W. Tibbals	Circle Barn N Ranch	295625	05/01/03		796.440		11026/5715	$ 637,152	$ 800
16	John Cooper	Sunrise Ranch	349399	04/22/05		320.000		5687	$ 250,000	$ 781
17	Mark Arrighi	Circle Barn N Ranch	379946	04/10/06		274.800		9832	$ 151,140	$ 550
	Supplemental -- sum or weighted average 1999-06					1,391.2			$ 1,038,292	$ 746
	Supplemental -- sum or weighted average 2005-06					594.8			$ 401,140	$ 674

MASON VALLEY LARGER FARM SALES > 50 ACRES

Ref. No. MLF-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.	Water Rights WRID	Water Rights Well	Water Rights WRID & Well	Buildings
1	12-191-13	01/11/99	$ 216,000	80.00	$ 2,700	80.00	$ 2,700			Yes	No
2	14-321-11	06/10/99	$ 120,000	80.00	$ 1,500	15.00	$ 8,000	Yes			No
3	14-241-24	06/22/99	$ 2,300,000	713.26	$ 3,225	657.75	$ 3,497			Yes	Yes
4	12-471-95	07/21/99	$ 1,800,000	1,022.87	$ 1,760	560.00	$ 3,214			Yes	No
5	12-011-10	09/24/99	$ 2,199,822	1,306.37	$ 1,684	1,282.00	$ 1,716	Yes			Yes
6	12-062-23	02/09/00	$ 300,000	116.46	$ 2,576	116.46	$ 2,576	Yes			No
7	12-251-05	03/01/00	$ 600,000	159.93	$ 3,752	159.93	$ 3,752	Yes			Yes
8	14-201-32	03/10/00	$ 256,000	160.00	$ 1,600	153.00	$ 1,673			Yes	No
9	12-351-21	05/23/00	$ 268,000	137.04	$ 1,956	129.00	$ 2,078			Yes	Yes
10	14-201-33	06/27/00	$ 500,000	115.00	$ 4,348	110.00	$ 4,545	Yes			Yes
11	14-501-08	01/11/01	$ 750,000	320.00	$ 2,344	320.00	$ 2,344			Yes	No
12	14-241-03	04/23/01	$ 700,000	401.93	$ 1,742	159.00	$ 4,403			Yes	Yes
13	14-421-17	11/01/01	$ 2,500,000	1,658.47	$ 1,507	1,405.84	$ 1,778			Yes	Yes
14	14-241-43	12/10/01	$ 200,000	80.00	$ 2,500	80.00	$ 2,500	Yes			No
15	14-241-38	01/08/02	$ 449,460	300.04	$ 1,498	247.90	$ 1,813	Yes			No
16	12-471-20	02/25/02	$ 2,850,000	3,286.29	$ 867	1,889.00	$ 1,509			Yes	Yes
17	14-481-07	09/25/02	$ 455,000	73.00	$ 6,233	72.65	$ 6,263	Yes			Yes
18	12-361-11	09/28/02	$ 249,000	79.40	$ 3,136	16.00	$ 15,563	Yes			Yes
19	14-321-03	10/14/02	$ 1,850,000	855.00	$ 2,164	738.20	$ 2,506			Yes	Yes
20	14-321-04	09/15/03	$ 1,000,000	1,200.00	$ 833	933.00	$ 1,072			Yes	No
21	12-321-11	01/26/04	$ 700,000	356.00	$ 1,966	356.00	$ 1,966			Yes	Yes
22	12-421-03	02/05/04	$ 1,300,000	360.32	$ 3,608	250.90	$ 5,181			Yes	No
23	12-351-04	02/26/04	$ 600,000	160.00	$ 3,750	160.00	$ 3,750			Yes	No
24	14-521-03	03/25/04	$ 239,950	217.68	$ 1,102	182.00	$ 1,318	Yes			No
25	12-031-07	05/17/04	$ 900,000	152.02	$ 5,920	152.02	$ 5,920			Yes	Yes
26	14-521-09	06/11/04	$ 560,000	75.40	$ 7,427	75.40	$ 7,427	Yes			No
27	12-361-27	08/10/04	$ 4,550,000	1,067.63	$ 4,262	695.00	$ 6,547			Yes	Yes
28	12-191-23	08/12/04	$ 750,000	200.80	$ 3,735	198.37	$ 3,781	Yes			No
29	12-331-04	12/23/04	$ 1,400,000	568.00	$ 2,465	406.10	$ 3,447	Yes			Yes
30	01-531-01	06/21/05	$ 2,500,000	1,113.41	$ 2,245	1,082.00	$ 2,311	Yes			No
31	12-311-02	08/12/05	$ 2,100,000	495.62	$ 4,237	430.00	$ 4,884			Yes	Yes
32	01-551-09	09/23/05	$ 1,300,000	146.00	$ 8,904	146.00	$ 8,904	Yes			Yes
33	12-351-17	12/01/05	$ 1,200,000	171.50	$ 6,997	154.00	$ 7,792			Yes	Yes
34	12-191-13	03/15/06	$ 555,000	182.69	$ 3,038	180.69	$ 3,072			Yes	No
35	12-191-23	08/14/06	$ 1,500,000	200.80	$ 7,470	198.37	$ 7,562	Yes			No

	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.
sum or weighted average 1999-2006	$ 39,718,232	17,613	$ 2,255	13,792	$ 2,880
sum or weighted average 2005-2006	$ 9,155,000	2,310	$ 3,963	2,191	$ 4,178

MASON VALLEY SMALL FARM SALES < 50 ACRES

Ref. No. MSF-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.	Water Rights WRID	Water Rights Well	Water Rights WRID & Well	Buildings
1	12-351-14	05/24/00	$ 100,000	40.00	$ 2,500	38.00	$ 2,632			Yes	No
2	12-131-34	01/04/01	$ 94,000	25.34	$ 3,710	25.34	$ 3,710	Yes			No
3	12-352-03	04/25/02	$ 150,000	40.09	$ 3,742	40.09	$ 3,742	Yes			No
4	12-361-18	10/24/03	$ 100,000	20.00	$ 2,500	15.00	$ 6,667	Yes			No
5	12-281-14	04/26/04	$ 130,000	20.00	$ 6,500	14.00	$ 9,286	Yes			No
6	12-281-15	08/17/04	$ 305,000	40.33	$ 7,563	33.00	$ 9,242	Yes			No
7	12-361-18	08/23/04	$ 165,000	20.00	$ 8,250	15.00	$ 11,000	Yes			No
8	14-531-10	09/03/04	$ 403,000	42.33	$ 9,520	41.33	$ 9,751	Yes			Yes
9	12-171-11	03/16/06	$ 225,000	29.62	$ 7,596	25.00	$ 9,000			Yes	No
10	12-401-19	05/11/06	$ 331,500	20.05	$ 16,534	18.00	$ 18,417	Yes			No
11	12-161-11	06/08/06	$ 215,000	20.41	$ 10,534	15.00	$ 14,333	Yes			No

	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.
sum or weighted average 1999-2006	$ 2,218,500	318	$ 6,973	280	$ 7,930
sum or weighted average 2005-2006	$ 771,500	70	$ 11,009	58	$ 13,302

MASON VALLEY PUMPWATER FARM SALES

Ref. No. MPF-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.	Water Rights WRID	Water Rights Well	Water Rights WRID & Well	Buildings
1	14-321-06	09/29/99	$ 600,000	240.00	$ 2,500	238.81	$ 2,512		Yes		Yes
2	14-321-06	04/01/02	$ 625,000	240.00	$ 2,604	118.75	$ 5,263		Yes		Yes
3	14-351-41	04/22/03	$ 73,000	82.06	$ 890	60.00	$ 1,217		Yes		No
4	14-381-01	01/07/05	$ 552,500	90.03	$ 6,137	70.00	$ 7,893		Yes		No

	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.
sum or weighted average 1999-2006	$ 1,850,500	652	$ 2,838	488	$ 3,795
sum or weighted average 2005-2006	$ 552,500	90	$ 6,137	70	$ 7,893

MASON VALLEY LAND SALES

Ref. No. ML-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Water Rights	Multiple Parcels
1	12-361-24	04/06/99	$ 58,000	41.27	$ 1,405	No	No
2	14-341-03	07/30/99	$ 45,000	100.80	$ 446	No	No
3	14-091-09	04/13/00	$ 375,000	1,712.50	$ 219	Yes	No
4	14-321-26	05/30/00	$ 25,000	156.00	$ 160	No	No
5	14-081-11	06/06/00	$ 14,000	80.00	$ 175	No	No
6	14-051-01	06/19/00	$ 680,000	2,204.76	$ 308	Yes	Yes
7	14-321-20	07/18/00	$ 10,000	40.00	$ 250	No	No
8	14-161-04	03/07/01	$ 120,000	240.00	$ 500	No	No
9	14-141-01	11/21/01	$ 501,000	2,105.00	$ 238	No	No
10	14-161-01	12/28/01	$ 80,000	160.00	$ 500	No	No
11	12-401-11	08/27/02	$ 160,000	86.56	$ 1,848	No	No
12	12-401-08	03/19/04	$ 65,000	120.00	$ 542	No	No
13	14-281-02	05/24/04	$ 90,000	40.00	$ 2,250	No	No
14	12-221-06	06/22/04	$ 337,500	114.56	$ 2,946		Yes
15	14-561-08	06/25/04	$ 165,000	80.00	$ 2,063	No	No
16	14-541-09	07/30/04	$ 225,000	117.37	$ 1,917	No	No
17	12-332-10	01/13/05	$ 90,000	22.42	$ 4,014	No	No
18	12-332-09	01/17/05	$ 150,000	20.48	$ 7,324	No	No
19	12-332-08	03/02/05	$ 160,000	22.30	$ 7,175	No	No
20	14-181-04	03/01/05	$ 60,000	46.60	$ 1,288	No	No
21	14-181-03	04/09/05	$ 126,000	58.74	$ 2,145	No	Yes
22	14-311-11	05/20/05	$ 45,000	19.20	$ 2,344	No	No
23	14-071-02	06/16/05	$ 44,000	440.00	$ 100	No	Yes
24	12-311-14	07/14/05	$ 139,000	21.82	$ 6,370	No	No
25	14-372-16	08/10/05	$ 150,000	25.85	$ 5,803	No	No
26	14-371-03	08/26/05	$ 167,000	63.80	$ 2,618	No	No
27	12-391-03	09/08/05	$ 200,000	80.00	$ 2,500	No	No
28	12-211-34	10/17/05	$ 200,000	20.02	$ 9,990	No	No
29	12-332-09	03/10/06	$ 175,000	20.48	$ 8,545	No	No
30	12-332-10	05/25/06	$ 200,000	22.42	$ 8,921	No	No
31	14-341-09	05/26/06	$ 133,500	39.77	$ 3,357	No	No

	Sale Price	Gross Acres	Price Per Acre
sum or weighted average 1999-2006	$ 4,990,000	8,323	$ 600
sum or weighted average 2005-2006	$ 2,039,500	924	$ 2,207

Mason Valley Farm & Land Sales -- Water Value Pairs

Pair No.	A.P.N.	Acres	Water Rights	Buildings	Sale Date	Sale Price	Sale Price Per Acre	Est. Water Value/Ac.	Est. Water Value/AF.
	14-321-11	80	Yes	No	6/10/1999	$120,000	$1,500		
1								$1,325	$331
	14-081-11	80	No	No	6/6/2000	$14,000	$175		
	14-201-32	160	Yes	No	3/10/2000	$256,000	$1,600		
2								$1,440	$360
	14-321-26	156	No	No	5/30/2000	$25,000	$160		
	12-351-04	160	Yes	No	2/26/2004	$600,000	$3,750		
3								$1,833	$458
	14-541-09	117.37	No	No	7/30/2004	$225,000	$1,917		
	12-401-19	20.05	Yes	No	5/11/2006	$331,500	$16,534		
4								$7,989	$1,997
	12-332-09	20.48	No	No	3/10/2006	$175,000	$8,545		
	12-161-11	20.41	Yes	No	6/8/2006	$215,000	$10,534		
5								$1,613	$403
	12-232-10	22.42	No	No	5/25/2006	$200,000	$8,921		

average 99-06 (5)	$2,840	$710
average 05-06 (2)	$4,801	$1,200

SMITH VALLEY WATER RIGHT SALES

Ref. No. SWR-	Seller	Buyer	Document Number	Sale Date	Water Rights Acre Feet WRID	Water Rights Acre Feet Underground	Permit No.	Certificate No.	Sale Price	Price Per Acre Foot
1	Karin A. Fleischhaker	Kim K. Steward	288695	12/23/02		324.04	68151/65470/69124		$ 648,080	$ 2,000
2	James G. Metternich	Shawn Hall	298458	05/28/03		11.00		5714	$ 22,000	$ 2,000
3	JGM	James Lee	312421	07/11/03		2.02		5714	$ 4,040	$ 2,000
4	Kim K. Steward	Frederick W. Schwake	300526	07/21/03		2.02		3397	$ 4,000	$ 1,980
5	Todd O'Banion	Kim K. Steward	303083	08/28/03		162.02	68151		$ 324,040	$ 2,000
6	Mark Harris	Andrew Proud	304561	09/10/03		5.00		9176	$ 10,000	$ 2,000
7	James P. Herner	Donna K. Hustace	314698	01/09/04		3.00		12646	$ 4,500	$ 1,500
8	James P. Herner	Donna K. Hustace	357878	03/02/04		0.60		12646	$ 900	$ 1,500
9	Acme Leasing	GR8DEAL	319589	04/19/04		151.50		8495	$ 265,125	$ 1,750
10	Kim K. Steward	SV Development	319213	04/23/04		292.02	65470-68151		$ 400,000	$ 1,370
11	James G. Metternich	Leo H. Sommer		06/14/04		0.98		5714	$ 1,960	$ 2,000
12	Peter Raisbech	Jack White	328040	08/05/04		21.00		5318 & 8090	$ 43,000	$ 2,048
13	Louis J. Cote	Todd J. O'Banion	333272	09/20/04		20.00	64961		$ 50,000	$ 2,500
14	Steven H. Ragan	Joe Benigno	335842	10/14/04		5.00	53907		$ 10,000	$ 2,000
15	Roland Faiferek	John Zwart	338092	12/13/04		20.00		12481	$ 40,000	$ 2,000
16	Mark Harris	John Gagne	341204	01/05/05		57.50		9176	$ 287,500	$ 5,000
17	John J.Seward	Thomas Tran	385606	03/15/05		10.00		72180 & 81	$ 33,500	$ 3,350
18	Steven H. Ragan	Phillip Gangwish	331936	04/02/05		2.00	53907		$ 4,000	$ 2,000
19	A. Dane Dunham	Patrick Murphy	356825	06/12/05		8.77	66458		$ 22,456	$ 2,561
20	A. Dane Dunham	Allen Redden	355528	06/16/05		8.77	66458		$ 17,540	$ 2,000
21	Roland Faiferek	John Steward	356468	07/14/05		50.00		72180 & 81	$ 100,000	$ 2,000
22	Roland Faiferek	John Steward	356506	07/14/05		10.22		72180 & 81	$ 20,440	$ 2,000
23	Dana Chappell	SV Development	364339	10/05/05		20.00		8673	$ 40,000	$ 2,000
24	Smith Ranch	Michael Singleton	370793	12/14/05		10.00		5689	$ 22,000	$ 2,200
25	Smith Ranch	Stuart Cronan	370794	12/14/05		12.00		5689	$ 26,400	$ 2,200
26	Gilber e. Cook	Sophia Seubert	372540	01/10/06		12.00	17756		$ 60,000	$ 5,000
27	Farias Wheel Ranch	Steven A. Fulstone	375371	02/15/06		601.72	71864	6855	$ 350,000	$ 582
28	Peter Raisbech	Nat Lommori	380320	04/18/06		5.00		16628 & 29	$ 12,500	$ 2,500
29	Peter Raisbech	Ellis Farias	387146	07/25/06		16.00	61898 & 99		$ 44,000	$ 2,750
	GW -- sum or weighted average 1999-2006					1,844			$ 2,867,981	$ 1,555
	GW -- sum or weighted average 2005-2006					824			$ 1,040,336	$ 1,263
30	Sovereign Enterprises	Hunewill Land & Livestock	321105	05/13/04	313.00				$ 156,500	$ 500
31	GR8DEAL	Steven A. Fulstone	325052	06/04/04	218.86				$ 60,000	$ 274
	WRID -- sum or weighted average 1999-2006				532				$ 216,500	$ 407

SMITH VALLEY LARGER FARM SALES > 50 ACRES

Ref. No. SLF-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.	Water Rights: WRID	Water Rights: Well Only	Water Rights: WRID & Well	Buildings
1	10-081-19	01/07/99	$ 395,000	103.41	$ 3,820	92.70	$ 4,261			Yes	Yes
2	10-081-11	03/15/99	$ 850,000	242.72	$ 3,502	220.86	$ 3,849			Yes	Yes
3	10-441-27	04/08/99	$ 270,000	152.37	$ 1,772	58.00	$ 4,655	Yes			No
4	10-441-12	10/08/99	$ 2,205,500	802.03	$ 2,750	711.00	$ 3,102	Yes			No
5	10-081-20	11/18/99	$ 801,000	356.34	$ 2,248	341.60	$ 2,345			Yes	No
6	10-421-07	12/27/99	$ 475,000	120.59	$ 3,939	116.00	$ 4,095	Yes			No
7	10-081-26	02/16/00	$ 524,385	223.96	$ 2,341	78.00	$ 6,723	Yes			No
8	10-441-30	05/08/00	$ 912,110	309.19	$ 2,950	295.00	$ 3,092	Yes			No
9	10-441-32	05/25/00	$ 669,990	223.33	$ 3,000	223.33	$ 3,000	Yes			No
10	10-441-26	11/28/00	$ 275,000	76.56	$ 3,592	76.56	$ 3,592	Yes			No
11	10-081-24	01/12/01	$ 418,651	255.29	$ 1,640	255.29	$ 1,640	Yes			No
12	10-731-06	05/23/01	$ 1,450,000	321.00	$ 4,517	295.00	$ 4,915			Yes	Yes
13	10-441-31	12/19/01	$ 768,000	269.55	$ 2,849	269.55	$ 2,849	Yes			No
14	10-291-30	01/25/02	$ 1,423,965	481.33	$ 2,958	240.00	$ 5,933	Yes			Yes
15	10-441-12	03/12/02	$ 1,265,000	309.19	$ 4,091	295.00	$ 4,288	Yes			No
16	10-291-27	09/18/02	$ 400,000	163.95	$ 2,440	55.00	$ 7,273	Yes			No
17	10-731-24	12/17/02	$ 375,000	132.90	$ 2,822	119.50	$ 3,138			Yes	Yes
18	10-081-26	01/23/04	$ 675,000	162.07	$ 4,165	78.00	$ 8,654	Yes			No
19	10-421-06	03/20/04	$ 4,375,000	1,050.00	$ 4,167	1,050.00	$ 4,167			Yes	Yes
20	10-331-34	06/04/04	$ 2,200,000	163.95	$ 13,419	55.00	$ 40,000	Yes			No
21	10-731-24	09/17/04	$ 795,000	132.90	$ 5,982	119.50	$ 6,653			Yes	Yes
22	10-291-36	02/08/05	$ 885,000	88.92	$ 9,953	48.00	$ 18,438	Yes			Yes
23	10-441-27	02/15/05	$ 1,218,960	152.37	$ 8,000	58.00	$ 21,017	Yes			No
24	10-441-12	04/13/05	$ 2,500,000	309.18	$ 8,086	295.00	$ 8,475	Yes			No
25	10-193-30	06/27/05	$ 1,040,000	80.00	$ 13,000	80.00	$ 13,000			Yes	No
26	10-481-09	06/30/05	$ 1,700,000	278.68	$ 6,100	160.00	$ 10,625			Yes	Yes
27	10-681-07	08/18/05	$ 650,000	56.49	$ 11,506	56.49	$ 11,506			Yes	No
28	10-741-44	12/05/05	$ 4,750,000	973.00	$ 4,882	914.00	$ 5,197			Yes	Yes
29	10-291-42	06/27/06	$ 1,400,000	159.89	$ 8,756	152.89	$ 9,157	Yes			No

	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.
sum or weighted average 1999-2006	$ 35,667,561	8,151	$ 4,376	6,809	$ 5,238
sum or weighted average 2005-2006	$ 14,143,960	2,099	$ 6,740	1,764	$ 8,016

SMITH VALLEY SMALL FARM SALES < 50 ACRES

Ref. No. SSF-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.	Water Rights WRID	Well Only	WRID & Well	Buildings
1	10-541-03	02/10/99	$ 369,500	42.00	$ 8,798	40.00	$ 9,238	Yes			Yes
2	10-741-21	09/12/00	$ 550,000	25.00	$ 22,000	15.00	$ 36,667	Yes			Yes
3	10-681-06	09/12/03	$ 250,000	40.06	$ 6,241	40.06	$ 6,241			Yes	No
4	10-193-18	06/02/04	$ 250,000	20.00	$ 12,500	20.00	$ 12,500			Yes	No
5	10-741-52	07/30/04	$ 155,000	20.00	$ 7,750	20.00	$ 7,750	Yes			No
6	10-681-08	02/23/05	$ 318,000	35.97	$ 8,841	35.97	$ 8,841			Yes	No
7	10-741-25	05/20/05	$ 220,000	20.01	$ 10,995	20.01	$ 10,995	Yes			No
8	10-301-21	05/31/05	$ 473,650	44.23	$ 10,709	43.00	$ 11,015	Yes			No
9	10-193-19	06/22/05	$ 880,000	20.26	$ 43,435	20.26	$ 43,435			Yes	Yes
10	10-681-09	06/24/05	$ 425,000	37.27	$ 11,403	37.27	$ 11,403			Yes	No
11	10-291-34	07/13/05	$ 425,000	40.00	$ 10,625	40.00	$ 10,625	Yes			No
12	10-741-21	02/01/06	$ 880,000	25.00	$ 35,200	15.00	$ 58,667	Yes			Yes
13	10-081-08	02/02/06	$ 500,000	20.00	$ 25,000	18.00	$ 27,778	Yes			Yes
14	10-193-13	04/18/06	$ 735,000	39.36	$ 18,674	29.00	$ 25,345			Yes	Yes

	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.
sum or weighted average 1999-2006	$ 6,431,150	429	$ 14,985	394	$ 16,341
sum or weighted average 2005-2006	$ 4,856,650	282	$ 17,216	259	$ 18,787

SMITH VALLEY PUMPWATER FARM SALES

Ref. No. SPF-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.	Water Rights WRID	Well Only	WRID & Well	Buildings
1	10-011-04	11/05/99	$ 750,000	1683.76	$ 445	256.00	$ 2,930		Yes		Yes
2	10-221-07	04/13/00	$ 245,000	70.00	$ 3,500	70.00	$ 3,500		Yes		No
3	10-011-02	09/18/00	$ 489,000	741.54	$ 659	549.69	$ 890		Yes		Yes
4	10-301-15	08/12/02	$ 150,000	20.00	$ 7,500	20.00	$ 7,500		Yes		No
5	10-221-07	01/06/03	$ 338,000	70.01	$ 4,828	56.72	$ 5,959		Yes		No
6	10-721-02	03/29/04	$ 800,000	160.00	$ 5,000	150.40	$ 5,319		Yes		No
7	10-011-03	04/01/04	$ 780,000	741.54	$ 1,052	549.69	$ 1,419		Yes		Yes
8	10-301-15	11/02/04	$ 225,000	20.00	$ 11,250	20.00	$ 11,250		Yes		No
9	10-011-04	02/25/05	$ 4,000,000	1,682.76	$ 2,377	880.17	$ 4,545		Yes		No
10	10-181-13	08/20/05	$ 4,000,000	303.13	$ 13,196	240.29	$ 16,647		Yes		Yes
11	10-011-33	11/23/05	$ 3,700,000	774.41	$ 4,778	479.50	$ 7,716		Yes		No
12	10-011-03	03/09/06	$ 5,000,000	741.54	$ 6,743	549.69	$ 9,096		Yes		Yes

	Sale Price	Gross Acres	Price Per Acre	Irrigated Acres	Price Per Irr. Ac.
sum or weighted average 1999-2006	$ 19,727,000	7,009	$ 2,815	3,822	$ 5,161
sum or weighted average 2005-2006	$ 16,700,000	3,502	$ 4,769	2,150	$ 7,769

SMITH VALLEY LAND SALES

Ref. No. SL-	Lyon County A.P.N.	Sale Date	Sale Price	Gross Acres	Price Per Acre	Water Rights	Multiple Parcels
1	10-761-32	02/10/99	$ 65,000	19.40	$ 3,351	No	No
2	10-211-16	05/13/99	$ 65,000	19.47	$ 3,338	No	No
3	09-041-01	05/25/99	$ 52,000	18.88	$ 2,754	No	No
4	09-131-01	05/18/00	$ 400,000	93.89	$ 4,260	No	Yes
5	10-741-11	09/06/00	$ 52,000	160.00	$ 325	No	No
6	10-211-07	12/17/01	$ 94,584	78.82	$ 1,200	No	No
7	10-311-05	01/16/02	$ 250,000	27.15	$ 9,208	No	Yes
8	10-741-43	02/06/02	$ 169,200	42.30	$ 4,000	No	No
9	10-181-11	04/22/02	$ 80,000	40.00	$ 2,000	No	No
10	10-401-01	09/03/02	$ 310,000	362.08	$ 856	Yes	No
11	10-211-11	11/25/02	$ 180,000	58.07	$ 3,100	No	Yes
12	10-181-14	12/31/02	$ 147,000	60.00	$ 2,450	No	No
13	10-221-07	01/06/03	$ 338,000	47.32	$ 7,143	No	No
14	09-132-06	04/08/03	$ 250,000	134.23	$ 1,862	No	No
15	10-211-24	09/23/03	$ 99,500	18.94	$ 5,253	No	No
16	10-211-23	10/27/03	$ 105,000	20.10	$ 5,224	No	No
17	10-211-11	12/12/03	$ 270,000	58.07	$ 4,650	No	Yes
18	10-401-20	02/05/04	$ 209,000	19.60	$ 10,663	No	No
19	10-211-04	02/10/04	$ 80,000	20.00	$ 4,000	No	No
20	10-401-14	02/12/04	$ 457,500	89.79	$ 5,095	No	Yes
21	10-741-47	03/02/04	$ 293,000	121.89	$ 2,404	No	Yes
22	10-211-14	03/31/04	$ 200,000	39.20	$ 5,102	No	No
23	10-761-54	05/12/04	$ 150,000	28.19	$ 5,321	No	No
24	10-211-21	05/14/04	$ 115,000	20.10	$ 5,721	No	No
25	10-211-22	06/02/04	$ 115,000	20.10	$ 5,721	No	No
26	10-081-29	07/12/04	$ 2,100,000	201.48	$ 10,423	No	Yes
27	10-211-25	07/12/04	$ 150,000	20.00	$ 7,500	No	No
28	10-741-47	10/05/04	$ 200,000	40.45	$ 4,944	No	No
29	09-132-19	10/12/04	$ 150,000	14.21	$ 10,556	No	No
30	09-132-04	11/05/04	$ 135,000	10.00	$ 13,500	No	No
31	09-132-13	11/16/04	$ 145,000	10.00	$ 14,500	No	No
32	10-151-20	12/09/04	$ 150,000	20.00	$ 7,500	No	No
33	10-151-22	12/15/04	$ 170,000	20.00	$ 8,500	No	No
34	10-151-21	12/29/04	$ 160,000	20.00	$ 8,000	No	No
35	10-211-26	03/04/05	$ 187,500	20.00	$ 9,375	No	No
36	10-111-40	03/08/05	$ 315,000	39.48	$ 7,979	No	Yes
37	10-181-10	03/09/05	$ 335,000	40.00	$ 8,375	No	No
38	10-401-16	05/19/05	$ 210,000	19.60	$ 10,714	No	No
39	10-471-12	08/08/05	$ 240,000	33.78	$ 7,105	No	No
40	10-481-32	09/19/05	$ 250,000	19.87	$ 12,582	No	No
41	09-261-01	10/17/05	$ 322,000	20.01	$ 16,092	No	Yes
42	10-181-11	10/25/05	$ 400,000	40.00	$ 10,000	No	No
43	10-151-21	01/03/06	$ 225,000	20.00	$ 11,250	No	No
44	10-181-06	02/16/06	$ 825,000	161.45	$ 5,110	No	No
45	10-741-60	04/14/06	$ 200,000	40.68	$ 4,916	No	No
46	10-211-25	04/21/06	$ 272,000	20.00	$ 13,600	No	No
47	10-761-58	09/07/06	$ 399,000	20.35	$ 19,607	No	No

sum or weighted average 1999-2006	$12,087,284	2,469	$ 4,896
sum or weighted average 2005-2006	$ 4,180,500	495	$ 8,442

Smith Valley Farm & Land Sales -- Water Value Pairs

Pair No.	A.P.N.	Acres	Water Rights	Buildings	Sale Date	Sale Price	Sale Price Per Acre	Est. Water Value/Ac.	Est. Water Value/AF.
	10-421-07	120.59	Yes	No	12/27/99	$475,000	$3,939		
1								$3,614	$903
	10-741-11	160.00	No	No	09/06/00	$52,000	$325		
	10-081-26	223.96	Yes	No	02/16/00	$524,385	$2,341		
2								$2,016	$504
	10-741-11	160.00	No	No	09/06/00	$52,000	$325		
	10-731-24	132.90	Yes	No	12/17/02	$375,000	$2,822		
3								$959	$240
	09-132-06	134.23	No	No	04/08/03	$250,000	$1,862		
	10-081-26	162.07	Yes	No	01/23/04	$675,000	$4,165		
4								$1,761	$440
	10-741-47	121.89	No	No	03/02/04	$293,000	$2,404		
	10-291-42	159.89	Yes	No	06/27/06	$1,400,000	$8,756		
5								$3,646	$912
	10-181-06	161.45	No	No	02/16/06	$825,000	$5,110		

simple average 99-06 (5)	$2,399	$600
simple average 05-06 (1)	$3,646	$912

APPENDIX C

YIELD ANALYSIS OF SURFACE WATER RIGHTS WITHIN THE WALKER RIVER IRRIGATION DISTRICT[1]

INTRODUCTION

The nature and administration of surface water rights within the Walker River Irrigation District (WRID) is substantially different from that of other irrigation districts in Nevada. In the nearby Truckee-Carson Irrigation District (TCID), for example, all water rights have the same priority date, and all share equally based on the water supplies available from upstream inflows, diversions, and storage. In a "normal" water year, TCID's bench land water rights receive up to 4.5 AF/acre, and bottomlands receive up to 3.5 AF/acre, both measured at the farm head gate. During a drought year, all water rights share equally in a reduced percentage of water available

Within WRID, the annual distribution of surface water to serve established rights (i.e., decreed natural flow or direct diversion rights) is based on two overarching factors: 1) watershed yield; and 2) priority date. Watershed yield includes both natural inflows to the system and return flows from upstream diversions; and priority is based on the established date of appropriation (or first use) associated with each and every right natural flow diversion right. (The oldest priority on the system is 1859 and is associated with the Walker River Indian Reservation at Shurz; the youngest priority is 1907 to 1915.)[2]

In addition to direct diversions from the Walker River, WRID administers storage water rights from Bridgeport and Topaz Lake Reservoirs. Bridgeport Reservoir (located wholly within California on the East Walker River) has a storage capacity of approximately 42,500 AF and a California State Water Resource Control Board (SWRCB) license to store up to 39,700 AF per annum "from about September 1 of each year to about July 20 of the succeeding year."[3] Topaz Lake Reservoir (located mostly within California on the West Walker River) has a usable storage capacity of approximately 59,400 AF and a SWRCB license to divert and store up to 57,580 AF per annum "from about October 1 of each year to about July 15 of the succeeding year," plus a separate license to store up to 200 acre feet per annum derived from local tributary inflows "to be collected from January 1 to December 31 of each year."[4]

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[1] Analysis by Rob Scanland, Nevada Program Manager, Great Basin Land & Water, March 2007.

[2] The latest (most junior) surface water right on the system is actually a 1970-priority non-diversionary right issued by the Nevada State Engineer to the Nevada Department of Wildlife on behalf of Walker Lake – see Application 25792, Certificate 10860 dated December 28, 1983.

[3] SWRCB Application 1389, Permit 2536, License 9407 dated April 7, 1970. License 9407 states that the maximum amount to be held in the reservoir at any one time is 42,500 acre feet; that the maximum withdrawal in any one year shall not exceed 36,000 acre feet; and that "storage rights under this license in combination with the Licensee's rights confirmed by United States Decree C-125 shall not exceed 57,000 acre-feet per annum." The license was amended on September 4, 1991 so as to be "conditioned upon full compliance with section 5937 of the [California] Fish and Game Code."

[4] Application 2221, Permit 2537, License 6000 dated February 11, 1960; and Application 2615, permit 2538, License 3987 dated October 28, 1921. License 6000 states that "[t]he right hereunder is included in Federal Decree

Rights to the use of storage water within WRID boundaries were originally apportioned into two basic classes: those which supplement more junior (post-1873) decreed natural flow diversion rights (i.e., approximately 28,930 acres out of the 45,420 acres of direct diversion rights located within WRID boundaries); and those which serve "New Land" or storage-only parcels (i.e., approximately 34,370 acres without direct diversion rights).

WATER RIGHT YIELD

The Yield Analysis presented herein is an update of a 1969 yield study performed by the Federal Land Bank of Berkley, California for water rights within the WRID service area. The original study was undertaken to assist agricultural lenders in assessing relative loan repayment risk, the thought being that an agricultural property with a higher relative water yield would have a better chance of producing higher and/or more reliable income (and thus debt service) than another property with a lower relative water yield, all other factors being equal. The analysis is not intended to quantify any particular water right, but rather to be used as a tool that can provide a relative measure of water reliability between differing water rights within the basin. The tool remains useful today for potential buyers of water rights. Whether the ultimate use of the water is for irrigation or other uses, relative "yield" is important and should continue to be recognized in the market as having value.

Under the Walker River Decree (Decree C-125), natural flow diversion rights were adjudicated to individual landowners and/or ditch companies based on priority (see above) and assuming diversion rates of either 1.2 cfs ("low duty") or 1.6 cfs ("high duty") per 100 acres of irrigated (water righted) land.[5] In the uppermost portions of the basin, the decreed irrigation season lasts for up to 199 days (i.e., from March 1 to September 15), while in the lower portions it lasts for up to 245 days (from March 1 to October 31). In practice, the length of the irrigation season will vary from year to year depending on location, climate, and hydrologic conditions. For this analysis the term "Days Available" will be used. This term better reflects the period of time during which water is called for and used dependent primarily on the growing season. The days for which water is available occur within the irrigation season. Further discussion on the topic is presented below.

Information contained on individual WRID water rights cards suggests that the District uses an effective water "duty" (expressed as acre-feet per acre at the point of diversion) based on 134.8 days of water delivery per season.[6] Thus, during a "normal" water year with no floodwaters and

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C-125;" and both licenses were amended on September 4, 1991 so as to be "conditioned upon full compliance with Section 5927 of the [California] Fish and Game Code."

[5] The natural flow diversion rights of the Walker River Paiute Tribe are based on 1.25 cfs per 100 acres of land over a 180-day irrigation season.

[6] District representatives have previously objected to use of the term "duty" for the Walker River system. While that term does appear in Decree C-125 and in subsequent implementing orders, in this analysis we have simply adopted the terminology and assumptions used on or implied by the District's own water rights cards.

assuming a 134.8 day irrigation season (or 134.8 days of water delivery per season), all "high duty" users can receive (divert) up to 4.2768 AF/acre, while all "low duty" users can receive (divert) up to 3.2076 AF/acre. New Land or "storage only" users can receive up to 1.5444 (low duty) or 2.0592 (high duty) AF/acre of storage water (based on 64.9 days) plus additional or "excess" surface water whenever the river is in "flood" and all other vested users have been served ("full"). During below-average or drought years, the priority system comes into effect, with water delivery going only to those users "in priority." For example, if there is only enough natural flow in the river to serve those users with an 1875 priority and earlier (i.e., 1874, 1873, …), then they receive water while users with an 1876 priority and later receive no water until river flows increase.[7] To estimate average annual yield based on priority, two components are needed: 1) the average number of days a particular water right is "in priority" (or is being served); and 2) the average reliability of storage water. These two components can then be used to calculate the average annual amount of water available based on priority.

DAYS IN PRIORITY

To estimate water availability (or water yield) associated with any particular water right, the long-term annual average "days available" by priority date must be estimated. This will be done using historical averages for each fork of the river, and for the main stem as well.

The 1969 Federal Land Bank study estimated average days available based on water right priority date over 158-days of potential water delivery from April 1 to September 5. It has been assumed the study period was 1939 through 1969, encompassing 31 years. The study went on to estimate the average annual duty of both decreed, or direct diversion, and storage water rights. Storage water availability was estimated at 100%, or always fully available.[8] As noted above, the calculations are based on a flow rate of .012 cfs/acre low duty, and .016 cfs/acre high duty.

In preparation of this analysis, information was gathered from the Federal Water Master's office and from WRID to continue the water yield study through the present. The analysis uses the same methodology as was used in the original Federal Land Bank study. The period of time researched was 1970 through 2005, an additional 35 years. The analysis was again segregated into three segments: the East Fork, the West Fork, and the Main Walker River. In 1988, the Water Master broke out a portion of the West Fork in Mason Valley known as the Tunnel Section. For this analysis, the Tunnel Section was simply included as part of the West Fork. Summaries of the average number of days served by priority date for each of the three river segments are presented below. A weighted average was then calculated based on the period of time, 31 years for the first column and 35 years for the second column.

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[7] Priorities are established on a daily basis throughout the irrigation season; they will also vary with demand (i.e., if river flows are limited but there is no, or limited, demand for water by more senior rights holders then more junior rights may also be served).

[8] In practice, storage-only rights include the right to divert water whenever the river is in flood, i.e., when all priorities "in demand" are being served and there is still "excess water" available.

Decreed Natural Flow Diversion Rights within WRID: Average Days Available
East Walker River

Priority	Average Days Available 1/ 1939-1969	Average Days Available 2/ 1970-2005	Weighted Average Available 1939-2005
1860-62	158	154	156
1863	157	149	153
1865	149	138	143
1867	141	131	136
1870	129	117	123
1871	119	109	114
1873	114	107	110
1874	108	105	106
1875	101	101	101
1876	96	94	95
1877	95	93	94
1879	89	91	90
1880	85	87	86
1881	80	81	80
1882-83	80	81	80
1885-88	76	78	77
1889	74	78	76
1890	72	77	75
1891-93	70	70	70
1894-95	69	70	69
1896	67	68	68
1897	66	68	67
1898	66	68	67
1899-01	65	68	66
1902-05	65	68	66
1906	65	68	66
1907	63	68	66
Newland	45	44*	44

* Calculated based on difference in 1860-62 priority

1/ Federal Land Bank of Berkeley Study - Walker River 158-day irrigation season April 1 to September 5. Water entitlement at point of diversion, may deduct for ditch losses estimated to vary 10 to 30%.

2/ Great Basin Land & Water analysis - Walker River, 158-day irrigation season April 1 to September 5.

Decreed Natural Flow Diversion Rights within WRID: Average Days Available
West Walker River

Priority	Average Days Available 1/ 1939-1969	Average Days Available 2/ 1970-2005	Weighted Average Available 1939-2005
1861-62	158	154	156
1863	157	147	152
1864	154	140	146
1865	152	135	143
1866	150	131	140
1868	148	129	138
1869	142	127	134
1870	136	124	130
1872	129	114	121
1875	111	107	109
1877	105	100	102
1878	101	97	99
1879	98	94	96
1880	96	92	94
1882-83	93	82	87
1884	92	82	86
1885	89	80	84
1888	87	79	83
1890	85	78	81
1891-92	83	68	75
1894-95	83	68	75
1897	81	68	74
1899-00	81	68	74
1903	81	67	74
1905	79	67	73
Newland	51	50*	50

* Calculated based on difference in 1861-62 priority

1/ Federal Land Bank of Berkeley Study - Walker River 158-day irrigation season April 1 to September 5. Water entitlement at point of diversion, may deduct for ditch losses estimated to vary 10 to 30%.

2/ Great Basin Land & Water analysis - Walker River, 158-day irrigation season April 1 to September 5.

Decreed Natural Flow Diversion Rights within WRID: Average Days Available
Main Walker

Priority	Average Days Available 1/ 1939-1969	Average Days Available 2/ 1970-2005	Weighted Average Available 1939-2005
1861	158	155	156
1862	158	153	155
1863	158	149	153
1864	157	146	151
1865	157	142	149
1868	154	134	143
1869	150	132	141
1870	140	126	132
1871	135	119	126
1872	132	117	124
1873	127	116	121
1874	122	113	117
1875	113	109	111
1876	111	105	108
1877	109	103	106
1878	104	100	102
1879	102	97	99
1880	99	94	96
1881	97	87	91
1882-83	96	86	91
1884	96	86	90
1885-88	92	83	87
1889	88	82	85
1890	87	81	84
1891-93	85	73	79
1894	85	73	78
1895-97	83	72	77
1898-99	83	71	77
1900-01	82	71	76
1902-05	82	71	76
1906	80	71	75
Newland	54	53*	53

* Calculated based on difference in 1860-62 priority

1/ Federal Land Bank of Berkeley Study - Walker River 158-day irrigation season April 1 to September 5. Water entitlement at point of diversion, may deduct for ditch losses estimated to vary 10 to 30%.

2/ Great Basin Land & Water analysis - Walker River, 158-day irrigation season April 1 to September 5.

The typical season of use within WRID has also been reduced. The original Federal Land Bank study was based on a low duty of 3.76 AF/acre (158 days x .012 cfs/day x 1.983 AF/cfs/day) and a maximum high duty of 5.01 AF/acre (158 days x .016 cfs/day x 1.983 AF/cfs/day). The current study is based on a maximum low duty of 3.2076 AF/acre (134.8 days x .012 cfs/day x 1.983 AF/cfs/day) and a maximum high duty of 4.2768 AF/acre (134.8 days x .016 cfs/day x 1.983 AF/cfs/day). This represents an average reduction in duty of 14.66%. To be consistent, the current study used a 158-day period. An adjustment factor of 100-14.66% or 85.36% will be applied in calculation of duty

APPORTIONED STORAGE WATER RIGHTS

The second component needed to calculate water availability is the reliability of apportioned storage water rights. As noted above, the original Federal Land Bank study assumed storage water was 100% reliable. It has been assumed this was based on historical reservoir fill data over the period 1939 to 1969. The WRID provided 30 years of annual reservoir apportionment (estimated fill) data from 1976 through 2005. Re-apportionment ("Reapp") represents a subsequent adjustment to the initial annual apportionment to more accurately reflect actual runoff and storage conditions when needed. The data are presented below:

<u>**WRID Storage Apportionments 1976- 2005**</u>

Year	East Fork	Reapp.	Total	West Fork	Reapp.	Total
1976	100.0%		100.0%	90.0%		90.0%
1977	32.0%	6.0%	38.0%	19.0%	2.0%	21.0%
1978	60.0%		60.0%	35.0%		35.0%
1979	110.0%		110.0%	110.0%		110.0%
1980	100.0%		100.0%	100.0%		100.0%
1981	90.0%	12.0%	102.0%	66.0%	18.0%	84.0%
1982	110.0%		110.0%	110.0%		110.0%
1983	120.0%		120.0%	120.0%		120.0%
1984	149.0%	-39.0%	110.0%	136.0%	-26.0%	110.0%
1985	95.0%	36.0%	131.0%	55.0%	64.0%	119.0%
1986	115.0%		115.0%	115.0%		115.0%
1987	115.0%		115.0%	75.0%	12.0%	87.0%
1988	30.9%		30.9%	22.0%		22.0%
1989	29.0%	26.7%	55.7%	22.2%	52.0%	74.2%
1990	23.2%		23.2%	38.3%	-7.6%	30.7%
1991	6.9%	2.8%	9.7%	8.8%	30.3%	39.1%
1992	18.4%		18.4%	13.8%		13.8%
1993	115.0%		115.0%	115.0%		115.0%
1994	36.2%		36.2%	40.7%	7.9%	48.6%
1995	115.0%		115.0%	115.0%		115.0%
1996	115.0%		115.0%	115.0%		115.0%
1997	115.0%		115.0%	115.0%		115.0%
1998	115.0%		115.0%	115.0%		115.0%
1999	115.0%		115.0%	115.0%		115.0%
2000	115.0%		115.0%	115.0%		115.0%
2001	56.0%		56.0%	53.0%		53.0%
2002	20.0%		20.0%	46.0%		46.0%
2003	51.0%		51.0%	98.0%		98.0%
2004	67.0%		67.0%	53.0%		53.0%
2005	100.0%		100.0%	100.0%		100.0%
AVG	**81.3%**		**82.8%**	**77.7%**		**82.8%**

Over the 30-year period, both the East Fork (Bridgeport Reservoir) and the West Fork (Topaz Lake Reservoir) averaged 82.8% fill. Values greater than 100% account for conveyance losses, i.e., a 115% fill with 15% conveyance loss provides a full 100% storage water right. The main stem of the Walker storage component would be calculated based on the relative contributions of water that the main stem receives. For example, the main stem would be based on 63% from the West Fork and 37% from the East Fork based on the ratio of gage flows (1948-1998) at Hoye Canyon (174,136 AF/year average) and Bridgeport (110,834 AF/year average). As coincidentally both forks have the same average storage fill rate, the weighted average fill for the main stem will also be 82.8%. A weighted average fill rate based on historic and current information can then be calculated.

Weighted Average Storage Water Availability

Source	Years 1939-1969	Years 1970-2005	Weighted Average 1993-2005
East Fork--Bridgeport Res	100%	82.8%	90.7%
West Fork--Topaz Lake Res	100%	82.8%	90.7%
Main Stem Walker River	100%	82.8%	90.7%

These factors will be used to adjust the storage water availability.

WATER RIGHT YIELD ESTIMATION

The final calculation will estimate an average annual available duty, or yield, based on priority and river segment. Summaries of these calculations are presented on the following pages.

WALKER RIVER IRRIGATION DISTRICT WATER AVAILABILITY

EAST WALKER RIVER / 1 & 2

Priority	Average Days Available 1939-2005	NATURAL FLOW: Low Duty 0.012 CFS/Ac. 0.0238 AF/Ac./Day	NATURAL FLOW: High Duty 0.06 CFS/Ac. 0.03173 AF/Ac./Day	Low Duty Adjust. Factor 0.8536	High Duty Adjust. Factor 0.8536	STORAGE WATER: Storage Water Days	STORAGE WATER: Low Duty 0.012 CFS/Ac. 0.0238 AF/Ac./Day	STORAGE WATER: High Duty 0.016 CFS/Ac. 0.03173 AF/Ac./Day	Low Duty Adjust. Factor 0.9074	High Duty Adjust. Factor 0.9074	Nat. Flow & Storage Yield Low Duty AF/Ac.	Nat. Flow & Storage Yield High Duty AF/Ac.
1860-62	156	3.7128	4.9499	3.17	4.23		0.0000	0.0000	0.00	0.00	3.17	4.23
1863	153	3.6414	4.8547	3.11	4.14		0.0000	0.0000	0.00	0.00	3.11	4.14
1865	143	3.4034	4.5374	2.91	3.87		0.0000	0.0000	0.00	0.00	2.91	3.87
1867	136	3.2368	4.3153	2.76	3.68		0.0000	0.0000	0.00	0.00	2.76	3.68
1870	123	2.9274	3.9028	2.50	3.33		0.0000	0.0000	0.00	0.00	2.50	3.33
1871	114	2.7132	3.6172	2.32	3.09		0.0000	0.0000	0.00	0.00	2.32	3.09
1873	110	2.6180	3.4903	2.23	2.98		0.0000	0.0000	0.00	0.00	2.23	2.98
1874	106	2.5228	3.3634	2.15	2.87	4	0.0952	0.1269	0.09	0.12	2.24	2.99
1875	101	2.4038	3.2047	2.05	2.74	8	0.1904	0.2538	0.17	0.23	2.22	2.97
1876	95	2.2610	3.0144	1.93	2.57	9	0.2142	0.2856	0.19	0.26	2.12	2.83
1877	94	2.2372	2.9826	1.91	2.55	11	0.2618	0.3490	0.24	0.32	2.15	2.86
1879	90	2.1420	2.8557	1.83	2.44	22	0.5236	0.6981	0.48	0.63	2.30	3.07
1880	86	2.0468	2.7288	1.75	2.33	25	0.5950	0.7933	0.54	0.72	2.29	3.05
1881	80	1.9040	2.5384	1.63	2.17	27	0.6426	0.8567	0.58	0.78	2.21	2.94
1882-83	80	1.9040	2.5384	1.63	2.17	28	0.6664	0.8884	0.60	0.81	2.23	2.97
1885-1888	77	1.8326	2.4432	1.56	2.09	29	0.6902	0.9202	0.63	0.83	2.19	2.92
1889	76	1.8088	2.4115	1.54	2.06	30	0.7140	0.9519	0.65	0.86	2.19	2.92
1890	75	1.7850	2.3798	1.52	2.03	30	0.7140	0.9519	0.65	0.86	2.17	2.90
1891-93	70	1.6660	2.2211	1.42	1.90	31	0.7378	0.9836	0.67	0.89	2.09	2.79
1894-95	69	1.6422	2.1894	1.40	1.87	32	0.7616	1.0154	0.69	0.92	2.09	2.79
1896	68	1.6184	2.1576	1.38	1.84	32	0.7616	1.0154	0.69	0.92	2.07	2.76
1897	67	1.5946	2.1259	1.36	1.81	32	0.7616	1.0154	0.69	0.92	2.05	2.74
1898	67	1.5946	2.1259	1.36	1.81	33	0.7854	1.0471	0.71	0.95	2.07	2.76
1899-01	66	1.5708	2.0942	1.34	1.79	33	0.7854	1.0471	0.71	0.95	2.05	2.74
1902-05	66	1.5708	2.0942	1.34	1.79	34	0.8092	1.0788	0.73	0.98	2.08	2.77
1906	66	1.5708	2.0942	1.34	1.79	35	0.8330	1.1106	0.76	1.01	2.10	2.80
1907	66	1.5708	2.0942	1.34	1.79	35	0.8330	1.1106	0.76	1.01	2.10	2.80
Newland	44	1.0472	1.3961	0.89	1.19	65	1.5470	2.0625	1.40	1.87	2.30	3.06

1/Federal Land Bank of Berkeley Study - Walker River, 158-day irrigation season April 1 to September 5. Water entitlement at point of diversion, may deduct for ditch losses estimated to vary from 10 to 30%.
2/Great Basin Land & Water Analysis- Walker River, 158-day irrigation season April 1 to September 5.

WALKER RIVER IRRIGATION DISTRICT WATER AVAILABILITY

WEST WALKER RIVER / 1 & 2

Priority	Weighted Average Available 1939-2005	NATURAL FLOW Low Duty 0.012 CFS/Ac. 0.0238 AF/Ac./Day	NATURAL FLOW High Duty 0.0158 CFS/Ac. 0.0317 AF/Ac./Day	Low Duty Adjust. Factor 0.8536	High Duty Adjust. Factor 0.8536	STORAGE WATER Storage Water Days	STORAGE WATER Low Duty 0.012 CFS/Ac. 0.0238 AF/Ac./Day	STORAGE WATER High Duty 0.016 CFS/Ac. 0.0317 AF/Ac./Day	Low Duty Adjust. Factor 0.9074	High Duty Adjust. Factor 0.9074	Nat. Flow & Storage Yield Low Duty AF/Ac.	Nat. Flow & Storage Yield High Duty AF/Ac.
1861-62	156	3.7128	4.9499	3.17	4.23		0.0000	0.0000	0.00	0.00	3.17	4.23
1863	152	3.6176	4.8230	3.09	4.12		0.0000	0.0000	0.00	0.00	3.09	4.12
1864	146	3.4748	4.6326	2.97	3.95		0.0000	0.0000	0.00	0.00	2.97	3.95
1865	143	3.4034	4.5374	2.91	3.87		0.0000	0.0000	0.00	0.00	2.91	3.87
1866	140	3.3320	4.4422	2.84	3.79		0.0000	0.0000	0.00	0.00	2.84	3.79
1868	138	3.2844	4.3787	2.80	3.74		0.0000	0.0000	0.00	0.00	2.80	3.74
1869	134	3.1892	4.2518	2.72	3.63		0.0000	0.0000	0.00	0.00	2.72	3.63
1870	130	3.0940	4.1249	2.64	3.52		0.0000	0.0000	0.00	0.00	2.64	3.52
1872	121	2.8798	3.8393	2.46	3.28		0.0000	0.0000	0.00	0.00	2.46	3.28
1875	109	2.5942	3.4586	2.21	2.95	8	0.1904	0.2538	0.17	0.23	2.39	3.18
1877	102	2.4276	3.2365	2.07	2.76	11	0.2618	0.3490	0.24	0.32	2.31	3.08
1878	99	2.3562	3.1413	2.01	2.68	17	0.4046	0.5394	0.37	0.49	2.38	3.17
1879	96	2.2848	3.0461	1.95	2.60	22	0.5236	0.6981	0.48	0.63	2.43	3.23
1880	94	2.2372	2.9826	1.91	2.55	25	0.5950	0.7933	0.54	0.72	2.45	3.27
1882-83	87	2.0706	2.7605	1.77	2.36	28	0.6664	0.8884	0.60	0.81	2.37	3.16
1884	86	2.0468	2.7288	1.75	2.33	29	0.6902	0.9202	0.63	0.83	2.37	3.16
1885	84	1.9992	2.6653	1.71	2.28	29	0.6902	0.9202	0.63	0.83	2.33	3.11
1888	83	1.9754	2.6336	1.69	2.25	29	0.6902	0.9202	0.63	0.83	2.31	3.08
1890	81	1.9278	2.5701	1.65	2.19	30	0.7140	0.9519	0.65	0.86	2.29	3.06
1891-92	75	1.7850	2.3798	1.52	2.03	31	0.7378	0.9836	0.67	0.89	2.19	2.92
1894-95	75	1.7850	2.3798	1.52	2.03	32	0.7616	1.0154	0.69	0.92	2.21	2.95
1897	74	1.7612	2.3480	1.50	2.00	32	0.7616	1.0154	0.69	0.92	2.19	2.93
1899-00	74	1.7612	2.3480	1.50	2.00	33	0.7854	1.0471	0.71	0.95	2.22	2.95
1903	74	1.7612	2.3480	1.50	2.00	34	0.8092	1.0788	0.73	0.98	2.24	2.98
1905	73	1.7374	2.3163	1.48	1.98	34	0.8092	1.0788	0.73	0.98	2.22	2.96
Newland	50	1.1900	1.5865	1.02	1.35	65	1.5470	2.0625	1.40	1.87	2.42	3.23

1/Federal Land Bank of Berkeley Study - Walker River, 158-day irrigation season April 1 to September 5. Water entitlement at point of diversion, may deduct for ditch losses estimated to vary from 10 to 30%.
2/Great Basin Land & Water Analysis- Walker River, 158-day irrigation season April 1 to September 5.

WALKER RIVER IRRIGATION DISTRICT WATER AVAILABILITY

MAIN WALKER RIVER / 1 & 2

	NATURAL FLOW			Low Duty Adjust. Factor	High Duty Adjust. Factor	STORAGE WATER			Low Duty Adjust. Factor	High Duty Adjust. Factor	Nat. Flow & Storage Yield Low Duty	Nat. Flow & Storage Yield High Duty
Priority	Weighted Average Days Available 1939-2005	Low Duty 0.012 CFS/Ac. 0.0238 AF/Ac./Day	High Duty 0.016 CFS/Ac. 0.03173 AF/Ac./Day	0.8536	0.8536	Storage Water Days	Low Duty 0.012 CFS/Ac. 0.0238 AF/Ac./Day	High Duty 0.016 CFS/Ac. 0.03173 AF/Ac./Day	0.9074	0.9074	AF/Ac.	AF/Ac.
1861	156	3.7128	4.9499	3.17	4.23		0.0000	0.0000	0.00	0.00	3.17	4.23
1862	155	3.6890	4.9182	3.15	4.20		0.0000	0.0000	0.00	0.00	3.15	4.20
1863	153	3.6414	4.8547	3.11	4.14		0.0000	0.0000	0.00	0.00	3.11	4.14
1864-65	150	3.5700	4.7595	3.05	4.06		0.0000	0.0000	0.00	0.00	3.05	4.06
1868	143	3.4034	4.5374	2.91	3.87		0.0000	0.0000	0.00	0.00	2.91	3.87
1869	141	3.3558	4.4739	2.86	3.82		0.0000	0.0000	0.00	0.00	2.86	3.82
1870	132	3.1416	4.1884	2.68	3.58		0.0000	0.0000	0.00	0.00	2.68	3.58
1871	126	2.9988	3.9980	2.56	3.41		0.0000	0.0000	0.00	0.00	2.56	3.41
1872	124	2.9512	3.9345	2.52	3.36		0.0000	0.0000	0.00	0.00	2.52	3.36
1873	121	2.8798	3.8393	2.46	3.28		0.0000	0.0000	0.00	0.00	2.46	3.28
1874	117	2.7846	3.7124	2.38	3.17	4	0.0952	0.1269	0.09	0.12	2.46	3.28
1875	111	2.6418	3.5220	2.26	3.01	8	0.1904	0.2538	0.17	0.23	2.43	3.24
1876	108	2.5704	3.4268	2.19	2.93	9	0.2142	0.2856	0.19	0.26	2.39	3.18
1877	106	2.5228	3.3634	2.15	2.87	11	0.2618	0.3490	0.24	0.32	2.39	3.19
1878	102	2.4276	3.2365	2.07	2.76	17	0.4046	0.5394	0.37	0.49	2.44	3.25
1879	99	2.3562	3.1413	2.01	2.68	22	0.5236	0.6981	0.48	0.63	2.49	3.31
1880	96	2.2848	3.0461	1.95	2.60	25	0.5950	0.7933	0.54	0.72	2.49	3.32
1881	91	2.1658	2.8874	1.85	2.46	27	0.6426	0.8567	0.58	0.78	2.43	3.24
1882-83	91	2.1658	2.8874	1.85	2.46	28	0.6664	0.8884	0.60	0.81	2.45	3.27
1884	90	2.1420	2.8557	1.83	2.44	29	0.6902	0.9202	0.63	0.83	2.45	3.27
1885-88	87	2.0706	2.7605	1.77	2.36	29	0.6902	0.9202	0.63	0.83	2.39	3.19
1889	85	2.0230	2.6971	1.73	2.30	30	0.7140	0.9519	0.65	0.86	2.37	3.17
1890	84	1.9992	2.6653	1.71	2.28	30	0.7140	0.9519	0.65	0.86	2.35	3.14
1891-93	79	1.8802	2.5067	1.60	2.14	31	0.7378	0.9836	0.67	0.89	2.27	3.03
1894	78	1.8564	2.4749	1.58	2.11	32	0.7616	1.0154	0.69	0.92	2.28	3.03
1895-97	77	1.8326	2.4432	1.56	2.09	32	0.7616	1.0154	0.69	0.92	2.26	3.01
1898-99	77	1.8326	2.4432	1.56	2.09	33	0.7854	1.0471	0.71	0.95	2.28	3.04
1900-01	76	1.8088	2.4115	1.54	2.06	33	0.7854	1.0471	0.71	0.95	2.26	3.01
1902-05	76	1.8088	2.4115	1.54	2.06	34	0.8092	1.0788	0.73	0.98	2.28	3.04
1906	75	1.7850	2.3798	1.52	2.03	35	0.8330	1.1106	0.76	1.01	2.28	3.04
Newland	54	1.2852	1.7134	1.10	1.46	65	1.5470	2.0625	1.40	1.87	2.50	3.33

1/Federal Land Bank of Berkeley,CA Study - Walker River, 158-day irrigation season April 1 to September 5. Water entitlement at point of diversion, may deduct for ditch losses estimated to vary from 10 to 30%.
2/Great Basin Land & Water Analysis- Walker River, 158-day irrigation season April 1 to September 5.

This analysis illustrates that water yield, or effective water duty, will vary based on priority and other factors. As an example, a property with high duty water rights from the East Fork can receive from 2.80 to 4.23 AF/acre dependent on priority. An 1875 priority water right from the East Fork segment has an estimated relative annual yield of 2.97 AF/acre, or 69% of the required (maximum) duty (i.e., 2.97 AF/acre available ÷ 4.2768 AF/acre duty). In relation to the maximum flow rate of .016 cfs/acre(.03173 AF/acre/day) and a 245 day irrigation season (7.77AF/season) the 1875 estimated relative annual yield of 2.97 AF/acre equates to 38% (i.e., 2.97 AF/acre divided by 7.77 AF/acre).

In practice, specific properties will tend to have a mixture of surface water rights that include a range of decreed natural flow priorities as well as supplemental storage and New Land (storage only) apportionments. This analysis tool can then be used to estimate average available "duty" as well as expected water supply reliability for the property as a whole. The result can be used, when available, as a comparison factor in analysis of comparable sales data. Two examples will help to illustrate this application:

<u>Example One</u>

Farm 1 contains a total of 220 water righted acres with high duty rights out of the West Fork of the Walker River. The 220 acres include 15 acres of decreed natural flow (or direct) diversion rights with an 1864 priority; 40 acres of direct diversion rights with an 1870 priority; 40 acres of direct diversion rights with an 1872 priority; 20 acres of direct diversion rights with an 1877 priority along with supplemental storage rights (as apportioned); and 105 acres of New Land (storage only) rights. Inserting Farm A's water rights breakdown into the West Fork –High Duty analysis tool provides the following result:

FARM 1

WRID AVG. YIELD - WEST FORK - HIGH DUTY				
Priority	Acreage	Nat. Flow & Storage Yield Acre-Feet Acre	Total Acre Feet	
1861-62		4.23	0.00	
1863		4.12	0.00	
1864	15.00	3.95	59.32	
1865		3.87	0.00	
1866		3.79	0.00	
1868		3.74	0.00	
1869		3.63	0.00	
1870	40.00	3.52	140.84	
1872	40.00	3.28	131.09	
1875		3.18	0.00	
1877	20.00	3.08	61.59	
1878		3.17	0.00	
1879		3.23	0.00	
1880		3.27	0.00	
1882-83		3.16	0.00	
1884		3.16	0.00	
1885		3.11	0.00	
1888		3.08	0.00	
1890		3.06	0.00	
1891-92		2.92	0.00	
1894-95		2.95	0.00	
1897		2.93	0.00	
1899-00		2.95	0.00	
1903		2.98	0.00	
1905		2.96	0.00	
Newland	105.00	3.23	338.70	
TOTAL	220.00		731.532	
Surface Water Duty Baseline Acre-Feet/Acre:				4.2768
Avg. Surface Water Yield Acre-Feet/Acre:				**3.3251**
Percent Avg. Surface Water Yield provides:				**78%**

Example Two

Farm 2 contains 320 water righted acres with a low duty right out of the East Fork of the Walker River. The farm has 67.62 acres of 1865 direct diversion water rights; 17.65 acres of 1870; 67.29 acres of 1875 plus supplemental storage; 85.08 acres of 1880 plus supplemental storage; 27.03 acres of 1885 plus supplemental storage; 23.40 of 1890 plus supplemental storage; 23.05 of 1895 plus supplemental storage; 0.60 acres of 1902 plus supplemental storage; and 8.28 acres of New Land (storage only) rights. Inserting Farm B's water right breakdown into the E. Fork –Low Duty analysis tool provides the following result:

FARM 2

WRID AVERAGE YIELD - EAST FORK - LOW DUTY				
Priority	Acreage	Nat. Flow & Storage Yield Acre-Feet Acre	Total Acre Feet	
1860-62		3.17	0.00	
1863		3.11	0.00	
1865	67.62	2.91	196.45	
1867		2.76	0.00	
1870	17.65	2.50	44.10	
1871		2.32	0.00	
1873		2.23	0.00	
1874		2.24	0.00	
1875	67.29	2.22	149.70	
1876		2.12	0.00	
1877		2.15	0.00	
1879		2.30	0.00	
1880	85.08	2.29	194.58	
1881		2.21	0.00	
1882-83		2.23	0.00	
1885-1888	27.03	2.19	59.21	
1889		2.19	0.00	
1890	23.40	2.17	50.81	
1891-93		2.09	0.00	
1894-95	23.05	2.09	48.24	
1896		2.07	0.00	
1897		2.05	0.00	
1898		2.07	0.00	
1899-01		2.05	0.00	
1902-05	0.60	2.08	1.25	
1906		2.10	0.00	
1907		2.10	0.00	
Newland	8.28	2.30	19.02	
TOTAL	320.00		763.365	
Surface Water Duty Baseline Acre-FeetAcre:				3.2076
Avg. Surface Water Yield Acre-Feet/Acre:				**2.3855**
Percent Avg. Surface Water Yield provides:				**74%**

These two examples result in relative average water yields ranging from 2.39 to 3.32 acre-feet per acre. These examples illustrate one way in which the relative yield analysis can be used. Coupled with experience, this type of information can be quite useful in developing acquisition strategies and in determining relative and appropriate water right values.

APPENDIX D

History of Water Right Transfers in the Walker River Basin

April 23, 2007

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Contract No.: Walker River Basin – Water Rights Transfers Task 2

CONTENTS

PURPOSE

The purpose of this report is to cover the following four topics:

1. Provide an explanation of the existing water rights transfers within the Walker River Basin;
2. Describe the storage waters rights;
3. Provide a history of Decree C-125.

WATER RIGHT TRANSFERS

Decree C-125

The decreed water rights are administered by the Walker River Federal Watermaster and the US Board of Water Commisioners through a set of rules and regulations that were provided by the US Federal District Court in 1953. The provisional rules and regulations involving changes and transfers of water rights were first initiated by the Court on May 17, 1988. After extensive argument the court set forth the rules and regulations on July 7, 1989, with a modification on September 11, 1989. A final amendment was made on May 1, 1996 that included wording to cover compliance applications through the California Water Resource Control Board. Water rights transfers involving Decree C-125 vested rights are filed through the state agencies as with any other transfer, however there is an additional layer of oversight by the US Board of Water Commissioners. Additional requirements include:

1. Within 90 days after filing notice is to be published five times during four consecutive weeks in appropriate newspapers in Mono County CA, Douglas County NV, and Lyon County NV (typically the notice is only published in the county that the Point of Diversion resides);

2. Upon filing the application with the appropriate agency copies are to be sent to the US Board of Water Commissioners, the US Attorney for the District of Nevada, the Walker River Paiute Tribe, and the Nevada Division of Wildlife; and

3. Additional fees can be collected over and above the standard set fees by the state agencies to cover processing costs.

The US Board of Water Commissioners then oversees the transfer through the state agency.

There are 44 water rights transfer filings that were found for Decree C-125 water rights in the Nevada portion of the Walker Basin. (See Exhibit A.) Of these transfers 16 were for change of Point of Diversion only. The majority of the filings were permitted prior to the institution by the Court of the rules and regulations

Table A Water Rights Applications Recognized Under Decree C-125

C-125 Claim	Application	Certificate
236	1258	79
237	1476	243
238	1619	911
239	1630	364
240	1776	(permit)
241	2040	1800
242	2040	1801
243	2040	1802
244	2040	1803
245	2040	1804
246	2523	664
247	3369	2445
248	3370	2446
249	4381	(cancelled)
250	4391	(denied)
251	4856	3886
252	5052	(cancelled)
253	4246	(abrogated by 4893)
253	4893	737
254	3830	1178

There are 19 applications for the new appropriation of water rights that were recognized by Decree C-125. In the cases of claims 249, 250, and 252, the applications were cancelled or denied due to the applicants failure to comply with state regulations.

Existing Transfers

Three applications were filed by the Nevada Division of Wildlife that were part of a demonstration project to provide information on the efficiency of transferring water rights to the Walker Lake. The first attempt to transfer water rights was Application 69525, filed on 1/31/2003, however it was withdrawn on 3/5/2003. Application 70649 was filed on 11/19/2003 by the Nevada Division of Wildlife to transfer portions of Decree C-125 claims 12, 41, 141, and 229, as well as Permit 23753 to Walker Lake for Wildlife & Public Recreation purposes. Protests were filed by the Circle Bar “N” Ranch, Edelweiss Farms, Peri Brothers & Sons, Borsini Ranch Inc., L&M Family Limited Partnership, Thomas Bobrick Trust, and Peavine Leasing LLC. These protests were withdrawn by stipulation on 3/4/2004, and the permit was issued on 3/5/2004. Although not issued as a temporary permit, it expired on October 31, 2004 (end of the official irrigation season). Apparently the application was filed as a full permit because, as a Walker Basin application, notices had to be filed regardless of the duration due to the rules and regulations issued by the Walker River Court. (Typically, the advantage in a temporary transfer permit is that the transfer is not required to be noticed in the local newspaper, thus circumventing most of the possible protests.) Application 72055, filed on 12/16/2004 by the Nevada Division of Wildlife, proposed to transfer approximately the same water rights as Permit 70649. This application was withdrawn on 5/25/2005.

Two applications had been permitted, 63325 and 69391, that effect decree water rights. Application 63325 (Jason Corporation) is a change in the place of use only. Application 69391 (Circle Bar “N” Ranch) changes both place of use and point of diversion. Both of these permits can be considered to be housekeeping measures.

Storage Rights

In Decree C-125 the District Court has provided for storage water rights in the Walker River Basin. The two primary reservoirs include the Topaz Lake Reservoir on the West Fork and the Bridgeport Reservoir on the East Fork. Both of these reservoirs are owned and administrated by WRID. Transfers of storage rights are under the jurisdiction of WRID only, and do not require applications for change through NDWR.

The process to transfer a storage water right is as follows (per Lea Compston – WRID, telephone communication):

1. A petition is filed with the WRID Board;
2. A map has to be submitted that delineates the Existing Place of Use and the Proposed Place of Use;
3. Notices are filed in the local newspaper for two weeks; and
4. The petition is then reviewed at the next monthly WRID board meeting.

The following restrictions are placed on the storage water transfers:

1. The water right must stay in the same hydrographic basin;
2. The water right must be taken from the same reservoir;
3. The water right must be transferred to an area that does not currently have an appurtenant water right;
4. Transfer of the water right must not have an adverse effect either at the EPOU or the PPOU; and
5. Supplemental storage water rights under Decree C-125 cannot be transferred.

Flood Water Rights

Applications were filed by WRID on the West Walker River (Permit 5528, filed in 1919) and the East Walker River (Permit 25017, filed in 1969) for non-storage excess waters (variously referred to as flood or surplus water). Both permits were certificated on 10/15/1976 (8859 and 8860, repectively). A combined duty of 4.0 afa from any and all sources is specified in the permit terms.

Currently there are four applications (58784, 58871, 58872, and 58910) for the transfer of certificated flood water rights. Each of the applications has been filed for the water right holder by WRID. Applications 58784 and 58910 were protested by the BIA as Decree C-125 water right transfers. These protests have been withdrawn because the water rights were not Decree C-125 rights as the protests specified. All four applications have been in Ready for Action (RFA) status since 1993 and are still awaiting permit review. It appears that the purpose of these applications was to move all surface water rights from the land so that there would not be a conflict with stand alone groundwater rights.

A General History of the Federal Adjudications for Walker River Water Rights

Adjudication of the Walker River water rights was a lengthy and difficult process. Because the Walker River is an interstate stream that flows from California to Nevada the problem of setting the water rights has fallen on the federal court system. Filing of the Walker River case predated the creation of the Office of the Nevada State Engineer, which caused obstacles in formulating the adjudication. The Doctrine of Prior Appropriation had begun evolving in the courts of the western states during the 1880's as a rational way to apportion the scarce available water to incoming individuals. By the time that a major conflict occurred that forced the water users to request an adjudication of the Walker River rights the doctrine had not yet been codified by the Nevada Legislature. Passage of the federal 1902 Irrigation Act pushed the Nevada Legislature (which meets bi-annually) to create the State Engineer position in 1903. Once a crude set of state water right laws were passed the federal court placed the responsibility of determining the water rights onto the states. The majority of the irrigation rights were adjudicated by Nevada State Engineer Henry Thurtell, and the balance of the rights were completed by the district court. This resulted in the

TABLE B Walker River Timeline

YEAR	EVENT
1860	First recorded irrigation from the Walker River
1902	Miller & Lux vs. Pacific Land & Livestock filed in federal District Court
1909	Findings filed by Henry Thurtell for Nevada water rights
1919	Decree 731 issued, formation of WRID
1922	Construction of Topaz and Bridgeport reservoirs
1924	USA vs. Walker River Irrigation District filed in federal District Court
1936	Decree C-125 issued, appealed to Ninth Circuit Court of Appeals
1940	Amended Decree C-125 issued
1976	Permits 5528 and 25017 for flood waters certificated by NDWR

1919 Decree 731. In 1924 the Walker River Paiute Tribe pushed for a new adjudication of the Walker River to increase the allocation of water that was established for the reservation. Additional water rights, primarily on the California portion of the basin, were added to the new decree, and the ownership changes from Decree 731 rights were incorporated into the water right descriptions. When Decree C-125 was issued in 1936, despite substantial additions to Decree 731, the allocation for the reservation remained the same. The Tribe filed protest to the new decree, and the case was taken to the Ninth Circuit Court of Appeals. In 1940, an amendment was added to Decree C-125 that increased the diversion of water to the reservation.

Decree 731

In June of 1902 Miller & Lux (later as Pacific Live Stock Co.) filed suit against Thomas B. Rickey (succeeded by Antelope Valley Land & Cattle Co.) to bring about an adjudication of the Walker River water rights. Miller had purchased the Mason Ranch in Yerington, and Rickey had acquired most of the ranch land in Antelope Valley. The primary difficulty with adjudicating the Nevada water rights in 1902 was that the Nevada state legislature had not yet passed comprehensive water laws. The federal court struggled with this issue until 1905, when an amendment was made to the 1903 water laws that delineated a permitting process. The problem was passed on to the then current State Engineer, Henry Thurtell, who was appointed Special Master. The district court specified the use of the 1903 Nevada water laws for this adjudication. There were many meetings between Thurtell and the ranchers, and every effort was made to reach a consensus to the priority dates and amount of water that was used. Thurtell published a preliminary version of the Findings on 7/30/1907. Due to various protests by several individuals and the Walker River Water User's Association the evidence was reassessed and an amended version of the findings was published in 1908. A final agreement was entered on 6/18/1909 by Thurtell, and the plaintiff made a partial withdraw of the protest on 3/30/1910. The case was then returned to US District Court, which proceeded to adjudicate the water rights of the Antelope Valley Land & Cattle Co. and several other ranchers using California water laws. Testimony of the various farmers and ranchers was taken at the Bridgeport courthouse, and also in Antelope Valley, from 1911 to 1913. The case then languished in court during WW I. A special master, Frank Norcross (later as the federal court judge that signed the 1944 Orr Ditch Decree) was appointed to take charge of the case and organize the data. Norcross packaged the Nevada and California portions together, and submitted it to Judge M.J. Dooling, who signed it on March 22, 1919.

Decree C-125

Shortly after Decree 731 was officially signed farmers in the Nevada side of the Walker River Basin created the Walker River Irrigation District to finance the construction of the Topaz and Bridgeport reservoirs. Immediately applications were filed through the state agencies in both Nevada and California for storage rights for flood and previously unappropriated water in the east and west forks of the Walker River, as well as other sites. The Topaz and Bridgeport reservoirs were completed in 1922, however the other reservoirs were never constructed. The Walker River Paiute Tribe became alarmed at the decreased flow to Walker Lake due to the reservoirs, and urged the United States government to intervene in the matter. (In 1907 the United States Attorney for the District of Nevada was notified of the Decree 731 adjudication, however no effort was made to become involved in the proceedings.) On 7/3/1924 the United States filed suit to include the Tribe into a new adjudication, as well as to include other individuals that had been left out of the earlier decree. Two special masters, first Benjamin F. Curler and then Robert M. Price, were appointed to take charge of the proceedings and to formulate the decree. After extensive hearings and several preliminary sets of findings, a final decree was submitted on 4/14/1936. This fixed the Tribe's allocation at 22.93 cfs with priority dates that ranged from 1868 to 1886. These rights had originally been designated by Henry Thurtell in the 1908 findings, and had been included intact in Decree 731. The tribe protested the decree, and the case was taken to the ninth circuit court of appeals. This resulted in an amended decree filed on 4/24/1940 that provided for 26.25 cfs with a single priority date of 1859, thus giving the Tribe the most senior water right.

Decree C-125 established the following water rights:

1. Fixed the vested water rights of the Walker River Indian Reservation at 26.25 cfs for 2,100 acres with a senior priority date of 1859;
2. Included the previously adjudicated water rights under Decree 731 (and consequently Thurtell's Findings) as claims 1 through 180 (with ownership updates from Decree 731);
3. Designated additional vested water rights not previously adjudicated in Decree 731, primarily in California (claims 181 through 232);
4. Designated water rights for Sierra Pacific Power Company for primarily non-consumptive riparian rights;
5. Specified storage rights for the Walker River Irrigation District to be stored in Topaz and Bridgeport reservoirs;
6. Assigned storage rights under applications for the proposed Pickel Meadows and Leavitt Meadows reservoirs, and supplemental storage rights for Bridgeport and Topaz reservoirs;
7. Recognized applications for non-vested water rights (claims 236 through 254); and
8. Established a federal watermaster position to administrate the decree.

Because there were three steps involved in the Walker River adjudication (Thurtell's Findings, Decree 731, and Decree C-125) that occurred at different times (1909, 1919, and 1936/40, respectively) there has been a considerable amount of confusion as to description and form of the water right claims. Since the adjudication of the majority of the water rights was achieved under Thurtell's Findings the actual water right descriptions are located in the original proofs that were filed at the Nevada State Engineer's Office (now Nevada Division of Water Resources) and the Decree 731 source files. In the period between 1909 when Thurtell's Findings fixed the Nevada water rights and 1919 when Decree 731 was issued there were 25 changes in ownership (see Decree 731, page 10). These successor title changes were reflected in the 1919 decree. The later Decree C-125 added additional water rights for the Walker River Paiute Tribe, Sierra Pacific Power Co., miscellaneous ranchers that had been missed in Decree 731 (primarily in Bridgeport Valley), and 19 water rights applications that had been filed with the Nevada State Engineer dating to 1/20/1909. The descriptions for these later claims are in the Decree C-125 source files, and the applications are described in the files located at the Nevada Division of Water Resources. The Decree 731 water right claim owners were researched, and the ownerships were updated to approximately 1933. In the thirteen years between when Decree 731 was signed and 1932 nearly all of the original claims had changed ownership, in large part due to the Great Depression. In some cases the larger ranches had been subdivided into smaller parcels, and in others older ranches were combined. The updated claim ownerships in C-125 reflect these changes, however the base water rights were defined in the earlier decree.

Table C Water Rights Covered by the Various Walker River Adjudications

Adjudication	Date	What Was Covered	Source Documentation
Thurtell's Findings	6/18/1909	Pre-1905 vested rights (NV only)	State Engineer proofs
Decree 731	3/22/1919	Thurtell's Findings, AVLCC vested rights (CA, NV)	Decree 731 source documents
Decree C-125	4/14/1936 (Amended 4/24/1940)	Decree 731 vested rights, Tribal reservation rights, Sierra Pacific rights, miscellaneous additions not included in Decree 731	Decree C-125 source documents, NDWR application files

In Nevada the concept of water rights was still in its infancy when the process started, and was being defined through common law cases. When the US District Court instructed Thurtell to adjudicate the Nevada water rights it specifically stipulated that the 1903 Nevada Statutes, Chapter 4, sections 1-14, be used (see Stipulation as to Trial of Cause, 1907, transcribed into Decree 731 Final Decree, page 5). The 1903 laws essentially established the office of the State Engineer, and provided for a limited definition of a water right for the purposes of establishing vested rights. The definition included the source of the water used, dates of first irrigation (priority date), the amount of water used (set at 3.0 afa maximum); the dates of construction for the ditches, and the types of crops that were raised. Place of Use, Manner of Use, and Point of Diversion descriptions were not required at that time.

Thurtell made modifications to the assigned duty for each of the claimants. In the Statement of Findings from the original 1907 report Thurtell explained that different diversion rates were applied to the various lands based on the size of the supply ditches and degree of isolation:

"In the case of persons diverting water through small ditches or high up on the river, it will be seen that these persons are allowed by these findings a slightly larger unit of water per acre than is allowed to the users of water on lower ground or through large diverting ditches. The equity of this will be easily seen. The large ditches lose by seepage and evaporation a very much smaller proportion of their water in transit than is the case in the smaller ditches."

When the findings were published the diversions were either 1.2 cfs or 1.6 cfs per 100 acres of irrigated land.

For the Antelope Valley Land & Cattle Company in California for Decree 731 water rights, the court instructed Special Master Frank Norcross to provide the following information:

- *a.* *Land irrigated and dates of irrigation, both in California and Nevada, to be in accordance with testimony already taken and the law of appropriation.*
- *b.* *Priority to be allowed from date of first irrigation although transfer from first person first irrigating was by parole.*
- *c.* *Eight-tenths of a miner's inch per acre to be allowed.*
- *d.* *Computation of land irrigated and priorities to be determined from the testimony already taken by a person or persons to be agreed upon by the attorneys of the parties.*
- *e.* *Water now reservoired by Antelope Valley Land & Cattle Company above Bridgeport, during the winter or during times when all appropriations are supplied, to be used by Antelope Valley Land & Cattle Company, but the same shall not be removed from the watershed of said river and any surplus or waste there from shall be returned to the river and may be used by the other parties thereto.*

(See Memorandum to Agreement, 1913, transcribed into Decree 731 Final Decree, page 31)

An extensive amount of mapping was done from 1905 to 1907 to ascertain the amount of irrigated area that was to be assigned to each farmer. During the summers of 1905 and 1906 the US Reclamation Service (later renamed the US Bureau of Reclamation), in conjunction with the Nevada State Engineer's Office, made detailed planetable maps of the irrigated lands in the valleys and along the

Walker River. At the same time, a private surveyor, William W. Coleman, was also contracted by the Pacific Live Stock Co. and various other ranch owners to make separate surveys of their properties. These maps became the basis for the Proofs of Appropriation that were filed for each ranch. In addition, many ranchers provided sketch maps to accompany the proofs. Typically, it appears that whichever map showed more irrigated land was used to define the areas. The priority dates were extrapolated from proofs, and also from the land patent dates from the General Land Office. An exhibit book, composed of bound color-coded GLO plats showing land patents and dates, was submitted as part of the Decree 731 findings.

REFERENCES

7/30/1907 Abstract of Claims to Waters of the East, West, and Main Walker River and Tributaries, Henry Thurtell
1/27/1908 Amended Statement of Findings, Claims to Water of Walker River and Its Tributaries in Nevada, Henry Thurtell

3/22/1919 Pacific Live Stock Company vs. Antelope Valley Land & Cattle Company, Docket 731, District Court of the United States – District of Nevada

4/14/1936 USA vs. Walker River Irrigation District, Docket C-125, District Court of the United States – District of Nevada (amended filing on 4/24/1940)

1990, Administrative Rules and Regulations Regarding Change of Point of Diversion, Manner of Use or Place of Use of Water of the Walker River and its Tributaries, United States Board of Water Commissioners (amended by document entitled "Final Order Pursuant to Stipulation", filed on 6/3/1996)

1991, Shamberger, Hugh A., Evolution of Nevada's Water Laws, as Related to the Development and Evaluation of the State's Water Resources, from 1866 to about 1960, Nevada Division of Water Resources, Water-Resources Bulletin 46

1999, Pahl, Randy, Walker River Basin Water Rights, Volume 1 – An Introduction to Natural Flow Diversion Rights defined in Decree C-125 (as amended 4/24/40), Nevada Division of Water Planning

Note on Plates

The plates for this report were created using a variety of software and data sources. Vector data layers were compiled and digitized using Autocad R2000 Map 4 in State Plane Nevada West NAD 83 (feet) projection. The reference layer was the Public Land Survey System (PLSS) that was created from the BLM Geographic Coordinate Data Base (GCDB) flat files. Political boundaries (state, counties, municipal, WRID) were reconciled to the GCDB base. The WRID boundary and the flood water right areas were taken from the Permit 5528 Proof of Beneficial Use maps, on file at NDWR. Ditches and Points of Diversion were digitized using the 1994 USGS Digital Orthoquads (DOQ) and USFSA NAIP 2006 aerial photography. The Decree C-125 claim boundaries were individually located by legal descriptions as described in the decree tabulations and also reconciled to the GCDB base. The hydrography data layer was taken from the USGS 250k Digital Line Graphs (DLG). Hydrographic divisions (basin boundaries and USBOC divisions) were compiled in part from watershed boundaries generated in Arcview 3.3 using the Hydrographic Delineator module and the 10m digital elevation data, and also by digitizing of boundaries from numerous USGS

7½‘ topographic quadrangle maps (DRG). Data layers were exported from Autocad into Mapinfo MIF coverages and imported into Manifold 7.1 by Western Engineering and Surveying Services in Carson City. The hillshading backdrop was created using the USGS 10m digital elevation data from the USGS Seamless Data Distribution website:
http://seamless.usgs.gov/website/seamless/viewer.php
and reprojected using Global Mapper 7.

APPENDIX E

Legal Analysis of Water Rights and Transfers in the Walker River Basin Nevada - California

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I. Introduction

This analysis, undertaken for Great Basin Land and Water (GBLW) in conjunction with GBLW's Walker Basin Study, provides an overview and summary of legal issues (both substantive and procedural) relating to the acquisition of water from willing sellers in the Walker River Basin of Nevada/California and its prospective transfer to the lower Walker River and/or Walker Lake under state and federal law.

II. The Walker River Decree (C-125)

The rights to divert the natural flows (including return flows) of the Walker River stream system, as set forth in the Walker River Decree, Case in Equity, C-125, ordered filed April 24, 1940 (hereinafter "Decree C-125" or "the Decree"), are contained in tabulations which give in separate columns (reading from left to right), the name of the owner of an existing right, the name of the stream from which the appropriation was made, the date of priority, "the amount of water expressed in cubic feet per second to the use of which the owner is entitled <u>at the point of diversion</u>, the number of acres irrigated by such water, and the description of the land to which the appropriated waters have been conducted or supplied to a beneficial use." Decree at 11 (emphasis added). The amount of water available for appropriation to a beneficial use is measured at the point of diversion. The water duty, expressed in cubic feet per second (cfs), is correlated with the number of acres irrigated. Although there is a general description of the lands irrigated by section and township, the final Decree includes no accompanying Court-approved maps showing the location of the lands irrigated at the time priority attached to the use relative to the unirrigated land owned by the appropriator.[1]

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[1] Although there are no court-approved maps, certain maps apparently do exist. These maps are described in "History of Water Right Transfers in the Walker River Basin – prepared for GBLW by Andy Stroud, Western Engineering & Surveying Services, April 2007" as follows:

The Decree also confers storage rights on the Walker River to the Walker River Irrigation District. The storage rights are described as involving ownership of "the flow, and use of the flood water" of the East and West Walker Rivers for storage in Bridgeport and Topaz reservoirs. With respect to Bridgeport Reservoir, the water (42,000 acre-feet) "owned" by the District is to be stored from November through March 1 of each season. WRID is also authorized to divert at any time in excess of 42,000 acre feet up to 57,000 acre feet "when there is in the river a quantity of water <u>in excess</u> of the total amount adjudicated to the parties." Similar provisions are set forth with respect to Topaz Reservoir (50,000 acre-feet base storage, up to 85,000 acre-feet in the times of excess flow). (Decree, pp.63A-65) (emphasis added)[2]

With respect to stored water adjudicated to WRID, the Decree provides:

> "Said WRID <u>may</u> distribute such water so stored in said reservoirs to the lands in the District entitled thereto, in accordance with their respective rights." (Decree, p. 65)

> "An extensive amount of mapping was done from 1905 to 1907 to ascertain the amount of irrigated area that was to be assigned to each farmer. During the summers of 1905 and 1906 the US Reclamation Service (later renamed the US Bureau of Reclamation), in conjunction with the Nevada State Engineer's Office, made detailed planetable maps of the irrigated lands in the valleys and along the Walker River. At the same time, a private surveyor, William W. Coleman, was also contracted by the Pacific Live Stock Co. and various other ranch owners to make separate surveys of their properties. These maps became the basis for the Proofs of Appropriation that were filed for each ranch. In addition, many ranchers provided sketch maps to accompany the proofs. Typically, it appears that whichever map showed more irrigated land was used to define the areas. The priority dates were extrapolated from proofs, and also from the land patent dates from the General Land Office. An exhibit book, composed of bound color-coded GLO plats showing land patents and dates, was submitted as part of the Decree 731 findings."

[2] These ancillary storage rights above the base amount envisioned expansion in the storage capacity of both reservoirs. The storage rights of WRID under Licenses from the State of California are set forth in detail below at XI.

Under the Decree, some of the stored water owned by the District is treated as "supplemental water," to be distributed as needed during the irrigation season in accordance with rights established under the Decree. WRID is given clear authority to distribute this supplemental water to allow for beneficial use up to the amount of the water "duty" (measured as cfs/acre/season at the point of diversion from the natural stream channel) established under the Decree.

Paragraph XI of the Decree provides that "each and every party to this suit, is forever enjoined and restrained from claiming any rights in or to the waters of Walker River and/or its branches and/or its tributaries, except the rights set up and specified in this decree." (emphasis added). This expresses the Court's intention that the Decree is a complete adjudication of rights in or to the waters of the Walker River. Under the Decree, all parties are "enjoined" from claiming any such additional water rights under either Nevada or California law unless the Decree is amended to incorporate such additional water rights.[3]

Paragraph XII provides that the Decree "shall be deemed to determine all of the rights of the parties to this suit…to the waters of Walker River and its tributaries except the undetermined rights of WRID under its applications to the State Water Commission of the State of California and the undetermined rights of the applicants for permits from the State Engineer of the State of Nevada herein above specified, and it is hereby ….decreed that none of the parties to this suit has any right, title, interest, or estate in or to the waters of said Walker River, its branches or its tributaries other

[3] A similar provision in the Alpine Decree was construed in United States v. Alpine Land & Reservoir, 919 F.Supp 2d 1470 (D. Nevada, 1996). There the Federal District Court held that treating the water right therein as other than a supplemental storage water right would "violate the terms of the Alpine Decree" which constrains all claimants (and their successors in interest) from "asserting …any right in or to the waters of the Carson River or its tributaries…except in accordance with the rights specified, determined and allowed by this Decree." 919 F.Supp 2d at 1478. Thus, the Court was holding that to sever the supplemental storage right from the direct diversion right by allowing transfer of the storage right to use for irrigation elsewhere could violate the Decree, insofar as it would result in an increase in use of the waters of the Carson River in excess of the water duties "assigned for the various categories of the land" under the Alpine Decree. Id. See, infra, at X (Acquisition of Supplemental Water Rights).

than as set forth above."[4] (emphasis added).

Paragraph XIII provides for "rotation" in the use of water among the parties or for combination or exchanges of use, so far as they may do so without injuriously affecting the rights of any user. The Water Master "may permit the said parties to rotate the use of said water or to combine or exchange the use thereof, having due regard for the priorities fixed, so far as the same may be done without injuriously affecting the rights of other parties to this suit."

This paragraph contemplates rotations, exchanges, or combinations of water rights under supervision of the Water Master to more efficiently effectuate the beneficial uses (for irrigation, primarily), set forth in Decree C-125. Under internal rules applicable solely to rotations or exchanges of water within its boundaries, WRID supervises and enables such rotations, exchanges, and/or combinations during each irrigation season.[5] See XI, infra.

III. Order of the Court Implementing the Decree (1953 Rules and Regulations)

In its Order Approving Rules and Regulations for Distribution of Water on the Walker River Stream System (filed September 3, 1953; hereinafter 1953 Distribution Rules and Regulations), the Court established irrigation seasons for Divisions 1 through 6 of the Walker River, as designated in the Order.[6] The Order also established water duties for the Divisions (1.2 cfs for divisions 1,2,3, and

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[4] WRID is not listed in the Decree as an identified applicant for permits from the Nevada State Engineer. WRID was seeking from the California State Water Commission permits for additional storage in Bridgeport and Topaz Reservoirs.

[5] The water master (chief deputy water commissioner) works with river riders (under his employ), ditch riders (employed by individual ditch companies or associations), and WRID to oversee the diversion (river riders) and rotation/exchange (ditch riders) of decreed natural flow water. See Yardas email, meeting with Shaw, Spooner, et al., January, 2007.

[6] The 1953 Rules and Regulations define six divisions "for [water] distribution purposes" moving from Walker Lake upstream as follows:

Division 1 (lands served in the Schurz area (Walker River Indian Reservation) between Walker lake and Webber Dam);

5; and 1.6 cfs for divisions 4 and 6) for each 100 acres of land entitled to water during the irrigation season.[7] The 1953 Distribution Rules and Regulations also state:

> "If at any time the Chief Deputy Water Commissioner determines that there is more water available in the stream than is required to fill the rights of all of the vested users including the rights of the WRID and others similarly situated to store water, then he <u>shall prorate such excess water to all users in proportion to the rights already established.</u>" (emphasis added)

The Order further provides that records of the current and previous users shall be used to determine the percentage of return flow applicable to the consumptive use of water in the area. As will be discussed below, consistent with Paragraph X of the Decree, this Order contemplates that with respect to transfers, only the water consumptively used may be transferred, and that downstream users have vested rights to use return flows.[8]

Division 2 (lands served from the Main Walker (Mason Valley) from the Yerington Weir to the East-West confluence);
Division 3 (lands served by the East Walker from the East-West confluence to Bridgeport Dam);
Division 4 (lands served by the East Walker and tributaries above Bridgeport Dam (principally Bridgeport Valley);
Division 5 (lands served from the West Walker and tributaries from the East-West confluence to the Intake canal for topaz Reservoir); and
Division 6 (lands served from the West Walker and tributaries above Topaz Lake Intake Canal (principally Antelope Valley).

[7] Based on the final amended Decree (1940), the diversion duty for the Walker River Paiute Tribe's 1859-priority natural flow diversion right is 1.25 cfs per 100 acres (<u>i.e</u>., 26.25 cfs to irrigate 2100 acres over a 180 day irrigation season).

[8] Thus, beneficial use is determined by the consumptive use under the right. Water not consumptively used becomes the property of downstream users. Although the downstream users have vested rights in the water not consumptively used, they cannot defeat a transfer application limited to (beneficial) consumptive use by claiming the irrigation use on lands to which water rights are appurtenant must continue <u>in situ</u>. <u>See</u> VI, <u>supra</u>.

IV. Intra and Interstate Transfers of Water Under the Decree and the 1996 Rules and Regulations Pertaining to Transfer of Decreed Water Rights.

Paragraph X of the Decree C-125 confers rights on the parties to the Decree to change the manner, means, place, or purpose of use "in the manner provided by law, so far as they may do so without injury to the rights of other parties hereto, as the same are fixed hereby." Paragraph XI provides that all parties to the Decree (and their successors in interest) are "enjoined and restrained from taking, diverting, or interfering in any way with the waters of the said Walker River … so as to in any manner interfere with the diversion, enjoyment, and use of the water of any of the other parties to this suit as set forth in this decree …." Any transfer thus would have to result in no interference with the use and enjoyment of water of the river by others with vested rights. A transfer only of water consumed (beneficially used for irrigation purposes) protects the rights of downstream junior appropriators-irrigators. Paragraph XIV provides that the Court (the Federal District Court in Reno) retains jurisdiction with respect to any "change of the place of use of any water user."

The United States Board of Water Commissioners (hereinafter USBWC)[9] has promulgated "Administrative Rules and Regulations Regarding Change of Point of Diversion, Manner of Use or Place or Use of Water of the Walker River and its Tributaries." (Revised, June 1996; hereinafter "1996 Change Rules and Regulations"). These rules implement Paragraph X of the Decree and have been approved by the Court.[10] These rules delegate the function of considering water rights transfer

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[9] The USBWC is a six-person board appointed by the federal District Court "to act as a water master or board of commissioners to apportion and distribute the waters of the Walker River, its forks and tributaries in the State of Nevada and the State of California." USBWC, 1996 Administrative Rules and Regulations, section 1.1(l).

[10] The records of the District Court in C-125 reflect some requests during the last 3-4 years for changes in the rules on behalf of the United States and the Walker River Paiute Tribe. These requests predominantly involve notice to the Tribe and to the United States concerning water rights applications in the Basin and requests for transfers. The USBWC has filed a report with the Court as to the proposals for change, but it appears the Court has not taken any action. Report of the US Board of Water Commissioners Regarding Possible Changes to Rules and Regulations Governing Change Applications (December 5, 2003).

applications to the Nevada State Engineer (with respect to transfers taking place within Nevada) and to the State Water Resources Control Board (SWRCB) of California (with respect to transfers within California), subject to review by the District Court.

Section 3.1 of the 1996 Rules requires applicants within the State of Nevada to file a change application with the State Engineer on such forms and in such manner as required by that office. Applicants within the State of California shall file a change application with the State Water Resources Control Board. Section 3.4 requires applicants to pay "direct costs" associated with the processing of the change application, including notice and attendant publication costs. The section does not define "direct costs." Section 4.1 requires notice of all change applications to be published five times for a period of four consecutive weeks in a newspaper of general circulation in the county "where the change is to occur."[11] Similar notice must be published in Mono County, Douglas County and Lyon County. [12] Section 4.1 (c) requires publication as may be prescribed by applicable state law. Section 4.3 requires that the notice of change application include, inter alia, the location of the existing point of diversion or place of use, and the present manner of use, as well as the location of the new (proposed) place of use and the new (proposed) manner of use. There must be a description of the quantity of water involved in the change application and the purpose for which the application has been filed. Section 4.4 requires filing of proof that notice of the change application has been given and shall be filed with the agency of each state and with the USBWC.

Section 5.1 provides that all change applications will be processed in accordance with the practice and procedures of the Nevada State Engineer or the SWRCB. Protests may be filed in accordance with Nevada or California law, as applicable. Section 5.4 allows the USBWC to participate as a party in all proceedings relating to a change application. Whether or not it

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[11] This is ambiguous, but suggests that the 1996 Rules are referring to the County where the water is presently being used.

[12] These duties are the responsibility of the respective state agencies.

participates as a party, "the Board of Water Commissioners shall provide the agency [Nevada State Engineer/SWRCB] with comments and recommendations concerning the change application."

Section 6.1 requires the Nevada State Engineer or the SWRCB to approve or reject a change application within one year after filing, with certain limited exceptions that require the consent of the applicant. However, "where an action has been filed in any court which may affect the allocation and distribution of the waters of the Walker River, the Agency may withhold for good cause shown any pending decision on a change application until such court action is concluded." (emphasis added). The pendency of US v. WRID (C-125c) in the Federal District Court in Reno is such a court action. See XII, infra. The State Engineer/SWRCB may, on good cause, because of the pendency of this action, decline to decide any transfer application. The regulation does not define "good cause."

Any party to the proceedings before the Nevada State Engineer/SWRCB (a "protestant" is a party) may appeal to the District Court (Section 7.1). Even entities or individuals not a party to the agency proceedings may seek review by the District Court upon showing "good cause" as to why such entity or individual was not a party to the agency proceedings.

Section 7.2 of the 1996 Rules provides that judicial review of any Agency decision with respect to transfer may be instituted "by the filing of a petition in the Walker River Action" now pending before the Court. Copies of the petition for judicial review must be served on the responsible State agency (State Engineer/SWRCB), all parties to the administrative proceeding, the Board of Water Commissioners, the United States Attorney for the District of Nevada, the Walker River Paiute Tribe, and the Nevada Department of Wildlife. There is no requirement that all Walker River stakeholders be served, nor is there a requirement that the California Department of Fish and Game be served.

Section 7.2 contemplates a proceeding to be initiated with the court to approve any "modifications of the Walker River Decree in accordance with the decision or report of the agency regarding change applications." Section 7.2 contemplates modification of the Walker River Decree when transfer applications have been approved.[13] Such a proceeding would have to be initiated by a transfer applicant by petition (to be filed with the Court within 45 days after service of the Agency decision.)[14]

Section 7.5 provides that the decisions or report of the state agency regarding a change application shall not take effect unless and until the court having jurisdiction over the Walker River action approves it and enters an order modifying the Walker River Decree accordingly.

Section 7.7 allows the District Court to consider additional evidence if it is material and there was good cause for failure to present it in the proceeding before the state agency.

Section 7.9 provides that the Court will review all agency decisions "regarding change applications which recommend modification of the Walker River Decree, irrespective of whether any party files a formal request for judicial review." A decision of the Nevada State Engineer/SWRCB approving a change in place of use to Walker Lake and/or the lower Walker River would be considered a “recommended modification” of the Walker River Decree, and therefore should require court review. Section 7.9 authorizes the Court to reverse or modify the Agency’s decision if the decision "would impair existing rights under the Walker River Decree, adversely impact some public

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[13] The Nevada Department of Wildlife’s 2004 application to transfer most of its decreed water to Walker Lake for one year was submitted to the Court for its approval following approval (subject to stipulated conditions) by the Nevada State Engineer. See Notice of Filing of Petition Concerning One Year Change in Place of Use of All or a Portion of Water Adjudicated to the Nevada Division of Wildlife, filed March 11, 2004 (Relating to Application 70649 to temporarily modify the decree to shift appurtenant water rights to Walker Lake.)

[14] Since the State Engineer has determined there is a hydrological connection between underground waters and waters of the Walker River, see XV, infra, certificated permits approved by the State Engineer for the pumping of ground-water in the Walker River Basin may be subject as well to a requirement that they be approved by the Court and incorporated into the Decree. Paragraph XII of the Decree provides that it “shall be deemed to determine all of the rights of the parties to this suit…to the waters of the Walker River and its tributaries.” (emphasis added). To the extent the waters being pumped are waters of the Walker River, the Decree contemplates that there must be amendment and incorporation into the Decree, to validate such permits as decreed rights. See fn 3, supra.

interest, or prejudice substantial rights of the petitioner" for judicial review. Section 7.10 confers on the court broad powers to reverse or modify the decision of the State Agency, and to remand to the State Agency for appropriate findings. It does not limit the court to the "clearly erroneous" standard of judicial review of administrative agency action. However, if there are no objections to the recommendations of the State Agency, the Court may approve the decision without further proceedings.

Section 8.1 provides that if there is a protest by the Walker River Paiute Tribe to a change application, the trial court must hear all of the evidence in a new proceeding (de novo) and make its own factual determination, without being bound by the Agency's factual determinations.

Finally, Section 9.1 confers broad rights of intervention on third parties both with respect to proceedings before the State Engineer and the SWRCB, as well as in the federal court.

It would appear that Nevada and California law applies to transfer applications within each respective state, both with respect to procedure and substance, except to the extent that Nevada or California law is inconsistent with the provisions of Paragraph X of the Decree and the 1996 implementing administrative rules. [15] In effect, the Decree incorporates Nevada and California state

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[15] In its "Final Order Pursuant to Stipulation" (June 3, 1996), the Court "clarified" the 1996 Rules and ordered that transfers across state lines are within the exclusive jurisdiction of the District Court:

> "Because the [1996] Administrative rules deal only with change applications entirely within the boundaries of Nevada or entirely within the boundaries of California and do not address the three change applications referred to in the preceding paragraph, only the Court has jurisdiction to consider such applications." ¶17 (emphasis added)

The change applications referred to by the court were to be submitted to the Court by WRID. See ¶15, p. 17. The WRID applications included converting storage rights for irrigation to storage rights for recreation, and/or to change storage rights for irrigation to an instream flow right below Topaz and Bridgeport Reservoirs to keep fish in good condition, as required by California Fish and Game Code §5937. They were approved by the Court. Presumably, the federal court would have applied California law

law as the federal rule of decision for determining change of use applications within the boundaries of each respective state, and also for use by the Court in reviewing State Agency decisions and approving petitions for modifying the Decree. Where an application for transfer involves both Basin states, the Court's final order of June 3, 1996, supra, suggests that it has exclusive jurisdiction over proposed interstate transfers, and thus the transfer applicant could come directly to it. This would save the transfer applicant the time and expense of filing the applications with both State Agencies concurrently (and then to seek Decree modification in the District Court), unless of course the federal court in turn required that the applicant should first make such filings.

V. Nevada Procedures and Rules Relating to Transfer Applications

Under NRS §533.370(1)(b), the State Engineer "shall" approve an application which contemplates the application of water to a beneficial use if the proposed use or change does not adversely affect the cost of water for other holders of water rights in an irrigation district or lessen the efficiency of the district in the delivery or use of water.[16] The applicant must also demonstrate his financial ability and reasonable expectation to apply the water to the intended beneficial use with reasonable diligence. NRS §533.370(1)(c).

The State Engineer with certain exceptions (pending litigation or an applicant/protestant agreement to defer) must approve or reject an application within one year after the final date for filing

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as the federal rule of decision to determine the transfer applications, as they involved beneficial uses at (and below) Topaz and Bridgeport Reservoirs, consistent with the requirements of California Fish and Game Code §5937 to keep fish in good condition below a dam.

[16] The provisions of NRS §533.370 apply both to applications for water rights as well as to transfer of use applications. When the Nevada Division of Wildlife applied for a permit for flood or surplus water rights for Walker Lake, protests were made on economic grounds. The State Engineer rejected these protests. Ruling Re Application 25792.

a protest. NRS §533.370(2). The State Engineer must also determine (where there is no unappropriated water in the proposed source of supply) whether the proposed change conflicts with existing rights or with protectible interests in existing domestic wells. NRS §533.370(5). The State Engineer must also find that the proposed transfer does not "threaten" to prove detrimental to the public interest. Id. [17]

NRS §533.430 provides that every permit to appropriate water in a stream system that has been adjudicated is subject to existing rights and to the decree and modifications thereof entered by the court with jurisdiction over the matter, and subject to regulation and control by the State Engineer. [18]

Under NRS §533.363(1), if water is requested to be used in a county other than that county in which it is to be appropriated, the State Engineer must give notice of the application to the county of proposed use and the county of current diversion and use. The statute requires that the county commissioners of both the county of use and proposed use shall consider the request for transfer at a public meeting after notice for three consecutive weeks in a newspaper of general circulation. "At the conclusion of the meeting, the Board may recommend a course of action to the State Engineer, but the recommendation is not binding on the State Engineer." NRS §533.363(4). Any interested person (including the County Board of Commissioners) can protest the granting of an application and

[17] Senate Bill 405, March 19, 2007 proposes an amendment to NRS §533.370(5) that would add an additional criterion requiring the State Engineer to reject any application for a permit (or for a transfer) "where the proposed use or change increases the historic amount of consumptive use under the existing use or otherwise enlarges the use of the right." S.B. 405, §8.

[18] The reference in the Nevada permits to adjudicated water rights is intended to apply to stream systems adjudicated under Nevada law. Although the permits do not reference rights adjudicated under federal decrees, such as C-125, it is expected that the State Engineer would generally defer to federal decreed water rights.

must set forth the grounds for the protest, verified by affidavit. NRS §533.365.

An application for a transfer may be made by a person by whom a water right has been acquired. NRS §533.384. The applicant must in this case tender the prescribed fee to the State Engineer, along with a copy of any deed, written agreement, or other document pertaining to the acquisition.

NRS §533.345 provides that if an applicant for a temporary transfer of place of use (not to exceed one year) accompanies the application with the prescribed fees, the temporary change is in the public interest, and the temporary change does not impair water rights held by other persons, the State Engineer shall approve the application.[19] Non-temporary applications for a change in the place of use are governed by NRS §533.370.

It is interesting to observe that the statute contemplates that the Nevada State Engineer has clear authority and jurisdiction to accept and process applications for transfers both within and outside of WRID boundaries. Since, however, WRID has its own rules for transfers of storage waters within its boundaries, based on the authority provided by section 2.4 of the USBWC's 1996 Change Rules and Regulations, it is apparent that irrigators seeking changes in the place of use of storage water within WRID boundaries seek the District's approval (only) and do not apply for permits from the State Engineer under §533.370.[20]

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[19] NRS 533.345(3) provides: "If the state engineer determines that the temporary change may not be in the public interest, or may impair water rights held by other persons, he may hold a hearing and render a decision as provided in this chapter." This section may be of limited utility for transfers of use to Walker Lake, since it is likely to take more than one year to have any such application approved by the State Engineer as well as the Court. See 1996 Rules and Regulations, §7.5, discussed supra.

[20] Section 2.4 of the USBWC's 1996 Change Rules and Regulations provides that changes of the place of use (or point of diversion) of WRID's storage waters "which change is entirely within the

As noted above, the 1996 Change Rules and Regulations of the USBWC require that with respect to transfers <u>in</u> Nevada, the Nevada procedures relating to transfer are applicable. The 1996 Change Rules and Regulations prescribe additional requirements relating to notice and publication (<u>see,</u> <u>supra)</u> and would govern in the event of any conflict.

NRS §533.345 requires that every application for a permit to change the place of diversion, manner of use, or place of use of water already appropriated must contain such information "as may be necessary to a <u>full understanding</u> of the proposed change" (<u>emphases added</u>). All applications must be accompanied or followed by maps and such other data as may be prescribed by the State Engineer (§533.350).

The State Engineer may "require the filing of such evidence as he may deem necessary to a full understanding of the rights involved." NRS §533.365(3). If the State Engineer "determines that a <u>hydrological study, and environmental study, or any other study is necessary before he makes a final determination</u> on an application, the required study must be performed <u>at the expense of the applicant</u>." NRS §533.368.[21] The State Engineer is required to consult with the applicant and the governing body of the <u>county or counties in which the both the existing and proposed places of use are located,</u> concerning the scope of the study. NRS §533.368(4)(a). Not only must the governing boards of the counties in which the water was being used and in which the proposed use will take place be consulted, but the statute requires as well that a copy of any completed study be sent to the board of county commissioners of these counties. NRS §533.368(4)(b).

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boundaries" of WRID shall be made pursuant to rules and regulations of the District's governing body.

[21] In the case of an application to transfer water to Walker Lake, it would be prudent to set out the ecological values of Walker Lake that warrant both the change in the place of use and in the manner of use from an irrigation use to a "recreational" or fishery <u>in-situ</u> beneficial use.

VI. Analysis of the No Conflict With Existing Rights Criterion.

As discussed supra, NRS §533.370 requires the State Engineer to approve an application "submitted in proper form which contemplates the application of water to beneficial use if the application is accompanied by the prescribed fees"[22] and the proposed use or change does not conflict with existing rights or threaten to prove detrimental to the public interest. Thus, the Nevada statutory criterion relating to the approval of a transfer application, that it does not conflict with existing rights, is consistent with the criterion for approval of transfers under the Decree. An additional criterion, not contained in Decree C-125, must also be met - the transfer cannot threaten to prove detrimental to the public interest.

As stated by the Supreme Court of Colorado, the general rule is that junior appropriators have vested rights in the continuation of stream conditions as they existed at the time of their respective appropriations, and that subsequent to such appropriations they may successfully resist all proposed changes in points of diversion and use of water from that source "which in any way materially injures or adversely affects their water rights." Farmers Highline Canal & Reservoir Co. v. City of Golden, 129 Colo. 575, 272 P.2d 629 (1954). Where a stream loses water throughout its length, a change of an upstream right to a point downstream cannot be made where it would throw the burden of stream losses upon other appropriators. Haney v. Nearce-Stark Co., 109 Or. 93, 216 P.757 (1923). Ordinarily, the portion of an irrigation right equivalent to the amount of water consumed in the irrigation process is transferable. The amount not consumed is relied on by junior appropriators and must be left in the stream. See Water Resources Management, Meyers, Tarlock & Getches, 3rd Ed.

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[22] There is an application fee. The costs of publication of the notice of application in a newspaper of general circulation in the County where the water is sought to be appropriated are included in the application fee. The State Engineer causes the notice to be published. Nevada Revised Statutes §533.360.

p. 347.[23]

Under Decree C-125, the amount of water diverted is measured at the point of diversion from the natural stream course and does not account separately for conveyance losses between the point of diversion and the farm headgate. The actual present (or recent historical) consumptive use will thus likely differ considerably from the decreed diversion amount, expressed in cfs at the point of diversion from the river. Although the Decree is silent on the issue, the burden will likely fall on the transfer applicant to demonstrate and/or justify the amount of consumptive use[24]; and the burden may be on the protestant to demonstrate harm to its interest. In any event, experts may have to be employed by both applicant and protestant. At least for the foreseeable future, the need to employ experts and the expense of litigation will impose substantial transaction costs on the determination of consumptive use in the case of transfer of water for beneficial use at Walker Lake (and possibly in all future change applications).

In Basin Electric Power Corp. v. State Board of Control, 578 P.2d 557 (Wyo. 1978), the Court stated that:

> The key to understanding the application of beneficial-use concepts to a change-of-use proceeding is a recognition that the issues of nonuse and misuse are inextricably interwoven with the issues of change of use and change in the place of use. This is true even without the formal initiation of abandonment proceedings under the statutes. If an appropriator, either by misuse or failure to use, has effectively abandoned either all or part of his water right through noncompliance with the beneficial-use requirements imposed by law, he could not effect a change of use or place of use for that amount of his appropriation which had been abandoned. Id., 578 P.2d at 563-565.

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[23] In Order 1178, Further Designation of the Antelope Valley Hydrographic Basin, the State Engineer ordered that any application "seeking to change an existing irrigation right may be limited to the consumptive duty, at the discretion of the State Engineer."

[24] Most states place the burden on the proponent of the change to show there will be no injury to junior water rights. This is the rule in Colorado, Idaho, New Mexico, and Montana. The rule in Nevada is unclear. In the Alpine Land & Reservoir litigation, the Court seemed to place on the protestant the burden of showing injury to its interests. See US v. Alpine Land & Reservoir Co., 340 F3d 903 (9th Cir., 2003), See also the discussion below at XVI, concerning how the consumptive use calculation is made (in California).

In its recent decision in North Kern Water Storage District v. Kern Delta Water District, 147, Cal.App.4th 555, 580 (2007), the California Court of Appeals likewise describes the link between the law relating to forfeiture of water and the beneficial use doctrine:

> The highest level of beneficial use, historically, established the limit of an appropriator's original claim. In circumstances like those in the foregoing examples, however, the paper entitlement has ceased to function as the limit on the right holder's use of water; the paper entitlement is merely a historical artifact. Instead, the right holder's need for and ability to beneficially use water during the forfeiture period has resulted in a new level of maximum use. In effect, the law of forfeiture serves to *redefine* a paper entitlement based on the same measure that established the right in the first instance, namely, the "historical beneficial use." But under the law of forfeiture, the "historical beneficial use" becomes the highest use during the five-year history encompassed in the forfeiture period when, as in our examples, such use was not constrained by the actual availability of water to divert. What is forfeited is the unexercised portion of the historical paper entitlement; what is left to the right holder is a new paper entitlement established in a more recent historical period. In this sense, it does not matter whether an appropriative right was initially established at 200 cfs or 20 cfs; what matters is how much the right holder beneficially used during the historical period specified by the forfeiture statute…Instead, what is forfeited is the right to appropriate water in excess of historical beneficial use as reflected in the forfeiture period… The amount forfeited, if any, is the amount difference between the highest use in any period within the span and the entitlement to water established by the appropriation… (Id.)

Under the law of appropriation, any downstream appropriator, regardless of seniority, has a right to preservation of the flows in the stream, as they existed at the time of perfection of the appropriative right. Thus to the extent the downstream appropriator uses irrigation return flow from the transferor, any transfer of water rights can take place only insofar as it does not place the downstream appropriator in a worse position. Stated somewhat differently, the amount of water that can be transferred cannot exceed the amount that has been consumptively used on the transferor's property in recent historical times; and the amount of water that may be transferred may be further reduced to account for any conveyance losses between the existing and new points of diversion, and/or to ensure that remaining rights can still be served at the existing point of diversion.[25] Likewise, if water rights are acquired from junior downstream appropriators, only the water that is beneficially re-used by such downstream appropriators could be the subject of any transfer to another place of use, in order to protect the rights of other more junior downstream appropriators. The State Engineer must deny any permit which would impair existing rights. Griffin v. Westergard, 96 Nev. 627, 615 P.2d 235 (1980).[26]

In anticipation of possible protests, and to prevent delay in the processing of the application, the transfer applicant should be prepared to put evidence into the record as to the amount of water consumptively used on the transferor's irrigated lands (water that does not find its way back to the river via seepage, drainage, or conveyance channels). The State Engineer has the authority to order such a hydrology study to be performed if the applicant does not make it part of his application, and

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[25] The Nevada State Engineer's stipulated approval of the Nevada Department of Wildlife's application to transfer most of its decreed natural flow rights from the Mason Valley Wildlife Management Area to Walker Lake in 2004 states, in section 2(b), that "whenever any of the water rights changed by the permit are in priority, the flow allowed…to be diverted at the existing point of diversion to serve those water rights (the "Flow Rate Duty") shall be administered so that 55% of the Flow Rate Duty remains in the stream (the "Instream Flow Portion") and 45% of the Flow Rate Duty (the "Ditch Portion") is diverted at the existing point of diversion into the applicable ditches." While Section 4 makes clear that "the terms of this Stipulation…shall not apply to or constitute a precedent for any purpose whatsoever…," it nevertheless illustrates how factors beyond consumptive use are likely to come into play in future change proceedings. (Stipulation for Protest Dismissal Without Prejudice in the Matter of Change Application No. 70649, February 2004.)

[26] State Engineer Ruling 5185 (Pyramid Lake Tribe) characterizes the "no injury rule" as meaning that "junior appropriators are entitled to maintenance of the conditions as they existed on the date they first exercised their rights." (Ruling 5185, p.64). See US v. Orr Water Ditch Co., 309 F.Supp.2d 1245, (D. Nev. 2004). In US v. Orr Ditch Co., the District Court stated:

> "Thus, potential impairment to junior appropriators is analyzed by comparing the impact of a proposed change against a baseline of existing conditions." 309 F.Supp.2d at 1253.

to charge the applicant for the study.

Thus, if a senior water right is being transferred, allowance must be made for the rights of junior downstream appropriators. To the extent that in critically dry years the senior appropriator gets less water, the junior downstream appropriator maintains a vested right in the irrigation return flow (however reduced it might be in a particularly dry year).[27]

NRS §533.325 confers authority on the State Water Engineer to consider and approve transfer applications to change the place of diversion, or the manner or place of use, with respect to water "already appropriated." The term "already appropriated" means that there must be actual application of water to beneficial use on the transferor's property. To constitute a valid appropriation of water, there must be actual diversion, with intent to apply to beneficial use, followed by an application to such use within a reasonable period of time. In In Re Manse Spring, 108 P.2d 311 (1940) the Nevada Supreme Court stated:

> "To constitute a valid appropriation of water, there must be an actual diversion of it, with intent to apply to beneficial use, followed by an application to such use in a reasonable time." Id. 108 P.2d at 314.

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[27] Before there can be any reasonable degree of certainty concerning the delivery of purchased water there must be adequate gauging devices in place. Under the decree, the Water Master has the power to do this. The decree provides that the Water Master may make such "rules as may be necessary and proper for the enforcement of this decree and for the carrying out of its purposes and objects and the proper apportionment and distribution of the waters of the Walker River." Decree, Paragraph 15. Any transferor contemplating a purchase of water rights should take into account the adequacy of the gauges currently installed. Paragraph 14 of the Decree requires further that "the owner of each ditch or canal authorized to divert water from the Walker River or its tributaries" must install and "at all times maintain at or near the intake of such ditch or canal, a reliable, sufficient and easily operated regulating headgate and a locking measuring box, flume, or other device to be approved by the Water Master, whereby the water diverted into such ditch or canal may be regulated and correctly measured." Decree, Paragraph 14. The U.S. Geological Survey currently maintains approximately 60 active surface water monitoring sites (including two diversion ditches) in the Walker River system. All remaining diversion ditches are monitored by the federal Water Master, WRID, and/or individual ditch tenders; however few if any of these diversion ditches include publicly-accessible remote real-time monitoring capabilities.

Under NRS §533.324 "water already appropriated" includes water for whose appropriation the State Engineer has issued a permit, but which has not been applied to the intended use before an application to change to place of diversion, manner of use, or place of use is made. NRS §533.060(1) provides that the right to the use of water is restricted "to as much as may be necessary, when reasonably and economically used for irrigation, and other beneficial purposes, irrespective of the carrying capacity of the ditch." The statute goes on to state: "The balance of the water not so appropriated must be allowed to flow in the natural stream from which the ditch draws its supply of water, and must not be considered as having been appropriated thereby."

With respect to storage of water, appropriation occurs when water is diverted and stored. NRS §533.055 declares storage of water to be a beneficial purpose. Storage rights, then, can be acquired and transferred to another place of use. Water rights that have not been beneficially used within the meaning of the applicable statutes, discussed supra, are not subject to transfer. In any event, the acquisition of "unused" water rights would be speculative at best, since it is possible that under Nevada law such unused water rights could be lost due to "forfeiture" or abandonment, particularly those with priorities later than 1913.[28]

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[28] NRS §533.060 provides "rights to the use of surface water shall not be deemed to be lost or otherwise forfeited for the failure to use the water there from for a beneficial purpose." Although forfeiture seems proscribed, abandonment can result in a loss of rights. "Abandonment" requires an intent to abandon. See Alpine Land and Water v. US, 340 F3d 903 at 916-917 (9th Cir. 2003). See also U.S. v. Orr Water Ditch, 256 F3d 935, 946-948 (9th Cir. 2001). Under §533.060, a presumption is created that there has not been abandonment if the user shows evidence that within the preceding year period there has been delivery of water, payment of costs of maintenance or other costs incurred in water delivery, payment of costs for capital improvements, including irrigation or diversion works, or the actual performance of maintenance related to the delivery of water. NRS §533.060(4).

Thus Nevada law, as amended in 1999, appears to narrow the circumstances under which there can be a loss of water rights due to non-use. Forfeiture is eliminated, and the criteria for proof of abandonment very stringent in light of the presumptions created under the statute.

Under Nevada law prior to the 1999 amendment of §533.060, a failure to use water beneficially for five successive years could result in a forfeiture of the water right. United States Alpine Land and Reservoir Co,, 983 F2d 1487 (9th Cir. 1993). In order for abandonment to occur

WRID holds permits from the State of Nevada for the appropriation and diversion of unappropriated flood water or "excess water" on the Walker River. For present purposes, relating to identifying transferable water rights, it should be noted that WRID's permits for "excess" waters have been certificated, and under Nevada law are thereby deemed "appropriated water." [29]See NRS §533.425. It would appear that in this respect they meet the test for transferability set forth in US v. Alpine Land and Reservoir, 983 F.2d 1487 (1992). In Alpine, the Court cited NRS §533.040 and commented:

> "NRS §533.040 (water rights may be transferred 'in the manner provided in this chapter, and not otherwise"). The statutes setting forth the procedure for transferring water rights in Nevada refer to "changing the place of diversion, manner of use or place of use of water already appropriated." (emphasis added)

VII. California Law Relating to Transfer of Water Rights

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there must be clear evidence of an intent to abandon. United States v. Alpine Land & Reservoir Co., 878 F2d 1217 (9th Cir. 1989).

Nevada Acts of 1999, ch 515, §7 provides: "The mandatory provisions of …§533.060 [as amended in 1999] do not apply to water rights that are under challenge in any legal or administrative proceeding on or before April 1, 1999."

§533.085 provides that:

> "Nothing contained in this chapter shall impair the vested right of any person to the use of water, nor shall the right of any person to take and use water be impaired or affected by any of the provisions of this chapter where appropriations have been initiated in accordance with law prior to March 22, 1913."

The Nevada law of abandonment and forfeiture will not apply to any of the primary water rights under the decree with a priority date of prior to 1913. With respect to those junior rights that have a priority date after 1913, the Nevada law of abandonment and forfeiture, as embodied in NRS §533.060 may be applicable, pursuant to the above cited Acts of 1999, ch515, §7.

In US v. WRIDc, discussed infra, in Section XII the expanded reserved rights claimed by the Walker River Paiute Tribe and the United States (on its behalf) implicate the rights of junior rights holders. To that extent acquisition of a non-historically recently used post-1913 decreed right could be risky, in that the right may be subject to the law of forfeiture and abandonment in Nevada that pre-dates the 1999 amendment of NRS §533.060.

[29] See discussion infra, in Section VIII.

Section 1701 of the California Water Code provides that a post-1914 appropriator may change the point of diversion, place of use, or purpose of use from that specified in a permit or license, subject to approval by the State Water Resource Control Board. Pursuant to Water Code §1702, the Board must determine that the change will not injure any other appropriator or lawful water user.[30]

Water Code §§470, 475-484, enacted in 1986, were intended to promote water transfers. In § 475 the Legislature encouraged the "coordinated assistance of state agencies for voluntary water transfers to allow more intensive use of developed water resources in a manner that fully protects the interests of other entities which have rights to, or rely on, the water covered by a proposed transfer."

There are several types of surface water statutory transfers. Under §1435 a permittee or appropriator may petition the State Board to change a point of diversion, place of use, or purpose of use for a temporary change in the event of an "urgent need." An "urgent need" is defined as the existence of circumstances demonstrating that a temporary change "is necessary to further the constitutional policy that the water resources of the State be put to beneficial use to the fullest extent of which they are capable and that waste of water be prevented…" Water Code §1435(c). If such a finding is made by the Board, all of the procedural requirements otherwise applicable to transfers, prescribed by Water Code §§1725-1731, are waived. Water Code § 1435(a).[31]

A temporary urgency change can be granted for 180 days, but can be renewed for an additional 180 days. Water Code §1440. The Board may at any time revoke the temporary change order. Id.

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[30] "Pre-1914" appropriative rights holders may change a place of use without State Board approval, subject to the "no injury rule."

[31] The Constitutional policy of putting the water resources of the State to beneficial use to the fullest extent of which they are capable does not preclude use of such waters at Walker Lake, a terminal lake fed by the waters of the Walker River, which originates in California.

Before granting a temporary urgency change, the Board must find the "urgent need" criterion is satisfied, that there be no injury to any other legal user of water, that the change is in the public interest, and that the change would not cause unreasonable effects on fish, wildlife, or other instream beneficial uses. Water Code §1435(b).[32]

Under Water Code §§1725-1732, applications for "temporary changes" in a place of use may be made, Water Code §1728 defines a "temporary change" as "any change of point of diversion, place of use, or purpose of use involving a transfer or exchange of water or water rights for a period of one year or less." The application must be for an amount of water not to exceed consumptive use (or storage) during the period of the transfer, must not injure any legal user of the water, and cannot unreasonably affect fish, wildlife, or other instream beneficial uses. Water Code §1725.[33]

Upon such application, and with notice to Fish and Game, the State Board can approve a temporary change without a public hearing if it finds the proposed change will not injure any legal user of water, and will not unreasonably affect fish, wildlife, or other instream beneficial uses. Water Code §1727(a). If there is insufficient evidence to make such findings, the State Board must conduct a public hearing within 60 days of receiving the application. Water Code §1727(c).[34]

There are also procedures for long-term transfers (for more than one year). See Water Code §§1735-1737. The Board may approve such an application if the "change would not result in substantial injury to any legal user of water and would not unreasonably affect fish, wildlife, or other

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[32] Presumably, also, the Board must in light of Fish and Game Code §5937, consider the impact any such change of use would have on the condition of fish below Bridgeport and/or Topaz reservoirs.

[33] There must also be notice and an opportunity for a hearing, with review by the California Department of Fish & Game. Water Code §1736.

[34] Temporary changes are exempted from CEQA compliance. Water Code §1729.

instream beneficial uses." Water Code §1736.[35] Long term transfers are not exempt from the requirements of the California Environmental Quality Act, Pub.Res.Code §§21,000, et seq.

There are no maximum time limits for a long-term transfer. If the transfer is of water, and does not involve a sale of rights, all rights revert to the holder of the right after the transfer term expires. Water Code §1737.

§§ 1010, 1011, and 1244 of the Water Code allow a water user to conserve water (through, for example, increased irrigation efficiency) without losing rights in the water saved and that then would be available for transfer.[36] Water Code §1010 extends protection to persons using water under any "existing right" against forfeiture for non-use when they use reclaimed, desalinated, or polluted water in place of groundwater or surface water diversions. The holder of any such existing right can accept reclaimed or polluted water and transfer the unused water to another place of use. Water Code §1011 extended similar treatment to water unused or salvaged as a result of conservation efforts under an appropriative right. Land fallowing is included in the definition of water conservation. Water Code §1011. However, to be eligible for protection against forfeiture, the land fallowing (crop rotation)

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[35] There must be notification to other users of water, publication of the application, and investigation by SWRCB . A party opposing the transfer may file written comments within thirty days of the publication of notice. Water Code §1726(d)-(e).

[36] In California where there has been a reduction in the use of water used conjunctively (surface water and groundwater) due to substitution of an alternative supply, the amount of water saved may be sold, leased, exchanged, or otherwise transferred to the extent the requirements of the transfer provisions are met. Water Code §1011.5(d). Section 1011.5 of the Water Code authorizes conjunctive use of surface and groundwater to promote state policy of making surface water available for other beneficial uses. Under this section, if surface water is replaced with groundwater as an alternative supply, the surface water right may be sold, leased, exchanged, or otherwise transferred. Water Code §1011.5(e). Nevada has no comparable efficiency stimulating statutory provisions though they would likely be of little benefit in the Nevada portions of the Walker River stream system due to the State Engineer's prior "designation" of the associated groundwater basins as closed to further appropriation.

must not be permanent, Id. Transfers under Water Code §§1010, 1011 are limited to the actual cessation or reduction in historical use.

§1244 states that "[t]he sale, lease, exchange, or transfer of water or water rights…shall not constitute evidence of waste or unreasonable use, unreasonable method of use, or unreasonable method of diversion…" §1011(a) provides that "[w]hen any person entitled to the use of water under an appropriative right fails to use all or any part of the water because of…conservation effort, any cessation or reduction in the use of such…water shall be deemed equivalent to a reasonable beneficial use of water to the extent of such cessation or reduction in use."

The no-injury rule may prevent or limit water transfers, however, if the transfer will adversely affect any junior users to return flow, and the sections of law quoted above may be substantially limited in their intended purposes, to facilitate transfers, once the no-injury rule is brought into play. See Scott v. Fruit Growers Supply Co. (1927), 202 Cal. 47, 55.[37] In California, as in Nevada, only the right holder's consumptive use can be transferred where third party rights are involved. See County of Amador v. El Dorado County 7(1999), 6 Cal.App. 4th 931. The SWRCB follows this rule in transfer application situations. In a 1999 ruling, the State Board held that although a Water District had conserved more than 18,000 acre feet of water, return flows from its uses had created rights in third parties, and also had benefited the environment. Thus third parties were using most of the conserved water, and the conserved water was also producing instream environmental benefits. In light of these considerations, the SWRCB approved for transfer only 10% of the conserved amount.

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[37] For a detailed discussion of transfers in California, see California Water, Littleworth and Garner (1995, Solano Press).

WR 99-12 (modified in part in WR 2000-01, Denying Reconsideration of and Modifying Order WR 99-12).[38]

The SWRCB recognized, however, that past conservation efforts could be considered in a water transfer application. The transferor in WR99-12 proposed that it was reasonable to calculate consumptive use by measuring three years of the proposed transferor's highest use and comparing that period against average consumptive use after conservation. The Board held that the transferor must demonstrate that the reduction in prior consumptive use was attributable to conservation as part of a pre-existing conservation plan.[39] If a transferor decides to reduce irrigation for economic reasons and has no express conservation plan to justify its land fallowing, the Board could determine that such "saved" water could not be transferred, in light of the forfeiture for non-use provisions of the Water Code.

The amount of water that is subject to temporary transfer is limited to the amount of water that has been "consumptively used or stored" by the transferor. Water Code §1725. (emphasis added). The term "consumptive use" includes all the water consumed through evapo-transpiration, percolation underground, or that otherwise has been removed from the supply available to downstream users. Water Code §1725. As noted above, under some limited circumstances, water "conserved" and that is no longer being consumptively used may be subject to transfer, provided that other water rights holders are not injured.

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[38] This result may be inconsistent with Water Code §1011, which provides credit to a water user for conservation practices. Nonetheless, it appears to be the rule with respect to transfers that the amount that can be transferred can be no greater than the amount that has been historically consumptively used, where third party rights are involved.

[39] An applicant is precluded from replacing the quantity of water transferred by pumping groundwater, except under statutory prescribed conditions. Water Code §1732.

The petition requirements for applicants for transfers are set forth in Title 24, §794 of the California Code of Regulations. These requirements are:

> A petitioner seeking to transfer water subject to the jurisdiction of the SWRCB must comply with the requirements of Title 23, section 794 of California Code of Regulations. As such, a proper petition for change should include the following:
>
> (1) The amount(s) of water which would have been diverted, consumptively used, or stored under the water right in the absence of the proposed change(s), (a) during the period for which the change is requested, or (b) in a maximum year if the change is permanent;
>
> (2) The amount(s) of water proposed for change, transfer or exchange;
>
> (3) The existing and the proposed purpose(s) of use of water;
>
> (4) The existing and the proposed point(s) of diversion and rediversion, and the existing and proposed location(s) of any return flow;
>
> (5) The existing and the proposed place(s) of use of the water for various purposes of use;
>
> (6) The existing and the proposed diversion, release and return flow schedules if stored water is involved or if the streamflow regime will be changed;
>
> (7) Any changes in property ownership(s) involved, and the point(s) of diversion and place(s) of use of other known users of water who may be affected by the proposed change(s);
>
> (8) Information identifying any effects of the proposed change(s) on fish, wildlife, and other instream beneficial uses;
>
> (9) Information identifying any effects of the proposed change(s) on other known users of water, including identification in quantitative terms of any projected change in water quantity, water quality, timing of diversion or use, consumptive use of the water, reduction in return flows, or reduction in the availability of water within the streams affected by the proposed change(s);
>
> (10) The parties involved in the proposed change, transfer or exchange;
>
> (11) Map(s) prepared in accordance with Article 7 which describe the proposed change(s), delineate any additional information required by Items (4), (5), and (7) above, and show the hydrologic basin of origin and the streams which could be affected by the proposed change(s).

> (12) The proposed place(s) of use for irrigation may be listed as net acreage(s) within gross area(s) shown on a map submitted with the petition.[40]
>
> (emphasis added)

In Ruling 98-01, In the Matter of License 11395, (Merced Irrigation District) (1998), there were objections to an application for transfer of stored waters to the Bureau of Reclamation for fish and wildlife purposes. The downstream appropriators and riparian rights holders claimed that the water stored upstream by MID should be released to satisfy their needs. The SWRCB held that the protestants were not legal users of the stored water and had no rights to the use of the stored water under the control of the irrigation district. Since the proposed transfer would not injure the rights of parties with legal rights to the use of the water, the transfer application was approved.

In its ruling in WR 98-01, the SWRCB explained its reasoning as follows:

> "If MID were to simply release water from its storage facilities during the irrigation season, the water would be considered abandoned, and if that water reached the southern Delta, SDWA's members could divert and use the water under any appropriative water rights they may have. By transferring the water to the USBR under section 1707 in October, however, MID will release it outside the irrigation season and will protect it from being appropriated in the reach (Merced River to Vernalis) where the USBR intends to beneficially use it for fish and wildlife enhancement.
>
> "In effect, SDWA wants MID to abandon its excess storage during the irrigation season so that SDWA's members will have adequate water for their uses without paying for it. SDWA has no claim to MID's stored water while MID has it under control. Even though SDWA's members could divert and use water that MID abandoned, pursuant to their appropriative rights, this does not mean that they can require MID to abandon water stored in an earlier season, on a time schedule that would be to SDWA's benefit. (Lindblom v. Round Valley Water Co. (1918) 178 Cal. 450 [173 P. 994, 997].)

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[40] In connection with the information to be provided under §794(8) the applicant may consider including information concerning incidental instream wildlife and fishery beneficial uses associated with irrigation diversions and return flows to riparian areas, creeks, and associated wetlands.

"Further, SDWA's members can neither require nor use abandoned storage release from MID under their alleged riparian rights. Riparian rights attach only to the natural flow of the stream and do not attach to water that is present because of releases from storage, importing from another watershed, or return flows from groundwater pumping. (Lux v. Haggin (1884) 69 Cal.255 [4 P. 919]; Bloss v. Rahilly (1940) 16 Cal.2d 70 [104 P.2d 1049].) The natural flows in the San Joaquin River diminish during the irrigation season and riparian right holders generally do not have adequate water available to them during the entire irrigation season."

VIII. WRID's Surplus (Excess) Water Permits

The Nevada State Engineer has granted two permits to WRID for unappropriated or surplus water. Permit #25017 is for 349.1 cfs from the East Walker and Main Walker Rivers. According to Application 25017, filed April 11, 1969, the water is to be used for irrigation of 60,000 acres and for domestic purposes. Approved August 20, 1970, the permit is subject to all existing rights on the source. The permit is issued in accordance with the State Engineer's (oral) ruling of July 28, 1970. [41]

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[41] In 1969 WRID first applied for excess (or surplus) flow rights for irrigation purposes. The water was to be diverted through existing diversion structures. According to testimony at the June 28, 1970 hearing held before State Engineer Roland Westergard, 400 individuals users would benefit from use of the water. (Transcript, p. 11). The District claimed that the applications were for water already being "historically" used by irrigators within WRID and was water that had been distributed by the Water Master among the various users, pursuant to the USBWC's 1953 Distribution Rules and Regulations under paragraph XV of the Decree. Those rules provide that:

> "If at any time the Chief Deputy Water Commissioner determines that there is more water available in the stream than is required to fill the rights of all of the vested users including the rights of the WRID and others similarly situated to store water, then he shall prorate such excess water to all users in proportion to the rights already established." (emphasis added) (Order Approving Rules and Regulations for the Distribution of Water on the Walker River Stream System, 1953.)

WRID claimed that users within the District had been making use of the [excess] water since 1930. WRID claimed that "under the practice and custom and usage of the District," under color of authority of the quoted language in the regulation, "that the District and the United States Board of

The amount of water to be appropriated is 349.1 cfs, but not to exceed a combined water duty of 4.0 acre feet “from all sources” per acre of land irrigated. Certificate 8860, dated October 15, 1976, states that the amount of appropriation is not to exceed 63,688 acre feet. The period of use is from May 1 to July 31 each year. The permit has a priority date of April 11, 1969. A description of the lands to which the water right is “appurtenant” is set forth in Exhibit A to the certificate. (See Certificate, Exhibit A, pp. 1-5).

The District holds an additional permit to “surplus” Walker River surface water in Nevada. It holds Permit 5528 and Certificate 8859 on the West Walker River for 491.2 cfs not to exceed 89,612 acre feet annually. It has a priority date of June 6, 1919. Permit 5528 allows the appropriation of water for irrigation and domestic purposes, including stock watering on up to 30,000 acres.

Under the description of proposed works, it is stated:

> “In the practical application of this water to the lands, it is planned to use the West Walker River as a main canal, distributing the water to the various

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Water Commissioners have in fact utilized and distributed the excess waters." (Transcript, p.14).

WRID claimed it was seeking to appropriate the "total supply of "excess" water in the River" for the purpose of allocating the excess water to historical users consistent with the Decree. (Transcript, p. 15). WRID claimed that between 1959 - 1969, there were six years when there was flood water available. (WRID acknowledged that in the event Hoye Canyon dam was built the flood waters appropriated would be stored in that facility pursuant to an existing permit for storage.)

WRID claimed that the Water Master was distributing excess water to the irrigators "until such water is appropriated by someone legally." (Transcript, p. 30). WRID’s applications were protested by Mineral County and the State Department of Wildlife. Mineral County argued that use of the excess flow waters for irrigation would ultimately lower the level of the Lake as consumptive uses within the Basin increased and as such salinity in the Lake would increase. (Transcript, p. 56, et seq.). The applications were also protested by B.P.O.E., Hawthorn Lodge No. 1704, on the ground of damage to trout fishing at the Lake. No expert evidence was tendered by these protestants with respect to the effects on the Lake. At the hearing the State Engineer orally granted Application 25017, The water duty was not to exceed 4.0 acre feet per acre of irrigated land from any and/or all sources. (Transcript, p. 122, et seq.).

> users through the present system of ditches, or through a new series of canals, as they may be determined by future needs of the District."

The conditions are identical to those contained in Permit 25017. Permit 5528 was approved August 26, 1970. Certificate 8859 was issued October 5, 1976.

The Court's 1953 Order, as quoted supra, contemplates that the allocation of "excess water" is within the purview of the Chief Deputy Water Commissioner. [42] In the exercise of this function he would not necessarily be governed by the provisions of a permit issued by the Nevada State Engineer purporting to confer rights in the WRID to surplus water. [43]

Thus, if under the 1953 Distribution Rules and Regulations "excess water" is controlled and distributed by the Chief Deputy Water Commissioner and to the extent the certificated permits have not been incorporated into the Decree, WRID's permits from the Nevada State Water Engineer for the appropriation of surplus or flood waters may be said to have a dubious provenance. Allocation of excess waters has bi-state implications, and the excess flows should not be "captured" by WRID under a Nevada permit, conferring "rights to use excess water in Nevada." The "excess flows" rights,

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[42] The quoted provision of the 1953 Rules and Regulations, approved by the District Court, can be construed as requiring that surplus waters are to be distributed only among users with established water rights. In practice, the excess flow rights belonging to WRID are being used to irrigate lands without established water rights under Decree C-125, or under Nevada law. Paragraph XI of the Decree enjoins any party from claiming any rights to water of the Walker River except the rights set up and specified in the Decree. WRID is a party to the Decree. Nonetheless it applied for and obtained permits from the State Engineer for the diversion of surplus waters that exceed the amount of water decreed for direct diversion and storage, and has not sought inclusion of such rights in the Decree. See, discussion, supra, at n.3.

[43] In Ruling 5113 the State Engineer characterizes Certificate 8859 (Permit 5528) as follows:

> "The water right granted under Certificate 8859 is for unappropriated surplus or flood water from the West Walker River which shall be allocated to users of the stream after the Chief Deputy Water Commissioner determines that there is more water available in the stream than is required to fill the rights of all the vested users, including the rights of the WRID and others similarly situated, to store water."

claimed under the Nevada permits, should be approved or validated by the Court in order to resolve doubts about their provenance.

Permits 25017 and 5528 confer rights on WRID to distribute Walker River water for irrigation of lands that have no decreed water rights and in amounts that exceed the water duties prescribed in Decree C-125. Although such surplus waters have been beneficially used on irrigated lands within the District during surplus water years, and the Water Commissioner has included such water in his annual distribution plan, questions remain as to whether they have been used (and applied for) in a manner consistent with the Decree, and whether the permits purporting to confer rights to apply such waters to beneficial use are valid without incorporation into the Decree through an application to the District Court.

IX. Nevada Public Interest Criteria

Under NRS §533.370(5), the State Engineer is required to reject an application for transfer if he determines that the proposed use conflicts with existing rights or the proposed use threatens to prove detrimental to the public interest. In US v. Alpine Land and Reservoir, 341 F.3d 1172 (9th Cir. 2003), the Ninth Circuit affirmed the decision of the State Engineer approving a transfer of upstream appropriative water rights to Stillwater National Wildlife Refuge for wildlife purposes.[44] The Court held:

> "[T]he State Engineer has broad discretion under Nevada Law to determine whether a change in place of use of existing water rights will have a detrimental impact on the public interest or other study is necessary before approving such a transfer.[45] (341 F.3d at 1175)

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[44] The Court deferred to the Engineer's determination that the City of Fallon's water supply would not be harmed by the transfers to Stillwater.

[45] NRS §533.368(1) provides that the State Engineer may require an applicant for transfer to perform a hydrological study before an application is granted.

These public interest criteria are set out in Pyramid Lake Paiute Tribe v. Washoe Co., 918 P.2d. 697 (1996). The relevant criteria approved by the Nevada Supreme Court in Pyramid Lake Paiute Tribe, supra, are:

1. An appropriation must be for a beneficial use.
2. The applicant must demonstrate the amount, source and purpose of the appropriation…
4. The right to divert ceases when the necessity for the use of water does not exist.
5. The applicant must demonstrate the magnitude of the use of water, such as the number of acres irrigated, the use to which generated hydroelectric power will be applied, or the number of animals to be watered…
7. For large appropriations, the State Engineer must consider whether the applicant has the financial capability to develop the water and place it to beneficial use.
8. The State Engineer may also cooperate with federal authorities in monitoring the development and use of the water resources of the State…
10. Rotation in use is authorized to bring about a more economical use of supplies.
11. The State Engineer may determine whether there is over pumping of groundwater and refuse to issue permits if there is no unappropriated water available.
12. [The State Engineer] may determine what is a reasonable lowering of the static water level in an area after taking into account the economics of pumping water for the general type of crops growing and the effect of water use on the economy of the area in general.
13. Within an area that has been designated, the State Engineer may monitor and regulate the water supply.

NRS §533.030(2) provides that water for fisheries, wildlife, and recreation is a beneficial use under Nevada law. See State Board of Agriculture v. Morros, 766 P.2d 263 (1988). Under NRS §533.030, water for recreational purposes constitutes a beneficial use. NRS §501.100 recognizes recreational values of wildlife, and §§501.181 and 533.367 recognize the need to provide wildlife with water. NRS §533.023 defines "wildlife purposes" as including "the watering of wildlife and the establishment and maintenance of wetlands, fisheries, and other wildlife habitats." Thus, the waters of Walker Lake can be beneficially used in place under Nevada law for fishery, wildlife, and recreational purposes, in fulfillment of the public interest.

In his ruling Re Application 25792 (an application by the Nevada Dept. of Wildlife for 8000 cfs for Walker Lake) the State Engineer recognized that under an amendment to the Nevada statutes in 1969 use of water for recreational purposes is a beneficial use. The ruling further recognized that use of Walker River water at Walker Lake to "support a more stable Lake level" and to maintain the quality and quantity of lake water, is a beneficial use under Nevada law.

Permit 25792 was certificated in 1983 subject to future appropriations for municipal and/or industrial purposes. The Certificate of Appropriation (10860) states the amount of appropriation as 795.2 cfs not to exceed 575,870 acre feet per annum, with a priority of 1970. The manner of use is described as "to help maintain the lake at a stable level to support public use for recreation and improve water quality and quantity to sustain and help prevent loss of the fishery in Walker Lake."

In making public interest determinations, the State Engineer also may examine applicable federal law, including the law of the Decree and applicable federal court orders relating to the Walker River Basin. Although there is currently no federal legislation pertaining to the Basin, federal law is embodied in the Decree and the regulations implementing the Decree. In <u>US</u> v. <u>Alpine</u> <u>Land</u> <u>and</u> <u>Reservoir,</u> 341 F.3d 1172, <u>supra</u>, the Court relied on the Congressional authorization to the Fish and Wildlife Service to acquire water through purchase for use at Stillwater National Wildlife Refuge. In those instances where the Pyramid Lake Tribe sought to augment water flow to Pyramid Lake through transfers (or protests to transfer applications), the Ninth Circuit took into account the fact that preservation of the fishery for the federally-endangered cui-ui and the threatened Lahontan cutthroat trout accorded with a primary purpose of the establishment of their reservation (and therefore had given rise to a reserved water right). <u>See</u> also <u>US</u> v. <u>Alpine</u> <u>Land</u> <u>and</u> <u>Reservoir</u> <u>Co.,</u> 340 F.3d 903 (9^{th} Cir. 2003).

By contrast, however, in US v. WRID, 104 F.2d 334 (1939), in characterizing the Walker Lake Tribe's reserved right, the Circuit Court emphasized the Tribe's irrigation practices on land above Walker Lake and did not characterize sustaining the fishery at Walker Lake as implicating a primary purpose of the reservation. [46]

Article XIII of the California –Nevada Interstate Compact (not legally operative because it has not been approved by Congress) declares that "the use of waters for preservation, protection, and enhancement of fish, wildlife, and recreation is hereby recognized as an inseparable part of the public interest in the use of the waters of … Walker River Basin in both states, and is, therefore beneficial." There is no such provision in Decree C-125, however, or in any of the Court Orders or Regulations implementing that Decree.

In light of the provisions of Decree C-125 and the Orders of the Court implementing the Decree that are directed toward promoting irrigation uses, and the lack of any explicit allocation of any water to the Lake for recreational or fishery purposes, and the failure of Congress to approve an interstate compact with the force of law allocating the waters of the Walker Basin, there are legitimate concerns that the Court could reject a transfer application on public interest grounds. Nothing in Decree C-125 or the Court's Orders sets out, for purposes of administering an interstate decree, any intent of the parties to the Decree, or either State, to benefit Walker Lake or its fishery. Rather, the Decree implies the public interest is served (in both states) by meeting the needs of irrigators for water in an arid area.

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[46] The Court found the reserved right to include a 26.25 cfs flow over a 180-day irrigation season to irrigate 2100 acres of land and a flow necessary for stock-watering purposes, with a priority of November 29, 1859.

Such concerns are considerably alleviated by the Court's approval of the 2004 transfer application by the Nevada Department of Wildlife from the Mason Valley WMA to Walker Lake. See supra, at n.13. As such, the Court's Order approving the application stands as a useful precedent for future applications to transfer water to Walker Lake for beneficial uses recognized by law.

X. Acquisition and Transfer of Supplemental Storage Water Rights

Having obtained storage rights under the Decree, WRID distributes its storage water from Bridgeport and Topaz Lake Reservoirs to irrigators within the District. Bridgeport Reservoir (located wholly within California on the East Walker River) has a storage capacity of approximately 42,500 AF and a California State Water Resource Control Board (SWRCB) license to store up to 39,700 AF per annum "from about September 1 of each year to about July 20 of the succeeding years."[47] Topaz Lake Reservoir (located mostly within California on the West Walker River) has a usable storage capacity of approximately 59,400 AF and a SWRCB license to divert and store up to 57,580 AF per annum "from about October 1 of each years to about July 15 of the succeeding year," plus a separate license to store up to 200 acre feet per annum derived from local tributary inflows "to be collected from January 1 to December 31 of each year."[48]

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[47] SWRCB Application 1389, Permit 2536, License 9407 dated April 7, 1970. License 9407 also states that the maximum amount to be held in Bridgeport reservoir at any one time is 42,500 acre feet; that the maximum withdrawal in any one year shall not exceed 36,000 acre feet; and that "storage rights under this license in combination with the Licensee's rights confirmed by United States Decree C-125 shall not exceed 57,000 acre-feet per annum." The license was amended on September 4, 1991 so as to be "conditioned upon full compliance with Section 5937 of the [California] Fish and Game Code."

[48] Application 2221, Permit 2537, License 6000 dated February 11, 1960; and Application 2615, Permit 2538, License 3987 dated October 28, 1923. License 6000 states that "[t]he right hereunder is included in Federal Decree C-125;" and both licenses were amended on September 4,

Paragraph VIII of the Decree suggests that WRID's storage water rights were intended to supplement the diversion rights of decreed water rights holders when there was insufficient water in the river to serve their needs.[49] Paragraph VIII of the Decree states:

> "WRID may distribute such water stored in said reservoirs to lands in the District <u>entitled</u> thereto, <u>in</u> <u>accordance</u> <u>with</u> <u>their</u> <u>respective</u> <u>rights</u>." (emphasis added)

WRID has distributed storage rights to both decreed and non-decreed lands (Appendix A). Storage rights allocated to decreed lands (approximately 28,930 acres with priorities of 1874 or later out of 45,520 total decreed acres within WRID boundaries) are used to supplement decreed natural flow diversion rights. (Storage rights allocated to non-decreed lands are discussed in Section XI below.)

There are special considerations relating to acquisition and transfer of these supplemental storage water rights. Storage of water is recognized under NRS §533.055 as a beneficial use. Some of the storage rights that derive from Decree C-125 are supplemental to decreed surface water rights, and are used, when there are insufficient natural surface water flows in the system, to augment deliveries to decreed water rights holders up to the amount of the water duty allocated to their lands under the Decree.[50]

1991 so as to be "conditioned upon full compliance with Section 5937 of the [California] Fish and Game Code."

[49] License 9407 states that the water will be put to beneficial use on 52,062 acres within the WRID.

[50] Supplemental storage water is distributed by WRID to water rights holders under the decree according to their yearly need for irrigation water to supplement any deficiencies caused by unavailability of water from direct diversion. To supply the supplemental storage water, WRID releases storage water from Topaz and Bridgeport Reservoirs, as authorized by Decree C-125, and as

In US. v. Alpine Land and Reservoir Co., 919 F. Supp. 1470 (D. Nev. 1996), the successor in interest of an irrigator, who had storage rights under the Alpine Decree which were used "to supplement the irrigation of portions of their property on which direct diversion rights under the Alpine Decree were appurtenant" (919 F.Supp at 1475) applied to the State Engineer for a transfer of these surface irrigation rights into storage in Mud Lake reservoir.

The Court accepted the finding of the State Engineer that the storage water had been used to supplement the irrigation of portions of appellant's property on which direct diversion rights under the Alpine Decree were appurtenant and that the stored water enabled the appellants to irrigate later in the summer when their land was out of priority. Based on these findings of fact, the State Engineer had ruled that the Mud Lake storage rights and direct diversion rights were used conjunctively and that the stored water could not be severed from the direct diversion right.

The District Court agreed that a supplemental storage (reservoir) right, "absent an underlying beneficial use" is not a valid appropriation and water right that can be independently conveyed. In support of its conclusion that the supplemental storage right cannot be severed from the water-righted land and independently conveyed, the Court cited Prosole v. Steamboat Canal Co, 140 P. 720, 722 (1914), and NRS. §533.530 (unlawful to "divert and conduct the water or portion thereof, of any river, creek, or stream into any slough, dam, or pond and retain, or cause the water to be held or retained therein, without making any other use of the water"). 919 F.Supp. 1476. Although the

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subsequently conditioned by SWRCB permits. The purpose of the release is to provide the irrigators the amount of water consistent with their decreed rights.

District Court's opinion is inartfully worded, it is clear that it was only addressing supplemental storage rights, not the use of WRID storage waters that are not appurtenant to water-righted land.[51]

The Court also reasoned that a supplemental storage right is not separate and distinct from a direct diversion right based on NRS §533.045, providing that "when the necessity for the use of water ceases to exist or is reduced, the extent of the water right is limited to the extent of the beneficial purpose which remains." The Court reasoned that there is no right to supplemental water when the direct diversion right is adequate, and therefore the supplemental water right cannot have a separate legal existence apart from the primary (diversion) right.

Supplemental storage waters then, cannot be severed and transferred to another place of use independent of the direct diversion rights they supplement. When senior diversion rights are acquired, the water beneficially used to supplement that direct diversion right will be acquired as well, and all of the water used consumptively on that parcel (whatever its derivation) may be transferred to another place of use. In a transfer context, then, acquisition includes the primary right for diversion, together with the supplemental storage water right; the amount to be transferred could not exceed the water duty established under the Decree for the acreage at issue; and the composite transferable interest could not exceed the recent historic consumptive use associated with the exercise of both types of rights (i.e., decreed plus supplemental storage).

The water that is the subject of the Alpine transfer discussed supra flows from California and was to be placed to a beneficial use in Nevada. The State Engineer approved the change application

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[51] NRS §533.055 provides: "Water may be stored for a beneficial purpose." The Court did not address the transferability of non-supplemental storage rights. See below, discussion re: non-supplemental storage water rights.

on the condition that no wells are drilled in California to irrigate the land that would be (presumably) fallowed. The District Court held that the Nevada State Engineer "had the inherent authority to condition his approval of an application to appropriate based on his statutory authority to deny applications if they impair existing water rights." 919 F.Supp at 1479. The State Engineer had concluded "that a hydrological link exists between the area's groundwater resource and the Carson River's flow such that when groundwater is tapped, the river's water level is lowered to the detriment of downstream users." Id.[52]

In his ruling on this application (see Ruling 4207), the State Engineer held that, under the Alpine Decree, changes in the manner of use are to be allowed only for the net consumptive use, which under the Alpine Decree was specified at 2.5 AF/acre. The State Engineer concluded this limitation allows the river to be kept whole for downstream users by compensating for return flows. The State Engineer found that "the applicant seeks to strip 757.9 acres of irrigation which equates to 1894.75 acre feet to be transported to Mud Lake storage for later release… Therefore the maximum

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[52] In view of the District Court's holding in US v. Alpine Land and Reservoir, supra, it could be anticipated that the District Court, in approving an interstate transfer with respect to the Walker River Basin, would likely impose some constraint on groundwater pumping. Under California law a landowner has an overlying right to use percolating ground-water for reasonable beneficial uses on the land overlying the groundwater. Peabody v. Vallejo (1935), 2 Cal.2nd 351, 372. Overlying rights are considered "part and parcel" of the land. See Burr v. Maclay Rancho Water Company (1911), 160 Cal. 268, 281-282.

Thus, it would be desirable for a transferee to obtain a California transferor's agreement not to exercise his overlying right to groundwater during the term of the transfer. Any such agreement to forego use of the overlying right during the transfer period should be recorded as a covenant running with the land in order to put any future purchaser of the land on notice concerning the limitations on exercise of the overlying right. See Hutchins, California Law of Water Rights at 669-670. The right to use groundwater by an overlying landowner is real property. In Pasadena v. Alhambra, 33 Cal.2d 908, 925 (1949), the California Supreme Court stated that the "overlying right" to take water from the ground for use on his overlying land "is based on ownership of the land and is appurtenant thereto."

quantity of water to be stored in Mud Lake for later release…is 1894.75 acre feet [757.9 acres x 2.5 AF/acre].” Ruling 4207, pp 8-9. This ruling was affirmed in all respects by the District Court. Neither the State Engineer nor the Federal Court made any finding that the net consumptive use of water on the base property was less than the decreed duty (2.5 AF/acre). [53]

XI. Acquisition and Transfer of Non-Supplemental Storage Water Rights

As noted in the previous section, WRID has distributed storage water to both decreed and non-decreed lands. The non-decreed lands (i.e., lands without adjudicated direct diversion rights under Decree C-125) are generally described as "New Lands" and make use of allocated storage water on a non-supplemental basis. (There are approximately 34,370 New Land acres; see Appendix A.) These non-supplemental allocations of storage water raise important issues for all prospective acquisitions and transfers.

First, WRID's storage rights are derived from the Decree. <u>See</u> II, <u>supra</u>. Under NRS §533.440 any storage rights held by WRID that are not used for purposes supplemental to irrigation of decreed lands may be transferred, since such waters have been already appropriated (into storage) within the meaning of Nevada law, and applied to a beneficial use. NRS §533.055. [54] Primary storage rights and secondary permits for application of non-supplemental storage water (if any such permits exist in the Walker Basin) could be acquired and the water transferred to Walker Lake, subject to the 1996 Change

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[53] In the acquisition of a base water right supplemented by storage water, WRID should be involved in some manner. In connection with the intra-district transfer of water appurtenant to lands with direct diversion rights supplemented by storage rights, it has been District practice to require the applicant to go to the State Engineer to move the natural flow part of the right and to the WRID directors to move the supplemental storage part of the right. Transcript of Proceedings, August 28, 1989, in <u>US</u> v. <u>WRID</u>, at p.38.

[54] Stored water is being used for a beneficial purpose. NRS §533.055.

Rules and Regulations of the USBWC.[55] If a primary storage right is obtained that has not "attached" a secondary permit, the transferor or his successor in interest could apply for a secondary permit, pursuant to NRS §533.440, with the place of beneficial use being Walker Lake. If the application is for a secondary permit and the water being transferred is to be used at Walker Lake, the procedures prescribed by Nevada law must be followed, and an application made to the State Engineer.

As noted above, Paragraph VIII of the Decree suggests that WRID's storage rights were intended to supplement the diversion rights of decreed water rights holders when there was insufficient water in the river to serve their needs, i.e.:

> "WRID may distribute such water stored in said reservoirs to lands in the District <u>entitled</u> thereto, <u>in accordance with their respective rights</u>."
> (emphasis added)

The Decree is the exclusive source of surface water rights in the Walker River Basin.[56] The rights created under the Decree are direct diversion rights, which can be supplemented with storage

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[55] NRS §533.444 provides that "the person or persons proposing <u>to apply to a beneficial use</u> the water stored in any such reservoir shall file an application for a permit, to be known herein as the secondary permit…" (emphasis added.) The application for the secondary permit must accord with the requirements for obtaining an appropriative permit, except that no notice of such application need be published. Thereafter, once beneficial use has been made, and the proofs of commencement and completion of diversion works made, a final secondary certificate of appropriation shall be issued (as other certificates are issued), except that the secondary certificate must refer to the reservoir described in the primary permit. NRS §533.440.

[56] "Entitlement" arises under the decree. The Decree establishes the "respective" rights appurtenant to the water entitled lands. Paragraph XII of the Decree states that the Decree "determine[s] all of the rights of the parties to this suit to the water of the Walker River…and it is hereby decreed that none of the parties to this suit…has any right, title, interest or estate in or to the waters of the Walker River…other than as set forth above." Thus, it could be argued that WRID has distribution powers only for provision of storage water to water-righted lands under the Decree.

water.[57] Had the Decree contemplated distribution of storage water to irrigators of lands without decreed water rights, it presumably would have provided that WRID may distribute water stored in said reservoirs to *any* lands in the district (not simply to those "entitled thereto, in accordance with their respective rights.") Barring an alternate reading of the Decree, this interpretation calls into question the legal basis for acquiring and transferring the non-supplemental storage water that has been allocated by WRID to non-decreed lands.[58]

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[57] The 1953 Rules and Regulations for the Distribution of Water of the Walker Stream System Under the Provisions of Paragraph 15 of the Decree in Equity, approved by Order of the Court on September 3, 1953, however, seem to contemplate distribution of the storage water owned by WRID to non-water righted lands. At p.4 of the 1953 Rules and Regulations it is provided that:

> "If at any time the Chief Deputy Water Commissioner determines there is more water available in the stream than is required to fill the rights of all of the vested users, including the rights of the Walker River Irrigation District and others similarly situated to store water, then he shall prorate such excess water to all users in proportion to rights already established." (emphasis added)

This provision is inartfully worded, but apparently has been read to provide authority to the Water Master to include in his annual distribution plan allocation of storage water to non-water righted land. Particularly puzzling is the authorization to "prorate excess water" to all users "in proportion to rights already established." As will be discussed below, it is not easy to ascertain what water users have established rights other than decreed water rights holders (with direct diversion and supplemental storage water rights) and WRID, with storage water rights. This provision may alternatively be read as an authorization to the Water Commissioner to distribute flood (surplus) waters to irrigators already using Walker River Basin waters. Under this reading, it has nothing to do with distribution of storage waters under Paragraph VIII of the Decree.

[58] Under an alternate reading, Paragraph VIII may be construed as conferring on WRID ownership of storage water that could be applied to non-water righted lands (provided that first the rights of the decreed parties for supplemental storage water are satisfied). Paragraph VIII of the Decree (C-125) "adjudges" WRID to be "the owner of the flow and use of the flood water of the East Walker River and its tributaries for storage in Bridgeport Reservoir, to the amount of 42,000 acre-feet, said water to be diverted from said river and stored in said Reservoir from the first of November to the first of March…and also the right to divert and store at any time in excess of 42,000 acre-feet up to 57,000 acre feet when there is in the river a quantity of water in excess of the total amount adjudicated to the parties hereto to the extent of such excess…And said [WRID] is hereby adjudged to be the owner of the flow and use of flood water of West Walker River and its tributaries for storage in Topaz Lake Reservoir…to the amount of 50,000 acre feet such water to be diverted and

In any event, to the extent that such allocations are both lawful and appropriate under the Decree, it appears that users of non-supplemental storage water in Nevada have not received secondary permits from the State Engineer to apply the stored water to irrigation uses. In such cases, these "New Lands" irrigators (irrigators of non-water righted land under the Decree) have no water rights acquired under the provisions of Nevada law, nor under the Decree, and could not transfer any interest in water other than as (annually renewable) licensees of WRID's storage rights. Ownership of non-supplemental storage water rights belongs to WRID and would be transferable by acquisition from WRID.[59] Such transfers would not impair valid existing rights, as the users of that water have no secondary permits under Nevada law, and appear to use the water on an annual basis, under license

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stored in said reservoir from the first of November to the first of March….and also the right to divert at any time in excess of 50,000 acre feet up to 85,000 acre feet when there is in the river water a quantity of water in <u>excess of the total amount adjudicated to the parties hereto to the extent of that excess</u>." (emphasis added)

Although this language is somewhat ambiguous, it could be read as conferring on WRID ownership of storage water that can be distributed to non-water righted lands once the needs (as established under the Decree) of the owners of the water-righted lands, for irrigation (and stock-watering purposes) are satisfied. In construing the Decree's language conferring ownership of storage water rights on WRID, it would be useful to know, at the time the Decree was entered (in 1940), how much supplemental storage water was needed to satisfy the needs of the junior appropriators, under the Decree, during an "average" water year. Under this reading, the language of Paragraph VIII allowing distribution to lands in the District "entitled thereto, in accordance with their respective rights," may be referring to the District's storage rights, not the rights of the water-righted landowners under the Decree.

[59] NRS §539.230(1) provides that the District may appropriate or otherwise acquire water in accordance with the law, and also construct the necessary dams, reservoirs and works for the collection, storage, conservation, and distribution of water for the district and for the drainage of the lands thereof.

NRS §539.230(3) states that "water appropriated or acquired by the District is <u>appurtenant to and may be beneficially used and applied to lands anywhere within the described place of use</u>."

from WRID, as distributed by WRID, guided by the Water Master's annual Plan of Operation.[60]

Section XV of WRID's bylaws provides for distribution of storage waters "in proportion to the apportionment of benefits to such parcel in relation to the total benefits apportioned throughout the entire district." Thus WRID does the distribution (relative to the water duties prescribed to the lands) without regard to whether "secondary" permits have been obtained. Under Section XVI of the by-laws WRID's Board "may increase or decrease the benefits thereto apportioned to any land owner or may apportion benefits to land upon which no benefits have theretofore been apportioned."

Section 2-3 of the By-laws sets forth WRID's view of its authority:

> "According to Judge Norcross' decision in 1941, the US Water Master has no authority to regulate storage water after its diversion from the stream system where no rights to normal flow are involved. Collaterally, the Court does not deny the authority of the District to enlist the cooperation within the District generally of the Water Master to assist the District in its statutory duties of proper distribution and/or regulation of all waters. Thus the Water Master (or the US Board) impliedly derive legitimate administrative and regulatory authority within the District to the extent that the Board of the District chooses to invest them with such authority."[61]

In its Memorandum Decision re Contempt Proceedings in US v. Walker River Irrigation District (Case in Equity, C-125), dated July 8, 1941, the Court (Judge F. Norcross) held that though the Decree required the Court to appoint a Water Master to apportion and allocate the waters of the

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[60] The Water Master (in conjunction with WRID) makes an annual determination with respect to storage waters based on available and forecast inflows/storage. It appears that storage water has been distributed to decreed lands and since the 1920's and 1930's to lands within the District without decreed rights. In the 1930's there were many depression-era and drought-related defaults. This resulted in WRID's stripping the lands of their storage water. ("Lands totaling about 30,000 acres were stripped of their reservoir water rights, leaving 41,000 acres with storage rights." Public Resource Associates 1994, "Water Resources in the Walker River Basin: A Search for Water to Save Walker Lake," pp 12-13).

[61] NRS §539.233 provides that the Board of an irrigation district shall have the power to pass bylaws for the distribution and use of water in the District.

Walker River in accordance with the provisions of the Decree, and even though the Water Master "cooperates with [WRID] in the distribution of storage water subject to its control, it does not follow that such Water Master has authority to regulate storage water <u>after diversion</u> from the stream system, <u>where no rights to normal flow are involved.</u>" Decision at 2 (emphasis added).

Thus, the regulation and distribution of storage water owned by WRID reposes in WRID, and not in the Court, after diversion from the stream system, although WRID appears to "defer" to the Water Master's annual operating plan, which sets forth water availability and allocations. As discussed in Section X, with respect to the delivery of supplemental storage water, WRID has an obligation under the Decree to deliver such water as needed by the decreed water rights holders (up to the specified water duty).

It would appear that the District views the functions of the Water Master with respect to the yearly determinations of water available for storage and its manner of distribution to both decreed rights holders as supplemental water and to New Lands irrigators as a power that the District Board has invited the Water Master to exercise, and constitutes an exercise of invited or derived regulatory power that the Court condones. Bylaws, Section 2-3.

If a storage right is being acquired that is not supplemental to irrigation uses on water righted land, then the entire amount of the storage right can be transferred, and the transfer application may seek also, as part of the application, alternatively, a secondary permit for beneficial use at Walker Lake. If an application is filed solely for transfer of stored WRID water to be applied to beneficial use at Walker Lake, the transfer would likely be considered an inter-state transfer under the jurisdiction of the Court, since the storage rights arise under a California license and the place of use is in Nevada at Walker Lake. Secondary permit approval need not be sought from the Nevada State

Engineer if what is being acquired is a water interest arising under California law, owned by WRID or under license to a Nevada irrigator, whose water interests are derived from the licensor and who has no Nevada water "rights.".[62] Thus the transfer of a storage right to beneficial use at Walker Lake could be done through a transfer application directly to the federal court. The federal court may apply California law as the federal rule of decision with respect to transfer of a (non-supplemental) storage right. See supra at IV.

New Land "licensees" of the WRID storage rights have only rights under an annual license to use the water.[63] Since they have not obtained secondary permits to apply the waters to beneficial use on their lands, they do not have any legally protectible interest that would be injured, for purposes of any application to transfer storage water to Walker Lake. They have not obtained a permit for an appropriation for a beneficial use "as provided in this chapter and not otherwise," NRS §533.030.

Thus, if this analysis is correct, it may be possible to "package" or combine leases, licenses, etc. to use non-supplemental storage water acquired from WRID for a specific period of use into one application for transfer for beneficial use at Walker Lake. The application could be made directly to the federal court if it involves acquisition of storage rights under California licenses for use at Walker

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[62] If a WRID storage right is being acquired that has been administered as a supplemental right to water-righted land under the Decree, it is clear that the storage right cannot be severed from the diversion right and that what can be transferred is limited to the consumptive use on the irrigated land (within the limits of the decree and not to exceed the water duty). The supplemental storage water right is distributed by WRID, and varies annually according to river conditions. The "storage water" is "owned" by WRID. Although, under the non-severance doctrine, the supplemental water right cannot be acquired separately from the decreed diversion right, and may be deemed an appurtenant right that can be acquired directly from the water-righted land owner, in any such transaction, it would be prudent to involve the District.

[63] Any protest to an application to transfer a WRID storage right by a New Lands irrigator would be defeated, since the protestant would not have any legally protectible interest that would be injured. At best, the New Lands irrigators have only annual licenses to use WRID storage water.

Lake, or applications could be made to the Nevada State Engineer for secondary permits for uses at Walker Lake. [64] All such applications would involve WRID's storage water rights, and would require WRID's cooperation and involvement.

XII. Federal Reserved Water Rights Claims

In US v. WRID, pending in the District Court of Nevada (Case in Equity, C-125c), the Walker River Paiute Tribe is seeking a right to store water in Weber Reservoir for use on the lands of the Walker River Indian Reservation, including the lands restored to the reservation in 1936.[65] The Tribe also seeks a reserved water right for direct diversion from the Walker River to the lands restored to the reservation in 1936. The Tribe also seeks federal reserved ground water rights in the groundwater underlying and adjacent to the lands of the Reservation, including lands restored to the reservation in 1936. The Tribe is seeking these reserved water rights for use on reservation lands.

A First Amended Counterclaim, filed July 31, 1997 states the claims of the United States to Walker River water. The claims are made by the United States at the request of the Secretary of Defense, the Secretary of Agriculture, on its own behalf and on the behalf of and for the benefit of the Walker River Paiute Tribe, the Yerington Paiute Tribe, the Bridgeport Paiute Indian Colony, and individual Indians who are owners of allotments in the Basin.

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[64] If application is made for a secondary permit for beneficial use at Walker Lake, the applicant should follow state procedures, and then apply to the federal court for its approval.

[65] By order dated September 25, 1936, the Secretary of the Interior restored to the Reservation approximately 167,460 acres. Counterclaim ¶5. See generally, First Amended Counterclaim of Walker River Paiute Tribe (filed July 31, 1997). The Tribe's priority date for storage in Weber Reservoir is April 15, 1936. The Tribe claims a reserved right for storage of 13,000 acre feet plus evaporation and seepage.

On behalf of the Walker River Paiute Tribe, the United States requests storage rights at Weber Reservoir, with a priority date of 1936. The United States also requests reserved rights for the lands restored to the Reservation in 1936, with a priority date as of the date of restoration. The United States also requests reserved rights in groundwater under all lands of the Reservation. The priority claimed with respect to groundwater rights is November 29, 1859, or "in the alternative" April 15, 1936. See First Amended Counterclaim of the United States.

Federal reserved water rights claims are also asserted for the Yerington Paiute Tribe, the Bridgeport Paiute Indian Colony, and various allotments along the River vested in Indian allotees. Claims are also asserted on behalf of the Hawthorne Munitions Depot, the Bureau of Land Management, and the Forest Service (Toiyabe National Forest).

Mineral County and the Walker Lake Working Group have filed a Motion to Intervene to assert public trust claims on behalf of Walker Lake. Since the filing of the Amended Counterclaims by the United States and the Tribe in 1997 and the filing by Mineral County and the Walker Lake Working Group of a Motion to Intervene in 1994, most of the Court's and parties' involvement has been directed to the complex task of achieving service on the hundreds of water rights holders and claimants in the Walker River Basin in California and Nevada. This task has not been completed.

The Court also ordered mediation in 2003 at the request of the parties. The parties reported to the Court in 2006 that mediation efforts had failed. The Court has since ordered the parties to complete service of process and to proceed. There have been no court rulings on the merits. The Motion to Intervene has not been ruled upon. The case cannot move forward until service is completed.

During the course of the mediation, which began in 2003, the proceedings were stayed. That stay has now been lifted. The United States has agreed to defer its requests for water rights for the Forest Service and the Hawthorne Munitions Storage facility, and other Indian allotees and reservation claims, and first to obtain court rulings as to the reserved rights claimed by the Walker River Paiute Tribe.

The Claims of the Tribe and the United States for federal reserved rights in groundwater are premised on the interrelationship between groundwater and upstream use by junior upstream appropriators of groundwater connected to the Walker River for irrigation. This irrigation use has contributed to increased groundwater levels in the Mason Valley. This groundwater (much of it Walker River water) is being pumped for supplemental irrigation uses under permits issued by the Nevada State Engineer. If granted by the Court, the reserved rights claims of the Tribe to underground waters could result in reduced irrigation throughout the Basin, and depending on the seniority date, could trump many junior ground water rights held for irrigation purposes under Nevada permits.

XIII. Waste of Water; The Impracticability Requirement

NRS §533.530 provides that it is an unlawful use and <u>waste</u> of water for any person during the irrigation season "to divert and conduct the water… of any river…into any slough, dam, or pond and retain, or cause the water to be retained therein, without making any other use of the water, or to divert water, and allow the water to run to waste on sagebrush or greasewood land."

NRS §533.040 provides that "if at any time it is <u>impracticable</u> to use water beneficially or economically at the place to which it is appurtenant, the right may be severed from the place of use and be simultaneously transferred and become appurtenant to another place of use…without losing priority of right."

NRS §533.040 implements the prohibitions of NRS §533.530 relating to waste. NRS §533.040 was intended to facilitate or promote transfers through severance of water rights when irrigation is no longer practicable. It was not intended to inhibit transfers by designating impracticability as the sole "criterion" for transfer. Water rights can be transferred to another place of use (and severed) if the lands on which they are being used are currently irrigable and productive.[66] They can also be transferred if the lands have become "impracticable" for irrigation use. However, any such transfer of a post-1913 decreed unused diversion right must take place before a forfeiture occurs under NRS §533.060, to the extent that Nevada Acts of 1999, Ch 515, §7, may be applicable. See supra at 20,n.28.

XIV. Severance of Supplemental Ground Water

In 2004 the Nevada Department of Wildlife filed an application for a temporary change in the diversion and place of use of supplemental underground water, previously appropriated to the Mason Valley Wildlife Management Area, for wildlife and recreation purposes. The "supplemental

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[66] In US v. Alpine Land and Reservoir 878 F.2d 1217, at 1227 (9th Cir.1989), the Court of Appeals held:

> "The district court concluded that the Engineer had made an implied finding that irrigation was impracticable on the transferee properties. Section 533.040..1 provides [t]hat if for any reasons it should at any time become impracticable to use water beneficially or economically at the place to which it is appurtenant, the right may be severed from such place of use… The Tribe argues that this section precludes the Engineer from granting a transfer application unless it is well-nigh impossible to irrigate the transferor property economically. Nevada case law does not support this restrictive reading of section 533.040.1, nor does the statute itself indicate that the Engineer can approve an application only if present use is impossible." (emphasis added)

underground water" was permitted to supplement Decree C-125 water rights (for irrigation). Under Application 70649, in March 2004, the State Engineer had previously approved the transfer of up to 13,588 acre feet of water to be changed from irrigation on the Mason Valley Wildlife Management Area to Walker Lake for a single irrigation season. The new application (71612T) explained that the change application was needed to supplement the surface water now not available for use at the Refuge as a result of approval of Permit 70649, in order to maintain wetland habitat at the Mason Valley Wildlife Management Area.

In Ruling 5501, the State Engineer characterized a supplemental underground right as follows:

> "Supplemental underground rights are primarily issued for the purpose of insuring that irrigated land can receive its full duty of water when surface water rights cannot be satisfied due to some circumstance that is out of the control of the farmer, such as drought. In a normal water year, it is expected that the supplemental underground right would not be utilized and only a portion of the right would be utilized in a drought year. The supplemental underground right is tied to the surface water on the existing place of use. Under most circumstances, the supplemental underground water cannot be changed without a corresponding change in the surface water, i.e. both the surface water and underground water must move together or, in some circumstances the surface water may be moved if the underlying supplemental underground water is withdrawn." Ruling, at 2.

In his ruling the State Engineer concluded:

> "In this case, the applicant [Nevada Department of Wildlife] has proposed severing the supplemental underground water from the surface water on the existing place of use to utilize the underground water at a nearby place of use on the Mason Valley Wildlife Refuge. The reason given for needing additional water is that the amount of surface water on the new place of use was reduced as a result of the applicant diverting a substantial portion of its surface water to Walker Lake. If Application 71612-T were approved, this would create an improper use of a supplemental underground [water] right that would result in an additional withdrawal of underground water from the Mason Valley aquifer that would not otherwise occur, thus creating a de facto water appropriation of 450 acre-feet in a groundwater basin where new appropriations of water are limited to preferred uses less than 1,800 gallons per day (`2.02 acre-feet) by State Engineer's Order No. 1125. The

> supplemental underground water has a period of use that ends with the typical irrigation season on October 15th of each year. The request temporary change would result in water being withdrawn from the aquifer after that date.
>
> The State Engineer finds the proposed changes under Application 71612T are inconsistent with the supplemental character of Permit 18934, Certificate 6075, and would result n the additional withdrawal of 450 acre-feet of ground water that otherwise would not be withdrawn from the underground aquifer." Ruling 5501 at 3.

Ruling 5501 would have to be taken into account with respect to any acquisition of a permit to pump groundwater. To the extent the permit involved a supplemental underground right, as defined in Ruling 5501, any water derived from pumping under the permit could not be separately acquired, but could be acquired only as a "package" of direct diversion rights, underground water, and any supplemental storage water.

XV. Combined Applications for Change of Place of Use of Surplus (Flood) Waters and Severance of Storage and Underground Rights.

Ruling 5113 of the State Engineer is instructive with respect to the legal limitations on transfer of excess waters, supplemental storage, and underground water rights as a "package." Applications for a change of place of use with respect to surplus water, supplemental storage rights, and underground waters, were filed with the State Engineer in 1998. These applications involved a proposed transfer by WRID and applicant Fulstone of 246.87 acre-feet of Permit 5528 water (surplus or flood rights), a proposed transfer of a certificated direct diversion irrigation water right (671.52 acre-feet), and a proposed transfer of appropriated certificated underground water as well as storage water, all to the same place of use The State Engineer rejected these applications. The State Engineer noted the intention of the applications to co-mingle groundwater, storage, and direct diversion rights and transport them via the River Simpson Canal to the new place of use within the

District. The new place of use was described as being of better quality for irrigation uses than the "marginally producing low lands" then being irrigated. Ruling 5113, at 5.

In rejecting these applications, the State Engineer first stated that under WRID's internal rules "storage water transfers within a river section can be requested by the holder of such a water right from WRID throughout the irrigation season."[67] Ruling at 7. The State Engineer further found that storage water transfers can cause "a separation of supplemental storage and underground water rights wherein only <u>one</u> of the <u>supplemental</u> waters is transferred from the original place of use, which in effect is an expansion of acreage since previous supplemental waters will now be irrigating different acreages." <u>Ibid.</u>

The Engineer concluded:

> "The type of transfer proposed under the subject applications would cause <u>additional pumpage for those lands with underground water rights now lacking supplemental storage water</u>. The State Engineer finds that the proposed and existing places of use of the applications do not have water rights under the Walker River Decree for direct diversion…<u>The State Engineer further finds that he cannot control nor ensure the union between supplemental storage and underground water rights since storage water can be separated and transferred without his knowledge</u> [under WRID internal rules]." Ruling at 7.

In denying the transfer applications, the State Engineer concluded that to approve them would be contrary to the public interest since underground diversion "will necessarily and inversely vary as

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[67] Regulation No. 7 of WRID's Rules and Regulations Governing the Distribution and Use of Water (revised January 1986) allows for the "temporary transfer of storage water" to any other land owner within the District, provided the assignments are for one season only, are approved by the District, and do not result in an exceedance of the water duty "originally allocated to said parcel." The Regulation also provides: "The temporary transfer of storage water to be used on non-water right land is prohibited." By email dated 3/19/07, Ken Spooner, General Manager of WRID, clarified that any petition to transfer stored water within District boundaries on a *permanent* basis may only be to non-water righted land.

the allocation of storage water to the proposed place of use." Ruling at 8. Thus, severances of the supplemental water rights from the base irrigation right could result in increases in ground water pumping and/or use of storage water to the extent that the new place of use would now have a higher consumptive use. Id.

With respect to the application to change the place of use of the excess (surplus) waters, the State Engineer concluded that it would be against the public interest to approve an application to change the place of an irrigation use that would have to rely on an "undependable source." The State Engineer found that: "…flood water is undependable because it is seasonal and under Certificate 8859 can only be diverted for a 92 day period of use from May 1 to July 31 each year."

Thus the State Engineer's concern with the use of flood waters to irrigate previously non-irrigated lands is that the "uncertainty of occurrence of floodwater creates an increasing dependence upon the reliable groundwater source." Upon this basis, the State Engineer concluded that "to issue a permit under Application 51925 (for change of use of surplus waters) for irrigation purposes would conflict with existing water rights and would threaten to prove detrimental to the public interest."

Ruling 5113 is important in the following respects:

a. transfers in the place of use of flood waters for irrigation uses on non-water righted land will be reviewed skeptically by the State Engineer in light of its implications for augmented groundwater pumping;[68] and

b. the intra-district transfer approvals by WRID have resulted in severances of supplemental water rights from base rights that may result in increases in ground water pumping (and storage water

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[68] The groundwater basins in the Walker River Basin in Nevada have been designated by the State Engineer and are closed to further appropriation for irrigation purposes. See, e.g., Order 1125.

uses) and that have made it difficult for the State Engineer to exercise regulatory oversight over the use of water for irrigation purposes in the Walker Basin.[69]

XVI. Public Interest Considerations in Transfer Applications With Respect to Groundwater Appropriation Permits

In the Matter of Applications 31645, 31646, 31647, 31648, Filed to Appropriate the Waters of an Underground Source in Mason Valley, Lyon County, Nevada, the State Engineer rejected three applications to appropriate water from an underground source in Mason Valley. The Engineer denied the applications on the ground that irrigation of additional land or more intensive agricultural uses using groundwater is "not considered to be a preferred use of the limited water resources of the Mason Valley." Ruling at 5.

The State Engineer found, in connection with this ruling, that:

> "The groundwater reservoir water table has risen since the advent of farmland irrigation in Mason Valley and the water table is now substantially higher than under natural conditions prior to the initiation of irrigation in the valley. The rise in the water table has now nearly stabilized with water levels close to the surface in most of Mason Valley." Ruling, at 3.

Recognizing the interconnectedness between ground water pumping and flows in the River, the State Engineer concludes:

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[69] In Ruling 5113, at p. 8, the State Engineer notes that the "amounts and types (decreed, storage, and surplus) of water delivered to the various places of use for irrigation in Smith Valley by WRID vary from year to year, and <u>currently there is not a readily available method to differentiate between flood and storage water delivered within the Basin</u>. The State Engineer finds that he will not be able to determine the amount of flood and storage water delivered to the proposed places of use under Application 51925, 51926, and 51928. Therefore, he will not be able to determine if the amount of groundwater pumpage is equitable or excessive, or if the welfare of the area will be threatened by overpumpage [if permits are granted as applied for]," Ruling at 8-9.

> "The underground water applied for …would diminish return underground and drain flow to the Walker River and so would adversely affect the prior rights as set forth in Decree C-125 and would conflict with appropriated rights on the Walker River Stream system." (Ruling at 5)

In other rulings as well the Nevada State Engineer has repeatedly recognized the interconnected nature of surface diversions and groundwater pumping in the Nevada portion of the Walker River Basin. See, for example, Re Application 33341 to Appropriate Underground Water. A transfer of water rights vested under the Decree to another place of use would involve, as discussed above, a transfer of water consumptively used. Water consumptively used would include water lost through seepage to the aquifer, but would not include irrigation return flow to the River.

In connection with an application to transfer direct diversion rights to Walker Lake, the State Engineer could take into account the loss to the aquifer through lack of seepage due to fallowing. Although the amount transferred is usually measured by historical consumptive use, there could be some offset against that amount to account for the loss to the aquifer of seepage water at the former place of use. [70]

XVII. Determination of Consumptive Use

In North Kern Water Storage District v. Kern Delta Water District, 147 Cal.App.4th 555 (2007), North Kern sought to establish that Delta had forfeited the portion of its appropriative right that exceeded Delta's historical use of the water. In California, in order to establish a forfeiture, the plaintiff must prove that the defendant failed to use some portion of its water entitlement over a period of five years immediately prior to the plaintiff's assertion of conflicting rights.

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[70] The relevant public interest factors, with respect to transfer applications in the Walker Basin include, inter alia, "whether a reduction of static water [levels] is reasonable." See US v. Alpine Land & Reservoir, 341 F.3d at 1182-1183, supra.

The California Court of Appeals had previously held that in determining the amount of forfeited water rights "use during each measurement period, whether a month, by, growing season, or otherwise, is then to be compared across the forfeiture period." 147 Cal.App.4th at 560. The Court continued:

> "The amount forfeited, if any, is the amount of difference between the highest use in any period within the span and the entitlement to water established by the appropriation…(Id.)

In this case, the Court noted that the parties had accepted orders from their irrigation customers on a daily basis. The Court also noted that the parties did not retain records of use for each day but instead consolidated their records into monthly reports. The Court of Appeals affirmed the trial court's adoption of the monthly average measure as providing the closest available basis for evaluating the parties actual daily use of water, in light of the unavailability of the daily records. 147 Cal.App.4th at 573.

In affirming the trial court's use of monthly records to determine the actual daily use of water the Court commented:

> "[T]he pattern of initial need could validly be viewed as the seasonal use necessary to bring a crop to maturity. But the pattern of initial need could equally validly be viewed as the daily need for water to sustain the growth of the crop until the next water becomes available. In this case, the evidence showed that irrigators determined need on a daily basis, even though that resulted in seasonal patterns of use. Ample evidence supports the trial court's conclusion that daily measurements reflected historical pattern of beneficial use of Kern River water."[71] Id.

XVIII. Acquisition of Water Rights from Mutual Water Companies

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[71] The trial court subtracted the greatest amount diverted in any of the 5 preceding Januaries, for example, in the forfeiture period, from the monthly entitlement. The result was the amount forfeited from the water right for all future Januaries. (Opinion at 148)

Under Decree C-125, more than 256 cfs of natural flow diversion rights of varying priorities were adjudicated to water users in and above the Antelope Valley in California; of these, approximately 228 cfs (nearly 90%) were adjudicated to the Antelope Valley Mutual Water Company. (Walker River Basin Water Rights, Volume 1: An Introduction to Natural Flow Diversion Rights defined in Decree C-125, Nevada Division of Water Planning, September 1999, Appendix C.)

Under California law, a mutual water company may be formed wherein the individual holders of water rights may either reserve their water rights and delegate to the company the function of handling the diversion and distribution facilities, or convey water rights to the company for the purpose of convenience in management and distribution of the water. Hutchins, California Law of Water Rights (1956). According to Hutchins:

> "Some mutual irrigation companies are formed for the purpose of acquiring appropriative rights for the service of agricultural lands within reach of their conveyance and distribution systems. The shareholders of such a company are equitably entitled to the proportionate distribution of such waters as the corporation acquires by appropriation or otherwise for the uses for which the waters are acquired." (p169)

In some mutual water companies, the incorporator-irrigators assigned their water rights to the corporation in exchange for shares of capital stock. Where such has occurred, the stockholders still possess individual water rights, and there has been no severance of the water right from the land to which it is appurtenant. Woodstone Marble and Tile Company v. Dunsmore Canyon Water Co., 47 Cal.App.72 (1920). The corporation becomes merely the agent of its shareholders for the purpose of serving their mutual interests in the distribution of water for irrigation. The company is in effect a trustee of the individual water rights that has "mere naked title" for the use of the beneficial owners. Quist v. Empire Water, Co., 204 Cal.646,651, 269 P. 533 (1928).

Thus in such a mutual water company a water right may be obtained from the company and transferred to another place of use. Acting as a trustee of the individual stockholders, the company can sell, lease, or otherwise make a disposition of the water right. Whether nor not such a sale can be approved by a majority of the shareholders, or by its Board of Directors, is a matter to be determined under the company's by-laws.

This writer has examined a copy of the by-laws of the Antelope Valley Mutual Water Company, dated January 16, 1926, as amended November 30, 1978. Under these by-laws, which were not obtained directly from the company, and which may not be current, it is clear that the company has shareholders. Each share of stock "shall be entitled to receive its proportional share of all of the waters and water rights owned by the corporation without priority and to receive a flow of approximately .0159 cfs of waters of the West Walker River." By-laws, Article VI. There are 14,643 shares. Id. Although the stock is transferable, the water is owned by the corporation. Id. The by-laws provide that water shall be delivered, supplied, and distributed "only to owners of the capital stock of the corporation, and such stock and the water rights thereunder shall be appurtenant to those certain lands described in that certain decree entitled Pacific Live Stock Company…v. Rickey et al." Id.

Although the stock is transferable, and rotation in the use of water within the boundaries of the company is encouraged, any use of the water outside of the boundaries would require approval of the Company. It is unclear whether this could be done by the Board of Directors, or whether it would require a vote of the shareholders. Any shareholder, however, is subject to assessments to "carry forward the objects and purposes for which the corporation is formed." Article IX. Thus, even though the place of use of the water would not be within the company's boundaries, and such use was approved by the company, any assessments would still have to be paid by the shareholder or by the transferee of shares, according to the negotiated provisions of the transfer contract or sale agreement.

APPENDIX A

Water Rights Claimed by WRID

In its Memorandum in Opposition to Petition For Writ of Mandamus, filed in the Nevada Supreme Court by Mineral County in Mineral County v. State of Nevada (Case No. 36352, October 2000), WRID, through its legal counsel, characterized its water rights as follows:[72]

"(b) California Surface Water Rights Recognized By The Walker River Decree.

(i) Bridgeport Valley

There are approximately 26,000 water right acres in Bridgeport Valley in California. With respect to those lands, the Walker River Decree provides for direct diversion rights from the natural flow of the various tributaries to the East Walker River. In addition it allows for the storage of water in Upper Twin Lake, Lower Twin Lake, East Lake, West Lake and Green Lake all in California to be used to irrigate those lands, which also have a direct diversion natural flow right under the Walker River Decree. Ax. At 118-128. These direct diversion, storage rights and storage reservoirs are owned by individual farmers and the water rights are established under California law.

In addition, the Walker River Decree recognizes the right of the Walker River Irrigation District to store water from the East Walker River in Bridgeport Reservoir in California for distribution to and use upon land within the District. This water right is established under California law for use in Nevada. Bridgeport Reservoir has a capacity of 42,460 acre feet and the District's storage right allows for filling and refilling in certain circumstances.

(ii) Antelope Valley.

There are approximately 14,600 water rights acres in Antelope Valley, substantially all of which are located in California. The Walker River Decree provides for direct diversion rights form the natural flow of the West Walker River for irrigation of those lands. In addition it allows for the storage of water in Poor [?] Lake in California to be used to irrigate lands in Antelope Valley which also have a direct diversion natural flow rights. Those direct diversion, storage rights and storage reservoir are owned by

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[72] The memorandum is signed and dated October 2, 2000,by Gordon DePaoli, Esq., counsel for WRID.

individual farmers and in some cases by the Antelope Valley Mutual Water Company and the water rights are established under California law. Ax. At 78-86.
In addition, the Walker River Decree recognizes the right of the District to divert water from the West Walker River in California into Topaz Reservoir, located partly in California and partly in Nevada, for distribution and use upon the lands within the District. This water right is also established under California law for use in Nevada. Topaz Reservoir has a capacity of 59,400 acre feet and the District's storage right allow for filling and refilling under certain circumstances. Ax. At 134

(c) Nevada Surface Water Rights Recognized By The Walker River Decree.

(i) Walker River Irrigation District.

Of the 79,906 water right acres along the East Walker River, and in Smith and Mason Valleys in Nevada and located within the boundaries of the District, the Walker River Decree provides for direct diversion rights from the natural flow of the West, East and Main Walker Rivers for approximately 45,420 acres. Those direct diversion rights are owned by individual farmers and are established under Nevada law. <u>See</u> <u>e.g.</u>, Ax at 86-140. In addition, and as authorized by the Walker River Decree, approximately 28,930 of the 45,420 water right acres have direct diversion rights with priorities of 1874 and later, and receive supplemental storage water from Bridgeport and Topaz Reservoirs. <u>Finally, as authorized by the Walker River Decree, approximately 34,370 acres of land with no direct diversion rights receive stored water form Bridgeport and Topaz Reservoirs.</u> (Ax at 132-136.)

…<u>The District holds additional permits to surplus Walker River surface water in Nevada</u>. It holds Permit No. 5528, and Certificate No 8859 on the West Walker River for 491.2 cubic feet per second not to exceed 89,612 acre feet annually to irrigate descried land within the District. That permit was issued by the Nevada State Engineer in 1971 and has a priority of June 6, 1919. The District holds Permit No. 25017 and Certificate No. 8860 on the East Walker River for 349.1 cubic feet per second not to exceed 63,688 acre feet annually to irrigate described land within the District. That permit was issued by the Nevada State Engineer on October 15, 1976 and has a priority date of April 11, 1969. Use of water under all of these permits is limited to no more than 4.0 acre feet per acre of water from all sources. Finally, the District also holds Permit No. 9405, applied for in 1931 and issued in 1954, to appropriate up to 200,000 acre feet annually to be stored in a new reservoir on the West Walker River, downstream of Topaz Reservoir, commonly referred to as the Hoye Canyon Reservoir. This reservoir has not been built. Ax. At 165-176." (emphasis added)

APPENDIX F

Western Environmental Water Transactions: A Perspective on Experience and Institutions for The Walker Lake Basin, Nevada and California

A report submitted to

Great Basin Land & Water

By:
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Law Offices of Steven Malloch
Seattle, Washington

March 28, 2007

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Errors and omissions remain, of course, my responsibility; they persist despite the excellent information and advice received.

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The Walker Lake Basin, Nevada and California

1.0 Introduction

This report is intended to provide those charged with acquiring and managing water, land and related interests in order to restore and protect Walker Lake, Nevada, with background and perspective on how the field of water acquisition is developing in other areas of the West.

In 2002, a provision of the Farm Bill called for the Bureau of Reclamation to provide water to at-risk natural desert terminus lakes. As subsequently modified, that meant to research the need for, and provide the means to, supply water to restore fish, wildlife and associated habitats of specified desert lakes, including Walker Lake.[1] Under this authority and funding, the US Geological Survey (USGS) is conducing comprehensive studies of the hydrology of the Walker River watershed, including groundwater, and Walker Lake. When finished, in FY 2008, the USGS analysis should provide the science upon which to base any comprehensive effort to restore Walker Lake. Money was also provided to the University of Nevada to begin water acquisition and related efforts in the basin, part of a longer term effort to supply water to Walker Lake.

For this report, water acquisitions around the Western United States, primarily outside of Nevada, were surveyed. The objective was to provide perspective from efforts already in progress to help guide the Walker River and Lake Basin improvement project.

[1] Section 2507 of Public Law 107-171; Section 207 of Public Law 108-7.

2.0 Walker River and Walker Lake

Walker Lake, located in central Western Nevada, is a rare desert terminal lake – Walker River flows into it, but it has no surface outlet. As a terminal lake, its water exists in a delicate balance between inflow and evaporation. If inflow exceeds outflow (primarily evaporation), the lake level rises and the lake becomes less salty, as fresh water dilutes the salt remaining behind when water evaporates. If inflow drops below evaporation, the lake level falls until a new equilibrium is reached, and the water becomes more salty.

Diversions from Walker River and its tributaries for irrigated agriculture have greatly reduced the inflow into the Lake. Through agriculture extending from near the headwaters of Walker River, in California's high Sierra Nevada, down to Walker Lake proper, river flows have been diverted and put to economic use.[2] Because the Walker River crosses the California-Nevada state line, water law applicable is complex, involving both states' surface and groundwater law, as well as the jurisdiction of the federal courts when interstate disputes arise.

2.1 Salinity and Inflows

The Walker River basin covers an area of approximately 4050 square miles, on the boarder between California and Nevada. The California portion, about a quarter of the total area, includes a part of the high Sierra Nevada; most of the precipitation falls and most of the river flow arises in this part of the basin. On the other hand, most of the consumptive water use, as much as 90%, is in the Nevada portion of the basin.[3]

The Walker River system has two main tributaries, the West Walker River and the East Walker River. The West Walker River arises south of California's Yosemite National Park and flows north into Antelope Valley, one of the major agricultural areas within California. Topaz Reservoir, one of the three main storage reservoirs is located on the West Walker River. The East Walker River arises in the high Sierras north of Mono Lake. Bridgeport Reservoir, another main storage reservoir is located on the East Walker River. The confluence of these two tributaries is just upstream of the city of Yerington, Nevada, in Mason Valley. The main Walker River flows first north then south into the Walker River Paiute Indian Reservation. Continuing through the Reservation, the River enters Weber Reservoir, and then flows south twenty miles into Walker Lake.[4]

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[2] Two outstanding summaries of history, technical and other information on the Walker River are available, one from California and one from Nevada. For a history and overview of the Walker River, as well as one of better summaries of the technical issues see the Nevada Division of Water Resources Walker River website: http://water.nv.gov/Water%20Planning/walker/wrchrono.htm. California's perspective is found in: Department of Water Resources, 1992. *WALKER RIVER ATLAS*, State of California. A diagrammatic view of the Walker River and its major diversions is at: http://water.nv.gov/Water%20Planning/walker/walker5.htm.

[3] Nevada Division of Water Resources, Walker River. http://water.nv.gov/Water%20Planning/walker/walker1.htm (hereinafter NDWR, Walker 1)

[4] NDWR, Walker 1.

The USGS estimates that between 1882 and 1994, the level of Walker Lake dropped by 140 feet, and salinity increased from about 2,500 mg/l to 13,300 mg/l with salinity reaching 15,000 mg/l by 2004. The cause -- reduced inflow because much of the water from the Walker River was diverted for irrigated agriculture. With current water management on the Walker River, except during floods, the Walker River rarely reaches Walker Lake.[5]

Salinity in Walker Lake is reaching levels that eliminate the ability of some of its native fish and wildlife to live. In particular, the Walker Lake and River have populations of Lahontan cutthroat trout, the state fish of Nevada,[6] and a species listed as threatened[7] under the Endangered Species Act (ESA). Other native fish include the Lahontan tui chub, Tahoe sucker and Lahontan redside, which provide food for the cutthroat and migratory waterfowl. An estimate of a relatively safe level of salinity for the trout is about 12,000 mg/l. At about 16,000mg/l, salinity will be too high for a viable fishery population; at present salinity levels there is essentially no natural trout reproduction and the population is sustained only through stocking of hatchery-raised fish.[8]

The reasons for the increase in salinity of Walker Lake are not completely understood. While the reduction in inflows due to agricultural irrigation has played a large role in causing Walker Lake to become much smaller and shallower than in 1882,[9] basin precipitation is quite variable and may have played a role as well. Salinity increases are even more complicated. Reducing the water volume in the lake through evaporation has increased salinity levels, but there may also be re-dissolution of salts already in sediments. While there is some degree of uncertainty as to the cause, reduced inflows with attendant water quality decline, are causing problems for aquatic life. Also clear is that diversion for irrigated agriculture is at least a major contributing factor in the decline, and unlike precipitation, is within human control. Therefore, reducing irrigation diversion will be a part of any effort to restore and sustain the health of Walker Lake.

A simple water balance shows the fundamental problem of insufficient inflows. At its current size, evaporation from Walker Lake is about 137,000 acre-feet per year. Surface inflows to the Lake from Walker River for the period 1939-1993 averaged 76,000 acre-feet (but were highly variable), with an additional 14,000 acre-feet in direct precipitation on the Lake and 11,000 acre-feet in groundwater and 3,000 acre-feet of local surface inflow. That results in a long term average of about 104,000 acre-feet of inflow and 137,000 acre-feet in evaporation, for a 33,000 acre-feet average annual deficit over a 60 year period.[10]

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[5] USGS, 2007, Hydrology of the Walker River Basin, http://nevada.usgs.gov/walker/index.htm
[6] http://firstlady.state.nv.us/NevadaStateSymbols.htm
[7] USFWS 2007, Species Profile, Lahontan cutthroat trout. http://ecos.fws.gov/speciesProfile/SpeciesReport.do?spcode=E00Y
[8] NDWR, Walker 1.
[9] In 1882, Walker Lake was estimated to be about 224 feet deep and contain about 9 million acre-feet. It is now about 90 feet deep and holds 2 million acre-feet. It has about 50% of its 1882 surface area and 28% of the volume. NDWR, Walker 1.
[10] NDWR, Walker 1.

Walker River Watershed

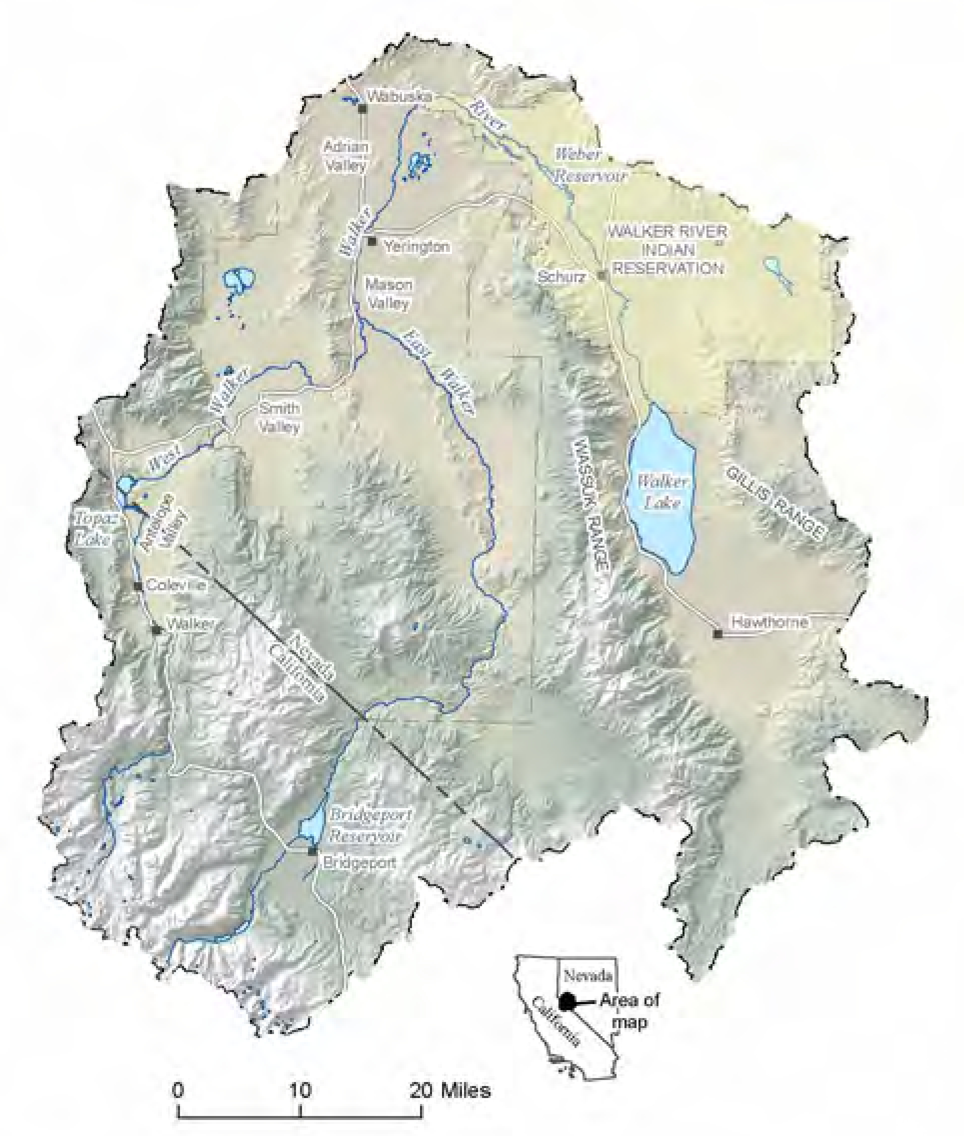

Figure 1: Walker River Watershed
Source: USGS http://nevada.usgs.gov/walker/index.htm

To sustain salinity at a level safe for Lahontan cutthroat trout and other species, more water than just this 33,000 acre-feet per year would be needed; the USGS and others are working on estimating what inflows are needed to stabilize Walker Lake. Once the Lake is stabilized at about 12,000 mg/l, this additional inflow does not need to occur every year, it could be more in wet years and less in dry, in order to minimize the impact on local agriculture and the communities that depend on agriculture.

2.2 Basin Water Institutions

Key actors in the Walker River watershed's management and regulation of water and water rights include:

- The Federal District Court for Nevada. Because water rights in both California and Nevada were involved, in 1902, suit was filed in the Federal District Court seeking adjudication of the water rights in the Walker River. In 1936, the court issued Decree C-125, known as the Walker River Decree, establishing rights to surface water, but not groundwater, in the basin. Under this Decree, finalized in 1940, the Court has jurisdiction over many aspects of surface water rights management. Administration of Decree C-125 is the responsibility of the US Board of Water Commissioners (USBWC), which acts as Water Master. USBWC has adopted Administrative Rules and Regulations for the administration of surface water rights, including changes to point of diversion, place of use, or manner of use of water.

- State of California. California water rights are administered by the State Water Resources Control Board (SWRCB) subject to review by the Federal Court under Decree C-125. The SWRCB is also responsible for water quality and the public interest in California's rivers, lakes and reservoirs within its borders, including two of the main storage reservoirs on the Walker River. The Department of Fish and Game manages wildlife.

- State of Nevada. The State Engineer and the Division of Water Resources administers Nevada water rights. Its administration of some Walker River surface rights is subject to review by the Federal Court under Decree C-125; however it has treated other surface rights and groundwater as not being subject to Decree C-125. The Department of Wildlife manages fish and game. The University of Nevada is also engaged through federal funding for the Walker Lake issues.

- Nevada's Congressional Delegation. Nevada's delegation, particularly Senate Majority Leader Senator Harry Reid is very involved in Walker Lake issues. Most recently, Senator Reid and Senator John Ensign have worked to provide significant federal appropriations to the University of Nevada for addressing the situation.

- Walker River Paiute Tribe. The Walker River Paiute Tribe is located on the Walker River Indian Reservation, along the lower Walker River, just upstream of Walker Lake. The Tribe has senior water rights for its reservation, but is seeking additional rights for restored portions of its reservation and Weber Reservoir through litigation.

- Irrigation and Ditch Companies. There are a number of irrigation and ditch companies on the Walker River and its tributaries. The largest and by far the most important in management of Walker River water rights is the Walker River Irrigation District (WRID), which owns and operates the primary storage on the Walker River, Bridgeport and Topaz Reservoirs, and distributes water to its members. Other companies own and operate 6 small reservoirs and numerous diversion structures, ditches and laterals.

- Federal Agencies. Some of the federal agencies engaged in the Walker River and Lake include: US Fish and Wildlife Service; US Forest Service; Bureau of Land Management; US Army; US Marines; Bureau of Indian Affairs; Department of Justice; and Bureau of Reclamation.[11]

- Local Government. Local government most actively involved in these issues includes Mineral and Lyon Counties in Nevada and Mono County in California, the city of Yerrington, and some of the smaller communities.

[11] The Walker River does not have a Bureau of Reclamation water project. However, the Bureau is administering the desert terminal lakes funding, and has had an advisory role. The major federal presence is through the Bureau of Indian Affairs and the Bureau of Land Management.

3.0 Hydrology and Water Law

Hydrologists tell a joke to explain why plumbers are paid more than they are – both know that water runs downhill, but plumbers also know that the hot water tap is on the left. The truism in the joke is that hydrology is essentially the study of water flowing downhill.[12] Water engineering manipulates that flow to achieve human purposes; fundamentally it is plumbing on a large scale. Water law determines who has legal rights to use the benefits of water as it makes its way downhill. The end result is that most water lawyers become reasonably proficient lay hydrologists and engineers; and most hydrologists and water engineers become very familiar with the water law within the jurisdictions they operate.

Purchasers and owners of real estate typically do not need any knowledge of geology, but water rights owners and purchasers do need an understanding of hydrology. The reason for this is a fundamental difference in the nature of ownership. An owner of land owns the dirt, can put a fence around the property, and subject to a host of zoning, building and environmental limits, can do with it as he or she pleases. An owner of water rights usually has only a right to the benefits the water provides, but not the water itself.[13] In legal terms, this water right is not entirely exclusive – other people may have rights to the benefits of that same water as well, either before or after its use. Hence the need for integrating an understanding of how the water moves into any proposed change to use; other people are inevitably injured, benefit or are otherwise interested.

Addressing Walker Lake inflows by manipulating water use and rights through willing-seller acquisitions requires a deep understanding of both the hydrology and water law of the Walker River basin. That deep background is well beyond the scope of this report, and is left to other efforts. Instead, this chapter provides a very brief overview of selected concepts of hydrology important when changing the location or use of water. It also provides a brief discussion of selected elements of water law relevant to such changes. While hydrology respects no state boundary, people must; therefore both California and Nevada law is presented. The intention is to provide just enough background material to help in understanding issues presented in descriptions of other Western efforts to move water in the following chapter.

3.1 Hydrology and Water Use Concepts

In considering changing the place and manner of water use in Western watersheds, several hydrological and irrigation concepts are frequently used. Explaining those concepts helps in understanding the issues involved in water transactions. In the

[12] More sophisticated hydrology extends that to water flowing from higher potential energy to lower potential energy. The typical ways this is expressed is in “head” or differences in pressure expressed as the weight of a column of water a certain distance high. The most common source of head is gravity, resulting in water running downhill.

[13] In legal terminology, a water right is a *usufructory* right. One has the right to the fruits of the water use, not the water itself.

following section, several of these concepts and their application to changes in water use are presented. A very simplified outline of water use concepts, with key terms in bold, relevant to agricultural water use and transfers follows.

Water from surface rivers or lakes is taken from those surface sources through a **diversion,** typically a dam or weir that redirects water into a **conveyance structure,** usually a ditch or pipeline. Diversion may also be through pumps that pull water from a deep section of a water body. Commonly, one of the measures of a water right is the amount of water that may be diverted. This diversion may be categorized in terms of a total amount of water (usually acre-feet) per growing season or year, or may be characterized in terms of a rate of diversion (often cubic feet per second) over a period of time. Decree C-125 on the Walker River typically measures water rights as a rate of flow (cubic feet per second) over an irrigation season for a specified number of irrigated acres.

Flowing through the conveyance structure, either by gravity or after pumping, water reaches a **headgate,** which diverts water from the conveyance structure to fields. There may be several or many water users drawing from a ditch; typically they band together in ditch companies or irrigation districts to share the expense of constructing and maintaining the ditches. Water is often transported significant distances in ditches before reaching the fields. During transportation water may seep out of the ditch into the ground, or may evaporate from the water surface. The difference in the amount of water diverted at the diversion and the amount of water reaching the headgates is the **conveyance loss.** Depending on the type of conveyance structure, the distance water travels, and the geology of the terrain through which the water travels, conveyance losses may be substantial. Particularly where ditches are simply scraped out of the ground, and are not lined with concrete or some other material to reduce seepage, a substantial proportion of water diverted may never reach the headgates. While commonly used figures for conveyance losses from ditches are in the range of 15% to 20%; the losses vary widely, and site specific information is needed to understand any specific situation. In cases where an unlined ditch crosses gravel or sandy soil, losses may amount to 75% or more. Some portion of the conveyance loss is evaporation, water that returns to the atmosphere. Most conveyance loss, however, is water that enters the soil column and groundwater system.

An agricultural producer takes water from the headgate and applies water to the fields. On the fields, some of the water is used by the plants -- incorporated into plant tissue, or drawn through the plant and transpired to the atmosphere. Other water is evaporated from the ground surface, ponded water or sprinkler spray. The process of water being incorporated into plant tissue, transpired or evaporated is termed **evapotranspiration.** Evapotranspired water is removed from the immediate hydrological system.[14]

[14] Water evaporated in one part of the country may fall as rain or snow in another area. In the US, where the dominant weather pattern is from west to east, some of the water falling on the Pacific Coast may move east, repeatedly falling, evaporating and being re-precipitated.

Evapotranspiration is a commonly used measure of **consumptive use**[15] –the amount of water a user removes from the hydrologic system and makes unavailable for others to use.

Water that is not evapotranspired, that is not consumptively used, continues through the hydrologic system and is termed **return flow** – it makes its way back into the local hydrologic system where it may be used by other water users. Surface return flow drains from the lower end of agricultural fields, where it may be used by wetlands plants or other agricultural producers, or make its way to streams or rivers. Subsurface return flow percolates through the soil column and reaches a groundwater aquifer, where again it may be pumped for subsequent use or ultimately make its way to surface water systems.

Water that is diverted from a source thus ends up in two different categories – return flow and consumptive use. Return flow consists of water lost during conveyance and a portion of water applied to fields that ends up elsewhere in the system. Even the most efficient on-farm water application will intentionally apply some water in excess of evapotranspiration. When water evaporates, it leaves any dissolved salts behind in the soil. From time to time, producers apply excess water to move that salt deeper in the soil column and away from the crops' root zone. If the salts are not leached away, excess salt build-up will reduce crop yields. However, drainage may be needed to allow the excess water applied to leave the root zone.

Where a water supply is a **groundwater aquife**r rather than a surface supply, only the initial stages of the water use process differs. An aquifer is an underground layer of rock, usually gravel, sand, silt or clay, through which water can move, and from which water can be drawn through a well. In a well, a pump draws water from the aquifer and brings the water to the surface where it discharges into a conveyance canal, pipe, or directly into a pressurized spray or drip system.

Groundwater hydrology is important because, in the general case, groundwater hydrologic systems and surface systems are linked. Surface water may infiltrate into the groundwater system, recharging the aquifer. Groundwater may seep from the ground to surface water bodies as springs, wetlands or directly into streams. When water is pumped from a groundwater aquifer, just like drinking from a glass with a straw, the level of water in the aquifer lowers, very slowly in the case of large aquifers, more rapidly for small aquifers or large rates of pumping. However, if new water flows into the aquifer at least as fast as it is being pumped -- if the aquifer is recharged **--** the aquifer water level stays the same. As long as pumping is less than recharge, water moves through the aquifer and eventually reaches the surface as springs, wetlands or streams[16].

Because return flow ends up in the hydrologic system as either groundwater or surface water, along a combined surface river and groundwater alluvial aquifer system, water

[15] Water that becomes otherwise unavailable for subsequent use may also be considered consumptive use. For instance, water that percolates to a saline groundwater aquifer or lake may, depending on the circumstances, be considered to be consumptively used as well.
[16] Groundwater may also flow from one aquifer to another, or if along the coast, may reach the sea.

may be used several times before it reaches a main stem river, terminal lake or the sea. This repeated use of the same water has several consequences. One consequence of repeated use of water in a hydrologic system is that downstream water users are essentially dependent on the pattern of upstream water use, including inefficiency. An upstream water user may want to increase application efficiency, say from 50% to 75% and divert the same amount of water, perhaps in order to switch to a more water-intensive crop or increase the acreage irrigated. But that increased efficiency would result in less water available for downstream water users, who have been dependent on the existing pattern of water use. Making such an increase in efficiency, while diverting the same amount of water, would result in an increased consumptive use. In most western states, that change in use pattern would, in theory, require applying for a change to the water right, which would likely be denied if it resulted in injury to other water users. In practice, increasing use of water through efficiency may not be accompanied by a formal change to water rights. A second consequence is that water quality changes as water is repeatedly used. Each time water is diverted, applied to irrigation and a portion returns to the hydrologic system, it changes in quality. Typically dissolved solids increase as salts leach out of the soil, and agricultural chemicals (pesticides, fertilizer and herbicides) are added. For surface return flow, temperature usually increases as well.

3.2 Water Law Overview

Water law used in the Western states arose in the mining camps of California's gold rush and is based on a simple notion consistent with mining claims – "first in time is first in right." This doctrine of "prior appropriation" is in use in one form or another in every western state, but is not necessarily the only system of water rights in use in any given state.

For transactional approaches involving changes to the place and type of water use, specific parts of a state's water law are important. The short list of these issues includes:

- **Injury to other water rights.** The overriding common element in all states when water rights are transferred to new uses is a concern for injury of or impairment to other water rights. As described above, the fate of return flow from a water right is often essential to other water rights holders. Because the presence, timing and location of water may depend on prior use by other water rights holders, if that prior use changes, there is a potential for injury.

- **Validity and scope of the original right.** Because a water right is defined by use, the history of use is important. In most states, a water right is not perfected until it has been put to actual use. In these states a water right to be transferred must be a "wet" water right, one that has been actually been used, and not a "paper" water right that exists in the files, but has not been used.

- **Abandonment or forfeiture.** Every state has rules that may invalidate some types of water rights that have not been used for a period of time (forfeiture), or where there has been a demonstrated intent to abandon the right. If a right was lost through forfeiture or abandonment, it cannot be revived through transfer to a new use.

- **Quantification of the transferable right.** Quantification of the transferable right is the complicated and critical part of the process. In every state, the portion of a water right that is consumptively used may be transferred, so long as there is no injury. In order to determine this amount, the pattern of historical use, and the components of that use (consumptive use and return flow) must be established. Beyond that consumptive use, state laws vary with respect to transferability of some or all of return flows and conserved water, usually depending on the potential for injury to other water rights holders. In addition in some cases public interest, impacts to third parties and impact on the environment are also considered in determining the transferable right.

3.2.1 Nevada Water Law

Nevada's water law is founded upon the prior appropriation doctrine ("first in time is first in right" and the concept of beneficial use (water rights are granted only to the extent that they serve approved purposes without waste).[17] Environmental uses (fish and wildlife) are well established beneficial uses in Nevada.[18] Both surface water and ground water are subject to the administration and jurisdiction of the state.[19] The Nevada Division of Water Resources, headed by the State Engineer, is responsible for administration of the water rights system, including issuing permits for new water rights and changes to the place or type of use to which water rights are put.[20] However in the case of the Walker River, the federal District Court, through federal Decree C-125 has a significant role, and retains jurisdiction, in most issues of surface water rights, including changes in use.

Nevada has procedures for expedited temporary (less than one year) as well as permanent changes in place of diversion, manner of use or place of use.[21] Water rights may be changed for less than one year as a temporary change without public notice, provided the State Engineer finds no impairment to other water rights or to the public interest.[22] For either temporary or permanent changes, a proposed water rights change within an irrigation district must not "adversely affect the cost of water for other holders of water rights in the district or lessen the efficiency of the district in its delivery or use of water" and must not be detrimental to the public interest.[23] The public interest is not defined in Nevada statutes, and is determined on a case by case basis to protect water for people as the highest and best use, and to protect the resource.[24] For changes other than temporary

[17] NRS 533.030, .035 http://www.leg.state.nv.us/NRS/NRS-533.html#NRS533Sec030
[18] *Nevada v, Morros*, 755 P.2d 263 [Nev.1988]
[19] NRS 534.020 http://www.leg.state.nv.us/NRS/NRS-534.html#NRS534Sec020
[20] See NRS 533 and 534. http://www.leg.state.nv.us/NRS/NRS-533.html , http://www.leg.state.nv.us/NRS/NRS-533.html
[21] http://www.leg.state.nv.us/NRS/NRS533Sec345
[22] NRS 533.345 http://www.leg.state.nv.us/NRS/NRS-533.html#NRS533Sec345
[23] NRS 533.370, NRS 533.371 http://www.leg.state.nv.us/NRS/NRS-533.html#NRS533Sec324
[24] Ken Haffey, Nevada Division of Water Resources. Personal Communication. February 2007.

changes, notice is given and a hearing may be held.[25] Applications involving interbasin transfers are subject to a variety of measures to protect the interests of the basin of origin. As a general matter, after application and granting of a permit, the water user must file a proof of completed diversion structure[26] and proof of application of water to beneficial use.[27]

Transfers and changes to environmental use require the same information[28] as for traditional uses – extensive information about historic use, hydrology, and water rights, often prepared by lawyers, engineers and other consultants in order to demonstrate that other water rights will not be impaired. Nevada water users are generally required to measure their use; the state estimates that 65% to 75% of water use is measured, so use data supporting changes is often available. Nevada does not manage groundwater and surface water together, even when hydrologically connected, except in rare circumstances.[29] Transfers of water are typically limited to consumptive use, in order to prevent injury to other water users, both surface and ground.

The differences in environmental use transfers are in tying the proposed environmental use to fish and wildlife or recreation.[30] The State Engineer requires a careful assessment of the beneficial use of instream flows, and has, especially for new appropriations, substantially reduced some claims. The place of use specified varies for environmental use. The State Engineer has allowed as broad a place of use as the entire Stillwater National Wildlife Refuge. For instream flows, a point of "diversion" is specified at the beginning of the reach, and a downstream point of use is designated as the end; measurement is typically required at both points, which define the protected reach.

Nevada does not have a state policy regarding irrigation efficiency and the use of conserved water; requests for water rights transfers involving conserved water would be dealt with on a case by case basis. In general, efficiency projects may be implemented to increase the irrigated acreage within the limits of the quantity of water specified by a water right certificate. This is likely to occur in areas where the basin is over-appropriated, thus obtaining water for expanding a farm operation through irrigation efficiency rather than a new water right.[31]

3.2.2 California Water Law

California has among the more complex systems of water law in the West. For surface water rights, there are two main types of right. Riparian rights are based upon ownership

[25] http://www.leg.state.nv.us/NRS/NRS-533.html#NRS533Sec360
[26] http://www.leg.state.nv.us/NRS/NRS-533.html#NRS533Sec390
[27] http://www.leg.state.nv.us/NRS/NRS533Sec400
[28] Because environmental water use is often controversial, a higher level of scrutiny sometimes seems to be applied.
[29] Malloch, Steven, 2005. *Liquid Assets: Protecting and Restoring the West's Rivers and Wetlands through Environmental Water Transactions*, Trout Unlimited.
[30] Id.
[31] Haffey.

of land adjoining surface water bodies, and entitle the owner to use water on adjacent riparian land, subject to the requirement that all riparian owners share the available water. Appropriative surface water rights are based upon diversion, control and beneficial use of water, and are fixed with respect to quality, time and purpose of use. They are also subject to a priority system based upon date of original use; most appropriative rights are junior to riparian rights. Appropriative rights that postdate adoption of a comprehensive water code in 1914 are subject to greater regulation. In general, groundwater in California is little regulated. Groundwater in "known and defined channels" is subject to appropriation as surface water. A small number of groundwater basins have been adjudicated or are subject to local management plans. Most groundwater is used based upon ownership of overlying land; all land owners within a groundwater basin have a right to reasonable use of the water through rights analogous to riparian rights. Appropriative groundwater rights can be obtained if there is water available excess to the needs of the overlying landowners; this water can be exported for use on land not overlying the groundwater basin.

California has a specific water code section that allows existing water rights to be converted to instream or environmental use.[32] The Trust for Public Land prepared a very useful guide on private instream flow transfers in its Water Acquisition Handbook.[33] Other good sources of information about the California transfer process include a Draft Guide to Water Transfers,[34] Department of Water Resources Water Transfer Office[35] and the State Water Resources Control Board's Water Transfers Program.[36] A report to California's water administration agency, the State Water Resources Control Board, on Water Transfer Issues in California [37]contains a discussion of some of the issues presented by instream flow dedications and environmental use.

California has general transfer or change requirements[38] as well as different procedures and requirements for temporary transfers of less than one year[39] and transfer longer than a year.[40] Dedication to instream flow may be accomplished in the course of a transfer, and has its own requirements.

In brief, temporary transfer, long-term transfer and transfer to environmental use all have common standards – not injuring valid water rights and not unreasonably affecting fish, wildlife and other instream uses. For each change, the proponent bears the burden of

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[32] Cal. Water Code §1707.

[33] Mooney, Donald B. and. Burch, Marsha A., 2003. *Water Acquisition Handbook: How to Acquire Water for the Environment in California,* The Trust for Public Land. http://www.tpl.org/tier3_cd.cfm?content_item_id=11521&folder_id=266

[34] State Water Resources Control Board, 1999. *Draft: A Guide to Water Transfers*. State Water Resources Control Board, http://www.waterrights.ca.gov/watertransferguide.pdf

[35] http://www.wto.water.ca.gov/

[36] http://www.waterrights.ca.gov/watertransfer/default.htm

[37]Water Transfer Work Group, 2002. *Water Transfer Issues in California: A Report to the State Water Resources Control Board from the Water Transfer Workgroup*. State Water Resources Control Board. http://www.waterrights.ca.gov/watertransfer/Final%20Report%20-%20Water%20Transfer%20Group.pdf

[38] http://www.leginfo.ca.gov/cgi-bin/waisgate?WAISdocID=41522711613+0+0+0&WAISaction=retrieve

[39] http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=01001-02000&file=1725-1732

[40] http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=01001-02000&file=1735-1737

demonstrating validity of the right, non-injury to other valid water rights, and affect on fish, wildlife, recreation or other instream use. To present that evidence, applicants will likely require extensive information about historic use, hydrology, and environmental issues, using the usual troop of lawyers, engineers and other consultants. For a long term transfer or transfer to environmental use the amount and quality of information required will be higher, because of the real or perceived greater possibility of injury. In addition the applicant will need to consult with a variety of state and federal environmental agencies about the effects of the transfer.

Temporary (less than one year) transfers of post-1914 appropriative water rights are limited to consumptive use or storage, reducing the chance of injury to other water users and have an expedited process. However, consumptive use in this context includes water evapotranspired and water which has percolated underground. The SWRCB does not have authority to condition these temporary transfers in the general public interest, although other water users must not be injured and the change may not unreasonably affect instream beneficial use, fish or wildlife.[41] Temporary transfers are not subject to the California Environmental Quality Act [42](CEQA).

Long term transfers (permanent or for terms greater than one year) of post-1914 rights are not subject to the expedited time lines. CEQA compliance is required, which may, depending on the factual situation, be brief or lengthy. The SWRCB has implicit authority to consider public interest issues, including third-party effects unrelated to water rights. For instance, the SWRCB could consider the economic or social effect on a community of fallowing significant irrigated acreage. If protests cannot be resolved, SWRCB holds a hearing. The whole process may take years. Of interest is that other water users may not be "substantially" injured, a slightly lower standard than non-injury used for temporary transfers. Long term transfers of conserved water are allowed provided the applicant can provide information to show that reductions in return flows or groundwater recharge do not adversely affect other legal water users and do not result in unreasonable effects to fish, wildlife or other instream beneficial uses.[43]

For environmental transfers, the issues of quantification and protected reach have been decided on a case-by-case basis. Dedication of a right to instream use may not result in an increase in water used and may not "unreasonably affect" any other water user. Unlike temporary transfers, which are limited to consumptive use, a long-term instream dedication could, if accomplished without unreasonably affecting another water user, include conveyance losses or return flows. California Water Code section 1011[44] exempts from forfeiture properly documented conserved water, allowing the water rights holder to transfer it to another use. SWRCB staff indicates that conveyance losses or return flows could be included in an instream dedication to the point where they would otherwise return to a stream, and perhaps further depending on the situation. In theory, dedication of the consumptive use could extend to the ocean or a saline sink.

[41] Cal Water Code § 1725.
[42] http://ceres.ca.gov/ceqa/
[43] *Guide to Water Transfers*, section 6
[44] http://www.leginfo.ca.gov/cgi-bin/displaycode?section=wat&group=00001-01000&file=1000-1017

3.2.3 Interstate Issues

Water law in the Walker River basin is made more complicated by being subject to the jurisdiction of two states.

Typically, interstate Western rivers are subject to compacts which apportion the rivers' waters among the states involved. In the 1970's California and Nevada negotiated, and their legislatures approved, a compact that covers the Walker River; however Congress never approved the compact, which is required for the compact to take effect.

In 1902, a lawsuit seeking adjudication of the water rights on the Walker River commenced; because the rights involved were in both California and Nevada, the suit was filed in Federal District Court. That suit, as modified in subsequent related proceedings, culminated in Decree C-125, known as the Walker River Decree, which established surface water rights on the river. The current state of legal rights to surface water is largely, but not entirely, under the Walker River Decree, as modified by rules and regulations ordered by the Federal District Court, and as administered by the United States Board of Water Commissioners. Most surface water rights in the basin are subject to the terms of the Decree, including acreage, priority, diversion rates, duty of water, irrigation season and storage rights. WRID was adjudicated storage rights in Bridgeport and Topaz Reservoirs, and granted authority to allocate water from those reservoirs to water users. Excluded from the Decree are important issues, such as groundwater rights, storage rights in Weber Reservoir, flood control rules for some reservoirs and any provision for the protection of instream or environmental beneficial uses including Walker Lake. The result of the Walker River Decree is that any transfers of water subject to its jurisdiction must be made under the rules and regulations of the relevant state, and then are subject to review by the Federal District Court.

4.0 Environmental Water Transaction Toolkit

A variety of approaches to water rights transactions intended to benefit the environment have been developed across the West. Each transaction is different, designed for a specific setting, to solve a particular problem, under the laws and practices of that place. However, there is a set of approaches to transactions that are more commonly used. In this chapter, the commonly used tools are described along with the conditions under which they are generally employed. A resource for understanding environmental water transactions and how they have been used in the West is *Liquid Assets: Protecting and Restoring the West's Rivers and Wetlands through Environmental Water Transactions.*

In real estate transactions, the basic transactional instruments are the lease (a temporary interest in land), the easement (a partial interest in land for a specified purpose), the option (reserving a right to lease or purchase in the future), and the fee simple transaction (where an entire interest in land is acquired).[45]

For water, the toolbox is larger, with some analogs to land transactions, and some approaches unique to water. The following are the basic tools:[46]

- Efficiency – doing more with the same amount of water;
- Leases or temporary transfers of water;
- Multi-party arrangements such as water banks and rotational fallowing;
- Changing water use through buying and selling water rights; and
- Changes to water project operations to allow a water system to provide a different mix of benefits.

4.1 Efficiency

Efficiency is a very popular approach to water shortage situations because it appears to be a "win-win" solution -- it lets water users squeeze more benefits from the same amount of water, or uses less water to deliver the same benefits. There is great room for improvement in efficiency in many Western water systems because efficiency was not as high a priority in original design of the projects as cost and speed of construction. Further, while construction technology in general and water system technology specifically has greatly improved since most Western projects were built, adoption of this new technology has been limited by water law and policy that creates disincentives for change, and marginal economics for much of irrigated agriculture. In particular, since water users do not pay for water, only the cost of delivering it, there is often little incentive to be efficient.

[45] There are, of course, other more complex and esoteric real estate transactional tools as well. Real estate lawyers have at their disposal other tools, for example defeasible fees, future interests, profits, covenants and servitudes, each of which has transactional application.
[46] See *Liquid Assets* for additional examples and background information on some of the projects and approaches presented in this section.

Making agricultural irrigation more efficient can pose certain problems, however. Inefficiently used water is not always "lost" as wasted energy is. Rather, water often returns to the hydrologic system where it becomes available to other water users, who may in turn have vested property rights in that inefficiency; or the water may be used in supporting environmental values. Increasing efficiency may therefore rob another human or environmental water user of return flows unless provision is made to use conserved water to address those dependencies (in which case both the quality and reliability of available supplies may even be enhanced). What happens to the water saved through efficiency is, in any event, a complicated technical and legal question, involving return flow, consumptive use, and satisfaction of "no injury" requirements under law. Whether efficiency has a role in a solving a problem depends greatly on how the problem is defined and what impacts to third parties or the environment are considered, as well as the legal and hydrologic setting. The answer to the question of whether efficiency is an appropriate tool to address a water shortage situation or other water reallocation need is often: "It depends."

Most approaches to irrigation efficiency fall into one of two areas. The first is conveyance (or system) efficiency – getting water from a water source (surface or groundwater) to an irrigated field with fewer losses. The second is on-farm efficiency – distributing water on fields so that less water is used consistent with maximizing yields. For both, the essential questions are (a) who has rights to the use of the conserved water, and (b) who was benefiting from "inefficient" prior use.

4.1.1 Conveyance Efficiency

Conveyance efficiency reduces losses between the point of diversion from a surface water body or a groundwater source and the irrigation (farm) headgate. In western irrigation systems developed before the mid- 20th century, the most common conveyance system was the unlined ditch. In an unlined ditch, a substantial proportion of the water transported may seep into the ground, and either percolates into the groundwater system or emerges nearby at the surface. Seepage losses do not always return to the surface system or to useable groundwater, and when they do substantial time lags may be involved and water quality may be degraded. The proportion of water that is lost varies greatly depending on the geology of the area and even how the flow changes in the ditch. If the ditch crosses sandy soil or gravel, losses increase. The losses can be substantial – a survey of Wyoming ditches in 2001 estimated ditch conveyance losses from 0% to 55% of diversion.[47] In other words, in some cases, more than two acre-feet of water has to be diverted to get one acre-foot to the farm.

A variety of methods are used to reduce conveyance loss. The two most commonly used are lining the ditch with one of a number of substances that reduces seepage, and replacing the ditch with a pipe. A survey of seepage reduction techniques reported that unlined ditches loose from 2 to 26 gallons per square foot of ditch per day, depending on

[47] Wyoming Water Development Commission. 2001. *Irrigation System Survey Report,* State of Wyoming. http://wwdc.state.wy.us/irrsys/2001/irrsys.pdf

geology. That seepage rate can be reduced to less than 0.1 gallons per square foot per day through lining with materials such as concrete, gunnite, plastic or compacted earth.[48] A newer approach is a product that is sprayed onto the canal before it is wetted at the beginning of each irrigation season and lasts throughout the season as long as the ditch is kept continuously full. This approach requires at least annual application, but requires far less capital investment than the permanent solutions. Piping essentially eliminates conveyance loss, but often at considerable capital cost.

Operations innovation can improve efficiency as well. For example, water deliveries along multi-user ditches can be scheduled, which may reduce losses. Many ditches are kept full all the time, allowing irrigators to draw water as needed, but causing spills when the water is not needed. With scheduling, water is delivered as required, but spills can be reduced. Consolidation of ditch and diversion works can also result in efficiency gains, and may be particularly appropriate when other factors (such as fish screening and passage) are involved.

4.1.2 On-Farm Efficiency

There are several measures of efficiency[49] in a diversion and irrigation system, for instance, conveyance efficiency, irrigation or application efficiency, and how uniformly water is applied across a field. A common on-farm measure of efficiency is how much of the water applied is evapotranspired as a proportion of the total water applied – a higher application efficiency implies that less water ends up as return flow. Efficiency in irrigated systems may be a very important topic for agricultural producers, so significant research has been conducted in improving irrigation management and technology.

Irrigation technology plays a large role in determining how much water reaching a field ultimately is consumptively used and how much is return flow. The oldest irrigation technology is flooding fields, applying water at the upper end of a field and letting it flow by gravity to the other end. With flood irrigation, half the water applied may end up as return flow (50% application efficiency); although modern refinements such as laser leveling of the field, surge flooding and collection and reuse of return flows (tailwater recovery) may greatly increase the efficiency. The various spray irrigation techniques (center-pivot is commonly used, but there are a variety of refinements and alternatives) require investment in technology and pumping, but apply water to fields more evenly, reducing return flow at the expense of somewhat increased evaporation and spray losses. Application efficiency for spray systems may range from 60% to 90%. Drip irrigation systems require costly technology investments but result in application efficiencies of from 70 to 90%.[50]

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[48] Fipps, Guy, 2000. *Characterization of Conveyance Losses in Irrigation Distribution Networks in the Lower Rio Grande Valley, Texas*. http://idea.tamu.edu/documents/report10.pdf

[49] See for instance http://www.oznet.ksu.edu/library/ageng2/mf2243.pdf , a fact sheet with a brief summary of various measures of efficiency produced by Kansas State University Agricultural Extension.

[50] USGS. Irrigation Techniques http://ga.water.usgs.gov/edu/irmethods.html; Solomon, Kenneth, 1988. *Irrigation Systems and Water Application Efficiencies*, Center for Irrigation Technology. http://www.wateright.org/site2/publications/880104.asp

Beyond water application hardware are the rising fields of irrigation operations and software. By watering only when crops need additional water, determined by field sensors, a just-in-time approach can be used rather than a fixed schedule, saving water.

4.1.3 Effects of Efficiency Improvements

Increasing the efficiency of a conveyance and irrigation system has a series of hydrologic, legal and ecological effects. While increasing efficiency results in less water used to grow the same crops, the overall effects of efficiency depend on what happens to the conserved water now no longer needed to grow those crops.

As an example, consider a surface water diversion from a river, where water is transported some distance in a leaky ditch, with a substantial conveyance loss. If the ditch is lined and the conveyance loss reduced, there are several possibilities for the conserved water and consequences for the now reduced return flows:

- For the conserved water:
    - If the water is not diverted and left in the river, it could:
        - increase flows available for fish and wildlife;
        - allow support of environmental beneficial use downstream, for instance in wetlands or lakes; or
        - allow other water rights holders to increase their draw on the river.
    - More water could be delivered, allowing:
        - production of a more water intensive crops;
        - an increase in the number of acres irrigated; or
        - support of environmental uses downstream, for instance in wetlands or lakes.

- For the return flows:
    - Return flows from the leaky conveyance that would have gone into the groundwater system no longer occur, resulting in:
        - greater depletion of groundwater from existing wells:
        - reduction in groundwater support of late season or winter flows in surface streams, upon which fish and wildlife depend; or
        - reduction in groundwater support of streamflows from which other surface water rights draw.
    - Surface return flows also no longer occur, resulting in:
        - reduction of surface water available for other water users; or
        - reduction of surface water used by fish and wildlife.

Similarly, if on-farm efficiency is increased, and return flows are decreased, the range of effects is the same – surface water rights, ground water rights and the environment are all potentially affected.

As described in the prior chapter, both California and Nevada, as well as the other Western states, require that changes to the point of diversion, place of use, or purpose of use not impair other water rights. Exactly when such impairment is possible, and when an efficiency improvement is required to undergo a change application process is subject to interpretation. While most changes that potentially impair other water users should go through a formal process, in practice, many do not, even those receiving funding through federal Farm Bill programs.

4.1.4 Examples of Efficiency Improvements

Efficiency improvements that benefit the environment are being undertaken in many places. In Montana, a particularly noteworthy set of efficiency improvements are taking place through state implementation of a water conservation program within the 2002 Farm Bill. The Farm Bill included a new surface and ground water conservation program in the Environmental Quality Incentives Program (EQIP), a voluntary program that provides assistance to farmers and ranchers who face threats to their resources. While the Farm Bill sets federal priorities (non-point source pollution, air emissions, soil erosion and recovery for at-risk species), state offices of the federal implementing agency, the Natural Resources Conservation Service (NRCS), have great latitude in setting priorities and implementing the programs. EQIP can fund water conservation projects up to $450,000 with the program providing up to half the cost, and the farmer or a third party the remainder of the cost.

The Montana office of the NRCS,[51] working with agricultural producers, state agencies, Trout Unlimited (TU) and the Montana Water Trust (MWT), designed its priority ranking system[52] to create incentives to lease water conserved through efficiency improvements for environmental purposes. The result is that farmers and ranchers who choose to lease[53] or convert conserved water for fishery flows get a priority boost that helps to currently assure that these projects receive funding. The term of the dedication to instream flows depends on the economic life of the projects – usually it is between 10 and 30 years.

Projects typically include reducing conveyance losses by improving ditches or pipelines, and increasing application efficiency through sprinkler irrigation. The producer portion of the cost share may come from the irrigator, often in an in-kind contribution of backhoe work or other labor, or funding from the state, TU, MWT and other sources. Montana water law allows a water user to retain use of conserved water, but it does not permit increasing consumptive use or injuring other water users.

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[51] http://www.mt.nrcs.usda.gov/

[52] http://www.mt.nrcs.usda.gov/programs/eqip/eqip2007/groundandsurfacewater2007.html

[53] Montana does not allow private permanent dedication of water to instream flows; it does allow long term leases. In Montana, state law limits instream flow leases to 10 years, with one renewal; however, if the water is derived from efficiency improvements up to a 30-year lease is allowed.

In locations with favorable hydrology and water use patterns, carefully designed efficiency improvements can provide flow benefits without causing adverse effect on other water users or the environment. Many of the projects put into place shift diversion from small tributaries, where the diversion essentially dries up the creek and blocks fish passage, to larger rivers or groundwater; this is most useful in areas where the problems are of timing and location of water rather than a more general shortage of water or connections between surface and groundwater. When coupled with more efficient irrigation, the new system reduces the amount of water needed to be diverted and opens tributaries to fish passage. Examples of Montana efficiency projects include:

- Poorman Creek[54] where a diversion of up to 18 c.f.s. near the confluence with the Blackfoot River often left the creek dry, cutting off access to bull trout spawning habitat. Replacing the diversion dam and ditch with a pump and pipe system reduced the draw to 3 c.f.s., with the remaining water left instream pursuant to a 15 year agreement. In addition, cattle were removed from the creek, further improving habitat.

- Weaver Ranch[55] on the North Fork of the Blackfoot River,[56] where replacing a gravity ditch diverting from a losing reach with a pump and pipe system diverting from a gaining reach resulted in reducing diversion from 15-18 c.f.s. to 2 c.f.s., with conserved water placed under a 30 year instream flow lease.

4.2 Leases - Temporary Changes to Water Use

Temporary changes in use are analogous to real estate leases – but with water, the right can often be split in a number of ways. For environmental purposes, leasing has been a very commonly used transfer mechanism, particularly active in the Pacific Northwest and California.[57]

Long-term leases. Where water users do not want to use their water right for its original purpose, but are unwilling or unable to relinquish their right permanently, leases of longer than a year are used. Water rights owners often like leases because they can provide an income, while avoiding the expenses of farming and leave open the possibility of lucrative sale of the water to cities or other future water users.

With long–term leases, the transaction usually must be approved through a formal change of use proceeding in the water rights administration system. Because all western states will consider a water right that is not exercised as having been forfeited after a certain period of time, a long-term lease for instream use must be accompanied by a change of

[54] http://montanapartners.fws.gov/mt5c34.htm
[55] http://www.missoulian.com/articles/2004/04/29/news/local/znews01.txt
[56] http://montanapartners.fws.gov/mt5c18.htm
[57] See *Liquid Assets* and Westwater Research, 2003, *Review of Western US Environmental Water Leasing Programs* http://www.ecy.wa.gov/programs/wr/instream-flows/Images/pdfs/WaterLeasingReview2003.pdf

use proceeding, or else the right may be in danger of being forfeited for non-use. Transaction costs may be high for a long term lease because the change of use process may be the same as for a permanent transfer of water rights, including hydrologic studies and protests by third-party water rights holders.

Annual leases The least complicated arrangement is a single season lease, where the entire water right for a specific property is leased to another water user for an irrigation season. Typically, annual leases pay a producer to forego water use for an entire irrigation season and switch to crops that do not need irrigation, use water under a different water right usually from a different source of supply, or let land go fallow for the length of the lease agreement. They are the most common instruments used today by water trusts and government. Private water trusts use them as a low risk way to introduce water users to environmental water transaction and set up conditions for longer term arrangements. State and federal agencies needing water for Endangered Species Act compliance are also active participants in short-term leases. Most Western states have expedited procedures for transferring water use for one year or less; typically these require that the transfer not injure other water rights holders, but public interest tests, environmental review, and other issues may not be addressed.

Split-season leases. A split season lease allows an irrigator to use the water during a portion of the growing season, and then leave the water instream during the rest of the season. This transaction works particularly well when an irrigator is growing a crop with multiple harvests, such as alfalfa or pasture, and when the water is needed instream for only a short portion of the growing season, such as late summer or fall. The irrigator receives the revenue from his first harvests and is paid not to use his water at the end of the season. Split season leases are commonly used in Oregon and Washington. Depending on the state water rights law, especially forfeiture rules, and the need to defend flows against diversion by other water users, a split season lease may not need to go through the state change of use proceedings.

Diversion reduction agreements. Slicing the right more finely, when the conservation objective can be achieved with only a few days reduction in diversion, agreements can specify shorter times. In Montana, when water is needed on the Blackfoot River for migrating bull trout, agreements specify ceasing irrigation diversion for the few days when the fish are passing specific choke points. These agreements may not reduce the overall amount of water used in an irrigation season, but through shifting the timing of use can accomplish an important environmental objective.

Contingent leases Contingent leases call for a change in use of water upon the occurrence of certain conditions. In a dry year lease, for instance, if stream flows fall below a certain level, water is not diverted and is instead used for instream purposes. Dry (or wet) year leases or similar arrangements allow water users to shift the risks of precipitation. Typically, a dry year lease allows an irrigator to use water during wet years, with the water remaining instream during dry years. Risk can be shifted either way, however. In California's Central Valley, a joint state-federal environmental water program has trouble conveying water from the wetter Sacramento Valley to the dryer San

Joaquin Valley through the Delta during wet years because then the state's plumbing system capacity through the Delta is fully used; consequently, it is exploring wet year options in the San Joaquin Valley to meet some of its water objectives.

Temporary changes to water use can be a very valuable tool in providing water for environmental needs, but the technique has serious limitations as well. The most important use for partial right acquisitions is in tailoring the transactional solution to the problem being solved. If water is short for a few months, or even a few days, there may be no need to acquire the entire right when a shorter diversion reduction could solve the problem. Similarly, if the environmental problem can be solved by using water only in wet or dry years, a partial right acquisition, where allowed, may provide a superior solution.

Term arrangements are very useful as bridges while permanent solutions to problems are in process. Annual leasing is an excellent way to provide environmental benefits while a permanent fix is being undertaken. An example of this is on Washington's Teanaway River, where the Bureau of Reclamation leased water for several years which prevented water rights from being forfeited, provided farmers with an income, and left water in the river for ESA-listed fish, while efficiency and conservation improvements were being constructed that provided a long-term fix. The ultimate result was reducing diversion from the river from 4000 acre-feet to roughly 1400 acre-feet per year.[58]

In addition to their value in solving problems, term arrangements are very useful in developing relationships with water users, producers and communities. In many parts of the West, using water for environmental purposes is viewed with suspicion and skepticism by the local community, especially when endangered species or government programs are involved. Term arrangements allow limited engagement by members of the community, and allow them to gauge the impacts and risks without selling their water rights. The water trusts in Oregon, Washington and similar organizations in Montana have used term arrangements effectively to gain entry into the water user community. Once trust is gained, the conservation organizations move towards more permanent transactions. The Columbia Basin Water Transaction Program (CBWTP) recognized this value and progression in its funding strategy. In the early years of its operation, most transactions funded were temporary. Now that they have more transactions developed than they have funding to complete, CBWTP is shifting its priorities to permanent transactions.[59] Whether the expectations established through annual leasing will make moving towards permanent solutions more difficult remains to be seen; however the experience to date is that as program acceptance grows, the move towards permanent solutions does as well.

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[58] For more on the Teanaway project, see http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=12401; and http://water.usgs.gov/owq/cleanwater/success/teanaway.html .

[59] Andrew Purkey, Columbia Basin Water Transactions Program. Personal Communication. February 2007. The CBWTP is a water acquisition effort housed in the non-profit National Fish and Wildlife Foundation, and funded through the Bonneville Power Administration as part of its Endangered Species Act compliance.

However, term transactions are limited in time -- temporary transactions do not solve permanent problems. They are also expensive. Annual funding is needed to lease water on an annual basis. California's federal and state water projects have spent more than a hundred million dollars on buying term water leases in recent years, most for supplies to meet endangered species and wetlands needs. The water will last only as long as the funding does. Transaction costs add to the expense. While many Western states have expedited process for short-term transactions, longer term transactions typically require the same expensive process as a permanent transaction.

Finally, as discussed above, changes to how one water right is used may affect other water rights or environmental water use. When a right is leased for instream use, the return flows derived from the prior use changes. Similarly, when water is leased for irrigation return flows that may have been supporting environmental benefits change. Those changes may have adverse or positive effects, depending on local hydrology and the objectives of the change in use.

4.3 Water Banks

Leases and fee acquisitions of water rights tend to involve a limited number of principals, often only two, or if the water right is to be transferred to a state entity, three. For large amounts of water or where large numbers of transactions are needed, it can be inefficient to have all of the interactions on a bilateral basis. In some of these cases, institutions have been created to make the transfer of water from one use to another use more efficient. Generally, these collective agreements are termed "water banks;" however they go by several different names, including fallowing programs and for smaller operations, ditch agreements.

Most water banks are operated to facilitate the transfer of water from a diversionary use (typically irrigation) to another diversionary use (typically irrigation or municipal supply). In a few cases, the objective is in whole or part to facilitate transfer of water to environmental uses. Functionally, the water bank serves as an intermediary between buyer and seller, setting the rules of the market and facilitating the trade, either by acting as a broker linking the parties, or by taking a position in the market by buying and selling water. The rules and structure of a water bank are dictated in part by the applicable law, and in part by the objectives of the system.

A brief overview of water banks follows. Once source for more detail is a recent report, *Analysis of Water Banks in the Western States,*[60] which provides a comprehensive survey of the structure and functions of water banks with the objective of identifying institutional arrangements that promote environmental values. *Liquid Assets* also provides additional detail on several of the banks discussed below.

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[60] Clifford, P., Landry, C. and Larsen-Hayden, A. 2004. *Analysis of Water Banks in the Western States,* Washington Department of Ecology. http://www.ecy.wa.gov/programs/wr/instream-flows/wtrbank.html

Single-buyer Lease Banks One of the more common bank structures for environmental water transactions is the single-buyer lease bank. For these banks, a single purchaser sets up an institutional arrangement to solicit and acquire water from a variety of sources. Typically the buyer is a governmental agency seeking water to meet ESA prescriptions, usually the Bureau of Reclamation, but could be another state or federal entity.

A single-buyer lease bank can be set up in a number of ways. The most typical is offering a set price and seeking sellers who will accept the price. However, soliciting offers, and then selecting the transactions based on price and suitability source, timing and location of the water also have been used.

The Bureau of Reclamation's ESA driven activities on the Klamath River in Oregon provide a series of examples of how such a bank can be arranged, and some of the problems that can occur. On the Klamath River, hydropower dams, a Bureau of Reclamation irrigation project, as well as non-Reclamation irrigation have caused well-publicized problems for ESA-listed salmon. One issue is that salmon need strong spring river flows, a time when the reservoirs are filling and irrigation water rights are not yet active. Because Reclamation needed to acquire early spring water, simply buying irrigation water would not suffice. Consequently, Reclamation looked for water from a variety of sources: surface water irrigation rights derived from fallowing irrigated land; surface water irrigation rights derived by switching groundwater pumping for surface water sources; and groundwater pumped directly into the River. Another problem confounding the issue is that the Klamath Basin has not been adjudicated, so claims of water rights are not entirely reliable.

In May 2002, when the Klamath Bank was first set up just as the irrigation season was starting, Reclamation went to irrigators directly and made individual water deals. In 2003, Reclamation set out a standard offer of $75 per acre-foot and limited water purchased to that within its project to avoid problems with unajudicated rights. This approach was criticized because the price overvalued water in the basin, and water from land outside the Reclamation project had lower economic value. In 2003 Reclamation shifted to soliciting sealed offers to sell, then buying water based on the price and their desired mix of water sources (fallowed land and groundwater substitution). In 2004 through 2007, Reclamation continued to solicit sealed bids, and added pumping of groundwater directly to the River when needed.[61]

One of the serious problems with the Klamath Bank is its reliance on groundwater. A 2005 USGS paper[62] on the Klamath Bank reported that the Bank demand for groundwater increased pumping of groundwater 8-fold, and resulted in significant depression of the water table in the area. On a long term basis, the reliance on groundwater is not sustainable.

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[61] For more information on the Klamath Bank, see *Liquid Assets* pp. 86-89 and the Reclamation Klamath Area Office website http://www.usbr.gov/mp/kbao/pilot_water_bank/2006_water_bank.html

[62] US Geological Survey, May 3, 2005. *Assessment of the Klamath Project Pilot Water Bank: A Review from a Hydrological Perspective* http://klamathsalmonlibrary.org/documents/USGS2005pd.pdf

More recently, Washington used a single user lease bank for the Yakima River in 2005 and again in 2007. It used a sealed bid/reverse auction system to select from the applicants to the bank. (See Appendix F)

Multi User Water Banks Multi-user water banks have many different buyers and sellers; the "bank" serves as a clearinghouse for transactions. Several states and many water districts operate this type of water bank to connect water users. In some instances, an environmental water buyer enters these banks to buy water.

There are a wide variety of possible structures for water banks, but only two are commonly used. In the widely used clearinghouse model, the bank serves essentially as a bulletin board – buyers and sellers post offers and conduct their trades on a bilateral basis at a negotiated price. The other common model is the fixed price version, where the bank sets a price, takes offers to sell at that price and matches them with offers to buy. The Idaho State Water Bank and various Idaho rental pools are the leading example. From 1993 on, Reclamation has used the Idaho Water Bank to buy up to 427,000 acre-feet per year to meet ESA requirements for Snake River salmon.[63]

In Oregon, the Deschutes River Conservancy (DRC) provides an unusual example of how multi-user water banking can provide both environmental benefit and benefit for water users. Unusual for a river conservation organization the DRC was established as collaboration among local government, an Indian Tribe, and the non-profit group Environmental Defense. It operates with a community conservation philosophy -- environmental conditions in the Deschutes basin must improve, and human activities must as well. In addition to water leasing for instream flow, the DRC has helped form two types of water bank. One sells surface flow mitigation credits that offset the impacts of new groundwater pumping on stream flows; because the Deschutes River gains flow from groundwater, offsetting increased groundwater for residential and irrigation use is critical. The other bank buys water from irrigators, especially those selling land to developers, and sells it to cities or dedicates it to instream use. This reallocation bank and the DRC have been engaged in negotiating "exit fees" paid by irrigators to the irrigation districts upon selling land and water to developers; the fees help the irrigation districts stay in reasonable financial condition as land is converted from agriculture to housing.[64]

Water banks as they have been used to date, can be fairly complex or relatively simple. Because the stock in trade of most water banks is the annual leasing of water, they only work efficiently if state law provides a way to shift water from use to use on a short term basis. Most Western states have expedited short term lease laws that do not involve the full hydrologic and legal review that longer term leases or permanent change in use require. However, the problems of the validity of the water right and possible injury due to changed return flows remain; banks have to set rules about what rights are validly

[63] See Appendix C and *Liquid Assets* p. 58.
[64] Kate Fitzpatrick and Bruce Alyward, Deschutes River Conservancy, Personal Communication. January 2007. See also Jenkins, Matt. October 16, 2006 A River Once More, *High Country News*.

incorporated into the system. Further, banking is greatly aided by a link to storage water rights – it is much easier to shift use when there is control over water through storage rather relying on natural flow. Some of the large water banks, such as Idaho's, are primarily for storage rights. Finally, for environmental uses, a major hurdle is cost and uncertainty. Annual leasing of water for a sustained, or even limited, period of time may cost as much as buying the water rights outright. While leasing water through a water bank may be easier, both legally and politically, at some point the cost of a sustained leasing program exceeds the cost of a more permanent solution. Then there is hydrologic uncertainty: in a dry year, when environmental needs may be greatest, there may be no water available for lease at affordable prices.

4.4 Rotational land fallowing

A water district or ditch company can broker water transactions in an orderly and systematic way that is somewhat similar to water banks. With a rotational fallowing agreement, water districts can meet a specified reduction in water use by fallowing a portion of its irrigated land, but each year there is flexibility in which land is fallowed. Of course, the landowners must agree to the fallowing. This allows a water district to reduce its overall water use, but not permanently put any land out of production or cause any one water user to bear the burden or benefit of ceasing production. Typically water districts have a role that allows them to intermediate between an ultimate water buyer and the individual producers. From the perspective of water district operations and the overall economics of a water district this intermediary role may have great advantage. Rotational fallowing has been long discussed, but not much used.

The leading examples of rotational fallowing are from California, where two water districts drawing from the Colorado River are using rotational fallowing to allow water to be transferred to Southern California cities, and in one of the cases, to provide interim water to meet environmental needs. California has a minimum right to Colorado River water of 4.4 Million acre-feet (MAF) per year but had long been using as much as 5.2 MAF annually. The other Colorado River Basin states demanded that California reduce its use to 4.4 MAF. Because irrigation use had the most senior priority and by far the majority of water, but the cities had the money and political power to insist on retaining and ultimately expanding their water use, much of the reduction had to result from shifting irrigation use to municipal and industrial use.

Palo Verde Irrigation District (PVID) has first priority to California's share of Colorado River water to irrigate its 104,000 acres. PVID is a special purpose district, with directors elected only by landowners who receive and pay for water within the irrigation district through voting proportional to land ownership. PVID recognized that it would be reducing irrigation water use and decided to manage the transition. In 1992, it set up a 2-year pilot fallowing program, with a resulting small loss of employment but no significant regional economic impact. As a consequence, there was some acceptance in the community of the concept of fallowing. In 2003, a second short term test fallowing program was implemented. After finalization of the agreement and environmental review, in 2005, PVID began implementing a 35 year agreement with Southern California's Metropolitan Water District (MWD) to fallow up to 29% of its acreage in any year and to transfer to MWD up to 110,000 acre-feet of the water "conserved" by fallowing. The agreement called for an initial payment of $3170 per acre enrolled in the program with $602 per acre (inflation adjusted) for every year the ground is actually fallowed. PVID diverts about 10 acre-feet per acre irrigated, with consumptive use of about 5 acre-feet per acre.[65] Individual landowners may enroll a maximum of 35% of their land in any given year, and the fallowed land and payments are spread across all enrolled acres (so if MWD calls for 15% of the acreage, all participating farmers fallow up to 15% of their irrigated land). MWD also agreed to provide $6 million for community mitigation. Individual landowners are responsible for paying PVID fees and managing fallowed land. In general, PVID and its members are pleased with the fallowing program.

Imperial Irrigation District (IID) is the nation's largest irrigation district, providing more than 3 million acre-feet of Colorado River water to a half million irrigated acres through 3000 miles of canals, as well as providing water and electricity to more than 137,000 residential customers.[66] Unlike PVID, IID's board is elected by the general population, not just landowners within the irrigation service area; it therefore has a broad set of responsibilities to the general public within its jurisdiction. As California's largest user of water from the Colorado River, IID also faced the political and economic pull of the burgeoning southern California cities as the state attempted to cut its draw on the Colorado River. IID, however, is a much more reluctant participant.[67] Ultimately, IID and several other entities reached agreement on a program that calls for voluntary land fallowing as an interim measure for 15 years while efficiency improvements are put into place that will allow for annual delivery of 303,000 acre feet of conserved water to several other water districts. Because return flows from irrigation have provided water for environmental and recreational use, the agreement incorporates a commitment to deliver 800,000 acre-feet to the Salton Sea over the 15-year fallowing period. The flows to the Salton Sea would be continued as an interim mitigation measure while a permanent approach to rehabilitating the Salton Sea is developed and implemented. There is also a socioeconomic mitigation program involved.[68] IID manages the fallowing program, enrolling eligible acres and randomly selecting land to be fallowed if overenrolled. For the 2007-2008 year, after a prior round of sealed bids to establish approximate market prices, IID pays for water from fallowing at a rate of $75 per acre-foot, which it then re-sells for urban and environmental use based on a previously negotiated price schedule. For 2007-2008, the blended approximate price paid to IID is $231 per acre-feet.[69] There has been opposition to the agreement within the Imperial Valley, because it will

[65] http://www.pvid.org/PVID%20Histroy.html
[66] Imperial Irrigation District, 2005 *Annual Water Report.* http://www.iid.com/Media/2005IIDWaterAnnualReport.pdf
[67] IID characterizes its position on fallowing as being "fundamentally opposed." http://www.iid.com/Water_Index.php?pid=267
[68] Yardas, David and Kusel, Jonathan, 2006. *The Local Entity 2003-2005: A Progress Report on Socioeconomic Mitigation Efforts Under the IID-SDCWA Water Conservation and Transfer Agreement* Environmental Justice Coalition for Water http://www.sierrainstitute.us/FinalFullReport.pdf
[69] For the price schedule see Yardas and Kusel, Table 3. http://www.sierrainstitute.us/FinalFullReport.pdf

result in a loss of about 10% of the water supply, and many fear a reduction of agriculture and a loss of jobs.[70]

Rotational fallowing has some of the same problems as water banking, and some unique issues. In common with water banking or leasing is the issue of cost. As the two California examples show, coercing water districts to do something they may not want to do can be very expensive. Southern California cities may be able to afford annual expenses such as those in the IID and PVID examples, but most environmental programs would find those costs unsustainable. As with water banks, fallowing programs have the same issues of legal constraints on short or long term transfer of water, return flows and injury to third parties. A problem that these two rotational fallowing programs addressed that most water banking programs do not is land management on property taken out of agriculture. Weeds and dust can be severe problems on fallowed lands unless those lands are appropriately managed; both IID and PVID have requirements that fallowed land be managed by the landowners, and established standards and in some cases reimbursement for that management. Most water banks do not have any such requirement. Similarly, water banks and rotational fallowing, as well as any strategy that results in reduction of irrigated agriculture, may cause socioeconomic impacts due to changes in the economic use of water; while these issues are at least considered (and funded) as part of the these two rotational fallowing programs, few water banks formally consider the potential problems.

Managing a large scale fallowing program takes significant administration and knowledge of the local conditions. Typically an irrigation district would be in a much better position to manage such a program than an outside buyer of water; hence involving a water district makes sense.

4.5 Buying and Selling Water Rights

To address long-term environmental issues, efficiency, rotational fallowing or water banks are not necessarily the best solutions because permanent change to water use may be required. The typical way this is accomplished is by simply buying the water right, sometimes along with the irrigated land. However other permanent changes to water use may also be transacted short of buying an entire right, such as through acquiring a change to the scope of a water right.

Water Rights Transactions (Without Land) If water is needed, the simplest transaction would appear to be buying a water right without the appurtenant land, and following the change of use procedures to redirect the water to the new use. In a few places, most notably Colorado, robust water markets are active. In these places water rights are commonly bought and sold; typically the water is sold by irrigators for use by cities or sometimes, higher valued agriculture.

[70] Cline, Harry, December 6, 2003, Peace Elusive along Colorado River, *Western Farm Press* http://westernfarmpress.com/mag/farming_peace_elusive_along/

For environmental use, bare water transactions, without appurtenant land are not yet common, but do occur, sometimes as purchases and sometimes as donations. Purchase of water without appurtenant land has occurred in a number of places in the west. The CBWTP has funded water right purchases in Oregon, Washington and Montana, both through direct purchases and as part of efficiency improvement efforts. In Oregon and Washington hydropower rights have been purchased, which allow rewatering of bypassed reaches of rivers between the hydropower intake and where water is returned to the river. However, with hydropower projects there is little or no consumptive water use, so there is no benefit to the river below the bottom of the bypassed reach.

A novel transaction recently occurred in the John Day River in Oregon, where a permanent water transaction occurred by reducing the scope of an existing water right. There the only irrigator on a river agreed to permanently forego a final late season cutting of hay, and formally change its water right to reflect the change. Because there were no other irrigators, and the basin is closed to new appropriations, reducing the right has the effect of dedicating the water to instream flows. (See Appendix E)

Purchases of Water and Related Interests (Usually Land) The more common water acquisition has been in conjunction with purchase of water, land, and related interests. This style of water right purchase comes in two different types. In the first, both the land and the water are useful to the purchaser, perhaps because of the land's inherent conservation value (e.g., riparian parcels) or because owning the land (at least for some period of time) adds important elements of flexibility and control to the ultimate disposition of the appurtenant water rights. In the second approach, the land is not particularly useful and eventually the buyer disposes of the land. Nevada is the leader in environmental water acquisitions through this model.

Buying land and water has an added benefit – control. If the land is purchased, the buyer has control of all water rights appurtenant to that land, which may include a variety of direct flow, storage and groundwater rights. Further, where the problem is net consumption of water rather than simply timing, there is no chance of the landowner simply switching to another form of water rights, such as groundwater, after selling surface rights. Eventually, the land may be sold, with covenants or easements limiting the use of the land to suit the problem.

Buying water rights with or without land requires patience, significant due diligence, and often high transaction costs. Patience is required in finding appropriate transactions, getting a potential seller to agree to the deal and then in the administrative process for changing the use of the water; each of those phases may take more time than seems reasonable. The Nevada Department of Wildlife once spent 20 years talking with a stock grower before he would sell his land and water for a state wildlife management area.[71] The inherent complexity of water rights, the uncertain status of rights that have not been recently adjudicated, and the possibility of forfeiture for past non-use make due diligence critical. Added to that uncertainty in the original right are the questions about potential problems in changing the right to a new use – will third parties have legitimate claims of

[71] Liquid Assets.

injury, can the water physically be moved to a new use, and how difficult will it be to defend the water from intervening water users? These issues will all arise in any proceeding needed to transfer the right to a new place, so due diligence beforehand is better than being surprised in the change of use proceeding. In Nevada, Department of Wildlife staff were surprised when they purchased a 5000 acre-foot right, but after mitigating third party injury and conveying the water through a reach of river where water seeped into the groundwater, only 200 acre-feet made it to the intended use.[72] Finally, the water right must be defended against others who may infringe upon it.

Many of the issues discussed above for leases, water banks and rotational fallowing apply as well. Common issues include injury, return flow, the legal process for changing location and use as well as enforcement and defense. The problem of the fate of land taken out of production becomes permanent rather than temporary. Where there is an identified subsequent land use, such as dryland farming or development, the issue is less of a problem; however, when the land is fallowed, the problem of weeds may become severe. The effect on third parties may be significant. Under Nevada law, there is some legal consideration of districts, ditch companies or other associations, but no explicit consideration for other third parties apart form the general public interest standard.

4.6 Improved Benefits from a Variable Water Supply

Water is an inherently variable resource that provides benefits and risks of a wide variety. As societal objectives change, markets change, technologies change and the climate changes, there may be significant benefit to changing the management, operations and sometimes infrastructure of water supply systems as well. That change may take a number of forms. In some cases, resources can be used in ways that take advantage of their particular attributes; for instance when groundwater and surface water supplies are used separately, fewer benefits may result than when they are used together, conjunctively, in an integrated manner. Climate change is affecting Western hydrology, with signals of a changing climate already being detected in the timing of spring runoff and the snow pack; as climate changes, water system operations will have to change as well.

Re-operation Water systems are managed using sets of rules crafted to meet the objectives of the project or projects, and derived using the available hydrologic data, applicable laws, as well as contractual and other relationships. That set of rules dictates the operations of the project, including the risks the project will take in supplying specified quantities of water, what flood risks will be tolerated, what environmental or recreational benefits will be provided and what hydropower, navigation or other objectives will be met. Meeting these multiple objectives involves balancing the benefits provided to different interests, and then trading-off risks among the objectives. For instance, even in a single purpose water supply project, deciding to supply a certain level of early spring water supplies may affect the ability of a project to provide late summer supplies. Similarly allowing space in the reservoir for spring floods may reduce the

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[72] Id.

overall yield of the project, but reduces the risk of overtopping the project and may provide flood control benefits downstream. Explicitly examining the trade-offs among the various purposes and objectives of a project may yield opportunities to improve the overall performance and mix of benefits. This examination and subsequent change in project operations is commonly termed re-operation.

Re-operation may involve meeting existing objectives with greater efficiency, or it may involve changing the mix objectives and the different priorities among them. Conceptually, re-operation involves two distinct phases. First there is identifying the objectives and the trade-offs or priorities among the objectives. Second, is applying the tools of modern systems analysis and risk-based hydrology to most effectively meet those objectives. In practice, the two phases are often iterative –objectives change based on what can be accomplished.

The leading examples of project re-operation are hydropower projects operating under license from the Federal Energy Regulatory Commissions (FERC). Under the Federal Power Act, non-federal hydropower projects operating on navigable waterways require licenses to operate from the FERC. Those licenses are valid for from 30 to 50 years. Upon expiration of the license, there is a lengthy and open process to review all of the objectives of the project – energy production, peaking and load following power, recreation, environmental issues, aesthetics, navigation, water supply and more. A new license is then issued that balances the various objectives, and sets the broad terms of future operation for the project. That process is a formal and complex version of project re-operation. Because concern over environmental performance has greatly increased in the last 30 to 50 years, since hydropower licenses now expiring were issued, there is much greater emphasis on the environment in new licenses. Enormous improvements in the environmental performance in hydropower projects have resulted from re-operation under the new licenses at modest cost in energy production and the value of energy production.

Single purpose water supply projects may be beneficially reoperated as well. Older projects typically use operations rules to emphasize firm yield – the water supply that could be met in all but hydrologically extreme years. As systems analysis becomes more commonly applied to water projects, explicitly risk-based operations may be developed for these projects. The overall average yield of the projects can be increased, at the expense of increasing the chance of a reduced yield in rare years.[73]

Conjunctive Use of Groundwater and Surface Supplies Surface water and groundwater supplies are both used for the some of the same things – irrigating crops or supplying domestic or municipal needs. But in some respects they have greatly differing characteristics. Optimizing the benefits from a water supply system requires taking advantage of those different characteristics.

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[73] Department of Water Resources, 2005. Chapter 19: System Reoperation, *California Water Plan 2005 Update* http://www.waterplan.water.ca.gov/docs/cwpu2005/vol2/v2ch19.pdf

One of the greatest differences between surface and ground water is the time scale upon which availability changes. Surface water in the West is typically most abundant during spring snowmelt and after intermittent storms, while groundwater is present in the ground year round.   Availability of surface water varies from year to year, as drought and high precipitation years wax and wane; groundwater supplies typically vary much less from year to year, but may reflect longer term precipitation trends. In much of the west, there is annual replenishment of some portion of groundwater, while deeper groundwater may have residence times of hundreds or thousands of years. Groundwater basins can be depleted, drawn down so that water stored for many years is gone and the energy cost of pumping rises dramatically; surface water is renewable as long as the rains come every year.

Another great difference between surface and ground water is location. Surface water collects in rivers and streams, and must be transported via canals, ditches or pipes to where it is put to use. Conveyance may be a matter of feet or hundreds of miles, with losses along the way and at sometimes significant energy cost. Groundwater, on the other hand, is often available at the location of use. A well is drilled, and the water pumped only a short distance; however, energy use and cost may be considerable.

Conjunctive use of ground and surface water takes advantage of those differences in characteristics to meet overall objectives. Groundwater can be used in dry years, when surface supplies are unavailable. Source switching, moving from a surface water diversion to groundwater, may allow the surface source to continue flowing during late summer low flow periods, while irrigation continues. Efficiency may improve as well because using groundwater may reduce conveyance loss greatly, and may facilitate shifting to pressurized sprinkler irrigation. However, if more groundwater is pumped than recharges in the wet years, the overall groundwater levels drop. Recharged groundwater and surface water ultimately come from the same source – annual precipitation.

For most Western water systems, there are huge opportunities to modify operations, make better use of surface and groundwater, and improve the overall mix of benefits provided. Reoperation of water projects, especially through application of systems analysis and modern risk-based decision making, can greatly improve the reliability or yield of projects, and can free up water for use when needed by the environment. Better integrated use of ground and surface water can improve water supplies or make available environmental water where problems are timing and location of use; where net water use is the problem, the utility of conjunctive use may be lower.

The two main difficulties in these modern approaches are: first, that there while some interests benefit from change, others do not or are harmed; and second, real legal and institutional impediments exist to making changes. Change always disrupts the existing mix of benefits, helping some people and harming others. For example, re-operation of a water project may increase the average yield, but make the yield more variable; for those who are at the end of the priority list for water deliveries, the result may be less water. Or, if a change increases water available for environmental use, water users who feel that they are being shorted in delivery may believe the water should be theirs. That disruption often makes resolving legal and institutional impediments more difficult.

5.0 Institutional and Operational Issues

Beyond the strictly technical and legal aspects of transactional approaches to environmental water transactions, a number of institutional and operations issues arise. This section describes some of those issues.

5.1 Matching the Solution to the Problem

The most striking difference among the various water acquisition programs is the emphasis placed on the three main techniques – efficiency, term arrangements and permanent solutions including acquisitions and reoperation. All three techniques clearly have their uses, but none of them is suited to all situations. The key to effective transactional approaches appears to be matching the characteristics of the solution applied to the characteristics of the problem to be addressed.

In the Pacific Northwest, the Columbian Basin Water Transactions Program (CBWTP) is working most vigorously at connecting main stem rivers with tributary fishery habitat; typically the problems are that at specific times of the year, flows are too low in the smaller streams to allow fish to pass as they move to upstream habitat. This is not an overall water consumption problem, but rather a problem of low flows at specific time in stream reaches that create choke points. The tools it primarily uses are fairly effective at bridging short term and limited geographic water needs: leases; non-diversion agreements; and efficiency measures. The leases and non-diversion agreements put water back instream in places that particularly need water, but when the tributaries reach the main stem rivers, there is no need to, and probably no ability to, track the water as it flows downstream. The efficiency measures, often coupled with a change in source (from tributary to mainstem or groundwater diversion), similarly have greatest effect in the tributary. For all of these efforts, decreasing overall consumptive use is less important than reducing diversion in specific reaches. The measures used match the problem. Of course, the CBWTP would prefer to solve the problems permanently, and is moving towards measures that do so. In some cases this might involve a permanent or long-term water rights acquisition, but in general it is moving away from drying up agricultural land, and towards targeted water management changes to water practices to improve fishery habitat.[74]

In Nevada, programs to increase inflow into Pyramid Lake, address flow-related water quality issues on the Truckee River, and increase water supplies to Stillwater National Wildlife Refuge are relying on permanent acquisition and retirement of agricultural irrigation. The problems to be addressed, particularly for Pyramid Lake and Stillwater, require permanent increases in environmental water supply and consequently permanent reductions in upstream agricultural consumptive use. Again the solution, water rights acquisition, matches the problems.

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[74] Purkey.

For the Imperial Irrigation District, there is a phased approach. Politically, IID has no real choice but to send water to the Southern California coastal population. It has been using water inefficiently, with huge quantities of water ending up in the Salton Sea. So it has accepted rotational fallowing as a temporary way of freeing up water to meet the municipal needs of the cities, while it works on increasing efficiency as its long term source of water for export. This phased approach makes a great deal of sense for IID, which does not want to reduce agriculture, the economic base of its community. It does, of course pose significant ecological problems for the Salton Sea, which will experience a great decrease in freshwater inflows; the Salton Sea will have to be reduced in size to match the new inflow rates to make the ecological system work.

The Palo Verde Irrigation District rotational fallowing and leasing program is an interesting set of contrasts. Metropolitan Water District has a need for a long term source of water, but has agreed to a long term lease rather than a permanent water right. As a municipal entity serving millions of people, MWD has the ability to assure itself of a stream of income that would pay for the leased water through its utility rates. This is in contrast to federal government funding for environmental water leases which are subject to annual appropriations and competition with other priorities. MWD appears willing to forego the certainty of permanent rights acquisition because it can rely on its ability to pay for leased water. PVID irrigators in turn receive a significant stream of income from their assets over the course of the 35 year agreement. While the problem of MWD water supply is permanent, and the solution is merely long term, the financial strength of MWD allows the mismatch to be acceptable. The agreement allows MWD the time to invest in other forms of water supply and demand reduction. The next agreement 30-odd years in the future may also address the mismatch.

Problems arise when the solution chosen fails to match the problem in some respect.

On the Klamath River, the Bureau of Reclamation is required to have a pool of water to be managed for salmon. Coho salmon need additional flows in March and April, before the peak June and July irrigation season. So buying or leasing irrigation rights, which produce flows during the irrigation season, does not address the problem, unless there is an ability to store the water. Reclamation has therefore paid groundwater well owners to pump water directly into the river when water is needed, essentially using the groundwater system as its storage. The consequence has been depletion of the groundwater system, as significant federal expense. This system works, but is probably unsustainable hydrologically, and may eventually run into problems with federal funding. Reclamation staff are looking for increased storage capacity that would allow it to manage water for environmental needs, reducing conflict with irrigation; they are actively exploring developing new storage. Fundamental problems with water rights in the basin make that solution difficult -- Klamath River basin water rights have been in adjudication since 1975, and far more water is claimed than the river could ever provide. While leasing is an appropriate interim approach, a long term solution must involve resolving water rights claims, and permanently providing fishery flows, possibly through retiring and storing a portion of irrigation rights.

In California, Reclamation is leasing water to supply wildlife refuges. Reclamation staff acknowledges that this is a short term solution to a long term issue, and is actively looking for alternatives.[75] Leasing takes a significant amount of federal money, and there are always competing demands for the federal funds. The mismatch between solution and problem is both in permanence and funding. Reclamation is considering shifting to groundwater pumping to meet the refuge demand. While this could exacerbate issues with groundwater depletion, it does address the term and funding issues.

Effectively matching solution to problem requires a careful assessment of the characteristics of both. For instance:

- **Efficiency** Efficiency measures have three main effects. First, they modestly reduce the consumptive use of water, by reducing evaporation not directly related to plant transpiration, such as from ponded water. Second, they greatly reduce return flows, both from conveyance and on farm losses. Finally they may reduce the amount of water that needs to be withdrawn from either ground or surface supplies. Of these, the reduction in consumptive use is likely to be much smaller than the reduction in return flow. Combined the two allow a greater reduction in diversion. Therefore, the greatest effect of efficiency measures is when there is a need to reduce diversion or capture return flows. Efficiency is effective in addressing problems of timing, and location of water where the diversion is large compared to the water supply source, such as with single irrigators drawing from tributary streams. At the level of a water district, such as for IID, efficiency measures have the potential to greatly reduce return flows, and allow that water to be put to other use.

- **Leasing** Leasing water is by its nature a term limited measure. With this in mind, it best applied to either short duration problems or as an interim measure while other measures are developed to address long-term problems. One rationale for leasing is that it allows irrigators to become comfortable with managing water for environmental purposes. However, that approach runs the risk of institutionalizing leasing for permanent problems, at which point the issues of funding arise. Andrew Purkey of CBWTP, which funds many leasing programs, made a particular point of the need to make explicit the short term nature of leasing programs where longer term solutions are being sought. MWD was willing to engage in long term leasing of water with PVID because it is assured of needed funding, but for environmental water needs, where funding is less secure, leasing may not be the best long-term solution.

- **Permanent Solutions** Permanent solutions are needed for permanent problems. For problems with overall water use, a reduction in consumptive use may be needed, which could be achieved through a combination of systemic efficiency and irrigation retirement. Where the problem is the source of water, rather than the overall use of water, a permanent solution might be system improvements, such as switching the source of water, from tributary to mainstem or groundwater.

[75] Dan Meier, Bureau of Reclamation. Personal Communication. March 2007.

The solutions may also require institutional changes. Examples of institutional approaches include agreements (including conservation easements) to cease diversion when flows drop below certain levels, or reoperating storage systems to change the mix of benefits generated.

5.2 Pricing

Pricing any good, from rare jewels to water rights, in thinly traded markets is difficult. In most environmental water and water rights acquisition situations, transactions are in thinly traded markets. In this context, establishing prices that are fair to both the buyer and seller can be difficult.

For water rights, sellers often have very high expectations of the value of their property, expectations not based on current economics. In particular, the water rights holder may not base value on the current use of water in sometimes marginal irrigated agriculture, but rather based on an assumed future use by thirsty and desperate cities. Whether that expectation is justified is almost immaterial; as long as the seller holds it, the price demanded for water rights makes environmental transactions difficult. In addition to the economic issues in pricing, there is a social component. In many rural communities, there is a strong sentiment against selling water rights for uses that take the water out of irrigated agriculture. For some people, only a high price will justify overcoming the social pressure against selling.

In addition to the issue of expectation, water and water rights are not easy to price because each has a unique setting and set of attributes that may change their value to different potential buyers. The first level of valuation is in the transferable quantity of water – this is where the issues of historical use, consumptive use, as well as the certainty of the water right and other legal and contractual issues (such as with water districts) arise. The second level of valuation is in conveyance of the water from its original use to another use – for some buyers and new uses, the conveyance is expensive, involves significant losses, creates legal risk, or makes resolving injury issues more difficult. The third level is the new use; water that can be readily sold for a high valued use, such as municipal or very high valued crops such as vineyards, is of greater value than water that has less economic potential use.

While there are probably limitless possible approaches that could be used in setting prices, several different approaches appear to be most common.

Bilateral Negotiation The most straightforward approach to setting a price and other terms of sale is through bilateral negotiation, where a buyer and seller discuss and agree upon a price. In a pure form, bilateral negotiation is fairly rare because relatively few environmental purchasers of water rights ultimately have final authority. A water trust buying water with its own assets would fall into the pure bilateral negotiation category. Fish and wildlife agencies or other government agencies buying bare water rights or water plus land may be in this category, depending on applicable government acquisition rules. In practice, the results of most bilateral negotiations have to be presented to a reserved decision maker for approval.

The results of bilateral negotiation can, of course vary wildly from an outcome that reflects a “market value,” or value “fair” to both buyer and seller, depending on position, leverage and the need to have a deal. When there is information about similar transactions available, or some other rational basis for a price, the “fair” deal is more likely to occur. However, getting that information can be difficult when there are few other similar transactions, or as with short term leases, the transactions may not be publicly reported.

To help bound the price negotiation, experts may be consulted. For water right deals, with or without land, appraisers are often consulted, and may ultimately set the price. In Nevada, Great Basin Land and Water[76] typically enters option agreements for water rights or land and water rights that set out a process of setting a price through an appraisal.[77] For lease agreements, appraisals are less commonly used, but brokers or other experts may be consulted. The Columbia Basin Water Transactions Program has established a draft policy calling for various levels of detail in appraisals, depending on the dollar value of the transaction, lease or sale.[78] In California, the program that buys water for wildlife refuges often uses brokers both for connecting with sellers and for establishing price.[79]

Standard Offer Standard offers are commonly used in leases of water though water banks and have been used in single purchaser-multiple seller situations. In these cases a price is established (usually by a water bank) and potential buyers or sellers willing to accept it make known their willingness to transact at that price. The price of the standard offer may be set through some form of negotiation or through more or less informed decisions about a price that would elicit the desired response.

Unilateral decisions about price may miss the mark, and certainly leave room for questions about how the price is set. In Idaho, state law specifically has allowed use of water banks to meet environmental purposes in two cases: Reclamation purchases to meet ESA flow requirements in the Snake River; and on the Lemhi River to avoid an ESA problem with a river reach drying up due to irrigation withdrawals. For the Snake River, the state sets the price, and has set different prices for irrigator-to-irrigator transactions than for irrigator-to-Reclamation environmental transactions; in 2002 the Reclamation price was more than triple the irrigator price ($3 vs. $10.50). The rationale for this difference in price was the local impact of actual farming rather than selling the water, but without any quantification of this differential. On the Lemhi, the local water district created a water bank to allow Reclamation to buy water and set a price of $220 per acre

[76] Great Basin Land & Water, for whom this report was prepared, is an active participant in environmental water transactions. However, the opinions and information presented in this report about Great Basin Land & Water are those of the author, and do not represent any position of, nor have been endorsed by, the organization.
[77] *Liquid Assts*, p. 74.
[78] Purkey.
[79] Meier.

or about $146 per acre-foot. A brief economic analysis of the value of water to irrigators on the Lemhi[80] performed for the Columbia Basin Water Transactions Program suggests that a reasonable range of values for water was from $45 to $92 per acre. These values suggest that the arbitrary price set for water was high, and that an auction or other market-based system might result in significant cost savings. Subsequent work on the Lemhi has allowed the problem to be addressed through non-diversion agreements that allow two irrigators to use water until the critical flow periods are reached.

Bulletin Board Open Pricing Bulletin board style water banks, where offers to buy and sell are posted, are reportedly the most common type of lease-based water banks in the West and set prices through open pricing.[81] However, few such water banks are used by environmental buyers, and there are few, if any, examples of how they could be used in practice. Water banks set up to serve the needs of both environmental needs as well as water user-to-water user transactions, such as the Central Oregon Water Bank, could use this open pricing model.

Sealed Bid Offers to Sell In the common context of single purchaser water acquisition, sealed bid offers to sell give a buyer some confidence that the ultimate price reflects market prices better than a fixed price might.

In Oregon, the Deschutes Resources Conservancy (now the Deschutes River Conservancy) used sealed bids in a water district where a standard offer of first $7 per acre-foot and then $29 per acre-foot failed to yield as much water as needed. So in 2003 it asked for sealed bids and accepted three that were below its $75 secret reserve. In 2004, using sealed bids, irrigators responded with the $75 ceiling from the prior year in mind and lowered their prices, while DRC raised its secret reserve expecting the high prices of the prior year to be repeated. The result was that the DRC managed to buy more water than it had expected for the sum it had set aside.[82]

Another example is the Yakima basin water bank created by Washington's Department of Ecology. There Ecology used a sealed bid/auction to buy water for domestic and instream flow in the Yakima River during drought in 2005, and for instream flow in 2007. (See Appendix F.)

Appraisal For land transactions, appraisal often informs, and sometimes determines transaction price. Water rights appraisals are becoming more common, but there are a limited number of experienced practitioners and the standards for practice are apparently still evolving.

In Nevada, the practice of buying land and water for environmental purposes is more established than in other western states, with two major acquisition programs operating. Both base their transactions on appraisals. Great Basin Land & Water (GBLW) is acting

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[80] Hamilton, Joel. *Water Acquisition for Maintaining Minimum Flows on the Lemhi River* CBWTP, http://www.cbwtp.org/library/WaterAcquisitionLemhiRiver.htm
[81] Clifford et al.
[82] *Liquid Assets.*

as an intermediary between sellers and both local government and an Indian tribe to buy water as part of a settlement of Clean Water Act litigation. It identifies likely prospects through its contacts, and then does the preliminary work investigating the transaction, including due diligence, preliminary title search, water rights assessment and if necessary an engineering assessment. If water, or land and water, is suitable, it enters into an option that sets out a process, but does not establish a price. An appraisal by a local qualified appraiser acceptable to both parties sets a price, which the seller may accept or reject. The US Fish & Wildlife Service is buying water rights, or land and water, for the Stillwater National Wildlife Refuge. It solicits offers to sell, and then, if a preliminary water rights assessment finds the offer acceptable, uses an appraisal to set the price. Both GBLW and Fish & Wildlife report that using an appraisal to set the price avoids negotiation over a potentially contentious issue, in transactions that are often emotionally charged.[83]

Practice on appraisals for term acquisitions vary, even among federally sponsored programs. The federally-funded Columbia Basin Water Transactions Program, is moving towards systematic use of appraisals. In 2005, it prepared a preliminary draft policy, requiring different levels of appraisal, depending on the dollar value of transactions.[84] This policy would apply to leases of water as well as permanent acquisition. While the policy has not been formally adopted, it is generally being followed.[85] Two federal programs leasing water, Klamath and the Bureau of Reclamation's program that buys water for wildlife refuges, do not require appraisal of annual acquisitions.[86]

Federal agency land acquisition is guided by appraisal standards commonly referred to as the "Yellow Book,"[87] which is based upon a policy of fairness to both the seller and the public. In most circumstances, federal land acquisition requires that the price of property, including leases, be based upon, or supported by, appraisal. Because water rights acquisition involves a number of issues not explicitly addressed by the Yellow Book, federal agencies are evolving additional standards for these transactions. The US Fish & Wildlife Service recently issued guidance for water rights acquisition in California.[88] The Bureau of Reclamation's Reclamation Manual also contains guidance on appraising water rights and leases.[89]

Hybrids and Combinations Price setting approaches may be combined or different approaches may be used at different times for the same project.

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[83] See *Liquid Assets*, pp 71-80.

[84] Columbia Basin Water Transaction Program, 2005*. Preliminary Draft 2005 Interim Water Valuation Policy Recommendations*. Available from CBWTP upon request.

[85] Purkey.

[86] Meier.

[87] Interagency Land Acquisition Conference, 2000. *Uniform Appraisal Standards for Federal Land Acquisition* Appraisal Institute http://www.usdoj.gov/enrd/land-ack/yb2001.pdf

[88] Herzog, Steven, 2006. *Guidelines for the Appraisal of Water Rights in California*, US Fish & Wildlife Service
http://www.fws.gov/cno/fisheries/docs/Guidelines%20for%20Appraisal%20of%20Water%20Rights.pdf

[89] Bureau of Reclamation, 1998. Reclamation Manual , Directives and Standards LND05-01
http://www.usbr.gov/recman/lnd/lnd05-01.pdf

Where a water district controls access to the pool of potential sellers, it may choose to intervene in the transaction process by negotiating the price and other terms and conditions of transfer. The Imperial Irrigation District and Palo Verde Irrigation District rotational fallowing situations are examples. In both cases the water districts involved negotiated the price and other terms of transactions with the municipal buyers through bilateral negotiation. Then with the districts setting a standard offer, individual irrigators made the decision as to whether to enroll in the rotational fallowing programs.

The Klamath Water Bank presents a sequence of price approaches. In 2002, the Bureau of Reclamation set the Water Bank up upon very short notice when additional flow was required as a Reasonable and Prudent Alternative under an Endangered Species Act Biological Opinion.[90] In 2002, with only weeks to find water to meet the requirements, it entered into bilateral negotiations with two groups of water rights holders and spent about $133 per acre foot for the required water supply. In 2003, it shifted to a standard offer of $75 per acre-foot of water; with more water offered than it needed, it could select offers to sell that best met its needs. In 2004, after an Oregon State University Extension study[91] suggested that economic returns to water ranged from about $25 to $250 per acre-foot, Reclamation switched to soliciting sealed bids with a price per acre water owners were willing to accept. Reclamation evaluated bids by reducing the offer to a price per acre-foot, using crop type and soil classification to calculate the water used per acre, and selected land for enrollment based on cost per acre-foot and their desired mix of water sources. The result was a cost of about $65 per acre-foot. [92] In subsequent years, Reclamation has continued to use a sealed bid approach.

For permanent water rights acquisition, setting price through either bilateral negotiation or appraisal, are probably the only real options. Sealed bids responsive to a very detailed set of qualifications might be feasible, but because water rights, especially with land, are so complex, drafting a complete set of bid qualifications would be a daunting task. On the other hand, for leases of water, where there is a reasonably large pool of potential applicants, the sealed bid process may result in prices that more fairly represent a market price in thinly traded commodity than bilateral negotiations might. In both the Klamath and DRC significant cost savings resulted from using sealed bids. For both water rights and water leasing, appraisal may still be an art rather than a science, and an art with a

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[90] After the high-profile events of 2001 where water was cut off to Klamath irrigators because of impact on salmon, the National Marine Fisheries Service revised its ESA prescriptions for the threatened Coho salmon and issued a May 2002 Coho Biological Opinion that set out water management requirements for 2002-2012. In addition to flow targets, the Biological Opinion required that Reclamation establish a supply of water to be used to supplement flows for the Coho. Under this prescription, Reclamation is obligated to obtain and use for flow augmentation: 30,000 acre-feet in 2002; 50,000 acre-feet in 2003; 75,000 acre-feet in 2004; and 100,000 acre-feet in 2005 and thereafter. The Klamath Water Bank is Reclamation's approach to obtaining this water. See *Liquid Assets*. NMFS, 2002. Biological Opinion, Klamath Project Operations. http://www.usbr.gov/mp/mp150/envdocs/kbao/KpopBO2002finalMay31.pdf

[91] Jaeger, W.K. 2004. The Value of Irrigation Water Varies Enormously Across the Upper Klamath Basin, Oregon State University Extension. http://eesc.orst.edu/agcomwebfile/edmat/EM8843-E.pdf

[92] Bureau of Reclamation, Klamath Basin Pilot Water Bank http://www.usbr.gov/mp/kbao/pilot_water_bank/latest_primer_waterbank.pdf

small number of practitioners. There is a significant move towards using appraisal to at least inform transactions, and set boundaries for the transaction price.

5.3 Community Response to Water Transactions

One topic arises for every environmental water transaction program – the role of the community and the extent to which community support is needed. While all agreed that community support is useful, there are different approaches to developing it and whether it is necessary.

The programs that have consciously worked to develop community support have typically used one of two related approaches; using pilot projects; or building a local positive presence in the community.

Pilot projects can be a very effective way of gaining support, beginning with modest transactions, and allowing community members to judge whether transactions ruin farmers or the community and help the ecosystem. An excellent example of the pilot project approach is the PVID-MWD transaction. PVID staff cites community acceptance of a pilot project in the early 1990’s as critical in moving to a long-term transaction. A corollary to the PVID positive experience is that the results of the pilot must be well understood; doing the pilot is not enough, the results must be monitored and evaluated using a rigorous analytical approach. Because the contentious issues are more than just hydrology, the questions posed and answered should be economic and sociological as well as physical. For the water trusts and the CBWTP, short term leasing serves as a pilot project and provides entrée to the less receptive member of the community. Leases allow the community to see that environmental transactions do not lead to demise of the community economics, and can lead to significant environmental improvement. The objective is to then switch to longer term and permanent solutions to the environmental problem. In the Columbia Basin, the shift is being pushed by the dominant water transaction funder, the CBWTP. Because CBWTP now has more projects seeking funding than it has funds available, it is preferentially funding long-term and permanent solutions. One of the lessons of the pilot project approach is that once the early efforts begin to win community support, limited funding can aid in forcing the shift to permanent solutions.

Sustained local presence, based on an open agenda, access to information and honest dealings is way to develop local credibility. In Montana, Trout Unlimited calls this the “Hats and Boots” approach – if a few producers are convinced to engage, and are subsequently willing to support a project, their presence will help convince neutral or opposed community members. TU selects its project to provide a combination of environmental benefit and generally positive impacts on producers. For instance, TU and others in Montana have financially supported efficiency projects funded in part by the federal EQIP Farm Bill program that provide both tributary flow benefits and irrigation efficiency improvements. They have also worked to solve flow problems with the minimum disruption to irrigation diversions, for instance through agreements that limit diversions only for a few critical days.[93]

Community support is not always possible or necessary. In Nevada, the Stillwater acquisition program attempted to use mass marketing to reach potential buyers, but found that publicity increased negative feeling about the program; this caused a switch to direct mail and publicity about improved hunting and fishing that results from increased water supplies.[94] The Truckee River acquisition program faces hostility from the local water district and county, yet continues to find individual land owners willing to sell their land and water. In California, the Bureau of Reclamation wildlife refuge water program works with sellers directly where possible, but finds that working through brokers reaches sellers reluctant to deal with it directly.

5.4 Environmental Review

Federally funded water acquisition programs are required to comply with federal environmental law, such as NEPA and ESA, requiring review of projects. The method of such review varies greatly. In California, Reclamation does NEPA and ESA review for each transaction, usually through an Environmental Assessment (EA); the cost and time involved in these reviews encourages longer term leases.[95] BPA is reportedly preparing NEPA compliance for all of its fish and wildlife activities; once completed, individual transactions through CBWTP that do not involve in-river work will not require further NEPA compliance.[96] The Klamath purchases by Reclamation are covered by environmental compliance for the project operations.[97]

5.5 Actors

The number of, and roles for, the actors in the water transaction programs surveyed vary considerably. In some programs, the principals deal with each other directly. Several programs have intermediates – brokers, co-principals, administrators-- between the government agency and the water rights holder.

For the Bureau of Reclamation programs in several states, and the Fish & Wildlife program in Nevada, the government agency may deal with sellers or lessors directly, without any intermediary.

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[93] Laura Ziemer. Montana Trout Unlimited, Personal Communication, February 2007.
[94] It is worth noting that over a period of 20 years, with a generally opposed community, the US Fish & Wildlife Service has purchased enough water (and farmland) to become one of the largest water users in the irrigation district which serves the area. A persistent, low key approach yielded tremendous environmental benefits.
[95] Meier.
[96] Purkey.
[97] John Hicks and Jennie Hoblit, Bureau of Reclamation, Klamath Area Office. Personal Communication, March 2007.

Reclamation in California uses water brokers in some cases to find sellers, help set prices, and serve as a buffer when the seller does not feel comfortable with the agency.

In Nevada, Great Basin Land & Water acts as a co-principal, functioning as an intermediary in finding sellers and entering into options that allow the deal to go forward; at closing, Great Basin assigns its rights to the ultimate owner or takes title and re-conveys the property. Because there is significant distrust between sellers and the Indian Tribe which is an ultimate owner of the water in some of its transactions, Great Basin's role is critical.

Water districts can serve as intermediaries in multiple capacities. For the PVID fallowing program, PVID negotiated the overall agreement with MWD and serves as an administrator for fallowing contracts between individual land owners and MWD. In contrast, for the IID fallowing program, IID is squarely in the middle of the deal, contracting with water users for fallowing and with the municipal districts for supplying water.

Perhaps the most extensive network of intermediaries is found in the Columbia Basin Water Transactions Program. Funding and direction for the program is from Bonneville Power Administration in cooperation with the Northwest Power and Conservation Council. BPA funds the National Fish and Wildlife Foundation, which runs the CBWTP. In turn CBWTP has formal relationships with 11 Qualified Local Entities (QLE's) in Washington (4 QLEs), Oregon (3 QLEs), Montana (3 QLEs) and Idaho (1 QLE). The QLEs develop transactions and then apply to CBWTP for funding to complete the transactions. Because the QLEs are quite different in approach, each type of QLE may appeal to, or have relationships with, different water users. Some QLEs are state government agencies, some are NGO water trusts, some have a specific watershed focus and one is a national NGO.

The prevalence of intermediation suggests that it has real value in at least four different areas.

- **Knowledge** Value is found in having the knowledge required to conduct the deals. Assessing the value and utility of a water right is a task complicated by legal issues (validity of original right, priority, proceedings for change of use), historical issues (history of use, abandonment, and forfeiture), technical issues (hydrology, injury to other water rights, impacts of moving the place and use of the right) and often community and political issues as well. While specialists capable of doing this work may be available within a purchasing organization, an outside intermediary may have specialized expertise needed. The more complicated the transactions and the subsequent operational issues, the greater the need for specialists.

- **Community and Politics** Intermediary organizations may have a different role in community and political affairs. Intermediaries can develop deep local contacts, relationships, trust and sometimes opportunities, which the ultimate buyer may not have. For geographically widespread programs, such as the Columbia River Basin, intermediaries are probably indispensable for this reason. For the CBWTP, several organizations operate within three of the four states, in part because each of the intermediate organizations has an ability to develop different contacts and relationships leading to a greater richness in the types and location of deals proposed.

- **Human Dynamics** It can be difficult for even purely commercial transactions to occur between actors with different world views or where one actor is considered difficult to deal with. For particularly controversial programs, such in Nevada where there are fundamental differences between irrigators and Indian Tribes, many irrigators would not deal directly with a Tribe, but would through intermediaries. Transacting with government agencies can be frustrating and difficult for water rights owners; having an intermediary to buffer the relationship, or step in entirely between two may be useful.

- **Water Districts** Water districts present a special case because of their intimate engagement with water use and management and they can play a variety of roles, from facilitator, administrator and supporter of transactions, to active opponent. The role of the district depends on the legal structure of the water right and who holds it, as well as the legal and contractual nature of the relationship between the water user and the district. In some cases, they are indispensable parties, in others they may have no role. When the proposed new water use affects the operations and efficiency of the water district, Nevada law requires, and reality dictates, some role for the district.

5.6 Operations

Most of the environmental water transactions surveyed did not involve complex operational issues. Leasing or efficiency measures affected stream reaches nearby, and did not affect complex water systems. Water rights purchases or non-diversion agreements resulted in water left instream, but not moved significant distance. An exception is the Bureau of Reclamation wildlife refuge program that in some cases conveys water from the Sacramento River through the Delta to the San Joaquin Valley via the Central Valley Project; however, due to conveyance losses, complexity, and reliability issues Reclamation minimizes these transactions. Water users are becoming much more creative in manipulating the water rights and water conveyance systems to achieve their ends. Environmental water transactions in a system such as the Walker River are likely to follow suit.

One form of environmental water manipulation is taking place. Where there are senior water rights upstream and an environmental need downstream, the senior right may be acquired and moved to a point of use downstream, below the reach where the environmental need exists. Even in states where instream environmental rights are not well established, these kinds of transactions can be completed, because the environmental benefit is incidental to the water rights transaction.

For non-environmental water users, the multi-party transactions involve shifts in timing and places of use to meet a new water demand, while at the same time resolving any injury issues to third parties. In Colorado, where the practice is very well developed, the primary techniques are exchanges and plans of augmentation. An exchange involves a junior upstream water user who would not otherwise be in priority and a senior right that if shifted upstream to the junior, would allow the junior to receive water. The junior finds a third source of water, often from storage rights, and trades it to the senior, substituting storage water for a natural flow right. This allows the junior to take water with the senior's priority, and assures the senior water as well. Plans of augmentation are used to provide water to third parties dependant on return flow from a water right that is proposed to be moved to a new location or use. The proponent of the change in use is obligated to find substitute water supplies to make up for the return flow no longer occurring as a result of the change. Typically, other water rights are acquired and substituted for the return flow.[98] In general, storage rights are extremely valuable in exchanges and plans for augmentation because they give the owner the ability to time the delivery of water to maximum benefit.

On the Walker River, there are a number of different building blocks for multi-party transactions – natural flow rights, storage rights, flood rights, and groundwater.   How they could be assembled to increase lake inflow remains to be determined, and would involve understanding of the relative value of rights at different times and locations, in economic terms, and to Walker Lake. For some of the possible arrangements, especially those involving storage rights, cooperation of the Walker River Irrigation District would be needed.

[98] See Hobbs, Greg, 2003. *Draft Citizens' Guide to Colorado Water Law*, Colorado Foundation for Water Education. http://sobek.colorado.edu/~preuhs/state/cowaterlaw.doc. See also See Dunning, Harrison, 1986. The "Physical Solution" in Western Water Law, 57 U. Colo. L. Rev. 445.

6.0 Observations and Recommendations

This report provides an overview of the experiences of environmental water transaction programs around the West. It is not intended to provide detailed recommendations about how a Walker Lake water acquisition program might be developed. However, the following recommendations and observations drawn from the other western programs may help to provide insights applicable to the Walker River and Lake situation.

6.1 Effective Programs Clearly Distinguish Problems of Timing and Location of Water from Issues of Consumptive Use

In the Columbia Basin, most of the programs address problems of timing and location of water, rather than overall water quantity deficits. There may be enough water in the system to meet the overall set of needs, but not necessarily at the right time and place. Where this is the situation, subtle changes to the pattern of water use may resolve the problem. Non-diversion agreements that are triggered by low flows, or changes to the point of diversion may be enough to address fishery issues. Efficiency measures where the effect is to change the location or timing of water as needed work well in these conditions. Overall reduction in consumptive use may not be needed, and many of the organizations working in the Columbia River Basin make a priority out of avoiding taking agricultural land out of production.

In contrast, other situations call for dedicated water supplies. The California wildlife refuges need an assured supply of water, every year, not just a bit more water at certain times of year. The water requirements are more like those of an agricultural crop, with somewhat different timing. A permanent supply of water is required to meet the need; hence planning to substitute developing groundwater supplies for leasing programs.

Klamath represents the worst of both situations. There is not enough water in the system to meet all the needs, and the timing and location of water demands make meeting environmental water needs difficult. In Klamath, the ultimate solution is probably a combination of efficiency to reduce agricultural water demands, transfer of some water rights from irrigation to the environment, along with storage for water that can be managed to meet the environmental needs.

In some respects the Walker Lake situation is a little simpler. Additional inflows are needed to reduce salinity levels in Walker Lake – the timing and consistency of those flows is far less important. While some consideration needs to be made for instream flows in the Walker River, for both the health of the river as well as to reconnect the lake/river ecosystem, the primary need at this point is to ensure that the total inflow increases.

6.2 Pilot Projects Provide Entrée to the Communities and Fair Warning of Problems

One of the strongest observations from this review is that pilot projects can be extraordinarily valuable, both for the communities indirectly affected and for understanding the direct effects of the transactions.

Palo Verde Irrigation District and Imperial Irrigation District responded very differently to being forced to transfer a portion of their water to Southern California cities. While there are a number of reasons for that difference, one is that PVID had the experience of a short pilot fallowing and transfer project that allowed the water users and the community to judge for themselves the effects of moving water. When the results of the fallowing project included only a 1 percent loss of jobs, but no significant regional economic impact, fears of the impact were allayed. (This underscores the importance of physical and socioeconomic assessment in conducting pilot projects.) In contrast, the loss of community jobs potentially resulting from fallowing was and still is, a major source of IID and community concern; IID and the cities to which water will be transferred continue to strongly disagree about community impact. A prior short term pilot project might have helped with IID community acceptance of the program.

In the Columbia Basin, CBWTP views short term leasing as the equivalent of local pilot projects – a way to introduce the concept of transferring agricultural water to the environment in a non-threatening way. It allows the water users and the local community a chance to see any negative effects, or lack thereof, on the community economy, and the positive effects on environmental values.

Pilot projects are helpful in anticipating political and legal problems as well. Because many western states have relaxed standards for change of water use proceedings involving short term leasing, leasing also provides a window into the potential for injury, previewing the possibility of a contentious change of use proceeding.

Where feasible, efforts to acquire water for Walker Lake and Walker River should start with pilot projects, including monitoring. Given that the University of Nevada is significantly involved, a research program connected to pilot water acquisitions may be institutionally appropriate. These preliminary efforts then can be used to inform more permanent institutional and transactional arrangements.

6.3 Money – Not Too Much or Too Little

"Having too much money, especially to start with, can be a problem" said Andrew Purkey of the CBWTP. His perspective is as the grant maker for the 11 local programs buying water to meet Bonneville Power Administrations ESA obligations. His problem was that as the program got started, there was more money than good projects. This meant that projects were funded that may have sent the wrong signals to local communities about the value of water, or the longevity of annual leasing programs. Purkey said that in 2007, with more projects proposed than funds, CBWTP can be more selective, and is putting a priority on permanent solutions rather than annual leasing.

Where funding comes from an outside source, whether it is philanthropy or federal appropriations, eventually “funder’s fatigue” sets in. Then as competition for the funding grows, something new comes along and the money flow slows. In California, since it started in 1994 the refuge water acquisition program has relied on a water and power user-fee based Restoration Fund. With a new major San Joaquin River restoration effort just underway, competition for the Restoration Fund will increase, causing uncertainty about the funding for the refuge water supply program.

Programs, especially if government funded, follow a trajectory of effectiveness and funding availability. Planning for that trajectory will result in maximizing effectiveness and a more sustainable result.

For the Walker Lake situation, acquisitions should be structured so as to create expectations that can be fulfilled. In particular, if pilot operations involve short term leasing of water, water purchases, or other incentives, the prices paid should be based upon commercially reasonable appraisal, or other market based methods, and not be set at arbitrarily high numbers to induce participation. Planning should also consider the possibility of a limit to high volume federal funding.

6.4 Take Advantage of Annual Variation through a Portfolio Approach

A reality of any water issue is that hydrology varies from year to year. For an instream flow problem, in a wet year, there may be no need for additional water to meet environmental objectives. Money spent on buying water or owning water rights in those years may be essentially wasted. In a dry year, when environmental needs may be highest, the water and water rights are most valuable and likely most expensive. Again, matching the method to the problem is critical.

Some of the programs are beginning to explicitly address this fundamental issue of annual variation. On the Klamath, Reclamation in 2007 is not buying water deliveries, instead it is buying options – if the water is needed, Reclamation will exercise its options. In Idaho on the Lemhi River, after Reclamation spent large amounts of money paying for water through a water bank, the state is negotiating for conservation easements that call for a few well placed irrigators to cease diversion when flows drop below specified levels – a “just in time,” “apply when needed” approach that leaves irrigated agriculture intact in most circumstances.

Most instream flow based environmental transaction programs are designed to ensure a minimum amount of water available every year. For Walker River, this may be the most appropriate model. However, for Walker Lake, methods can be developed to take advantage of annual variation. Once lake salinity drops below critical levels, inflows adequate to maintain water quality are needed, but that average inflow need not be achieved every year. One high-inflow wet year may make up for lesser flows in several dry years.

By using a portfolio approach, water acquisition programs can be structured to take advantage of this variation. A financial portfolio is structured to accommodate risk – it may not produce a minimum return every year, but on average it makes a return target. In a similar way, a portfolio of water rights could be assembled, incorporating senior decreed rights to ensure river flows to meet riparian and aquatic habitat needs, as well as junior decreed rights, flood rights, and storage rights to meet lake inflow needs.[99] This allows a significant proportion of water rights acquisitions to be junior rights or flood rights, minimizing costs while maximizing inflows during flood events or wet years. Depending on river hydrology, conveyance loss may even be less during the high flow events, allowing a greater proportion of water from higher in the basin to actually reach the Lake.

Once the lake is stabilized and the river instream flow needs are met, there may be some advantage to trading or selling water from the portfolio when hydrologic conditions warrant. If senior rights are acquired that are not needed for instream flow purposes, leasing that water during dry years would help gain community support, and raise money, allowing more wet year acquisitions. The entity that ultimately owns and manages the rights acquired should be legally permitted to trade water as well as water rights. In doing so, the entity should work to support community economics and values as well as environmental values.

6.5 Consider Complex Transactions

While complex transactions involving plans of augmentation or exchanges are common in Colorado, they are much less so elsewhere. Among practitioners of environmental water transactions, complex transactions are still quite rare. In part this is because while doing even a simple transaction is difficult, increasing the complexity by adding additional steps and water rights makes the transactions much more difficult. Especially in locations where water rights are not as well defined and administered as Colorado, adding transactions increases risk and uncertainty.

However, there may be real value in considering complex transactions in the Walker River watershed. With two states and water rights of different characteristics (decreed rights, flood rights, storage rights and groundwater rights) there may be opportunities to trade rights in various locations and qualities to allow transactions to be completed. The types of transactions possible are limited only by imagination and an admittedly cumbersome legal and administrative system. In complex transactions, the ability to manage stored water is extremely valuable because it allows a variety of potential interests to be met. Examples of possible complex transactions include:

- Acquisition of senior decreed rights low in the Walker River through exchange for storage rights or groundwater rights. The seller would receive rights of

[99] In a portfolio, groundwater pumping rights are probably better retired, used to trade for the surface rights, or mitigate for reduced surface flows, rather than direct pumping from the ground into the Lake or River. In the Klamath situation, significant problems with groundwater depletion have been caused by a program buying groundwater for direct pumping into Klamath River.

somewhat lower value, presumably plus cash, but the problem of defending environmental flows would be shifted to one of defending the replacement irrigation supplies, which may be more politically acceptable.

- Environmental dedication or non-diversion agreements reached with the Walker River Paiute Tribe in exchange for other water rights.
- Trade of water rights from less productive areas to areas of greater productivity where water rights have previously been acquired and transferred to other purposes.

The early phases of any Walker River water acquisition program should focus on less complex transactions that allow experience to be gained and any legal issues resolved expeditiously. However, later phases should at least consider more innovative and complex transactions. To prepare for these later transactions, even the early phases should include acquisition of the entire suite of water rights (including decreed, storage, groundwater) as well as appurtenant land from entire farms where possible.

6.6 Institutional Arrangements

Most of the environmental water transactions surveyed involve an environmental NGO, a state agency or the federal government. Each of these organizations has a natural constituency, and is viewed with suspicion by others. Even the most open and inclusive of these organizations has difficulty being accepted by others in a community affected by both environmental issues and an environmental water acquisition program.

Two models appear to be most successful. First is a single community-based organization that both acquires and ultimately owns and manages the land and water involved. The second is a division of responsibilities, with one organization acquiring the property, and a second that manages and owns the property. In this latter model, the acquiring organization must develop relationships and trust with the local community; the ultimate owner should do so as well.

An example of the single entity model is the Deschutes River Conservancy. DRC restores streamflows and improves water quality in the Deschutes basin, using market-mechanisms. It is an unusual partnership among government (federal, state, tribal and local), irrigated agriculture, timber, recreation, ranching, development, hydropower and environmental interests. Each of those interests has representation on the board of DRC, and each subscribes to the mission and values of the organization. The DRC:

- Purchases and leases water;
- Founded a water bank with the local water district that is used for both environmental and irrigation purposes;
- Facilitates retirement of irrigated agricultural land in a way that supports both the water districts and the environment; and
- Funds and implements water conservation projects.

While the DRC is not an arm of local government, as a conservancy district would be, it is a reasonable model for the kind of conservation efforts that restoring Walker Lake will involve. However, the DRC formed because environmental organizations and the local water district, as well as other interests realized that they collectively had a problem with environmental laws, notably the Endangered Species Act and the Clean Water Act, as well as river health issues that affected the community broadly. They collectively had a problem that could best be solved collectively. Whether the community and the various actors recognize the value of solving the problems faced by Walker Lake and Walker River remains to be seen. To the extent that community engagement is possible, a DRC model should be seriously considered.

From the perspective of funding the DRC model has a distinct advantage – it can and does receive money from a variety of sources. Congress has authorized and directly appropriated funds for the DRC, a most unusual situation for an NGO. As an NGO, the DRC can and does receive tax-deductible donations and grants from foundations. The main disadvantage of its status is that it is not local government, and has no taxing or municipal bonding authority.

The second model involves having the acquisition of property be the responsibility of one entity and the management and ownership of the water and land the responsibility of another entity. The closest example to this model is from the Truckee River in Nevada where Great Basin Land & Water facilitates acquisition of water and land for transfer to a tribal or governmental entity. A related approach is the Columbia Basin Water Transactions Program, where BPA indirectly funds a number of organizations that buy, own, and manage water and water rights to meet BPA's ESA obligations. While BPA has the money and responsibility to accomplish certain objectives, it essentially passes the resources and responsibilities to the local entities.

From the perspective of funding, having a government entity as the ultimate owner and manager of land and water may be useful. Government to government funding is common, especially from the federal government to local government. The DRC is somewhat unusual, but not unique, in that it is an NGO authorized to receive direct federal appropriations. Even BPA does not fund the Columbia Basin local entities directly, but rather through the National Fish & Wildlife Foundation, an unusual congressionally chartered tax-exempt organization designed to accept federal funds and then act as a conservation focused NGO. Further, a local governmental entity could have taxing and municipal bonding authority.

If a governmental entity is used to own and manage property, there may be real tension in accountability. An entity structured as water districts are may be accountable only to land and water owners – not the community broadly. While this simplifies the issues of accountability, as it did for the Palo Verde Irrigation District leasing of water, it creates something of a conflict of interest, since the governmental entity will likely end up buying assets from many of the electorate. On the other hand, if the entity is broadly accountable, with representation elected by all voters in the area, the implicit responsibility for community economics and other issues affected by asset purchases may make decision making very difficult. This is the position Imperial Irrigation District is in. Between the two options, the latter seems more likely to achieve a sustainable result, albeit not necessarily quickly.

With a government entity owner and manager of assets, the issues of community relations in the acquisition process arise. There are a number of examples of division of responsibility for developing transactions and actually owning property in the conservation world. At the national level, the Conservation Fund, Trust for Public Land and The Nature Conservancy specialize in acquiring property and then selling it to federal, state and local governments. At the state and local level, countless land trusts and other organizations work with same business model. The fundamental driver is that it is difficult for government agencies to spend the time necessary to develop transactions, and then move quickly to close them. In addition, for controversial projects, there is often benefit to separating the acquisition from ultimate ownership. These complications of controversy, government procurement rules and funding cycles open a niche for third parties in the transactions. Further, some sellers simply prefer not to deal with government entities. While it certainly is possible for agencies to conduct their own real estate transactions, and they do it all of the time, at least having the option of a non-governmental third party developing the transactions appears to be useful.

Any of the various options – single entity (NGO or government) and two entities (NGO acquisition and second, probably governmental, owner) – could work. Because community support is likely necessary for a sustainable model, an option where the owner is broadly accountable to the community is preferable. That accountability could be developed through a public-private partnership or through a public, governmental entity. Because developing adequate funding for the effort is essential, the choice should be made by assessing the funding possibilities. If the federal government is to provide most of the funding, a governmental entity to hold and manage the property, with a separate NGO to set up transactions, is the option that is already well established.

Appendix A - CALIFORNIA

Rotational Fallowing Agreements

Palo Verde Irrigation District

Palo Verde Irrigation District (PVID) holds some of the oldest irrigation water rights in California, dating from 1877. Located on the California-Arizona border about 110 miles north of the Mexico border, PVID consists of approximately 120,500 acres of agricultural land, of which about 90,000 acres is cultivated. PVID diverts water from the Colorado River for irrigation and also provides agricultural drainage to collect the return flows that are returned to the River at the low end of the valley. Seven Trustees are elected to the Board by district landowners on the basis of land valuation. Landowners pay an annual assessment plus a flat fee per acre for water; the total annual cost is approximately $61 per year.[100] The district offices are in Blythe, a city of approximately 20,000 people. Agriculture has long been the mainstay of the local economy; tourism is becoming more important with visitors attracted to the warm winter climate and recreation activities along the Colorado River.[101]

In 1992, PVID agreed to implement a pilot program – the Test Land Fallowing Program – in which the Metropolitan Water District (MWD) agreed to pay PVID for land taken out of production during the 2-year period from 1992 to 1994.[102] Participants in the Program were paid $1,240 per acre in five payments, and were responsible for taxes, PVID water tolls, and maintenance and dust control costs on the fallowed fields. At the conclusion of the Pilot Program, a community survey of regional economic impacts showed that there was a 1 percent loss of employment, but that overall the Program did not significantly affect the regional economic performance.

In 2000, California's Colorado River Water Use Plan described a multi-faceted framework to meet its annual apportionment of Colorado River water. The Plan included numerous policies, programs and actions, including cooperative land fallowing and water transfers.[103] MWD, a coalition of municipalities and water districts providing water to approximately 18 million people in five counties, worked with PVID to develop a 35-year agreement for a land fallowing program based on the earlier pilot program.[104] Since 2005, PVID farmers have contracted with MWD to fallow a portion of their lands, with the water saved to be available to MWD for urban water supplies. Through this program approximately 25,000 to 111,000 acre-feet of water will be delivered to MWD

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[100] http://www.pvid.org/PVID%20Histroy.html
[101] http://paloverdevalleylibrary.com/about_blythe,_ca.htm
[102] Great Western Research , 1995. Palo Verde Test Land Fallowing Program, Metropolitan Water District of Southern California. August 1995.
http://waterplan.state.wy.us/BAG/green/briefbook/fallow/fallow3.html
[103] http://crb.ca.gov/Calif_Plan%20May%2011%20Draft.pdf
[104] http://mwdh2o.com/mwdh2o/pdf/at%20a%20glance/mwd.pdf

annually.[105] PVID provides administration services, and individual irrigators sign agreements with MWD for fallowed lands, with farmers receiving $3,170 per acre up front plus $602 per acre per year, to be adjusted for inflation over the course of the agreement. To diminish community impacts, the total land to be fallowed is capped at 29% of the total acreage in the district, with an annual range between 7,000 – 25,000 acres. MWD must notify PVID of the amount of acreage to be fallowed annually, and must provide notice a year in advance to PVID to enable farmers to plan their planting schedules. Farmers notify MWD of the acreage they plan to fallow, up to 35% if their land, and MWD makes a call to notify each farmer of the amount to be enrolled in the following year. Every landowner in PVID can sign up to enroll their 35%, but MWD may decide to call for a portion which will apply to all the landowners. Thus, if MWD decides to call for 15% of the acreage, all participating farmers enroll 15% of their acreage. In addition, MWD agreed to provide $6 million for community mitigation. A local board is charged with determining the use of this fund; PVID and MWD provide some oversight. As of January 2007, the board has not determined what projects to support.[106]

As the program enters the second full year, PVID and the farmers are pleased with the results; although removing agricultural land from production is controversial, in the PVID area there have been minimal negative impacts. Nearly all the farmers are participating, and the community has a strong and relatively diversified economy. So far, the payments to farmers have spurred purchases of farm equipment; there may be some reductions in seed and fertilizer sales, although it is possible that farmers will change purchase patterns as they rotate crops to meet their obligations. Each parcel fallowed may be changed annually, but no parcel may be fallowed longer than 5 years; thus farmers may choose to plant different crops on the parcels they are rotating out of the fallowed acreage. Landowners are responsible for maintaining their land to prevent weeds and dust, often through leaving stubble on the field after killing the crop.

The Bureau of Reclamation monitors all water diversions from the Colorado River. The PVID diversion is downstream from the MWD diversion, and there is no guarantee that MWD will get its full entitlement of water. The agreed amount of water is based on the amount of fallowed acreage and the historic average amount of water used by PVID. If farmers use more water during the year, there may be less water for MWD later in the season; conversely, if MWD takes more water than the agreed amount, they would need to return the overage to PVID the following year. However, because the crop patterns have been consistent, the consumptive use is predictable and changes in PVID use are likely to be small. All three parties meet regularly to review the projects and make necessary changes.

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[105] Berman, Mindy. 2006. A TALE OF TWO TRANSFERS: Palo Verde, Imperial Valley farmers take different roads. http://www.mwdh20.org/Aqueduct/article_05.html

[106] Ed Smith, Palo Verde Irrigation District. Personal Communication. January 2007. *See also* Program Agreement, http://www.pvid.org/PVIDMWD.htm *and* MWD fact sheet, http://mwdh2o.com/mwdh2o/pdf/at%20a%20glance/Palo_Verde.pdf

As a pioneer in rotational fallowing agreements, PVID feels this is a successful program for both MWD and the farmers. Acknowledging that urban water demand is growing and the likely source for meeting that demand would be irrigation, PVID decided to engage in the process to craft a program that would benefit the district and the community. Including the pilot program, PVID has been working to meet the needs of their farmers in fallowing programs for over a decade, with increased activity since the California Plan in 2000. PVID has been asked to share their experience with irrigation districts in California and Colorado that are in the similar position of negotiating with other interests to supply water.[107]

Imperial Irrigation District

Imperial Irrigation District (IID) spans approximately 500,000 acres from the Mexico-California border north to the Salton Sea. Approximately 166,600 people live in Imperial County, many working in the agricultural sector. IID is the nation's largest irrigation district, and is also a utility providing electrical energy to more than 135,000 residents in the area.[108] A five-member Board of Directors is elected by political districts in the Imperial Valley to oversee the operations of IID. Irrigation water rates are $17 per acre-foot per year. Many of the landowners in the district do not live in the area and rent their land to tenants. Landowners may designate a tenant or agent as the responsible party for payment of water rates by submitting a "Certificate of Ownership and Authorization of Agent or Tenant" to IID.[109]

As a component of a complex agreement, Imperial Irrigation District (IID) and San Diego County Water Authority (SDCWA) have crafted a 15-year fallowing agreement that provides for water transfers to San Diego to meet requirements of the Quantification Settlement Agreement in 2003.[110] This, like the PVID agreement, emerged as one of the multiple programs and actions in California's effort to reduce its Colorado River allotment. However, an additional element of the IID agreement is environmental mitigation for the Salton Sea, as well as socioeconomic mitigation for community impacts from agricultural fallowing.

According to the multi-party agreement, IID will transfer 200,000 acre-feet per year to SDWCA; another 103,000 acre-feet per year will be available to neighboring Coachella Valley Water District. If Coachella does not take the water, it would then be available for MWD. Fallowing is a temporary measure that was added to the agreement to benefit the Salton Sea while a comprehensive restoration plan is developed. Because about 75% of the inflow to the Sea is agricultural runoff from the Imperial Valley, agricultural efficiency programs that result in reducing agricultural water use and runoff will have a significant effect on the condition of the already stressed Sea. In response to both the Salton Sea issues and community impacts from fallowing lands, by the end of the 15-year fallowing program all the water to meet the terms of the agreement must come from

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107 Smith.
108 http://www.iid.com/Sub.php?pid=702
109 http://www.iid.com/Water_Index.php?pid=49
110 Berman.

conservation improvements for on-farm and system efficiency. During the term of the fallowing program, IID is obligated to deliver a total of 800,000 acre-feet per year to the Sea. By 2018, the saved water from IID will be available for SDCWA, and a Salton Sea restoration program will presumably be in place.[111]

In the IID Fallowing Program, landowners or their designated agent/tenant can contract with IID to fallow land, with the price for the conserved water set by IID.[112] Each year IID sends out a solicitation for voluntary participation in the Program, and fields are enrolled according to published criteria, with a random selection process if there are more proposals than needed for contracts to meet the annual requirements for water according to the agreement. Each parcel may be enrolled in no more than two out every four years; participants are responsible for weed and dust control on the fallowed parcel. In 2005 approximately 11,000 acres in 105 fields were enrolled, with a total of 67,000 acre-feet of water saved; of the total, SDCWA took 30,000 acre-feet and 15,000 acre-feet provided environmental mitigation for the Salton Sea.[113]

For the 2007-2008 Program, the fifth year in the agreement, proposals may be submitted in December and January for fields to be fallowed from July 2007 through June 2008.[114] While the agreement between IID and SDCWA calls for water deliveries on a calendar year, farmers requested that fallowing contracts be based on the planting year, thus IID has developed a schedule for contracts from July 1 to June 30. IID set the payments at $75 per acre-foot per acre based on each field's baseline water use history. Using crop history records from farmers, IID does a trend analysis of water use using a rolling 10-year average; farmers must have a record of actual water use for the previous three years in order to participate. To prevent over-estimating water use by farmers, IID has capped the average annual water use at 6 acre-feet per acre.[115]

To transition from the Fallowing Program to efficiency-based conservation over the term of the agreement, IID will use the revenue from SDCWA for both on-farm and system-wide efficiency measures; an additional fund is included in the agreement to address socioeconomic mitigation impacts.[116] IID has implemented various system and on-farm efficiency measures since the 1950s; to meet the conservation efficiency requirements in the QSA, IID developed an aggressive plan. The Efficiency Conservation Definite Plan will guide programs to conserve and transfer nearly 303,000 acre-feet per year by 2028; this plan will replace the Fallowing Program in 2017. The plan is built on five basic assumptions: 1) there will be no fallowing; 2) participation by landowners and growers will be voluntary and incentive-driven; 3) water saved must be verifiable; 4) all viable and cost-effective methods to conserve water will be considered; and 5) the stipulated

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[111] http://www.water-ed.org/novdec01.asp; *See also*. http://www.swrcb.ca.gov/rwqcb7/saltonseawatershed.htm.
[112] Tina Shields, Imperial Irrigation District. Personal Communication. January 2007.
[113] 2005 Water Conservation and Transfer Agreement Annual Implementation Report http://www.iid.com/Water_Index.php?pid=2679
[114] http://www.iid.com/Water_Index.php?pid=267
[115] http://www.iid.com/Water_Index.php?pid=285. Shields.
[116] Yardas, David, 2006.*Land Fallowing for Water Conservation in the Imperial Irrigation District*, Great Basin Land and Water.

schedule must be met.[117] Essential to the development and implementation of this plan is a team of specialists and consultants, and a series of white papers will be prepared regarding various demonstration projects.[118] IID is the last diversion on the Colorado River, and all water not used consumptively is drained to the Salton Sea, thus there are no water rights injury issues in this efficiency program; however there are significant environmental impacts in reducing inflows to the Salton Sea. A major complication is the salinity in the soils, which necessitates continuing irrigation to leach salts from the soils in the Valley.[119]

The IID and SDCWA agreement includes $20 million for mitigation to address anticipated community socioeconomic impacts from the fallowing program in the Imperial Valley. A "Local Entity" was formed to develop a mitigation plan and act as administrator of mitigation funds to be received by IID. Due to controversy between IID and SDCWA regarding the mitigation needed, as well as a lack of agreement among the Local Entity representatives, no mitigation plan was developed. In 2006, IID reconstituted the Local Entity, which is meeting regularly, and IID is involved in arbitration to resolve the dispute with SDCWA. Meanwhile, the current Local Entity is working to develop a mitigation plan, including how to use an initial $3.5 million allocation from SDCWA. However, the major issue remains unresolved: defining the nature and extent of local community impacts from the fallowing program.[120]

Lessons Learned

Fallowing land remains controversial; as a mechanism to transfer water from agriculture to municipal or environmental purposes; it can be successful but faces varying degrees of opposition. There are basic differences in the two California communities, as well as the structure of the fallowing programs, that affect the level of acceptance of the programs. The Imperial Valley covers five times the geographic area, with about eight times the population of the PVID area. Imperial County includes population centers that are demographically diverse, and is divided into five districts that elect the IID Board of Directors. IID Directors are also responsible for the energy utility side of the organization, and are responsive to the diverse constellation of interests in the community. PVID is centered in the community of Blythe, and all members of the district who pay their annual assessments and water tolls elect seven Trustees from among their fellow members. PVID Trustees focus is on the operation of the irrigation district serving a smaller and more homogeneous community.

While both districts hold irrigation water rights, water use is administered and distributed differently. Farmers using IID water may or may not be local residents; many out-of-town landowners rent their fields to tenants who may have an agreement to act as the landowner's agent in dealing with IID. IID charges a flat fee per acre for agricultural water use; the landowner or tenant/agent notifies the IID water department which fields will need water and IID tracks water usage. In the fallowing programs, IID administers

[117] http://www.definiteplan.com/intro-to-definite-plan.php
[118] http://www.definiteplan.com/demo-projects.php
[119] Shields.
[120] http://www.iid.com/Water_Index.php?pid=2227. Shields. *See also* Yardas, 2006.

the program directly, defining criteria, setting rates, and tracking water use; IID pays a flat rate to either the landowner or tenant/agent according to the authorizations on file with IID for water use.[121] In PVID, everyone who owns agricultural land in the district pays an annual assessment and a water toll for water use based on acreage. PVID farmers contract with MWD directly, and PVID plays an administrative role in recording which fields are receiving water and which are to be fallowed. MWD pays PVID farmers an initial payment plus an annual payment based on acreage enrolled in the program.[122]

In addition to these differences in the two irrigation district communities, two other factors influence the level of acceptance of fallowing programs. First, the QSA agreement imposed the fallowing program on IID, and consequently the larger community, absent prior experience with a fallowing program. There is a significant degree of animosity toward fallowing in general in the Imperial Valley, and there was strong opposition to this late addition to the QSA negotiations. In contrast, PVID had prior experience with the Test Fallowing Program that demonstrated minimal economic impacts in the community. The PVID Trustees, local farmers themselves, recognized the pressure to transfer water out of agriculture to supply growing urban areas in California, and decided to engage in crafting a fallowing program that would best serve their community.[123] In contrast, the general community opposition to any fallowing in the Imperial Valley led to ongoing controversy both between IID and SDCWA and in the community at large. The ineffective attempts to form a local entity to define the socioeconomic impacts and then create a mitigation program reflect the extent of the animosity in the Valley.

Second, the basic pattern of land ownership and control of fallowing program payments influences community response to the program. Out-of-town individuals or corporations who depend on local farmers to manage their fields are unlikely to have strong ties to the community. The IID fallowing program payments are tied to agreements between landowners and their tenant/agents; while IID controls the payments to the authorized agent, how that money is distributed among the owners and tenants is a separate contractual arrangement. PVID farmers and their elected Trustees are equally eligible for the fallowing program and the participation rate is high. While there are concerns about potential socioeconomic impacts and MWD has provided funds for mitigating those impacts, so far the fallowing payments are supporting local businesses and the community generally supports the program.

As PVID continues to implement the program, the Trustees are also responding to inquiries from interested parties and sharing their positive experiences. IID is implementing the program and meeting their obligations to deliver water to the Salton Sea and SDCWA while also beginning to transition to an aggressive conservation program, pursuing negotiations with SDCWA regarding the mitigation program, and re-convening the "local entity" to develop a mitigation program. The continuing lack of agreement about the nature and extent of socioeconomic impacts, as well as

[121] Shields.
[122] Smith.
[123] Smith.

administrative complexities in managing the program with numerous landowners and tenants, are factors in IID's desire to develop an aggressive conservation plan to replace the fallowing program before the target date of 2017.[124]

Wildlife Refuge Water Supply

In 1992, Congress passed the Central Valley Project Improvement Act [125](P.L. 102-575) (CVPIA), which attempted comprehensive reform of California's federal water project. CVPIA made fish and wildlife protection, enhancement, and restoration project purposes, with priority equal to water supply and power generation. However, CVP water had long been contracted, leaving little to support the new purposes. The consequence was that water had to be acquired for some of the new environmental purposes.

The Water Acquisition Program (WAP) is Interior's mechanism to obtain water for two CVPIA-specified purposes: providing water needed in wildlife refuges primarily for waterfowl; and doubling the anadromous fish population. The Bureau of Reclamation is the lead agency for water acquisitions. The Wildlife Refuge Program[126] component supplies water to federal and state wildlife areas (primarily National Wildlife Refuges and California Wildlife Areas) in order to meet their optimum water supply needs (known as Level 4 supplies).

WAP is the longest-running of California's major water acquisition programs, beginning in 1994 after passage of the 1992 CVPIA. For both the refuge and fish recovery efforts, Reclamation typically buys (leases) water rather than water rights, although it has made limited use of other approaches, including buying water rights and paying for foregone hydropower production in order to re-water a bypassed reach.[127]

Initially, Reclamation approached water districts and offered to buy water under one-year contracts. However, as the program became better known and accepted, Reclamation formed relationships with repeat sellers of large quantities of water. Reclamation's obligation to comply with federal environmental review laws, particularly NEPA and ESA, increase transaction costs and make one-off deals expensive and more difficult. Reclamation therefore had strong incentive to identify water suppliers with large blocks of water likely to be available in multiple years; they then completed multi-year environmental review that covered multiple one-year contracts, reducing transaction costs. For water beyond that the regular sellers supply, Reclamation uses one-year purchases, often brought to them from commercial water brokers.

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[124] Shields.
[125] http://www.usbr.gov/mp/cvpia/
[126] http://www.usbr.gov/mp/cvpia/wap/docs/level4-wildlife.pdf
[127] Meier, Dan. Water Acquisitions Program, US Bureau of Reclamation. Personal communication. May 2004 and March 2007.

Most water is purchased from suppliers within the CVP system, eliminating the need to comply with state law governing water transfers. Where out-of-CVP sources are used, state law temporary transfer procedures are followed.

Between 1994 and 2003, WAP acquired almost 1.5 million acre-feet at a cost of over $94 million.[128] Full water supply requirements are not yet being met for all refuges. WAP has acquired water rights to 6300 acre-feet that supplies all needs north of the Delta for the refuges that have access to conveyance canals. But there are some refuges that are not connected to the state's plumbing system. Refuge needs south of the Delta are 103,00AF; however, the program currently can supply only about 75,000 to 90,000AF, due to financial constraints rather than lack of willing sellers.[129]

The overarching lesson from WAP is that buying water on an annual basis is an expensive proposition – well in excess of $100 million to date. At $130 - 150 per acre-foot (a current typical price), the 103,000 acre-feet demand for refuges south of the Delta alone implies an annual cost of $14.4 million.

WAP is exploring arrangements besides annual purchase of water. WAP is actively exploring developing groundwater supplies for some refuges, especially those not connected to conveyance systems. It would either contract with groundwater well owners, or drill wells for the refuges. An issue is who would be responsible for maintenance and pumping costs for the wells.

WAP is very sensitive to the political consequences of buying water for the environment. It avoids outbidding agriculture for water by encouraging potential sellers to offer water within districts and to local farmers before selling to WAP. Permanent acquisition of water rights is not a strategy vigorously pursed, in part because transactions are complicated by the annual federal appropriations cycle and in part because of political issues.

[128] http://www.usbr.gov/mp/cvpia/wap/docs/WYWEBSUM.pdf
[129] Meier.

Appendix B --COLORADO

Transaction Approaches

The essential party involved in environmental water transactions is the Colorado Water Conservation Board (CWCB), the state agency authorized to hold instream water rights and protect instream flows. The CWCB works with various non-governmental organizations interested in resource protection to develop transactions, including the Colorado Water Trust (CWT), Trout Unlimited and The Nature Conservancy. In general, the organizations seek water rights holders through public outreach efforts to generate interest in voluntary or paid transactions that would benefit stream flows. They then present the potential transactions to the CWCB, which may or may not accept the water right, in some cases rejecting offers of donated rights that are deemed to not be in the public interest. Transactions that CWCB independently pursues are generally opportunistic. In all cases, limited funding poses constraints on the degree of strategic research that is feasible in identifying transactions. While CWCB is authorized to acquire water rights on a permanent or temporary basis for instream flow uses,[130] most of the acquisitions have been permanent donations. CWCB has acquired or is in the process of finalizing 17 permanent water rights acquisitions; as of December 2006, none have been completed.[131] CWCB has entered into three long-term 99-year lease agreements, and three short-term leases, two of which are related to expansion of the Elkhead Reservoir project.[132] Recent legislation would allow CWCB to enter into short-term leases (up to 120 days) in the future but this has not yet been pursued.[133]

CWT is actively engaged in developing a water trust approach in Colorado. While one primary advantage of a water trust is the ability to move relatively efficiently in seeking and negotiating water transactions with water rights holders, CWT is faced with inherent constraints in the Colorado water rights system. With the requirement for careful accounting of water rights, extensive legal, engineering and technical work is necessary to complete a transaction, which is time-consuming and costly. CWT has completed two transactions using purchase or donation of water rights, both in the Colorado River basin. In a third project in the San Juan River basin, CWT is working on a project that involves a variation on an irrigation efficiency project that would renovate a diversion structure to improve fish passage, with the potential to eventually add benefits for flows. CWT is actively promoting the approach, and is seeking opportunities to raise the profile of environmental water transactions.[134] Both CWCB and CWT are noting increasing interest among irrigators.

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[130] http://www.cwcb.state.co.us/Streamandlake/Acquisitions.htm
[131] http://www.cwcb.state.co.us/Streamandlake/acqDonations.htm
[132] http://www.cwcb.state.co.us/Streamandlake/acqLeasesContracts.htm
[133] Linda Bassi, Colorado Water Conservation Board. Personal Communication. January 2007. http://www.cwcb.state.co.us/Statutes/37-83-105.pdf , Agricultural loan of a water right (HB05-1039).
[134] John Carney. Colorado Water Trust. Personal Communication. January 2007.

Water rights, both new appropriations and changes to existing rights including transfers, are issued through a water court system in Colorado. The courts require that a change to a water right not injure other existing water rights. To transfer a water right from a traditional use to instream flow purposes requires proof of documented historic consumptive use as the measure of water that can be transferred to minimize injury. During the water court process all applications are scrutinized and objections from third parties claiming injury can be expected. Thus, to reduce the likelihood of a protracted court case, CWT and CWCB invest significant effort in negotiating and structuring transactions to minimize potential injury and third-party objections. The time and resources needed to thoroughly research the historic use, transferable quantity and potential for injury, as well as potential environmental benefit, is significant. Professional services have been donated to CWT or absorbed by CWCB staff depending on the nature of the transaction. CWT anticipates that such services may require seeking additional funding in the future should attorneys and engineers decide to charge for their time.

A variation of typical transactions is rotational fallowing, or crop management, used in conjunction with water rights leases. The Colorado legislature enacted a rotational crop management bill (HB06-1124) in 2006 enabling farmers to use rotational crop management contracts to forego irrigation on a portion of historically irrigated lands through a change of water right in water court.[135] This bill emerged as one response to recent drought years when municipalities were physically running out of water to serve their customers. As a tool that cities could use to obtain water from farmers or water districts, this was intended as a flexible approach to address water demand without permanently drying up agricultural lands. As of December 2006, no rotational fallowing system had been implemented.[136]

Storage Operations

Several efforts to improve river flows for fish are underway using existing storage reservoirs. In some cases, the efforts involve construction of additional capacity, and in others the existing capacity is used differently.

In the Yampa River basin, the Elkhead Reservoir near Craig is being enlarged as a multi-party project between federal and state entities and the Colorado River Water Conservation District, adding 11,750 acre-feet of storage. The agreement includes acquisition by CWCB of a 5,000 acre-foot water right with a storage space easement, to be used to benefit stream flows as part of the Upper Colorado Basin Endangered Fish Recovery Program.[137] The water right and easement allows the CWCB to manage the release of water to benefit endangered fish. This acquisition required extensive negotiations among all the parties, and is not yet final in water court.

[135] HB06-1124: An Act Concerning the Adjudication of a Rotational Crop Management Contract
[136] Ken Knox, Colorado State Engineer's Office. Personal Communication. January 2007.
[137] http://www.crwcd.org/media/uploads/Elkhead_fact_sheet_9_06.pdf

Another approach to recover ESA-listed fish in the Upper Colorado River Fish Recovery Program is timing releases from upstream reservoirs to improve flows in the "15-mile reach" of the Colorado River between Palisade and the mouth of the Gunnison River.[138] Three programs are being implemented depending on water availability and regulatory requirements. To comply with an ESA Section 7 Consultation agreement, releases from four upstream reservoirs are coordinated according to established flow targets between June and October to improve flows for endangered fish. In this tightly managed system, regular conference calls among the parties determine the amount of water to be released to meet the flow targets. This program has been in place since 1990, and previously de-watered portions of the river now have more predictable flows. The second program is a voluntary "early release" program that allows for reservoir releases in May or June to allow excess water to flow downstream. Although this has occurred in only three years since 1998, it provides an opportunity for channel scouring to improve habitat in the river. [139]

The third program, the Grand Valley Water Management Project, involves structural adaptations to the 55-mile Government Highline Canal that have been effective in conserving water through reducing diversions. Seven new check structures were installed that maintain water levels in the canal, essentially creating a series of storage reservoirs. The addition of a SCADA (supervisory control and data acquisition) system allows for adjustments to gates upstream in response to changing irrigation demands along the length of the canal. Prior to the installing the check structures, if more water was flowing in the canal than was being used for irrigation, the excess spilled into waste ways along the canal. With the system changes, water diversions from the upstream reservoir are more carefully calibrated to actual use, significantly reducing the spills and making more water available for flows in the river. Potential benefits to the 15-Mile Reach could total nearly 50,000 acre-feet during the irrigation season.[140]

Another approach to improving instream flows through storage operations is a proposal in the Pine River basin in southwest Colorado that would use historic reservoir release data to benefit instream flows for fish and other downstream needs. This proposal by the Pine River Irrigation District (PRID) and the Southern Ute Indian Tribe (Tribe) to CWCB grew out of efforts by PRID to meet agricultural and domestic water demand. Simultaneously, fisheries interests were requesting action to improve flows in the river downstream of Vallecito Dam. The dam and reservoir, a Bureau of Reclamation (BoR) project,[141] is operated by PRID to furnish water for irrigation below the dam, as well as flood control and domestic use. To meet increasing demand in the area, PRID and BoR began exploring a contract to provide water for miscellaneous purposes, culminating in a Draft Environmental Assessment in March 2006.[142]

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[138] Tom Iseman, The Nature Conservancy. Personal Communication. January 2007.
[139] George Smith, USFWS. Personal Communication. January 2007.
[140] George Smith. *See also* Uilenberg, Brent R., and Robert E. Norman, Grand Valley Water Management Project (received from George Smith).
[141] http://www.usbr.gov/dataweb/html/pineriver.html
[142] http://www.usbr.gov/uc/envdocs/ea/pineRiver-misc/index.html Draft Environmental Assessment: Contract between the United States and the Pine River Irrigation District for the Use of Project Water for Miscellaneous Purposes. March 2006.

Since the 1990s stakeholders in Pine River basin have explored options to provide a reliable water supply to this growing community, including using federal irrigation project water for municipal purposes. Fisheries interests, concerned about conditions in the river, requested that CWCB apply for an instream flow water right in the Pine River below the dam, and CWCB initiated consideration of an instream flow appropriation in 2003 for this reach of the river. PRID and the Tribe opposed this appropriation, and proposed an alternative approach to protect irrigation and fish populations.[143] PRID and the Tribe submitted a joint proposal to CWCB in July 2006 that would guarantee minimum instream flows through a schedule of releases from the reservoir. This proposal also includes an application for a new storage water right and, if approved, serves as the basis for a water donation to CWCB in lieu of a new appropriation for instream flow purposes. PRID investigated the history of reservoir releases and based the amount of water available for releases on winter storage levels: during winter, the reservoir must be maintained at a relatively constant level to prevent ice damage to the spillway. PRID typically releases at least 5 cfs, and often more, to the Pine River in the winter. During the irrigation season PRID releases between 500 – 700 cfs for irrigation purposes to water users who are all downstream from the reservoir; the proposal would donate 136 cfs of that amount for instream flow purposes. This proposal would not require changes in irrigation operations, since the farmers would continue to divert according to their existing water rights.[144] Under this donation proposal, based on the formalization of historic PRID operations, instream flows would be protected downstream for about 19.5 miles in winter and about 12 miles in summer. Upon approval by all three parties, they will jointly file an application for a new junior storage water right in water court to provide water for instream flow use by CWCB, which would then be responsible for protecting the flows through this reach.

Water Banking

Despite a statute allowing water banking in Colorado, only been one bank has been established. The Arkansas River basin water bank allows for banking of stored water, however there has been minimal activity – a few deposits were recorded but no transactions were completed through the bank. This bank was created as a pilot program in 2001 and rules were drafted in 2002. Due to changes in the statute, the rules were revised in February 2006, to be effective through June 2007.[145] Establishing this water bank was controversial in the basin due to concerns that water would be transferred out of the basin, leading to a legislative amendment that prohibits interbasin transfers and also facilitates water banks in other basins in the state. When the original operator, Southeastern Colorado Water Conservancy District, changed administrators the water bank became a lower priority for the District, and in 2004 the District withdrew support of the bank operation. As of January 2007, the revised rules are in water court for final

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[143] http://www.cwcb.state.co.us/Board/Agendas/2006/July_06/24.pdf
[144] Hal Pierce and Steve Harris, PRID. Personal Communication. January 2007.
[145] Rules Governing the Arkansas River Water Bank Program, Draft 02/27/06 http://water.state.co.us/pubs/rule_reg/waterbankrules_proposed.pdf . Statement of Purpose for rules at http://water.state.co.us/pubs/rule_reg/arkriverbasis.pdf

approval, but the legislation must be extended to authorize the bank beyond the July 2007 sunset date.[146]
There is some interest in reviving the water bank by the Upper Arkansas Water Conservancy District;[147] however the future of water banking in Colorado is uncertain.

Lessons Learned

In Colorado, water rights transfers for environmental benefit require a significant investment of time. The process involves introducing the possibilities to water rights holders, locating appropriate streams and water rights, performing due diligence, preparing the agreements and participating in the water court proceedings.[148] As a general rule, due diligence and negotiations take longer than anticipated because there are always site-specific issues that arise. Objections from interested parties, usually other water rights holders, are to be expected and may delay or stall the transaction. So far, thorough due diligence and extensive negotiations have addressed most of the issues regarding potential injury and third-party impacts in Colorado; projects where protracted litigation looms are dropped in favor of other approaches or work in other regions.

Once completed, environmental transactions in Colorado have been generally successful in getting water to the intended destination. CWCB relies largely on gages to monitor flows, but also on watchful citizens to notify them of issues in protected stream reaches. With staff and funding limitations it is unlikely that instream flow rights are consistently monitored and enforced, and political considerations and interagency consultations may retard enforcement efforts. However, in instances where CWCB has decided to place a call on junior water users, the calls have been honored.[149]

The Upper Colorado Recovery Program demonstrates the importance of investing time in developing good science to develop defensible program goals. Despite some resistance and skepticism about what is necessary to recover fish populations, stakeholders have participated in the process and generally agree on the goals and underlying science.[150] Participation by all stakeholders requires a significant investment in time and resources, but also yields better results. To meet the program goals, water users are encouraged to share their engineering knowledge and their creative energy in crafting solutions. One challenge in the Upper Colorado Program is monitoring the effectiveness of the flow increases on fish populations: the fish are long-lived and the waters are turbid, making sampling difficult. While operating the reservoirs to release water according to biological needs of fish is improving flows in the "15-mile reach" of the Colorado River, it is more difficult to show a measurable response in fish populations. Improving the monitoring plan and determining what questions to ask are ongoing tasks for participants.

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[146] Steve Witte, Colorado Division of Water Resources. Personal Communication, January 2007.
[147] Chris Woodka. "Water banking gets renewed attention." The Pueblo Chieftain Online, January 21, 2007. http://www.chieftain.com/metro/1169372935/2
[148] Carney. Bassi.
[149] Bassi.
[150] Iseman.

Appendix C - IDAHO

Water Banks and Environmental Transactions

Idaho has a long history of using water banks that enable more flexible water use among traditional water users. In a water bank transaction, a water user can temporarily transfer a water right to one of the state-authorized water banks and another water user then purchases the water from the bank and arranges delivery. Most of the water banks are associated with large storage reservoirs in the state, so banked water can be managed to meet demands. Water users and the state agencies have preferred to facilitate water transfers among agricultural and other out-of-stream users; however requirements to meet flows for endangered fish are forcing changes in Idaho.

To transfer a water right to instream flow purposes, three constraints must first be addressed. First is the requirement that water may only be transferred to those streams with a state-designated and Legislature-approved minimum instream flow in place that would be fulfilled by that transfer. The second constraint is the principle that the priority for water use is for diversionary beneficial purposes rather than to meet minimum instream flows. Third, pending resolution of the Snake River Basin adjudication, water rights in much of the state are uncertain. Many water rights have been verified, at least through a preliminary review and recommendation to the court, but until this process is complete the state is wary of entering into lease agreements that involve unverified water rights.[151] Despite these constraints, the state could benefit instream flows by purchasing a water right from a water bank and then arranging delivery to a downstream user, timing the delivery to meet an instream flow need and thus shepherding the water through the designated reach.

Snake River Flow Augmentation

The Bureau of Reclamation has large storage projects in the Snake River basin that impact endangered fish. To meet Endangered Species Act requirements, the Bureau has been authorized by the state of Idaho to release 427,000 acre-feet annually for flow augmentation. The Bureau has leased water from the State Water Supply Bank, a multi-purpose bank managed by the Idaho Water Resource Board, and local rental pools to meet this requirement. This annual lease arrangement has recently evolved into a long-term 30-year agreement that will provide more predictability for the Bureau's flow augmentation needs.[152] The 2004 Nez Perce Tribal water rights settlement and the 2005 purchase by the state of irrigation water rights for nearly 25,000 acres from the Bell Rapids Irrigation Company coincided with the Bureau's need to find a more predictable water supply. The Nez Perce Tribal agreement included a change in the state water code to allow the Bureau to lease water from the state water banks for up to 30 years. The state's purchase of Bell Rapids water rights provides a long-term source of water in the

[151] Morgan Case, Idaho Department of Water Resources. Personal Communication. January 2007.
[152] Cynthia Bridge Clark, Idaho Water Resource Board. Personal Communication. January 2007.

State Water Supply Bank that the Bureau can lease, thus eliminating annual re-negotiations.[153]

The Bell Rapids transaction results in permanent fallowing of irrigated land. With increasing energy costs for lifting water some 600 feet from the Snake River to irrigate land near Hagerman, Idaho, plus reduced crop prices, Bell Rapids shareholders voted unanimously to sell their water rights to the state. While this water provides the state with a source of water for the 30-year lease agreement with the Bureau, at the end of the term the state could choose to lease the water to other water users. Responding to the loss of agricultural production in the Hagerman area, farmers are expected to switch to dryland farming or cattle ranching, or put in wind turbines.[154]

Salmon River Basin Flow Restoration

Numerous activities in the Salmon River watershed, a central Idaho tributary to the Snake River, are underway to restore flows that have been impacted by years of diversions. In 2001, dead salmon in the lower Lemhi River, a tributary to the Salmon River, led to an ESA enforcement action and ultimately to an arrangement between the state, Water District 74, and the Bureau of Reclamation to create and fund the Lemhi Water Supply Bank.[155] Irrigators in the Lemhi could lease water to the Lemhi Bank, with payments from the Bureau of Reclamation. However, one flaw in this arrangement was the requirement that once an irrigator agreed to lease water, irrigation had to cease for the remainder of the season. While the Bureau of Reclamation paid handsomely for these rights and water again flowed through the critical reach of the river, lands were dried up during the summer, creating some concerns in the local community.[156]

By 2005, the Bureau of Reclamation had determined that their program in the Lemhi basin would cease. About the same time, the Columbia Basin Water Transactions Program (CBWTP) emerged as another means to acquire water to benefit streams, and the Idaho Department of Water Resources (IDWR) became the entity that could initiate transactions in Idaho. With CBWTP funding, IDWR focuses on tributaries where a small amount of water can make a significant difference in providing flows for fish migration or spawning habitat.[157] Since 2003, IDWR has developed 25 water transactions in the Salmon River basin, including non-diversion agreements with irrigators in the lower Lemhi basin.[158] During the past two seasons, IDWR has crafted agreements with individual farmers to forgo irrigation during critical periods for fish migration through the critical reach of the lower Lemhi River based on flow targets for migratory fish. In 2006, this arrangement yielded 34.5 cfs to benefit flows through the focus reach during the May 16 – June 30 migration, while not requiring major changes in farming practices.

[153] http://www.idwr.idaho.gov/nezperce/pdf_files/agreement_summary.pdf; http://www.idwr.state.id.us/about/rels2005/2005-53.pdf
[154] http://www.bluefish.org/bellsell.htm
[155] http://www.idwr.state.id.us/waterboard/water%20bank/Documents/Lemhi%20River%20Basin%20WSB%20Procedures.pdf
[156] R.J. Smith, Chair, Board of Directors, Water District 74. Personal Communication. January 2007.
[157] Case.
[158] http://www.cbwtp.org/jsp/cbwtp/projects/transactions.jsp?sub_basin_id=59

A complementary approach to address instream flow and agricultural community needs is emerging in the Lemhi basin. Willing landowners could enter into permanent conservation easements to protect land along the river through a partnership between IDWR, The Nature Conservancy (TNC) and Water District 74. Ultimately, rather than conducting annual negotiations with the landowners, long-term agreements with IDWR and conservation easements with TNC could provide both enhanced instream flows and predictability for farmers, balancing the loss of irrigated agriculture and protecting the ranching community.[159]

Storage Project Alterations

Other efforts to enhance stream flows in Idaho are occurring through altering reservoir operations. In the Portneuf River basin, a local group proposed purchasing a large agricultural parcel in order to cease production and make the water available to support a recreational fishery in the reservoir. In attempting to improve the fishery in the reservoir, however, another problem arises: diminishing instream flows downstream from the reservoir. To address the potential downstream impacts, Trout Unlimited (TU) is working with the community to design a project based on the land trust model. Rather than purchase and fallow the entire parcel, an expensive approach that entails long-term maintenance issues for a non-profit entity, TU is exploring whether conservation easements could be used to reduce water use and, combined with altering reservoir releases, provide water downstream in a manner that mimics the natural hydrograph.[160]

In the South Fork Snake River basin TU is also working on a similar change in dam operations. Flows below Palisades Dam, operated by the Bureau of Reclamation for irrigation, power generation and flood control, have been a particular problem in recent drought years, with a significant fish kill in the winter of 2000-2001.[161] To maintain flows below the Dam at approximately 1,050 cfs, the Bureau, TU, irrigators and other community stakeholders are coordinating to explore solutions, including modifying flows from the dam to mimic a more natural flow regime. In the past two years, flow modifications have been implemented and monitored, demonstrating recovery of Yellowstone cutthroat trout without losses of water for irrigators.[162]

Other Approaches

TU develops partnerships with state and federal agencies, landowners and water users to leverage restoration projects that include stream flow enhancements. For example, a recent revenue bond in the City of Pocatello will improve flows in the Portneuf River through upgrading the city treatment plant and acquiring senior water rights in the headwaters of the river. Through collaboration between the City and TU to meet diverse goals, this project is expected to restore flows for Yellowstone cutthroat trout as a

[159] http://www.nature.org/wherewework/northamerica/states/idaho/files/idfo_ar_06.pdf
[160] Kim Goodman, Trout Unlimited, Idaho Water Project. Personal Communication. January 2007.
[161] http://www.tu.org/site/pp.asp?c=7dJEKTNuFmG&b=295188
[162] http://www.tu.org/site/pp.asp?c=7dJEKTNuFmG&b=275425

secondary benefit. As another example of TU's efforts to leverage habitat and flow restoration actions, TU has entered into a 30-year agreement with landowners that will enhance flows in Badger Creek, a tributary to the Little Lost River in central Idaho. TU is assisting Badger Creek landowners with irrigation efficiency improvements, converting from pumped flood irrigation to a gravity-fed sprinkler system to reduce overall water use. In addition, changing the point of diversion from Badger Creek to the Little Lost River in this small stream with few diverters shows good potential to restore flows in the Creek. Over the life of the agreement, TU will be responsible for monitoring the project's effectiveness in meeting the goal of opening up the creek for fish passage.[163]

Lessons Learned

Efforts to improve stream flows and enter into environmental transactions are evolving in Idaho. Each program is testing how to improve stream flows through various combinations of water transactions through water banks, altering operations, and irrigation efficiencies. Both IDWR and TU are demonstrating that small changes make a difference, especially in tributaries. These tributary gains may not be measurable in mainstem rivers, but water is flowing in target reaches, improving migration corridors and spawning habitats, and fish populations are improving. Changes in storage facilities and in irrigation efficiency are alternative approaches that can make water available for stream flows, depending on the local hydrology.

The Water Supply Bank provides a mechanism for short-term leasing that can benefit instream flows, indeed the only way to lease water rights in Idaho. However, this may not be the most appropriate tool for longer time periods, which have the same administrative requirements as a permanent change of use. One factor in leasing water rights will be the completion of the Snake River adjudication that will verify water rights and reduce the uncertainty involved with transferring water rights. Another factor is the general lack of understanding of the legal system, particularly the amount of water that can legally be changed according to historic use; continuing outreach by IDWR and TU are necessary in both locating transaction opportunities and educating landowners.

Working with landowners is an essential element of successful projects, and collaborative projects involving all interested parties may take more time but yield better outcomes. Gaining both trust and consent of irrigators is key in being able to move forward. IDWR, through a local contractor who is a long-time resident in the area, coordinates efforts to locate and develop potential water transactions with the Upper Salmon Basin Watershed Project (Project).[164] The contractor does the public outreach in targeted basins, and coordinates with IDWR staff to arrange public meetings and explain options for improving stream flows. Having a local liaison has been important in making initial contacts and developing relationships in the basin.[165]

[163] Goodman.
[164] http://www.modelwatershed.org/index.html
[165] Case.

Any transaction requires that other water users are not injured, thus thorough due diligence in determining locations and types of projects is essential. Quantification of water rights and doing hydrological studies is costly; the state has absorbed much of these costs, and TU has added some fees to agreements as a way to cover their costs for research and monitoring. Funding affects transactions, and is determined by the nature of the problem – recovery of endangered anadromous salmon or local trout species depends on different funding sources and thus different programmatic approaches in Idaho. To meet ESA requirements, the Bureau of Reclamation set initial prices for water very high and set an unrealistic precedent; with the new agreement for a long-term lease, the Bureau is moving out of the market which may reduce competition for water among other water users.

Appendix D - MONTANA

Transaction Approaches

Over the past two decades, leasing water rights for instream benefits in Montana has matured. Since 2003 the Columbia Basin Water Transactions Program (CBWTP) has added funding for opportunities to expand environmental water transactions. Trout Unlimited (TU) and the Montana Departments of Natural Resources and Conservation (DNRC) and Fish, Wildlife and Parks (FWP) were the initial actors; Montana Water Trust (MWT) is a more recent player in the state.

MWT and TU both work strategically to identify critical streams that meet several criteria: important fishery or biological issues that would benefit from improving flows; hydrology and water rights situations that allow for effective transactions, usually in headwater areas where small amounts of water and a limited number of water rights are involved; and community members who indicate some interest in exploring options.[166]

In the Blackfoot River basin, TU is working collaboratively with other groups, particularly through the Blackfoot Challenge, on basin restoration projects that include stream flows.[167] With funding from CBWTP, TU completed 11 leasing transactions between 2003 and 2007 in the Blackfoot basin, with the most recent being a 10-year lease in Wasson Creek in the Nevada Creek tributary system. TU worked with landowners on this restoration project, leasing 0.5 cfs during the irrigation season and improving habitat for westslope cutthroat trout.[168] MWT, with CBWTP funding, has been active in the Clark Fork River basin, with nine completed lease transactions since 2004. A recent 1-year diversion reduction agreement in the Little Blackfoot River was a result of stream flow and temperature studies that identified low-flow reaches. With a landowner who was willing to reduce his irrigation, MWT crafted an agreement in 2005, renewed in 2006, that restores 1.68 cfs in a critical reach, increasing flows by 35% over 2004 levels.[169]

Both MWT and TU work closely with individual water users on tributaries, and investigate the hydrological and biological needs as well as historic water use. Initial research includes use of DNRC GIS maps showing low-flow reaches and water rights information. Proof of actual historic diversion through review of water use records is another component of the due diligence investigation. Montana posts water rights data online as part of the ongoing state adjudication and TU uses this data as an initial

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[166] John Ferguson, Montana Water Trust. Personal Communication. January 2007. Stan Bradshaw, Trout Unlimited – Montana Water Project. Personal Communication. January 2007.
[167] Blackfoot Challenge, Committees and Projects http://www.blackfootchallenge.org/am/publish/index_cp.php
[168] http://www.cbwtp.org/jsp/cbwtp/projects/stories.jsp?sub_basin_id=54 ; *See also* http://www.cbwtp.org/jsp/cbwtp/projects/stories.jsp?sub_basin_id=55
[169] http://www.montanawatertrust.org/projects/success.html ; *See also* http://www.cbwtp.org/jsp/cbwtp/projects/transactions.jsp?transaction_id=176&sub_basin_id=55

screening tool to identify potentially valid water right in priority tributaries.[170] To determine the quantity of a transferable water right, the return flow amount is subtracted from the total historic diversion quantity to calculate the consumptive quantity that can be transferred and protected for instream flow. A critical aspect of due diligence is thorough examination of potential injury to other water users and third party impacts; MWT and TU each invest significant resources in anticipating these issues during the research and negotiations in order to avoid serious objections to a transaction. In addition, as part of the process of crafting landowner agreements, MWT and TU include a monitoring and reporting component to ensure that flows will be met according to the agreement. This initial investment is resulting in effective transactions: more water is flowing in streams that have had flow problems and improving fish habitat in tributaries.

TU uses a strategic approach to identify streams with flow problems, and often works with the irrigator that can most directly fix the problem.[171] In a number of basins in Montana, fish are unable to reach essential tributary habitat because of low flow conditions and physical blockage, often from diversions; these conditions are often near the confluence of the tributary and mainstem of the river. By working with individuals with water diversions in these lower reaches of tributary streams, TU has successfully increased flows and opened headwater habitats in tributaries for fish. Depending on the site conditions TU has a variety of tools to use. A split-season lease can be implemented to stop irrigation when flows drop below a certain trigger level. Another tool is changing the point of diversion downstream below the low flow area or to the main stem of the river, combined with a change in the irrigation system from a gravity ditch to a pump and center pivot system. Farm Bill water efficiency programs under the EQIP program have been important in funding irrigation system changes. Because consumptive use and return flow issues may arise depending on the location, TU is attentive to the potential for detrimental impacts from an irrigation system change. In conjunction with irrigation efficiency grant funding, in certain circumstances TU would enter into a project that would then have a 30-year term, to cover the life of the system infrastructure.

In addition to the lease agreements by MWT and TU, the state Department of Fish, Wildlife and Parks holds leases of water rights for instream flow purposes under a state pilot project that is scheduled to sunset in 2009 unless renewed by the state legislature. The leasing program is an important element of drought response plans and FWP works with local communities on instream flow protection and enhancement. However, because Montana does not allow permanent water rights acquisitions for instream flow purposes, FWP is seeking legislation that would allow permanent changes and thus increase their effectiveness in addressing fishery impacts from low flow and drought conditions over the long term.[172]

Changing Operations of Storage Projects

[170] Bradshaw. *See also* http://dnrc.mt.gov/house_bill22/default.asp
[171] Bradshaw.
[172] 2006 Drought Summary, page 15. http://fwp.mt.gov/content/getItem.aspx?id=25888

To meet drought response plan requirements, FWP contracts with DNRC for 15,000 acre-feet of water in the Painted Rocks Reservoir, built in 1940 on the West Fork Bitterroot River near Darby. The FWP contract provides supplemental water in late summer for fisheries based on flow needs and is regulated by the local water commissioner.[173] Recognizing an opportunity to leverage investments in maintenance for this aging dam structure to address stream flow needs, TU is exploring longer term arrangements with the state and water users that could manage a portion of the stored water more predictably and address de-watered reaches below the dam. TU is also exploring opportunities to change management of a federal dam on the Sun River; hydrological studies are underway to gather data about precipitation and runoff as the initial step in understanding options.[174]

In Montana, private individuals may operate a storage reservoir. MWT is working with a landowner to reduce water use and schedule water releases from a private reservoir during the irrigation season. A major factor in this project is gathering the stream flow and storage information needed to guide changes in the reservoir operation.[175]

Water Banking

A local version of water banking was developed in 2001 by the Blackfoot Challenge and the Big Blackfoot Chapter of Trout Unlimited as a Drought Response Plan.[176] The underlying principle of this Plan is that all water users share in reducing water use, rather than strictly following seniority. Water users agreed to implement voluntary conservation measures in order to protect instream flows during drought years. Water users with rights senior to the FWP instream flow water right can voluntarily contribute conserved water to the water bank to provide a match for junior users who also conserve water. Through "shared sacrifice" in the basin, junior users do not bear the entire burden of reducing water use when flows drop below certain target flows during a drought. The Drought, Water Conservation and Recreation Committee administers the water bank, in addition to developing an overall conservation strategy in the basin. The Committee is re-assessing the Drought Response Plan, originally conceived as an emergency response but invoked each summer due to drought conditions, to determine how to craft a long-term strategy. Meanwhile, the voluntary water bank has been successful in keeping water in the river: in 2006, this plan protected flows in the Blackfoot River without FWP placing a call.[177]

Lessons Learned

Due diligence is essential in the development of meaningful and successful projects. Taking the time to develop working relationships with water users and the larger community is a valuable investment, and basin restoration projects can be leveraged to

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[173] Ibid., pages 4, 14.
[174] Bradshaw.
[175] Ferguson.
[176] http://www.blackfootchallenge.org/am/uploads/blackfoot_drought_response_plan__11_19_01.pdf
[177] 2006 Drought Summary, page 11.

include flow improvements. Understanding physical conditions of the stream channel and incorporating water transactions in stream restoration projects leads to a higher likelihood of water actually flowing when and where it is intended.

Because water users may have an inaccurate understanding of their water rights, and what looks good on paper may not be a valid water right, the initial screen followed by researching historic use is essential. The state adjudication process is providing essential data that is available to MWT and TU in screening potential transactions; recent legislation is expected to speed up the adjudication.[178] Understanding hydrology in the focus area is also an essential component of due diligence in determining the most effective approach for either a water transaction or altering reservoir operations. The entities doing water transactions in Montana depend on a combination of local, state and federal funding sources to cover professional services by staff and consultants. MWT and TU do most of the research in house, which allows them to manage costs and quality. Funding also limits the number of potential transactions that can be researched, negotiated, and monitored.

Montana's leasing program allows for leases up to 10 years with the possibility of renewal, except for water derived from efficiency improvements, for which leases up to 30 years are possible. Working with landowners in basin-wide projects and using initial short-term agreements builds trust and experience among participants, and effects of reducing or changing water use patterns can be studied and built into future agreements. The CBWTP and the Blackfoot Challenge provide additional funding and community support for transactions. MWT and TU particularly focus on transactions in small tributaries that demonstrate that small changes can make a big difference instream. With fewer diverters, these small transactions also minimize issues of injury and third-party impacts. Monitoring programs that are built into the lease agreement can be implemented by a combination of staff and volunteers; TU has developed a successful program to train community volunteers to take on some of this responsibility. As TU continues to develop lease agreements, however, the volunteer training program will need to keep pace with the need, and TU may explore ways to collaborate with state agency staff to implement monitoring programs.

The community-based drought response plan in the Blackfoot basin demonstrates the ability of diverse interests to collaborate in face of a short-term emergency. With repeated drought years, the plan has been successful in keeping water instream through voluntary measures, and has recently received federal recognition.[179] This broad-based community effort will be moving to another phase, as they review the annual drought plan and water bank arrangement to craft a long-term strategy to manage water and land in the basin.

[178] http://dnrc.mt.gov/house_bill22/default.asp
[179] http://www.r6.fws.gov/pfw/r6pfw18.htm

Appendix E - OREGON

Transaction Approaches

Water rights can be dedicated and protected for instream purposes in a combination of programs in Oregon: the Instream Flow Leasing Program, permanent transfers, and the Allocation of Conserved Water Program.[180]

A landowner who is interested in leasing or donating a water right for instream flow purposes may submit an application directly to Oregon Water Resources Department (OWRD) or negotiate an agreement with a third-party organization. In either case, OWRD must approve the application and holds the dedicated water right in trust for instream flow purposes; through the regional watermasters, OWRD monitors flows to ensure compliance. About half of the environmental water transactions have been accomplished through direct applications to the state; the others have been negotiated through a non-governmental organization – Oregon Water Trust, Deschutes River Conservancy, or Klamath Basin Rangeland Trust. The OWRD staff coordinates with local watershed councils to provide information about water transactions; interest is growing as farmers learn about the potential benefits of putting water instream either temporarily or long term. Applications have increased each year, and in 2006 OWRD processed 118 instream flow leases with 456 cfs dedicated to streams statewide.[181] Direct transactions with OWRD do not involve payments: water rights holders benefit significantly from protection of a water right from forfeiture while the water remains instream. For farmers who enter into third-party agreements, another benefit is financial compensation for the lease or purchase.

The third option for water rights holders is the Allocation of Conserved Water program. Irrigators who implement efficiency projects designate 25% of the conserved water to instream flow use, and retain for their own use or sale the remaining 75% of the conserved water.[182] Absent the conserved water program, irrigators would face legal challenges to retaining and using the conserved water. If an applicant receives public funding for an irrigation efficiency project, such as through Farm Bill conservation programs, an additional amount of water is allocated to instream use proportionate to the level of funding. State watermasters evaluate potential efficiency projects and return flow issues to determine whether this approach is effective for stream flows without injury to existing water rights. Only the conserved water may be transferred instream, and mitigation for impacts is part of the calculation of the quantity of conserved water to be transferred. Site-specific hydrogeological studies are an essential component of this determination, as well as calculations of consumptive use, requiring pre-project evaluation and planning that can be extensive.

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180 http://www.wrd.state.or.us/OWRD/mgmt.shtml

181 Debbie Colbert, Oregon Water Resources Department. Personal Communication. January 2007.

182 http://www.wrd.state.or.us/OWRD/mgmt_conserved_water.shtml

Oregon Water Trust (OWT) pioneered the water trust model: seek willing landowners on small tributaries to enter into temporary or, preferably, long-term transactions to improve stream flows. OWT has been most successful in negotiating short-term leases; however of the 160 cfs of water protected in 2006, long-term or permanent agreements protected 58 cfs– a significant increase over previous years.[183] By targeting smaller streams in watersheds where there are potential benefits for increasing flows, and by working closely with landowners and other partners, OWT crafts a variety of agreements to improve flows to benefit fish while supporting agricultural communities. Some of these agreements result in legally protected water instream, while others are projects that manage water use and benefit stream flows using creative approaches with landowners and water districts without enrolling water in the state instream flow program.

One example of an innovative approach is a performance-based agreement in the Grande Ronde River basin. In 2005, and again in 2006, OWT negotiated annual agreements with five ditch companies and approximately 100 landowners to meet a flow target of 15 cfs in the Lostine River, a tributary to the Wallowa River. The agreement stipulated that the irrigators would be compensated if the flow target was met during the dry months of August and September, allowing the irrigators to determine how to meet the target at the monitoring point on the river. OWRD and OWT coordinated to monitor flows, and results were reported daily to the ditch companies to use in determining how to change their operations.[184] In both years, flow targets were met – and in the second summer the average flows were 21 cfs, 6 cfs over the target flow. Spring Chinook migrated to spawning grounds upstream, complementing efforts by the Nez Perce Tribe to restore the fishery in a watershed with long-standing low flow issues.[185] For OWT, this was efficient administratively in that while some 100 irrigators participated, OWT only negotiated five contracts that covered actions by all the irrigators; in order to participate each irrigator signed a contract with their ditch company.[186] Although not providing legal protection for the water instream, this forbearance agreement harnessed the creativity of the irrigators to alter their irrigation practices and restore flows in the river. This arrangement was successful for the farmers who continued to farm and received payments, and recognition, for their efforts.[187] OWT is continuing to adapt this project to better meet the needs of both farmers and fish, and anticipates that this will lead to long-term flow restoration through a potential ditch consolidation and piping project.[188]

Another OWT project involved purchasing water to permanently shorten the irrigation season in the John Day River basin. In this situation, Chinook salmon needed additional streamflows in the late summer and early fall on a river reach closed to new water appropriations and which had only one water user. To enable the landowner to complete the purchase of the property, OWT negotiated a permanent water right change and arranged $700,000 in compensation to the landowner. The original water right was for

[183] http://www.owt.org/images/Final%202006%20Water%20Report.pdf
[184] http://www.owt.org/images/OWT_2005_AR.pdf . *See also* http://www.cbwtp.org/jsp/cbwtp/projects/transactions.jsp?transaction_id=128&sub_basin_id=2
[185] http://www.efw.bpa.gov/publications/Lostine98.pdf
[186] Steve Parrett, Oregon Water Trust. Personal Communication. January 2007.
[187] http://www.fwee.org/news/getStory?story=1441
[188] Fritz Paulus, Oregon Water Trust. Personal Communication. February 2007.

irrigation between April and October; with the change, irrigation will cease on July 21, eliminating the last cutting of hay on the property but ensuring late summer stream flows. The state approved the permanent change of the water right, but because no other water users were, or could be, involved, dedication of the water to the instream flow program was unnecessary.[189]

The Deschutes River Conservancy (DRC) has worked collaboratively with stakeholders in this central Oregon basin for over ten years, enhancing stream flows through temporary leasing and permanent water rights transfers. The leasing program has been most active, restoring 111 cfs to the Deschutes River and tributaries in 2005 by working with 180 landowners.[190] DRC has cultivated working relationships with the seven water districts in the region, and has recently crafted MOUs with each district to institutionalize their leasing program.[191] Land use is changing in the basin as agricultural lands are sold, which presents opportunities for instream flow benefits. Irrigators are leasing water rights to benefit streams as an interim water use option while they consider whether and how they will be exercising their water rights as they transition to new land uses. In one recent instance, the local water district allowed water from 200 acres of land on the urban fringe to be dedicated to instream use as the land changed from agriculture to more urban development. DRC paid an "exit fee" of about $600 per acre to the district to allow the water transfer. While the legal basis for the payment may be uncertain, it served a political end in that it secured the district's agreement to dedication of water instream, and helped the district resolve issues associated with loss of a water user.[192]

Walla Walla Basin Watershed Council (WWBWC) has been instrumental in facilitating an integrated approach in response to settlement agreements between three irrigation districts and USFWS in 2000.[193] The Walla Walla River flows north from its headwaters in northeast Oregon to its confluence with the Columbia River in Washington. When bull trout and steelhead were listed as threatened species under the Endangered Species Act, irrigators in the basin were faced with threat of federal enforcement and a lawsuit by environmental organizations. In response, three irrigation districts, two in Oregon and one in Washington, entered into agreements with USFWS to restore flows in the river, long known for drying up during the summer season. To meet the flow targets the districts implemented a combination of instream leases and irrigation efficiency projects. As an initial action, the Oregon districts negotiated interim leases with OWT that resulted in water flowing in the river during the first summer of the agreement – the first time water flowed through the de-watered stretch in over 100 years. Some farmers chose to use this opportunity to lease water while changing crops; others with supplemental groundwater rights switched from using surface water to well withdrawals during the summer.[194] By working with state and federal agencies, WWBWC assisted in securing funding for irrigation efficiency improvements that continue to keep water flowing in the

[189] Purkey.
[190] http://www.deschutesrc.org/About_Us/Accomplishments/default.aspx
[191] Kate Fitzpatrick, Deschutes River Conservancy. Personal Communication. January 2007.
[192] Purkey.
[193] http://www.wwbwc.org/Media%20&%20Maps/Newsletter/WWBWC-newsletter-2006-08.pdf
[194] Brian Wolcott, Walla Walla Basin Watershed Council. Personal Communication. January 2007

state's conserved water program, as well as providing technical assistance and monitoring water quality and quantity in the river. The settlement agreements have been re-negotiated annually, and are currently being re-negotiated for the next two to three years; meanwhile a basin-wide Habitat Conservation Plan is being prepared that is anticipated to eventually supersede the settlement agreements.

Due to the geology of the Walla Walla basin, irrigation efficiency projects involve injury issues in both the Oregon and Washington segments of the basin. This situation has engendered some controversy about how to protect the saved water that flows downstream across the state line to Washington where it is available for water users under a different legal system. One approach that is underway in the basin is investigating shallow aquifer recharge as mitigation for irrigation efficiency impacts.[195] WWBWC and the Hudson Bay District Improvement Company have initiated a pilot project to divert up to 50 cfs from the river in winter and spring to a series of ponds that supplement the natural groundwater recharge in the basin. In the first two seasons, WWBWC monitored the project; results show an improvement in both the aquifer water level and spring flows in the creek systems. This approach is also being explored in the Washington side of the basin.

Storage Water Transaction

In the Umatilla River basin, OWT negotiated a purchase of stored water from a rancher with a water contract in the McKay Reservoir near Pendleton. This Bureau of Reclamation dam was constructed to provide supplementary water to two irrigation districts; in addition, about 71 individuals contract for about 8% of the storage space in the reservoir.[196] Due to long-standing problems with low flows in the Umatilla River, among many efforts to improve flows for fish are releases from the reservoir to McKay Creek to enhance flows downstream to the Umatilla River.[197] In this transaction, the rancher upgraded his irrigation system and no longer needed the full allotment of his contract for water, providing an opportunity to further enhance flows in McKay Creek through dedicating a portion of his contract to instream flow use. OWT negotiated the purchase of 300 acre-feet of water from the reservoir that will enhance stream flows through McKay Creek to the Umatilla River in perpetuity – an example of pioneering work by OWT.[198]

Water Banking

DRC is evolving to meet a variety of needs and expanding its programs to integrate leasing, groundwater mitigation, and water rights exchange through the Central Oregon Water Bank.[199] Initially organized to serve the needs of irrigation districts, DRC is planning to expand the Bank to include municipal water suppliers, and all parties will

[195] http://www.wwbwc.org/Projects/Restoration_Action/Recharge/Recharge.htm
[196] http://www.usbr.gov/dataweb/html/umatilla.html
[197] http://www.usbr.gov/pn/programs/lcao_misc/draft-oxbowsiteplan.pdf
[198] http://www.owt.org/images/OWT%202004%20Annual%20Report.pdf
[199] http://www.deschutesriver.org/What_We_Do/Water_Banking/Water_Bank/default.aspx

have the option to participate in instream flow leasing, groundwater mitigation, and water rights exchanges. Now in its second year, the bank is acquiring water through implementing irrigation efficiency programs and negotiating temporary leases and permanent transfers.[200] The overall goal of the bank is to facilitate an orderly transition of water to new uses in this changing basin.

Lessons Learned

With the long history of water transactions in Oregon, experience shows that interim leases are effective in restoring flows while building trust among landowners. With changing land uses and agricultural practices, there is increasing interest in temporary leases that allow farmers to consider options for both land and water use while receiving some compensation to assist with farm management. As landowners become familiar with instream flow leasing programs, they also become more willing to consider long-term agreements to put water instream through permanent transfers. Although still a small proportion of all water transactions, interest in environmental transactions is growing through the efforts of OWRD and the non-governmental organizations in local communities.

In crafting agreements, due diligence is essential; pre-project monitoring is invaluable in determining the amount of water actually available, potential injury issues and mitigation options, and how to structure a compensation package. Additionally, pre-project evaluation is critical in understanding landowners' concerns and building trust in the community. In negotiations, it is important to be clear about expectations and responsibilities, and to anticipate and address potential opposition to changing water from agricultural to instream uses.

Monitoring programs should be incorporated in the agreements, and should include funding for gages that can be monitored remotely as well as state and/or local staff time. Instream flows, like other beneficial uses, are monitored largely in a complaint-based system; collaborative relationships with watermasters and community groups support efforts to protect instream water rights.

Performance-based agreements may be very effective in restoring stream flows through direct participation by stakeholders in developing and monitoring specific projects with clear outcomes. Although these agreements may not provide long-term legal protection – the ultimate goal of flow restoration efforts – they are often the first step in the process.

[200] Bruce Aylward, Deschutes River Conservancy. Personal Communication. January 2007.

Appendix F - WASHINGTON

Transaction Approaches

Washington embarked on a collaborative effort to address water quantity and stream flow issues in 1998 with the Watershed Management Act (also known as "2514 planning" from the legislation creating the Act). The state legislature also enacted a salmon recovery planning effort in 1998. After years of planning in watersheds around the state, twenty-two "2514" watershed plans have been approved and adopted by county governments,[201] and watershed-based salmon recovery plans have been incorporated into the Statewide Strategy to Recover Salmon.[202] As these processes were underway, the Department of Ecology (Ecology) promoted the Water Acquisitions Program to acquire water rights through leases, purchases or donations to the state Trust Water Program.[203] Sixteen "fish critical" basins with low flow issues were designated by Ecology and the Department of Fish and Wildlife (DFW), and provide a focus for strategic water transactions to improve flows. The watershed plans provide complementary information for water transactions to restore stream flows in Washington's watersheds.

Landowners who are interested in leasing, selling or donating water rights can work directly with Ecology or with a private non-governmental organization to arrange transfers of water rights to the state Water Trust Program. The Washington Rivers Conservancy (WRC) has been active for just over a year and has completed one transaction on a small side channel in the Methow River basin.[204] Washington Water Trust (WWT) has been actively pursuing water transactions since its inception in 1998, using a willing seller, willing buyer approach to acquiring water for the state Water Trust Program. WWT coordinates with Ecology to identify and evaluate potential locations and transactions, and works closely with landowners to build trust and develop effective deals. As an intermediary, WWT fulfills an important role: many water rights holders have been reluctant to participate due to concerns about effects of transferring water from agriculture to instream flows and mistrust of governmental agencies.[205] Since 2003, the Columbia Basin Water Transactions Program (CBWTP) has also been an important partner, providing funding for Ecology, WWT and WRC to negotiate transactions in the Columbia Basin.[206]

Most of WWT's Columbia Basin transactions have been in the Teanaway River basin, a tributary of the Yakima River, to benefit flows for salmon, steelhead and bull trout. The Teanaway River has been the focus of a major restoration effort that began in 1996 to address low flow problems in the river due to irrigation diversions.[207] The Bureau of Reclamation spearheaded the regional effort, negotiating temporary transfers of irrigation

[201] http://www.ecy.wa.gov/pubs/0611046.pdf
[202] http://www.governor.wa.gov/gsro/publications/default.htm
[203] http://www.ecy.wa.gov/programs/wr/instream-flows/wacq.html
[204] Lisa Pelly, Washington Rivers Conservancy. Personal Communication. January 2007.
[205] http://www.ecy.wa.gov/programs/wr/instream-flows/ofwater_trust.html
[206] http://www.cbwtp.org/jsp/cbwtp/index.jsp
[207] http://www.usbr.gov/newsroom/newsrelease/detail.cfm?RecordID=12401

water rights to instream flow purposes that complemented irrigation efficiency projects and changing points of diversion to improve stream flows in the Teanaway River.

WWT has negotiated a series of renewable leases in the Teanaway basin,[208] providing a transition period for landowners who are not certain they are ready to permanently transfer their water right to the state. A significant advantage for farmers who are contemplating changing crops is the protection from forfeiture while the water right is enrolled in the Trust Water Program. Both Ecology and CBWTP prefer longer term transactions; one strategy WWT uses is to include a first right of refusal in contracts that could be an opportunity to move from a lease to a permanent water right transfer.[209] WWT has used a variety of tools in the water trust toolbox, including split-season leases and irrigation efficiency projects, working closely with irrigation districts and individual landowners to craft site specific and effective agreements. In addition to coordinating efforts with Ecology, WWT collaborates with conservation districts and other local organizations to integrate transactions with related restoration projects.

In a recent complex transaction, WWT coordinated with Ecology, with funding support from CBWTP,[210] to do an extensive hydrological analysis for a project to augment winter flows in Taneum Creek in the Yakima basin. The Creek is a critical area for restoration of steelhead and bull trout that are both listed as threatened under the Endangered Species Act.[211] The Taneum Canal Company has diverted water from the creek for seasonal irrigation and year-round stock water purposes since 1873, dewatering the Creek below the Canal Company diversion.[212] Upon determining the extent of ground and surface water connectivity in the basin, WWT worked with the Canal Company to arrange a permanent transfer of 28.8 cfs in the winter to the state Trust Water Program, and substitution of groundwater for the surface water supply. This entailed drilling 63 wells to provide up to 10 acre-feet per year for stock water supply between November and February, replacing the winter surface withdrawals. The permanent water right change restores and protects flows in the Creek and the Yakima River, providing flows to open some 20 miles of habitat for steelhead bull trout migration as well as improving general habitat conditions. In addition to financial compensation, the Canal Company reduced its maintenance costs and obtained clean water for stock watering.[213]

Irrigation Efficiency

Capture and reuse of irrigation water is permitted in Washington as long as the consumptive use of water is not increased, and procedures to change water rights are followed where necessary.[214] Ecology promotes this as a conservation measure to allow water users to achieve maximum beneficial use of their water, as well as to benefit stream

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208 http://www.cbwtp.org/jsp/cbwtp/projects/transactions.jsp?transaction_id=177&sub_basin_id=27
209 Susan Adams and Kelly McCaffrey, Washington Water Trust. Personal Communication. January 2007.
210 http://www.cbwtp.org/jsp/cbwtp/projects/stories.jsp?sub_basin_id=27
211 Taneum Canal Company Amended Report of Examination.
212 http://www.cbwtp.org/jsp/cbwtp/checklist_pdf/checklist_pdf.jsp?transaction_id=30
213 Hedia Adelsman, Department of Ecology. Personal Communication. January 2007. *See also* http://www.cbwtp.org/jsp/cbwtp/projects/stories.jsp?sub_basin_id=27
214 http://www.ecy.wa.gov/pubs/fwr92108.pdf

flows. In some cases, Ecology may provide funding to construct re-regulating reservoirs that capture and recycle irrigation water on the same fields as a way to leverage reductions in water diversions or withdrawals.[215] Capture and reuse is limited to those water users who have valid water rights and who use irrigation water return flows for the same purpose and on the same fields as authorized by their water rights.

In the Walla Walla basin in southeast Washington, a 4-year study is underway to investigate the feasibility of restoring stream flows in the basin through various techniques, including shallow aquifer recharge.[216] This effort emerged in response to a threat of ESA enforcement in 2000 after bull trout and steelhead were trapped in a historically dewatered stretch of the Walla Walla River. The River, divided by the Washington-Oregon state line, suffered for years from low flows from irrigation diversions. In studying the problem, parties on both sides of the state line have begun to explore diverting winter and spring flows to ponds that would supplement natural groundwater recharge. The Walla Walla Basin Watershed Council is coordinating the investigation in Oregon; early results show improvement in both the aquifer water level and flows in the spring branches.[217] The Washington feasibility study is a cooperative effort between the Washington Department of Ecology, the Confederated Tribes of the Umatilla Indian Reservation, and U.S. Army Corps of Engineers; results are due in late 2007.

Water Banking

An Ecology report in December 2006 outlines the current status of water banking in the state.[218] In the Yakima basin, water banking has been authorized since 2003 but a water bank structure has not been formally created. A technical group meets regularly to review proposed water right transfers and guides applicants in determining the types of transfers that are likely to be approved by the state. In addition, Ecology implemented a reverse auction in the Yakima basin in 2005 and plans to hold a second reverse auction in early 2007. The 2005 auction was a component of the statewide drought response to provide water for domestic and instream uses in the Yakima River; five leases were signed that yielded consumptive water rights for 1,626.2 acre-feet. The 2007 auction is intended to provide a portfolio of options for leases and purchases to improve flows in tributaries and the lower Yakima River.

Water banking has been suggested as a potential tool for managing water in the Columbia basin, as one of the suggestions in the nascent Columbia River Management Program. In other parts of the state a number of watershed planning groups have expressed interest in the concept as a water management tool in specific watersheds. For example, in the Bertrand sub-basin of the Nooksack River, a local group is investigating a locally managed performance-based program as a form of water banking. In this program, contracts between the Bertrand Watershed Improvement District and local water users

[215] Adelsman.
[216] http://www.ecy.wa.gov/news/2006news/2006-105.html
[217] http://www.wwbwc.org/Projects/Restoration_Action/Recharge/Recharge.htm
[218] http://www.ecy.wa.gov/pubs/0611048.pdf

would provide incentives for existing water rights holders to participate in a program to meet instream flow targets.

Lessons Learned

Water transactions require significant pre-project investigation, and thus an investment of time and resources. Ecology is an essential partner with local watershed groups and the WWT and WRC to perform technical work, particularly hydrological studies, to determine the best approach in a particular location. The role of WWT and WRC in locating willing sellers and negotiating transactions is one key to the success of the state's Water Acquisition Program.

A number of projects and programs are in formative stages around the state, and likely will become better defined as watershed plans are implemented. One of the challenges facing the local and state entities is funding to implement the plans. Funding for transactions to meet instream flow needs that have been identified in the Columbia basin planning processes may come through CBWTP; however, ongoing funding for annual leases is uncertain. While short-term leases are effective in introducing the concept to water users, up-front funding for long-term leases or purchases is preferable from both a financial and ecological standpoint, guaranteeing long term benefits for stream flows. WWT and WRC perform some contract monitoring and Ecology monitors flows, at least in those basins where there are watermasters to do so. Funding for these ongoing duties is also a critical element to build into project plans.

A few watershed groups are exploring innovative approaches, such as performance-based projects and shallow aquifer recharge to improve stream flows. As watershed-based planning moves to the next phase in Washington, results from current studies and pilot projects will be useful in determining the level of success in meeting intended outcomes.

APPENDIX G

ADDITIONAL INFORMATION

G-1: Walker Basin System Operations

G-2: Agricultural Sub-Areas

G-3: Farm Bill Conservation Programs

G-4: Desert Terminal Lakes Program Authorities 2002-2005

G-5: Water Conservation at the Mason Valley Wildlife Management Area

G-6: Walker Basin Project Research Summary

G-7: Proposed 2004 Fallowing Program, Walker River Paiute Tribe

G-1. System Operations

The Walker River system is operated and administered by a variety of entities. The Chief Deputy Water Commissioner (federal water master) of the U.S. Board of Water Commissioners (USBWC) has primary responsibility for the day-to-day administration of water rights adjudicated by federal Decree C-125. The Walker River Irrigation District (WRID) allocates and administers adjudicated storage rights as well as "flood" or "excess" waters under state-issued certificates of appropriation. Groundwater rights in Nevada are administered by the Nevada State Engineer in Nevada, except for domestic use rights using less than 1,800 gallons per day (which do not need a permit) and groundwater rights within the exterior boundaries of the Walker River Indian Reservation. (Groundwater rights in the California portions of the Walker River basin are not regulated.) The Walker River Paiute Tribe and/or the Bureau of Indian Affairs administer both surface and groundwater rights within the Walker River Indian Reservation. And a variety of intermediary organizations, such as the Antelope Valley Mutual Water Company and both decreed and non-decreed ditch and water user associations, oversee the conveyance and delivery of surface waters to individual users following their diversion from the natural stream course.

Decreed Natural Flows

Prior to March 1 each year, the Chief Deputy Water Commissioner (or federal water master) develops a Plan of Distribution for the forthcoming irrigation season for each of the six administrative divisions set forth in the USBWC's 1953 *Rules and Regulations*.[1] The annual Plan of Distribution is based upon current and/or expected snowpack, runoff, and reservoir storage conditions in the Walker River basin on or around February 1. In general, the federal water master coordinates with the Antelope Valley Mutual Water Company, the Walker River Irrigation District, ditch companies, and individual water rights holders concerning the apportionment and distribution of the natural flows of the Walker River and its tributaries in accordance with the natural flow diversion rights adjudicated by Decree C-125.[2] "Standard operating procedures" include the use of five "river riders" – one each for the Antelope Valley and Bridgeport areas and for the East, West, and Main Walker Rivers – who work for the water master and who control the diversion of water from the River system into the various ditches.[3]

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[1] See **Plate 4-I**. Division 1 = Schurz area from Walker Lake to Weber Dam; Division 2 = lands served from the Main Walker (Mason Valley) from the Yerington Weir to the East-West confluence; Division 3 = lands served by the East Walker from the East-West confluence to Bridgeport Dam; Division 4 = lands served by the East Walker and tributaries above Bridgeport Dam (principally Bridgeport Valley); Division 5 = lands served from the West Walker and tributaries from the East-West confluence to the Intake Canal for Topaz Reservoir; and Division 6 = lands served form the West Walker and tributaries above Topaz Lake Intake Canal (principally Antelope Valley). The irrigation season lasts officially from March 1 to October 31 for Divisions 1, 2, 3, 5 and the lower portion of Division 6; and from March 1 to September 15 for Division 4 and the upper portion of Division 6.

[2] Decreed natural flow diversion rights are measured at their point of diversion from the River in accordance with the priorities, diversion rates (or duties), and irrigated acreage specified in the Decree. While circumstances may from time to time require more detailed investigations, the federal water master generally does not deal with the particulars of how or where diverted waters are used so long as that use takes place within the legally-described areas specified in the Decree.

[3] The federal water master measures the rights of the United States (i.e., rights held in trust for benefit of the Walker River Paiute Tribe) at the Wabuska gaging station near the northern (upstream) boundary of the Walker River Indian

Local ditch riders (or ditch tenders) work closely with the water master and the river riders, meeting daily throughout the season, coordinating and aggregating requests from individual users, and controlling the actual distribution of water diverted into the ditches to individual farms.[4] Allowable diversions and the year of priority to be served are determined on a daily basis throughout the season by comparing the total amount of water available (i.e., the sum of natural inflows and estimated return flows) to the actual demands (requests) for water in accordance with the "abstract of diversion rights" maintained by the USBWC.[5] It generally takes about 3-4 days for water to flow from the top to the bottom of the Walker River system, so allowance must also be made for transit times.

Stored Waters

WRID's primary responsibilities include managing and distributing stored waters derived from the storage rights adjudicated to the District under Decree C-125 (i.e., waters diverted into, stored in, and released from Bridgeport and Topaz Lake Reservoirs).[6] As provided therein, water is generally stored (or diverted into storage) during the non-irrigation season (November 1 to March 1), and then released (delivered) during the irrigation season, however the Decree also provides for additional refill rights "at any time" whenever "excess water" exists (see below). Stored water is distributed to individual users (i.e., landowners within the District) in accordance with the District's adopted Rules and Regulations Governing the Distribution and Use of Water (revised January 1986) and "in proportion to the apportionment of benefits to each parcel in relation to the total benefits apportioned throughout the entire District."[7] In general, whenever natural flows (including return flows) are insufficient to serve daily demands "in priority" under

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Reservation; and either the Tribe or the U.S. Bureau of Indian Affairs administers those rights once they enter the Reservation. Because losses below Wabuska can be significant, the Tribe defines its rights under the Decree based on diversions at Little Dam, below Weber Dam, near Schurz (see, e.g., Application 71719 before the Nevada State Engineer). In 2005, the USBWC's Plan of Distribution established April 15 (rather than March 1) as the effective start of the Division 1 irrigation season due to the 180-day season set forth in Decree C-125 (as amended) and because of the Tribe's inability to fully utilize Weber Reservoir due to dam safety concerns.

[4] The "rotation" of water among individual users is allowed under the Decree (section 13) but only on a ditch-by-ditch basis, not across ditches or divisions. Rotation is overseen by the ditch riders when desired by individual users, however those users bear the risk of any ensuing shortfalls due to daily changes in priorities or other factors.

[5] The formula set forth in the USBWC's 1953 Rules and Regulations (page 4) provides that the Chief Deputy Water Master "shall determine the total amount of water entering the Walker River Stream system through natural channels. He shall add to this accumulated total of natural flow water the amount of return flow he computes to be returning to the stream system through seepage, drain canals and any other sources. The sum total of water from these two sources shall be considered to be the total amount of water available to serve vested rights under the decree and the year of priority to be served shall be determined daily…"

[6] The USBWC operates Bridgeport and Topaz Reservoirs according to Decree C-125, WRID's Operations Manual, and applicable SWRCB permit conditions; and it regulates, monitors, and keeps daily records of flows at all points of diversion, including water for storage and stored water at Bridgeport and Topaz Reservoirs and at Twin Lakes. (Bazeyeff 1994)

[7] Bylaws of the Walker River Irrigation District (1986), Article XV, Distribution of Storage Water. WRID apportions storage water prior to March 1 each year, and sometimes re-apportions those supplies later in the season if needed. Detailed instructions for the Ordering of Water are set forth in Regulation No. 5 of the District's 1986 Rules and Regulations.

post-1873 decreed natural flow rights, or when demands for storage water to serve New Lands (storage-only parcels) exist, the ditch riders (or tenders) convey individual or aggregated orders/requests for stored waters to the river riders and/or directly to WRID, and waters are released from storage (if available) by WRID in order to satisfy those demands. Unlike natural flow diversion rights, storage rights are allocated to specific parcels of land and can only be used on those parcels; and the "rotation" of storage-only water is prohibited.[8] In general, the District assumes an average transit loss of approximately 15% from the points of release below Bridgeport and Topaz Dams to the various points of diversion, however such losses can increase dramatically during dry and critically dry conditions.

Excess (or Flood) Water

The USBWC's 1953 *Rules and Regulations* provide for the allocation of "excess water" whenever "the Chief Deputy Water Commissioner determines that there is more water available in the stream than is required to fill the rights of all the vested users including the rights of the WRID and others similarly situated to store water" (page 4). While the 1953 *Rules and Regulations* also state that such "excess water" is to be prorated to all users "in proportion to the rights already established," in practice the Chief Deputy Water Commissioner defers to WRID when it comes to allocating and distributing such water based on two certificates of appropriation issued by the State of Nevada to WRID in 1976.[9] Thus, in practice, the primary beneficiaries of "excess water" would appear to be all users of stored water within WRID (because WRID can divert "excess water" into storage and thus replenish available storage supplies even during the irrigation season), and particularly those with New Land parcels (because, by definition, all decreed rights – including those with supplemental storage allocations – would need to be satisfied for "excess water" to exist, and because New Land "duties" are insufficient based on nominal or face-value allocations). According to Meyers (2001), diversions of excess water averaged approximately 26,000 AF/year over the period 1931-1995.

Stock Water

In practice, anyone who has decreed water rights <u>and</u> owns livestock (apparently fewer and fewer users over time) has stock water rights, however those rights can only be exercised during the non-irrigation season.[10] (During the irrigation season, stock water needs must be satisfied from decreed natural flow rights or other sources.) Orders for stock water are developed and submitted by the individual ditch riders, and are then adjusted and distributed by the federal water master on a "common sense" basis (e.g., no flooding, no impact on other beneficial uses, allowance for ditch losses, need to avoid icing up, subject to water availability, etc.).

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[8] Ken Spooner, WRID General Manager, personal communication January 2007. Regulation No. 12 the District's 1986 Rules and Regulations provides for the rotation of "decree water" under certain conditions, but "land allocated strictly storage water shall not rotate with those lands with a decreed water right."

[9] Jim Shaw, personal communication, January 2007. Decree C-125 has never been modified to incorporate these state-issued certificates, which were issued with "the understanding that the total duty of water shall not exceed 4.0 ac-ft/acre/season from any and/or all sources."

[10] Decree C-125 refers to stock water rights only as constraints on WRID's ability to divert water into storage during the non-irrigation season (Decree, pages 63A-64); they are not otherwise specifically referenced or quantified.

Groundwater

Groundwater is used extensively by individual landowners in the Smith and Mason Valley's under state-issued certificates of appropriation, both as "stand alone" (or primary) sources of supply and to supplement decreed and/or storage rights. While virtually all supplemental groundwater permits in Nevada limit total water use from all sources to a combined duty not to exceed 4.0 AF/acre, in practice there is little if any enforcement of this condition because (a) neither the USBWC nor WRID accepts responsibility for administering state-issued rights, and (b) while the State of Nevada has increased its groundwater monitoring efforts in recent years there is as-yet neither effective real-time monitoring nor meaningful coordination with those responsible for administering surface water deliveries. From anecdotal reports it appears that groundwater rights (especially supplemental rights) are exercised in a variety of ways which vary from year to year; and in recent years they may also have been used with increasing regularity outside the normal irrigation season, particularly for the pre-irrigation of certain crops.[11]

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[11] Regulation No. 10 of WRID's 1986 Rules and Regulations provide in part that "[t]he season for the delivery of state permit water shall begin on May 1st and end on July 31st each year."

G-2. Agricultural Sub-Areas

The Walker River basin features six major agricultural water use areas: Bridgeport Valley (CA) and the East Walker corridor (primarily NV) on the East Walker River; Antelope Valley (CA) and Smith Valley (NV) on the West Walker River; Mason Valley (NV) on the East, West, and Main Walker Rivers; and the Schurz (Reservation) area (NV) on the Main Walker River. This section provides an overview of each area.

The **Bridgeport Valley**, near the headwaters of the East Walker River, is located entirely within California. Water is diverted from the East Walker and its tributaries primarily for the irrigation of pasture lands. The Valley includes an adjudicated total of 26,426 acres of natural-flow (decreed) water rights decreed primarily to individual users, and features some of the most senior water rights in the Basin.[12] Pahl (2000a) assumes that an annual average of about 20,000 acres were irrigated between 1926 and 1995, and that annual diversions of approximately 50,000 AF (2.5 AF/acre) would have been needed for this purpose.[13] According to Sharpe et. al. (in review, 2007), many of these lands are also ecologically diverse and productive due to the stream and wetland environments that they support, which are themselves highly productive; because the Valley itself lies at an "ecotone" where the Sierra Nevada and Great Basin meet; and because its many meadow-like areas are part of the migration flyway for numerous bird species. Moreover, while grazing impacts the dynamics of a natural ecological system, this area is not planted and harvested like other agricultural areas in the lower Walker basin. In recognition of these and other values, a significant percentage of the Bridgeport Valley's irrigated lands – including at least 6,350 acres of pasture and uplands -- are currently protected by agricultural conservation easements.[14]

The **East Walker corridor** includes the upper East Walker (CA) and the lower East Walker (primarily NV) downstream of Bridgeport Dam. In some studies (e.g., Tracy et. al. 2001), diversions of water from the East Walker River into the East Mason Valley are included as part of the East Walker area; in others (e.g., Pahl 2000b) those diversions are accounted for separately, or are simply included in the Mason Valley total. For example, the Desert Research Institute (**Table 2-B**; **Appendix A**) estimates that irrigated acres in the East Walker corridor (upstream of Mason Valley) varied from about 2,700 acres in 1992 to 5100 acres in 1986; but acreage estimates for the East Mason Valley are included in the Mason Valley total (see below). Over the same time period, the combination of diverted waters and River flows sustained more than 3,000 acres of riparian and wetland vegetation on average in the East Walker area, close to 75% of the average for irrigated acres in this area, again based on DRI's analysis. Agricultural crops include irrigated pasture, alfalfa hay, and some higher value crops. Water rights include a

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[12] Pahl (1999b), Figures 5-12.

[13] The retired U.C. Agricultural Extension agent for the Bridgeport area estimates that irrigated lands in the Valley vary from 24,000-26,000 acres each year, and that another 6,000-7,000 acres of riparian habitat are sustained (as they have been for decades) by the associated irrigation diversions. He also describes the entire Valley as working a bit "like a sponge," i.e., filling up slowly during the irrigation season and then "drying out all winter long." (Richard Delmas, personal communication, January 30, 2007.)

[14] See Wildlife Conservation Board 2002. Delmas (op. cit.) felt that "maybe one-third" of the Valley's irrigated acres are currently protected by some form of agricultural conservation easement.

mixture of decreed natural flow, storage, groundwater, and flood rights though the majority of diversions appear to derive from decreed natural flow rights. Data compiled by Pahl (1999b and 2000b; see also **Table 4-A**) indicate that decreed rights in the East Walker corridor encompass 7,596 acres, and that surface water diversions from all sources averaged about 21,100 AF/year from 1931-1995 (**Table 2-D**).

The **Antelope Valley** (including several upstream tributaries) lies entirely within California near the headwaters of the West Walker River. This area includes some of the most senior decreed natural flow rights on the West Walker River, with approximately 90 percent of all rights adjudicated to the Antelope Valley Mutual Water Company under Decree C-125.[15] Approximately 68,000 AF/year were diverted, on average, from 1931-1995 (**Table 2-D**), including an estimated 2,500 AF/year in the upstream tributaries, primarily to irrigate alfalfa and pasture; and approximately 12,200 acres were irrigated each year, on average, along with about 2,800 acres of riparian-wetland habitat based on DRI's analysis of six years of data between 1986 and 2002 (**Table 2-B; Appendix A**).

The **Smith Valley** lies entirely within Nevada on the West Walker River downstream of the Antelope Valley and Topaz Lake Reservoir. Diversions of natural flow, storage, and flood waters from the West Walker River support pasture lands, alfalfa, and some higher-value crops; and diversions and return flows to the northwest end of the Valley provide water under secondary drainage rights to the Alkali Lake (Artesia) Wildlife Management Area (Meyers 2001; Sharpe et. al., in review 2007). Groundwater is used throughout the Smith Valley, both for supplemental purposes and as the exclusive source of supply for several large "pumpwater farms." Storage rights also play an important role: according to information complied by WRID,[16] only 15% of all surface water-righted acres in the Smith Valley area were "decree only" rights; the balance included decreed rights with supplemental storage (28%) and New Land (storage-only) rights (57%). From 1931-1995, diversions into the Smith Valley from all sources averaged approximately 71,200 AF/year (**Table 2-D**); from 1994-2006, groundwater withdrawals averaged 24,000 AF/year (**Table 2-F**); and from 1986-2002, approximately 17,500 acres were irrigated, on average, along with 3,300 acres of riparian-wetland habitat (**Appendix A; Table 2-B**). Tracy et. al. (2001a) estimate that the annual return flow fraction for water diverted from the West Walker River into the Smith Valley averages 27 percent, except that no water diverted to the Artesia area (northern Smith Valley) finds its way back to the River.[17] Meyers (2001c), by comparison, found that, for most of Smith Valley, the River gains flow from both surface and groundwater returns: approximately 33 percent of applied irrigation water returns to the River in normal years, dropping to 11 percent during dry years; and return flows generally lag diversions by 1-2 months.

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[15] Antelope Valley land owners formed the Antelope Valley Mutual Water Company in 1926. Shares in the company – a privately-owned entity under California law -- are issued to members in proportion to their acreage. (California Department of Water Resources 1992, page 59)

[16] Walker River Basin Advisory Committee (2000), Table 6.3; see also **Table 4-B**.

[17] Tracy et. al. (2001) cite Meyers (2000) in asserting that to acquire and transfer Artesia-area diversion rights one would also have to acquire state-issued tail water rights. (See Meyers, Table 12, for a listing of these rights.) Curiously, neither the federal water master nor WRID appears to recognize the existence of these tail water rights (Jim Shaw and Ken Spooner, personal communication, 1/3/07).

The **Mason Valley** lies downstream of the Smith Valley (on the West Walker, including the so-called "Tunnel Section") and the East Walker corridor (on the East Walker) and includes the confluence region of the two forks south of Yerington as well as the main-stem region heading north. Diversions of natural flow, storage, and flood waters out of the East, West, and Main Walker Rivers averaged close to 139,000 AF/year from 1931-1995 (**Table 2-D**). Agricultural crops include a mixture of irrigated pasture, a "relatively high proportion of high value crops," and "a large number of acres growing alfalfa" (Tracy et. al. 2001b); in recent years, onions and garlic have also become prominent higher-valued crops. Water rights in the Mason Valley include a mixture of decreed natural flow, allocated storage, and state-certificated groundwater rights. Along the main Walker River, approximately 26% of all surface water-righted acres (about 28,500 acres total) were "decree only" rights, compared with 46% for acres with decreed rights plus supplemental storage and 28% for acres with New Land (storage-only) rights (**Table 4-B**). From 1994-2006, groundwater withdrawals in the Mason Valley averaged 79,200 AF/year (**Table 2-F**); and from 1986-2002, approximately 35,000 acres were irrigated, on average, along with 7,400 acres of riparian-wetland habitat (**Table 2-B**), including an estimated 2,000-2,500 acres of managed wetlands at the Mason Valley Wildlife Management Area (Sharpe et. al., in review, 2007).[18] Tracy et. al. (2001a) estimate that agricultural return flows from the Mason Valley to the Walker River average about 35% of diverted water; yet Meyers (2001b) concludes that losses to evapo-transpiration and/or groundwater recharge for surface waters conveyed through the Mason Valley are substantial, ranging from 30-40% in most months to as much as 90% during dry, late summer months. There is, in any event, a significant connection between the river and the groundwater basin in this area.

Finally, the **Schurz area** is located within the Walker River Indian Reservation approximately mid-way between Weber Dam and northernmost end of Walker Lake. (Weber Dam is located about 10 miles downstream from Wabuska, and about 25 miles above Walker Lake.) The final (amended) Walker River Decree adjudicates the most senior rights on the system to the Walker River Paiute Tribe, i.e., an 1859 priority right to 26.25 cfs of natural flow water for 180 consecutive days to irrigate 2,100 acres of land within the present Reservation boundaries. Significantly, the federal water master administers and accounts for the Tribe's decreed natural flow rights at the northernmost end of the Reservation, near Wabuska, after which those waters flow into (and eventually through) Weber Reservoir en-route to two on-Reservation diversion points below Weber Dam near Schurz (i.e., the two most downstream diversion points on the River).[19] Disagreements over the magnitude of losses between Wabuska and the Tribe's point(s) of diversion,[20] as well as the status of and operations at Weber Dam (and many other

[18] In addition, "approximately 1,200 acres within the Mason Valley WMA are irrigated for production of alfalfa, other cereal grains such as winter wheat, and corn with the specific intent for use by wildlife for forage and cover… Harvesting practices for [these] crops…are very different from commercial production farms, which do not follow practices to maintain crop habitat for wildlife."

[19] In temporary change applications 71719 (9/21/04) and 75337 (2/14/07) before the Nevada State Engineer, the Tribe states that its rights "may also be expressed as 26.25 cubic fee per second [or] 9,370 acre feet per year…*measured at the Tribe's point of diversion"* (i.e., at Little Dam; emphasis added).

[20] Tracy et. al. (2001a) assumed 8% losses for seepage and evaporation between Wabuska and Weber Reservoir, while USBR/USBIA and the Tribe assumed 15% losses between Wabuska and Weber Reservoir, plus apportioned evaporation losses in Weber Reservoir, for the conveyance of decreed waters conserved for delivery to Walker Lake by the Mason Valley Wildlife Management Area in 2004 (see USDOI 2004b, Attachment 6, item IV.F).

issues),[21] have been a source of tension and controversy for many years. Beginning in 2003, the U.S. Geological Survey initiated a 5-year monitoring program in cooperation with the Tribe[22] that should help to resolve at least some of these controversies – a desirable if not imperative pre-requisite to the success of water acquisition efforts for Walker Lake. Data are limited over the historic period of record concerning the Tribe's annual diversions below Weber Dam, however it appears that both inflows at and losses below Wabuska have left the Tribe unable to take full advantage of its rights under some conditions,[23] while actual diversions have sometimes exceeded what the Decree appears to allow.[24] (These and other matters are currently the subject of renewed litigation between the Tribe, WRID, and other parties.) On-Reservation diversions are administered by the U.S. Bureau of Indian Affairs on behalf of both tribal and non-tribal farmers/landowners. Between 1986 and 2002, approximately 2,500 acres were irrigated, on average, while River flows, groundwater, and diversions above and below Weber Dam sustained approximately 4,200 acres of riparian-wetland habitat on average (**Table 2-B; Appendix A**).

Disagreements over these assumptions may also have contributed to the demise of the 2004 fallowing agreement between USBR and the Tribe, and/or to its renewal or reconfiguration in 2005 (see section G-7 below). For reference, a 2006 USGS analysis found that losses between Wabuska and Schurz varied inversely with inflows at Wabuska (e.g., 38% at 50,000 AF but only 12% at 400,000 AF) using data from the two historic periods: 1915-1933 (before Weber Dam) and 1995-2005 (long after). See http://nevada.usgs.gov/walker/presentations/PublicLands3-06.pdf.

[21] Weber Dam, constructed as part of the Walker River Indian Irrigation Project in the mid-1930's, was not included in the Walker River Decree (1936) nor in the Amended Final Decree (1940). Since 1989, the Dam has been ranked number one by the U.S. Bureau of Indian Affairs' nationwide Dam Safety, Maintenance, and Repair Program, making it "the most unsafe BIA dam in operation" (Miller Ecological Consultants, 2005). Interim Operating Criteria currently limit the amount of water that can be safely stored in Weber Reservoir to less than half its present capacity. A final EIS for its repair and modification was completed in 2005 (ibid.), and a Record of Decision was issued on October 11, 2005. (Repairs and modifications were finally underway as of early 2007.)

[22] See http://nevada.usgs.gov/walker/index.htm

[23] Meyers (1997) assessed channel losses in the Wabuska-Weber reach during water year 1995 and found that (a) summertime flows at Wabuska (June-September) varied from 14-64 cfs but dropped below 26 cfs almost 30 percent of the time (at Wabuska) and more than 66 percent of the time at Weber (still well above the Tribe's diversion dam near Schurz); and (b) summertime losses averaged about 34 percent while annual losses averaged about 24%.

[24] USGS data indicate that diversions below Weber Dam (at Canals 1 & 2 near Schurz) averaged approximately 15,500 AF/year over the period 1998-2006. (USGS Water Resources Data, Sites 10301742 and 10301755, 1998-2006)

G-3. Farm Bill Conservation Programs

Numerous landowners in the Walker River basin have entered into contractual agreements with the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) to implement land, irrigation, and related system improvements under a variety of conservation-oriented programs authorized and funded by the 1996 and 2002 Farm Bills. Information provided by the Nevada NRCS indicates that more than 100 such agreements were executed with farmers in Lyon and Mineral counties in Nevada, and in Mono County in California, between approximately 1998 and 2006, representing a total contract (improvement) value of nearly $4.4 million.[25] (See summary table, attached.) Program participants are required to maintain all NRCS-funded improvements over the specified "service life" of the conservation practice (typically 5-25 years); and if they cease to irrigate their land due to the sale or lease of appurtenant water rights (or otherwise fall into contractual non-compliance) they will likely have to repay NRCS for the pro-rated costs (plus interest) of all NRCS-funded improvements *plus* liquidated damages (to recover NRCS' forgone administrative and technical service costs) up to an additional 20 percent.[26] While NRCS prefers that their contract holders avoid these or other non-compliance events altogether,[27] at a minimum they request and encourage advance discussions with any prospective sellers who are or have been NRCS contract holders.[28]

Following are summary descriptions of the specific farm-bill conservation programs upon which contracts with landowners in Lyon, Mineral, and Mono Counties are based.

The Wildlife Habitat Incentives Program (WHIP) is a voluntary program for people who want to develop and improve wildlife habitat primarily on private land. Through WHIP, USDA's Natural Resources Conservation Service (NRCS) provides both technical assistance and up to 75 percent cost-share assistance to establish and improve fish and wildlife habitat. WHIP agreements between NRCS and the participant generally last from 5 to 10 years from the date the agreement is signed. http://www.nv.nrcs.usda.gov/programs/WHIP_NV.html

The Environmental Quality Incentives Program (EQIP) is a voluntary USDA program managed by NRCS. The objective of EQIP is to promote agricultural production and environmental quality as compatible goals. EQIP offers financial and technical assistance to eligible private landowners, tribes and groups to install structural, vegetative and management practices on eligible agricultural land. Up to 75 percent cost-share assistance may be provided for 1-10 year agreements.

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[25] Lyon County accounts for $3.6 million (84%) of the nearly $4.4 million total, however this may also include contracts for lands in that County which are not part of the Walker River basin.

[26] See NRCS Conservation Programs Manual, Section 512.58 (Recovery of Costs). Under the U.S. Fish and Wildlife Service's Water Rights Acquisition Program in Fallon, Nevada, these costs are included in appraisals and are paid to NRCS at closing.

[27] NRCS is also concerned about the potential for soil erosion, dust, and/or noxious weed problems if land and/or water acquisitions result in the cessation of irrigation without adequate provision for establishing suitable replacement vegetation. These issues are discussed in **Section 6**.

[28] Cost recovery particulars must be evaluated on a contract-by-contract basis. Note also that conservation practices may have substantially longer "service lives" than the original NRCS-landowner agreements.

http://www.nv.nrcs.usda.gov/programs/eqip2006.html

The Conservation Security Program (CSP) is a voluntary program that provides financial and technical assistance to promote the conservation and improvement of soil, water, air, energy, plant and animal life, and other conservation purposes on Tribal and private working lands. Working lands include cropland, grassland, prairie land, improved pasture, and range land, as well as forested land that is an incidental part of an agriculture operation. The program provides equitable access to benefits to all producers, regardless of size of operation, crops produced, or geographic location. CSP contracts vary by “tier” and range from 5-10 years in length; annual payments range from $20,000-$45,000, and one-time payments may be included if “new practices” are needed to move between tiers.
http://www.nv.nrcs.usda.gov/programs/csp.html

The Agricultural Management Assistance Program (AMA) provides cost-share funds to assist producers with implementing conservation systems and addressing regulatory requirements associated with improved nutrient and wastewater management systems at concentrated animal feeding operations (CAFO’s).
ftp://ftp-fc.sc.egov.usda.gov/NV/web/publications/CAFO_factsheet.pdf

FARM BILL CONSERVATION PROGRAM CONTRACTS in LYON, MINERAL, and MONO COUNTIES

Ref.	Program	Start Year	County	Obligation	Ref.	Program	Start Year	County	Obligation
1	AMA	2002	Lyon	N/A	52	EQIP 2002	2005	Lyon	$ 213,126
2	CSP	2005	Lyon	$ 16,381	53	EQIP 2002	2004	Lyon	113,880
3	CSP	2005	Lyon	27,761	54	EQIP 2002	2004	Lyon	137,962
4	EQIP 1996	2001	Lyon	10,525	55	EQIP 2002	2003	Lyon	75,160
5	EQIP 1996	2000	Lyon	36,646	56	EQIP 2002	2005	Lyon	41,587
6	EQIP 1996	1999	Lyon	50,000	57	EQIP 2002	2003	Lyon	17,680
7	EQIP 1996	2000	Lyon	11,036	58	EQIP 2002	2004	Lyon	80,784
8	EQIP 1996	2000	Lyon	46,226	59	WHIP	2005	Lyon	17,738
9	EQIP 1996	2000	Lyon	5,992	60	WHIP	2005	Lyon	46,442
10	EQIP 1996	2001	Lyon	15,000	61	WHIP	2006	Lyon	20,684
11	EQIP 1996	2000	Lyon	45,870	62	WHIP	2005	Lyon	5,082
12	EQIP 1996	1999	Lyon	16,379	63	WHIP	2004	Lyon	22,771
13	EQIP 1996	2000	Lyon	6,439	64	AMA	2002	Mineral	N/A
14	EQIP 1996	1999	Lyon	16,474	65	EQIP 1996	2000	Mineral	4,275
15	EQIP 1996	1997	Lyon	44,286	66	EQIP 1996	1999	Mineral	7,219
16	EQIP 1996	2001	Lyon	18,962	67	EQIP 1996	2000	Mineral	13,114
17	EQIP 1996	2000	Lyon	15,750	68	EQIP 1996	1998	Mineral	4,048
18	EQIP 1996	1999	Lyon	30,305	69	EQIP 1996	1998	Mineral	14,970
19	EQIP 1996	2001	Lyon	13,411	70	EQIP 1996	1999	Mineral	14,044
20	EQIP 1996	2000	Lyon	28,236	71	EQIP 1996	1999	Mineral	1,890
21	EQIP 1996	2000	Lyon	50,000	72	EQIP 1996	1998	Mineral	5,412
22	EQIP 1996	2001	Lyon	-	73	EQIP 1996	2001	Mineral	7,733
23	EQIP 1996	2001	Lyon	9,548	74	EQIP 1996	2001	Mineral	12,708
24	EQIP 1996	1999	Lyon	1,497	75	EQIP 1996	1998	Mineral	9,148
25	EQIP 1996	2001	Lyon	24,466	76	EQIP 1996	1998	Mineral	2,070
26	EQIP 1996	1999	Lyon	11,542	77	EQIP 1996	1998	Mineral	30,052
27	EQIP 1996	1998	Lyon	7,032	78	EQIP 1996	2000	Mineral	30,375
28	EQIP 2002	2003	Lyon	15,360	79	EQIP 1996	1999	Mineral	51,648
29	EQIP 2002	N/A	Lyon	252,758	80	EQIP 2002	2004	Mineral	15,233
30	EQIP 2002	2004	Lyon	71,023	81	EQIP 2002	2006	Mineral	75,030
31	EQIP 2002	2002	Lyon	32,844	82	EQIP 2002	2005	Mineral	30,770
32	EQIP 2002	2003	Lyon	22,625	83	EQIP 2002	2005	Mineral	19,465
33	EQIP 2002	2004	Lyon	49,135	84	EQIP 2002	2003	Mineral	3,106
34	EQIP 2002	2004	Lyon	124,867	85	EQIP 2002	2003	Mineral	99,938
35	EQIP 2002	2003	Lyon	171,000	86	EQIP 2002	2003	Mineral	3,919
36	EQIP 2002	2006	Lyon	116,091	87	WHIP	2004	Mineral	5,498
37	EQIP 2002	2006	Lyon	55,134	88	WHIP	1998	Mineral	N/A
38	EQIP 2002	2004	Lyon	23,906	89	2002 Farm Bill	n/a	Mono	33,496
39	EQIP 2002	2005	Lyon	107,185	90	2002 Farm Bill	n/a	Mono	14,270
40	EQIP 2002	2004	Lyon	433,042	91	2002 Farm Bill	n/a	Mono	28,055
41	EQIP 2002	2003	Lyon	-	92	2002 Farm Bill	n/a	Mono	6,152
42	EQIP 2002	2002	Lyon	17,077	93	2002 Farm Bill	n/a	Mono	898
43	EQIP 2002	2004	Lyon	334,931	94	2002 Farm Bill	n/a	Mono	1,245
44	EQIP 2002	2003	Lyon	7,760	95	1996 Farm Bill	n/a	Mono	10,666
45	EQIP 2002	2005	Lyon	24,224	96	1996 Farm Bill	n/a	Mono	50,000
46	EQIP 2002	2002	Lyon	17,979	97	1996 Farm Bill	n/a	Mono	16,333
47	EQIP 2002	2004	Lyon	189,540	98	1996 Farm Bill	n/a	Mono	27,571
48	EQIP 2002	2006	Lyon	113,418	99	1996 Farm Bill	n/a	Mono	31,587
49	EQIP 2002	2006	Lyon	52,477	100	1996 Farm Bill	n/a	Mono	15,224
50	EQIP 2002	2003	Lyon	10,680	101	1996 Farm Bill	n/a	Mono	17,986
51	EQIP 2002	2004	Lyon	$ 57,226					$ 4,368,086

Source: NRCS-Reno Summary Data Sheets 6/13/06, 2/2/07, and 2/22/07

G-4. Desert Terminal Lakes Program Authorities 2002-2005

Public Law 107-171: Farm Security and Rural Investment Act of 2002 (5/13/02)

Sec. 2507 DESERT TERMINAL LAKES.

(a) IN GENERAL - Subject to subsection (b), as soon as practicable after the date of enactment of this Act, the Secretary of Agriculture shall transfer $200,000,000 of the funds of the Commodity Credit Corporation to the Bureau of Reclamation Water and Related Resources Account, which funds shall –

(1) be used by the Secretary of Interior, acting through the Commissioner of Reclamation, to provide water to at-risk natural desert terminal lakes; and

(2) remain available until expended.

(b) LIMITATION - The funds described in subsection (a) shall not be used to purchase or lease water rights.

Public Law 108-7: Omnibus Appropriations Bill (2/20/03)

Bureau of Reclamation

Sec. 207 RESTORATION OF FISH, WILDLIFE, AND ASSOCIATED HABITATS IN WATERSHEDS OF CERTAIN LAKES

(a) In General.- In carrying out section 2507 of Public Law 107-171, the Secretary of Interior, acting through the Commissioner of Reclamation, shall –

(1) subject to paragraph (3), provide water and assistance under that section only for the Pyramid, Summit and Walker Lakes in the State of Nevada;

(2) use $1,000,000 for the creation of a fish hatchery at Walker Lake to benefit the Walker River Paiute Tribe; and

(3) use $2,000,000 to provide grants, to be divided equally, to the State of Nevada, the State of California, the Truckee Meadows Water Authority and the Pyramid Lake Pauite Tribe to implement the Truckee River Settlement Act, PL 101-618.

(b) Administration.- The Secretary of Interior, acting through the Commissioner of Reclamation, may provide financial assistance to State and local public agencies, Indian tribes, nonprofit organizations, and individuals to carry out this section and section 2507 of PL 101-171.

Public Law 108-137: Energy and Water Development Appropriations Act of 2004 (12/01/03)

SEC. 217. RESTORATION OF FISH AND WILDLIFE HABITAT, PROVISION OF BOTTLED WATER FOR FALLON SCHOOLCHILDREN, AND ASSOCIATED PROVISIONS.

(a) IN GENERAL- In carrying out section 2507 of Public Law 107-171, title II, subtitle F, the Secretary of Interior, acting through the Commissioner of Reclamation, shall—

(1) Notwithstanding section 2507 (b) of Public Law 107-171, title II, subtitle F, and in accordance with Public Law 101-618, provide $2,500,000 to the State of Nevada to purchase water rights from willing sellers and make necessary improvements to benefit Carson Lake and Pasture: Provided, That such funds shall only be provided by the Bureau of Reclamation when the title to Carson Lake and Pasture is conveyed to the State of Nevada.

(2) As soon as practicable after enactment, provide $133,000 to Families in Search of the Truth, Fallon, Nevada, for the purchase of bottled water and costs associated with providing such water to schoolchildren in Fallon-area schools.

(3) In consultation with the Pershing County Water Conservation District, the Commissioner shall expend $270,000 for the State of Nevada's costs associated with the National Environmental Policy Act review of the Humboldt Title Transfer: Provided, That notwithstanding Public Law 107-282, section 804(d)-(f), the State of Nevada shall pay any other costs assigned to the State as an entity receiving title in Public Law 107-282, section 804(b)-(e) or due to any reconveyance under Public Law 107-282, section 804(f), including any such National Environmental Policy Act costs that exceed the $270,000 expended by the Commissioner under this subparagraph.

(4) Provide $1,000,000 to the University of Nevada, Reno's Biodiversity initiative for public education and associated technical assistance and outreach concerning the issues affecting the restoration of Walker Lake.

(b) ADMINISTRATION- The Secretary of the Interior, acting through the Commissioner of Reclamation, may provide financial assistance to State and local public agencies, Indian tribes, nonprofit organizations, and individuals to carry out this section and section 2507 of Public Law 107-171.

Public Law 109-103: Energy and Water Development Appropriations Act (11/19/05)

Title II, Department of the Interior, Bureau of Reclamation, General Provisions

SEC. 208. (a)(1) Using amounts made available under section 2507 of the Farm and Security Rural Investment Act of 2002 (43 U.S.C. 2211 note; Public Law 107-171), the Secretary shall provide not more than $70,000,000 to the University of Nevada –

(A) to acquire from willing sellers land, water appurtenant to the land, and related interests in the Walker River Basin, Nevada; and

(B) to establish and administer an agricultural and natural resources center, the mission of which shall be to undertake research, restoration, and educational activities in the Walker River Basin relating to—

(i) innovative agricultural water conservation;

(ii) cooperative programs for environmental restoration;

(iii) fish and wildlife habitat restoration; and

(iv) wild horse and burro research and adoption marketing.

(a)(2) In acquiring interests under paragraph (1)(A), the University of Nevada shall make acquisitions that the University determines are the most beneficial to—

(A) the establishment and operation of the agricultural and natural resources research center authorized under paragraph (1)(B); and

(B) environmental restoration in the Walker River Basin.

(b)(1) Using amounts made available under section 2507 of the Farm and Security Rural Investment Act of 2002 (43 U.S.C. 2211 note; Public Law 107-171), the Secretary shall provide not more than $10,000,000 for a water lease and purchase program for the Walker River Paiute Tribe.

(b)(2) Water acquired under paragraph (1) shall be—

(A) acquired only from willing sellers;

(B) designed to maximize water conveyances to Walker Lake; and

(C) located only within the Walker River Paiute Indian Reservation.

(c) Using amounts made available under section 2507 of the Farm and Security Rural Investment Act of 2002 (43 U.S.C. 2211 note; Public Law 107-171), the Secretary, acting through the Commissioner of Reclamation, shall provide—

(1) $10,000,000 for tamarisk eradication, riparian area restoration, and channel restoration efforts within the Walker River Basin that are designed to enhance water delivery to Walker Lake, with priority given to activities that are expected to result in the greatest increased water flows to Walker Lake; and

(2) $5,000,000 to the United States Fish and Wildlife Service, the Walker River Paiute Tribe, and the Nevada Division of Wildlife to undertake activities, to be coordinated by the Director of the United States Fish and Wildlife Service, to complete the design and implementation of the Western Inland Trout Initiative and Fishery Improvements in the State of Nevada with an emphasis on the Walker River Basin.

(d) For each day after June 30, 2006, on which the Bureau of Reclamation fails to comply with subsections (a), (b), and (c), the total amount made available for salaries and expenses of the Bureau of Reclamation shall be reduced by $100,000 per day.

G-5. Water Conservation at the Mason Valley Wildlife Management Area

The Mason Valley Wildlife Management Area (MVWMA) is located in the northern end of the Mason Valley near Wabuska.[29] Owned and managed by the Nevada Department of Wildlife (NDOW) for wetland habitat and waterfowl, the MVWMA used approximately 17,000-24,000 AF/year from all sources over the period 1995-2002, including natural flow decreed rights (representing approximately 2/3 of the overall average of nearly 21,000 AF/year), storage water, groundwater, and effluent over the period 1995-2002.[30]

Since the mid-1990's, numerous observers have suggested that there may be a significant potential for conserving water at the MVWMA in order to benefit Walker Lake.[31] In March 2004, the U.S. Bureau of Reclamation and the Nevada Department of Wildlife confirmed this potential by entering into a $2.36 million *Assistance Agreement*[32] that "will allow the Mason Valley Wildlife Management Area to reduce their diversions of Walker River decree water from the Walker River and increase discharge to the River" by (1) allowing the Management Area to more efficiently use alternative water supplies, (2) reducing total water demands by allowing better water management, and (3) increasing discharges to the Walker River by modifying water management so that water quality is improved enough to meet discharge standards.[33] The Agreement goes on to state that "this project will benefit the public and the environment in the Walker River basin by increasing instream flows in the lower Walker River, and increasing Walker Lake inflows."[34]

A total of 10 specific projects are included in the Agreement:

1. Purchasing and installing a pump and pipeline to allow mixing of hatchery discharge water and water diverted directly from the Walker River;
2. Purchasing and installing a pump and pipeline to allow water discharged from the Sierra Pacific Power Company's Ft. Churchill cooling ponds to be spread over a larger area and filtered by more wetlands;
3. Purchasing and installing an underground pipeline to allow discharges of water from the north (downstream) end of the Management Area to the Walker River;

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[29] The Management Area's establishment included an historic change in the manner of use in established water rights from agriculture to wildlife following the purchase of "over 8,700 acres of land…from an existing cattle ranch" (Sharpe et. al., in review 2007).

[30] *Cooperative Agreement between the Nevada Department of Wildlife and the U.S. Bureau of Reclamation*, March 18, 2004, Attachment A, Table 1.

[31] See, e.g., Public Resource Associates (1994); and Grenier (1999).

[32] Funding and authority for the *Assistance Agreement* originated with section 2507 of Public Law 107-171 (enacted May 13, 2002), which transferred $200 million to the U.S. Bureau of Reclamation to provide water for at-risk natural desert terminal lakes, however those funds cannot be used to purchase or lease water rights.

[33] USBR 2004, section A.3. (Purpose). The Agreement notes that, in years prior to 2004, no discharges occurred from the Management Area to the River "due to water quality concerns."

[34] *Ibid*, section A.5. (Benefits)

4. Purchasing and installing an underground well and pump to reduce the amount of surface water needed for agricultural irrigation on Management Area lands;
5. Reconditioning three existing groundwater wells to allow them to operate more efficiently;
6. Moving an existing groundwater well to a better location with greater flow that does not conflict with other MVWMA wells;
7. Laser leveling approximately 164 acres of ponds to allow them to be managed as moist soil units (to raise wildlife food) during the summer and flooding them (for habitat) only in the fall;
8. Constructing a water efficiency development and maintenance facility to keep MVWMA equipment (including pumps and motors) in good operating condition;
9. Purchasing and installing a water treatment system for Fort Churchill cooling pond water for application to wetland areas (concurrent with #2 above) or for discharge to the Walker River (concurrent with #3 above); and
10. Purchasing and installing an electronic fish barrier to prevent movement of non-game fish from the Ft. Churchill cooling pond to an adjacent pond which would otherwise have to be drained every 3-5 years.

Expenditure of funds under the Agreement was made contingent on the prior satisfaction of at least three conditions. First, an Environmental Assessment (EA) under the National Environmental Policy Act (NEPA) had to be completed, and a Finding of No Significant Impact (FONSI) reached, or a more detailed Environmental Impact Statement (EIS) would be needed. Second, the State of Nevada was required to obtain all necessary approvals from the Nevada State Engineer and the Federal District Court (Walker River Decree Court) in order to transfer approximately 10,000 acre-feet of water to Walker Lake during the first year of the Agreement, during which time the Management Area would not be able to make use of those waters due to construction activities funded by the Agreement. And third, for all subsequent years, Reclamation needed a commitment from the State of Nevada that it would use its "best efforts" to send water conserved under the Agreement to Walker Lake.[35] Steps taken to satisfy each of these conditions are discussed briefly below.

NEPA Compliance A Final Environmental Assessment and Finding of No Significant Impact were issued by the U.S. Bureau of Reclamation on March 1, 2004. The FONSI was based on the following three factors:

1. Only minor and insignificant adverse impacts to the human environment were identified in the environmental analysis of the Proposed Action;
2. The beneficial impacts to the human environment arising from funding and implementation of the Proposed Action with attached stipulations[36] exceed those minor and insignificant adverse impacts identified; and

[35] Apparently NDOW was not willing to forgo any of it's Decree water *in perpetuity*. Instead, NDOW plans to continue to divert it's Decree water into and through the Management Area, and then to discharge any surplus to the River under a secondary discharge permit.

[36] "Construction work will be located so as to avoid cultural resource sites; if this is not feasible, affected sites will be evaluated for inclusion in the National Register of Historic Places in consultation with the State Historic

3. The Proposed Action constitutes a necessary initial step in the preservation of an at-risk natural desert terminal lake.

State-Federal Approvals In 2004, Permit 70649 was issued to NDOW by the Nevada State Engineer for a one-year transfer of water rights from the Mason Valley Wildlife Management Area to Walker Lake. The original application, filed by NDOW in November 2003, was proposed as a demonstration project to see how much of the transferred water would make it to Walker Lake. In January 2004, a single protest was filed by a group of ten individuals and seven businesses located throughout the Mason Valley. Their primary concern was that the proposed transfer would waste water because historic USGS gage data had already shown that, when flows are reduced, the majority of the water which passed the Wabuska weir was consumed by phreatophytes (primarily tamarisk, an invasive tree species) and evaporation due to a heavily braided stream channel. A second concern was that the proposed transfer would impact decreed water rights holders on shared ditches and elsewhere in the basin because NDOW proposed to transfer a total of 13,588 AF without regard to the historical consumptive use, return flows, delivery schedules, rotation schedules, or ditch losses associated with those rights.

To satisfy the protestants, an apportionment was negotiated under which 55% of the flow rate duty would remain in the stream and 45% would be diverted into the applicable ditches to facilitate water deliveries to other decreed water users whenever the subject rights were in priority. The protest was withdrawn by stipulation on 3/4/2004, and the permit was issued on 3/5/2004, subject to the above and with the express understanding that the terms of the stipulation would not constitute a precedent for any future change applications involving decreed water rights. NDOW would also bear responsibility for reaching agreement with the Walker River Paiute Tribe and the U.S. Bureau of Indian Affairs concerning the sharing of transportation losses to and through Weber Reservoir.

Although the permit was handled as a permanent transfer, an expiration date of 10/31/2004 (the end of the decreed irrigation season) was imposed. A total diversion rate of 50.957 CFS (not to exceed 13,588 AF per season) was permitted from Decree C-125 Claims 12, 41, 141, and 229, and from Permit 23753, for Wildlife and Public Recreation purposes. The permit specified that no diversion of the instream flow portion was to occur, that this water was to remain in the natural channel past the Wabuska weir and Weber Dam to Walker Lake, and that Weber Dam could be used as a regulating reservoir to facilitate delivery to Walker Lake. The entire arrangement was also made subject to final approval of the U.S. District court.

Best Efforts On March 18, 2004, NDOW and USBR entered into a *Cooperative Agreement* under which NDOW agreed to take all reasonable measures to assure that:

(a) construction of the improvements summarized above would be completed within a reasonable period of time;

Preservation Office and other interested parties. If eligible, mitigation will be conducted after development of a memorandum of agreement that will be signed with SHPO. If not eligible, construction will proceed."

(b) in 2004, MVWMA would divert, of the Decree water to which it was entitled, no more than needed to satisfy the terms of the *Stipulation for Protest Dismissal Without Prejudice in the Matter of Change Application 70694*;

(c) in future years, MVWMA would be operated consistent with proper wildlife area management so as to increase its discharge of water to the Walker River for the purpose of increasing inflows to Walker Lake;

(d) NDOW would work with the Walker River Paiute Tribe and others if “appropriate opportunities” arise to reduce losses in the stretch of the River below the MVWMA; and

(e) NDOW would obtain and defend all local, state, or federal permits, certificates, and other forms of approval necessary for delivery to Walker Lake of NDOW’s Walker River decree water not diverted to, or water discharged from, the MVWMA to the lower Walker River.[37]

Attachment A to the *Cooperative Agreement* provides further quantification of NDOW’s “best efforts” commitment:

> “If climatic conditions remained similar to those experienced during the 1995 through 2002 period [1995-1999 was very wet; 2000-02 was dry], NDOW feels it could make a firm commitment to contribute between 2,500 and 3,500 acre feet of water per year in 3 out of 5 years running. In years when water supplies are high, the amount contributed could be greater. Conversely, if the Walker River watershed experienced an extended drought period, NDOW would be unable to contribute to river flows without damaging the wildlife habitat of the area.”

Finally, the same attachment includes a number of other considerations that shed additional light on the commitments noted above and on other potential issues and opportunities:

- Availability of water in the fall and early winter is very important to the [MVWMA]. Under no circumstances should any storage water be used to augment flows to Walker Lake. Any opportunity to acquire more storage water should be explored since additional storage water could further decrease reliance on decree water.
- The total use of all permitted well rights would decrease reliance on decree water. However, the Department does not budget for the pumping costs. Any relief on pumping costs could free up [surface] water for the Lake.[38]
- NDOW should be compensated for its decree water through reimbursement of assessment fees paid to the [WRID].
- The amount of water lost while running through the various ditch systems is significant – probably 20-30%. Any strategies…to reduce and/or eliminate ditch loses would result in decreased reliance on decree water. This concept should be explored system-wide.
- It is impossible to estimate how much of the water that NDOW contributes…will actually make it to Walker Lake. There are significant impediments to the flow of the river and those items would need to be cleared up if very much water is…to make it to the Lake.

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[37] “The United States agrees to employ its best efforts to likewise assure that such water is delivered to Walker Lake.” Section 7 (Best Efforts).

[38] This appears to assume that there is no significant connection between groundwater pumping within Wildlife Management Area boundaries and surface water flows in the lower Walker River.

G-6. University of Nevada – Walker Basin Project -- Research Summary

The following summary of approximately $10.1 million in initial research projects under section 208(a)(1)(B) of P.L. 109-103 was provided by the University of Nevada in January 2007.

Development of a Water Rights GIS Database and Associated Demographic, Economic and Property Databases of the Walker River Basin: In support of land and water acquisitions in the Walker Basin, a geographic information systems (GIS) framework for linking water rights with individual parcels, water distribution networks, points of diversion, and place of use information will be developed. Water rights to be contained within the GIS database include decreed natural flow rights, decreed/allocated storage rights, state-issued groundwater rights (both primary and supplemental), with the associated PLSS and individual parcel data. The water rights mapping team will begin the proposed effort by identifying two to three specific properties/parcels in the Walker Basin where a cooperating landowner will allow the team to validate the accuracy of the water rights mapping procedure performed on the property. The resultant database, when integrated with the water rights model, hydrologic models, and the biodiversity assessment may be used to assess how water and land acquisitions will affect the entire Walker Basin system.

Development of a Decision Support Tool in Support of Water Right Acquisitions in the Walker River Basin: The overall objective of this project is to develop, test and implement a computer-based DST for the Walker River basin to evaluate the effectiveness of proposed water right acquisitions for increasing water deliveries to Walker Lake. The DST will capture the spatial and temporal complexity of important relationships among climate, evapotranspiration, river flows, groundwater-surface water exchange along the river, irrigation practices, groundwater pumping, lake volume, and total dissolved solids levels in Walker Lake.

A Socio-economic, Political and Environmental Analysis of Land and Water Rights Acquisitions in the Walker River Ecosystem: This analysis will provide an overview of the context in which the acquisition of land and appurtenant water rights for ecosystem restoration in the Walker River system occurs. Key focal components include arid land agriculture, multi-state involvement, urban/rural interface issues, river restoration, sensitive species, Native American reservation and treaty rights, mediation efforts, the involvement of non-governmental organizations, and political conflict. The analysis will also include documentation of these efforts throughout the duration of the project with the final product being a book that captures, in visual and textual format, the history and contemporary framework of the Walker Basin.

Alternative Agriculture & Vegetation Management: The project objectives are to identify the cultural practices necessary for and the economic potential of low water use crops, including forages, alternative energy crops, food crops, nursery stock, and native seed production, with the aim of minimizing aerial soil erosion and evapotranspiration while enabling profitable agronomic returns on crops. In addition, the research will to survey and determine the current native and non-native plant species composition of key landscape areas that will be affected by hydrological system changes, and anticipate vegetation responses under likely scenarios identified through modeling efforts.

Plant, Soil, & Water Interactions: Data collection will be carried out to determine likely responses by soils and vegetation to changes in water application and consumptive use, water table depth, and surface salinity in three key landscapes, as well as to determine the effects of enhanced water use efficiencies from the use of alternative agricultural vegetation, especially with regard to competition for available soil water at various depths. Information on the impacts of changes in water table and stream elevation on soil physical properties, and nitrogen and phosphorus cycling will aid in assuring that air and water quality will improve, both in the river and in the lake.

Assessing the Importance of Water Acquisitions to Health of the In-stream Environment, Aquatic Ecology, and TDS loading to Walker Lake: This project will describe the environmental condition of Walker Lake, determine characteristics of healthy and degraded Walker River aquatic communities, determine environmental factors that are most important to structuring aquatic communities in the Walker River, develop decision tools to analyze the efficacy of different water acquisitions to improve Walker Lake and Walker River ecological integrity, measure and evaluate the effects of increased flow on river bottom and stream temperatures relative to impacts on fish and microhabitats, apply temperature and water chemistry data to identify potential locations of groundwater inflows to both the Walker River and Walker Lake which would facilitate development of nutrient, salinity, and water inflow/outflow budgets.

Development of Tools to Quantify Sediment Transport within the Walker River Watershed along with Recommendations to Maximize Water Conveyance and Minimize Degradation of Water Quality in Walker Lake Due to Erosion, Sediment Transport, and Salt Delivery: The primary objective of the research is to develop a set of recommendations to minimize further sediment and salt loading to Walker Lake and degradation to the lower Walker River under increased flows. This project will combine field surveys, GIS analyses, laboratory flume studies, and sediment transport and hydraulic modeling to define the conditions under which erosion occurs within the Walker River watershed and predict sediment erosion, transport, and delivery to Walker Lake over a range of flows. The results of this effort will be synthesized into a set of recommendations that can be used by land and water managers to assess potential impacts resulting from variations in flow, water quality, and channel geometry on the transport of sediments and on the flow capacity of the Walker River.

Water Conservation Practices for Agricultural Producers: The objective of this study is to determine the most economically effective use of water on agricultural lands and provide producers with an estimate of the potential amount of water rights they may be able to offer to the market for lease or sale. One way to increase the amount of water that agricultural land holders may be willing to sell is to improve the efficiency with which they use existing water rights. This can be accomplished through changes in agricultural crops or increased water use efficiency.

Formulation and Implementation of Economic Development Strategies to Mitigate Economic and Fiscal Dislocations: The proposed project includes the development of detailed estimates of the fiscal impacts driven by the economic impacts resulting from the acquisition of water rights and the changes in agricultural production and land use, formulation of economic development action plans to mitigate the projected economic and fiscal dislocations, and assistance in implementation of the economic development action plans. A benefit of this research will be to identify appropriate sustainable economic development actions and related public policy alternatives.

Wild Horse and Burro Marketing Study: The primary objective of this proposal is to determine which characteristics of wild horses and burros increase adoption rates and investigate alternative auction procedures which could increase adoption rates and simultaneously increase revenues to government agencies. Specific objectives are to estimate the value individuals place or the different characteristics of wild horses and burros offered at BLM auctions, and **t**o analyze alternative auction procedures that will enhance wild horse and burro adoptions and increase auction revenues.

G-7. Land Fallowing on the Walker River Indian Reservation

The Walker River Indian Reservation lies at the lower end of the Walker River system. It includes a 35-40 mile stretch of the River as it flows from the Wabuska gage downstream through Weber Dam and Reservoir on to its terminus at Walker Lake.

The Tribe's (i.e., the United States') rights under Decree C-125 include "the continuous flow of 26.25 cubic feet of water per second, to be diverted from the Walker River upon or above the Walker River Indian Reservation during the irrigation season of [180] days for the irrigation of [2,100] acres of land on the Reservation…with a priority of November 29, 1859."[39] Based on the above, and using a conversion factor of 1.9835 AF/cfs per day, decreed irrigation diversions would amount to approximately 9,370 AF/year, or 4.5 AF/acre on average.

The Bureau of Indian Affairs (BIA) administers the Tribe's surface water rights through the Walker River Indian Irrigation Project.[40] Weber Dam and Reservoir are used to regulate the delivery of irrigation water to the allotments encompassed by the Project and to provide irrigation water to other downstream lands.[41] Diversions take place at Little Dam, approximately 2 miles below Weber Dam, supplying water via Canal 1 to some 966 acres on the west side of the River, and via Canal 2 to some 1,091 acres on the east side of the River.

In 2002, constraints on Desert Terminal Lakes funding combined with the Reservation's proximity to Walker Lake to suggest that a program might be developed that would increase flows to the Lake by paying landowners on the Reservation to temporarily fallow their lands.[42] Beginning in 2003 and continuing into 2004, the U.S. Bureau of Reclamation worked closely with the Tribe and the Bureau of Indian Affairs to develop a proposed $2.047 million *Assistance Agreement* to implement a land fallowing program on the Walker River Indian Reservation during the 2004 irrigation season. Though the Agreement was not finalized (see below), its provisions provide key insights into many of the issues that will have to be addressed as part of any fallowing-based water conservation program in the Walker Lake basin in the future.

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[39] Also adjudicated to the United States for use by the Walker River Paiute Tribe during the non-irrigation season was "the flow of water reasonably necessary for domestic and stock watering purposes and for power purposes to the extent now use by the Government." United States vs. Walker River Irrigation District et. al. No. 8779, Circuit Court of Appeals, Ninth Circuit, June 5, 1939 (104 Federal Reporter, 2d series, pp. 334-340). The final decree made no provision for storage rights at Weber Dam and Reservoir.

[40] Much of the information included in this introductory section is derived from background information contained in the Assistance Agreement discussed below.

[41] According to the *Assistance Agreement* discussed herein, irrigated lands on the Reservation are comprised primarily of 20-acre allotments (i.e., lands held by the U.S. in trust for individual Indian allottees). The acreage that can actually be irrigated on many such allotments is less than 20 acres due to the presence of roads, canals, ditches, buildings, and other structures. Some allotments are irrigated by the owners; some are irrigated under lease arrangements; and approximately 145 acres of former allotments are owned in fee by non-Tribal members.

[42] "Funds will not be used to purchase or lease water rights [but to] compensate tribal irrigators for foregone income they would normally get from raising crops." Assistance Agreement, Section A.3.

As stated in the Agreement, implementation of the 2004 fallowing program would "allow the Walker River Paiute Tribe to reduce their diversion of Walker River decree water from the Walker River and allow that water to flow to Walker Lake…increasing inflows [and] improving the Lake's water quality and its freshwater ecosystem."[43] The program was designed to include the following elements and understandings:

1. The program would be established as one-year demonstration with a one-year option to renew subject to the availability of grant funds;
2. Landowner participation would be voluntary (willing sellers only);
3. A minimum of 1,000 acres of land (up to a maximum of 2,100 acres) would have to be enrolled by willing sellers (landowners) before it would take effect;
4. BIA would determine which acres would be eligible for enrollment based on BIA-approved maps of recently-irrigated lands;
5. Participating landowners and the Tribe would execute a Fallowing Agreement approved by BIA (and appended to the *Assistance Agreement*) in accordance with applicable regulations;
6. BIA would operate Weber Dam and Reservoir, and monitor irrigation facilities, as required to administer the commitments agreed to by the Tribe and by participating allotment landowners;
7. Participating landowners would receive $600 for each recently-irrigated acre enrolled in the program, plus an additional $300 per acre if 100% participation was achieved within specified "blocks" of land;[44]
8. Any landowner wishing to participate in the program whose allotment was subject to an existing lease agreement would be required to complete and sign a Lease Amendment Form and obtain the signature of the current lessee, and that Form would be included as part of the Fallowing Agreement;
9. Surface water that would have been diverted to BIA-approved irrigated acres enrolled in the fallowing program, including surface water calculated to be saved by the fallowing of the enrolled acres, would be released from Webber Dam for delivery to Walker Lake during the 180-day irrigation season established for the reservation in 2004; and
10. The Tribe would monitor surface water released from Weber Dam pursuant to the fallowing program at four downstream locations as specified in the Agreement.

In addition to the items noted above, implementation of the 2004 fallowing program (including expenditure of funds under the Agreement) was made contingent on timely completion each of the following:

- An Environmental Assessment (EA) and a Finding of No Significant Impact (FONSI) under the National Environmental Policy Act (NEPA) by the Bureau of Reclamation and/or the Bureau of Indian Affairs;

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[43] Assistance Agreement, section A.4. (Purpose)

[44] Section 10 of the Fallowing Agreement makes clear that "the rent paid by the Lessee to the Lessor includes the compensation that might be required in order for the Lessor to re-establish irrigated crops on the Leasehold subsequent to the termination of this agreement" and that doing so "is solely the responsibility of the Lessor."

- Federal District Court approval (to be secured by the Walker River Paiute Tribe) to deliver water from fallowed lands to Walker Lake;
- An agreement between BIA and the U.S. Department of the Interior to operate Weber Reservoir to release a portion of stored water to Walker Lake *and* to pass through water conserved at the Mason Valley Wildlife Management area for the benefit Walker Lake (see section G-5 above); and
- Execution of a Fallowing Compliance Agreement between the BIA and participating landowners to ensure that participants in the fallowing program do not receive irrigation water [for those acres enrolled in the program], and that the water saved as a result of fallowing is sent to Walker Lake and is not used by farmers on the reservation who are not participating in the program.

The Agreement then sets forth a total of 12 Tasks and associated timelines for implementing the fallowing program "as proposed by the Tribe and/or BIA." These include (1) compilation of a mailing list of affected allotment landowners; (2) notification about the program to all persons on that list; (3) compilation of individual files for each eligible allotment; (4) public information meetings with affected landowners and tribal members; (5) consultations during regular office hours with prospective willing sellers; (6) review and approval by BIA of any fully executed Fallowing Agreements which conform to the requirements of the program, and determination as to whether voluntary enrollment is "sufficient to continue" with program implementation during Calendar Year 2004 (and if so how lands which are not enrolled in the program will be served during that year);[45] (7) mechanisms for making payments to participating landowners; (8) a monitoring program to be administered by the Tribe in accordance with Attachment 5 to the Agreement;[46] (9) installation of a new/additional stream measuring device at a location to be agreed to by Reclamation, BIA, and the Tribe; (10) operation of Webber Dam in accordance with Attachment 6 to the Agreement;[47] (11) an evaluation of fallowed acres by BIA during the 2004 Fallowing Program to determine what soil conservation measures should be taken (if any) in the event that a one-year option to renew the program is exercised for 2005; and (12) a report on the results of the Fallowing Program by the Tribe and BIA.

As noted above, neither the *Assistance Agreement* nor the associated on-Reservation fallowing program was finalized prior to the onset of the 2004 irrigation season. A variety of factors appear to have led to this result, including threshold enrollment challenges; community

[45] Task 6 includes two additional and very important components. First, it provides for equivalent payment (i.e., fair compensation) to landowners who are not enrolled in the Fallowing Program but for whom BIA determines that it cannot deliver irrigation water to parcels that they own (and that are eligible to receive irrigation water) due to implementation of the Program that year. And second, it provides for an additional agreement to be reached between BIA and Reclamation to assure compliance with the amount of water to be diverted during the period of the Fallowing Program, including allowance for any "special circumstances" which might arise (such as increased conveyance losses) that would justify diversion of additional water.

[46] Letter from USGS to the Walker River Paiute Tribe's Water Resource Coordinator dated February 9, 2004, setting forth USGS' recommendations for new or refurbished monitoring stations as part of the Fallowing Program and/or in cooperation with other proposed or ongoing USGS monitoring efforts on the lower Walker River.

[47] Operating plan for Weber Dam and Reservoir, BIA, FY2004 Fallowing Program (including provisions for the storage, conveyance, and apportionment of losses of water conserved and transferred to Walker Lake as a result of infrastructure improvements at the Mason Valley Wildlife Management Area).

confusion about certain aspects of the program; unresolved concerns over the equitable apportionment of losses associated with the conveyance of water conserved and transferred from points above the Reservation to Walker Lake as part of the 2004 program; third-party challenges relating to the jurisdiction of the Nevada State Engineer vis a vis the federal decree court for the initial processing water rights change applications; and the relatively limited amount of time available to address all of these (and other) concerns. Initial planning and community outreach efforts associated with the 2005 authorization for and funding of a $10 million on-Reservation water lease and purchase program (to be developed and administered by the Tribe; see discussion in **Section 7**) will hopefully provide new opportunities for addressing and resolving these and other key issues.[48]

[48] In addition to the initial planning efforts described in the 2006 *Annual Funding Agreement* between the Tribe and Reclamation under the authority of section 208(b) of P.L. 109-103, the Tribe is proceeding with efforts to develop and implement a fallowing program for the 2007 irrigation season that will be similar in most respects to the program originally envisioned back in 2004. (John McMasters, personal communication, April 2007). See also temporary change application no. 75337 filed with the Nevada State Engineer on February 14, 2007.