This document presents a Comprehensive Aquifer Management (Plan) for the Treasure Valley. At the direction of the Board, the Plan was developed collaboratively by the Treasure Valley Advisory Committee (Committee). This Plan in no way modifies or diminishes existing state water law, including the prior appropriation doctrine, or the power and duties of the Director of the Idaho Department of Water Resources (Department).

Contents

1. EXECUTIVE SUMMARY

2. INTRODUCTION

In 2008, the Idaho Legislature passed House Bills 428 and 644, establishing the statewide comprehensive aquifer planning and management effort and creating a fund to support the effort. The Idaho Water Resource Board (IWRB) and the Idaho Department of Water Resources (IDWR) initiated work in the Treasure Valley to establish a framework and path forward which will lead to sustainable water supplies, optimum use of the aquifer, and develop strategies to minimize potential future conflicts. This effort was conducted under the leadership of the IWRB. The IWRB is the constitutionally established agency responsible for formulating and implementing the state water plan for optimum development of the water resources in the public interest. This plan is a component of the state water plan, which guides the development, use, conservation and management of water resources in Idaho. The specific goals of the statewide CAMP program are to:

- Provide reliable sources of water, projecting 50 years into the future
- Develop strategies to avoid conflicts over water resources
- Prioritize future investments in water

The IWRB recognizes that the long-term management of the water resources of the Treasure Valley must be acceptable to the local community and take into account the social and economic interests of the residents and public interest. The long-range plan must also be consistent with the legal constraints and laws of Idaho. The Idaho Water Resource Board appointed an Advisory Committee to consider these interests and develop recommendations for this plan. For a list of Advisory Committee members, see Appendix 1.

As the Advisory Committee progressed in their work, the members built on the CAMP goals and developed a unanimously-supported vision for the TV CAMP.

> ***The vision of the Treasure Valley CAMP is to promote and protect Treasure Valley water resources through:***
>
> - ***Respect for Idaho water law and water rights***
> - ***A sustainable framework of collaboration, cooperation, and stewardship, and***
> - ***A commitment to ongoing research, data collection, and analysis***

This Plan and the recommended actions described are guided by this vision.

3. BACKGROUND AND CURRENT CONDITIONS

The Treasure Valley water system is a complex system of dynamic interconnection. However, the connection between these waters is a critical element in the location and availability of water for the needs of the Treasure Valley. Water used in one location will likely be the supply for a different water need elsewhere in the basin. Although comprehensive studies have been undertaken, and continue today, the full extent of when, how, and where the ground and surface waters interact is not fully understood. The contribution of surface water to recharge of the aquifer system and the importance of aquifer discharge to drains and the rivers does, however, require that any discussion of the Treasure Valley Aquifer System will inevitably be a discussion about both ground and surface water.

Hydrology and Water Supply

Most of the surface water used in the Treasure Valley originates as snow in the higher elevations of the Upper Boise basin where precipitation can be as high as 60 inches annually. This upper basin supplies an estimated 90 percent of the water for the Treasure Valley. The snowpack is important to the Boise River as the March-July runoff season runoff provides 77% of the annual streamflow at the Boise River near Boise gaging station while only 23% of the natural flow occurs during the August-February season. The upper basin is approximately 2,650 square miles and consists of four major tributaries including the North, Middle and South Forks of the Boise River, and Mores Creek. From Lucky Peak Dam, the lower Boise River flows about 64 (river) miles northwestward through the Treasure Valley to its confluence with the Snake River.

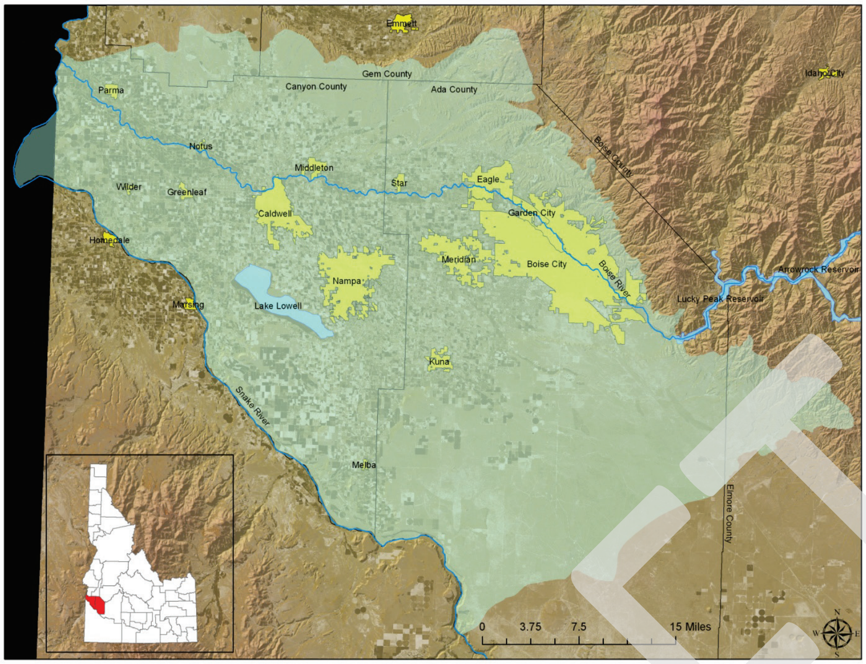

Figure 1. Map of the Treasure Valley study area (green-shaded area).

Hydrogeology

The Treasure Valley Aquifer System (TVAS) underlies the lower Boise River basin in southwestern Idaho (Figure 1). The TVAS extends downstream from Lucky Peak Dam to the confluence with the Snake River and serves as the primary source of drinking water for the communities and residents within the Treasure Valley. Approximately 95% of the valley's drinking water is pumped from the TVAS.

The TVAS can be conceptualized as a complex system of shallow, intermediate, and deep aquifers (Figure 2). The depths and thicknesses of the aquifers vary spatially and are controlled by geologic faulting, topography, and local land use characteristics (e.g. flood irrigation). The hydraulic communication between the various aquifers varies throughout the Treasure Valley, adding to the complexity. Hydraulic connections to aquifers underlying areas to the north (Boise foothills to the Payette River) and to the east (Mountain Home Plateau) are currently not fully understood.

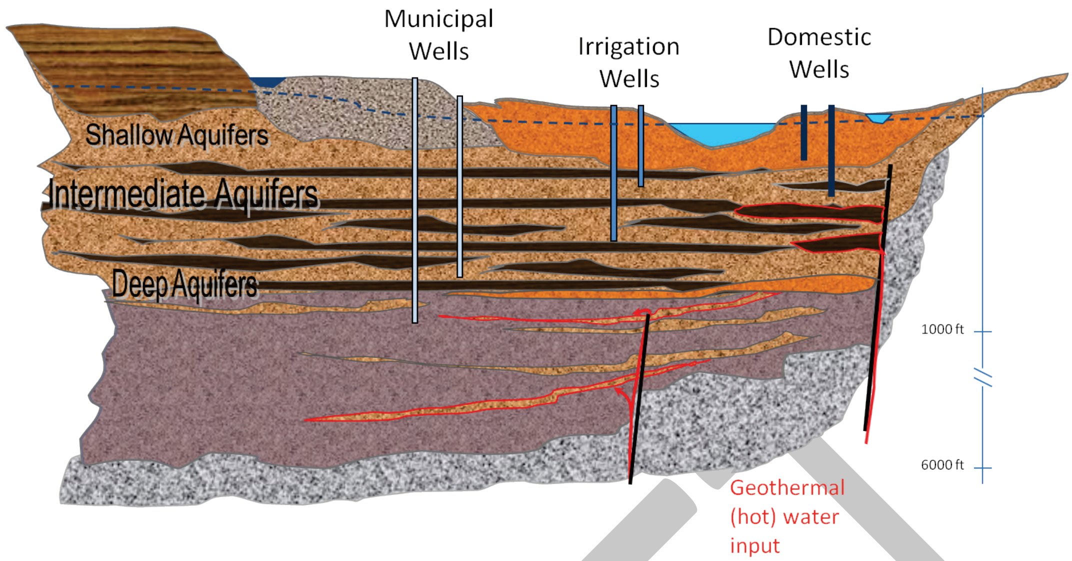

Figure 2. Conceptual schematic of the Treasure Valley hydrogeology.

The Aquifer system in the Treasure Valley consists of:

- Shallow aquifers - these shallow aquifers supply water to rural domestic and some irrigation wells. Shallow aquifers are generally in direct hydraulic communication with surface water features, and form localized flow systems with the nearest surface water body. The shallow aquifers are generally unconfined (the water level represents the top of the saturated zone), and water levels are typically controlled by topography (i.e., the elevations of canals or drains).
- Intermediate aquifers – the intermediate aquifers supply water for domestic, irrigation, and municipal uses. The hydraulic communication between the intermediate aquifers and the surface water features of the valley is unknown.
- Deep Aquifers - municipal, industrial, and some irrigation wells typically draw water from deeper aquifers. The hydraulic communication between the deeper aquifers and the surface water features of the valley is limited due to the depths below land surface where the deeper aquifers are found. The deeper aquifers are generally confined (water levels rising above the depth of the water bearing zone), and flowing artesian wells exist within the Treasure Valley. The hydrology of the deeper aquifers is not fully understood.

Surface Water flows

Unregulated natural flow volumes in the Boise River basin have varied from a low of 676,000 acre-feet annually to a high of 3.6 million acre-feet annually. The average unregulated natural flow (1929 – 2010) is 1.9 million acre-feet annually. These volumes were calculated at Lucky Peak and are published by the U.S. Bureau of Reclamation. On average 1.6 million acre-feet annually is diverted for irrigation and serves as a significant source of recharge to the TVAS (BOR, 2007). Table XX and figure XX, below, display a summary of historical Boise River (Nov 1 – Oct 31) runoff and outflow volumes.

The average annual basin outflow (1972 – 2010) is 1.1 million acre-feet, with outflow volumes varying from 334,000 acre-feet annually to 2.8 million acre-feet annually. The basin outflow is measured at the Boise River near Parma gage, operated by the U.S. Geological Survey in cooperation with IDWR.

The remaining storage water left in the reservoirs (Arrowrock, Anderson, and Lucky Peak) at the end of an irrigation season is highly dependent on snowfall and irrigation demand for that season. The average reservoir storage on November 1st (1956 -2010) is 390,000 acre-feet and has varied from a low of 65,000 acre-feet to a high of 665,000 acre-feet. The availability of this "carry over" water reduces the risk of a shortage of irrigation water in the succeeding year. Wise and efficient use of water from year to year helps to ensure better carryover storage for the next year, especially during consecutive dry years.

Table XX: Summary of historical Boise River Nov 1 – Oct 31 runoff and outflow.

	Boise River Runoff (at Lucky Peak)		Boise River Outflow (near Parma)		November 1 Storage	
	Acre-Feet	Year(s)	Acre-Feet	Year(s)	Acre-Feet	Year(s)
Long-term Average	1,929,000	1929 - 2010	1,120,000	1972 - 2010	390,000	1956 - 2010
Maximum	3,673,000	1965	2,820,000	1983	665,000	1965
Minimum	676,000	1977	334,000	1992	65,000	1992

Source of Data: IDWR 2011

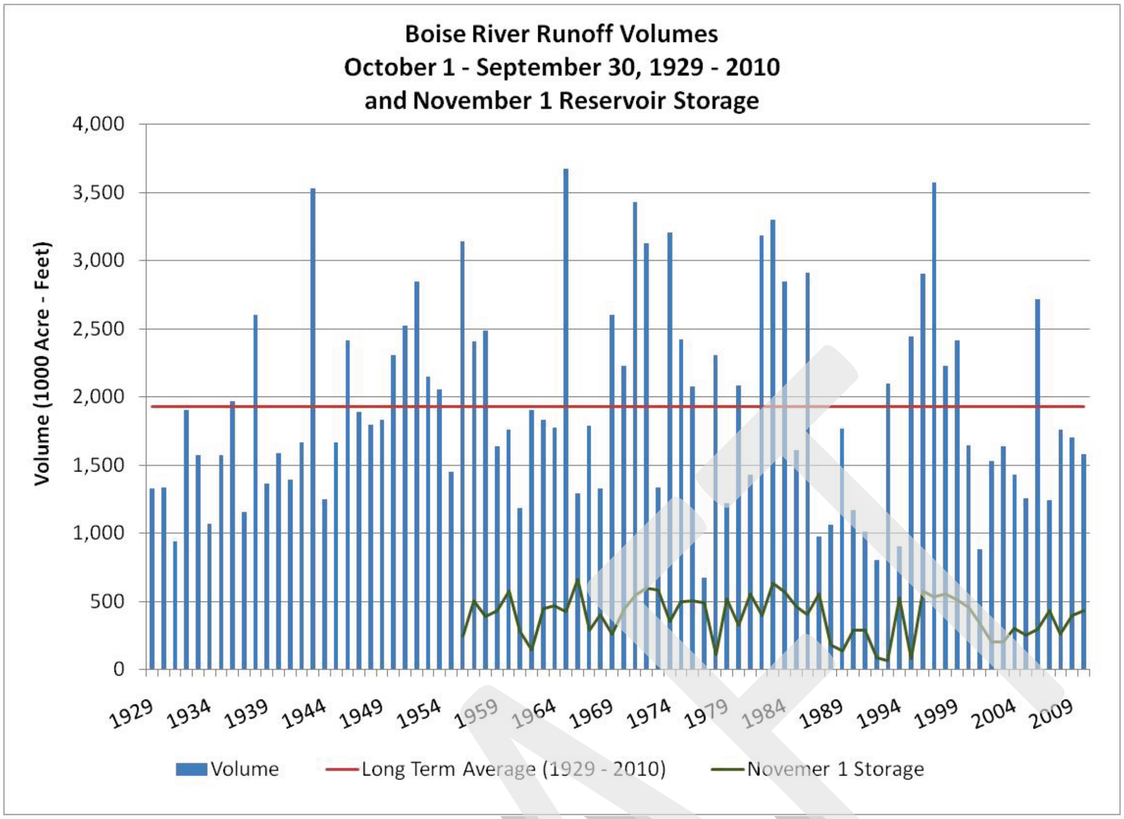

Figure XX: Boise River annual unregulated natural flow volumes 1929 – 2010 and November 1 reservoir storage volumes. Source?

The hydrograph below (figure XX) summarizes the historical data from the Boise River at Glenwood Bridge for the period of record (1982 – 2010). The Army Corps of Engineers utilizes the Boise River gage at Glenwood Bridge to monitor and evaluate flood impacts on the river. Currently flood stage as measured at the Glenwood Bridge gage is 10.01 feet (approximately 7,000 cfs). The maximum discharge since the completion of the reservoir system was 9,840 cfs on June 13, 1983 (USGS, 2011). Typical winter flow out of Lucky Peak (November – March) is approximately 250 cfs. Typical flow at Glenwood after the spring runoff and during the irrigation season (July–September) is approximately 1,000 cfs.

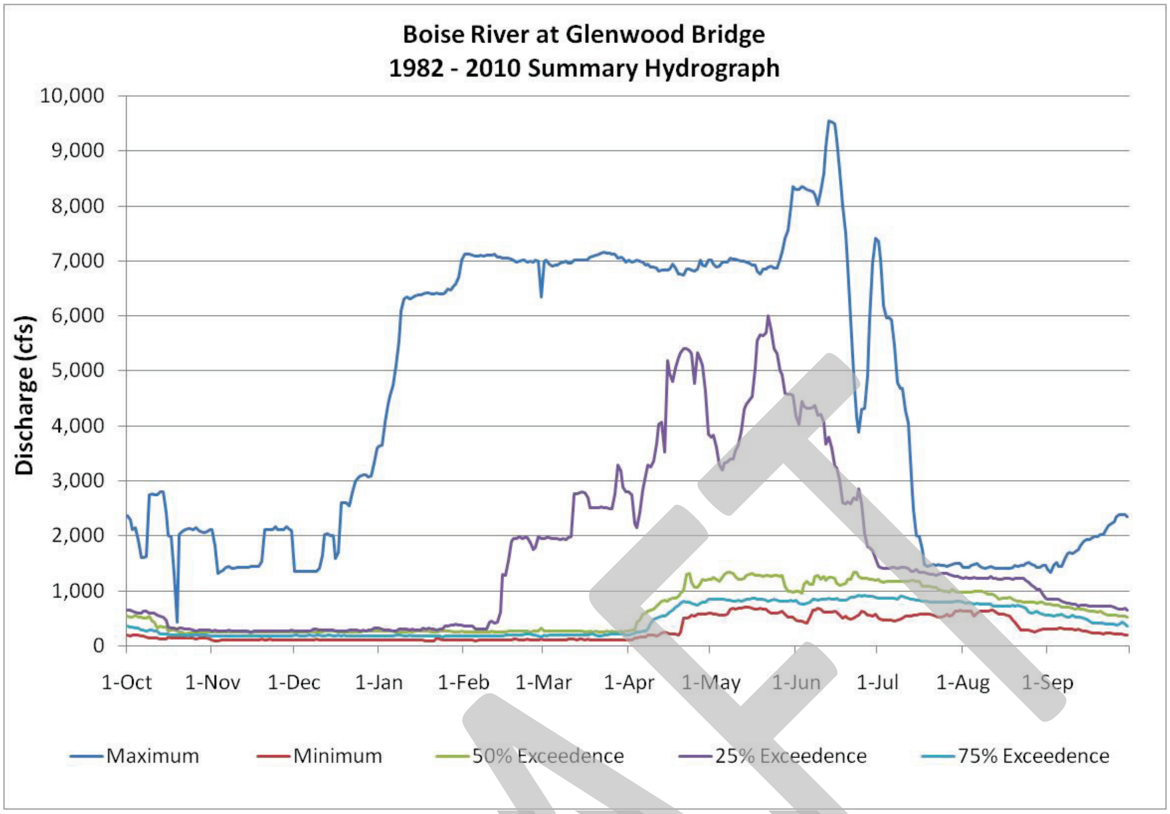

Figure XX: 25% exceedence means that for the specified day of the year the flow was greater than this value 25% of the time for the same day from 1982 through 2010. 50% exceedence is the median and means that for the specified day of the year the flow was greater than this value for 50% of the time for the same day from 1982 through 2010. 75% exceedence means that for the specified day of the year the flow was greater than this value 75% of the time for same day from 1982 through 2010.

During the irrigation season, the Boise River from Lucky Peak to Middleton does not have enough natural flow to meet irrigation demands. Irrigators rely on storage water to supplement the limited natural flow supplies. Below Middleton there are often enough return flows, from drains and/or groundwater seepage into the river to satisfy existing irrigation demands. On average, there is approximately 310,000 acre-feet per year of gain in flow between Middleton and Parma gages. These gains, 310,000 acre-feet, make up 28% of the 1,112,000 acre-feet of outflow from the basin near Parma. The return flows that increase river flows downstream are important and help to provide the necessary water and elevation head to deliver water in the lower Treasure Valley. These baseflows are an important part to efficiently deliver irrigation water in the Treasure Valley.

TVAS Ground Water Budget

The annual ground water budget for the Treasure Valley Aquifer System (TVAS) varies from year to year. For illustration purposes, estimates for water year 2000 are used to show the components of the annual water budget for the TVAS because total precipitation and temperature during the 2000 water year were near normal.

Table 1. Summary of TVAS ground water budget (modified from Urban, 2004).

Sources of Recharge and Discharge	Estimated Recharge and Discharge for 2000	
	(af)	(% of total)
Recharge		
Canal Seepage	521,500	50
Flood Irrigation	404,400	35
Other Sources	172,800	15
Total Recharge	**1,098,700**	**100%**
Discharge		
Discharge to Rivers and Drains	881,600	83
Pumping from wells	175,000	17
Total Discharge	**1,056,600**	**100%**

The shallow aquifers of TVAS are generally in direct hydraulic communication with the Boise River and to a lesser extent the Snake River throughout most of the Treasure Valley. The aquifer discharges directly to the rivers and the ground water drainage network constructed in the Treasure Valley to drain shallow ground water from low-lying areas. It is estimated that over 80% of the TVAS total discharge enters the rivers and the drain network. Some of the drain water is also re-diverted and used for irrigation by downstream users. The amount of water leaving the TVAS through discharge to the drains, tributaries, or the rivers in 2000 was over 881,000 acre-feet (Urban).

Ground water Flow Direction and Water Levels

The ground water flow direction in the TVAS is generally east to west and follows the course of the Boise River. In the southern portion of the TVAS, ground water flows to the south, and discharges into the Snake River. Locally, ground water flow directions are dependent on the location (spatially) within the valley.

Water level trends are a good indication of a stable storage of water in an aquifer system. Rising water levels indicate an increase in water stored, and declining water levels indicate a reduction in water stored. Stable water levels generally indicate an aquifer storage that is in equilibrium. In the early to mid 1900's, water levels in the shallow aquifer rose significantly because of the development of the valley's irrigation network and continued to rise until the aquifer system eventually reached equilibrium with the drains and river, as indicated by stable water levels. In general, water levels in the shallow aquifer system have remained stable and are controlled by the operation and elevation of the surface water features. Water levels in the intermediate and deep aquifers also appear relatively stable, but some areas of water level decline have been identified in the valley, particularly in the Southeast Boise and Lake Lowell vicinities (Petrich and Urban, 2004).

There are existing mathematical models of the Treasure Valley aquifer, of various ages and scopes, however they are not adequate to address aquifer management needs.

Climate Variability

Climate variability adds another element of uncertainty to planning for future water needs. The IWRB contracted with Boise State University to evaluate potential changes to water supply and demand which might result from climate variability on a watershed scale. There is a large range of uncertainty to climate model predictions; however, general trends are indicated.

Multiple studies of climate change in the Pacific Northwest and northern Rockies estimate increases in mean monthly temperatures of 0.48 to 3.05 (Celsius) for the 2040 irrigation season compared to the 1971-2010 temperature average (BOR, 2008, 2011).

Regional studies for the northwest United States indicate greater climate variability conditions (floods and droughts) will be more severe, and change the flow regime on which current hydrologic operating procedures are based. For example, temperature increases would allow more winter precipitation to fall as rain instead of snow, alter the timing of snowmelt and result in earlier snow melt. On average, peak flows in the Boise River basin may be higher in the future than current historic high flows. Timing of spring runoff is complex and a function of climatic indexes (e.g. El Niño-Southern Oscillation, Pacific decadal oscillation , etc.) , forest fires and climatic change. Analysis of streamflow measurements shows peaks are occurring a few weeks earlier, as also predicted by the climate change models. Peak flow and trends are also influenced by phenomenon such as El Nino and La Nina, and other longer term climatic cycles. Other impacts of snowpack melting earlier in the summer are increased annual evapotranspiration, and lower summer/baseflows. Fall precipitation could occur more frequently as rain and less frequently as snow.

Climate change projections indicate the Boise River Basin may experience wetter wet years and drier dry years. However, because our water storage capacity in the basin is fixed the increased water supplies during the wet years cannot be captured and held over for use during the dry years. Consequently, wet years do not offset dry years.

Drought

Drought is a significant concern for all Treasure Valley water interests. One major drought of the 20th century that affected the Treasure Valley extended from 1987-1992. During those six years, the Palmer Drought Severity Index in Figure XX classified conditions as extreme drought for 28 of the 36 months that comprised the irrigation seasons in the Treasure Valley. The series of dry, hot summers made response more difficult than the drought of 1977 because, although 1977 set the record low flow for the upper Boise River, 1976 and 1978 had wet irrigation seasons, reducing the stress on water supply. The Boise Reservoir system is designed to provide carryover storage to get through consecutive dry years. The most severe droughts are consecutive dry years that last for two to three or more years when annual runoff is below average and carryover storage is minimal because it has been used in previous dry years.

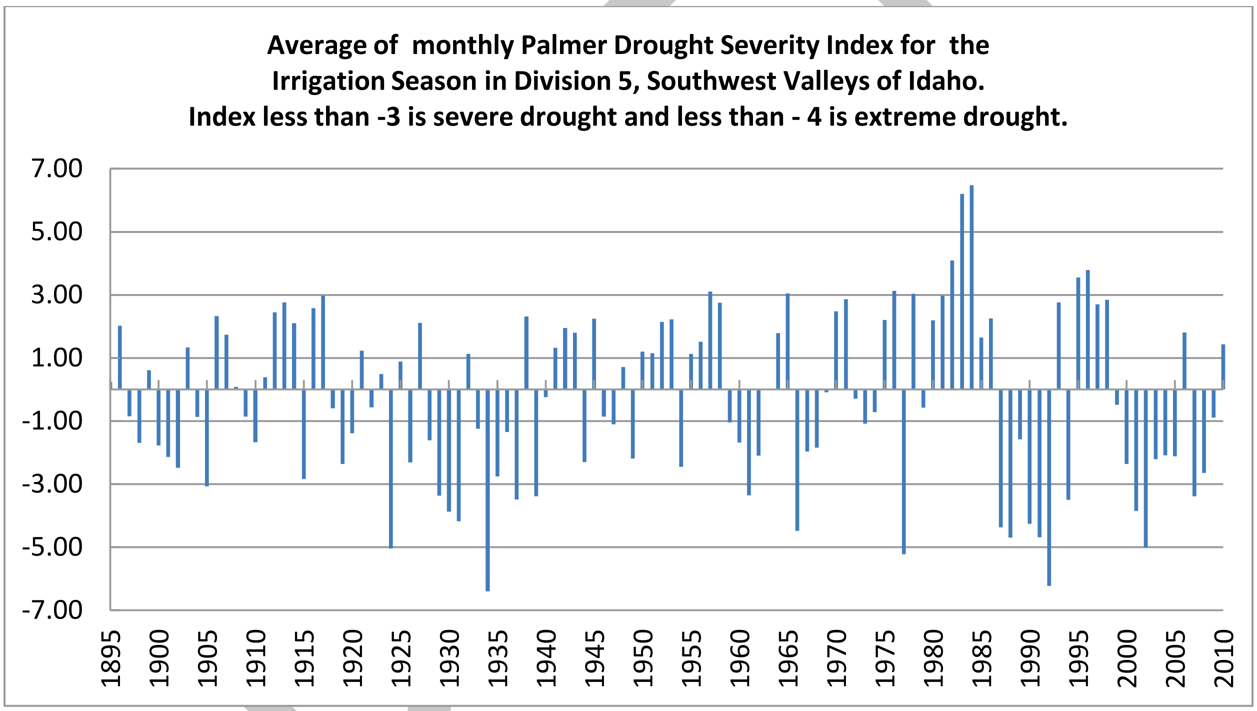

Figure XX

The Idaho Drought Plan (IDP) encourages local communities to plan for and mitigate for future droughts. The IDP describes the authority counties and cities have to restrict water use and raise funds through ordinances, rules, regulations, proclamations, and short-term levies. It also authorizes the IDWR to take actions to provide for full use of the available water supply, in accordance with valid rights for its use, during shortages by increasing supervision of water distribution from adjudicated sources, increasing water-right enforcement for non-adjudicated sources, and defining procedures to expedite processing of applications for replacement water supplies.

In conjunction with IDWR's Drought Plan and Water Supply Committee, the Natural Resource Conservation Service (NRCS) compiles a monthly Surface Water Supply Index (SWSI) to illustrate the total seasonal water supply. NRCS uses 1.5 MAF as the threshold for when water supply shortages start to appear in the Treasure Valley. This is based on past years when shortages were realized by irrigation districts. For the period 1987-1992, 5 of the 6 years had shortages, and below normal carryover storage.

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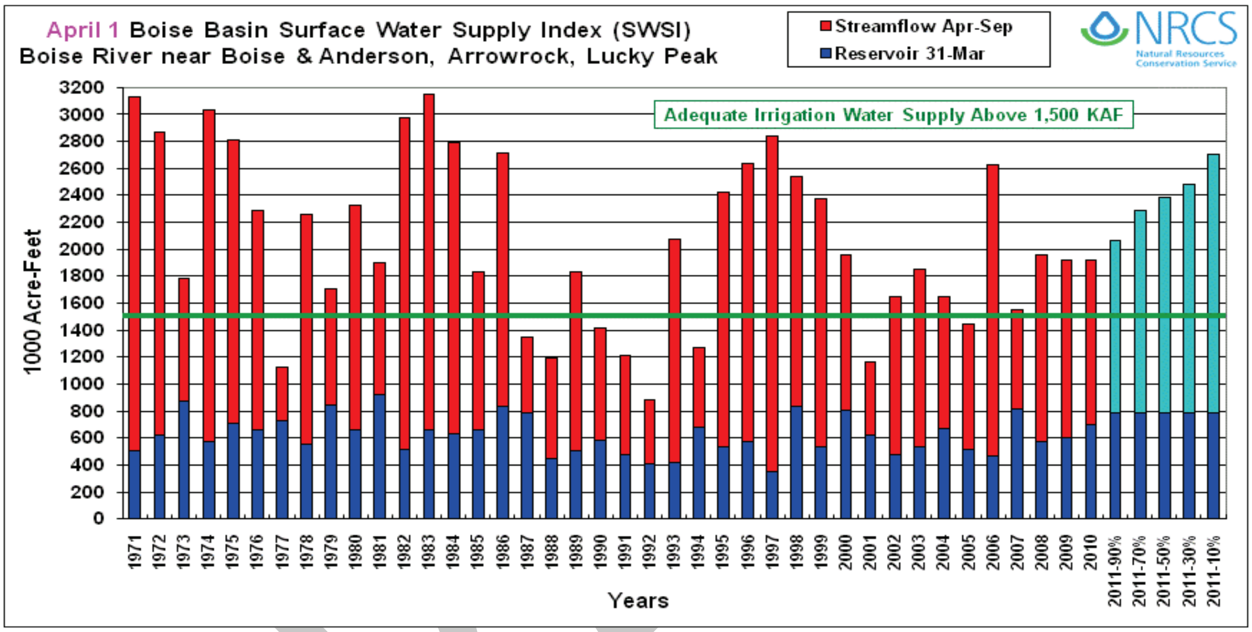


Note: Graph will be updated to remove forecast data.

Available records indicate that during drought years surface water irrigation is supplemented with groundwater by up to as much as 300,000 acre-feet. This situation places additional stress on groundwater supplies.

WATER SUPPLY CHALLENGES::

Predicted future demand cannot be met solely by readily available ground water supplies in some areas

Ground water supplies are not infinite. There is potential for additional groundwater development, however, the Treasure Valley aquifer is not homogeneous. Characteristics vary locally and regionally (and by depth). This variation results in limited availability of ground water supplies in some areas to meet existing and future needs. Ground water supplies are especially limited in southeast Ada County, and the Lake Lowell area. There are also concerns about ground water levels in the north foothills. (IDWR data was used.)

Increased annual precipitation variability increases uncertainty for meeting existing and future needs utilizing the existing water supply infrastructure

Because of increased variability, historical hydrological records may not be sufficient for forecasting future conditions. Water supply solutions may include better monitoring to improve flow predictions which allow better planning in the short term while planning for future longer term needs in the valley.

Predicted intra-year variability is expected to reduce natural flow in the summer and fall
Reduced natural flows will result in less water available to fill natural flow water rights. This phenomenon results in increased use of stored water from the reservoirs leading to less reservoir carryover. Warmer temperatures during the growing season would increase water demand for all uses.

Currently there is no Treasure Valley drought plan.

Lack of a comprehensive regional response before the next drought will delay demand reduction actions needed to reduce the negative impacts of drought and increase the likelihood of conflict between water-right holders

Distribution

Reservoir System

The irrigation water supply of the Treasure Valley relies upon a reservoir system capable of storing approximately 1,000,000 acre-feet of water, which equals about one-half of the average annual inflow of the Boise River. Four reservoirs make up the reservoir system. Three of those reservoirs—Arrowrock, Anderson Ranch, and Lake Lowell—were constructed in the early to mid-1900's by the Bureau of Reclamation as part of the development of the Boise Project. A fourth reservoir, Lucky Peak, was constructed in 1957 by the Army Corps of Engineers for flood control, irrigation, and other congressionally authorized purposes. Combined, these reservoirs provide water supplies for congressionally authorized purposes.

To meet irrigation demand, flows past Lucky Peak Dam average approximately 3,900 cfs during the irrigation season, which spans April through October. During periods of peak irrigation demand, flows past the dam are kept at about 4,500 cfs. Reservoir space is allocated to storage users according to terms set out in spaceholder contracts entered into between the various users and the Secretary of Interior, through the Bureau of Reclamation. While the majority of the contracted reservoir space is used for irrigation storage, approximately 5,000 acre-feet in Anderson Ranch Reservoir is used to store water for municipal and industrial purposes.

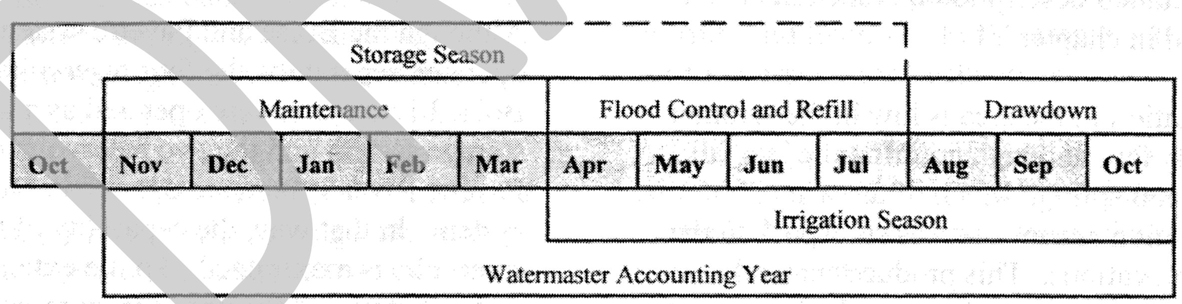
Arrowrock, Anderson Ranch, and Lucky Peak are operated as a unified system for flood control and refill purposes. Flood control operations are governed by flood control rule curves developed by the U.S. Army Corps of Engineers. Taking into account various hydrological data, the rule curves attempt to fix the amount of empty reservoir space needed to intercept and capture peak spring runoff flows in order to minimize the effects of flooding downstream. Presently, the flood control objective is to limit flood flows at the Glenwood Bridge to 6,500 cfs.

Capacities of Federal Reservoirs in the Boise Basin					
Reservoir	Elevation at Full Pool	Capacity (Acre-Feet)			
		Active	Inactive	Dead	Total
Lake Lowell	2531.2	159,400	--	--	159,400
Arrowrock	3216.0	272,200	--	--	272,200
Anderson Ranch	4196.0	413,100	37,000	24,900	475,000
Lucky Peak	3055.0	264,370	28,730	--	293,100

Table XX: Active capacity is space from which water can be released for specifics purposes; Inactive capacity is space from which water can be released but is normally retained for a specific purpose, e.g., Anderson Ranch inactive space is reserved for power head; Dead capacity is space from which water cannot be released by gravity because it is below the elevation of the lowest outlet.

Operation of the reservoir system, with the exception of Lake Lowell, is coordinated between Reclamation, which operates Arrowrock and Anderson Ranch, and the Corps which operates Lucky Peak. By agreement between the two federal agencies, the storage system is operated as a unified system in order to maximize the capabilities of the reservoirs. Reservoir operations are generally defined by three operating periods which are based on climatological patterns, runoff and irrigation demand as shown below:

Figure 5.—Operating Periods and Seasons (Water year shown by shaded blocks)



During the maintenance period, the system is operated primarily for carry over and storage as allowed by flood control requirements; however, storage releases continue for municipal and industrial and streamflow maintenance uses. During the flood control and refill period, operation is adjusted continually based on runoff forecasts to provide space for flood control and to assure storage refill for water users, while releasing water necessary to satisfy irrigation demand. The drawdown period is operated for release of irrigation storage water. To the extent possible water is typically stored as high in the system as possible, although storage accrues to accounts in order of priority. During the summer Lucky Peak is held near full pool for recreation purposes and water is released from Arrowrock and Anderson Ranch reservoirs to meet irrigation demand.

Lake Lowell is operated by the Boise Project Board of Control. It is used to store water and regulate water supplies for the lower end of the Boise Project. Lake Lowell is drawn-down during the summer when irrigation demands exceed the capacity of the New York Canal.

Canals

An extensive distribution system carries water to 75 points of diversion and provides irrigation to 350,000 acres of land below Diversion Dam. Most large canals branch into sub-canals and laterals to distribute water throughout the valley. Irrigation districts and canal companies maintain their individual systems of delivery for their patrons. There are approximately 1,170 miles of major irrigation canals.

[Map of Canals]

Drains

Eleven principle drain systems discharge into the Boise River. Approximately 195 miles of drains channel water out of low-lying areas. Most drains were constructed to drain groundwater from shallow aquifers and reduce the incidence of water logged soils. Some of these drains were modified or expanded existing natural drainage systems. Some drains also serve as canals, providing additional irrigation water through re-diversion. Some drains flow year round because of groundwater discharge. Groundwater discharge to the drains will fluctuate due to water table changes. These fluctuations can be caused by a variety of reasons including seasonal changes, groundwater withdrawals, irrigation practices, recharge, drought and other changes in the water budget. Studies are currently underway to better understand the drainage system and quantify seasonal and annual flows.

CHALLENGES ASSOCIATED WITH DISTRIBUTION:

Ability of water infrastructure to meet existing and future needs

Protecting existing infrastructure of wells, canals, ditches, and collection systems that have existed for decades is needed to retain the regional benefits expected of it now, and into the future. An additional challenge is the need to modernize existing infrastructure to optimize the beneficial use of water.

Management of Interconnected Sources

Surface water and ground water are hydraulically connected. This interconnection presents a challenge for future management of surface and ground water rights, which historically have been managed separately. Further complicating this challenge is the recognition that while we understand that a connection exists our understanding of the timing, extent and location of the interconnected sources is limited and needs further study in order to provide effective management.

Use/Needs

Ninety-five percent of the Treasure Valley water use falls into one of two major categories: domestic, commercial, municipal, and industrial use (DCMI), and irrigation. While not always included in water-use estimations, water is used to recharge the aquifer, support the river and tributary biological systems, and to provide delivery head to convey irrigation water (e.g. conveyance losses). Some municipal and industrial systems implement aquifer storage and recovery techniques to store treated water off peak and re-pump during summer demand. Water leaving the Valley passes through downstream hydropower plants that generate low-cost electricity used in the valley.

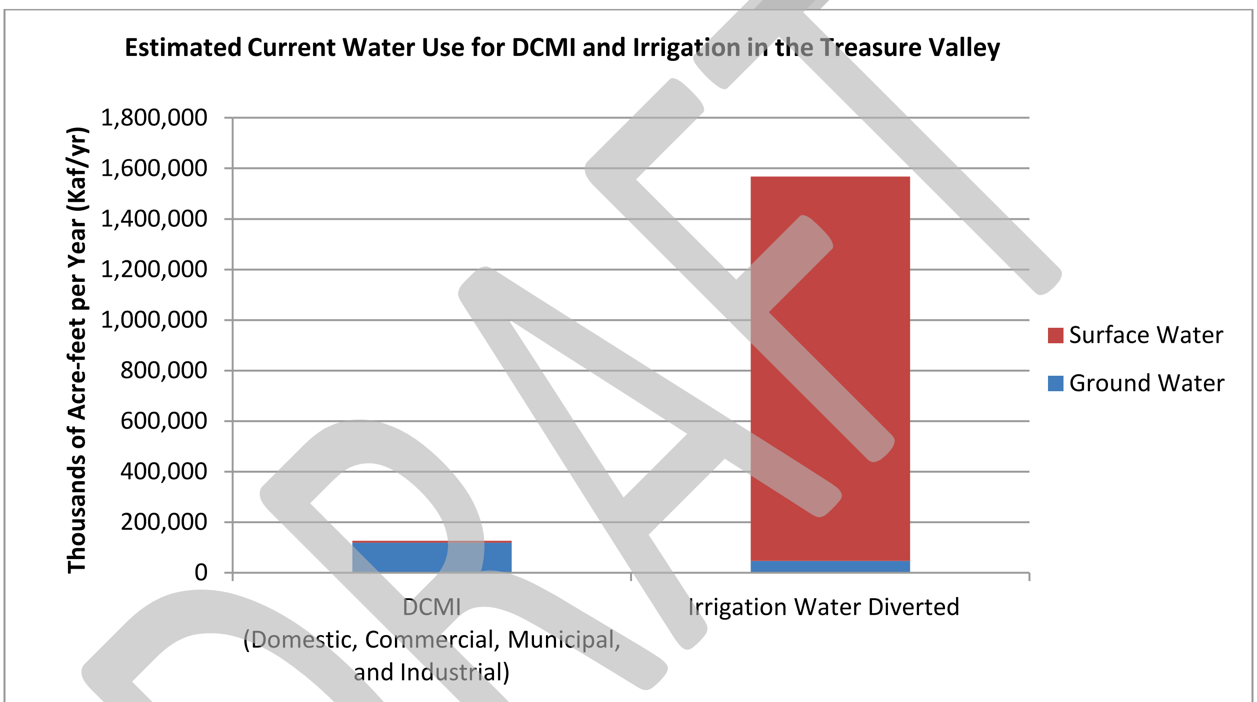


Figure XX: Source of Data: IDWR 2011.

In the Treasure Valley, the principal source of water for DCMI is groundwater. For DCMI, 94% of the water comes from ground water sources and 6% comes from surface water sources. For irrigation water, 3% of water comes from ground water sources and 97% comes from surface water sources. Large and small community systems as well as individual wells all provide water for domestic use in the Treasure Valley. Per Capita daily use is approximately 160 gallons (WRIME 2010, USGS 2005).

Individual homes that are not on a water-supply system use groundwater for drinking water, culinary uses, and irrigation. There are over 23,500 domestic wells in the Treasure Valley. This is a minimum number because there are domestic wells that have not been documented in IDWR records.

The single largest supplier of groundwater is United Water Idaho, whose service area includes the City of Boise and part of Ada County. United Water is currently the only municipal supplier that also delivers treated surface water for DCMI uses. United Water serves a population of approximately 240,000. United Water Idaho produces about 45,000 acre-feet/year (32,000 acre-feet from groundwater and 13,000 acre-feet from surface water) and regularly updates its water demand projections based on records on customer usage and modeling future growth. The other large suppliers are the Meridian Water Department (78,000 people served), City of Nampa (81,000 people served), and the City of Caldwell (46,000 people served). These three systems use groundwater exclusively for supply.

While surface water is the primary source of water for irrigation, ground water is also a source for irrigation. The annual demand varies because some irrigators rely on groundwater every year and some use it to supplement surface water. Weather conditions strongly influence irrigation demand and therefore the necessity of using groundwater in a particular year.

IDWR records show there are almost 30,000 total wells in the Treasure Valley. Ground water quality in the Treasure Valley Shallow (TVS) and Treasure Valley Deep (TVD) hydrogeologic subareas is regularly determined from data collected through the Statewide Ambient Ground Water Quality Monitoring Program. The Statewide Program is administered by IDWR in cooperation with the USGS. The TVS and TVD subareas are located primarily in Ada and Canyon Counties and generally correspond to the Treasure Valley CAMP study area. USGS, in cooperation with Idaho Department of Environmental Quality (IDEQ), has performed a comprehensive survey of existing wells in the TV CAMP study area from 1992 to 2000.

Water Quality

Water quality is an important characteristic in meeting future water needs in the Treasure Valley. Ground water in the Treasure Valley Aquifer System is generally of good quality for drinking and other uses. Surface water quality is variable and has been impacted by both natural and anthropogenic sources. Public drinking water systems are required to monitor their water supply for compliance with drinking-water regulations and report the results to their users. Individual private wells generally do not have this requirement. Overall, the water quality throughout the system could constrain the availability of water supplies to meet current and future water needs if the water quality is degraded.

The IDWR has statutory authority for State-wide administration of the rules regarding well construction, licensing of drillers, and proper abandonment of wells in Idaho. Well construction standards are designed to protect the quality of water in the aquifer. Additionally, the IDEQ administers the Idaho Wellhead Protection Program. The purpose of this program is to prevent the contamination of ground water that is used for drinking water. The Idaho Wellhead Protection Program is voluntary for local government and water purveyors to implement.

Degraded water quality can impact both supply as well as significantly increase costs for ground water providers, and surface water users.

Fisheries/Biological flows

Native coldwater species including trout and whitefish inhabit the middle and upper reaches of the Boise River between Star and Lucky Peak Dam. Winter stream flows below Lucky Peak Dam are the largest constraint on fish populations. Prior to the 1990s, winter flows were often 150 cfs or lower, providing only marginal overwinter habitat for wild trout and other sportfish.

Reclamation holds 152,300 acre-feet of un-contracted storage space, which it has used in consultation with the Idaho Department of Fish and Game to provide flows in the Boise River below Lucky Peak Dam during the non-irrigation season. Storage releases have increased typical winter flows to 240 cfs, which requires approximately 86,000 AF of storage for about 180 days. During drought periods these flows have been reduced to avoid exhausting the winter storage supply. Since winter flows increased in the mid-1990's, wild trout populations have increased 17-fold, with an estimated 2,000 fish per mile in some reaches.

From Star to its confluence with the Snake River the Boise River is generally a gaining reach with good stream flows, although water quality conditions support a cold-water fishery only seasonally. This section of river supports a fair fishery for introduced sport fish, including largemouth bass, smallmouth bass and channel catfish. The Lake Lowell fishery consists primarily of largemouth bass, smallmouth bass, yellow perch, black crappie, bullhead, bluegill, and channel catfish.

Some tributaries to the Lower Boise were channelized and capacities have changed which may have altered aquatic and riparian habitat. Functional riparian zones and wetlands adjacent to the Boise River and tributaries provide ecological services such as water quality protection, storm water control, aquifer recharge and ground water protection and provide important habitat for fish and wildlife. Riparian and wetlands support a disproportionately large number of species and diversity relative to other areas.

Recreation and Aesthetic Values

The Boise River contributes greatly to the quality of life in the Treasure Valley and is partly responsible for the growth in the area. Cultural attractions include a string of city parks and greenbelt trails, undeveloped areas within an urban setting, and sportsman's access areas.

Natural attractions along the river range from basalt cliffs to a gallery of cottonwood forests and an extensive riparian zone.

There are water recreation opportunities available from the upper reaches of the Boise basin, on each of the reservoirs and on the Boise River below Lucky Peak.

Boaters and fisherman access the lower Boise River from Lucky Peak dam to the confluence with the Snake River. Floating the five mile reach from Barber Dam to the center of Boise is especially popular in the hot summer months. Likewise, water skiing is popular on Lucky Peak Reservoir.

Hydropower

Hydropower is generated below the reservoirs at both federal and non-federal hydroelectric power plants. Federal Reclamation power plants were constructed at Anderson Ranch Dam (40,000 kW) and Boise Diversion Dam (1,500 kW) as part of the development of the Boise Project (Project) in order to provide power to operate project facilities and to help reduce power costs to Project farmers who depend upon pumping water for irrigation. In 1988, four of the five irrigation districts who make up the Boise Project Board of Control completed construction of a power plant at Lucky Peak Dam (101,250kW). Power generated at the facility is under contract with the Seattle Light Company. More recently, in 2010, the Board of Control completed construction of a second hydropower facility on the Boise River at Arrowrock Dam (18,000 kW). Ada County owns a 3,700 kW power plant located at Barber Dam which is located just upstream of Boise. Upstream of the reservoir system the Atlanta Power Company owns a 187 kW hydro power plant at Kirby Dam to supply electricity to the town of Atlanta. Water leaving the Boise River basin enters the Snake River and continues to generate low-cost electricity at Idaho Power's Hells Canyon Complex for Idaho Power customers in the Treasure Valley.

Anticipated Changes in Water Use

Water demand in the Treasure Valley is expected to increase, although there is no consensus on the amount as demonstrated by three recent studies. The U.S. Bureau of Reclamation projected in a 2006 assessment level study that consumptive water demand in the Boise Basin could increase by as much as 124, 085 af/year by 2050. WRIME's detailed 2010 demand study determined that demands for water in the Treasure Valley would increase by 82,880 af/year by 2060. IDWR staff estimates that new water demands and shortfalls in water supply for existing demands could result in a need for new water supplies of approximately 170,000 af/year.

New water needs are difficult to quantify because there are areas of uncertainty, along with many variables which will determine actual water use and need. Changing land uses, social attitudes, as well as economic conditions are all factors which will affect water use in the Treasure Valley.

Future water demand, driven mostly by increased population and economic growth, may be partially met by water conservation and land use and water use changes. Particularly difficult to anticipate is what proportion of growth will be on undeveloped land, rather than farm land, and what industrial or commercial uses might develop. Those changes are most likely to increase demand for water above current usage.

CHALLENGES ASSOCIATED WITH WATER USE/NEEDS:

A significant challenge will be to meet water needs and uses associated with future development patterns in a manner that minimizes conflict

The Treasure Valley population and economy has grown over the past decade and is expected to do so in the future. A recent study projects up to 650 KAF (WRIME 2010) could transition in use from agricultural to DCMI although a wide range of possible scenarios could occur.
The Treasure Valley must begin to evaluate how best to fulfill the anticipated new demand for water, actively planning for expansion, while encouraging conservation and protecting existing uses and benefits.

Maintaining Quality of Life

The challenge for the Valley will be to preserve the quality of life while being sensitive to the changing needs of the Valley into the future. Quality of life can include aesthetics, recreational needs, property values, socio-economic values and influences economic development. Issues of quality of life are often subjective and water management decisions can affect quality of life in the Treasure Valley. How these issues influence water management will remain a challenge.

Meeting Environmental Needs

The challenge over the next fifty years will be to conserve and protect the water resources in the Treasure Valley's streams and aquifers and the riparian habitat it supports, while providing the water supplies for the current and future use. An incomplete understanding of the effect of water diversions for both consumptive and non-consumptive uses on the surface and ground water leads to a difficulty in assessing their impact on the natural environment. Water managers and water users will be challenged to voluntarily and collaboratively provide functional habitats and mitigate the impacts of water diversions and discharges on the natural environment.

Meeting Water Supply Needs

The challenge for the Valley will be to meet new and on-going water demands over the next 50 years. The size and location of future water demands, as well as projections for shortfalls in meeting current demands, is uncertain. Water supply solutions involve resolving difficult social and economic issues depending upon form, size and location. Some solutions, such as ground and surface water storage proposals, require a long lead time to plan and construct, so must be commenced long before there is consensus regarding the size and scope of future water demands. The challenge will be to conduct wise, proactive planning, and marrying that with careful monitoring of demand increases and supply shortfalls, to develop appropriate, timely and economical water supply solutions.

Management and Administration

A long history of water development and legal decisions has led to a complex system of interaction among water managers in the Treasure Valley. Water administration is under the authority of the Director, Idaho Department of Water Resources (IDWR). However, numerous organizations and agencies are involved in the practical management of water. The Idaho Water Resource Board (IWRB) is a constitutionally created body responsible for formulating, adopting and implementing a comprehensive state water plan for conservation, development, management and optimum use of all unappropriated water resources and waterways of this state in the public interest. The state water plan is a guiding document for all state actions and activities. The IWRB undertakes water projects for a variety of purposes throughout the state. The IWRB also provides financing for local water entities, such as canal companies, irrigation districts, cities, and others to undertake water projects, including improvement, expansion, and reconstruction of facilities.

Water District #63 was created by the Director of the Idaho Department of Water Resources to administer surface water rights from the Boise River currently subject to administration. The administration is carried out under state water law and court decrees. Water rights to more than 330,000 irrigated acres are administered in the Treasure Valley from the Boise River. In addition to irrigation, water rights for other uses are also administered.

Throughout the water year, the Watermaster works closely with the NRCS Snow Survey, IDWR, U.S. Bureau of Reclamation and the U.S. Army Corp of Engineers. The information provided by these agencies help the water users understand predictions for the total amount of water available each year. Water District #63 currently records 75 points of diversion weekly during the irrigation season. This information is used with the IDWR accounting program to track natural flow and storage use at each diversion. Data from the water district, USGS, Bureau of Reclamation, and Idaho Power are compiled to run the water rights accounting model. IDWR operates the daily water rights accounting model and the water master uses the model output to administer the water rights and storage water in the basin.

Flows regulated to Star

Average summer flows at Star vary with irrigation demand, but 250 cfs is the target flow for the administration of water deliveries below Star. Surface water in the Boise River and its tributaries upstream from Star is considered fully appropriated during the irrigation season and during much of the rest of the year. In 1995, the Director, IDWR, issued a moratorium order stating that new applications for water would be denied unless it included an acceptable plan to mitigate or avoid injury to existing water rights. The order also describes an area in which applications for ground water shallower than 200 feet below the surface would only be processed if they included mitigation measures, or could show no adverse impacts to existing water rights.

Downstream from Star, surface water (as well as ground water) is available for new appropriation, but the actual amount will vary from year to year and season to season.

Irrigation districts/canal companies/lateral associations

There are 47 Irrigation entities that operate within the Treasure Valley. These entities were created locally for the purpose of new irrigation development. Irrigation entities usually hold water rights and own diversion facilities and infrastructure. The majority of storage space in the reservoir system is used for irrigation by these entities that hold spaceholder contracts with the Bureau.

State law associated with requiring the continued use of irrigation water for landscaping

In 2005, the Idaho Legislature adopted Idaho Code 67-6537 which encourages the use of surface water for irrigation. The law amended the Local Land Use Planning Act and requires that if land has irrigation water appurtenant and is reasonably available, access and use of the surface water for irrigation will be used. The requirement is directed at applications for land use changes, such as from agricultural land to residential subdivisions.

Salmon Flow Augmentation

The Bureau of Reclamation holds 40,932 acre-feet of storage space in Lucky Peak Reservoir to be used for downstream salmon flow augmentation. This is a component of the (up to) 427,000 acre-feet of storage water that Reclamation delivers from the Snake River above Brownlee Reservoir every year for salmon flow augmentation, consistent with the Nez Perce term sheet and Idaho Code 42-1763B. If replacement water supplies could be found in another basin (consistent with the Nez Perce term sheet) and delivered for salmon flow augmentation, this 40,932 AF in Lucky Peak could potentially be made available to help meet future water needs in the Treasure Valley.

Water Markets

The Idaho Water Supply Bank was legislatively recognized in 1979 (Section 42-1761, *Idaho Code*) and is operated under the authority of the Idaho Water Resource Board (Board). The state program includes two distinct programs, **Rental Pools** and the **Water Supply Bank**, which are both essentially water exchange markets intended to assist in the marketing of natural flow and water stored in Idaho reservoirs. They also provide a mechanism by which water rights and stored water that is not being used can be made available for use by others through a lease and rental process.

The Water Supply Bank (Bank) includes water rights from surface water and ground water sources throughout Idaho. Water rights may be leased to the Bank (e.g. deposited), if not currently in use, and then rented from the Bank (e.g. withdrawn) by another water user for beneficial uses such as commercial, industrial, irrigation, or mining. In addition, water rights leased to the Bank are protected from forfeiture. Applications to lease and rent water from the Bank are currently received and processed by the IDWR. The Boise River drainage had the most activity in the state in 2010 for leasing water rights into the Bank, but only 9% of these rights were rented back out for actual use (2010 Water Supply Bank Annual Report, IDWR).

Water District #63 Rental Pool (Rental Pool) is a mechanism for reservoir spaceholders to make stored water available to other entities in short supply in a given year. The Rental Pool also provides a source of revenue for Water Districts #63 to make improvements in water distribution while encouraging the maximum beneficial use of stored water. The Rental Pool is under the jurisdiction of and operated by the local committee appointed by the IWRB. The Local Committee develops the rules of procedure, lease pricing and operation requirements for their rental pool which then must be approved by the Idaho Water Resource Board. Reclamation must also approve the rules and rates for Federal storage as a facility owner. A Watermaster administers the rental pool under the guidance of the committee.

The Water District #63 rental pool has rented an average of 6,236 AF over the past 8 years, excluding Reclamation-held uncontracted space. Use of the Boise Rental Pool appears to be low compared with the other rental pools despite the rapid growth of DCMI uses in the basin.

Ground water rights not currently administered

The administration of water rights generally refers to the curtailment of junior water rights to satisfy senior water right. Water rights are administered by a Watermaster appointed by the IDWR. In order to administer water rights, they must be legally quantified through adjudication or other administrative action, such as a license. In the Treasure Valley, only surface water rights are currently administered by the Watermaster because ground water rights have not been fully adjudicated. Following the completion of the SRBA, it is expected that groundwater rights may be included in a water district and conjunctively administered in priority. Conjunctive administration is the term used to describe administration of both ground and surface water under a common system. Administration of ground water rights or the implementation of conjunctive administration in the Treasure Valley is not currently underway.

The legislature adopted the “Ground Water District Act” in 1995 to create a mechanism to allow groundwater users to organize to formulate and implement mitigation plans to provide protection for senior surface water rights that otherwise would be materially injured by groundwater pumping. To date the groundwater users in the Treasure Valley have not elected to form such a district.

CHALLENGES ASSOCIATED WITH MANAGEMENT AND ADMINISTRATION:

The lack of organizational structure for ground water users to collectively plan for and respond to future challenges

Solutions to meeting long-term water needs and avoiding conflict may require action beyond single individuals. Long term successful solutions may require cooperative/collaborative efforts within and among ground water users who share a common interest.

Advanced technical capabilities are needed to meet increasingly complex water management challenges

Although we understand a great deal about the regional hydrology, our information does not provide a full understanding of the localized interaction between ground and surface water, and between the shallow aquifer and deep aquifer. Knowledge is not sufficient to fully characterize the hydrologic system which results in difficulty predicting system responses to management actions. Historical hydrological records may not be sufficient for forecasting future conditions. Existing ground-water models do not incorporate newer information or forecasts.

Existing water Management tools that appear to be under-utilized could help provide solutions to meeting water needs in the future

Several water management tools exist that could be utilized to help meet future water needs, but currently appear to be under-utilized. The Boise River (Water District 63) Rental Pool, which facilitates marketing of reservoir storage water, has a lower level of activity when compared with the Payette and Upper Snake Rental Pools, despite the Treasure Valley having rapidly growing water needs. The Water Supply Bank, which facilitates marketing of natural flow and ground water rights, shows that in the Treasure Valley there is considerable activity to lease water rights into the Bank, but little demand to rent water rights out of the Bank, again, with the Treasure Valley having rapidly growing DCMI water needs. Another tool is the Municipal Water Rights Act of 1996 which provides for growing municipalities to acquire water rights based on future growth projections. However due to lack of a defined process and criteria and high costs, both IDWR and municipal water users have been somewhat unsure with how to proceed, resulting in under-utilization of this statute.

4. ACTIONS NEEDED

Guided by the CAMP goals and this vision, the Advisory Committee identified several recommended actions for addressing the challenges discussed in previous section of this plan . Understandably, these actions will need to be more fully refined during the implementation phase, but the plan by adopting a mix of strategies represents a balanced approach to addressing the future water challenges in the Treasure Valley. These actions have not been ranked or placed in order of priority.

Enhance Water Data Collection, Analysis and Planning

Water planning and management tools, developed and updated using accurate data and current interpretations of the hydrology and estimates of water use of the Valley are needed to reduce uncertainty, effectively and efficiently use the water resources of Idaho, and better manage the resource.

Successful water management protects the public health and safety, minimizes conflicts, and promotes the economic and environmental health of Idaho.

The following should be accomplished:

- Improve ground water models and technical tools to meet administrative purpose and to facilitate decision making
- Support water supply modeling and stream flow monitoring
- Measure water usage changes, reporting demand trends to IWRB
- Support drought planning to increase the resiliency of the water supply specific to the Boise drainage
- Support efforts at assessing potential effects of water management on the natural environment
- Create a mechanism for coordination within the ground water community Continue to increase transparency of planning process
- Organize a periodic Water Forum (“Water Summit”) to assess the state of the aquifer and discuss emerging issues and opportunities

Additional storage and supply

Additional storage or other sources of water supply may be needed in the future to offset the increased variability of water supply and additional water demand. Due to the complexity and extended lead time required for initiating storage and water supply projects, study of these projects should be continual to ensure the information is available when decisions need to be made.

- Continue the study of the feasibility of potential surface water storage projects in a manner that comprehensively addresses supply options and avoids conflict
- Investigate the feasibility of utilizing managed recharge for meeting future water demands
- Support the exchange of Reclamation's Salmon flow augmentation space in Lucky Peak (excluding stream flow maintenance) with replacement water supply consistent with the Nez Perce term sheet
- Evaluate augmentation of existing cloud seeding programs as an option for increasing supply

Reducing Demand through Water Conservation

Reducing demand should be adopted as one of the strategies for meeting future water needs in the Treasure Valley. Capital costs associated with new supply may be avoided through the reduction of per capita demand. Addressing these issues is a multi-jurisdictional responsibility; therefore the Department should work in cooperation with water users and water providers to collaboratively develop incentives to reduce demand.

- Use education to encourage conservation
- Encourage conservation and efficient use of groundwater
- Encourage conservation and efficient use of surface water, where a viable opportunity exists, taking into consideration the benefits of incidental recharge.
- Support efforts for retrofitting neighborhoods with pressurized irrigation
- Encourage and support wastewater/gray water reuse
- Encourage or support incentives for conservation
- Develop guidelines for conservation programs
- Consider conservation requirements for new water appropriations

Potential Conversion of Water Use from Agriculture to other Uses

Urbanization has changed some water demand from agricultural irrigation to residential irrigation and other uses. This trend is expected to continue into the future as additional growth occurs. The intent is to ensure irrigation water is available for residential use and irrigation entities continue to have a financial basis/protection of infrastructure. This is also beneficial because it reduces the amount of water that municipal water systems need to provide if domestic irrigation is provided through the canal systems.

The following actions should be undertaken to ensure orderly transition of water use from agriculture to DCMI and other uses:

- Continue to support the use of surface water on those lands that convert from agriculture to DCMI and other uses utilizing the existing irrigation entities.
- Support voluntary cooperative arrangements between irrigation entities and municipal providers to deliver surface water recognizing the long-term challenges associated with maintaining HOA-owned systems.
- Encourage the use of Water Marketing to meet current and future needs including the use of rental pool and water supply bank.

Municipal Water Rights Act of 1996

The Municipal Water Rights Act of 1996 is an essential tool to meeting the goals of the TV CAMP. The reasonably anticipated future needs (RAFN) provision in the Act is a tool available to municipal water providers to secure water rights for growing municipal water demands based on anticipated future needs. The Act sets out a process through which municipal water providers can apply for and perfect water rights which may be needed over a longer time period than traditionally used for perfecting water rights.

All municipal providers should be encouraged to develop reasonably anticipated future water supply needs over the same time horizon as the Treasure Valley CAMP. Developing a basin-wide projection of municipal water supply needs over a common planning timeframe will enable better planning and create opportunities to avoid potential conflicts in advance. Municipalities should bear the cost of this planning effort but in return the Department must allocate resources to process RAFN applications in a timely manner that result from this effort.

Preserve and Protect Water Delivery Infrastructure

The integrity of the delivery system is vital to the optimal use of water in the Treasure Valley. The following actions recognize specific components of the water delivery system which will ensure continued integrity into the future.

- Support voluntary arrangements between irrigation entities and municipalities to ensure long-term maintenance of new residential irrigation systems.
- Encourage the use of funding sources.
- Ensure easements/access to canals for maintenance in face of growth.
- Continue to support considerations of security, both in terms of infrastructure and on water quality.
- Support the rehabilitation and modernization of water delivery infrastructure.
- Explore opportunities to minimize fish entrainment in the canal systems.
- Inform land-use entitlement and transportation authorities at both the local and state level to help the Irrigation community protect its easements and rights of way to maintain the canals and ditches that provide irrigation water.

5. Treasure Valley CAMP Implementation

Management of the Treasure Valley Aquifer affects numerous stakeholders. Effective implementation of the plan will require the participation and cooperation of stakeholders and governmental entities with jurisdictional authorities and responsibilities.

Board Staff will provide leadership and coordinate activities for the implementation of this plan.

The Board may continue to convene the Advisory Committee to guide and make recommendations concerning the implementation of management strategies and review of goals and objectives. The Advisory Committee could provide a forum for discussing implementation, establishing benchmarks for evaluating the effectiveness of actions, coordinating with water users and managers, evaluating and addressing environmental issues and identifying and pursuing funding opportunities.

The Advisory Committee will continue to include interest groups currently represented, and may expand or contract as appropriate to include other interested people, per the Board's direction. In addition, the Board will appoint at least one of its members to serve as a liaison between the Committee and the Board. The Advisory Committee will serve at the pleasure of the Board and provide a forum for public participation. Board staff will facilitate the work of the Advisory Committee and provide the technical information needed for its deliberations. The Board will make all final decisions concerning Plan project priorities, implementation, and funding.

As various programs are implemented, additional monitoring or modifications will likely be needed. Specific projects may require site specific measurement and analysis which are not currently available. Additional analysis will likely be required to assist the Board and the Advisory Committee.

Outreach and Education

During implementation of the Treasure Valley CAMP, the Advisory Committee will help develop a plan for broad water education and outreach, building on existing efforts and programs. Emphasis will be placed on education efforts that promote conservation and a reduction in consumptive use.

Funding

Implementation of the CAMP actions will be a partnership among the State, local and federal governments, stakeholders, water users and non-governmental organizations. The costs of implementation are anticipated to be shared among partners. As the implementation plan is developed, the funding needs for the plan components will be evaluated and potential funding sources, including federal grants will be identified.

The many existing activities for maintaining the health of the Treasure Valley Aquifer reflect the value and importance the aquifer and water resources have to the region. These existing activities are undertaken by a myriad of governments, agencies, and others. They activities are funded through various sources and through various programs. The Board supports existing programs which protect and enhance the water resources of the area. Opportunities to combine resources and leverage existing programs with CAMP implementation will be encouraged and supported.

Additionally, the Idaho Water Resource Board (IWRB) has an existing financial program that can provide financial assistance to improve infrastructure for irrigation and community water supplies, and for flood control and hydroelectric power. This assistance is provided in the form of loans and Board-issued revenue bonds.

Adaptive Management

The goal of adaptive management is to support improved decision-making and performance of water management actions over time.

Key principles fundamental to this approach include:

1. Anticipating possible future uncertainties and contingencies during planning.
2. Employing science-based approached to build knowledge over time.
3. Designing projects that can be adapted to uncertain or changing future conditions.

Adaptive management involves taking actions, testing assumptions, and then monitoring and adapting/adjusting the management approach as necessary. It is a way of taking action in a complex system with many variables and constant change. Developing perfect knowledge concerning any system, including the Treasure Valley Aquifer, is impossible. Therefore, an adaptive management approach is critical to the successful attainment of the qualitative and quantitative goals set forth in the plan. Successful adaptive management requires patience and long term commitment, just as acquiring enough data to make decisions about program changes takes time.

The adaptive management strategy will allow the Board to:

- Develop protocols for revising management actions
- Compare costs and impacts of different actions on the Treasure Valley Aquifer.
- Adjust funding allocation between projects to get the most “bang for the buck.”
- Concentrate funding on management actions that produce results.
- Make adjustments and revisions to the plan as new information becomes available, or in response to changing water supply and demand needs.
- Proceed with flexibility depending on results and analysis of monitoring and measurement data.

Coordination & Implementation

Management of the TVA affects numerous stakeholders within Idaho and requires coordination. The Advisory Committee will be charged with providing guidance and recommendations concerning the implementation of management strategies. The Advisory Committee will provide a forum for discussing implementation, establishing benchmarks for evaluating the effectiveness of actions, coordinating with water users and managers, evaluating and addressing environmental issues and identifying and pursuing funding opportunities.

Monitoring and Data Gathering

The Advisory Committee and Board staff will be able to assess the impacts of various management activities using data gathered through the monitoring process. In some cases, it may take a number of years to obtain sufficient data to achieve a comprehensive understanding of the effects of particular actions. Regardless, the success of the plan depends upon the development and maintenance of state-of-the-art monitoring and evaluation tools that provide the information necessary to make sound planning decisions for the future.

Appendices

TV CAMP MEMBER	AFFILIATION
Abramovich, Ron	NRCS
Adamson, Brent	Boise County Assessor
Amick, Doug	City of Greenleaf Public Works Director
Anderson Jamie	Boise County Commissioner
Atkinson, Michelle	Micron Technology, Inc.
Barrie , Rex	Boise River Watermaster WD #63
Batt, Gayle (Vern Case)	Wilder Irrigation District
Berggren, Ellen	Army Corps of Engineers
Bowling, Jon	Idaho Power Company
Burnell, Barry	Idaho Dept of Environmental Quality
Dane, Russ	Keller Williams Realty
Decker, Kevin	Idaho Wildlife Federation, Treasurer
Deveau, Paul	Boise Project Board of Control
Dixon, Dave	Owner, Greenleaf Farms Inc.
Duspiva, Gary	Canyon County P&Z Commission
Echeita, Mike	City of Eagle Public Works Director
Funkhouser, Allen	Drainage District # 2
Fuss, Michael	Nampa Public Works Director
Goodson, Stephen	Governor's Office
Howard, Matt	Bureau of Reclamation
Jones, Chris	VP Ted Trueblood Chapter, Trout Unlimited
Larson, Bill	Treasure Valley Partnership
Leatherman, Megan	Ada County
McKee, Lynn	Vice Chair, Ada Cty. SWCD
Nelson, Greg	Farm Bureau member, former mayor of Kuna
Patton , Brian	Idaho Department of Water Resources
Peter, Kathy	Unaffiliated, former Dir. Of USGS Idaho Water Science Program
Pline, Clinton	Board, Nampa-Meridian Irrigation District
Prigge, John	Sorrento Lactalis, Wastewater Treatment Manager
Rhead, Scott	Director Engineering for United Water
Ronk, Jayson	VP of Idaho Assn of Commerce & Industry
Schmillen, Bob	City of Middleton Public Works Director
Shoemaker, Gary	City of Caldwell Water Dept.
Stewart, Lon	Sierra Club
Stewart, Warren	Engineering Manager, City of Meridian Public Works Dept
Telford, Craig	Mayor of Parma
Thornton, John	of N. Ada Cty. Tech. Working Group
Ward, Rick	Idaho Dept of Fish and Game
Woods, Paul	Boise City Public Works Dept.
Yerton, Janice	Water System Operator, Kuna
Zirschky, Mark	Pioneer Irrigation District

Abbreviations and Terms

acre-foot	A volume of water equivalent to one acres covered in water one foot deep. One acre-foot (af) equals 325,851 gallons
aquifer	a water-bering layer of rock that will yield water in a usable quantity to a well or spring
CAMP	Comprehensive Aquifer Management Plan
Cfs	Cubic feet per second. A rate of flow equal to one cubic foot of water passing a point each second. One cfs equals approximately 7.48 gallons per second, or 449 gallons per minute.
Consumptive Use	Consumptive use Is water that is actually consumed and not returned to the immediate water environment. It is the portion of water that evaporates, is used in products or crops, or consumed by humans or livestock
DCMI	Domestic, Commercial, Municipal and Industrial
GWMA	Ground Water Management Area
KAF	Thousand Acre Feet
kW	Kilowatt, one thousand Watts of electric power
Plan	Treasure Valley Aquifer Management Plan
SRBA	Snake River Basin Adjudication
TVAS	Treasure Valley Aquifer System

Key Agencies/Entities

BOR	Bureau of Reclamation
BPBC	Boise Project Board of Control (also abbreviated as Boise Project)
IDFG	Idaho Department of Fish and Game
IDWR	Idaho Department of Water Resources (also abbreviated as “Department”
IWRB	Idaho Water Resource Board (also abbreviated as “the Board”)
HOA	Homeowners Association
NRCS	Natural Resources Conservation Service
USACE	U.S. Army Corps of Engineers (also abbreviated as “Corps”)
USGS	U.S. Geological Survey
WRIME	Water Resources & Information Management Engineering, Inc.

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