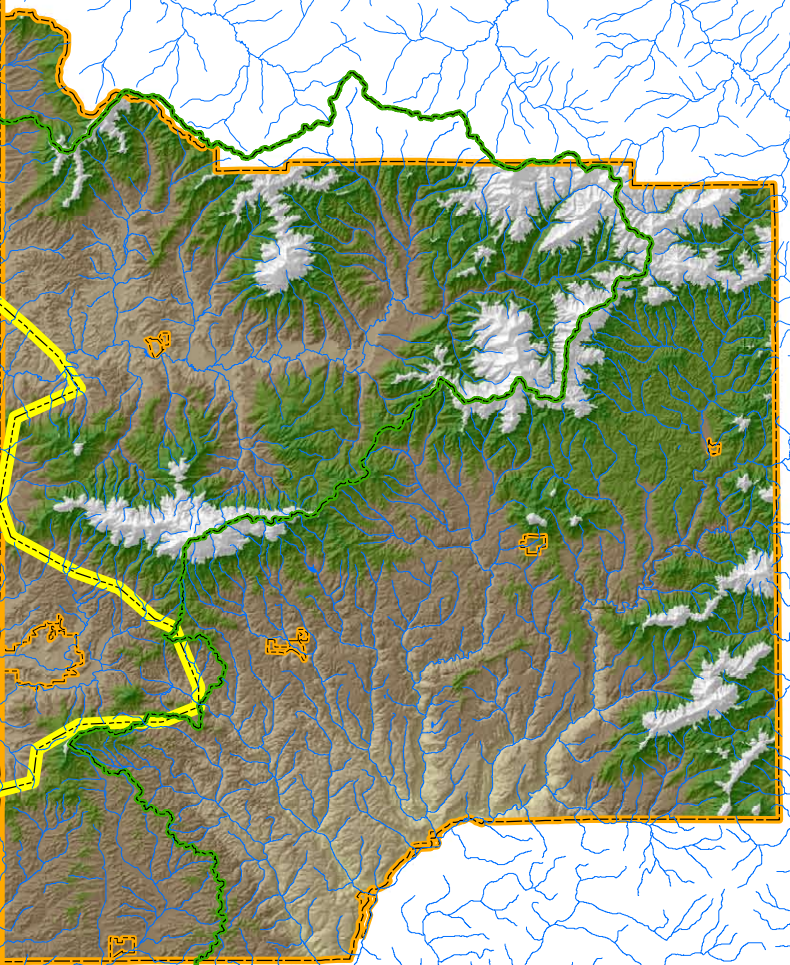
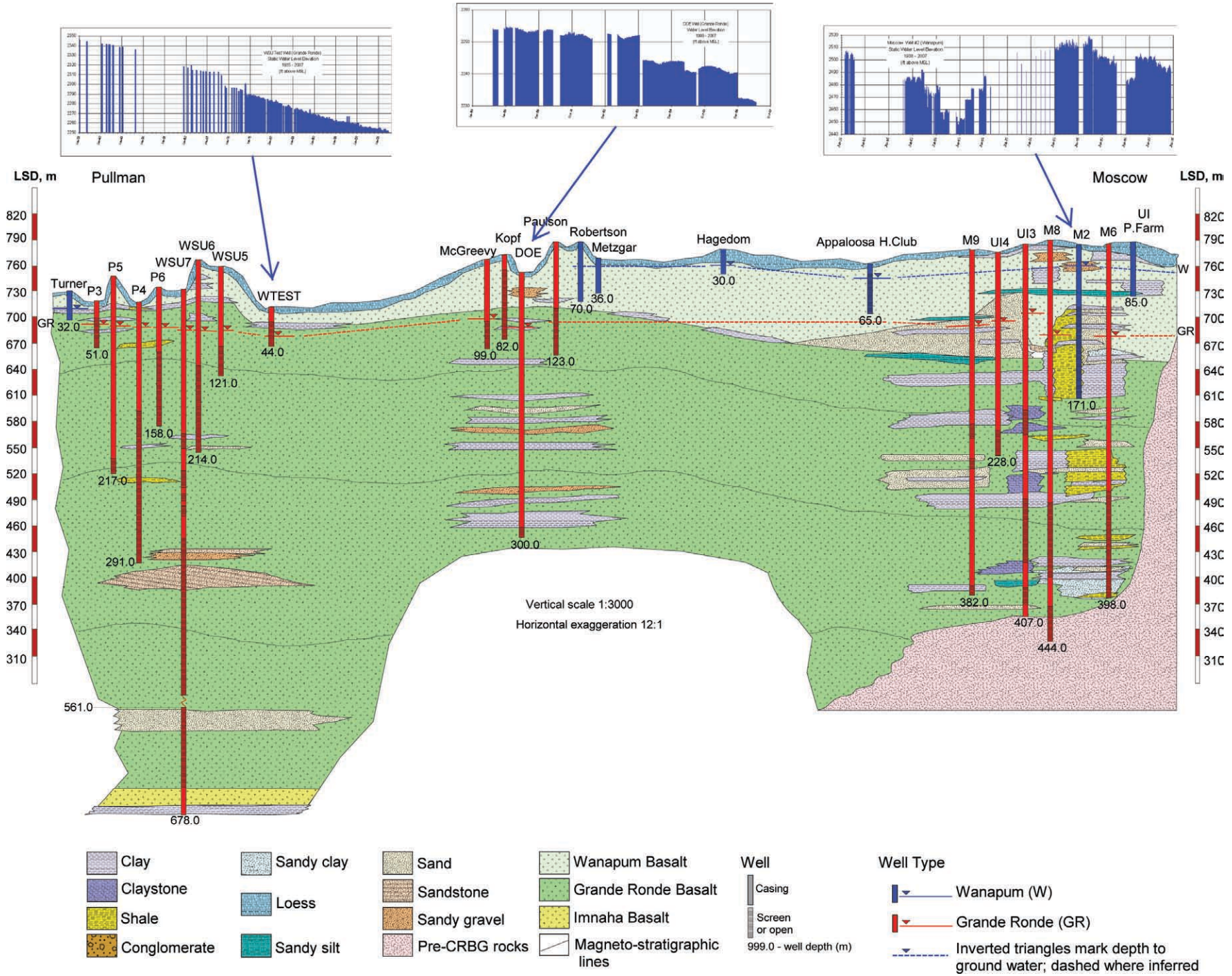
2006
Palouse Ground Water Basin
Water Use Report



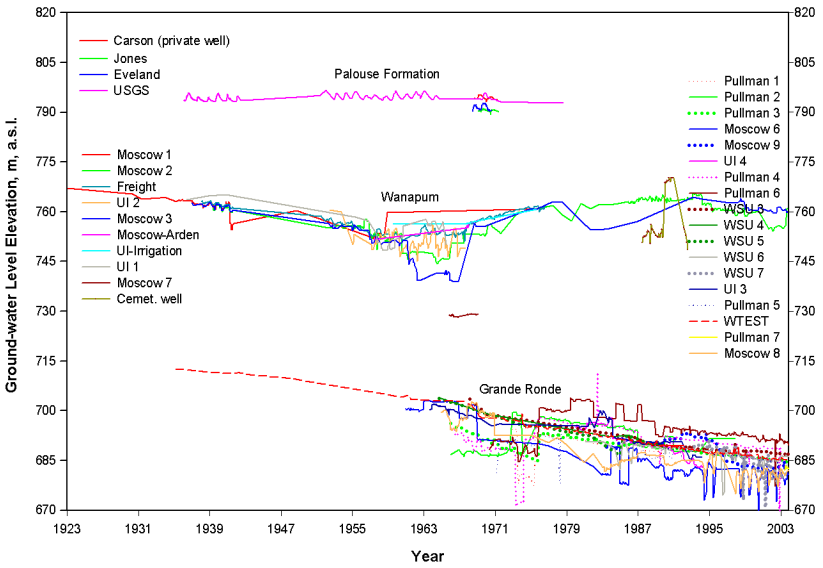
Palouse Basin Aquifer Committee

September 2007

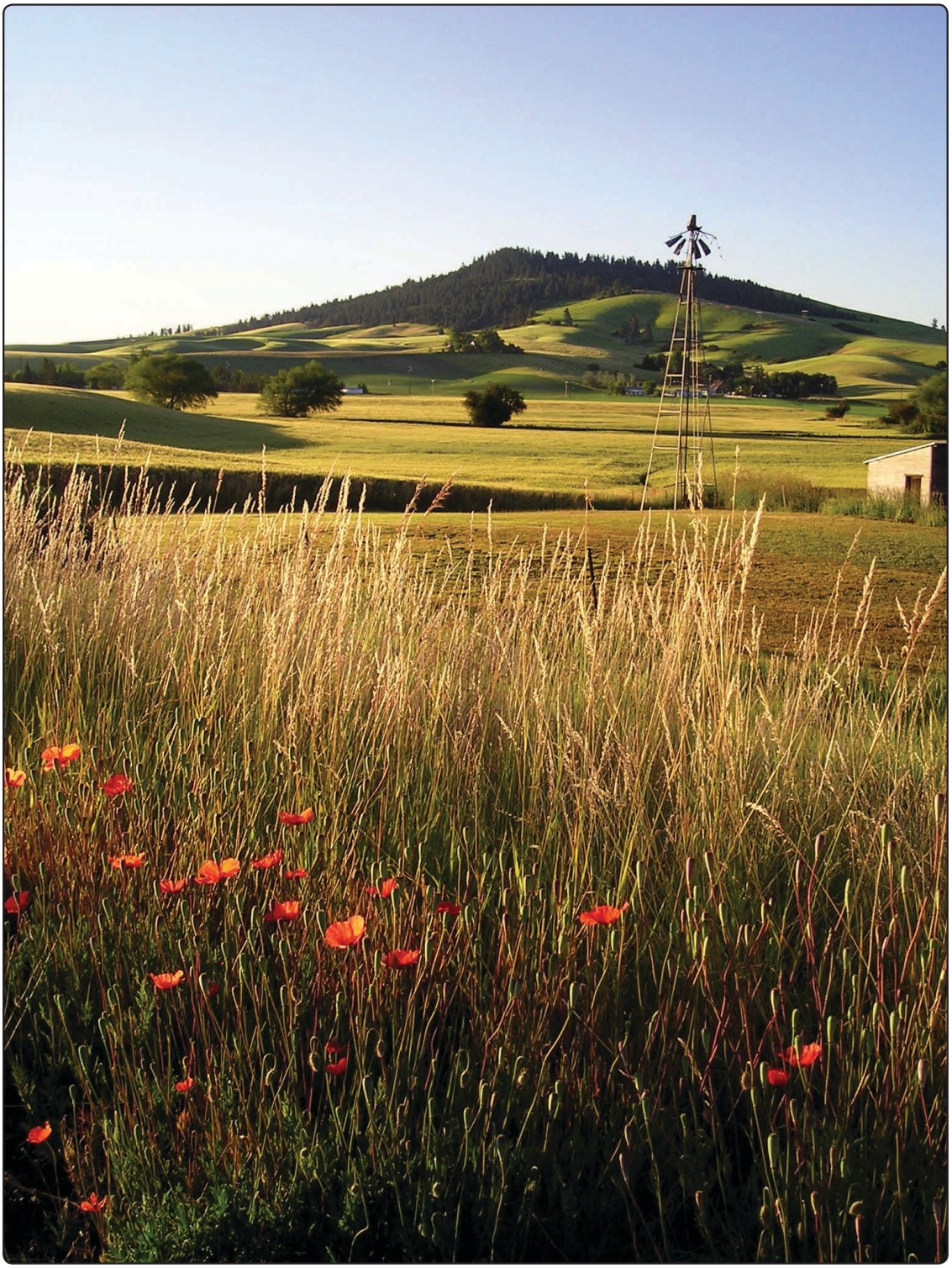


Hydrogeologic Cross Section (Leek 2006). Also shown at top are water level data for 2 Grande Ronde (WTEST, DOE) and one Wanapum (M2) wells.

Table of Contents



Composite Ground Water Hydrographs (Leek 2006)



South Fork of the Palouse River looking toward Tomer Butte

Executive Summary

Ground water is the drinking water supply for the nearly 56,000 residents of Whitman County in Washington and Latah County in Idaho residing within the Palouse Ground Water Basin (the Basin).

The Palouse Basin Aquifer Committee (PBAC) is a voluntary, cooperative, multijurisdictional group with representatives from the cities, counties and universities in the Basin. PBAC is charged with ensuring a long-term, quality water supply for the Palouse Basin region. This task is to be accomplished through the implementation of a Ground Water Management Plan, first enacted in 1992.

The Ground Water Management Plan and an associated Intergovernmental Agreement include requirements to report accomplishments, pumpage and water level information. The purpose of this report is to review ground water pumpage and summarize aquifer water levels and research accomplishments during 2006.

The total combined ground water pumpage by the four cities and two universities for the year 2006 was 2.83 billion gallons. In aggregate, pumping for 2006 was approximately 2% more than in 2005 and 8% less than in 1992, the first year the Ground Water Management Plan took effect.

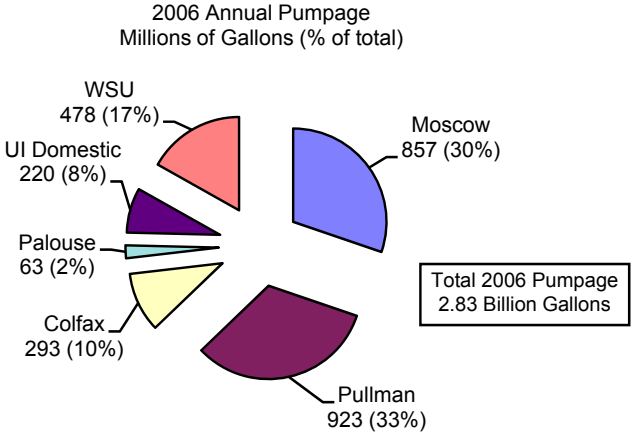


Figure 1: Combined Gound Water Pumpage

Water level data for 2006 reveal no consistent trend, with some wells experiencing a decline in static water level and others remaining relatively stable.

In 2006, PBAC sponsored several research projects. Activities included continuation of shallow and deep aquifer monitoring and testing projects, a study of a standby well at the University of Idaho, and an ongoing compilation of existing data and publications related to the Palouse Basin Aquifer system.

The foundation of the 1992 Ground Water Management Plan consists of a set of goals. As of 2006, PBAC's primary goal is to develop and implement a balanced, basin-wide, water supply and use program by the year 2020. In order to accomplish this goal, PBAC will work toward the creation of an action plan for aquifer system enhancement and alternate water supply development by 2010.

Moscow Mountain rain shower

Annual Water Use Report

The report that follows includes water use and level information for the period from 1992 through 2006. In an attempt to provide as up to date information as possible, in some instances data are included for portions of 2007. Water use reports for earlier years can be viewed at the PBAC web site ***www.uidaho.edu/pbac***.

Foxglove on north side of Kamiak Butte

Introduction

The Palouse Basin Aquifer Committee

Ground water is pumped in the Basin by four major water suppliers (Pullman, Moscow, Washington State University and the University of Idaho), several smaller cities and towns, and many businesses and rural residents residing in the unincorporated areas of Whitman County, Washington and Latah County, Idaho. Ground water levels in the deep aquifer system have been declining since measurement began in the late 19th century. Growth in the area following World War II led to increased pumping from the aquifer system, and by the late 1950's a serious decline in the water levels was being recognized by the cities, state institutions and regulatory agencies. A recommendation made at a meeting of the Regents of the University of Idaho led to the 1967 formation of a committee, known then as the Pullman Moscow Water Resource Committee (PMWRC), to study the problem and make recommendations to the administrative and elected representatives of the major pumping entities. As time progressed, membership in the committee was expanded to include Whitman and Latah counties and then Colfax, Washington. And although not a PBAC member, in 2006 the City of Palouse also contributed to the management of the Committee. In 1998, to reflect its expanded membership, the committee name was changed to the Palouse Basin Aquifer Committee (PBAC). In 2005, a Citizens Advisory Group (CAG) was formed to enhance ground water management by providing a forum for dialogue among a broader range of parties. The current makeup of PBAC and CAG is detailed at the end of this report.

The Ground Water Management Plan

In 1992, the PMWRC, with the support of Washington and Idaho state regulatory agencies, drafted and enacted a Ground Water Management Plan for the Basin. The Plan is authorized by an Intergovernmental Agreement between the (then 4 - now 7) member entities and an Interagency Agreement between the Washington Department of Ecology and the Idaho Department of Water Resources. The plan details the governance structure of the committee and lays out specific goals for the pumping entities. Since 1992, the goals have been periodically reviewed and updated by PBAC.

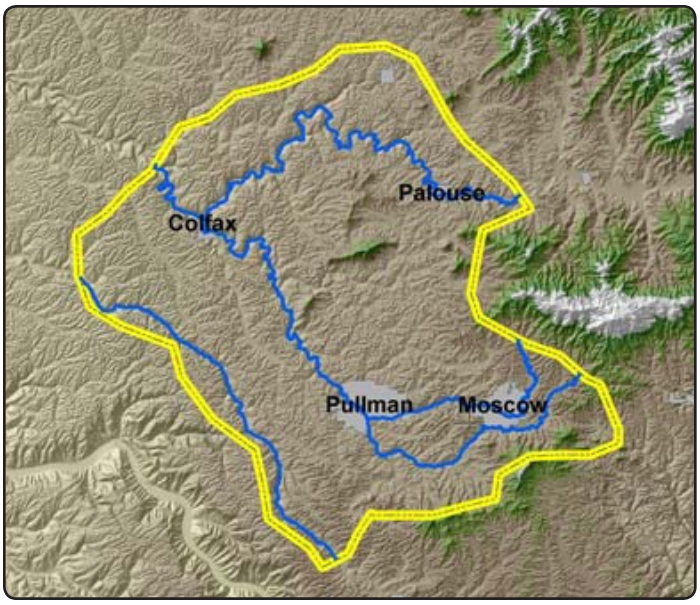


Figure 2: Working boundary for the Palouse Ground Water Basin

Basin Description

The precise boundaries of the Basin have not been delineated, but a working boundary appears as shown in figure 2. Ground water in the basin is pumped primarily from two aquifer systems: the shallower Wanapum and the deeper Grande Ronde. The Wanapum and Grande Ronde Formations are part of the Columbia River Basalt Group, which consists of thousands of feet of lava flows that covered much of eastern Washington and northeastern Oregon during eruptions between 17 and 6 million years ago.

The nature of the emplacement of the basalts over time resulted in significant differences in geology from west to east across the basin. The eastern end of the basin is characterized by thick sedimentary interbeds that thin west of Moscow. The Grande Ronde basalts are thicker beneath Pullman. An exaggerated schematic cross section of the Basin is shown in figure 3.

Moscow/Pullman Highway road cut.

The primary municipal drinking water source in the Basin is the Grande Ronde aquifer system. In Pullman, all of the municipal and most of the rural residents obtain their drinking water from the Grande Ronde. In Moscow, nearly one third of the supply is from the Wanapum, and many of the rural residents in Latah County also tap the shallower aquifer. In general, the Grande Ronde wells are more productive and contain higher quality water than those in the Wanapum.

Water levels in the Grande Ronde have historically declined at a rate of 1 to 2 feet per year for 70 or more years (**see figure 4 below**). Water levels in the Wanapum dropped drastically in the 1950's and early 60's, but recovered in the 1970's and 80's when much of the pumping switched to the deeper Grand Ronde (**see figure 5 below**). Although absolute values are still uncertain, it is thought that there is limited recharge to the Wanapum and very little recharge to the Grande Ronde.

Basalt Outcrop near Glenwood

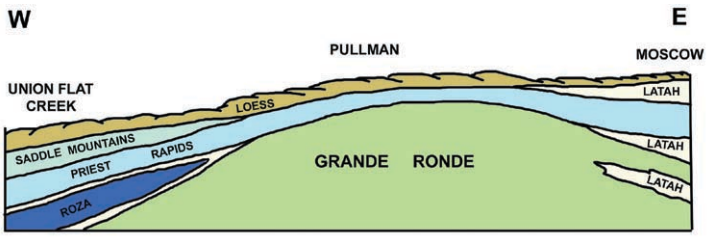


Figure 3: E-W Schematic Cross Section (Bush, Garwood)

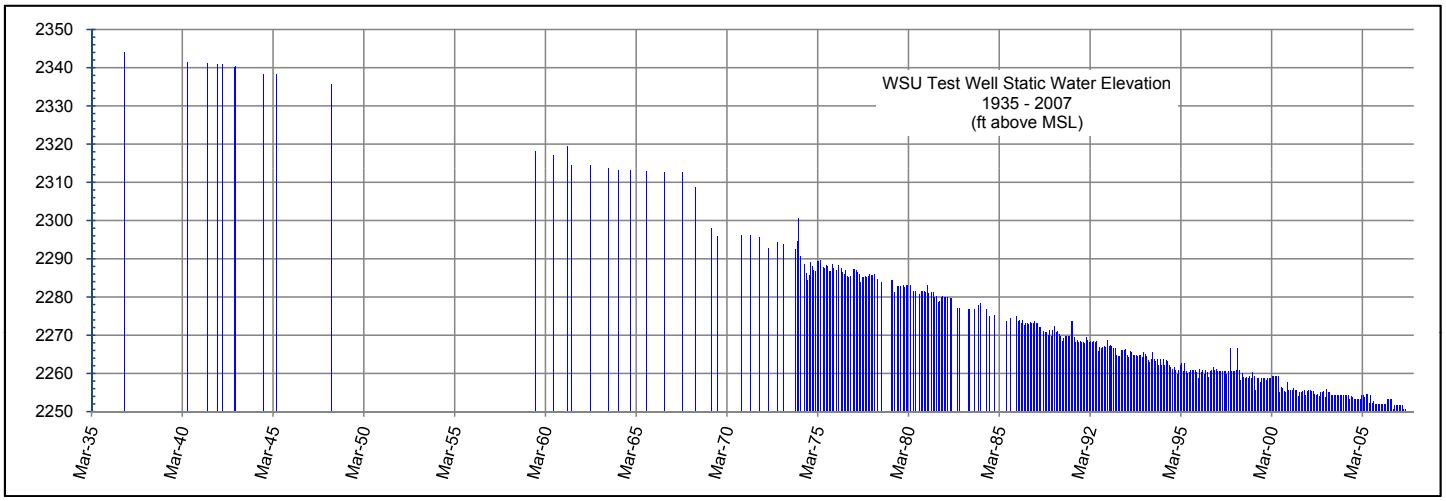


Figure 4: Static Water Level, WSU Test Well, 1938-2007

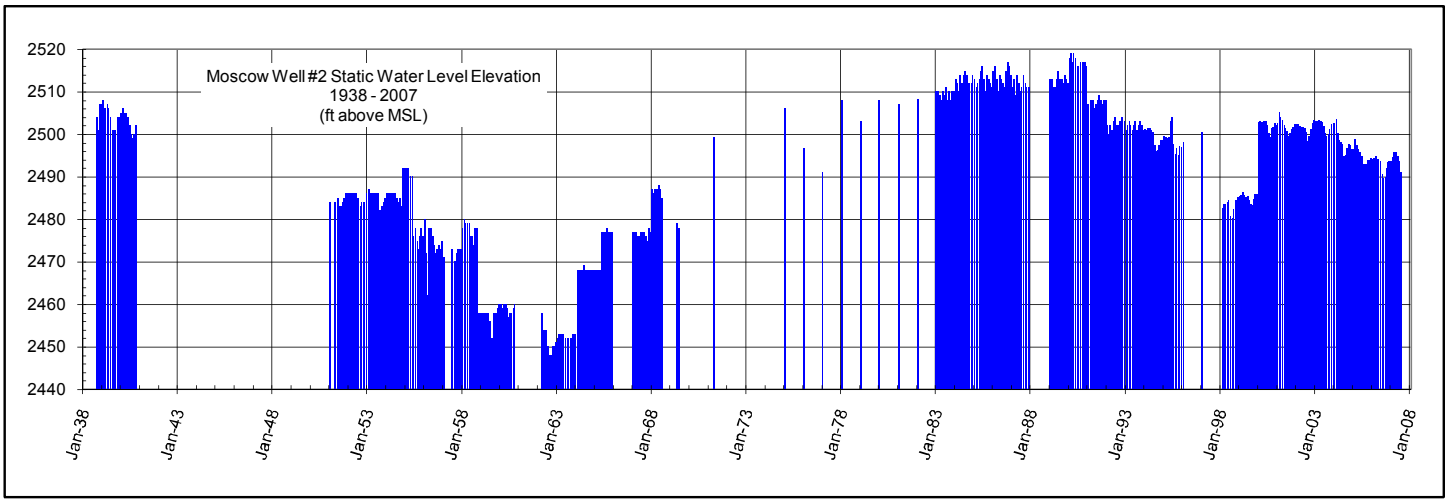


Figure 5: Static Water Level Elevation, Moscow Well#2, 1938-2007

Ground Water Pumpage and Water Levels

The total combined ground water pumpage by the four cities and two universities for the year 2006 was 2.83 billion gallons (**see figure 6 below**). This was approximately 2.4% more than was pumped in 2005 (2.77 billion gallons), but 8.3% less than was pumped in 1992 (3.09 billion gallons), the first year the Ground Water Management Plan took effect.

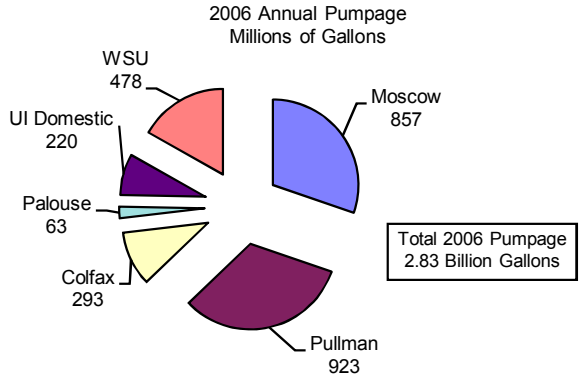


Figure 6: 2006 Combined Gound Water Pumpage

In 2006, Pullman and Moscow each accounted for roughly one third (33% and 30% respectively) of the total pumping, followed by WSU at 17%. Colfax and UI pumped 10% and 8%, respectively, and Palouse pumped just over 2% of the combined pumping total. (**see figure 7 below**)

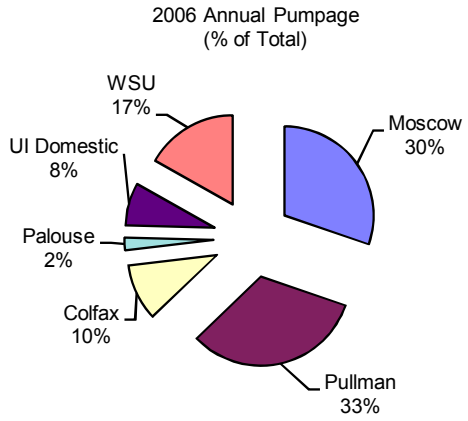


Figure 7: 2006 Pumpage - Percentage of Combined Total

Moscow pumped nearly 32% (270 million gallons) of its water from the Wanapum aquifer system in 2006; the other pumping entities all pump solely from the Grande Ronde. Of the combined pumping total, the Moscow Wanapum contribution amounts to approximately 9.5%.

Pumping increases significantly in the summer months, primarily due to increased irrigation needs. For 2006, an estimate of the baseline pumping was calculated as the average of the pumping levels for the months of

Moscow Mountains from North of Kamiak Butte

November, December, January and February. Pumping above this average level can be considered non-baseline usage. As a percentage of total pumping, the non-baseline usage for the four largest pumping entities ranges from 27.5% for UI to 32.2% for Pullman (**see figure 8 below**) (Note: UI utilized 95 million gallons of reclaimed water in 2006 that is not included in this calculation.)

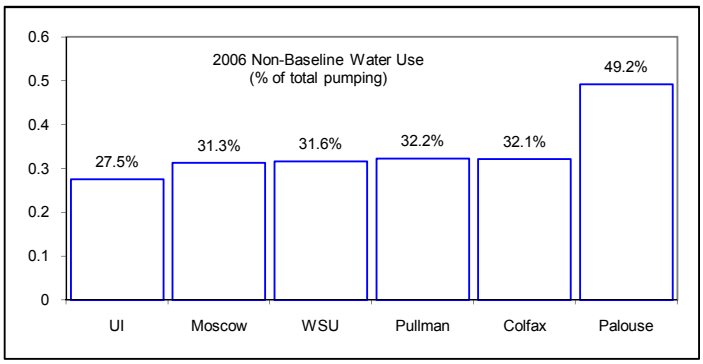


Figure 8: Non-baseline Water Use

Non-baseline usage is contingent upon the weather conditions experienced during a given year. Overall, the 2006 and (first half of the) 2007 irrigation season was warmer and drier than the average of the past five years, as evidenced in figures 9-11. Charts of 2006 and early 2007 monthly pumping compared to the 2001-2005 averages are shown in figures 12-16.

Steptoe Butte looking South and East

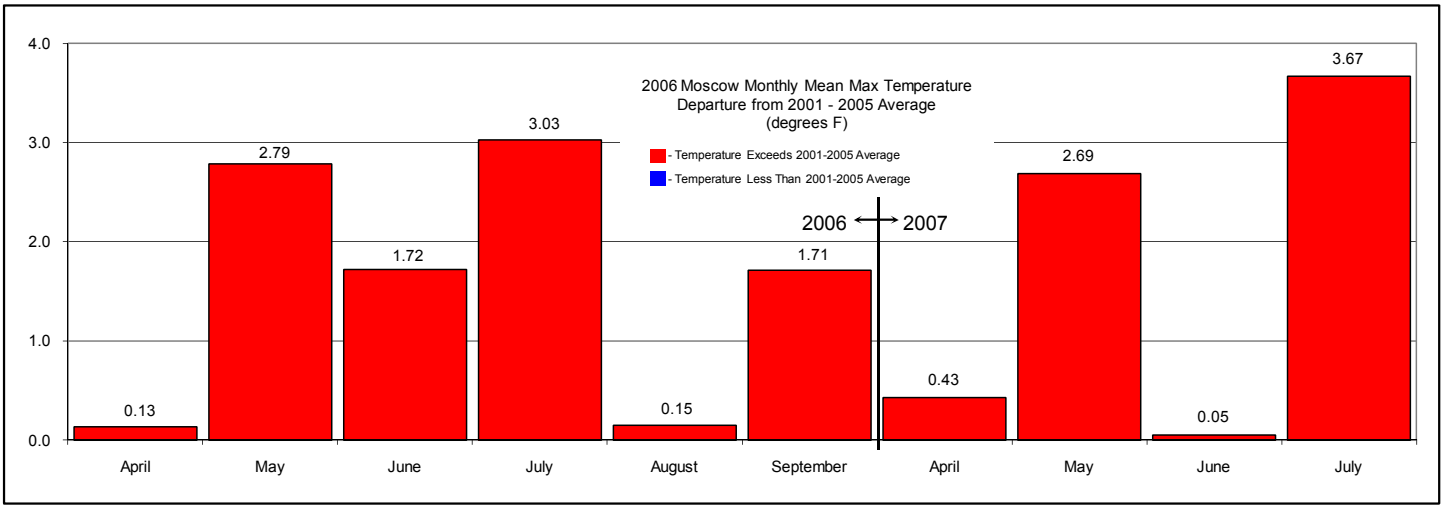


Figure 9: 2006,2007 (early) Season Weather - Mean Maximum Tempurature

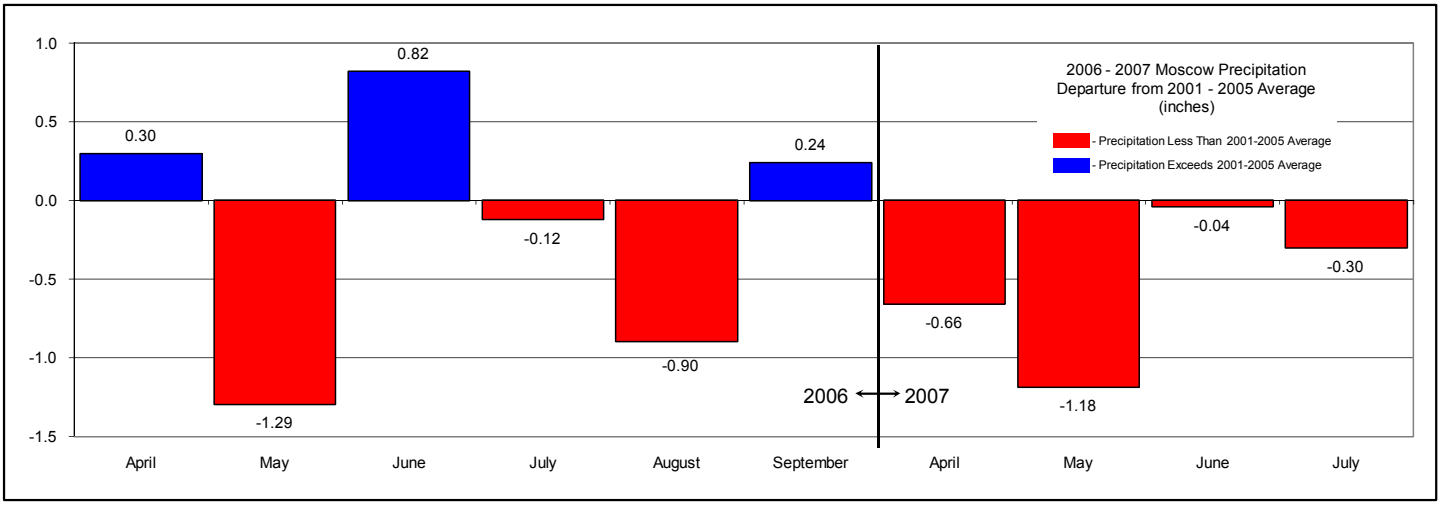


Figure 10: 2006,2007 (early) Season Weather - Precipitation

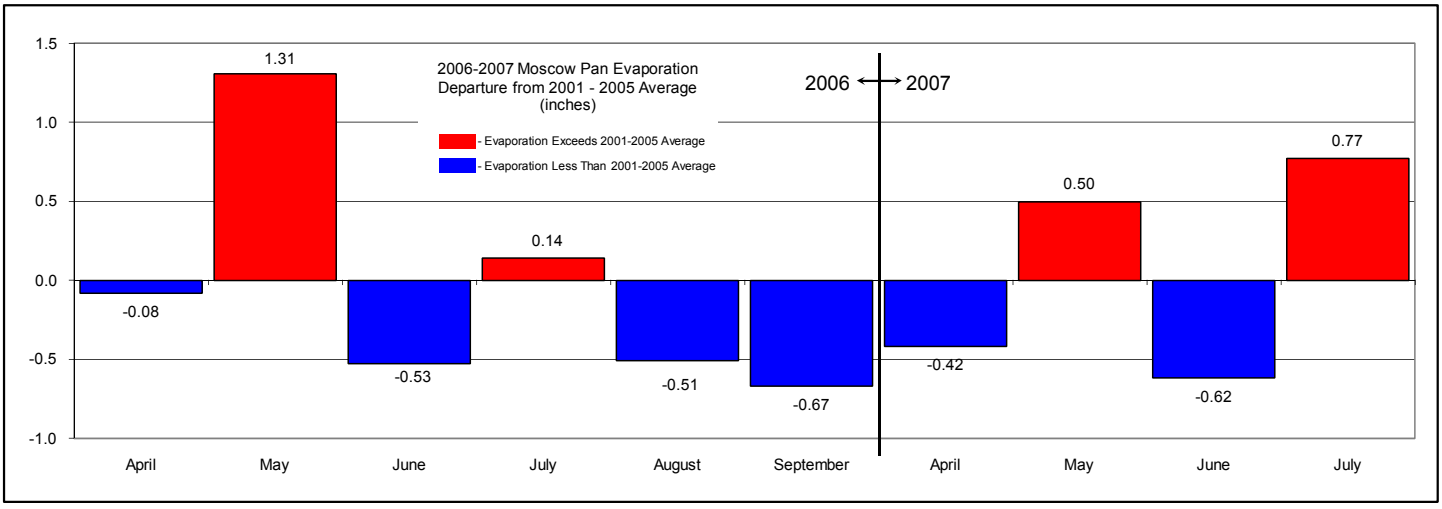


Figure 11: 2006,2007 (early) Season Weather - Pan Evaporation

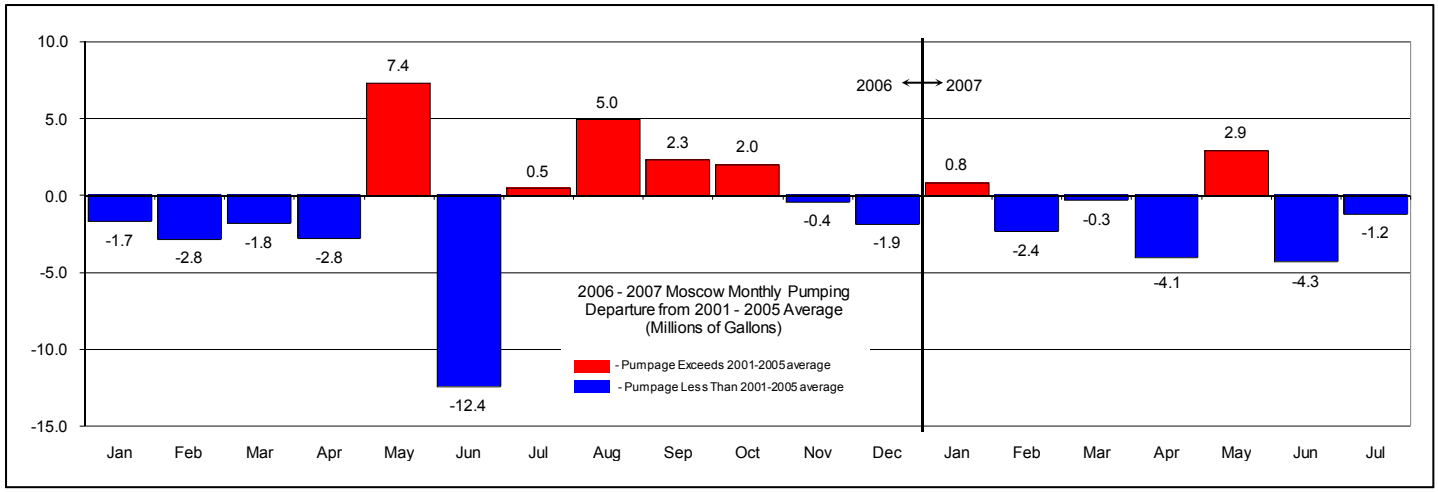


Figure 12: Moscow 2006-2007 Monthly Pumping - Departure from 5-year Average

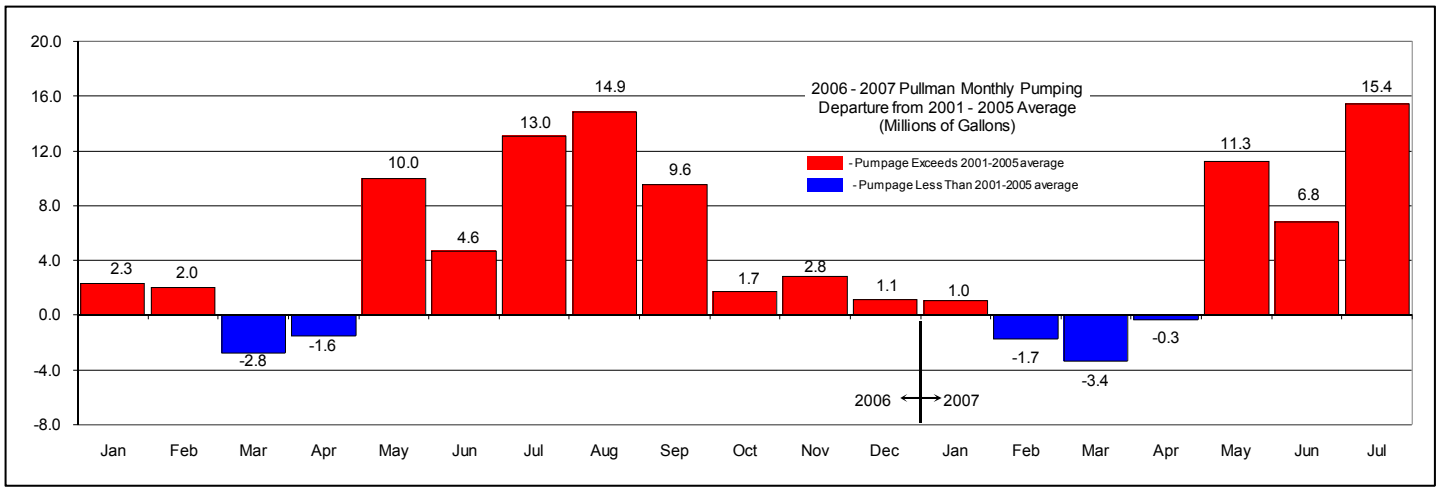


Figure 13: Pullman 2006-2007 Monthly Pumping - Departure from 5-year Average

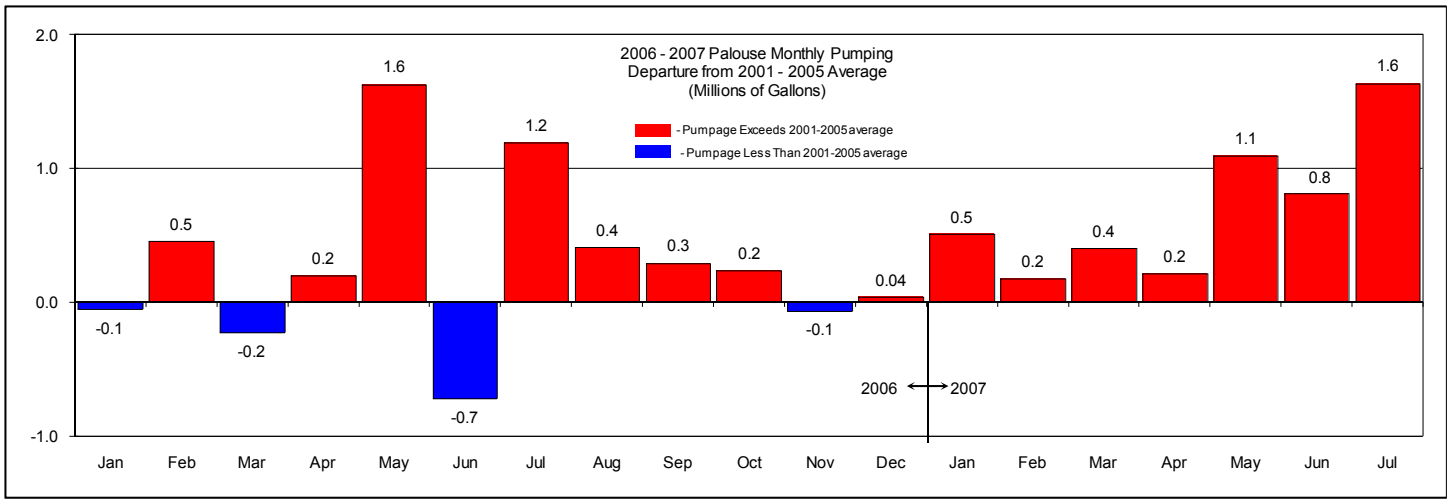


Figure 14: Palouse 2006-2007 Monthly Pumping - Departure from 5-year Average

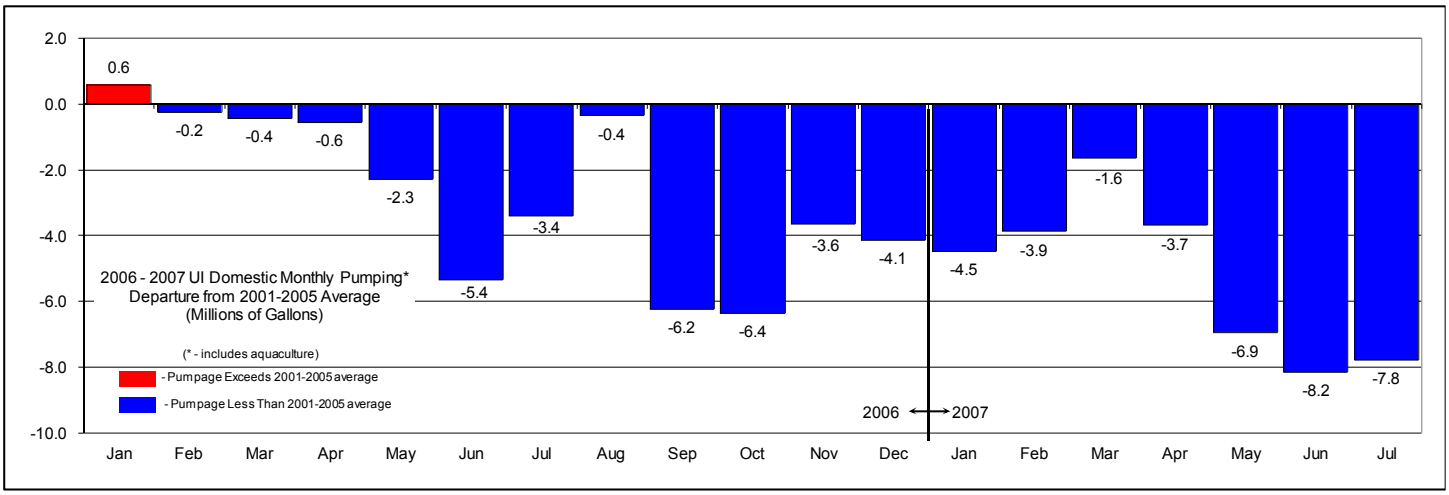


Figure 15: University of Idaho 2006-2007 Monthly Pumping - Departure from 5-year Average

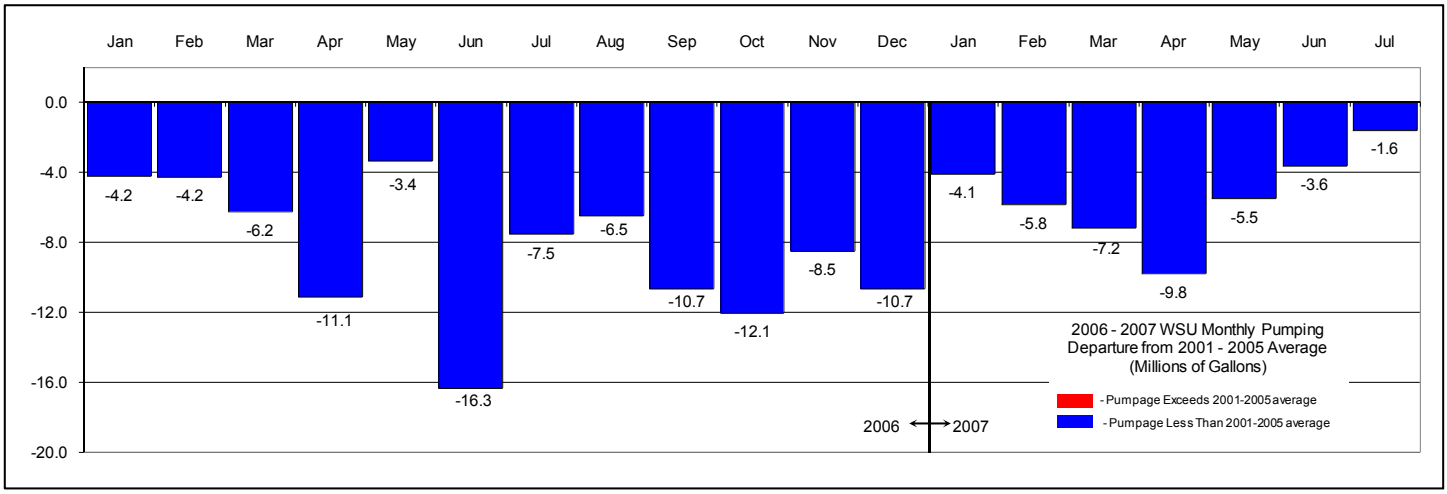


Figure 16: WSU 2006-2007 Monthly Pumping - Departure from 5-year Average

Monthly pumping figures for the four cities and two universities for the period between 2002 and mid-2007 are shown in figures 27-32 and annual pumping figures for the period between 1992 and 2006 are illustrated in figures 33-38 at the back of this report.

As part of the Ground Water Management Plan, each pumping entity has agreed to voluntary pumping targets. Each signatory entity agreed to attempt to limit annual pumping increases to 1% of the 1986-1990 average pumping level. In addition, each entity is to keep its total pumping below 125% of the 1981-1985 average pumping level. An aggregation of the pumping targets for the four signatory entities is shown in figures 17 and 18. The 1% and 125% targets for each entity are illustrated in figures 19 - 22 and figures 23-26. Note that no charts are shown for Colfax and Palouse, as they were not original signatories to the Ground Water Management Plan, and as such are not subject to the pumping targets.

Water level data for the period show no consistent trend, with some wells experiencing a decline in static water level and others remaining relatively stable. Measurement of static water levels in pumping wells is problematic, and there have been additional complications associated with the instrumentation and protocols utilized to make the measurements during the period. The combination of these factors makes it difficult to provide any generalized conclusions as to the aquifer water level trends at this time. Representative charts of historic water levels for several area wells are presented inside the front cover of this report and in figures 39-43.

Monitoring Wells North of Moscow

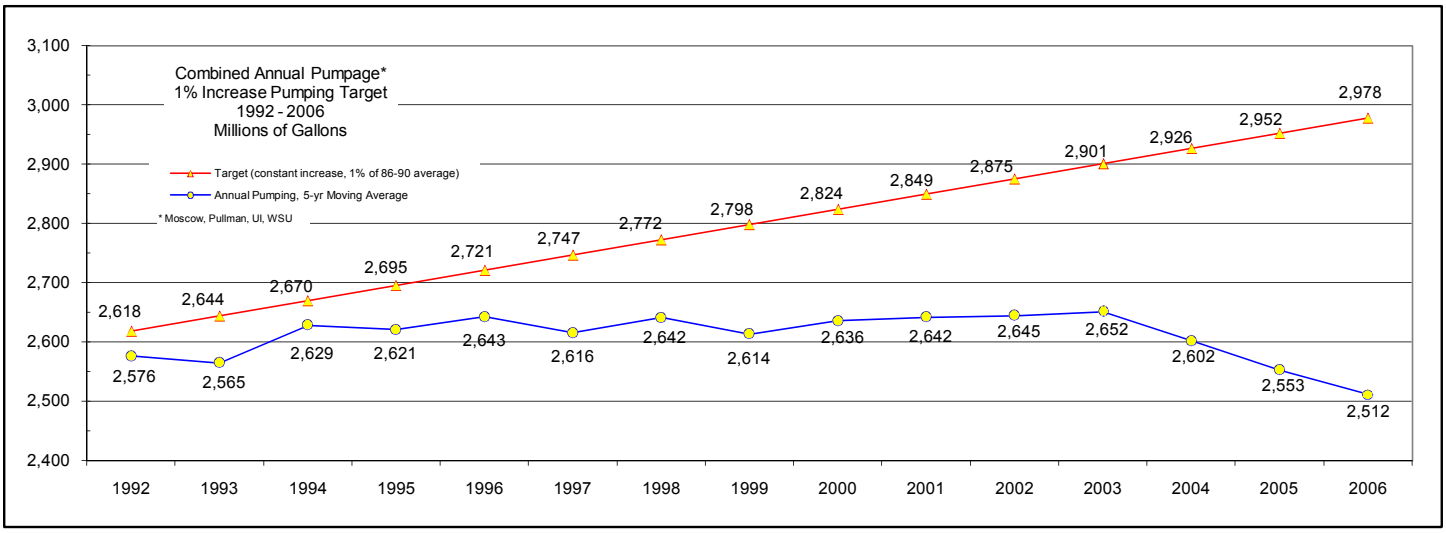


Figure 17: Voluntary 1% Annual Pumping Increase Target - 4 Major Pumping Entities Combined

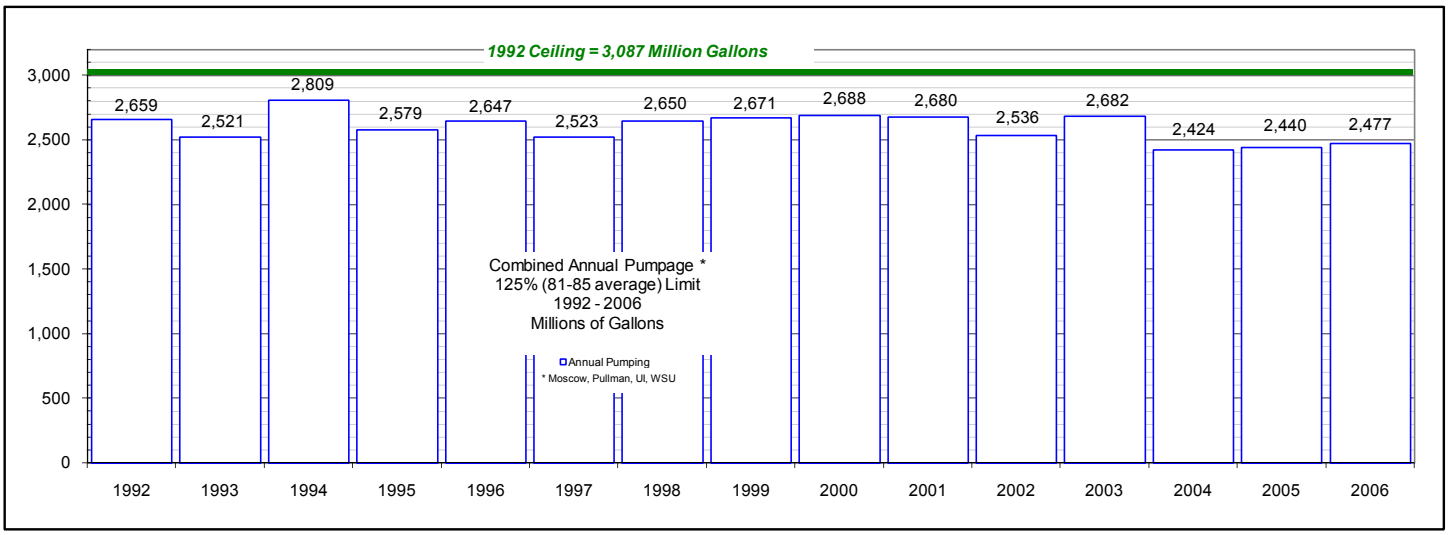


Figure 18: Voluntary 125% (of 1981-85) Pumping Ceiling - 4 Major Pumping Entities Combined

Research Accomplishments 2006 – 2007

Four PBAC research projects reported results during 2006 and early 2007

Farida Leek (WSU) reported her Masters thesis work to compile and analyze existing information pertinent to the hydrogeology of the Palouse Basin aquifer system. Elements of the compilation include a GIS database, research reference citations, hydrogeologic cross sections (see inside front cover), ground water contour maps, and a variety of supporting data. The goal of the project was to provide baseline information that can be utilized in the creation and verification of improved 3-dimensional ground water flow models. Much of the data have been gathered, but significant work remains to field check and process the data into readily accessible formats.

Derek Holom (UI) reported his Masters thesis work involving a gravity survey in the Kamiak Gap. His results indicate the presence of a V-shaped boundary condition between Kamiak Butte and Angel Butte, and the lack of continuous Grande Ronde basalts through the Gap. PBAC is currently working with the WRIA 34 Watershed Planning Unit to secure funding for a project that will construct a test well in the Gap and attempt to verify Derek's conclusions.

Nicole Badon (UI) reported her Masters thesis work involving pump tests of the shallow Wanapum aquifer system in the vicinity of Moscow. Nicole concluded that the Wanapum system is poorly connected hydraulically (at short time scales) and demonstrates compartmentalization, at least in the vicinity of the Moscow Wanapum pumping center.

Mike McVay's (UI) Masters work centered around pump tests of the deeper Grande Ronde aquifer system. Mike's results indicate that in the Pullman-Moscow vicinity the Grande Ronde is a system of several hydraulically connected aquifers. McVay cites evidence from a January 2006 test indicating that pumping at Pullman and WSU wells impacts wells in Moscow and Palouse.

In addition to the research conducted by graduate students, in 2006 PBAC collaborated with the Idaho Water Resources Research Institute to utilize funding from the State of Idaho to construct 4 monitoring wells on UI property north of the Moscow Mall. In the future PBAC hopes to secure funding to construct similar wells at strategic points throughout the Basin in order to provide high quality long term water level information that will better inform future water management decisions.

South Fork of Palouse River at Robinson Park

Goals, Plans and Ongoing Efforts of the Committee

The foundation of the Ground Water Management Plan consists of a set of goals. Each member entity crafts its water resource management plan(s) to support the goals. The goals are periodically reviewed and updated by PBAC.

The goals were revised in 2006, and the current primary goal of PBAC is to develop and implement a balanced basin wide water supply and use program by the year 2020. An interim goal requires that an action plan for the program be developed by 2010.

In order to meet the current goals, research will be required to better characterize those components of the Basin water balance that currently lack high levels of certainty. As part of the characterization effort, PBAC in 2007 plans to continue funding shallow and deep aquifer monitoring and testing projects, as well as complete a project studying a standby well on the UI campus in which water is entering from the Priest Rapids (Wanapum) Basalts and flowing down into the Vantage Formation (Wanapum) interbed.

The Citizens Advisory Group (CAG), aimed at ensuring dialogue among a broader range of interested parties, has been continuing its work on recommendations for consideration by PBAC involving management, research, conservation and public participation. The CAG presented management and research recommendations to PBAC in 2006, and is currently focusing its efforts upon the topic of conservation.

PBAC members continue to work with the WRIA 34 Watershed Planning Unit as it develops and works toward implementation of a watershed plan. As of mid-2007, the plan was in final draft form, and this fall the Planning Unit plans to pursue adoption by the counties with the goal of moving into an implementation phase beginning in 2008.

In early 2007 a new interdisciplinary graduate water resources program (WoW – Waters of the West) was approved at the University of Idaho. A portion of the graduate program includes an interdisciplinary water resources case study, the first of which will focus upon the Palouse Basin area. PBAC looks forward to working with WoW in 2007 to support the program and enjoy the benefits of research projects that will enable better-informed decision making aimed at ensuring a sustainable, high quality water supply for the region.

In 2006, PBAC participated in the second Palouse Water Summit. The Summit focused its efforts on local water resource issues, and resulted in the formation of a series of working groups charged with providing feedback and direction on the management of the resource. PBAC will support and participate in a third Summit, scheduled for October 2007.

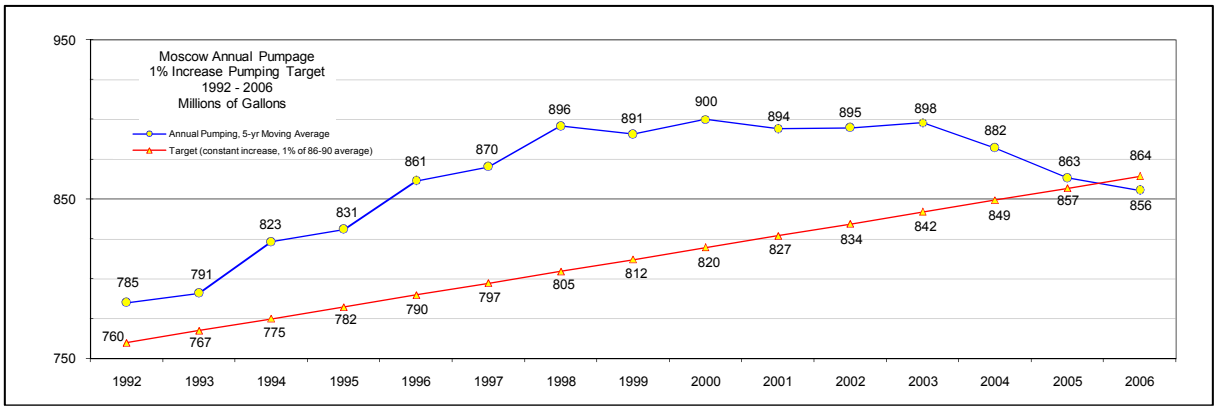


Figure 19: Moscow 1% Target

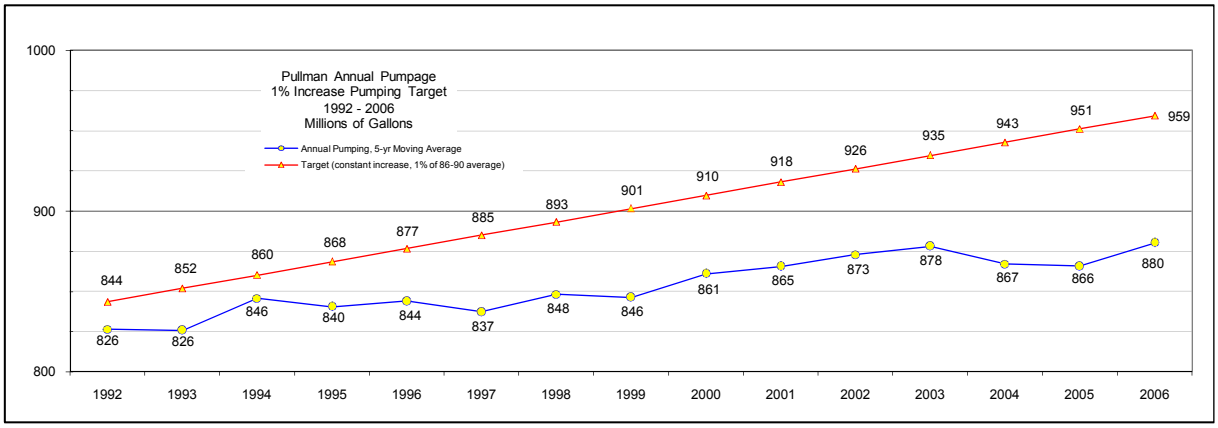


Figure 20: Pullman 1% Target

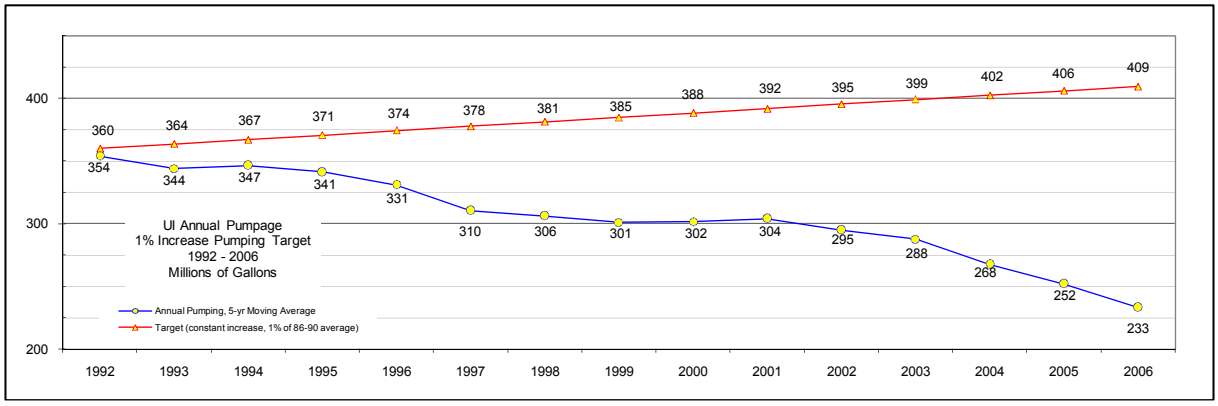


Figure 22: University of Idaho 1% Target

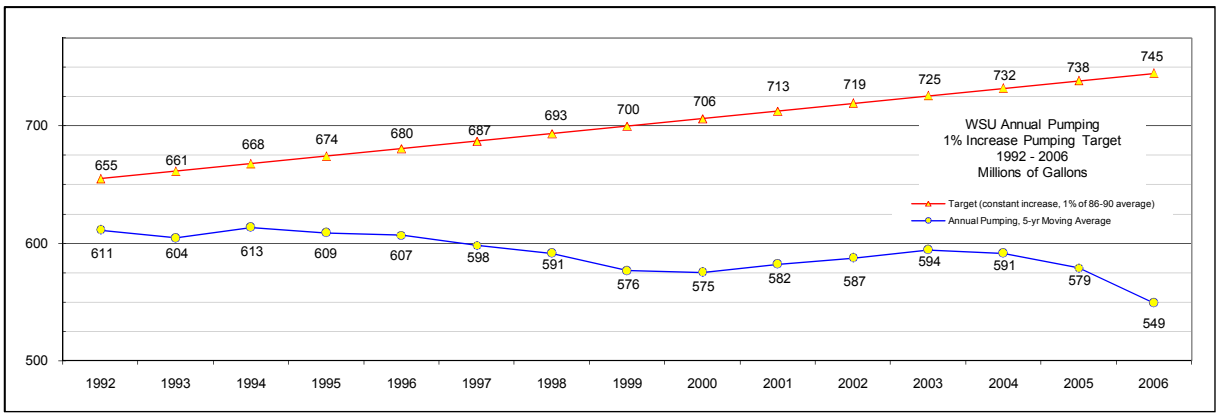


Figure 21: WSU 1% Target

Voluntary 125% (of 1981-85 average) Pumping Ceiling 1992-2006

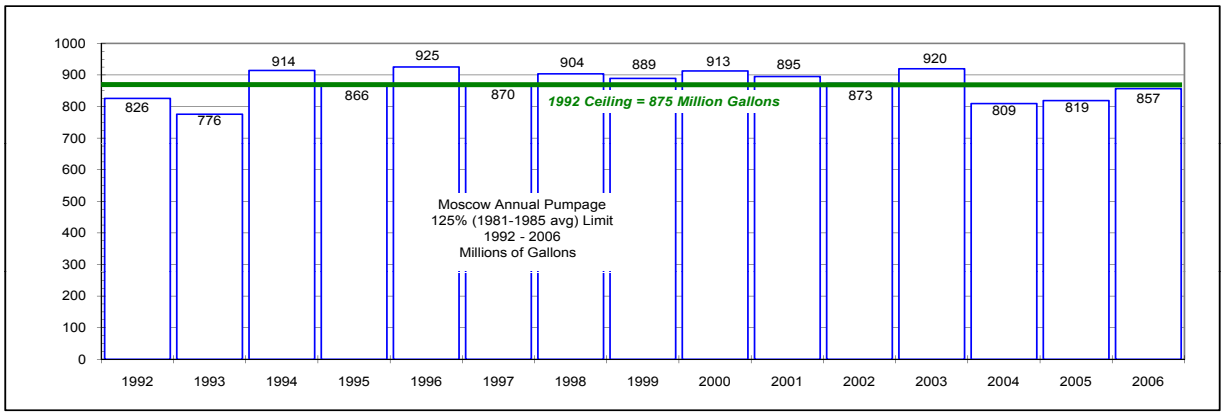


Figure 23: Moscow 125% Ceiling

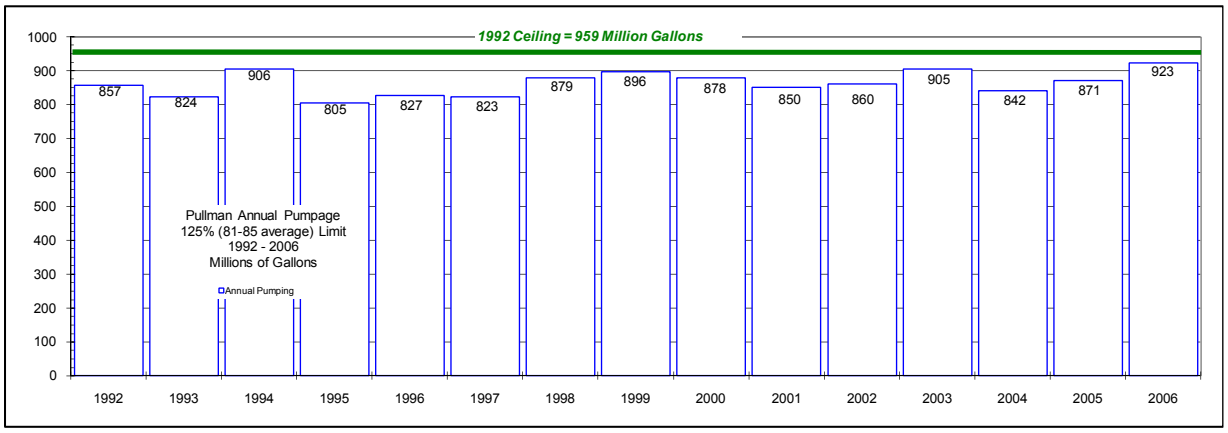


Figure 24: Pullman 125% Ceiling

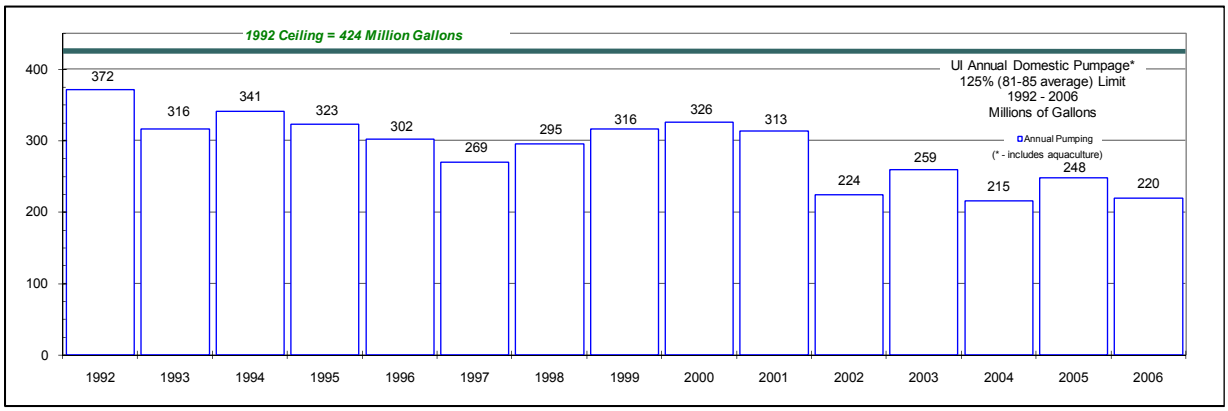


Figure 25: University of Idaho 125% Ceiling

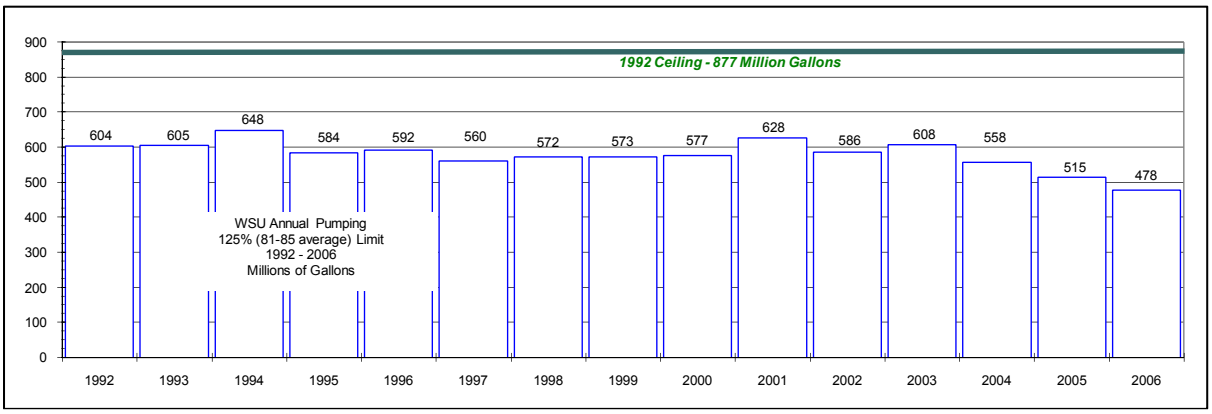


Figure 26: WSU 125% Ceiling

Monthly Pumping Totals 2002-2007

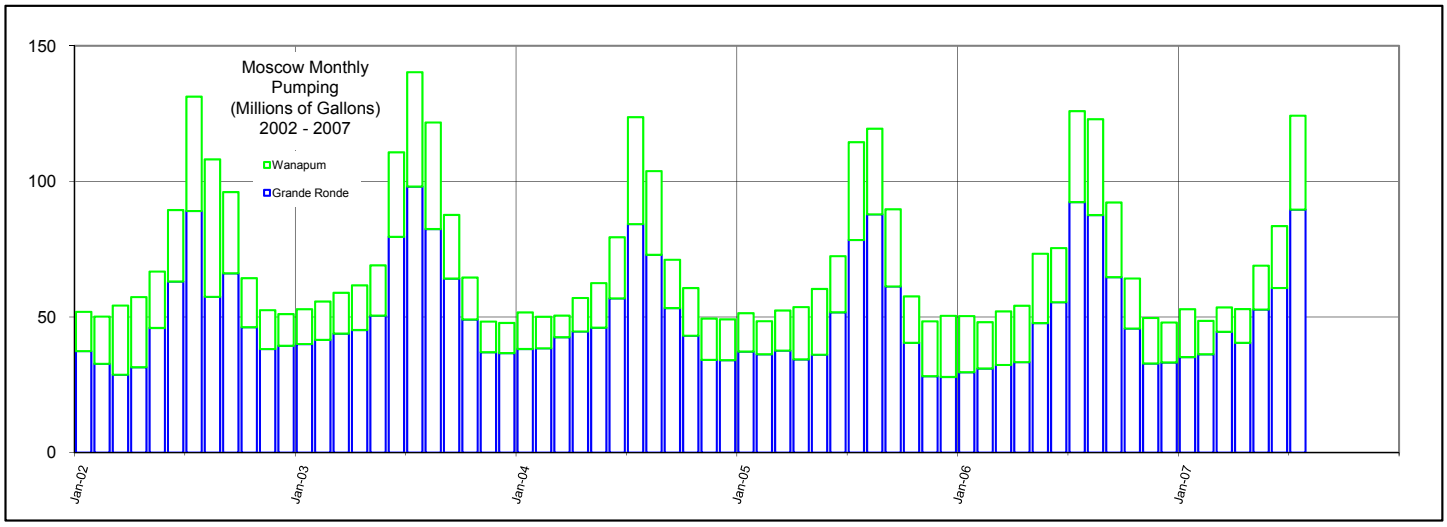


Figure 27: Moscow Monthly Pumping

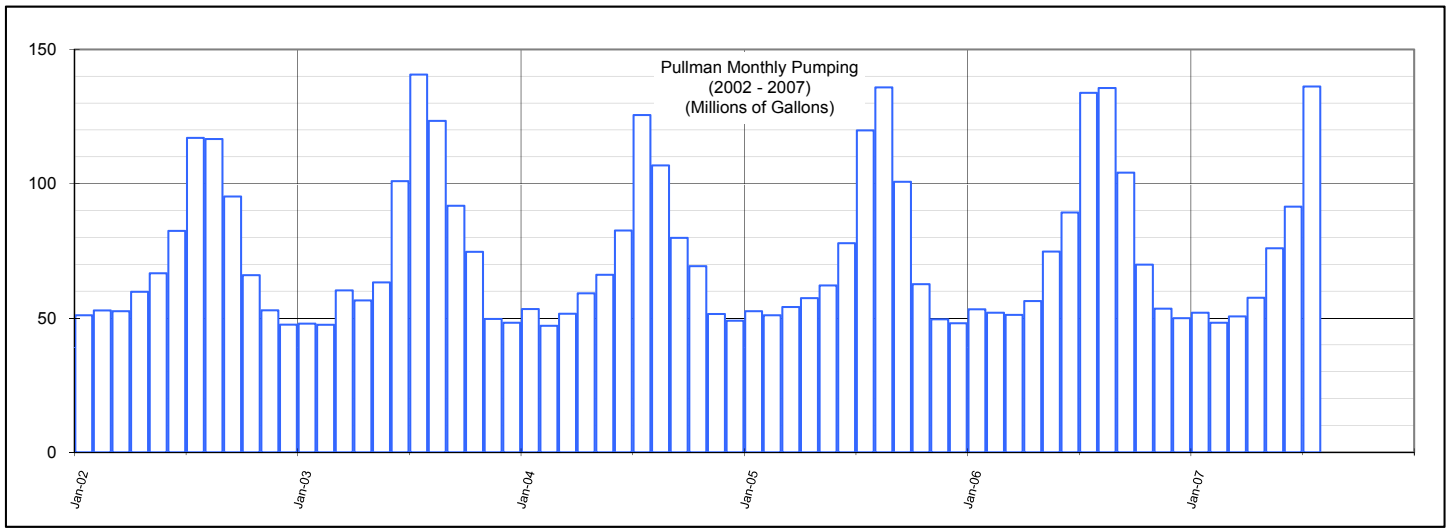


Figure 28: Pullman Monthly Pumping

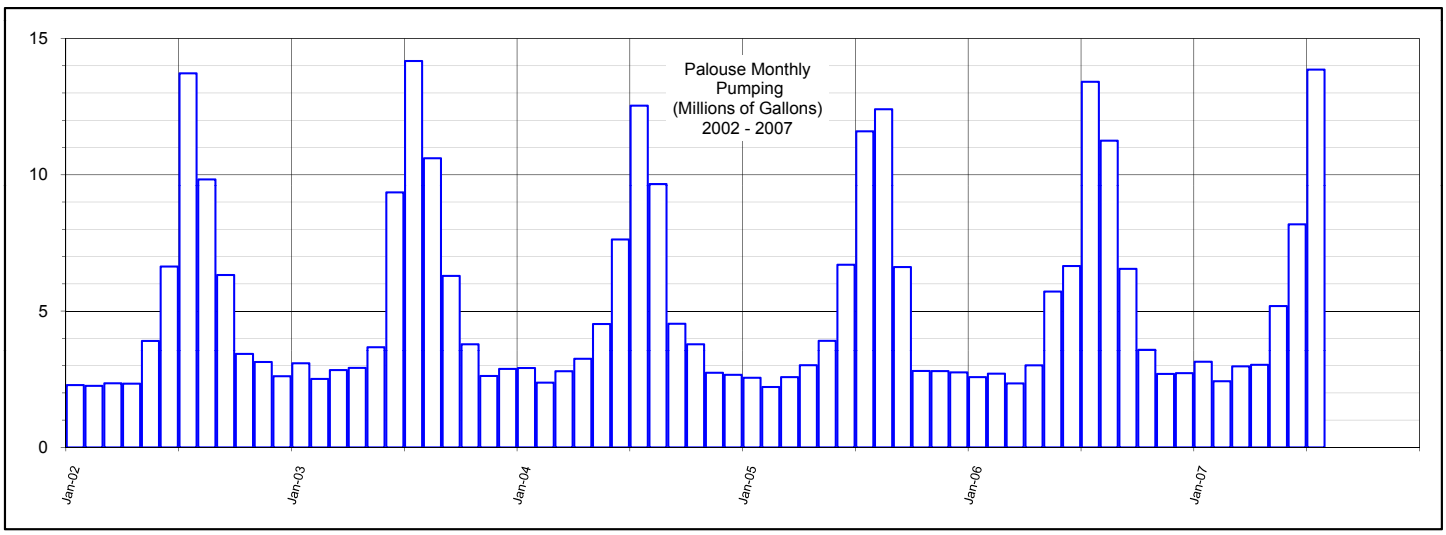


Figure 29: Palouse Monthly Pumping

Monthly Pumping Totals 2002-2007

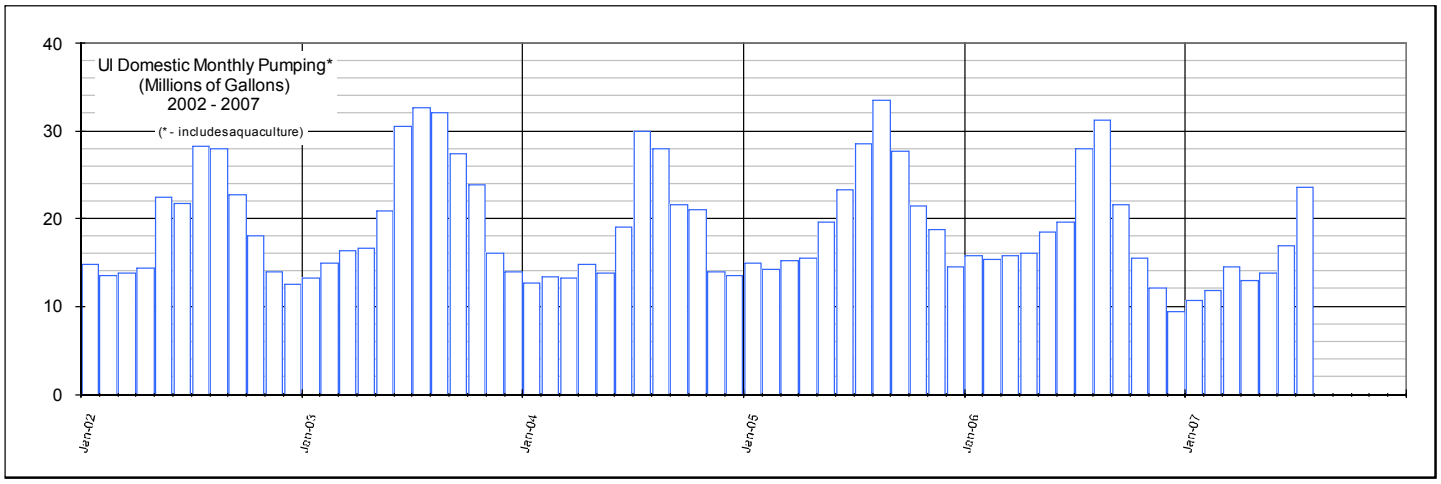


Figure 30: University of Idaho Monthly Pumping

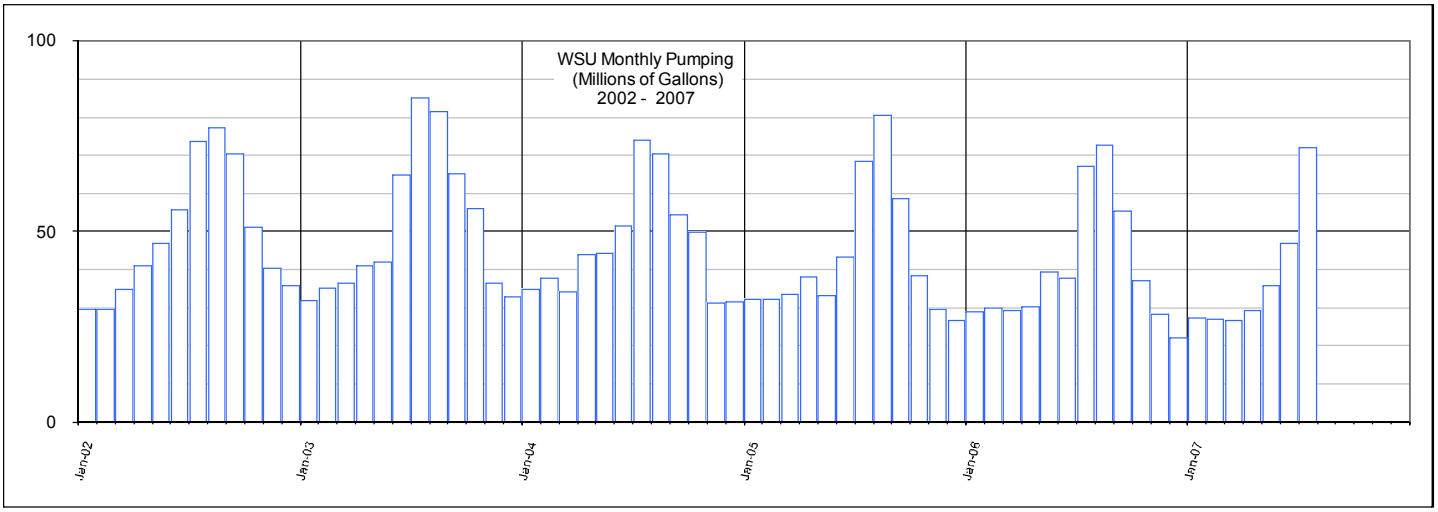


Figure 31: WSU Monthly Pumping

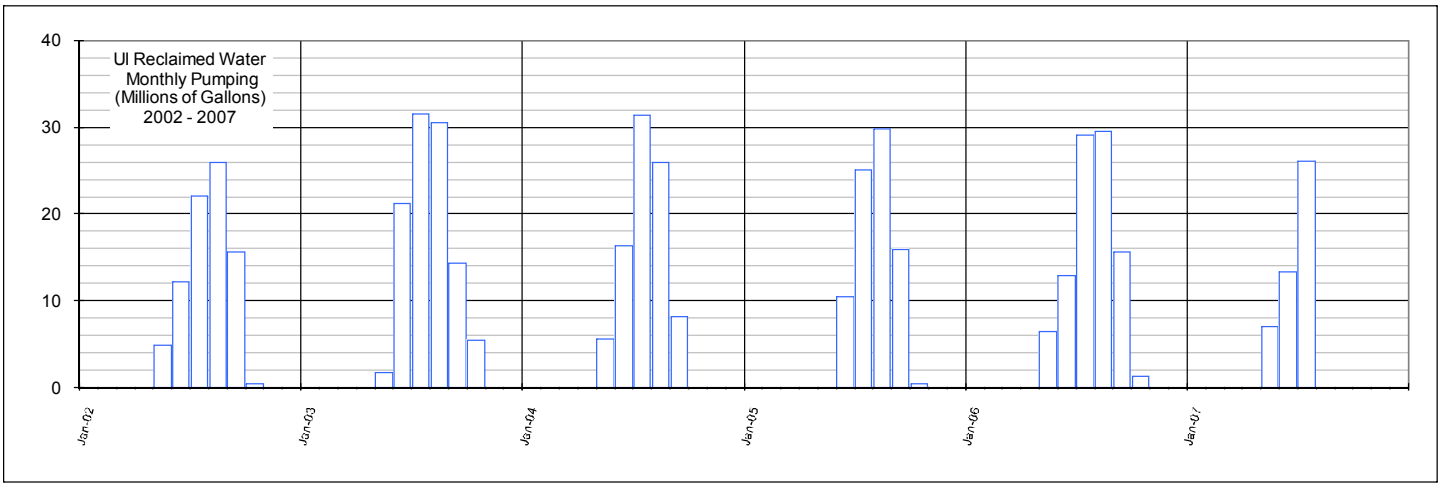


Figure 32: University of Idaho Reclaimed Water Monthly Pumping

Annual Pumping Totals 1992-2006

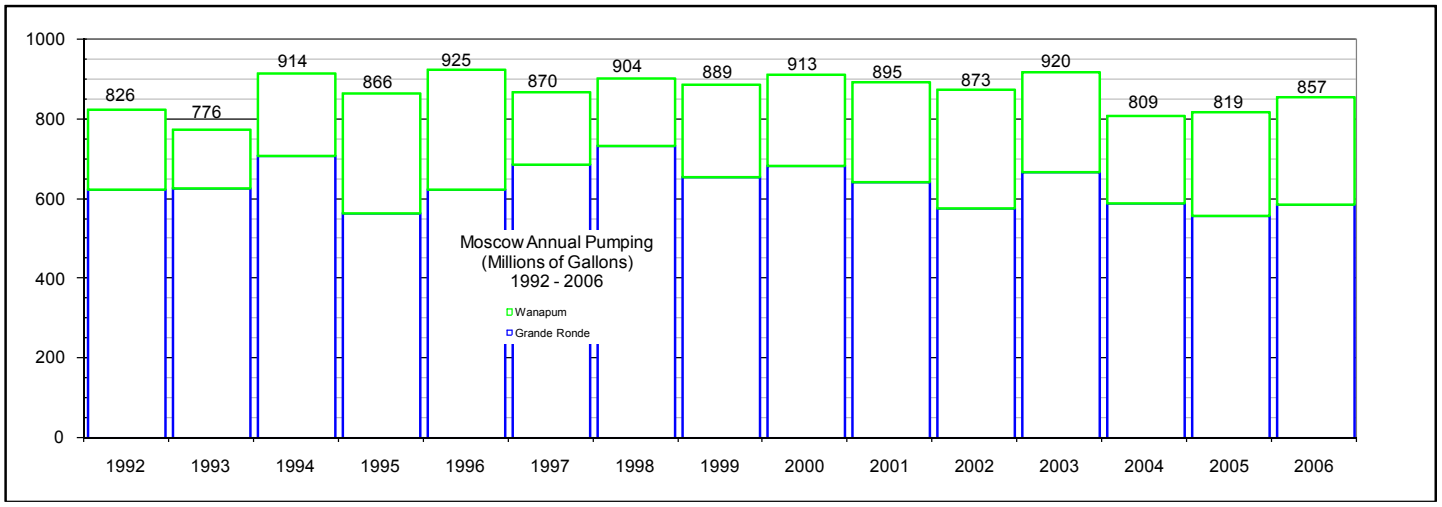


Figure 33: Moscow Annual Pumping

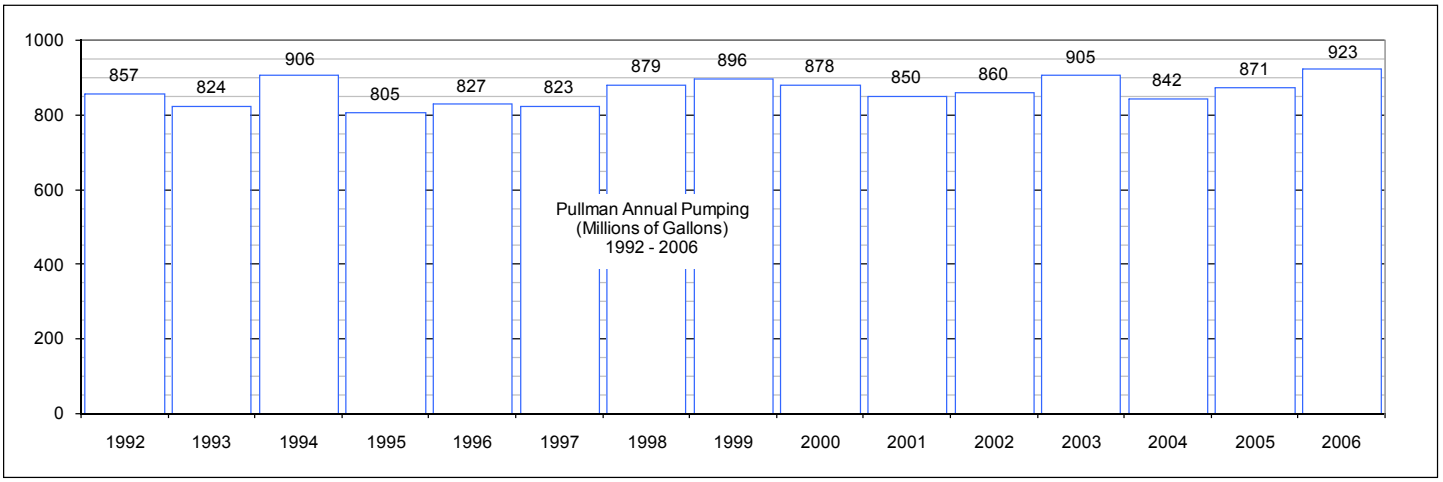


Figure 34: Pullman Annual Pumping

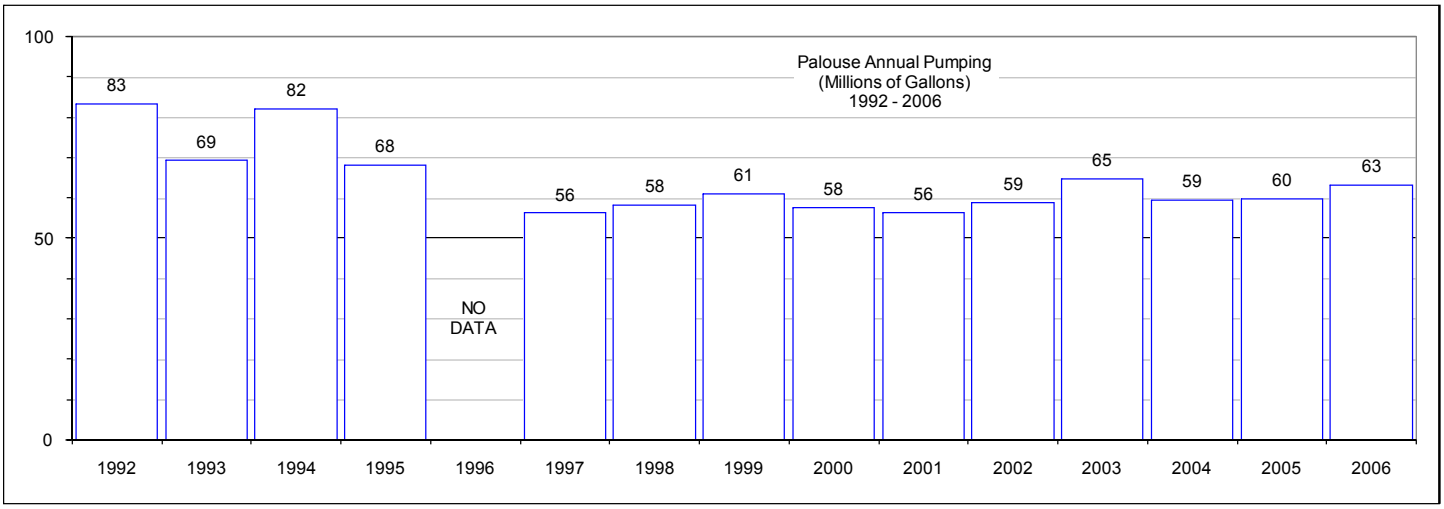


Figure 35: Palouse Annual Pumping

Annual Pumping Totals 1992-2006

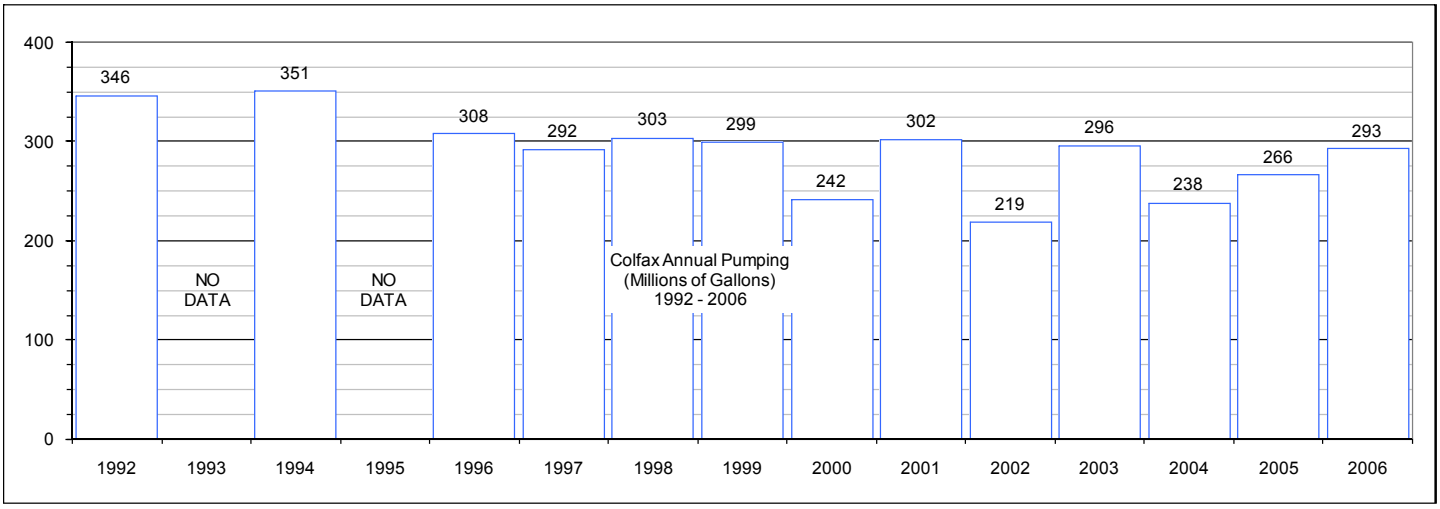


Figure 36: Colfax Annual Pumping

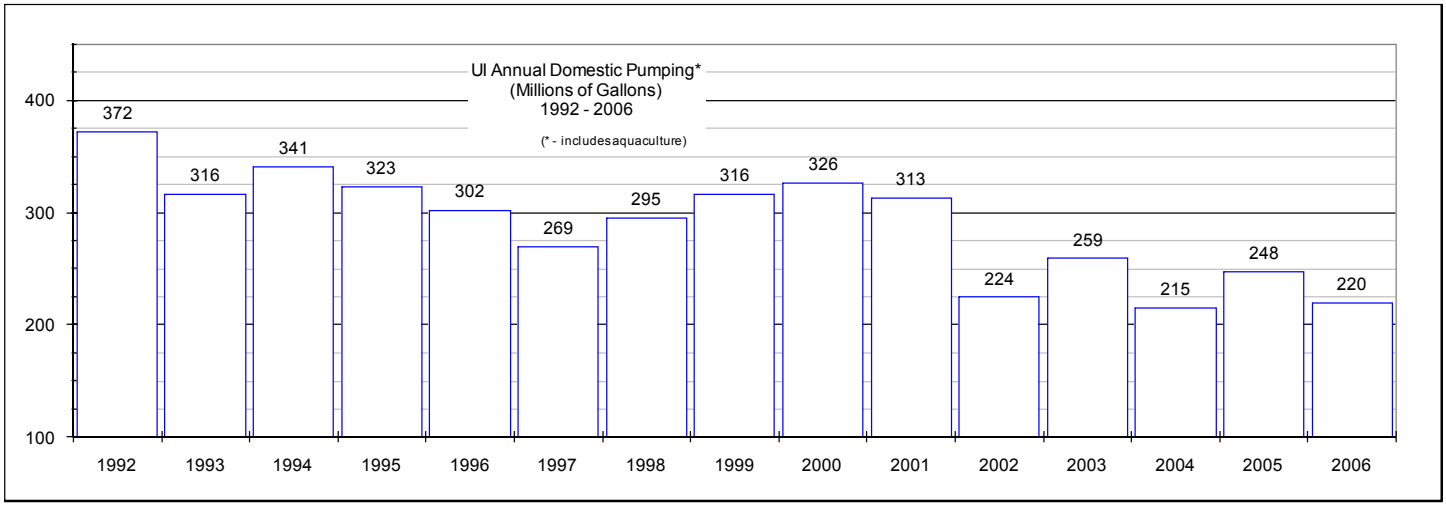


Figure 37: University of Idaho Annual Pumping

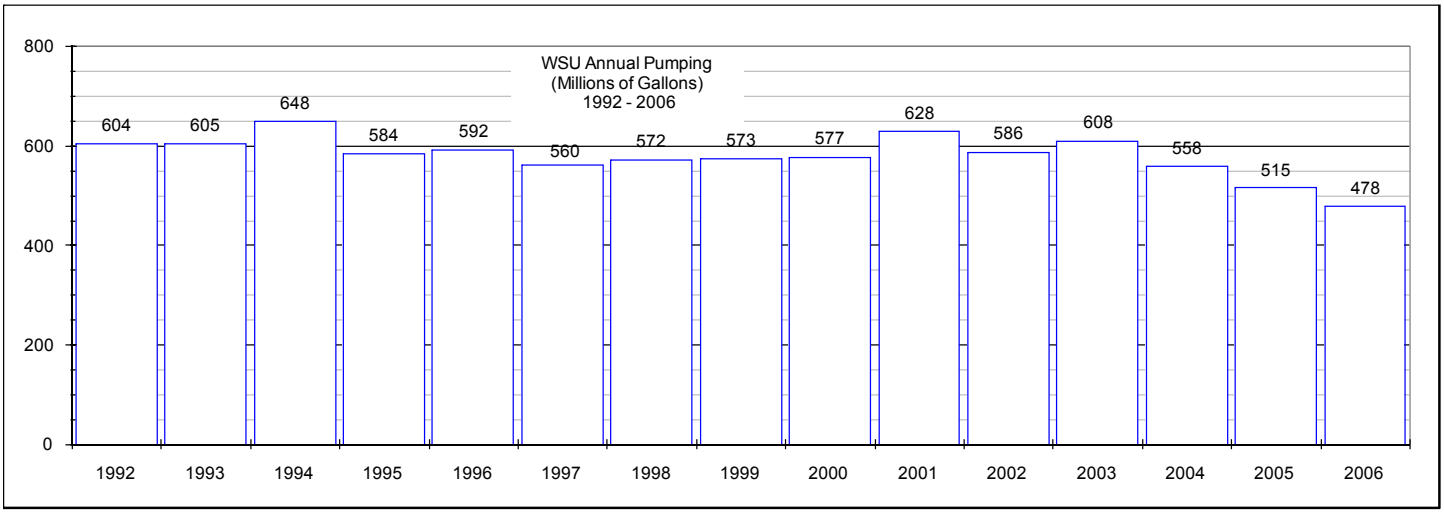


Figure 38: WSU Annual Pumping

Water Levels 2002-2007

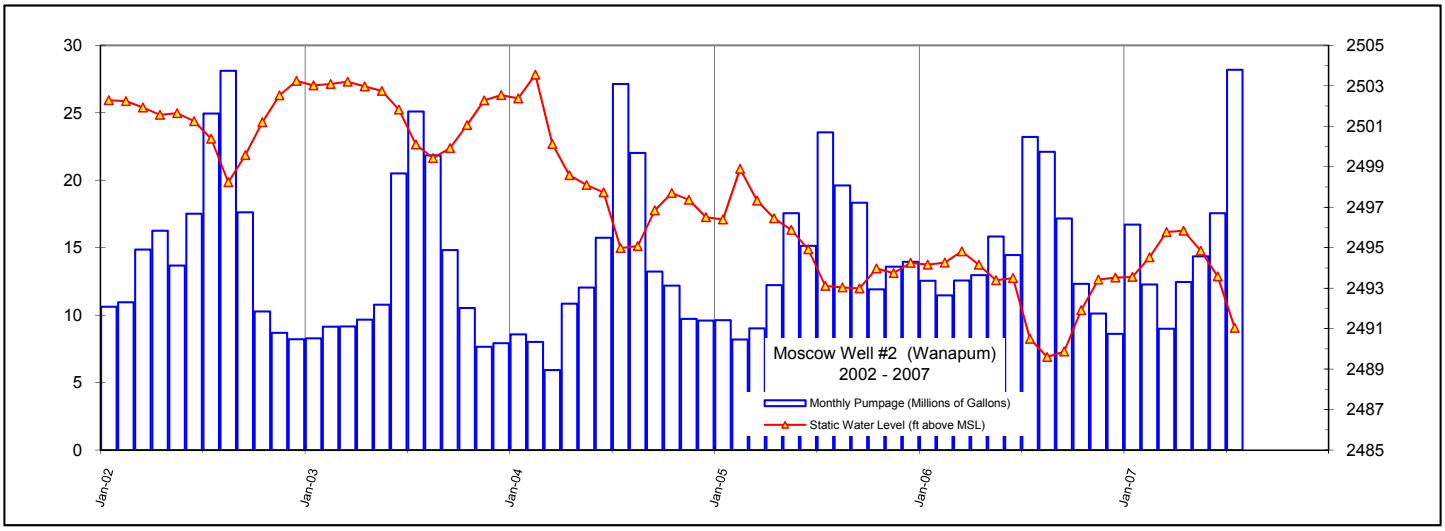


Figure 39: Moscow Well #2 (Wanapum) Water Levels

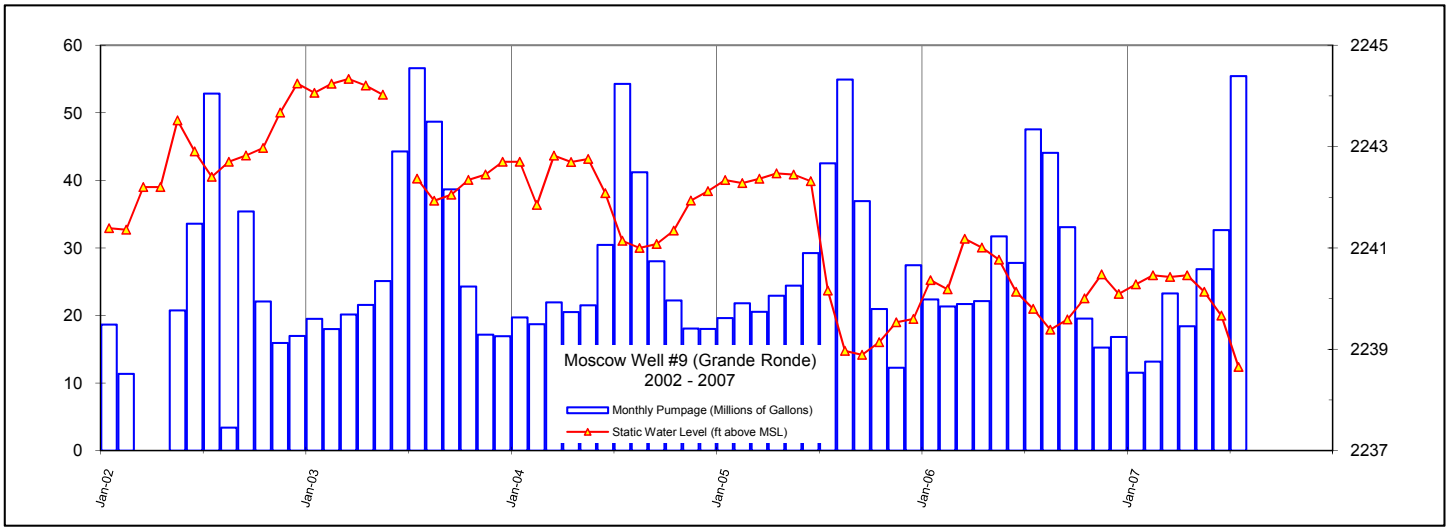


Figure 40: Moscow Well #9 (Grande Ronde) Water Levels

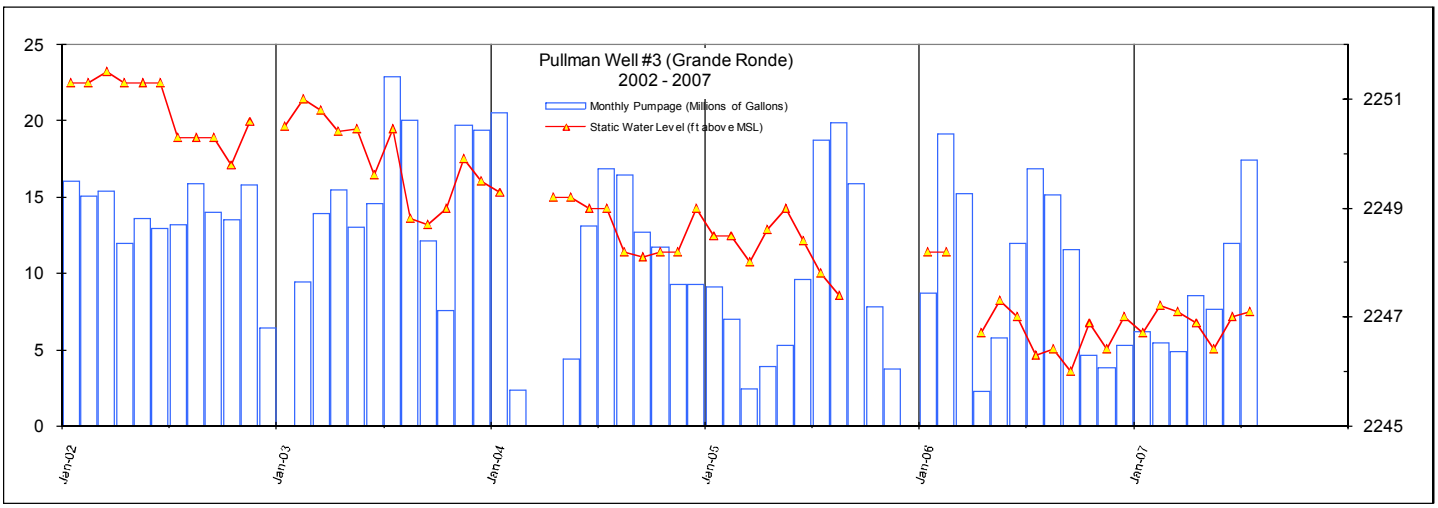


Figure 41: Pullman Well #3 (Grande Ronde) Water Levels

Water Levels 2002-2007

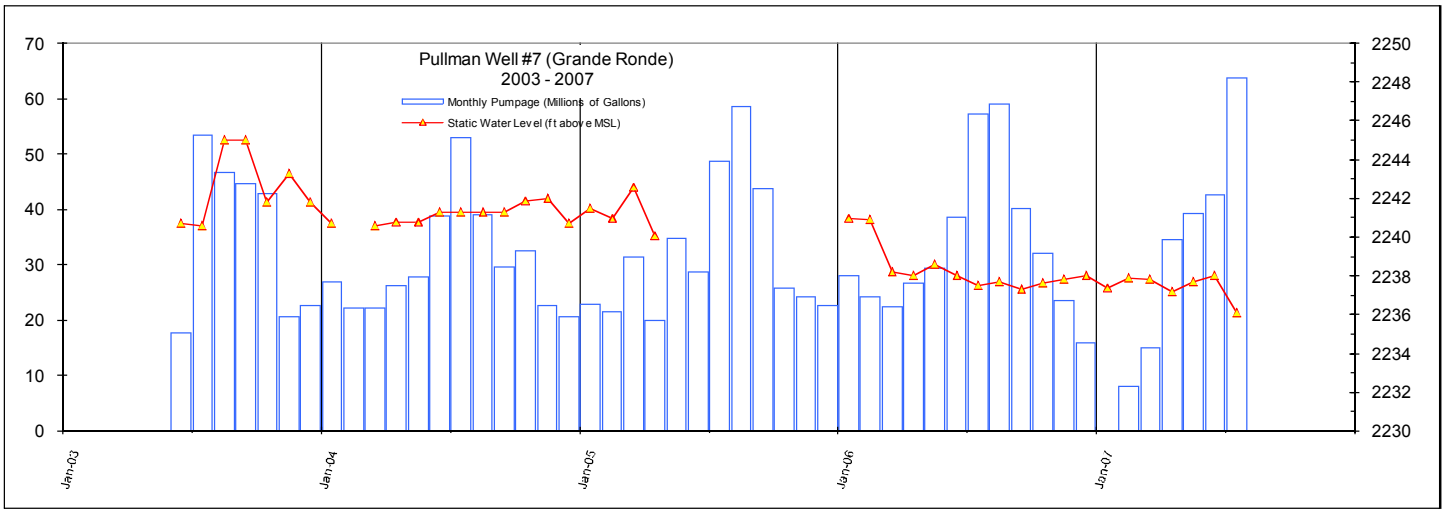


Figure 42: Pullman Well #7 (Grande Ronde) Water Levels

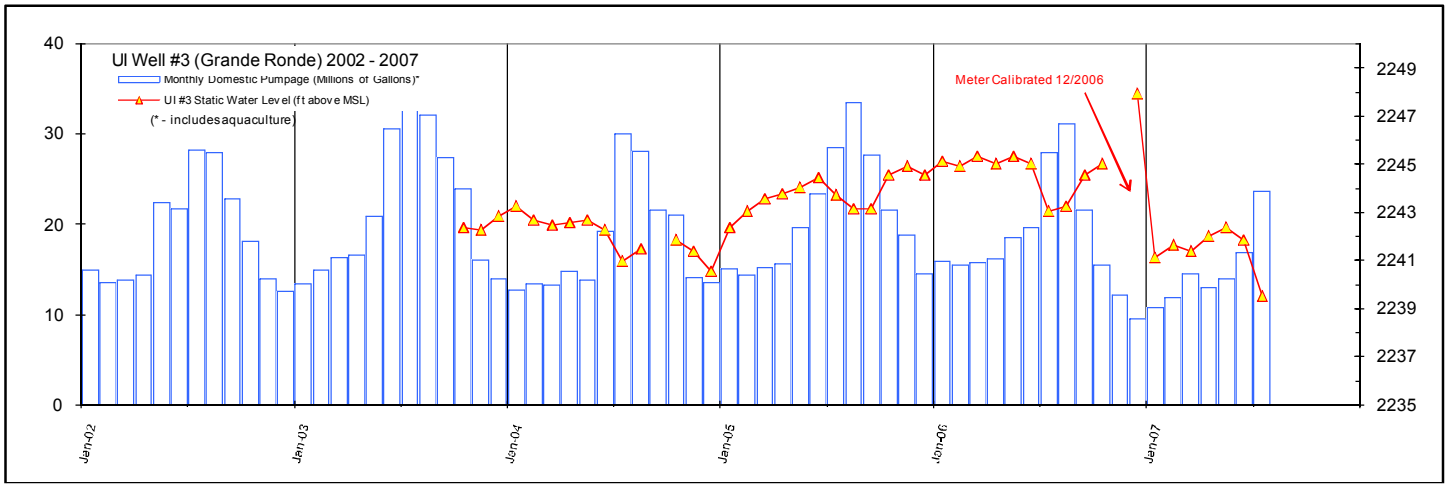


Figure 43: University of Idaho Well #3 (Grande Ronde) Water Levels

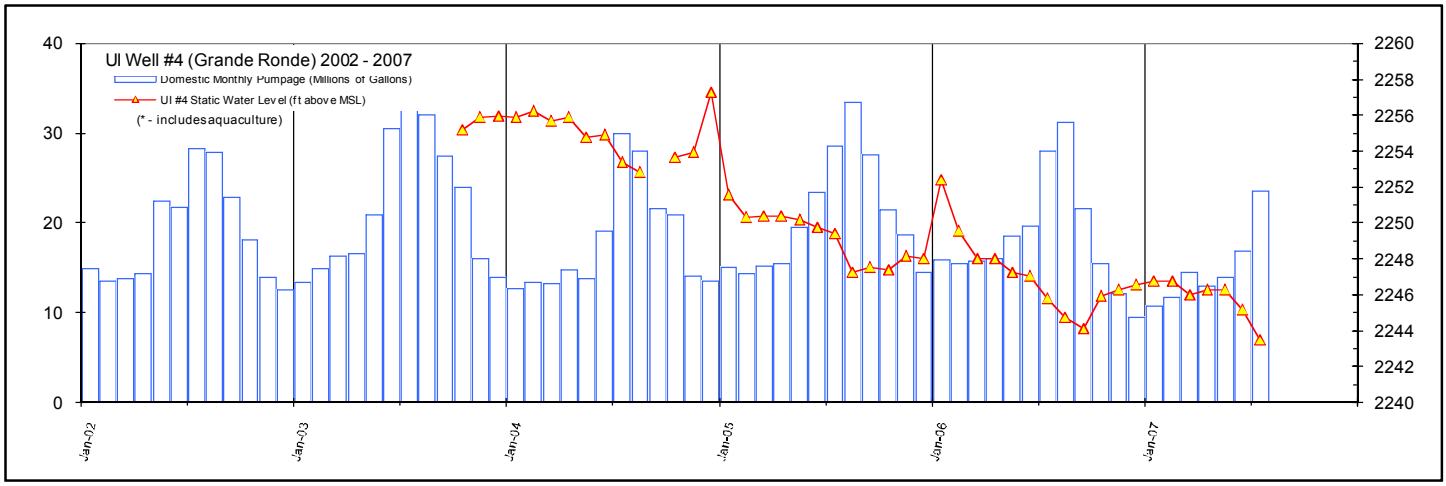
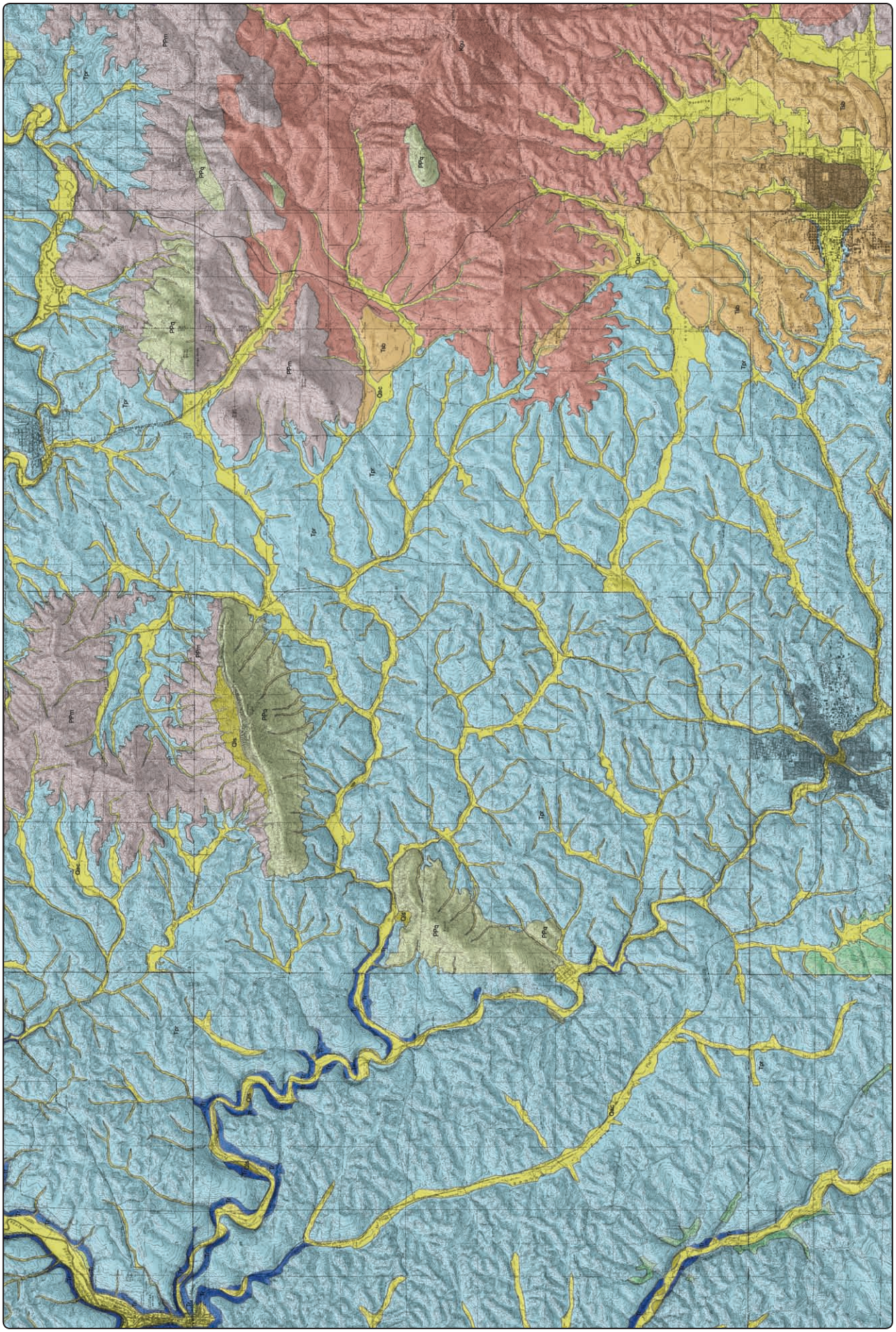


Figure 44: University of Idaho Well #4 (Grande Ronde) Water Levels



Segment of a Compiled Bedrock Geological Map of the Palouse Basin (Bush, Garwood, Hinds, Preliminary Draft, 2007)

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Installing Instrumentation Guide Tube in Monitoring Well

PBAC Mission

To ensure a long-term, quality water supply for the Palouse Basin region.

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