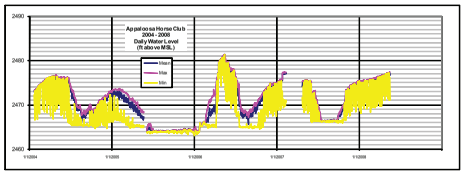
2007
Palouse Ground Water Basin
Water Use Report

Palouse Basin Aquifer Committee
September 2008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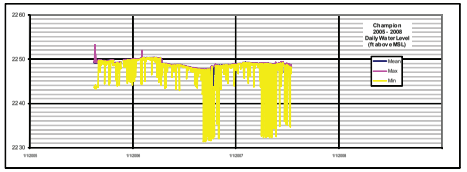
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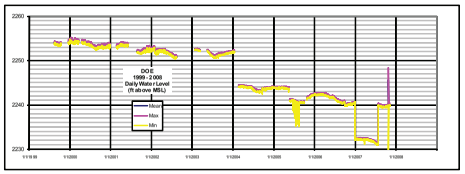
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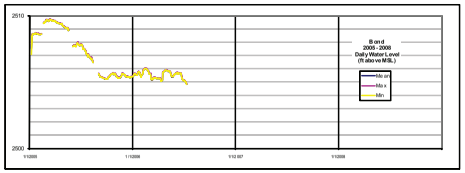
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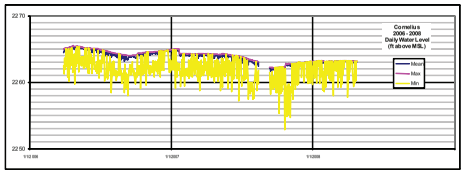
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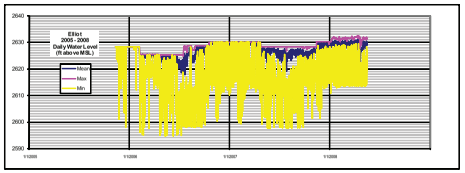
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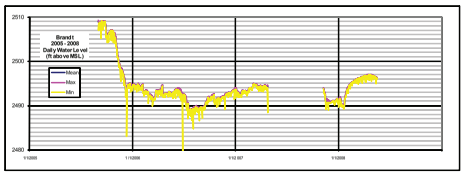
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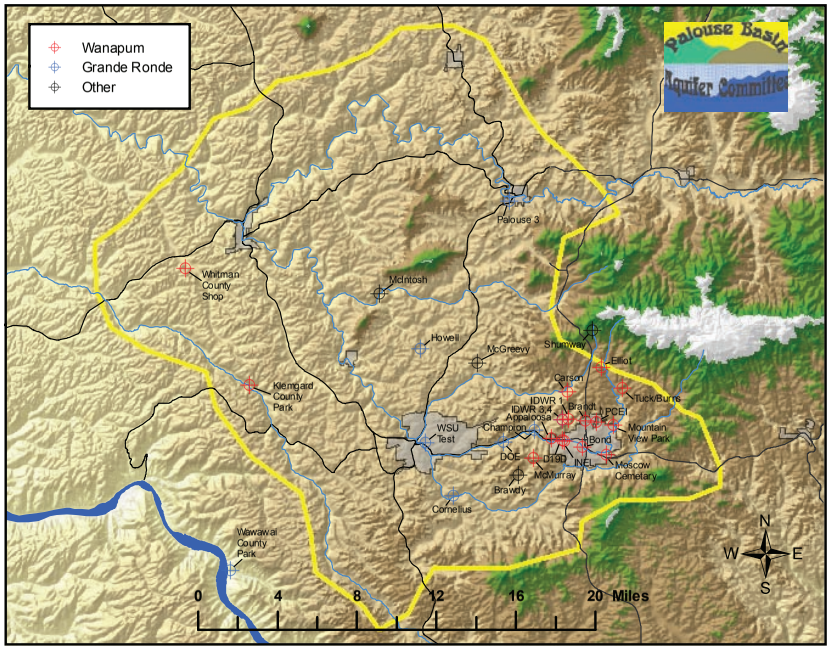
Wanapum
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Other
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Aquifer Committee
Palouse 3
Whitman
County
Shop
McIntosh
Howell
McGreevy
Shumway
Elliot
Carson
Kiemgard
County
Park
IDWR 1
IDWR 3/4
Appaloosa
Champion
Brandt
PDEL
Tuck/Burns
WSU
Test
Bond
Mountain
View Park
DOE
D190
INEL
Moscow
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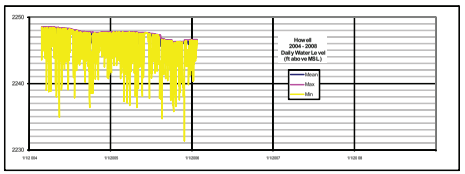
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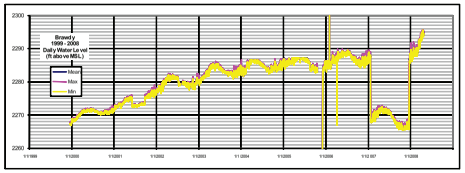
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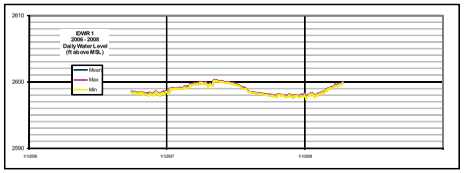
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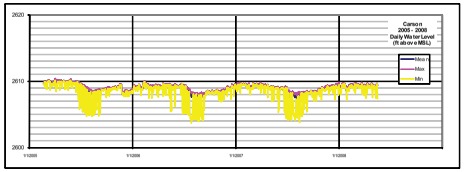
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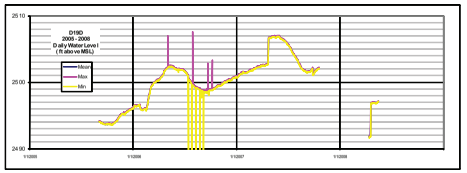
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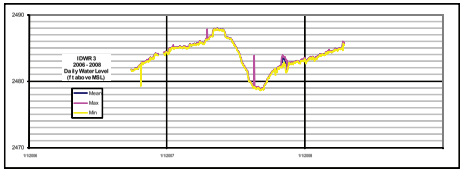
IDWR 3
2006 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
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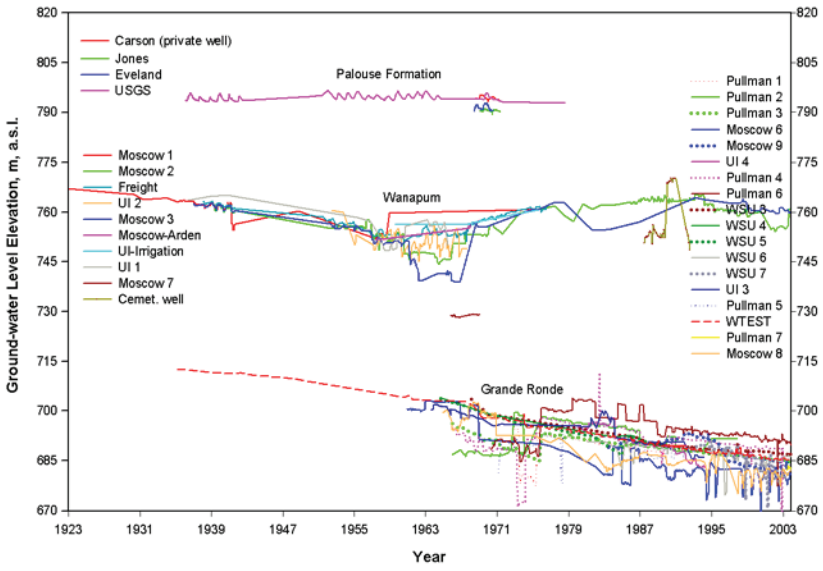

Composite Ground Water Hydrographs (Leek 2006)

Researchers investigate well near Four Mile gap

Executive Summary

Ground water is the drinking water supply for the nearly 58,000 residents of Whitman County (Washington) and Latah County (Idaho) 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 2007.

The 2007 total combined ground water pumpage by the primary pumping entities within the Basin was 2.77 billion gallons (Figure 1). In aggregate (Pullman, Moscow, WSU, UI, Colfax, Palouse), pumping for 2007 was approximately 2% less than in 2006 and 10% less than in 1992, the first year the Ground Water Management Plan took effect.

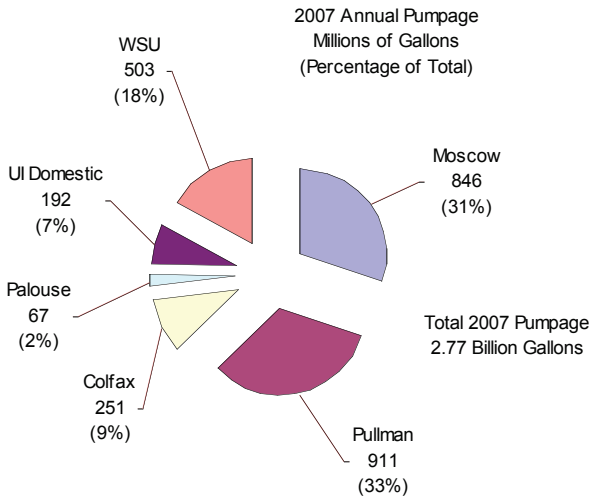

Figure 1: 2007 Ground Water Pumpage

Water level data from production wells for 2007 reveal no consistent trend, with some wells experiencing a decline in static water level and others remaining relatively stable. Four wells constructed north of Moscow in late 2006 have been instrumented and are collecting monitoring information that will be of use in the future.

Robinson Lake Spillway

In 2007, PBAC sponsored several research projects. Activities included continuation of shallow and deep aquifer monitoring and testing projects and a study of a standby well at the University of Idaho.

The foundation of the 1992 Ground Water Management Plan consists of a set of goals. As of 2007, 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.

Annual Water Use Report

The report that follows includes water use and level information for the period from 1992 through 2007. In an attempt to provide up to date information where possible, in some instances data are included for portions of 2008. Water use reports for earlier years can be viewed at the PBAC web site ***www.uidaho.edu/PBAC***.

Winter thistle below Moscow Mountain

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.

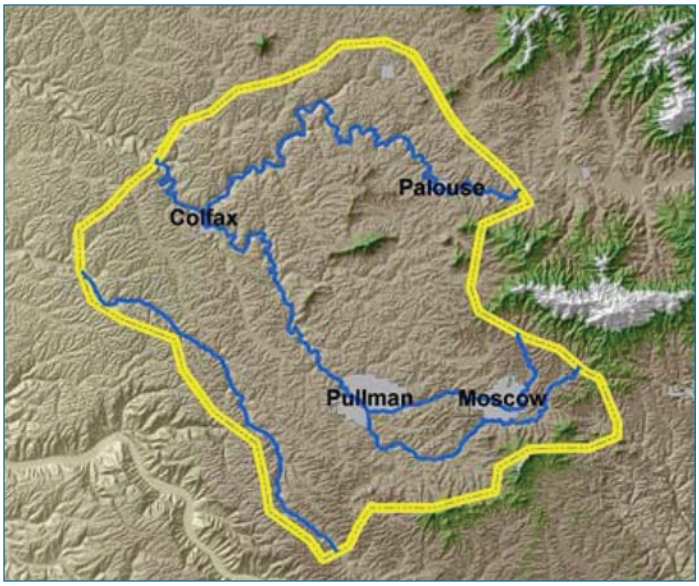

Figure 2: Working boundary for the Palouse Ground Water Basin

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 that occurred 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 east-west cross section of the Basin is shown in Figure 3.

Paradise Ridge with SF Palouse in foreground

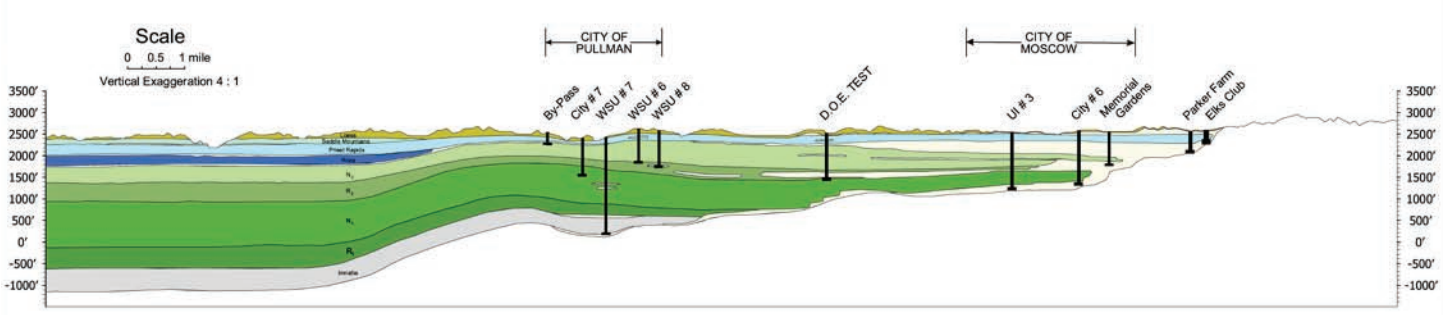

Figure 3: E-W Schematic Cross Section (Bush, Garwood)

The primary municipal drinking water source in the Basin is the Grande Ronde aquifer system. In Pullman, all of the municipal and many 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 between 1 and 2 feet per year for 70 or more years (Figure 4). Water levels in the Wanapum dropped drastically in the 1950s and early '60s, but recovered in the 1970s and '80s when much of the pumping switched to the deeper Grand Ronde (Figure 5). 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.

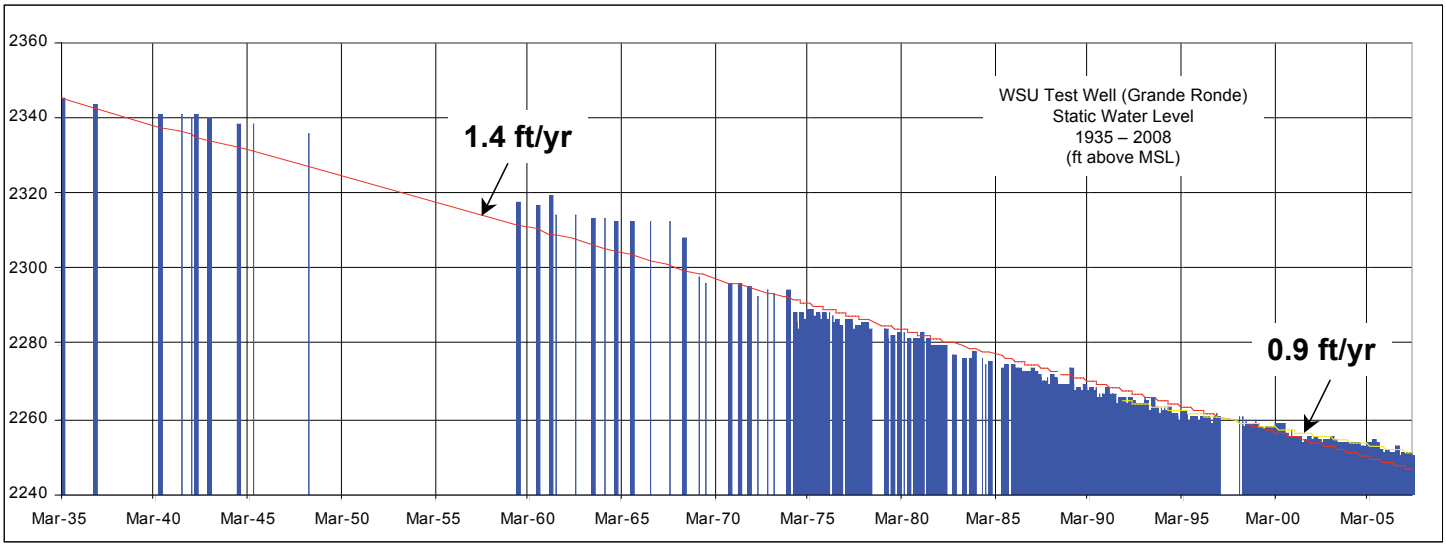

Figure 4: Static Water Level, WSU Test Well, 1938-2008

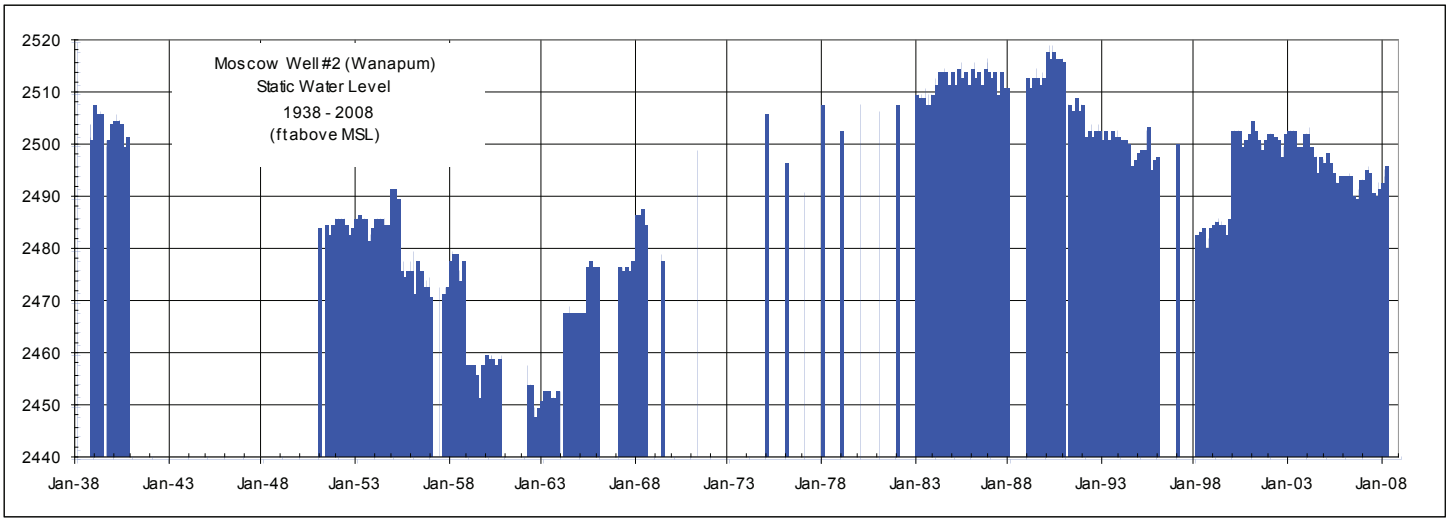

Figure 5: Static Water Elevation, Moscow Well #2, 1938-2008

Ground Water Pumpage and Water Levels

The total combined ground water pumpage by the four cities and two universities for the year 2007 was 2.77 billion gallons (Figure 6). In aggregate, this was approximately 2.2% less than was pumped in 2006 (2.83 billion gallons), and 10.3% less than was pumped in 1992 (3.09 billion gallons), the first year the Ground Water Management Plan took effect.

By entity, comparisons to 2006 pumping are shown in Figure 7.

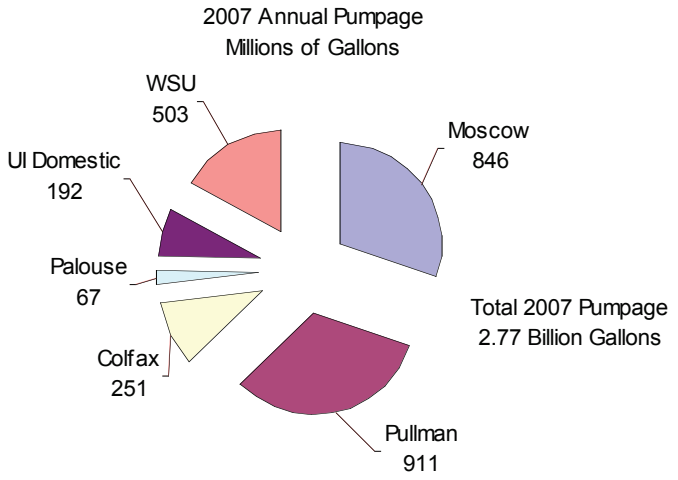

Figure 6: Ground Water Pumpage – 2007

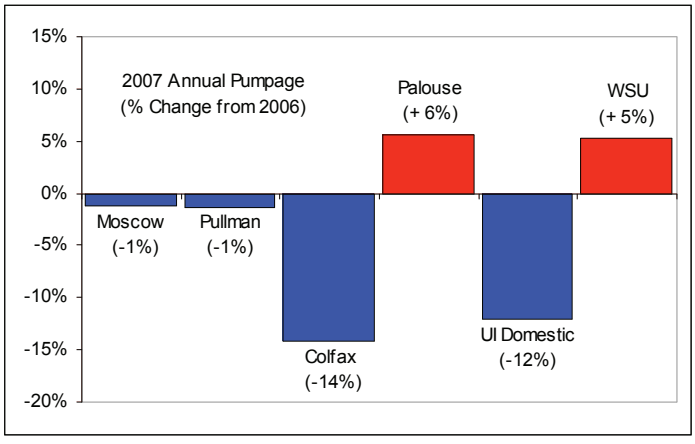

Figure 7: 2007 Pumpage - Change from 2006

In 2007, Pullman and Moscow each pumped approximately 1/3 of the total (33% and 31%) followed by WSU at 18%. Colfax and UI pumped 9% and 7%, respectively, and Palouse pumping accounted for just over 2% of the combined pumping total.

Moscow pumped nearly 28% (234 million gallons) of its water from the Wanapum aquifer system in 2007; the other pumping entities all pump solely from the Grande Ronde. Of the combined pumping total, the Moscow Wanapum contribution amounts to approximately 8.3%.

Pumping increases significantly in the summer months, primarily due to increased irrigation demand. For 2007, an estimate of the baseline pumping was calculated as the average of the pumping levels for the months of 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 28.5% for Moscow to 38.4% for WSU (Figure 8). (Note: The UI non-baseline use is presented both with and without inclusion of the 93 million gallons of reclaimed water utilized in 2007)

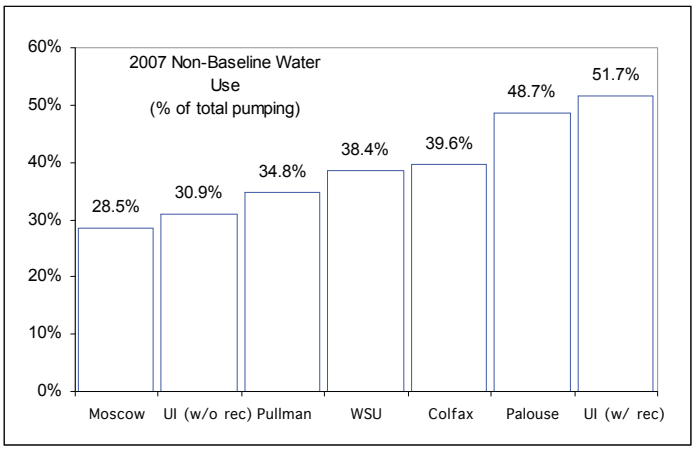

Figure 8: Non-Baseline Water Use – 2007

Non-baseline usage varies with the weather conditions experienced during the year. In aggregate, the 2007 and early 2008 irrigation season was cooler and drier than the five year average, as illustrated in Figures 9-11. Charts of monthly pumping compared to the 2002-2006 averages are shown in Figures 12-16.

Paradise Creek in late February

Paradise Creek in late May

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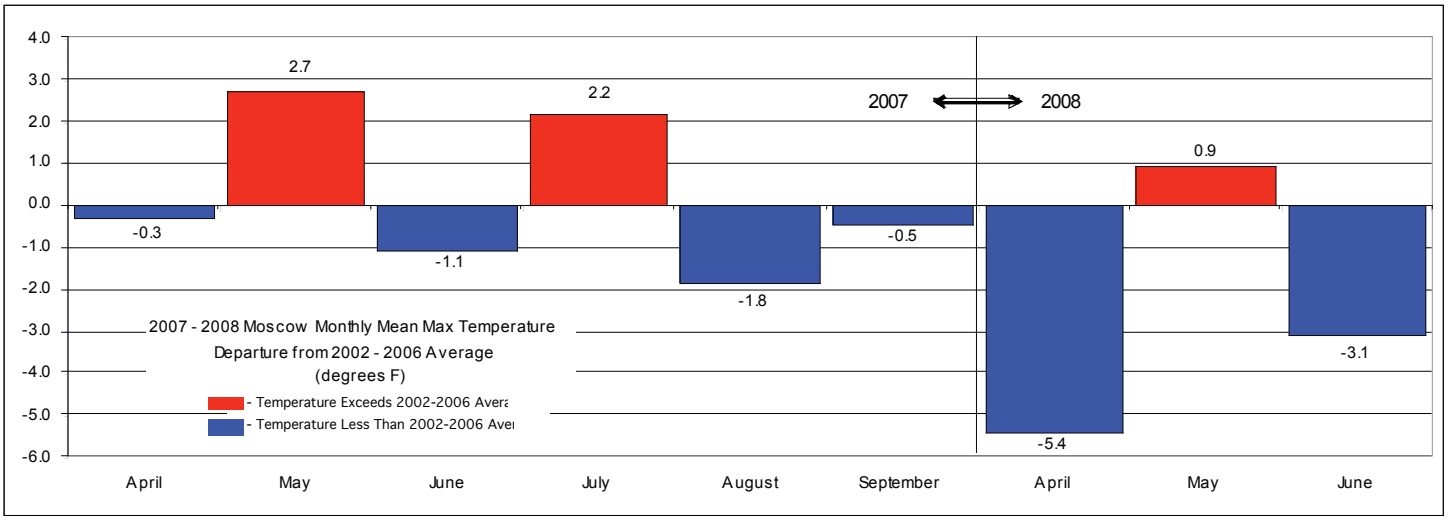

Figure 9: Spring and Summer Maximum Mean Temperature, Moscow, 2007-2008

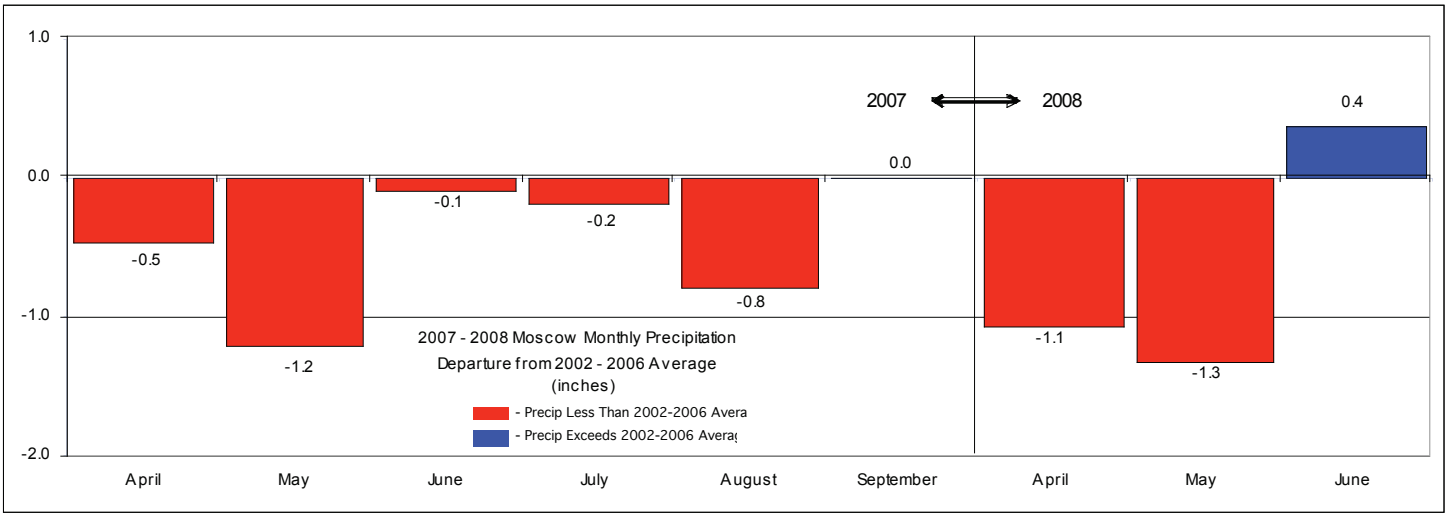

Figure 10: Spring and Summer Precipitation, Moscow, 2007-2008

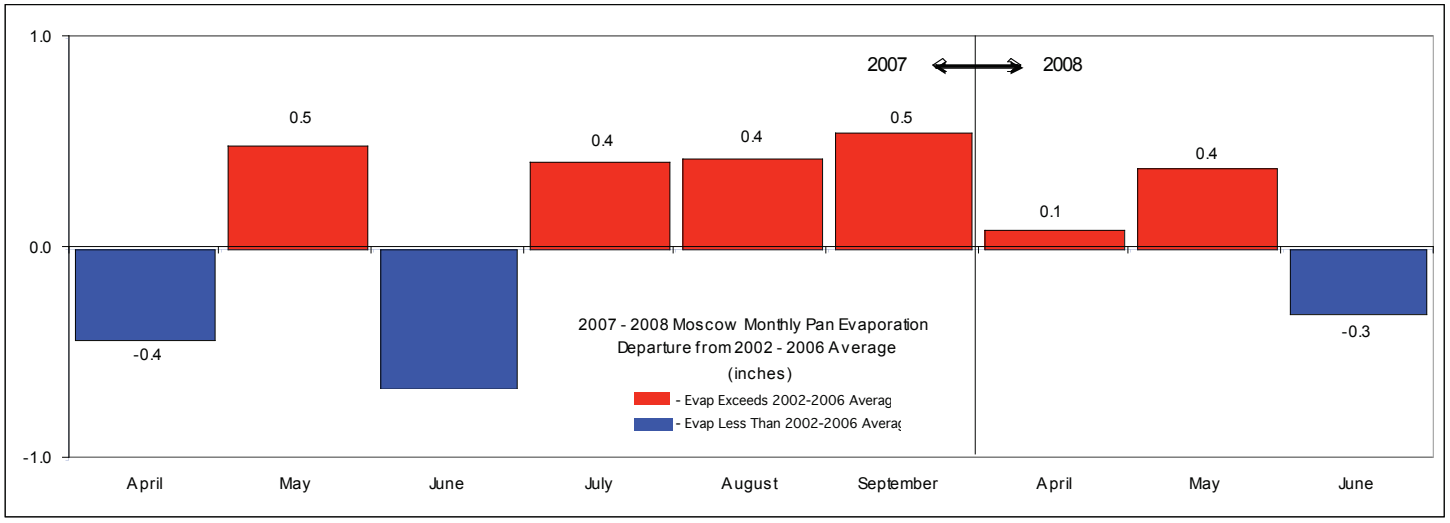

Figure 11: Spring and Summer Pan Evaporation, Moscow, 2007-2008

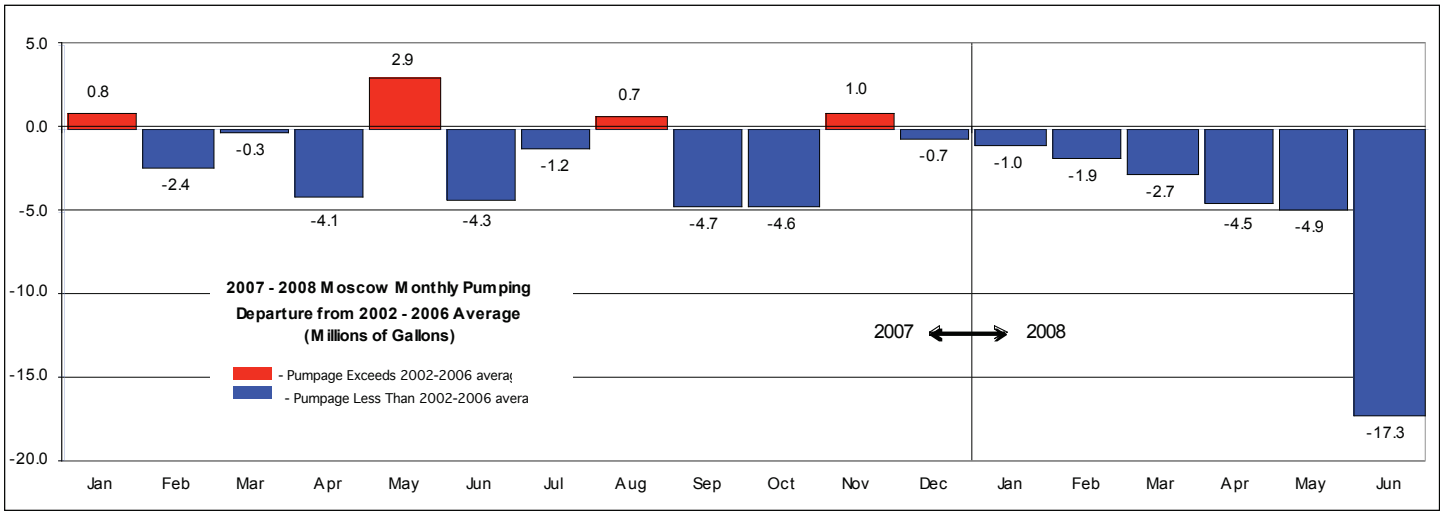

Figure 12: Moscow Monthly Pumping, Departure from 5-year Average, 2007-2008

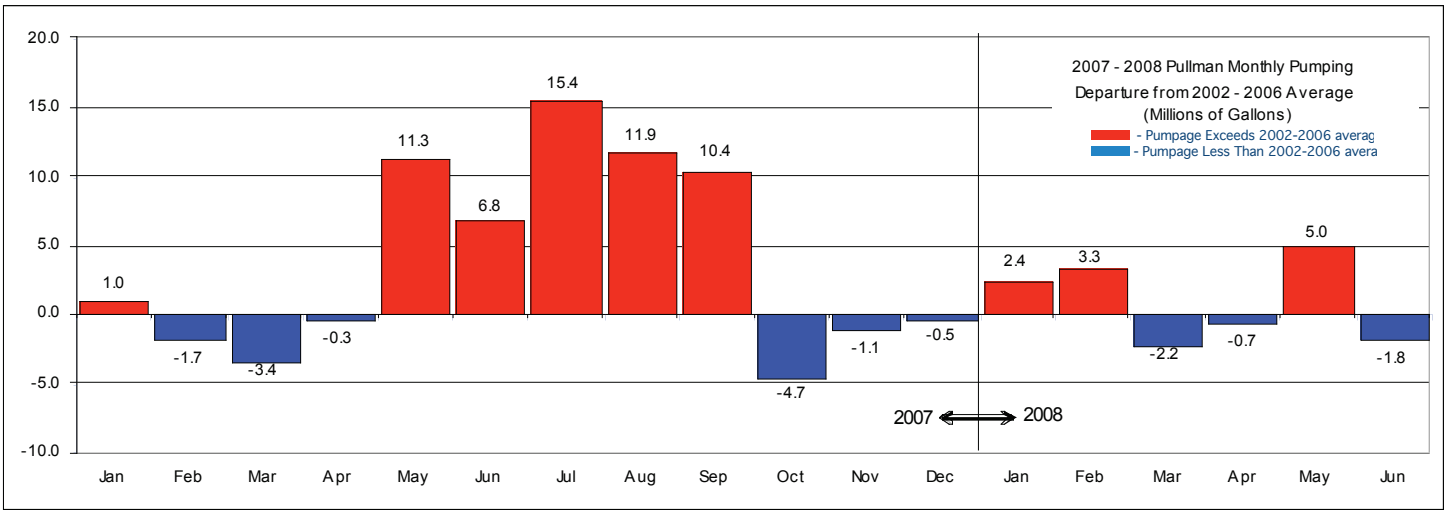

Figure 13: Pullman Monthly Pumping, Departure from 5-year Average, 2007-2008

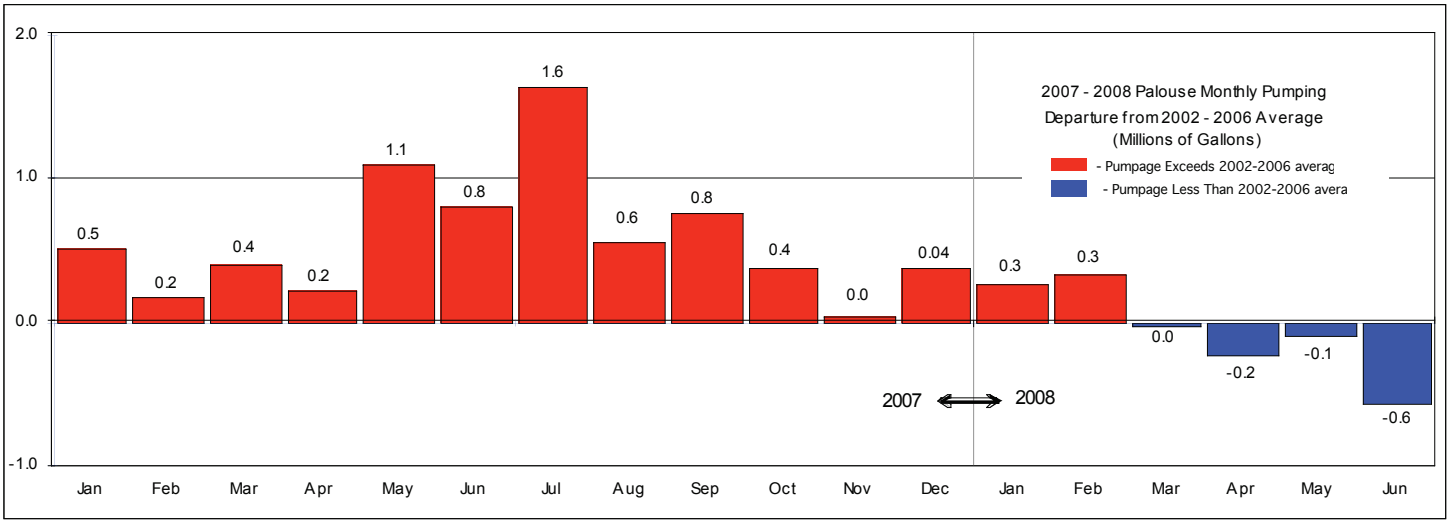

Figure 14: Palouse Monthly Pumping from 5-year Average, 2007-2008

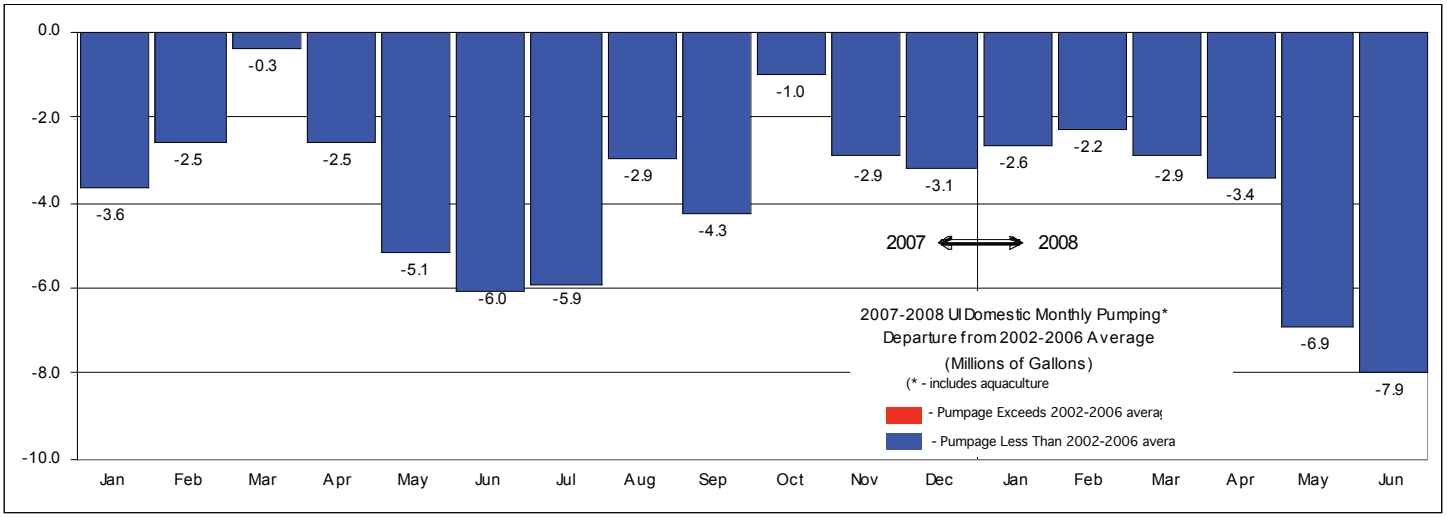

Figure 15: University of Idaho Monthly Pumping, Departure from 5-year Average, 2007-2008

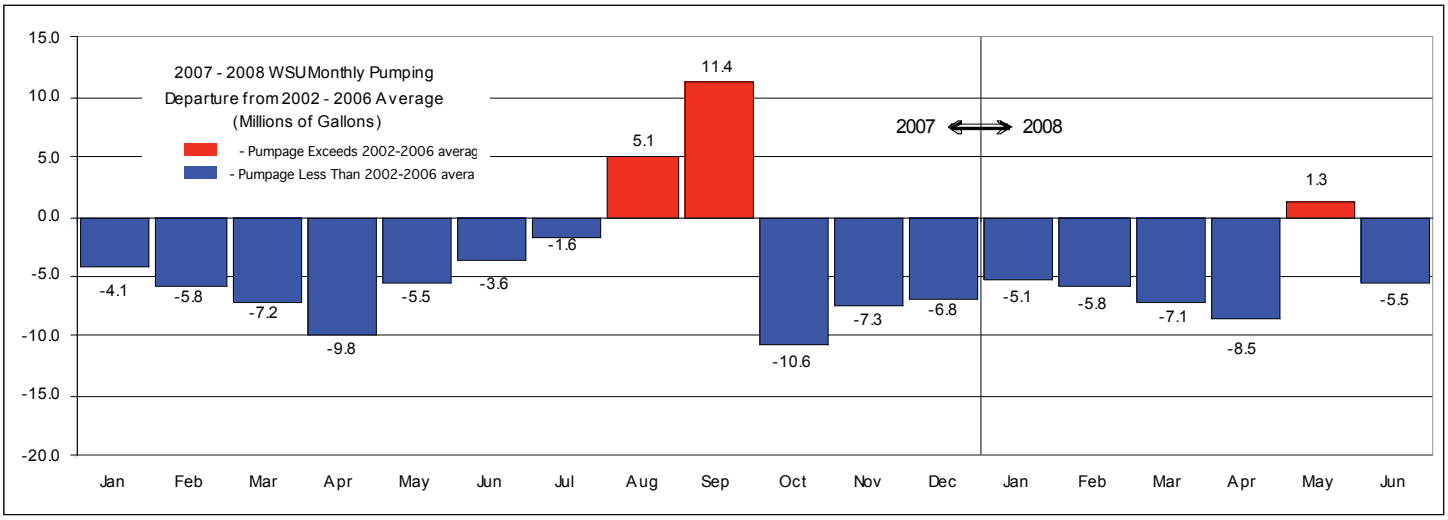

Figure 16: WSU Monthly Pumping, Departure from 5-year Average, 2007-2008

Monthly pumping figures for the four cities and two universities for the period between 2003 and mid-2008 are shown in Figures 27-32 and annual pumping figures for the period between 1992 and 2007 are illustrated in Figures 33-38.

As part of the Ground Water Management Plan, each pumping entity has agreed to voluntary pumping targets. Pullman, Moscow, and the universities agreed to attempt to limit annual pumping increases to 1% of the 1986-1990 average pumping level. In addition, the cities and universities agreed to keep total pumping below 125% of the 1981-1985 average pumping level. An aggregation of the pumping targets for the four major entities is shown in Figures 17 and 18. The 1% and 125% targets for each of the major entities 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 are not subject to the pumping targets.

Water level data for the year 2007 show no consistent basin-wide 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 in the monitoring wells during the reporting period. The combination of these factors makes it difficult to provide any generalized conclusions as to the aquifer water level trends at this time.

In the Grande Ronde aquifer, the WSU Test and IDWR4 monitoring wells appear to have declined by somewhat less than a foot during 2007 (Figures 39 and 40). In the Wanapum aquifer, the static level in the IDWR2 monitoring well varies seasonally but appears to have returned to similar levels at corresponding times each year (Figure 41). Water level and pumping charts for three production wells in the Basin are shown in Figures 42-44. Additional charts of historical water levels for many of the Basin monitoring wells are presented on the inside front and back covers of this report.

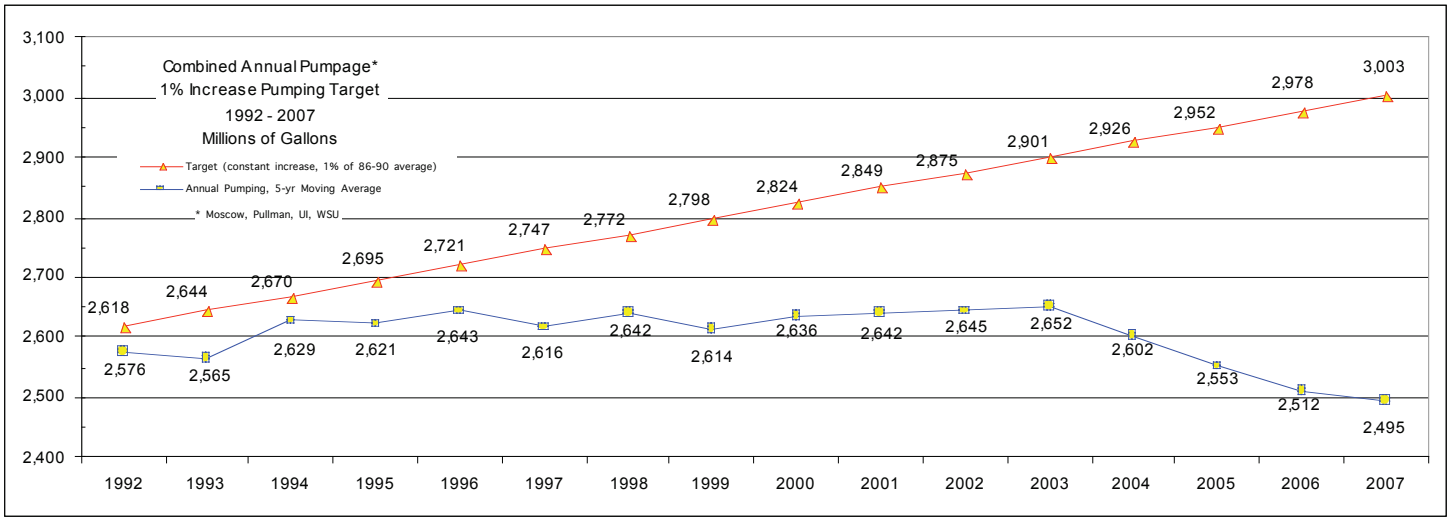

Figure 17: Voluntary 1% Annual Increase Target, 4 Major Entities Combined, 2007

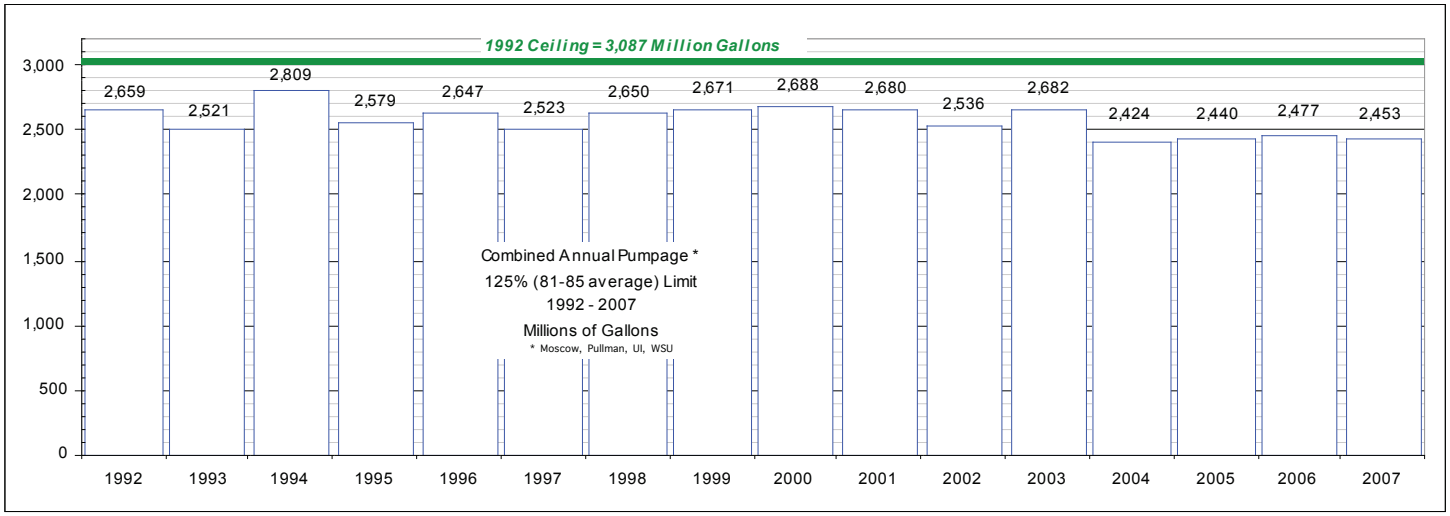

Figure 18: Voluntary 125% (of 1981-85 average) Pumping Target, 4 Major Entities Combined

Research Accomplishments 2007

Two PBAC research projects reported results during the second half of 2007 and early 2008.

Chad Opatz (UI) reported his Masters project work involving an evaluation of the impact of cleaning and rehabilitation of UI's Well 2 upon the (Wanapum) ground water system in Moscow. Chad monitored water levels and temperature in the surface and shallow ground water systems before, during, and after the cleaning of a well that had become partially filled with sediment. He noted that an observed water level rise in wells at the UI Ground Water Field Laboratory (UIGWFL) was coincident with the well cleaning, but also with a period of high flows in Paradise Creek. He concluded that the observations strongly suggest that the Wanapum systems in the vicinity of the UIGWFL are recharged during high flow events in the creek.

Hannah Hernandez (UI) also reported Masters work on the Wanapum system. Hannah monitored water levels and temperature in a network of wells in the Moscow area, and conducted several aquifer pump tests at the UIGWFL. The tests indicate that (in this area) the shallow sediments respond immediately to pumping in the underlying Wanapum basalts. Water levels stabilized after a period of pumping, indicating that water was potentially being supplied to the system from Paradise Creek.

Goals, Plans and Ongoing Efforts of the Committee

Spring Tamarack

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 2008 plans to continue funding shallow and deep aquifer monitoring and testing projects, and is pursuing funding of several additional projects through the Washington WRIA 34 watershed planning unit.

The Citizens Advisory Group (CAG), aimed at ensuring dialogue among a broad range of interested parties, continued its work on recommendations for consideration by PBAC involving management, research, conservation and public participation. In 2007 the CAG focused much of its work in the area of conservation.

PBAC members continue to collaborate with the WRIA 34 Watershed Planning Unit. The WRIA 34 watershed plan was adopted in the fall of 2007, and in 2008 the group will develop a detailed implementation plan to guide future activities.

In early 2007 a new interdisciplinary graduate water resources program (WoW – Waters of the West) was approved at the University of Idaho. In the fall, PBAC began working with WoW researchers in an effort to develop a system dynamics model of the basin that can be used as an aid in future management decisions.

In 2007, PBAC participated in the third Palouse Water Summit. The Summit continued its focus on local water resource issues, and featured a variety of presentations and panel discussions related to the Basin's common ground water resource. PBAC will support and participate in the fourth Summit, scheduled for October 2008.

Crumarine Creek below headwaters

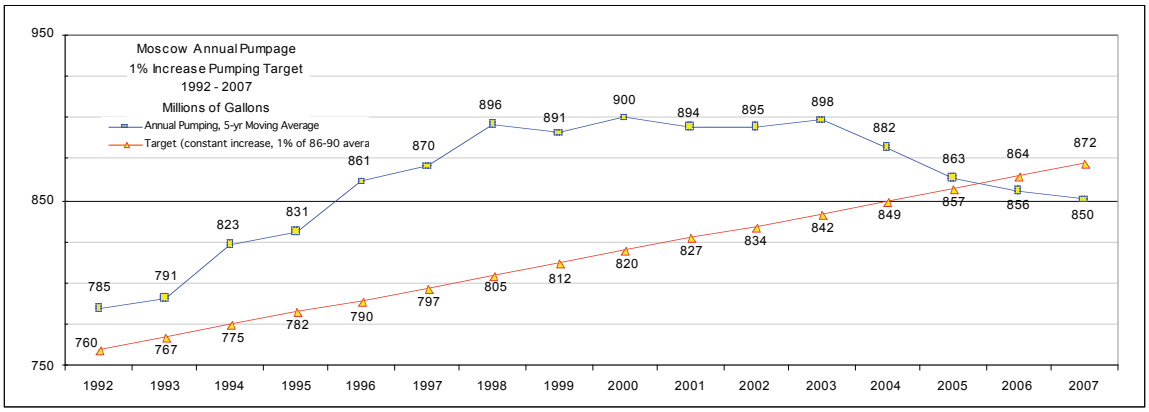

Figure 19: 1% Annual Increase Target, Moscow, 2007

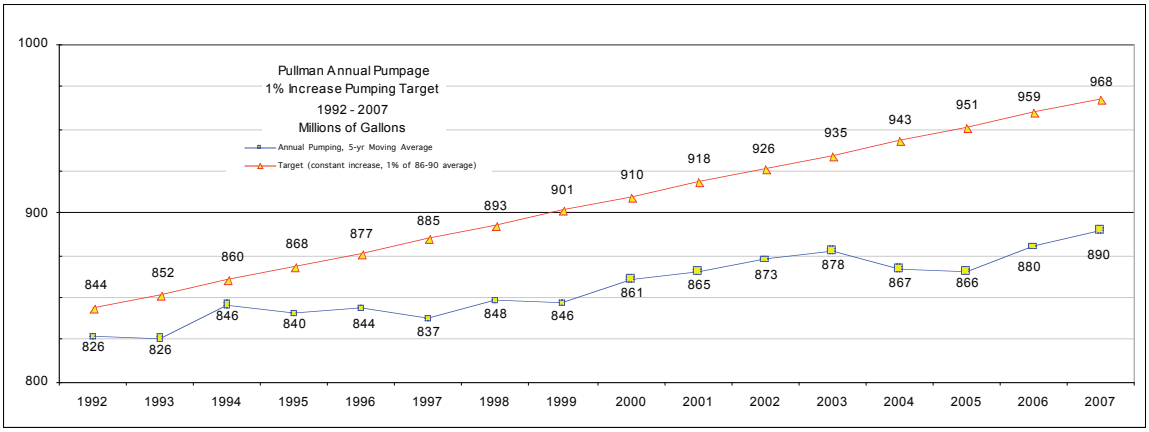

Figure 20: 1% Annual Increase Target, Pullman, 1992-2007

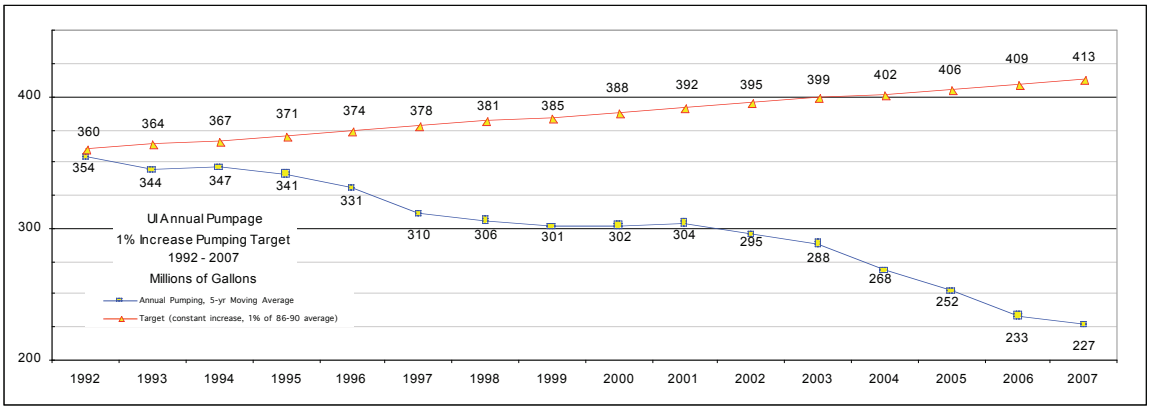

Figure 21: 1% Annual Increase Target, University of Idaho, 1992-2007

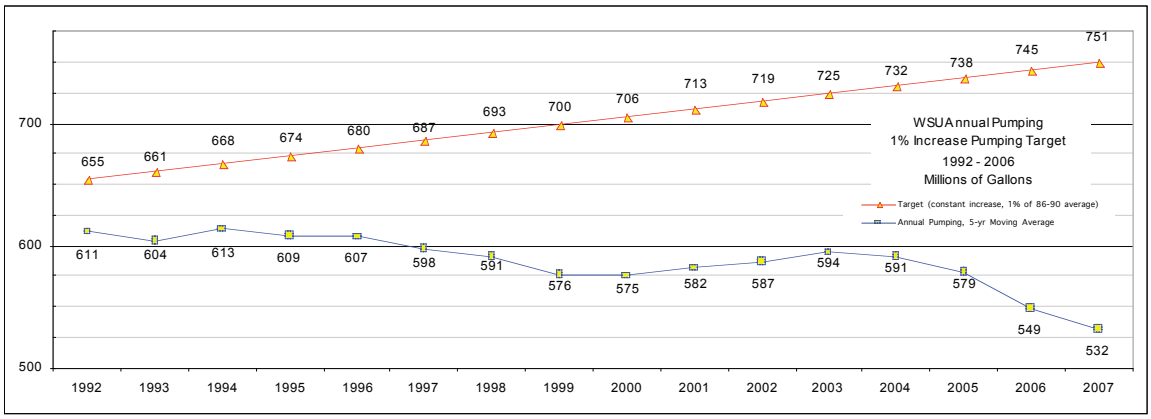

Figure 22: 1% Annual Increase Target, WSU, 1992-2007

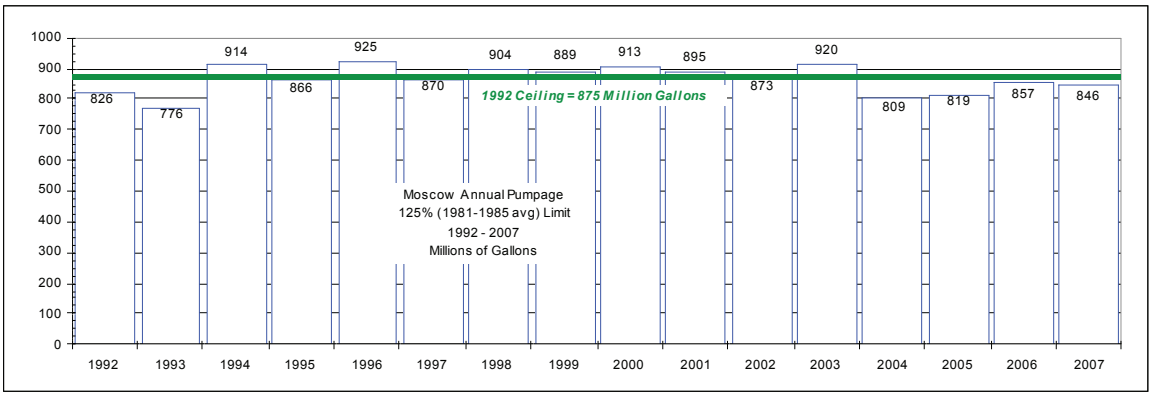

Figure 23: 125% (of 1981-85 Average) Ceiling Target, Moscow, 1992-2007

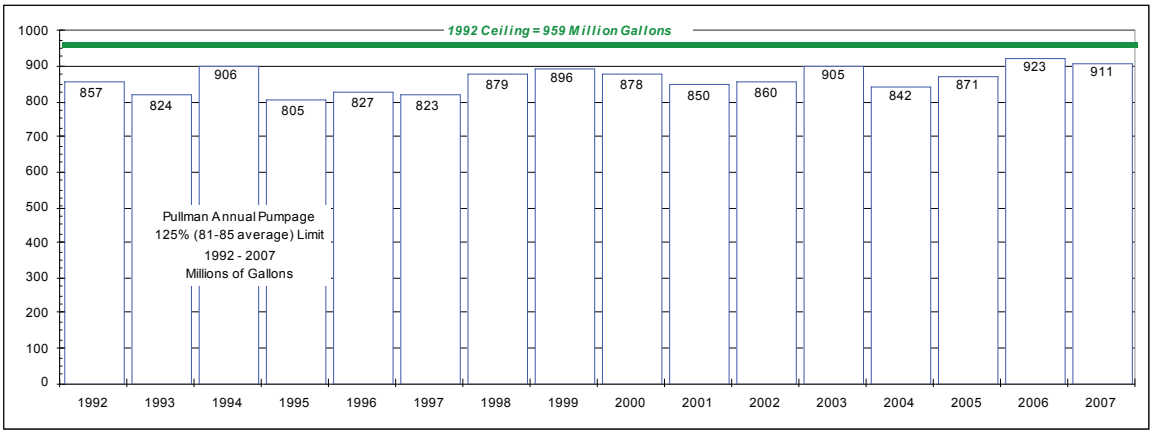

Figure 24: 125% (of 1981-85 Average) Ceiling Target, Pullman, 1992-2007

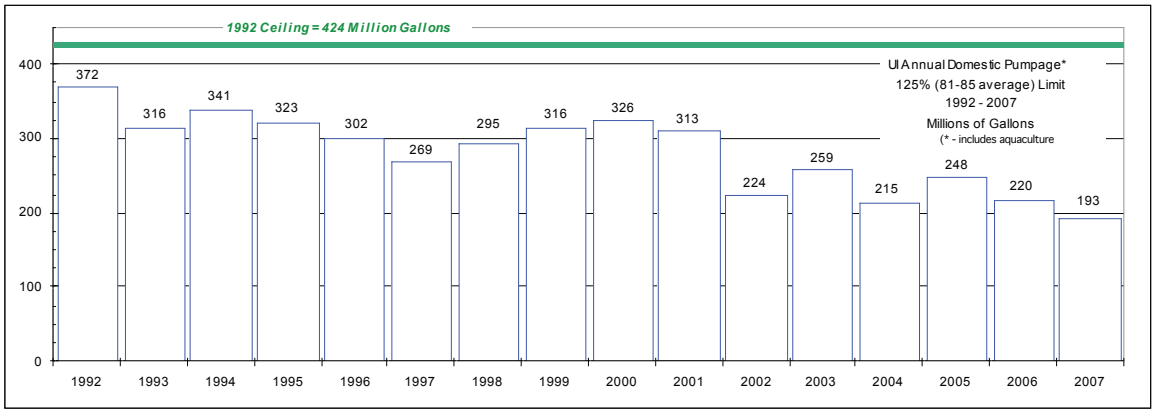

Figure 25: 125% (of 1981-85 Average) Ceiling Target, University of Idaho, 1992-2007

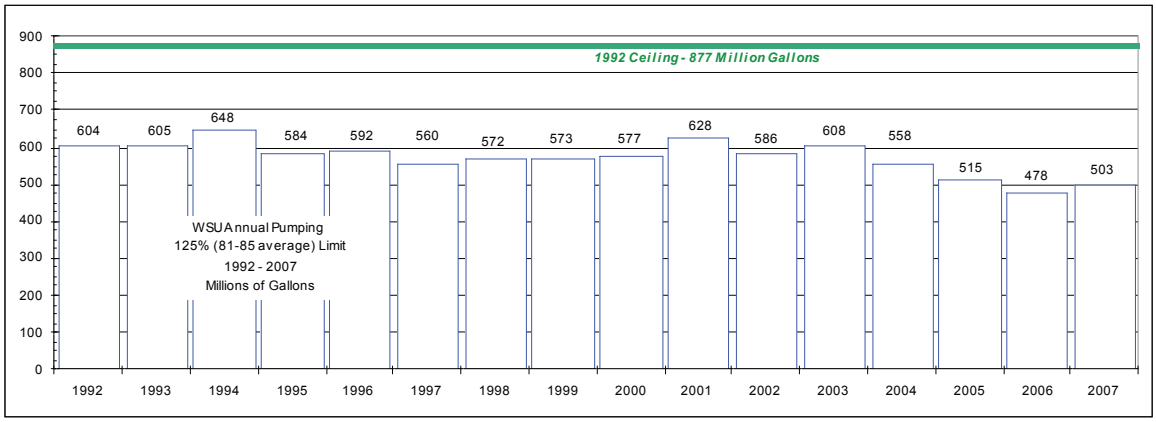

Figure 26: 125% (of 1981-85 Average) Ceiling Target, WSU, 1992-2007

Monthly Pumping Totals 2003-2008

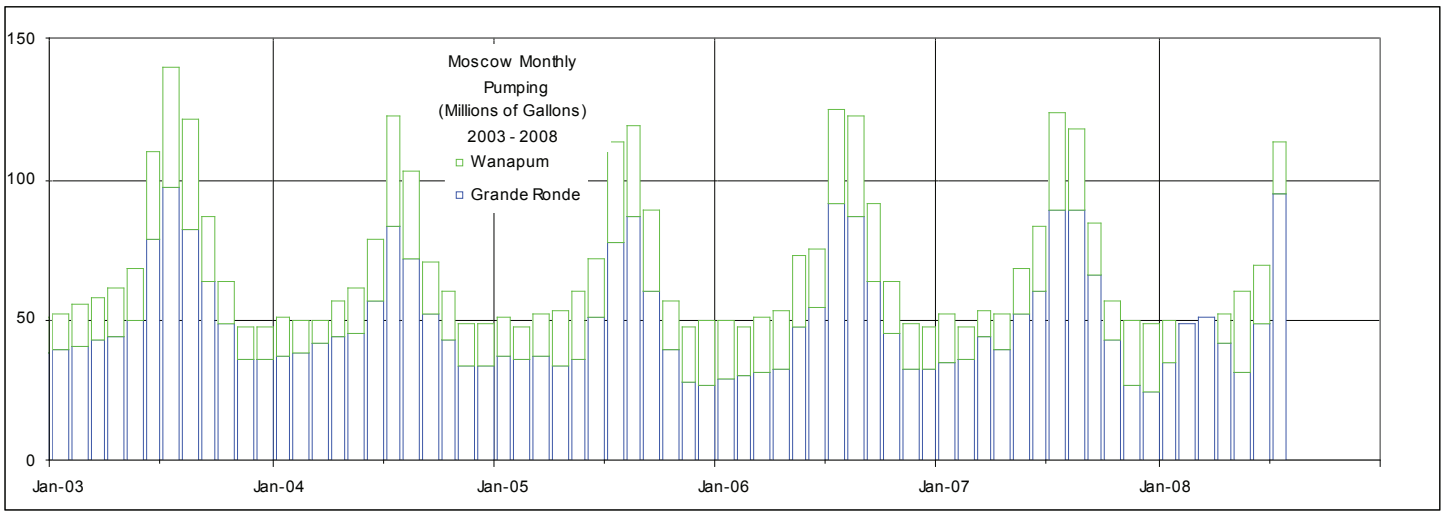

Figure 27: Monthly Pumping, Moscow, 2003-2008

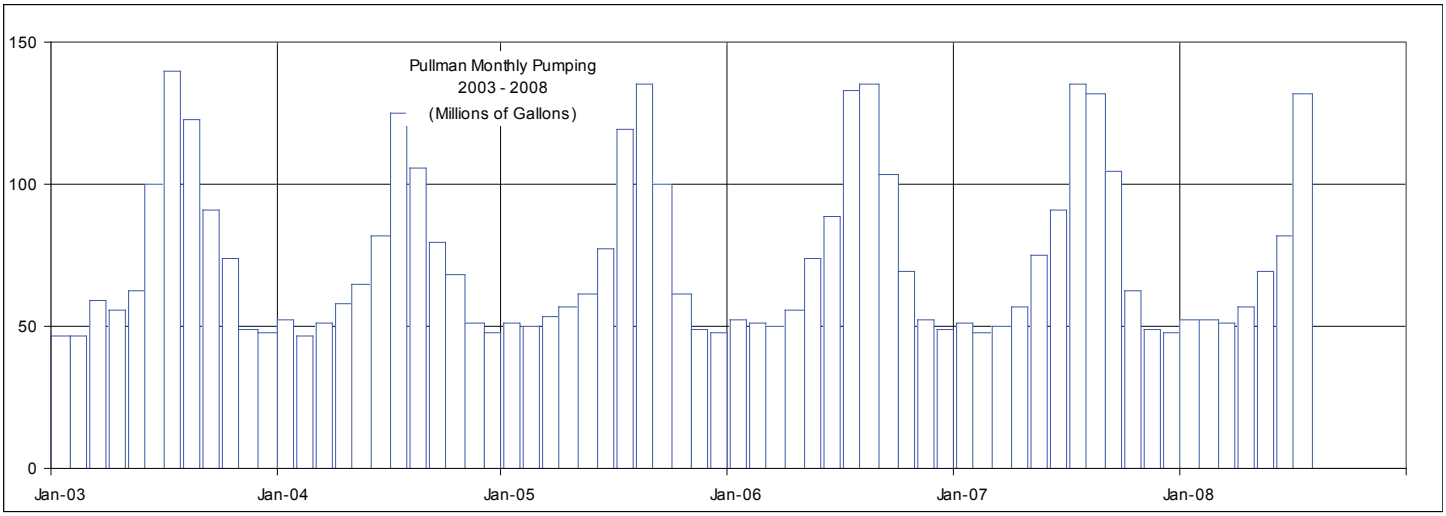

Figure 28: Monthly Pumping, Pullman, 2003-2008

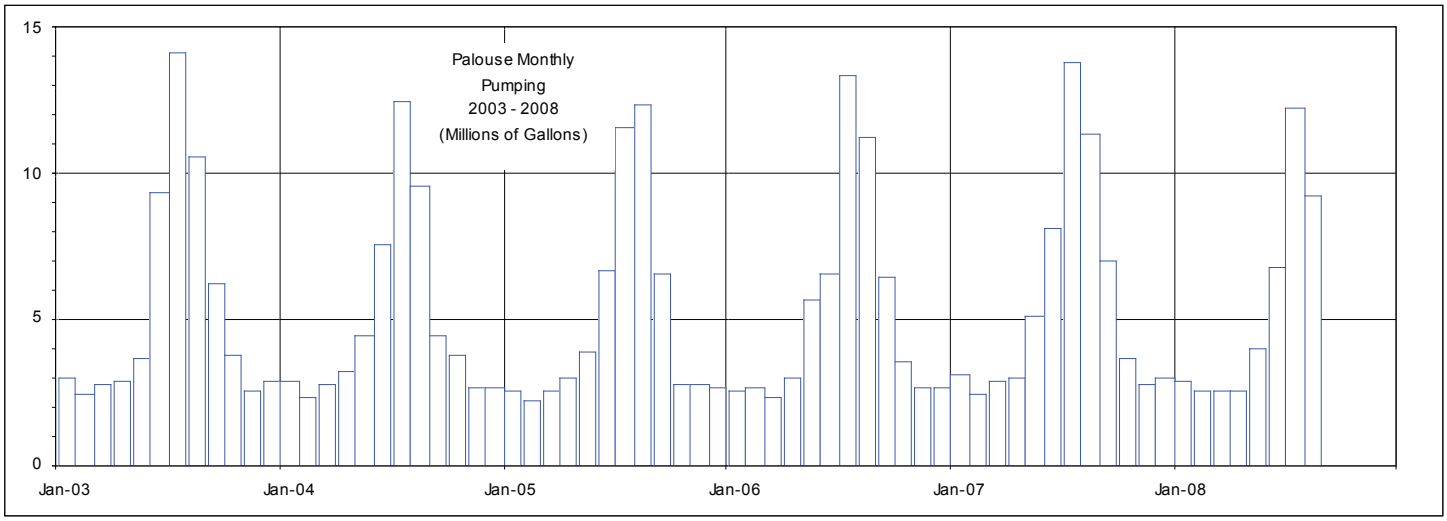

Figure 29: Monthly Pumping, Palouse, 2003-2008

Monthly Pumping Totals 2003-2008

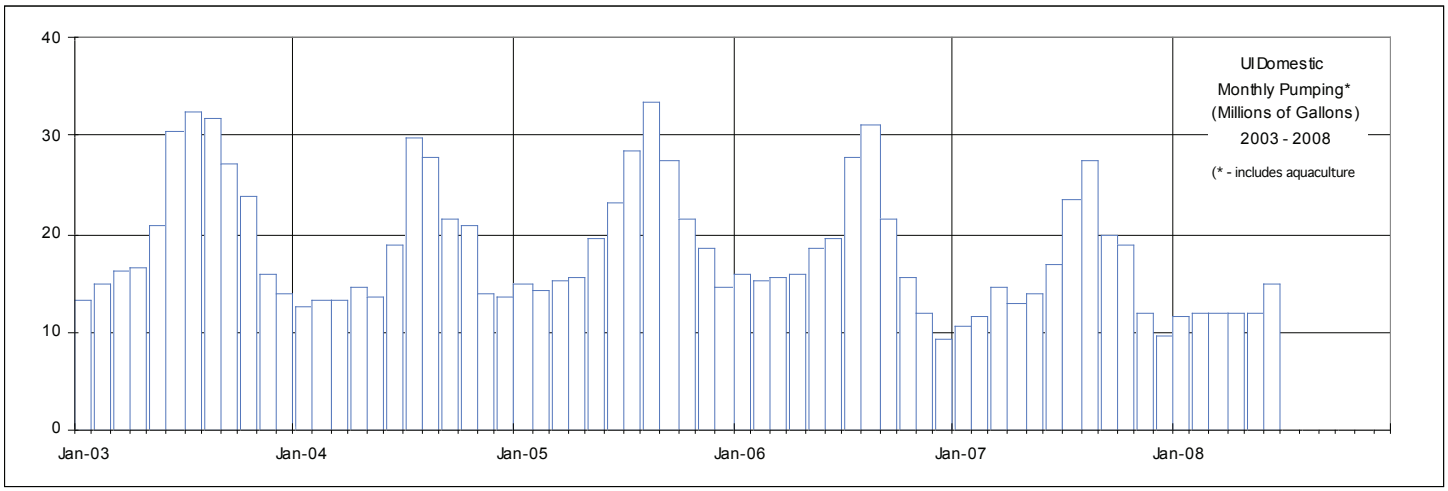

Figure 30: Monthly Pumping, University of Idaho, 2003-2008

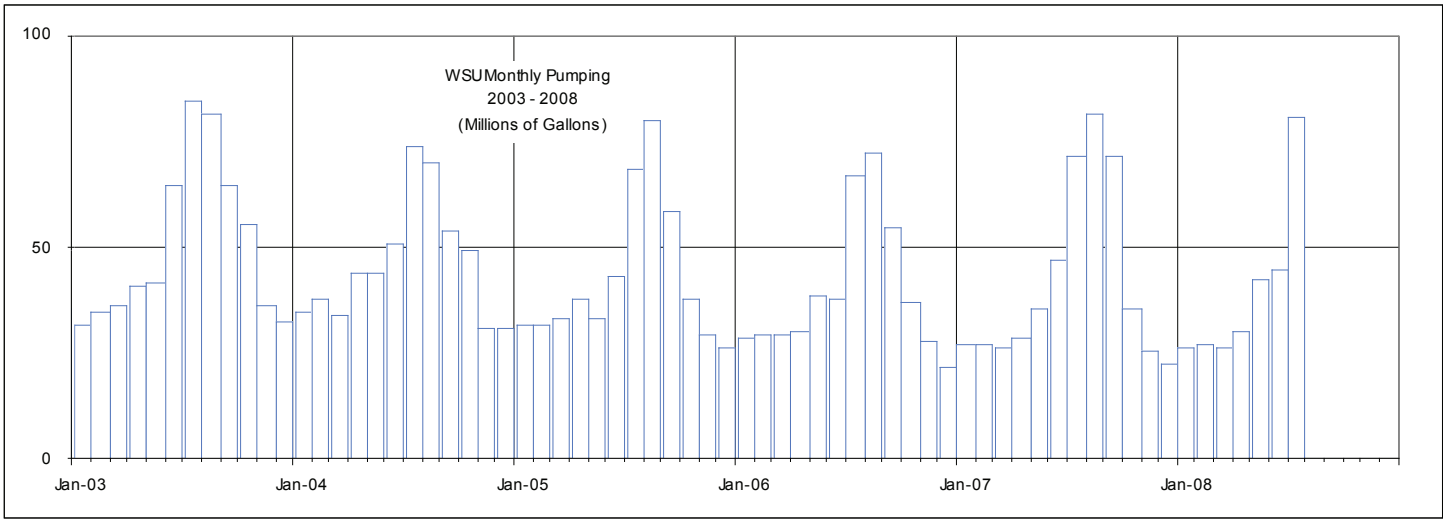

Figure 31: Monthly Pumping, WSU, 2003-2008

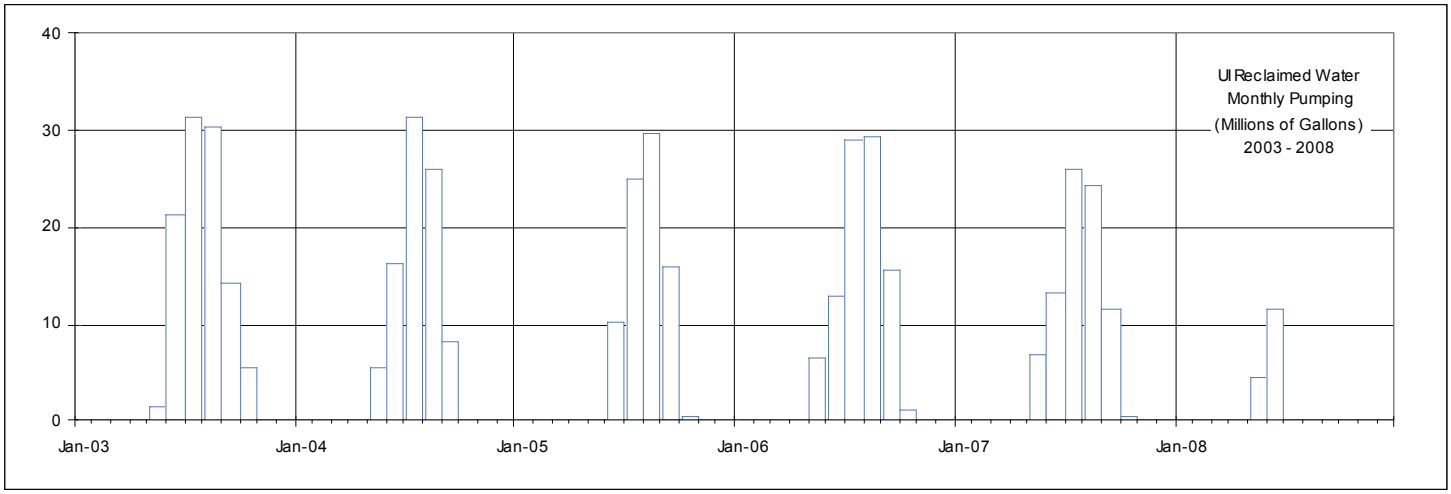

Figure 32: Monthly Pumping, University of Idaho (reclaimed), 2003-2008

Annual Pumping Totals 1992-2007

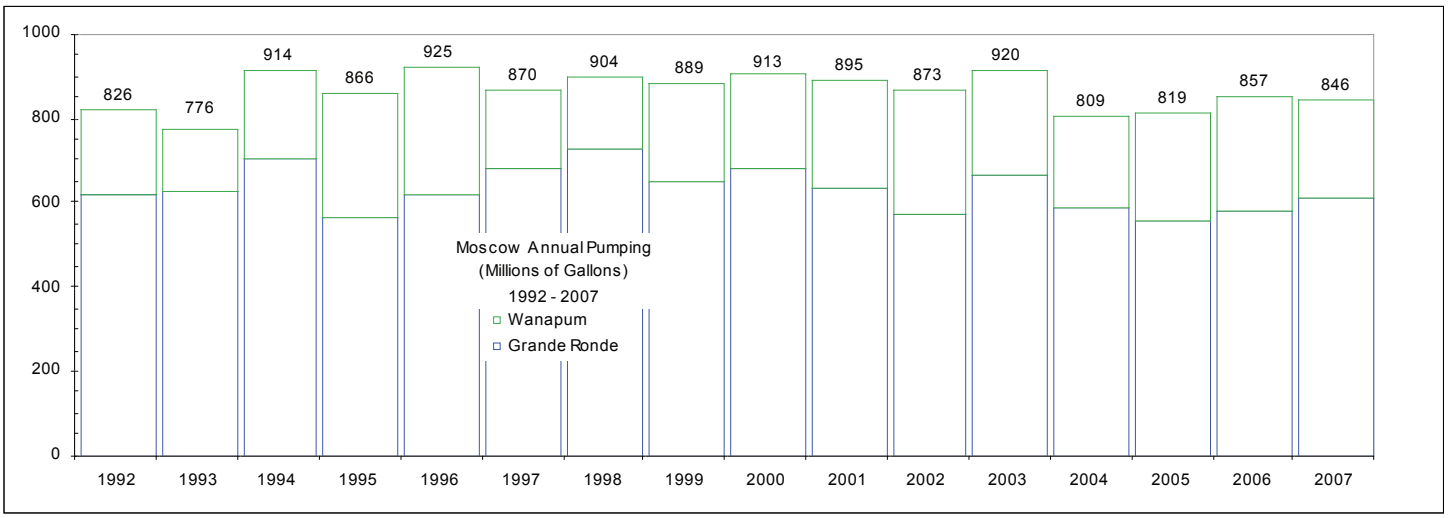

Figure 33: Annual Pumping, Moscow, 1992-2007

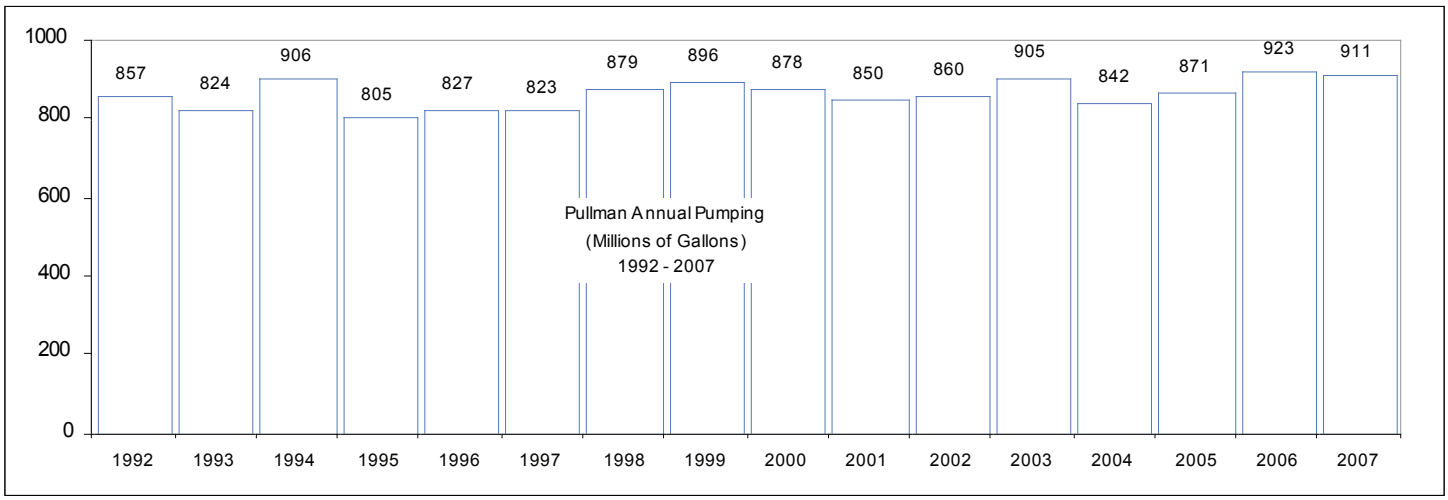

Figure 34: Annual Pumping, Pullman, 1992-2007

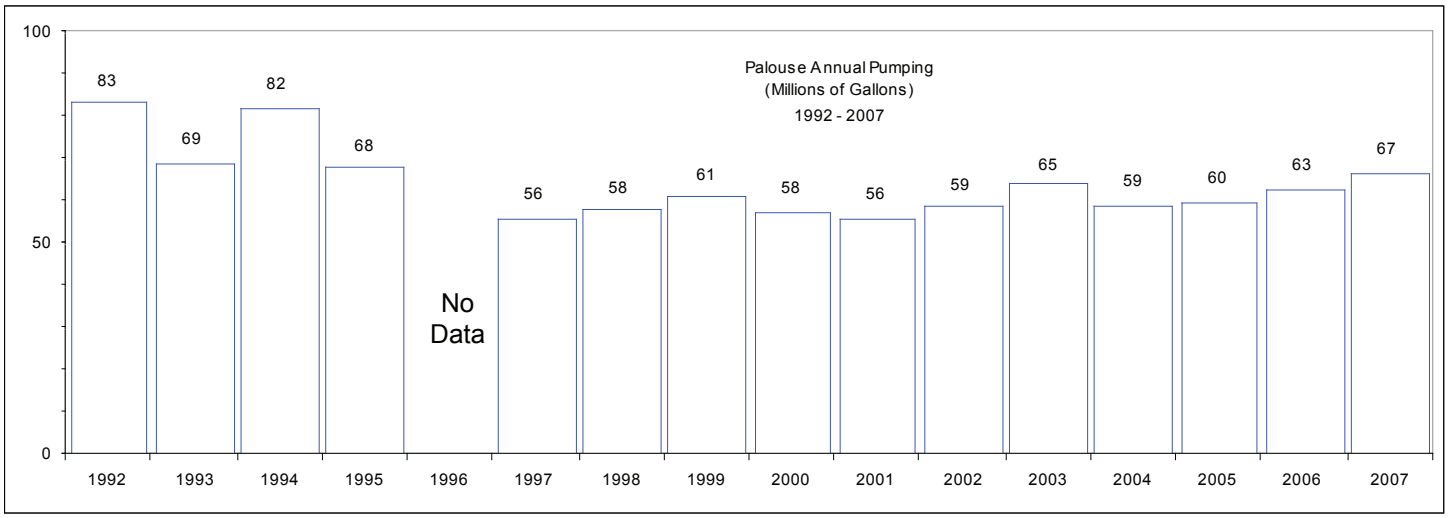

Figure 35: Annual Pumping, Palouse, 1992-2007

Annual Pumping Totals 1992-2007

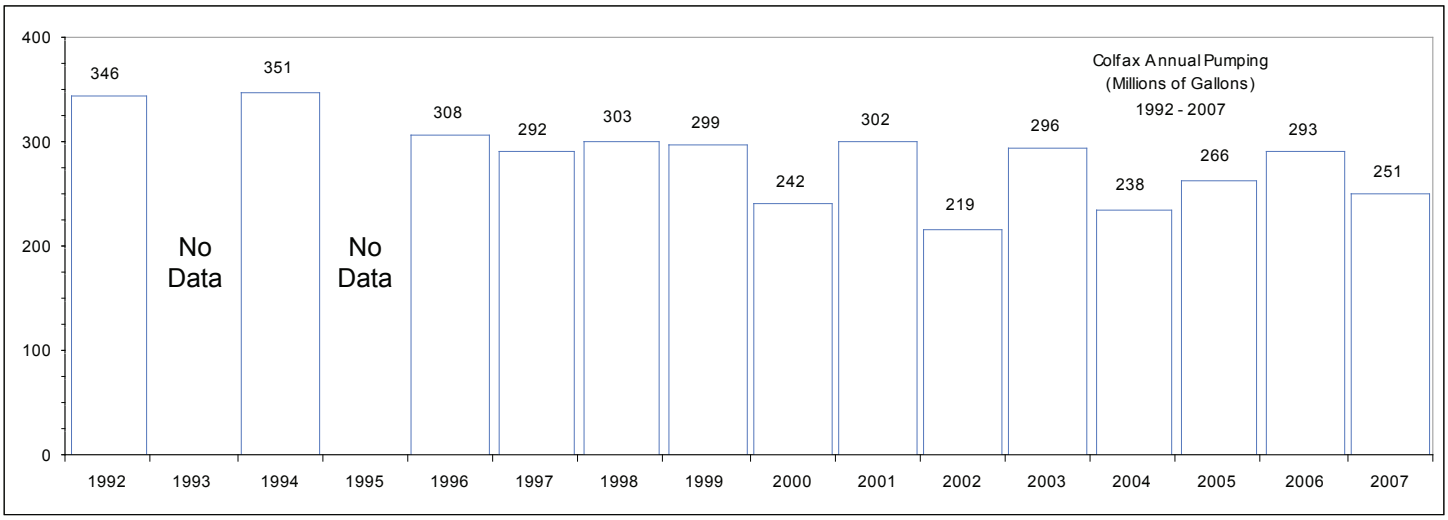

Figure 36: Annual Pumping, Colfax, 1992-2007

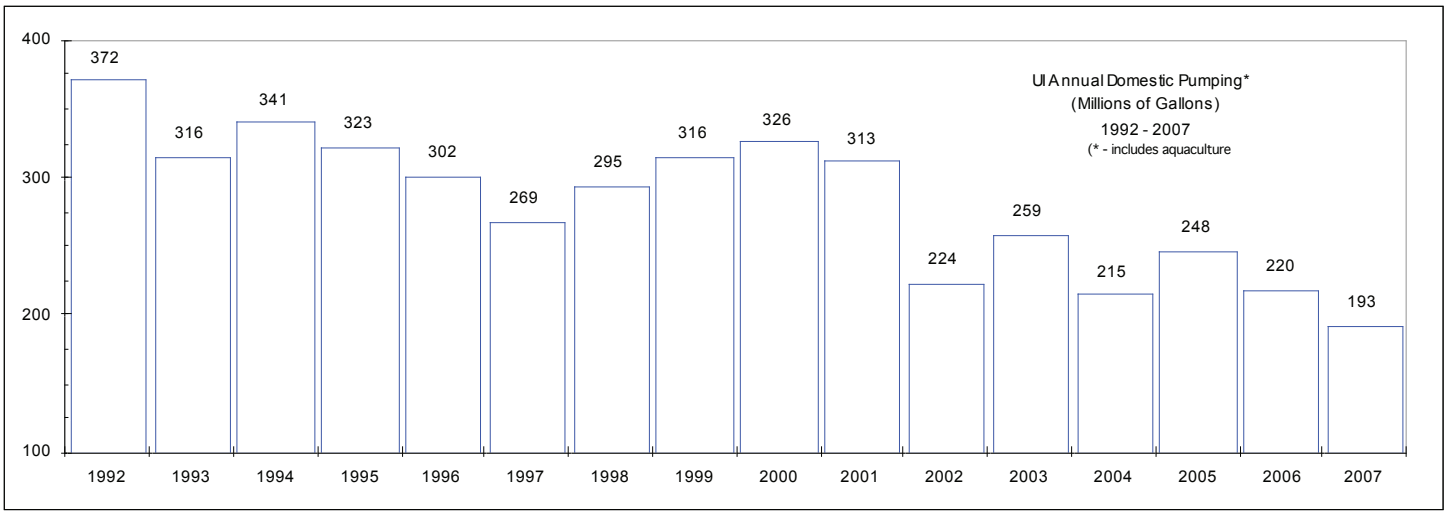

Figure 37: Annual Pumping, University of Idaho, 1992-2007

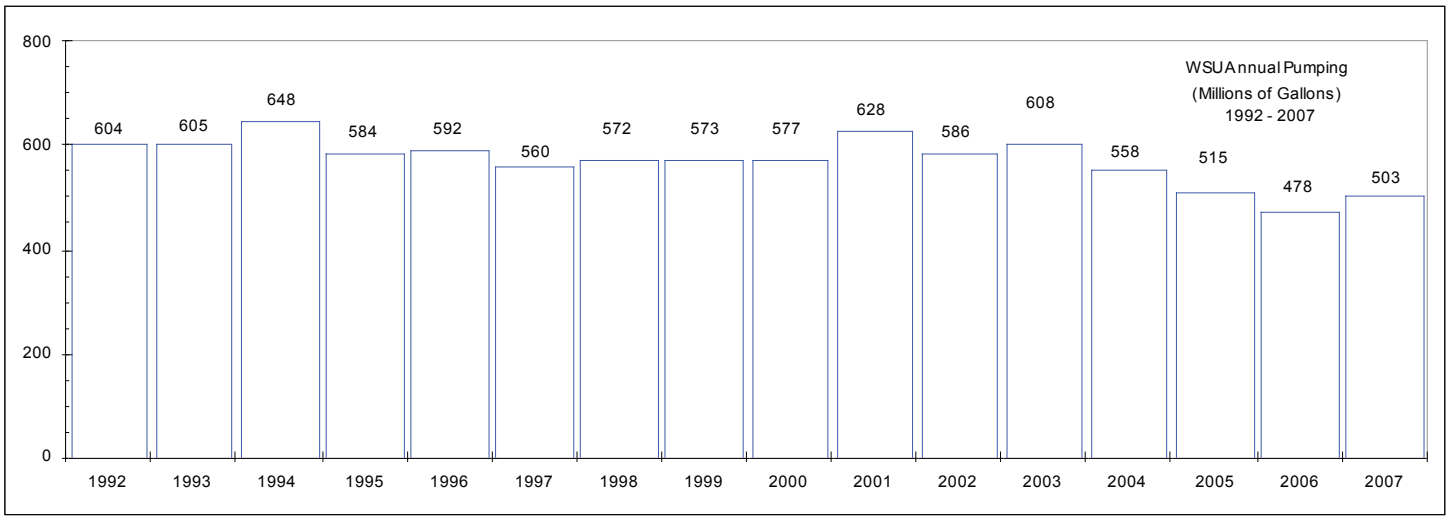

Figure 38: Annual Pumping, WSU, 1992-2007

Water Levels 2006-2008

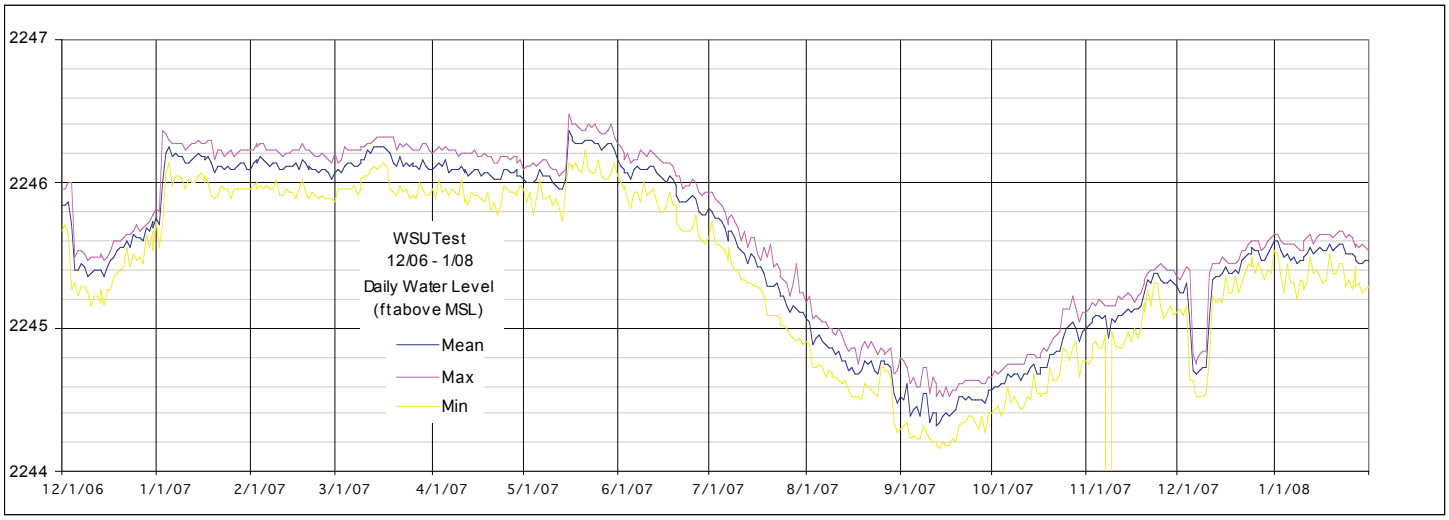

Figure 39: Daily Static Water Level, WSU Test Well (Grande Ronde), 2007

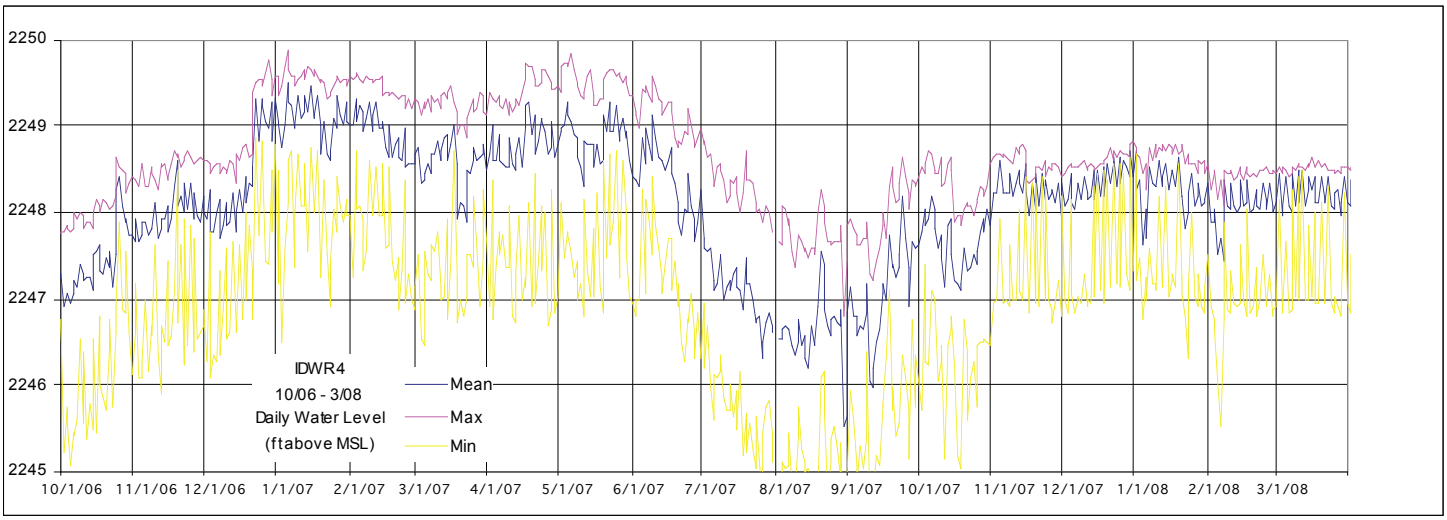

Figure 40: Daily Static Water Level, IDWR Well #4 (Grande Ronde), 2007

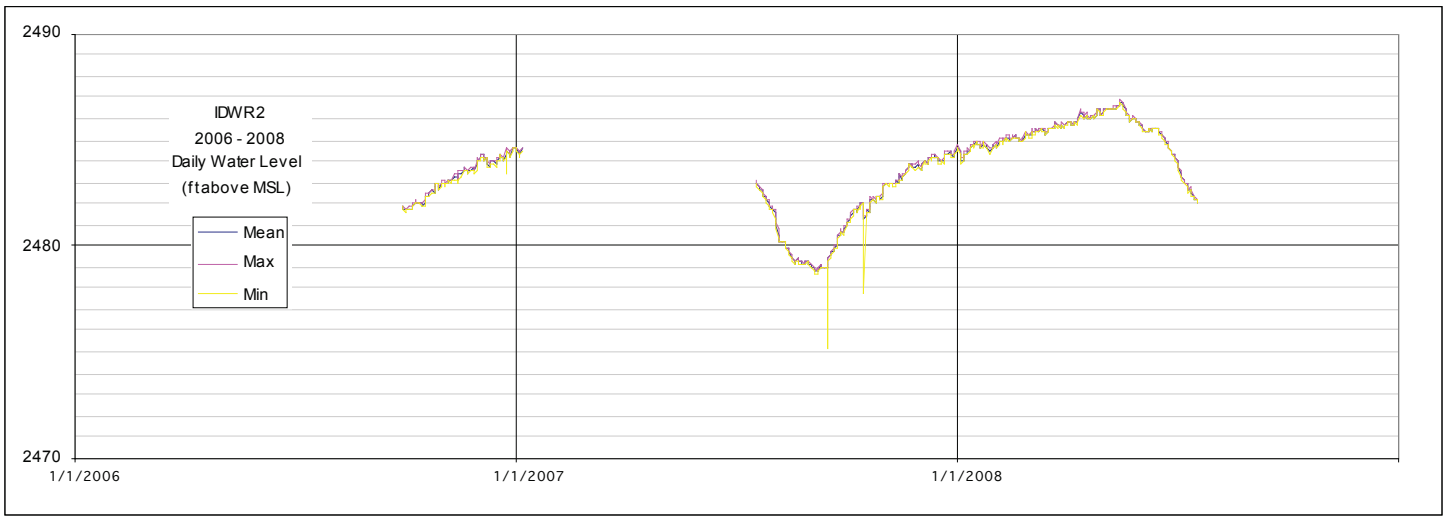

Figure 41: Daily Static Water Level, IDWR Well #2 (Wanapum), 2007

Water Levels 2003-2008

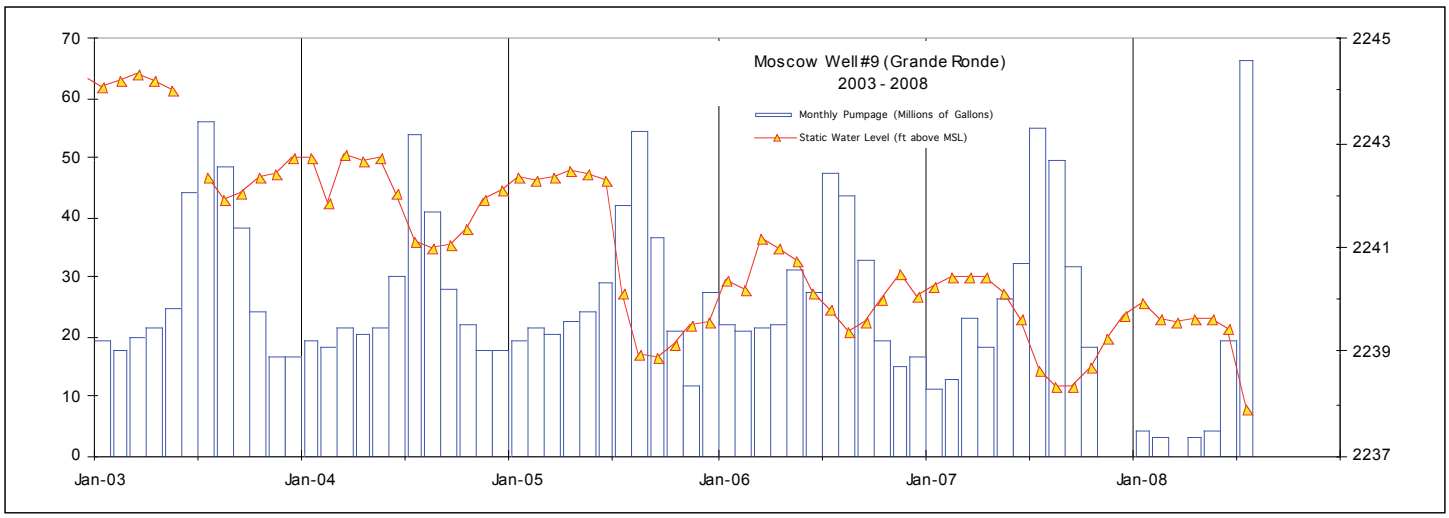

Figure 42: Monthly Pumping and Average Static Water Level, Moscow Well #9, 2003-2008

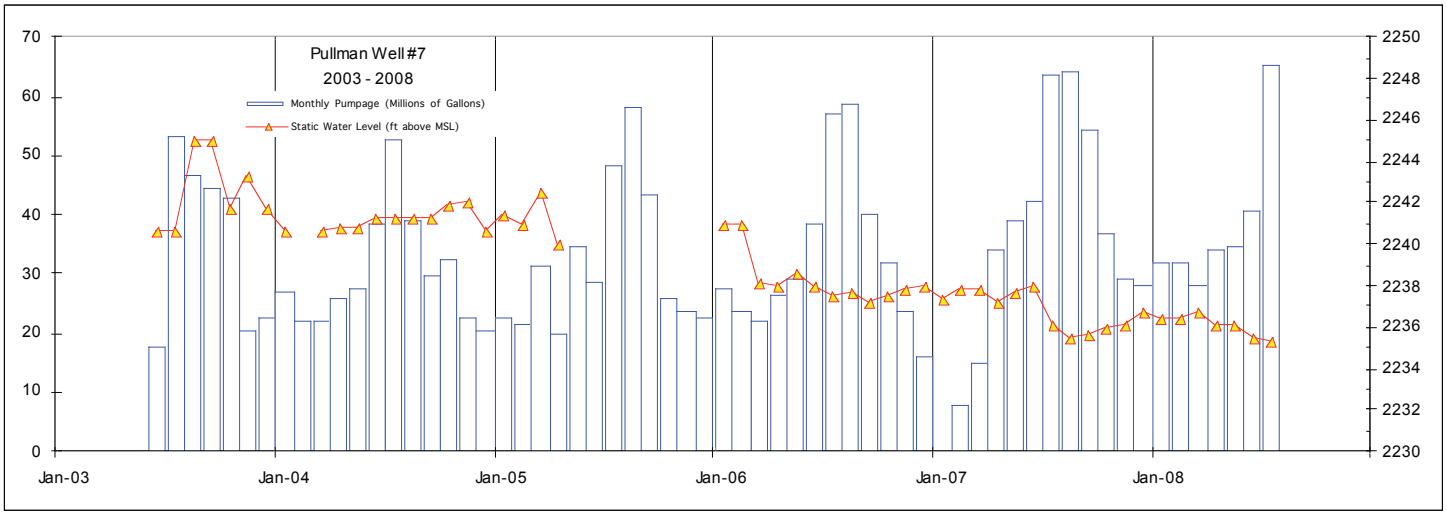

Figure 43: Monthly Pumping and Average Static Water Level, Pullman Well #7, 2003-2008

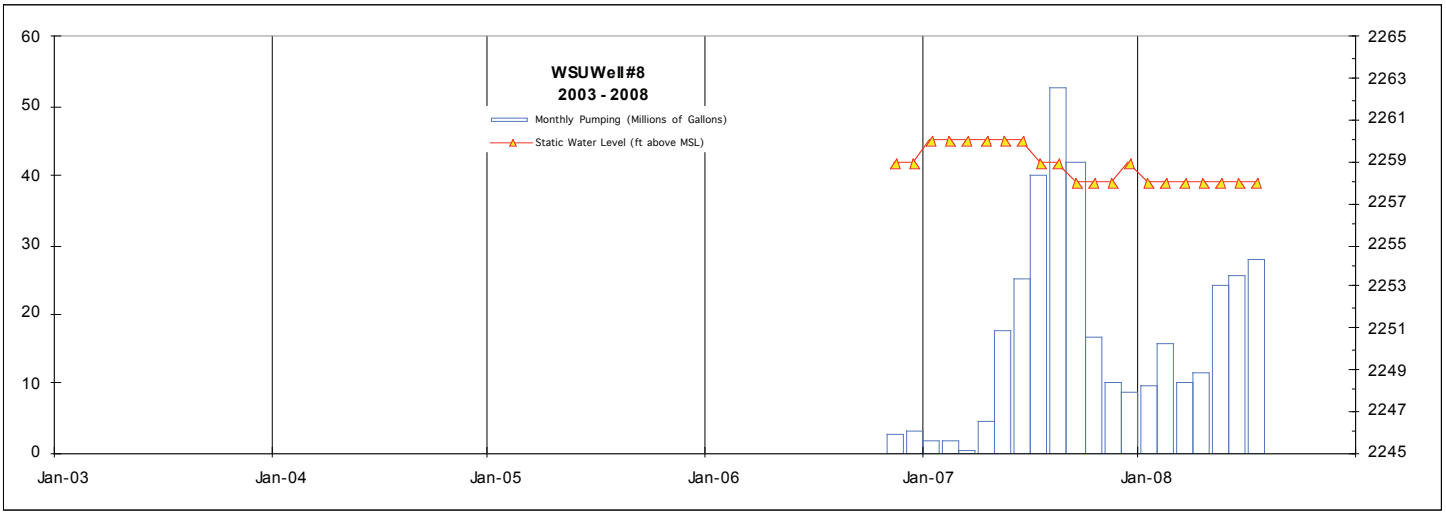

Figure 44: Monthly Pumping and Average Static Water Level, WSU Well #8, 2003-2008

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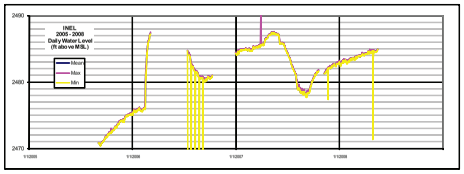
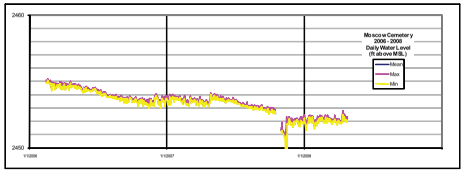
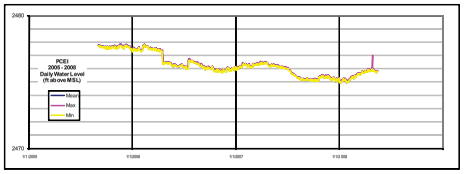
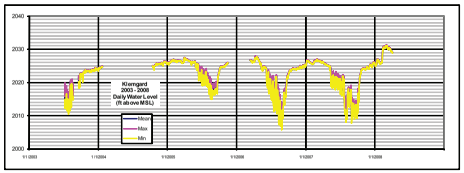
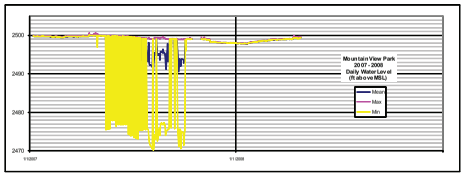
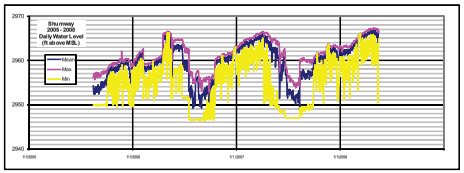

INEL
2005 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

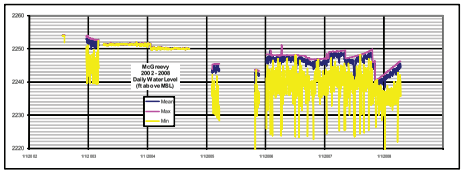

Moscow Cemetery
2005 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

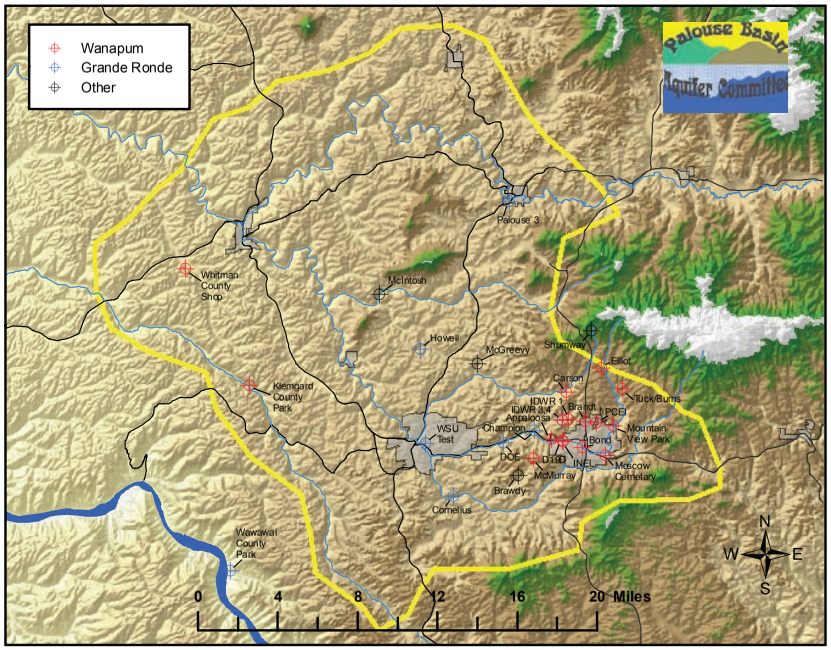

PCEI
2005 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

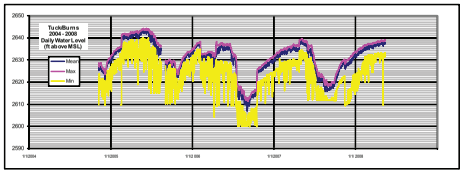

Kiemgard
2003 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

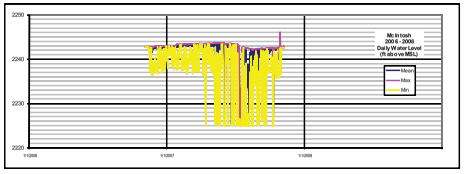

Mountain View Park
2007 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

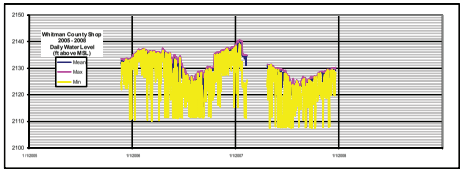

Shumway
2005 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

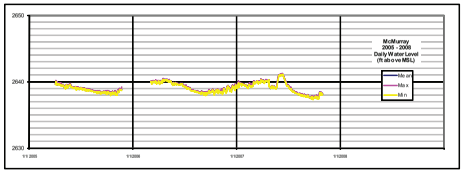

McGreevy
2002 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

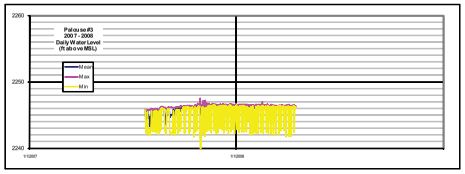

Wanapum
Grande Ronde
Other
Palouse Basin
Aquifer Committee
Palouse 3
Whitman
County
Shop
McIntosh
Howell
McGreevy
Shumway
Elliot
Carson
Kiemgard
County
Park
IDWR 1
IDWR 3/4
Anatum/CSA
Brandt
PCEI
Truck/Burns
WSU
Test
Champion
Bond
Mountain
View Park
DOE
D190
INEL
McMurray
Moscow
Cemetery
Brawdy
Cornelius
Wawawai
County
Park
N
W
E
S
0
4
8
12
16
20 Miles

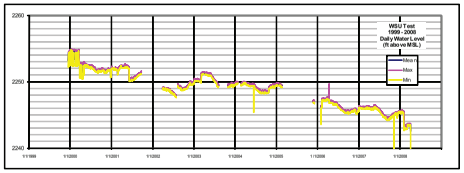

Tucidlums
2004 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min


McIntosh
2006 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min


Whitman County Shop
2005 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min


McMurray
2005 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min


Palouse #3
2007 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min


WSU Test
1998 - 2008
Daily Water Level
(ft above MSL)
Mean
Max
Min

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