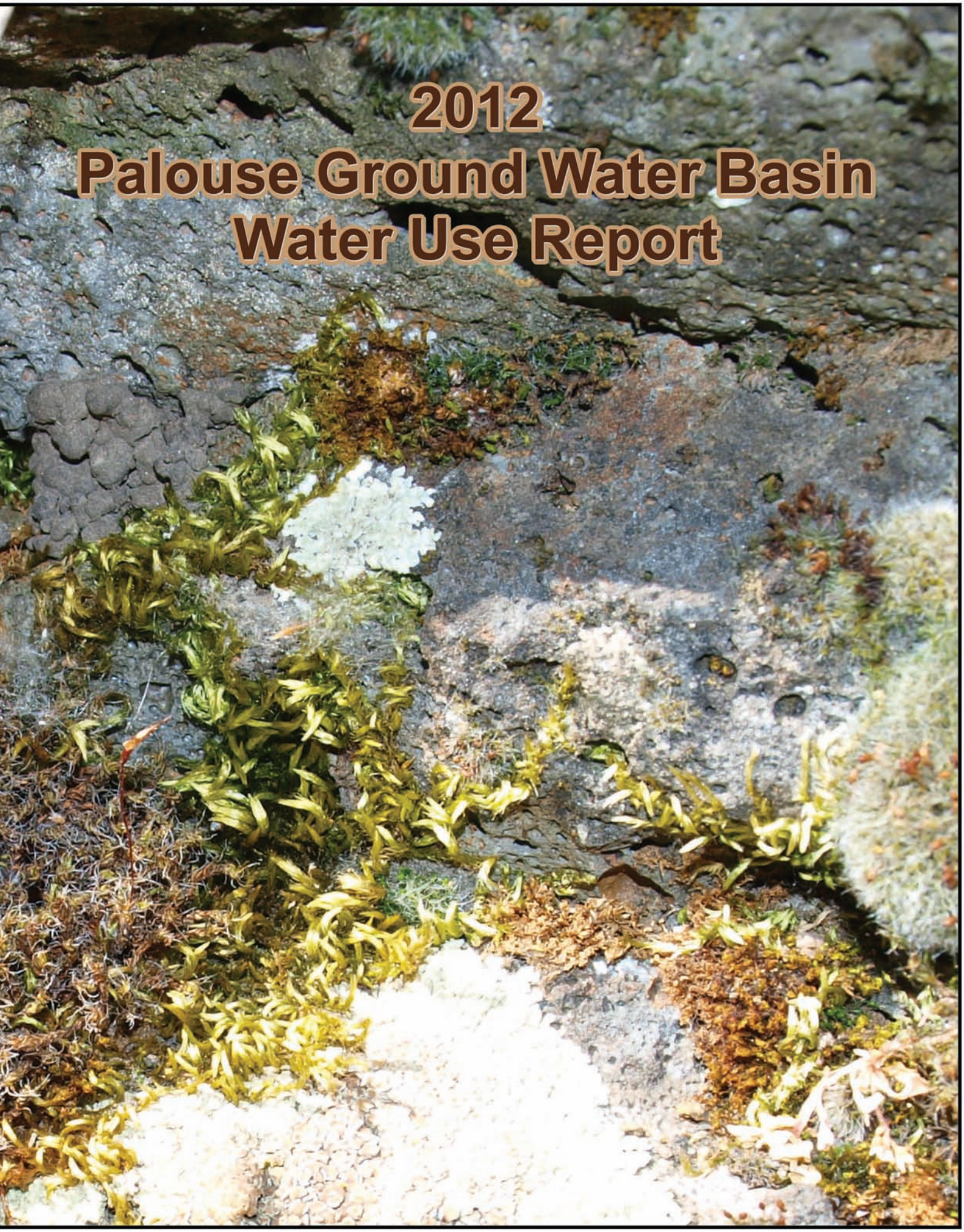
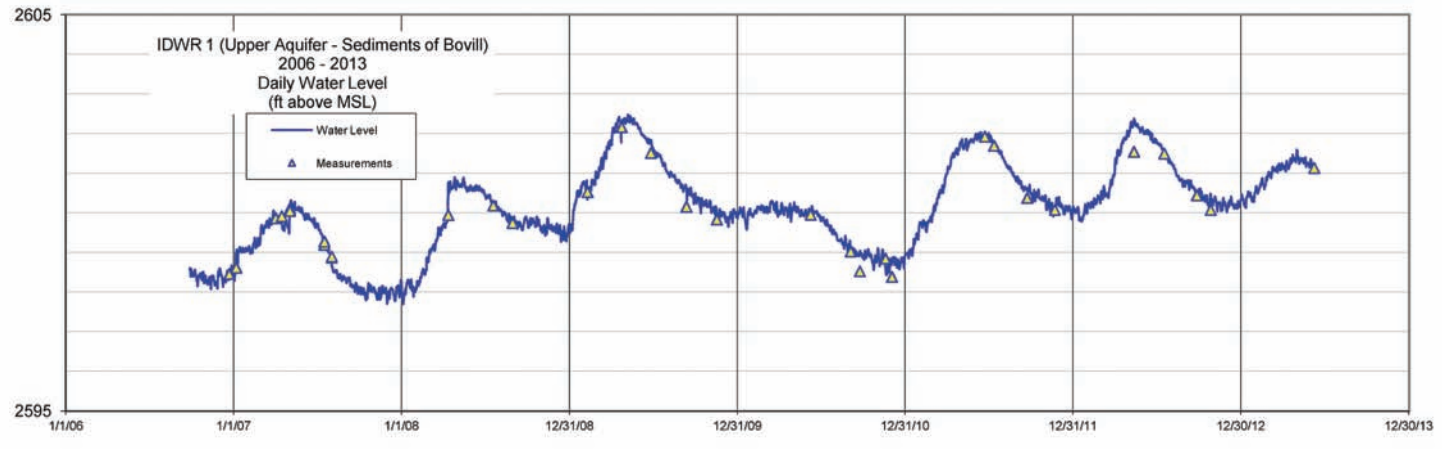
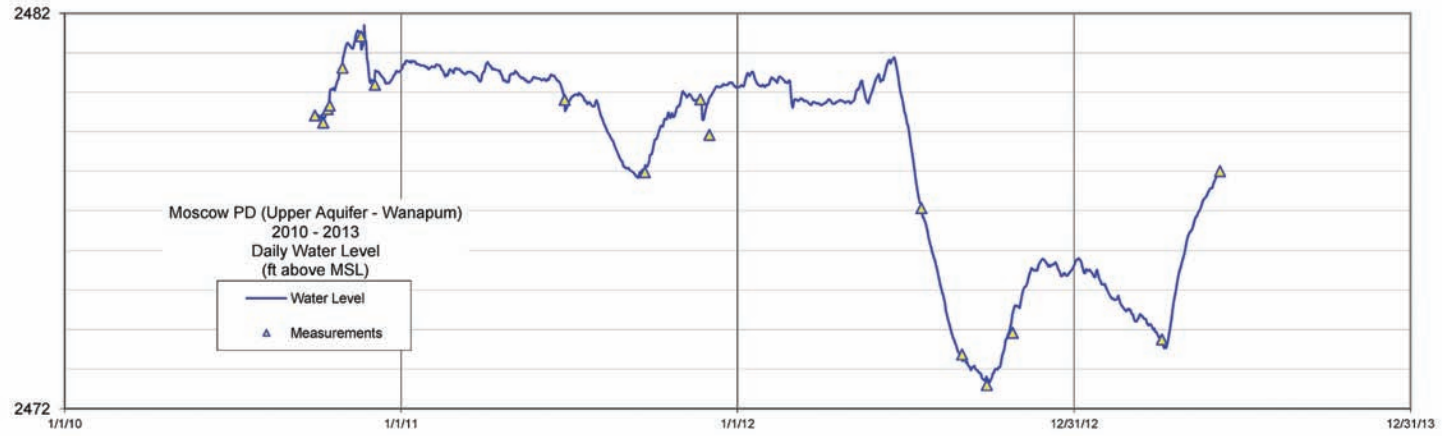
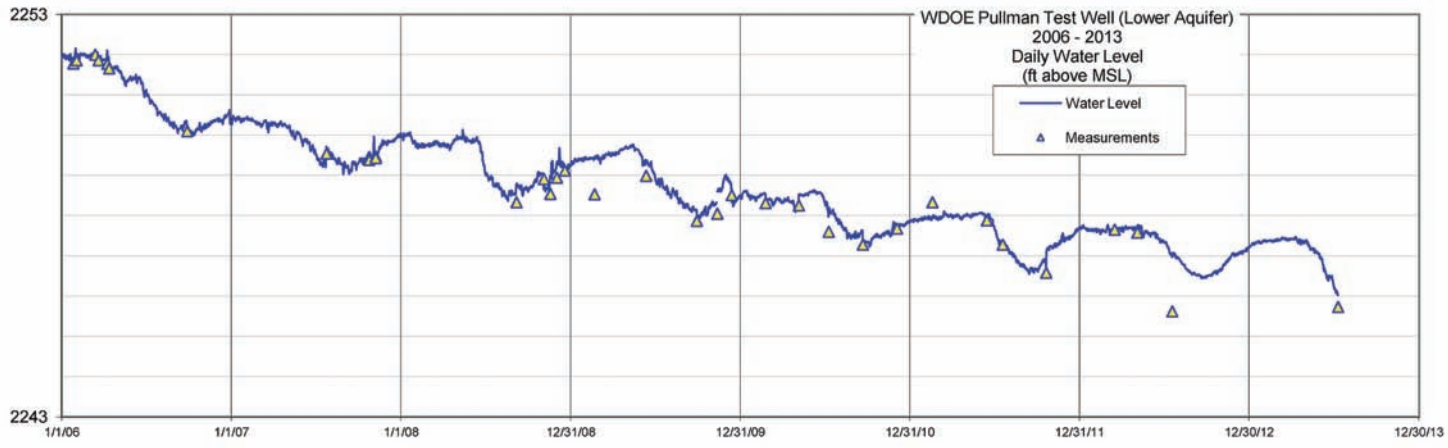


2012
Palouse Ground Water Basin
Water Use Report







Water level hydrographs for 3 Palouse Basin monitoring wells

Note: Photographs in this report are of aquifer components recovered from wells, drill cores and cuttings throughout the Palouse Basin.

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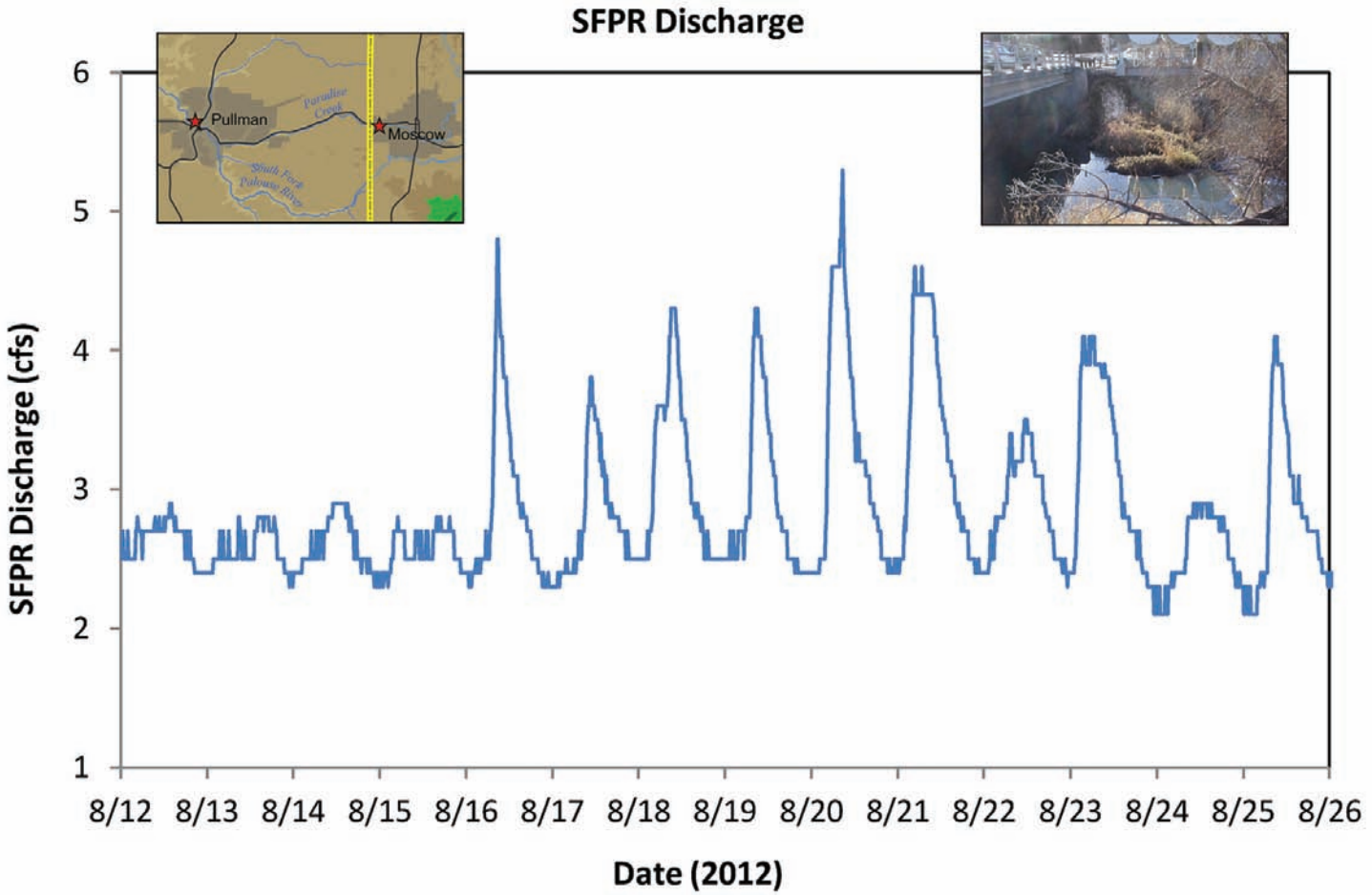


South Fork Palouse River (SFPR) Discharge with Moscow Waste Water Treatment Plant (WWTP)

Effluent Discharge of the SFPR as measured at the USGS gauging station in Pullman for a typical 2-week period in late summer, 2012, with low flow conditions. This particular 2-week period spans the start of the school year at both WSU and UI. The first day of school was Monday, August 20, with the bulk of the student population arriving the preceding weekend, on August 16 and 17. Note that the increase in discharge as measured at the USGS gauging station only reflects WWTP effluent from Moscow via Paradise Creek because the stream gauge is upstream of the Pullman WWTP outfall. (from Stable Isotope Analysis of Surface Water and Precipitation in the Palouse Basin: Hydrologic Tracers of Aquifer Recharge, Moxley, Washington State University, 2012)

Executive Summary

Ground water is the drinking water supply for over 60,000 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 (GWMP), 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 2012.

The 2012 total combined ground water pumpage by the primary pumping entities within the Basin was 2.64 billion gallons (Figure 1). In aggregate (Pullman, Moscow, WSU, UI, Colfax, Palouse), pumping for 2012 was approximately 1.5% more than in 2011 and 14.6% less than in 1992, the first year the Ground Water Management Plan took effect.

Water level data from deep production wells for 2012 reveals a reasonably consistent decline in static water level of somewhat less than 1 foot. A network of deep and shallow monitoring wells have been instrumented and are collecting information that will provide a useful long term record of the ground water levels throughout the Basin. Hydrograph records for wells in both the upper and lower aquifers are illustrated on the inside front cover of this report.

In 2012, PBAC participated in several projects. Sponsored research activities included a basinwide lower aquifer testing project and a ground water/surface water interaction project on the South Fork of the Palouse River between Pullman and Albion.

The foundation of the 1992 Ground Water Management Plan is a set of goals. As of 2012, PBAC's primary goal is to develop and implement a balanced, basin-wide, water supply and use program by the year 2025.

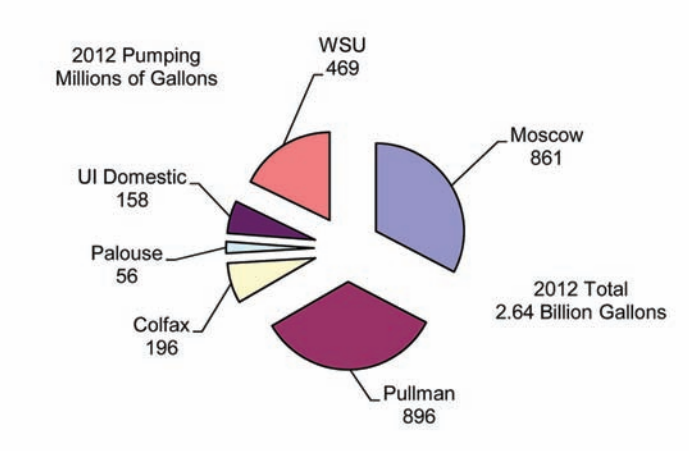


Figure 1: 2012 Ground Water Pumpage

Annual Water Use Report

The report that follows includes water use and water level information for the period from 1992 through 2012. To provide up to date information where available, data are included for portions of 2013. Water use reports for earlier years can be viewed at the PBAC web site (http://www.webpages.uidaho.edu/PBAC).

Introduction

The Palouse Basin Aquifer Committee

Ground water is pumped in the Basin by five major water suppliers (Pullman, Moscow, Colfax, 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 water levels was recognized by the cities, institutions and state regulatory agencies. Concerns regarding long term water supplies in the area led to the 1967 formation of an informal 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. In time membership in the committee was expanded to include Whitman and Latah counties and then Colfax, Washington. And although not a formal PBAC member, since 2006 the City of Palouse has contributed funding toward the administration of the Committee. In 1998, to reflect its expanded membership and the regional nature of the resource, the committee name was changed to the Palouse Basin Aquifer Committee (PBAC). PBAC member contact information is detailed on page 16.

The Ground Water Management Plan

In 1992, the PMWRC, with the support of Washington and Idaho state regulatory agencies, enacted a Ground Water Management Plan (GWMP) for the Basin. The Plan is authorized by an Intergovernmental Agreement between the (then 6 - 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.

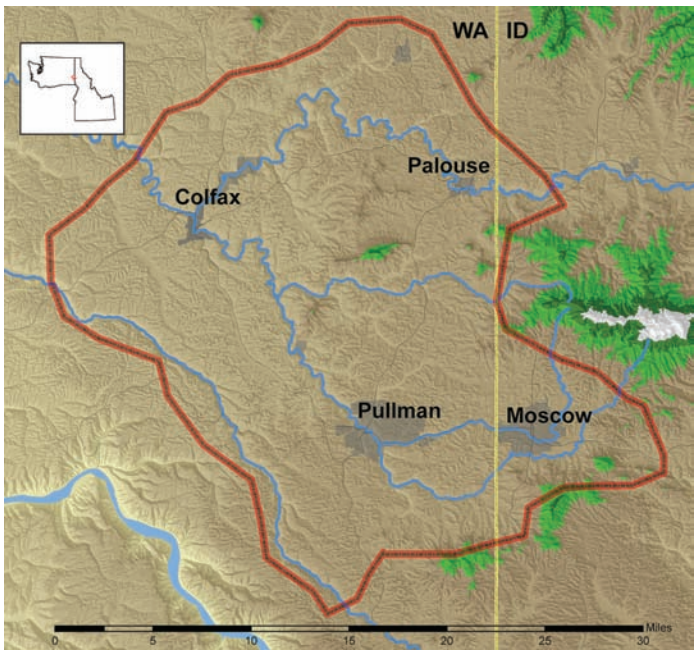


Figure 2: Working Boundary for the Palouse Ground Water Basin

Basin Description

The precise boundaries of the Basin have not been delineated, but the current working boundary appears as shown in Figure 2. Ground water in the Basin is pumped primarily from two aquifer systems: the upper Wanapum and the lower 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, northern Oregon, and portions of western Idaho during eruptions that occurred between 17 and 6 million years ago (see inside rear cover).

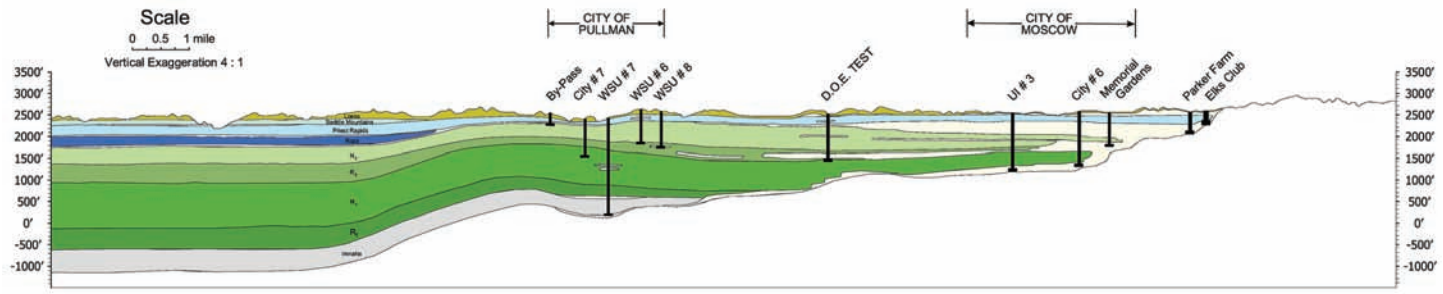


Figure 3: E-W Schematic Cross Section (Bush, Garwood, 2005)

Introduction

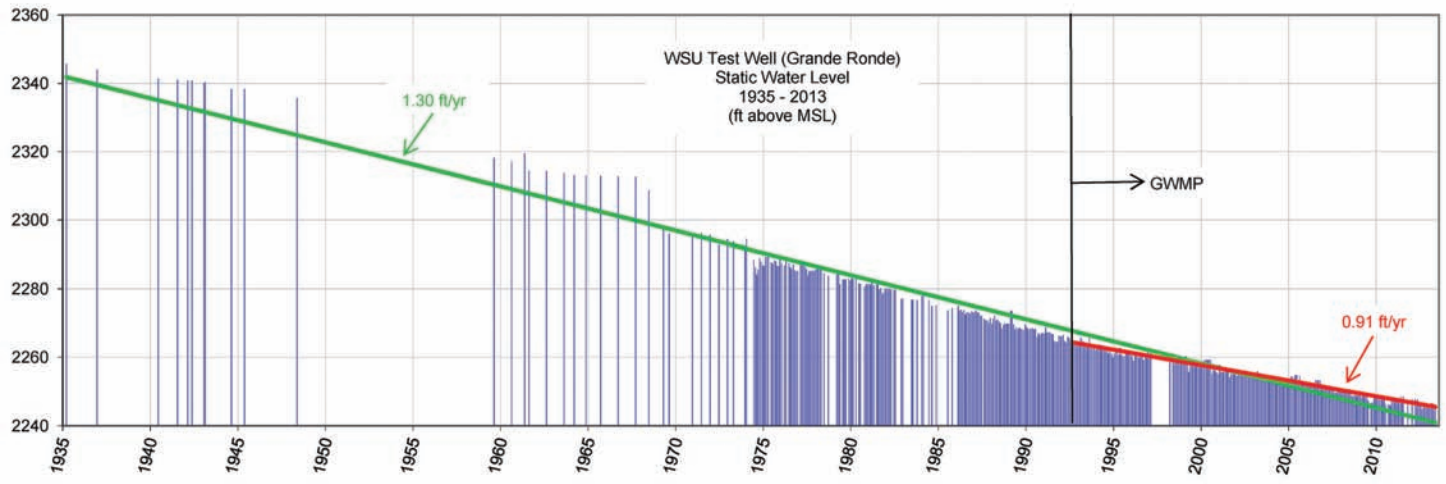


Figure 4: Static Water Level, WSU Test Well (Lower Aquifer), 1935 - 2013

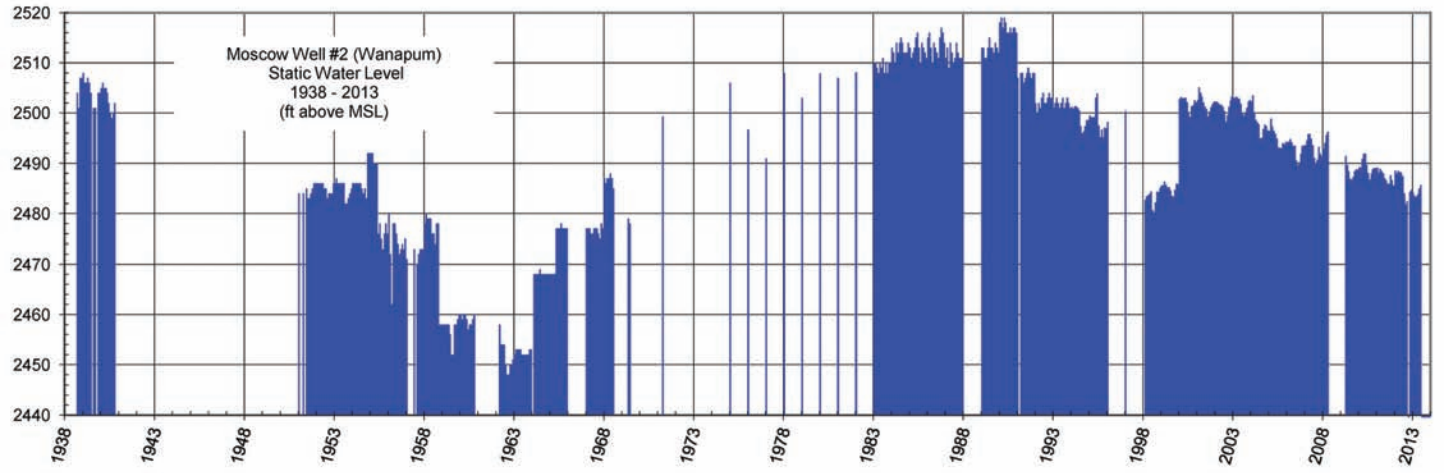


Figure 5: Static Water Level, Moscow Well #2 (Upper Aquifer), 1938 - 2013

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.

The primary municipal drinking water source in the Basin is the lower Grande Ronde aquifer system. In Pullman, all of the municipal residents obtain their drinking water from the Grande Ronde. Rural Basin residents in Whitman County pump from both the upper and lower aquifers. In Moscow, in 2012 nearly 42% of the supply came from the upper Wanapum, and many of the rural residents in Latah County also tap the upper 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 0.9 and 1.5 feet per year for 70 or more years (Figure 4). Water levels in the upper aquifer dropped drastically in the late 1950s and early '60s, but recovered in the 1970s and '80s when much of the pumping switched to the lower aquifer (Figure 5). Although absolute values are still uncertain, it is thought that there is limited recharge to the Wanapum and little recharge to the Grande Ronde.

Ground Water Pumpage and Water Levels

The total combined ground water pumpage by the four cities and two universities for the year 2012 was 2.64 billion gallons (8,091 acre-feet). In aggregate, this was 1.5% more than was pumped in 2011 (2.6 billion gallons), and 14.6% less than was pumped in 1992 (3.09 billion gallons), the first year the Ground Water Management Plan took effect.

In 2012, Pullman and Moscow each pumped approximately 1/3 of the total (34% and 33% respectively), followed by WSU at 18%. Colfax and UI pumped 7% and 6%, respectively, and Palouse pumping accounted for 2% of the combined total (Figure 6). By entity, comparisons to 2011 pumping are shown in Figure 7.

Moscow pumped 41.7% (359 million gallons) of its water from the upper Wanapum aquifer system in 2012. This is the most water Moscow has pumped from the upper aquifer since 1963. The other pumping entities all pump solely from the lower Grande Ronde system. As a percentage of the combined pumping total, the 2012 Moscow Wanapum contribution amounted to 13.6%.

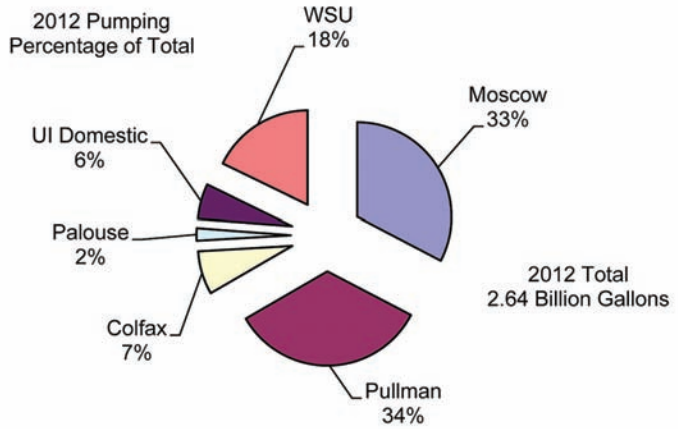


Figure 6: Ground Water Pumpage – Percentage of Total – 2012

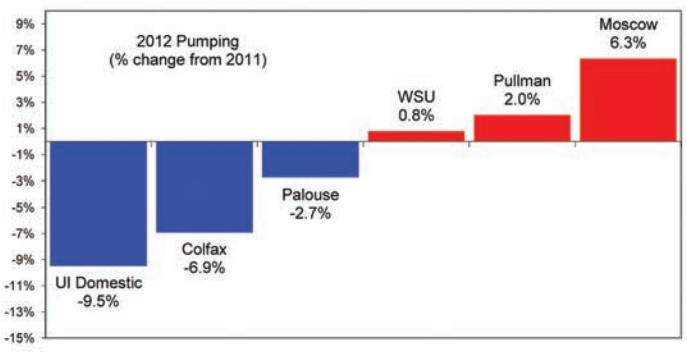
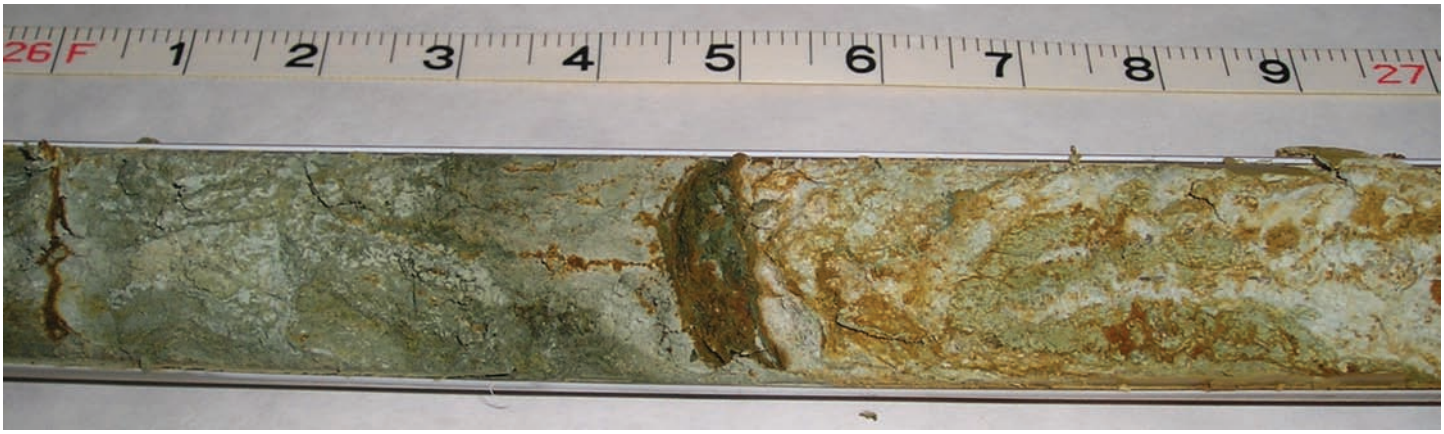


Figure 7: 2012 Pumping – Change from 2011

Pumping increases significantly in the summer months, primarily due to increased irrigation demand. For 2012, an estimate of the baseline pumping was calculated as the average of the pumping levels for the months of January, February, November, and December. Pumping above this average level can be considered non-baseline usage. As a percentage of total pumping, the 2012 non-baseline usage for the five largest pumping entities ranged from 21.4% for UI to 41.3% for Colfax (Figure 8). (Note: In the figure the UI non-baseline use is presented both with and without inclusion of the 85 million gallons of reclaimed water utilized in 2012)

Non-baseline usage varies with the weather conditions experienced during the year. In 2012, with the exception of September, the irrigation season was warmer than 2011, as detailed in Figure 9. 2012 precipitation was above 2011 in May and early June, but very low from late June through September (figure 10). The May thru August pan evaporation total (refer to Figure 11) for 2012 was slightly higher than that of 2011, which is likely reflected in the relatively small annual pumping change detailed earlier.



Fairley et al, 2006, Latah County Hydrologic Characterization Project

Ground Water Pumpage and Water Levels

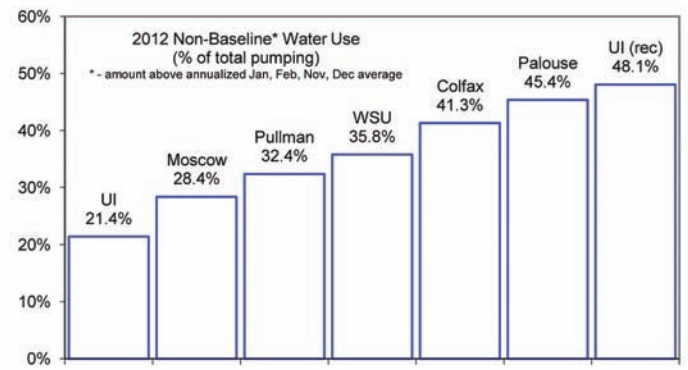


Figure 8: Non-Baseline Water Use – 2012

Charts of 2012 and first half 2013 monthly pumping compared to the 2007-2011 averages are shown in Figures 12-17. Figures 28-33 illustrate monthly pumping for the period between 2008 and mid 2013.

As part of the Ground Water Management Plan, each pumping entity has agreed to voluntary pumping targets. Pullman, Moscow, and the universities have agreed to attempt to limit annual pumping increases to 1% of the 1986-1990 average pumping level. In addition, Pullman, Moscow and the universities agreed to keep total pumping below 125% of the 1981-1985 average pumping level. An aggregation of the pumping targets for the GWMP pumping entities (Pullman, Moscow, WSU, UI) is shown in Figures 18 and 19. The 1% and 125% targets

for individual GWMP pumping entities are illustrated in Figures 20-23 and Figures 24-27. 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 hydrographs for 3 of the wells in the monitoring network are presented on the inside front cover of this report. Inspection of the hydrographs reveals that the maximum water level in the DOE Pullman Test monitoring well (lower Grande Ronde aquifer) in 2012 appears to have declined by approximately one half foot from the 2011 maximum. In the upper Wanapum aquifer, a marked decline in water level is evidenced in the Moscow PD well during 2012. This was the result of increased pumping of the upper aquifer by the City of Moscow to meet summer demand while working to repair the main lower aquifer production Well 9. When Well 9 was brought back on line in early 2013, the City reduced pumping in the upper aquifer and much of the decline has since been recovered. In the IDWR 1 monitoring well, which is completed above the Wanapum basalt in the Sediments of Bovill, water levels exhibit seasonal variation but were not impacted by the increased pumping by the City.

2012 Irrigation Season Weather

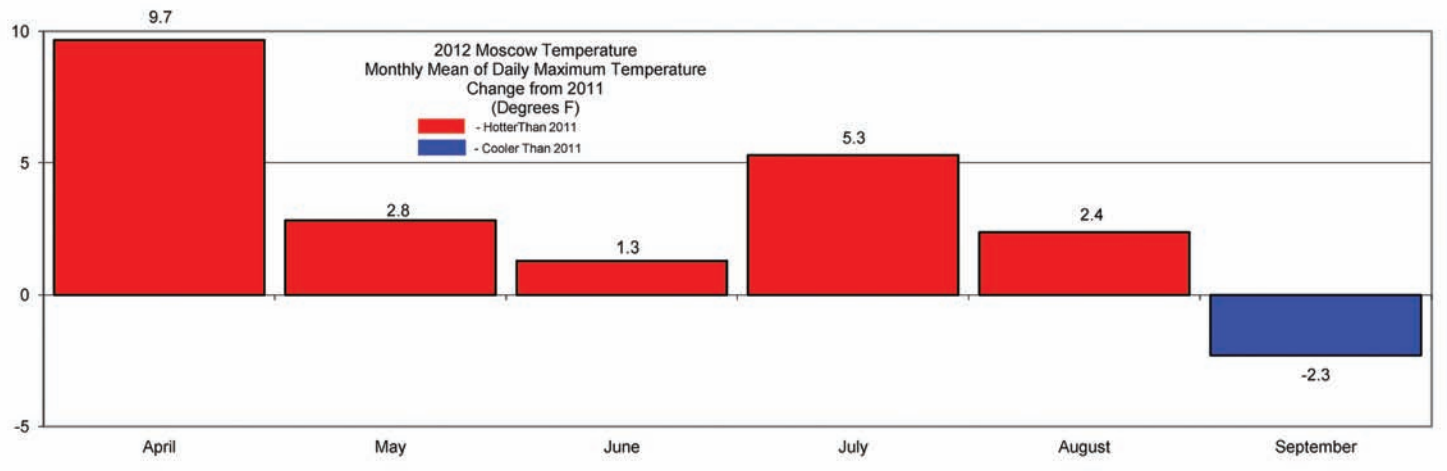


Figure 9: Moscow Mean Maximum Temperature – 2012

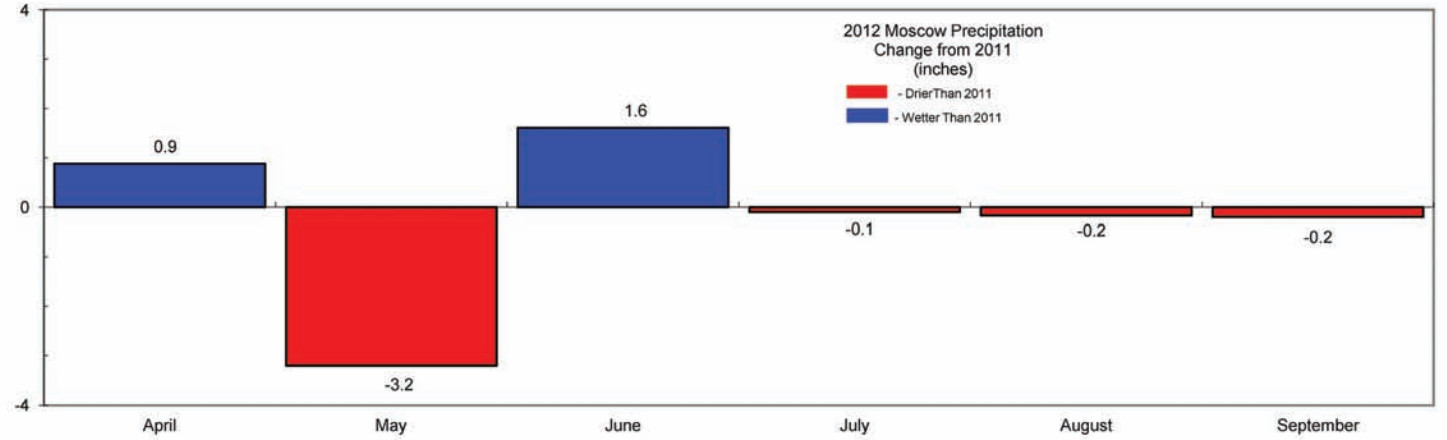


Figure 10: Moscow Precipitation – 2012

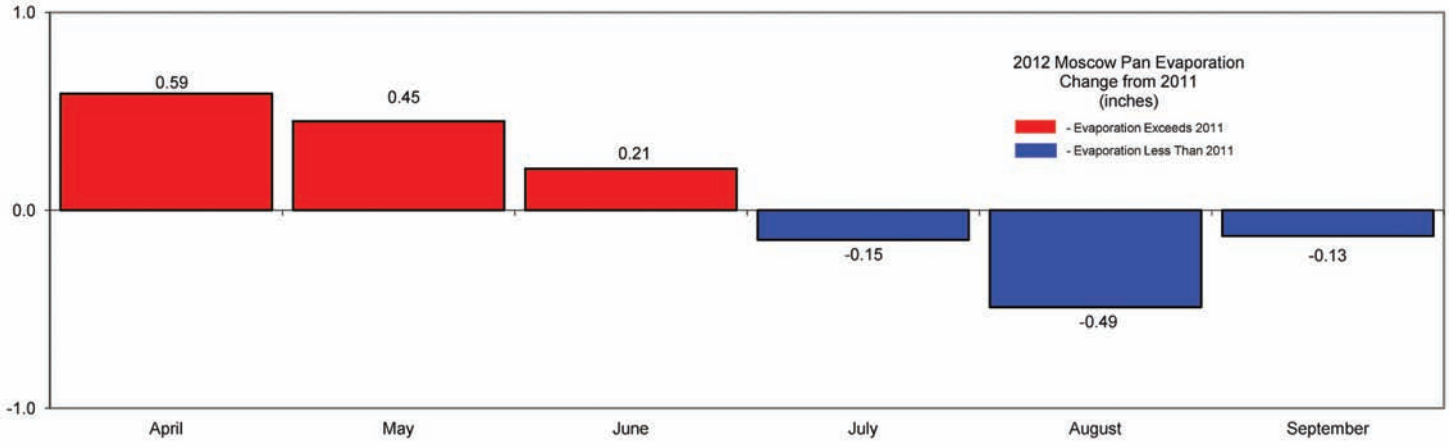


Figure 11: Moscow Pan Evaporation - 2012

Monthly Pumping Compared to 5 Year Average

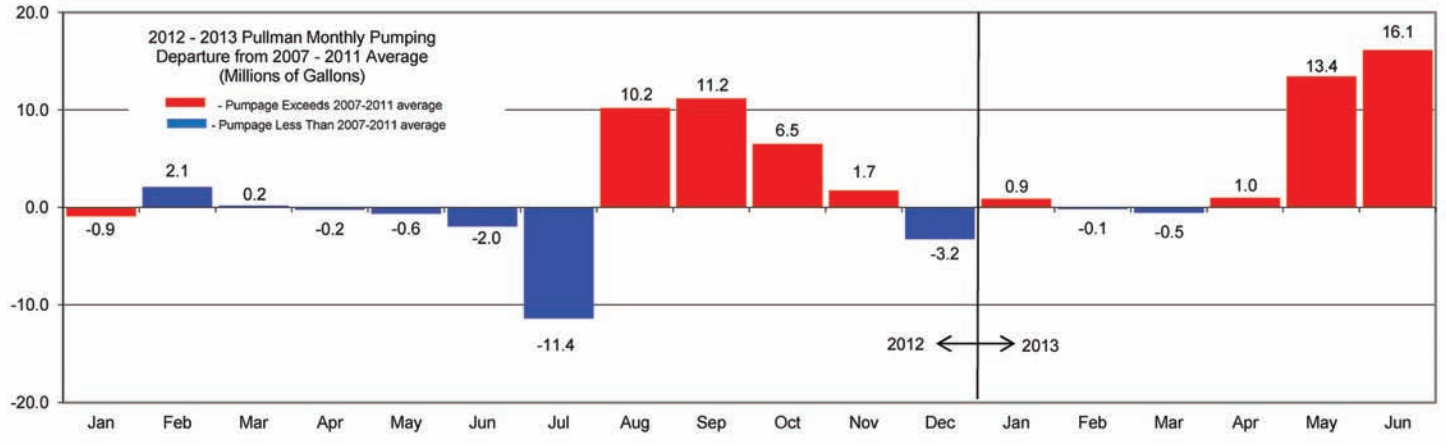


Figure 12: Pullman Monthly Pumping, Departure from 5-year Average, 2012-2013

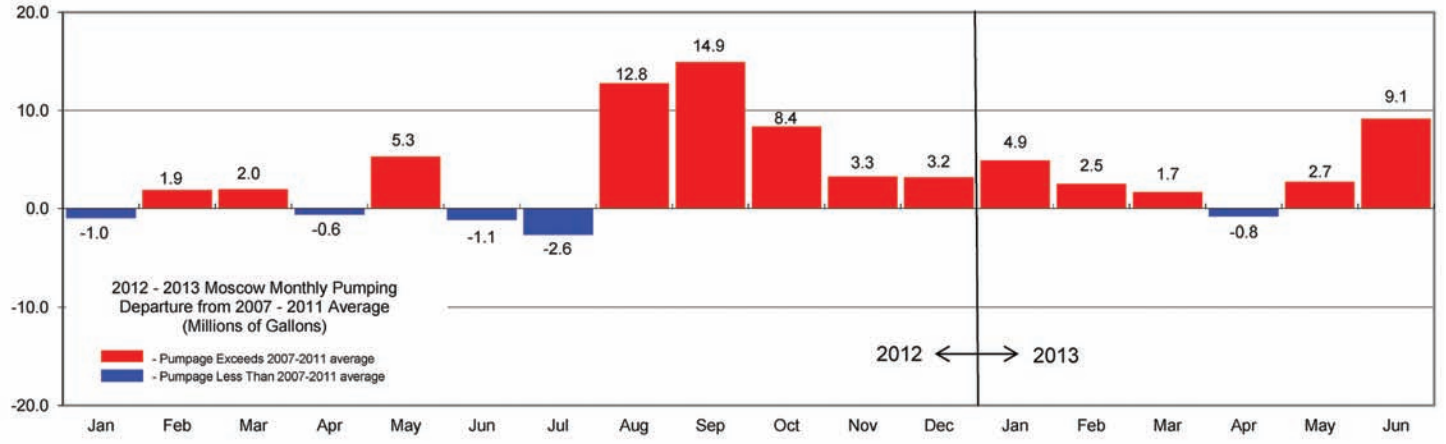


Figure 13: Moscow Monthly Pumping, Departure from 5-year Average, 2012-2013

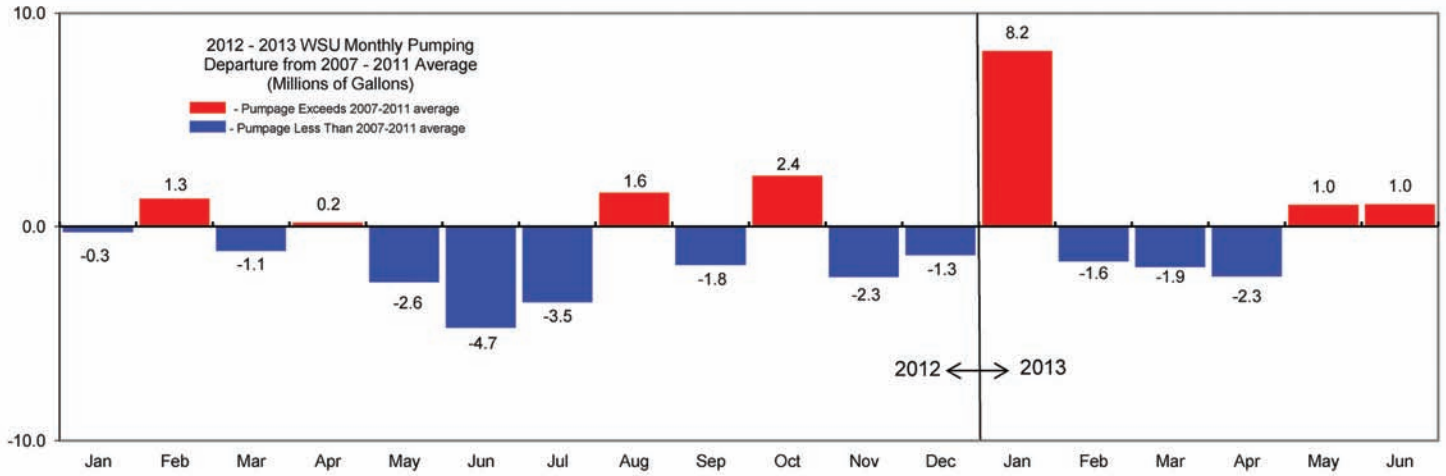


Figure 14: WSU Monthly Pumping, Departure from 5-year Average, 2012-2013

Monthly Pumping Compared to 5 Year Average

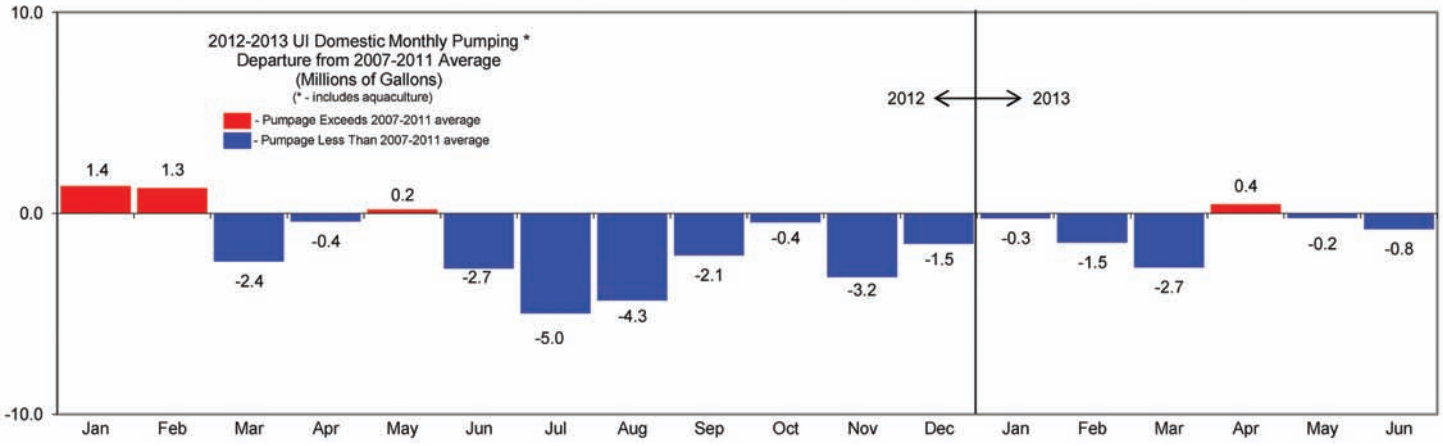


Figure 15: UI Monthly Pumping, Departure from 5-year Average, 2012-2013

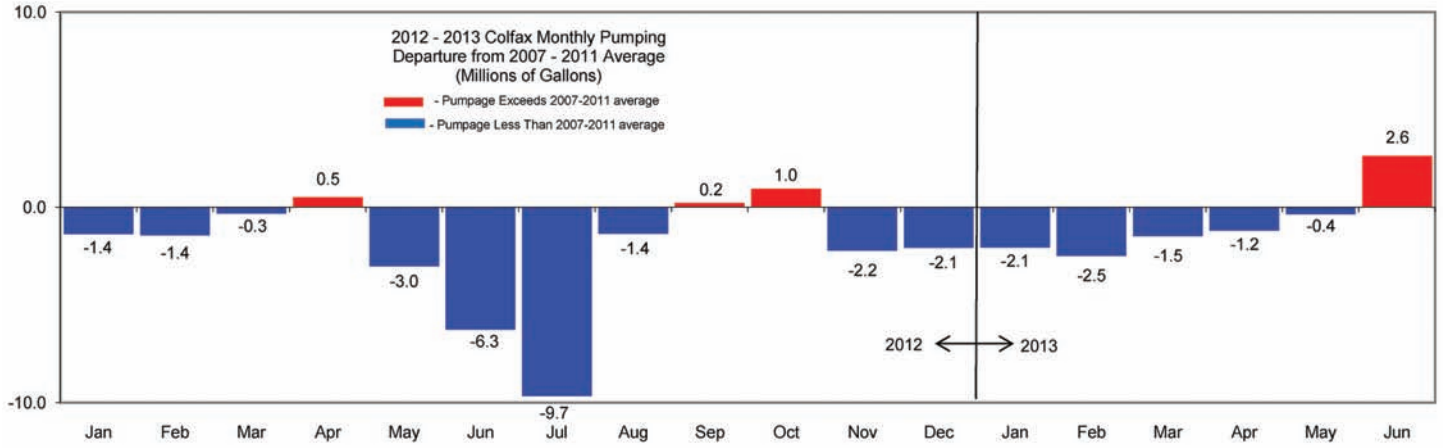


Figure 16: Colfax Monthly Pumping, Departure from 5-year Average, 2012-2013

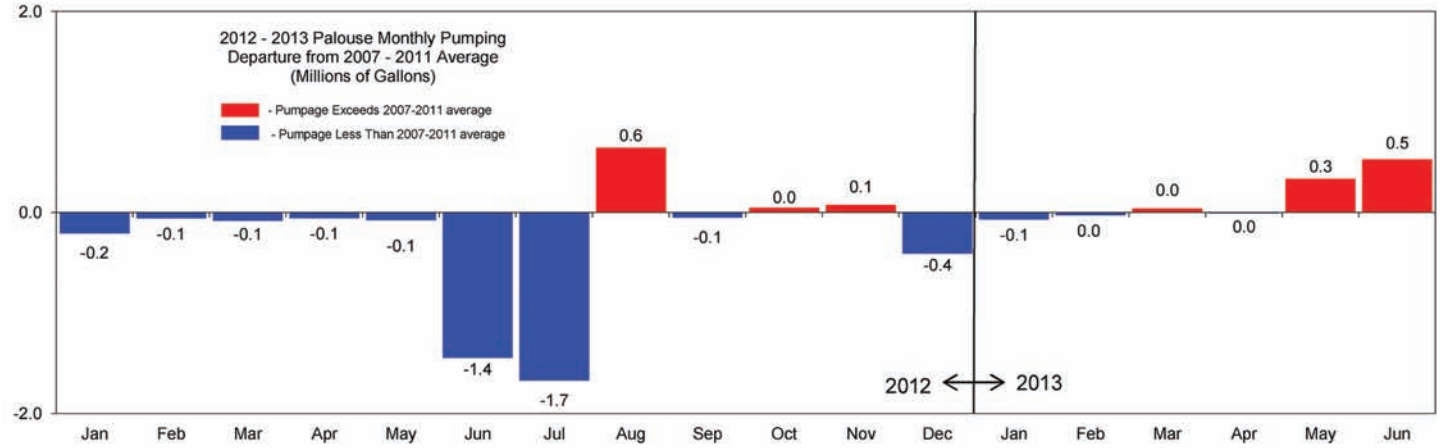


Figure 17: Palouse Monthly Pumping, Departure from 5-year Average, 2012-2013

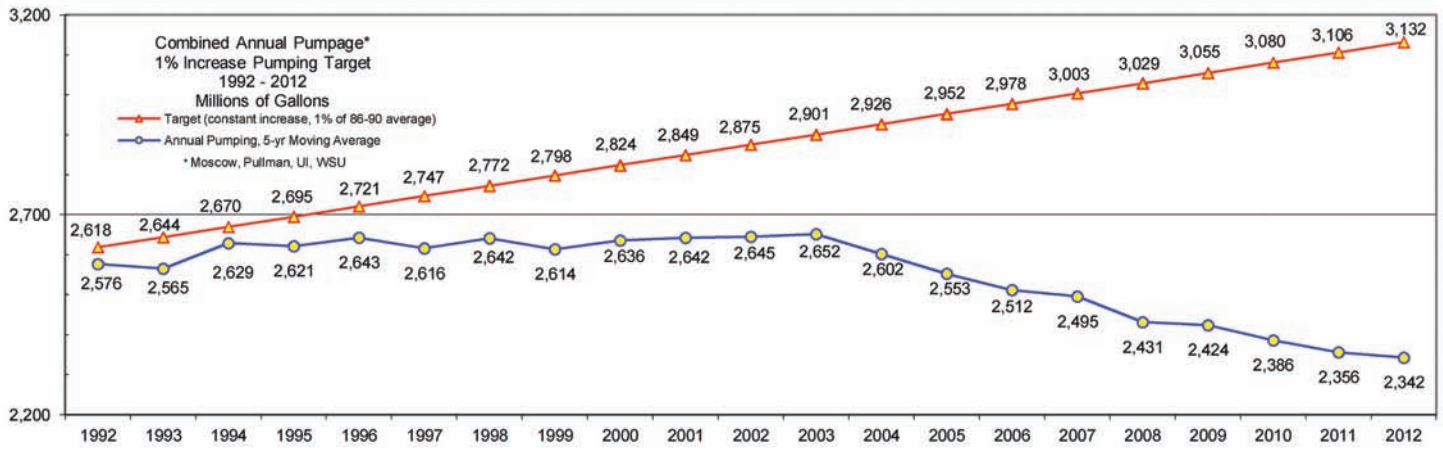


Figure 18: Voluntary 1% Annual Increase Target, 4 Major Entities Combined, 1992-2012

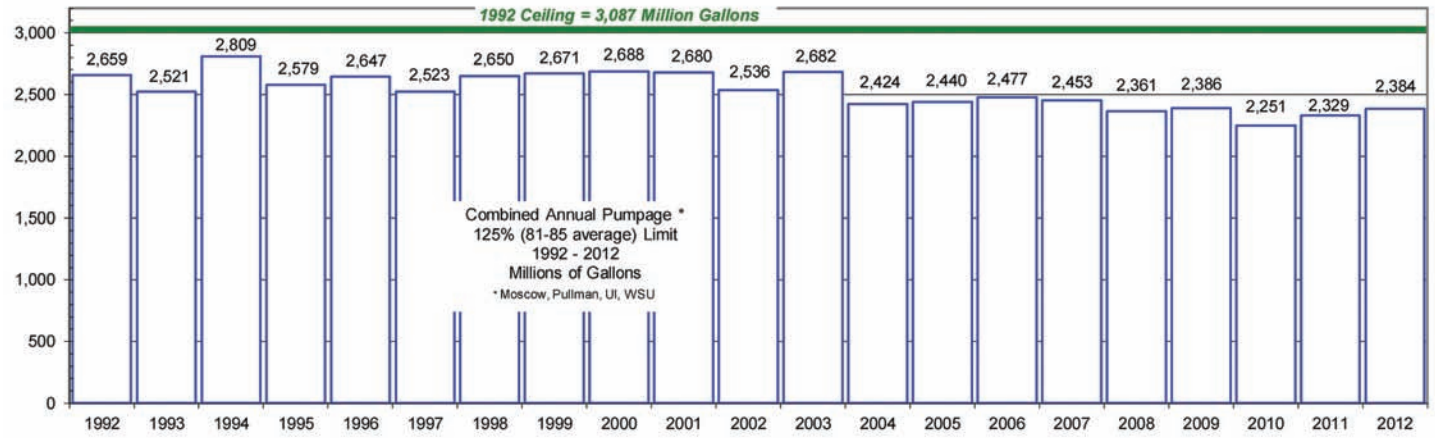


Figure 19: Voluntary 125% (of 1981 – 85 average) Pumping Ceiling, 4 Major Entities Combined, 1992-2012

Research Accomplishments 2012

PBAC participated in two research projects during 2012. One project was conducted by a graduate student at the University of Idaho under the guidance of Professor James Osiensky, and another by a graduate student from WSU under the guidance of Professor Kent Keller.

Attila Folnagy (UI) completed the second year of an ongoing basinwide aquifer testing project that involved the installation of instrumentation and monitoring of pumping quantities for the large municipal providers within the Basin. By combining the pumping data with data from water level transducers located in monitoring wells throughout the area, Folnagy's analyses were able to better quantify aquifer system properties and delineate aquifer compartmentalization in the lower Grande Ronde aquifer.

Nathan Moxley (WSU) conducted a study to identify areas adjacent to the South Fork of the Palouse River (SFPR) between Pullman and Albion where there may be a hydraulic connection between surface and ground water. Investigation of stable isotopes, tritium, and water levels led Moxley to conclude the SFPR is recharging the Grande Ronde aquifer system in the area.

In 2012 the committee also partnered in a project funded by a grant from the Washington Department of Ecology. The Palouse Monitoring Wells project drilled and constructed 7 lower aquifer monitoring wells in locations removed from the major pumping centers that will provide long-term water level data and help researchers understand aquifer behavior over a wider geographic extent.

Goals, Plans and Ongoing Efforts of the Committee

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

In 2012, PBAC reviewed the GWMP with the intent of incorporating information gathered since its 1992 creation. Each PBAC entity is now charged with reviewing and updating its individual action plan(s) to better reflect current conditions in the Basin.

The Citizens Advisory Group (CAG), aimed at ensuring dialogue among a broad range of interested parties, completed its work on recommendations for consideration by PBAC involving management, research, conservation and public participation and was dissolved in June, 2012. PBAC is working to develop a new public engagement and communication outreach process, and a subcommittee has been formed to provide recommendations for action to the group.

In 2012, PBAC participated in the seventh (modern) Palouse Water Summit. The 2012 Summit continued to provide information and avenues for dialogue through networking opportunities and presentations related to the Basin's common ground water resource. PBAC will support and participate in the eighth Summit, scheduled for October 2013.

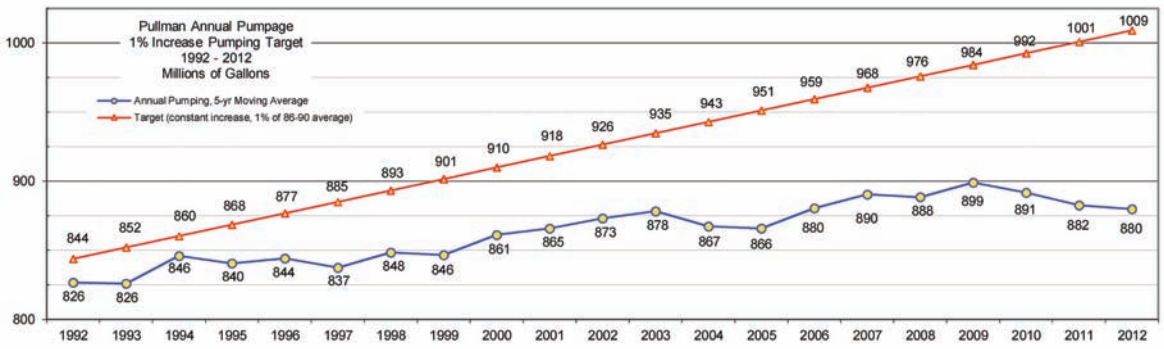


Figure 20: 1% Annual Increase Target, Pullman, 1992 - 2012

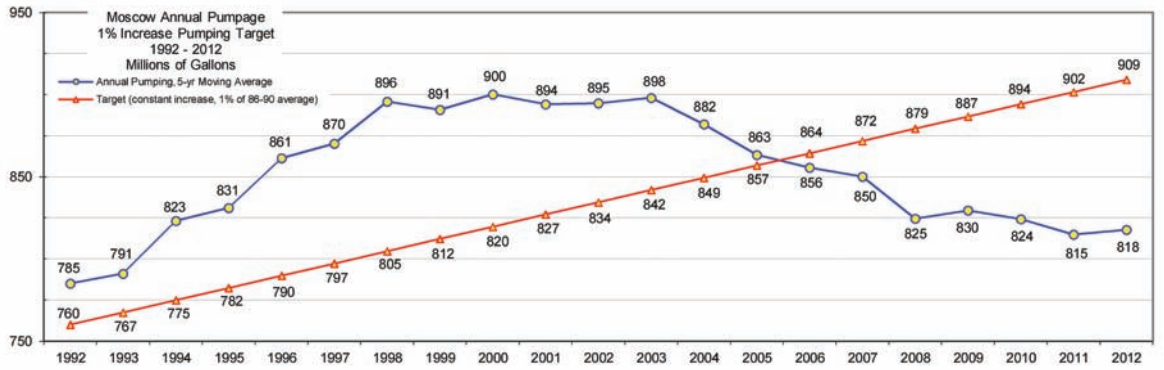


Figure 21: 1% Annual Increase Target, Moscow, 1992 - 2012

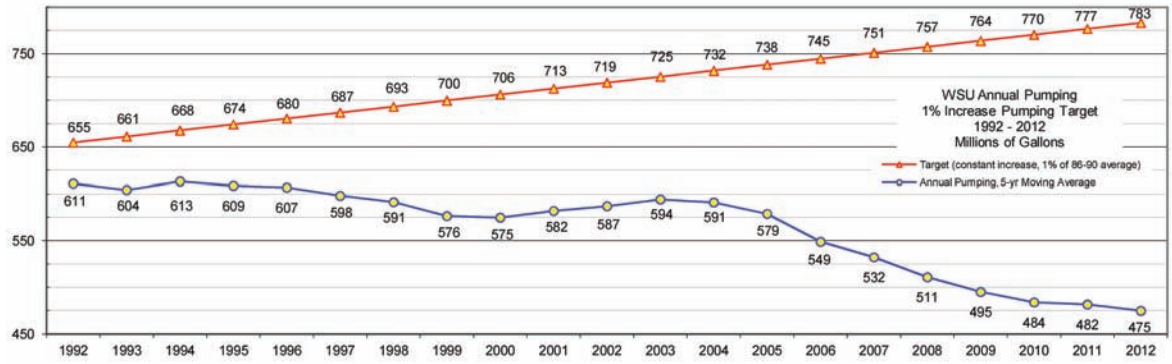


Figure 22: 1% Annual Increase Target, WSU, 1992 - 2012

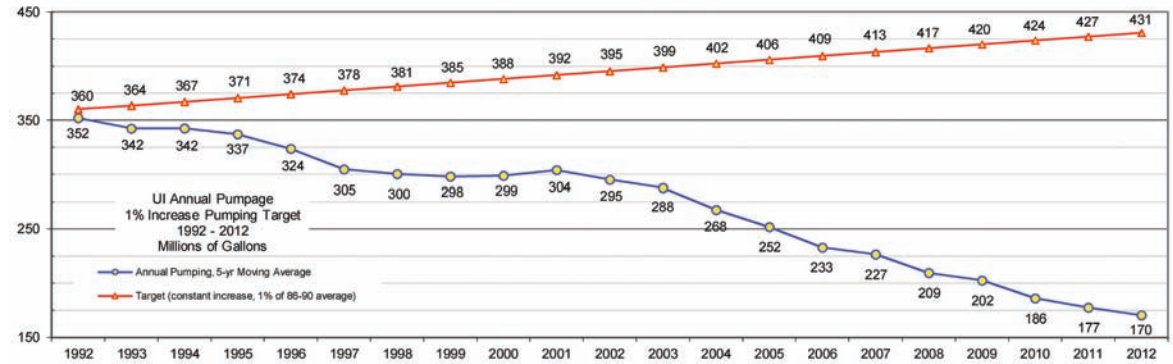


Figure 23: 1% Annual Increase Target, UI, 1992 - 2012

Voluntary 125% (of 1981-85 Average) Pumping Ceiling 1992-2012

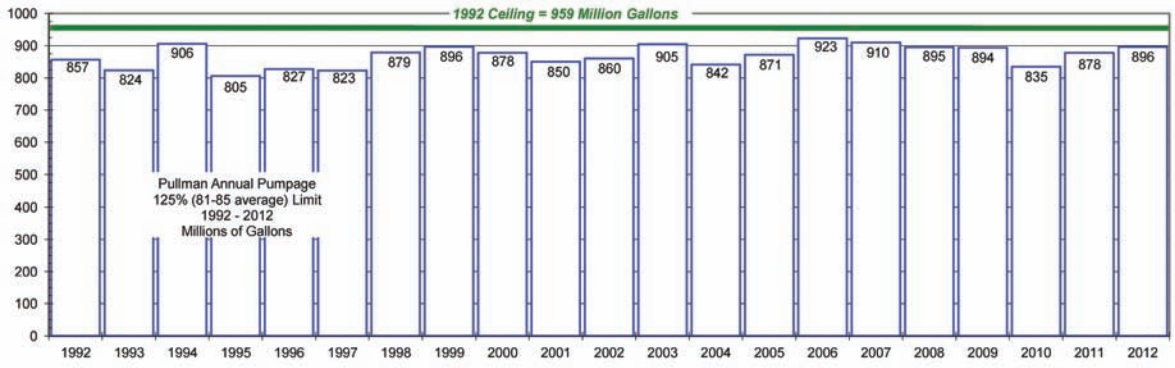


Figure 24: 125% (of 1981 – 85 average) Ceiling Target, Pullman, 1992 - 2012

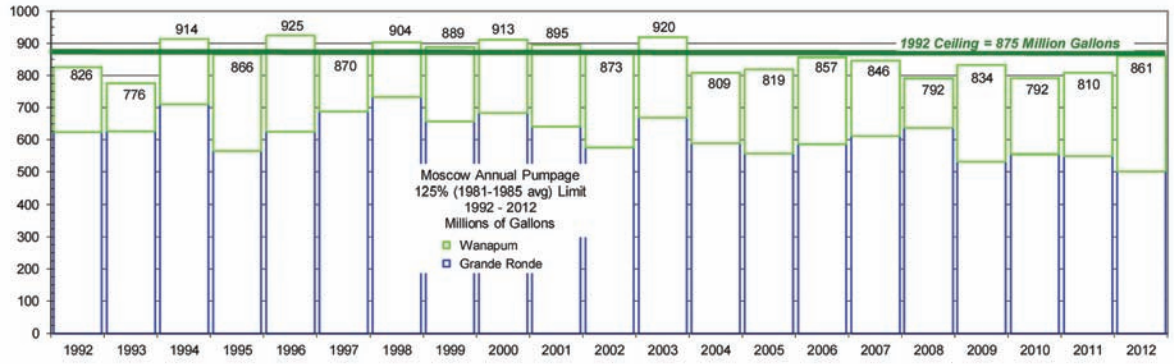


Figure 25: 125% (of 1981 – 85 average) Ceiling Target, Moscow, 1992 - 2012

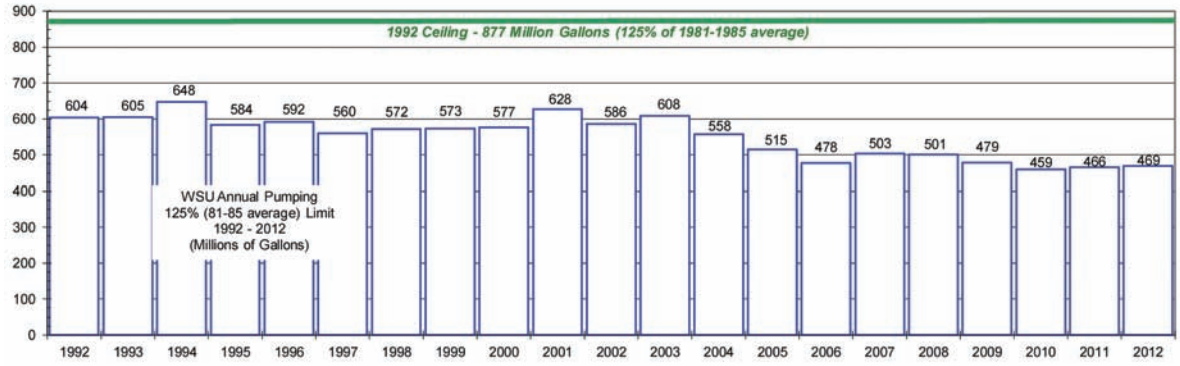


Figure 26: 125% (of 1981 – 85 average) Ceiling Target, WSU, 1992 - 2012

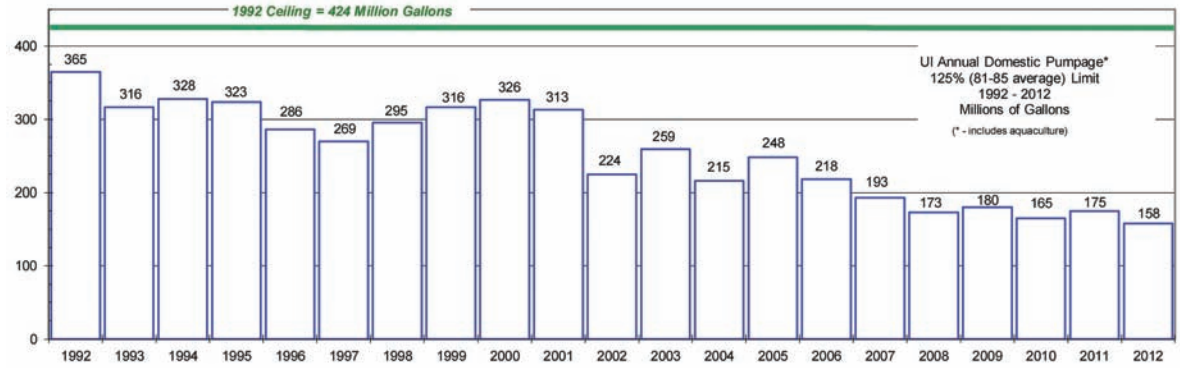


Figure 27: 125% (of 1981 – 85 average) Ceiling Target, UI, 1992 - 2012

Monthly Pumping Totals 2008-2013

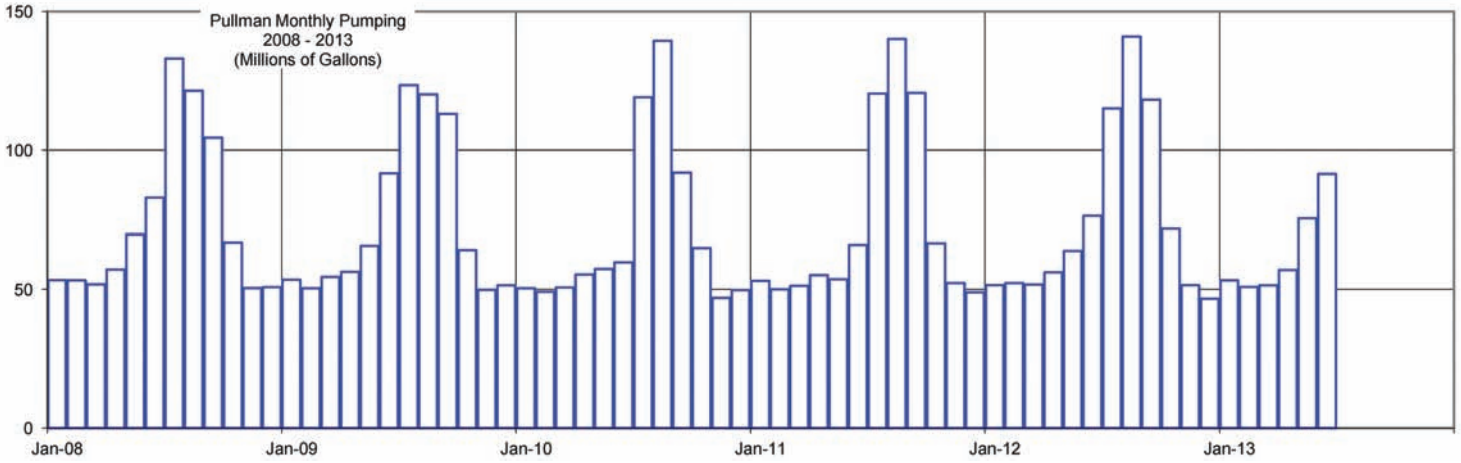


Figure 28: Monthly Pumping, Pullman, 2008 - 2013

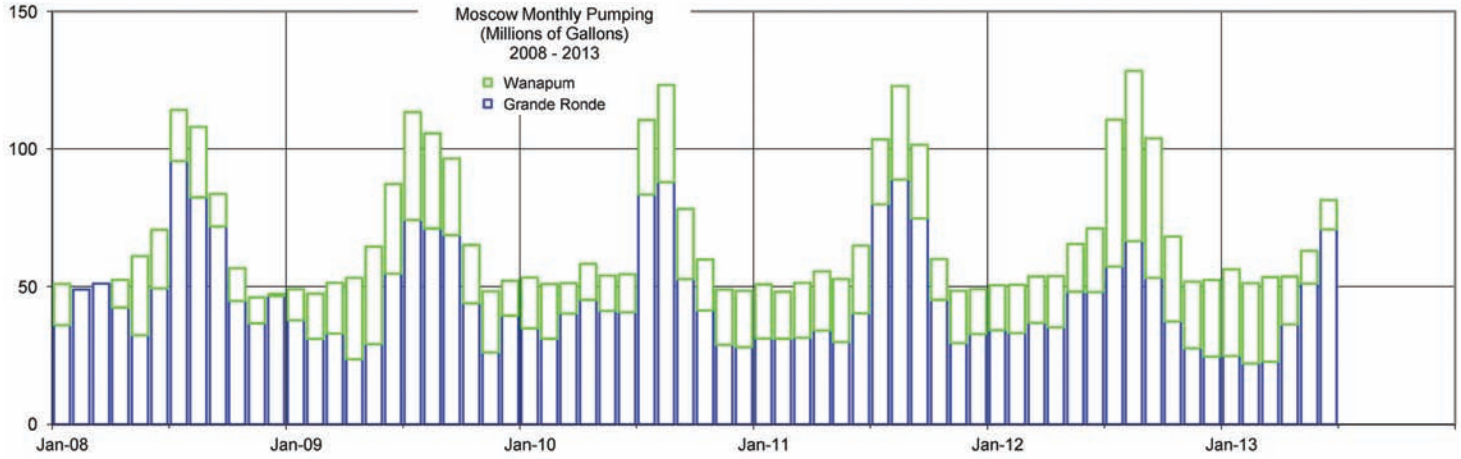


Figure 29: Monthly Pumping, Moscow, 2008 - 2013

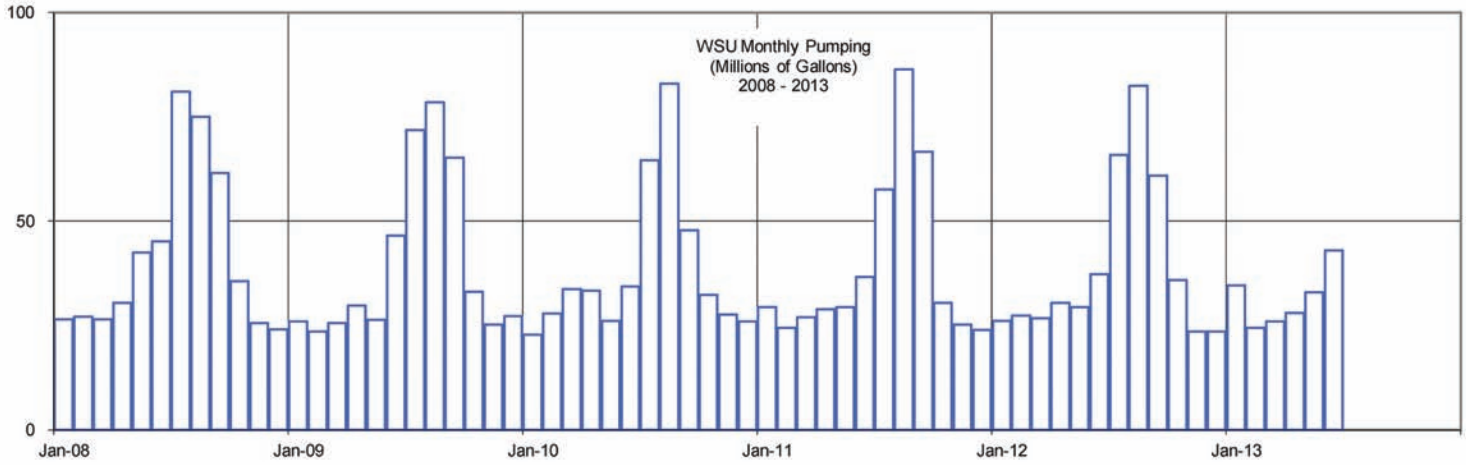


Figure 30: Monthly Pumping, WSU, 2008 - 2013

Monthly Pumping Totals 2008-2013

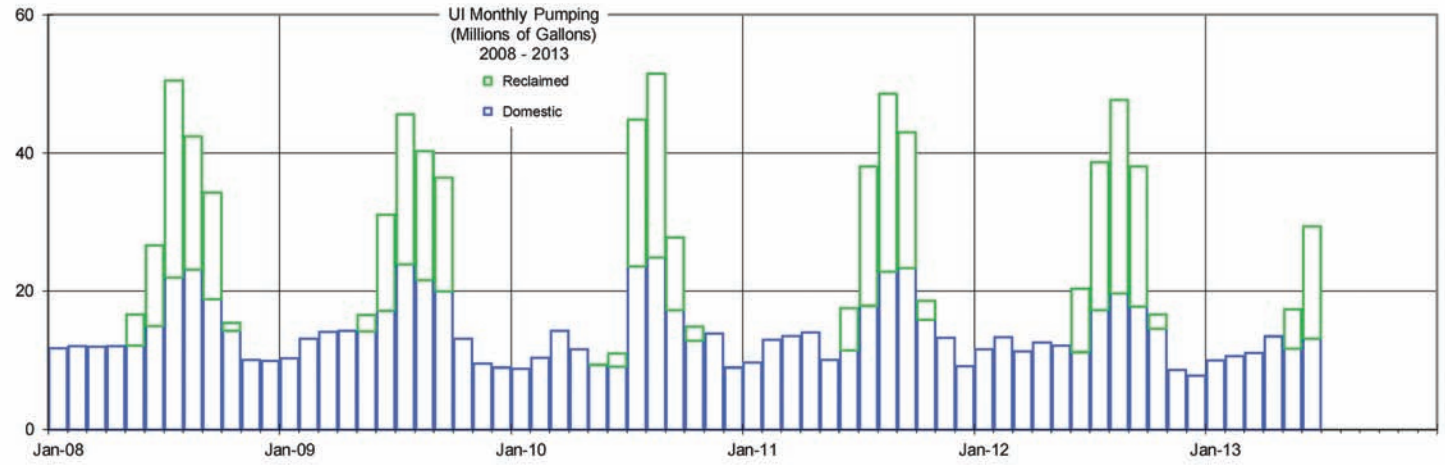


Figure 31: Monthly Pumping, UI, 2008 – 2013

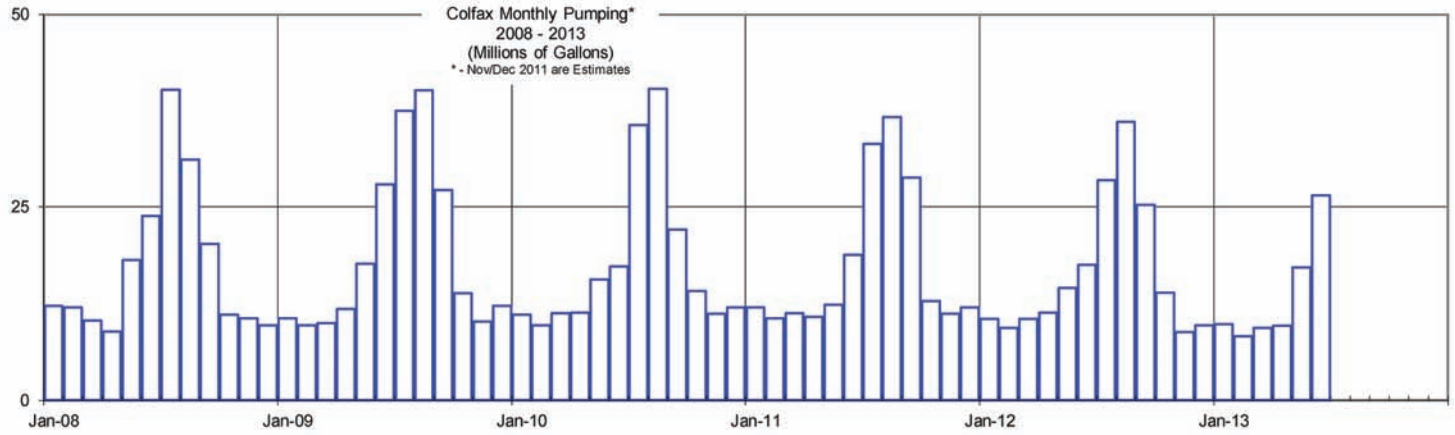


Figure 32: Monthly Pumping, Colfax, 2008 – 2013

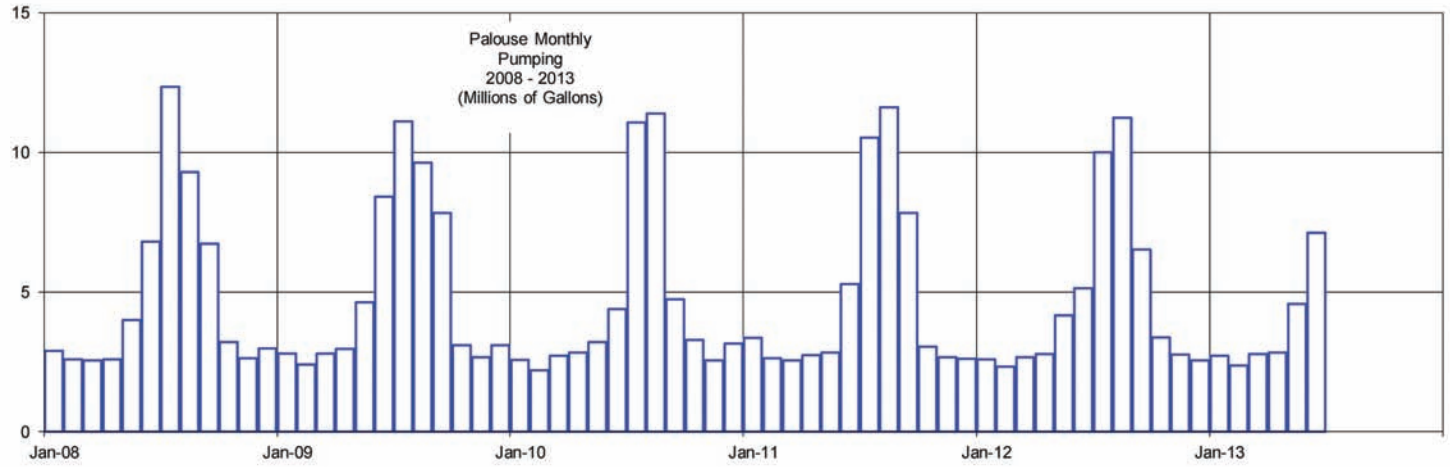


Figure 33: Monthly Pumping, Palouse, 2008 – 2013

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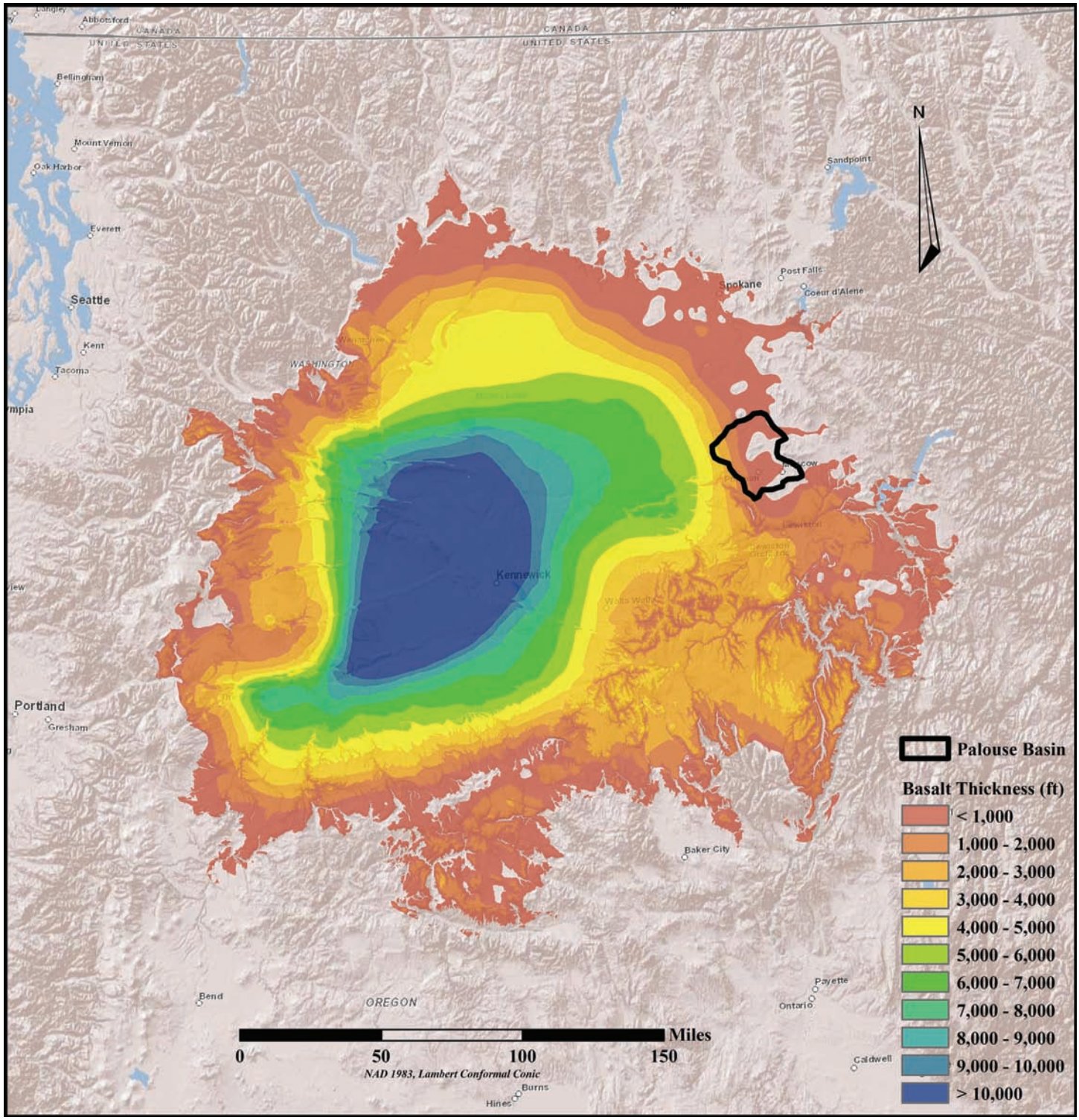
UI Well 3 Drill Cuttings, photo courtesy Richard Conrey



Thickness of Grande Ronde Basalt unit, Columbia Plateau Regional Aquifer System (after Burns, E.R., Morgan, D.S., Peavler, R.S., and Kahle, S.C., 2011, Three-dimensional model of the geologic framework for the Columbia Plateau Regional Aquifer System, Idaho, Oregon, and Washington: U.S. Geological Survey Scientific Investigations Report 2010-5246).


Palouse Basin Aquifer Committee
September 2013