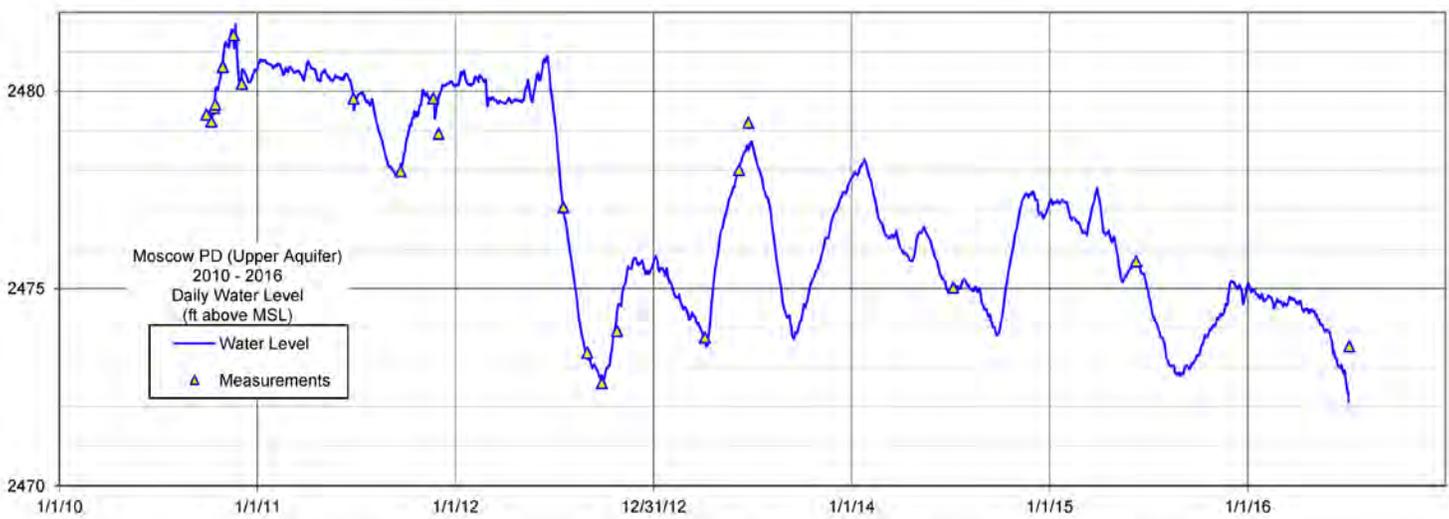
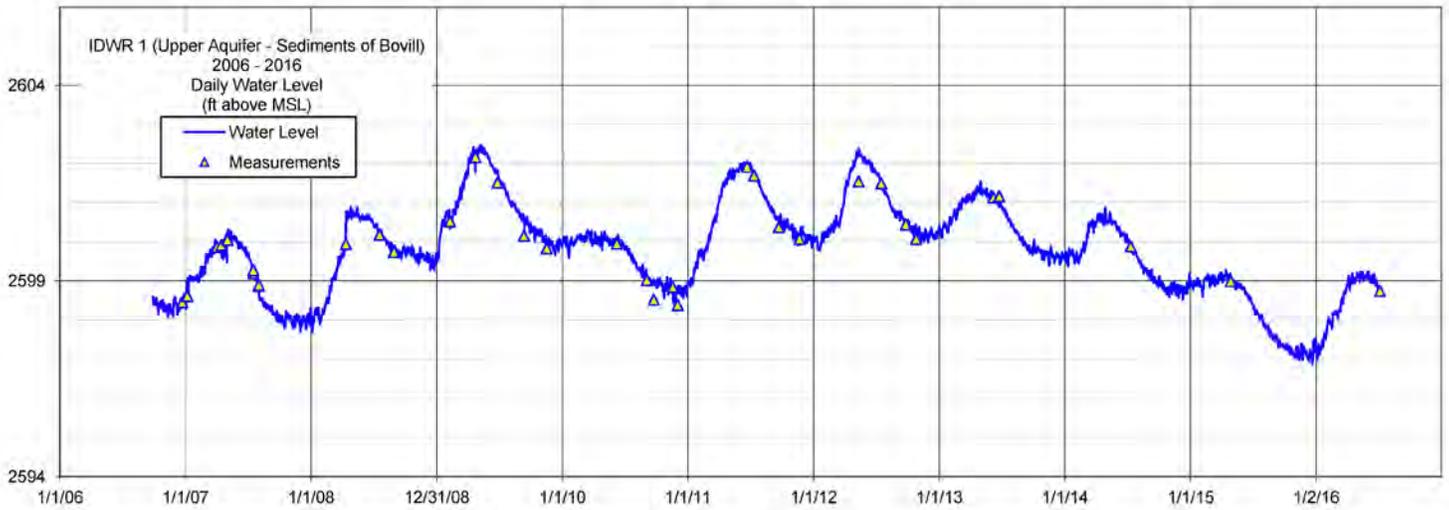




2015
Palouse Ground Water Basin
Water Use Report



Water level hydrographs for 3 Palouse Basin monitoring wells

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 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 2015.

The 2015 total combined ground water pumpage by the reporting pumping entities within the basin was 2.52 billion gallons (Figure 1). In aggregate (Pullman, Moscow, WSU, UI, Palouse), pumpage for 2015 was approximately 3% more than in 2014, and 8% less than in 1992, the first year the Ground Water Management Plan took effect.

2015 water level data from several lower aquifer wells exhibits a reasonably consistent decline in maximum water level of slightly less than 1 foot from 2014

levels. A network of 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 representative wells in both the upper and lower aquifers are illustrated on the inside front cover of this report.

The foundation of the 1992 Ground Water Management Plan is a set of goals. PBAC's primary goal is to develop and implement a balanced, basin-wide, water supply and use program by the year 2025. As a step toward reaching that goal, in 2015 PBAC initiated the Palouse Ground Water Basin Water Supply Alternatives project. The project is analyzing selected past as well as new water supply alternatives in light of current conditions.

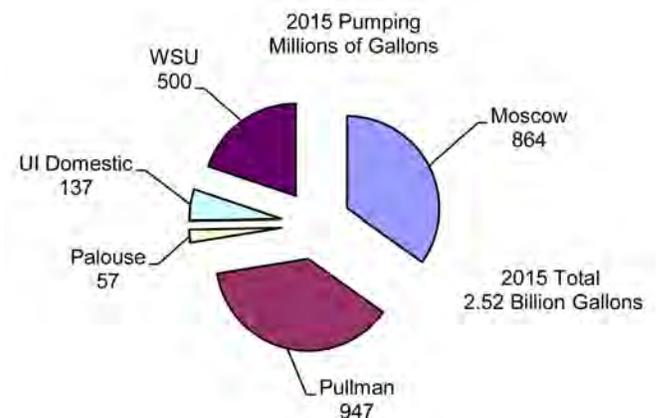


Figure 1: 2015 Ground Water Pumping

Annual Water Use Report

The report that follows includes water use and water level information for the period from 1992 through 2015. To provide up to date information where available, data are included for portions of 2016. 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, state institutions and 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. 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). Although not a formal PBAC member, since 2006 the City of Palouse has contributed funding toward the administration of the Committee. Colfax withdrew its membership in PBAC in October 2014. PBAC member contact information is detailed on page 8.

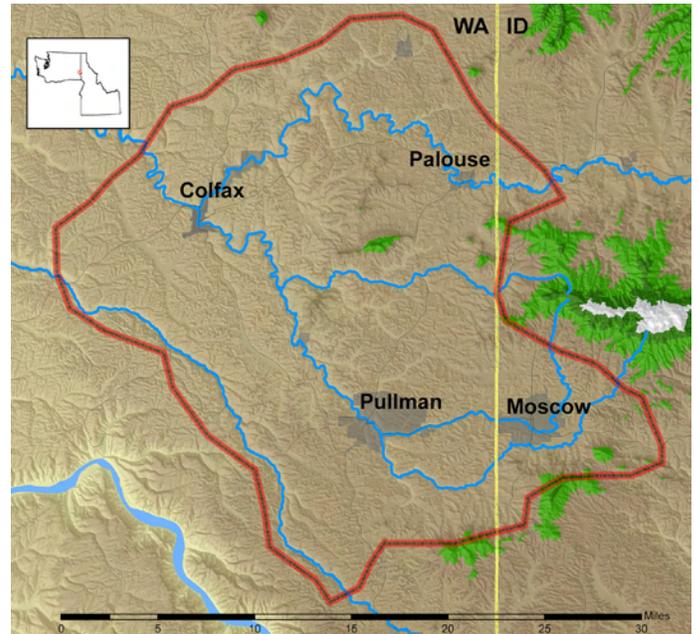


Figure 2: Working Boundary for the Palouse Ground Water Basin

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 4 - now 6) 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.

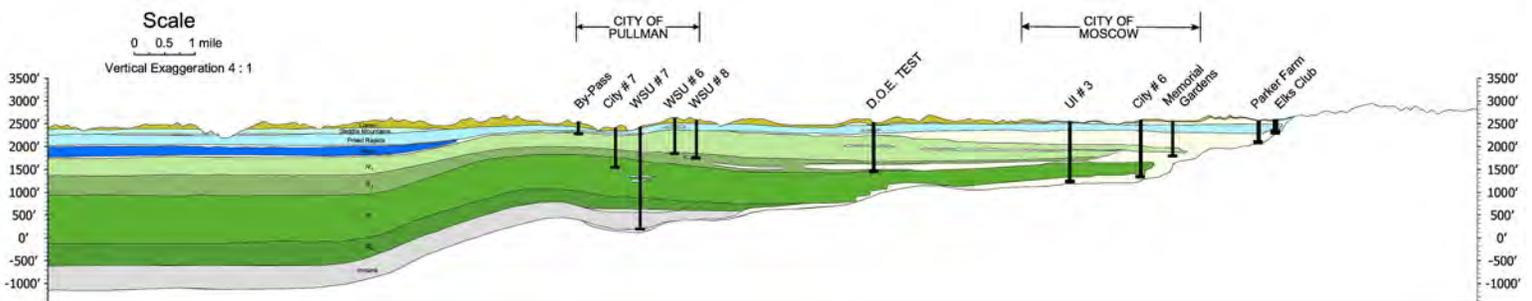


Figure 3: E-W Schematic Cross Section (Bush, Garwood, 2005)

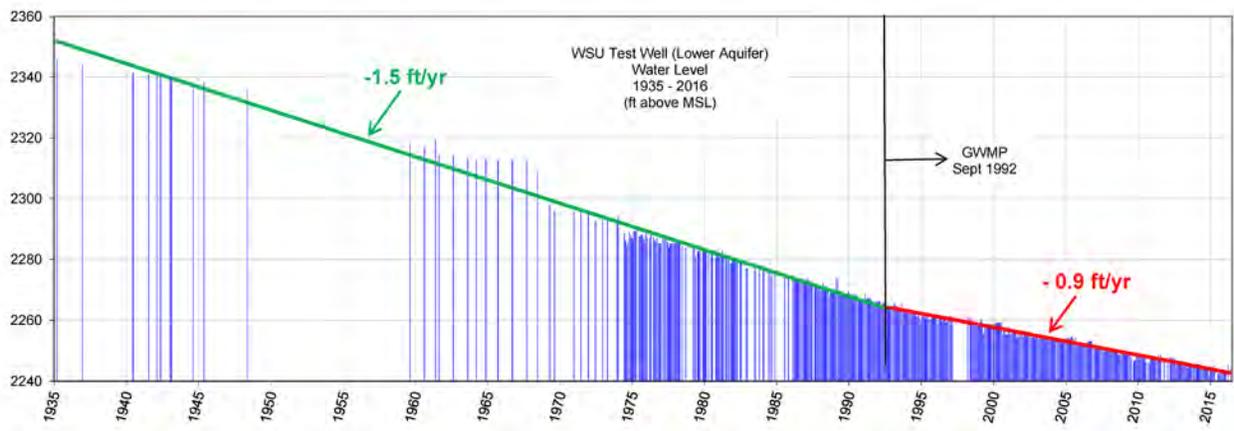


Figure 4: Static Water Level, WSU Test Well (Lower Aquifer), 1935 -2016

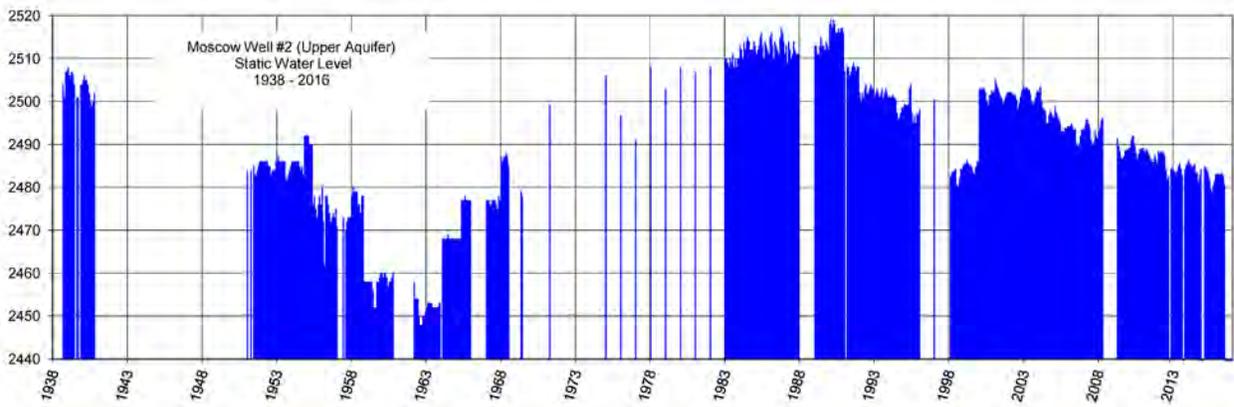


Figure 5: Static Water Level, Moscow Well #2 (Upper Aquifer), 1938-2016

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.

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, 27% of the 2015 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). More recent data (since 2006) indicate the average annual rate of decline has decreased to 0.66 feet per year. 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 both the Wanapum and the Grande Ronde aquifer systems.

GROUND WATER PUMPAGE AND WATER LEVELS

The total combined ground water pumpage by the reporting cities (Pullman, Moscow, Palouse) and universities (WSU and UI) for the year 2015 was 2.52 billion gallons (7,730 acre-feet). In aggregate, this was 2.9% more than was pumped in 2014 (2.45 billion gallons), and 8.1% less than was pumped in 1992 (2.74 billion gallons), the first year the Ground Water Management Plan took effect.

In 2015, Pullman and Moscow each pumped slightly more than 1/3 of the total (38% and 35% respectively), followed by WSU at 20%. UI pumped 5%, and Palouse pumping accounted for 3% of the combined total (Figure 6). By entity, comparisons to 2014 pumping are shown in Figure 7.

Moscow pumped 27% (235 million gallons) of its water from the upper Wanapum aquifer system in 2015. The other pumping entities all pump solely from the lower Grande Ronde system. As a percentage of the combined pumping total, the 2015 Moscow Wanapum contribution amounted to 9.3%.

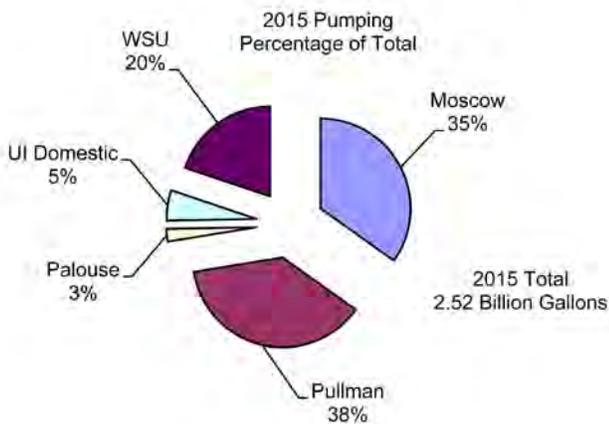


Figure 6: Ground Water Pumping – Percentage of Total - 2015

Pumping increases significantly in the summer months, primarily due to increased irrigation demand. For 2015, an estimate of the baseline pumping was calculated as the average of the pumping amounts for the months of January, February, November, and December. Pumping above this average amount can

be considered non-baseline usage. As a percentage of total pumping, the 2015 non-baseline usage for the five pumping entities ranged from 22.8% for UI to 54.9% for Palouse (Figure 8). (Note: In the figure the UI non-baseline use is presented both with and without inclusion of the 101 million gallons of reclaimed water utilized in 2015).

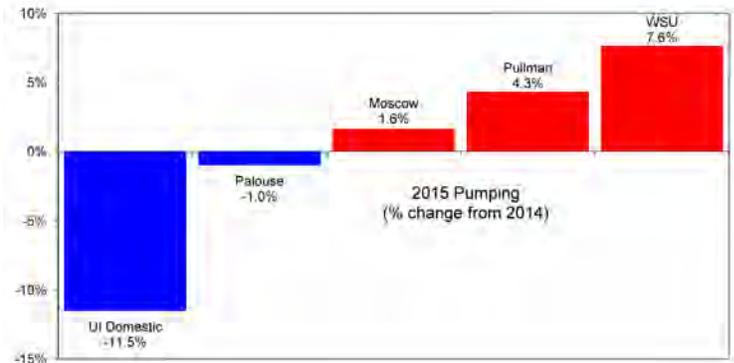


Figure 7: 2015 Pumping – Change from 2014

Non-baseline usage varies with the weather conditions experienced during the year. In 2015, the months of April through August were all warmer than the 5-year trailing average. Additionally, the month of April and the span of June through September were drier than the trailing average. Weather conditions during June 2015 alone played a major role in the 2.9% annual pumping increase detailed earlier. Compared to 2014, warmer-drier conditions in June 2015 resulted in an 19% increase in pumping for the month. Charts of 2015 and first half 2016 monthly pumping compared to the 2010-2014 averages are shown in Figures 10-14 on pages 6-7. Figures 19-23 (pages 11-12) illustrate monthly pumping for the period between 2011 and mid 2016.

As part of the Ground Water Management Plan, each pumping entity has agreed to voluntary pumping limitation goals. Pullman, Moscow, and the universities have agreed to attempt to limit annual pumping increases to 1% of the 1986-1990 average pumping amount. In addition, Pullman, Moscow and the universities agreed to keep total pumping below 125% of the 1981-1985 average pumping amount.

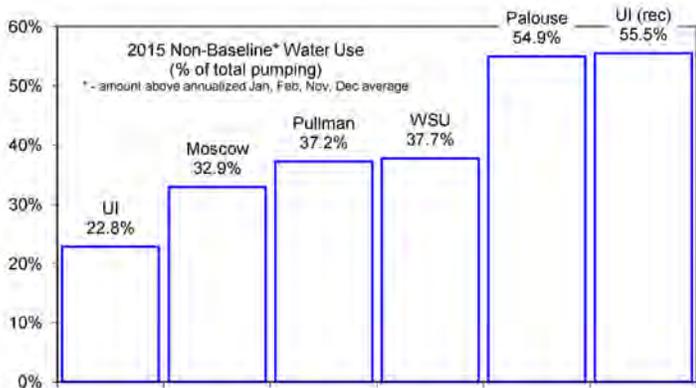


Figure 8: Non-Baseline Water Use – 2015

An aggregation of the limitation goals for the GWMP pumping entities (Pullman, Moscow, WSU, UI) is shown in Figure 9 below. The limitation goals for individual GWMP pumping entities are illustrated in Figures 15-18 (pages 9-10). Note that no charts are shown for Palouse as they were not a signatory to the Ground Water Management Plan, and are not subject to the pumping targets.

PBAC maintains a network of monitoring wells throughout the basin. A map illustrating monitoring well locations and hydrographs can be accessed on the PBAC web site (<http://www.webpages.uidaho.edu/pbac>). 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 hydrograph for the WDOE Pullman Test monitoring well (bottom figure on inside front cover) reveals variation in year to year water level declines. The decline in annual maximum between 2014 and 2015 was 0.64 feet. In contrast, the maximum water level in 2014 declined almost 1.2 feet from that of 2013. A regression line for the years 2006 through early 2016 indicates an average annual decline over the period of approximately 0.66 ft/yr.

In the upper Wanapum aquifer (middle figure, inside front cover), the 2015 maximum water level at the Moscow PD monitoring well declined 0.73 feet from that of 2014. Preliminary data indicate the decline during 2016 will exceed that of 2015. The marked decline in water level in 2012 was likely 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.

Comparing the Moscow PD hydrograph to that of the IDWR 1 monitoring well (upper figure, inside front cover), which is completed above the Wanapum basalt in the Sediments of Bovill, it appears that water levels in the IDWR well exhibit seasonal variation but were not as heavily impacted by the increased pumping by the City in 2012.

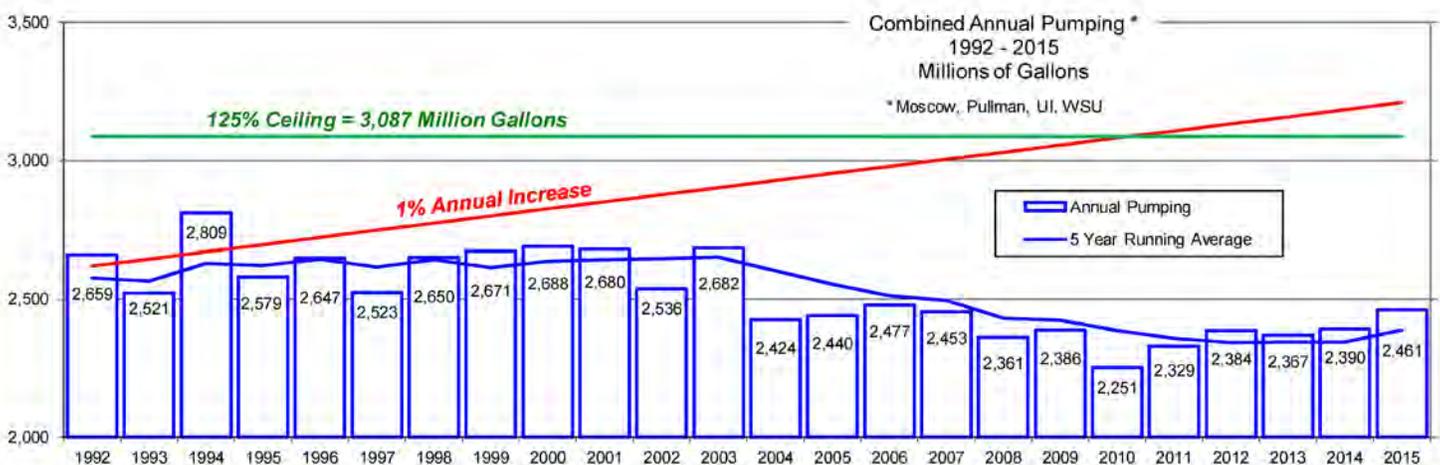


Figure 9: Pumping Limitation Goals, 4 Major Entities Combined, 1992 - 2015

MONTHLY PUMPING COMPARED TO 5 YEAR AVERAGE

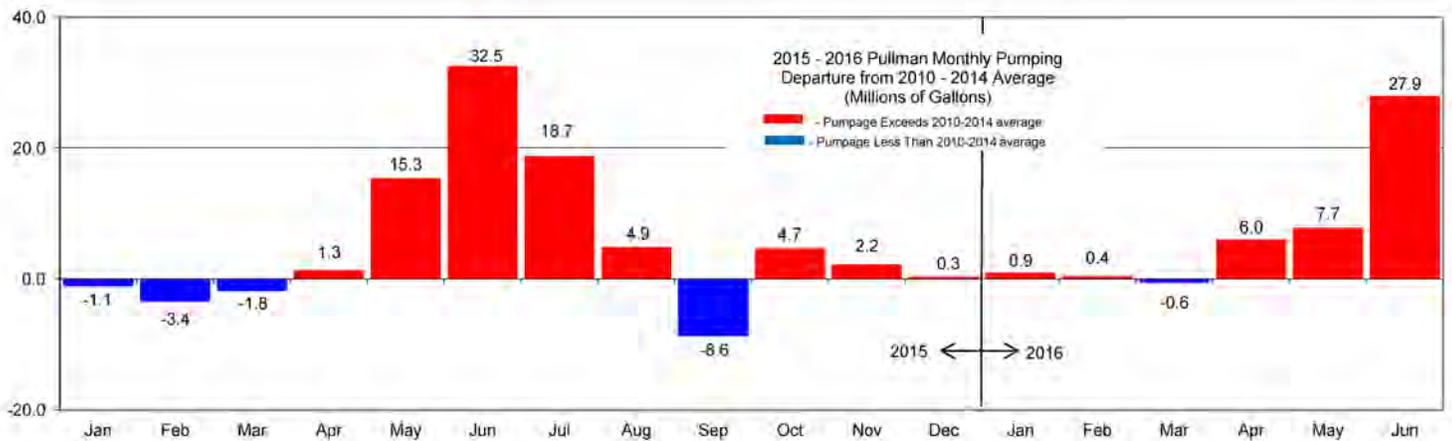


Figure 10: Pullman Monthly Pumping, Departure from 5-year Average, 2015-2016

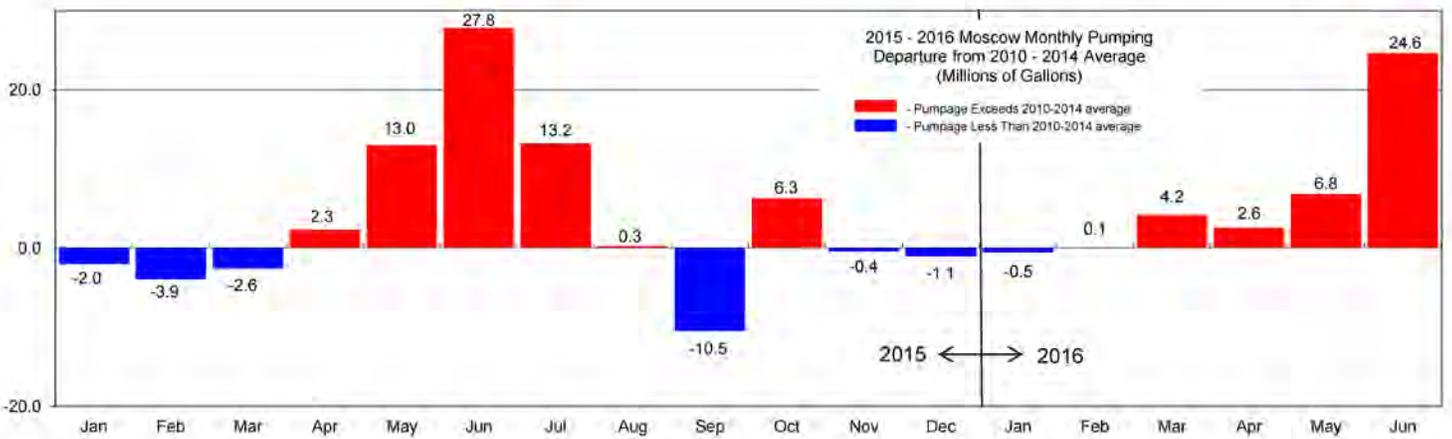


Figure 11: Moscow Monthly Pumping, Departure from 5-year Average, 2015-2016

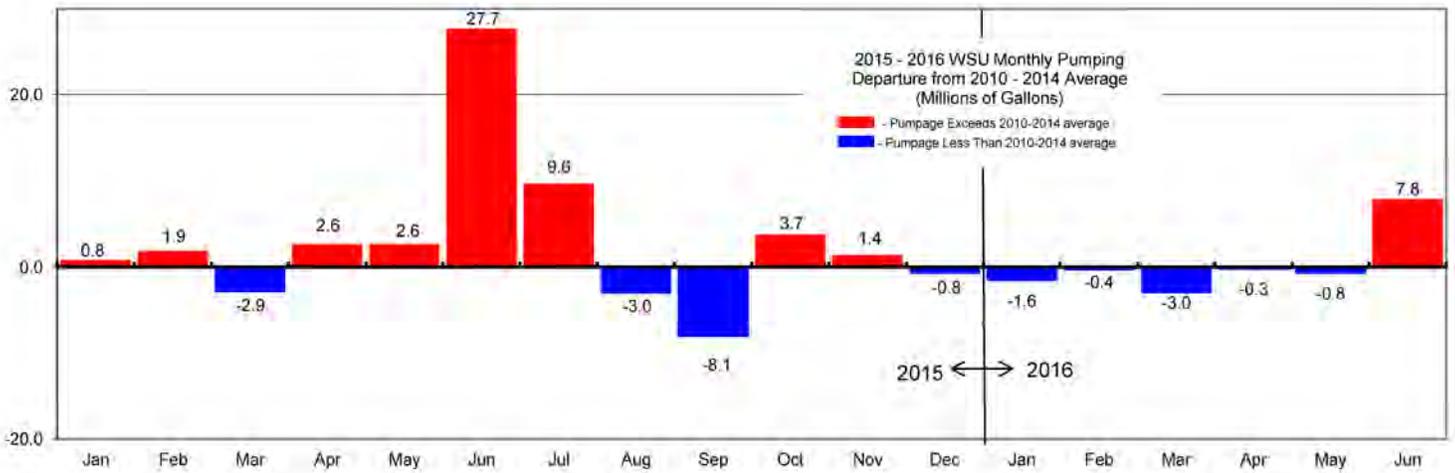


Figure 12: WSU Monthly Pumping, Departure from 5-year Average, 2015-2016

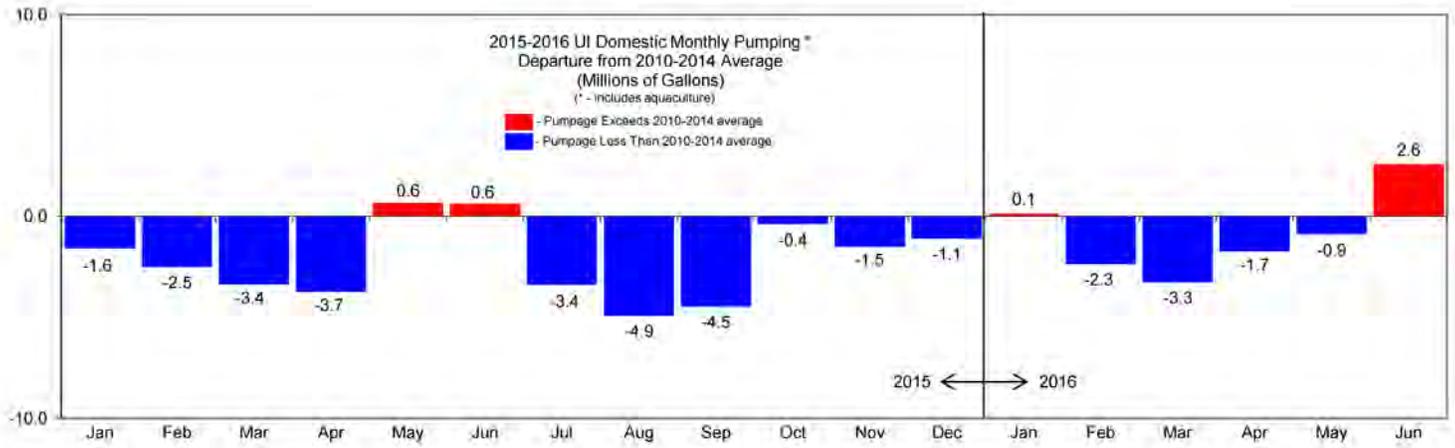


Figure 13: UI Monthly Pumping, Departure from 5-year Average, 2015-2016

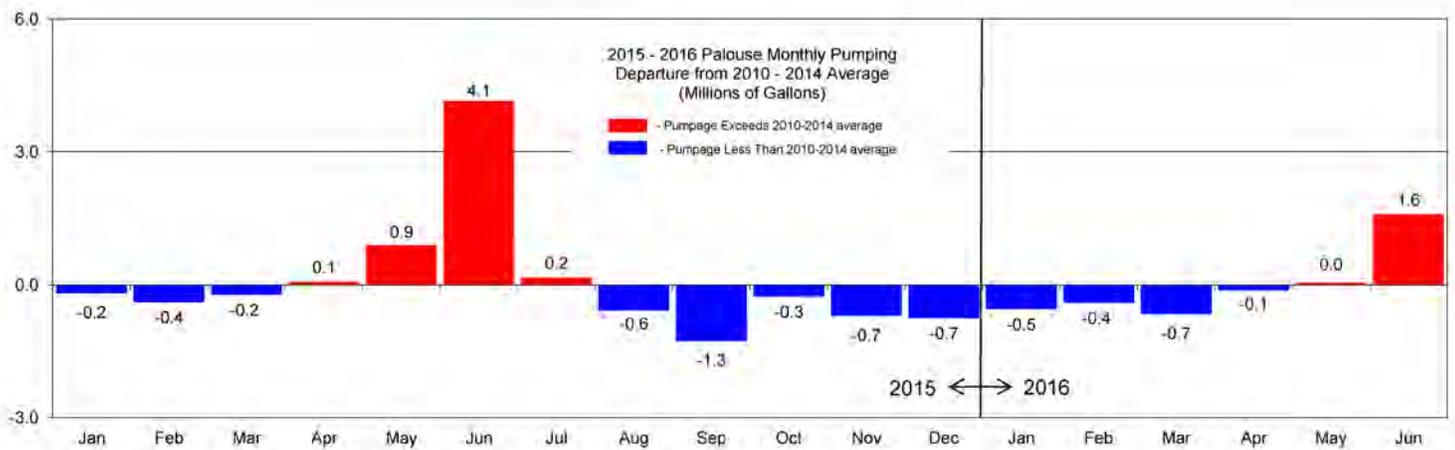


Figure 14: Palouse Monthly Pumping, Departure from 5-year Average, 2015-2016

RESEARCH ACCOMPLISHMENTS 2015

In 2015 PBAC initiated the Palouse Ground Water Basin Water Supply Alternatives project. The project is compiling previously identified alternatives and subjecting the most currently feasible to updated analyses that will include consideration of 13 (quantitative as well as qualitative) evaluation criteria. The project is benefitting from a generous grant provided by the State of Idaho through the Idaho Water Resource Board and the Idaho Department of Water Resources.

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 the spring of 2015 PBAC issued a GWMP Informational Update (available on the PBAC web site). As part of the update, each PBAC entity reviewed and updated its individual action plan(s) to better reflect current conditions in the basin.

In 2015, PBAC participated in the 11th (modern) Palouse Water Summit. The 2015 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 12th Summit, scheduled for October 2016.

2016 PBAC REPRESENTATIVES

Kevin Gardes (Pullman)
kevin.gardes@pullman-wa.gov
208-338-3217

Fritz Hughes (Pullman)
fritz.hughes@pullman-wa.gov
509-338-3208

Elmer Johnson (UI)
elmerj@uidaho.edu
208-885-9407

Paul Kimmell (Latah Co.)
paul.kimmell@avistacorp.com
509-592-7801

2016 PBAC REPRESENTATIVES CONT.

Tom Lamar (Latah Co.)
bocc@latah.id.us
208-883-2275

Les MacDonald (Moscow)
lmacdonald@ci.moscow.id.us
208-883-7028

Tyler Palmer (Moscow)
tpalmer@ci.moscow.id.us
208-883-7097

Steven Potratz (WSU)
steve_potratz@wsu.edu
509-335-9300

Walter Steed (Moscow)
wmsted@ci.moscow.id.us
208-883-0123

Mark Storey (Whitman Co.)
marks@co.whitman.wa.us
509-387-4622

Greg Streva (WSU)
gstreva@wsu.edu
509-335-9040

Art Swannack (Whitman Co.)
arts@co.whitman.wa.us
509-397-5247

Mark Workman (Pullman)
mark.workman@pullman-wa.gov
509-338-3212

2016 PBAC EX OFFICIO REPRESENTATIVES

Morgan Case (IDWR)
morgan.case@idwr.idaho.gov
208-762-2800

Guy Gregory (WDOE)
ggre461@ecy.wa.gov
509-329-3509

2016 PBAC STAFF

Steve Robischon
pbac@uidaho.edu
208-885-6429

PUMPING GOALS

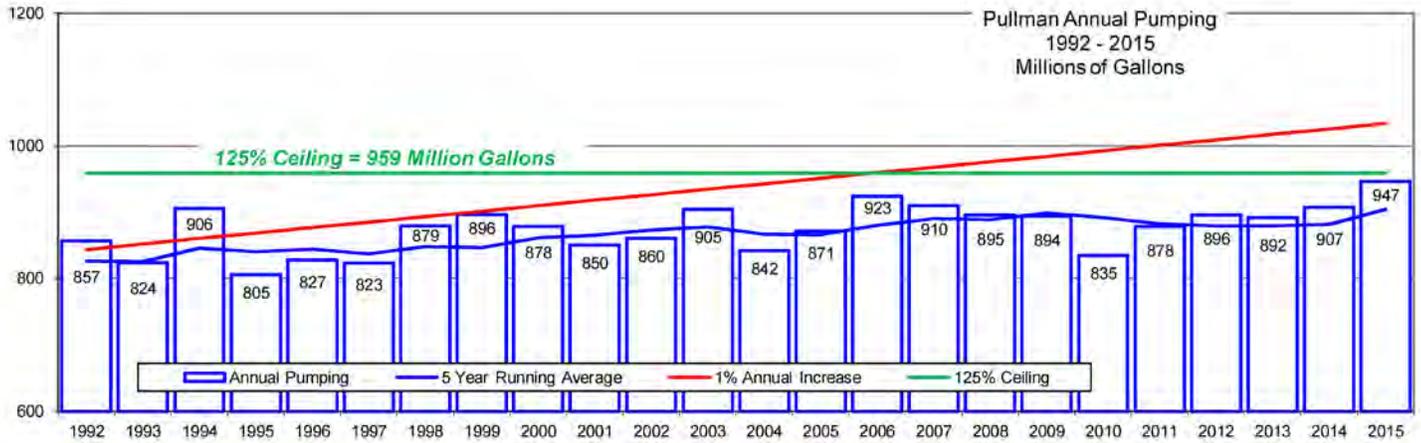


Figure 15: Pumping Limitation Goals, Pullman, 1992-2015

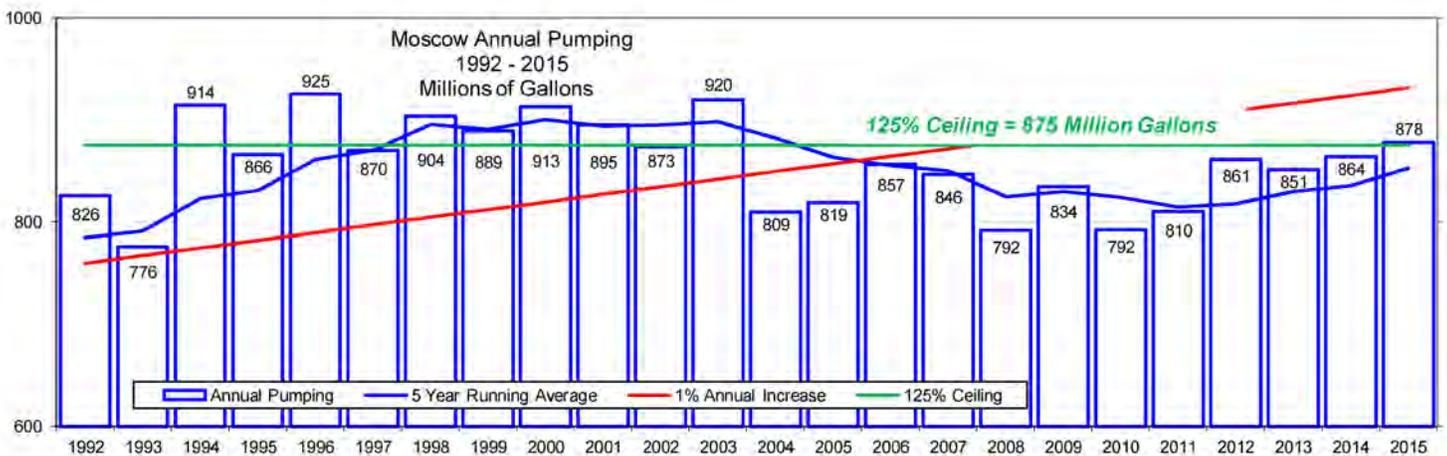


Figure 16: Pumping Limitation Goals, Moscow, 1992-2015

PUMPING GOALS

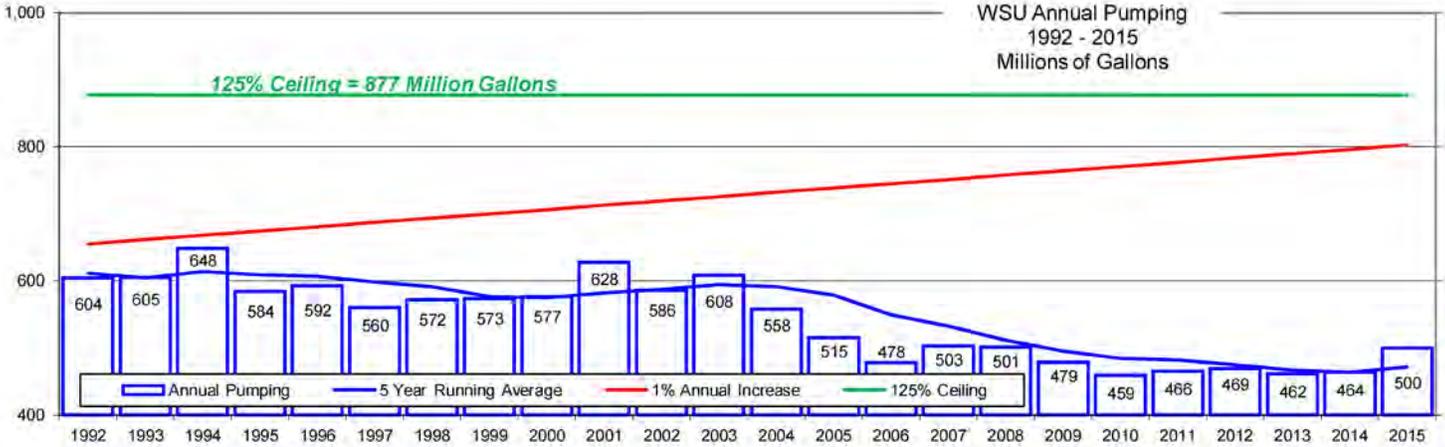


Figure 17: Pumping Limitation Goals, WSU, 1992-2015

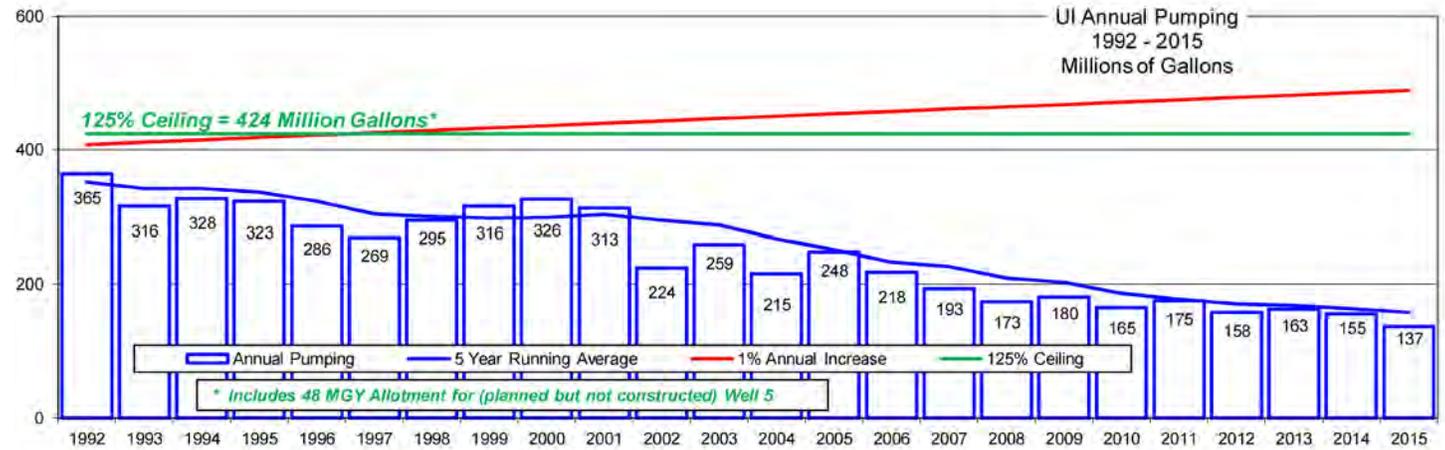


Figure 18: Pumping Limitation Goals, UI, 1992-2015



MONTHLY PUMPING

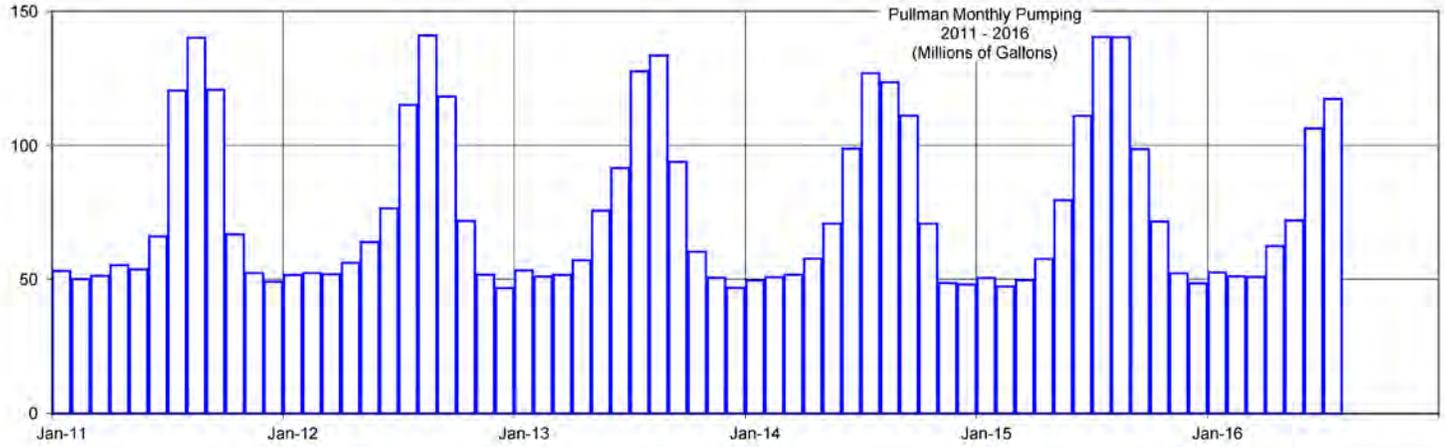


Figure 19: Monthly Pumping, Pullman, 2011-2016

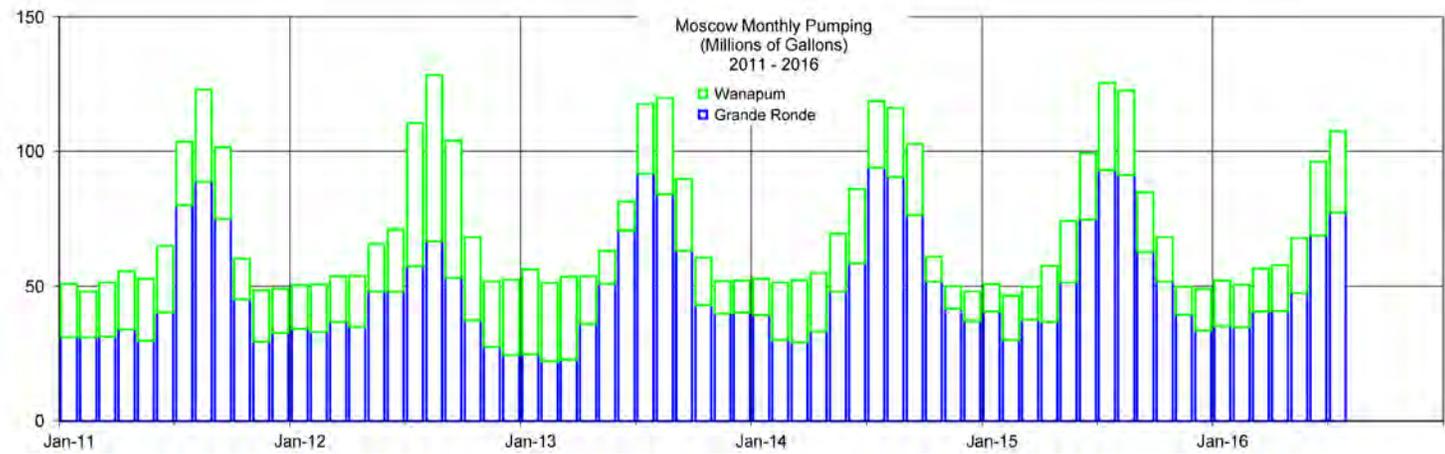


Figure 20: Monthly Pumping, Moscow, 2011-2016

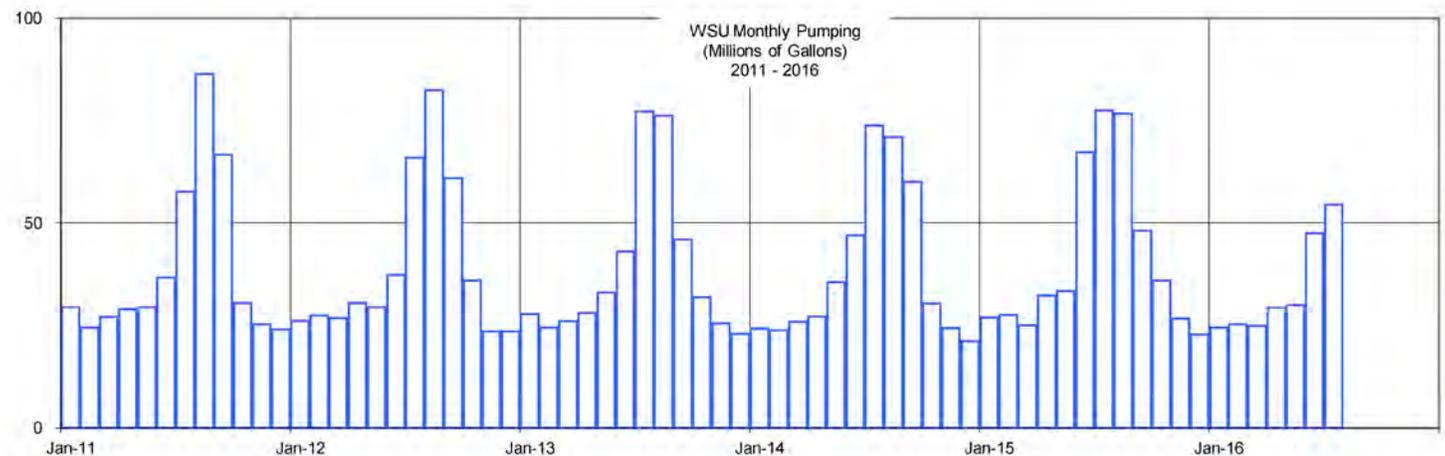


Figure 21: Monthly Pumping, WSU, 2011-2016

MONTHLY PUMPING

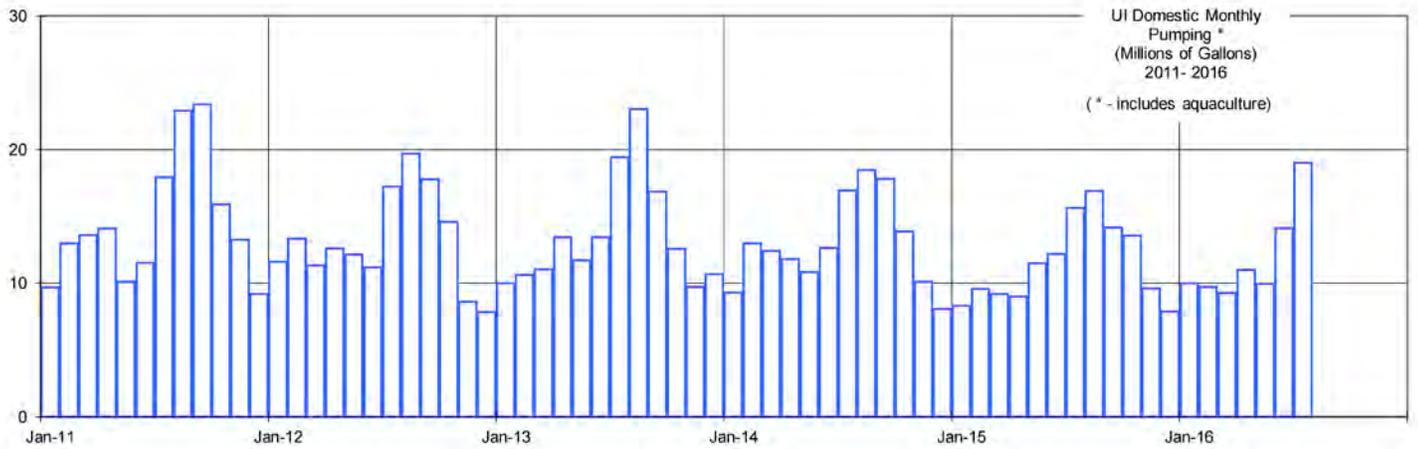


Figure 22: Monthly Pumping, UI, 2011-2016

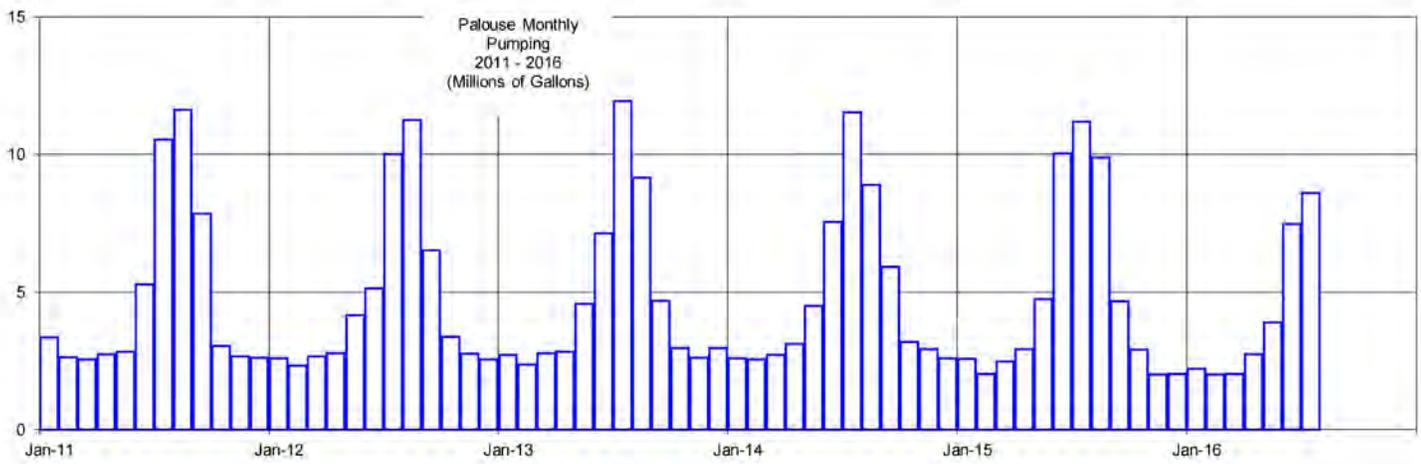
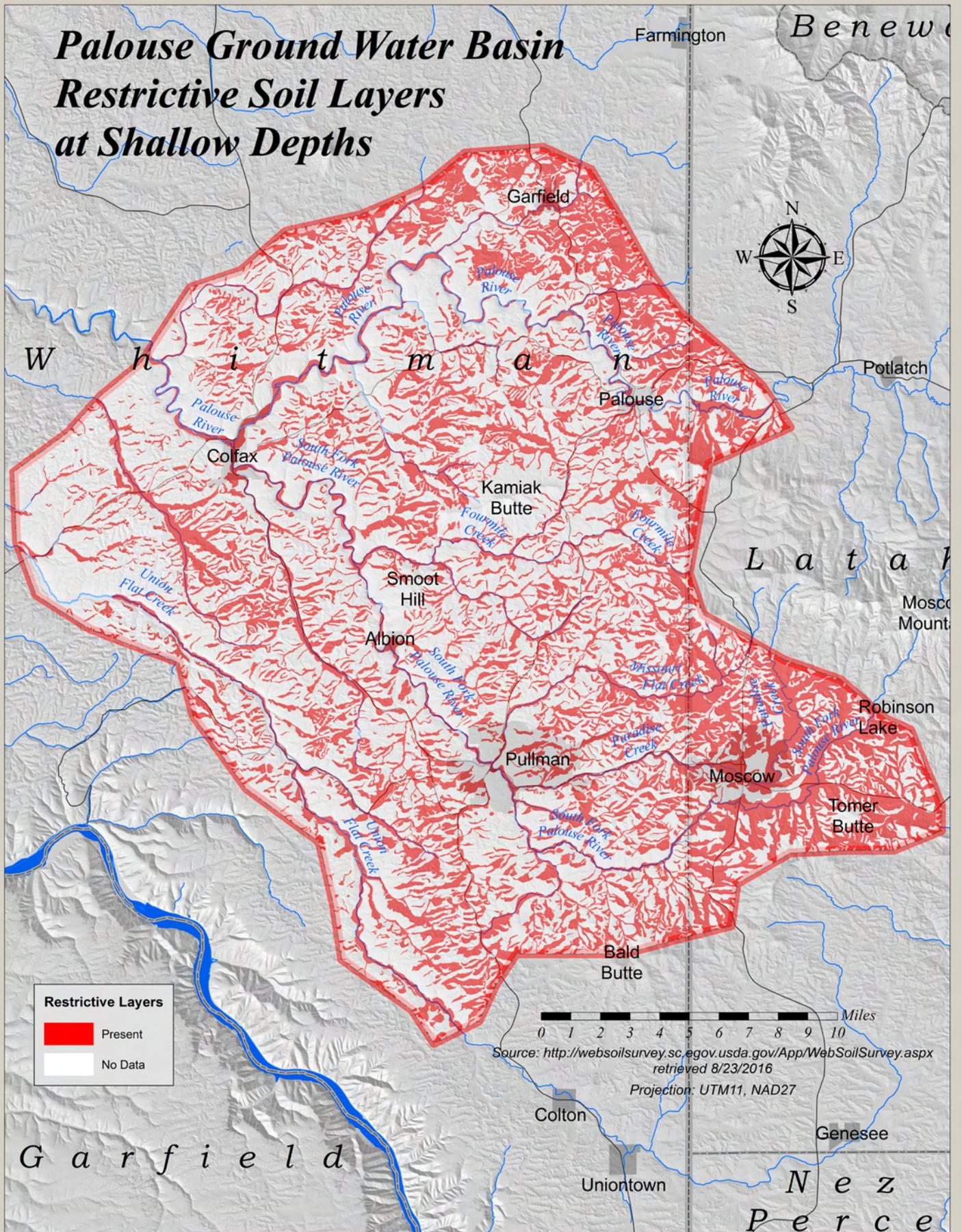


Figure 23: Monthly Pumping, Palouse, 2011-2016



Palouse Ground Water Basin Restrictive Soil Layers at Shallow Depths



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Palouse Basin Aquifer Committee
September 2016