PALOUSE BASIN
AQUIFER
committee

ANNUAL WATER USE REPORT

2016

Palouse Basin Aquifer Committee
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WATER IS ESSENTIAL.

The Palouse Groundwater Basin provides the sole drinking water supply for over 60,000 residents.

Executive Summary

Water is the essential ingredient needed for human residency in any region. The Palouse Groundwater Basin provides the sole drinking water supply for over 60,000 residents of Whitman County (Washington) and Latah County (Idaho).

Within the basin there are two major aquifers, the Wanapum and Grande Ronde, which are confined aquifers. An aquifer is an underground layer of water stored in permeable rock or between layers of rock. A confined aquifer differs from an unconfined aquifer in that there is an impermeable layer of rock or soil present that prevents water from readily entering from the surface above.

While we pump water out of our confined aquifers, water is not reentering the aquifers at the rate that we are pumping water out. As a result, the aquifer levels have been declining since the beginning of usage.

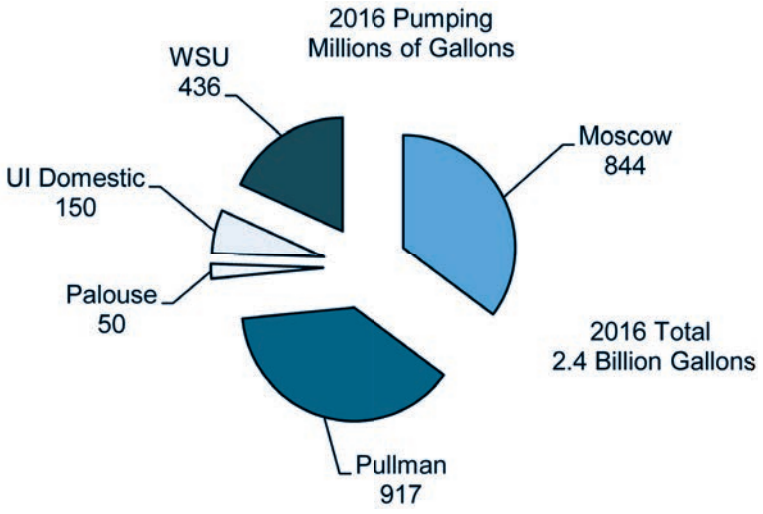


Figure 1: 2016 Groundwater Pumping

The Palouse Basin Aquifer Committee (PBAC) is a voluntary, cooperative, multijurisdictional group with representatives from the cities, counties, and universities within 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 the Ground Water Management Plan (GWMP), first enacted in 1992.

The GWMP and an associated Intergovernmental Agreement include requirements to report accomplishments, pumpage, and water level information. The purpose of this report is to review groundwater pumpage, summarize aquifer water levels, and review research accomplishments during 2016.

The 2016 total combined groundwater pumpage by the reporting pumping entities within the basin was 2.40 billion gallons *(Figure 1)*. In aggregate (Pullman, Moscow, WSU, UI, Palouse), pumpage for 2016 was approximately 4.8% less than in 2015, and 12.5% less than in 1992, the first year the GWMP took effect.

The 2016 water level data from several lower aquifer wells exhibits a reasonably consistent decline in maximum water level of slightly less than 1 foot from 2015 levels. 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 groundwater levels throughout the basin. Hydrograph records for representative wells in both the upper (Wanapum) and lower (Grande Ronde) aquifers are illustrated on the next page of this report.

The GWMP consists of a set of goals that are pursued by PBAC. 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 2016 PBAC completed the Palouse Groundwater Basin Water Supply Alternatives project. The project analyzes selected past as well as new water supply alternatives in light of current conditions.

Water level hydrographs for 3 Palouse Basin monitoring wells

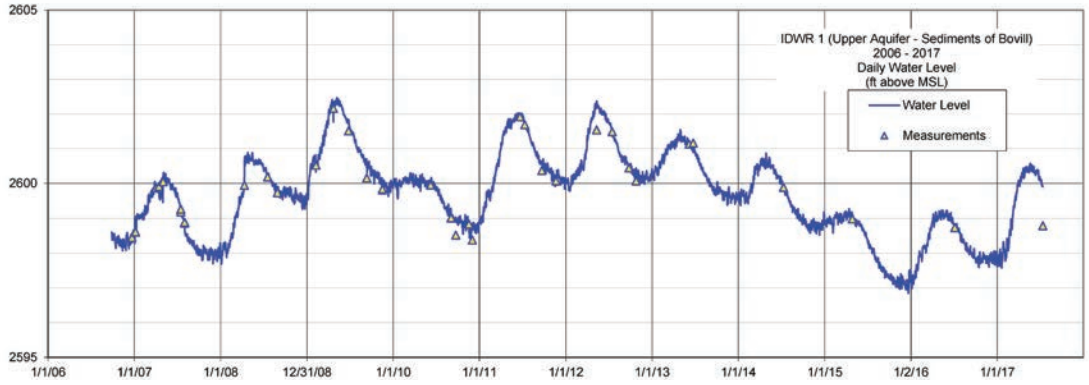


Figure 2—Hydrograph record, IDWR 1

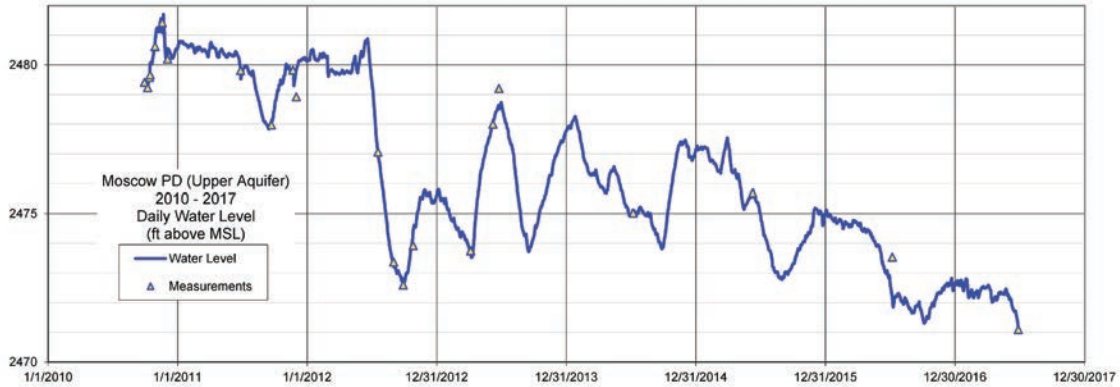


Figure 3.—Hydrograph record, Moscow PD

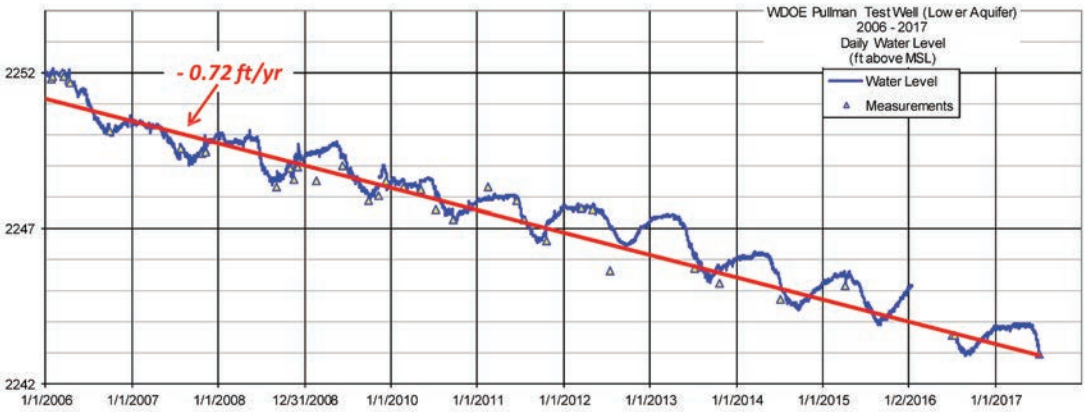


Figure 4.—Hydrograph record, WDOE Pullman Test Well

ANNUAL WATER USE REPORT

"The PBAC mission is to ensure a long-term quality water supply for the Palouse Basin region"

Introduction

The report that follows includes water use and water level information for the period from 1992 through 2016. To provide up-to-date information where available, data are included for portions of 2017. Water use reports for earlier years can be viewed at the PBAC web site.

The Palouse Basin Aquifer Committee

Groundwater 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. Groundwater 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 18.

The Ground Water Management Plan (GWMP)

In 1992, the PMWRC, with the support of Washington and Idaho state regulatory agencies, enacted the 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.

Basin Description

The precise boundaries of the basin have not been delineated, but the current working boundary appears as shown in *Figure 5*. Groundwater 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.

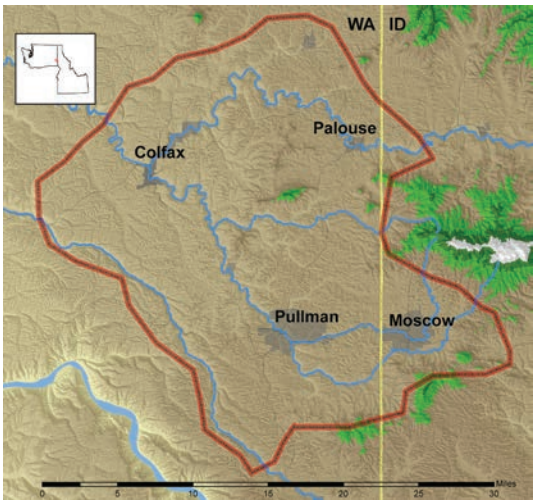


Figure 5: Working Boundary for the Palouse Ground Water basin

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 6*.

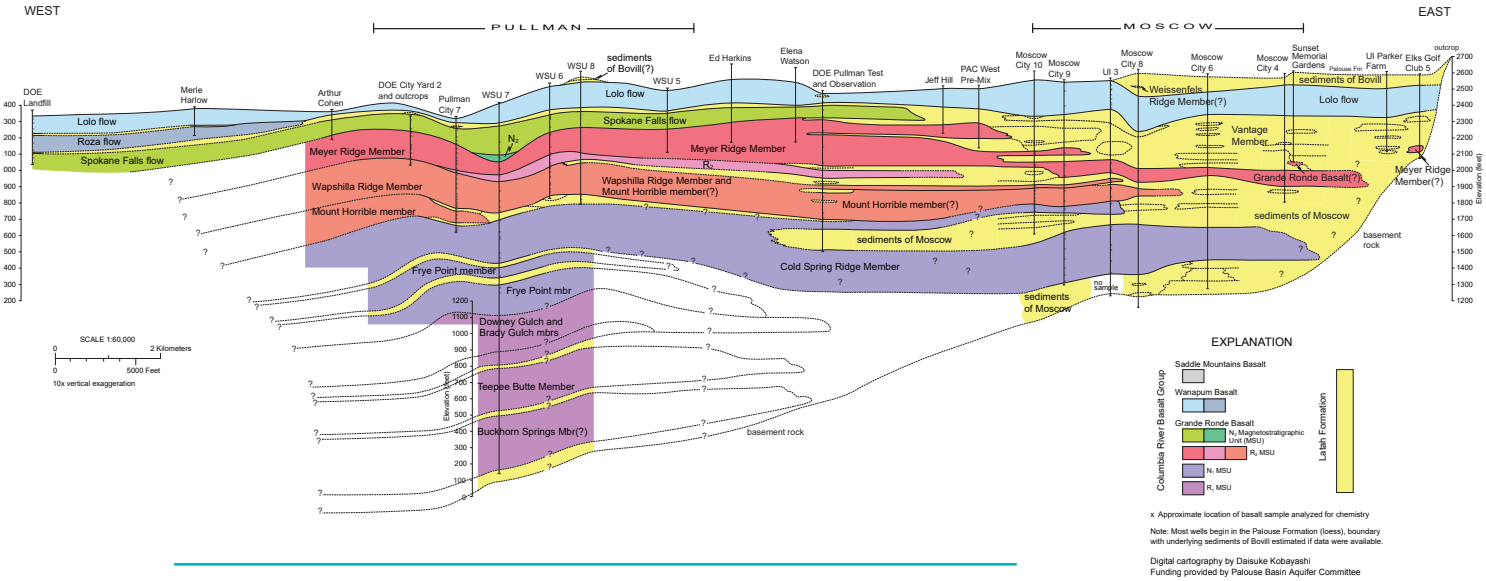


Figure 6: E-W Schematic Cross Section (Bush, J.H., Dunlap, Pamela, and Reidel, S.P., 2017)

The primary municipal drinking water source in the basin is the lower Grande Ronde aquifer system. In Pullman, all 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, 29% of the 2016 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 7)*. 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 8)*. Although absolute values are still uncertain, it is thought that there is limited recharge to both the Wanapum and the Grande Ronde aquifer systems.

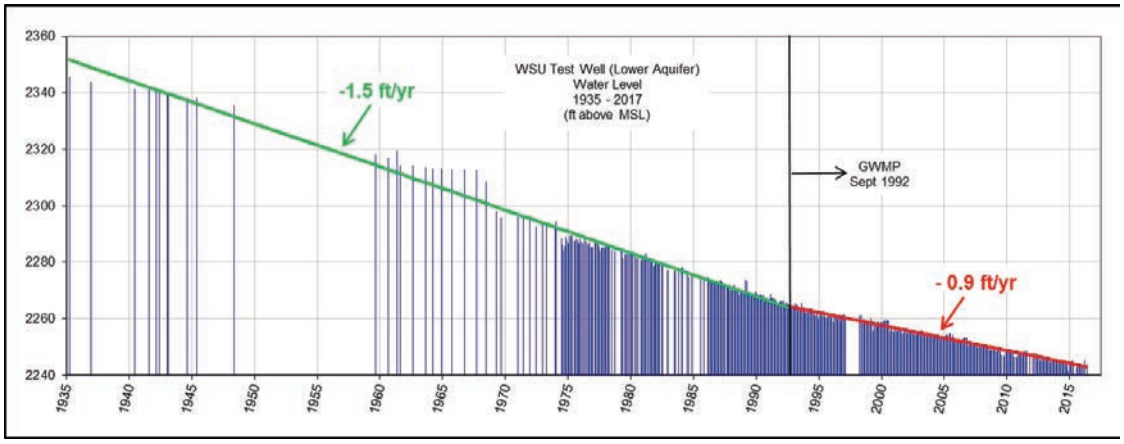


Figure 7: Static Water Level, WSU test well (lower aquifer), 1935-2017

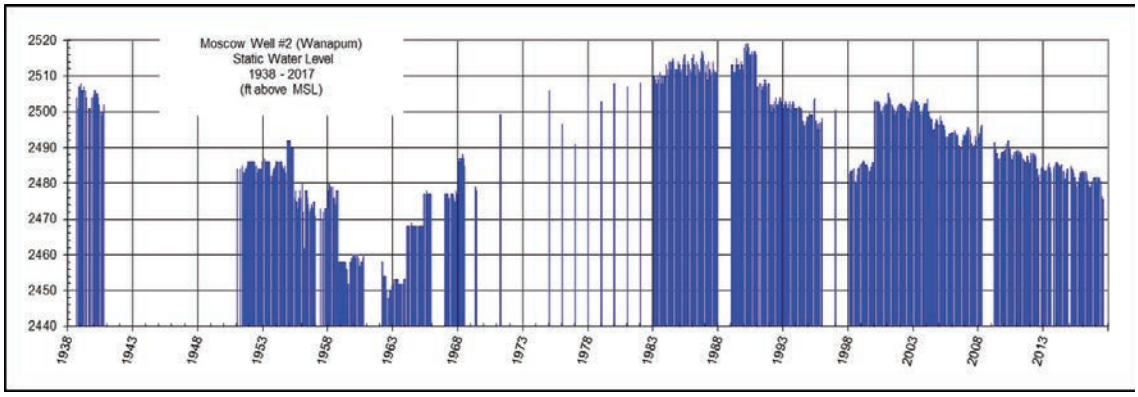


Figure 8: Static Water Level, Moscow Well #2 (upper aquifer), 1938-2017

GROUNDWATER PUMPAGE AND WATER LEVELS

The total combined groundwater pumpage by the three cities (Pullman, Moscow, Palouse) and two universities (WSU and UI) for the year 2016 was 2.40 billion gallons (7,365 acre-feet). In aggregate, this was 4.8% less than was pumped in 2015 (2.52 billion gallons), and 12.5% less than was pumped in 1992 (2.74 billion gallons), the first year the GWMP took effect.

In 2016, Pullman and Moscow each pumped slightly more than 1/3 of the total (38% and 35% respectively), followed by WSU at 18%. UI pumped 6%, and Palouse pumping accounted for 2% of the combined total *(Figure 9)*. By entity, comparisons to 2014 pumping are shown in *Figure 10*.

Moscow pumped 29% (248 million gallons) of its water from the upper Wanapum aquifer system in 2016. The other pumping entities all pump solely from the lower Grande Ronde system. As a percentage of the combined pumping total, the 2016 Moscow Wanapum contribution amounted to 10.4%.

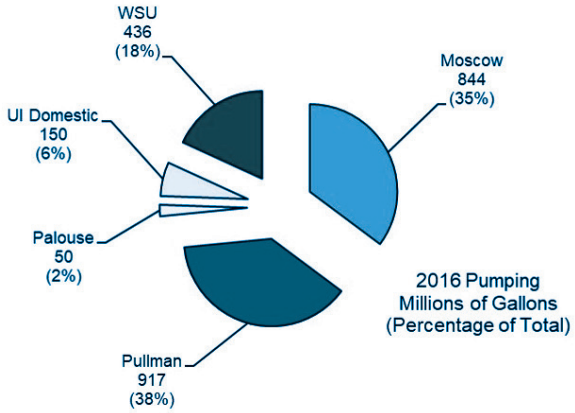


Figure 9: Ground water pumping—percentage of total—2016

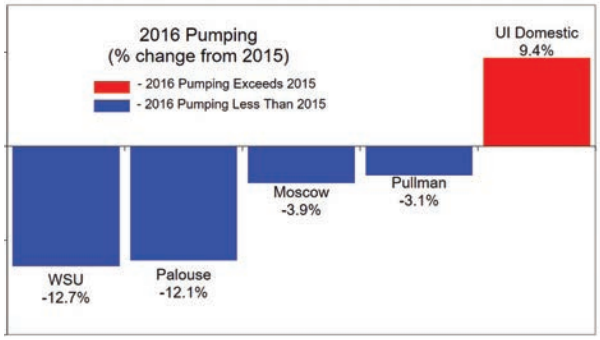
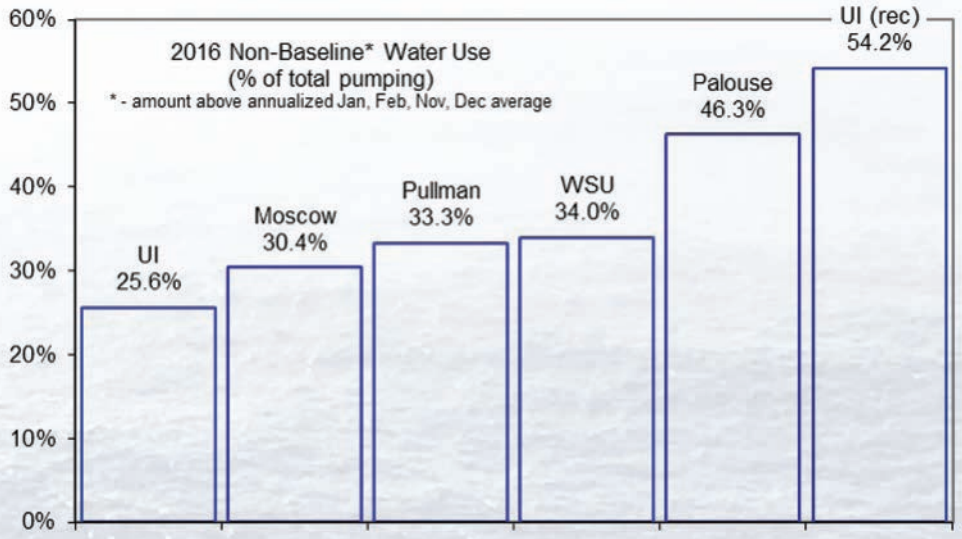


Figure 10: 2016 percentage change from 2015

Pumping increases significantly in the summer months, primarily due to increased irrigation demand. For 2016, 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 2016 non-baseline usage for the five pumping entities ranged from 25.6% for UI to 46.3% for Palouse *(Figure 11)*. (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 2016).

Non-baseline usage varies with the weather conditions experienced during the year. In 2016, the months of July through September were cooler than the 5-year trailing average and precipitation was similar to the 5-year trailing average, except for July where there was 0.6 of an inch more than the 5-year trailing average. Weather conditions during July 2016 alone played a major role in the 4.8% annual pumping decrease detailed earlier. Compared to 2015, cooler-wetter conditions in July 2016 resulted in decreased pumping for the month. Charts of 2016 and first half 2017 monthly pumping compared to the 2011–2015 averages are shown in *Figures 12–16* on pages 10–11. *Figures 17–21* (pages 12–13) illustrate monthly pumping for the period between 2011 and mid 2017.

Figure 11 (below): Non-baseline water use, percentage of total pumping, 2016



MONTHLY PUMPING

2016-2017 compared to 5 year average

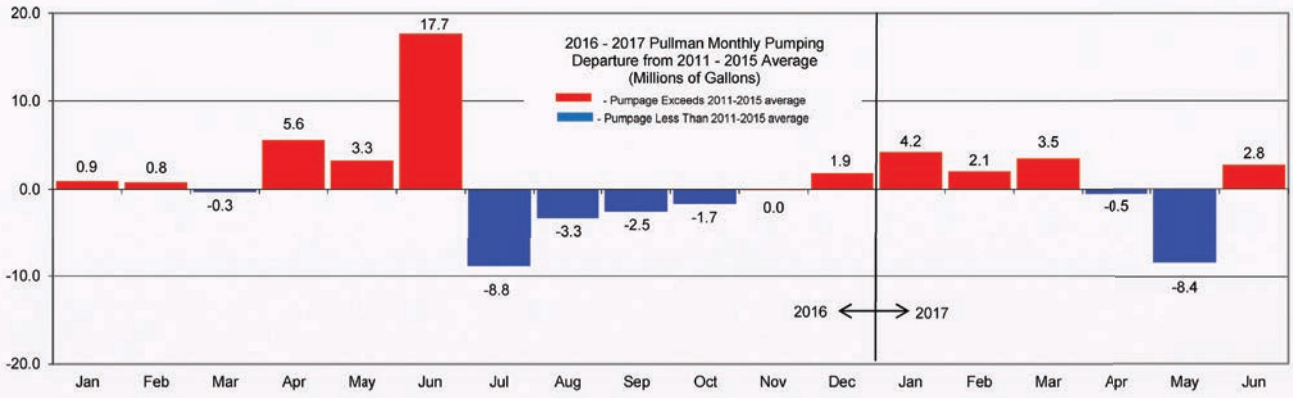


Figure 12: Pullman Monthly Pumping

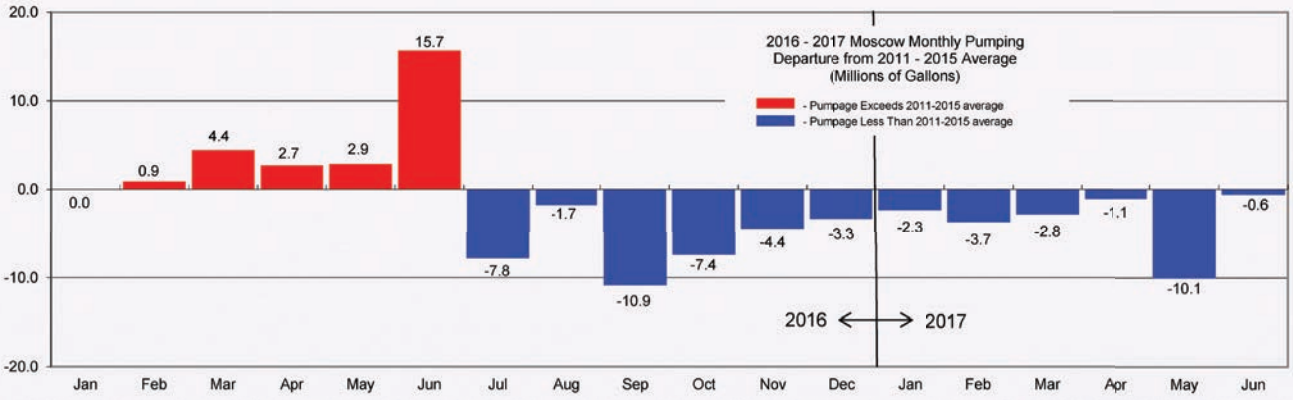


Figure 13: Moscow Monthly Pumping

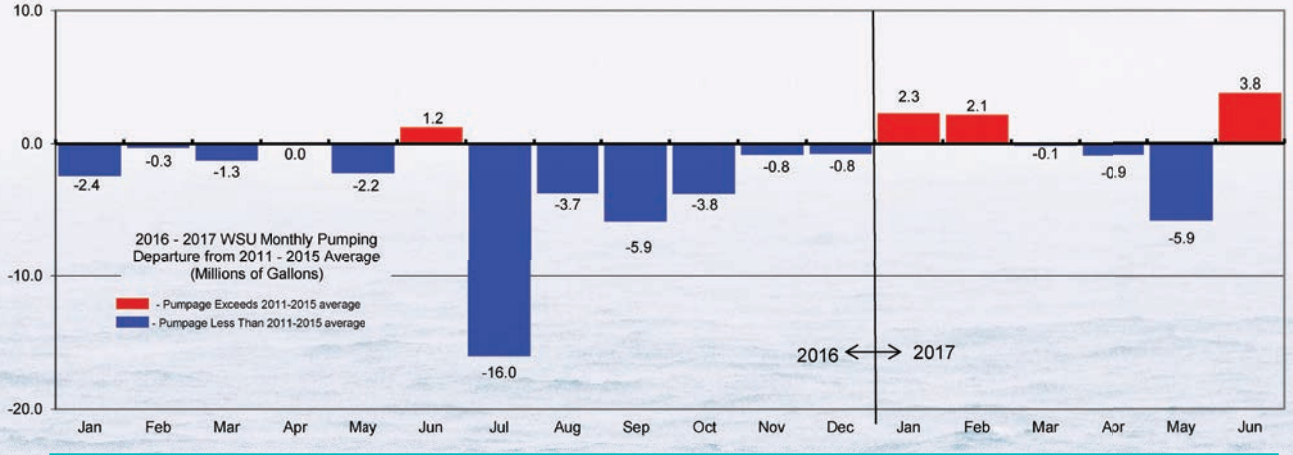


Figure 14: WSU Monthly Pumping

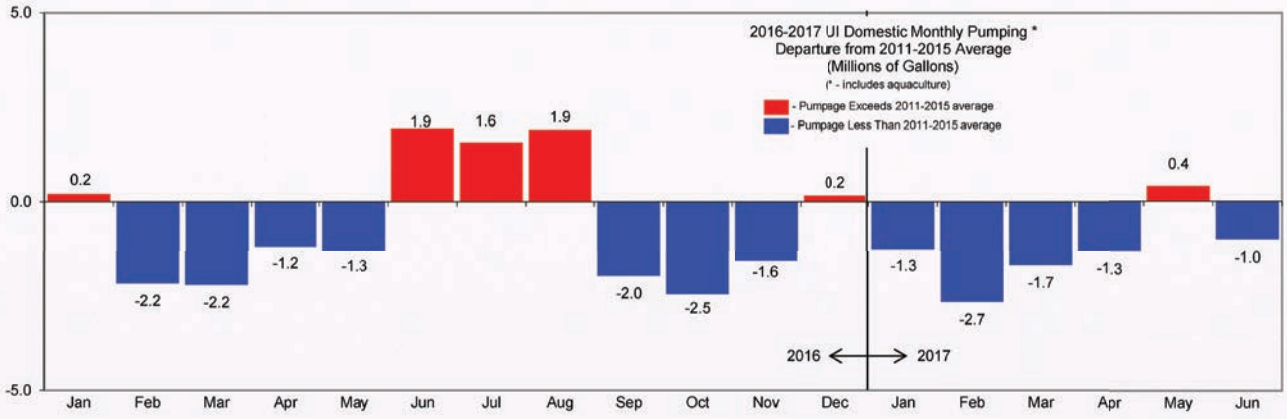


Figure 15: UI Monthly Pumping

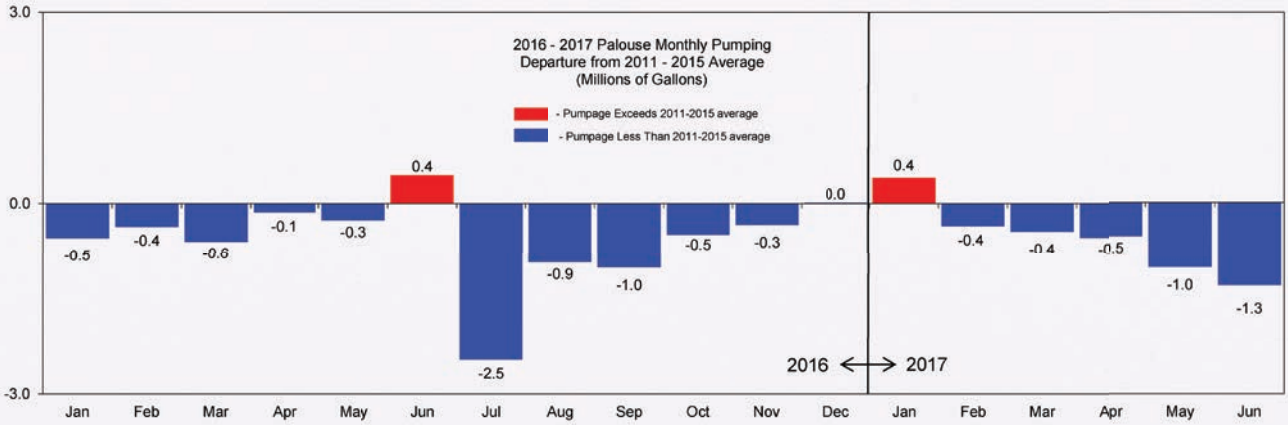


Figure 16: Palouse Monthly Pumping

MONTHLY PUMPING

2011—2017

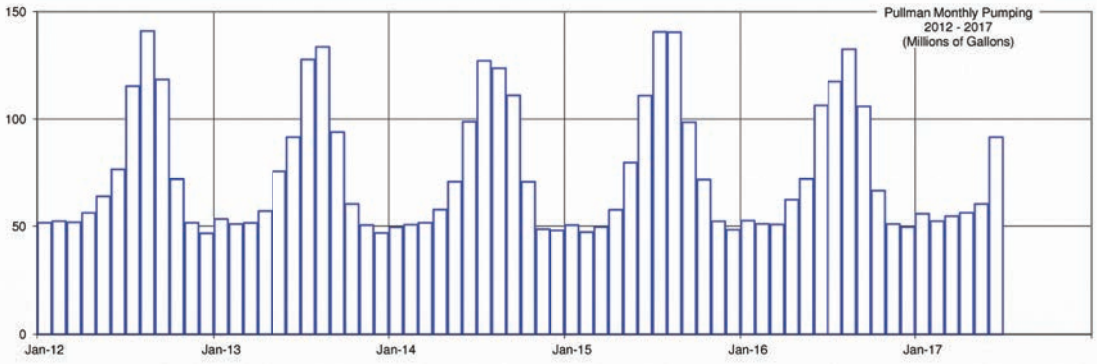


Figure 17: Pullman Monthly Pumping

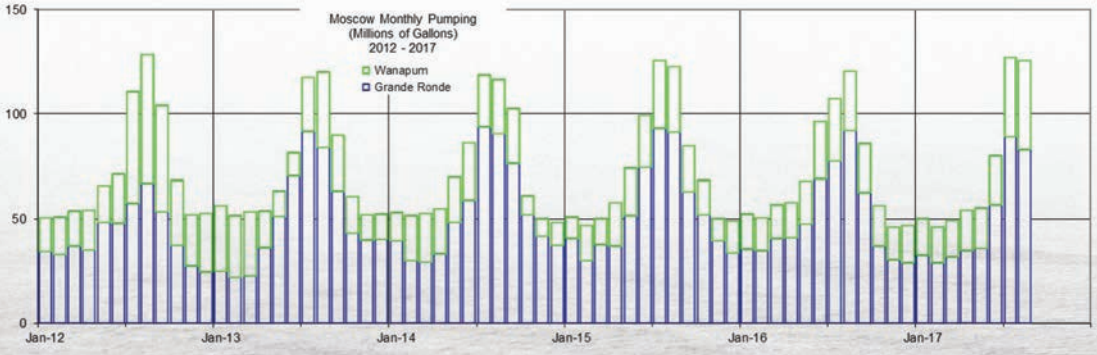


Figure 18: Moscow Monthly Pumping

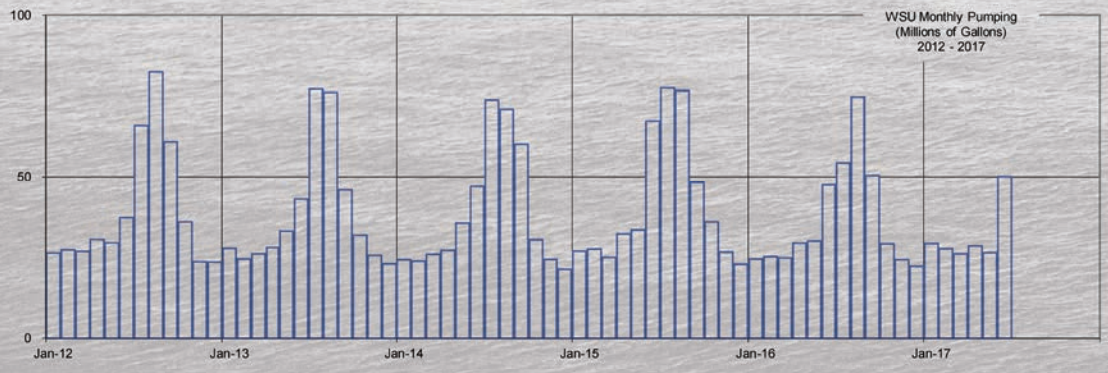


Figure 19: WSU Monthly Pumping

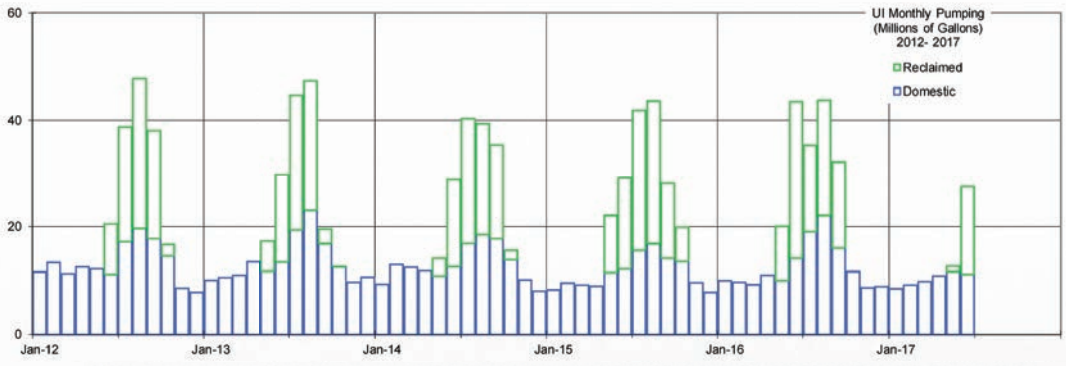


Figure 20: UI Monthly Pumping

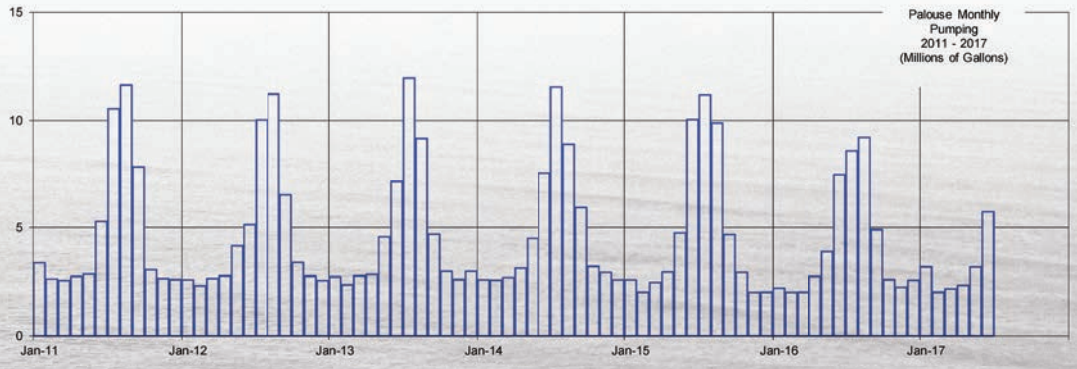


Figure 21: Palouse Monthly Pumping

LIMITING WATER USAGE.

As part of the GWMP, 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. An aggregation of the limitation goals for the GWMP pumping entities (Pullman, Moscow, WSU, UI) is shown in *Figure 22*. The limitation goals for individual pumping entities are illustrated in *Figures 23-26*. Note that no charts are shown for Palouse as they were not a signatory to the GWMP, 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. Water level hydrographs for 3 of the wells in the monitoring network are presented on page 4 of this report.

Inspection of the hydrograph for the DOE Pullman Test monitoring well *(pg 4, Figure 4)* reveals variation in year to year water level declines. The decline in annual maximum between 2015 and 2016 was 0.48 feet. In contrast, the maximum water level in 2015 declined 0.64 feet from that of 2014. A regression line for the years 2006 through early 2017 indicates an average annual decline over the period of approximately 0.72 ft./yr. *(pg 4, Figure 4)*.

In the upper Wanapum aquifer *(pg 4, Figure 3)*, the 2016 maximum water level at the Moscow PD monitoring well declined 2.42 feet from that of 2015. In contrast, the maximum daily water level decline from 2014 to 2015 was 0.73 feet. The drastic 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 *(pg 4, Figure 2)*, 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.

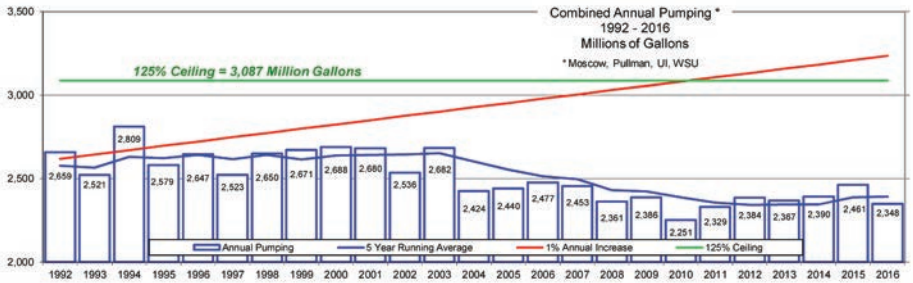


Figure 22: Combined Aunnual Pumping

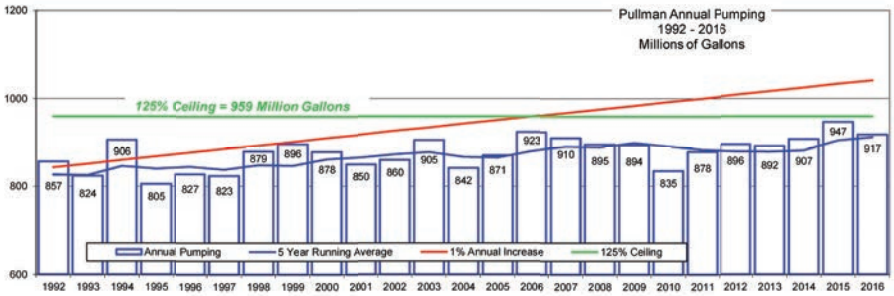


Figure 23: Pullman Annual Pumping

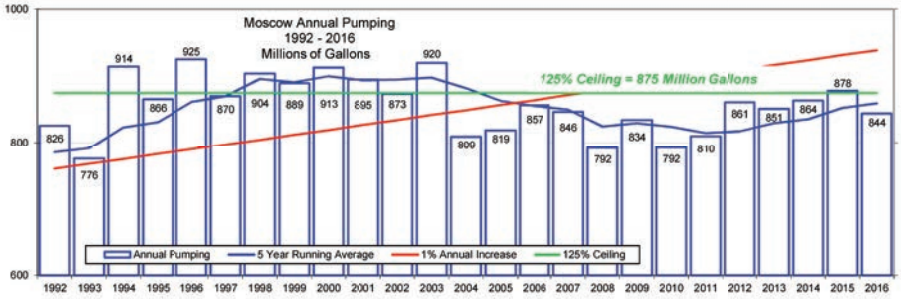


Figure 24: Moscow Annual Pumping

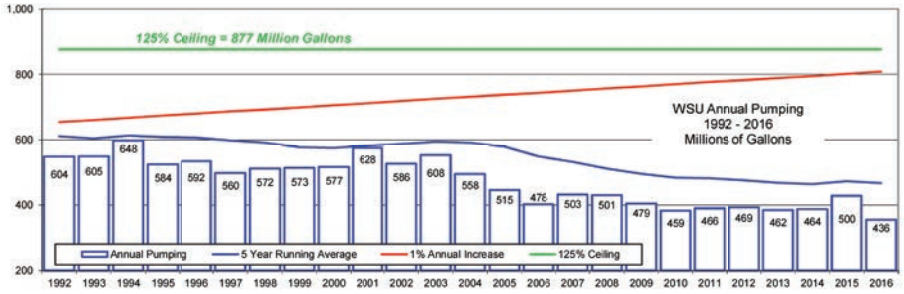
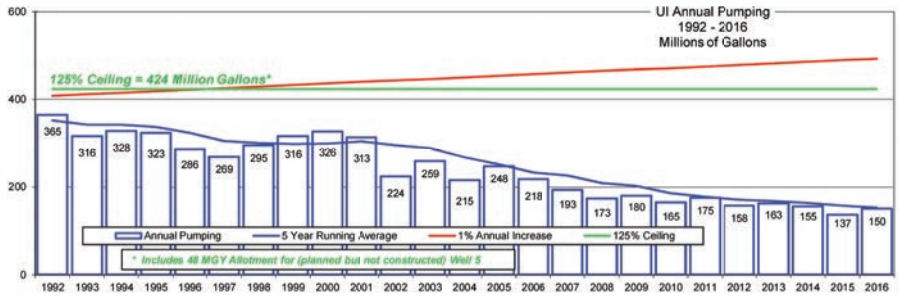


Figure 25: WSU Annual Pumping



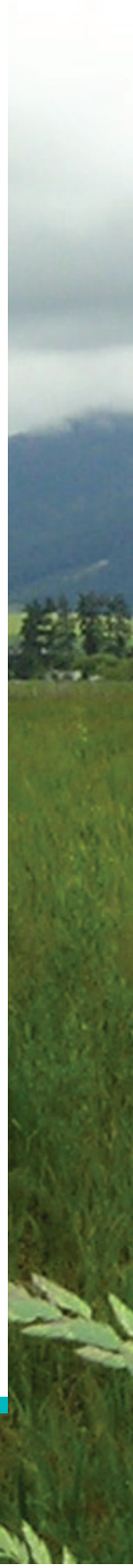
Figures 26: UI Annual Pumping

RESEARCH ACCOMPLISHMENTS

In 2016 PBAC completed the Palouse Groundwater Basin Water Supply Alternatives report. The report compiles previously identified alternatives and summarizes the four most feasible options that include consideration of 13 (quantitative as well as qualitative) evaluation criteria. The project was funded by a generous grant provided by the State of Idaho through the Idaho Water Resource Board and the Idaho Department of Water Resources as well as PBAC.

A major accomplishment of 2016/2017 is the near completion of the Geologic Map Updates and New Work for the Palouse Basin project by John Bush and Pamela Dunlap. PBAC funded the project in order to obtain new geologic maps with accompanying cross sections as well as ten new geologic cross sections of the Palouse Basin. The maps reveal a great amount of detailed information. An additional accomplishment of this project was a file of over 100 well logs, located by latitude and longitude, with up-to-date geologic data and interpretations in a geographic information system (GIS) that also is usable in Google Earth.

In 2016, PBAC funded a project proposed by Jeff Langman with the University of Idaho. The project involved tracing recharge in the Palouse Basin aquifers. This project uses developed knowledge about regional groundwater geochemistry and applies it to properly understand recharge and travel time. Langman is in the process of building on the existing geochemical data for the Wanapum and Grande Ronde aquifers by establishing a new groundwater sample collection from Palouse Basin supply wells, analysis of geochemical tracers, and an initial source-water tracking investigation. Stay tuned, we will add an update on this project in next years report.



Goals, Plans and Ongoing Efforts of the Committee

The foundation of the GWMP (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.

Community outreach and engagement has become a central focus for PBAC in the coming years. In early 2017, PBAC hired Korey Woodley as their new Executive Manager who is a community oriented problem solver that will guide PBAC with their community outreach efforts. The committee seeks community feedback regarding the Groundwater Basin Water Supply Alternatives report. Water is an essential ingredient to any functioning society; therefore, only a societal based approach to solving our water dilemmas will allow us to secure our water future.

In 2016, PBAC participated in the 12th (modern) Palouse Water Summit. The 2016 Summit continued to provide information and avenues for dialogue through networking opportunities and presentations related to the basin's common groundwater resource. PBAC will support and participate in the 13th Summit, scheduled for October 2017.

2017 PBAC Representatives

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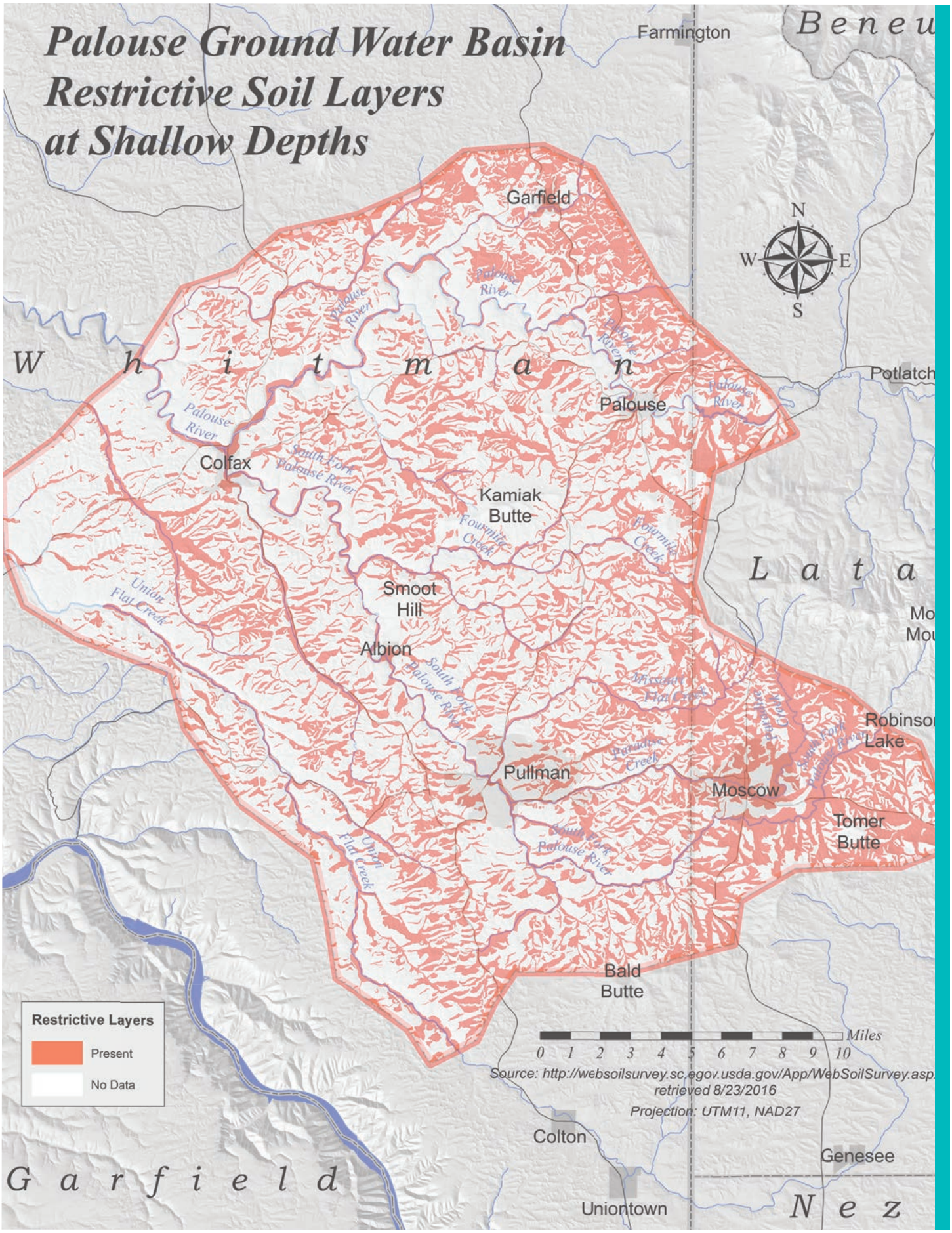
Palouse Ground Water Basin
Restrictive Soil Layers
at Shallow Depths
Farmington
Beneu
Garfield
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W h i t m a n
Potlatch
Palouse
Colfax
Kamiak
Butte
Smoot
Hill
Albion
L a t a
Mo
Mou
Robinson
Lake
Pullman
Moscow
Tomer
Butte
Bald
Butte
Colton
Genesee
Uniontown
G a r f i e l d
N e z
Palouse River
South Fork
Palouse River
Fourmile
Creek
Union
Flat Creek
Paradise
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Missouri
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0 1 2 3 4 5 6 7 8 9 10
Source: http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.asp
retrieved 8/23/2016
Projection: UTM11, NAD27

PALOUSE BASIN AQUIFER committee