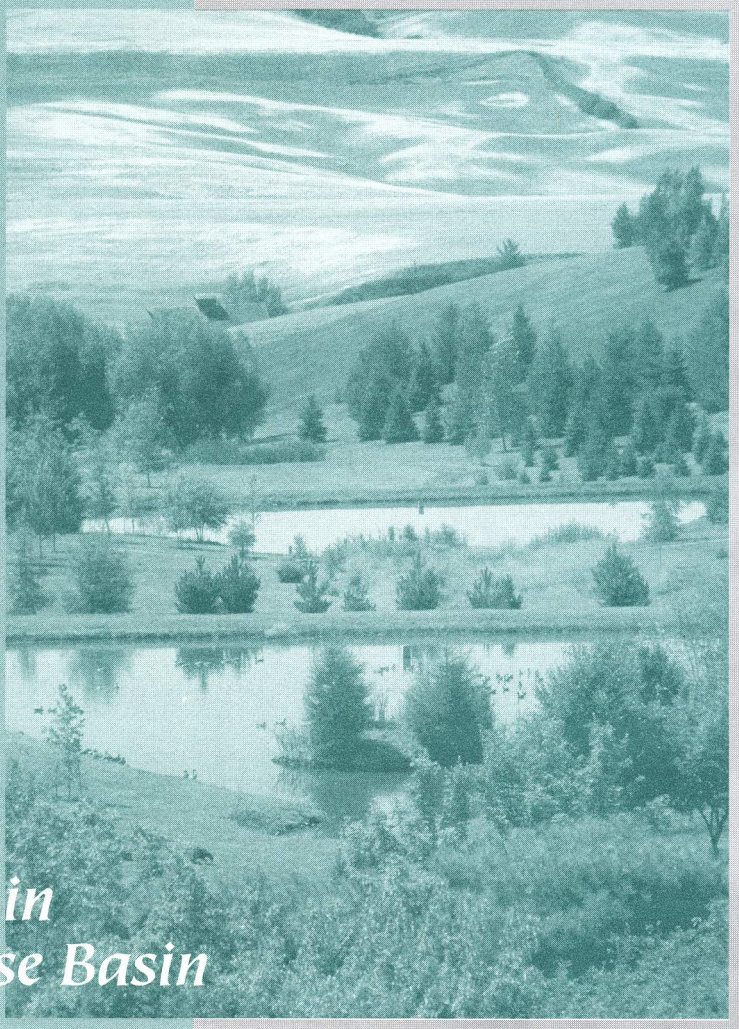
2001 ANNUAL REPORT

The Palouse Basin Aquifer Committee



Water Use in the Palouse Basin

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April 2002

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Executive Summary.

The communities of the Palouse region rely on ground water from the Palouse Ground water Basin as their sole source of drinking water. In 2001, the Palouse Basin Aquifer Committee (PBAC), refined the goals adopted by the Committee in 2000. The primary goal is to stabilize the declining ground water levels in the deep Grande Ronde aquifer, that supplies over 90 percent of the water to the communities, by the year 2020. PBAC also continued to struggle with the details of the 20-Year Plan and how best to continue and accomplish other PBAC goals, such as providing a stable long-term water supply for the area.

Research funded by PBAC continued in 2001, and has greatly improved PBAC's understanding of how ground water moves in and out of the basin. However, because of the complexity of the basin, many basic features regarding basin size and recharge are still not well characterized at this point. PBAC pursued funding from both Washington and Idaho to broaden the scope of research and initiated contacts with federal agencies for potential future funding. In 2001, PBAC continued to maintain a high profile in the community by making public presentations and maintained the PBAC website. Ground water pumping by the four major pumping entities in 2001 decreased approximately 1 percent from 2000, for a total of 2,678 million gallons. Water levels in the Grande Ronde wells continue to decline at a steady rate of 1 to 2 feet per year.

Introduction.

The Pullman-Moscow area, commonly referred to as the Palouse area encompasses the eastern edge of Washington and a piece of northern Idaho (See figure 1). The Palouse area, relies entirely on ground water for it's supply of municipal, domestic, and institutional water. The ground water is primarily drawn from one of two aquifer systems underlying the area. Both the upper aquifer, commonly referred to as the Wanapum aquifer, and the lower aquifer, commonly referred to as the Grande Ronde aquifer, are composed of basalts of the Columbia River Basalt Group (See figure 2). The Wanapum aquifer supplies ground water to City of Moscow wells (2 and 3), University of Idaho wells (5 and 6), and smaller domestic wells throughout the basin. The lower Grande Ronde aquifer supplies over 90% of the ground water for the Palouse area in 2001.

Concerns over the declining ground water levels in the Palouse area led to formation of the Pullman-Moscow Water Resource Committee, now called the Palouse Basin Aquifer Committee (PBAC). The committee was established by the cities of Pullman, Washington, and Moscow Idaho; Washington State University (WSU); the University of Idaho (UI); and Whitman and Latah Counties. Each entity has two representatives on the committee. The committee is responsible for providing future beneficial use of the basins ground water resources, without depleting the basin aquifers, and in addition protecting the quality of ground water supplies.

The PBAC publishes an annual ground water report to provide an update on local water consumption and ground water issues. The 2001 report includes (1) a summary of 2001 ground water pumping volumes for both cities and associated Universities, (2) Grand Ronde and Wanapum aquifers water level data, and (3) a review of 2001 PBAC accomplishments.

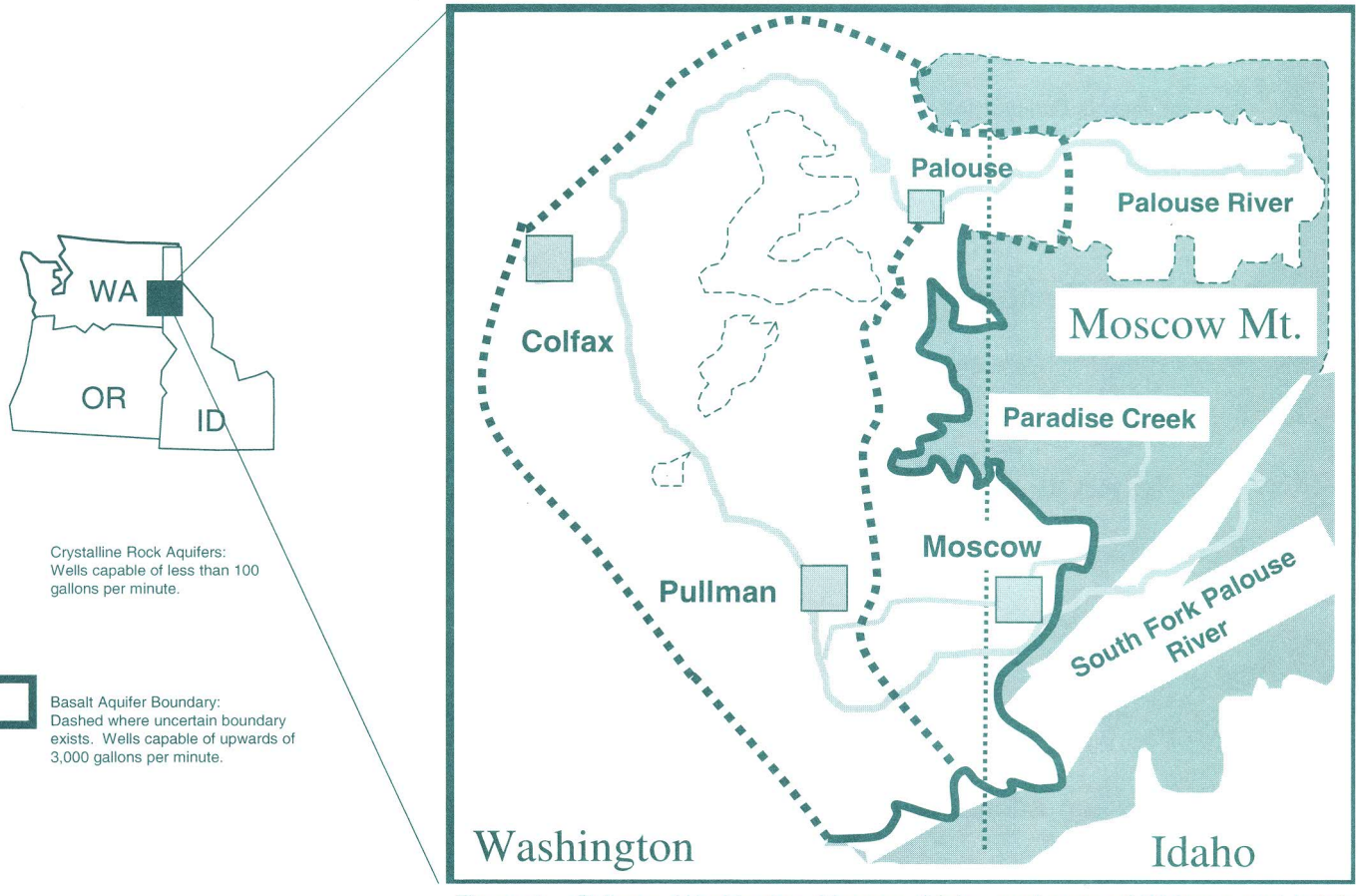
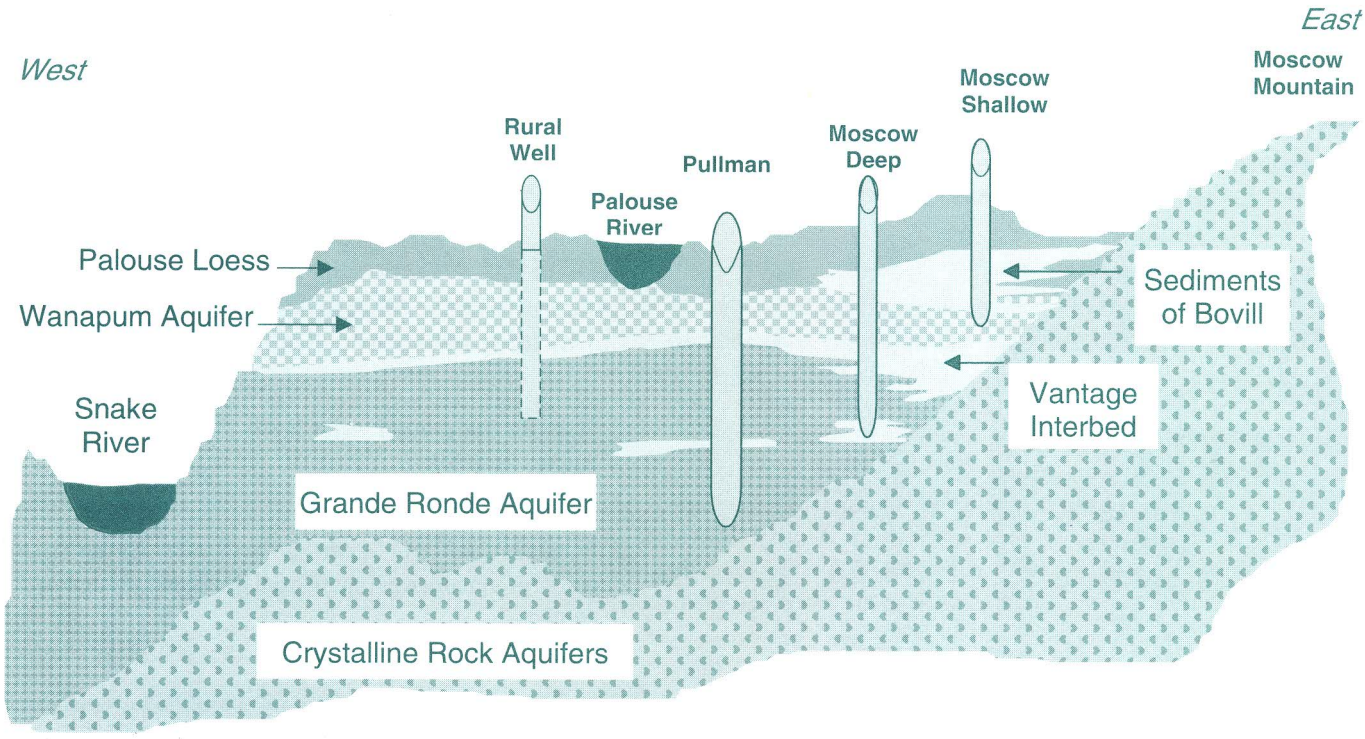


Figure 1. Pullman, Washington; Moscow, Idaho, and parts of Whitman and Latah Counties lie within the boundaries of the Palouse Ground Water Basin. To the east, the basin is bounded by the crystalline rocks of Moscow Mountain and the Palouse Range.



Conceptual hydrogeologic cross section of Palouse groundwater basin. *(Not to scale)*

Figure 2. The Wanapum Aquifer and the Vantage sedimentary unit become thin west of Moscow and the Grande Ronde Aquifer is deeper beneath Pullman. Researchers are suggesting that the Basalts in this area are more deformed and folded than previously thought. This folding is thought to be controlling gournd water flow directions.

The Aquifers on the Palouse.

Ground water in the Palouse basin is pumped from two basalt aquifer systems. The basalt units are part of the Columbia River Basalt Group, which consist of thousands of feet of lava flows covering most of eastern Washington as a result of massive "flood basalt" eruptions between 12 and 17 million years ago. The primary municipal drinking water source in the Palouse basin is the deep Grande Ronde aquifer. The shallower Wanapum (Priest Rapids) aquifer supplies water to wells in the city of Moscow and on the campus of the University of Idaho, but is the primary water supply for rural residents of Latah County within the basin limits and in some areas of Whitman County. Water levels in the Grande Ronde aquifer have been declining by 1 to 2 feet per year for over 50 years or more. Residential wells in the Wanapum aquifer are typically pumped between 25-60 gallons per minute (gpm) whereas municipal and institutional wells in the Grande Ronde aquifer can pump in excess of 1,500 gpm.

Brief History of PBAC.

In the late 1970's, concerns over declining ground water levels in local aquifers led to the formation of the Pullman-Moscow Water Resources Committee, now called the Palouse Basin Aquifer Committee (PBAC). After a hiatus in the early 1980's, PBAC was reconvened in 1987. The purpose of PBAC has always been to provide a forum for the stakeholders to work together to secure a reliable long-term quality water supply for all users in the basin. PBAC is a voluntary, cooperative, multijurisdictional committee currently comprised of six entities: Pullman, Washington; Moscow, Idaho; University of Idaho (UI), Washington State University, Whitman County, and Latah County. Two state water management agencies, the Washington Department of Ecology (WDOE) and the Idaho Department of Water Resources (IDWR), have supported PBAC in the implementation of the Ground water Management Plan. PBAC is guided by an Intergovernmental Agreement signed by the six stakeholder representatives and an Interagency Agreement signed by IDWR and WDOE.

2001 Goals and Accomplishments

To provide for future beneficial use of the basin groundwater without depleting the basin aquifers while protecting the quality of the water.

–Mission Statement of the Palouse Basin Aquifer Committee

2001 Annual Report.

In 1992, PBAC drafted and signed a Ground water Management Plan, which requires that an annual report be published by the Committee. The 2001 report presents a summary of accomplishments of the past year, planned activities for the coming year, annual ground water pumpage, and annual ground water levels. Readers are referred to the 1999 Annual Report for more detailed information on the history of PBAC, ground water management strategies, voluntary pumping limits, basin hydrogeology, historical pumping quantities, and water level declines. The 1999 and 2000 report can be viewed at http://www.uidaho.edu/pbac or a copy can be obtained by contacting PBAC directly.

Goals of PBAC

PBAC reviewed and updated its original goals from the Ground water Management Plan to include:

1 Stabilize the ground water levels in the Grande Ronde aquifer by 2020.

2 Implement efficient water use and water conservation practices to reduce pumping from the deep Grande Ronde aquifer.

3 Continue to promote a program of public outreach and education for efficient water use and awareness of ground water issues in the Palouse Basin.

4 Continue data collection and analysis of ground water levels and usage for the basin.

5 Continue to support research in the Palouse Basin.

6 Protect the high quality of ground water in the Palouse Basin.

7 Utilize PBAC funds to match outside funding wherever possible for maximum benefit.

These goals form the foundation of the PBAC 20-Year Plan, which was adopted by PBAC in 2000. The 20-Year Plan outlines a strategy and timeline for PBAC in order to meet the goal of stabilizing water levels in the Grande Ronde aquifer by the year 2020 while providing a long-term water supply for the basin and communities.

Accomplishments During 2001

In the 2000 Annual Report, PBAC outlined several specific objectives to accomplish during 2001. A summary of the progress on each objective is provided below.

Stabilize Ground Water Levels in the Grande Ronde aquifer

Although ground water levels in the Grande Ronde continue to decline approximately 1.5-2 feet a year, the total pumpage in the whole basin is well below the 1% (average of the years 1982-1986), and 125% (average pumped between 1981-1985) established by PBAC in the 1992 Ground Water Management Plan (GMP).

Water Conservation

PBAC continued to encourage water conservation to the entities and citizens that rely on ground water from the basin for all their water supply needs. The City of Moscow now has staff and a budget dedicated to this task and is continuing it's outreach to water customers and elementary schools. PBAC also serves as a resource to all six entities and the community at-large for water conservation issues.

Community Outreach

Increase community leadership awareness of ground water and local water supply issues.

The Executive Secretary/Technical Advisor made presentations to the public. In recognition of Drinking Water Week, the Moscow Water Department organized an open house at the water treatment plant. PBAC set up a booth at the University of Idaho Internship Fair for local summer internships. Several water summits were held in 2001 at the Moscow City Hall, Latah County Court House, and Pullman City Hall. PBAC made presentations to the Earth and Faith Forum on the Palouse Basin Water Supply at the Latah county courthouse.

Data Collection

Collect and analyze hydrogeologic data obtained from drilling the new municipal supply Well 7 in Pullman.

In 2000, the city of Pullman installed Pullman Well 7. The drill cuttings from the well were collected, but were not analyzed until 2001. Drill cuttings analysis, stratigraphic interpretation, and pump test data are available from the Pullman Well 7. John Bush, Professor of Geology, provided a report on the city of Pullman's Well 7. The report looked in depth at the stratigraphy of Well 7, and surrounding wells in the Palouse Basin area. In summary, the subsurface basalts horizons changes rapidly over short distances in the Pullman area. These rapid changes could be creating a "mosaic" of ground water basins and controlling ground water flow.

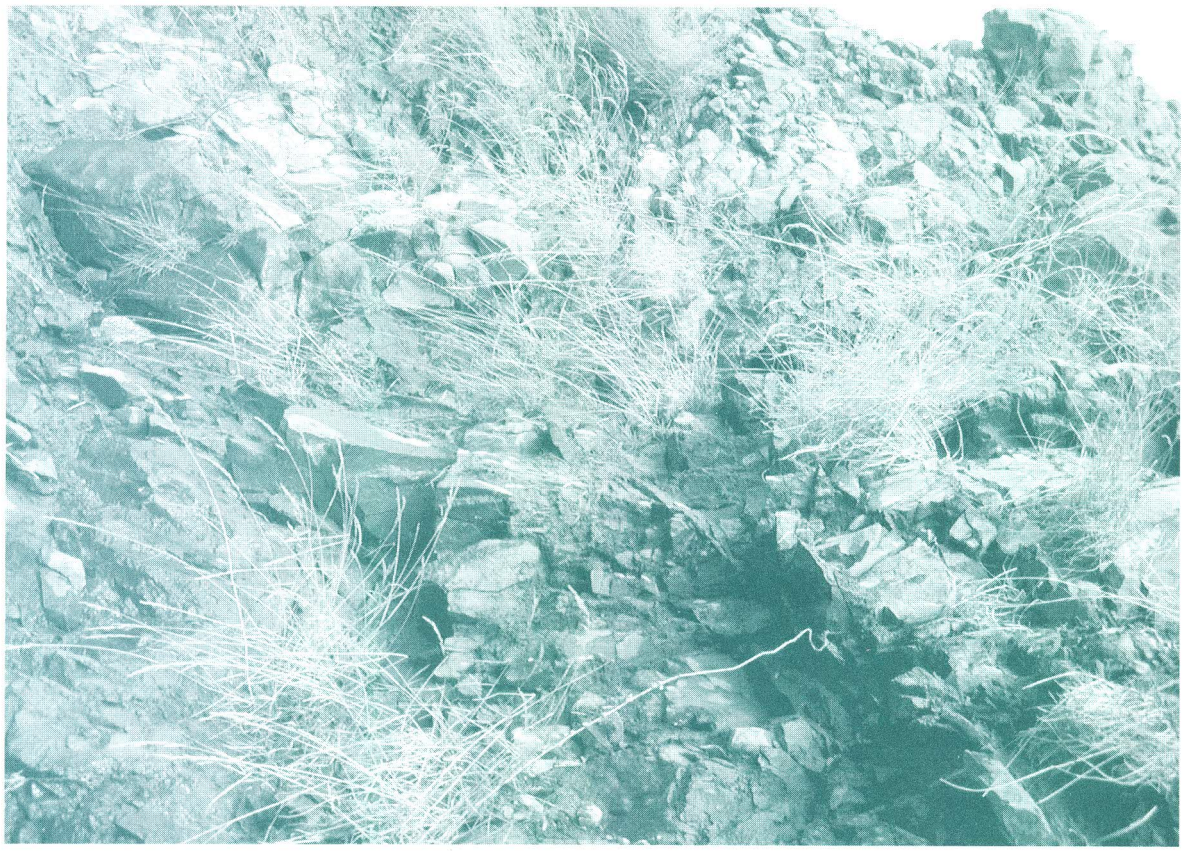
Research

Continue to improve the understanding of hydrogeological conditions of Palouse Basin.

a. The current phase of PBAC funded research began in July 2000. PBAC funding totaling as much as $80,000 per year is committed through June 2002. The PBAC funding is provided by the deep aquifer pumpers: Pullman, Moscow, UI, and WSU. The research is being conducted by Dr. Jim Osiensky of the UI and Dr. Kent Keller of WSU and, two hydrology graduate students. The results of the study will support informed water management decisions to ensure the quality and quantity of the ground water needed to support long-term sustained use. The semi-annual research report was presented in February of 2001. Water level monitoring and results from pump test data are being analyzed, a GPS survey of 46 area wells has been completed, and investigation of the hydraulic conductivity distributions in the area is being studied. In addition, carbon-14 data is being collected. This data will help assess the boundaries, potential sub-basins and recharge rates in the Palouse Basin.

b. Dale Ralston, Professor Emeritus of Hydrogeology, and president of Ralston Hydrologic Services, Inc., presented "Ideas for Enhancing Ground Water Recharge" to the Palouse Basin. The project proposed to use a passive drainage well connecting the upper and lower aquifers, to increase recharge to the lower aquifer. PBAC has adopted a plan for testing a pilot drainage well in the near future.

c. Eddy Teasdale presented "Evidence for Structural Partitioning of Ground Water Resources in the Palouse area of Idaho and Washington" New geologic interpretations as well as re-interpreted hydrogeologic data suggest that several sub-basins could exist within the Palouse area.



Basalts in the Palouse area supply over 100 percent of the ground water to the municipalities, institutions and residents in the basin.

Protect the high quality of ground water in the Palouse Basin

None of the cities or universities had any ground water quality problems in 2001. All past testing of the two primary aquifer (systems) has resulted in high quality, uncontaminated water.

Funding

Attempt to secure supplemental funding for additional research and related projects from the states of Idaho and Washington.

The groundwork was laid for a funding request to Idaho during 2000 by working closely with state legislators and the Idaho Department of Water Resources to define project needs and objectives. PBAC's current request from the state of Idaho for research funds in the amount of $100,000 was approved in April. The state funds were later temporarily resented, because of overall state budget cutbacks in Idaho.

Groundwater Management Plan

Complete update.

New goals were passed (see previous section) and a new Intergovernmental Agreement and Bylaws were drawn up. The update to the Plan includes the goals, new Bylaws, and a new Intergovernmental Agreement and will be signed by all parties and published in 2002.

PBAC Website

Regularly update and continue to improve.

Since coming on-line in late 1999, the website is updated monthly with minutes and upcoming meeting agendas. Pumping data are posted semi-annually. The website will be further improved with water conservation information and links to related websites.

Entity Action Plans

The GMP includes Action Plans adopted by each entity in 1992 outlining specific actions that would reduce water use and help achieve the voluntary pumping limits. According to the terms of the GMP, the Entities are supposed to provide PBAC with an annual update on progress towards implementing their Action Plan. Copies of the Action Plan updates can be obtained by contacting PBAC directly. Action Plans will be updated in 2002.

2002 Workplan

The objectives of PBAC during the year 2002 build on the progress made in 2001. Continued yearly progress on each of these issues is essential to accomplish the 20-Year Plan.

1. Continue to improve understanding of hydrogeological conditions of Palouse Basin through support of the basin research.
2. Secure supplemental funding for additional research and related projects from the states of Idaho and Washington to systematically carry out a long-term plan for halting the water level decline in the deep aquifer while maintaining a sustained water supply for area communities, and accomplish this in the most economical manner possible.
3. Complete and publish the Ground water Management Plan Update.
4. Regularly update and continue to improve PBAC website.
5. Increase community leadership awareness of ground water and local water supply issues.
6. Complete a water quality and microbiological study for the Wanapum and Grand Ronde aquifers in preparation for a passive recharge pilot project.
7. Select a site for the passive recharge enhancement project.
8. Adopt a 5-year research plan.
9. Calculate the overall pumping in the area from domestic wells in the Palouse area. Domestic wells are being defined as wells that produce 250 gallons per minutes or less.
10. Determine the quantity of surface water available from the Moscow Mountain range for direct use or aquifer recharge.

Groundwater Pumpage

The total amount of ground water pumped during 2001 by the four major pumping entities was 2,678 million gallons - a 1 percent decrease from 2000.

Percentage of Ground water Pumped by Each Entity in 2001.

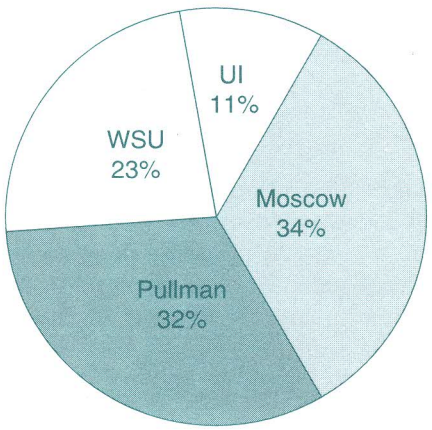
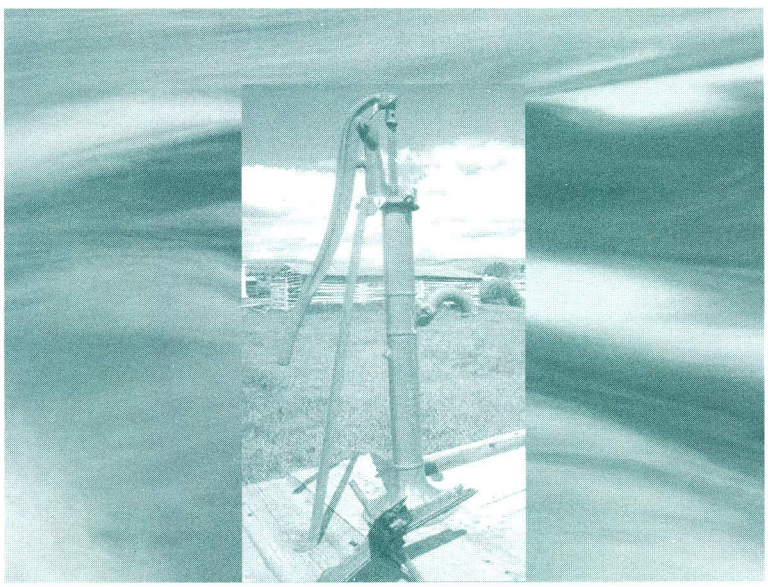


Figure 3. The proportion of ground water pumped in the Palouse area by each entity has remained nearly constant for the last five years.

The Grande Ronde aquifer supplied over 90 percent of the water used by the four major pumping entities in 2001. Moscow was able to meet 16 percent of potable water demand with water from the Wanapum aquifer, and the UI used a small amount of ground water from the Wanapum aquifer for its aquaculture facilities. The Wanapum aquifer is thinner in the Pullman area than beneath Moscow. Therefore, the city of Pullman and WSU rely exclusively on the Grande Ronde aquifer for potable water.



Treated Effluent or "Reclaimed Water"

UI utilizes "reclaimed" water supplied by Moscow's wastewater treatment plant and the UI's aquaculture lab for outdoor irrigation on large green spaces, playing fields, the arboretum, and the golf course. Reclaimed water use at UI between May through October amounted to 74 mgy, or 24 percent of UI's total water usage in 2001. UI plans to expand the system in the future to include the Administration lawn.

Pullman and WSU have reopened discussions for using treated effluent from the Pullman wastewater treatment plant to irrigate on campus and city green spaces. An engineering feasibility study (performed by Parametrix, Inc.) was completed for WSU in 2000. WSU and Pullman are negotiating with Parametrics on a design study using local and state funding. If completed, this projected could reduce dependence on ground water by as much as 150 mgy.

Voluntary Pumping Limits

As part of the Ground water Management Plan, in 1992 the four pumping entities agreed to attempt to limit yearly pumping increases, based on a five-year moving average, to a 1 percent increase of the average during the years 1982 to 1986, and not to exceed 125 percent of the average pumped between 1981 to 1985. The annual pumping quantities for the period 1976 through 2001 are compared to the voluntary pumping limits for each entity and the basin as a whole in the following charts (See figures 4-8).

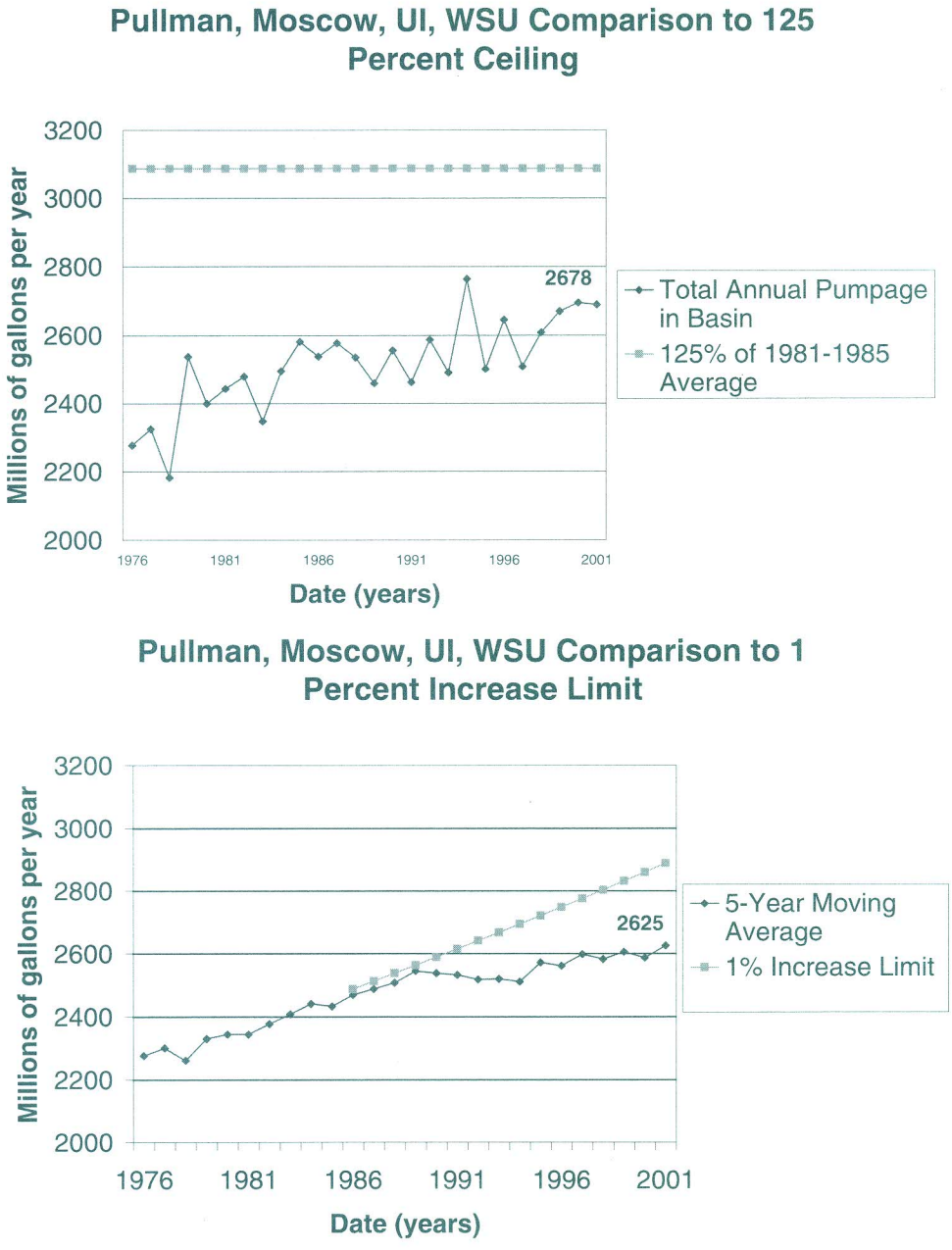
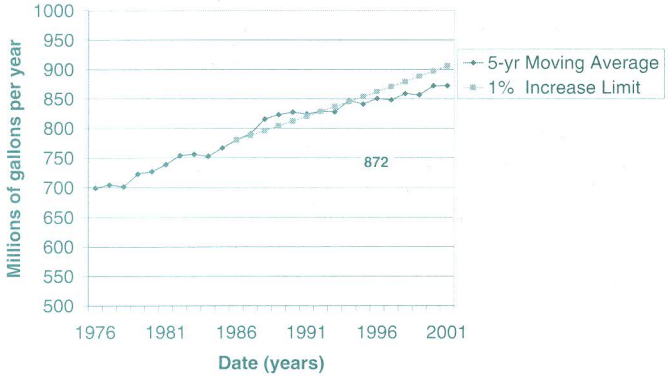


Figure 4. Combined, both cities and universities remain below the voluntary pumping limits.

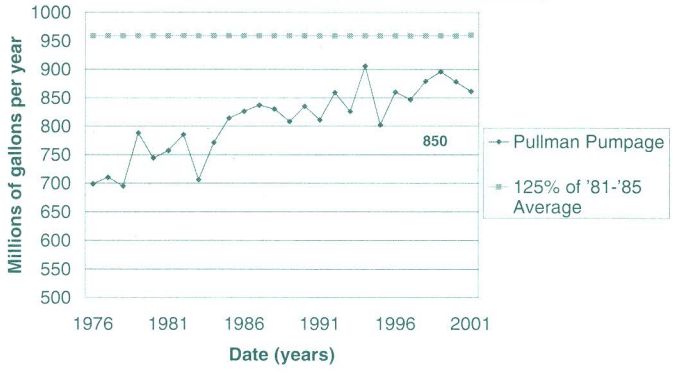
Enactment of pumping limits spurred the water suppliers to introduce water management policies that resulted in increased efficiencies and reduced per capita water use. As a result, the annual rate of increase in pumping in the 1990's has been significantly slowed. Ground water pumpage for all four pumping entities has increased at an average rate of only 0.5 percent since 1990 compared to average annual rate of 0.9 percent between 1976 and 1989. Taking population growth into account makes these pumping reductions in the last decade even more impressive. According to population data provided by the cities, the combined Pullman-Moscow population (which includes university students) grew an average of approximately 0.5 percent per year between 1976 and 1989, and in the 1990's grew at an average annual rate of 1.5 percent per year.

Moscow's pumpage has exceeded the 125-percent ceiling limit and the allowable 1-percent curve for several consecutive years. Due to the higher concentrations of iron and manganese in the city's wells, particularly in Wells 2 and 3 that pump from the Wanapum aquifer, the city filters this water before it enters the distribution system. Because of this, Moscow is required to regularly flush hydrants to reduce iron and manganese build-up in water lines and to routinely backwash the filter system, which increases the city's water usage, but helps reduce pumping from the Grande Ronde by using more water from the shallow aquifer. The shallow aquifer gets adequate recharge and is not in danger of being over pumped.

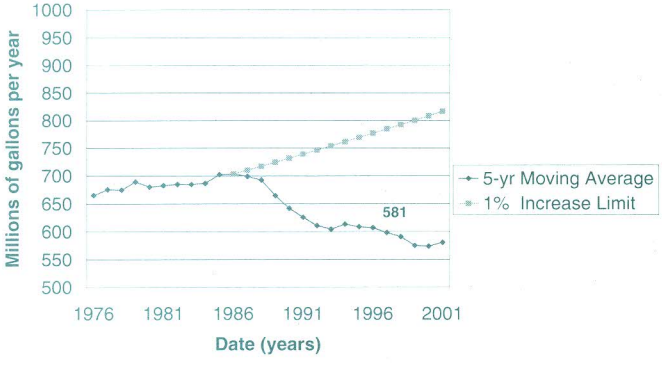
Pullman
Comparison to a 1 Percent Limit



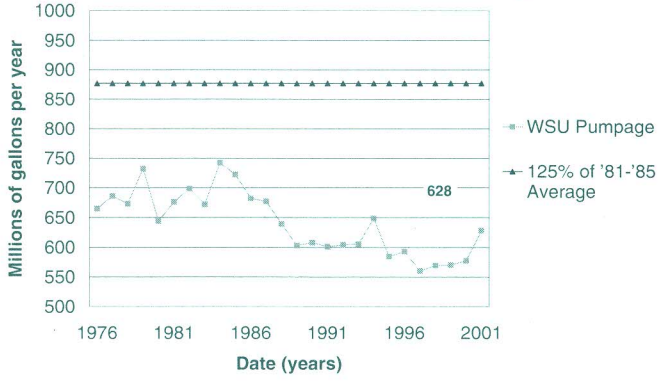
Pullman
Comparison to 125 Percent Ceiling



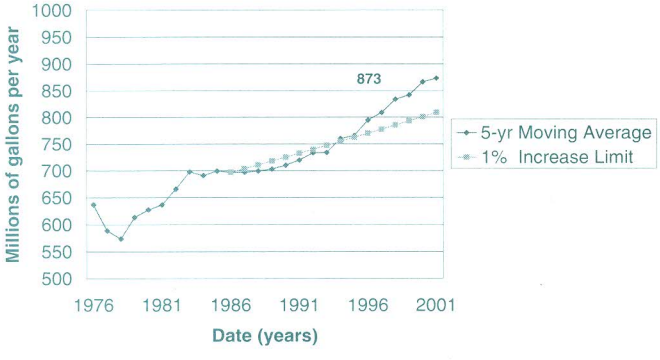
WSU
Comparison to a 1 percent Limit



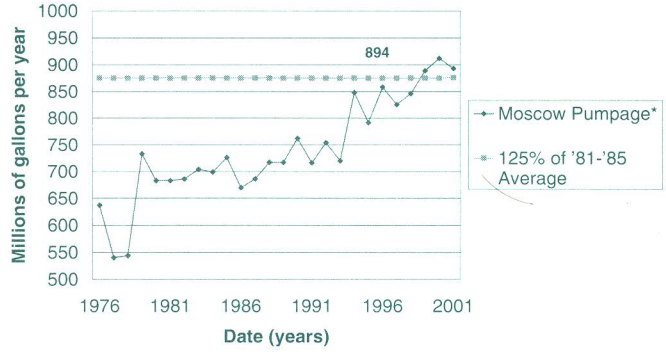
WSU
Comparison to 125 Percent Ceiling



Moscow
Comparison to 1 Percent Increase Limit



Moscow
Comparison to 125 Percent Ceiling

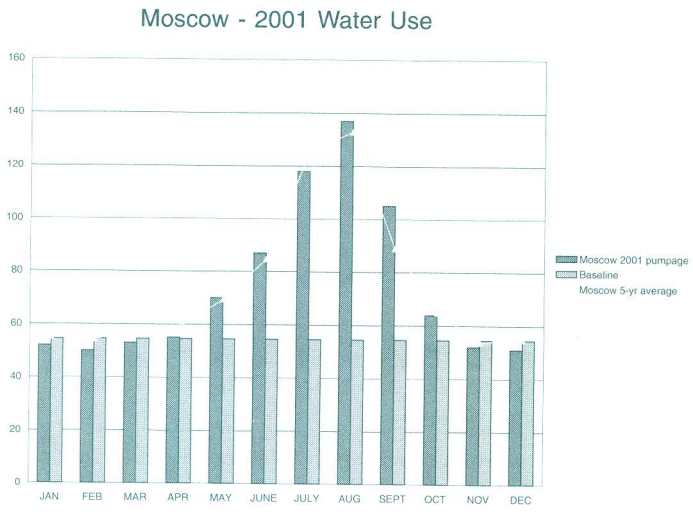


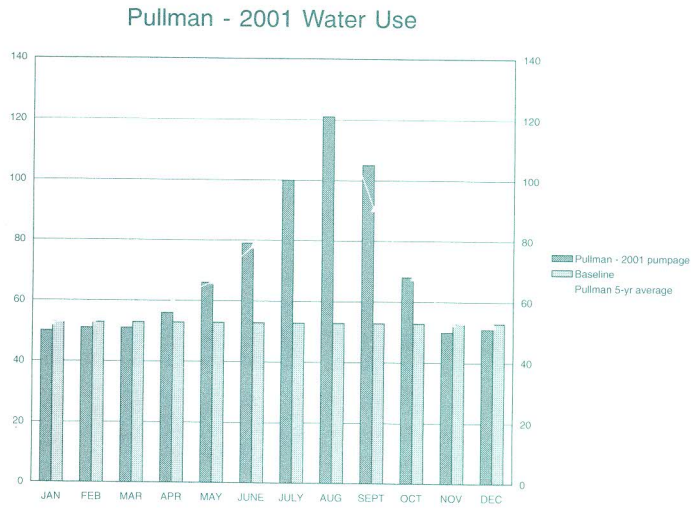
U of I
Comparison to 1 Percent Increase Limit

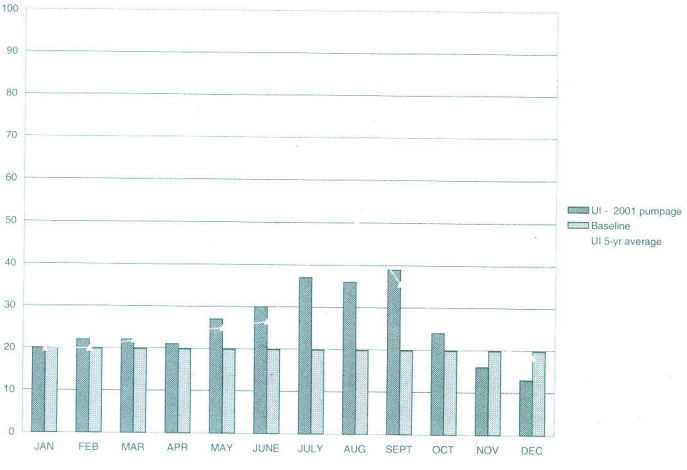
U of I
Comparison to 125 Percent Ceiling

Monthly and Peak Water Use

The difference between average winter and summer pumping rates provides a general indication of the amount of ground water pumped for outdoor use during the summer months. Residential and institutional water demand is much greater in the hotter and drier summer months than during the rest of year. This water use pattern is typical in the arid western half of the country. The baseline water use is defined as the average monthly pumpage for November through February for the five previous years (1996 - 2000). Peak water use is equal to the amount that exceeds this baseline use. Peak water use is primarily irrigation, but it also includes other outdoor activities like swimming pool filling, car washing, and sidewalk cleaning (See figures 9-11).







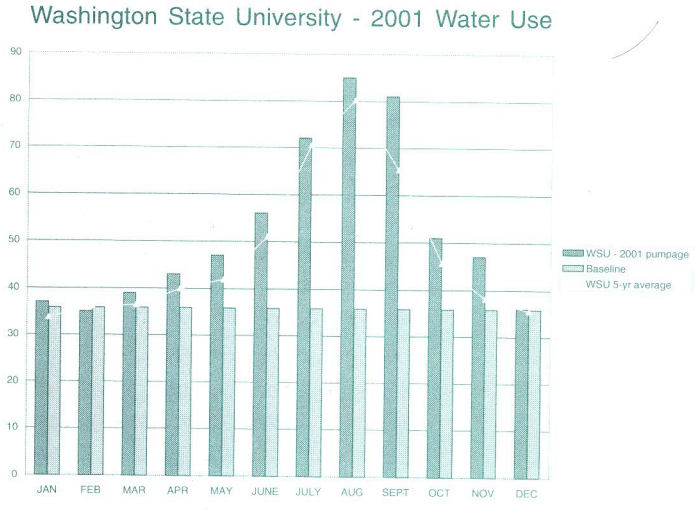


Figure 9. Figure 10. Figure 11. Figure 12. In 2001, all four entities had the highest monthly water usage during August and September.

Figure 5. Figure 6. Figure 7. Figure 8. In 2001, Pullman, Moscow and UI pumping decreased slightly from 2000 levels, whereas pumping at WSU increased. Of the four entities, only Moscow exceeds the voluntary pumping limits.

Moscow Mountain. This area is believed to act as an eastern barrier for the ground water basin in the Palouse area but also is the source of most of the surface runoff from the basi area.

Per Capita Water Use

Per capita water use is defined as the average amount of water used by one person in one day. Previously published per capita water use data for Pullman and Moscow (including the universities) ranged from around 150 to 180 gallons per person per day (gpd), with an average of approximately 170 gpd using population data from the 2000 U.S. Census, and assuming a constant annual growth rate to estimate population in 2001. Between 1990 and 2000, population increased by as much as 16 percent, based on data provided by the cities of Pullman and Moscow. While total ground water pumpage decreased 2 percent between 1990-2000.

Note that the available per capita usage figures are calculated from total pumpage divided by total population, and therefore include commercial and institutional uses of water as well as household use. This number should not be confused with *indoor residential per capita data*, which quantifies the amount of water used in a residence by an individual for personal needs (showers, laundry, toilets, dishwasher etc), and averages 69.3 gpd nationally (AWWARF, 1999). Because of the difficulty in collecting these data, there is no information currently available on residential end use of water in the Palouse area to compare with the national average. However, both Pullman and Moscow are now collecting data which will make this possible in future years.

Groundwater Levels

Regardless of annual increases or decreases in amount of ground water pumped since ground water development began in the late 1890's, the ground water levels in municipal wells in the Grande Ronde aquifer have experienced consistent annual drops averaging 1 to 2 feet per year. In 2001, PBAC realized that the continually declining water levels in spite of the recent attempts in the 1990s to stabilize annual pumping rates indicate that the amount of ground water pumped is more than the amount that is being recharged, or replaced, naturally to the Grande Ronde aquifer. The data also suggest that the rate of ground water decline occurring in the Pullman area is more uniform than the rate of ground water decline in the Moscow area. These data suggest that there is some recharge occurring in the Moscow area, although this has not been substantiated yet.

Water level data are supplied to PBAC by each entity and, until recently, there was no method to verify measuring techniques or calibration. As part of the research that PBAC is funding, well head elevations have been surveyed and a network of monitoring wells has been established using the newly acquired water level transducers/data loggers. Data from this network are recording water level changes much more accurately across the basin than ever before (See figures 13-14).

Historical water level data for the Wanapum aquifer are obtained from City of Moscow water level monitoring devices installed in Moscow Wells 2 and 3 (figure 15). Pumpage from the Wanapum has decreased since the 1950s when declining ground water levels prompted Moscow and UI to drill new wells into the Grande Ronde. Some fluctuations may be due in part to inaccurate measuring devices, but some may also be due to recharge.

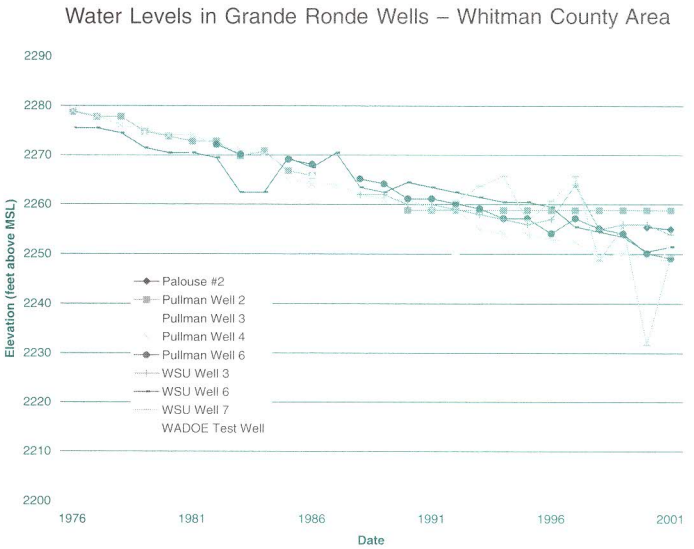


Figure 13. Water levels in Grande Ronde wells in Whitman County, Washington show a steady decline between 1 and 1.5 feet per year during the last 25 years. The Washington State DOE well is located along the Moscow-Pullman Highway, approximately halfway between the two towns, and unlike other Grande Ronde wells in Washington, the ground water levels in this well are increasing. These data indicate that recharge is probably occurring to this well.

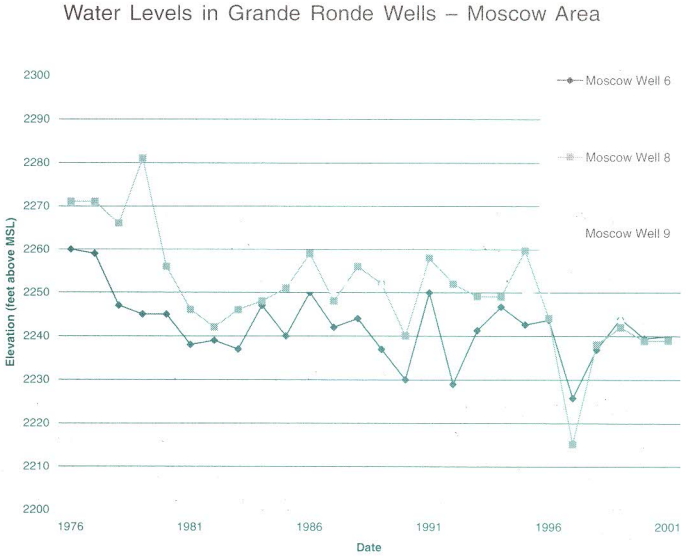


Figure 14. Water levels in Grande Ronde wells in Moscow area also are declining, although the rate of decline is apparently not as constant as it is in Whitman County nor as much on an annual basis.

During spring, a significant amount of run-off water from the Moscow Mountain area leaves the basin via local streams. Researchers are looking at methods to capture, and recharge some of this water into the basalt aquifers.

Water Quality

Water quality in the Palouse basin remains very high. No violations of health-based standards for analyzed constituents were reported in 2001, the year for which most recent data are available. Concentrations in water supplied to the public were below federal drinking water standards, or Maximum Contaminant Limits (MCLs), for all analyzed constituents. Because of the high quality of ground water, the water suppliers need only treat the water with a small amount of chlorine to prevent bacteria growth from occurring in the water supply system. No additional treatment is necessary, except to remove iron and manganese from water pumped from several of Moscow's shallow aquifer wells. Some run-off water from the granites of Moscow Mountain and the Palouse Ridge infiltrates through the sediments of Bovill (which contains high levels of iron and manganese) before reaching and recharging the Wanapum Aquifer . The higher concentrations of iron and manganese in Moscow's shallow aquifer water supply are attributed the sediments of Bovill located near the fringe of the eastern portion of the Palouse Basin.

PBAC Representatives

Moscow

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References and Additional Information

Available from PBAC upon request (208) 885-4569.
or our website at www.uidaho.edu/pbac

Paradise Ridge defines the southeast extent of the basin in the Moscow area.


University of Idaho