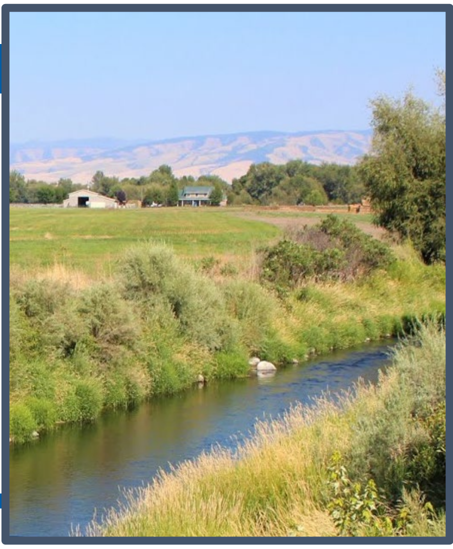


January 2025

# STUDY UPDATES NEWSLETTER

## *Walla Walla River Basin*

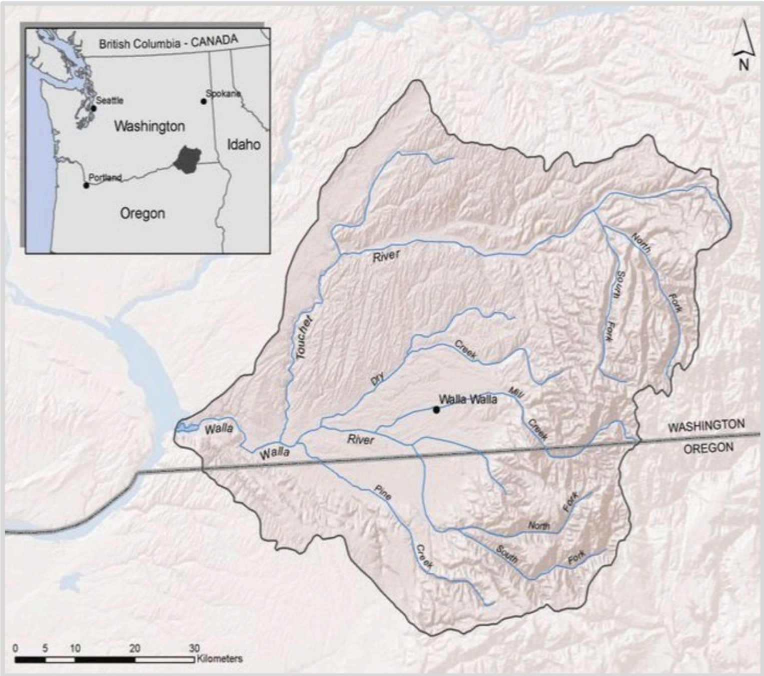
Scientists from the US Geological Survey (USGS) are working with scientists from the Oregon Water Resources Department (OWRD) and the Washington State Department of Ecology (Ecology) on a study to better understand groundwater in the Walla Walla River Basin

## Why Conduct a Groundwater Study?

**The Walla Walla Watershed spans over 1,700 square miles across Oregon and Washington.**

The Watershed is important to community industries, agriculture, and environment. However, groundwater levels in wells have been declining since the 1940s. Flows in streams and rivers are also declining in some areas and surface water is over appropriated, meaning that there is not enough water to meet people's needs and keep healthy aquatic habitats.

**This Newsletter Highlights New Study Reports**




*Map: Walla Walla Watershed Boundaries*

***Started in 2019, the study is anticipated to be completed in 2026***

## Implications of Decreasing Groundwater for Communities

**In many of the basin's aquifers, community demands for groundwater is outpacing groundwater supplies, which threatens communities and the environment. This study helps us better understand the changing groundwater system in the Walla Walla River Basin.**

**Water Supply for Residents:** Many residents in the basin rely on domestic or city wells for water in their homes. Declining groundwater levels may dry out wells or decrease well yields (gallons per minute), putting a strain on households' ability to access water.

**Agricultural Production:** Declining groundwater supplies may harm farms, vineyards, and orchards, by potentially reducing crop yields and increasing costs for production. This could impact the local and regional economies and food supply.

**Environmental Effects on Threatened Species:** Reduced streamflow harms aquatic habitats, impacting ESA (Endangered Species Act) listed salmon. The continued loss of these fish and habitats could have cascading effects on the ecosystem across the basin.

2019

## The study is working to fill important information gaps to help us plan for our water futures through a series of reports.

**Since early 2019, the study has been collecting data and is currently in the process of organizing information into a series of reports that will be released between 2024 and 2026.**

## Walla Walla River Basin Study
## Preliminary Report Release Timeline

2024

**"Hydraulic properties of stratigraphic units and geologic structures in the Walla Walla River Basin, Oregon and Washington"**

Estimate how fast or slow water moves through local rock types and explain how geological features like faults separate or connect groups of basalt wells.

**"Analysis of conveyance losses across the Walla Walla River Floodplain, Oregon"**

Measure how much water the Little Walla Walla River and nearby irrigation canals contribute to the basin-fill groundwater system.

2025

**"Stream seepage analysis to quantify stream and groundwater interactions within the Walla Walla River Basin, Oregon and Washington"**

Measure where and how much groundwater discharges into streams into groundwater to better understand the groundwater flow system.

**"Hydrogeologic framework of the Walla Walla River Basin, Oregon and Washington"**

Explain the thickness and depth of underground rock layers and the water-bearing properties. Present basin groundwater level maps.

**"Water use and groundwater pumpage estimates in the Walla Walla River Basin, Oregon and Washington"**

Estimate the amount of water used and pumped from the ground for irrigation, municipal, and other uses in the Walla Walla River Basin, including how the amount has changed in different areas through time from 1985-2022.

**"Interpret groundwater sources, mixing, and flow paths across the basin"**

Summarizes water chemistry data from water samples to identify the elevation where the water entered the groundwater system, to better understand the movement and timing of groundwater flows.

2026

**"Conceptual Model of the Walla Walla Groundwater System"**

Combines results from other studies and adds new analysis of groundwater and chemistry. It explains how groundwater works, including where it comes from, how it moves, and where it flows out.

*Denotes newly completed or upcoming reports highlighted in this newsletter*

# Conceptual Model of a Groundwater System

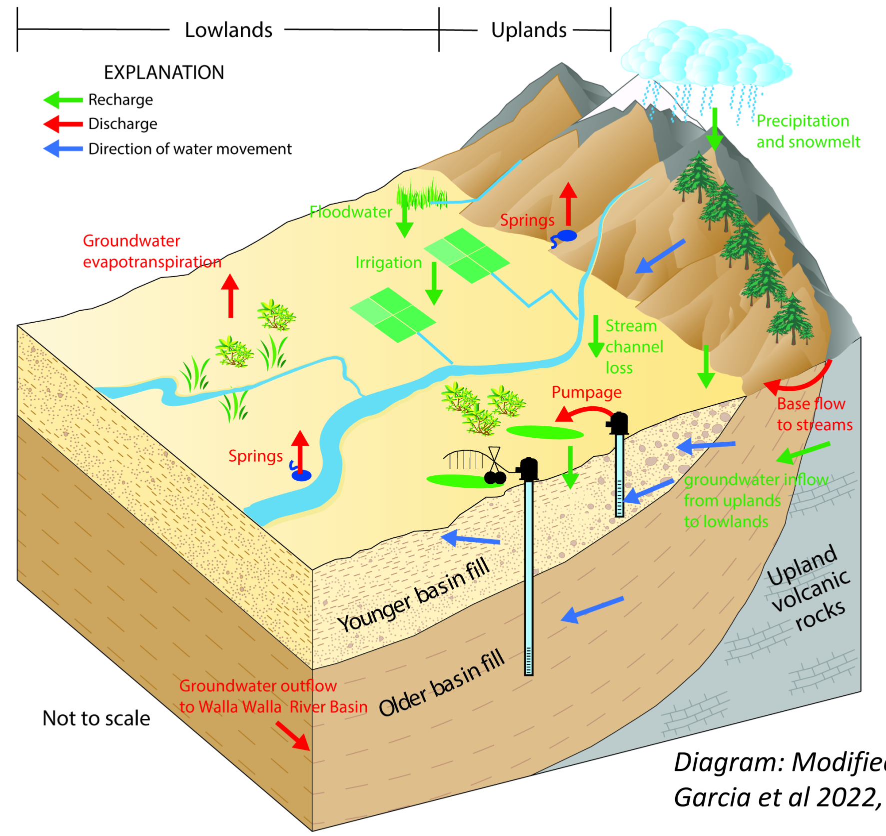



*Diagram: Modified from Garcia et al 2022, USGS*

**Study reports build onto each other to inform a conceptual watershed groundwater model.**

Scientists are using different tools to learn more about our groundwater. These include measuring groundwater levels in wells, measuring surface water in streams and rivers, looking at water chemistry to determine the age and source of water, and looking at the layers of rocks across the basin to understand the factors controlling groundwater flow.
These different data sets will help scientists get a better understanding of how water resources are changing within the Walla Walla River Basin and create a conceptual model for groundwater as a comprehensive way of understanding water movement throughout the watershed.

**The conceptual model will provide needed information that supports decision-making for planning and managing groundwater resources in the Walla Walla River Basin.**

- **Water Availability:** Shows how much water might be available in the aquifers for drinking, farming, and other needs.
- **Recharge Areas:** Identifies areas where water enters the ground, which helps communities protect these areas to ensure a steady water supply.
- **Contamination Risks:** Locates where potential pollutants might enter the groundwater system, so communities can work to prevent contamination.
- **Sustainability:** Helps communities plan for how much water can be used over time without running out, supporting long-term water management.

*Photo: Overlook of the Walla Walla River Basin farming fields.*

NEW REPORT HIGHLIGHT

# Hydraulic properties of stratigraphic units and geologic structures in the Walla Walla River Basin, Oregon and Washington

*This report quantifies the water conducting properties of the rocks that host the Walla Walla River Basin groundwater system.*

Characterizing hydraulic properties, hydrostratigraphic units, and the hydraulics of geologic structures allows us to quantify the effects of pumping or injecting at wells. Hydraulic property data, in combination with other basin study reports, also allow scientists to estimate future groundwater level changes associated with potential management options.

**ACCESS THE OPEN-FILE HERE: https://owrd.info/ww_hydroreport**

## What data were collected and How were they used in the report?

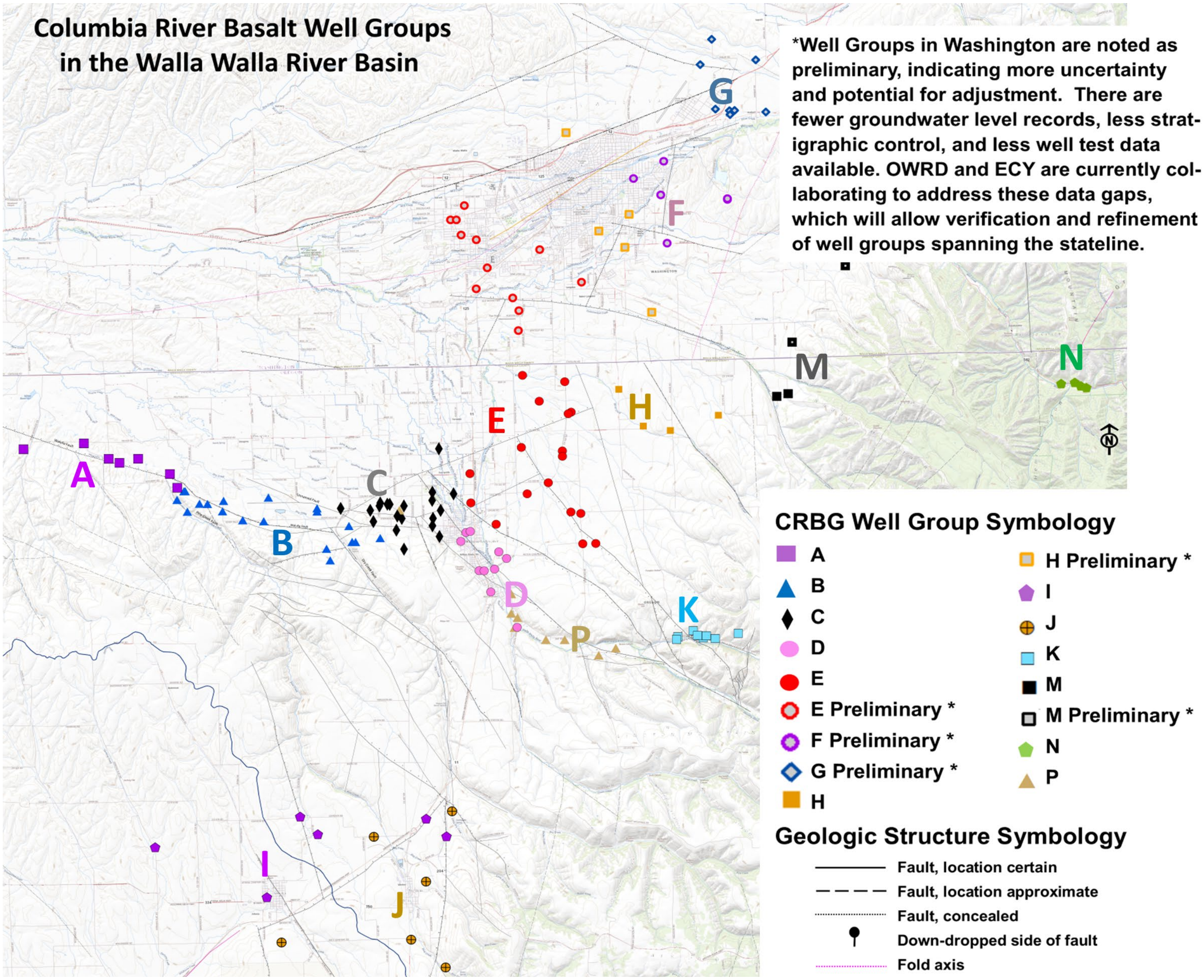
From 2020 to 2024, scientists measured static groundwater levels in Oregon and Washington. This included 220 wells annually to characterize winter groundwater level highs and 160 wells quarterly to describe seasonal changes. Wells were selected from sedimentary (sand and gravel) and basalt geologic units. This report uses groundwater levels and well pumping tests to identify basalt well groups. The study also reports hydraulic properties of geologic materials. Basalt wells are connected within a group and hydraulically separated from adjacent groups on pumping timescales of days to decades. A current hypothesis suggests that permeability contrasts in the basalt may cause the observed groundwater level elevation step changes. While the exact mechanisms are not known, available data suggest that layering of Columbia River Basalt Group (CRBG) lava flows, and fault related rock shatter may contribute to permeability contrasts that either connect or separate water-bearing portions of stratigraphic units. This is important because changes to basalt groundwater resource management will need to reflect the hydraulics of the observed aquifers and geologic structures.

## *Key Scientific Terms*

**Hydraulic Properties:** are characteristics of geologic materials like clay, sand, or rocks, that control movement of water below ground. These properties help us understand how quickly groundwater drawdown effects from one well are seen at other wells and how much wells are expected to yield. Geologic materials' hydraulic (water-conducting) properties are influenced by how rocks are originally formed and by geologic events such as movement during earthquakes or erosion.

**Hydrostratigraphic Units:** are layers of geologic materials with similar hydraulic properties, stratigraphic position, and depositional history. Lumping or splitting geologic units into hydrostratigraphic units creates a framework for building a comprehensive hydrogeologic conceptual model.

**Geologic Structures:** can contain zones of altered rocks that have different hydraulic properties than the surrounding, undeformed extents of the same geologic unit. In the Walla Walla River Basin, fault zones are a kind of geologic structure that control how groundwater moves through the Columbia River Basalt Group. Fault zones can either resist or conduct flow, and in many parts of the Walla Walla River Basin groups of wells with similar water level elevations are separated from other well groups by geologic structures.




*Map: Walla Walla River Basin map across state lines of Oregon and Washington*

## Basalt Well Groupings

Groundwater level data and multiple-well pumping test results from basalt wells were used to identify groups of wells that have similar water levels. These well groups were created by the hydraulic properties of local fault zones. Using winter groundwater levels, scientists defined 12 distinct basalt well groups based on similar water level elevations and responses to pumping tests. Between these groups large groundwater elevation changes occur over short distances. Well construction, well depth, or stratigraphy do not explain the abrupt water level changes between most of the groups. These groups are shown in the figure above.

The geology of the Walla Walla River Basin is complex because it is located at the intersection of two regional fault zones. Surface and subsurface information provided when drilling wells shows that faults have vertically offset CRBG geologic units by tens to hundreds of feet. There are also mapped faults with horizontal offset. Movement of rocks along geologic structures such as fault zones can change the permeability of rocks. If the rocks become lower permeability, such as when rocks are ground up along fault zones, this slows down groundwater flow and disconnects flow paths. Alternatively, rocks can fracture near faults and become more permeable in the process, connecting groundwater flow paths that were previously separate.

*Photo: Exposure of Touchet Beds, Washington*

## Walla Walla River Basin Hydrostratigraphic Units:

- **Upper Alluvium:** Coarse to fine-grained river deposits
- **Missoula Flood Deposits:** Unconsolidated and repeating deposits of sand, silt, and clay rhythmites, also known in the Walla Walla Valley as Touchet Beds. The laminations record the periodicity and recurrence of catastrophic glacial ice dam outburst events.
- **Loess:** Windblown sandy silt deposits, both above and below Missoula Flood Deposits.
- **Lower Alluvium Coarse:** Poorly consolidated to cemented conglomerate interbedded with sandstone and claystone.
- **Lower Alluvium Fine:** Consolidated sedimentary rocks including sandstone, claystone, siltstone and mudstone.
- **Columbia River Basalt Group (CRBG):** Large-volume, stacked sheet flows of lava that have a characteristic three-part structure: flow top, dense flow interior, and flow bottom. The combination of a flow top and an overlying flow bottom make up a permeable "interflow zone" where groundwater storage and flow is usually concentrated.

***This information will be further explored in an upcoming study report:***
**"Hydrogeologic Framework of the Walla Walla River Basin, Washington and Oregon"**


**The water-conducting properties of local geologic units and structures summarized in this report will be incorporated into a three-dimensional conceptual groundwater framework currently in development by the USGS. The resulting hydrostratigraphic units are the layers within this framework. A three-dimensional groundwater framework can be viewed on a computer, rotated, and sliced to see cross sectional views of the underground basin features.**

## NEXT REPORT RELEASE

# Analysis of conveyance losses across the Walla Walla River Floodplain, Oregon

*This report will quantify the volume of surface water recharging the basin fill groundwater system through the distributaries and irrigation conveyance channels of the Little Walla Walla River.*

The data and analysis in this report, along with other related studies, spatially identifies and quantifies groundwater-surface water exchanges throughout the Walla Walla River basin. These results also inform estimates of water applied to grow crops throughout the valley.

## What data were collected and How were they used in the report?

Around 300 discharge (flow) measurements were made on 18 different channel segments (reaches) of the Little Walla Walla River's distributary system on the Oregon side of the valley between 2021 and 2024. These measurements included all turnouts and pumps within each reach of the Little Walla Walla River, ensuring that all surface water inflows and outflows were accounted for within a channel segment. This comprehensive dataset enabled the study to formulate water balance calculations for each reach, with unaccounted water attributed to seepage losses or gains.

*Photo: OWRD taking stream measurements.*

## *Key Scientific Terms*

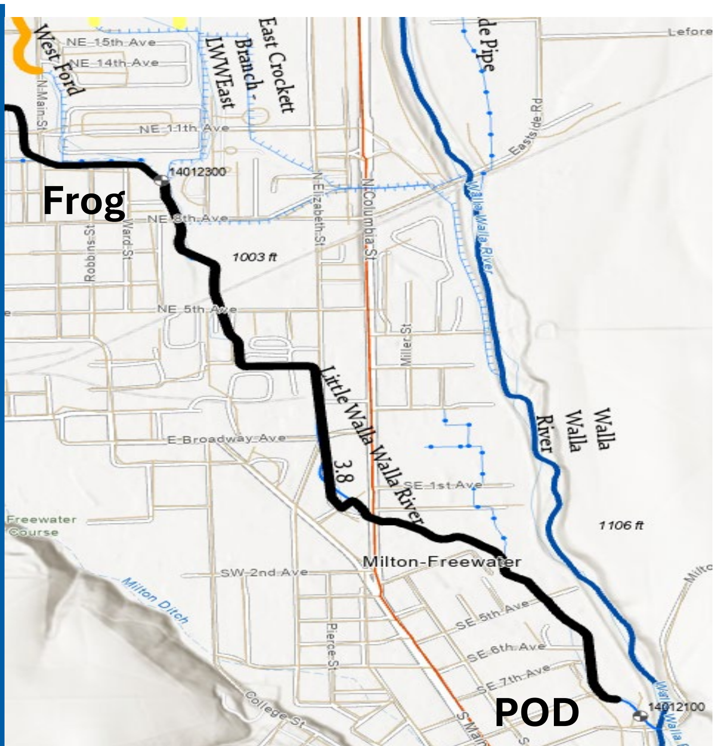
**Basin Fill Groundwater System:** Shallow groundwater system associated with the fluvial deposits of the Walla Walla valley that interact with surface water at different locations and times.

**Fluvial Deposits:** Layers of sand, gravel, silt, or clay left behind by rivers and streams. These materials are carried by moving water and get deposited when the water slows down. Fluvial deposits often form along riverbanks, in riverbeds, or where rivers flood, and often store groundwater like a sponge.

**Alluvial Fans:** Form where streams exiting the Blue Mountains deposit sediment as they reach flatter terrain. These fans consist of coarser materials near the mountain front and finer sediments further out, playing a key role in groundwater recharge and supporting diverse ecosystems. While they enhance agricultural fertility, alluvial fans are prone to flooding and sediment deposition during high flows from heavy rains or seasonal snowmelt events.

Recharge: Water from the surface, like rain, melted snow, or flows from rivers and canals that seeps into the ground and replenishes aquifer(s), the saturated pore space in rock and soil layers. The process is similar to filling a sponge.

# Little Walla Walla River (POD): To The "Frog" Bifurcation and

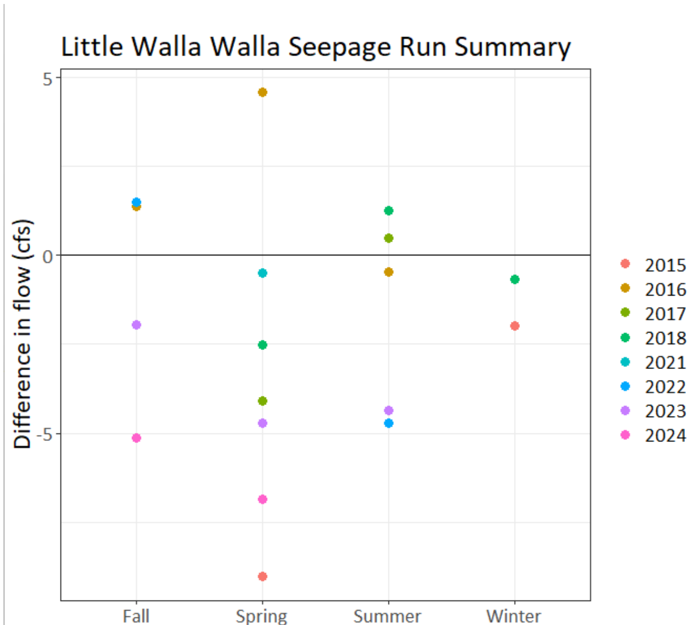



The rocky river bed (coarse fluvial deposits) of the Little Walla Walla River (LWWR) between the point of diversion (POD) from the Walla Walla River and the "Frog" bifurcation suggests significant water might be leaking into the ground from the LWWR channel. Concurrent flow measurement along this reach of river (i.e., seepage run) performed by the Montgomery Water Group in 2004 seemed to confirm this by measuring over 20% less water at the Frog compared to flow at the POD. However, another study performed in 2004 by HDR Engineering found no losses in this channel reach.

***The map to the left shows the reach in question. This reach potentially represents a significant area of groundwater recharge to the Basin fill and conversely a potential area to conserve surface water resources by piping and reducing channel losses.***

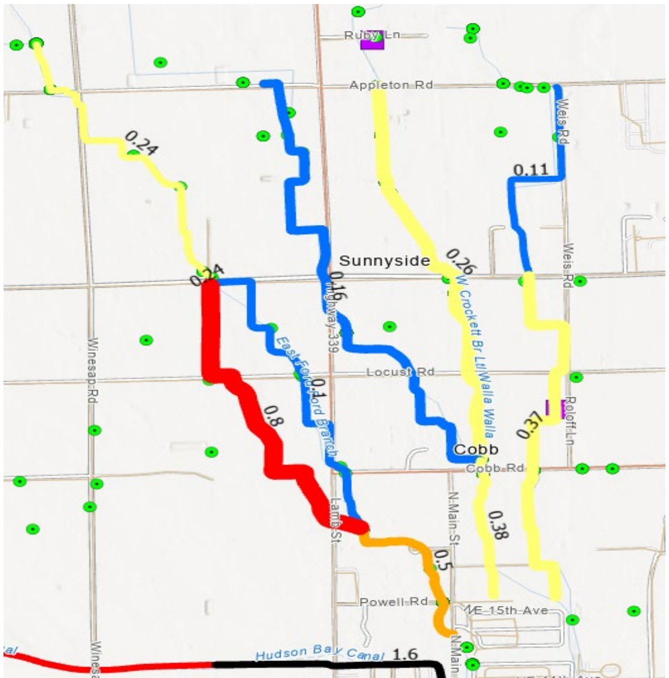
To confirm if flow losses are occurring in this reach, OWRD performed new seepage runs, 2021-2024. This analysis coupled with results from the Walla Walla Basin Watershed Council (WWBWC, 2015-2018), suggests that losses are smaller than expected, vary seasonally and are only weakly correlated to the amount of flow in the channel. The average losses from the WWBWC and OWRD seepage runs (23 total) were on the order of 2-4 cubic feet per second (cfs) and a small percentage (3%) of the typical flow entering the reach.

The average loss percentage is less than typical measurement uncertainty. Although the entire WWBWC and OWRD data set suggests the presence of seasonal patterns in losses (figure to the right), variation in results between efforts are likely primarily due to measurement uncertainty compared to the amount of loss occurring in the reach. Collectively, these results indicate that the losses, while important, are much less than the 20% found in the initial 2004 study.




Data sources: WWBWC (2015-2020); OWRD (2021-2024)

# Little Walla Walla River (POD): Conveyance Channels (2023-2024)

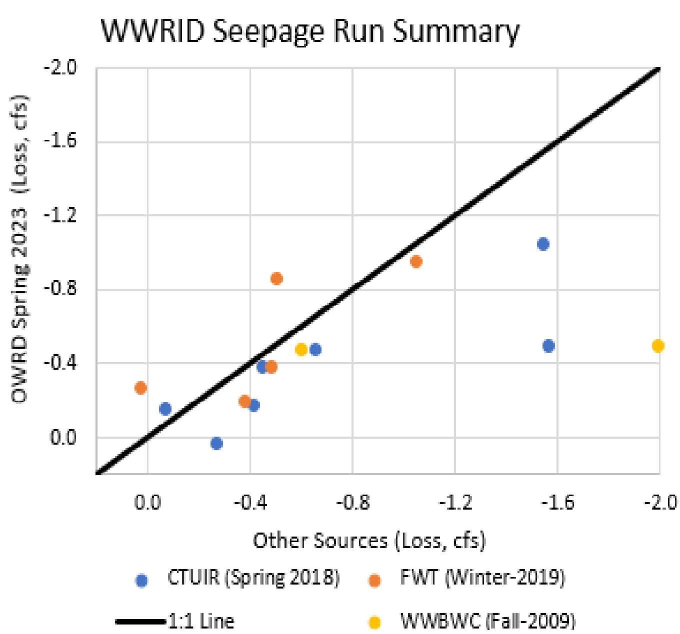



Normalized loss (loss per mile) varied spatially but averaged between 0.5 cfs to 0.6 cfs/mile for HBDIC and WWRID, respectively, and are shown in the map to the right. Losses are generally higher closer to the Frog and seem to correspond to coarser channel substrate.

Based on these seepage runs, the total current channel losses across the Oregon side of the valley is estimated to be about ~ 20% of the diverted flow at the LWWR POD, which would be roughly equivalent to 9,000 acre-feet per year (af/yr). These estimates are preliminary.

***Map: Conveyance channels***

Losses measured during the OWRD 2023 and 2024 seepage runs on distributaries of the Little Walla Walla River were generally in agreement with previous efforts. OWRD results for the different channels (reaches) of the Walla Walla River Irrigation District (WWRID) are compared to earlier efforts, shown in the graph to the right. If the analysis from the different efforts were in perfect agreement, the data for each reach would plot directly on the 1:1 line. The Ford Branch had the highest variation in losses between the studies. Similar to the LWWR seepage runs, the differences in results between the distinct efforts on the WWRID are likely due to measurement uncertainty and to a lesser extent differences in flow or other hydrologic conditions during the time (season) of the measurements.





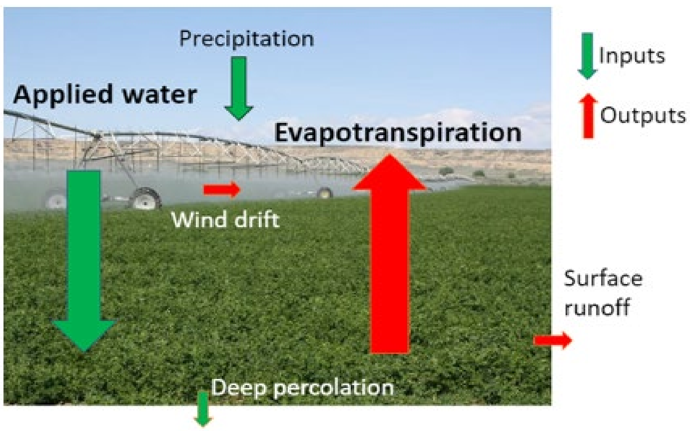
**The study covered over 18 miles of the distributary system, providing critical data to enhance understanding of groundwater recharge processes and movement in the valley. For the community, this report highlights how surface water management practices have influenced the groundwater system through irrigation-related recharge. These findings also support defining the region's hydrologic budget.**

## NEXT REPORT RELEASE

# Water use and groundwater pumpage estimates in the Walla Walla River Basin, Oregon and Washington

COMING SOON

This report will determine the amount of water used and pumped from the ground for irrigation, municipal, community, livestock, commercial, and other uses in the Walla Walla River Basin, including how the amount has changed through time.




## How Can The Community Better Understand Irrigation Water Use?

**Irrigation is an important part of the water budget in the Walla Walla River Basin. This study is using the following steps to better understand how much irrigation water is used in the basin:**

### Agricultural Fields And Their Water Source:

Agricultural fields in the Walla Walla River Basin were identified and mapped using existing field boundaries, aerial imagery, satellite data, and spatial information for water right places of use. These mapped agricultural fields were related to groundwater and surface water sources using water rights information.

### Evapotranspiration (ET) Across The Basin:

EvapoTranspiration (ET) maps were made by OpenET (https://etdata.org/) using satellite images, weather data, and computer models. ET maps show how much water is lost to the air from evaporation (water loss from soil and surfaces) and transpiration (water released by plants). The water for ET comes from irrigation or natural precipitation.

### Determine Irrigation From ET:

Using the ET information and a computer model called ET Demands, the contribution of natural precipitation, ET attributable to irrigation, and estimated applied irrigation amounts were determined for agricultural fields in the basin from 1985 to 2022. Since these fields were linked to their water sources, irrigation amounts are also being associated with their surface and groundwater source and therefore could be summed across the basin.

### Verifying With Ground Observations:

Verifying modelled irrigation estimates is an important final step. Staff conducted field surveys to evaluate field mapping accuracy and collected flowmeter data to compare with modeled irrigation estimates.

Next Steps

**Currently, this team is working to release this report in 2025. The team is actively working on the last step in the agricultural water budget – verifying modeled irrigation estimates – and is also compiling water use for non-agricultural uses. The team will then write up results and other parts of the study will be shared with the community.**

# New study reports will continue to be released throughout 2025 and 2026

**Addressing groundwater decline in the Walla Walla River Basin requires a combination of immediate and long-term actions from the community. Here are some actionable steps the community can take:**

- **Water Conservation Measures**: Reduce water use at home and in agriculture through efficient appliances, smart landscaping, improved irrigation, and rainwater harvesting.
- **Collaborative Efforts**: Educate residents, organize water-saving initiatives, and create shared rain gardens to enhance groundwater recharge.
- **Promote Groundwater Recharge**: Participate in aquifer recharge projects, data monitoring, and riparian zone restoration to maintain groundwater levels.
- **Promote Coordinated Investment**: Partner with stakeholders and seek grants to support conservation projects and infrastructure improvements.
- **Technology and Innovation**: Leverage tools for water monitoring, encourage treated wastewater reuse, and explore innovative solutions like desalination.
- **Policy and Regulation Advocacy**: Support equitable water management policies, incentivize conservation practices, and promote collaborative water-sharing agreements.

**The States of Oregon and Washington are working together to stabilize declining groundwater levels in the basalt aquifer and figure out how to comanage the cross-border basalt well groups.**

OWRD and Ecology are working together to enhance our understanding of the groundwater system along the shared border between Oregon and Washington. Using funds provided by Ecology, OWRD will be hiring a limited duration position (approximately 2year position) focused on gathering data about wells along the border and then engaging with well owners to gain access to perform pump tests between 2025 and 2027.

These pump tests will help us better understand where groundwater is shared between wells on either side of the border so that we can make informed decisions about groundwater management. The new information will expand and refine current well groupings from this study.

OWRD and Ecology are also in coordination on the Walla Walla 2050 Strategic plan implementation, the Bi-State Flow Study, and a US Bureau of Reclamation Basin Study. All these activities will inform a bi-state management framework for each state to consider.

*Photo: Mill Creek, Washington*


*Photos: Community events in 2024 sharing study findings*

# MOVING FORWARD TOGETHER THROUGH COMMUNITY ENGAGEMENT

**Continuing to engage with and plan alongside the community remains to be an essential part of this study. New study reports are planned for release between now and the end of 2026. With each study report, we come closer to better understanding how our community's groundwater system is changing. The study will continue to share information with the community through many different pathways including:**

- **As reports are completed, these will be publicly available on the OWRD website.**
- **The study team will be holding a Spring 2025 virtual roundtable, to listen and continue to learn about data gaps and needs for planning.**
- **The study team will be holding a Fall 2025 study open house highlighting new data.**
- **The community and the study team will continue to work together to plan for our shared water future and discuss ways to better manage groundwater.**

OREGON WATER RESOURCES DEPARTMENT

DEPARTMENT OF ECOLOGY State of Washington

## *For More Information Contact*

Tim Seymour
OWRD Assistant Manager, Groundwater Section
Cell: 503-979-3512 | timothy.r.seymour@water.oregon.gov