VOLUME 3, ISSUE 1

SOUTHERN WILLAMETTE VALLEY GROUNDWATER MANAGEMENT AREAS

NOVEMBER 2020

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State of Oregon Department of Environmental Quality

DEQ SWV GWMA UPDATES

In an effort to keep members and partners informed during the COVID-19 pandemic, DEQ revived the Southern Willamette Valley Groundwater Management Area (SWV GWMA) newsletter. This newsletter provides updates such as EPA groundwater research, OSU Extension's rural outreach program, retiring committee members, and modified monitoring well locations.

While we canceled the fall meeting, partners can be assured that DEQ's work to understand and reduce groundwater nitrate in the SWV GMWA continues. One of DEQ's key roles in the SWV GWMA is groundwater well monitoring. *Continued on page 2.*

FROM FIELD TO GROUNDWATER: EPA RESEARCH IN THE GWMA

EPA scientists have been involved in two major projects associated with the Southern Willamette Valley Groundwater Management Areas (SWV-GWMA), and this work is described below. The first effort involves analysis of the long-term Oregon Department of Environmental Quality (DEQ) monitoring well data. The second effort is the latest update on the Partnership to Improve Nutrient Efficiency or PINE study.

Groundwater nitrate trends update: Nitrate contamination of groundwater is an important issue in many agricultural areas within Oregon and across the US. The southern Willamette Valley (SWV) can be used as a case study to understand groundwater nitrate sources, dynamics and management. *Continued on page 4.*

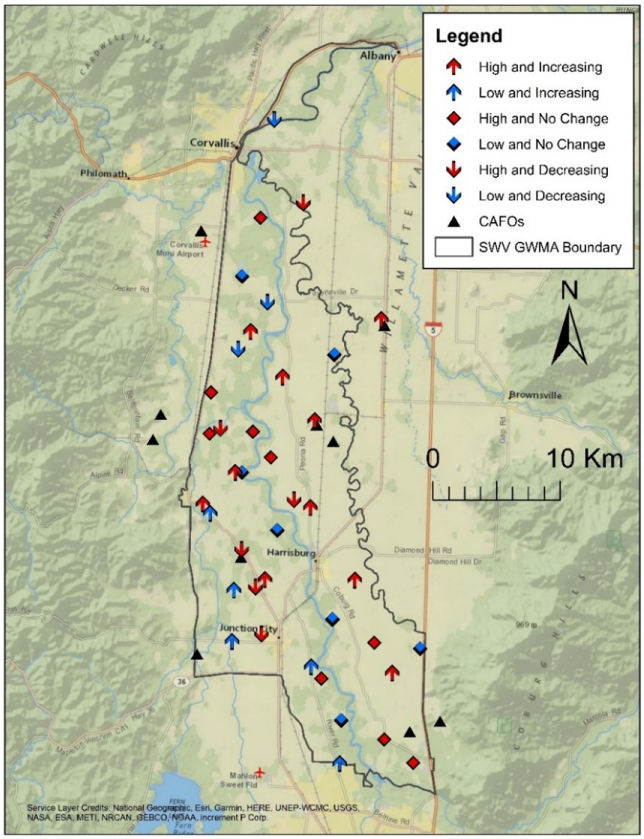


Figure 1. The overall trends and concentrations for all monitoring wells (2006-2019). Red indicates wells with any single concentration above the 7 mg/L nitrate-N (high), while blue indicates all values were under 7 mg/L nitrate-N (low). The trend of decreasing or increasing was determined by using Pearson correlation testing to calculate the significance ($p < 0.10$) of nitrate trend over time.

DEQ UPDATES, CONTINUED

In 2020 DEQ technicians collected 54 samples spanning 43 locations. They will go out again in early December to collect the fourth round of annual samples.

Due COVID-19 social distancing guidance and limited internet connectivity for some committee members, future SVW GWMA meeting dates remain uncertain.

For now, DEQ will continue publishing semi-annual newsletters to highlight SWV GWMA activities.

If you have a topic you would like to read more about or project you want to share, please contact the new SWV GWMA coordinator: Sarah Sauter at 541-774-5905.

CALL FOR SWV GWMA COMMITTEE MEMBERS

The committee represents a balance of interests in the affected area and includes attendance at biannual meetings, advice and assistance regarding ongoing research, and implementation of the area's Action Plan. Current vacancies include watershed councils, farmers, and business owners. If you know anyone who may be interested, contact Sarah Sauter at 541-774-5905.

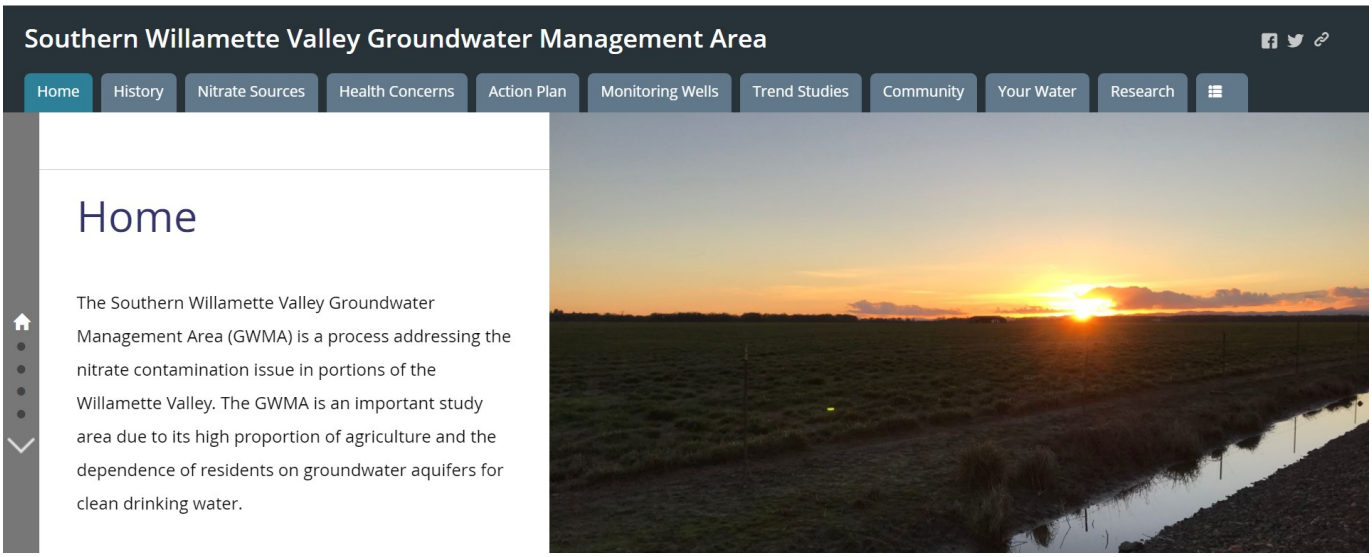
RURAL RESIDENT OUTREACH BEGINS

As we move into the colder months and the rain moves in, OSU Extension is launching the first wave of nitrate testing outreach for our current DEQ 319 grant. Our goal over the next two years is to provide 400 nitrate well water tests that include a 6 month follow-up for those that have any level of nitrate found during the screening. The model we used in the past, being at many community events with an educational booth and providing in the field testing, is not an option during these unique times. We adjusted to begin with targeted postcards and newsletter articles to the residents of the SWV GWMA. Residents will be asked to make an appointment for well water testing at any of the OSU Extension offices within the region. Upon arrival the sample will be tested, an informational packet given, and contact information gathered for the future. Every resident will be provided with contact information so they can reach out with any immediate questions. This isn't a perfect solution, but we are excited to get the project underway. For any questions or to refer anyone with questions please reach out to Chrissy Lucas at: Chrissy.Lucas@oregonstate.edu or 541-713-5009

By Chrissy Lucas, OSU Extension

IN CASE YOU MISSED IT: STORY MAP COMPLETED

The SWV GWMA story map lets users explore the Southern Willamette Valley GWMA. Beginning with the establishment of the SWV GWMA, the story map showcases nearly 20 years of activities aimed at educating the public and investigating groundwater nitrate. It explores nitrate sources, health concerns, and actions well and septic users can take to reduce nitrate contamination. The story map includes maps of the monitoring network, trend studies, and a link to multiple research papers. The project was created by Madeleine Moyano and Cody Piscitelli. You can visit the SWV story map at: https://arcg.is/1H4ynu.



HAPPY TRAILS TO GEORGE PUGH AND JO MORGAN

Long term stakeholder, friend and valued contributor George Pugh has elected to step away from our GWMA committee and move on to the next adventure. George has been a stalwart part of the roster since day one when Audrey convened our first meeting in Harrisburg. It has been my privilege to know George from other venues for the last 40 years, and I have always benefited from his sage wisdom. Quiet and self-effacing, George manages to deliver clear and convincing advocacy for critical ideas in a warm and friendly manner based on a lifetime of real world agricultural experience. He has been a treasured volunteer in too many organizations to list, but know that his local community as well as the state have all benefitted greatly by his participation. We will miss him at the table but we will also wish him the best down the road. Thank you George for all that you have given and we will always welcome you anytime you want to drop by. Fair winds and following seas my friend.

By Jerry Marguth, SWV GWMA Chair

Jo Morgan retired May 2020, to the detriment of the state's agricultural water quality program. She was hired away from the Department of Energy five years ago to be ODA's Regional Water Quality Specialist for the Mid Coast and Southern Willamette Valley.

Jo began her career in Oregon in 1998 as an Aquatic Policy Analyst for the Department of Forestry. After 9 years she left to work with the City of Corvallis as a policy analyst for 2 years and then the Department of Energy for 3 years.

She spends her time now catching up on home projects and working in her yard. Jo has 3 grandsons she hopes to spend more time with when we can all be together again! She plans to explore the Pacific Northwest and travel around the world.

By Ellen Hammond, ODA

MEET THE NEW SWV GWMA COORDINATOR

Welcome to Sarah Sauter who is the new DEQ SWV GWMA Coordinator. Sarah joined DEQ in April as a Western Region Basin Specialist . Sarah brings a background in stakeholder engagement and watershed restoration. In her free time, she enjoys trail running and volunteering at the local makers space.

You can reach Sarah at: sarah.sauter@deq.state.or.us, 541-774-5905 (office) or 541-690-0312 (cell).

MONITORING CHANGES

Despite our best efforts to follow the SWV GWMA monitoring plan, it is inevitable that changes need to be made. Since the beginning of the monitoring program, DEQ has lost and gained monitoring wells due to budget fluctuations, mechanical damage by mowers and road graders, and changes in landowners. We adapt to these modifications by consulting researchers and reviewing data to see what patterns or trends may or may not be impacted by changing locations or monitoring frequencies.

This summer DEQ lost permission to sample one of the SWV GWMA drinking water wells (DW-17). DEQ convened a technical advisory team of EPA, Oregon Department of Agriculture, and DEQ experts to identify a replacement strategy. Maps showed that we did not need to replace the well because an existing and nearby well had similar geologic conditions and water quality trends. Therefore, this loss presented us with an opportunity to shift our resources to a different well – one with a concerning nitrate trend. Annual monitoring data show nitrate levels at GW-7 are going up quickly and approaching the 7 mg/L action threshold. The technical team determined that seasonal monitoring at GW -7 might help us understand why nitrate levels are rising so quickly. Similarly, the team recommended to reduce monitoring frequency at DW-6 and increase monitoring frequency at GW-11. DEQ will implement the changes this winter.

By Sarah Sauter, DEQ

FROM FIELD TO GROUNDWATER, CONTINUED

Because nitrate is a human health concern and high concentrations have been observed in the SWV, the state of Oregon declared the SWV Groundwater Management Area (GWMA) in 2004. A network of monitoring wells for both drinking water and groundwater was established throughout the GWMA and these wells have been sampled by Oregon DEQ since 2006. These monitoring well data were recently analyzed by Cody Piscitelli as part of his MS thesis in OSU's Environmental Science Graduate Program (Piscitelli 2019). Over the sampling period between 2006-2019, average nitrate concentrations exceeded the state of Oregon's 7 mg nitrate-N L^{-1} Action Level in 33% of the SWV-GWMA monitoring wells, and average concentrations exceeded the U.S. Environmental Protection Agency's (EPA) Maximum Contaminant Level (MCL) of 10 mg/L nitrate-N for 12% of the wells (Figure 1). From 2006-2019, nitrate concentrations increased in 57% of monitoring wells, with a significant increase seen in 38% of monitoring wells (p-value <0.10). The mean nitrate concentration across all monitoring wells increased significantly from 5.41 mg/L nitrate-N during the 2006-2011 sampling period to 6.28 mg/L nitrate-N during the 2012-2019 sampling period, with variability among wells in a particular year (Figure 2). Figure 1 shows the spatial patterns in these trends over time. The findings indicate that despite the greater public awareness of the issue of groundwater nitrate contamination in the SWV-GWMA, concentrations have continued to increase over the last 14 years (Piscitelli 2019).

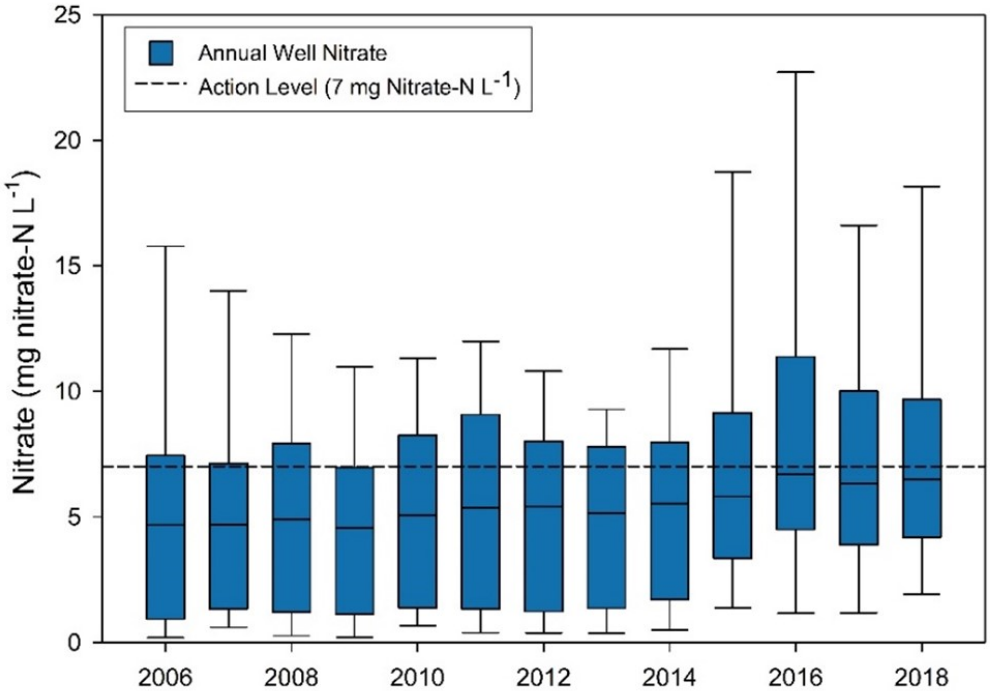


Figure 2. Box and whisker plot showing nitrate concentration median, 50th percentile (blue box) and min/max (whiskers) in 42 wells monitored from 2006-2018 in the SWV GWMA.

Tracking changes in nitrate concentrations over time has shown that wells behave somewhat independently (Figures 1 and 2), and, thus, it has been challenging to use the concentration data alone to assess the long-term effectiveness of nitrogen management in the GWMA. To better understand the source and processing of nitrogen within the soil and groundwater, stable isotopes of water and nitrate are being studied. Since 2012, EPA's Renée Brooks has been measuring water isotopes in the monitoring network, and post-doctoral associate Julie Weitzman began measuring the nitrate isotopes in 2016. Weitzman et al. (In review) used these isotope tools to identify sources and transformations of nitrogen in groundwater, ultimately providing an effective means for classifying wells based on unique patterns associated with water and nitrogen source and processing. The results suggest that managing groundwater nitrate in the region will require integration of different approaches, such as controlling nitrate sources and/or enhancing nitrate sinks across the landscape.

PINE study update: Nutrient best management practices in the GWMA can support the sustainability of agriculture and water quality. In 2013, a team of researchers from US EPA, Oregon Department of Environmental Quality, Oregon Department of Agriculture, local Soil and Water Conservation Districts, and USDA-NRCS were funded to study nutrient management in production agriculture. This study, called "Partnership to Improve Nutrient Efficiency" or PINE, examined fourteen fields over a four-year period (2014-2017), providing over fifty sets of annual, field-level performance metrics related to nitrogen (N) from agricultural crops in the southern Willamette Valley. This work is summarized in a recently submitted journal article led by EPA's Jana

Left: Field trip to identify lysimeter locations (EPA's Alan Henning, Donna Schmitz and Teresa Mattson from Benton SWCD, and Ross Penhallegon from OSU extension). Middle: Field trip with the PINE team and USDA staff . Right: Field site showing precipitation sampler and lysimeter.

Compton (Compton et al., In review). Metrics included N inputs, crop outputs, N use efficiency (NUE), nitrate leaching and surplus N remaining after crop harvest. Across the study area, leaching varied widely; crop-specific average nitrate-N leaching ranged from 10 kg N/ha/yr in hazelnuts, to over 200 kg N/ha/yr in peppermint. Most of the nitrate leaching occurred during the fall. The research team used a graphical approach to explore the relationships among N surplus, crop N output, and NUE, which allowed for examination of crop differences. For example, blueberry crops had high N inputs and N surplus, peppermint crops had high N inputs, but also high crop N removal and NUE, and thus lower N surplus; and most wheat crops had high NUE and evidence of soil N mining. Annual N inputs and surplus generally were not well correlated with nitrate leaching losses, suggesting that leaching varied more with specific crop type than fertilizer rate alone in this area. Grass seed and hazelnuts, the dominant crop types in the southern Willamette Valley, were intermediate in terms of NUE, nitrate leaching, and N surplus. While the overall NUE across all fields was 57%, variation between fields was substantial, and, thus, consideration of multiple metrics (nitrate leaching, crop N harvest, NUE, and N surplus) will best inform efforts to improve groundwater quality and agricultural sustainability. A second publication analyzing the soil N testing metric (pre-fertilization and post-harvest) and how it compares with both nitrate leaching and fertilizer N surplus after crop harvest, is also forthcoming.

By Jana Compton, Renée Brooks and Julie Weitzman, EPA.

Acknowledgements: We thank the farmers in the southern Willamette Valley who worked with us to conduct this collaborative study by providing access, knowledge and data about their crops and management practices on their production farmland for four years. Several of these farmers also participated in the 1994-1997 OSU study thus reflecting their long-standing interest in understanding the connections between crop dynamics and water quality. The study was funded largely by US EPA and a grant from the Oregon Department of Agriculture's Fertilizer Fund to Benton Soil and Water Conservation District. Susanna Pearlstein, Rob Coulombe and Blake Hatteberg were instrumental in the study design, site selection, data analysis and field work. Donna Schmitz, Teresa Mattson, Dave Downing, Kevin Seifert and Holly Crosson from the Benton, Linn and Upper Willamette Soil and Water Conservation Districts provided valuable information and landowner connections during the study design phase. Current and retired Oregon State University Extension faculty Ross Penhallegon, Mark Mellbye, Neil Christensen, Jon Hart, Ed Peachey and Dan Sullivan provided connections to landowners, review of study results, information about cropping systems, soils, plant nutrition, and fertilizer practices. The views expressed in this article are those of the authors and do not necessarily represent the views or policies of the US Environmental Protection Agency.

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Compton, J.E., S.L. Pearlstein, L. Erban, A. Henning, R. Coulombe, B. Hatteberg, J.R. Brooks, J.E. Selker and A. Eldridge. In Review. Nitrate leaching and field-level N balances from cropland in the southern Willamette Valley, Oregon. ***Nutrient Cycling in Agroecosystems***

MERCURY TMDL

The Environmental Protection Agency is expected to take final action on their revised Willamette Basin Mercury TMDL before the end of the year. Following this, DEQ will begin implementation of the 2019 Willamette Basin Mercury TMDL Water Quality Management Plan (WQMP). The WQMP addresses the entire Willamette Basin, including the geographic area of the SWV GWMA.

The 2019 WQMP identifies over 170 different agencies and entities as responsible for implementing soil and erosion reduction strategies to reduce soil-adsorbed mercury from entering streams and rivers. One of the biggest changes between the 2006 Mercury TMDL WQMP and the 2019 Mercury TMDL WQMP is that irrigation and drainage districts have been named as responsible persons. Some of these districts will be required to report directly to DEQ regarding soil and erosion reduction strategies they use to manage their irrigation and/ or drainage system canals and infrastructure. Oregon Department of Agriculture will continue to be the designated management agency directly responsible for implementing water quality programs in the agricultural community.

You can access the WQMP and the list of designated management agencies and responsible persons at: https://www.oregon.gov/deq/wq/tmdls/Pages/willhgtmdlac2018.aspx

By Priscilla Woolverton, DEQ

MIDDLE WILLAMETTE LOCAL ADVISORY COMMITTEE

Every two years, the Oregon Department of Agriculture (ODA) convenes the Local Advisory Committee (LAC) and interested parties to review implementation of the Middle Willamette Agricultural Water Quality (AgWQ) Management Plan. The purpose of the Plan is to prevent and control water pollution from agriculture. The Zoom meeting on October 21 was well attended by LAC members and conservation partners alike. ODA provided suggested edits to the AgWQ Management Plan that included more information on nitrate and *E. coli* issues in drinking water, showed results of nitrate testing in wells, and listed activities being undertaken in the GWMA to address water quality goals. In addition, Benton SWCD announced that they will focus efforts in the Benton County portion of the GWMA.

The LAC will next meet in in late summer 2022 for a light biennial review. Light reviews do not include edits to Area Plans: ODA is proposing that the LACs from all three AgWQ Management Areas that include portions of the GWMA meet for a joint field trip. The Middle Willamette LAC supported this idea.

By Ellen Hammond, ODA

DOMESTIC WELL SAFETY PROGRAM

Oregon's Domestic Well Safety Program (DWSP) at the Oregon Health Authority has gone dormant until they secure further funding. The DWSP plays an important role in the SWV GWMA's ongoing efforts to educate well owners about elevated nitrate levels in groundwater. They are a resource to private well users and a hub for collecting, analyzing and acting on Domestic Well Testing Act (DWTA) data.

Fortunately, OHA's partnership with Oregon State University and the Be Well! study will provide 0.1 FTE to dedicate to DWSP. This funding will allow OHA to continue answering emails and phone calls. In the future when new resources become available, OHA hopes to resume entering, analyzing and acting upon DWTA data, updating domestic well educational materials and re-engaging in outreach and education efforts in support of their partners including realtors, private well professionals, laboratories and natural resource partners such as the SWV GWMA. In the meantime, the DWSP website (www.healthoregon.org/wells) provides an array of resources to support well users to understand well contaminants, testing, treatment, maintenance and more.

By Curtis Cude and Alyssa McClean, OHA