VOLUME 3, ISSUE 2

SOUTHERN WILLAMETTE VALLEY GROUNDWATER MANAGEMENT AREAS

MAY 2021

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GROUNDWATER MONITORING UPDATE

This summer marks a milestone in the SWV GWMA groundwater monitoring effort. —15 year of monitoring! Beginning in the summer of 2006, DEQ started a long-term nitrate monitoring program that included 26 monitoring wells and 17 domestic wells. The collaborative 15-year monitoring effort provides partners with the baseline data necessary to understand existing groundwater quality and nitrate dynamics. With the help of EPA, the program expanded to include isotopes in 2012. EPA's isotope research, described in an article on page 2, provides us with a new framework to approach groundwater nitrate.

DEQ's ongoing commitment to the SWV GWMA groundwater monitoring program remains strong. The agency's Water Quality Monitoring Strategy 2020 specifically identifies monitoring in key programmatic areas, including the state's three Groundwater Management Areas (page 41). In February our monitoring team collected the first round of quarterly well samples (12 wells). *Continued on page 4.*

FREE NITRATE SCREENINGS COMING TO LANE COUNTY

Beginning in May the Lane County OSU Extension Service will offer free well water nitrate screenings for domestic well users. In the region Linn and Benton OSU Extension Service offices already offer this service. While it is especially important for all households to do regular well water screenings, we especially encourage homes with small children, newborns, and pregnant women to test for nitrate because of a rare type of blue-baby syndrome. All homes with private wells should be aware of their nitrate level. The nitrate ion moves easily through the soil profile (especially during the rainy season) making it a contaminant of concern, but also an indicator to check for other surface based contaminants.

For a free nitrate screening, bring ½ cup of untreated well water in a clean, water-tight container to the Lane County Extension Service office. Choose a container that you are comfortable not getting back and clearly mark your contact information on it, just in case one of our trained testers is not in. The test takes about 10 minutes to complete.

Due to COVID-19, our office is open by appointment only until further notice. We continue to offer Extension programs online, and we are available via email and phone. Call us at 541-344-5859 to schedule an appointment.

Lane County Office is open Monday-Friday from 8:00 AM to 5:00 PM. Please wear a mask and physical distance when you enter the building. The office is located at 996 Jefferson Street in Eugene.

For additional information on well water and septic systems, free Rural Living Basics classes (offered remotely), and other nitrate screening opportunities visit the OSU Extension Service website wellwater.oregonstate.edu or for more information call 541-713-5009 or email Chrissy.Lucas@oregonstate.edu

- Chrissy Lucas, OSU

For more information:

wellwater.oregonstate.edu/swvgwma

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State of Oregon Department of Environmental Quality

MEET CHRISTY TANNER, OSU FIELD CROPS EXTENSION AGENT

Welcome to Christy Tanner who is the new OSU field crops extension agent for the southern Willamette Valley. Christy was hired in October 2020 and works with field crop producers in Linn, Benton, and Lane counties. During the last six months Christy has been learning about crop production in the Willamette Valley and she is developing research and extension programs to address challenges that growers are facing.

For the last two years Christy has served as the field crops extension agent for Malheur County, OR, where her extension program focused on cover cropping, forage production, and pesticide education. Prior to her time in Malheur County, she gained experience in agricultural water quality issues during her PhD at the University of California, Davis. Christy Grew up in Lebanon and is excited to be home in the Willamette Valley.

Christy can be reached at 541-730-3537 or christy.tanner@oregonstate.edu. When pandemic restrictions are lifted she will be stationed at the Linn County Extension Office at 33630 McFarland Rd in Tangent.

NEW FRAMEWORK FOR CLASSIFYING CURRENT AND LEGACY GROUNDWATER POLLUTION

ORISE Postdoctoral Fellow Julie Weitzman, along with EPA Scientists Renée Brooks and Jana Compton, recently published the peer-reviewed journal article "Coupling the dual isotopes of water (δ2H and δ18O) and nitrate (δ15N and δ18O): A new framework for classifying current and legacy groundwater pollution" in a special focus issue of Environmental Research Letters. The article's goal was to provide insights into well nitrate dynamics based on the analysis of stable isotopes of water (δH2O) and nitrate (δNO3-) from the long-term monitoring wells in the Southern Willamette Valley Groundwater Management Area (SWV-GWMA), managed by Oregon Department of Environmental Quality (ODEQ). A short synopsis of the study findings is detailed below.

Despite 15 years of mitigation efforts 57% of wells in the SWV-GWMA exhibit increasing nitrate concentrations (Piscitelli 2019). These increasing trends emphasize the urgency to link management practices to variations in groundwater nitrate concentrations. Simply tracking changes in nitrate concentrations over time has been inadequate to evaluate long-term effectiveness of management practices. Rather, the addition of isotopic tools to identify sources and transformations of N in groundwater, and to establish estimated residence times for contaminated water, was found to be an effective means for identifying mechanisms controlling observed nitrate concentrations. Understanding the factors responsible for different groundwater nitrate patterns within wells thus allows for implementation of targeted management practices that might better address contamination issues.

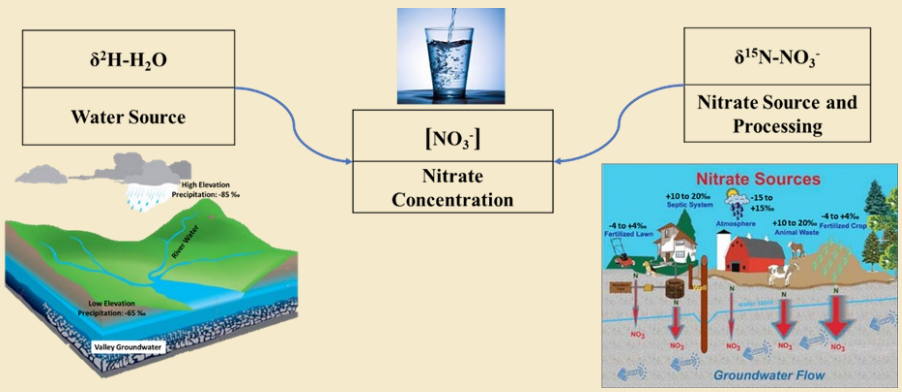


Figure 1. Isotopic tools can reveal sources of nitrate.

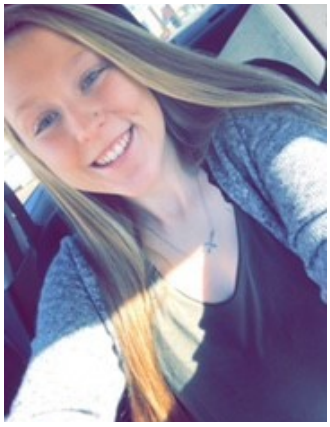
Different sources of groundwater and nutrients have distinct isotopic compositions. Specifically, δH2O values can reveal the origin of water sources to groundwater, while δNO3- values can differentiate between source inputs of nitrate in groundwater (Figure 1).

Continued on page 3.

MEET THE OSU EXTENSION SUMMER INTERNS

Alli Studnick (pictured left), is from Scio, where she lives and works her family's 400 acre cattle ranch. She is a senior at Oregon State University majoring in agricultural science with minors in crop and animal science, and has applied to (fingers crossed accepted soon) the agricultural education master's program. Alli plans on becoming an extension agent once she graduates!

Kelci Free (pictured right), is an Oregon State University junior studying agriculture sciences. She also hails from Scio, and is very excited to be working with extension this summer. Her goal is to learn more about what extension service is all about and if it would be the type of job she would be interested in.



Alli and Kelci will be working with the Groundwater Protection Program helping revamping the SWV GWMA website and doing outreach and nitrate screenings for domestic well owners in Linn, Benton, Lane, Marion, and Polk Counties from June through September. Both expressed great excitement to work within their communities and learn about groundwater issues.

The correlative relationship between δNO3- values and groundwater nitrate concentrations can also be used to ascertain N transformation processes. The variance in nitrate concentrations and values of the coupled dual isotopic indicators of δH2O and δNO3- across space and time within the wells of the SWV -GWMA revealed the complex nature of groundwater nitrate transport throughout the relatively uniform shallow aquifer. We classified well behavior into five categories, with the percentage of wells in each category, from greatest to least, as follows: 28% stable, 26% leaching, 21% dilution, 15% multi-process, and 10% mixing (Table 1). These results suggest that managing groundwater nitrate concentrations in the region will require integration of different approaches that may take into account factors like water source, residence time, and nitrogen source. Potentially successful approaches include optimizing nitrogen inputs from fertilizer and/or enhancing nitrate sinks across the landscape by conservation measures, such as incorporating perennial vegetation or cover crops.

Table 1. Categorization of nitrate trends across 39 wells of the SWV-GWMA.

Category	Number of Wells	Meaning*
Stable	11	$[NO_3^-]$ is relatively unchanging
Dilution	8	$[NO_3^-]$ are diluted by "cleaner" river water
Mixing	4	High and low $[NO_3^-]$ sources mix together
Leaching	10	Seasonal precipitation/irrigation events lead to leaching of excess $[NO_3^-]$
Denitrification	0	Necessary conditions seem to be lacking across the SWV-GWMA landscape
Multi-Process	6	$[NO_3^-]$ trends driven by multiple/interacting processes

*Note: $[NO_3^-]$ signifies nitrate concentration.

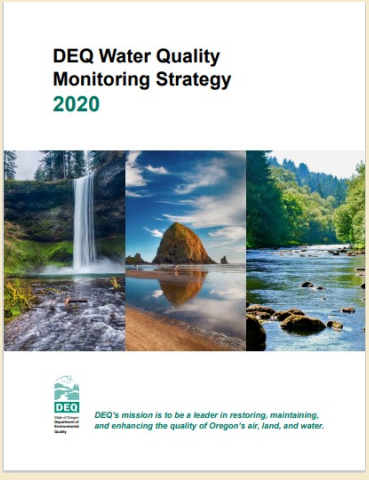
References:

Piscitelli, C.M. 2019. A trend analysis of nitrate in the Southern Willamette Valley Groundwater Management Area (GWMA). *MSc Thesis*, Oregon State University, Corvallis, OR. https://ir.library.oregonstate.edu/concern/graduate_thesis_or_dissertations/cr56n703s

Weitzman, J.N., Brooks, J.R., Mayer, P.M., Rugh, W.D., and J.E. Compton. 2021. Coupling the dual isotopes of water (δ^2H and $\delta^{18}O$) and nitrate ($\delta^{15}N$ and $\delta^{18}O$): A new framework for classifying current and legacy groundwater pollution. *Environmental Research Letters* 16(4): 045008. https://doi.org/10.1088/1748-9326/abdcef

DEQ WATER QUALITY MONITORING STRATEGY 2020

In February, DEQ completed the 2020 Water Quality Monitoring Strategy. The five -year monitoring strategy describes a comprehensive, statewide water monitoring and assessment program for providing high quality, publically accessible data, to address water quality program and statewide needs. The strategy outlines the chartered governance structure DEQ uses to propose, evaluate, prioritize and implement monitoring activities. It describes the status of existing monitoring programs and identifies internal and external strategic documents that influence the direction of DEQ's monitoring programs. The strategy emphasizes the important role that monitoring partnerships play in providing needed monitoring data. It outlines the monitoring designs, indicators, quality assurance processes and data management systems required to provide and deliver the right information. Most importantly, the document looks at Oregon's emerging water quality challenges to identify the information needed to understand Oregon's emerging water quality concerns.



GROUNDWATER MONITORING UPDATE, CONTINUED FROM PAGE 1

In June DEQ will collect samples from all 37 participating wells and 6 surface water sites. Additional monitoring is scheduled for August and November.

This summer DEQ will send each participating well owner a letter showing the last five years of nitrate levels measured in their wells. The letters will indicate whether the observed groundwater nitrate levels were above or below the maximum contaminant level (MCL) of 10 milligrams per liter (mg/L) and a fact sheet with additional information and recommendations.

- Sarah Sauter, DEQ

IS IT TIME TO PUMP YOUR SEPTIC TANK?

Take a few moments to see if your tank is getting close to the pumping window based upon the tank size and how many people live in your household. Septic tanks that are not routinely pumped can push sludge out into your drain field. When your drain field is damaged by sludge build-up you may have to replace the entire field, have excess nitrate, and bacteria that can contaminate the aquifer. There is no substitute for pumping. We do not recommend any additives to "eat or breakdown" sludge, they are ineffective and many times can harm the breakdown processes happening within the tank.

-Chrissy Lucas, OSU Extension

Estimated Septic Tank Pumping Frequencies in Years

Tank Size	Household Size (number of people)									
(Gals)	1	2	3	4	5	6	7	8	9	10
500	5.8	2.6	1.3	1.0	0.7	0.4	0.3	0.2	0.1	—
750	9.1	4.2	2.6	1.8	1.3	1.0	0.7	0.6	0.4	0.3
900	11.0	5.2	3.3	2.3	1.7	1.3	1.0	0.8	0.7	0.5
1000	12.4	5.9	3.7	2.6	2.0	1.3	1.2	1.0	0.8	0.7
1250	15.6	7.5	4.8	3.4	2.6	2.0	1.7	1.4	1.2	1.0
1500	18.9	9.1	5.9	4.2	3.3	2.6	2.1	1.8	1.5	1.3
1750	22.1	10.7	6.9	5.0	3.9	3.1	2.6	2.2	1.9	1.6
2000	25.4	12.4	8.0	5.9	4.5	3.7	3.1	2.6	2.2	2.0
2250	28.6	14.0	9.1	6.7	5.2	4.2	3.5	3.0	2.6	2.3
2500	31.9	15.6	10.2	7.5	5.9	4.8	4.0	4.0	3.0	2.6

ODA FERTILIZER PROGRAM UPDATE

The ODA fertilizer research grant project entitled "Precision Ag. In Grass Seed Production, ODA-3895-iG" has been completed. The project sites were all located in the SW GWMA and a final report entitled "Enhanced Efficiency Nitrogen Fertilizer: Potential Impacts on Crop Yield and Groundwater in Tall Fescue Fields of the Southern Willamette Groundwater Management Area, Oregon, USA." has been produced and is available for review. The project navigated several challenges including COVID 19 and the report describes the details of the challenges.

The project looked at stabilized nitrogen fertilizer compared with untreated nitrogen fertilizer in tall fescue seed production to see if any ground water quality or crop yield benefits were gained by using the stabilized product. The results were mixed and are discussed in detail in the report. ODA appreciates the collaboration of all study participants in the SW GWMA in this project.

ODA is planning on issuing the next Request for Proposals call for fertilizer research projects in early winter, 2021.

ODA appropriates $70,000/year for funding research projects.

There are currently two ongoing, multi-year projects in progress for 2021. One project is drip irrigation for onions trial located in the Lower Umatilla GWMA at the OSU Hermiston research station. The second project is nutrient uptake study in high-density hazelnut culture with the newest cultivars. The hazelnut project is being conducted at the OSU Aurora research station and north Willamette Valley growers' orchards. - *Wym Matthews, ODA*

NEXT GEN FERTILIZER CHALLENGE RECIPIENTS

The Fertilizer Institute (TFI), along with the **International Fertilizer Development Center** (IFDC), **The Nature Conservancy** and the **National Corn Growers Association** (NCGA), have announced the organizations and products selected for phase two trials in the **Next Gen Fertilizer Challenge**.

Collectively, the challenges aim to accelerate the development of innovative fertilizer product technologies and to increase the use of existing **enhanced efficiency fertilizers** (EEFS) that maintain or increase crop yields and reduce environmental impacts to air, land and water. The organizations partnered with the Environmental Protection Agency (EPA) and the U.S. Department of Agriculture (USDA) on the challenges.

The first of two Next Gen Fertilizer Challenges, **EEFs: Agronomic and Environmental Challenge**, aims to identify existing EEFs currently on or near-market that meet or exceed certain environmental and agro-economic criteria. Phase one included review and selection of product nominations by an expert judging panel. Phase two, to be initiated this spring, will include greenhouse trial evaluations of the winning products by researchers at IFDC. The products will be evaluated based on environmental, agronomic and economic performance factors.

EEFs and other new product technologies and formulations control fertilizer release or alter reactions to increase nutrient uptake by the plant and reduce nutrient losses to the environment. These technologies can be an important addition to a conservation practice system that helps reduce row crop agriculture impacts on the environment, while maintaining or increasing agricultural productivity and profitability.

The winning companies/products:

- AgroLiquid: Pro-Germinator
- CHS Agronomy: Trivar
- Corteva Agriscience: Optinyte
- EuroChem Agro: ENTEC
- Harrell's: POLYON
- Koch Company Services: CENTURO
- Koch Company Services: SUPERU
- MicroSource: Hi-Test
- Nutrien: ESN
- Pursell Agri-Tech: PurYield
- Renuvix: Renuvix CRFs
- SABIC: BCRU
- The Andersons: Struvite DG
- Timac Agro USA: Duo Maxx
- Timac Agro USA: Top-Phos
- Verdesian Life Sciences: AVAIL

The second component of the **Next Gen Fertilizer Innovation Challenge** will identify novel pre-market technologies for fertilizers that can reduce the environmental effects from modern agriculture while maintaining or increasing crop yields. Winners are expected to be announced in spring 2021.