AWRA newsletter
Washington Section
AMERICAN WATER RESOURCES ASSOCIATION

SPRING 2020

President's Notes

John Chandler, Puget Sound Energy, AWRA-WA Section President

Hello AWRA-WA members. I hope you're all safe and well. It's been a rough year thus far with the threat to public safety and economic ramifications. Please know that the AWRA-WA Board of Directors continues to serve our membership in these difficult times. You'll notice some of the changes we're making to adapt to the circumstances.

There are several in-person events delayed due to COVID-19, such as our dinner meetings, student mixer, and more. We're looking forward to continuing these networking events when doing so is safe again. The Board is switching to webinars to continue providing content to our membership in place of in-person meetings. We'll start with our annual Legislative Update on April 29th by one of our new Board members, Carrie Sessions. And to be sensitive to the financial uncertainty of this time, these webinars will be provided for **free**. See page 8 for information.

The conference committee has announced the title of this year's conference: "The Challenges of Change: How Washington is Responding to Interdisciplinary Changes to Water Resources." See page 2 for more details. No one knows how matters will unfold, but for now we're assuming that the annual conference will occur as normal on October 6th.

We're also excited for next year, when we will host the national AWRA conference! See page 9 for more information.

Next, I want to thank our corporate sponsors. They play a major role in keeping our dinner events free for students and providing fellowships. Speaking of which, we received so many excellent student proposals that we gave out three fellowships this year instead of two. Congratulations to Hisham Eldardiry (UW), Ravi Appana (WSU), and Alyssa DeMott (CWU). Please see more about them and their proposals on page 8.

I am pleased to welcome our two new Board members this year, Katherine Ryf and Carrie Sessions. Their fresh perspectives are already providing helpful insight in our Board meetings and committees. The Board also thanks our retiring member, Dave Christensen, for all of his great ideas and outstanding service to this organization.

Finally, let me express my gratitude to all of our members. You make the AWRA-WA the great organization that it is! I look forward to connecting with all of you throughout the course of the year. Please email me at john.chandler@pse.com if you have any questions or comments. Stay safe everyone.

INSIDE THIS ISSUE

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Stream Level Sponsors $500

Contact: Jessica Kuchan <kuchan@confluencelaw.com>

Thanks to our 2019-2020 Sponsors!

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2020 AWRA-WA State Conference: The Challenges of Change

How Washington is Responding to Interdisciplinary Changes to Water Resources

The Washington Section of the American Water Resources Association will host its annual water resources conference at the Mountaineers Seattle Program Center in Seattle, Washington on October 6, 2020. This year's theme, "The Challenges of Change: How Washington is Responding to Interdisciplinary Changes to Water Resources", will highlight recent and ongoing changes to water supply and water quality, and the market, technological, regulatory, and legislative responses to those changes. This year's conference will present interdisciplinary perspectives on and approaches to changes in water resources, including municipal, agricultural, environmental, and energy-related perspective. Please check our website for updates (www.waawra.org).

AWRA-WA Seattle February 2020 Dinner Meeting Recap

Featuring Brian Walsh, Policy and Planning Manager for the Washington State Department of Health

Reviewed by Felix Kristanovich, PhD, PE, Ramboll Environmental

On February 26, 2020, the AWRA Section hosted dinner meeting in lively Pyramid Alehouse restaurant in Seattle. The speaker was Brian Walsh, Policy and Planning Manager for the Washington State Department of Health.

Brian talked about Per- and polyfluoroalkyl substances (PFAS), evolution in their detection, and proposed state rule to control these substances. The PFAs constitute a family of chemicals used since the 1950s to manufacture stain-resistant, water-resistant, and non-stick products. PFAS are widely used as coatings in common consumer products such as food packaging, outdoor clothing, carpets, leather goods, ski and snowboard waxes, and more. Certain types of firefighting foam—historically used by the U.S. military, local fire departments, and airports—are especially concerning due to the potential for groundwater contamination of drinking water supplies. PFAS compounds are very persistent and have also been found in rivers, lakes, fish, and wildlife. In humans, associations have been found between PFAs exposure and increased cholesterol levels, increased serum liver enzyme levels, reduced immune response to vaccine, blood pressure problems, thyroid disease, and risk of testicular cancer. As analytical methods have improved and epidemiology studies have advanced, 139 water systems were tested for PFAs in Washington State. The results showed 3 areas with extremely high PFAs levels: Whidbey Naval Air Station, Joint Base Lewis McChord, and FairChild Airforce Base.

Contaminant	Value (PPT)
PFOA	10
PFOS	15
PFNA	14
PFHxS	70
PFBS	1,300

In 2018, Washington State Legislature passed three bills restricting use of PFAs chemicals. In 2019, a Draft Chemical Action Plan (CAP) was developed. The CAP proposes the following State Action Levels/limits shown on left. The State accepted public comments on the Draft CAP through January 2020, and Department of Health is currently finalizing Draft Rule Language and Significant Analysis. The Final CAP is expected to be issued in October 2020, with the rule being effective in January 2021.

2020 AWRA-WA BOARD

Refilling the Baker Project

John Chandler, Puget Sound Energy

How do water managers plan on refilling reservoirs? This article explains how it's done at the Baker Project, a two reservoir system in the Skagit Valley. As you'll see this basin typically receives an incredible amount of snow. Estimating the volume of water in the snowpack and when it will melt drives much hydropower Puget Sound Energy will generate during the spring and summer.

On one hand, the Baker operating license requires that Baker Lake (the upper reservoir) fills close to full by late May while the minimum instream flows at the Lower Baker dam are met for environmental purposes. Therefore Puget doesn't want to generate too much or else the lakes won't refill in time and there won't be enough water for environmental flows later in the summer. On the other hand, if Puget doesn't generate enough then the dams will be forced to spill the extra water and waste energy later on. Having an estimate of the water coming from snowmelt helps to strike a balance between these competing objectives.

Below is a photo of a snow marker around elevation 5800 feet in the basin. Typically the company plane flies with a photographer to get seven to nine of these photos each month and sends them to Puget's water management. Each of the markers has specifications of height and by counting down the boards to the snowline an estimated depth is calculated.

Photo 1 Snow Marker at Mount Blum

There are also several automated SNOTEL sites (snow telemetry) which gather lots of information in and near the basin, such as snow depth, temperature, and precipitation. From these sites an estimate of snow density is possible. The density is necessary to determine the volume of water contained within the snowpack. This is converted to a height, often called snow water equivalent or SWE.

For example, in the photo above the snow depth estimate is around 156 inches or 13 feet. From nearby SNOTEL sites, the snow density is about 41%. Therefore the SWE is about 64 inches. In some sense at that location it's like having another reservoir 64 inches deep. We just can't use it until it melts.

Of course over an area of 300 square miles and an elevation difference of 10,000 feet in this basin getting an overall volume is a crude endeavor from around a dozen points. The best estimate that Puget's water management has for the total water stored in the snowpack comes from averaging SWE heights over their respective areas. In this case, there is around 500,000 acre-feet of water in the Baker basin snowpack in March. This is about 250,000 Olympic-sized swimming pools worth of water that will be coming to the lakes over the next few months. It's around 110% of the long term average for late March. There are no concerns about refilling the Baker lakes this year.

The snow density also provides a second important insight; when the snow might melt. When fresh snow falls its density is typically quite low, perhaps 10-15%. As the snowpack warms, gets rained on, etc. the density increases. Once the density is high enough, the snow melt will start. In this basin, when the SNOTELs show a density around 50% the snow begins to melt (though this varies somewhat). By comparing snow densities to other years, and the best current forecasts for temperatures and precipitation, a crude estimate of when the snow might melt is used to create a refill plan. This plan determines how much water is available for power generation during the spring.

In a perfect world the lakes would both finish refilling as the last part of the snowpack melts. This situation ensures the maximum amount of water available for environmental flows and power production through the dry summer months. Given the significant uncertainty of forecasts, this isn't a perfect science. Plans are constantly updated with new information and modified accordingly.

The refill plans count on more than just hydrology. The Plants need to take outages from time to time for maintenance of the equipment. Hydropower is part of Puget's generation portfolio and is used to support the rest of the fleet. There are many objectives to balance.

A Climatic Review of Washington's Winter of 2019-2020

Karin Bumbaco and Nick Bond, Office of the Washington State Climatologist

In the fall of 2019, the El Niño-Southern Oscillation (ENSO) – one of the more reliable sources of seasonal predictability for the climate system – was expected to remain near-neutral and thus not a large consideration for our upcoming winter in Washington. Seasonal forecast models and forecasts from the Climate Prediction Center were calling for near-normal to above normal temperatures for winter with considerable uncertainty in precipitation. So how did the winter actually play out? Here we summarize the winter ENSO conditions, average temperature and precipitation anomalies for WA, and corresponding snowpack with the current implications for summer water supplies.

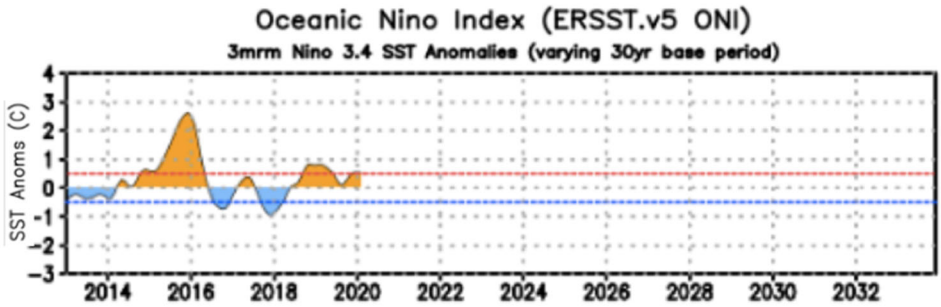

Figure 1: The 3-month Oceanic Niño Index based on the sea-surface temperatures in the Niño3.4 region of the equatorial Pacific Ocean from 2013 through 2020 (from Climate Prediction Center).

As expected, ENSO remained in a near-neutral state throughout the winter. **Figure 1** shows a 3-month running mean of the sea-surface temperature (SST) anomalies for the Niño3.4 region of the equatorial Pacific Ocean (known as the Oceanic Niño Index) from 2013 through early 2020. As shown, SSTs were on the warm side this past winter, but not enough to cross the threshold (dotted, red line) to signify El Niño. Therefore, the state of the tropical Pacific Ocean likely had very little impact on our weather.

Figure 2 shows the departure from average temperature and percent of normal precipitation across the state from October 2019 through March 2020. Averaged statewide, both temperatures and precipitation were near-normal, with temperatures only +0.3°F different from the 1981-2010 normal and precipitation at 94% of normal. For temperatures, the statewide average is a fair representation of the average winter temperatures for most of the state. The statewide average precipitation, on the other hand, masks the variability seen within WA state. As shown in **Figure 2b**, conditions east of the Cascade Mountains were significantly drier than normal during winter, with most regions receiving between 55 and 85% of normal. Specific average precipitation amounts for October through March for the counties of Benton, Okanogan, and Yakima counties totaled 59, 78 and 81% of normal,

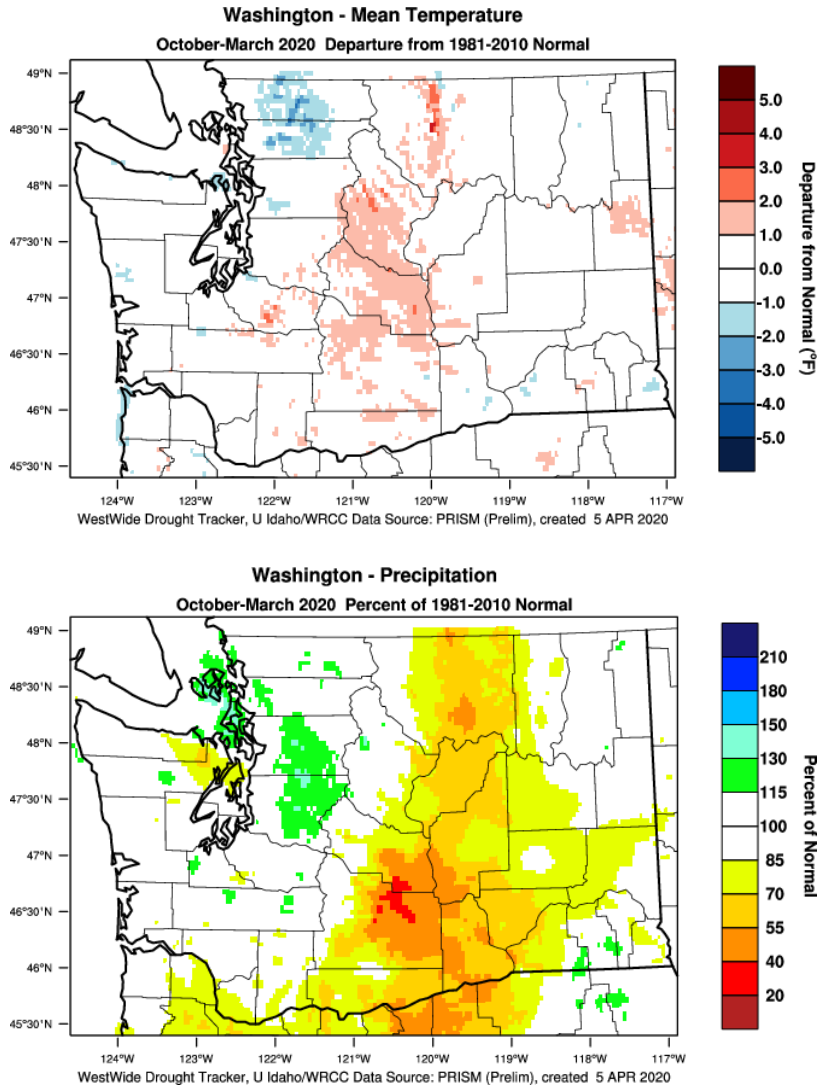

Figure 2: October 2019 through March 2020 (a) average temperature departure from the 1981-2010 normal and (b) precipitation percent of normal for WA state (from Westwide Drought Tracker).

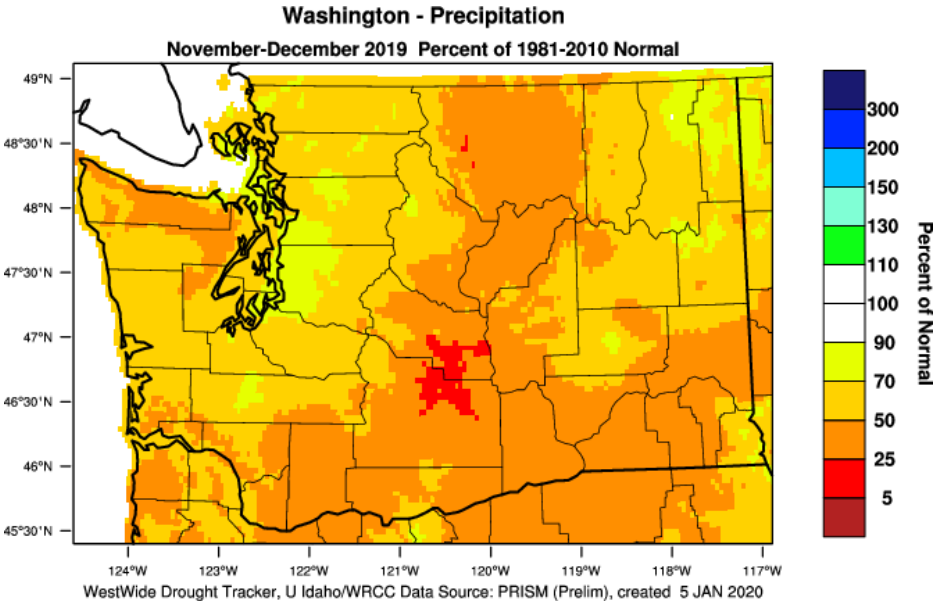

Figure 3: November-December 2019 precipitation percent of normal for WA state (from Westwide Drought Tracker).

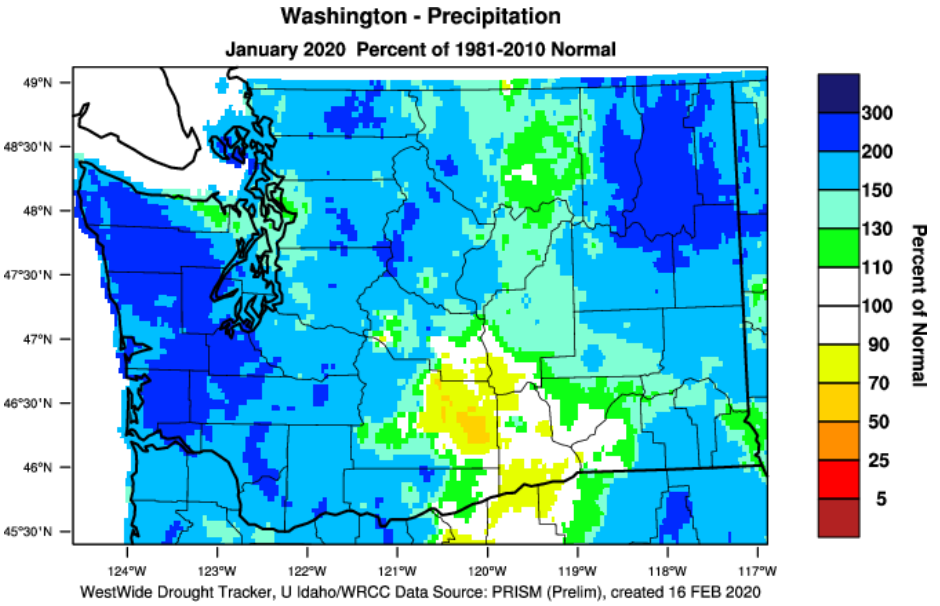

Figure 4: January 2020 precipitation percent of normal for WA state (from Westwide Drought Tracker).

respectively. Notably, the low precipitation in Benton county ranked as the 9th driest Oct-Mar on record (since 1895).

The average October through March temperatures and precipitation masks some substantial monthly variability as well. Water year 2020 began with an extremely cold October – the 2nd coldest averaged statewide since records began in 1895 – with a large number of individual stations in eastern WA reporting record low October temperatures and early season snow. November followed with unusual conditions of another type, ranking as the 5th driest November on record averaged statewide. November temperatures were near-normal, but the lack of precipitation resulted in very little accumulation of snowpack. December was also drier than normal for much of the state with the exception being parts of the Puget Sound region where heavy rains near the end of the month brought monthly precipitation totals back up to near normal. Still, November and December precipitation combined (shown in **Figure 3**) was between 25 and 70% of normal for much of the state, and by January 1, statewide snowpack was only 49% of normal.

Snowpack made an impressive comeback in January, however, as the month ranked as the 4th wettest January on record with between 130 and 300% of normal precipitation for most of the state (**Figure 4**). Overall, there was almost a 15" gain in snow water equivalent averaged statewide with statewide snowpack at 97% of normal by February 1. A unique feature of this past winter that is evident in Figure 4 is the slightly below normal precipitation in the Lower Columbia Basin for January. This rain shadow was even more widespread in February and was due to westerly and northwesterly flow anomalies that left the eastern side of the Cascades with precipitation deficits, while most areas of western WA and southeastern WA received above normal precipitation. March was dry statewide, on the other hand, but below normal temperatures helped to preserve the snowpack.

By April 1, statewide average snowpack was at a comfortable 109% of normal; **Figure 5** shows the snowpack averages by basin. Despite the healthy snowpack, at the time of this writing (mid-April), April has been considerably drier than normal, at least thus far. The streamflow forecasts from the National Weather Service Northwest River Forecast Center are reflecting this recent dryness and the dry conditions expected in the next 10 days, which has reduced some of the April through September streamflow forecasts compared to projections from just a few weeks ago. **Figure 6** shows the Apr-Sept streamflow natural forecast as of April 12, 2020, indicating some lower than normal flows in SW WA and on the Olympic Peninsula. Southeastern WA also has an area of below normal flows, with the South Fork of the Palouse at Pullman a low spot with only 33% of normal Apr-Sept streamflow expected. Other parts of the state are looking better, and it should be noted that

the early April Yakima Bureau of Reclamation forecast was for junior water users to received 96% of their normal water allotment. Spring conditions will impact this, however, and updates to these forecasts in the May and June will provide more definitive information on water availability and summer streamflows.

In summary, our wet season had near-normal temperatures with quite variable precipitation amounts depending on location. So, the early fall seasonal forecasts can be considered accurate, though they did not (and certainly could not) imply the monthly variations in both temperature and precipitation. The Climate Prediction Center has a higher likelihood of warmer and drier than normal conditions for both spring and summer so while there aren't many water supply issues in WA at present, conditions need to continue to be monitored as we enter our drier part of the year.

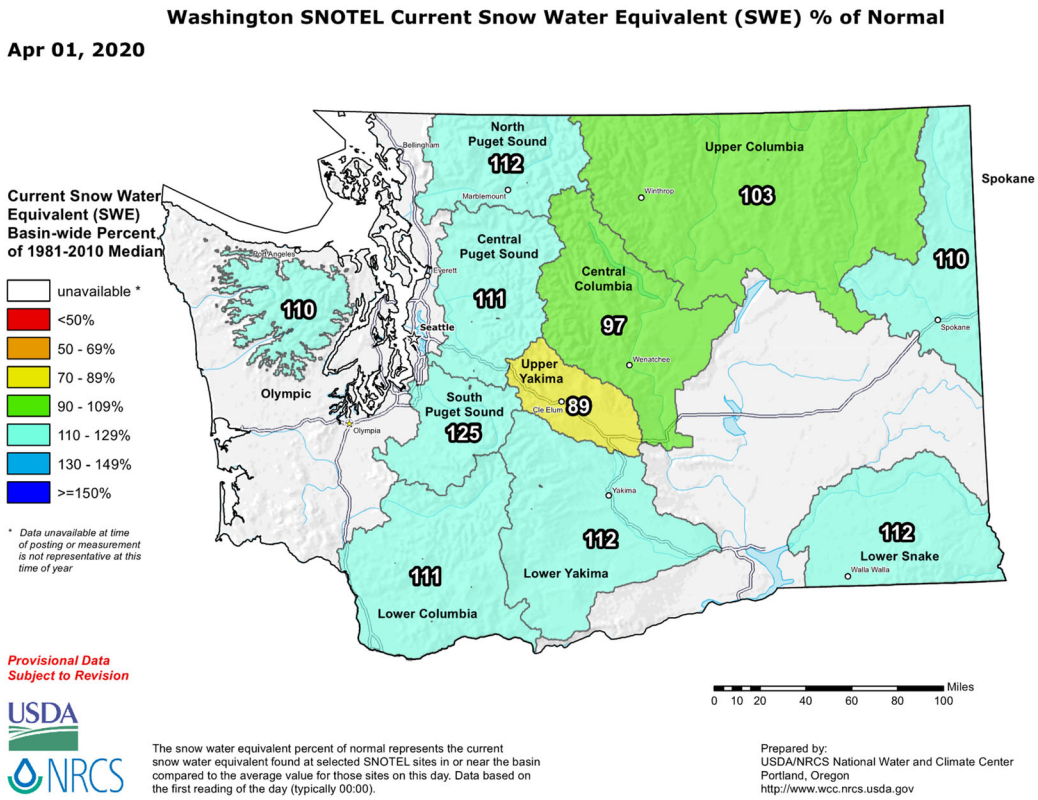

Figure 5: Basin-average snow water equivalent (SWE) on April 1, 2020 for WA (from NRCS).

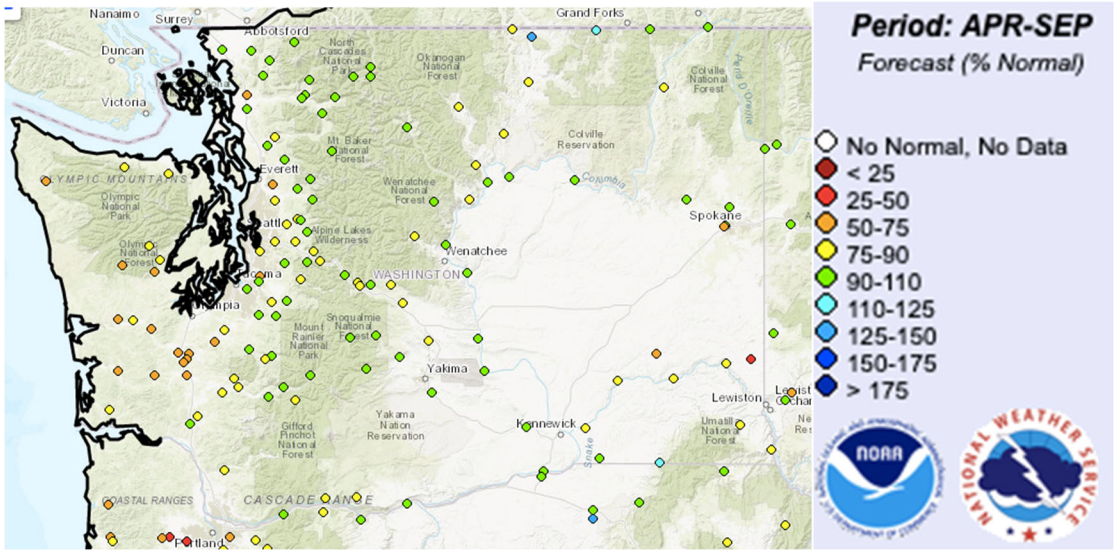

Figure 6: April through September 2020 natural water supply forecast in percentage of normal for WA as of April 12, 2020 from the NWS Northwest River Forecast Center. Forecasts are updated daily.

Using Geochemistry to Assess Potential Groundwater Storage Locations in the Yakima River Basin

Silas Sleeper, Central Washington University Graduate Student and AWRA-WA Chapter President

Currently in the Yakima River Basin more people possess surface water rights than there is available surface water. As a result, the local community devised the Yakima Integrated Plan, with the goal of creating a sustainable source of water for the foreseeable future. One of seven elements outlined in this plan is groundwater storage. Groundwater storage is beneficial when compared to surface water storage (i.e. dams and reservoirs) because it's more cost effective (Eaton et al, 2009), less environmentally destructive, requires less land area and limits water-loss via evaporation. The idea is to take available water during high spring flows and store it in the subsurface via infiltration. The stored water will then be used to increase stream flows and decrease stream water temperatures during the summer months.

A main challenge associated with groundwater storage is determining the fate of the recharged water. In this project we analyzed major ions and stable isotope ratios ($^{18}O/^{16}O$ and D/H) of surface waters and groundwaters within three valleys (Roslyn, Kittitas Valley and Moxee Valley) to determine water-rock interactions, recharge regimes and groundwater surface-water interactions (Yaun et al 2011; Criss and Davisson 1996). After collecting a total of 99 groundwater samples and 17 surface water samples we found that irrigation water generally had heavier isotopic values and higher nitrogen levels when compared to naturally recharged groundwater. This allowed us to identify which aquifers were dominantly recharged by irrigation water versus aquifers that are recharged naturally (typically by snowmelt). Using this information, combined with known hydrogeologic units and structures (Vaccaro et al., 2009) we created conceptual models of groundwater relationships at each site (Figure 1). These conceptual models provide subsurface information that was previously unknown and can be used to inform future management decisions regarding groundwater storage in the Yakima Basin.

Acknowledgements

I would like to thank the Yakima Basin Integrated Plan Groundwater Sub-Committee, the WA-AWRA, and Puget Sound Energy for the funding that allowed me to complete this research. I would also like to acknowledge that none of my work would have been possible without my adviser Dr. Carey Gazis or the Central Washington University lab tech, Cindy White. Thank you to my wife, Jenny Sleeper for accompanying me in the field. And a big thank you to the people of the Yakima River Basin for allowing me to sample from their wells. None of my work would have been possible if not for the kindness of these strangers.

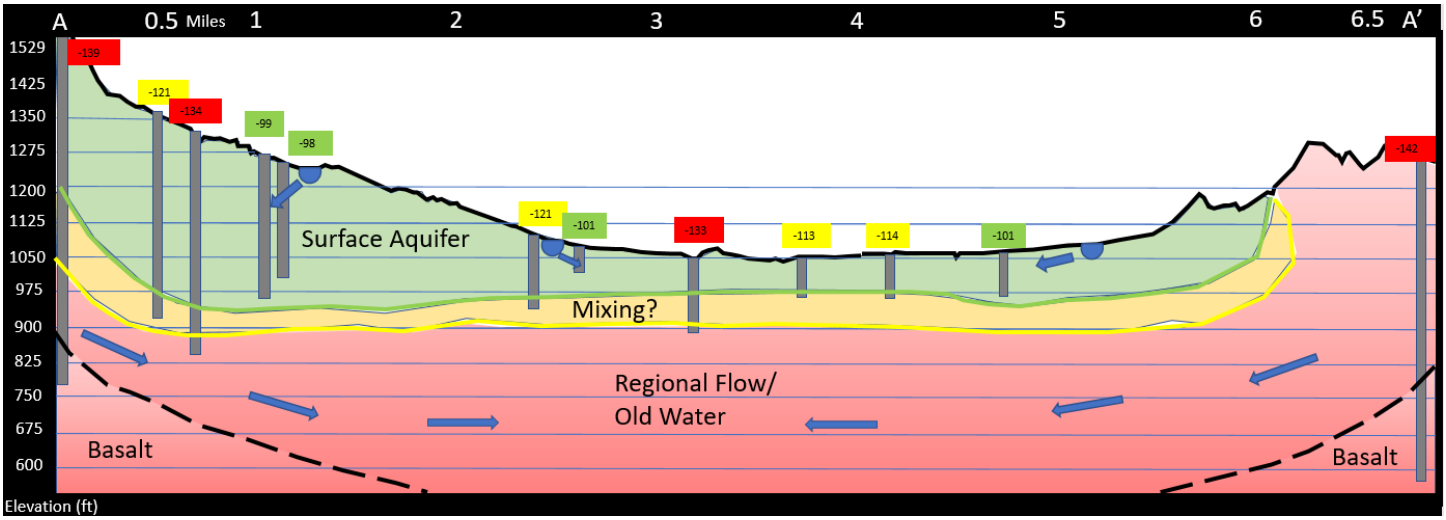

Figure 1. A North-South cross-section of Moxee Valley demonstrating groundwater relationships. The numbers on top of the wells represent stable isotope values for hydrogen. Green values are water bodies dominated by irrigation water while red values are likely dominated by old/deep/natural groundwater. Yellow values may be younger groundwater or a mix between the irrigation water and the deep groundwater. Blue half-circles represent major irrigation canals.

AWRA-WA Virtual Dinner Meeting: 2020 Legislative Update: Wednesday, April 29th, 2020

Featuring Speaker Carrie Sessions, Washington Department of Ecology

Abstract: There was some expectation that the 2020 legislative session was going to be quiet on water resource issues – boy were we wrong! The legislature debated several bills about water transfers and water banking. They also considered bills on instream flows, drought, and bottled water. Carrie will discuss the water resource-related bills that were introduced, describe the debates that ensued, and review the bills that passed.

Fees: Free for EVERYONE!!!

VIRTUAL MEETING!!! **You must register by Monday, April 27th at waawra.org.** Once registered, we'll send you a link to participate via our webinar service. Thank you to Green Economics for sponsoring the technology of this event!

2019-2020 Student Fellowship Awards Announced

By Stan Miller, Awards Committee Chair

The AWRA-WA Board has finalized the selection of the 2019-2020 Student Fellowship Award winners from a slate of ten applicants. This year the Rod Sakrison Memorial Award, presented to a member of an AWRA Student Chapter, goes to **Alyssa DeMott**. Alyssa is a student at Central Washington University and her thesis topic is "Long-term geomorphic effects of the Glines Canyon Dam removal on the Elwha River, WA, USA"

We were so impressed with the quality of the applications that we awarded two additional fellowships: one to **Hisham A. Eldardiry** from the University of Washington (UW) and the other to **Ravi Appana** from Washington State University (WSH). Hisham's thesis is titled "Adaptive Reservoir Operation in the Transboundary Nile River basin." Ravi's thesis is titled "Improving the Representation of Groundwater Dynamics in Regional Hydrologic Models." Students enrolled in a graduate program in water resources at a Washington College or University are eligible the fellowship. The closing date for applications for the 2020-2021 academic year will be in **February 2021**. Generally two Fellowship Awards of $2,500 each are offered. One, the Rod Sakrison Memorial Fellowship Award will be to a member of an AWRA Student Chapter at a Washington school. In 2007 the Section dedicated this award to the memory of Rod Sakrison in recognition of his effort to increase student involvement in AWRA. Rod was a two-time board president and was instrumental in establishing the UW AWRA Student Chapter. The other award will go to a student enrolled in a graduate program at a college or university in Washington State. In addition to $2,500, each award includes a 1-year membership in both State and National AWRA, a 1-year subscription to the *Journal of the American Water Resources Association,* and admission to the State Section Annual Conference.

Call for Nominations: Outstanding Contribution to Water Resources

This award is for outstanding contribution to the water resources profession in the State of Washington. We plan to honor an individual at the State Conference Award Luncheon. Current Chapter members are encouraged to send in a nomination for themselves or another candidate containing an explanation of how the candidate specifically meets the below criteria. An individual need not satisfy all of the criteria, and other appropriate factors brought up WILL be considered.

- Outstanding contribution or achievement in the water resources field (broadly defined) within the State of Washington.
- Leadership, so that others are enabled, inspired or organized to advance the understanding, management or wise use of water resources.
- Interdisciplinary or bridge-building qualities.
- Degree of innovation.

Any person may be nominated for this award, but only current State Chapter members may submit a nomination. The nomination must be received by **July 15, 2020**. The winner will be awarded a handsome plaque commemorating the honor. In addition, the Board will make a donation to a water-related, nonprofit organization of the individual's choosing. You may submit your nomination to:

- Stan Miller, Awards Committee, samillerh2o@comcast.net

There are lots of people out there working hard to protect and enhance Washington's water resources. This is your chance to bring some much-deserved recognition to one of them.

THE AWRA NATIONAL CONFERENCE IS COMING TO WASHINGTON IN 2021!!!

We are excited to announce that AWRA-WA has been selected to host the AWRA Annual Water Resources Conference in 2021. The date and venue have not been finalized yet, but the event is anticipated in early-November of next year in Seattle or vicinity.

WE NEED THE SUPPORT OF OUR MEMBERSHIP TO MAKE THIS A SUCCESS!

The best way to help is by leading or joining the various Committees. Below is a list of the Committees, along with their status.

If you have any questions or would like to be a part of this planning effort, please reach out to the Conference Planning Committee Chairs **by May 6, 2020**:

Rabia Ahmed (rahmed@greeneeconomics.com)

Felix Kristanovich (fkristanovich@ramboll.com)

Committees	Chair	Members
Technical Program Committee	Open	Open
Finance Committee	Filled	Open
Technical Field Trips Committee	Filled	Open
Exhibits Committee	Filled	Open
Student Activities Committee	Open	Open

What this State Section is All About!

The Washington State Chapter of the AWRA fosters educational and professional development. **Student support** is provided in the form of two annual student fellowships, sponsorship of two student chapters (University of Washington and Central Washington University), underwriting of a special meeting in the late spring hosted by the student chapter, and other subsidies. **Interorganizational support** is fostered with local, interstate, national, and international organizations. A **newsletter** is published several times per year containing in-depth analysis and editorials on current issues. Several **dinner meetings** are held throughout the year providing good food and good company followed by a presentation by featured guests. **Brownbags** are organized on special issues as they arise. The annual climax is the **Annual Section Fall Conference;** the next one will be held this Fall, 2020**.** The Conference is the principal funding vehicle for many Section activities, including providing financial support to the Section's Student Fellowship program. A **dedicated board** meets regularly to plan, organize and facilitate events. If you wish to learn more about your Section and/or wish to participate more in Section activities, you will be warmly welcomed. Please contact any of the board members listed on Page 2.

American Water Resources Association, Washington Section
P.O. Box 2102
Seattle, WA 98111-2102

(Change service requested.)

Special Thanks to Washington Water Trust and Associated Earth Sciences, Inc. for word processing support on this newsletter.

2020 Membership / Change of Address Form

(↖ please circle, as appropriate ↗)

Annual membership in the state chapter costs $35.

Name_____Position_____ Affiliation_____

Street Address_____City _____State _____Zip_____

Phone (_____)_____Fax (_____)_____E-mail_____@_____

❑ Please check this box to indicate if you prefer to receive your newsletter electronically.

NEW MEMBERSHIP OPTION – ADD SUPPORT FOR THE WA-AWRA STUDENT FELLOWSHIP FUND

_____2020 Membership Dues: $35.00 ($5 automatically donated to the WA-AWRA Student Fellowship Fund!)

_____ I am including an additional Donation of $_____ to support the WA-AWRA Student Fellowship Fund

Preferred Method: Pay via Paypal on our website: www.waawra.org

For Checks: please make payable to AWRA Washington Section.

Mail to: American Water Resources Association Washington Section

P.O. Box 2102 Seattle, WA 98111-2102

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