AWRA newsletter
Washington Section
AMERICAN WATER RESOURCES ASSOCIATION

Fall 2021

PRESIDENT'S NOTES

Tom Fitzhugh
Stantec Consulting
AWRA-WA Section President

Hello AWRA-WA members, I hope you are all having a great summer. I am happy to report that AWRA-WA has continued to be very busy, holding a variety of virtual events through the spring and summer of this year, and we have more planned for the fall. I'd like to highlight those events and also discuss our plans for the future. But first, I want to thank our corporate sponsors, whose financial contributions have helped keep all our events free or low-cost again this year, and our dedicated Board, who have continued to put together high-quality events and make other contributions such as the newsletter you are reading now.

We held four lunch and dinner meetings during March, May, and June of this year, all of which were held virtually. Additional details on all these events are available in this newsletter. On March 25th, Alex Shannon of WSP Engineering presented a very timely discussion of capital and financial planning for water utilities in the face of economic uncertainty, specifically focusing on the economic effects of Covid-19. On May 13th, Alyssa DeMott of Central Washington University presented on her research on the long-term geomorphic effects of the removal of the Glines Canyon Dam on the Elwha River. Given the potential for removal of dams elsewhere in the Pacific Northwest (e.g. on the Klamath River), this is very important research.

On May 25th, Tristan Weiss and Emelie McKain of Washington Department of Fish and Wildlife discussed ongoing challenges in ecosystem restoration and adaptation planning, with examples of how programmatic watershed recovery creates opportunities for innovative cross-programmatic collaborations, and case studies of new research bridging the gap between recovery priorities. Finally, on June 21st, Robin McPherson and Dave Christensen of the Washington Department of Ecology provided an update on water resources-related legislation in 2021. We greatly appreciate the staff at the Ecology who provide us with this update on an annual basis every June.

Newsletter Contents

I want to remind everyone that registration is now open for our 2021 State conference, which will be held on October 6th and 7th, as a virtual event.

The conference title is Transboundary Water Management and Water Market Trends. We are excited to be able to present a variety of speakers from throughout Washington State and beyond. Bob Sanford of the United Nations University Institute for Water, Environment and Health will be the keynote speaker. The conference will also include presentations by past Washington State Section Fellowship winners, networking opportunities, and a water-related trivia contest! See pages 3-4 for more information about the conference.

We recently sent out a survey to our membership which solicited input on interest in volunteer opportunities with AWRA-WA, nominations for new Board members and award recipients, and priorities for future spending by the Washington section. We appreciate all the responses, and we are working on incorporating all the information received into this year's activities and into our long-term planning.

Finally, I want to highlight the beginnings of our work on putting together the AWRA National Conference, which will be held in Seattle in Fall 2022. A venue has been selected and the committees who will organize the conference are now fully staffed. Thanks to all of you who have volunteered, and we will be passing on more information on this event in the future.

If you have any questions or comments for the Board please contact me at thomas.fitzhugh@stantec.com. I look forward to seeing everyone at our events through the rest of the year.

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On October 6 and 7, 2021 the Washington Section of the American Water Resources Association will host a virtual conference on: "Transboundary Water Resources Management and Water Marketing Trends." This year's Keynote address will be presented by Robert W. Sandford, the Chair in Water and Climate Security at the United Nations University Institute for Water, Environment and Health. Mr. Sandford is the co-author of the United Nations *Water in the World We Want* report on post-2015 global sustainable development goals relating to water. He is also lead author of *Canada in the Global World*, a new United Nations expert report examining the capacity of Canada's water sector to meet and help others meet the United Nations 2030 *Transforming Our World* water-related Sustainable Development Goals. Mr. Sandford is also the author, co-author or editor of over 30 books on topics including the history of water resources of the Canadian Mountain West.

Sessions for day one of this two day event will highlight interagency management in the Spokane, Palouse, and Walla Walla River Basins. The Spokane and Walla Walla basin sessions will address ways of maintaining river flows under water stress situations. The Palouse Basin session focuses on the declining water levels in the aquifer serving the communities of Moscow, Idaho and Pullman, Washington.

Sessions for day two will include interstate and international considerations for the management of the Columbia River, including elements of the current negotiations of the Columbia River Treaty, U.S. Tribal and Canadian First Nations efforts to reintroduce salmon above Grand Coulee Dam, and the proposed temperature Total Maximum Daily Load for the Columbia River. Day 2 will also cover recent proposals for managing interstate and international concerns regarding the lower Snake River dams and trends in water marketing.

A unique feature this year will be two presentations by former Washington Section Fellowship winners.

The early bird registration fee for this event is $35 and is available through September 15, 2021; after September 15th, the cost of registration is $50. And remember, your paid conference registration also earns you a membership to AWRA-WA for the rest of 2021 and all of 2022 (a $35 value)! To register, go to https://www.waawra.org/

Register Now at: www.waawra.org

2021 AWRA WA Statewide Conference: Speaker Schedule

Date	Session	Presenter	Affiliation	Presentation Title
6-Oct	Keynote	Bob Sandford	United Nations University	
	Spokane Basin	Guy Gregory	Gregory Geologic	*Transboundary effects of water use in the Spokane-Coeur d'Alene region: The Case for Conservation*
		Terry Pickel	Idaho-Washington Aquifer Collaborative	
		Kara Odegard	City of Spokane	
		BiJay Adams	Liberty Lake Water and Sewer District	*Landscape Irrigation Efficiency*
	Palouse Basin	Korey Woodley	Palouse Basin Aquifer Committee	
		Robin Nimmer	Alta Science and Engineering	*Palouse Basin Water Supply Alternatives Investigation within Transboundary Water Management*
	Nile River	Hisham Eldardiry	University of Washington	*Adaptive Reservoir Operation in the Transboundary Nile River Basin: Towards Win-Win Solutions*
	Walla Walla Basin	Chris Kowitz	Oregon Water Resources Department	
		Melissa Downes	Washington Department of Ecology	
		Chris Marks	Confederated Tribes of the Umatilla	
7-Oct	Columbia River	Kelly Ferron	Washington Department of Ecology	*Addressing Temperature in the Columbia and Snake Rivers: Washington's Implementation Plan*
		Andy Dunau	Lake Roosevelt Forum	*Lake Roosevelt: Battery for the Columbia River Basin*
	Water Trends	Harry Seely	WestWater Research	*Summary of Water Market Activity and Evolution in the Western U.S.*
		Kristina Ribellia	Western Water Market	*The Washington water market: Emerging trends, drivers and pricing*
		Eric Weber	Landau Associates	*Making Water Markets Work – Facilitating Transfers in the Columbia Basin*
	Snake River	Rick Agnew	VanNess Feldman	
	Elwha River	Alyssa Demont	Central Washington University	*Long-term geomorphic effects of the Glines Canyon Dam removal on the Elwha River, WA, USA*
	Little Spokane	Mike Hermanson	Spokane County	*Meeting changing rural water supply needs in WRIA 55 with the Little Spokane Water Bank*

May 13, 2021 Dinner Meeting – Alyssa DeMott, CWU Graduate Student Long-term Geomorphic Effects of the Glines Canyon Dam Removal on the Elwha River, WA, USA

By Stephen Thomas, AWRA Board Member

On May 13th, we were pleased to have Alyssa DeMott, a current grad student at CWU, present an overview of her Master's thesis to our member virtual webinar. Alyssa was a recipient of one of the Chapter's student fellowship award for 2019. Her research has focused on quantifying the short-term geomorphic effects on the Elwha River from removal of the Glines Canyon Dam between July 2011 and August 2014 as part of the restoration of the river's ecosystem. As a result of the removal, the river washed out roads and two campgrounds. Her specific focus was on four parameters - in-channel large wood; main channel sinuosity; channel braiding; and sedimentation. Provide template for other dam removals?

In the 1900s, the Elwha and Glines Dams were constructed to support regional economic growth. Glines Canyon Dam was constructed in a tight ravine and towered 210-foot tall and spanned 150-foot wide between the rocky canyon walls. The dam created the Lake Mills reservoir while providing hydroelectric power. The Elwha River once provided vital habitat for a variety of salmonid species, with more than 400,000 adult salmon returning upstream to spawn each year. These historical runs were culturally and economically significant to many Native American groups, specifically the Elwha Klallam Tribe, who relied on the fish for sustenance. The dam also cut off sediment and wood influx, and reduced habitat by as much as 90 percent. In 1992, US Congress passed the *Elwha River Ecosystem and Fisheries Restoration Act* to restore the ecosystem by incrementally removing the dam. In 1995, an Environmental Impact Statement identified the removal of the dams as a preferred alternative to restore native fish runs and the entire river system. In 2000, the U.S. Department of the Interior purchased the dams for $29.5 million.

Alyssa defined three primary hypotheses in her study. First, that the dam removal would result in an initial increase in log jam area and the number of and sinuosity of channels, but that this rate would decrease over time. Second, the removal would promote sediment bar formation and sediment size increase after 2014. Finally, that the rate of channel change would decrease in the 6 years since dam removal.

She tested these hypotheses using a combination of detailed ArcMap technology data, high-resolution aerial photography from 2012-2020, and fieldwork mapping to examine and document sediment size (using the pebble count approach) at five survey sites. She presented some highly informative hydrographs illustrating her data along with river discharge to develop relationships between the key parameters, and to identify the important processes and trends. She concluded that the dam removal caused:

- Logjams to form and accumulate individual logs, thereby increasing logjam areas as she expected
- Initially, significantly increase sinuosity but later decreasing. This was no expected.
- Braiding to stabilize at a value that is slightly higher than before the removal, also not as she expected.
- Sediment size to become more mixed compared to before and during dam removal – as expected

She concluded that for large, staged dam removals, a new equilibrium may take longer than expected to occur. But once un-dammed, rivers can restore to natural, but more complex states.

Alyssa gave a highly professional presentation which was attended by more than 60 chapter members. We thank her for volunteering her time, congratulate her on graduating, and wish her well in her career and future endeavors!

Read more at: **https://www.americanrivers.org/elwha-and-glines-canyon-dams/**

Adaptive Reservoir Operation in the Transboundary Nile River Basin

By Hisham Eldardiry. Postdoctoral Research Associate at Pacific Northwest National Laboratory, WA

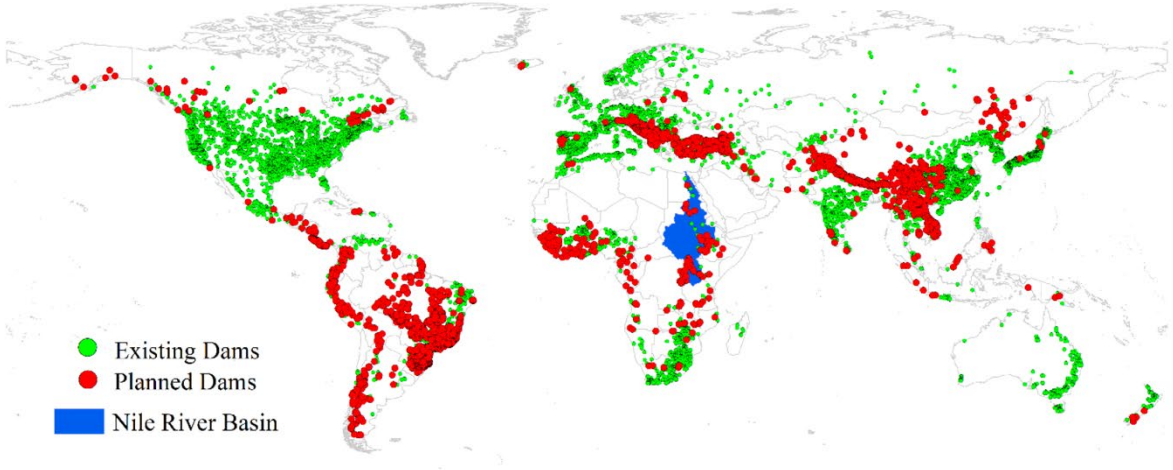
Department of Civil and Environmental Engineering, University of Washington, Seattle

Hisham is a postdoctoral research associate at the Pacific Northwest National Laboratory (PNNL). Hisham's research is geared towards finding sustainable solutions to the challenges facing the security of energy and water systems in transboundary basins. Hisham's PhD research has recently been recognized in different news media including BBC Science in Action program and ArabNews deep dive article.

The Nile River Basin (NRB) is home to more than 200 million people sharing the water resources for agriculture, industry, municipal uses, in-stream navigation, and hydropower generation. A central and existential water management issue for the region is maintaining a sustainable supply of water against increasing population, recurring drought, and climate change. Recent published datasets on future dams reveal an increasingly impounded NRB for hydropower development by upstream and transboundary nations, notably Ethiopia. The most downstream country, Egypt, therefore needs to adapt the operation of High Aswan Dam (HAD), which is key to the country's water security, to planned dams, such as the Grand Ethiopian Renaissance Dam (GERD).

The Nile River at Rosetta port, Egypt
Photo: Hisham Eldardiry on May 24th, 2021

The overarching goal of Hisham' PhD dissertation is to derive an adaptive reservoir operating policy under the combined impacts from climate variability, population pressures and planned dams. First, a modeling framework was developed to simulate streamflow and understand reservoir operations in the NRB using satellite earth observations and macroscale hydrologic modeling. The satellite-based framework yielded a reasonable skill in deriving monthly HAD releases in good agreement with measured discharge downstream of the dam. Building upon this satellite-based modeling, the second study evaluated the hydrological potential of the Upper Blue Nile (UBN) basin for meeting the declared hydropower production design from the GERD (5150 MW). The results indicated the hydrology of the UBN limited the hydropower potential of GERD and thus the initial plans to upgrade the GERD capacity (from 5250MW to 6000MW to 6450 MW) have not been beneficial to improving the dam's hydropower production.



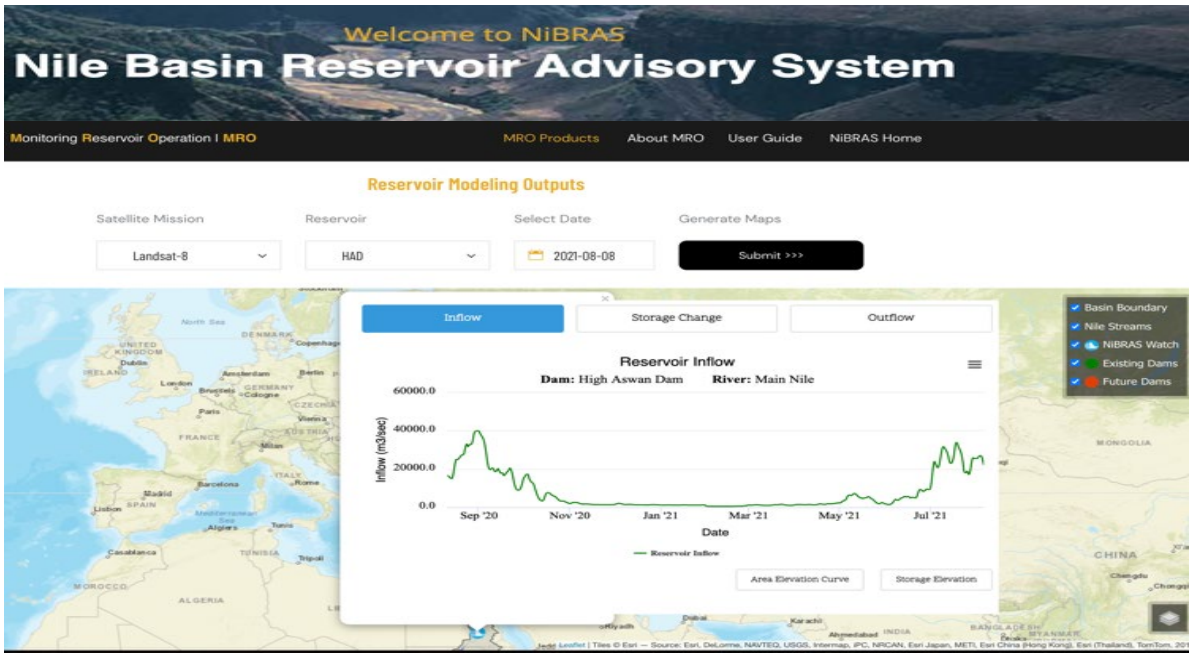
Global map of existing and planned dams

The third study in Hisham's dissertation presented a blueprint for adapting HAD operation under the impacts of filling/operation of the GERD based on a Water Supply Stress Index (WaSSI). To adapt to a faster

GERD filling scenario (e.g., 3-year filling), HAD needs to modify its operation in summer months by elevating the downstream stress level (store more and release less), e.g., WaSSIAG=0.70. Such adaptation can also help HAD recover its normal operating level in four years after GERD is completely filled compared to 7 years with no adaptation scenario. Additionally, maintaining HAD storage at higher levels prior to GERD filling can significantly reduce the HAD recovery period to only 2 years. In a fourth study, Hisham introduced a Forecast-based Adaptive Reservoir Operation (FARO) approach to explore how HAD can improve its operation by using long-term streamflow forecasts. The FARO results showed that the forecast horizon for HAD operation, using perfect forecasts, ranges between 5- and 12-month lead time in low and high demand scenarios, respectively, beyond which the forecast information no longer improves the release decision. The forecast value to HAD operation is more pronounced in the months following the flooding season (October through December).

To advance societal impacts by converting the results from the scientific research into a sound decision support system, Hisham has operationalized the dissertation results operationalized through a web portal system (namely, **N**ile **B**asin **R**eservoir **A**dvisory **S**ystem or **NiBRAS;** can be accessed at www.hishameldardiry.com/nibras). The system is currently in the development stage to integrate complex back-end models with front end user needs. NiBRAS benefits from the growth of open-source and non-proprietary tools, e.g., Google Earth Engine API, which made it possible to build a costeffective real-time operational system. The system functionality will include different tools to facilitate the understanding of the water management issues associated with reservoir operation in the NRB and provide a basis for evaluating potential solutions.

The work presented in Hisham's dissertation provides a tangible way forward for existing dams to adapt their operations to realworld transboundary challenges while inspiring a win-win deal and considering the equitable rights of development in the Nile countries. Hisham's PhD research has recently been recognized in different news media outlets including BBC Science in Action program and ArabNews deep dive article.



NiBRAS system (www.hishameldardiry.com/nibras) showing current monitoring of High Aswan Dam.

Acknowledgement
This work was supported by NASA Applied Science Program grant in Water Resources (awarded to Hisham's advisor, Dr. Faisal Hossain). I would like to gratefully acknowledge the fellowships I received from AWRA- Washington State Section and Ronald and Mary Nece Endowed Fellowship from the University of Washington, Civil and Environmental Engineering department. I would also like to express my deep and sincere gratitude to my supervisor, Dr. Faisal Hossain, for his continued support, encouragement, and his inspiring guidance throughout the period of my study.

Quantifying Groundwater Dynamics in High Mountain Asia by Integrating In-Situ Groundwater Levels with Remotely Sensed Data and Numerical Models

Ravi Appani, Washington State University Graduate Student and 2020 AWRA-WA Fellowship Recipient

Residents in a parched Delhi slum mobbed a water tanker during the early days of the COVID-19 pandemic (April 17, Source: BBC News). These form day-to-day experiences for many living in this part of the world.

Groundwater is the most widely used freshwater resource globally. Quantifying changes in groundwater is essential for its sustainable use, especially in a changing climate, and has significant implications for the food, water, and energy security of a region. Therefore, measuring this hidden resource is necessary but challenging over large regions as groundwater basins span do not follow political boundaries. Growing up in India, I have experience with water scarcity and the influence it has on one's way of life (see picture below). This experience has primarily shaped my belief that sustainable use of water resources is vital for developing and strengthening communities. I am a practicing hydrogeologist and currently working to improve methods/ tolls that adequately capture regional groundwater dynamics. In this endeavor, I am collaborating on an interdisciplinary project with engineers and hydrologists at NASA, water resource scientists at Washington State University (WSU), and groundwater modelers in the industry.

Climate change is rapidly altering the hydrologic cycle of High Mountain Asia (HMA), a region with the world's largest reservoir of glaciers and snow outside of the Earth's polar ice sheets. These changes are subsequently affecting the groundwater dynamics and water resource availability for the millions of people living in the Asian sub-continent. Accurately modeling groundwater dynamics can help in improving regional water budget estimates for the effective management of water resources.

Recent innovations in satellite technologies, i.e., GRACE (Gravity Recovery and Climate Experiment), have provided unprecedented data to map terrestrial water storage through temporal observations of the changes in the earth's gravitational field. Today, such data are used increasingly with hydrological and land surface models to simulate changes in water storage over large regions of the earth. However, these model estimates are preliminary, and often inaccurate concerning groundwater stores, as they represent the groundwater dynamics in a simplified way. My current research involves developing a novel method to estimate subsurface aquifer parameters by comparing trends in in-situ groundwater storage changes calculated using groundwater levels measured in more than 18,500 wells with trends from the GRACE mission. These parameter estimates are the first step in improving the representation of groundwater in hydrological and land surface models. Future work will involve the advancement of the modeling tools to incorporate more complex groundwater schemes. Such innovations in data use and improvements in modeling tools will significantly help in better predictions of regional water resources in an uncertain climate future.

THE AWRA NATIONAL CONFERENCE IS COMING TO WASHINGTON IN 2022!!!

We are excited to announce that AWRA-WA will be hosting the AWRA Annual Water Resources Conference in 2022. 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.

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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

Rabia Ahmed (rahmed@greeneeconomics.com)

Felix Kristanovich (felixk@windwardenv.com)

(Note that if you have already communicated your interest to the Conference Planning Committee Chairs in response to the announcement made in March of 2020, please contact us again to confirm if you are still interested and the Committee you would like to be part of.)

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

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