2022

OSOYOOS LAKE WATER SCIENCE FORUM

NK'MIP (OSOYOOS LAKE)

THE HEART OF THE WATERSHED

BRIDGING INDIGENOUS AND WESTERN APPROACHES TO KNOWLEDGE, SCIENCE AND MANAGEMENT

HOSTED IN SW' IW'S (OSOYOOS) B.C.

OCTOBER 27 – 29, 2022

PRESENTED BY

Osoyoos Indian Band

syilx Okanagan Nation Alliance

International Joint Commission • Commission mixte internationale

Okanagan Basin Water Board

Osoyoos Canada's warmest welcome

Zosel Dam - Photo courtesy Destination Osoyoos

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CONFERENCE OVERVIEW

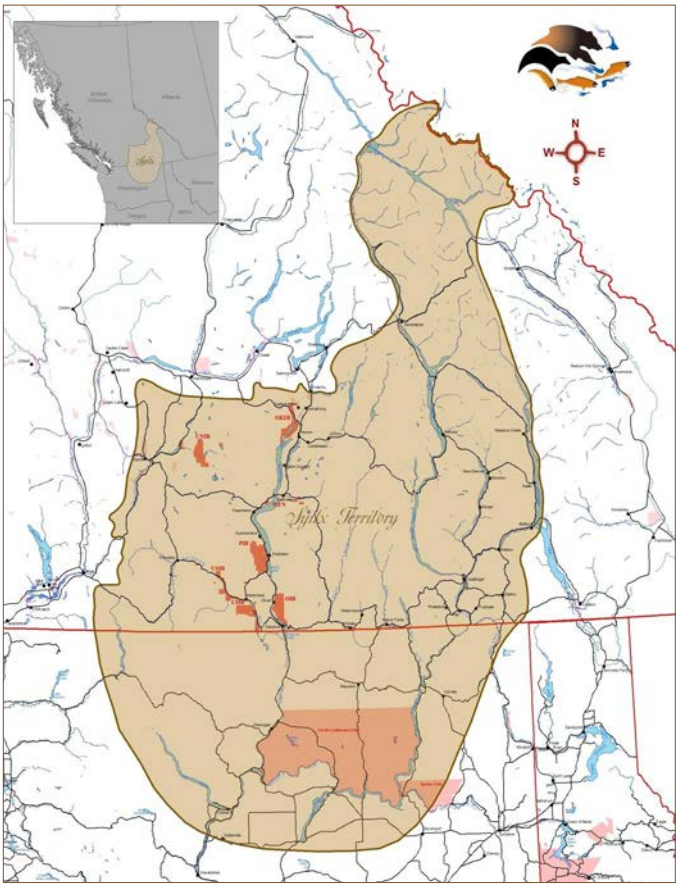
This forum is presented by the Okanagan Basin Water Board, the International Joint Commission, the Okanagan Nation Alliance, with many other partners. It is hosted by the Osoyoos Indian Band and the Town of Osoyoos.

This is the fourth edition of the conference, with previous ones held in 2007, 2011 and 2015. The goal this year is to learn about Indigenous and western approaches to knowledge, science and management. The event will be facilitated by members of the Syilx (Okanagan) nation, and is designed to allow participants time to reflect on both the scientific information and Indigenous perspectives.

The forum is an opportunity for residents of the Okanogan/Okanagan watershed, and the wider community, to learn about water issues of importance to Osoyoos Lake and the broader transboundary watershed. It is also an opportunity, for resource managers and stakeholders to identify common goals and challenges, and to promote transboundary lake stewardship.

THE SYILX NATION

The Syilx (Okanagan) people's territory is approximately 69,000 square kilometers and extends from just north of modern day Revelstoke, B.C., close to the area of Mica Creek, south to Wilbur, Wash., and stretches from west into the Nicola Valley, to east near Kaslo on Kootenay Lake. The territory's stunning landscape includes deserts and lakes, alpine forests and endangered grasslands.



OKANAGAN NATION TERRITORY

https://www.syilx.org/wp/wp-content/uploads/2017/01/ON_Territory.pdf

PROGRAM OVERVIEW

DAY 1 - THURSDAY, OCTOBER 27TH

FIELD TRIP 1:00 - 3:00 P.M.

Location: Meeting point at the Sonora Centre at 12:45 P.M.

- kłlilx'w (Spotted Lake)
- Nk'Mip Desert Cultural Centre

REGISTRATION, WELCOME AND RECEPTION 4:00 PM - 7:30 P.M.

Location: The Nk'Mip Desert Cultural Centre

4:00 - 5:00 P.M.	Registration
5:00 P.M.	Welcome - *Tribal Chairman Osoyoos Indian Band (OIB) Clarence Louie;* Opening prayer - *OIB Coun. Sonya Jensen*
5:10 P.M.	Opening of conference - *Osoyoos Mayor Sue McKortoff*
5:20 P.M.	Conference theme introduction, welcome from elected officials, honouring Kim Hyatt - *Anna Warwick Sears & Arnie Marchand*
6:00 - 7:30 P.M.	Wine and cheese social

Grasslands as seen from Nk'Mip Desert Cultural Centre with Osoyoos Lake in the distance. Photo OBWB-OkWaterWise

DAY 2 – FRIDAY, OCTOBER 28

Location: Sonora Community Centre

BREAKFAST AND REGISTRATION 8:00 – 9:00 A.M.

9:00 A.M.	WELCOME	**Land Acknowledgment and Opening Remarks** - *MC: Anna Warwick Sears and Arnie Marchand*
		Town of Osoyoos Welcome - *Osoyoos Mayor Sue McKortoff*
		Conference overview, objectives and theme
		Setting the Foundation for Learning and Community Building - *Facilitator Kelly Terbasket*
	KEYNOTE #1	**Syilx siwɬkʷ (Water) Strategy – ks_kəɬqayxʷntim iʔ siwɬkʷ (We will protect the water)** - *Tessa Terbasket, Syilx member, and Brian Holmes, Upper Nicola Valley Band*
		Questions & comments
	KEYNOTE #2	**What is Indigenous Knowledge and What is Western Science, and How Do They Complement One Another?** - *Gwen Bridge, Gwen Bridge Consulting*
		Questions & comments
BREAK	15 min	**Posters session**
11:05 A.M.		**The Four Food Chiefs, Setting the Foundation for Learning Together** - *Kelly Terbasket and Aaron Derrickson, Conference Facilitators*
11:40 A.M. – 12:40 P.M.	SESSION 1	**Nk'mip (Osoyoos Lake) Management** - *Moderator: Al Josephy*
		Syilx guiding question
		How is Osoyoos Lake Managed and Dam Safety Operations - *Craig Jordan, Washington State Department of Ecology*
		How to Consider and Respond to Osoyoos Lake Climate Change Impacts - *Jeremy Fyke, Environment and Climate Change Canada*
		Facilitator-led session - *(Speakers will be available for questions during the breaks)*
12:40– 1:40 P.M.	LUNCH	**Lunch & posters session** - *(Speakers from previous session can be approached here for questions)*
1:40 – 2:50 P.M.	SESSION 2	**Climate Change** - *Moderator: Nelson Jatel*
		Syilx guiding question
		Okanagan Mainstem Floodplain Mapping - *Sarah North, Northwest Hydraulic Consultants*
		An Introduction to Topobathymetric Lidar and the 2021 Topobathymetric Survey of the Okanagan Lakes - *Sven Cowan, Quantum Spatial Consulting*
		Water Banking in Washington State - *Tom Tebb, Washington State Department of Ecology*
		Facilitator-led session - *(Speakers will be available for questions during the breaks)*
2:50 – 4:00 P.M.	SESSION 3	**Watershed Influences** - *Moderator: Birgit Arnstein*
		Syilx guiding question
		Watershed Response to Disturbances - *Sheena Spencer, B.C. Ministry of Forests and UBC Okanagan*
		Classifying Wetlands Using Remote Sensing Techniques in the Okanagan Basin - *Tina Deenik, UBC Okanagan*
		Microplastics in Okanagan Lake: A Process of Discovery - *Ryan Cope, Seven in the Ocean*
		Facilitator-led session - *(Speakers will be available for questions during the breaks)*
BREAK	15 min	**Posters session** - *(Speakers from previous session can be approached here for questions)*
4:15 – 5 P.M.	CLOSING KEYNOTE	*Moderator: Anna Warwick Sears*
	KEYNOTE #3	**Three-Eyed Seeing and Water: A Framework for Using Anishinaabemowin as Indicators for Aquatics Monitoring** - *Myrle Ballard, Environment and Climate Change Canada – University of Manitoba*
5:30 – 7 P.M.	RECEPTION	**WaterWays Exhibit opening** – *Osoyoos and District Museum and Archives*

DAY 3 – SATURDAY, OCTOBER 29

Location: Sonora Community Centre

BREAKFAST AND REGISTRATION 8:00 – 9:00 A.M.

9:00 A.M.	WELCOME	**Land Acknowledgment and Opening Remarks** - *MC: Anna Warwick Sears & Arnie Marchand*
		Town of Osoyoos Welcome - *Osoyoos Mayor Sue McKortoff*
		Setting the Stage - *Facilitators Kelly Terbasket and Aaron Derrickson*
9:10 – 10:30 A.M.	SESSION 4	**Responsibility Planning** - *Moderator: Nelson Jatel*
		Syilx guiding question
		Okanagan Lake Responsibility Plan - *Tessa Terbasket, Syilx Member & Scott Boswell, Okanagan Collaborative Conservation Program*
		International Watershed initiative - *Merrell-Ann Phare & Lance Yohe, International Joint Commission*
		Facilitated led session - *(Speakers will be available for questions during the breaks)*
BREAK	15 min	**Posters session** - *(Speakers from previous session can be approached here for questions)*
10:45 A.M. – 12:10 P.M.	SESSION 5	**Fisheries Restoration** - *Moderator: Al Josephy*
		Syilx guiding question
		Okanogan Basin Monitoring and Evaluation Program (OBMEP) Habitat Status and Trend Monitoring - *John Arterburn, Confederated Tribes of the Colville Reservation*
		Habitat Rehabilitation in the Okanogan Sub-basin in Response to Changing Environment Conditions - *Chris Fisher, United Tribes Technical College*
		Salmon Restoration in the Okanagan Basin - *Kari Alex, Okanagan Nation Alliance*
		Restoring sq̓awsitkʷ (Okanagan River)'s Ecosystem Health by Putting Back Salmonid Floodplain Habitat - *Natasha Lukey, Okanagan Nation Alliance*
		Facilitator-led session - *(Speakers will be available for questions during the breaks)*
12:10 – 1:10 P.M.	LUNCH	**Posters session** - *(Speakers from previous session can be approached here for questions)*
1:10 – 2:20 P.M.	SESSION 6	**Water Quality** - *Moderator: Birgit Arnstein*
		Syilx guiding question
		Mobilization of Pollutants from Lake Sediments - *Heather Larratt, Larratt Aquatic Consulting*
		The Value of Long-Term Monitoring Towards Understanding Changing Water Quality Conditions within the Osoyoos Lake Watershed - *Lucie Thompson, B.C. Ministry of Environment and Climate Change Strategy*
		Osoyoos Lake Nutrient Dynamics from a Fisheries Perspective - *Samantha Pham, Okanagan Nation Alliance*
		Facilitator-led session - *(Speakers will be available for questions during the breaks)*
2:20 – 3:20 P.M.	CLOSING	**Closing** - *Moderator: Anna Warwick Sears*
	KEYNOTE #4	**Why Does the Okanagan Lake Regulation System Need Modernizing, and How Should We Do It?** - *Brian Guy, Associated Environmental Consulting*
	30 min	**Q&A**
3:20 – 4:00 P.M.	REFLECTIONS	**Reflections on the forum** - *Anna Warwick Sears*

ACKNOWLEDGMENTS

Partners and Funders:

Osoyoos Indian Band
Town of Osoyoos
Okanagan Nation Alliance
International Joint Commission
International Osoyoos Lake Board of Control (IOLBC)
Okanagan Basin Water Board - Okanagan WaterWise
Environment and Climate Change Canada
U.S. Geological Survey
Washington State Department of Ecology
B.C. Ministry of Forests
Regional District of Okanagan-Similkameen
Confederated Tribes of the Colville Reservation
Osoyoos Lake Water Quality Society
Real Estate Foundation of B.C.

Sponsors:

True Consulting
Associated Environmental Consulting
Hoskin Scientific
Northwest Hydraulic Consultants

Special Thanks:

OSOYOOS INDIAN BAND
OKANAGAN NATION ALLIANCE
OKANAGAN BASIN WATER BOARD
SONORA CENTRE AND TOWN OF OSOYOOS PERSONNEL
VOLUNTEERS

Sammy Jo Louie
Tara Montgomery
Corinne Jackson

Forum Organizing Committee:

OBWB & IOLBC, CANADIAN CO-CHAIR	Anna Warwick Sears
U.S. CO-CHAIR	Al Josephy
OBWB, FORUM COORDINATOR	Carolina Restrepo
TOWN OF OSOYOOS & IOLBC	Sue Mckortoff
IOLBC, ECCC	Dave Hutchinson
OROVILLE MUSEUM & IOLBC	Arnie Marchand
ECCC & IOLBC SECRETARY	Martin Suchy
USGS & IOLBC SECRETARY	Andy Gendaszek
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IJC - CANADA	Rob Caldwell
IJC - CANADA	Paul Allen
IOLBC	John Arterburn
IOLBC	Brian Symonds
OKANAGAN WATER STEWARDSHIP COUNCIL	Brian Guy

ACRONYMS:

ECCC - Environment and Climate Change Canada
IJC - International Joint Commission
IOLBC - International Osoyoos Lake Board of Control
OBWB - Okanagan Basin Water Board
OIB - Osoyoos Indian Band
ONA - Okanagan Nation Alliance
RDOS - Regional District of Okanagan-Similkameen
USGS - U.S. Geological Survey

Conference Providers and Donors:

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SPIRIT RIDGE LAKE RESORT WINERY SACRED LAND
NK'MIP Desert Cultural Centre
BORDERTOWN CIDER & WINERY
QUEEN OF THE SOUTH CHARCUTERIE
LA STELLA
ADEGA ON 45TH ESTATE WINERY
Rooster Mafia Foods

PROGRAM AND FACILITATORS

This event brings together a diverse audience with a common interest in the health of Osoyoos Lake and its surrounding watershed. Canadians and Americans, Indigenous and non-Indigenous, young and old, scientists, water managers, and members of the public are gathering for two-and-a-half days of programming. This year, the fourth time the forum has been held since 2007, we bring together western science and Indigenous approaches for understanding and caring for the water. We will have presentations specifically about the Syilx (Okanagan) Water Declaration and planning initiatives, talks about Indigenous science and western science, and discussion on water topics of interest to all conference participants. These talks will be interspersed with Indigenous facilitation intended to help the audience reflect on the science from new perspectives.

Day 1

The forum begins on Thursday, October 27th with optional afternoon field trips and a welcoming reception in the evening.

Field trips:

Participants can choose to attend one of two field trips guided by members of the Osoyoos Indian Band:

- Excursion to kɬilx̓w (Spotted Lake) – a rare opportunity to visit this beautiful and special mineral lake, which is sacred to the Syilx people and a revered place of healing.
- Excursion to Nk'Mip Desert Cultural Centre – a walk through the stunning natural desert habitat of Osoyoos, with all its unique plants and animals.

Welcoming reception:

The award-winning architecture of the Nk'Mip Desert Cultural Centre offers the perfect venue for the opening of our conference.

The reception program includes:

- Welcome and opening remarks
- Conference introduction
- Honouring Kym Hyatt
- Wine and cheese social

Days 2 and 3:

Hosted at the Sonora Centre and facilitated by Kelly Terbasket and Aaron Derrickson, days 2 and 3 will include keynote presentations, sessions on topics relevant to the lake and lots of learning, sharing and discussion. Session topics include:

- Introduction to Indigenous Facilitation
- Indigenous Science and Planning
- Osoyoos Lake Management
- Climate Change
- Fisheries Restoration
- Watershed Influences
- Water Quality
- How Climate Change is Forcing Changes to Okanagan Lake Level Management
- And many others…

FACILITATORS

KELLY TERBASKET

Kelly Terbasket is the Program Director of IndigenEYEZ. Kelly has a Bachelor of Social Work from the University of Victoria and an extensive background working in Indigenous community development for over 30 years in regional andbio provincial positions, including at Health Canada and with her own band and nation. She is also a Certified Executive Coach (Royal Roads University) and trained in Creative Facilitation through Partners for Youth Empowerment (PYE Global). She has been passionate about the arts her whole life as a means of self-expression.

Through her community development work, Kelly became fascinated by systems change and barriers to change. She identified fragmented relationships and lateral violence as a key barrier to systems change and founded IndigenEYEZ to better support Indigenous community members who are champions of change. Drawing on her training in coaching and arts-based facilitation, and using Indigenous frameworks for change, IndigenEYEZ runs innovative Indigenous leadership training programs and youth camps that repair fragmented relationships and transform lateral violence into lateral liberation.

As a mixed-heritage woman Kelly has been bridging very distinct worlds all her life – reconciling and weaving together the strengths of her Indigenous and European ancestry. She is a top connector and relationship builder at a time in history when deeper connections to self, each other, and the land are critically needed. She lives in her family's ancestral home on the Blind Creek Reserve in Syilx territory in the South Okanagan-Similkameen.

AARON DERRICKSON

Aaron is a proud Syilx father of two beautiful baby boys, a husband to Catherine, a mentor to youth in the Westbank First Nation community and within the Okanagan-Syilx Nation, a self-proclaimed comedian, and a dedicated community leader.

As a consultant with over 16 years of experience in facilitation and public speaking, Aaron has served the Syilx nation in educational endeavours by contributing meaningful programming and workshops.

He has two degrees from UBC-Okanagan (UBCO) – a Bachelor of Arts, with a history major and a French minor, and a Bachelor of Education in French. Aaron is currently pursuing his PhD in Interdisciplinary Graduate Studies at UBCO, where he is employed in multiple research positions. His research entails leadership and governance from a Syilx perspective, based on ceptiklw (oral legends). He believes that by living out the principles found in oral traditions, the Syilx can revitalize their communities.

DAY 2 - OCTOBER 28, SONORA CENTRE

ABSTRACTS AND BIOS

Keynote 1: Syilx siwɬkʷ (Water) Strategy – ks_kəɬqayxʷntim iʔ siwɬkʷ (We will protect the water) – Tessa Terbasket, Siylx member and Brian Holmes, Upper Nicola Valley Band

Tessa Terbasket is a Syilx woman from the Lower Similkameen Indian Band. She has an undergraduate degree in Interdisciplinary Studies at UBC Vancouver, concentrating in Indigenous Studies, Political Science and Environmental Science. She is passionate about Syilx-led watershed planning and governance initiatives. She is currently doing contract work while spending time with her one-year-old son on their farm.

Tessa's work is shaped by countless millennia of traditional knowledge, close-knit community and her determination to keep educating herself. She surrounds herself with like-minded people willing to help change, be change and create change for the betterment of future generations, for the land, and for the plants and animals.

Brian Holmes is a Full Time Council member for the Upper Nicola Band Chief and Council. He previously worked for Douglas Lake Cattle Company for 20 years. He has been on council for the Upper Nicola Band since 2011. He has received a certificate for Restorative Justice Facilitator Training, a diploma in Police Sciences (Law End. & Prot.) and Land Guardian Certificate. He is actively leading various projects in his community like the invasives species eradication, water quality monitoring and streamflow monitoring.

ABSTRACT: The Syilx siwɬkʷ Strategy is a call to action that outlines how the Syilx Nation intends to care for their territory and work to ensure that siwɬkʷis properly respected and available for all living things. This presentation will go over how the Syilx siwɬkʷStrategy came to be, its key components and directives and next steps.

Keynote 2: What is Indigenous Knowledge and What is Western Science, and How Do They Complement One Another? – Gwen Bridge

Gwen Bridge is an environmental scientist and conservation advocate. Her work has focused on sustainable land management practices to help facilitate the cultural preservation of Indigenous communities across North America. Her work has largely focused on the concept of combining the fields of hydrology, ecology and conservation biology together with traditional Indigenous knowledge and expertise. She believes that the outcome of unifying these scientific fields with traditional Indigenous experience would lead not only to improvements in biodiversity conservation, but would also promote cultural sustainability and resilience.

Her work includes collaborations with the Mescalero Apache, the Makah Tribe and the Okanagan Nation. She was the chair of the Syilx Working Group which conducted the South Okanagan Similkameen National Park Reserve Feasibility Study. Bridge has worked on facilitating relationships between First Nations and other levels of government such as Parks Canada and the Canadian Wildlife Service.

ABSTRACT: This presentation will deepen our understanding of important components of the Indigenous worldview. Ideas for how to advance towards Ethical Space where discussions of the fundamental differences in how we behave (i.e. our laws, and our assumptions of where humans get their authority for natural resources decision making) are explored and new conceptual frameworks for relating, with each other and the natural world, are expounded. Gwen will provide an introduction to ethical space and the roots of conflict within the hierarchical legislative frameworks of Indigenous and Canadian societies and the challenges of understanding the legislative roles Traditional Ecological Knowledge and science play within the two structures. The exercise of reconciliation within legal pluralism requires the decolonization of western structures and the Indigenization of "western" law, and the implementation of Indigenous law. Ethical space is a place where we take responsibility for the creation of something new. Our world needs ways of understanding the application of Indigenous law and decision-making in shaping a new societal concept.

INTRODUCTORY TALK

The Four Food Chiefs – Setting the Foundation for Learning Together – Kelly Terbasket and Aaron Derrickson, Conference Facilitators

SESSION I
Nk'mip (Osoyoos Lake) Management - Moderated by Al Josephy

Presentation 1.1: Zosel Dam and Okanogan River Operations - Craig Jordan, Washington State Department of Ecology

Craig Jordan is a geotechnical engineer with 15 years of experience. Having worked on a wide range of projects as a private consultant he found working with dams and other water retaining structures to be of particular interest and looked for a career path that would allow for more of this type of work. He found it five years ago at Washington's Dam Safety Office under the umbrella of Washington State Department of Ecology.

ABSTRACT: This presentation will cover the history of damming the Okanogan River at Oroville, planned improvements to the existing dam, and an overview of how the water levels of Osoyoos Lake are managed by the dam.

Presentation 1.2: How to Consider and Respond to Osoyoos Lake Climate Change impacts - Jeremy Fyke, Environment and Climate Change Canada

Jeremy's background in climate science and services began with a Geology degree and Climate Modelling MSc at the University of Victoria in B.C., PhD work at Victoria University of Wellington in New Zealand and postdoctoral and staff climate research positions at the U.S. Department of Energy Los Alamos National Laboratory. Motivated to link climate science and public and private sector decision-making through the concept of climate services in the Canadian context, Jeremy currently works as a Coordinator with the Data Products Office at the Canadian Centre for Climate Services, within Environment and Climate Change Canada. He is Adjunct Professor at the Department of Geography at Simon Fraser University and the Department of Atmospheric and Oceanic Sciences at Colorado University at Boulder. He is also a registered Professional Geoscientist (P.Geo.) with Engineers and Geoscientists BC.

ABSTRACT: Climate change is and will continue to impact the water quality and quantity of Osoyoos Lake and the surrounding watershed, with important effects on Osoyoos Lake itself. In this talk we will consider the important climate processes that impact watershed and lake conditions and reflect on how these processes are expected to evolve with climate change. We'll also consider the best scientific tools and approaches for understanding present and future change, and explore how these tools could support western and Indigenous approaches to water and watershed management.

SESSION 2
Climate Change - Moderated by Nelson Jatel

Presentation 2.1: Okanagan Mainstem Floodplain Mapping - Sarah North, Northwest Hydraulic Consultants Ltd.

Ms. Sarah North is a Principal and GIS Analyst at Northwest Hydraulic Consultants Ltd (NHC). She leads NHC's GIS team and is a B.C. branch manager. In recent years, Sarah has had the opportunity to work on many flood studies in B.C. and is excited to work with a team that helps set the standard for this work in our region, including incorporation of climate change impacts and consideration of flood risk.

ABSTRACT: Record-setting high flows in the Okanagan Valley in 2017 with flooding, followed by high flows in 2018, prompted the Okanagan Basin Water Board (OBWB), the Okanagan regional districts, member municipalities, and the Okanagan Nation Alliance and member communities to update floodplain mapping for the Okanagan River and its lakes. NHC was retained to complete floodplain mapping of the Okanagan River from Penticton to Osoyoos Lake, along with the shoreline of Okanagan River's mainstem lakes: Ellison/Duck, Wood-Kalamalka, Okanagan, Skaha, Vaseux, and Osoyoos. The mapping was completed in early 2020, with updates in 2021 and 2022.

Map layers include flood inundation extents, depths, and flood construction levels (FCLs). Information is available for several flood scenarios, including for current operating conditions of the Okanagan Lakes Regulation System (OLRS) and for modified operations proposed to mitigate the future impacts of climate change.

Presentation 2.2: An Introduction to Topobathymetric Lidar and the 2021 Topobathymetric to Survey of the Okanagan Lakes - Sven Cowan, Quantum Spatial

Sven Cowan lives in Vancouver, B.C. and serves as NV5 Geospatial's Canada Program Manager. Sven has over 20 years of experience in customer-facing positions within the geospatial information industry and has worked for multiple geospatial remote sensing organizations. His current focus includes regional strategy, business development, relationship management, and brand awareness for NV5 Geospatial. NV5 Geospatial, powered by Quantum Spatial, is North America's largest provider of geospatial services, providing end-to-end solutions and insights to organizations that need geospatial intelligence to mitigate risk, plan for growth, better manage resources and advance scientific understanding. NV5 Geospatial combines the widest array of advanced remote sensing technologies with proprietary processes, analytics tools, algorithms, and analysis tailored to meet client needs.

ABSTRACT: Topobathymetric lidar is a technology to enable large-scale mapping of nearshore and riverine bathymetric environments. This presentation is designed to be a brief introduction to topobathymetric lidar including sensor technology, planning considerations, and applications. In fall 2021, NV5 Geospatial was contracted by the OBWB and the IJC to perform a topobathymetric survey of Ellison, Wood, Kalamalka, Okanagan, Skaha, Vaseux and Osoyoos lakes. This presentation will provide an overview of this survey and showcase examples of the data acquired.

Presentation 2.3: Water Banking in Washington State - Tom Tebb, Washington State Dept. of Ecology

A native of the Yakima Valley, Thomas Tebb has more than 36 years of environmental and engineering geology experience in both the private and public sectors. Currently, Tom is the Director for the Office of Columbia River within the Department of Ecology and maintains an office in Ecology's Central Regional Office located in Union Gap, Wash.

He has more than 30 years of experience with the Department of Ecology and has served as Central Regional Director and manager in four different programs during his tenure with the agency. Those programs include Nuclear Waste, Shorelands and Environmental Assistance, Water Quality, and Water Resources.

Tom received his Bachelor of Science degree from Western Washington University in Environmental Geology and is a licensed geologist, hydrogeologist, and engineering geologist in the State of Washington.

He was appointed to the Distinguished Managers Association by previous governor Christine Gregoire and currently serves on the Washington State Geologist Licensing Board.

ABSTRACT: This presentation provides a brief overview of water banking in Washington State. Washington Department of Ecology, through the Office of Columbia River and Water Resources Program, has established several water banking mechanisms to facilitate the use of scarce water resources within existing allocated water rights. The presentation also includes a summary of recent Washington State legislation (2021) that provided $14 million for water banking pilot grant funding to assist applicants such as local governments to buy water rights in rural counties with headwater streams designed to help public entities and their partners preserve water rights in their basin for local use and streamflow augmentation.

SESSION 3

Watershed Influences – Moderated by Birgit Arnstein

Presentation 3.1: Watershed Response to Disturbances - Sheena Spencer

Dr. Sheena Spencer is a research hydrologist with the B.C. Ministry of Forests and an adjunct professor in the Department of Earth, Environmental, and Geographic Sciences at UBC Okanagan. She conducts research on runoff generation processes in headwater catchments and the hydrologic response to forest disturbance and regrowth. Sheena is also the research lead for the Upper Penticton Creek Watershed Experiment, a long-term hydrology research site.

ABSTRACT: Over the last few decades, B.C.'s forested headwaters have been increasingly impacted by wildfire, logging, and disease. These disturbances can have a direct impact on stream water quantity and quality, and may cause greater risk for flooding, drought, and drinking water treatment for downstream communities. This presentation will use research examples from the B.C. Interior to showcase how local watersheds respond to these disturbances. The Upper Penticton Creek Watershed Experiment was initiated in 1985 to understand the hydrological effects of logging in south-central British Columbia. Fifty percent of two small snow-dominated watersheds were clear-cut logged and streamflow and snowpack dynamics were monitored before and after logging. The 2017 Elephant Hill fire, although outside the Okanagan Basin, can be used to anticipate how large severe wildfires may impact local hydrology. This fire burned 1.2 million hectares including 91% of the Arrowstone Creek sub-watershed while the neighbouring Criss Creek watershed was unaffected by the fire. Long-term Water Survey of Canada streamflow gauges were used to understand the changes in streamflow quantity and timing following the fire. Finally, the Mayson Lake study will be used to describe the effects of Mountain Pine Beetle infestation on snow hydrology.

Presentation 3.2: Classifying Wetlands Using Remote Sensing Techniques in the Okanagan Basin, B.C. - Tina Deenik

Kristina completed her B.Sc. at the University of Guelph in wildlife biology and her M.Sc. at the University of British Columbia (Okanagan) in Earth and Environmental Sciences. Her research involved creating a predictive wetland map for the Okanagan using earth observation satellite and LiDAR data and a random forest machine learning classifier. She has since been working as a graduate student intern with Selkirk College in Castlegar, B.C. where she is involved with forestry-related research using LiDAR to investigate forest-snow relationships and hydrological recovery. Kristina is continuing wetland research with the Okanagan Conservation Collaborative Program (OCCP) and Thompson-Nicola Conservation Collaborative (TNCC) with a goal of identifying areas that will most likely withstand the impacts of climate change. Kristina lives in Nelson, B.C. and is a board member of the Friends of Kootenay Lake Stewardship Society (FOKLSS) and is passionate about initiating local conservation projects.

ABSTRACT: Wetlands are critical components of healthy functioning landscapes and provide valuable ecosystem services, yet, they are being lost at alarming rates. In the semi-arid region of the Okanagan Basin, wetlands are rare biodiversity hotspots and provide critical habitat to many species. Comprehensive inventories are needed for conservation and management efforts; however, the vast spatial coverage and their dynamic nature make wetlands challenging to map with field-based methods. Remote sensing technology provides a cost-effective alternative to identify wetlands at regional scales. A random forest probabilistic model was trained using an existing wetland database and 22 covariates from remote sensing and LiDAR data. The model identified and classified new wetlands and provided a comprehensive inventory using a replicable approach with publicly available data. The wetland model presented here, which predicts the major wetland classes with a high level of accuracy and identifies small ephemeral wetlands at a high spatial resolution, represents the first probabilistic inventory of wetlands in the Okanagan.

Presentation 3.3: Microplastics in Okanagan Lake: A Process of Discovery - Ryan Cope

Ryan is the project manager for Microplastics Okanagan. Originally from the USA, she holds a B.S. in Marine Science from the University of Maine. She was first exposed to the issue of plastic pollution during a research sailing expedition with Sea Education Association across the Pacific in 2008 and again on Midway Atoll in 2012. She is passionate about sharing plastic pollution research in meaningful ways through storytelling, both in-person and online.

ABSTRACT: In 2021, a small team embarked on a scoping study to understand if microplastics were present in Okanagan Lake and in Kelowna's municipal wastewater. Unsurprisingly, they found microplastics, though in very small concentrations. This presentation will highlight work completed to date, including an overview of the collaborations this project has inspired, and a discussion about Phase II (which is ongoing).

DAY 2 CLOSING PRESENTATION

Day 2 Closing Presentation: Three-Eyed Seeing and Water: A Framework for Using Anishinaabemowin as Indicators for Aquatics Monitoring - Dr. Myrle Ballard, Director, Indigenous Science, Environment and Climate Change Canada, and Assistant Professor and Indigenous Scholar, University of Manitoba.

Dr. Myrle Ballard is the Director of the new Indigenous Science Division at ECCC and an Assistant Professor and Indigenous Scholar in the Dept. of Chemistry at the University of Manitoba. Anishnaabe from Lake St. Martin First Nation, Dr. Ballard's latest research explores how her fluency in Anishinaabemowin can transform approaches to water resource management using baseline monitors. Dr. Ballard also serves on a number of committees and currently holds prestigious NSERC (Natural Sciences and Engineering Research Council of Canada) and CIHR (Canadian Institutes for Health Research) grants. Her other research interests include; but are not limited to, climate, species at risk, sustainability and the politics of flooding/ displacement.

ABSTRACT: This talk explores a three-eyed framework that is premised on Anishinaabe laws. Anishinaabe laws – ona'ko'nikay-wiinan will be discussed. Examples based on Anishinaabe mowin / Indigenous place/ space/land forms will be used to explain how 3-eyed seeing and Asnishinaabemowin is important to use as an indicator and biomonitoring tool. Examples will also be presented of what western science cannot decipher and Indigenous aquatics knowledge regarding water and its "character."

DAY 3 - OCTOBER 29, SONORA CENTER

SESSION 4
Responsibility planning – Moderated by Nelson Jatel

Presentation 4.1: The kɬúsx̌nítkʷ (Okanagan Lake) Responsibility Planning Initiative- Tessa Terbasket & Scott Boswell

Tessa Terbasket is a syilx woman from the Lower Similkameen Indian Band. She has an undergraduate degree in Interdisciplinary studies at UBC Vancouver, concentrating in Indigenous Studies, Political Science and Environmental Science. She is passionate about syilx-led watershed planning and governance initiatives. She is currently doing contract work while spending time with her one-year-old son on their farm.

Tessa's work is shaped by countless millennia of traditional knowledge, close-knit community and her determination to keep educating herself. She surrounds herself with like-minded people willing to help change, be change and create change for the betterment of future generations, for the land, and for the plants and animals.

Scott Boswell is the program manager with the Okanagan Collaborative Conservation Program. He is a community development specialist with over 20 years of experience working with local government and non-profit organizations. Scott has successfully completed a broad range of initiatives that include: creating and implementing a regional economic transition strategy, establishing an interpretive trails network, coordinating soil conservation and agro-forestry projects and spearheading a provincial social enterprise program for youth entrepreneurship. Scott has an undergraduate degree in Environment Studies and Geography from the University of Victoria and a Masters of Environmental Design in Planning from the University of Calgary. Scott enjoys hiking and fly fishing and has been an avid environmentalist from a young age where he spent his youth helping out on his family's wilderness resort on Bonaparte Lake north of Kamloops.

ABSTRACT: This presentation will describe the planning and engagement process for the kɬúsx̌nítkʷ (Okanagan Lake) Responsibility Planning Initiative. The key emerging themes of reimagining water governance, using syilx Traditional Ecological Knowledge as a land-use planning framework, and the need for capacity-bridging between Syilx and non-Syilx partners for implementing actions that protect Okanagan Lake will be discussed.

Presentation 4.2: The International Watershed Initiative – Merrell-Ann Phare and Lance Yohe, International Joint Commission

Merrell-Ann Phare is a lawyer, writer, strategist, negotiator and relationship-builder who worked extensively in and with Indigenous organizations on environmental, land, water, rights and governance issues. She, along with 10 First Nation Chiefs, was the founding Executive Director of the Centre for Indigenous Environmental Resources (CIER), a national First Nation charitable environmental organization. As Chief Negotiator for the Government of the Northwest Territories, Ms. Phare led the negotiation of transboundary water agreements in the Mackenzie River Basin and the creation of Thaidene Nene, a national and territorial park in the east arm of Great Slave Lake. She is the author of the book "Denying the Source: The Crisis of First Nations Water Rights" and co-author of the book, "Ethical Water." She is a member of the Forum for Leadership on Water, Smart Prosperity's Leadership Council, and is a recipient of Canada's Clean 50 Award. She has served as legal counsel and advisor to a number of First Nation and Metis governments and organizations. Ms. Phare holds a Bachelor of Arts in Economics (Environmental), Bachelor of Laws, Master of Law (Aboriginal Water Rights and International Trade Law) from the University of Manitoba, and a Master of Fine Arts (Creative Writing) from University of British Columbia. She resides in Winnipeg, Manitoba.

Lance Yohe has been previously involved in Canada-U.S. transboundary organizations centered in the Red River Basin for over 25 years, serving as the executive director of the Red River Basin Commission in Fargo, North Dakota from its formation in 2002 until 2014. He was involved with its two predecessors, the Red River Basin Board and International Coalition for Land and Water Stewardship. He also served as a manager with the Southeast Cass Water Resources Board and as a member of the Red River Joint Water Resources Board's Executive Board of Managers.

In 2014, Mr. Yohe formed Trans Boundary Solutions, a consulting firm working with regional clients on both sides of the boundary, including the Prairie Improvement Network and the Assiniboine River Basin Initiative. He succeeds former International Joint Commission U.S. Commissioner Rich Moy, who served from 2011 to 2019. The commission prevents and resolves disputes between the U.S. and Canada under the 1909 Boundary Waters Treaty and pursues the common good of both countries as an independent and objective advisor to the two governments. U.S. and Canadian commissioners provide a binational oversight role on water quality and quantity issues in the basins where the governments have requested the IJC's assistance.

ABSTRACT: Since 1909, the International Joint Commission has worked to prevent and resolve disputes involving shared waters between Canada and the United States. Over the past 113 years of engaging with communities along our shared boundary, the Commission has evolved to understand and embrace an integrated, ecosystem approach to water management. The interconnected nature of watersheds is embodied in the IJC's International Watersheds Initiative, established in 1998. For nearly 25 years, the IWI has assisted the Commission's boards in delivering on their mandates and supporting water managers and communities across the transboundary. This presentation will discuss the purpose and vision of the IWI program, and highlight projects the program has supported and benefits brought through collaborative water management with local organizations including the IJC's International Osoyoos Lake Board.

SESSION 5
Fisheries Restoration – Moderated by: Al Josephy

Presentation 5.1: Okanogan Basin Monitoring and Evaluation Program - Habitat Status and Trend Monitoring - John Arterburn, Colville Confederated Tribes

John Arterburn is a nationally recognized principal biologist who has spent the last 21 years working for the Confederated Tribes of the Colville Reservation Fish and Wildlife Department. John is considered a local and regional leader in salmon recovery. His work is primarily focused on research, monitoring and evaluation and linking data with models to improve our understanding of how to improve restoration efforts. He enjoys hockey, fishing, and spending time with his dog Bella.

ABSTRACT: For almost 20 years, the Okanogan Basin Monitoring and Evaluation Program (OBMEP) has been collecting fluvial habitat data on both sides of the border. These data are entered into the Ecosystem Diagnosis and Treatment model (EDT), a deterministic, life cycle-based habitat model developed to support the conservation and recovery of declining Pacific salmon (Oncorhynchus spp.) and steelhead (Oncorhynchus mykiss) in the Pacific Northwest. The Okanogan EDT model is run every four years and results are reported electronically providing a valuable data synthesis and analysis platform, capable of transforming complex environmental data into useful quantitative metrics to guide decision-making. The integration of EDT with long-term research, monitoring, and evaluation in the Okanogan River Basin can support ongoing conservation and recovery of steelhead listed under the Endangered Species Act. The lessons learned in this important Columbia River sub-basin demonstrate the value of the OBMEP approach as an adaptive management tool that is both effective and transferable. Modeling and electronics reporting platforms are examples of using technological advances that will help resource managers identify priority habitats for conservation and restoration.

Presentation 5.2: Fisheries Restoration by the Colville Confederated Tribes in the U.S. Okanogan - Chris Fisher, Colville Confederated Tribes

Chris Fisher is a principal biologist employed by the Colville Confederated Tribes with more than 25 years of experience in habitat rehabilitation project management. Project experience includes barrier removal, irrigation efficiency, riparian vegetation reestablishment, land acquisition, floodplain and side channel reconnection, increase structural complexity, and re-establish hydrological connectivity through road decommissioning and vegetation management.

ABSTRACT: The Okanogan River is the uppermost tributary of the Columbia River which supports anadromous salmonids and encompasses nearly 9,000 sq. miles of which approximately 70% lies in B.C., Canada. The floodplain of the Okanogan River Basin averages one mile-wide, making the valley floor favorable for agricultural development. Consequently, many of the tributaries of the Okanogan River have been reduced in flow from irrigation withdrawals or diversions. Anadromous salmonids which inhabit these cold water tributaries have suffered and consequently, stream-type Chinook salmon are considered extirpated and summer steelhead are recognized as "threatened." Since the mid-1990's the Colville Tribes have initiated efforts to rehabilitate habitat within these tributaries to support anadromous salmonids, with the effort focusing on increasing flow or providing passage at man-made barriers. Though these efforts have been successful, climate change models predict water temperatures in these tributaries will exceed lethal threshold for spring Chinook salmon and summer steelhead. Thus, habitat rehabilitation efforts are now focusing on reaches higher in elevation that will be more resistant to forecasted temperature increases and hospitable to native anadromous salmonids.

Presentation 5.3: Salmon Restoration in the Okanagan Basin - Kari Alex, Okanagan Nation Alliance

Karilyn Alex is a fisheries biologist and fluvial geomorphologist with the Okanagan Nation Alliance (ONA). Karilyn worked as a fisheries technician and river rafting guide while finishing a Bachelor of Science degree at the University of Victoria. Karilyn then completed a Masters degree through the Canadian Rivers Institute at the University of New Brunswick. Her Masters was multi-disciplinary between fisheries biology and hydraulic engineering, looking at types of flow parameters that impact spawning sockeye salmon. Karilyn's major area of study is river restoration for salmon spawning and egg incubation habitat guided by Traditional Ecological Knowledge. She has been working with the ONA Fisheries Department since 2002 while raising her family.

ABSTRACT: Construction of dams, channelization, urban encroachment, industrial agriculture, and ineffective water management practices have all contributed to depletion and extinction of fish stocks within the Okanagan Basin. The ONA's restoration initiatives encompass a holistic approach to restoration that include the land, water and wildlife. The ONA is actively involved in the conservation, protection, restoration, and enhancement of fish stocks, and in particular with Okanagan River sockeye salmon.

Presentation 5.4: Restoring sq̓awsitkʷ (Okanagan River)'s Ecosystem Health by Putting Back Salmonid Floodplain Habitat - Natasha Lukey, Okanagan Nation Alliance

Natasha Lukey has lived and worked in Syilx (Okanagan) Territory since 2006. She completed her Bachelor of Science Honors at UBC Okanagan, and her Master of Environmental Studies at University of Waterloo. Although she has worked with a variety of Okanagan habitats and species, she's specifically dedicated to restoring the Okanagan River/ floodplain system, restoring the river ecosystem's capacity for providing food, shelter, and high quality of life for people, fish, and wildlife alike.

ABSTRACT: The Okanagan's salmon species require a range of habitat types, all which combine to form the once healthy, diverse Okanagan River and lake system. These habitat needs include engaged floodplains and cottonwood riparian forests, connected side channels, riffle-pool sequences, and a diversity of substrates dependant on specific depths and velocities. Restoring this diversity for salmon therefore means restoring the aquatic habitat form and functions which improve water quality and habitat structure for everyone, including people. Here we highlight recent projects within the Okanagan Valley portion of the Syilx Territory aimed at restoring salmonid floodplain habitat but which ultimately incrementally contribute to restoring the river system's water quality, flood capacity, and capacity to support all Okanagan creatures, including ourselves. These projects are the result of multiple collaborations, but underlying the success of all is the engagement and guidance of Syilx Traditional Ecological Knowledge Keepers; without knowing the past we cannot know the present or future. We hope that by sharing our experiences we can expand and continue the important work of the Syilx Okanagan Nation in bringing back the health of the sqʷawsitkʷ (Okanagan River) river system through bringing back the salmon.

SESSION 6
Water Quality – Moderated by: Birgit Arnstein

Presentation 6.1: Mobilization of Pollutants from Lake Sediments - Heather Larratt, Larratt Aquatic Consulting

Heather Larratt is a registered professional research biologist and is the owner of Larratt Aquatic Consulting (LAC) Ltd. in Kelowna, B.C. She was the first recipient of a First Class Honors B.Sc. in Environmental Biology from the University of Calgary in 1978. Yes, that's a very long time ago, thus the 43 year's experience in source water quality and reservoir management. Along the way, her team has developed innovations in lake management and mine reclamation. They specialize in the interactions between water quality and algae, so asking them casual questions about algae in social settings is ill-advised.

ABSTRACT: This presentation will explain why lake sediments accumulate contaminants. It will also cover sediment disturbance and pollutant, as well as emerging threats from large boat wakes, and solutions.

Presentation 6.2: The Value of Long-Term Monitoring Towards Understanding Changing Water Quality Conditions within the Osoyoos Lake Watershed - Lucie Thompson, B.C. Ministry of Environment and Climate Change Strategy

Lucie Thomson started her current position as the Head of the Ambient Surface Water Quality Monitoring Programs Unit with the Ministry of Environment and Climate Change Strategy in 2019. Prior to this, she spent 15 years building her applied biology skills, with focus on water quality issues, through consulting. She worked with various clients including several Indigenous communities in southern BC, a hazardous treatment facility and several oil and gas companies in Alberta and the Northwest Territories. Lucie lives in Vernon BC with her husband and son, and spends her spare time exploring BC's rivers, mountains and lakes on foot and by canoe.

ABSTRACT: Consistent monitoring of the water quality in lakes and rivers is essential to understanding current conditions and how those conditions change over time. This information is critical for effective management of British Columbia's water resources. Considerable amount of water quality data has been collected over the past several decades from Osoyoos Lake and its largest surface water contributor, the Okanagan River. We summarize key results from two long-term focused surface water quality monitoring programs: (1) the BC Lake Monitoring Network operated by B.C. Ministry of Environment and Climate Change Strategy (ENV) and (2) the Canada-BC Water Quality Monitoring Program operated jointly by Environment and Climate Change Canada and ENV. The results are put into context of historical information to provide a long-term perspective around changing water quality within the Osoyoos Lake watershed.

Presentation 6.3: Osoyoos Lake Nutrient Dynamics from a Fisheries Perspective - Samantha Pham, Okanagan Nation Alliance

Samantha Pham is a limnologist with the Okanagan Nation Alliance Fisheries Department, with 21 years of limnological and aquatic science experience. She is responsible for co-managing the nation's in-lake research programs, including the Skaha Lake Sockeye Re-introduction Program, Osoyoos Lake in-lake research program, and other lakes in the Syilx Okanagan Nation. She earned both a Bachelor of Science and a Master of Science degree from the University of Regina. Samantha spent nearly 10 years working with Canada Science Research Chairs in Saskatchewan, specializing in lake eutrophication and paleolimnology. She then went on and worked nine years with a First Nations environmental consulting company in Saskatoon, largely managing federal and provincial environmental effects monitoring programs in northern Saskatchewan, specializing in uranium and metal mines contamination. Samantha is passionate about restoration of sockeye salmon in the Syilx Territory while integrating western science and Indigenous Traditional Ecological Knowledge.

ABSTRACT: The Okanagan sockeye salmon (Oncorhynchus nerka) stock is the only remaining significant remnant stock of sockeye in the Columbia River Basin. From 1967-2004, total adult returns declined by nearly 50% despite drastically reduced annual exploitation in commercial and First Nations fishery in both Canada and the U.S. In response to these declines, the Okanagan Nation Alliance in partnership with Canadian federal and provincial governments, and Grant and Chelan County Public Utility Districts, initiated studies to quantify and characterize the rearing habitat for sockeye salmon in Osoyoos Lake. Preliminary data from the 1990s showed that summer oxygen concentrations at deeper depths (hypolimnion) was below the optimal concentration of 4 ppm for growth and survival of juvenile sockeye salmon in the south and central basins of Osoyoos Lake, and temperatures in the upper layer (epilimnion) were too warm (>17oC). Juvenile sockeye densities were reduced in these basins, and sockeye were rearing mostly in the colder more oxygenated north basin. However, it was noted that during the late summer in some years the deeper layer of the north basin of Osoyoos Lake had low oxygen concentrations and the upper layer was too warm (>17oC) for rearing, causing a "squeeze" to the optimal habitat zone. Continued intensive monitoring and evaluation of limnological conditions and juvenile sockeye salmon growth and survival have shown that conditions in the north basin hypolimnion have been deteriorating in the late summer, and juveniles are forced to rear in the deeper colder waters where oxygen is less optimal during that time resulting in reduced growth. While studies are ongoing, the declining water quality and associated reduced growth and survival of juvenile sockeye in Osoyoos Lake might suggest that future projected climate warming and potential increasing loads of nutrients from human development requires further mitigation to aid in Okanagan sockeye salmon stock recovery.

DAY 3 CLOSING PRESENTATION

Presentation 7.1: Why Does the Okanagan Lake Regulation System Need Modernizing, and How Should We Do It?"

Brian Guy is a Professional Geoscientist, with extensive experience in Okanagan water issues. He has a long history with the OBWB, ONA, and other organizations. Since 2018 he has co-chaired the City of Vernon Climate Action Advisory Committee, which developed the city's Climate Action Plan. He's presented at several previous Osoyoos Lake Water Science Forums, and has helped organize several previous Okanagan water conferences, including the fall 2018 Environmental Flow Needs conference that was managed by Syilx facilitators using a modified Enowkinwik process. Brian was recently elected as a City of Vernon councillor.

ABSTRACT: The Okanagan Lake Regulation System (ORLS) is a series of dams and other structures located on major lakes and the Okanagan River between Penticton and Osoyoos in the southern Okanagan Valley. It was constructed in the 1950s, primarily to control flooding. Operation of the system is becoming increasingly challenging because of the changing nature of the Okanagan hydrologic regime in response to the changing climate. In addition, OLRS assets are approaching the end of their service life. Therefore, the system and its operational guidelines need to be modernized. In 2020, the Province of B.C., which owns these assets, began a study to assess the information available to support their modernization. That study recommended 18 additional studies to fill information gaps before the modernization project can begin. This presentation will summarize the reasons why the OLRS need to be modernized, and present an overview of the 18 gap-filling studies. A modernized OLRS will be resilient to the changing climate and could include restoration of the highly impacted Okanagan River floodplain.

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sẁiẁs Provincial Park (Haynes Point) - Photo courtesy Destination Osoyoos

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