Global Institute for Water Security

Progress Report 2016-17



2017 World Water Day Global Institute for Water Security, University of Saskatchewan

Form left to right, back row: Razi Sheikholeslami, Richard Helmle, Jamaal Taghavimehr, and Nick Dylla. From the left, front row: Sahar Safaei, Magali Nehemy, Sujata Budhathoki, Prabin Rokaya, and Apurba Das. Photo Courtesy: Sopan Kurkute

OUR VISION

To undertake world-class research that enables and enhances water security. We define water security as the sustainable use and protection of water resources, the safeguarding of access to water functions and services for humans and the environment, and protection against water-related hazards (flood and drought).

OUR MISSION

- Create a focus and platform for interdisciplinary collaboration that recognizes the societal dimensions of water security, human impacts on the environment, and the linkages and feedbacks between atmosphere, land and water systems. This requires new integration of the relevant spectrum of natural, health and social sciences, public policy and engineering;
- Develop the knowledge, science and technologies needed to support integrated water quantity and quality management in the face of uncertain climate and water resource futures, and address local, regional and global water security agendas;
- Develop partnerships with key stakeholders to translate science into policy and management support to meet water security challenges, including interactions among water, food, energy and ecosystem services (i.e., benefits to human welfare), climate change adaptation and mitigation challenges, and the human health agenda;
- Provide tools, technologies, and computer models for application to key globally significant water security issues, with international application; and,
- Create a unique opportunity for governments, industry and universities to invest in and collaborate on one of our most pressing global issues.

DIRECTOR'S MESSAGE

Welcome to the University of Saskatchewan's (UofS) Global Institute for Water Security (GIWS). I hope that our 2017 annual report will give you a flavor of our exciting research and state-of-the art facilities, as well as introducing you to our Faculty, researchers and graduate students. GIWS is a highly international institution, carrying out world-leading research, engaged in major global programs, and attracting student and researchers from around the world. It builds on a 54-year history of water research in Saskatoon, including the co-location of the federal National Hydrology Research Center in 1986. In 2010, the University of Saskatchewan established *Water*

Security as a signature area of research focus and excellence, and GIWS was established in 2011 as its focus, with an investment of \$30 million through the Canada Excellence Research Chair (CERC) in Water Security.

The Institute coordinates research efforts of more than 100 faculty and senior government scientists and fosters research collaboration across the university and with key Federal,



Provincial and industrial partners. Located in one of the world's most rapidly warming environments, we are able to observe and model the profound changes taking place around us. From this base we are addressing regional and global challenges of Water Security, including the sustainable use and protection of water resources and protection against water-related hazards such as flooding and drought. The Institute works to ensure that society globally has the understanding and the tools to sustainably manage and protect the world's water resources and that Canada has the research and expertise needed to understand and manage its water systems in this era of rapid societal and environmental change.

Through the CERC research program, U of S researchers have developed new in-depth knowledge of water issues locally and globally, addressing the unprecedented challenges faced in rapidly warming cold regions. A special focus has been the two large river basins that dominate the interior of western Canada, the Saskatchewan and the Mackenzie River Basins. We have used new experimental, modelling and remote sensing approaches to understand, diagnose and predict changing land, water and climate in these major river basins, addressing drought and flood risk, competing societal water uses, and water quality challenges.

A major development in 2016 has been the award of a \$77.8 million grant from the Canada First Research Excellence Fund (CFREF) to lead "Global Water Futures: Solutions to Water Threats in an Era of Global Change", a pan-Canadian transdisciplinary initiative that may be the largest university-led water research program ever funded worldwide. With partner funding, the program budget is \$143.7 million over seven years. GWF involves more than 380 Canadian

university researchers at 18 universities, 19 federal and provincial agencies, seven Indigenous communities and governments, 39 industrial collaborators, 15 non-governmental agencies, and 45 international research institutes. Our researchers will also work with UNESCO, the World Climate Research Program and Future Earth, to develop the tools and models to mitigate water disasters, protect the environment and take advantage of economic opportunities.

2017 marks the end of my 7 years as CERC, and the CFREF award is a springboard to a new era of national and global achievements, so I made a personal decision this year to pass on the leadership of this remarkable program to the next generation at UofS. I am delighted that John Pomeroy, Canada Research Chair in Water Resources and Climate Change, took over the director's role for GWF in October; I will stand down as Director of the Global Institute for Water Security on March 31, 2018. Administrative leave next year will enable me to devote more time to international work, but I will continue to provide strategic support to John, who has served as GWF co-director over the past year, as well as advice to the GWF team and my graduate students.

GIWS has come a very long way since its foundation in 2011, and we are proud of our achievements thus far. None of this would have been possible without the far-sighted support of our major sponsors, the Canadian Government, through the Canada Excellence Research Chair program and the Canada First Research Excellence Fund (CFREF), the Province of Saskatchewan, and the UofS. They have provided a unique set of opportunities, enabling us to build a remarkable program to serve Canada and the global community. I would also like to record my personal thanks to the many people who have made by time at UofS so productive and memorable. These are too many to list, but I have had unprecedented support from my mentor and guide, Karen Chad, Vice-President Research, the UofS Presidents and senior management, from my academic colleagues, and the GIWS staff and students who have made all this happen. I am most proud of our new and outstanding young Faculty, appointed through the CERC and now the CFREF programs, who will take this work forward for future academic generations.

We hope you that will enjoy reading about our work, and our team of students and researchers. And as my close colleagues Jeff McDonnell, Associate Director GIWS and John Pomeroy, Program Director GWF-CFREF, note, we very much welcome interest in our work and have many opportunities for collaboration and recruitment.

Professor Howard Wheater, FREng Director, Global Institute for Water Security, Canada Excellence Research Chair in Water Security Founding Programme Director, Global Water Futures

ASSOCIATE DIRECTOR'S MESSAGE

Welcome to the 2017 University of Saskatchewan's Global Institute for Water Security report. I echo both Howard and John's messages of hope and optimism for the future. We have a number of water faculty searches currently underway. The hydrological landscape on the UofS campus is looking stronger and stronger. Of course, the Global Water Futures project is a massive undertaking and with John now as the project lead, we're all behind him 100%. We're very proud of our commitment to graduate student and postdoctoral training in water security. In 2017 the GIWS continued to lead the Fall term monthly 'Post Doc Mentoring Lunch' and together with Maureen Reed, the annual 'Launching an Academic Career' short-course. The CREATE



Program in Water Security, led by Cherie Westbrook is now well underway with a cohort of outstanding students this year. We have a new group of students too in the project-based Masters in Water Security. Our Distinguished Lecture series continued in 2017 with visits from world leaders in water security research, including: Bill Dietrich (UC Berkeley), Tim Burt (Durham University), Scott Tyler (University of Nevada-Reno), Roy Brouwer (University of Waterloo), Kathleen Weathers (Cary Institute), Yin Fan Reinfelder (Rutgers University), <u>Ximing Cai</u>, University of Illinois and Barbara Sherwood-Lollar (University of Toronto). These lectures are viewable at https://www.usask.ca/water/lecture-series.php

The GIWS continues to be a hub for researchers internationally—in 2017 we hosted visits from scientists from The Netherlands (M. Coenders, TU Delft; P. Kraaijenbrink, Utrecht University), Chile (L.M. Rmoero and Y. Videla Giering, University of Chile), China (Z. Li, NW Agricultural and Forestry University; J. Guo and M. Li, Shanxi University; Nanjing University, Xiamen University, and the Chinese Academy of Environmental Research), Colombia (P.F.A. Obando, National University of Colombia), UK (S. Sowat University of Edinburgh), USA (M. Bartlett, Duke University; L. Peskett, University of Southern California; N. Wayand, University of Washington) and a delegation from China, including Chunhong Hu (China Institute of Water Resources and Hydropower), Chunmiao Zheng (Southern University), Yuchun Wang (China Institute of Water Resources and Hydropower Research) and Fuqiang Tian (Tsinghua University).

We are tackling some of the world's biggest water security challenges Together with our research staff and our many international partners. We invite you to come and be a part of our team—as a visiting scientist, sabbatical visitor or student intern.

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Professor Jeffrey J. McDonnell, FRSC Associate Director, Global Institute for Water Security

MESSAGE FROM THE DIRECTOR GLOBAL WATER FUTURES PROGRAMME

Welcome! It is with excitement, gratefulness, anticipation, some trepidation and great optimism that I write to you as the new Director of the Global Water Futures (GWF) Programme.

Excitement because of the tremendous advances we have made during the first year of GWF, such as establishing the GWF Secretariat and launching 33 pan-Canadian research projects. There is just as much excitement for year two, as we roll out the Core Programmes in observations, modelling, knowledge mobilisation and computer science.

Gratefulness for our substantial funding, the remarkable team of researchers and partners and the foresight, scientific vision, and steady hand that Professor Howard Wheater has provided to all of us in designing



and launching GWF over its first year. I am also grateful for the steadfast support and guidance from Dr. Karen Chad, Vice-President Research, University of Saskatchewan, and the Vice-Presidents of research at the University of Waterloo, Wilfrid Laurier University and McMaster University, who have worked so well together. This partnership is critical to GWF, and will bring many campus communities together through our shared vision.

Anticipation in light of the remarkable, innovative plans that we are developing for understanding, measuring, managing, conserving and predicting Canada's water and enhancing our water security. The comprehensiveness of GWF research is exemplary and the new drone, sensor and modelling technology is stunning. GWF is the largest and most comprehensive university-led water research project in the world and with an unprecedented and multi-faceted research programme, will have much to offer our common understanding and capability to manage our water future.

Trepidation because we live in a time when dramatic climate change and development are threatening our water security and the environmental health of our blue planet. We will be surmounting great challenges in addressing complex and unprecedented water issues over the next six years.

Optimism because looking to the future, we will stay on track with GWF's objectives, to improve disaster warning, better predict water futures and inform adaptation and risk management. This unprecedented programme is poised to make significant scientific contributions nationally and globally.

It is the best of times to be a water scientist at the University of Saskatchewan and our future is bright. With GWF, we can offer substantial new scientific knowledge and capability to humanity as we all work to better predict and manage our common water futures.

Sincerely,

Professor John Pomeroy Canada Research Chair in Water Resources and Climate Change Director, Global Water Futures Programme Director, Centre for Hydrology

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EXECUTIVE SUMMARY

This report celebrates the remarkable journey and achievements of the Global Institute for Water Security (GIWS) over the last 7 years. From its humble beginning in March 2011 with support from the Canada Excellence Research Chair (CERC) in Water Security funding to Prof. Howard Wheater - a federal-provincial-university partnership with base funding of \$30 million over seven years - to winning the prestigious \$77.8 million Canada First Research Excellence Fund in September 2017, the GIWS has made significant contributions to water science to ensure that society has the understanding and the tools to sustainably manage and protect the world's water resources and ensure that Canada, and the world, has the research and expertise needed to understand our water systems in an era of rapid societal and environmental change. During this period, GIWS/CERC have created 14 new faculty positions at the University of Saskatchewan (UofS) to advance the signature area of Water Security.

GIWS was created to provide: a) a vehicle for the new disciplinary and trans-disciplinary science needed to address the local, regional and global challenges of water security (and specifically the Canada Excellence Research Chair (CERC) programme), and b) a platform and focus for the UofS signature area of water. The institute combines expertise in natural, health and social sciences, public policy and engineering, recognizing that people and their activities are of critical importance for water science and management.

GIWS aims to be a global leader in Cold Region water science and focuses its efforts through seven research themes: Climate Change and Water Security; Land-Water Management and Environmental Change; Sustainable Development of Natural Resources; Socio-hydrology, Water and health, Water and Wastewater Treatment Technologies, and Groundwater and Hydrogeology. We have developed new, internationally recognized research facilities, have taken on important national and international science leadership roles, attracted substantial additional research funding, and are now delivering the exciting science that was foreseen at the programme outset.

Some of the performance indicators of our success are as follows:

 International Leadership: GIWS is the host of the World Climate Research Programme's (WCRP) only *Regional Hydroclimate Project* in North America – Changing Cold Regions Network (CCRN) and also hosts the WCRP's *Global Hydroclimate Project* & UNESCO's International Hydrological Programme - International Network for Alpine Research Catchment Hydrology (INARCH). In addition, GIWS is the Canadian node for the Sustainable Water Futures Programme with the Future Earth. Recently, GIWS-UofS has been included as a new member with the University Consortia for Atmospheric Research (UCAR) to train the next-generation workforce and collaborate with partners in government and the private sector to advance our understanding of the Earth system for the betterment of society

- National Leadership: GIWS/CERC leads the \$5M five year (2013-2018) NSERC's changing Cold Regions Network (8 universities, 4 Federal agencies). It has brought the water community in Canada together through leadership of the \$143M seven year (2016-2023) Canada First Research Excellence Fund national water program "Global Water Futures – Solutions for Water Threats in an Era of Global Change" (total 157 partners, including 8 Federal Government Agencies, 39 Provincial Government Agencies, 45 international institutions, 34 industries, and 388 researchers from 17 Canadian universities).
- Institutional leadership: With \$30M CERC investment (2010-2017), CERC founded the GIWS, which integrates expertise of 254 members (including 72 researchers, 9 Canada Research Chairs, and 4 Industry Research Chairs) from 21 academic units at the UofS.
- Large-Scale Observatories and Major Facilities: The CERC/GIWS has successfully established the following large-scale observatories and major facilities of national and international significance:
 - Saskatchewan River Basin (410,000 km²; includes research sites in the Rocky Mountains, Boreal Forests, Prairies and the Saskatchewan River Delta)
 - Mackenzie River Basin (1.8 million km²)
 - o Autonomous and Airborne Cold Regions Innovation Facility
 - Mine Overlay Site Testing Facility
 - o The Ultrahigh Resolution Mass Spectrometer Facility
- **External Leveraged Funding:** In six years (2010-2017), from an investment of \$30 million the GIWS has leveraged an additional \$249.6 million in external funding to advance water research and training of highly qualified personnel.
- **Training:** GIWS/CERC established a new professional Master of Water Security graduate programme and developed the NSERC CREATE in Water Security graduate programme.
- Professional Development: The following professional development activities have been established to provide graduate students and postdoctoral fellows with skills for their career development: 1) Annual short-course for doctoral students and postdoctoral fellows "Launching an Academic Career" by creating their own research brand and orchestrating a power research group; 2) "Post Doc Mentoring Lunch" where GIWS faculty actively address mentorship issues, 3) The GIWS Distinguished Lecture Series, "Breakthroughs in Water Security Research" brings 11 international world-leading scientists to Saskatoon each Fall for lectures, tutorials and workshops.
- **Quality of Trainees:** Over the period 2010-2015, 48 GIWS trainees (53% of PDFs) have accepted faculty appointments or research positions in 18 countries.
- **Knowledge Dissemination:** From 2011-2017, the GIWS team has published 1265 journal articles, and 67 books/book chapters, contributed 973 conference papers, and presented and delivered more than 542 invited, key-note and plenary lectures.

- Building capacity: From 2010-2017, GIWS has trained:
 - 429 Graduate Students: Funded by CERC 117 (40 PhD and 77 Masters); additional students trained by GIWS members 312 (96 PhD and 216 Masters)
 - 117 Postdoctoral Fellows: Funded by CERC 71; by GIWS members 47
 - 97 Research Associates & Research Scientists: Funded by CERC 49; by GIWS members 48
 - o 146 Research Technicians: Funded by CERC 64; by GIWS members 82
 - o 338 Research Assistants: Funded by CERC 167; by GIWS members 171
 - 184 Visiting Scholars: Funded by CERC 140; by GIWS members 44
- **Recognition:** It is noteworthy that GIWS members sit on the advisory panels for the world's two leading water prizes (Stockholm Water Prize and Prince Sultan Bin Abdulaziz International Prize for Water), and include four Fellows of the Royal Society of Canada, three Fellows of the American Geophysical Union, one Fellow of the Royal Academy of Engineering, the winner of the 2017 J.Tuzo Medal, the winner of the 2016 IAHS-UNESCO-WMO Dooge Medal for Hydrology, as well as the current president of the American Geophysical Union's 7500-member Hydrology Section, the world's leading scientific hydrology organization.

1. Change of an Era for the Global Institute for Water Security

This report marks the conclusion of the 7-year Canada Excellence Research Chair (CERC) in Water Security programme that founded the Global Institute for Water Security (GIWS). It also marks the end of an era that brought the University of Saskatchewan (UofS) to the forefront of Canadian water science and established it as one of the leading water research institutions globally. From the launch of GIWS in March 2011, with a \$30 million CERC grant, to a remarkable \$249.6 million research programme by June 2017 has been an incredible journey. A journey that saw an exponential growth in its stature, and in the recruitment and training of highly qualified personnel including 426 graduate students, 116 postdoctoral fellows, 97 research associates and scientists, and 388 research assistants. The inception and implementation of the 7-year Global Water Futures – Solutions for Water Threats in an Era of Global Change (GWF) programme funded by the Canada First Research Excellence Fund (CFREF) in September 2016 marks the beginning of a new era that builds on a strong foundation created by the CERC programme.

Prof. Howard Wheater, a world-leading expert in hydrology and sustainable water resource management was the CERC in Water Security (2010-2017) and the founding director of the GIWS (2011-2018). In addition, he was the programme director for the GWF and led the GWF from inception to implementation until September 2017. He is also currently the principal investigator

for the Changing Cold Regions Network (CCRN) funded by the Natural Science and Engineering Research Council (NSERC) of Canada (2013-2018).

Prof. Wheater's legacy to UofS and Canada as a CERC in water security has included the recruitment of 14 new faculty positions at the UofS (an additional 12 faculty positions will be appointed at University of Waterloo, Wilfrid Laurier University and McMaster University), and the inception and implementation of the GWF programme, which has brought the



Prof. Howard Wheater receiving the University of Saskatchewan 2017 Distinguished Researcher Award from Prof. Karen Chad, Vice-President Research

water community in Canada together for a seven year (2016-2023) national water programme, comprising a total of 157 partners, including 8 Federal Government Agencies, 39 Provincial Government Agencies, 45 international institutions, 34 industries, and 388 researchers from 17 Canadian universities. It is estimated that the GWF programme will train more than 750 highly qualified personnel by 2023. The following timeline chart shows the sequence of achievements of the GIWS and CERC programme since September 2010 to-date.



This report celebrates the achievements of the CERC and GIWS, with particular emphasis on the following programmes:

- 2010–2017: \$30 million CERC in Water Security programme
- 2013–2018: \$5 million NSERC-CCRN
- 2016–2023: \$143 million GWF programme funded by the CFREF
- 2011–Ongoing: Water Security for Indigenous Communities

2. Canada Excellence Research Chair in Water Security

Prof. Howard Wheater moved to the University of Saskatchewan from Imperial College London in 2010 to take up the CERC in Water Security, funded through a \$30 million, 7 year federal-provincial-university CERC grant.

Key drivers for the CERC programme were the recognition that in the 21st Century, Canada and the world face immense challenges of water security. Locally and globally there are increasing risks from water-related hazards and increasing pressures on the water environment, from population growth, socio-economic development and environmental change. New disciplinary and trans-disciplinary science is urgently needed to address pressing local, regional and global needs. Prof. Wheater launched the Global Institute for Water Security (GIWS) in March 2011 as a vehicle for new science and new disciplinary integration, building on a rich history of water research at UofS, the existing expertise of more than 100 Faculty and senior scientists, and the co-location of Environment and Climate Change Canada's National Hydrology Research Centre. GIWS combines expertise in natural, health and social sciences, public policy and engineering, recognizing that people and their activities are of critical importance for water science and management.

GIWS aims to be a global leader in Cold Region water science and transdisciplinary water research. It has developed new, internationally recognized research facilities, taken on important national and international science leadership roles, attracted substantial additional research funding, and has begun to deliver the exciting science that was foreseen at the programme outset. It has transformed the research environment in Canada, and leads for the first time integrated large scale pan-Canadian research to meet national and global challenges.

Nationally, the CERC currently leads the \$5 million five year (2013-2018) NSERC's changing Cold Regions Network (8 universities, 4 Federal agencies) and has brought the water community in Canada together through his leadership of the \$143.7 million seven year (2016-2023) GWF-CFREF.

Internationally, GIWS leads the World Climate Research Programme's (WCRP) only *Regional Hydroclimate Project* in North America – based on the Saskatchewan and Mackenzie River Basins through the Changing Cold Regions Network (CCRN) – and the International Network for Alpine Research Catchment Hydrology (INARCH), supported by the WCRP's *Global Hydroclimate Project* & UNESCO's International Hydrological Programme. In addition, GIWS is the Canadian node for Future Earth's Sustainable Water Future Programme.

Research outputs have already delivered real benefits to Canadians. Through investment in large scale observatories, basic science and new generation modelling tools, we have improved understanding of historical change and 21st Century water futures in western Canada. Our high

resolution atmospheric models provide wholly new insights into future climate and extreme events. We have developed the first flood forecasting model for the Yukon and, working with Environment and Climate Change Canada (ECCC), will shortly launch new flood and seasonal forecasts for the Saskatchewan River Basin (SaskRB). We have developed the first water quality model for the South Saskatchewan River and Lake Diefenbaker. We are providing real time warning to water utilities so they can better manage threats to drinking water from algal blooms. We are working with farmers to improve agricultural efficiency through better management of nutrients and land drainage, and working with indigenous communities in the river deltas of western Canada to understand the effects of upstream management and environmental change on livelihoods and ecosystems. We are paving the way for transformative changes to our ability to monitor the natural environment and provide new data to user communities. Our work with NASA, currently in the North Saskatchewan River, will ultimately allow us to measure water levels globally from space. Our drone research will provide high resolution data on snowpacks to enhance forecasting capability. Our work on eDNA (environmental DNA) uses genetic fingerprinting to transform our understanding of the resilience of aquatic ecosystems and, with a single water sample, to detect the presence of invasive species.

Our future depends on the next generation of scientist and practitioners. CERC/GIWS has therefore developed two important new strategic educational initiatives in graduate education and training: 1) The NSERC *Collaborative Research and Training Experience (CREATE) Program in Water Security,* which commenced in September 2015 stimulates research Masters and PhD students to integrate science, engineering, and policy as they address current and future challenges in complex water systems. 2) Beginning in 2016, we are offering an innovative one-year professional Master of Water Security graduate program that provides intensive cross-training to build disciplinary and interdisciplinary expertise for research and practice.

2.1 Research Themes

The area of water security research is broad. To guide our efforts, and based on our current research strengths, we have identified a set of seven inter-disciplinary research themes, recognizing the need for deep disciplinary knowledge and the broader disciplinary dimensions of water security, and addressing challenges of local, regional and global significance.

These themes are supported by fully instrumented research observatories within SaskRB providing data of regional and global significance. Due to the importance of, and diversity in, its cold region hydro-climate and ecological zones, the rapid rate of environmental change and the need for improved understanding, diagnosis and modelling of change, the basin also raises numerous globally-relevant science challenges.

Themes 1 to 3 were initiated with funding through the CERC grant to Dr. Wheater. As GIWS has matured, Themes 4 to 7 have been developed to address broader inter-disciplinary issues that focus additional U of S expertise and address other local and global priorities.

2.1.1 Theme 1 - Climate Change and Water Security: Developing sophisticated understanding and modelling of current and future effects of climate change on hydrology, ecology and water resource systems, and the associated land-atmosphere feedbacks.



Video File: Forecasting Extreme Weather Events http://www.usask.ca/water/publications/videos.php

2.1.2 Theme 2 - Land-water Management and Environmental

Change: Exploring the effects of agricultural and urban land and water management on water quality and water movement through a watershed, as well as the potential for agricultural beneficial management practices (BMPs) to mitigate adverse effects.

2.1.3 Theme 3 - Sustainable Development of Natural Resources: Developing new science and management practices that could significantly change the way water is used, how land and water are managed, and how environmental risks are assessed and managed in natural resources development.

2.1.4 Theme 4 - Socio-hydrology: This program encompasses both the human drivers of hydrological change and the social processes through which hydrological science is translated and communicated to relevant decision-makers.

2.1.5 Theme 5 - Water and Health: We are looking at issues that are critical to



Video File: Socio-Hydrology

society, such as drinking water quality, water hygiene and sanitation, transmission of waterborne and water-related diseases in an ecosystem, aquatic pollution and effects on the food chain, wastewater re-use, extreme events such as flooding and drought, and health-based water quality standards.

2.1.6 Theme 6 - Water and Wastewater Treatment Technologies: We are assessing impacts of contaminants on environmental and human health by addressing challenges that include appropriate technology for rural communities, development of advanced water treatment technologies to tackle emerging contaminants in our water systems, improved technologies for the treatment of industrial wastes, including those generated by natural resource extraction, and improved technologies for remediation of pollution.

2.1.7 Theme 7 - Groundwater and Hydrogeology: This theme is exploring major challenges to quantify the extent of groundwater resources and their quality, the natural recharge, the long–term impacts of abstractions and waste disposals, the impact of resource development, and hence to provide the information needed for sustainable development.

2.2 Saskatchewan River Basin

GIWS has established the Saskatchewan River Basin (SaskRB; 410,000 km²) as a large scale observatory, which has come to be seen as an internationally-leading initiative. The multiple dimensions of water security and the accompanying science and management challenges, ranging from issues of water quality and quantity, anthropogenic activites, competing societal uses, industrialization, agricultural intensification, extreme weather events (flooding and

drought), etc. are all represented in the SaskRB. The basin, with an area approximately half the size of France, spans Canada's three Prairie Provinces of Alberta, Saskatchewan and Manitoba and faces a climate characterized by extremes and rapid climate change. Further, the basin encompasses critical environments deemed significant both nationally and globally.



2.2.1 Canadian Rockies Hydrological Observatory: In Western Canada the availability of water is dependent upon cold water processes involving snow, glaciers, wetlands and frozen soils that control the storage and delivery of water to river systems. The Canada Foundation for Innovation (CFI) -funded Canadian Rockies Hydrological Observatory includes Marmot Creek in the subalpine and montain forested Saskatchewan River headwaters, Lake O'Hara alpine sites and the Natural Resources Canada (NRCan) -funded Columbia Icefield Glacier-Climate Observing System in the glaciated Athabasca headwaters, Alberta. This provides a cluster of >25 high elevation snow/ice and hydro-meteorological stations in nested gauged catchments. Unique observations of alpine and sub-alpine sub-surface storage and release are available from Lake O'Hara and Marmot Creek. Alpine treelines in this area are advancing in elevation stations for flood forecasting, climate and fire prediction are clustered at both high and low elevations in the region. The archive for Marmot Creek covers most of 50 years. Sibbald Wetlands is the focus of hydro-ecological research into Rocky Mountain wetlands and the effects of current and legacy beaver activity¹.

2.2.2 Boreal Forest: Key shortterm objectives of research conducted at Boreal Forest sites are to assess the vulnerability of ecosystem response to climate



Video File: Canadian Rockies Hydrological Observatory http://www.usask.ca/water/publications/videos.php

variability and change, and the performance of land surface schemes for simulating hydrological processes in the Boreal Forest. Longer-term objectives are to synthesize, integrate and upscale hydro-ecological understanding of stand-scale processes to watershed scales. The western boreal

forest study area traverses the latitudinal and altitudinal extents of boreal forests in Canada and the range of permafrost conditions across which these forests exist (non-permafrost through to deep, continuous permafrost). Western permafrost-free boreal sites include the Boreal Ecosystem Research and Monitoring Sites (BERMS) in Saskatchewan that



Video File: Boreal Forest http://www.usask.ca/water/publications/videos.php

derive from the mid-1990s NASA-Canada Boreal Ecosystem-Atmosphere Study (BOREAS) and were subsequently expanded to the Environment Canada (EC) BERMS Programme. These sites in the Boreal Plains ecozone are characterized by heterogeneous forest types interspersed with wetlands and frequent wildfire disturbance, and include Black Spruce, Aspen, Jack Pine and Fen. Additional data sources in this region include Northern Alberta flux tower sites, developed in collaboration with the Oil Sands industry, as well as provincial and federal observation stations for climate and fire prediction.

2.2.3 Prairies: The prairie hydrology is complex and presents a unique set of challenges including the effects of changing climate on agriculture, flood and drought risk, and water quality. In

¹ Janzen and Westbrook. 2011. Hyporheic flows along a channeled peatland: influence of beaver dams. Canadian Water Resources Journal, 36(4): 331-347.

addition, land management practices, such as drainage and wetland removal, are changing the landscape and the ecological services that it provides.

The <u>St. Denis National Wildlife Area</u> site comprises internally drained wetlands, cultivated fields and pasture, and consists of numerous prairie pothole lakes of varying salinity. The focus is on runoff processes and pothole lake connectivity, surface-subsurface interactions and salinity dynamics. Brightwater Creek, near Kenaston, Saskatchewan, represents a mesonet site of lowland level pasture and cultivated grasslands. Multi-scale scale monitoring of spatial soil moisture, groundwater and land-atmosphere interactions is ongoing. Specialised soil moisture measurement arrays, cosmic ray soil moisture probes, a geological weighing lysimeter coupled to a network of groundwater observation wells, atmospheric measurements using large aperture scintillometer and Sonic Detection and Ranging (SODAR) and weather radar provide a unique concentration of measurements in a Canadian prairie environment. Hydrological connectivity and the effects of agricultural drainage on flows and water quality is the research focus at Smith Creek, Saskatchewan. The site has demonstrated the dramatic effects of inter-annual climate variability on water quality, and a complex response of flood generation and transmission to agricultural drainage². The effects of agricultural Beneficial Management Practices (BMPs) on flows and water quality, particularly those associated with changing tillage practices and on-farm reservoirs, are explored at Tobacco Creek, Manitoba. The Swift Current research site in Saskatchewan is home to AAFC agricultural research runoff plots. Thorough analysis of high frequency, long-term data, experimental monitoring of the surface hydrology and hydrological model building and testing are conducted at this site to improve understanding of the fundamental drivers of threshold-like hydrological runoff responses to snowmelt and rainfall events in a semi-arid, prairie landscape. Similarly, at semi-arid West Nose Creek site in Alberta, the studies are focused on groundwater recharge, groundwater hydraulics, surface- groundwater interaction, snow hydrology, and sustainable watershed management. At the Rosthern research site in Saskatchewan, the effect of agricultural practices such as stubble height on prairie snow dynamics, melting, and management is studied.



Video File: St. Denis National Wildlife Area



Video File: Brightwater Creek

² Shook and Pomeroy. 2011. Memory effects of depressional storage in Northern Prairie hydrology. Hydrological Processes, 26: 1752-1766



Video File: Swift Current Research Site

Video File: Rosethern Research Site – Prarie Hydrology

http://www.usask.ca/water/publications/videos.php

Research to explore water quality issues in the basin spans the study of the winter biogeochemistry of lakes to the monitoring of pharmaceutical products and heavy metals in urban wastewater and storm water. The first major study of pollutant loads and their ecological impacts for the South Saskatchewan River, Lake Diefenbaker and its tributary, Swift Current <u>Creek</u>, is underway. This project brings together researchers from the U of S (Biology, Toxicology, Geography, Civil and Geological Engineering, the Schools of Environmental and Sustainability and Public Health), Environment and Climate Change Canada and the Saskatchewan Water Security Agency. Lake Diefenbaker is more than 200 kilometers long and plays a major role in the economic and social development of a large proportion of the province. However, the capability of the reservoir to continue to provide water of reasonable quality under rapid economic development and under a changing climate is unknown given nutrient loads and increasing evidence of eutrophication. A comprehensive evaluation of the sensitivity of the reservoir to current and future nutrient inputs includes limnology, paleo-limnology, toxicology and hydrodynamic water quality modelling. A similar study has been initiated for Buffalo Pound Lake, including real-time water quality monitoring to support treatment of this major source of drinking water for the cities of Regina and Moosejaw, Saskatchewan.



Video File: Lake Diefenbaker

Video File: Buffalo Pound



Video File: Lake Diefenbaker – Toxicology & Water Quality



Video File: Swift Current Creek – Urban Municipal Drainage



Video File: Sediment and Nutrient Transport Modelling http://www.usask.ca/water/publications/videos.php

2.2.4 River Deltas: The Saskatchewan River, Peace-Athabasca, and Slave River deltas are biologically diverse and complex systems of rivers, lakes, and wetlands and are part of the <u>Delta</u> <u>Dialogue Network</u> (DDN). These deltas support a range of fish, wildlife, bird, and plant species. The ecological changes in these deltas are often an indicator of issues arising in our river systems; if there are problems, people in the delta are often the first to notice. These deltas continue to play an important role in supporting traditional, subsistence, and cultural activities of the Aboriginal peoples who have occupied these regions since time immemorial. Historically, inland deltas were also a central part of the fur trade industry³.

Located near the Saskatchewan/ Manitoba border, the Saskatchewan River Delta is a complex series of abandoned and active river channels, lakes and wetlands. Home to Cumberland Marshes, which has been designated as an Important Bird Area, this region experiences the accumulated effects of upstream water use, including abstractions and power generation. Since the beginning of the last century, annual discharge has been reduced by approximately 30%. In addition, winter base-flow is now higher and spring freshets have been dampened due to storage in upstream reservoirs. Experts in climate, hydrology, ecology and social science are addressing the cumulative repercussions of these changes in flow for the production of fish, water-birds and

³ http://www.usask.ca/research-groups/ddn/index.php

mammals, and for the activities and livelihoods of local communities. The aim of this research is to develop scenarios and an operational plan to provide for sustainable hydropower output without endangering the Delta habitat in the long-term.





Video File: E.B. Campbell Dam – Saskatchewan River Delta

Video File: Delta Dialogue Network

http://www.usask.ca/water/publications/videos.php

Working with local communities and the Slave River and Delta Partnership (SRDP), the <u>Slave</u> <u>Watershed Environmental Effects Program</u> (SWEEP) is establishing a community-based monitoring program. This program will empower communities to assess impacts to water quantity and quality in the Slave River Delta, monitor future changes, and collect information that can inform management decisions. A system of environmental indicators that incorporate both western science and Traditional Knowledge will address key community priorities, including water quality, hydrology and sediment load, air and climate, vegetation, and health of wildlife, fish, and insect populations.

One of the primary concerns in the Peace-Athabasca and Slave River deltas is understanding what factors are contributing to the changes in the delta that people are seeing. A decreasing number of annual floods and lower water levels are especially important, given their ecological and social role in the region. In response to this concern, we are working to understand how water flow is changing in the Peace-Athabasca-Slave catchment area. By modelling both natural and regulated

river flow scenarios, this project will provide insight into what the influence of climate change and the Bennett Dam have been on water flow in the area. In addition, another component of this project will examine whether or not there will be severe enough ice jams to flood the Slave River Delta and maintain delta ecology. It will also look at what changes in vegetation have occurred in the delta.



Video File: Modelling Riverine Processes http://www.usask.ca/water/publications/videos.php

3. Changing Cold Regions Network

GIWS interdisciplinary research in the SaskRB has been complemented by the <u>Changing Cold</u> <u>Regions Network</u> (CCRN) project, with a focus on changing climate, cryosphere, hydrology and ecosystems and expansion of geographical scope to include the Mackenzie River Basin (MRB; 1.8 million km²). The CCRN is led by Howard Wheater, CERC in Water Security, and brings together 42 Canadian co-Investigators, 4 Federal government agencies and 15 leading international

researchers. The overall aims of CCRN are to understand, diagnose, and predict changing land, ecosystems, water, and climate, and their interactions and feedbacks over western Canada's cold interior. This includes developing improved land surface and hydrological models for cold regions. We use a network of 14 intensely instrumented Water, Ecosystem, Cryosphere, and Climate (WECC) observatories representing the key biomes to study detailed



processes and linkages, and we are working to better understand the changing regional climate and its effects on large-scale Earth system change and the region's major river basins. Our programme is divided into five major thematic components: Theme A, Observed Earth System Change in Cold Regions – Inventory and Statistical Evaluation; Theme B, Improved Under-standing and Diagnosis of Local-Scale Change; Theme C, Upscaling for Improved Atmospheric Modelling and River Basin-Scale Prediction; Theme D, Analysis and Prediction of Regional and Large-Scale Variability and Change; and Theme E, Outreach and Engagement. Further details can be found at www.ccrnetwork.ca/science.

The CCRN is one of ten Regional Hydroclimate Projects of the World Climate Reasearch Programme's Global Energy and Water Exchanges (GEWEX) project – the only current one in North America. CCRN has an active research partnership with the US National Centers for Atmospheric Research (NCAR) and is also supported by and linked to Climate and Cryosphere (CliC) projects, to the Canadian High Arctic Research Station (CHARS) programme and integrated within NASA's Soil Moisture Active Passive (SMAP), Airborne Microwave Observatory of Subcanopy and Subsurface (AirMOSS), and Arctic Boreal Vulnerability Experiment (ABOVE) arctic programmes.

Key science and outreach highlights from the past year include:

- A synthesis of conceptual understanding of future Earth system change across western Canada has led to the development of scenarios of change to inform model application to simulate regional and local response to future climate. This was a key focus at a scenarios of change workshop in March (<u>http://ccrnetwork.ca/science/workshops/scenarios-of-change</u>) and the work is being written up as a two-part manuscript for a special issue of the journal Hydrology and Earth System Sciences (HESS)—see below.
- Fine scale model advancements have included improvement in process representation within the Cold Regions Hydrological Model (CRHM; <u>www.usask.ca/hydrology/CRHM.php</u>), and enhanced computational efficiency and landscape representation within the next generation Canadian Hydrological Model (CHM; <u>http://ccrnetwork.ca/science/workshops/summer-</u><u>2017-modelling-workshop/files/marsh ccrn modelling2017.pdf</u>)</u>, both developed at the University of Saskatchewan's Centre for Hydrology. CRHM has been set up and applied at selected WECC observatories for long-term historical runs and diagnosis of hydrological change. Some of this work has been recently published (Cordeiro et al., 2017⁴; Mahmood et al., 2016⁵; Krogh et al., 2017⁶) and further papers are in development.
- We have made major advancements in regional climate, land surface, and hydrological model development and applications. This work has involved close collaboration and a strong partnership with Environment and Climate Change Canada (ECCC) to incorporate improvements in research and operational models. Our main focus is the ECCC Canadian LAnd Surface Scheme (CLASS), Modélisation Environmentale Communautaire (MEC) -Surface and Hydrology (MESH), and Canadian Terrestrial Ecosystem Model (CTEM) models. The main effort has concentrated on developing improved large-scale MESH models of the Mackenzie and Saskatchewan River systems, and within this, improving the representation of processes such as permafrost, wetlands, hydrodynamics and large lakes, and snow processes, and also exploring ways of better handling spatial discretization (especially in mountainous terrain) and the effects of water management—CCRN is strongly linked to a GEWEX cross-cut project on including water management in large scale models. We have working models in place for both major basins and are in the midst of running future climate simulations and incorporating scenarios of landscape and ecological change. These activities detail at a discussed in were reviewed and recent modelling workshop (www.ccrnetwork.ca/science/workshops/summer-2017-modelling-workshop).

⁴ Cordeiro, M. R., Wilson, H. F., Vanrobaeys, J., *Pomeroy, J. W.*, & *Fang, X.* (2017). Simulating cold-region hydrology in an intensively drained agricultural watershed in Manitoba, Canada, using the Cold Regions Hydrological Model. *Hydrology and Earth System Sciences*, *21*(7), 3483, doi:10.5194/hess-21-3483-2017

⁵ Mahmood, T. H., Pomeroy, J. W., Wheater, H. S., & Baulch, H. M. (2016). Hydrological responses to climatic variability in a cold agricultural region. Hydrological Processes, <u>doi: 10.1002/hyp.11064</u>

⁶ Krogh, S. A., Pomeroy, J. W., & Marsh, P. (2017). Diagnosis of the Hydrology of a Small Arctic Basin at the Tundra-Taiga Transition using a Physically Based Hydrological Model. *Journal of Hydrology*, <u>doi: 10.1016/j.jhydrol.2017.05.042</u>

- In association with the above work, we have set up and run the US National Center for Atmospheric Research Weather Research and Forecasting (WRF) model over our domain and generated high-resolution (4 km), convection-permitting climate simulations for 2001–2015 as well as pseudo-global warming simulations under RCP8.5 for 2086–2100. This provides unprecedented high resolution climate information for running surface hydrological models and gives important insights on precipitation extremes. More information is at www.ccrnetwork.ca/science/PGW.
- We have focused on in-depth analyses of recent extreme events in western Canada. This includes the 2013 Calgary flood (<u>http://ccrnetwork.ca//science/2013-Alberta-flood</u>), summer flooding in the prairies (<u>http://ccrnetwork.ca//outputs/information-products/2014-assiniboine-flood</u>), severe dry conditions in 2015 (Szeto et al., 2016⁷) and 2017, extreme wildfires (Northwest Territories (2014), Saskatchewan (2015), Fort McMurray (2016), British Columbia and southern Alberta (2017), and more). This has included analyses from a variety of perspectives (climate, ecology, hydrology, modelling, etc.) and scales (continental to regional and local).
- CCRN has opened two special issues in the journals Earth System Science Data (ESSD) and Hydrology and Earth System Sciences (HESS). These special issues are important initiatives that aim to pull together our datasets and make them available as a legacy for the network, and to synthesize the recent science advances contributing to CCRN's overall aims and objectives. The special issues are open to all submissions within their scope and welcome related datasets and studies from cold-region environments around the world. More detailed information and links to papers already submitted can be found at www.earth-syst-sci-data.net/special issue901.html and www.hydrol-earth-syst-sci.net/special issue919.html.
- Outreach efforts as part of Theme E have continued, ranging from grassroots level engagement among individual researchers and local stakeholders, to collaboration at senior management levels with our federal provincial, and territorial government partners, and linkage to international initiatives such as GEWEX and the World Climate Research Programme. We have been active in developing science outreach communications for public consumption. These products provide plain language and informative summaries of some of the issues CCRN is addressing, and can be found at

www.ccrnetwork.ca/outputs/information-products.

⁷ Szeto, K., Zhang, X., White, R.E., and Brimelow, J. (2016) The 2015 extreme drought in Western Canada, BAMS. Doi: <u>10.1175/BAMS-D-16-</u> 0147.1

Climate change information: The climate across western and northern Canada has been

warming and showing other clear changes in recent decades. Rising temperature and the loss of cold continue to lead to declining snow and ice cover, thawing of frozen ground, and changes to terrestrial ecosystems and altered water cycling.

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Cold Regions Losing Cold (+6.5 degrees)

For additional information please contact Chris DeBeer, Science Manager at <u>chris.debeer@usask.ca</u> or visit: <u>http://www.ccrnetwork.ca/index.php</u>

4. Global Water Futures: Solutions to Water Threats in an Era of Global Change

In September 2016, the University of Saskatchewan (UofS) was awarded \$77.8 million from the Canada First Research Excellence Fund (CFREF) to lead the "Global Water Futures: Solutions to Water Threats in an Era of Global Change" (GWF) initiative—the largest university-led water research program ever funded worldwide. With additional partner funding, the total program budget is \$143.7 million over seven years. GWF aims to transform the way communities, governments, and industries prepare for and manage water-related risks in an era of unprecedented change.

The UofS-led water research network involves more than 380 Canadian university researchers at 18 universities from a wide range of disciplines who will work with international organizations such as UNESCO, the World Climate Research Programme, and Future Earth in developing the tools and models to mitigate water disasters, protect the environment, and take advantage of economic opportunities.

4.1 The GWF Mission

GWF's overarching goal is to deliver risk management solutions—informed by leading-edge water science and supported by innovative decision-making tools—to manage water futures in Canada and other cold regions where global warming is changing landscapes, ecosystems, and the water environment. Specifically, the GWF mission is to:

- Improve disaster warning—develop scientific knowledge, monitoring and modelling technologies, and national forecasting capacity to predict risk and severity of extreme events;
- Predict water futures—use Big Data to make informed decisions, with better models to assess change in human/natural land and water systems; and
- Inform adaptation to change and risk management—propose governance mechanisms, management strategies, and policy tools to reduce the risk of water threats, design adaptive strategies, and enhance economic opportunities.

GWF will achieve this through three interrelated pillars of activity.

 Pillar 1: Diagnosing and Predicting Change in Cold Regions will deliver transformative, transdisciplinary science on an unparalleled global scale across water, land and air and at the human-water interface. Informed by user needs, this comprehensive scientific approach will lead to a more complete understanding of our ecosystems and provide the necessary data that underpin cutting-edge technologies and forecasting models.

- Pillar 2: Decision Support Systems will create new water, snow and land sensing and modelling systems and deploy them across living laboratories in nature. These systems
- will feed in to our science, dramatically raise our observational power to unmatched levels and lead to the generation of the 'Big Data' required to uncover key insights and support user needs.
- Pillar 3: Designing User Solutions will work with our communities of users to translate decision support systems into user-friendly solutions providing stakeholders with warning systems for impeding climate disasters, predictable water futures for planning and evidencebased decision support for optimal economic and health choices for populations.



4.2 Progress to Date

- GWF has established an 11-member Strategic Management Committee (SMC) composed of representatives from the four institutional partners (University of Saskatchewan, University of Waterloo, McMaster University and Wilfrid Laurier University), two key stakeholders (Environment and Climate Change Canada and Health Canada), and other specialists that ensure a broad representation of disciplines and regions. The SMC is currently chaired by GWF Program Director John Pomeroy. The SMC reports to Karen Chad, U of S Vice-President Research (VPR), who is the formal holder of the \$77.8-million CFREF grant. Chad is advised by an oversight committee, consisting of the four partner university VPRs and Pomeroy.
- The SMC has approved a four-tier funding model for developing GWF research projects:
 - Funding to support core GWF water forecasting and prediction, observational and technical projects that include data management, collecting critical measurements at

observatories and laboratories, knowledge mobilization, and developing enhanced computational methods and user interfaces with complex information;

- Seed funding for workshops to identify disciplinary research needs and opportunities;
- Directed funding to targeted groups to develop transdisciplinary user-led projects in alignment with GWF deliverables; and

- An open call for proposals to identify new opportunities and accelerate research development.
- A \$10-million science budget has been created for disciplinary workshops and research that is transformative in advancing GWF capabilities.
 - A first request for proposals was announced in June 2017. Consequently, 36 LOIs were received. Out of these 22 LOIs were invited to submit full proposal by September 22.
 - The SMC received 16 full proposals asking for a total of \$7.0 million over three years. After a careful review of the proposals by the SMC, in conjunction with comments and advice from international peer reviewers, 14 projects have been approved, with a budget of \$5.8 million. In addition to these projects, 7 smaller pilot and studentship projects have been funded for a total of 21 projects with total funding of \$6.7 million. The final allocation was increased from the \$5.0 million budget envelope originally allocated for this call, given the overall high quality and wide-ranging scope and balance of the proposals received.
- The SMC allocated \$28 million for proposals that address a key focus—engaging with users to develop solutions to user needs through transdisciplinary science.
 - As part of the GWF proposal, 138 letters of support were secured. In November and December, a survey conducted via four consultants provided a user needs report.
 - The SMC issued the request for proposals for "Transformative Solutions to User and Stakeholder Needs" for a budget of \$10 million over three years.
 - The SMC envisions funding trans-disciplinary proposals driven by user needs that could have a regional, river basin or pan-Canadian focus and leverage user support as identified in the user needs report.
 - The available funding is mostly for hiring highly qualified personnel, with the expectation that major equipment purchases will be met from other sources.
 - In November-December 2016, the SMC held information sessions at the four partner institutions to inform researchers of the programme progress, answer questions, and outline the process for developing letters of intent (LOI).
 - On January 30th 2017, a total of 33 LOIs were received for a total funding request of more than \$37 million.
 - The LOIs were carefully reviewed by the SMC in conjunction with independent advice and recommendations from the International Science Advisory Panel (ISAP) against the six criteria outlined in the call for proposals. The SMC accepted the ISAP's recommendations and consequently 14 LOIs were invited to submit full proposals for this round of funding. Given the quality of the LOIs, GWF increased

the total funding envelope from \$10 to \$14 million for this round of funding. 12 projects were ultimately funded - see below.

4.3 GWF Core Modelling and Technical Support

GWF core support provides the necessary underpinning for certain core program objectives and deliverables, specifically:

- National capability for the modelling needed to deliver key programme goals; and,
- Capability for observational science, in particular with respect to key observatories.

GWF also provides core support teams for the programme as follows:

- Knowledge Mobilization Support Team
- Computer Science Team Human Computer Interface and Re-engineering Codes
- Observatories, Observations, and Data Management Team
- Modelling Core Team
 - o Hydrological and Water Quality Forecasting
 - o Climate and Diagnostic Hydrological & Water Quality Modeling
 - o Water Resources Modelling

4.4 Pillars 1-2 Transformative Science, Big Data and Decision Tools

The GWF program has funded 21 research projects under Pillars 1&2 across Canada totalling nearly \$6.6 million over the next three years to tackle some of Canada's most pressing water-related challenges.

These new 21 projects will deliver on two key areas: transformative science to help us understand, diagnose and predict change, and developing new decision support systems using new sensors, analytical procedures, and computer models. These projects will complement the previously funded user-question led Pillar 3 projects, and contribute to a better understanding of snow and rain storms, floods and droughts, how to better measure and manage the quality of source waters, how deep groundwater is affected by the surface, how to improve water governance and even how to encourage global water citizenship. The list is as follows:

- 1. Southern Forests Water Futures, Altaf Arain, McMaster University
- Collaborative Modelling Framework for Water Futures and Holistic Human Health Effects, Lalita Bharadwaj, University of Saskatchewan
- Linking Water Governance in Canada to Global Economic, Social and Political Drivers, Rob de Loe, University of Waterloo
- Old Meets New: Subsurface Hydrogeological Connectivity and Groundwater Protection, Grant Ferguson, University of Saskatchewan

- 5. Omic' and chemical fingerprinting methodologies using ultrahigh-resolution mass spectrometry for geochemistry and healthy waters, **Paul Jones**, University of Saskatchewan
- 6. Evaluation of ice models in Large Lakes using Three Dimensional Coupled Hydrodynamic-Ice Models, **Kevin Lamb**, University of Waterloo
- 7. Short-duration extreme precipitation in future climate, **Yanping Li**, University of Saskatchewan
- 8. Diagnosing policy and governance effectiveness for agricultural water management during times of change, **Philip Loring**, University of Saskatchewan
- 9. Linking stream network process models to robust data management systems for the purpose of land-use decision support, **Bruce MacVicar**, University of Waterloo
- 10. Winter Soil Processes in Transition, Fereidoun Rezanezhad, University of Waterloo
- 11. Global Water Citizenship Integrating networked citizens, scientists and local decision makers, **Colin Robertson**, Wilfrid Laurier University
- 12. Sensors and Sensing Systems for Water Quality Monitoring, **Ravi Selvaganapathy**, McMaster University
- 13. Linking multiple stressors to adverse ecological responses across watersheds, **Mark Servos**, University of Waterloo
- 14. Crowdsourcing Water Science, Graham Strickert, University of Saskatchewan
- 15. Storms and Precipitation Across the continental Divide Experiment (SPADE), Julie Theriault, University of Quebec at Montreal
- 16. SAMMS: Sub-Arctic Metal Mobility Study, Brent Wolfe, Wilfrid Laurier University
- 17. Adaptation governance and policy changes in relation to a changing moisture regime across the southern Boreal Forest, **Colin Laroque**, University of Saskatchewan
- 18. Significance of Groundwater Dynamics within Hydrologic Models, **Walter Illman**, University of Waterloo
- 19. Diagnosing and mitigating hydrologic model uncertainty in high latitude Canadian watersheds, **Tricia Stadnyk**, University of Manitoba
- 20. Hydrological Processes in Frozen Soils, Andrew Ireson, University of Saskatchewan
- 21. Improved Estimates of Wetland Evaporation, Warren Helgason, University of Saskatchewan

In total, 94 researchers from 10 Canadian universities are involved in collaboration with 37 partners including international institutions, government agencies, industry partners, non-governmental organizations, and Indigenous communities. This will also include the hiring of 100 highly-qualified personnel over the next three years. The projects are leveraging the GWF investment of \$6.6 million with an additional \$423,000 in cash and \$3.2 million of in-kind contributions from partners.

4.5 Pillar 3 User Questions-Led Projects

The GWF programme has funded 12 initial research projects across Canada totaling nearly \$16.9 million over the next three years to tackle some of Canada's most pressing water-related challenges.

These include protecting prairie agricultural lands from drought and floods, mitigating algae blooms in lakes, developing new monitoring systems for Canadian watersheds using drones and satellites, using environmental DNA to assess ecosystem health, understanding the impact that changes to mountain snow packs and glaciers will have on drinking water, and co-create Indigenous water-quality tools with First Nations.

Four projects are led by the University of Saskatchewan, three by the University of Waterloo, three by McMaster University, one by Wilfrid Laurier University, and one is jointly led by the University of Manitoba and University of Victoria. The list is as follows:

- Climate-Related Precipitation Extremes, Ronald Stewart, University of Manitoba; Francis Zwiers, University of Victoria
- 2. Northern Water Futures, Jennifer Baltzer and William Quinton, Wilfrid Laurier University
- 3. Next Generation Solutions to Ensure Healthy Water Resources for Future Generations, **John Giesy**, University of Saskatchewan
- 4. Forecasting Tools and Mitigation Options for Diverse Bloom-Affected Lakes, **Helen Baulch**, University of Saskatchewan
- 5. Agricultural Water Futures in Canada: Stressors and Solutions, **Merrin Macrae**, University of Waterloo
- 6. Canada's Boreal Wildlands-Society-Water Nexus, **Mike Waddington**, McMaster University
- 7. Prairie WATERSAVE: Sustainable Water Management for Civic and Provincial Policy Makers and Urban, Rural, and Indigenous Communities, Jeffrey McDonnell, University of Saskatchewan and Chris Spence, Environment and Climate Change Canada
- 8. Integrated Modelling for Prediction and Management of Change in Canada's Major River Basins, **Saman Razavi**, University of Saskatchewan
- 9. Mountain Water Futures, Sean Carey, McMaster University
- 10. Lake Futures Enhancing Adaptive Capacity and Resilience of Lakes and their Watersheds, Nandita Basu, University of Waterloo
- 11. Transformative Technologies for Canadian Water Futures Big Data Platform and "Smart" Watersheds, **Claude Duguay**, University of Waterloo
- 12. Co-creating of Indigenous Water Quality Tools, Dawn Martin-Hill, McMaster University

In total, 117 researchers from 15 Canadian universities are involved in the 12 projects. They are collaborating with 135 partners including international institutions, government agencies,

industry partners, non-governmental organizations, and Indigenous communities. More than 250 highly qualified personnel will be hired for the projects over the next three years.

All of these projects span a wide range of critically important topics related to water issues in cold regions of the world during a time of climate change and the research findings will impact all Canadians.

Canada is experiencing climate change at significant rates and this is affecting everything from melting permafrost, glaciers and snow packs, to increased algae blooms, increased floods and droughts in certain regions, as well as the potential for further disasters such as the recent floods in Ontario and Quebec, the Alberta floods of 2013, and the Fort McMurray wildfires in 2016.

These projects were all selected through an international peer-reviewed process. The \$16.9million investment in the projects has leveraged another \$26.4 million in cash from universities and partners, as well as \$114.8 million in in-kind contributions from partners.

Further information is accessible at: http://www.globalwaterfutures.ca

5. Water Security for Indigenous Communities

Indigenous Communities across Canada, and especially those located in the more northern latitudes and remote locations, have experienced profound change in the ways they coexisted with the land, waterways, and plant and animal life. The change is due to both climate and anthropogenic influences. For example, reduction in snow cover (of up to 2 months), permafrost thaw, and reduction in river ice cover (winter minimum temperatures have increased by 6.5°C) have affected the gathering of food, land access and winter transportation; many of the natural resource extraction operations in northern latitudes have legacy issues resulting in degradation of source water quality affecting the communities living downstream of these activities; lack of infrastructure and proper warning systems have resulted in reduced water treatment capacity and increased drinking water boil water advisories; construction of dams on rivers have resulted in change in flow regimes which have affected the availability of fish, flood events, ice cover and sediment transport with impacts on local flora and fauna; and increase in flood, drought and wildfire events. With such unprecedented change, it is clear that the historical patterns of water availability are no longer a reliable guide for the future. Adaptation to these changes requires new knowledge co-creation (merger of traditional knowledge with western science) to understand the changing earth system (changing climate, land, water and ecosystems and their interactions); new modeling tools that precisely capture these interconnected forces and their societal implications; new monitoring systems with greater capacity to warn of critical environmental changes; and more effective mechanisms to translate new scientific knowledge into societal action but respecting traditional ways of knowledge preservation. Working together to address these challenges can also address an agenda of reconciliation, considering the legacy of cultural and physical discrimination faced by indigenous communities across Canada, empower local communities, and provide educational opportunities relevant to local culture.

Since its inception in March 2011, the Global Institute for Water Security (GIWS) has focused its efforts on regional and national water security issues of global significance, including building relationships with indigenous communities to address their needs. Many challenges arise due to the vastness of the Canadian landscape and lack of data. Water is an important aspect of life and for indigenous people it is a critical part of their culture and in many cases their livelihoods depend on it. The human dimension of water is of strategic relevance to the GIWS, which is reflected in our theme of Socio-hydrology. GIWS always had the understanding of the "Sense of Place", and dedicated significant effort in addressing indigenous water security and social justice issues in Western and Northern Canada. Our efforts lay the foundation for co-creation of knowledge by incorporating traditional knowledge with western science; effective knowledge dissemination by respecting indigenous ways through oral tradition and through cultural expressions such as arts, crafts, and ceremonies and the cultivation, collection, and preparation
of traditional foods; and making significant effort in ensuring sustainability of our research efforts. Below we summarize some of the innovative projects with indigenous communities, to meet their needs and cultural values. These include co-creation of science, social science to address governance and culture challenges, provision of education opportunities, and the use of different artistic and theatrical media to enhance knowledge translation.

5.1 Knowledge Co-Creation and Sustainability of Traditional Knowledge

The very first project undertaken by our institute explored and led by Patricia Gober was titled **"A Collaborative Approach to Defining Water Security in the Saskatchewan River Basin"** (2013-2015), which engaged various stakeholders including the Cree and Metis communities and representing range of interests in water and water management in the provinces of Alberta, Saskatchewan, and Manitoba to understand how people engaged in the water sector within the Saskatchewan River Basin (410,000 km²) personally defined water security. The project was designed to recognize and account for stakeholder viewpoints, served as a mechanism for translating scientific products into relevant tools for decision making, and constituted a research laboratory in which the science-policy interface is mined for new insights through quantitative and qualitative analysis.

One of our early projects led by Tim Jardine studied "Links between water, wildlife and people in the Saskatchewan River Delta" (2013-2016). This project team worked with the Elders, Chiefs and Mayors from the Northern Village of Cumberland House and the Cumberland House Cree Nation to better understand the connections between water, animals and people in the Saskatchewan River Delta – one of the largest inland freshwater deltas in the world and homeland to a substantial indigenous population. Through this project, our team identified how current and future water flows in the Saskatchewan River can influence the distribution of lakes and wetlands; identified aquatic habitats that are important for fishes, birds, and mammals; explored natural resource use by people in the region and what the social, cultural, and economic value of these activities (and related conservation activities) are; and created a framework to help estimate ecological and social implications of future water flow scenarios in the delta. In addition, throughout the project, high school students were given opportunities to learn from older generations and receive training in subjects such as biology, anthropology, and natural resource management.

Sustainability of research and empowerment of indigenous communities have been the focal point of the **"Slave Watershed Environmental Effects Program (SWEEP)"** (2013-2015) project led by Paul Jones, SENS and Toxicology Centre which worked with local communities and the Slave River and Delta Partnership (comprising a partnership of 11 indigenous communities) and established a community-based monitoring program. This program empowered communities to assess how upstream changes impact water quantity and quality in the Slave River Delta, monitor current changes, and collect information that informs management decisions. A system of

environmental indicators was developed by incorporating both western science and Traditional Knowledge to address key community priorities, including water quality, hydrology and sediment load, air and climate, vegetation, and health of wildlife, fish, and insect populations. The team also interacted with a grade 10-12 science class at Deninu School in Fort Resolution and provided information on Slave River ice formation and dynamics, and also discussed the importance of aquatic invertebrates (i.e., as fish food, sentinels of water quality) and their common use in environmental monitoring programs. The students then spent time in learning how to identify various invertebrate species found in the Slave River and delta and analyzed invertebrate samples collected as part of the SWEEP monitoring activities. Students then spoke with community elders and searched the internet for information as to which fish ate which type of invertebrate.

As a complementary study to the SWEEP project, the project on **"Hydrologic modelling in the Peace-Athabasca and Slave Deltas"** (2013-2015) identified factors contributing to the changes in the Peace-Athabasca and Slave River deltas. A decreasing number of annual floods and lower water levels are especially important, given their ecological and social role in the region. In response, our team modelled both natural and regulated river flow scenarios to provide insight into the influence of climate change and the Bennett Dam on water flow in the area. In addition, another component of this project examined whether or not there was severe enough ice jams to flood the Slave River Delta and maintain delta ecology resulting in changes in vegetation.

The Delta Dialogue Network (DDN) (2014-2016) led by Toddi Steelman, SENS was one of the cornerstone projects which included a network of three deltas (the Saskatchewan River Delta, Peace-Athabasca Delta, and Slave River Delta), which are biologically diverse and complex systems of rivers, lakes, and wetlands. These deltas support a range of fish, wildlife, bird, and plant species. The ecological changes in these deltas are often an indicator of issues arising in our river systems; if there are problems, people in the delta are often the first to notice. These deltas continue to play an important role in supporting traditional, subsistence, and cultural activities of the Aboriginal peoples who have occupied these regions since time immemorial. Historically, inland deltas were also a central part of the fur trade industry in Canada. DDN worked within and across communities to improve understanding of knowledge mobilization around issues of sustainability within northern inland deltas. By focusing on knowledge mobilization, DDN built upon the best ways to share and create knowledge so it is useful for communities, decision-makers, and academics. Three research projects (one in each delta) approached different aspects of this goal, including knowledge mobilization for youth, evaluation of existing knowledge mobilization strategies, and knowledge mobilization for policy and decision-makers.

Another important project led by Doug Clark, SENS titled "**The Water In Me – Collaboratively Developing a Water Strategy for the Champagne and Aishihik First Nations (CAFN)' Traditional Territory, Yukon**" (2015-2017) was aimed at discovering how a self-governing First Nation can move beyond participating in government-led processes for management of natural resources through "contribution" of traditional knowledge to express an authentic indigenous ethic for environmental stewardship that such policy and regulatory processes could ultimately be reoriented around. Specifically, the project is designed to: 1) Understand the dynamic set of CAFN beliefs, relationships, culturally-based core values, stories, codes of ethical conduct and respect, and decision-making relating to water; 2) Explore and express knowledge and values about water embodied within the traditional languages used within the CAFN traditional territory; 3) Understand and demonstrate how the expression of CAFN knowledge and values about water can shape decision-making processes to be more inclusive and effective; 4) Transform insights gained about CAFN values into content for the draft CAFN Water Strategy, and pilot the draft strategy in a real-world water governance and management situation; and 5) Mobilize CAFN values and knowledge about water in unique ways to promote its stewardship.

The Safe Water for Health Research Team (2010-ongoing) led by Lalita Bharadwaj, School of Public Health is examining how co-creation of decision support tools and strategies to improve trust, understanding and reconciliation in research, and prediction of how changing water futures affects holistic health. Health impacts are examined through supporting, facilitating, and codesigning functional participatory water and holistic health effects models with Indigenous communities. The health of indigenous communities is defined from the broad medical, holistic, and wellness perspectives, as being in the state of physical, mental & social wellbeing, free from illness or disease, and having the ability to adapt to social, environmental and cultural challenges and thereby realize aspirations. The process of co-creating these models builds on existing work recommending collaborative partnerships for effective integrative water research with Indigenous communities. This project co-develops: 1) understanding of threats to holistic health in Indigenous communities from multiple perspectives through a collaborative modeling framework, 2) new knowledge on how to articulate and blend traditional knowledge and Western Science as model parameters for integrative water futures and human health impacts models. Finally, the team applies the models to support creation of protective actions, tools, and new policy that are informed by Traditional and Western knowledge.

5.2 Knowledge Translation and Indigenous Communities

In addition to putting emphasis on knowledge co-creation, GIWS equally values in knowledge translation to indigenous communities. GIWS also believes that when indigenous language, music, and imagery are used to convey the findings of environmental risks, they can support the maintenance and ongoing use of that language and can contextualize the Western scientific research within a more appropriate cultural modality for the intended audience. For example, digital storytelling may not only represent the successful bridging of indigenous and Western knowledge systems but also may encourage preservation of traditional languages and improve the effective dissemination of important environmental health messages to indigenous

communities. Modalities that were used to present scientific information to indigenous communities include:

Downstream Theatrical Play: As another example of outreach and engagement, the Institute, in collaboration with the University's Department of Drama and School of Environment and Sustainability, developed a theatrical play called *Downstream*. This play represented an innovative way to communicate water research knowledge in an engaging and interactive way. The production toured throughout Saskatchewan and Alberta in mid-February, 2017 including Indigenous Communities, and took audience members through an exercise in decision-making when floods threaten.

(Source - https://www.youtube.com/watch?v=k6USx9JaQ94)

Delta Days video (English, Cree, Chipewyan, and Michif versions): This short film is a summary of Delta Days workshop organized by the Delta Dialogue Network (DDN), an event that took place in Saskatoon, Saskatchewan on April 5-7th, 2016. Delta Days brought together community members, Elders, youth, decision-makers, students, and researchers to talk about changes that are occurring in the Slave River Delta, Peace-Athabasca Delta, and Saskatchewan River Delta. (Source - https://www.youtube.com/watch?v=R0z6loAn9kY&feature=youtu.be)

Travelling Exhibit: The information gathered during the Delta Days workshop and research outcomes of the DDN also became part of a travelling exhibit.



Photograph: Delta Days – Travelling Exhibit

Delta Ways Remembered video: This is an animated story about the changes in the Slave River and Delta over the last 100 years. The story and animation are based on traditional knowledge interviews with Elders and local people in the South Slave region of the Northwest Territories, Canada. It was created in partnership with the Slave River and Delta Partnership, Department of Environment and Natural Resources, Government of Northwest Territories, University of Saskatchewan's Global Institute for Water Security, and the School of Public Health.

(Source - https://www.youtube.com/watch?v=XHjmcdNwVpE)

Listening station: Audio of the Saskatchewan River "heartbeat": This exhibit includes graphs and audio recordings. The graphs show the amount of water that was flowing past the three deltas before and after several dams were put in upstream in the 1960s. Time series vary, with shorter records available in the Peace and Slave rivers (1960 to present) and a longer record in the Saskatchewan River (1913 – present). An observer can see how the flow of water changes on

the graph. One can also listen to the audio and will be able to hear the differences.

Mural from Delta Days and "post-its": This mural was created during Delta Days. Throughout the event, we asked participants different questions. The participants wrote down or drew their answers on the "nature post-it" notes. The postit notes were made to show some of the different materials you



would find in a delta, such as rocks and reeds. Not all of the participant responses are included here.

Dream Catcher: Designed and created by Michela Carriere, an indigenous member from the Saskatchewan River Delta community. The dreamcatcher includes pelican feathers, pinecones and mallard feathers from the Saskatchewan River Delta. It evokes flowing water and the triangle symbol that is representative of the shape of the deltas. The dreamcatcher is there to filter through all the good thoughts and ideas during the presentation. The blue colours represent the water of the delta. The three feathers in the middle make the triangle which is the symbol of the delta.



6. Performance Indicators

GIWS was created with the vision to attain research excellence at U of S and become one of the world-leading research-intensive institutions in the area of water security. Intensive efforts have been invested to recruit members, recruit and retain HQP, develop internationally-recognized research facilities with cutting-edge instrumentation, find a niche in research, take on national and international science leadership roles, attract substantial additional research funding, develop leading training programs, gain recognition of research outcomes through peer reviewed publications, secure national and international awards and honours, and establish collaboration with industry, government and non-government organizations. Since inception, GIWS has made remarkable progress in each of these areas, and is now delivering the exciting science that was foreseen at the programme outset.

6.1 Membership: A key aim of GIWS is to develop the new science and new trans-disciplinary science integration that is needed to address the major challenges to water security faced locally, regionally and globally. GIWS now integrates expertise from 254 members (72 Members, 43 Associate Members, 3 Affiliate Members, and 136 Student Members) from 21 academic units across the U of S, and has formed strong and mutually supportive working partnerships with Federal and Provincial agencies, in particular Environment and Climate Change Canada (ECCC) and the Saskatchewan Water Security Agency (SWSA) (Appendix A).

6.2 Support Staff: GIWS has grown under a policy of developing a lean and efficient administration, and only making new staff appointments when absolutely necessary. However the number of researchers and the level of research funding and facilities to be managed are large, and financial accounting requirements are quite onerous. Therefore, GIWS currently has a Director, Associate Director, GWF Programme Director, Assistant Director, Director of Finance, GWF Science Manager, Executive Assistant and Director Facilities and Human Resources, Financial Officer, Communication Specialist, Knowledge Mobilization Specialist, Outreach Coordinator, Clerical Assistant, and Data Manager (Appendix B).

6.3 Highly Qualified Personnel: During 2016-17, GIWS has financially supported 72 graduate students (36 PhD and 36 Masters), 29 postdoctoral fellows, 26 research assistants, 10 research associates and scientists, and 13 research technicians and support personnel (Appendix B). In addition, its members have supported 130 graduate students (49 PhD and 81 Masters), 10 postdoctoral fellows and research associates, 5 research scientists, 8 research technicians, 59 research assistants, research engineers and summer students, and 10 visiting scholars (Appendix C).

6.4 Research Funding: To support our research and training endeavours, financial resources are critical. Healthy financial resources help attract and retain the 'best-of-the-best' from around

the world, and help develop cutting edge research facilities. Therefore, another of the institute's main objectives has been the pursuit of research funding to leverage the base CERC funding of \$30 million over seven years. In 2016-17, GIWS faculty members have secured a total of \$8.6 million (81% federal sources, 7% provincial, 8% industry and 4% from international and UofS sources) (Appendix D). Since March 2011, GIWS has secured a total funding of \$249.6 million (including the CFREF \$77.8 million) on top of the original \$30 million CERC investment.

6.5 Research Publications: In 2016-17, GIWS members have published 246 journal articles, including papers in Science and Nature, published and presented 185 papers in proceedings and at conferences, delivered 130 plenary, key note and invited lectures, and published 10 book chapters and books. Since 2011, GIWS members have published a total of 1265 journal articles and 67 books/book chapters, participated in 974 conference proceedings and presentations and

delivered more than 542 invited, key-note and plenary lectures to share research outcomes and enlighten our stakeholders and scientific community (Appendix E).

6.6 Awards and Honours: One of the measurable parameters for research and training excellence is the number of awards and honours received by GIWS members and students. Again in 2016-17, we have achieved significant success in this area and are targeting to promote and support our members and students in



Jeffrey McDonnell (centre) receiving the 2016 Dooge Medal

pursuing strategic awards and honours in near future. It is a pleasure to recognize that Jeffrey McDonnell, Associate Director GIWS was awarded the 2016 Dooge Medal by IAHS, with UNESCO

and World Meteorological Organization to recognize his outstanding achievements in the field of hydrology through demonstration of scientific excellence, and for his fundamental contributions to the science of hydrology as evidenced by publications in the international scientific literature and other evidence of high standards.

John Pomeroy, Programme Director, Global Water Futures, Canada First



John Pomeroy (centre) receiving the 2017 J. Tuzo Medal

Research Excellence Fund (CFREF), Canada Research Chair in Water Resources and Climate Change (Tier 1), Distinguished Professor and Director of the UofS Centre for Hydrology and the Coldwater Laboratory (Canmore, AB) was awarded the 2017 J.Tuzo Wilson Medal at the Joint Annual Scientific Meeting of the Canadian Geophysical Union (CGU) and the Canadian Society of Agricultural and Forest Meteorology (CSAFM). Vancouver, BC.

Howard Wheater has been awarded the University of Saskatchewan's highest honour for research, the Distinguished Researcher Award, during a convocation ceremony June 2017. According to Karen Chad, Vice-President Research, UofS "The value of Howard's research cannot be overstated. He is a man of vision. A leader of leaders. A role model of integrity. An individual of great passion. An ambassador of good will, humility, and compassion. He is a wizened owl of knowledge. And a gentle soul of kindness of warmth." (*See photo on page 1 of this report*)

It is noteworthy that GIWS members sit on the advisory panels for the world's two leading water prizes (Stockholm Water Prize and Prince Sultan Bin Abdulaziz International Prize for Water), have four fellows of the Royal Society of Canada, three fellows of the American Geophysical Union (only 0.01% recognized as fellows), and that Jeff McDonnell is currently president of the American Geophysical Union's 7500-member Hydrology Section, the world's leading scientific

hydrology organization. Helen Baulch was elected Vice-President of the Society of Canadian Limnologists.

Karl-Erich Lindenschmidt, Associate Professor, School of Environment and Sustainability was awarded the GIWS Research Excellence Award for 2017 in recognition of his outstanding excellence in water security research as acknowledged his peers based by on his international stature, impact of research, training of highly qualified personnel, and research productivity.



Karl-Erich Lindenschmidt receiving the GIWS Research Excellence Award 2017

Lalita Bharadwaj, Associate Professor, School of Public Health and co-leader of the Safe Water for Health Research Team has been awarded the 2016 YWCA Women of Distinction Award in the Research and Technology category.

Yanping Li, Assistant Professor, School of Environment and Sustainability received the University Corporation for Atmospheric Research (UCAR) Outstanding publication award 2016. While Xu Li, Postdoctoral Fellow, GIWS received the 2015 Sustainability Science Best Paper Awards (awarded in November 2016), Sustainability Science.



Lalita Bharadwaj

Toddi Steelman, Former Executive Director, School of Environment and Sustainability received

the American Meteorological Society, Weather, Climate, and Society, Editor's Award.

Jonathan Doering received the Governor General's Gold Medal for the best PhD dissertation at the UofS. Jonathan was supervised by John Giesy, Canada Research Chair in Environmental Toxicology and Markus Hecker, Canada Research Chair in Predictive Aquatic Ecotoxicology, Toxicology Centre. Jonathan is now has a fellowship to work with the US EPA in Duluth Minnesota.

John Pomeroy's research team: E. Anderson received the Professor Bill Stolte Student Paper Award, CWRA 2017 Conference, and was also awarded the Dorothy Friebel Graduate Scholarship – Canadian Federation of University Women. H. Robichaud received the 2017 NSERC Alexander



Jonathan Doering and Markus Hecker

Graham Bell Canada Graduate Scholarship-Master's Award. And C. Marsh was awarded the 2016 Cryosphere Innovation Award, AGU Flash Freeze competition.

7. Student Corner

The GIWS Student Outreach Committee (SOC) had an active year hosting and participating in many academic and social events during 2016-17. These events encouraged the building of teams, mingling of people, passage of knowledge and having just plain fun. Through active participation, members gained new friends, ideas, and an appreciation for teamwork. The following section has been organized in chronological order.

7.1 Movie Night: On November 17th, 2016 the GIWS-SOC organized a movie night at the UofS. In this event the documentary "Before the Flood" about climate change crises directed by Fisher Stevens in collaboration with Leonardo DiCaprio and others was exhibited to the students that enjoyed the movie with pizza and drinks. The event was well attended by GIWS members and School of Environment and Sustainability students. It was a great way to bring the students community together and at the same time see discussion about climate change from other perspectives.

7.2 Christmas Party and Student Fundraiser: On December 7th, 2016 the GIWS hosted a Christmas party for students, members, and employees. This gathering also brought together researchers in a casual setting in order to kick off the Global Water Futures program. At this event, the GIWS-SOC held a 50/50 raffle fundraiser with the proceeds going to WaterAid Canada, whose mandate is to provide clean water to impoverished nations, while also aiding in sanitation. Their global mission fit well with the institute's own purpose. The fundraiser raised over \$250. The winner of the raffle was former GIWS Communications Specialist Chris Morin. However, he graciously declined the winnings to donate the entire raffle to WaterAid Canada.

7.3 World Water Day and Trivia Night: On March 23rd, 2017 the GIWS-SOC was present for World Water Day 2017. The events of the day were very fulfilling and helped promote engagement with members from various water science sectors. There were talks conducted by GIWS-SOC committee members Magali Nehemy and Razi Sheikholeslami. Following the talks everyone mingled and viewed posters during the poster presentation period. The World Water



Magali Nehmy

Razi Sheikholeslami

Day brought together an interdisciplinary group of researchers and students working in the fields of water resources and enable relevant discussions, exchanging valuable scientific knowledge.

In the poster competition, Diogo Costa, Geography and Planning received the award for the best poster by a postdoctoral fellow titled "PULSE: A numerical model for the simulation of snowpack solute dynamics to capture runoff ionic pulses during snowmelt". For the student category, Connor Pettem (MSc Toxicology) won the first place for his poster titled "Metabolic and cardiovascular effects of dietary selenomethionine exposture in adult zebrafish (Danio rerio)", Mosi Aghbol Aghy (PhD Chemical & Biological Engineering) received second place and Sopan Kurkute (PhD SENS) third place.



Diogo Costa

Connor Pettem



Mosi Aghbol Aghy

Sopan Kurkute

Following World Water day, the GIWS SOC hosted a Trivia Night and Slide Karaoke. The night was entertained by Jay Maillet who played great songs using his carbonless (solar powered) sound system. Joined by many students from the School of Environment and Sustainability, we conducted a water themed trivia session and impromptu slide karaoke for the prize of a gift card.

7.4 Student BBQ: Then GIWS-SOC held a fun barbecue on May 22, 2017 on a warm day along the Meewasin Trail by the South Saskatchewan River. Besides enjoying great barbecue food, students were able to socialize and play some outdoor games.



GIWS Students along the South Saskatchewan River

7.5 Travel Awards: This years was the first time GIWS-SOC gave a travel award. The purpose of this award is to defray travel costs associated with making a scientific presentation as a first author or present at a conference, symposium or other appropriate professional meeting. GIWS-SOC wanted to encourage students to engage in scientific events and share their work, besides improving communication skills and increasing the visibility of their research. This year Sujata

Budhathoki (MES) and Holly Anand (PhD) received the awards.

7.6 Student Body Elections: On October 17, 2017 GIWS-SOC committee election was held. The executives were elected based on the applicants received in each position. Ms. Magali Nehemy, PhD student with Prof. Jeffrey McDonnell was elected as the new president of GIWS student body. Ms. Nehemy also served previously as a social coordinator in the GIWS student body. Likewise, the other elected executives are:



GIWS – Student Outreach Committee 2017-18

- Vice President: Apurba Das (PhD)
- Secretary: Leila Dehabadi (PhD)
- Treasurer/ Social Coordinator: Michelle Wauchope Thompson (PhD)
- Communications and Web Master: Kasra Keshavarz (MES) and,
- CWRA SYP Coordinator: Richard Helmle (MES)

We thank all members of the previous committee for the great year!

7.7 Student Mixer: We had another great event on October 20, 2017 at the University Club at UofS. The GIWS Student Mixer event was organized to welcome new student members of GIWS. In this event students were able to meet each other and interact over some games and appetizers. The event was also marked by the transition between the previous year GIWS-Student Chapter committee and the recent elected committee. Member participated in water related trivia and presentation karaoke slides, and the winning teams received our new t-shirts.

8. Concluding Remarks

2016-2017 was another remarkable and productive year for GIWS and members. We have experienced exponential growth in terms of activities, members, and outcomes as evidenced by our "Performance Indicators", which we anticipate to continue in foreseen future. GIWS productivity and training programs are testaments of our commitment and excellence to advance the area of Water Security having local, national and global significance.

A significant effort has been invested in enhancing communication of our research outcomes and impact stories to society and stakeholders. GIWS will continue to go with its momentum and will establish new and sustain existing collaborations of mutual benefit to local and international partners and communities. GIWS collaboration and outreach activities are listed in Appendix F.

In this brief overview of the recent work of GIWS it has not been possible to do full justice to the work of our members, and we encourage those interested to visit our web-site <u>www.usask.ca/water</u> or to contact our members directly. We welcome students and postdoctoral researchers to either join our team full time or spend time with us as visiting researchers and we also welcome academic colleagues for short or longer visits. Our Assistant Director, Dr. Phani Adapa <u>phani.adapa@usask.ca</u> is always available for contact regarding the work of GIWS and welcomes enquiries from individuals, governments, industry and others concerning research collaboration.

APPENDIX A – Current Membership

Members: Individuals working at a level of responsibility which includes initiating and leading water research activities. This may include, but is not limited to Faculty members at UofS; Research Scientists, Staff Scientists, or Science Associates in recognized co-located (e.g. Saskatoon-based) research institutions (i.e. Environment Canada, Saskatchewan Research Council, Canadian Light Source, Agriculture and Agri-food Canada); and UofS Research Scientists.

Barbour, Lee, Professor, Civil and Geological Engineering Geotechnical/Geo-environmental: Saturated/Unsaturated Groundwater Flow and Contaminant Transport, Mine Waste Reclamation

Baulch, Helen, Assistant Professor, School of Environment and Sustainability Water quality; Aquatic ecology; Global change; Biogeochemical cycles; Greenhouse gas emissions; Eutrophication

Bedard-Haughn, Angela, Associate Professor, Soil Science Study fundamental understanding of pedologic properties of Canadian ecosystems and how land use and climate changes affect, and are affected by, these properties

Belcher, Ken, Professor, Bioresource Policy, Business and Economics Ecological economics; Resource and environmental economics; Environmental policy; Climate change; Wetland and wildlife conservation policy

Bharadwaj, Lalita, Associate Professor, School of Public Health

Barriers and Key Issues to the Access of Safe and Sustainable Drinking Water Sources in First Nations Communities; Community Based Participatory Research with Indigenous Communities; Human and Environmental Health Risk Assessment; Community-Based Education

Cessna, Allan, Research Scientist, Agriculture and Agri-Food Canada Agricultural pesticides and veterinary pharmaceuticals

Chambers, Patricia, Research Scientist and Section Head, Environment Canada Human Impacts on Aquatic Ecosystems Processes

Chang, Won Jae, Assistant Professor, Civil and Geological Engineering Contaminated site assessment and remediation; Bioremediation of oil sands pollutants, mine wastes, frozen contaminated sites; Characterization of microbial communities/populations; Molecular biology techniques for contaminated environmental matrices

Chapra, Steve, Professor, Civil and Environmental Engineering, Tufts University Water Quality Modeling, Numerical Methods, Advanced Computer Applications in Environmental Engineering

Clark, Bob, Research Scientist and Adjunct Professor, Environment Canada Avian Ecology, Reproction and breeding habitate selection, Landscape ecology **Clark, Doug**, Centennial Chair and Assistant Professor, School of Environment and Sustainability Polar bear-human conflicts; Decision-making under conditions of rapid social-ecological change; Wildlife and protected area management; Environmental governance and policy processes

Dalai, Ajay, Canada Research Chair in Bioenergy and Environmental Friendly Chemical Processes, Chemical and Biological Engineering Renewable Energy; Heavy Oil and Gas Processing; Catalytic Reaction Engineering

Davison, Bruce, Research Scientist, Environment Canada

Hydrometeorological modelling, including incorporating physical or statistical processes into models; Operationalization of modelling tools; Incorporating software engineering tools into model development; Models for decision making

de Boer, Dirk, Research Scientist, Environment Canada Drainage basin; Suspended sediment; Fluvial geomorphology; Soil Erosion

Doig, Lorne, Research Scientist, Toxicology Centre

Bioavailability and toxicity of metals, including nanomaterials, in surface waters and sediments; Deriving environmental quality criteria (water, sediment, and tissue-based); Aquatic ecotoxicology; Aquatic paleoecotoxicology

Elliott, Jane, Research Scientist, Environment Canada

Soil processes; Soil-water interactions and agrochemical leaching; Impacts of management practices on water transport of nutrients and contaminants

Elshorbagy, Amin, Professor, Civil, geological and Environmental Engineering Water Resources Engineering: Hydrinformatics - mechanistic & data-driven watershed modeling, soft-computing techniques; Multicriterion decision analysis, system dynamics

Ferguson, Grant, Associate Professor, Civil, geological and Environmental Engineering Hydrogeology; Geothermal Energy; Climate Change

Fonstad, Terry, Associate Professor, Civil, geological and Environmental Engineering Ion exhange, groundwater, livestock, waste, nutrients, mass mortalities

Fulton, Murray, Professor and Graduate Chair, Johnson-Shoyama School of Public Policy Economics of biotechnology; Policy analysis of corruption; Performance of co-operatives

Giesy, John, Professor and Canada Research Chair in Environmental Toxicology Ecology; Ecotoxicology; Aquatic toxicology; Environmental analytical chemistry of organic compounds; Environmental chemistry (Fates of trace substances in aquatic ecosystems)

Gober, Patricia, Professor Emeritus, Johnson-Shoyama School of Public Policy Water policy; Sustainability science; Decision making under uncertainty; Urban systems; Human migration and population geography; Science-policy interface and stakeholder engagement; Applied climatology **Gray, Richard**, Professor, Bioresource Policy, Business and Economics Agricultural trade; Agricultural marketing; Environmental economics

Hania, Patricia, Assistant Professor, College of Law Legal water governance models in Canada

Hecker, Markus, Associate Professor and Canada Research Chair in Predictive Aquatic Ecotoxicology

Investigation of biological effects of environmental stressors; Environmental risk assessment; Development and application of bioanalytical techniques to assess environmental pollution; Aquatic ecology/fish biology

Helgason, Warren, Associate Professor, Civil, geological and Environmental Engineering Atmospheric boundary layer processes; Energy and mass transport in the soil-plant-atmosphere continuum; Irrigation

Hendry, Jim, Professor and NSERC-Cameco Industrial Research Chair

Aqueous and environmental geochemistry of contaminants in uranium tailings; Characterization of biogeochemical reaction rates in vadose zones; Fate and transport of solutes in aquitards; Sorption controls on the transport of bacteria in saturated porous media; Reactive barrier technologies

Hill, Harvey, Research Scientist, Agriculture and Agri-Food Canada Economics; Climate decision support and adaptation

Hobson, Keith, Research Scientist, Environment Canada

Conservation and management of boreal forest birds and other wildlife; Conservation and management of waterbirds with particular emphasis on the interactions between fish-eating birds and commercial and sport fisheries; Use of stable isotopes to track the source and fate of environmental contaminants in terrestrial and marine systems

Hogan, Natacha, Assistant Professor, Animal and Poultry Science Aquatic toxicology; Sources and fate of aquatic contaminants; Aquatic animal health; Agricultural intensity and water quality

Howard, Allan, Manager, Agriculture and Agri-Food Canada

Adaptation techniques for drought and conditions of extreme wetness; Best practices for monitoring soil moisture; Models for assessing drought and for forecasting regional scale crop yield; Develop systems for accessing local and regional scale information on climate impacts

Hudson, Jeff, Professor, Biology

Biogeochemical cycles in aquatic ecosystems; Effects of food web structure, ultraviolet radiation, climate change and biodiversity on elemental cycling and energy flow

Ireson, Andrew, Associate Professor, School of Environment and Sustainability Climate change and water security; Land-water management and environmental change; Sustainable development of natural resources

Janz, David, Professor, Veterinary Biomedical Sciences Climate change and water security; Land-water management and environmental change

Jardine, Tim, Assistant Professor, School of Environment and Sustainability Freshwater food webs; Applications of stable isotope analysis in ecology; Tropical floodplain hydrology and ecology; Contaminant biomagnification in aquatic ecosystems; Sources and fate of trace metals; Fish migration; Land-water and river-ocean connectivity

Johnstone, Jill, Associate Professor, Biology Climate change and water security

Jones, Paul, Associate Professor, School of Environment and Sustainability Land-water management and environmental change; Naphthenic Acid

Kells, Jim, Professor, Civil, geological and Environmental Engineering Hydraulic Structures; Use of Rock in Hydraulic Engineering; Scour Processes in Cohesionless Materials; Water Quality of Stormwater Runoff; Ecologically Engineered Systems

Laroque, Colin, Professor, College of Agriculture and Biorsource Climate change; Boreal ecosystems; Dendrochronology; Dendrochemistry; Dendrohydrology

Li, Yanping, Assistant Professor, School of Environment and Sustainability Regional climate modelling; Mesoscale dynamics; Boundary layer meteorology; Air-sea interaction

Liber, Karsten, Professor and Director, Toxicology Centre

Bioavailability and toxicity of metals, including nanomaterials, in surface waters and sediments; Deriving environmental quality criteria (water, sediment, and tissue-based); Aquatic ecotoxicology; Aquatic paleoecotoxicology

Lindenschmidt, Karl-Eric, Associate Professor, School of Environment and Sustainability Surface water quality modelling; River ice processes; Climate change and river morphology; Flood and flood risk management

Lindsay, Matt, Assistant Professor, Geological Sciences Groundwater; Biogeochemistry; Mining management and reclamation

Loring, Philip, Assistant Professor, School of Environment and Sustainability Rural water systems, Climate change, Food-water-energy nexus, Environmental health, Cumulative effects, adaptive capacity **Marsh, Phil**, Canada Research Chair in Cold Regions Water, Wilfrid Laurier University Hydrologic processes and modelling of snowmelt and rainfall runoff in cold environments; Impact of climate change on water resources of the Canadian Arctic

Martz, Lawrence, Professor and Vice-Dean Faculty Relations, Arts & Science Soil erosion and sediment transport; Impacts of climate change on water use in the South Saskatchewan River Basin

McDonnell, Jeffrey, Professor and Associate Director, Global Institute for Water Security Watershed hydrology; Runoff processes; Modelling, Isotope hydrology

McKenzie, Marcia, Associate Professor and Director, Sustainability Education Research Institute Place, environment and sustainability

McPhedran, Kerry, Assistant Professor, Environmental Engineering Municipal wastewater, Partitioning to organic matter, Stormwater runoff, Recreational water quality

Meda, Venkatesh, Associate Professor, Chemical and Biological Engineering Water treatment system design and development

Morrissey, Christy, Assistant Professor, Biology

Ecotoxicology; Water pollution; River and wetland ecology; Freshwater biology; avian and aquatic ecotoxicology

Noble, Bram, Professor, Geography and Planning

Environmental impact assessment; Cumulative effects assessment; Strategic environmental assessment; Environmental planning and management; Environmental decision making

Patrick, Robert, Professor and Chair of Regional & Urban Planning Program, Geography & Planning

Water Policy and Governance; Watershed Planning and Management; Source Water Protection; Integrated Water Resource Management; First Nations access to safe Drinking Water; Regional Planning; Urban Water Issues

Pennock, Dan, Professor Emeritus, Soil Science

Landscape-scale soil processes and the spatial pattern of soil properties

Pickering, Ingrid, Professor and Canada Research Chair in Molecular Environmental Science Development of new synchrotron radiation techniques; Metals and metalloids transformation in the environment; Identification of toxicologically significant compounds in vivo

Pomeroy, John, Professor and Canada Research Chair in Water Resources and Climate Change Hydrological processes and modelling in mountain, prairie and arctic environments; Climate change, hydrology and water resources; Snow chemistry and ecology; Droughts in the Canadian Prairies; Cold regions hydrometeorological modelling and surface-atmosphere feedbacks **Razavi, Saman**, Assistant Professor, School of Environment and Sustainability Environmental and Water Resources Systems Planning and Management; Hydrologic and Groundwater Models Development and Calibration; Single- and Multi-objective Optimization and Uncertainty Analysis; Climate Change and Impacts on Hydrology and Water Resources; Reconstruction of Paleo-hydrology – Implications for Climate Change Analysis; Short-term and Long-term Rainfall and runoff forecasting; Surrogate Modeling, Artificial Intelligence, and Machine Learning

Reed, Maureen, Professor, School of Environment and Sustainability

Environmental Governance; Sustainability of Rural Communities; Feminist and Gender-based Analysis; Social Resilience; Political Ecology; Forestry; Model Forests; Biosphere Reserves; National Parks

Shook, Kevin, Research Scientist and SGI Canada Research Fellow, Geography and Planning Snowmelt modelling; Fractal analysis of hydrological phenomena; Flood modelling and extreme events analysis

Si, Bing, Professor, Soil Science

Understand the mechanisms of soil water dynamics and thermal regimes in non-level landscapes—at the pedon, hillslope (catchment) and landscape scale

Singh, Satya, Research Scientist, Geological Sciences

Environmental geochemistry particularly in trace metal biogeochemistry; geochemical cycling; Remediation of contaminated soils, sediment, surface and groundwater; Quantification of geochemical processes in wetlands and mining wastes

Soltan, Jafar, Professor, Chemical and Biological Engineering

Emerging pollutants in water; ozone in water treatment; catalytic ozonation in water treatment; advanced oxidation; industrial wastewater treatment; environmental catalysis

Spence, Christopher, Research Scientist, Environment Canada

Hydrology and hydrometeorology of Canada's cold regions, especially the subarctic Canadian Shield; Hydrological processes in the Prairie Pothole region of Saskatchewan

St-Maurice, Jean-Pierre, Canada Research Chair in Environmental Sciences, Arts and Science Atmospheric electricity; Space weather; Geophysical fluid dynamics; Atmospheric evolution; Climate change

Steelman, Toddi, Professor and Executive Director, School of Environment and Sustainability Socio-hydrology: communication, knowledge co-production, knowledge mobilization, community involvement, science-policy interface, decision making

St-Maurice, Jean-Pierre, Professor and Canada Research Chair in Environmental Sciences, Physics and Engineering Physics

Atmospheric electricity, Space weather, Geophysical fluid dynamics, Atmospheric evolution, Climate change

Strickert, Graham, Assistant Professor, School of Environment and Sustainability Socio-hydrology, relationship between human behavior and environment

van der Kamp, Garth, Research Scientist, Global Institute for Water Security Impacts of climate changes and land-use changes on prairie wetlands and lakes; Evaluation of groundwater availability and sustainability; Impacts of groundwater withdrawals on aquatic ecosystems; Groundwater flow and solute transport in low -permeability formations; Study of the hydrology of peatlands

van Rees, Ken, Professor, Soil Science Agroforestry and biomass energy systems and their impacts on soils

Westbrook, Cherie, Associate Professor, Geography and Planning Wetland Ecohydrology; Effect of beavers and humans on pathways between surface and ground waters; Transport of water and nutrients from wetlands and riparian areas

Wheater, Howard, Professor, Canada Excellence Research Chair in Water Security, and Director, Global Institute for Water Security

Hydrological processes and modelling, with applications to the management of flood risk, water resources, water quality, wastes and climate change adaptation

Wheaton, Elaine, Senior Research Scientist, Saskatchewan Research Council Climatology; Climate impacts and adaptation; Climate change; Hazards climatology

Whitfield, Colin, Assistant Professor, School of Environment and Sustainability Atmospheric pollution, Hydrochemistry, Catchment modelling, Hydrology, Biogeochemistry

Wilson, Lee, Associate Professor, Chemistry

Water, Solution Chemistry, Hydration Phenomena, Polymers, Biomaterials, Membranes, Porous Materials, Colloids & Surfactants, Materials & Environmental Science, and Chemical Separations

Wittrock, Virginia, Research Scientist, Saskatchewan Research Council Climatology; Climate impacts and adaptation; Climate change; Hazards climatology

Yang, Daqing, Research Scientist, Environment Canada Global water resources and availability; Climate change; Extreme hydrological events; Human impact on water systems; Arid and cold region hydrology **Associate Members:** Individuals who are making a significant contribution to water research or who are providing support for water research activities in areas relevant to GIWS. This may include, but is not limited to UofS research staff (e.g. Research Associates, Research Assistants, Research officers or Postdoctoral fellows); Research staff from recognized national or international research institutions who are affiliated with a member of the Institute; and Professional affiliates – professional individuals who may not hold a PhD, but who can serve on graduate student advisory committees and/or teach graduate courses.

Abbasi, Soroush, Postdoctoral Fellow, Environment Canada Water resources management; water quality; hydrology; hydrogeology

Ali, Melkamu, Postdoctoral Fellow, Global Institute for Water Security Hydrology, Subsurface, Solute transport, Groundwater, Physically based model, Snowmelt, Surface flow

Alimezelli, Hubert Tote, Postdoctoral Fellow, Integrated Training Program in Infectious Diseases, Food Safety and Public Policy

Water quality, water safety, water security, and health implications in First Nation communities in Saskatchewan and the Yukon

Ameli, Ali, Postdoctoral Fellow, Global Institute for Water Security Hydrology & Hydrogeology, Groundwater Ecohydrology, Contaminant Hydrogeology & Applied Hydro-geochemistry, Water-Energy Nexus, Contaminant Fate and Transport, Multi-Phase Flow Through Porous Media, Environmental Isotopes, Water Resources Planning, security and Restoration, Water Resources and Environmental Engineering

Anis, Muhammad Rehan, Postdoctoral Fellow, Global Institute for Water Security Climate change impact, Distributed hydrological modelling, Statistical downscaling, Disaggregation of climate variables, Sensitivity and uncertainty analysis

Apples, Willemijn, Postdoctoral Fellow, Global Institute for Water Security Vadose zone; groundwater; infiltration; recharge; solute transport

Asong, Zilefac Elvis, Postdoctoral Fellow, Global Institute for Water Security

Physical and regional climatology; the impact of climate change on hydrological regimes and water resources under non-stationarity; development of statistical downscaling models for downscaling of AOGCM output; regional flood frequency and risk analysis; seasonal hydrological forecast; analysis of drought characteristics; weather generation for water and agricultural applications

Bradford, Lori, Research Associate, School of Public Health

Social psychological and social determinates of health including policy analysis which supports the Institute's goals of improving understanding of societal controls of water management

Chen, Liang, Postdoctoral Fellow, Global Institute for Water Security Comparing the changes in the synoptic preconditions for the extreme convective events that may lead to flooding over east of the Canadian Rockies (Sask. River Basin)

Chu, Thuan, Postdoctoral Fellow, Global Institute for Water Security Remote sensing and GIS techniques; climate change and land use practices; model river ice processes and flood risk

Chu, Yin, Visiting Scholar, Civil and Geological Engineering Watershed Modeling; Water Quality; Hydrology; Forest Watershed; Water Pollution Control

Chun, Kwok Pan, Assistant Professor, Department of Geography, Hong Kong Baptist University Hydrology; Statistics; Climate change

Da Costa, Diogo Andre Pinho, Postdoctoral Fellow, Department of Geography and Planning Agricultural land management in the Canadian Prairies

Elshamy, Mohamed, Research Associate, Global Institute for Water Security Climate change, Satellite hydrology, Water resources modelling, Flood forecasting, Downscaling, Land surface schemes

Ghanbarpour, Reza, Water Allocation Modeller, Alberta Energy and utilities Board Flood-risk modelling, Watershed hydrology, Decision analysis, Optimization

Gharari, Shervan, Postdoctoral Fellow, School of Environment and Sustainability How information is translated into the model via assumptions on model structure, model parameterization and model parameters.

Gooding, Raea, Research Assistant, College of Agriculture and Bioresources

Haghnegahdar, Amin, Postdoctoral Fellow, Global Institute for Water Security, and Program Manager for IMPC-GWF-CFREF Land surface-Hydrological Modeling, Model Sensitivity and Uncertainty Assessment, Model

Calibration/Validation

Hosseini, Nasim, Research Associate, Global Institute for Water Security Water quality modelling of surface water, model calibration, model validation, and sensitivity analysis

Janzen, Kim, Research Associate, Global Institute for Water Security Analysis and post processing of stable isotope data

Kehoe, Michael, Postdoctoral Fellow, School of Environment and Sustainability Water quality; Ecological modeling; Toxic cyanobacteria blooms; Monitoring; Data mining

Keim, Dawn, Postdoctoral Fellow, Global Institute for Water Security Recharge processes; hydrogeology; unsaturated flow processes; contaminant transport **Kinar, Nicholas**, Postdoctoral Fellow, Centre for Hydrology Use of electronic circuits to collect data; forward and inverse mathematical models; measure environmental phenomena

Li, Zhi, Professor, Northwest A&F University, China Impact assessment of climate change on streamflow, Weather generator, Groundwater recharge, Isotope hydrology

Mahmood, Taufique, Assistant Professor, University of North Dakota Hydrology; water quality; remote sensing

Mamet, Steven, Postdoctoral Fellow, Department of Biology Effect of climate and environmental change on tree line dynamic

Mantyka-Pringle, Chrystal, Postdoctoral Fellow, School of Environment and Sustainability Conservation planning; biodiversity; Land-use change; Climate change; Environmental decisionmaking; Prioritization; Water management

Mohamed, Mohamed, Research Associate, Department of Chemistry Oil sands process water remediation, Sequestration of agrochemicals from environmental waters, Removal of organic pollutants from aqueous media

Musselman, Keith, Postdoctoral Fellow, Centre for Hydrology, University of Saskatchewan Hydrology; Water Resources; Snow; Hydrometeorology

Nachshon, Uri, Research Scientist, The Jacob Blaustein Institute for Desert Research, Ben-Gurion University of the Negev, Isreal Hydrology, Vadose zone, Salinization, Land-atmosphere interaction, Salt dynamics, Evaporation

Nazemi, Ali, Assistant Professor, Concordia University, Montreal Water resources modelling and management under climate change conditions

North, Rebecca, Research Associate, Global Institute for Water Security Utrophication issues; Phytoplankton physiology and ecology; Land use practices and nutrient bioavailability; Nutrient limitation of algae; Aquatic biogeochemistry

Pan, Xicai, Postdoctoral Fellow, Global Institute for Water Security Hydrology; Cryosphere; Climate; Soil physics; Hydrogeophysics

Pedinotti, Venessa, Postdoctoral Fellows, Global Institute for Water Security Using modelling to better understand the large scale interactions between the multiple components of the water cycle

Pernica, Patricia, Postdoctoral Fellow, Global Institute for Water Security Lake-atmosphere interaction; physical limnology; modelling; mixing dynamics

Raja, Bharat, Postdoctoral Fellow, Civil and Geological Engineering Impacts of climate variability on water-related ecosystem functions

Ryan, Christopher, Visiting Scientist & Director, Operations, Environment Canada and Tundra Energy Marketing Limited

Environmental forensics; Athabasca oils sands; Synchrotron radiation; Absorption spectroscopy; Naphthenic acids; Petroleum Coke; Mine drainage; Industrial effluent

Sagin, Jay, Assistant Professor, Nazarbayev University, Kazakhstan Remote Sensing and GIS applications; Hydrology; Hydrogeology; Modelling; Trans-boundary basins

Wayand, Nicholas, Postdoctoral Fellow, Centre for Hydrology, Department of Geography and Planning

Vetting and diagnosing current issues in model representation of critical snowpack processes that impact the hydrology of Canada

Wong, Jeff, Postdoctoral Fellow, Global Institute for Water Security Development of large-scale hydrological models

Xu, Li, Postdoctoral Fellow, Global Institute for Water Security

Complex systems analysis with specific focuses on socio-hydrology and social-ecological systems of rivers and lakes; Sustainability and resilience sciences and their integration; Risk assessment and management in response to natural disasters; and Science-policy interface in environmental contexts

Yeteman, Omer, Lecturer, Environmental Engineering, The University of Newcastle, Australia Ecohydrology; Geomorphology; Vegetation dynamics; Landscape evolution

Affiliates: Distinguished individuals who have a demonstrable commitment to the goals and objectives of GIWS's SaskRB program. Affiliates are generally positioned outside traditional research environments.

Halliday, Bob, Senior Vice President, Chief Financial Officer, Applied Materials, Inc.

Lamb, Susan, Chief Executive Officer, Meewasin Valley Authority and Chair of VIDO/Intervac liaison Committee

Sanford, Bob, EPCOR Chair of the Canadian Partnership Initiative in support of United Nations "Water for Life" Decade, Director of the Western Watersheds Research Collaborative

Student Members: Students registered at a postsecondary institution who are engaged in waterrelated research activities, and who are under the supervision or co-supervision of a GIWS member, or any graduate or undergraduate student registered at the University of Saskatchewan.

Glossary: MSc – Master of Science; PhD – Doctor of Philosophy; MSEM – Master in Sustainable Environmental Management; MPP – Master of Public Policy; MES – Master of Environment and Sustainability; MPH – Master of Public health; MPA – Master of Public Administration; SENS – School of Environment and Sustainability; JSGS – Johnson Shoyama Graduate School of Public Policy; SPH – School of Public Health

Name	College/ School	Supervisor	Degree
Abirhire, Oghenemise	Biology	J. Hudson	Masters
Abu, Razak	SENS	M. Reed	PhD
Adesokan, Adedoyonsola	SENS	n/a	MSEM
Aghbolaghy, Mostafa	Chemical & Biological	J. Soltan	PhD
	Engineering		
Ahmed, Hafiz	Chemical & Biological	W. Helgason	MSc
	Engineering		
Akomeah, Eric	SENS	K. Lindenschmidt	PhD
Aksamit, Nikolas	Centre for Hydrology	J. Pomeroy	PhD
Alam, Md. Shahbul	Civil & Geological Engineering	A. Elshorbagy	MSc
Amin, Mahmud Rashedul	Civil & Geological Engineering	K. Mazurek	MSc
Amos, Mike	Civil & Geological Engineering	L. Barbour	
Anderson, Emily	Geography	J. Pomeroy	MSc
Annand, Holly	Geography & Planning	J. Pomeroy	PhD
Armstrong, James	Biology	N. Chilton	MSc
Armstrong, Maria	Geography	H. Baulch	MSc
Awume, Bennet	SENS	n/a	MSEM
Baer, Thomas	Civil & Geological Engineering	L. Barbour	MSc
Bagatim, Tabata	SENS	M. Hecker	MSc
Baijius, Warrick	Geography & Planning	R. Patrick	MA
Bam, Edward	SENS	A. Ireson	PhD
Beitel, Shawn	Toxicology	P. Jones	MSc
Berry, Pamela	SENS	K. Lindenschmidt	MES
Bihum, Samantha	Arts & Science	n/a	Undergraduate
Brannen, Rosa	SENS	A. Ireson	MES
Brown, Robin	Soil Sc.	A. Bedard-	MSc
		Haughn	
Brown, Robyn	Arts & Science	n/a	Undergraduate
Bruce, Kristin	JSGS	P. Gober	MPP
Buchanan, Astri	SENS	M. Reed	MES
Budhathoki, Sujata	SENS	A. Ireson	MES
Burke, Amanda	SENS	H. Wheater	MES
Burlock, David	Arts & Science	n/a	Undergraduate

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Carr, Meghan	SENS	К-Е.	MES
		Lindenschmidt	
Cavaliere, Emily	SENS	H. Baulch	PhD
Chowdhury, Rocky	Civil & Geological Engineering	K. Mazurek	MSc
Coles, Anna	SENS	J. McDonnell	PhD
Cronmiller, Josh	Geography & Planning	B. Noble	MSc
D'Silva, Lawrence	Toxicology	K. Liber	MSc
Das, Apurba	SENS	К-Е.	MES
		Lindenschmidt	
David, Cody	Soil Science	W. Helgason	MSc
DeMars, Shelby	Civil & Geological Engineering	A. Ireson	MSc
Demuth, Brandon	Biology	D. Chivers	PhD
Dobrovolskaya,	SENS	B. Si	MES
Yekaterina			
Doering, Jonathon	Toxicology	M. Hecker	PhD
Dompierre, Kathryn	Civil & Geological Engineering	L. Barbour	PhD
Dylla, Nicholas	SENS	H. Baulch	PhD
Dudiak, Scott	Arts & Science	n/a	Undergraduate
Evaristo, Jaivime	SENS	J. McDonnell	PhD
Ferdous, Jannatul	Chemical & Biological	W. Helgason	PhD
	Engineering		
Ford, Lorelei	SENS	L. Bharadwaj	MES
Franco, Jorge Garcia	GIWS	A. Ireson	Visiting UG
Gabrielli, Chris	SENS	J. McDonnell	PhD
Garvey, Phillip	Soil Science	S. Siciliano	PhD
Gibb, Josh	SENS	K. Mazurek	PhD
Gilmour, Kim	Arts & Sc.	n/a	Undergraduate
Gillio Meina, Esteban	Toxicology Centre	K. Liber	PhD
Gonda, Jordan	Civil & Geological Engineering	A. Elshorbagy	MSc
Gooding, Raea	SENS	H. Baulch	MES
Green, Derek	Toxicology Centre	D. Janz	MSc
Hehar, Gurdeep	SENS	K. Lindenschmidt	MSEM
Hamisi Karoyo, Abdalla	Chemistry	L. Wilson	PhD
Harder, Phillip	Geography & Planning	J. Pomeroy	MSc
Hassanzadeh, Elmira	Civil & Geological Engineering	A. Elshorbagy	PhD
Hatzel, Kayla	Arts & Science	n/a	Undergraduate
Head, Kerry	Biology	J. Hudson	MSc
Hermann, Kristian	Geological Sciences	J. Hendry	MSc
Hoemsen, Brittney	Biology	D. Chivers	MSc
Hossain, Md. Kamrul	Civil & Geological Engineering	A. Elshorbagy	PhD
Howitt, Nicholas	SENS	n/a	MSEM
Hueser, James	Arts & Science	n/a	Undergraduate
Hunter, Kristine	Biology	J. Hudson	M.Sc.
Jafri, Syed	SPH	A. Backman	MPH

-	Javid, Hammad	SENS	K. Lindenschmidt	PhD
	Jeirani, Zahra	Chemical & Biological	J. Soltan	PhD
		Engineering		
	Johansson, Jess	Biology	J. Hudson	MSc
	Kardas, Jeffrey	Geography & Planning	n/a	Undergraduate
	Karran, Daniel	Geography	n/a	Undergraduate
	Kurkute, Sopan	SENS	Y. Li	PhD
	Lakhanpal, Anchit	Civil & Geological Engineering	Elshorbagy/Razavi	PhD
	Lakken, Nils	SENS	D. Clark	MES
	Leach, Nigel	Environmental Engineering	???	???
	Leroux, Nicolas	Geography & Planning	J. Pomeroy	PhD
	Li, Yiwen	SENS	Y. Li	MSc
	Liu, Ning	SENS	K. Lindenschmidt	PhD
	Lokken, Torbjom	RRM	n/a	Undergraduate
	Lucas, Brett	Toxicology	K. Liber	MSc
	Madaeni, Fatemeh	Civil & Geological Engineering	A. Elshorbagy	PhD
	Mahmood, Fazilatun	Geological Sciences	J. Hendry	PhD
	Mamo, Moges	Civil & Geological Engineering	A. Ireson	MSc
	Marsh, Chris	Geography	Pomero/	
	Masse, Anita	Toxicology	D. Janz	MSc
	Masud, Badrul	SENS	N. Khaliq	PhD
	Meissner, Anna	SENS	K. Lindenschmidt	MES
	Mekonnen, Balew	Civil & Geological Engineering	K. Mazurek	PhD
	Memon, Sameer	SENS	K. Lindenschmidt	MSEM
	Mercer, Jason	Geography & Planning	C. Westbrook	MSc
	Miller, Cody	SENS	J. McDonnell	MES
	Mohamadmahdi, Kowsari	Chemical & Biological	J. Soltan	MSc
	Morrison, Alasdair	Geography & Planning	C. Westbrook	MSc
	Mulhall. Liam	SENS	H. Baulch	MSFM
	Nazarbakhsh. Mahtab	SENS	A. Ireson	PhD
	Nehmey. Magali	SENS	C. Laroque	MES
	Parratt. Toomas	Civil & Geological Engineering	G. Putz	PhD
	Payton, Diana	JSGS	P. Gober	MPP
	Perry, Tom	Arts & Science	n/a	Undergraduate
	Peterson, Amber	Civil & Geological Engineering	A. Ireson	MSc
	Phillips, Iain	Biology	D. Chivers	PhD
	Pradhananga, Dhiraj	Centre for Hydrology	J. Pomeroy	PhD
	Prestie, Chance	Biology	J. Hudson	MSc
	Qin, Kaixuan	Geological Sciences	M. Lindsay	MSc
	Rahimova, Nargiz	SENS	, H. Hesseln	MES
	Rasouli, Kabir	Geography & Planning	J. Pomeroy	PhD
	Rokaya, Prabin	SENS	, Razavi/	PhD
	• ·		Lindenschmidt	

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Roste, Jennifer	Geography & Planning	H. Wheater/J.	MSc
		Pomeroy	
Rozon, Jordan Hilare	Geography & Planning	J. Pomeroy	MSc
Sadeghi, Azam	Chemical & Biological	J. Soltan	MSc
	Engineering		
Sadeghian, Amir	SENS	K. Lindenschmidt	PhD
Safaei, Sahar	SENS	S. Razavi	MSc
Saunders, David	Toxicology	J. Giesy	MSc
Scaff, Lucia	SENS	Y. Li	PhD
Schabert, Marcie	Arts & Science	n/a	Undergraduate
Shafiei, Farshad	Biology	J. Hudson	PhD
Shahariar, Md Shayeb	Soil Science	A. Bedard-	PhD
		Haughn	
Sheikholeslami, Razi	GIWS	S. Razavi	PhD
Sizo, Anton	Geography & Planning	B. Noble	PhD
Steeves, Joel	Civil & Geological Engineering	L. Barbour	MSc
Stetkiewicz, Maciej	SENS	K. Lindenschmidt	MSEM
Terry, Juli	SENS	H. Baulch/ K.	PhD
		Lindenschmidt	
Tendler, Brett	Toxicology Centre	J. Geisy	MSc
Tootoosis, Mylan	Native Studies	R. Innes	PhD
Tipman, James	Civil & Geological Engineering	L. Barbour	MSc
Tritschler, Felix	SENS	J. McDonnell	MSc
Tse, Timothy	Toxicology	P. Jones	MSc
Ufondu, Lotanna	Civil & Geological Engineering	G. Ferguson	PhD
Virdi, Satpal	JSGS	D. Beland	MPA
Wauchope-Thompson,	SENS	H. Baulch	PhD
Michelle			
Weber, Darian	Arts & Science	n/a	Undergraduate
Yassin, Faud	SENS	H. Wheater	PhD
Yee, Briana	Arts & Science	n/a	Undergraduate
Yip, Hayden	Biology	J. Hudson	MSc
Younes, Firas	SENS	R. Patrick	MSEM
Yuan, Hongda	Toxicology Centre	M. Hecker	MSc
Zhang, Fan	SENS	K. Lindenschmidt	PhD
Zee, Jenna	SENS	M. Hecker	MES

APPENDIX B – GIWS Employees and Students 2016-2017

The following table provides information on GIWS employees and students funded during the period of 2016-17. A total of 166 personnel were funded during this period, including 7 GIWS faculty members, 9 administrative staff, 49 research assistant/technicians/ associates/scientists/specialists, 29 postdoctoral fellows, 36 doctoral students, and 36 masters' students.

Name	Title/Area	Supervisor/Unit
CERC Faculty		
Baulch, Helen	Assistant Professor	SENS
Ireson, Andrew	Assistant Professor	SENS
Li, Yanping	Assistant Professor	SENS
Lindenschmidt, Karl-Erich	Associate Professor	SENS
Razavi, Saman	Assistant Professor	SENS
McDonnell, Jeffrey	Professor and Associate Director	SENS
Wheater, Howard	Professor and Director	SENS
Administrative Staff		
Adapa, Phani	Assistant Director	H. Wheater
Dumanski, Stacey	Outreach Coordinator	H. Wheater
Ferguson, Mark	Communications Specialist – 1.0 FTE	H. Wheater
Martel-Andre, Michelle	Executive Assistant	H. Wheater
McDonnell, Veva	Business Development Officer - 0.6 FTE	H. Wheater
McShane, Kelly	Director of Finance	H. Wheater
Olauson, Sherry	Clerical Assistant	H. Wheater
Truong, Viet	Financial Officer	H. Wheater
Zdravkovic, Branislav	IT Administrator – Data	H. Wheater
Technical Support		
Abbasi, Soroush	Research Associate	K. Lindenschmidt
Annand, Holly	Research Assistant	J. Pomeroy
Barr, Alan	Research Technician	H. Wheater
Bauer, Jay	Research Technician	Baulch/Bedard-Haughn
Bayne, Dell	Research Technician	W. Helgason
Baxter, Jonathan	Research Assistant	S. Razavi
Berry, Pamela	Research Assistant	K. Lindenschmidt
Brenna, Britni	Research Assistant	H. Baulch
Buchynski, Matt	Research Assistant	A. Ireson
Das, Apurba	Research Associate	K. Lindenschmidt
DeBeer, Chris	Research Associate	H. Wheater
Doig, Lorne	Research Technician	K. Liber
Duncan, Angus	Research Technician	J. Pomeroy
Elshamy, Mohamed	Research Associate	H. Wheater
Esfahbod, Bahareh	Data Visualization Specialist	S. Razavi

Fang, XingResearch OfficerJ. PomeroyFranco, JorgeResearch AssistantA. IresonGilmour, KimberlyResearch AssistantH. BaulchGuan, JuanResearch OfficerJ. PomeroyHosseini, NasimResearch AssociateH. WheaterHunter, KristineLab TechnicianJ. HudsonJanzen, KimberlyResearch AssociateJ. McDonnellJohnson, BruceResearch AssociateH. BaulchKaur, NavjotResearch AssistantH. BaulchKaur, NavjotResearch AssistantH. BaulchKits, JeremyResearch AssistantH. BaulchKinston, BrockResearch AssistantJ. McDonnellLyon, OliverResearch AssistantJ. McDonnellLyon, OliverResearch AssistantJ. McDonnellLyon, OliverResearch AssistantJ. McDonnellMillar, CodyResearch AssistantJ. McDonnellMeissner, AnnaResearch AssistantJ. HudsonMamo, MogesResearch AssistantJ. HudsonMamo, MogesResearch AssistantB. ZdravkovicMovadi, LalehResearch AssistantC. WhitfieldMurray, CarolynResearch AssistantC. WhitfieldNazemi, AliResearch AssistantJ. HudsonNazemi, AliResearch AssistantJ. HudsonNazemi, AliResearch AssistantC. WhitfieldNorth, RebeccaResearch AssistantJ. HudsonNazemi, AliResearch AssistantJ. HudsonNazemi, AliResearch Assist		A STOCKED AND AND AND AND AND AND AND AND AND AN	1 10 10 10 10 10 10 10 10 10 10 10 10 10
Franco, JorgeResearch AssistantA. IresonGilmour, KimberlyResearch AssistantH. BaulchGuan, JuanResearch OfficerJ. PomeroyHosseini, NasimResearch AssociateH. WheaterHunter, KristineLab TechnicianJ. McDonnellJanzen, KimberlyResearch AssociateJ. McDonnellJohnson, BruceResearch TechnicianHelgason/ Wheater/ McDonnellKambietz, AlyseResearch AssistantH. BaulchKaur, NavjotResearch AssistantH. BaulchKiss, JeremyResearch AssistantH. Baulch/Bedard-HaughnKinuson, BroceResearch AssistantJ. McDonnellLyon, OliverResearch AssistantBaulch/Bedard-HaughnKinuston, BrookeResearch AssistantJ. McDonnellLyon, OliverResearch AssistantJ. McDonnellMillar, CodyResearch AssistantJ. McDonnellMeissner, AnnaResearch AssistantJ. HudsonMamo, MogesResearch AssistantA. IresonMoradi, LalehResearch AssistantA. IresonMoradi, LalehResearch AssistantC. WhitfieldMurray, CarolynResearch AssistantC. WhitfieldNazemi, AliResearch AssociateH. BaulchParker, ElisabethResearch AssociateH. BaulchParker, JahaResearch AssociateH. BaulchParker, JahaResearch AssociateH. BaulchMargo, MogesResearch AssistantC. WhitfieldMoradi, LalehResearch AssistantC.	Fang, Xing	Research Officer	J. Pomeroy
Gilmour, KimberlyResearch AssistantH. BaulchGuan, JuanResearch OfficerJ. PomeroyHosseini, NasimResearch AssociateH. WheaterHunter, KristineLab TechnicianJ. HudsonJanzen, KimberlyResearch AssociateJ. McDonnellJohnson, BruceResearch TechnicianHelgason/ Wheater/ McDonnellKambietz, AlyseResearch AssistantH. BaulchKaur, NavjotResearch AssistantH. BaulchKaur, NavjotResearch AssistantH. BaulchKiss, JeremyResearch AssistantBaulch/Bedard-HaughnKinuston, BrookeResearch AssistantJ. McDonnellLyon, OliverResearch AssistantJ. McDonnellMillar, CodyResearch AssistantJ. McDonnellMessener, AnnaResearch AssistantJ. HudsonMoradi, LalehResearch AssistantJ. IresonMoradi, LalehResearch AssistantB. ZdravkovicMowat, AidenResearch AssistantC. WhitfieldMurray, CarolynResearch AssociateWheater/ ElshorbagyNorth, RebeccaResearch AssociateH. BaulchParker, ElisabethResearch AssociateH. BaulchParker, ElisabethResearch AssistantJ. HudsonPrintz, DanResearch AssistantJ. McDonnellPrintz, DanResearch AssociateH. BaulchPrintz, DanResearch AssociateJ. McDonnellPrintz, DanResearch AssociateJ. McDonnellPrintz, DanResearch AssociateJ. Mc	Franco, Jorge	Research Assistant	A. Ireson
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Parker, ElisabethResearch AssistantJ. HudsonPratt, DyanResearch TechnicianJ. McDonnellPrincz, DanResearch AssistantH. WheaterRodriguez-Prado, ArcadioResearch AssociateJ. McDonnellShook, KevinResearch ScientistJ. Pomeroy	North, Rebecca	Research Associate	H. Baulch
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Rodriguez-Prado, ArcadioResearch AssociateJ. McDonnellShook, KevinResearch ScientistJ. Pomeroy	Princz, Dan	Research Assistant	H. Wheater
Shook, Kevin Research Scientist J. Pomeroy	Rodriguez-Prado, Arcadio	o Research Associate	J. McDonnell
	Shook, Kevin	Research Scientist	J. Pomeroy
Snarr, Kyle Research Assistant Helen Baulch	Snarr, Kyle	Research Assistant	Helen Baulch
Steeves, Joel Research Assistant A. Ireson	Steeves, Joel	Research Assistant	A. Ireson
Tomchuk, Patricia Research Assistant J. Hudson	Tomchuk, Patricia	Research Assistant	J. Hudson
Tu, Frankie Research Assistant S. Razavi	Tu, Frankie	Research Assistant	S. Razavi
Yassin, Fuad Research Assistant K. Lindenschmidt	Yassin, Fuad	Research Assistant	K. Lindenschmidt
Yip, Hayden Research Technician J. Hudson	Yip, Hayden	Research Technician	J. Hudson
Postdoctoral Fellows	Postdoctoral Fellows		
Alebachew Ali, Melkamu Postdoctoral Fellow Ireson/Ferguson/McKay	Alebachew Ali, Melkamu	Postdoctoral Fellow	Ireson/Ferguson/McKay
Ameli, Ali Postdoctoral Fellow J. McDonnell	Ameli, Ali	Postdoctoral Fellow	J. McDonnell
Anis, Muhammad Rehan Postdoctoral Fellow H. Wheater	Anis, Muhammad Rehan	Postdoctoral Fellow	H. Wheater
Asong, Elvis Postdoctoral Fellow H. Wheater/ S. Razavi	Asong, Elvis	Postdoctoral Fellow	H. Wheater/ S. Razavi
Bradford, Lori Postdoctoral Fellow L. Bharadwai	Bradford, Lori	Postdoctoral Fellow	L. Bharadwai
Carr, Meghan Postdoctoral Fellow K. Lindenschmidt	Carr, Meghan	Postdoctoral Fellow	K. Lindenschmidt
Chen, Liang Postdoctoral Fellow Y. Li	Chen, Liang	Postdoctoral Fellow	Y. Li
Chen, Wenrui Postdoctoral Fellow K. Lindenschmidt	Chen. Wenrui	Postdoctoral Fellow	K. Lindenschmidt

and the second of the		
Conway, Jonathan	Postdoctoral Fellow	Pomeroy/Helgason
Haghnegahdar, Amin	Postdoctoral Fellow	S. Razavi
Huang, Mingbin	Postdoctoral Fellow	A. Ireson
Gharari, Shervan	Postdoctoral Fellow	S. Razavi
Karoyo, Abdalla	Postdoctoral Fellow	L. Wilson
Kehoe, Michael	Postdoctoral Fellow	H. Baulch
Keim, Dawn	Postdoctoral Fellow	Ireson/Ferguson/McKay
Kinar, Nicholas	Postdoctoral Fellow	J. Pomeroy
Li, Zhaoqin	Postdoctoral Fellow	K. Lindenschmidt
Mantyka-Pringle, Chrystal	Postdoctoral Fellow	Jardine/Bedard-Haughn/Baulch
Morales Marin, Luis	Postdoctoral Fellow	Lindenschmidt/Wheater
Musselman, Keith	Postdoctoral Fellow	J. Pomeroy
Orlowski, Natalie	Postdoctoral Fellow	J. McDonnell
Pan, Xicai	Postdoctoral Fellow	Y. Li
Pedinotti, Vanessa	Postdoctoral Fellow	H. Wheater
Peng, Hui	Postdoctoral Fellow	Giesy/Jones
Pernica, Patricia	Postdoctoral Fellow	Wheater/McKay
Pinho da Costa, Diogo	Postdoctoral Fellow	Pomeroy/Wheater
Wayand, Nicolas	Postdoctoral Fellow	Pomeroy/Wheater
Wong, Jeff	Postdoctoral Fellow	H. Wheater/ S. Razavi
Xu, Li	Postdoctoral Fellow	H. Wheater
Graduate Students		
Akomeah, Eric	Doctoral Student	K. Lindenschmidt
Bam, Edward	Doctoral Student	A. Ireson
Carr, Meghan	Doctoral Student	K. Lindenschmidt
Cavaliere, Emily	Doctoral Student	H. Baulch
Chilima, Jania	Doctoral Student	L. Bharadwaj
Coles, Anna	Doctoral Student	J. McDonnell
Das, Apurba	Doctoral Student	K. Lindenschmidt
de Toledo, M.	Doctoral Student	H. Baulch
Dompierre, Kathryn	Doctoral Student	Wheater/Barbour
Dylla, N.	Masters Student	H. Baulch
Evaristo, Jaivime	Doctoral Student	J. McDonnell
Faizen Ahmed, Hafiz	Doctoral Student	W. Helgason
Frentress, Jay	Doctoral Student	J. McDonnell
Gabrielli, Chris	Doctoral Student	J. McDonnell
Hammad, Javid	Doctoral Student	Lindenschmidt/Wheater
Hossain, Kamrul	Doctoral Student	Wheater/Elshorbagy
Kurkute, Sopan	Doctoral Student	Y. Li
Lakhanpal, Anchit	Doctoral Student	G. Ferguson/ S. Razavi
Liu, Ning	Doctoral Student	K. Lindenschmidt
Maillett, Jason	Doctoral Student	Johnstone/Laroque
Masud, Mohammed	Doctoral Student	Wheater/Khaliq

Michalicz, J.	Masters Student
Morandi, Garrett	Doctoral Student
Nazarbakhsh, Mahtab	Doctoral Student
Rokaya, Prabin	Doctoral Student
Sadeghian, Amir	Doctoral Student
Scaff, Lucia	Doctoral Student
Shafiei, Farshad	Doctoral Student
Sheikholeslami, Seyed	Doctoral Student
Terry, Julie	Doctoral Student
Tse, Timothy	Doctoral Student
Ufondu, Lotanna	Doctoral Student
Wang, Xiaoyue	Doctoral Student
Wauchope, Michelle	Doctoral Student
Yassin, Fuad	Doctoral Student
Zhang, Fan	Doctoral Student
Abirhire, Oghenemise	Masters Student
Ali, Mustakim	Masters Student
Armstrong, Marie	Masters Student
Aume, Obadiah	Masters Student
Bell, K.	Masters Student
Berry, Pamela	Masters Student
Boyer, Lisa	Masters Student
Budathoki, Sujata	Masters Student
Carr, Meghan	Masters Student
Das, Apurba	Masters Student
DeMars, Shelby	Masters Student
D'Silva, Lawrence	Masters Student
Gonda, Jordan	Masters Student
Grande, Alannah	Masters Student
Hewitt, Kelsey	Masters Student
Ledoux, A.	Masters Student
Li, Yiwen	Masters Student
Mkandla, H.	Masters Student
Meissner, Anna	Masters Student
Mercer, Jason	Masters Student
Millar, Cody	Masters Student
Nehemy, Magali	Masters Student
Pettem, Connor	Masters Student
Prestie, Chance	Masters Student
Roste, Jennifer	Masters Student
Hosseini Safa, Hamideh	Masters Student
Safaei, Sahar	Masters Student
Schiffer, Stephanie	Masters Student

Student Student

H. Baulch J. Giesy A. Ireson K. Lindenschmidt K. Lindenschmidt Y. Li J. Hudson S. Razavi Lindenschmidt/Baulch P. Jones G. Ferguson A. Bedard-Haughn H. Baulch H. Wheater K. Lindenschmidt J. Hudson S. Razavi C. Westbrook Patrick/Wheater H. Baulch K. Lindenschmidt H. Baulch A. Ireson K. Lindenschmidt K. Lindenschmidt A. Ireson Liber/Doig Wheater/Elshorbagy A. Ireson G. Ferguson H. Baulch Y. Li A. Ireson K. Lindenschmidt C. Westbrook J. McDonnell C. Laroque Janz/Wheater J. Hudson Wheater/Baulch Wheater/Elshorbagy

S. Razavi K. Liber

Steeves, Kean	Masters Student	N. Hogan
Steele, Colin	Masters Student	A. Ireson
Tendler, Brett	Masters Student 🕖	P. Jones
Watts, Christena	Masters Student	P. Jones
Willness, Ross	Masters Student	K. Belcher
Wu, Hongye	Masters Student	C. Westbrook
Zhang, Fan	Masters Student	M. Hecker
Zhang, Zhe	Masters Student	Y. Li

APPENDIX C – Students and Highly Qualified Personnel Not Funded by CERC

The following table provide information on students and highly qualified personnel not funded by the CERC program. It was determined that a total of 130 graduate students (PhD 49 and Masters 81) were funded by our members during the period 2016-17. In addition, our members supported and trained 92 highly qualified personnel, including 12 postdoctoral fellows and research associates, 8 research technicians, 5 research scientists, 10 Visiting Scholars (including 8 Distinguished Lecturers) and 59 Research Assistants, Research Engineers and Summer Students.

Glossary: MSc – Master of Science; PhD – Doctor of Philosophy; MSEM – Master in Sustainable Environmental Management; MPP – Master of Public Policy; MES – Master of Environment and Sustainability; MPH – Master of Public health; MPA – Master of Public Administration; SENS – School of Environment and Sustainability; JSGS – Johnson Shoyama Graduate School of Public Policy; SPH – School of Public Health

Student	Supervisor/ Co- Supervisor	Degree	Department	Subject Area
Abirhire, O.	Hudson	PhD	Biology	Limnology
Abu, R.	Reed	PhD	SENS	Socio-hydrology
Adams, D.	Bharadwaj	MPH	School of Public	First Nations (FN)
			Health	Water Risk
				Communication
Aghbolaghi, M.	Soltan	PhD	Chemical &	Ozonation
			Biological Eng.	
Aksamit, N.	Pomeroy	PhD	Geography	Hydrology
Al Masum, A.	MacPhedran	MSc	Engineering	Stormwater
Alam, S.	Barbour	PhD	Civil & Geo	Geoenviron.
Al-Harbi, H.	Giesy	PhD	Toxicology	Enviro. Tox.
Annand, H.	Pomeroy	PhD	Geography	Hydrology
Anderson, E.	Pomeroy	MSc	Geography	Hydrology
Armoh <i>,</i> M.	Barbour	MSc	Civil & Geo	Geoenviron.
Armstrong, M.	Baulch/	MSc	Geography	Nutrient
	Westbrook			Chemistry
Atwa, A.	Bharadwaj	MPH	School of Public	Urban Aboriginal
			Health	Knowledge
				Network
Awume <i>,</i> O.	Patrick	MSc	Geography	First Nations water
				governance
Baijius, W.	Patrick	PhD	Geography	Watershed
				Planning
Bains, S.	Bharadwaj/	MSc	SENS	Water Policy
	Steelman			

Students

	The states		U. SAV	
Balladares, O.	Soltan	MSc	Chemical &	Degradation of
Deutlett M	L MaDannall		DIDIOGICAI EIIg.	
Bartlett, IVI.		PhD-Duke U		Flood Widdelling
Bauer, J.	Bedard-	IVISC	Soli Sc	irrigation
	Haughn/			management
	Helgason			zones in a canola
				crop with spatially
				variable soil
Beckhusen	Laroque	MA	Soil Sc	Caribous fence
Bentancur, S.	Reed	MES	SENS	Indigenous
				Knowledge
Boakye-	Reed	PhD	SENS	Forest
Danquah, J.				Governance
Brock, T.	Reed	MES	SENS	Indigenous
				Engagement
Buchynski, M.	Barbour	MSc	Civil & Geo. Eng.	Geochemistry
Cavallaro, M.	Liber/ Morrissev	PhD	Toxicology	, Aquatic
,				Toxicology
Chad. S.	Barbour	MSc	Civil & Geo Eng	Geoenviro Eng
Chuhaniuk. S.	Barbour	MSc	Civil & Geo Eng	Geoenviro Eng
Coccola. C.	Patrick	MWS	SENS	Community
				source water
				protection
D'Silva I	Liber/Doig	MSc	Toxicology	Phosphorous
		Wide	Толісотобу	Loading
Dangeti, S	Chang	MSc	Civil & Geo Eng	20001118
DeBofsky, A.	Giesy	PhD	Toxicology	Environmental
			0,	Toxicology
Deen, S.	Barbour/	MSc	Civil & Geo. Eng.	Geochemistry
,	Hendry		0	,
Doering, J.	, Giesy/Hecker	PhD	Toxicology	Enviro. Tox.
Durado, C.	Barbour	MSc	Civil & Geo Eng	Geoenviro Eng
England, K.	Westbrook	MSc	Geography	Hydrology
Fleming, T.	Loring	MES	SENS	One health in
	0			coastal BC
				shellfish
Furlan-Nehemv.	Laroque	MSc	Soil Sc	Tree-radial growth
M.	Laroque	11100		
Drancis, D.	Barbour	PhD	Geological Sc.	Hydrogeochem
Gannon, G.	Loring	MES	SENS	Community
				responses to
				fisheries collapse
Gerhart, A.	Janz	MSc	Toxicology	Selenium in Fishes
Ghavami-Lahiji, M.SoltanPhDChemical Eng.Ozonation of VOCM.Gibb, N.ChangMScCivil & Geo EngGillio Meina, E.LiberPhDToxicologyVanadium ToxicityGraves, S.JanzMScToxicologySelenium in Boreal LakesGreen, D.Janz/ JardineMScToxicologyEcoepidemiologyHarder, P.PomeroyPhDGeographyHydrologyHerrera, G.M.SoltanPhDChemical Eng.Emerging contaminants				
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M. Gibb, N. Chang MSc Civil & Geo Eng Gillio Meina, E. Liber PhD Toxicology Vanadium Toxicity Graves, S. Janz MSc Toxicology Selenium in Boreal Lakes Green, D. Janz/ Jardine MSc Toxicology Ecoepidemiology Harder, P. Pomeroy PhD Geography Hydrology Herrera, G.M. Soltan PhD Chemical Eng. Emerging contaminants				
Gibb, N.ChangMScCivil & Geo EngGillio Meina, E.LiberPhDToxicologyVanadium ToxicityGraves, S.JanzMScToxicologySelenium in Boreal LakesGreen, D.Janz/ JardineMScToxicologyEcoepidemiologyHarder, P.PomeroyPhDGeographyHydrologyHerrera, G.M.SoltanPhDChemical Eng.Emerging contaminants				
Gillio Meina, E.LiberPhDToxicologyVanadium ToxicityGraves, S.JanzMScToxicologySelenium in Boreal LakesGreen, D.Janz/ JardineMScToxicologyEcoepidemiologyHarder, P.PomeroyPhDGeographyHydrologyHerrera, G.M.SoltanPhDChemical Eng.Emerging contaminants				
Graves, S.JanzMScToxicologySelenium in Boreal LakesGreen, D.Janz/ JardineMScToxicologyEcoepidemiologyHarder, P.PomeroyPhDGeographyHydrologyHerrera, G.M.SoltanPhDChemical Eng.Emerging contaminants				
Green, D.Janz/ JardineMScToxicologyLakesHarder, P.PomeroyPhDGeographyHydrologyHerrera, G.M.SoltanPhDChemical Eng.Emerging contaminants				
Green, D.Janz/ JardineMScToxicologyEcoepidemiologyHarder, P.PomeroyPhDGeographyHydrologyHerrera, G.M.SoltanPhDChemical Eng.Emerging				
Harder, P.PomeroyPhDGeographyHydrologyHerrera, G.M.SoltanPhDChemical Eng.Emerging contaminants				
Herrera, G.M. Soltan PhD Chemical Eng. Emerging				
contaminants				
Containinants				
Harris, N. Chang MSc Civil & Geo Eng				
Hinzman, M. Loring MES SENS Indigenous				
Fisheries & Co-				
management				
Holt, S. Bharadwaj MPH School of Public Urban Aboriginal				
Health Knowledge				
Network				
Horachek, M. Johnstone/ MSc Biology Plant ecology				
Laroque				
Hunter, K. Hudson MSc Biology Limnology				
Howat, B. Laroque MSc Soil Sc Shelterbelts				
Idowu, B. Bharadwaj MPH School of Public Safe Water for				
Health Health				
Imtiazy, N. Hudson MSc Biology Limnology				
Jeirani, Z. Soltan PhD Chemical Eng Catalytic				
Ozonation				
Johansson, J. Hudson MSc Biology Limnology				
Kapronczai, L. Janz MSc Toxicology Proteomic				
Markers				
Karran, D. Westbrook/ PhD Geography				
Bedard-Haughn				
Kelly, R. Barbour MSc Civil & Geo Geo-Enviro. Engrg.				
Engrg.				
Khanal, B. Reed MES SENS Forest				
Management				
Kim, J. Chang PhD Civil & Geo Eng				
Kiss, J. Bedard-Haughn MSc Soil Science Predictive Digital				
Soil Mapping				
Koehler, B. Barbour/ MSc Civil & Geo Geo-Enviro. Engrg.				
Ferguson Engrg.				
Krogh, S. Pomeroy PhD Geography Hydrology				
Kuzyk, T. Barbour/ MSc Civil & Geo. Eng. Geochemistry				
Hendry				
Lefrancois, N. Chang MEng Civil & Geo Eng				

	- Filed		U VEINS	and the second
Leroux, N.	Pomeroy	PhD	Geography 🕖	Hydrology
Leung, L.	Noble	PhD	Geography &	
			Planning	
Lewallen, G.	Westbrook	PhD	Geography	Hydrology
Luke, L.	Noble	MSc	Geography &	
			Planning	
Lv, Z.	Pomeroy	PhD	Geography	Hydrology
Lynch, K.	Barbour	PhD	Q. U.Belfast	Geotech. Engrg
			(N.Ireland)	
Maillet, J.	Laroque	PhD	Soil Sc	Tree-radial growth
Maloney, E.	Liber/Morrissey	PhD	Toxicology	Aquatic
				Ecotoxicology
Markwart, B.	Liber/ Doig	MSc	Toxicology	Inorganic
				Selenium
Marleau, N.	Laroque	MSc	Soil Sc	Dendrochemistry
Marsh, C.	Pomeroy/	PhD	Geography	Hydrology
	Wheater			
Matzke, C.	Reed	MSEM	SENS	Collaborative
				Planning
Mayrinck, R.	Laroque	PhD	Soil Sc	Carbon Budget
Maule, V.	Patrick	MSEM	SENS	Urban water
				planning
Mercer, J.	Westbrook	MSc	Geography	
Mihalicz, J.	Jardine/ Baulch	MES	SENS	Aquatic
				Toxicology
Moate, A.	Hecker/ Jardine	MSc	Toxicology	Emerging
				Contaminants
Morandi, G.	Giesy	PhD	Toxicology	Enviro. Tox.
Morrison, A.	Noble/	PhD	Geography	Flood Risk
	Westbrrok			
Morrison, G.	Chang	MSc	Civil & Geo Eng	
Muthuri, R.	Loring	MSEM	SENS	Food Security
Neufeld, H.	Loring	MES	SENS	Collaboration in
				environmental
				governance
Norris, M.	Bharadwaj	MPH	School of Public	First Nations
			Health	Drinking Water
Nwanekezie, K.	Noble	PhD	Geography &	
-			Planning	
Oluwatayo, B.D.	Bharadwaj	MPH	School of Public	VOC Emissions
			Health	trom PUF
Peskett, L.	J. McDonnell	PhD-USC		Plant Water
				Relation

	in A Sherit		U SAMP	and proved
Pettem, C.	Janz	MSc	Toxicology	Zebrafish
Pradhananga, D.	Pomeroy	PhD 🔍	Geography	Hydrology
Prestie, C.	Hudson	MSc 🕖 🐘	Biology	Limnology
Prestie, K.	Jardine	MSc	Toxicology	Fish
				Biomonitoring
Raes, K.	Liber	MSc	Toxicology	Selenium
Robichaud, H.	Pomeroy	PhD	Geography	Hydrology
Rohanizadegan, M.	Pomeroy	MSc	Geography	Hydrology
Ruso, G.	Jardine	MSc	Toxicology	Amphibian Health
Santafé, V.	Loring	PhD	SENS	Ecotourism &
				Food Sovereignty
Saunders, D.	Giesy	PhD	Toxicology	Enviro. Tox.
Schenn <i>,</i> W.	Jardine/ Janz	PhD	SENS	Aquatic
				Toxicology
Schiffer, S.	Liber	MSc	Toxicology	Vanadium Toxicity
Shah, H.	Soltan	MEng	Chemical Eng.	Horizontal &
				Vertical Wells
Shahadu, H.	Reed/ Steelman	PhD	SENS	Policy innovation
				and wildfire
Shahariar, S.	Bedard-Haughn	PhD	Soil Sc.	Land-use
				management
Shahkarami, S.	Dalai/ Soltan	PhD	Chemical &	CO2 Capture
			Biological Eng.	
Shaw, A.	Steelman	MES	SENS	Environment and
				Sustainability
Siemens, A.	Chang	MSc	Civil & Geo Eng	
Sigda, R.	Barbour	PGD	Civil & Geo	Geo-
				Environmental
Smith, L.	Bedard-	MSc	Soil Sc.	Delineation of
	Haughn/			Functional Land
	Laroque			Management
				Zones
Smith, I.	Jardine	MSc	SENS	Biomonitoring
Sowat, S.	J. McDonnell	PhD-		Stream isotope
		UEdinburgh		Modelling
Srayko, S.	Jardine/ Chivers	MSc	Biology	Toxicology
Stoll, N-L.	Westbrook	MSc	Geography	Hydrology
Streich, S.	Westbrook	MSc	Geography	Hydrology
Tang, Y	Barbour	MSc	Civil & Geo	Geo-Tech. Engrg.
			Engrg.	
Tipman, J.	Barbour	MSc	Civil & Geo. Eng.	Geo. Enviro. Eng.
Тse, Т.	Doig	PhD	Toxicology	Paleolimnology
Toews, H.	Westbrook	PhD	Geography	Hydrology

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Videa Giering, Y.	Poemroy	PhD	Geography 🕖	Hydrology
Vogel, T.	McPhedran	MSc	Engineering	Clean Water
Walker, H.	Reed	PhD 🕖 🔍	SENS	Gender, Culture and Climate Change
Wang, X.	Bedard-Haughn	PhD	Soil Sc.	Mountain peatland
White, K.	Liber	MSc	Toxicology	Oil Sands Process Water
Whitely, C.	Loring	MSEM	SENS	Food Justice
Wong, L.	Noble	MSC	Geography & Planning	

Highly Qualified Personnel

Glossary: Postdoctoral Fellow – PDF; Visiting Scholar – VS; Research Engineer – RE; Research Assistant – RA; Research Associate – RAsso; Research Technician – RT; Summer Student – SS; Research Scientist – RS

Research	Supervisor	Position	Department	Subject Area
Personnel				
Alam, R.	MacPhedran/	PDF	Civil & Geo Eng	Stormwater
	Chang			
Aubry-Wake, C.	Pomeroy	RA	Geography	Hydrology
Bews, B.	Barbour	RE	Civil & Geo	Geo-
				Environmental
Bettman, N.	MacPhedran	SS	Engineering	Stormwater
Bichel, C.	Doig	RT	Toxicology	Paleolimnology
Brown, T.	Pomeroy	RT	Geography	
Bradford, L.	Bharadwaj	PDF	SPH	Water for Health
Buchynski, M.	Barbour	RA	Civil & Geo	Geo-
				Environmental
Cantin, J.	Giesy	VS	Toxicology	Environmental
				Toxicology
Coates, C.	Noble	SS	Geography &	
			Planning	
Costa, D.	Pomeroy	PDF	Geography	Hydrology
Courtin, E.	Pomeroy	RT	Geography	Hydrology
Fang, X.	Pomeroy	RT	Geography	Hydrology
Franco, J.	Ireson	SS	GIWS	Groundwater
Galloway, G.	Pomeroy	RT	Geography	Hydrology
Guo, J.	Liber	VS-Shanxi Univ	Toxicology	Ecological Effects
Hassanzadeh, E.	Noble	PDF	GIWS	Socio-Hydrology
Houston, J.	Jardine	RT	Toxicology	Field Assistance

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L.			-OPDA	Or and the
Zhang, Z.	Soltam	SS	Chemical Eng	Air pollution
40 Students	Giesy	vs	Toxicology	Environmental

Geisy supervised 40 students at the City University of Hong Kong, The University of Hong Kong, Hong Kong Baptist University, Hong Kong University of Science and Technology Nanjing University, Xiamen University, and the Chinese Academy of Environmental Research (CRAES)

APPENDIX D - GRANTS 2016-2017

Following table shows ongoing and new grants received by members of GIWS during the period of 2016-17. The GIWS membership received a total funding of \$8,626,036 of which core GIWS faculty secured \$1,584,456, which is in addition to the base operating funding of \$241 million secured by GIWS from 2011-16. To avoid double counting of total grant value, we have listed amounts in *Italics* that were either previously reported or are co-led by investigators.

Baulch, Helen	
\$880,000	Undertaking lake metabolism and algal blooms: New tools for the management of potable water sources, Natural Sciences and Engineering Research Council (NSERC) Strategic Project Grant (Co-I: J.P. Giesy, R. Leavitt, P. Jones, K. Liber, K- E. Lindenschmidt)
\$130,000	Biogeochemistry of lakes in winter and the implications of declining ice cover, NSERC Discovery Grant
\$309,478	A water quality modelling system of the Qu'Appelle River catchment for long- term water management policy development, Environment Canada Environmental Damages Fund (PI: Lindenschmidt, Co-Is: Noble, Strickert)
\$400,000	Centennial Enhancement Chair, University of Saskatchewan
\$1,700,000	PrairieWaterSAVE, Global Water Futures Grant (PI: McDonnell)
\$1,498,700	Agricultural Water Futures, Global Water Futures Grant (PI: Macrae)
\$860,000	FormBloom, Global Water Futures Grant
\$186,000	Better BMPs – Budgeting and minimizing greenhouse gas emissions from agricultural water bodies, Agriculture and Agri-Food Canada (PI: Whitfield)
\$5,500,000	LakePulse Network, NSERC Strategic Network Grant (PI: Yannick Huot)
Bedard-Haughn, A	Ingela
\$200,934	Enhanced Saskatchewan Soil Data for Sustainable Land Management, Co- Funded by Saskatchewan Ministry of Agriculture – Agriculture Development Fund, Saskatchewan Canola Development Commission, and Saskatchewan Bulse Growers (Co. I: Van Boos)
4	ruise Growers (CO-1. Vall Rees)
\$1,700,000	PrairieWaterSAVE, Global Water Futures Grant (PI: McDonnell)
\$1,700,000 \$160,000	PrairieWaterSAVE, Global Water Futures Grant (PI: McDonnell) Hydric Soils of the Prairie Pothole Region, \$160,000. Natural Sciences and Engineering Research Council of Canada Discovery Grant; April 2017 – March 2022
\$1,700,000 \$160,000 \$852,036	PrairieWaterSAVE, Global Water Futures Grant (PI: McDonnell) Hydric Soils of the Prairie Pothole Region, \$160,000. Natural Sciences and Engineering Research Council of Canada Discovery Grant; April 2017 – March 2022 Understanding Resilience in Agroecosystems, \$852,036. Natural Sciences and Engineering Research Council of Canada Strategic Partnerships Grants for Projects; September 2016 – August 2019 (Co-I: Arcand, Knight, Laroque, Peak, Stewart, Walley, Belcher)
\$1,700,000 \$160,000 \$852,036 Barbour, Lee	PrairieWaterSAVE, Global Water Futures Grant (PI: McDonnell) Hydric Soils of the Prairie Pothole Region, \$160,000. Natural Sciences and Engineering Research Council of Canada Discovery Grant; April 2017 – March 2022 Understanding Resilience in Agroecosystems, \$852,036. Natural Sciences and Engineering Research Council of Canada Strategic Partnerships Grants for Projects; September 2016 – August 2019 (Co-I: Arcand, Knight, Laroque, Peak, Stewart, Walley, Belcher)

\$85,731	An evaluation of the controls on salt release from oil sands reclamation covers, Syncrude Canada Ltd., (Co-Is: J. McDonnell, A. Ireson)
\$1,735,695	UofS Research Proposal for Teck Coal's Applied Research and Development Program on Selenium and Watersheds - Y2-4", TECK Coal Ltd. (Co-I: J. Hendry)
\$130,000	Multiscale soil water and temperature monitoring and stochastic simulation in semiarid farmlands", Chinese National Natural Science Foundation, \$130,000 (PI: Bing Si)
\$1,298,392	Evaluation and Modeling of Soil Water Dynamics to Determine Land Capability of Coarse Textured Hydrocarbon Affected Reclamation Soils - Aurora Capping Study", CONRAD (sponsors: Shell Canada Energy, CNRL, IORL, Suncor, Syncrude, TEPCA), Industry Contract (PI: Bing Si)
\$1,305,800	Hydrogeological Characterization of Oil Sands Mine Closure Landforms", NSERC Industrial Research Chair - Syncrude Canada Ltd portion
\$1,305,800	Hydrogeological Characterization of Oil Sands Mine Closure Landforms", NSERC Industrial Research Chair - NSERC portion
\$135,000	Large scale mine cover monitoring and mine cover design for cold regions", NSERC, Discovery Grant
\$122,305	An evaluation of the controls on salt release from oil sands reclamation covers, Syncrude – NSERC Collaborative Research and Development Grant (Co-Is: A. Ireson, J. McDonnell)
\$1,845,000	Mine Overlay Site Testing (MOST) Facility, Western Economic Diversification (Co-PI: J. McDonnell, J. Hendry, A. Ireson)
\$1,650,000	Water Security – Collaborative Research and Training Experience (CREATE) Program, NSERC CREATE Grant (PI: C. Westbrook; Co-I: H. Baulch, H. Wheater, J. Pomeroy, J. McDonnell, P. Gober, B. Noble, K. Belcher, A. Bedard-Haughn)
\$449,408	Characterization of controls on mass loading to an oil sands End Pit Lake, Syncrude – NSERC Collaborative Research and Development Grant (Co-I: M. Lindsay)
\$151,819	Development of a Local Meteoric Water Line (LMWL) and a Stable Isotope of Water Catalogue for the Aurora North Mine Site", Syncrude Canada Ltd.
\$54,692	Evaluation of the 2014 and 2015 Mass Balances for BML", Syncrude Canada Ltd., Addendum to SCL-BML Industry Contract (PI: Hendry)
\$58,249	Determining the Sorbing Capacity of a Fill (Se Lab Testing)", TECK Coal Ltd., Industry Contract (PI: Hendry)
\$7,500	Real Time Monitoring of Water Content in Reclaimed Mine Waste Using Cone Penetration – TDR", Mitacs Accelerate Grant, O'Kane Portion (Co-I: Elwood)
\$100,000	Quantifying the effects of freeze-thaw cycles on mine cover system design and performance (MOST), NSERC-CRD, (PI: McDonnell, Co-Investigators: J. Hendry, A. Ireson)
\$50,000	Quantifying the effects of freeze-thaw cycles on mine cover system design and performance (MOST), O'Kane Grant, (PI: McDonnell, Co-Investigators: J. Hendry, A. Ireson)

\$102,643	Expansion of the scope of field-based research activities to include a Budget for annual sampling at Base Mine Lake (BML), Syncrude Canada Ltd.,
	Addendum to SCL-BML Industry Contract
\$53,750	Numerical Modelling of the Long-Term Water Dynamics and the Impact of Alternative Soil Covers on the Water Balance for Reclamation Soil Covers on Lean Oil Sands Overburden (Co-I: Si)
Bharadwaj, Lalita	
\$860,000	FORecasting Tools and Mitigation Options for Diverse BLOOM-affected Lakes, Global Water Futures Pillar 3 Grant (PI: Baulch)
\$1,700,000	Prairie WATERSAVE. Global Water Futures, Global Water Futures Pillar 3 Grant (PIs: McDonnell and Spence)
\$19,530	CONFLUENCE (Co-design of iNfrastructure For Life: Understanding Elements of Nations and Constructing Emergent systems), Canada Excellence Research Chair in Water Security; GIWS Seed funding
\$140,000	Making Health Water Drinking Water, Federation of Sovereign Indigenous Nations (FSIN), 2016 – 2017
\$25,000	Urban Aboriginal Knowledge Network (UAKN) Prairie Centre. Collaborative Processes and Co-Creation for Supporting Urban Movers in Transition, SSHRC Partnership Grant
\$2,000	Collaborative Processes and Co-Creation for Supporting Urban Movers in Transition, Vice-Provost, Teaching and Learning Special Support
\$20,000	Partnership Grant Connection and Insight Program: A Social Network Analysis For Knowledge Integration and Extension of WEPGN Research, SSHRC-WEGPN Partnership Grant Connection and Insight Program
\$10,000	Indigenous Water Forum, Saskatchewan Health Research Foundation Connections Grant
\$7,500	Indigenous Water Forum: Bridging Cultural Knowledges for Water and Health, Global Institute for Water Security –Canada Excellence Research Chair
\$3,300	Indigenous Water Forum: Connecting People, Dakota Dunes Development Corporation
\$3,000	Indigenous Water Forum: Connecting People and Water Cultures, Government of Saskatchewan First Nations and Metis Sponsorship Grant
\$1.000	Indigenous Water Forum: Connecting People, Saskatchewan Indian Gaming

- Authority\$3,000 Indigenous Water Forum: Connecting People and Bridging Cultural Knowledge, University of Saskatchewan Conference Fund
- \$7,500 "Spirit, Safety, and a Stand-off" Knowledge Mobilization of results from Beyond Physical: Impacts of Water Regulations in Saskatchewan First Nations Communities, SSHRC-WEPGN Partnership and Connections Research Program

Chang, Won Jae	
\$115,000	Remediation in Challenging Environments: A New Approach for Accelerating
	Bioremediation in Cold Climates, NSERC Discovery Grant

\$99,245	Microbial Assessment and Bioremediation Feasibility for Petroleum Hydrocarbon Contaminated Soils, Husky Oil Operations - NSERC-CRD Grant					
\$52,500	Areva Resources Canada - Mitacs Accelerate Grant (PI: McPhedran, Co-I: Schmid) 2017-2018 Development of Functionalized Clay-Based Reactive Media for Removal of Cationic Salts from Brine Effluent, International Minerals Innovation Institute (Agrium, Mosaic, and PotashCorp), IMII-Mitacs Accelerate Cluster Grant					
\$365,000						
\$208,897	Geoenvironmental Engineering Laboratory for Contaminated Site Remediation Research, Canada Foundation for Innovation					
\$25,000 \$18,806 \$1,000	NSERC Engage grant with Cypher Environmental CFI Infrastructure Operating Fund AIMDay Minerals grant					
Clark, Bob						
\$140,000 \$1,700,000	Mitacs Elevate Postdoctoral Fellowship to Chrystal Mantyka-Pringle Prairie WATERSAVE. Global Water Futures, Global Water Futures Pillar 3 Grant (PIs: McDonnell and Spence)					
Elshorbagy, Amin						
\$280,000 \$105,000	Co-Leader Theme 4 - Canadian FloodNet, NSERC Strategic Network Grant Sustainability-oriented Water Resources Allocation, Management, and Planning, NSERC Discovery Grant					
\$1,650,000	Integrated Modelling for Prediction and Management of Change in Canada's Major River Basins, Global Water Futures - Canada First Research Excellence Fund, 2017-2020 (Co-Is: Pietroniro, Lindenschmidt, Elshorbagy, Li, Jardine, Wheater, Pomeroy, Strickert, Gober, Gutwin, Stadnyk, Brouwer, Tolson, Coulibaly)					
Ferguson, Grant						
\$1,700,000	Prairie WATERSAVE: Sustainable water management for civic and provincial policy makers and urban, rural, and Indigenous communities, Global Water Futures (PI: McDonnell)					
\$525,000	Hydrogeological Research for Saskatchewan's Potash Industry, International Minerals Innovation Institute (Co-I: M. Lindsay, B. Eglington, C. Hawkes, J. Hendry)					
Giesy, John						
\$200,000	Novel Natural and Synthetic Brominated Compounds in the Environment, NSERC Discovery					
\$2,000,000	Saskatchewan River Basin: a large-scale observatory for new interdisciplinary water science, Canada Foundation for Innovation (PI: H. Wheater, Co-I: J. Pomeroy)					
\$961,000	Analytical Toxicology Base in Support of Economic Development, Western Economic Diversification (PI: K. Liber; Co-I: P.D. Jones, M. Hecker)					

\$880,000	Undertaking lake metabolism and algal blooms: New tools for the management of potable water sources. Natural Sciences and Engineering Research Council
	(NSERC) Strategic Project Grant (PI: H. Baulch; Co-I: R. Leavitt, P. Jones, K. Liber, K-E. Lindenschmidt)
\$142,180	Marine Biogeochemistry and Ecotoxicology Program of Introducing Talents of Discipline to Universities, Ministry of Education and the State Administration of Foreign Experts, China to State Key Lab of Marine Environmental Science, Xiamen University, total funding \$710,900
\$491,180	Emission, Diffusion and Environmental Effects of Emerging Pollutants from Rapid Urbanization, National Science Foundation of China (Co-I: X. Zhang)
<i>\$1,400,000</i>	Canada Research Chair Program
\$530,000	Institutional Support from University of Saskatchewan for Canada Research Chair
\$77,840,000	Global Water Futures: Solutions to Water Threats in an Era of Global Change, Canada First Research Excellence Fund, Tri-Agency 2016-2023 (PI: Wheater plus 8 Co-PIs)
\$20,060	Sources of Organo-bromine Compounds in Sediments, University Faculty Research Investment Program, funded by the Baylor Office of the Vice Provost for Research
\$224,250	Evaluating Effects of the Huskey Oil Spill on Fishes in the North Saskatchewan River, National Contaminants Advisory Group, Fisheries and Oceans Canada (PI: Jardine, Co-I: Jones)
\$272,382	CREATE Training Program in Human and Ecological Risk Assessment (HERA), National Science and Engineering Research Council of Canada 2016-2017 (Co- Is: S.D. Siciliano, K.S. Solomon, K.R. Reimer, R.C. Copes, J.G Guernsey, J.P. Giesy, B.H. Hale and L.B. Bharadwaj)
\$75,545	Toxico-genomic Assessment of Emerging Environmental Pollutants Using Novel Functional Genomic and High Throughput Technologies, European Commission, Directorate for Innovation and Research, Directorate of Environment, total funding \$453,270 (Co-PI: X. Zhang)
\$286,800	Potential Impacts of Modern Perfluorinated Chemicals on Fish, National Contaminants Advisory Group, Fisheries and Oceans Canada (PI: Jones)
\$195,000	Novel Natural and Synthetic Brominated and Iodinated Compounds in the Environment, Discovery grant, National Science and Engineering Research Council of Canada 2017-2022
\$502,000	Assessment of Occurrence of Synthetic Hormone [melengestrol Acetate (MGA), Trenbolone Acetate (TBA)] and Beta-agonist (ractopamine) in Cattle Operations and Associated Environments, Beef Cattle Research council of Canada; 2018-2021 (PI: Larney, Co-I: Jones)
Hecker, Markus	
\$575,000	Predictive Aquatic Ecotoxicology, Canada Research Chair Program
\$402,261	Predictive Aquatic Eco-Toxicology Facility, CFI Infrastructure Grant for Canada Research Chairs

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\$200,000	Chair Program
\$75,000	Predictive Aquatic Eco-Toxicology Facility, Institutional Support for Canada
	Research Chair Program
\$36,203	Predictive Aquatic Eco-Toxicology Facility, CFI Institutional Operation Fund
\$444,998	Assessing the Adverse Effects of Emerging Chemical Contaminants on Fishes of Commercial, Aboriginal and Recreational Value to Canadians (AECCO), Fisheries and Oceans Canada
\$299,140	Safe Water for Health Research Team (SWHRT), Saskatchewan Health Research Foundation (PI: L. Bharadwaj and others)
\$202,496	Aquatic impact assessment of municipal effluents, Canadian Water Networks
\$200,000	Functional Transcriptomics of Native Canadian Fish Species; NSERC Discovery
\$961,000	Analytical Toxicology Base in Support of Economic Development, Western Economic Diversification (PI: K. Liber; Co-I: J.P. Giesy, P.D. Jones)
\$402,261	Predictive Aquatic Ecotoxicology Facility; CFI and matching CRC portion
\$29,530	Application of environmental DNA to detect aquatic invasive species. Fish and
1 - /	Wildlife Development Fund (Co-I: Jardine)
\$725.070	Advancing environmental risk assessment of selenium (ERASe). NSERC
. ,	Strategic Project Grant (Co-PIs K. Liber and D. Janz)
\$444,998	Assessing the Adverse Effects of Emerging Chemical Contaminants on Fishes of
. ,	Commercial, Aboriginal and Recreational value to Canadians (Co-I: M. hecker,
	P. Jones, S. Wiseman)
Helgason, Warren	1
\$988,149	Improved water and nutrient use efficiency to maximize the net greenhouse
	gas balance in irrigated production systems, Agriculture and Agri-Food Canada
	(Co-I: R. Farrell)
\$114,250	Evaporation Field study For the Prairie Provinces Water Board, Saskatchewan
	Water Security Agency
\$148,340	Improved variable rate irrigation prescription development, Saskatchewan
	Agriculture Development Fund
Hendry, Jim	
\$525,000	Hydrogeological Research for Saskatchewan's Potash Industry, International Minerals Innovation Institute (Co-I: G. Ferguson, M. Lindsay, B. Eglington, C.

	Hawkes)
\$1 735 695	UofS Research Proposal for Teck Coal's Applied Research and Development
<i>~_)</i> , <i>cc</i> , <i>ccc</i>	Program on Selenium and Watersheds - Y2-4", TECK Coal Ltd. (Co-I: J. Hendry)
\$150,000	Towards Environmentally Responsible Resource Extraction (TERRE), NSERC
	CREATE Program, \$1,650,000 (PI: D.W. Blowes; Co-I: 9 Co-Applicants, 20
	Collaborators)
\$1,113,725	Cameco Industry Research Chair in Environmental and Aqueous

\$1,189,500	NSERC Industry Research Chair in Environmental and Aqueous Geochemistry,
	\$237,900 per year for 5 years
\$90,000	Saskatchewan Potash Producers Grant
Hogan, Natacha	
\$903,925	Fate and toxicity of lubricating oils across Canadian ecoprovinces, TransCanada Corp – NSERC Collaborative Research and Development Grant (PI: S. Siciliano; Co-I: E. Farrell)
\$172,235	Strategies to mitigate the negative effects of deoxynivalenol (DON) in nursery pigs. Agricultural Development Fund (PI: D. Beaulieu; Co-I: L. Eastwood, H. Wilson, T.A. Scott)
\$196,000	The impact of reducing mycotoxins in poultry feed on the natural defense against disease. NSERC Collaborative Research and Development Grant, Canadian Poultry Research Council, Canadian Bio-Systems. (Co-I: T.A. Scott)
\$176,500	Using toxicogenomics in amphibians and the adverse outcome pathway for environmental effects monitoring of oil sands industrial development. Strategic Technology Applications of Genomics in the Environment (STAGE), Environment Canada (PI: B. Pauli, Co-I: V.L. Trudeau, D. Schock)
Hudson, Jeff	
\$218,930	Lake Diefenbaker water quality assessment, Saskatchewan water Security
¢4.000	Agency
\$4,000 \$4,000	University Undergraduate Student Research Assistantships Grant
\$4,500 \$12,270	CEL infrastructure operating fund
\$15,528 \$95,000	Novel Riegeochemical Pathways, Patterns and Measurements of Nitregen and
\$35,000	Phosphorus in Lakes and Reservoirs, NSERC Individual Discovery Grant, April 1, 2017-2022
Ireson, Andrew	
\$132,000	Groundwater-surface water interactions in the prairies, NSERC Discovery Grant
\$1,846,000	The Mine Overlay Site Testing (MOST) Facility, Western Economic Diversification (Co-I: Barbour, Hendry and Ireson)
\$122,305	An evaluation of the controls on salt release from oil sands reclamation covers, Syncrude – NSERC Collaborative Research and Development Grant (Co-Is: J. McDonnell, L. Barbour)
\$25,000	Improving and benchmarking models for snowmelt infiltration in seasonally frozen soils, NSERC Engage Grant with Geo-slope International Ltd
\$208,000	Quantifying salt release from oil sands reclamation covers, NSERC Collaborative Research and Development Grant with Syncrude Canada Ltd as an industry partner
\$150,000	Quantifying the Effects of Freeze-Thaw Cycles on Mine Cover System Design and Performance, NSERC Collaborative Research and Development Grant with O'Kane Consultants Inc as an industry partner

lanz David	
\$235 000	Mechanisms of Developmental Toxicity and Metabolic Disruption in Fishes
<i>9233,000</i>	Exposed to Selenium NSERC Discovery Grant 2016-2021
\$616 622	Grizzly-PAW: Grizzly Population Assessment in yelloWhead: Integrated
<i>9010,022</i>	Approaches Toward Conserving Grizzly Bears on a Human-Dominated
	Landscape of Western Alberta. NSERC. Collaborative Research and
	Development Grants Program. Total funding is \$1.8 million
\$725,070	Advancing environmental risk assessment of selenium (ERASe). NSERC
	Strategic Project Grant (Co-PIs M. Hecker and K. Liber)
\$124,000	Development of a fish biomonitoring program for northern Saskatchewan.
	Environmental Damages Fund (Co-I: Jardine)
\$149,233	Critical need for a new chiller for the Aquatic Toxicology Research Facility,
	Toxicology Centre, Research Tools and Instruments, Natural Sciences and
	Engineering Research Council of Canada (PI: Hecker; Co-I: Liber, Hogan, Niyogi,
644 7 444	Weber, Giesy, Raine)
\$117,114	Woving from lab to field to assess cardiorespiratory and metabolic
	contaminant effects in fish, Research Tools and Instruments, Natural Sciences
\$115 101	Motivated for movement? Exercise and the gestation environment on sow
JII <i>J,</i> 404	nerformance and welfare Agriculture Development Fund Government of
	Saskatchewan
\$224,480	Bioaccumulation and effects of environmental contaminants in St. Lawrence
. ,	Estuary belugas and minke whales, National Contaminants Advisory Group,
	Fisheries and Oceans Canada (PI: Verreault; Co-I: Houde, Lesage, Helbing,
	Brinkman)
Jardine, Tim	
\$135,000	Ecological benefits and toxicological consequences of flooding in river
¢1 (50 000	ecosystems, NSERC Discovery Grant
\$1,650,000	Integrated Modelling for Prediction and Management of Change in Canada's
	Fund 2017-2020 (Co-ls: Pietroniro, Lindenschmidt, Elsborbagy, Li, Jardine
	Wheater Pomerov Strickert Gober Gutwin Stadnyk Brouwer Tolson
	Coulibaly)

- \$224,250 Evaluating Effects of the Huskey Oil Spill on Fishes in the North Saskatchewan River, National Contaminants Advisory Group, Fisheries and Oceans Canada (Co-Is: Jones and Giesy)
- \$30,000 Application of an advanced and user-friendly rapid environmental DNA protocol to detect aquatic invasive species. Fish and Wildlife Development Fund (PI: Hecker)

Johnstone, Jill	
\$539,000 ()	Population dynamics and critical habit of woodland caribou in the boreal shield of Saskatchewan, NSERC Collaborative Research and Development Grant (Co- I: McLoughlin, P.D.)
\$150,000	Regional consequences of changing climate-disturbance interactions for the resilience of Alaska's boreal forest: Bonanza Creek LTER, U.S. National Science Foundation, Long-Term Ecological Research program (Co-I: Ruess, R., and 24 others)
\$105,000	Resistance, resilience, and vulnerability of boreal forests to environmental change, NSERC Discovery Grant
Jones, Paul	
\$961,000	Analytical Toxicology Base in Support of Economic Development, Western Economic Diversification (PI: K. Liber; Co-I: J.P. Giesy, M. Hecker)
\$444,998	Assessing the Adverse Effects of Emerging Chemical Contaminants on Fishes of Commercial, Aboriginal and Recreational value to Canadians (Co-I: M. hecker, P. Jones, S. Wiseman)
\$224,250	Evaluating Effects of the Huskey Oil Spill on Fishes in the North Saskatchewan River, National Contaminants Advisory Group, Fisheries and Oceans Canada (Co-Is: Jones and Giesy)
Laroque, Colin	
\$852,036	Understanding Resilience in Agroecosystems, \$852,036. Natural Sciences and Engineering Research Council of Canada Strategic Partnerships Grants for Projects; September 2016 – August 2019 (PI: Bedard-Haughn; Co-I: Arcand, Knight, Peak, Stewart, Walley, Belcher)
\$10,000	SoTL Cluster for Environmental Science FYRE research, U of S SoTL Cluster – Laroque
\$15,000	Stelfox Mountain Caribou Fence Project, Northwest Territories Government – Archeological Branch
\$1,440,180	Development of A Management Support Toolbox For Carbon Sequestration Strategies Using Agroforestry Shelterbelt Systems In Saskatchewan, Agricultural Greenhouse Gases Program 2, (Co-I: Van Rees, Belcher, Kulshreshtha)
Li, Yanping	
\$5,000,000	Chaging Cold Regions network, Climate Change and Atmospheric Research, NSERC (36 Canadian Scientists and 15 International Collaborators),
\$1,498,700	Canadian Agricultural Water Use: Current State and Prospects, Global Water Futures (PI: Macrae)
\$1,650,000	Integrated Modeling Network for Prediction and Management of Change in Canada's Major River Basins, Global Water Futures (PI: Razavi)
\$1,100,000	Climate-Related Precipitation Extremes, Global Water Futures (Co-Pls: Stewart/Ziwers)

\$471,656	The Global Water Futures: Solutions to Water Threats in an Era of Global
	Change. Compute Canada's Research Platforms and Portals 2017 competition
\$110,000	Warm season diurnal precipitation over the plains east of the Rockies, NSERC
	Discovery Grant, 2017-2022
\$5,000	Hybrid Modeling to generate annual and daily source contributions and
	ambient concentrations for NO2, PM2.5, and O3 at a high spatial resolution (≤1
	km) across Canada, Health Canada (PI: Hakami)

Liber, Karsten

\$232,000	Neonicotinoid insecticide toxicity to aquatic organisms: Addressing key
	knowledge gaps on toxicity thresholds, mixtures and mitigation strategies
	using buffer zones. Dept of Fisheries and Oceans, National Contaminants
	Advisory Group (Co-I: K. Liber)

- *\$200,000* Assessment of metal contamination of rivers in Shanxi Province, P.R. China, associated risk to environmental and human health, and recommendation of options for environmental restoration. 100 Talents Program, Shanxi Province, P.R. China. Principal Investigator
- *\$725,070* Advancing environmental risk assessment of selenium (ERASe). NSERC Strategic Project Grant (Co-PIs M. Hecker and D. Janz)
- *\$149,233* Critical need for a new chiller for the Aquatic Toxicology Research Facility, Toxicology Centre, Research Tools and Instruments, Natural Sciences and Engineering Research Council of Canada (PI: Hecker; Co-I: Liber, Hogan, Niyogi, Weber, Giesy, Raine)
- *\$22,600* Analysis of suspect contaminants of concern in tissues of fish collected from downstream of a Canadian mining operation, Teck Coal 2016-17

\$1,650,000	Integrated Modelling for Prediction and Management of Change in Canada's Major River Basins, Global Water Futures - Canada First Research Excellence Fund, 2017-2020 (Co-Is: Pietroniro, Lindenschmidt, Elshorbagy, Li, Jardine, Wheater, Pomeroy, Strickert, Gober, Gutwin, Stadnyk, Brouwer, Tolson,
4-4 0-0	
<i>Ş71,250</i>	Near real-time Ice-Related Flood Hazard Assessment (RIFHA), Canadian Space Agency's & C-Core (PI), St. John's, NFLD 2016-2018
\$10,000	Climate change impacts on secondary production for fish, SK Fish and Wildlife Development Fund
\$25,000	Reinforcing river and lake ice covers to maintain their load-bearing capacity in a warming climate, NSERC Engage grant with NOR-EX ICE Engineering, Ottawa
Lindsay. Matt	

• •	
\$140,000	Biogeochemical and Mineralogical Processes in Redox Dynamic Groundwater
	Systems, NSERC Discovery Grant
\$694,136	Mine Closure Geochemistry, Associate Industrial Research Chair, NSERC
	Industrial Research Chairs Program

\$694,136	Mine Closure Geochemistry, Associate Industrial Research Chair, Syncrude Canada Ltd., Industry Contribution
\$33,000	Towards Environmentally Responsible Resource Extraction (TERRE), NSERC CREATE Program, \$1,650,000 (2% available to M. Lindsay) (PI: D.W. Blowes; Co-I: 9 Co-Applicants, 20 Collaborators)
\$259,071	Characterization of controls on mass loading to an oil sands End Pit Lake, Syncrude Canada Ltd., (Co-I: M. Lindsay)
\$50,000	Toward Environmentally Responsible Resource Extraction Network (NSERC- TERRE-NET), \$5,500,000. Natural Sciences and Engineering Research Council of Canada – Strategic Partnership Grants for Networks Program, June 30, 2016 – June 29, 2021, year 1 of 5, \$1,000,000 (\$50,000 available to MBJL)
\$283,663	Geochemical Potential of Site Materials, \$283,663. Syncrude Canada Limited, April 1, 2016 – March 31, 2018, year 1 of 2, \$133,295
\$43,750	Assessing the Sodium Buffering Capacity of Reclamation Materials in Sandhill Fen, \$43,750. Syncrude Canada Limited, May 1, 2015 – June 30, 2016, year 2 of 2, \$6,250
\$449,408	Examining controls on mass loading to an oil sands end pit lake, \$449,408 (50% available to MBJL). Natural Sciences and Engineering Research Council of Canada – Collaborative Research and Development Grants, June 1, 2015 – May 31, 2018, year 1 of 3, \$88,934 (\$44,467 available to MBJL)
Loring, Phil	
\$180,000	Dimensions of Sustainability in Haida Gwaii. Parks Canada 2015-2017
\$75,000	Early Career Faculty Grant: Linking Ocean Health and Human Health in Haida Gwaii. MEOPAR, Tri-council NCE 2015-2017
\$32,000	Changing Inner City Food Environments: Interventions to Address Nutritional Health Inequities. CIHR. Total funding \$285,000
\$1,600,000	Sustainable Futures North: Food, Water and Energy Security in a Changing Arctic. US National Science Foundation. Total grant is \$2.9 million. 2013-2017.
\$178,000	Climate Change Adaptation, Sustainable Energy Development, and Comparative Agricultural and Rural Policy. US Department of Agriculture. Total grant is \$913,000 USD. 2013-2017
\$37,000	Rural Policy Learning Commons: Building Rural Policy through International Comparative Analysis. SSHRC Partnership. Total grant is \$2.7 million. 2014- 2021

\$70,000 Risk, Resilience, and Innovation in Gulf Islands Food Systems, SSHRC Insight Development; 2016-2018

Mantyka-Pringle, Chrystal

\$140,000 Mitacs Elevate Fellowship to Chrystal Mantyka-Pringle

McDonnell, Jeffrey	
\$150,000	Impacts of biofuel production in forested watersheds, US Dept. of Energy
\$425,000	How do watersheds store and release water? NSERC Discover Grant

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\$120,000	How do watersheds store and release water? NSERC Accelerator Award
\$108,300	Hydrological impacts of biofuel production. US Dept of Energy
\$208,512	Eucalyptus plantation impacts on catchment water balance, US Dept. of Energy
\$143,855	Sustainable Water Use and Bioenergy: Application of Isotopic Tracers
	techniques to Improve Methods for Estimating Water Use in Intensively
	Managed Woody Crop Systems, Su-contract, University of Georgia, USA
\$85,731	An evaluation of the controls on salt release from oil sands reclamation covers,
	Syncrude Canada Ltd (Co-Is: A. Ireson, L. Barbour)
\$1,846,000	The Mine Overlay Site Testing (MOST) Facility, Western Economic
	Diversification (Co-I: Barbour, Hendry and Ireson)
\$77,840,000	Global Water Futures: Solutions to Water Threats in an Era of Global Change,
	Canada First Research Excellence Fund, Tri-Agency 2016-2023 (PI: Wheater
	plus 8 Co-Pls)
\$150,000	Quantifying the Effects of Freeze-Thaw Cycles on Mine Cover System Design
	and Performance, NSERC Collaborative Research and Development Grant with
	O'Kane Consultants Inc as an industry partner
McPhedran, Kerry	/

wich neurally kerry	
\$180,000	Investigation of the role of organic matter in partitioning of chemicals in the municipal wastewater treatment process, NSERC Discovery Grant; 2016-2021
\$52,500	Areva Resources Canada - Mitacs Accelerate Grant (Co-I: Schmid, Chang) 2017-2018
\$2,250	Undergraduate Student Research Award
\$20,950	Natural Sciences and Engineering Research Council Engage Grant
\$22,700	Environment Canada Research Contract (Co-I: MacDougall, Drouillard)
\$1,000	Natural Sciences and Engineering Research Council Connect Grant

Morrissey, Christy	/
\$1,999,566	Facility for Applied Avian Research, Canada Foundation for Innovation (Co-I:
	J.P. Giesy, K. Machin)
\$232,000	Neonicotinoid insecticide toxicity to aquatic organisms: Addressing key
	knowledge gaps on toxicity thresholds, mixtures and mitigation strategies
	using buffer zones. Dept of Fisheries and Oceans, National Contaminants
	Advisory Group (Co-I: K. Liber)
\$320,000	Distribution and Impact of Neonicotinoid Insecticides on Prairie Wetlands and
	Waterbirds, NSERC Strategic Project Grant (Co-I: K. Liber)
\$140,000	Effect of endocrine disrupting chemicals on avian life cycles, NSERC Discovery
	Grant

Noble, Bram\$309,000A water quality modelling system of the Qu'Appelle River catchment for long-
term water management policy development. Environment Canada Disaster
Management Fund (PI: K-E. Lindenschmidt, Co-I: H. Baulch, G. McMaster)

\$148,452	Assessing regulators' information needs to make decisions regarding cumulative effects under the Mackenzie Valley Resource Management Act.
	Northwest Territories Cumulative Impact Monitoring Program (Co-I: K. Hanna)
\$1,391,228	Next generation solutions to ensure healthy water resources for future
	generations, Global Water Futures (PI: J Geisy; Co-PIs: M. Servos, P. Jones, B.
	Noble, M. Hecker, T. Jardone, P. Craig, A. Doxey)
\$74,108	Flood risk in rural communities experiencing rapid environmental change:
	Toward a framework for stakeholder-based evaluation of alternative flood
	policy and mitigation strategies, SSHRC Insight Development Grant (Co-I:
	Westbrook)
\$292,000	Uncertainty analysis and communication in Canadian environmental impact
	assessment practice and decision making, Social Sciences and Humanities
	Research Council of Canada Insight Grant
\$124,000	Developing a community tool-kit for advancing marine related knowledge and
	baseline information in environmental assessment and planning processes,
624 024	Nunavut Research Institute and Irving Shipbuilding Inc.
\$24,934	(Ply C. Dealers, Co. applicante, P. Nabla, T. Staalman)
	(PI. G. POElzer; Co-applicants: B Noble, T. Steelman)
Pickering, Ingrid	
\$425,000	Canada Research Chair Operational Support, University of Saskatchewan
	(OVPR, College, Department)
\$2,358,200	CIHR-Training grant in Health Research Using Synchrotron Techniques
	(THRUST), Canadian Institutes of Health Research (CIHR) Strategic Training
	Initiative in Health Research (STIHR) Training Grant (23 Co-applicants)
\$1,759,500	HSFC/CIHR Team in Synchrotron Medical Imaging, Canadian Institutes of
	Health Research (CIHR) Team Grant - Clinical Imaging (PI: H. Nichol, Co-I: 9
57E0 000	applicants) Support for Canada Bosoarch Chair, Drovinco of Sackatchowan
\$230,000 \$300.000	Support for Canada Research Chair, Province of Saskatchewan
<i>JJUU,UUU</i>	and Engineering Research Council (NSERC) Discovery Grant
\$296,000	Analyzing Crude Oils for Sulfur Species and Oxygen Speciation. Chevron Energy
<i>+ ,</i>	Technology Company, Richmond California, USA (PI: G.N. George)
Pomeroy, John	
\$360,000	Snow Hydrology, Discovery Grant, NSERC
\$1,400,000	Canada Research Chair in Water Resources and Climate Change
\$350,000	Highly Qualified Personnel, Canada Research Chair
\$140,065	Canada Research Chair Research Grant
\$2,000,000	Saskatchewan River Basin: a large-scale observatory for new interdisciplinary
\$271 000	Water Science, CFI (CO-I: J. Glesy, H. Wriedter) Changing Cold Regions Notwork, NSERC CCAR
\$374,000 \$250.000	NSERC CREATE in Water Security
\$100.527	Canada Foundation for Innovation – Infrastructure Operating Fund
T / - /	

\$550,000	Rocky Mountain Water Supply Resilience and Vulnerability Evaluation, Alberta Innovates
\$381,900	Expanded Testing and Development of the Prairie Hydrological Model in Three Prairie Pothole Watersheds, Ducks Unlimited Canada
\$77,840,000	Programme Director, Global Water Futures: Solutions to Water Threats in an Era of Global Change, Canada First Research Excellence Fund, Tri-Agency 2016-2023
\$27,500,000	Programme Director, Global Water Futures: Solutions to Water Threats in an Era of Global Change, University of Saskatchewan Contribution 2016-2023
\$240,000	GWF PhD Scholarship Supplement, College of Graduate and Postdoctoral Studies, University of Saskatchewan
\$270,400	Yukon Hydrological Modelling – MESH Streamflow Forecast, Yukon Government
\$275,000	Mountain Forest Management for Water, Forest Resource Improvement Association of Alberta/Spray Lake Sawmills
\$1,374,576	Autonomous and Airborne Cold Regions Innovation Facility, Western Economic Diversification Grant 2017-2020
Reed, Maureen	
\$1,964,996	The sustainability and education policy network: Leading through multi-sector learning, SSHRC Partnership Grant (PI: McKenzie)
\$72,593	Linking gender, climate change, adaptive capacity and forest-based communities in Canada, SSHRC Insight Development Grant (Co-I: Johnston, Natcher)
\$443,559	The role of communities in collaborative forest governance in Canada: Contributing to theory and practice through comparative study (Co-I: Parkins, Sinclair)
\$199,882	Delta Dialogue Network, SSHRC Partnership Development Grant (Co-Is: Fresque-Baxter, J.A., McLachlan, S.M., Bharadwaj, L.A., Bradford, L.E.A., Jardine, T., Jones, P.D., Lindenschmidt, KE., Poelzer, G.M., Reed, M.G., and Strickert, G.E.H.)
\$1,700,000	Prairie WATERSAVE: Sustainable water management for civic and provincial policy makers and urban, rural, and Indigenous communities, Global Water Futures (PI: McDonnell)
\$46,250	Knowledge Mobilization on the Future of Forest Work and Communities, SSHRC Connection Grant (PI: Robson)
	Co-building sustainability and reconciliation, SSHRC Connection Grant (Co-I: Ferguson, Messier, Belcher, Abernethy)
\$24,994	Indigenous Digital Asset Management System: Building Reconciliation by Responding to Indigenous Requests for Capacity Building, SSHRC Knowledge Mobilization Grant (PI: Carlson, Co-I: Harkema)
\$227,275	Developing strategies for informed collaborative decision making for vegetation management on northern Rights-of-Way, MITACS Accelerate and SaskPower (PI: Stewart)

\$6,000

Showcasing Community-engaged learning in the Redberry Lake Biosphere Reserve, UofS Curriculum Innovation Fund

Razavi, Saman	
\$1,650,000	Integrated Modelling for Prediction and Management of Change in Canada's Major River Basins, Global Water Futures - Canada First Research Excellence Fund, 2017-2020 (Co-Is: Pietroniro, Lindenschmidt, Elshorbagy, Li, Jardine, Wheater, Pomeroy, Strickert, Gober, Gutwin, Stadnyk, Brouwer, Tolson, Coulibaly)
<i>\$125,000</i>	Development of a New Framework for Watershed Systems Analysis and Modelling under Climate and Environmental Changes, NSERC Discovery Grant Chaging Cold Regions network, Climate Change and Atmospheric Research, NSERC (36 Canadian Scientists and 15 International Collaborators); \$5,000,000; 2013-2018
Soltan, Jafar	
\$22,879	Analytical Infrastructure for the Catalytic Ozonation Laboratory, John R. Evans Leaders Fund, Canada Foundation for Innovation
\$10,000	Degradation of emerging pollutants in water, Emerging Leaders in Americas Program (ELAP) fellowship by Canadian Bureau of International Education, to support Ms. Lisbeth Katherina Mena Perez (from Escuela Politecnica Nacional, Ecuador)
\$10,000	Advanced oxidation for removal of emerging contaminants, Emerging Leaders in Americas Program (ELAP) fellowship by Canadian Bureau of International Education (CBIE),) to support Ms. Gloria Maria Doria Herrera (from National University of Colombia, Colombia)
\$120,000	Novel catalysts and processes to enhance reaction of ozone with pollutants in air and water, NSERC Discovery Grant
\$70,000	Mitigation of Antimicrobial Resistance Risk by Removal of Antibiotics from Waste Stream of Animal Production Facilities, Agriculture Development Fund (ADF) (Co-I: Nemati)
Steelman, Toddi	
\$199,882	Delta Dialogue Network, SSHRC Partnership Development Grant (Co-Is:

	Fresque-Baxter, J.A., McLachlan, S.M., Bharadwaj, L.A., Bradford, L.E.A.,
	Jardine, T., Jones, P.D., Lindenschmidt, KE., Poelzer, G.M., Reed, M.G., and
	Strickert, G.E.H.)
\$73,428	Northern Governance Innovation and Development for Socially Resilient
	Boreal Communities, SSHRC Insight Development Grant (PI: R. Bullock; Co-I: K.
	Coates, G. Broad)
\$48,344	Building bridges between deltas: crossing knowledge and cultural divides.
	SSHRC Connection Grant (Co-I: Strickert, Fresque-Baxter, Reed and Shantz)
\$29 <i>,</i> 500	Fire Safety Survey, Canadian Interagency Forest Fire Centre Inc; 2016-2017 (Co-

\$100,000	Renewable Energy and Remote, Northern and Indigenous Communities, SaskPower Grant: 2016-2017 (Co-I: Poelzer)
\$14,800	Renewable Energy in Indigenous, Northern, and Remote Communities Engagement Project, U.S. Department of State Federal Assistance Award; 2017-2018
\$359,309	Effective Network Governance for Co-Management: The Role of Cognitive Alignment in Risk Perception and Value Orientation toward Collaboration. US Joint Fire Science Program; USD\$359,309; 2017-2020 (PI: Nowell, B.)
Strickert, Graham	
\$239,525	The Human Dimensions of Permafrost Thaw. College and Community Social Innovation Fund, Partnership Development Grant, Social Science and Humanities Research Council of Canada (Co-Is: Bell, S., Clark, D., Calmels, F., Collins, C., Jinnear, L.)
\$1,650,000	Integrated Modelling for Prediction and Management of Change in Canada's Major River Basins, Global Water Futures - Canada First Research Excellence Fund, 2017-2020 (Co-Is: Pietroniro, Lindenschmidt, Elshorbagy, Li, Jardine, Wheater, Pomeroy, Strickert, Gober, Gutwin, Stadnyk, Brouwer, Tolson,

Westbrook, Cherie

\$1,650,000	Water Security – Collaborative Research and Training Experience (CREATE)
	Program, NSERC CREATE Grant (Co-I: H. Baulch, L. Barbour, H. Wheater, J.
	Pomeroy, J. McDonnell, P. Gober, B. Noble, K. Belcher, A. Bedard-Haughn)
\$1,726,083	Mountain Water Futures, Global Water Futures Programme
\$160,000	Exploring the effectiveness of using beaver as an aquatic ecosystem restoration
	tool, NSERC Discovery Grant 2017-2022
\$4,500	Beaver dam retention following the Alberta 2013 flood, USRA, College of Arts
	& Science
\$1.000	College of Arts and Science Leadership Grants for Female Faculty

Wheater, Howard

\$30,000,000	Canada Excellence Research Chair in Water Security: Sustainable freshwater
	resources and environmental change, Government of Canada, Government of
	Saskatchewan and University of Saskatchewan
\$5,000,000	Chaging Cold Regions network, Climate Change and Atmospheric Research,
	NSERC (36 Canadian Scientists and 15 International Collaborators),
\$2,000,000	Saskatchewan River Basin: a large-scale observatory for new interdisciplinary
	water science, CFI (Co-I: J. Giesy, J. Pomeroy)
\$240,000	Saskatchewan River Basin: a large-scale observatory for new interdisciplinary
	water science, CFI Infrastructure Operating Fund (Co-I: J. Giesy, J. Pomeroy)
\$475,000	Environment and Climate Change Canada grant 2016-2021
\$77,840,000	Global Water Futures: Solutions to Water Threats in an Era of Global Change,
	Canada First Research Excellence Fund, Tri-Agency 2016-2023

\$1,374,576	Autonomous and Airborne Cold Regions Innovation Facility, Western Economic
\$240,000	GWF PhD Scholarship Supplement, College of Graduate and Postdoctoral Studies, University of Saskatchewan 2017-2023
\$471,656	The Global Water Futures: Solutions to Water Threats in an Era of Global Change. Compute Canada's Research Platforms and Portals 2017 competition
\$415,000	Water Cycle Prediction in Global Water Futures, Environment and Climate Change Canada 2017-2020
Whitfield, Colin	
\$3,800	Plain language summary of boreal and taiga soils of SK for Boreal Watershed Initiative Report, Saskatchewan Ministry of Environment
\$186,000	Better BMPs – Budgeting and minimizing greenhouse gas emissions from agricultural water bodies, Agriculture and Agri-Food Canada (Co-I: Baulch)
\$3,000	LUGNuts Project Co-ordinator, Winnipeg
Wilson, Lee	
\$175,000 \$40,000	NSERC Discovery Grant International Flagship Partnership Research Grants, University of Saskatchewan (shared 50% with the Beijing Institute of Technology)

APPENDIX E – Publications, Conference Proceedings and Presentations

Journal Publications - 2017

- Akomeah, E. and Lindenschmidt, K.-E. 2017. Seasonal variation in sediment oxygen demand in a northern chained river-lake system. Water 9: 254. http://dx.doi.org/10.3390/w9040254
- Allen, S., R. Keim, H. Barnard, J.J. McDonnell, R. Brooks, 2017. The role of stable isotopes in understanding interception processes: A review. Wires Water, in press.
- Ameli, A, M. Erlandsson, K. Beven, I. Creed, J.J. McDonnell and K. Bishop, 2017. Primary weathering rates, water transit times and concentration-discharge relations: A theoretical analysis for the critical zone. Water Resources Research, in press.
- Appels, W.M., Wall, S.N., Barbour, S.L., Hendry, M.J., Nichol, C.F., Chowdhury, S.R. 2017. 'Pyrite weathering in reclaimed shale overburden at an oil sands mine near Fort McMurray, Canada', Mine Water and the Environment, online May 3, doi:10.1007/s10230-017-0454-4.
- Appels, W.M., L. Bradford, K.P. Chun, A.E. Coles, G. Strickert. 2017. DIY meteorology: use of citizen science to monitor snow dynamics in a data-sparse city. FACETS doi:10.1139/facets-2017-0030.
- Asante, C.K., Jardine, T.D., Van Wilgenburg, S.L., and Hobson, K.A. In press. Tracing origins of waterfowl using the Saskatchewan River Delta: Incorporating stable isotope approaches in continent-wide waterfowl management and conservation. The Condor 119: 261-274.
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- Lewallen G, and Westbrook C. Taking the pulse of beaver research. American Water Resources Association AGM, May 2017. Utah, USA.
- Liu, Q., Rudderham, S.B., Lindsay, M.B.J., Barbour, S.L. (2017). 'Influences of biogeochemical processes on mass transport across the tailings-water interface of an oil sands end pit lake', Cdn Geophysical Union (CGU) Annual Mtg., B04D: Mine Reclamation: Multidisciplinary Studies from Across Mining Sectors, Vancouver, B.C., May29-31 (Liu presenting).
- Loring P.A., and T. Fleming. "Risk, Resilience, and Innovation in Gulf Island Food Systems. 2017 Meeting of the Clam Garden Network. 21 April 2017. Vancouver, BC.
- Lv, Z. and Pomeroy, J.W. Poster Presentation. Detecting intercepted snow on mountain needleleaf forest canopies using satellite remote sensing. Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 29, 2017.
- Malard, J. J., Baig, A. I., Díaz, M. R., Hassanzadeh, E., Adamowski, J., Tuy, H., and Melgar-Quiñonez,
 H. 2017. Tinamit: Making coupled system dynamics models accessible to stakeholders.
 General Assembly of the European Geosciences Union, Vienna, Austria, April 23-28
- Maloney, E., C.A. Morrissey, J. Headley, K. Peru and K. Liber. 2017. Neonicotinoid insecticide mixtures: Cumulative toxicity under chronic exposure scenarios. Society of Environmental Toxicology and Chemistry Prairie Northern Chapter 8th annual meeting, Saskatoon, SK, June 15-16, 2017.
- Markwart B, Liber K, Hecker M, Janz DM, Raes K, Doig L. 2017. The influence of community composition on selenium bioconcentration in freshwater periphyton. Prairie Northern SETAC Regional Meeting, Saskatoon, SK.
- Marsh, C., Pomeroy, J.W., Wheater, H.S., and Spiteri, R. The Canadian Hydrological Model: A multiscale, multiphysics, variable-complexity hydrological model. Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 29, 2017.
- Morandi, G., Giesy, J., S. Wiseman, M. Guan, X. Zhang, J. Martin. "Elucidating Mechanisms of Toxic Action of Dissolved Organic Chemicals in Oil Sands Process Affected Water (OSPW)." To: 8th Annual SETAC PNC Meeting, June 15-16, 2017, Saskatoon, SK.
- Morrison A, Noble BF, and Westbrook C. 2017. Coordinating FRM governance through SEA principles. Montreal, QC: International Association for Impact Assessment

- Murray, C.A. & C.J. Whitfield. 2017. Steady-state critical loads of acidity and nutrient nitrogen under a changing climate in northern Saskatchewan. CGU and CSAF Joint Annual Scientific Meeting. Vancouver, BC, Canada. May 2017.
- Nehemy, M. F.; Laroque, C.P. What did the water table say to the drowning tree? Peatland water table reconstruction.(Oral presentation). In: World Water Day 2017 Global Institute for Water Security, 2017, Saskatoon.
 Nehemy, M. F.; Laroque, C.P. Tree-rings: a proxy for peatland water-table variability. In: CGU-CSFM National Meeting, Vancouver, 2017.
- North, R.L., Graham, J.L., Obrecht, D.V., Baulch, H.M., Hudson, J.J., Abirhire, O., Dillon, P.J., Smith, R.E.H., Kim, T.Y., Thorpe, A.P., Pollard, C., Jones, J.R. Shifting peaks: when are our lakes the greenest? Universities Council on Water Resources (UCOWR) Annual Conference: Water in a Changing Environment (https://www.ucowr.org) June 13-15, 2017, Ft. Collins, Colorado.
- Nowell, B. and Steelman, T. 2017. "Building Better Systems for Effective Disaster Response and Recovery: Insights from the Field." 16th Biennial Conference of the Society for Community Research and Action. Ottawa, On. June 21-24.
- Nowell, B. and Steelman, T. 2017. Studying Networks in Complex Problem Domains: Advancing Methods in Boundary Specification. Academy of Management 2017 Annual Meeting, August 4-8, 2017. Atlanta GA.
- Nowell, B. and Steelman, T. 2017. "Building Better Systems for Effective Disaster Response and Recovery: Insights from the Field." 16th Biennial Conference of the Society for Community Research and Action (SCRA). University of Ottawa and Wilfred Laurier University. June 21-24.
- Pradhananga, D. and Pomeroy, J. Hydrological response of Peyto Glacier to climate change and glacier recession. Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 30, 2017.
- Raes KA, Doig L, Liber K, Janz DM, Markwart B, Hecker M. 2017. Does community structure matter? Assessing the trophic transfer of selenomethionine to an amphipod (Hyalella azteca) through a diet of field-collected microorganism communities. Prairie Northern SETAC Regional Meeting, Saskatoon, SK.
- Rasouli, K., Whitfield, P.H., Martz, L.W., Ireson, A.M., Janowicz, J.R., Marks, D. and Pomeroy, J.W. Are effects of transient vegetation and soil changes as important as climate change impacts on hydrological processes? Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 30, 2017.
- Sadeghi, A., M. Aghbolaghy, and J. Soltan. 2017. Enhanced removal of atrazine from water using zano ZnO catalyst, World Water Day 2017, Saskatoon, SK, March 23.
- Schultz D, Tang S, Miller C, Janz DM, Hecker M. 2017. Determination of acute and subchronic toxicity of emerging contaminants in early life stages of three Canadian fish species. Prairie Northern SETAC Regional Meeting, Saskatoon, SK.
- Shaw, A. and T. Steelman. 2017. "The Limits and Opportunities of Using GIS as a Boundary Object to Represent Indigenous Knowledge in Resource Planning and Implementation Processes." International Symposium on Society and Resource Management. Umea, Sweden. June 17-24.
- Shaw A. and T. Steelman. The Limits and Opportunities of Using GIS as a Boundary Object to Represent Indigenous Knowledge in Resource Planning and Implementation Processes.

2017. U of S Building Reconciliation Forum. University of Saskatchewan Campus, Saskatoon, Canada. March 16.

- Shaw, A. and T. Steelman. 2017. "The Limits and Opportunities of Using GIS as a Boundary Object to Represent Indigenous Knowledge in Resource Planning and Implementation Processes." Nisbet Forest Planning and Implementation Committee Meeting. Prince Albert Wildlife Federation, Saskatchewan, Canada. May 31 2017.
- Shaw, A. and T. Steelman. "The Limits and Opportunities of Using GIS as a Boundary Object to Represent Indigenous Knowledge in Resource Planning and Implementation Processes". Prince Albert Model Forest Meeting. University of Saskatchewan Campus. Saskatchewan, Canada. February 2, 2017.
- Shea, J.M., Harder, P. and Pomeroy, J.W. Improving quantification of mountain snowpack properties using observations from Unmanned Air Vehicles (UAVs). Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 29, 2017.
- Sheikholeslami, R., and Razavi, S. 2017. An Efficient and Robust Sampling Strategy for Uncertainty and Sensitivity Analysis of Environmental Systems Models, Canadian Geophysical Union (CGU) Annual Scientific Meeting, May 28-31, 2017, Vancouver (Oral Presentation).
- Shook, K., and Pomeroy, J.W. Development of a Conceptual Model of the Hysteric Relationship between Water Storage and the Contributing Fraction for large-Scale Models of Prairie Basins. Canadian Water Resource Association National Conference. Lethbridge, AB. June 5, 2017.
- Shook, K. and Pomeroy, J.W. Causes of the shapes of hysteretic connected-fraction curves of Prairie drainage basins. Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 30, 2017.
- Smith, L.A., Barbour, S.L., Hendry, M.J., Elwood, D. 2017. 'Profiling the In Situ Compressibility of Cretaceous Shale using Grouted-in Piezometers and Laboratory Testing', Proceedings: Advances in Laboratory Testing and Modelling of Soils and Shales (ATMSS) International Workshop, Jan.18-20, 2017, Villars-sur-Ollon, Switzerland, Elwood presenting, pp. 296-303.
- Steelman, T. and B. Nowell. 2017. "Evidence of Effectiveness in the Cohesive Strategy: Measuring and Improving Wildfire Response". National Cohesive Wildland Fire Management Strategy Workshop. All Hands, All Lands: Implementation Rooted in Science. Reno, Nevada. April 25-27, 2017.
- Steelman, T., G. Strickert, G. Andrews, E., Baines, S., L. Bradford, L. Bharadwaj, J. Fresque-Baxter,
 T. Jardine, P. Jones, K. Lindenschmidt, G. Poelzer, M. Reed, S. Shantz, K. Staples. 2017.
 "Transdisciplinary Tradeoffs in the Delta Dialogue Network: Balancing Scholarship with
 Community Engagement". Global Institute for Water Security Annual Workshop. Saskatoon,
 SK. June 12.
- Stone, L.E., Fang, X., Pomeroy, J.W., Sonnentag, O., and Quinton, W.L. Modelling the effects of permafrost loss on discharge from wetland dominated basins in the discontinuous permafrost zone. Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 29, 2017.
- Velez, A., J. Diaz, B. Nowell, T. Steelman, and A. Faas. 2017. "Understanding Engagement in Disaster Planning in Relation to County Officials' Individual-Level Psychological Indicators,

Organizational, and Institutional Factors." Public Management Research Conference. June 8-10, 2017.

- Walker, H., Culham, A., Fletcher, A.J. and Reed, M.G. 2017. Applying Intersectionality to Understand the Social Dimensions of Climate Hazards in Rural Canada. Congress of Social Sciences and Humanities. 2017 Annual General Meeting, Toronto, ON, May 29-June 2 2017.
- Watmough, S.A., Whitfield, C.J. & Baker, S. An assessment of traditional chemical indicators of atmospheric pollution in northern Saskatchewan forest soils. Canadian Society of Soil Science. Peterborough, ON, Canada. June 2017.
- Watts, T., Giesy, J., H. Peng, P.D. Jones. "Occurrence and in vitro Toxicity of Disinfection By-Products in Saskatchewan Drinking Water Treatment Plants." To: 8th Annual SETAC PNC Meeting, June 15-16, 2017, Saskatoon, SK.
- Wauchope-Thomson, M., Baulch H. Understanding the drivers of internal phosphorus loading in the Canadian Prairie lakes of Qu'Appelle. ASLO (Association for the Sciences of Limnology and Oceanography). February 2017, Honolulu Hawaii.
- Wayand, N.E., Marsh, C., and Pomeroy, J. Evaluating blowing snow and avalanche models over the Canadian Rockies. Canadian Geophysical Union and Canadian Society of Agricultural and Forest Meteorology Joint Annual Scientific Meeting. Vancouver, BC. May 29, 2017.
- Wayand, N.E., Marsh, C. and Pomeroy J. Evaluating the impact of blowing snow and avalanche redistribution on modelling alpine snowpack and snowcovered area over the Canadian Rockies. 85th Annual Western Snow Conference. Boise, Idaho. April 2017.
- Whitfield, P., Shook, K.R., and Pomeroy, J.W. Patterns of Spatial Change in Canadian Prairie Hydrology. Canadian Water Resource Association Conference. Lethbridge, AB. June 5, 2017.
- Wittrock, V, D Corkal, R Halliday, M Johnston, I Stewart, E Wheaton. 2017 Jan. Saskatchewan Flood and Natural Hazards Risk Assessment. Invited presentation to the Natural Hazards Risk Assessment Provincial Agency Team, 21 Jan, Regina, SK. Saskatchewan Research Council, Saskatoon, SK. SRC # 14113-1D17. 22 slides.
- Wittrock, V, E Wheaton, S Kulshreshtha, M Johnston. 2017 Feb. Sustainability Indicators for Agriculture and Forest Management: Implications of Climate Change and Extremes. Invited Presentation to the Prairie Regional Adaptation Collaborative Research Forum: Exploring future directions of adaptation research on the Prairies, 13 Feb, Winnipeg Manitoba. SRC #13749-D17, 19 slides.
- Yassin, F.*, Razavi, S., and Wheater, H. 2017. Improved representation of water management and reservoirs in a land surface-hydrology model, Canadian Geophysical Union (CGU) Annual Scientific Meeting, May 28-31, 2017, Vancouver (Oral Presentation).
- Zettl, J.D., Barbour, S.L., Lindsay, MBJ, Carey, S.K. 2017. 'Base Mine Lake Chemical Mass Balance 2013-2016', Cdn Geophysical Union (CGU) Annual Mtg., B04A: Mine Reclamation: Multidisciplinary Studies from Across Mining Sectors, Vancouver, B.C., May29-31 (Zettl presenting).

Conference Proceedings and Presentations - 2016

Adams, S.; Berg, R.; Griffeth, J.; Person, P.; Siemes, T.; Thicke-Rattray, V.; Nehemy, M. F.; Laroque, C. P. Spruce it up! Effects of the oil sands on trembling aspen and white spruce. In: FYRE on the Beamlines Presentation Series, Canadian Light Source, Saskatoon, December, 2016

- Alcaraz, J., Giesy, J., B. Eisner, D. Schultz, S. Tang, S. Wiseman, P.D Jones and M. Hecker. "Characterization of Molecular Toxicity Pathways of Selected Emerging Contaminants to Elucidate Species-specific Sensitivity of Three North American Fishes." To: 43rd Annual Meeting, September 25-28, 2016, Edmonton, AB.
- Alcaraz, A., Giesy, J., B. Eisner, D. Schultz, S. Tang, S. Wiseman, P. Jones, M. Hecker.
 "Characterization of Molecular Toxicity Pathways of Selected Emerging Contaminants to Elucidate Species-Specific Sensitivity of Three North American Native Fishes" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Alharbi, H., Giesy, J., G. Morandi, S.B. Wiseman. "Effect of Total Dissolved Organic Compounds of Oil Sands Process Affected Water (OSPW) on Toxicity of 7-Isopropyl-1-Methylphenanthrene (Retene) to Early Life-Stages of Japanese Medaka (Oryzias latipes)" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Alharbi, H., Giesy, J., S.B. Wiseman, P.D. Jones, B. Tendler, E. Ohiozebau. "Characterization of Gene Expression as Biomarkers for Monitoring the Exposure to the Oil Sands and Associated Development using Northern Pike in the Athabasca/Slave River System, Canada" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Bagatim, T., Giesy, J., S. Hanson, H. Yuan, K. Steeves, S. Wiseman, N. Hogan, A. Hontela, P.C. Jones,
 L. Bragg, H. Dhiyebi, M. Servos, C. Gauthier, F. Gagné and M. Hecker. "Characterization of the Endocrine Potencies of Municipal Effluents across Canada Using In Vitro Bioassays." To: 43rd Annual Meeting, September 25-28, 2016, Edmonton, AB.
- Bagatim, T., Giesy, J., S. Hanson, H. Yuan, K. Steeves, S. Wiseman, N. Hogan, A. Hontela, P. Jones,
 L. Bragg, H. Dhiyebi, M. Servos, C. Gauthier, F. Gagne, M. Hecker. "Characterization of the Endocrine Potencies of Municipal Effluents across Canada using In Vitro Bioassays" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Bahrami, A., Goita, K., Razavi, S., Magagi, R., Elshamy, M., Haghnegahdar, A., Davison, B., Yassin,
 F. 2016. Assimilation of GRACE derived terrestrial water storage data into Canadian land surface and hydrology model, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Baig, A. I., Malard, J. J., Hassanzadeh, E., Adamowski, J. F., Tuy, H., and Melgar-Quiñonez, H. 2016.
 Design of Soil Salinity Policies with Tinamit, a Flexible and Rapid Tool to Couple Stakeholder-Built System Dynamics Models with PhysicallyBased Models. American Geophysical Union, San Francisco, USA, December 12-16
- Baines,S., Steelman, T., and Bharadwaj, L. (2016). Water policy innovation: Consideration of cultural flows in decision processes. June 23, International Symposium on Society and Resource Management, Houghton, Michigan, USA.
- Bradford, L.E.A., Bharadwaj, L.A. (2016). Whiteboard Animation for traditional knowledge. Building Bridges Workshop (Delta Dialogue Network). Saskatoon, April 7-9th 2016.
- Bradford, L.E., L.A Bharadwaj. (2017). Safe Water for Health 2016. Presentation at Global Institute for Water Security Annual Workshop. June 13, Park Town Hotel, Saskatoon, SK.
- Bharadwaj, L.A., Jones, P., Lewin, S. (2016) Community Based Monitoring in the Slaver River and Delta. Delta Days April 5-7th 2016, Saskatoon, SK. Wanuskewin Heritage Park.
- Bharadwaj, L., L.E.A Bradford, (2016) SWEEP Framework. SWEEP project final workshop and hand-off. Slave River and Delta Partnership(SRDP), Energy and Natural Resources

Government of the Northwest Territories Final SRDP Indicator Workshop Roaring Rapids Hall Fort Smith, NWT, January 25th – 29th 2016.

- Boyer, L., Baulch, H.M., Higgins, S., Leavitt, P.R. Nitrogen fixation rates along the Qu'Appelle Valley. Undergraduate Student Research Poster session, University of Saskatchewan. August 2016.
- Cavallaro, M.C., K. Liber, J.V. Headley, K. Peru and C.A. Morrissey. 2016. Early chironomid emergence from chronic, low-level neonicotinoid exposure in a prairie pond: Is timing everything? Society of Environmental Toxicology and Chemistry 37th Annual Meeting, Orlando, FL, USA, November 6-10, 2016.
- Costa, D. and Pomeroy, J.W., and Wheater, H. Identifying key hydrological and biochemical processes for predicting field scale nitrate and ammonia export in agricultural cold regions. Poster presentation at the American Geophysical Union Fall Meeting. San Francisco, CA. Dec 2016.
- Crawford, S., S. Lofts and K. Liber. 2016. Modeling the bioavailability of sediment-associated uranium to a freshwater midge. Society of Environmental Toxicology and Chemistry German Language Branch 20th annual meeting, Tübingen, Germany, September 5-8, 2016.
- D'Silva, L., K. Liber, H. Baulch and L. Doig. 2016. Sediment characteristics affecting internal loading of arsenic in a prairie reservoir, Buffalo Pound Lake, SK, Canada. Society of Environmental Toxicology and Chemistry 37th Annual Meeting, Orlando, FL, USA, November 6-10, 2016.
- Doering, J., Giesy, J., M. Hecker. "Predicting the Sensitivity of Oviparous Vertebrates to Dioxin-Like Compounds Based on In Vitro Activation of the AHR" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Doering, J., Giesy, J., S. Wiseman, A. Alcaraz and M. Hecker. "Predicting the Sensitivity of any Oviparous Vertebrate to any Dioxin-like Compound Based on In Vitro Activation of the AHR." To: 43rd Annual Meeting, September 25-28, 2016, Edmonton, AB.
- Doering, J., Giesy, J., S. Tang, S. Wiseman, H. Peng, B. Eisner, J. Sun, M. Hecker. "Characterization of Toxicity Pathways of 2,3,7,8-TCDD, PCB 77, and Benzo[a]pyrene in White Sturgeon using Whole Transcriptome and Proteome Analysis" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Dompierre, K, Barbour, S.L. 2016. 'Evaluating water and chemical release from oil sands fluid fine tailings using multiple tracers", CYGEGC 2016, Whistler, BC, Sep.29-Oct.1, Dompierre presenting.
- Drebert, Y., P. Kingsmill, M. Reed, V. Kricsfalusy, and T. Steelman. 2016. Connecting With Community for Striking a Sustainable Balance: A Documentary about Student Experience in a Biosphere Reserve. Association for the Advancement of Higher Education. Baltimore, MD, October 9 – 12, 2016.
- Drouillard, K., McPhedran, K., Grgicak-Mannion, A., Lafontaine, J., Paterson, G., Briggs, T., Ciborowski, J., Haffner, G. 2016. A multi-chemical hazard metric predicts chironomid abundance in the Detroit River. Proceedings from the biennial State of the Strait Conference. Francoeur, S., J. Ciborowski, J. Gannon, D. Kashian, and K. Kahl, eds. 2016 State of the Strait: Coordinating Conservation in the St. Clair-Detroit River System. Great Lakes Institute for Environmental Research, Occasional Publication No. 9, University of Windsor, Ontario, Canada

- Gharari, S., and Razavi, S. 2016. On the importance of hysteresis in hydrological modeling, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Gillio-Meina, E., S. Niyogi and K. Liber. 2016. Investigating the mechanism of toxicity of vanadium to Daphnia spp. 43rd annual Canadian Ecotoxicology Workshop, Edmonton, AB, September 25-28, 2016.
- Graves S, Liber K, Palace V, Hecker M, Janz DM. 2017. Characterizing the uptake and trophic transfer of selenium in Canadian boreal lake food webs. Prairie Northern SETAC Regional Meeting, Saskatoon, SK.
- Green D, Janz DM, Jardine TJ. 2016. The influence of hydropeaking on growth and mercury concentrations of low-pitched shoreline dwelling spottail shiner (Notropis hudsonius). Canadian Ecotoxicity Workshop, Edmonton, AB.
- Green D, Janz DM, Jardine TJ, Weber LP. 2016. The effect of hydropeaking on energy stores and mercury concentrations in shoreline dwelling spottail shiner (Notropis hudsonius). Society of Environmental Toxicology and Chemistry, Orlando, FL.
- Haghnegahdar, A.*, Razavi, S., A Novel Global Sensitivity Analysis Technique for an Enhanced Multi-criteria Analysis of the Behavior of Complex Environmental Models, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Hanson, S., Giesy, J., T. Bagatim, K. Steeves, S. Wiseman, N. Hogan, A. Hontela, P.D. Jones and M. Hecker. "Reproductive and General Health Assessment of Fathead Minnow (Pimephales promelas) Populations Inhabiting an Effluent-Dominated Stream, Wascana Creek, SK." To: 43rd Annual Meeting, September 25-28, 2016, Edmonton, AB.
- Hanson, S., Giesy, J., T. Bagatim, K. Steeves, S. Wiseman, N. Hogan, A. Hontela, P. Jones, M. Hecker. "Reproductive and General Health Assessment of Fathead Minnow (Pimephales promelas) Populations Inhabiting an Effluent Dominated Stream, Wascana Creek, SK, Canada" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Hassanzadeh, E., Sagin, J., Chun, K. P., Wheater, H., Jardine, T. D., Lindenschmidt, K-E., and Elshorbagy, A. 2016. Assessing the impacts of upstream water availability and regional irrigation expansion on the flow regime in the Saskatchewan River Delta. 69th National Conference of the Canadian Water Resources Association, Montréal, Canada, May 25-27 (oral).
- Hassanzadeh, E., Elshorbagy, A., Wheater, H., and Gober, P. 2016. Towards improved water resource management under uncertainty. 69th National Conference of the Canadian Water Resources Association, Montréal, Canada, May 25-27 (oral).
- Hosseini, N., Sheikholeslami, R.*, and Razavi, S., (2016), Progressive Sampling Technique for Efficient and Robust Uncertainty and Sensitivity Analysis of Environmental Systems Models: Stability and Convergence, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Janz DM, Liber K, Park B, Allen Jarvis R (Ed.), (2016). Proceedings of the 42nd Annual Canadian Ecotoxicity Workshop: October 4-7, 2015, Saskatoon, SK. Canadian Technical Report of Fisheries and Aquatic Sciences, 3191: xxii + 160 p.
- Jardine, T., Mantyka-Pringle, C., Bradford, L., Bharadwaj, L., Fresque-Baxter, J., Kelly, E., Somers, G., Lindenschmidt, K., Doig, L., Jones, P., & Slave River and Delta Partnership. (2016) Unifying Aboriginal Knowledge and Science to support community-based monitoring in a large river and delta. Presentation at: Transitioning: Toward Sustainable Relationships in a Different

World, International Symposium on Society and Resource Management (ISSRM), June 22-26, 2016 in Houghton, Michigan, USA.

- Karran D, Westbrook CJ, and Bedard-Haughn A. 2016. Beaver mediated water table dynamics in a Rocky Mountain fen. American Geophysical Union Fall Annual Meeting, San Francisco, California, USA.
- Kehoe, M., Baulch, H.M. The Long and the Short of Integrating Monitoring Time Series with Models for Water Quality Predictions. NALMS. (North American Lake Management Society) Banff, Alberta. November 2016.
- Lane T, Janz DM, Liber K, Hecker M. 2016. Validation of in ovo embryo microinjections using selenomethionine to simulate maternal transfer in the fathead minnow (Pimephales promelas). Society of Environmental Toxicology and Chemistry, Orlando, FL.
- Lane T, Raes K, Janz DM, Liber K, Hecker M, Doig L. 2016. Validation of in ovo embryo microinjections using selenomethionine to simulate maternal transfer in the fathead minnow (Pimephales promelas). Canadian Ecotoxicity Workshop, Edmonton, AB.
- Leathers, J., Casson, N., Baulch, H., Nugent, K., Venkiteswaran, J. Effect of Freeze/Thaw Cycles on the Release of Phosphorus From Riparian Vegetation in Southern Manitoba. Prairie Canadian Association of Geographers meeting. Melfort, Saskatchewan. September 2016.
- Li, A., Giesy, J., K.J. Rockne, N.C. Sturchio. "Polyhalogenated Carbazoles in Sediment of the Great Lakes: Natural or Anthropogenic?" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Loring, P.A. "Food Security in the North". Building Vibrant Rural Futures: 2016 Meeting of the Canadian Rural Revitalization Foundation. 12-15 October, 2016. Guelph, ON.
- Main, A.R., J. Fehr, K. Liber, J.V. Headley, K.M. Peru and C.A. Morrissey. 2016. Reduction of neonicotinoid insecticide residues in Prairie wetlands by common wetland plants. American Chemical Society annual meeting, Philadelphia, PA, USA, August 21-25, 2016.
- Maillet, J., Johnstone, J.F., Laroque, C.P. Understanding the Climate, Radial-Growth, and Carbon Interface at BERMS. Annual General Meeting for the Changing Cold Regions Network. Guelph, ON. Nov 2-4, 2016.
- Maloney, E., C.A. Morrissey, J. Headley, K. Peru and K. Liber. 2016. Investigating the cumulative toxicity of neonicotinoid insecticide mixtures to Chironomus dilutus using MIXTOX analysis. Society of Environmental Toxicology and Chemistry 37th Annual Meeting, Orlando, FL, USA, November 6-10, 2016.
- Marsh, C., Pomeroy, J.W., and Wheater, H. The Canadian Hydrological Model (CHM): A multiscale, variable-complexity hydrological model for cold regions. American Geophysical Union Fall Meeting. San Francisco, CA. Dec 11-15, 2016.
- Meiers, G., Bradley, C., Barbour, L. (2016). 'Coal waste storage facilities reclaimed with engineered cover systems Performance based on three years of field monitoring', Tailings and Mine Waste, October 2-5, 2016, Keystone, Colorado (M. O'Kane presenting).
- Morandi, G and J. Giesy. "Characterizing the Toxicity of Oil Sands Process Affected Waters (OSPW)" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- North, R.L., Venkiteswaran, J., Pernica, P., Silsbe, G., Armstrong, M., Cavaliere, E., Guildford, S., Hudson, J., Smith, R. Dillon, P. Baulch, H. What happens in lakes when nobody's looking? NALMS. Banff, Alberta. November 2016.

- Peng, H., Giesy, J., J. Sun, D.M.V. Saunders, S. Tang, M. Hecker, S. Wiseman, P.D. Jones, A. Li, K.J.
 Rockne, N.C. Sturchio. "Deconvolution of Environmental Mixture: Chemical and Biological Strategies" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Pettem CM, Weber LP, Janz DM. 2016. Metabolic and cardiovascular effects of dietary selenomethionine in adult zebrafish (Danio rerio). Canadian Ecotoxicity Workshop, Edmonton, AB.
- Pettem CM, Weber LP, Janz DM. 2016. Metabolic and cardiovascular effects of dietary selenomethionine in adult zebrafish (Danio rerio). Society of Environmental Toxicology and Chemistry, Orlando, FL.
- Pomeroy, J.W., Fang, X., Whitfield P.H., Rasouli, K., Harder, P., Siemens E., and Pradhananga, D. Mountains, Climate Change and North American Water Security. Poster presentation at the American Geophysical Union Fall Meeting. San Francisco, CA. Dec 2016.
- Raja, B., Lakhanpal, A., Elshorbagy A.*, Razavi, S., Ceola, S, and Montanari, A., (2016), Framework for National Flood Risk Assessment for Canada, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Razavi, S.*, Sheikholeslami, R., Haghnegahdar, A., Esfahbod, B., (2016), VARS-TOOL: A Comprehensive, Efficient, and Robust Sensitivity Analysis Toolbox, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Razavi, S.*, Anis, M. R., and Wheater, H. (2016), Integrated Modelling of Hydrology and Water Management in a Land Surface-Hydrology Model, Workshop on Including Water Management in Large Scale Models by The Global Energy and Water Cycle Exchanges Project (GEWEX), Sept. 28-30 2016, Gif-sur-Yvette, France.
- Razavi, S.*, Gupta, H., Haghnegahdar, A., and Sheikholeslami, R., (2016), A New Framework for Global Sensitivity Analysis for Environmental Modelling, International Environmental Modelling and Software Society (iEMSs), 8th International Congress on Environmental Modelling and Software, July 10-14 2016, Toulouse, France.
- Raes KA, Doig L, Liber K, Janz DM, Markwart B, Hecker M. 2016. Assessing the trophic transfer of selenium to Hyalella azteca and Pimephales promelas through a diet of field-collected periphyton communities. Society of Environmental Toxicology and Chemistry, Orlando, FL.
- Sadeghian, A., J. Hudson, H. Wheater, K. Lindenschmidt. 2016 Sediment plume model for the 2013 flood. Annual Conference of the North American Lake Management Society. November 1-4. Banff, Canada.
- Sadeghian, A., J. Hudson, H. Wheater, K. Lindenschmidt. 2016 Variable algal stoichiometry modeling. Annual conference of the North American Lake Management Society. November 1-4. Banff, Canada.
- Safaei, S.*, Haghnegahdar, A., and Razavi, S. (2016), Addressing Curse of Dimensionality in Sensitivity Analysis: How Can We Handle High-Dimensional Problems?, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Sapriza-Azuri, G.*, Gamazo, P., Razavi, S., Wheater, H. S., (2016), Definition of initial conditions and soil profile depth for Hydrological Land Surface Models in Cold Regions, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Schlageter, B, Baulch, H. Benthic Denitrification in Wascana Creek and the Qu'Appelle River. USRA Poster session, University of Saskatchewan. August 2016.

- Schultz, D., Giesy, J., S. Tang, C. Miller, D. Janz, M. Hecker. "Determination of Acute and Sub-Chronic Toxicity of Emerging Contaminants in Early Life Stages of Three Canadian Fish Species" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Schultz D, Tang S, Miller C, Janz DM, Hecker M. 2016. Determination of acute and subchronic toxicity of emerging contaminants in early life stages of three Canadian fish species. Society of Environmental Toxicology and Chemistry, Orlando, FL.
- Shahariar, S., Soolanayakanahally, R., Schroeder, W., Bedard-Haughn, A. 2016. Effects of short rotation willow on riparian soil organic matter qualities. Soil Science Society of America Annual Meeting, Phoenix, AZ.
- Shahkarami, S., A. K. Dalai* and J. Soltan, 2016, Enhanced CO2 adsorption on activated carbon, The 66th Canadian Chemical Engineering Conference, Quebec City, QC, October 16-19
- Shaw, A. and T. Steelman. 2016. "The Limits and Opportunities of Using GIS as a Boundary Object to Represent Indigenous Knowledge in Resource Planning and Implementation Processes". Nisbet Forest Planning and Implementation Committee Meeting. My Place Cafe, Saskatchewan, Canada. December 7 2016.
- Sheikholeslami, R.*, and Razavi, S. 2016. Finding Positive Feedback Loops in Environmental Models: A Mathematical Investigation, American Geophysical Union (AGU) Fall Meeting, December 12-16, 2016, San Francisco, CA.
- Sheikholeslami, R., and Razavi, S. 2016. A Novel Sampling Approach for Efficient and Robust Uncertainty and Sensitivity Analysis of Environmental Models, International Environmental Modelling and Software Society (iEMSs), 8th International Congress on Environmental Modelling and Software, July 10-14 2016, Toulouse, France.
- Shu, Z., Singh, A., Klamerth, N., McPhedran, K., Chelme-Ayala, P., Bolton, J.R., Belosevic, M., Gamal El-Din, M. 2016. Application of the UV/H2O2 advanced oxidation process for municipal reuse water: bench- and pilot-scale studies. WIT Transactions on Ecology and The Environment, Vol 209. Proceedings of the 13th International Conference on Modelling, Monitoring and Management of Water Pollution
- Steelman, T., Andrews, E., Baines, S., L. Bradford, L. Bharadwaj, J. Fresque-Baxter, T. Jardine, P. Jones, K. Lindenschmidt, G. Poelzer, M. Reed, S. Shantz, G. Strickert, K. Staples. 2016. Voices from the Deltas. 8th Canadian River Heritage Conference. October 16-19, 2016. Saskatoon, SK.
- Steelman, T., Reed, M.G., and Shahadu, H. 2016. Fire Management Resiliencies & Vulnerabilities in Canada: Results from a National Survey. Wildland Fire Canada 2016: Building Resilience. Kelowna, 24-28 October, 2016.
- Steeg, R.; Nykiforuk, B.; Wu, Q.; Xuan, O.; Yang, Z.; Grover, S.; Knuttila, K.; Howatt, B.; Newman, K.; Nehemy, M. F.; Laroque, C. P. The Lord of the Rings: What do tree rings reveal about pollution in Saint John, New Brunswick? FYRE on the Beamlines Presentation Series, Canadian Light Source, Saskatoon, December, 2016.
- Steeves, K., Giesy, J., S. Hanson, T. Bagatim, S. Wiseman, P. Jones, M. Hecker, A. Hontela, N. Hogan. To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL. "Exposure to Municipal Wastewater Effluent Influences Fecundity and Hormone Signaling Pathways in Fathead Minnows (Pimphales promelas)"

- Tang, S. and J. Giesy. "Shifts in Diversity and Function of Sediment Bacterial Community in the Hengshi River upon Acid Mine Drainage Pollution" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Tse, T., Giesy, J., S. Tang, S. Wiseman, L. Doig, M. Hecker and P.D. Jones. "Reconstructing Cyanobacterial Population Trends in Freshwater Lakes using Metagenomic Techniques and Physicochemical Analyses." To: 43rd Annual Meeting, September 25-28, 2016, Edmonton, AB.
- Tse, T.J., Giesy, J., T. Song, L.E. Doig, S. Wiseman, M. Hecker, P.D. Jones. "Integrating paleo-16S Metagenomics with Paleo-variables to Infer Historial Trends of Cyanobacterial Composition within a Freshwater Lake" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Von Ness K, Loisel J, Karan DJ, Westbrook C, and Kohlmeyer C. Long-term hydrological reconstruction from a beaver meadow using testate amoebae. American Geophysical Union Fall Annual Meeting, December 2016, San Francisco, USA.
- Watts, C., Giesy, J., H. Peng, P.D. Jones. "Identification of Novel Brominated Disinfection By-Products of Concern in Drinking Water by Use of DIPIC-Frag Untargeted Screening" To: 37th Annual Meeting, November 6-10, 2016, Orlando, FL.
- Wauchope-Thompson, M, Leavitt, P.R., Baulch, H.M. Phosphorus Dynamics in the Qu'Appelle Lakes the importance of Internal Loading. NALMS. Banff, Alberta. November 2016.
- White, K.B. and K. Liber. 2016. Effects of elevated salinity and dissolved organic matter in surface water from an oil sands end-pit lake on the toxicity of metals to zooplankton (Ceriodaphnia dubia). Society of Environmental Toxicology and Chemistry 37th Annual Meeting, Orlando, FL, USA, November 6-10, 2016.
- White, K.B. and K. Liber. 2016. Effects of elevated salinity and dissolved organic matter in surface water from an oil sands mine end-pit lake on the toxicity of metals to zooplankton (Ceriodaphnia dubia). 43rd annual Canadian Ecotoxicology Workshop, Edmonton, AB, September 25-28, 2016.
- Wiseman, S., Giesy, J., J. Sun, S. Tang, H. Peng, D. Saunders, T. Stang, J. Doering, M. Hecker and P.D. Jones. "A Combined Transcriptomic and Proteomic Approach to Identify Toxicity Pathways in Early Life Stages of Japanese Medaka (Oryzias latipes) Exposed to 1,2,5,6tetrabromocyclooctane (TBCO)." To: 43rd Annual Meeting, September 25-28, 2016, Edmonton, AB.
- Wittrock, V., D Corkal, R Halliday, M Johnston, I Stewart, E Wheaton. 2016 Oct. Saskatchewan Flood and Natural Hazards Assessment: Finalizing the Work Plan. Invited presentation to the Saskatchewan Ministry of Government Relations, Regina, SK Oct 14. SRC 14113-1D16. Saskatchewan Research Council, Saskatoon, SK. 13 slides
- Zagozewski, R., L. Bharadwaj, C. Waldner, and P. Johnston. 2016. First Nations Drinking Water Regulations: A Culturally-Inclusive Model. Federation of Saskatchewan Indian Nations Water Regulations Forum, Travelodge Hotel, Saskatoon, SK. March 9, 2016.
- Zagozewski, R., L. Bharadwaj, C. Waldner, P Johnston, and J. McLeod (2016) Drinking water in First Nations Communities: The inclusion of culturally-relevant regulations. May 13, Wake Me Up Symposium, Walter Murray Collegiate, Saskatoon, SK.

- Reed, M.G., 2017. Marginality and Gender at Work in Forestry Communities of British Columbia, Canada, In Colfer, C.J.P., Elias, M., Basnett, B.S., and Hummel, S.S. (eds.) The Earthscan Reader on Gender and Forests. London and New York: Routledge. 307-336. (This was a reprint of an article originally published in 2003.)
- Reed, M.G. 2017. Understanding the gendered labours of adaptation to climate change in forestbased communities through different models of analysis. In Cohen, M. (ed.). Gender and Climate Change in Rich Countries: Work, Public Policy and Action. London: Routledge. 199-214.
- Xu L., Raphaely T. (2017) What Can We Do Better for Sustainability in an Uncertain Future?. In: Zacher L. (eds) Technology, Society and Sustainability. Springer, Cham
- Xu L., Marinova D. (2017) Nano-biotechnology for Water Sustainability: Bibliometric Analysis. In: Zacher L. (eds) Technology, Society and Sustainability. Springer, Cham

Books and Book Chapters - 2016

- Cavallaro, M. C., M. Boucher*, and T. Steelman. 2016. "Sustainability champions: Role-models in sustainability graduate education" Eds. Walter Leal-Filho. Handbook of Theory and Practice of Sustainable Development in Higher Education. Chapter 19. . Springer:
- Kulshreshtha, S. E. Wheaton, V. Wittrock. 2016 August. The Impacts of the 2001-2002 Drought In Rural Alberta and Saskatchewan. Chapter 4 in Diaz, H, M Hurlbert and J Warren (editors) Vulnerability and Adaptation to Drought on the Canadian Prairies. University of Calgary Press, Calgary, AB. https://press.ucalgary.ca/books/9781552388198
- Patrick, R. Dec. 2016 "Indigenizing Source Water Protection" in Indigenous Peoples and Resource Development in Canada by Robert Bone and Robert Anderson. Captus Press. Toronto, pp 307-316.
- Reed, M.G. (with Drebert, Y. and Kingsmill, P.) 2016. Sustaining Home: Canadian Biosphere Reserves in Action. Available from the iBOOKstore. [Reed 90 writing; Drebert design and layout, Kingsmill editing and some writing] Not peer-reviewed.
- Reed, M.G., and Abernethy, P. 2016. (accepted October). Social Learning Driven By Collaboration in the Canadian network of UNESCO Biosphere Reserves. In: Transformations of Social-Ecological Systems: Studies in co-creating integrated knowledge toward sustainable futures. Sato, T., and Chabay, I. Editors. Springer: Japan. (will also become available in Japanese)
- Wheaton, E, D Sauchyn, B Bonsal. 2016 August. Future Possible Droughts. Chapter 3 in Diaz, H, M Hurlbert and J Warren (editors) Vulnerability and Adaptation to Drought on the Canadian *Prairies*. University of Calgary Press, Calgary, AB.

https://press.ucalgary.ca/books/9781552388198

Plenary, Key Note and Invited Lectures - 2017

Barbour, L. Invited workshop/mtg: "GIWS Workshop – Annual Progress and Plans", 2 presentations: 'AB Oil Sands – Salt Dynamics/End Pit Lks/Reclamation' (with Lindsay/Ireson/McDonnell), and 'MOST Research Update' (with McDonnell/Ireson/Hendry), Saskatoon, SK, Jun 12-13, 2017 (Lindsay and Ireson presenting).

- Barbour, L. Invited workshop presenter: "Geotechnical modeling using SLOPE/W, SEEP/W, SIGMA/W", GeoSlope International Geotechnical Modeling Workshop (Ap.24-26 2017), Stockholm Sweden).
- Barbour, L. Invited Presentation "Reinstating the open cast mines of Northern Canada some environmental challenges and engineering solutions", Guest Lecture for: QUB, Room 01.041 in the DKB, Belfast, Ap.5, 2017.
- Barbour, L. Invited workshop: "Oil Sand Innovation Summit 2017" (COSIA Conference cosponsored by Alberta Innovates and NSERC); Invited presentations on 'Sustainable Reclaimed Landscapes' with Matt Lindsay (UofS) and Kevin Devito(UofA); Barbour was part of panel at session end/question period, (Mar.21-22, 2017, Calgary, AB).
- Barbour, L. Invited workshop presenter: "Geotechnical modeling using SLOPE/W, SEEP/W, SIGMA/W", GeoSlope International Geotechnical Modeling Workshop (Feb. 6-8, 2017), Auckland New Zealand).
- Barbour, L. Invited Presentation "SCL Aurora Capping Technical meeting", UofS participants: Shahab Alam, Lee Barbour, Bing Si, Ian Fleming (Jan.31 2017, Edmonton).
- Barbour, L. Invited Presentation "SCL BML Technical meeting", UofS participants: Matt Lindsay, Lee Barbour, Julie Zettl, Sarah Rudderham (Jan.25-26 2017, Edmonton).
- Barbour, L. Invited Presentation "A (very) Introductory look at Mine Closure and Reclamation Cover Design", Guest Lecture for: CE 468, UofS, Saskatoon, Jan. 14, 2017.
- Baulch, H.M. Drainage effects on water quality. March 2017. Moose Jaw River Stewards meeting. Avalon, Saskatchewan.
- Bedard-Haughn, A., Van Rees, K., Bentham, M., Krug, P., Walters, K., Heung, B., Jamsrandorj, T., Deters, R., Cerkowniak, D. 2017. Sneak Preview of the Saskatchewan Soil Information System. Soils and Crops 2017 Re-Tooling the Ag Diagnostics Toolbox Symposium. Saskatoon, SK. (Invited Presentation)
- Giesy, J. "China's Role in the Canadian Oil Sands". To: School of Life Sciences, Chinese University of Hong Kong. February 9, 2017, Hong Kong, SAR, China. Invited
- Giesy, J. "Identification and Quantification of Novel Contaminants in Food, Water, Human Tissues and Environmental Matrices". To: Environmental Health Program, University of Macau. March 3, 2017, Macau, SAR, China. Invited
- Giesy, J. "Dialogue with Prof. Giesy". To: School of Biological Sciences, University of Hong Kong, March 7, 2017. Invited
- Giesy, J. "Environmental Forensics: What is it and how is it Practiced?". To: University of Hong Kong, Public Lecture Series, Hong Kong, PRC, March 7, 2017. Invited
- Giesy, J. "Canada's Oil Sands, Winners and Loosers: Eocial, economic, political and Environmental Issues." To: Environmental Science Program, University of Windsor, March 17, 2017. Invited
- Giesy, J. "Perfluorinated Chemicals in the Environment". To: Chemistry Department, University of Manitoba, March 18, 2017. Invited
- Giesy, J. "Siloxane D5: The Science Court in Canada" To: Human Health and Risk Assessment Class, Department of Environmental Science, Baylor University, Waco, Texas, April 7, 2017. Invited
- Giesy, J. "Brominated Flame Retardants Fate, effects of policies". To: Toxicologu Class, Department of Environmental Science, Baylor University, Waco, Texas, April 11 2017. Invited

- Giesy, J. Environmental Forensics: What is it and What can it do? To: Department of Environmental Science, Baylor University, Waco, Texas, April 11, 2017. "Invited
- Giesy, J. "Environmental Restoration of the Tittabawassee River, Michigan, USA". To: Ecosystem Management Class, Department of Environmental Science, Baylor University, Waco, Texas, April 7, 2017. Invited
- Giesy, J. "Environmental Restoration of the Tittabawassee River, Michigan, USA". To: Ecosystem Management Class, Department of Environmental Science, Baylor University, Waco, Texas, April 19, 2017. Invited
- Hudson, J., O. Abirhire, and K. Hunter. 2017. (Invited) Limnological characteristics of Lake Diefenbaker during years of variable hydrologic flow. Global Institute of Water Security Annual Workshop. Park Town Hotel, Saskatoon, SK. June 12-13.
- Laroque, C. Jessie Caldwell Memorial Speaker March 17, 2017. The intertwining branches of dendroarchaeology. Saskatoon Archeological Society.
- Laroque, C. Sheri Andrews-Key and Colin Laroque, March 2017. Sustainable Forest Management, Climate Change and Adaptation in Canada. Webinar for Canadian Forest Service.
- Laroque, C. Sheri Andrews-Key and Colin Laroque, April 2017. Sustainable Forest Management, Climate Change and Adaptation in Canada. Presentation in Meadow Lake, SK for Mistik Management Ltd. Public Advisory Group.
- Laroque, C. Sheri Andrews-Key and Colin Laroque, June 2017. Sustainable Forest Management, Climate Change and Adaptation in Canada. Presentation at the North American Forest Ecology Workshop, Edmonton, Alberta.
- Loring, P.A. Invited Keynote: "Five Words on Sustainability." U of S Graduate Student Association Sustainability Slam. 29 March 2017. Saskatoon, SK. Talk available here: https://www.youtube.com/watch?v=beySSH4cUm8&t=9s
- Loring, P.A. Invited Workshop Participant: Ocean Change and People: COMPASS Science Communication Workshop. 19-21 March 2017. Airlie, VA.
- Loring, P.A. Invited Speaker & Panelist: Food Sustainability Summit. University of Saskatchewan. 1 February 2017. Saskatoon, SK.
- McDonnell, J.J. EcoHydro2017: International Multidisciplinary Conference on: Hydrology and Ecology, Birmingham UK [Conference Keynote]
- McDonnell, J.J. AWRA Spring Specialty Conference on Aquatic System Connectivity, Alta Utah [Conference Keynote]
- McDonnell, J.J. European Geophysical Union, Meet the Expert Session, Vienna
- McDonnell, J.J. American Geophysical Union, Session on Preferential flow and transport across scales in the Critical Zone, San Francisco
- McDonnell, J.J. Joint European Stable Isotopes User Group (JESIUM) Meeting, Ghent Belgium.
- McDonnell, J.J. 3rd International Conference on Hydropedology, Beijing, China.
- McDonnell, J.J. TERENO Workshop on Ecology and Water Quality, Leipzig, Germany [Helmoltz Inst]
- McDonnell, J.J. Giessen University, Institute for Landscape Ecology and Resources Management, Giessen, Germany
- McDonnell, J.J. Freiburg University, Faculty of Environment and Natural Resources, Freiburg, Germany

McDonnell, J.J. University of Lausanne, Institute of Earth Surface Dynamics, Lausanne, Switzerland

McDonnell, J.J. University of Luxembourg, Doctoral Training Program, Luxembourg

McDonnell, J.J. Saskatchewan Polytechnic, Simulcast across 4 campus in Saskatchewan, Canada.

McDonnell, J.J. Oregon State University, Post Doc Association, Corvallis OR.

McDonnell, J.J. Luxembourg Institute for Science and Technology (LIST), Luxembourg

McDonnell, J.J. Helmholz Agrosphere Institute, Forschungszentrum, Juelich, Germany

- McDonnell, J.J. Federal Institute for Geosciences and Natural Resources, Geozentrum, Hanover, Germany
- Noble BF. 2017. So, you're thinking about an academic career in impact assessment? Impact assessment trends, prospects and career success. Montreal, QC: International Association for Impact Assessment Student and Young Professional Forum, Keynote.
- Noble BF. 2017. Learning to listen: Aboriginal participation in EA. Montreal, QC: International Association for Impact Assessment Canadian Environmental Assessment Agency Special Panel on the Implication of the United Nations Declaration on the Rights of Indigenous Peoples.
- Noble BF. 2017. Cumulative effects frameworks: snapshots from practice and key considerations for scoping valued components and indicators. Yellowknife, NWT: Government of the Northwest Territories Workshop on Cumulative Effects.
- Patrick, R. 2017. Community Navigators Workshop (First Nations). Presentation title: "Planning 101" Saskatoon. Hosted by Indigenous and Northern Affairs Canada. March 14, 2017.
- Patrick, R. 2017. Partners for the Saskatchewan River Basin. Annual Conference. Presentation title: "Source Water Protection Planning with Siksika Nation, Treaty 7, Alberta" Saskatoon, Oct 19, 2017.

Patrick, R. 2017. Source Water Protection 101. Webinar. CWRA Webinar Series. January 18, 2017.

- Pomeroy, J. Key Note. Bow River Basin Council Science Forum. Global Water Futures. Calgary, May 2017
- Pomeroy, J. Key Note. Johnson Shoyama Graduate School of Public Policy (JSGS) and Centre for the Study of Science and Innovation Policy (CSIP) Science in Society Symposium. Transdisciplinary Research in the Global Water Futures Programme. Saskatoon, Mar 2017
- Pomeroy, J. Key Note. Fred Holmsley Moore Lecture. Global Water Futures A transdisciplinary research programme to develop solutions to water threats in an era of global change. University of Virginia, Charlottesville, VA, March 2017
- Pomeroy, J. Key Note. Living in the Natural Environment Annual Forum. Climate Change and Forest Change the Impacts on our Waters. Municipal District of Bighorn, Cochrane, Feb 2017
- Pomeroy, J. Invited. Shook, K. and Pomeroy, J. Prairie Modelling. Global Institute for Water Security Annual Progress and Plans Workshop. Saskatoon, SK. June 12, 2017.
- Pomeroy, J. Invited. Baulch, H., Pomeroy, J., Shook, K., Westbrook, C., Wheater, H. Prairie Ag Water Quality: Smith Creek and Tobacco Creek. Global Institute for Water Security Annual Progress and Plans Workshop. Saskatoon, SK. June 12, 2017.
- Pomeroy, J. Invited. Helgason, W., Ireson, A., Pomeroy, J., Shook K. Bright Water Creek, Kenaston. Global Institute for Water Security Annual Progress and Plans Workshop. Saskatoon, SK. June 12, 2017.

- Pomeroy, J. Invited. Pomeroy, J., Westbrook, C., McDonnell, J., Helgason, W., Ireson, A., Bedard-Haughn, A. Canadian Rockies Hydrological Observatory. Global Institute for Water Security Annual Progress and Plans Workshop. Saskatoon, SK. June 12, 2017.
- Pomeroy, J. Invited. Pomeroy, J. Rocky Mountain Water Supply Resilience and Vulnerability Evaluation. Alberta Innovates - Water Innovation Program Forum. Edmonton, AB. May 25, 2017.
- Pomeroy, J. Invited. Pomeroy, J. Global Water Futures Programme in Canada: the National Water Prediction and Forecasting System. Faculty of Physical and Mathematical Sciences of the University of Chile Seminar. Santiago, Chile. Mar 27, 2017.
- Pomeroy, J. Invited. Annand, Holly and Pomeroy J.W. The Influence of Agriculture on Prairie Hydrology. Saskatchewan Conservation and Development Association AGM. Saskatoon, SK. Mar 23,2017.
- Pomeroy, J. Invited. Pomeroy, J. and Wheater, H. Predicting Floods, Droughts and Climate Change Through the Global Water Futures Program. Canadian Water Resources Association & Canadian Society for Hydrological Sciences in Partnership with Environment and Climate Change Canada: Climate Extremes: National Collaboration on Floods and Droughts. Ottawa, ON. Jan 27, 2017.
- Razavi, S. 2017. Observation, Diagnosis, and Prediction of Hydroclimatic Change: A Canadian Approach, Iran Water and Power Resources Development Company (Iranian Ministry of Energy), Tehran, Iran 27-28 February, 2017.
- Razavi, S. 2017. Observation, Diagnosis, and Prediction of Hydroclimatic Change: A Canadian Approach, Ferdowsi University, Mashad, Iran May 9, 2017.
- Razavi, S. 2017. Observation, Diagnosis, and Prediction of Hydroclimatic Change: A Canadian Approach, University of Tehran, Tehran, Iran, April 23, 2017.
- Razavi, S. 2017. A New Framework for Comprehensive, Efficient, and Robust Global Sensitivity Analysis, The European Commission Joint Research Centre (JRC) Ispra 2 May 2017.
- Razavi, S. 2017. Observation, Diagnosis, and Prediction of Hydroclimatic Change: A Canadian Approach, International Conference on Climate Change, Ministry of Energy, Tehran, Iran 27-28 February, 2017.
- Reed, M.G. Jardine, T., Abu, R., Andrews, E., Baines, S., Belcher, K., Bharadwaj, L., Bradford, L., Mantyka-Pringle, C., Steelman, T., Reed, M., and Strickert, G. 2017. Canada's inland deltas: Complex social-ecological systems in need of environmental flows. Workshop on Social and Ecohydrological Connections for Environmental Flows, June 20, National Socio-Environment Synthesis Center, Annapolis, MD.
- Reed, M.G., 2017. Integrating culture and social aspects in ecosystem-based adaptation to climate change. Invited moderator for session. Canadian Commission for UNESCO. Montreal QC. May 26, 2017.
- Reed, M.G., Cibien, C. and Roth, A. 2017. Partnerships between BRs and Universities. Organized workshop for EuroMAB, Sarlat, France, April 5th 2017.
- Reed, M.G. 2017. Building bridges and partnerships with practitioners and researchers in Canadian Biosphere Reserves, Invited speaker for a special session on scientific partnerships. For EuroMAB, Sarlat, France, April 6, 2017.

- Reed, M.G. 2016. Gender, culture and climate hazards: Connecting the dots in Canadian Rural Communities. Faculty of Environment, Earth and Resources Seminar Series, University of Manitoba, Winnipeg Canada, February 16, 2017.
- Reed, M.G. and Abernethy, P. 2017. Social Learning Driven by Collaboration in the Canadian network of UNESCO Biosphere Reserves. ILEK Project International Symposium: Transformations of Social-Ecological Systems: Co-creating integrated knowledge toward sustainable futures. Research Institute for Humanity and Nature, Kyoto Japan, January 22 2017.
- Soltan, J. 2017. Emerging pollutants in water and novel water and wastewater treatment technologies, Non-conventional Water Treatment Processes, Quito, Ecuador, June 4-10.
- Steelman, T. 2017. "Wonder Woman and other Myths". Women in Science speaker series. College of Natural Resources, North Carolina State University. Raleigh NC. April 19, 2017.
- Steelman, T. and B. Nowell. 2017. Assessing and Managing Social Risks on Large Wildfires. Webinar. BC-IMT Training, British Columbia Wildfire Service. April 19-20, 2017. Chilliwack, BC.
- Steelman, T. 2017. Understanding the wildfire policy context: Where are we now? A Century of Wildland Fire Research: Contributions to Long-Term Approaches for Wildland Fire Management. A Workshop. National Academy of Sciences. Washington, DC. March 27, 2017.
- Westbrook C. Saskatoon Nature Society, 16 February 2017. "Looking to the beaver for flood and drought protection", Saskatoon, SK.
- Westbrook C. Wetlands in Yukon: A Science-Based Discussion. 2 March 2017. "Hydrological lessons learned from studying peatlands drained by streams", Whitehorse, Yukon.
- Wheater, H.S., Hassanzadeh, E., Nazemi, A., and Elshorbagy, A. 2016. Managing Water-Food-Energy Futures in the Canadian Prairies. American Geophysical Union, San Francisco, USA, December 12-16 (oral, invited).
- Wheater, H.S.Canadian Water Resources Association Climate Extremes: National Collaboration on Floods and Droughts Workshop, Ottawa (2017).

Wheater, H.S.2017 CMOS Congress, Toronto (2017).

Wheater, H.S.70th Annual CWRA Conference, Lethbridge (2017).

Plenary, Key Note and Invited Lectures - 2016

- Barbour, L. Invited Presentation/Meetings "IRC (Barbour) Research: Annual Syncrude Cda Ltd seminar/mtgs/discussions: for Barbour & his students/research staff (including Associate Chair Matt Lindsay and his students) to give presentations/updates on their IRC work/projects, as well as discuss other associated SCL/UofS research projects, Edmonton AB, Dec. 5, 2016.
- Barbour, L. Invited Presentation "Oil Sands Research", Guest Lecture for: EVSC 203 Class (Sampling and Laboratory Analysis), UofS, Saskatoon, Nov.30, 2016.
- Barbour, L. Invited workshop presenter: "Geotechnical modeling using SLOPE/W, SEEP/W, SIGMA/W", GeoSlope International Geotechnical Modeling Workshop (Oct.17-19, 2016, Calgary, AB).
- Barbour, L. Invited Meetings/Presentations "SCL IRC and related Research: Syncrude Cda Ltd mtgs/discussions: for Barbour/Lindsay to give presentations/updates on their IRC work/SCL

projects to D. Heisler (SCL), Also included a MOST tour and discussion on Shelby DeMars' research (proposal defense), Saskatoon SK, Oct. 12-13, 2016.

- Barbour, L. Invited mtg presenter. "BML Summer Technical meeting", participants: Rebecca North, Kathryn Dompierre, Matt Lindsay, Lee Barbour (July 26-27 2016, Edmonton).
- Baulch, H.M. Nutrient Dynamics in Prairie Ecosystems. October 2016. Prairie Provinces Water Board meeting on nutrients. Regina, Saskatchewan
- Bedard-Haughn, A. 2016. The Soil Landscape Mosaic: Building our knowledge base to manage complexity. Saskatchewan Ministry of Agriculture Agronomy Research Update. Saskatoon, SK. (Invited Presentation)
- Bedard-Haughn, A. 2016. Enhanced Soil Data for Sustainable Land Management. Saskatchewan Assessment Appraisers Association Annual Meeting. Regina, SK. (Invited Presentation)
- Laroque, C. Sheri Andrews-Key and Colin Laroque, Oct. 2016. Sustainable Forest Management, Climate Change and Adaptation in Canada. Presentation in Meadow Lake, SK for Mistik Management Ltd. Public Advisory Group.
- Liber, K. 2016. Addressing ecotoxicological concerns in western Canada: An overview of personal research programs at the U of S Toxicology Centre. Faculty of Natural and Applied Sciences, University of Buenos Aires, Buenos Aires, Argentina, October 17, 2016. (Invited seminar).
- Liber, K. 2016. Toxicity of neonicotinoid insecticides and their mixtures to aquatic insects. Society of Environmental Toxicology and Chemistry Meeting, Cordoba, Argentina, October 11-14, 2016. (Plenary address).
- Liber, K. 2016. Non-target toxicity of neonicotinoid insecticides to freshwater organisms and associated ecological risk. Institute of Loess Plateau, Shanxi University, Taiyuan, Shanxi, P.R. China, August 19, 2016. (Invited lecture).
- Loring, P.A. Invited Panelist: 5th Annual Global Health Conference: Creating a Sustainable Future for Health Equity. 1 October 2016. Saskatoon, SK.
- Loring, P.A. Invited Workshop Participant: Meaningful Engagement of Indigenous Peoples and Local Communities in Marine Activities, Arctic Council. 17 September 2016. Brunswick, ME.
- Massé AJ, Muscatello JR, Janz DM. 2016. Reproductive and developmental effects of elevated maternal dietary selenium in the model amphibian Xenopus laevis. Dr. Richard Playle Award for Outstanding M.Sc. Thesis in Ecotoxicology, Canadian Ecotoxicity Workshop, Edmonton, AB.
- Noble BF. 2016. Environmental assessment: On the front lines of conflict and reconciliation. University of British Columbia Faculty of Forestry. Visiting lecturer series – inaugural lecture.
- Noble BF 2016. Cumulative effects assessment: Good practices. Montreal, QC: James Bay Advisory Committee on the Environment – Practitioner and Regulator Workshop on Cumulative Effects
- Noble BF. 2016. Environmental assessment reform. Toronto, ON: Ontario Association for Impact Assessment AGM Plenary Panel.
- Noble BF. 2016. Cumulative effects assessment big data challenges. Montreal, QC: Concordia University, Department of Geography.
- Patrick, R. 2016. North American Lake Management Society. Science to Stewardship: Balancing Economic Growth with Lake Sustainability. First Nations and Water special session.
 "Saskatchewan River Delta: Water Stewardship Planning Initiative". November 1-4, 2016. Banff, Alberta.

- Pomeroy, J. Key Note. Under Western Skies Conference. Our Water Future in Western Canada. Mount Royal University, Calgary, Sept 2016
- Pomeroy, J. Invited. Pomeroy, J. Theme B progress, synthesis of diagnosing change (following CRHM Expert Workshop), outreach and dissemination plans. Changing Cold Regions Network Fourth Annual General Meeting. Guelph, ON. Dec 2016.
- Pomeroy, J. Invited. Pomeroy, J. Progress in cold regions hydrology process and modelling studies. Changing Cold Regions Network Fourth Annual General Meeting. Guelph, ON. Dec 2016.
- Pomeroy, J. Invited. Pomeroy, J. Progress in Theme B. Changing Cold Regions Network Modelling Workshop. Saskatoon, SK. Nov 2016.
- Pomeroy, J. Invited. Pomeroy, J., Wayand, N., and Marsh, C. Evaluating a dynamic-mesh hydrology model driven by GEM forecasts over the Canadian Rockies. The International Network for Alpine Research Catchment Hydrology 2nd Workshop. Grenoble, France. Oct 17-19, 2016.
- Pomeroy, J. Invited. Pomeroy, J. INARCH and the Global Water Futures (GWF) Programme: Common Interests in Cold Regions Mountains and Next Steps. Second International Network for Alpine Research Catchment Hydrology Workshop. Grenoble, FRANCE. Oct 2016.
- Pomeroy, J. Invited. Pomeroy, J. Downscaling of regional climate model outputs to drive a hydrological model in alpine research basins: Intercomparison of snow hydrology and impacts of climate change along a North American transect from Yukon to Idaho. Second International Network for Alpine Research Catchment Hydrology Workshop. Grenoble, FRANCE. Oct 2016.
- Pomeroy, J. Invited. Pomeroy, J. and Vionnet, V. Opening talk on INARCH objectives, progress and special Issue in ESSD. Second International Network for Alpine Research Catchment Hydrology Workshop. Grenoble, FRANCE. Oct 2016.
- Pomeroy, J. Invited. Helgason, W. and J. Pomeroy. Open discussion on publishing SOAP datasets. The Changing Cold Regions Network Special Observation and Analysis Period (SOAP) Workshop. Saskatoon, SK. Oct 2016.
- Pomeroy, J. Invited. Pomeroy, J. and M. Demuth. Mountain and glacier sites (Marmot, Fortress, Wapta, Brintnell-Bologna, Columbia. The Changing Cold Regions Network Special Observation and Analysis Period (SOAP) Workshop. Saskatoon, SK. Oct 2016.
- Pomeroy, J. Climate and Water Navigating Turbulent Waters Ahead. The Red River Basin Commission North Chapter In partnership with the Prairie Climate Centre. Winnipeg, MB. September 15, 2016.
- Razavi, S. (2016), The Changing Cold Regions Network: Observation, Diagnosis, and Prediction of Environmental Change in the Saskatchewan and Mackenzie River Basins, 2016, GEWEX Hydroclimatology Panel (GHP) Meeting, October 3-5, 2016, Gif-sur-Yvette, France.
- Steelman, T. G. Strickert, T. Jardine, S. Shantz and G. Carriere. 2016. Community Engaged Scholarship: the Delta Dialogue Network as Transdisciplinary Practice. Presentation for UofS Senior Leadership Retreat. Waskesiu, SK. August 23, 2016.
- Wheater, H.S. Environment Canada Seminar Series, Burlington, Ontario (2016).

Wheater, H.S. Globe 2016 – Vancouver (2016).

Wheater, H.S. FSIN Water Regulations Forum, Saskatoon, Saskatchewan (2016).

- Wheater, H.S. International Court of Justice 70th Anniversary Celebration, The Hague, Netherlands (2016).
- Wheater, H.S. Canadian Network for Regional Climate and Weather Processes Annual Science Meeting, Montreal, Quebec (2016).
- Wheater, H.S. Young Hydrologic Workshop CGU/CMOS 2016, Fredericton, New Brunswick (2016).
- Wheater, H.S. Eric Wood Symposium, Princeton University, Princeton, New Jersey (2016).
- Wheater, H.S. 2016 Orlob Symposium, UC Davis, California (2016).
- Wheater, H.S. 2016 Schultz Oration, Flinders University, Adelaide, Australia (2016).
- Wheater, H.S. CUAHSI 2016 Biennial Colloquium, Shepherdstown, West Virginia (2016).
- Wheater, H.S. The Global Network on Water and Development Information for Arid Lands (G-WADI) Global Conference, Beijing, China (2016).

Wheater, H.S. Canadian Water Resources Association 2016 Webinar Series, via webinar (2016).

Wheater, H.S. American Geophysical Union Fall Meeting, San Francisco (2016).

Patents 2016

- Li, S. and K. Liber. 2016. Soil parameters test device. Chinese Utility Model Patent no. 201620070237.1, State Intellectual Property Office, Beijing, P.R. China.
- Li, S. and K. Liber. 2016. Coal gob leachate collection device. Chinese Invention Patent no. 201610388217.3, State Intellectual Property Office, Beijing, P.R. China

Editorial Boards

Bedard-Haughn, Angela

• Associate Editor, Canadian Journal of Soil Science

Clark Bob

- Expert Reviewer for the First Order Draft of the IPCC Special Report on 1.5 Degrees (2017)
- Prairie Habitat Joint Venture (PHJV) Science & Policy Committee member (2016ongoing)

Elshorbagy, Amin

- Associate Editor, Water Resources Research
- Editor, Journal of Hydroinformatics

Ferguson, Grant

- Associate Editor, Geofluids
- Associate Editor, Ground Water

Giesy, John

- Editorial Board. Ecosystem Health and Sustainability. Published by Ecological Society of America and Ecological Society of China. 2013-Present
- Editorial Board Geochemistry and Environmental Health. 2006-Present

- Editorial Board Environmental Bioindicators. 2007-Present
- Editorial Board. Reviews in Environmental Contamination and Toxicology. 2007-Present
- Editorial Advisory Board: Toxicological and Environmental Chemistry. Gordon and Breach/Scientific Publishers. London. 1989-Present.
- Editorial Board: Environmental Toxicology and Pharmacology. 2006-Present
- Guest Editor: Proceedings of the National Academy of Science, USA. 2007-Present
- Editorial Board: Environmental Research: 2014-Present
- Editorial Board: Environmental Reviews. 2014-Present
- Advisory Board The Handbook of Environmental Chemistry series. Springer Verlag. 2004-Present.
- Editorial Board Handbook of Ecotoxicology, Lewis Publishers /CRC Press. 1992-Present.

Janz, David

- Senior Editor for journal Bulletin of Environmental Contamination and Toxicology, 2016present
- Editorial Board Member for journal Aquatic Toxicology, 1998-present

Laroque, Colin

• Physical Geography Editor "Canadian Geographer"

Li, Yangping

• Associate editor of "Monthly Weather Review", American Meteorology Society journal, 2017-2020.

McDonnell, Jeffrey

- Editorial Board, Rhyzosphere, Elsevier
- Editorial Board, Sustainable Water Developments (Book Series), CRC Press
- Editorial Board, Ecohydrology, John Wiley and Sons
- Editorial Advisory Board, Forest Science and Technology, Taylor and Francis Ltd
- Editorial Board, Wires Water, John Wiley and Sons
- Associate Editor, Hydrological Processes, John Wiley and Sons.
- Editorial Board, Hydro-Science and Engineering, Nanjing Hydraulic Res. Institute, China
- Editorial Board, Advances in Water Science (China), UNESCO
- Editorial Board, MASKANA (the multidisciplinary journal of the University of Cuenca).
- Editorial Board, Forest Research—Open Access, OMICS Publishing Group (final year)
- Associate Editor, Journal of Hydrology and Hydromechanics, Open access journal
- Editorial Board, Asian Journal of Geosciences, Hindawi Publishers
- Editorial Board, Journal of Hydrogeology and Hydrologic Engineering, Sci-Technol.
- Editorial Board, Riparian Ecology and Conservation, Versita and Springer
- Editorial Board, Water, MDPI Publishers, Switzerland
- Editorial Board, International Journal of Hydrology Science and Technology, Inderscience Enterprises Ltd (UK).

McPhadren, Kerry

Editorial Board - Bulletin of Environmental Contamination and Toxicology

Noble, Bram

- Associate Editor, Environmental Management, 2015 Current
- Associate Editor, Journal of Environmental Assessment Policy and Management, 2009 Current
- Editorial Board Member, Environmental Impact Assessment Review, 2007 Current
- Editorial Board Member, Impact Assessment and Project Appraisal, 2016 present

Razavi, Saman

- Associate Editor, Journal of Hydrology, Elsevier, Jan, 2016 present
- Editorial Board Member, Environmental Modelling & Software, Elsevier, May, 2015 present
- Deputy Chair of Hydrologic Uncertainty Technical Committee of American Geophysical Union (AGU), 2017 present
- Member of Surface Water Hydrology Technical Committee (SWHTC) of American Society of Civil Engineers (ASCE), 2016 present
- Member of Hydrologic Uncertainty Technical Committee of American Geophysical Union (AGU), 2016 present
- Member of Student Travel Grant Committee of American Geophysical Union (AGU), 2015

 present
- Member of "Thirsty Future: Energy and Food Impacts on Water" working group of the IAHS (The International Association of Hydrological Sciences) scientific decade 2013–2022 (Panta Rhei: Everything Flows).
- Co-convener, The 2017 Scientific Annual Meeting of Canadian Geophysical Union (CGU), Insights into Environmental/Hydrological Models Using Sensitivity and Uncertainty Analysis and Information Theory, Primary convener: Amin Haghnegahdar, co-conveners: Saman Razavi and Steven Weijs, May 28-31, 2017, Vancouver.
- Co-convener, European Geosciences Union (EGU) General Assembly 2017 session on "Advances in Sensitivity and Uncertainty Analysis of Earth and Environmental Systems Models", Co-conveners: Amin Haghnegahdar, Hoshin Gupta, Cristina Prieto, Mary Hill, William Becker. April 23-28, 2017, Vienna, Austria.
- Co-convener and Chair, American Geophysical Union (AGU) 2016 Fall Meeting session on "Advances in Sensitivity and Uncertainty Analysis of Earth and Environmental Systems Models", Co-conveners: Amin Haghnegahdar, Hoshin Gupta, Mary Hill, San Francisco. December 12-16, 2016.
- Co-convener, American Geophysical Union (AGU) 2016 Fall Meeting session on "Advances in Process-Based Hydrologic Modeling", Co-conveners: Shervan Gharari, Martyn Clark, Bethanna M Jackson, San Francisco. December 12-16, 2016.
- Co-convener, American Geophysical Union (AGU) 2016 Fall Meeting session on "Food, Energy, and Water Nexus: Synergies and Tradeoffs", San Francisco. December 12-16, 2016.

Steelman, Toddi

- Member, International Editorial Board, Policy Sciences, 2015-present
- Member, Board of Directors, International Association of Wildland Fire, 2016-2019
- Member, Scientific Advisory Committee, International Symposium on Society and Resource Management (ISSRM), 2017-present
- Member, 2018 Fire Continuum Conference Planning Committee, International Association of Wildland Fire, 2017-present
- Program Chair, Cohesive Strategy Workshop, 2018, International Association of Wildland Fire, 2017-present

Westbrook, Cherie

• Member, Editorial Board, Annals of the American Association of Geographers, Physical Geography and Environmental Sciences section (Feb 2017 - Dec 2020) [invited]

Whitfield, Colin

- Session Chair, CGU and CSAF Joint Annual Scientific Meeting
- Reviewer: Boreal Environment Research, Canadian Journal of Soil Science, Journal of Basic Microbiology, Journal of Environmental Quality, Science of the Total Environment

APPENDIX F – Collaborations and Outreach

Barbour, Lee

- Dr. Lee Barbour: Video interview for an SCL promo on 'Reclamation Research'
- Mention of Dr. Barbour's previous reference to the oil sands in NowToronto.com: 'Mordor comparison stirs tempest in the oil sands' by Adria Vasil; https://nowtoronto.com/news/ecoholic/mordor-comparison-stirs-tempest-in-the-oilsands/

Bedard-Haughn, Angela

- Interview with Jay Whetter for Country Guide article titled "A Giant Leap for Soil Kind" re: Enhanced Saskatchewan Soil Data for Sustainable Land Management (ADF grant, see above). Published June 22, 2017.
- Television interview with Bob Simpson for FarmGate re: Understanding Resilience in Agroecosystems (see NSERC Strategic Project grant, above). Feb. 16, 2017

Bharadwaj, Lalita

- L.A. Bharadwaj, 2017. From the Lab to the Reserve: The Transformative Power of Community Engaged Scholarship. Published as a podcast for the National Collaborating Centre for Infectious Disease (NCCID). https://drive.google.com/file/d/0B5tXl0zCSreMEgzeGZ4STcxa1U/view?usp=sharing
- March 10, 2017 Live Radio Interview: CBC News Radio Saskatchewan with Garth Materie. "The Afternoon Edition". Comment on the announcement from the federal government that it was on track to ensure First Nations would have safe drinking water within the next five years.
- April 28th, 2017: Telephone Interview: VICE News with Hilary Beaumont: Water Challenges in First Nations.
- April 26th, 2017: Telephone Interview (L.E.A. Bradford#): Eagle Feather News Saskatchewan. History of Yellow Quill First Nation Water: Animated Story through Video.
- April 26th, 2017: Live Radio Interview (LE.A. Bradford#): CBC News Radio Saskatchewan with Garth Materie. "The Afternoon Edition". Background on the project and video production with Yellow Quill First Nation.
- April 26th, 2017: Telephone Interview (L.E.A. Bradford#): CBC News Saskatchewan with Samanda Brace. Background on the project and video production with Yellow Quill First Nation. http://www.cbx.ca/news/canada/saskatoon/yellow-quill-first-nation-watervideo-sask-uof-1.4089416
- February 21st, 2017: Telephone Interview: National News: Canada Lacks Research on Drinking Water and Indigenous Health. http://watercanada.net/2017/canada-suffers-from-a-dearth-of-research-on-drinking-water-and-indigenous-health/
- April 27th, 2017 (Article): University of Saskatchewan School of Public Health. C. Bonner: "Bridging the Gap" https://www.usask.ca/sph/articles/2017/bridging-the-gap.php
- April 27th, 2017 (News Brief): On Campus News University of Saskatchewan. http://news.usask.ca/articles/colleges/2017/bridging-the-gap.php

- Bradford, L.E.A. (2017) Grant Writing Workshop (June 13th 2017). Workshop for Federation of Indigenous Sovereign Nations head office and member communities. 25 attendees.
- Bradford, L.E.A. (2017). Data Analysis and Visualization Workshop (May 16th 2017). Workshop for Federation of Indigenous Sovereign Nations head office and member communities. 17 attendees.
- Zagozewski, Bradford, Bharadwaj. (2016). Indigenous Water Forum, Dakota Dunes event Center, whitecap First Nation, Saskatchewan, SK, Canada. October 27th and 28th 2016. 150 attendees.
- L.E.A. Bradford, R. Zagozweski, L.A. Bharadwaj (2016). First Community Screening at the Yellow Quill First Nation Hall April 11, 2017, Funded by CIHR and WEPGN, Sponsor, YQFN. "Spirit, Safety, and a Stand-off". Animated video on the History of Water in Yellow Quill First Nation. Video 25 minutes. Produced at request of Yellow Quill First Nation. https://www.usask.ca/sph/articles/2017/bridging-the-gap.php

Shown also at the Indigenous Water Forum October 28th, 2016 Whitecap Dakota First Nation.

Giesy, John

- International Advisory Board, State Key Laboratory in Marine Pollution (SKLMP), City University of Hong Kong, Hong Kong, China, 2013-2016
- Alberta Minister of the Environment, Science Advisor, 2013-2016
- Canada Institute for Health Research (CIHR) Member Evaluation Group, 2015-2017
- Health Canada Member Chemcial Management Plan Science Committee, 2017-2020
- Alberta Minister of Environment and Parks Science Advisory Panel, 2016-2017
- Chair Advisory Council for Research Centre for Toxic Compounds in the Environment Centre (RECETOX), Faculty of Science, Masaryk University. 2016-Present.
- Member of the Scale Model Association of Saskatoon
- Member of the Saskatchewan Wildlife Federation
- Serve on the Board of Directors of the State Key Laboratory for Marine Pollution at City University of Hong Kong.
- Co-wrote water quality criteria for China.
- Serve as Visiting Distinguished Professor the Department of Biology and Chemistry, City University of Hong Kong, Hong Kong, SAR, China
- Serve as a Concurrent Professor in the Nanjing University, Environmental Sciences Program, Nanjing, China
- Serve as an Einstein Professor of the Chinese Academy of Sciences
- Serve as a Guest \Professor at Xiamen University, College of Oceanography and Environmental
- Serve as a Visiting Distinguished Professor in the School of Biological Science of the University of Hong Kong.
- Served on the national review committee of the Canada Foundation for Infrastructure: Grant proposals
- Chairing the panel for the reassessment of the insecticide Chlorpyrifos by the UE EPA.

Ireson, Andrew

• NASA: I served on a peer review panel in Washington DC, July 2016, for proposals submitted to the Understanding Changes in High Mountain Asia solicitation

Janz, David

- Member, Evolution and Ecology Scholarships and Fellowships Selection Committee (169), Natural Sciences and Engineering Research Council of Canada, 2016-2019
- Member, North American Metals Council, Selenium Working Group (2008-present)

Jardine, Tim

- Interview with Julia John of The Wildlife Society about waterfowl and the Saskatchewan River Delta, http://wildlife.org/ducks-chemical-signatures-point-to-importance-of-canadian-delta/, May 4, 2017.
- Interview with Allison Dempster of CBC Regina about the pending report on the Husky oil spill, broadcast on CBC radio November 17, 2016.
- Interview with Creeson Agecoutay of the CTV Regina about the Husky oil spill in the North Saskatchewan River, http://regina.ctvnews.ca/video?clipId=982159, September 26, 2016
- Interview with Carrie Tait of the Globe and Mail about the Husky oil spill in the North Saskatchewan River, http://www.theglobeandmail.com/news/national/husky-oil-spillhas-critics-questioning-independence-of-saskatchewansregulatorysystem/article31585612/, August 24, 2016
- Interview with Joel Senick of Global News Saskatoon about the Husky oil spill in the North Saskatchewan River http://globalnews.ca/news/2883385/wsa-releases-results-of-water-testing-following-north-saskatchewan-river-oil-spill/, August 15, 2016.
- Interview with Joelle Tomlinson of Global News Saskatoon about the Saskatchewan River Delta, http://globalnews.ca/video/2862489/protecting-the-saskatchewan-river-delta, August 3, 2016.

McDonnell, Jeffrey

- President, AGU Hydrology Section (7000 members of section)
- Member, AGU Council (the administrative body of the 60,000 member Union)
- Chair, Editor-in-Chief Search Committee, Water Resources Research (AGU)
- Visiting Professor, Luxembourg Inst for Science and Technology, Luxembourg
- Board member, University of Waterloo Water Institute (one annual Board meeting)
- Board Member, Helmholtz Inst., Germany, TERENO Terrestrial Observatory Network (one annual Board meeting)
- Chair, AGU Fellows Selection Committee
- Member, CGU Isotopes Committee

Patrick, Robert

• Robert Patrick. Opinion Editorial: We need to protect our drinking water, not just treat it. Edmonton Journal. June 13, 2017.

- Robert Patrick. Letters to the Editor: Invest in watershed plans. Saskatoon Star Phoenix. August 6, 2016.
- Robert Patrick. Viewpoint: Plan required to protect potable water. Saskatoon Star Phoenix. August 3, 2016.
- Mistawasis First Nation source water protection plan. Completed July 2016
- Beardy's First Nation source water protection plan. Start Up October 2015
- Cumberland House source water protection. Completion March 2016
- La Ronge Tri-Communities source water protection plan. Completed July 2016
- Cumberland House Water Stewardship Plan. Completed July 2016

Pomeroy, John

- CBC Radio Saskatoon Morning June 23, 2017. South Saskatchewan River
- National Post. May 31, 2017. 'The new normal': Brace yourself, Toronto, more heavy rain and flooding is expected
- CBC Radio Saskatchewan The Afternoon Edition June 1, 2017. Lack of water in Sask.
- Data Driven. Water Canada. May/June 2017
- CBC Calgary Eyeopener May 23, 2017. Flood prediction, climate change impacts on water studied at new Canmore lab
- News Talk 770 May 13, 2017. Global Water Futures
- CTV Your Morning May 11, 2017. Should Canada have a national strategy for dealing with floods
- 840 CFCW Radio May 10, 2017. Researchers teaming up to come up with a flood and drought prediction system for the country
- The Crag and Canyon. May 10, 2017. USaskatchewan opens cold water research facility in Canmore to study climate change.
- SASKNOW.ca May 8, 2017. U of S Involved in Multi-University Water Study
- 620 CKRM May 8, 2017. University of Saskatchewan involved in world's largest water study
- Saskatoon StarPhoenix May 5, 2017. U of S opens water research facility to study climate change
- Floods, drought and climate change: What does the future hold. 2017. Farming For Tomorrow. Apr/May issue, pp 18-21
- Stealing the Slims River. Hakai magazine. April 2017
- Winnipeg Free Press Apr 14, 2017. Regular flooding in southwest corner costs millions and affects thousands
- Yorkton This Week Mar 23, 2017. Politics Gov't must take on tough drainage issue
- News Talk 770 Radio Mar 22, 2017. How 3D maps of an Alberta mountain could help predict the next flood or drought
- The National TV Mar 21, 2017. How 3D maps of an Alberta mountain could help predict the next flood or drought
- CBC News Edmonton Mar 21, 2017. How 3D maps of an Alberta mountain could help predict the next flood or drought
- CHEK News at 5 Mar 21, 2017. How 3D maps of an Alberta mountain could help predict the next flood or drought
- Regina Leader-Post Mar 11, 2017. Drainage woes plaque province
- Rocky Mountain Outlook Jan 12, 2017. World's largest water research program sprouted in Canmore
- Time.com Jan 12, 2017. Is it Safe to Eat Desserts Made Out of Snow?
- PIQUE News Magazine Dec 29, 2016. World's largest water research program sprouted in Canmore
- Global News Saskatoon Dec 28, 2016. Flooding, tornadoes highlight Saskatchewan's weather during 2016
- The Crag and Canyon Dec 21, 2016. Water research centre expanding, looking to the future in Canmore
- Global News Dec 19, 2016. 'The Beast' is still burning east of Fort McMurray 1 year later
- The Canadian Rockies Hydrological Observatory (CRHO). Dec 2016. Mountain Views/Mountain Meridian Vol. 10(2), pp. 28-29
- Wolf Creek Research Basin. Dec 2016. Mountain Views/Mountain Meridian Vol. 10(2), pp. 30-31
- Love Nature (TV documentary) Nov 18, 2016. Wild Rockies
- Calgary Sun Oct 19, 2016. Glaciers getting 'thinner and smaller faster and faster,' expert says
- Saskatoon StarPhoenix Oct 11, 2016. Short-term thinking on climate change will bring pain
- CBC News Edmonton Oct 6, 2016. Rebuilding Fort McMurray homes on flood plain a 'poor decision,' says hydrologist
- Future water for agriculture. Farming For Tomorrow. 2016. Fall issue, pp. 18-20
- CBC Radio Calgary The Homestretch Sep 28, 2016. Climate change impacts for western Canada's water and the new CFREF Global Water Futures programme
- The Globe and Mail Sep 9, 2016. Five questions with hydrologist John Pomeroy
- Water Canada Sep 8, 2016. Professor John Pomeroy Describes Canada's New Million Research Program
- The Saskatoon StarPhoenix Sep 7, 2016. U of S leads major water project.
- 620 CKRM Radio News Sep 7, 2016. U of S to lead "Water Threats" research program
- Global News TV Sep 7, 2016. University of Saskatchewan awarded \$77.8 million in research funding
- Calgary Herald Sep 6, 2016. Southern Alberta flood leads to 'largest university-led water
- project in the world
- The Saskatoon StarPhoenix Sep 6, 2016. Liberals hand U of S \$77.8 million for massive water research program

Reed, Maureen

• Reed, M.G., Messier, J.P. and Ferguson, E. 2017. Co-building Sustainability and Reconciliation. A 4-day national meeting of Biosphere Reserve practitioners, Indigenous

peoples, academics and governing authorities. Baie-Comeau, QC: Manicouagan-Uapishka Biosphere Reserve. For "experience", see description and video here: <u>https://researchgroups</u>. usask.ca/reed/progress-news-articles/co-building-sustainabilityandreconciliationa-connection-event-in-canada.php

- Andrews, E., Staples, K., Reed, M., Rokoya, P., Willness, R., Daviduik, S., Baines, S., and Steelman, T. 2016. Delta Days: Moving from Awareness to Action. Final report of the workshop "Building Bridges Between Deltas". Saskatoon: University of Saskatchewan: 44 pp.
- "Striking Balance: A Documentary Series Celebrating Canada's Biosphere Reserves". Zach Melnick, Director. This series showcases Canada's biosphere reserves is being aired on TV Ontario (Fall 2016) and the Knowledge Network (Spring 2017). My role is as Executive Producer. There are presently 8 50-minute episodes:
 - o Long Point
 - Clayoquot Sound
 - o Mont Saint-Hilaire
 - Bras d'Or Lake
 - Georgian Bay
 - o Redberry Lake
 - o Fundy
 - o Waterton

Weekly average unique viewers in Ontario only 395,000. The cumulative reach (i.e. for the series overall) within Ontario in Fall 2016 was 1,755,000.

For more information, see: http://www.strikingbalance.ca/ or http://strikingbalance.ca/index-FR.html

Steelman, Toddi

- Strickert, G.E.H., Steelman, T, Orozs, C., Rose, I., Shantz, S., Reed, M., Bradford, L., Jardine, T. Fresque-Baxter, J. 2017. Building Bridges, Delta Days Exhibit Sculpture, Mix Media Interactive. Explorer Hotel Yellowknife, NT. February 13th February 14th, 2017.
- Strickert, G.E.H., Steelman, T., Orozs, C., Rose, I., Shantz, S., Reed, M., Bradford, L. Jardine, T. Fresque-Baxter, J. 2017 Building Bridges, Delta Days Exhibit Sculpture, Mix Media Interactive. Beaulieu Memorial Hall, Fort Resolution, NT. February 7th– February 10th, 2017.
- Strickert, G.E.H., Steelman, T., Orozs, C., Rose, I., Shantz, S., Reed, M., Bradford, L., Jardine, T. Fresque-Baxter, J. 2017. Building Bridges, Delta Days Exhibit Sculpture, Mix Media Interactive. Roaring Rapids Hall, Fort Smith, NT. February 3rd– February 5th, 2017.
- Strickert, G.E.H., Steelman, T., Orozs, C., Rose, I., Shantz, S., Reed, M., Bradford, L., Jardine, T. Fresque-Baxter, J. 2017. Building Bridges, Delta Days Exhibit Sculpture, Mix Media Interactive. Mamawi Hall, Fort Chipewyan, AB. January 31st February 1st, 2017.
- Strickert, G.E.H., Steelman, T., Orozs, C., Rose, I., Shantz, S., Reed, M., Bradford, L., Jardine, T. Fresque-Baxter, J. 2017 Building Bridges, Delta Days Exhibit Sculpture, Mix Media Interactive. Charlebois Community School, Cumberland House, SK January 18th – 20th, 2017.

- Strickert, G.E.H., Steelman, T., Orozs, C., Rose, I., Shantz, S., Reed, M., Bradford, L., Jardine, T., Fresque-Baxter, J. 2017. Building Bridges, Delta Days Exhibit Sculpture, Mix Media
- Interactive. Nisto Awasisak Memorial School, Cumberland House, SK. January 16th 17th, 2017.
- CBC News. September 1, 2017. Let it burn: Expert says wildfires can be healthy for Saskatchewan's forests. http://www.cbc.ca/news/canada/saskatchewan/photos/saskatchewan-wildfire-expert-1.4271348
- UsaskNews. March 31, 2017. U of S School of Environment and Sustainability Launches New Research Initiatives.. http://news.usask.ca/media-release-pages/2017/u-of-s-school-of-environment-and-sustainability-launches-new-research-initiatives-.php
- SaskNow. May 5, 2017. Fort McMurray fire still burning, a year later. http://www.sasknow.ca/local-news/fort-mcmurray-fire-still-burning-a-year-later
- CJWW Radio. March 31, 2017. School launches new research initiative. Renewable energy and northern, remote and Indigenous communities.
- UsaskNews. Steelman, T, Reed, M. March 10, 2017. SENS@10. http://news.usask.ca/articles/colleges/2017/sens--10.php
- UsaskNews. Steelman, T., Staples, K. February 10, 2017. Delta Days brings water research home. https://news.usask.ca/articles/colleges/2017/delta-days-brings-water-research-home.php
- UsaskNews. February 10, 2017. U of S secures silver sustainability rating. https://news.usask.ca/articles/general/2017/u-of-s-secures-silver-sustainabilityrating.php
- College of Arts and Science News. January 26, 2017. Discovering the Deltas. http://artsandscience.usask.ca/news/articles/784/Discovering_the_deltas
- CBC National/CBC Regina. December 9, 2016. Researchers expect wildfire threat to increase. https://www.usask.ca/sens/news/2016/expect-wildfire-threat-to-increase,-says-sens-professor.php
- CBC Radio Day 6. September 29, 2016. Why Prince Albert's wildfire threat is on par with Fort McMurray.. http://www.usask.ca/sens/news/2016/why-prince-alberts-wildfire-threat-is-on-par-with-fort-mcmurray.php
- CBC Radio. September 23, 2016. Facing the Change: Why Prince Albert's wildfire threat is on par with Fort McMurray. http://www.cbc.ca/radio/day6/episode-304-the-rise-of-wildfires-kaepernick-s-protest-trump-lingo-robot-cars-dyslexic-design-and-more-1.3770402/facing-the-change-why-prince-albert-s-wildfire-threat-is-on-par-with-fort-mcmurray-1.3770415

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Global Institute for Water Security

University of Saskatchewan National Hydrology Research Centre 11 Innovation Boulevard Saskatoon, SK S7N 3H5

Tel: (306) 966-2021 Fax: (306) 966-1193

Photograph by Stacey Dumanski, Outreach Coordinator Yukon River, Whitehorse, Yukon Territory

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