

Global Water Futures 2021 Operations Team Meeting – Project Reporting Template

Instructions: All GWF projects are asked to provide a summary update on their activities and accomplishments in preparation for the upcoming Operations Team meeting. **Please submit these by email to chris.debeer@usask.ca by no later than December 2.** These will be used to help guide discussions and breakout synthesis activities and will be made generally accessible on our website in advance of the meeting.

Project Name:	
Our major accomplishments to date are:	
<ul style="list-style-type: none">• Establishment of high-resolution mass spectrometry facility at the Univ. Saskatchewan. This facility includes state of the art ultrahigh resolution mass spectrometry systems for both liquid and gas chromatography applications. These instruments are accompanied by state-of-the-art chromatography systems for gas, liquid and nano-flow liquid chromatography.• Support of various projects requiring high-resolution mass spectrometry techniques. As well as our dissolved organic matter study we have supported studies on the fate of hormones and pharmaceuticals from cattle feed-lots, assessment of the impacts of perfluorinated compounds on salmonid reproduction, dioxin analysis, fatty acids as ecological biomarkers, impacts of the 2016 Husky oilspill, characterization of oilsands associated naphthenic acids , impacts of exposure to the flame retardant TBCO on fish and monitoring the impacts of Alberta oil sands activities on fisheries resources in the Northwest Territories.• Collection of a variety of environmental samples for the assessment of characteristics and changes in naturally occurring dissolved organic matter. As well as a 2 year seasonal collection of water samples from Buffalo Pound Lake we collaborated with Alberta Environment to obtain over 100 samples collected from the southern Alberta irrigation district. These samples will be used to assess changes in water quality and dissolved organic matter characteristics across a variety of relatively pristine to highly impacted waterways throughout this important prairie agricultural landscape.• A technique has been developed for the organic/inorganic speciation of mercury in environmental samples. While not routinely used for the detection of metal species the GC-Orbitrap system can be used to differentiate between organic and inorganic forms of mercury after a suitable derivatization process. This method was developed and automated utilizing the robotic sample handling capabilities of the GC-Orbitrap system.	
Publications	
Raine, J.C., Su, S., Lin, E., Yang, Z.L., Giesy, J.P., Jones, P.D. Prefertilization Exposure of Rainbow Trout Eggs to Per- and Polyfluoroalkyl Substances to Simulate Accumulation During Oogenesis (2021) Environmental Toxicology and Chemistry, 40 (11), pp. 3159-3165.	
Grimard, C., Mangold-Döring, A., Alharbi, H., Weber, L., Hogan, N., Jones, P.D., Giesy, J.P., Hecker, M., Brinkmann, M. Toxicokinetic Models for Bioconcentration of Organic Contaminants in Two Life Stages of White Sturgeon (<i>Acipenser transmontanus</i>) (2021) Environmental Science and Technology, 55 (17), pp. 11590-11600.	
Hanson, S., Steeves, K., Bagatim, T., Hogan, N., Wiseman, S., Hontela, A., Giesy, J.P., Jones, P.D., Hecker, M. Health status of fathead minnow (<i>Pimephales promelas</i>) populations in a municipal	

wastewater effluent-dominated stream in the Canadian prairies, Wascana Creek, Saskatchewan (2021) *Aquatic Toxicology*, 238, art. no. 105933, .

Van Essen, D., Alcaraz, A.J.G., Miller, J.G.P., Jones, P.D., Doering, J.A., Wiseman, S. The brominated flame retardant, TBCO, impairs oocyte maturation in zebrafish (*Danio rerio*) (2021) *Aquatic Toxicology*, 238, art. no. 105929, .

Wang, C., Gong, Y., Deng, F., Ding, E., Tang, J., Codling, G., Challis, J.K., Green, D., Wang, J., Chen, Q., Xie, Y., Su, S., Yang, Z., Raine, J., Jones, P.D., Tang, S., Giesy, J.P. Remodeling of Arctic char (*Salvelinus alpinus*) lipidome under a stimulated scenario of Arctic warming (2021) *Global Change Biology*, 27 (14), pp. 3282-3298.

DeBofsky, A., Xie, Y., Challis, J.K., Jain, N., Brinkmann, M., Jones, P.D., Giesy, J.P. Responses of juvenile fathead minnow (*Pimephales promelas*) gut microbiome to a chronic dietary exposure of benzo[a]pyrene (2021) *Environmental Pollution*, 278, art. no. 116821, .

Van Essen, D., Devoy, C., Miller, J., Jones, P.D., Wiseman, S. Effects of the brominated flame retardant, TBCO, on development of zebrafish (*Danio rerio*) embryos (2021) *Chemosphere*, 266, art. no. 129195.

Challis, J.K., Sura, S., Cantin, J., Curtis, A.W., Shade, K.M., McAllister, T.A., Jones, P.D., Giesy, J.P., Larney, F.J. Ractopamine and Other Growth-Promoting Compounds in Beef Cattle Operations: Fate and Transport in Feedlot Pens and Adjacent Environments (2021) *Environmental Science and Technology*, 55 (3), pp. 1730-1739.

DeBofsky, A., Xie, Y., Challis, J.K., Ankley, P.J., Brinkmann, M., Jones, P.D., Giesy, J.P. 16S rRNA metabarcoding unearths responses of rare gut microbiome of fathead minnows exposed to benzo[a]pyrene (2021) *Science of the Total Environment*, art. no. 151060, .

DeBofsky, A., Xie, Y., Jardine, T.D., Hill, J.E., Jones, P.D., Giesy, J.P. Effects of the husky oil spill on gut microbiota of native fishes in the North Saskatchewan River, Canada (2020) *Aquatic Toxicology*, 229, art. no. 105658, .

Tendler, B., Ohiozebau, E., Codling, G., Giesy, J.P., Jones, P.D. Concentrations of Metals in Fishes from the Athabasca and Slave Rivers of Northern Canada (2020) *Environmental Toxicology and Chemistry*, 39 (11), pp. 2180-2195.

Brinkmann, M., Alharbi, H., Fuchylo, U., Wiseman, S., Morandi, G., Peng, H., Giesy, J.P., Jones, P.D., Hecker, M. Mechanisms of pH-Dependent Uptake of Ionizable Organic Chemicals by Fish from Oil Sands Process-Affected Water (OSPW) (2020) *Environmental Science and Technology*, 54 (15), pp. 9547-9555.

Codling, G., Yuan, H., Jones, P.D., Giesy, J.P., Hecker, M. Metals and PFAS in stormwater and surface runoff in a semi-arid Canadian city subject to large variations in temperature among seasons (2020) *Environmental Science and Pollution Research*, 27 (15), pp. 18232-18241.

Jardine, T.D., Doig, L.E., Jones, P.D., Bharadwaj, L., Carr, M., Tendler, B., Lindenschmidt, K.-E. Vanadium and thallium exhibit biodilution in a northern river food web (2019) *Chemosphere*, 233, pp. 381-386.

Alharbi, H.A., Morandi, G.D., Jones, P.D., Wiseman, S.B., Giesy, J.P. Comparison of the Effects of Extraction Techniques on Mass Spectrometry Profiles of Dissolved Organic Compounds in Oil Sand Process-Affected Water (2019) *Energy and Fuels*, 33 (8), pp. 7001-7008.

Tse, T.J., Doig, L.E., Tang, S., Zhang, X., Sun, W., Wiseman, S.B., Feng, C.X., Liu, H., Giesy, J.P., Hecker, M., Jones, P.D. Combining High-Throughput Sequencing of sedaDNA and Traditional Paleolimnological Techniques to Infer Historical Trends in Cyanobacterial Communities (2018) *Environmental Science and Technology*, 52 (12), pp. 6842-6853.

Codling, G., Sturchio, N.C., Rockne, K.J., Li, A., Peng, H., Tse, T.J., Jones, P.D., Giesy, J.P. Spatial and temporal trends in poly- and per-fluorinated compounds in the Laurentian Great Lakes Erie, Ontario and St. Clair (2018) *Environmental Pollution*, 237, pp. 396-405.

Our current activities are:

- Work continues on the monitoring of PAHs in fish samples collected from the Northwest Territories.
- Data analysis is proceeding on naturally derived organic matter samples. The procedures developed for the analysis are able to reproducibly profile the dissolved organic matter in samples with minimal sample preparation that could lead to the loss of key analytes. The analyses routinely identify 10s of thousands of distinct mass spec 'features' in each sample
- Work is continuing on the assessment of fatty acids with the focus now shifting towards a more quantitative assessment of the movement of polyunsaturated fatty acids (PUFAs) through aquatic food chains. Since PUFAs are essentially of aquatic origin transfer of these compounds to terrestrial systems can be used to evaluate the extent of energy transfer between ecosystems.
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The main accomplishments expected by the end of the project are:

- While work continues on various aspects of this project funding for the project ended in December 2020.
- The established facility now ensures that GWF and other U. Sask researchers have access to the most up to date technologies for the identification and quantification of contaminants that impact water quality or that may be indicators of aquatic environmental quality.
- Once completed analysis of dissolved organic matter data will allow the identification of key indicators of aquatic environmental health that may be monitored in a more targeted fashion and so will be available to laboratories and investigators with equipment less sophisticated than the Orbitrap systems.

Here is a key visual from the project (figure, photo, table, graph, etc.)

