Robert Chlumsky, PhD, P.Eng.

President at Heron Hydrologic Ltd.

Dr. Robert Chlumsky is a Water Resources Engineer with a wide range of experience, including hydraulic and hydrologic modelling, mining applications, flood impact studies, Environmental Assessments, coastal engineering, geospatial analysis, and the development of several R packages. Dr. Chlumsky has worked on projects to support the development of flood forecasting models and codification of R workflows for numerous clients with Heron Hydrologic Ltd. Dr. Chlumsky is currently the President at Heron Hydrologic Ltd., as well as President of the Canadian Water Resources Association Ontario Branch.

Consulting Project Experience Highlights

Ongoing Raven model and software maintenance
Communauté métropolitaine de Montréal (CMM) (2021-present)
Mr. Chlumsky undertook the initial development of a Raven-based hydrologic model for CMM, and has been the technical lead and project manager on continuous Raven upgrades including model re-discretization, calibration, EnKF implementation and testing, and reservoir representations in the model since 2021. The model is used to support internal streamflow and lake forecasts during flood events.

FEWS Forecasting System R Support and Model Calibration
Government of Northwest Territories (through Deltares USA) (2022)
Mr. Chlumsky supported the implementation of R scripts for downloading streamflow data and generating reports in R Markdown for the FEWS forecasting system used by the GNWT, including adapting existing scripts for use in the FEWS system. Mr. Chlumsky also undertook the recalibration of the existing Liard River hydrologic model for use within FEWS, which required recalibration to account for the change of input data and new data records from FEWS.

Paris Flood Protection and Dyke Assessment and Flood Master Plan
Brant County (2018, 2019)
Mr. Chlumsky performed the hydraulic modelling using HEC-RAS 2D to generate flood inundation and flood hazard mapping for the Town of Paris, which was used in a successful National Disaster Mitigation Program (NDMP) application with the County. Mr. Chlumsky was also responsible for the generation of topographic surfaces from multiple data, coordinating the geotechnical dyke assessments with flood information to inform the Environmental Assessment, and communication with members of the public during public consultation sessions.

Raven Upgrades for North Saskatchewan
WaterSmart Solutions Ltd. (2024)
Mr. Chlumsky was the project manager for the Raven Upgrades project, which oversaw the implementation of water demand optimization via linear programming within Raven. This functionality supports the optimization of user-defined goals and constraints related to reservoir operations and water demands within Raven. Mr. Chlumsky supported the project by managing both the software upgrades performed by Dr James Craig and the testing of the code by MacHydro staff and Heron support staff, and also handled all administrative aspects of the project.

Years of Experience

10 years
Licensed Engineer in Ontario

Professional History

Heron Hydrologic
Jan 2021 – Present
President

Ecosystem Recovery Inc.
July 2017 – Jan 2021
Water Resources Engineering Intern/
Water Resources Engineer

Regional Municipality of Waterloo
May 2014 – August 2014
Engineering and Planning Student

Environment Canada
Centre for Inland Waters
Sept. 2013 – Dec. 2013
Integrated Modelling and Decision Support System Technician

Environment Canada
Meteorological Service of Canada
Jan. 2013 – April 2013
Junior Data Analyst

Environment Canada
Air Quality Research Division
May. 2012 – August 2012
Data Analysis Assistant

Education

University of Waterloo
PhD., Civil Engineering (Water),
2020-2024

University of Waterloo
MASc., Civil Engineering (Water),
2015-2017

University of Waterloo
BASc., Environmental Engineering,
Option in Water Resources and
Option in Statistics,
2010-2015

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Consulting Project Experience Highlights

Forecasting Model Investigation and Recalibration
TransAlta (through Deltares USA) (2023,2024)
Mr. Chlumsky undertook the recalibration of nine (9) Raven models maintained by TransAlta for distinct catchments within Alberta. Mr. Chlumsky also supported diagnosing issues related to model connections to the FEWS platform.

FEWS Forecasting System R Support
Yukon Government (through Deltares USA) (2023)
Mr. Chlumsky supported the implementation of R scripts for downloading streamflow data and performing calculations on internal Yukon datasets as part of import workflows to the FEWS forecasting system maintained by the Yukon Government.

Nahanni Butte Erosion and Flood Risk Study
Dillon Consulting (Oct 2023-present)
Dr. Chlumsky is providing support for study by modifying an existing Raven model and applying it under various climate change scenarios to generate boundary conditions for the hydraulic modelling. This will include performing a joint frequency analysis of peak flow at the confluence, developing scenarios for antecedent conditions under climate change as inputs to the hydrologic model, updating and recailbrating the existing hydrologic model, and providing the time series of boundary conditions for flood mapping.

Research Project Experience Highlights

Blackbird	Mr. Chlumsky is the lead developer of Blackbird, a novel hydraulic approach and software to support rapid flood model development and mapping at regional scales. This method uses a combination of geospatial analysis with industry-standard 1D hydraulic model calculations to compute flood inundation maps efficiently, and has been benchmarked favourably against conventional methods such as HEC-RAS 1D and the HAND-Manning method. Heron Hydrologic is currently undertaking a number of early pilot projects and internal research to deploy the method for large-scale inundation mapping.
RavenR	Mr. Chlumsky is the lead developer of the RavenR package, which is a software package developed using the R language. The package facilitates the handling of input data, output data, visualizations, and further utilities related to the Raven Hydrologic Modelling Framework. The RavenR package is open-source and available on GitHub (https://github.com/rchlumsk/RavenR) as well as CRAN. The RavenR package has supported course content in the Advanced Raven Training courses offered by Heron Hydrologic since 2022, and has been featured in the Principles of Hydrologic Modelling Short Course offered through CSHS since 2018.
Raven Development Team	Mr. Chlumsky has been involved in the Raven Development Team since starting his Master's degree in 2015, which has included review of the Raven open source code, code testing, documentation updates, and ongoing maintenance of the Raven Forum for users. Mr. Chlumsky routinely corresponds with Raven users and provides support through the forum, as well providing new features and manual updates for the Raven project.

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Select Peer-Reviewed Publications

Chlumsky, R., Craig, J. R., and Tolson, B. A.: A reach-integrated hydraulic modelling approach for large-scale and real-time inundation mapping, Geosci. Model Dev. Discuss. [preprint], https://doi.org/10.5194/gmd-2024-184, in review, 2024.

Chlumsky, R., Mai, J., Craig, J. R., and Tolson, B. A. (2024): Advancement of a blended hydrologic model for robust model performance, Journal of Hydrologic Engineering, 29 (5), 04024,033, doi:10.1061/JHYEFF.HEENG-6246

Chlumsky, R., Craig, J. R., Lin, S. G. M., Grass, S., Scantlebury, L., Brown, G., and Arabzadeh, R.: RavenR v2.1.4: an open-source R package to support flexible hydrologic modelling, Geosci. Model Dev., 15, 7017–7030, https://doi.org/10.5194/gmd-15-7017-2022, 2022.

Chlumsky, R., Mai, J., Craig, J. R., & Tolson, B. A. (2021). Simultaneous calibration of hydrologic model structure and parameters using a blended model. Water Resources Research, 57, e2020WR029229. https://doi.org/10.1029/2020WR029229

Craig, J. R., Brown, G., **Chlumsky, R.**, Jenkinson, R. W., Jost, G., Lee, K., Tolson, B. A. (2020). Flexible watershed simulation with the Raven hydrological modelling framework. Environmental Modelling & Software, 129, 104728. doi:10.1016/j.envsoft.2020.104728

Professional Workshops and Short Courses

Custom Raven Training for Alberta River Forecast Centre (2024-2025). Short professional course custom-tailored for the Alberta River Forecast Centre offered by Heron Hydrologic, Instructed by **R. Chlumsky**, Dr. J. R. Craig, and Dr. B. Tolson. Multiple days July 2024 and ongoing.

Advanced Raven Training Course (2024). Short professional course offered by Heron Hydrologic, Instructed by **R. Chlumsky**, Dr. J. R. Craig, and Dr. B. Tolson. February 22-23, 2024.

Raven Training Course (March 2023). Short professional course hosted by Heron Hydrologic Ltd, Instructed by **R. Chlumsky**.

Custom Raven Training for Water Security Agency (2022). Short professional course custom-tailored for the Water Security Agency offered by Heron Hydrologic, Instructed by **R. Chlumsky**, Dr. J. R. Craig, and Dr. B. Tolson. Multiple days November and December 2022.

Advanced Raven Training Course (2022). Short professional course offered by Heron Hydrologic, Instructed by **R. Chlumsky**, Dr. J. R. Craig, Dr. B. Tolson, and Dr. J. Mai. February 10-11, 2022.

Raven Training Course (2021). Short professional course hosted by the Canadian Water Resources Association Ontario Branch, Instructed by Dr. J. R. Craig and **R. Chlumsky**. February 4-5, 2021.

CSHS-hydRology: Using Git and GIthub with R. (2020). Webinar hosted by Canadian Water Resources Association (CWRA) on behalf of CSHS-hydRology by Dr. K. Shook and **R. Chlumsky**. Kitchener, ON. June 3, 2020.

CSHS-hydRology: R Webinar – Working with Canadian Data. (2019). Webinar hosted by Canadian Water Resources Association (CWRA) by S. Albers and **R. Chlumsky** on behalf of CSHS-hydRology. Kitchener, ON. September 25, 2019.

Principles of Hydrologic Modelling Short Course. (2018-2024). Guest lecture on Introduction to R and RavenR Package. University of Waterloo, Waterloo ON. Multiple recurring dates.

Professional Affiliations

Licensed Professional Engineer, Professional Engineers Ontario, 2019 – present (Member 2015-present)

President, Canadian Water Resources Association Ontario Branch. 2023 – present

Executive Board Member, Canadian Water Resources Association Ontario Branch. 2021 – present

Member, Canadian Water Resources Association, 2017-present

Steering Committee, Canadian Society for Hydrological Sciences R-package, 2017-2022