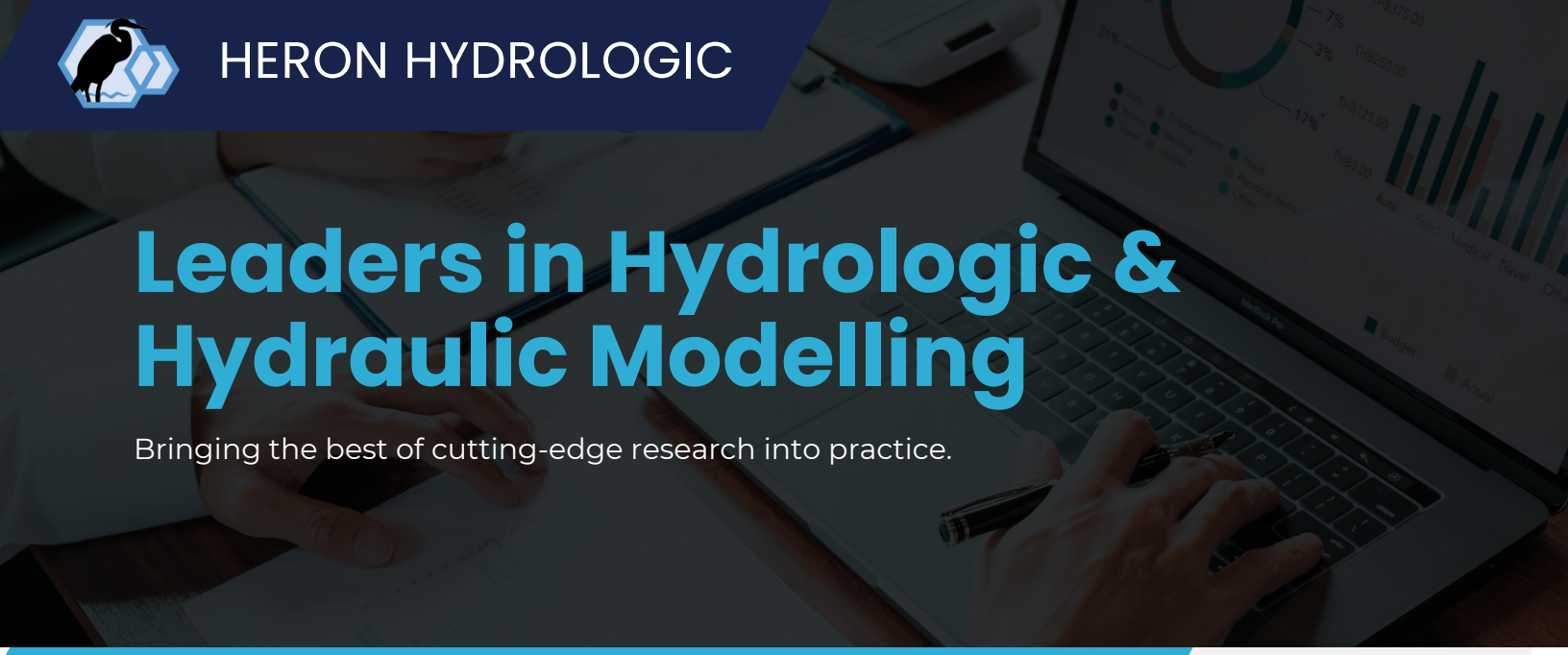
HERON HYDROLOGIC



Leaders in Hydrologic & Hydraulic Modelling

Bringing the best of cutting-edge research into practice.

Who We Are

We are a small and niche consulting firm (licensed with Professional Engineers Ontario) that specializes in the difficult challenges within hydrologic and hydraulic modelling. From model development, calibration, to flood mapping, we can help to build the highest quality models, enhance your data workflows, and any task in between.

Our close ties to academia allow us to integrate the latest research development directly into our practice and training courses.

Why Choose Us

Deep Industry Experience

We are the industry experts in environmental modelling, and frequently support other consulting firms in modelling studies.

Small Company Experience

We are a small team that knows how to work together efficiently without large overhead.

Rapid Value Creation

We can implement efficient workflows through a combination of scripting, leveraging existing data sources, and cutting through to cost-effective solutions that meet your needs.

Our Services

Hydrologic Modelling

- Raven and HEC-HMS modelling
- Basin delineation with BasinMaker
- Manual and auto calibration
- Forecasting and data assimilation

Hydraulic Modelling

- Blackbird model development
- HEC-RAS 1D and 2D
- Flood risk and mapping studies
- Flood damages calculations

Training Courses

- Basic & Advanced Raven Training
- Model Calibration and Analysis
- Software dev and scripting
- Geospatial analysis
- Custom courses for organizations

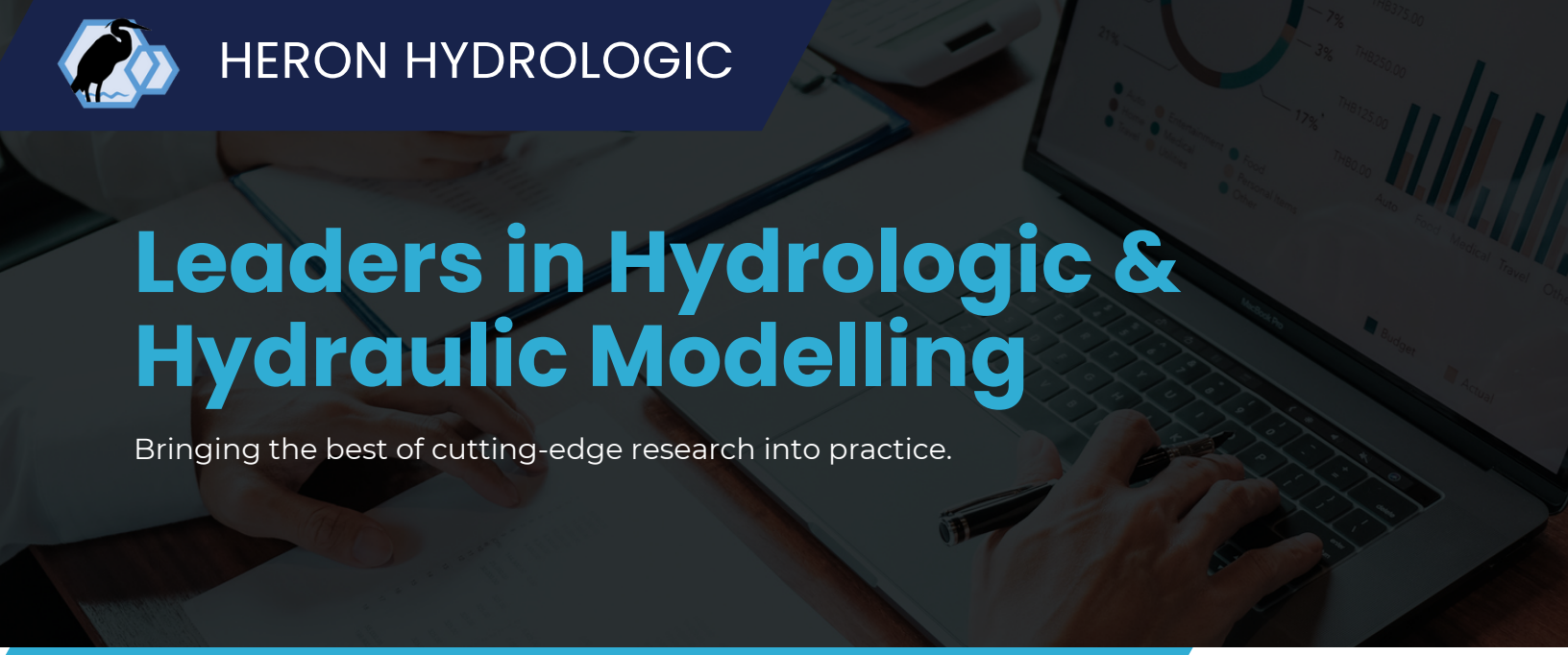
Large-scale flood data

- Applying Blackbird at regional and larger scales for fluvial events
- Cost-effective flood mapping
- Contact us to discuss large-scale flood products and projects

Contact Us

+1 (226) 791-1833 www.heronhydrologic.ca

HERON HYDROLOGIC



Leaders in Hydrologic & Hydraulic Modelling

Bringing the best of cutting-edge research into practice.

Project Highlights

Our team has had the privilege of working with amazing clients to deliver projects that meet their needs. A few of these are highlighted below.

Cost-Benefit Flood Damages Tool for Newfoundland and Labrador

- Developing a flood damage cost-benefit tool for municipalities to assess high-level mitigation options
- Compiling geospatial data, building footprints, infrastructure costs at the Provincial scale
- Enabling economic tradeoff assessments for structural and non-structural flood mitigation options
- Software designed for provincial-scale flood damage estimation by municipal users
- Delivering training and testing through multiple case studies across the Province

Raven Upgrades for the North Saskatchewan River Basin for WaterSmart Solutions

- Joint project with MacHydro Consultants for model upgrades
- Deployed in the North Saskatchewan River Basin model
- Added water demand optimization with linear programming, now available in Raven v4.0
- New features: water licenses, environmental flow constraints, reservoir targets
- Provided stakeholder tutorial on new capabilities

Raven Elbow River Hydrologic Model Improvement for City of Calgary

- Upgrading flood forecasting & management model for new and existing flood control reservoirs
- Enhancing model representation of reservoir operations & channel diversions in flood control
- Integrating data assimilation for improved forecast accuracy
- Ensuring compatibility with the City's FEWS system and updating the FEWS configuration

Contact Us

+1 (226) 791-1833 www.heronhydrologic.ca

HERON HYDROLOGIC

Leaders in Hydrologic & Hydraulic Modelling

Bringing the best of cutting-edge research into practice.

Software Projects

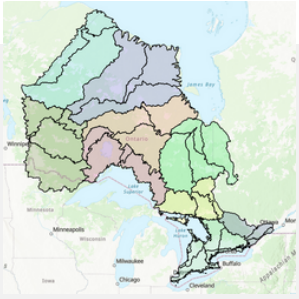
Heron has several projects that Heron or Heron staff have developed, contributed to or help maintain. Many of these efforts are closely connected with academia and the University of Waterloo specifically. We have a tendency to support open-source and non-proprietary software where possible, and believe that this is the best for clients as well as for the state of practice.

Blackbird - Regional and Real-time Flood Mapping

- Hydraulic software for rapid, regional-scale flood mapping
- Combines geospatial analysis with 1D hydraulic models
- Benchmarked against HEC-RAS 1D & HAND-Manning methods
- Used in pilot projects for large-scale inundation mapping
- Freely available software, may be used in forecasting workflows and scripting environments readily to support real-time inundation mapping

Upgrades to Raven Hydrologic Modellling Framework

- Raven is a flexible, robust and open-source hydrologic modelling framework
- Used and supported by many agencies including Ontario Power Generation, City of Calgary, Alberta EPA, BC Hydro, TransAlta, Deltares, and many more
- Heron has been retained to implement Raven upgrades, including:
  - support for adaptor-free Delatres FEWS integration
  - stream temperature simulation
  - Ensemble Kalman Filter (EnKF) data assimilation
  - integration of water resources management and optimization



University of Waterloo projects supported by Heron staff

- Ontario Lake and River Routing Product (OLRRP v2)
- Canadian Lake and River Hydrofabric (CLRH)
- RavenView - user interface for Raven
- Ostrich - model calibration software

Contact Us

+1 (226) 791-1833 www.heronhydrologic.ca

HERON HYDROLOGIC

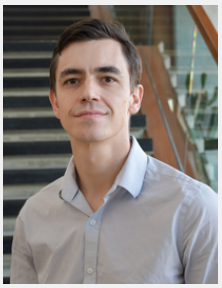
Leaders in Hydrologic & Hydraulic Modelling

Bringing the best of cutting-edge research into practice.

Our Team

We are a small but dynamic team that brings together many years of experience in hydrologic and hydrualic modelling, data analysis, environmental studies, engineering design, and software development.

Robert Chlumsky, PhD, P.Eng.



President, Senior Engineer, Senior Project Manager

- Key Skills: hydrologic and hydraulic modelling, data analysis, project management
- Lead author of Blackbird flood mapping software and RavenR package
- Course developer and co-instructor for Heron's professional courses
- Expert in hydrologic model development, calibration, and model structure selection
- Manages and delivers all Heron projects, ranging from flood studies and EAs to training

James R. Craig, PhD, P.Eng.

Principal, Senior Hydrologist

- Key Skills: model development, numerical solutions, C++ and web development
- Lead developer of the Raven project, including water management and EnKF features
- Developed the RavenView user interface for Raven visualization of results
- Through research, seeks to understand hydrologic relationships of permafrost, groundwater, upscaling relationships, and other hydrologic phenomenon

Bryan Tolson, PhD, LEL

Principal, Senior Hydrologist

- Key Skills: model calibration, sensitivity analysis, uncertainty analysis, large-scale delineation
- Authored the Dynamically Dimensioned Search algorithm, commonly used in hydrology
- Managed projects to deliver BasinMaker, Ontario Lake and River Routing Product, and Canadian Lake and River Hydrofabrics, all with large-scale geospatial data product processing

Contact Us

+1 (226) 791-1833 www.heronhydrologic.ca

HERON HYDROLOGIC

Leaders in Hydrologic & Hydraulic Modelling

Bringing the best of cutting-edge research into practice.

Our Team

We are a small but dynamic team that brings together many years of experience in hydrologic and hydraulic modelling, data analysis, environmental studies, engineering design, and software development.

Brian Peng, BASc

Software Engineer

- Key Skills: software development, C+, web applications, data analysis
- Wrote the C++ Blackbird project, including static linking of GDAL and NetCDF libraries
- Developed the Blackbird web interface for displaying results interactively
- Implemented forecasting workflows to support streamflow forecasting with Raven

Hannah Burdett, MA, PhD

Hydrologist, Data Analyst

- Key Skills: GIS, hydrologic modeling, automation, spatial analysis, machine learning
- Developed Magpie, an open-source Python/R tool for rapidly building hydrologic models
- Automated model creation from North American topographic, land use, soil, and climate data
- Upscaling of snow ablation processes using machine learning

Erazmo Popovic

Junior Engineering Hydrologist

- Key Skills: GIS, hydrologic modeling, automation, spatial analysis
- Developing GIS-based flood risk platform for provincial infrastructure
- Creating cost-benefit analysis tool for infrastructure resilience
- Created land prioritization maps for 1.3M ha in Southern Ontario
- Automated landuse change detection with GIS & Python

Contact Us

+1 (226) 791-1833 www.heronhydrologic.ca