Christopher L. Cahill

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Consulting profile

I am a quantitative fisheries scientist who helps agencies, tribes, industry groups, and resource managers turn real-world data into defensible management advice. My work spans stock assessment, population dynamics, harvest strategy evaluation, decision analysis, and applied statistical modeling for fisheries and aquatic resources, but my statistical and programming skills can be applied to a wide range of resource management problems.

I bring experience across inland, Great Lakes, Arctic, and marine systems, with a strong record of translating technical analyses into practical advice for harvest decisions, treaty fisheries, conservation planning, climate adaptation, and stakeholder communication. I write and maintain production-quality scientific code, build reproducible analytical workflows, and communicate results clearly in writing and in person to both technical and non-technical audiences. I have worked with state, provincial, federal, tribal, Indigenous, academic, and industry partners on high-stakes sustainability questions where decisions must be made under uncertainty.

How I can help clients

Stock assessment and fisheries sustainability
I develop, update, review, and improve stock assessment models used to support harvest decisions and long-term sustainability planning. A significant part of this work involves reading, auditing, and rewriting existing assessment code — finding bugs, correcting biases, and modernizing legacy workflows so that agency staff can understand, reproduce, and maintain them. Recent examples include converting 15 Lake Whitefish statistical catch-at-age models from Automatic Differentiation Model Builder (ADMB) to R-Template Model Builder (RTMB) for Treaty Waters of the Great Lakes; diagnosing and correcting technical errors in those models that had hidden evidence of lake-wide population declines; supporting Lake Erie Yellow Perch assessment improvements that contributed to more conservative quota recommendations in 2025; and serving as external reviewer for the American Lobster stock assessment (Atlantic States Marine Fisheries Commission, 2025).

Risk, Decision analysis, and management strategy evaluation
I help clients compare management options under uncertainty and identify strategies robust to data limitations, environmental change, and competing objectives. I have developed harvest control rules for British Columbia Pink Shrimp fisheries, co-developed simulation tools with Carl Walters to guide Alberta Walleye harvest strategies, and led USGS-funded work adapting data-rich inland fisheries lessons to data-limited climate adaptation scenarios. Results from this work have been presented to managers, stakeholders, and technical committees and written up for peer-reviewed publication.

Hierarchical, Bayesian, and spatiotemporal modeling
I build statistical models that allow clients to make better use of imperfect, sparse, or spatially structured data, and I write the code to fit and validate them in a fully reproducible way. My work includes spatiotemporal models of somatic growth across recreational fisheries landscapes, hierarchical models for gear selectivity estimation, Bayesian time-series models of Walleye collapse and recovery, and integrated diffusion-advection-taxis approaches for acoustic telemetry data (Great Lakes Fishery Commission, ongoing), and translating a diverse set of spatiotemporal models from Template Model Builder (TMB) to RTMB for ease of use and accessibility to individuals lacking C++ or TMB coding experience.

Data-limited fisheries and monitoring design
I help clients make defensible decisions when data are incomplete or uneven across places and years. I evaluate data-limited assessment methods, design simulation tests before real-world application, and build models that borrow strength across lakes, stocks, and jurisdictions. I have contributed to Arctic Char assessments for Fisheries and Oceans Canada in Nunavut and the Northwest Territories, including direct communication of findings to Indigenous Elders and community members.

Technical training, capacity building, and code review
I review, debug, and modernize fisheries assessment code, and I train the people who have to maintain it. I work with agency, tribal, and academic biologists in stock assessment, Bayesian modeling, RTMB, R, and Stan, and deliver workshops and one-on-one mentoring that leave clients with workflows they own and understand. I currently serve as Training Group Chair for the International Council for the Exploration of the Sea (ICES), coordinating international fisheries training across member countries (2025–present).

Technical expertise

Programming and reproducibility
R, RTMB, TMB, ADMB, Stan, JAGS; Quarto, Git, GitHub; parallel computing; Linux/Unix/Bash; reproducible project structures and version-controlled workflows

Population dynamics and fisheries stock assessment
Age-structured models; statistical catch-at-age; stock-reduction analysis; harvest control rules; biological reference points; management strategy evaluation; data-limited methods

Statistical and spatial modeling
Bayesian hierarchical models; mixed-effects and state-space models; spatiotemporal models; INLA-SPDE; Markov chain Monte Carlo; Laplace approximation

Decision analysis
Monte Carlo simulation; expected value of perfect information; certainty-equivalent policies; utility theory; tradeoff analysis

Scientific communication
Peer-reviewed writing; technical reports and stock assessment reviews; presentations to managers, stakeholders, Indigenous communities, and international technical bodies; media communication

Selected experience

Associate Director and Assistant Professor — 2022–present
Quantitative Fisheries Center, Michigan State University

Postdoctoral Researcher — 2021–2022
Simon Fraser University

Consultant — 2014–2022
Alberta Environment and Parks, Fisheries and Oceans Canada, and others

Education

University of Calgary, Ph.D. Ecology — 2021

University of Alberta, M.Sc. Ecology — 2014

University of Wisconsin-Stevens Point, B.Sc. Fisheries Science 2011

Selected publications

Google Scholar profile

Selected to illustrate the range of quantitative methods I bring to consulting projects.

Montealegre-More et al. 2025. Using machine learning to inform harvest control rule design in complex fishery settings. *Fish and Fisheries* 26: 1004–1020. *[Harvest control rules; MSE]*

Faust et al. 2025. Indirect estimation of contact selectivity for gill nets using hierarchical models. *Canadian Journal of Fisheries and Aquatic Sciences* 82: 1–16. *[Hierarchical modeling; gear selectivity]*

Cahill et al. 2022. Unveiling the recovery dynamics of Walleye after the invisible collapse. *Canadian Journal of Fisheries and Aquatic Sciences* 79(5): 708–723. *[Bayesian time-series; stock assessment]*

Cahill et al. 2020. A spatial-temporal approach to modeling somatic growth across inland recreational fisheries landscapes. *Canadian Journal of Fisheries and Aquatic Sciences* 77: 1822–1835. *[Spatiotemporal modeling]*

Books (in preparation)

Thorson J.T., Kristensen K., and C.L. Cahill. Spatio-Temporal Models for Ecologists. CRC Press. Co-author on the 2nd edition of this quantitative methods textbook, alongside Dr. James Thorson (NOAA, one of the most cited quantitative fisheries scientists globally) and Dr. Kasper Kristensen (DTU, developer of Template Model Builder, the dominant estimation platform in modern stock assessment). I led the conversion of all modeling examples from TMB to R-Template Model Builder (RTMB), making the material more accessible to a new generation of ecologists and fisheries scientists. Public code available at https://github.com/spacetime-ecologist/spacetime-ecologists-RTMB.

Teaching and training

Instructor for uncertainty and diagnostics course (2026), applied Bayesian modeling for natural resource management (2023), and Bayesian stock reduction analysis for provincial biologists in Alberta (2021–2023). Co-instructor for courses on stock-recruitment and fishery reference points (2025), maximum likelihood estimation with RTMB (2024, 2025).

Teaching testimonials

"This course was awesome. The instructor is very knowledgeable and was very supportive of each student's learning. I really appreciated the ability to participate online. I feel like this course gave me tools that will be directly applicable to my dissertation."

"It was a *fantastic* course, and I hope it keeps being offered in the future – I am sure recommending it to people in my department."

"Chris did a great job, especially for teaching this course for the first time. He was understanding of the difficulty of the material and some of our inexperience in our statistical backgrounds. He was very patient with us when we didn't understand things, offered plenty of opportunities for good discussion, and challenged us."

References

Dr. Carl Walters
Professor Emeritus, Institute for the Oceans and Fisheries
University of British Columbia

Dr. Anders Nielsen
Professor
National Institute of Aquatic Resources
Danmarks Tekniske Universitet (DTU AQUA)

Dr. Michael Hansen
Supervisor (Retired), Hammond Bay Biological Station
United States Geological Survey

Dr. Andrew Paul
Senior Science Advisor, Fish and Aquatic Ecosystems
Alberta Environment and Protected Areas

Jason Smith, M.Sc.
Fisheries Biologist
1836 Treaty Waters Co-chair of the Modeling Subcommittee
Bay Mills Indian Community

Mark Luehring, M.Sc.
Inland Fisheries Section Leader
Great Lakes Indian Fish & Wildlife Commission (GLFWC)

Matt Faust, M.Sc.
Fisheries Biologist
Ohio Division of Wildlife Resources