
Brokering Science for Environmental Management

Progress Report from the Chief Scientist:
A Term in Review

Foreword: Advancing science for a healthy, sustainable and prosperous Alberta



Over the past four years, I have had the sincere privilege to hold the inaugural appointed position of Chief Scientist for the Department of Alberta Environment and Parks. I believe that a lot has been accomplished through the establishment of the Office of the Chief Scientist (OCS) as documented in this progress report; however, it's only the start of the journey ahead in addressing an ongoing and ever evolving responsibility of providing credible, objective scientific data and information to inform relevant government policies and decision-making processes. In the ever changing economic, social, natural and built environments we face in Alberta, the availability of credible scientific information obtained through our various provincial monitoring, focused research, evaluation and public reporting efforts is paramount in shaping our current and future economy and social and environmental well-being.

My core objectives over the past four years were quite simple – initiate processes and facilitate mechanisms to enhance the scientific credibility and integrity of science being conducted within Alberta Environment and Parks, lay the foundation for open and transparent public reporting on the condition of Alberta's environment, and build effective collaborative partnerships with Indigenous communities, academic institutions, monitoring and stakeholder organizations, other government departments and agencies, and the private sector. Meeting these objectives was only possible through the dedication and hard work of the excellent staff in the Office of the Chief Scientist, along with significant input and support from the department's senior executive, relevant program leaders, and the diverse scientific and technical community. I also want to express my sincerest thanks to both the Science Advisory Panel and the Indigenous Wisdom Advisory Panel for their dedication and objective guidance and advice.

Sincerely,

Frederick J. Wrona, Ph.D.
Chief Scientist
Alberta Environment and Parks

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Alberta Environment and Parks
Mobile Air Monitoring Laboratory
Photo Credit: Shane Taylor



Introduction

Historical context

The sustainable development of Alberta's natural resources has received national and international attention, including focus on the capacity of environmental monitoring programs in the province to monitor and manage the cumulative impacts of resource development on the ambient environment.

Over the past decade, Alberta has taken steps to evaluate and improve the scientific design and implementation of its programs to monitor, evaluate, and report on the condition of the environment to support decision-making in the public interest. Following a series of independent reviews and recommendations^{1, 2}, in 2014 the Government of Alberta (GoA) implemented legislative changes³ to create independence for the environmental science program. Further legislative changes reinforced environmental monitoring as a key responsibility of government, with provision for upholding scientific integrity established through the role of a Chief Scientist for the Department of Environment and Parks.

The role of the Chief Scientist

The role of the Chief Scientist was established in June of 2016 through amendments to the [Environmental Protection and Enhancement Act](#) (Section 15.1(1)). The Chief Scientist's mandate is to develop and implement an environmental science program to monitor, evaluate, and report on the condition of the environment in Alberta on the basis of scientific evaluations and assessments of the data collected. This mandate fulfills the Minister of Environment and Parks' obligation to report on the condition of the environment in Alberta.

June 2016:

The role of the Chief Scientist is established in provincial legislation.

The Chief Scientist is empowered to undertake their duties openly and transparently in order to build public trust in the credibility and integrity of the environmental science program.

¹ A world class environmental monitoring, evaluation and reporting system for Alberta: the report of the Alberta Environmental Monitoring Panel. 2011.

² Implementing a world class environmental monitoring, evaluation and reporting system for Alberta: report of the Working Group on Environmental Monitoring, Evaluation and Reporting. Available at: <https://open.alberta.ca/publications/9780778599142>.

³ Bill 31: Protecting Alberta's Environment. Available at: https://docs.assembly.ab.ca/LADDAR_files/docs/bills/bill/legislature_28/session_1/20120523_bill-031.pdf.

The role of independent advisory panels

To ensure Alberta's environmental science program is designed and implemented in a scientifically credible and culturally respectful manner, the Chief Scientist consults with two independent advisory panels: the [Science Advisory Panel](#) and the [Indigenous Wisdom Advisory Panel](#).

Science Advisory Panel

The Science Advisory Panel reviews the scientific quality, integrity, and relevance of the environmental science program and makes recommendations on scientific priorities and methodologies.

Advice from the Science Advisory Panel guides continuous improvements in scientific standards and processes to ensure Alberta's environmental science program is robust, credible, and meets or set global best practices.

Chief Scientist Dr. Fred Wrona with members of the Science Advisory Panel and Indigenous Wisdom Advisory Panel

Advice from the Science Advisory Panel has been implemented in the following areas:

- Informing the strategic direction for environmental monitoring, evaluation, and reporting priorities.
- Setting and maintaining data standards and a quality assurance program.
- Expanding Alberta's knowledge network of partners in delivery of environmental science programs.
- Establishing, under the Office of the Chief Scientist, a programmatic science advisory process to provide direction on priority initiatives of the department.



Indigenous Wisdom Advisory Panel

The Indigenous Wisdom Advisory Panel provides advice regarding the meaningful application of Indigenous wisdom and inclusion of Indigenous peoples within Alberta's environmental monitoring, evaluation and reporting system.

Gifted advice from the Indigenous Wisdom Advisory Panel guides the ability of Alberta's science and monitoring program to braid both Indigenous and western scientific approaches in the appropriate context. The application of multiple knowledge systems—both Indigenous and contemporary western science—is important to ensure a more holistic understanding of Alberta's environment.

Formation of the Office of the Chief Scientist

To support the mandate of the Chief Scientist, the Office of the Chief Scientist was established in February of 2018 to support the priority areas of:

- Building a strategic knowledge network with the broader scientific community;
- Seeking ways to braid Indigenous Knowledge in Alberta's environmental science program;
- Supporting a strong science culture within the department;
- Brokering scientific reviews by external experts to address environmental concerns or issues;
- Reporting on the condition of Alberta's environment; and
- Improving availability and accessibility of scientific evidence to inform decision making processes.

Advice from the Indigenous Wisdom Advisory Panel to build the capacity for Indigenous Knowledge to inform and be included in Alberta's environmental science program has been implemented in the following areas:

- Inform the design and implementation of a multi-year project to document Indigenous Knowledge about climate change and identify biocultural signs of environmental change.
- Advise on how to best implement community-based monitoring programs with First Nations and Metis communities to monitor and report water quality results.



Chief Scientist Dr. Fred Wrona with members of the Indigenous Wisdom Advisory Panel

Key achievements

Setting a course & strategic direction for the program

Knowledge for a changing environment

Building on collective input received from relevant science-based programs within the department of Environment and Parks, relevant external organizations, and the joint advice from the Science Advisory Panel and the Indigenous Wisdom Advisory Panel, the [2019-2024 Science Strategy](#) was released by the Chief Scientist in March 2019.

The Science Strategy identifies the strategic direction for Alberta's environmental science program related to five current and emerging environmental issues. Through an integrated, adaptive, and collaborative lens, the Science Strategy outlines the approaches, tools, processes, and priority areas where both western science and local Indigenous knowledge systems will individually and collectively generate information to contribute to evidence-informed and policy-relevant priorities in Alberta.

Five-year program evaluations and re-designs

Guided by the Science Strategy, scientists in Alberta's environmental science program are evaluating and updating the programs and networks which monitor Alberta's rivers, streams, lakes, groundwater, air, and biodiversity. Direction specific to each of these program areas is being set for the next five years and shared through a series of publically accessible reports. The [first report](#) in this series, released in February of 2019, focuses on improving Alberta's capacity to monitor, evaluate, and report on the condition of rivers and streams.

Quality assurance and setting scientific standards

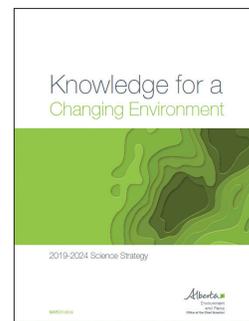
Following advice from the two Advisory Panels, a more stringent quality assurance program has been implemented across Alberta's environmental science program. This has included:

- An assessment of standard operating procedures and, where gaps were identified, developing and publishing new standard operating procedures;
- Working with partner science and monitoring organizations to consolidate and develop standardized methodology across multiple organizations;
- Establishing and distributing standard protocols that all contracted laboratories must adhere to; and
- Conducting annual proficiency tests at all contracted commercial and analytical laboratories.

Implementation of this quality assurance program has resulted in a significant reduction in deficiencies detected over time.

March 2019:

Chief Scientist releases the five-year [Science Strategy](#) for Alberta Environment and Parks.



2018 - Present:

Ongoing scientific evaluation and re-design of Alberta's environmental monitoring programs.

2018 - Present:

Nine new standard operating procedures published to fill process gaps.

Between four to six double-blind tests conducted annually for approximately 60 parameters.

Consolidated and standardized methodology for monitoring environmental emissions such as sulphur dioxide.



Advancing Alberta's knowledge network

Academic collaborations

The Office of the Chief Scientist is working with the Vice Presidents of Research at the Universities of Calgary, Alberta, Lethbridge, and Athabasca University to establish Memorandums of Understanding between each academic institution and Alberta Environment and Parks for mutually beneficial collaborations in research areas of strength and training of professionals in environmental science fields. These formalized partnerships seek to enhance access to scientific expertise and research infrastructure, promote information sharing, and leverage opportunities for applied environmental science and research grant funding.

Additional steps taken by the Office of the Chief Scientist to expand and formalize program-level partnerships across the research community at Alberta's academic institutions are described below.

University of Calgary

In 2017, a Memorandum of Understanding was signed with the University of Calgary to collaborate on areas of mutual benefit on applied research and training of professionals in environmental science fields.

In November of 2018, research collaboration was further strengthened with the establishment of the Centre of Excellence in Environmental Monitoring, which re-located approximately 40 AEP scientists, monitoring technicians and program staff to office and laboratory space on the University of Calgary campus research park. This co-location of government and academic personnel enhances access to scientific expertise, research infrastructure, promotes information sharing, and leverages opportunities for applied environmental science and research grant funding.

The collaboration with the University of Calgary has also increased expertise and capacity to address condition of environment reporting, enabled through access to dedicated faculty, post-doctoral, and graduate student expertise in the review and synthesis of current pressures and drivers of change in watersheds in Alberta⁴.

⁴ Lima, A. C. and F. J. Wrona. 2018. Multiple threats and stressors to the Athabasca River Basin: What do we know so far? *Science of the total Environment*, vol 649, p640-651, <https://doi.org/10.1016/j.scitotenv.2018.08.285>.



University of Alberta

In addition to formalizing a Memorandum of Understanding with the University of Alberta, Alberta Environment and Parks currently has a number of ongoing project-level collaborations with faculty at the University of Alberta including areas of Indigenous Knowledge and capacity building for community-based monitoring, invasive species and wildlife disease monitoring and management, and cold regions eco-hydrology. Enhanced collaborative program synergies are also being discussed with University-based institutions and programs such as the Alberta Biodiversity Monitoring Institute and the newly established Canadian Mountain Network Centre of Excellence.

University of Lethbridge

In addition to formalizing a Memorandum of Understanding with the University of Lethbridge, Alberta Environment and Parks is working collaboratively with research programs at the University of Lethbridge to expand environmental monitoring efforts in Alberta's eastern slopes. Initiated in 2019, this partnership will provide environmental decision-makers with scientific information to address key questions related to environmental conditions and change affecting species, recreational opportunities and other desired uses in Alberta's eastern slopes.

Athabasca University

In December of 2019, a research forum was held between scientists at Alberta Environment and Parks and Athabasca University to exchange knowledge on research programs, challenges and opportunities, and to identify next steps for working collaboratively. This forum provided an opportunity for information sharing and dialogue and has formed a foundation to build better connections on priority program areas, such as the Athabasca River Basin Research Institute and the Alberta-Canada Oil Sands Monitoring Program.

In March of 2020, a Memorandum of Understanding was signed with Athabasca University to collaborate on areas of mutual benefit on applied research and training of professionals in environmental science fields.

Connecting with Chief Science Advisors across Canada

In November of 2018, Alberta Environment and Parks Chief Scientist attended the Canadian Science Policy Conference to participate in discussions and meetings with Chief Scientists and Chief Science Advisors from across Canada, including the federal Chief Science Advisor, to champion Alberta's commitment to open, transparent, publicly trusted, credible science programs.

During the 2019 Canadian Science Policy Conference, the Office of the Chief Scientist organized a panel discussion hosting four Chief Scientists and Chief Science Advisors from various portfolios and levels of governments to share their perspectives on how their roles have improved, or may further improve, engagement of scientists in public discourse.

Participation in these events has provided the opportunity for Chief Scientists and Chief Science Advisors from across Canada to discuss shared challenges, strengthen inter-provincial relationships, and identify opportunities to advance the capacity for evidence-informed decision-making in Canada.



Federal Chief Science Advisor Dr. Mona Nemer and Alberta Environment and Parks Chief Scientist Dr. Fred Wrona at the 2018 Canadian Science Policy Conference in Ottawa.



Science-informed decision-making

The Chief Scientist acts as a champion of science, research, and the role of evidence by providing scientific advice to address complex environmental challenges and opportunities facing Alberta. This advice is provided on both a formal and informal basis, sometimes through direct communication with senior government or department officials on time-critical matters, and other times more formally in the publication of a special report or science review.

2017 - Present:

[Seven third-party science reviews](#) conducted and published.

Two expert panels retained to provide information to decision makers.

Spotlight on providing evidence to inform environmental management: ecological condition and stressors in Alberta's eastern slopes.

The eastern slopes of Canada's Rocky Mountains have been managed for headwater protection, natural resource production, recreation, and other land uses for over a century. Between 2017 and 2018 the Chief Scientist directed and released a series of scientific assessments to inform future land use planning in the Eastern Slopes of west-central Alberta. These scientific reviews were conducted to provide information on the impact of stressors including a changing climate, forest harvesting, off-highway vehicle use, and linear disturbances to wildlife, hydrology, and other valued ecosystem attributes in Alberta's eastern slopes.

Scientific findings from the reports were provided to resource managers across the Government of Alberta and made publicly available in the reports below:

Farr, D., Mortimer, C., Wyatt, F., Braid, A., Loewen, C., Emmerton, C., and Slater, S. 2018. [Land use, climate change and ecological responses in the Upper North Saskatchewan and Red Deer River Basins: A scientific assessment](#). Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-4069-7.

Farr, D., Braid, A., Slater, S. 2018. [Linear disturbances in the Livingstone-Porcupine Hills of Alberta: Review of potential ecological responses](#). Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-4033-8.

Farr, D., Braid, A., Janz, A., Sarchuk, B., Slater, S., Sztaba, A., Barrett, D., Stenhouse, G., Morehouse, A., Wheatley, M. 2017. [Ecological response to human activities in southwestern Alberta: Scientific assessment and synthesis](#). Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-3540-2.

Third-party science reviews process

The Chief Scientist commissions independent reviews to provide timely, scientific advice and/or information on specific issues or knowledge gaps to decision-makers in Alberta Environment and Parks. Expertise and knowledge from across scientific and Indigenous knowledge systems is retained to undertake third-party reviews or to form technically specialized science teams on an issues-based project basis. Outputs generated by independent science reviews are reported in an open, transparent, and credible manner with recommendations, information, and advice made publicly available on the [AEP Chief Scientist webpage](#) and published through the [Open GoA portal](#).

Spotlight on independent expert reviews: Oil Sands Process Water Science Team

Work to date

In January of 2018 the Chief Scientist convened experts from academia, industry, provincial and federal government, and holders of Indigenous and local knowledge to form an independent team to provide credible scientific information to government regulatory bodies on the potential release of treated oil sands process water (OSPW) to the Lower Athabasca River.

The Science Team was responsible for overseeing the design and implementation of pilot-scale experiments that will provide information on the toxicity of OSPW and is also designing and overseeing enhanced monitoring of baseline environmental conditions in the Lower Athabasca River. Outputs from the Science Team are publically available in a series of reports on:

The experimental study designed to evaluate the toxicity of treated OSPW:

Hatfield Consultants. 2019. [Ecotoxicity Assessment of Treated Oil Sands Process-Affected Water \(OSPW\): 2019 Toxicity and Mesocosms Studies](#). Published by Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-4450-3.

The study design for enhanced monitoring of baseline environmental conditions in the Lower Athabasca River:

Hicks, K., and Scrimgeour, G. 2019. [A study design for enhanced environmental monitoring of the Lower Athabasca River](#). Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-4536-4.

The results of enhanced monitoring of baseline environmental conditions in the Lower Athabasca River:

Hicks, K., and Scrimgeour, G. 2019. [Summary of enhanced monitoring of the Lower Athabasca River, 2018](#). Government of Alberta, Ministry of Environment and Parks. ISBN 978-1-4601-4537-1.

Next steps

As of 2019, independent third-party committees are expanding focus beyond the pilot-scale to fill technical information gaps and provide scientific advice for the safe release of OSPW at the sector scale. This will inform government regulatory bodies at the federal and provincial levels by providing evidence to inform Alberta's Tailings Management Framework and federal regulations developed under the *Fisheries Act*.

Science Seminars

Bi-weekly Science Seminars are hosted by the Office of the Chief Scientist to provide a regular venue for sharing information outputs from Alberta's environmental science programs in understandable non-technical language. These seminars encourage connections at the science-policy interface by providing scientists and researchers from Alberta Environment and Parks and external science institutions a platform to share their knowledge. Science Seminar speakers provide information on emerging topics of relevance to decision-makers in Alberta, including ecosystems and change, climate variability and change, condition and sustainability of water resources, and chemical and biological contaminants in the environment from a multiple evidence-based approach.

September 2018 - March 2020:

25 Science Seminars hosted by the Office of the Chief Scientist.

Total attendance of more than 2,000 scientists, policy analysts, resource managers, and environmental decision-makers.

Oil Sands Monitoring Program

The Chief Scientist represents Alberta as the Program Co-Chair of the Oil Sands Monitoring Program, jointly delivered between the Governments of Canada and Alberta. Program activities from the Oil Sands Monitoring Program are summarised in an [annual report series](#).

Growing a culture of science

A formal commitment to scientific integrity

The Office of the Chief Scientist has worked with the Public Service Commission to draft an Employer Policy to Uphold Scientific Integrity for Alberta Environment and Parks. It was developed to demonstrate the department's commitment to setting and upholding standards and expectations for professional conduct related to scientific activities in support of the environmental monitoring and science program. The principles of upholding scientific integrity are openness, transparency, credibility, accessible monitoring data and science, and respect.

In March of 2018, the Office of the Chief Scientist implemented a new quality assurance process, under the oversight of the Chief Scientist, for the publication of science reporting products. A set of guidance documents, reference materials, and supporting resources were developed to support and encourage the timely, open, and transparent communication of information on the condition of Alberta's environment. Importantly, the release of science reporting products occurs when the Chief Scientist is satisfied with their quality as demonstrated through qualified and transparent peer review processes.

Supporting professional development for scientists

To build internal capacity for open and transparent communication of environmental information from scientists to diverse non-technical audiences, a pilot Science Communication Workshop Series was held between March and June of 2019. The professional development series provided 35 Alberta Environment and Parks scientists and technical staff with training to enhance their science communication skills. The series hosted science communication experts from across Canada to lead sessions on topics including:

- Story telling;
- Knowing your audience and delivering an engaging message;
- Science & the media;
- Communicating scientific uncertainty; and
- Bridging the science-policy interface.

Raising the profile of science

The Office of the Chief Scientist regularly profiles scientific accomplishments, programs, and personnel internally and externally to raise the profile of Alberta's environmental science program through a variety of channels, including:

- An ongoing series of [science in stories](#) publically profiles the scientists working to deliver Alberta's environmental science program.
- Quarterly bulletins from the Office of the Chief Scientist to profile programs, recent and upcoming events, and publications.
- A series of informal Chats with the Chief Scientist for staff to discuss their thoughts, challenges, and opportunities to grow science culture across Alberta Environment and Parks.
- A Chief Scientist Award for Scientific Excellence has been proposed to be awarded annually to celebrate outstanding scientific achievements of professionals and teams involving Alberta Environment and Parks scientists and researchers.

Supporting communities of practice

Communities of practice provide formal and informal channels for scientists and researchers undertaking related work across Alberta Environment and Parks to exchange knowledge, discuss shared challenges and opportunities, and network. The Office of the Chief Scientist supports the development of scientific communities of practice through the delivery of keynote speeches at annual forums, promoting visibility of communities of practice in the Chief Scientist quarterly bulletins, and engaging in two-way communication with communities of practice to celebrate and profile successes to the broader science community.

March - June 2019: Science Communication Workshop:

- 35 participants.
- Two cities.
- 10 days of courses delivered by experts.

2018 - Present:

- 12 science stories.
- Four quarterly bulletins.
- Chats with the Chief Scientist delivered in three cities.
- Chief Scientist award of excellence delivered in 2018 and 2019.

Reporting on the condition of the environment

The Chief Scientist supports the development, peer review and release process for a variety of reporting products including:

- Annual reports on the status of Alberta's water quality, water quantity, and air quality, in support of Alberta's cumulative effects framework;
- Technical reports communicating results from focused monitoring activities;
- Journal articles reporting new scientific results;
- Reports on program activities and scientific results generated from the [Oil Sands Monitoring Program](#);
- Briefings for policy practitioners;
- Plain-language knowledge translation products; and
- Stories profiling the work of AEP's science and monitoring staff.

These resources are shared through the [GoA Open Library system](#) and brought together in a common narrative on the website for [Alberta's environmental science program](#).

Integrating multiple knowledge systems

Alberta's environmental science program is working to deepen relationships with Indigenous and local communities across the province to design and implement environmental monitoring, evaluation, and reporting programs that are respectful and inclusive of multiple knowledge systems.

This includes the research and development of principles of good practice for conducting citizen science in Alberta as well as community-based monitoring and research demonstration projects including:

- Expanding Alberta's [Indigenous Lake Monitoring Program](#) which has partnered with Indigenous communities [to monitor water quality in lakes](#).
- Supporting Alberta Lake Management Society's citizen science program [LakeWatch](#) which collects water quality data from 25-30 lakes annually.
- Establishing an Indigenous Climate Change Observation Network to document Indigenous Knowledge and identify culturally relevant signs of environmental change in order to enhance the capacity for climate change resiliency in Alberta's Indigenous communities.

2017 - Present:

- 21 publications in peer-reviewed journals.
- 31 technical reports published by the Chief Scientist.
- 11 Knowledge translation products.
- All accessible in one searchable library.

2018 - Present:

- Seven lakes monitored collaboratively with Indigenous communities.





The road ahead

The Office of the Chief Scientist will continue to strengthen, expand and leverage Alberta's knowledge network by pursuing formalized arrangements and agreements, partnerships, and other research collaboration mechanisms between Alberta Environment and Parks and external academic and research institutions. With a commitment to providing decision-makers with access to the best available science, the Office of the Chief Scientist will continue to leverage relevant expertise to address emerging issues, improve access and efficient use of research infrastructure, and seek strategic partnerships that will assist Alberta's environmental science program in providing new knowledge in priority areas of the Science Strategy.

Following advice of the Indigenous Wisdom Advisory Panel, a key priority for the Office will be supporting efforts to broaden our collective understanding of how Indigenous Knowledge and classical scientific knowledge can be used to improve understanding of the condition of the environment in equally valued and respected ways. The Office will continue to find opportunities and support initiatives that allow Indigenous communities to work together with researchers and environmental monitoring program staff to co-produce knowledge and incorporate multiple ways of knowing in Alberta's environmental science program.

On the road ahead, there will continue to be the long-standing challenges that are not unique to government science but also apply to the broader scientific community. Developing the information infrastructure and architecture required to deliver open science across institutions and to the public will be an area that requires continued effort. Additionally, ensuring that ongoing monitoring programs and initiatives continue to be adaptable with an ability to adjust course, based on new information and findings, will be another area that requires thoughtful and diligent effort.

More than ever, the complexities of our socio-economic system and how it interacts with our environment will raise important questions to society that we will look to the natural and physical sciences, in concert with Indigenous Knowledge and other scientific disciplines, to answer. It is with great pride that the role of Chief Scientist for Alberta Environment and Parks can continue to contribute to building the scientific capacity, programs and networks to be available and ready to answer these questions.

This publication can be found at: <https://open.alberta.ca/publications/9781460147641>

Comments, questions, or suggestions regarding the content of this document may be directed to:

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