

The background of the entire page is a photograph with a blue-to-teal gradient. It features several black silhouettes of birds in flight, scattered across the sky. In the lower right foreground, there is a silhouette of a person standing and looking through a telescope that is mounted on a tripod. The person's head and shoulders are visible, and they are holding the telescope with both hands. The tripod is a standard three-legged design. The overall scene suggests a citizen scientist or a nature enthusiast observing wildlife.

Citizen Science Principles of Good Practice

Preamble

The role of the Chief Scientist was established under Alberta's Environmental Protection and Enhancement Act (Section 15), with the mandate to develop and implement an environmental science program to monitor, evaluate and report on the condition of the environment to Albertans.

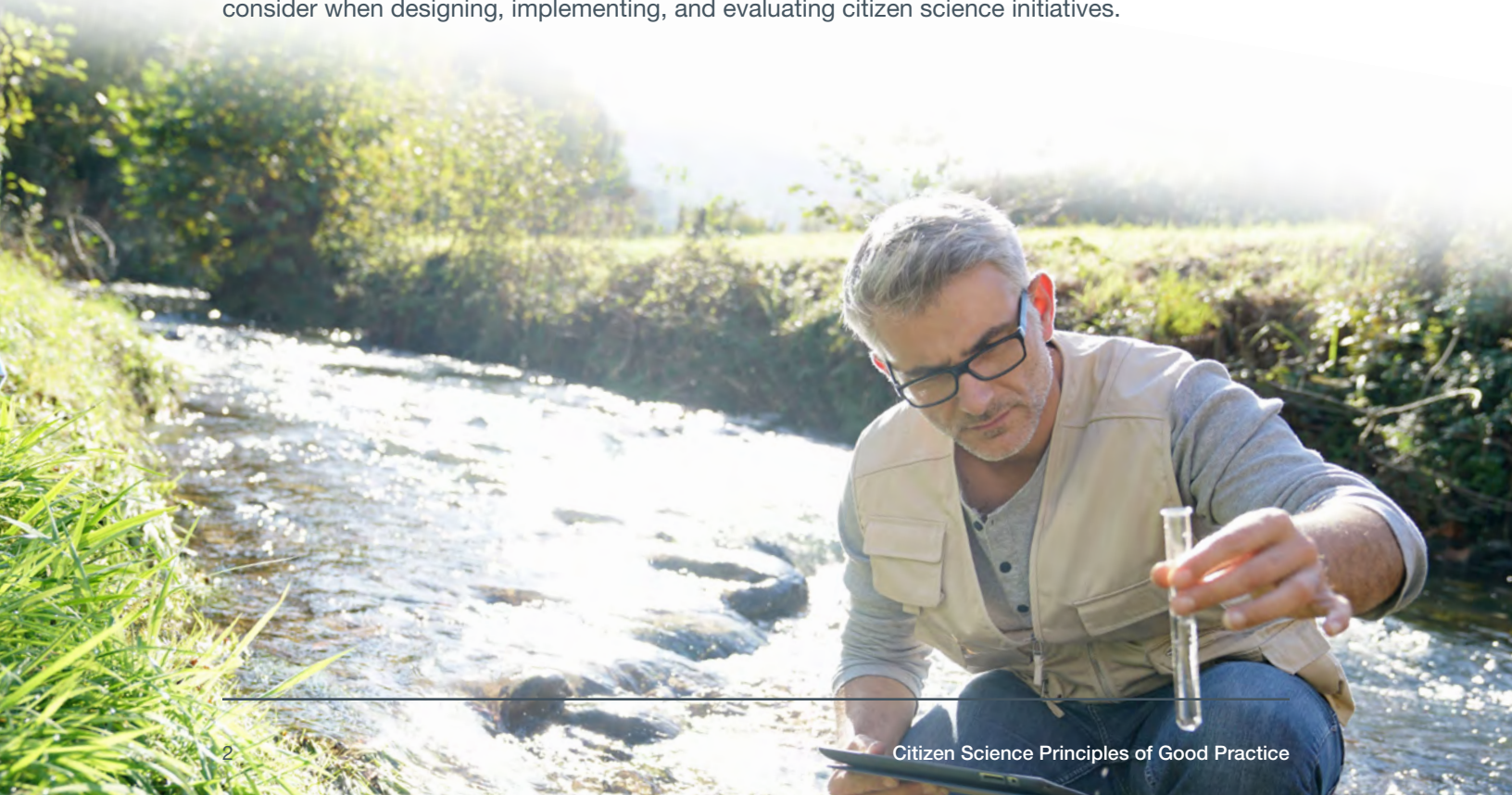
"Citizen science offers an approach that can change the way scientific data and information is collected and shared, improving accessibility, transparency, and credibility in monitoring and science. As citizen science continues to grow, it is important to consider how we in Alberta can support it."

~ Dr. Fred Wrona, Chief Scientist, Alberta Environment and Parks

In Alberta, there is a growing effort to engage the public in science and environmental monitoring. From reporting grizzly bear sightings, to listening to amphibian calls, to monitoring water quality, many Albertans are contributing data to help understand the condition of Alberta's environment. This stewardship of our air, water, land and wildlife is supported by a strong economy and the idea that recreation, economic use and conservation can and should support each other. The **Citizen Science Principles of Good Practice** serves as a foundation and catalyst for ongoing dialogue and collaboration in using citizen science to address information and knowledge gaps across the province.

The six principles below were co-developed by Alberta Environment and Parks and the Miistakis Institute, with guidance and input from external partner organizations, researchers and practitioners.

The principles provide practitioners, researchers and decision maker's common guidance to consider when designing, implementing, and evaluating citizen science initiatives.



Citizen Science

Principles of Good Practice

Citizen science encompasses the active participation of members of the public in monitoring and scientific research. Participation can range from collecting data to all aspects of the scientific process, including generation of research questions, data collection, analysis, evaluation and reporting.

The six principles below are intended to guide good practice and appropriate application of citizen science in Alberta.

1. Citizen science programs include a stated purpose and/or scientific outcome, such as generating new knowledge or informing conservation action, environmental management decisions or environmental policy.
2. Citizen science data is fit to function, collected using standards and protocols appropriate to the intended purpose and/or scientific outcome, and follows scientific practices in design, implementation, data quality assurance, data management and evaluation.
3. Citizen science programs operate in an open and transparent manner and, where appropriate, project data, applications and technologies are shared to encourage a culture of sharing and rapid innovation.
4. Citizen science programs are inclusive and encourage active, meaningful and productive citizen participation.
5. Citizen science programs are designed to provide benefit to all participants, including citizens, practitioners and researchers. Benefits may include the publication of research outputs, learning opportunities, personal enjoyment, social benefit and contributing to scientific evidence. Whenever possible, and permissions given, participants should be acknowledged in project results and publications.
6. Citizen science programs take into consideration safety, legal and ethical standards and guidelines surrounding copyright, intellectual property, confidentiality, data sharing agreements and the environmental impact of any activities.

Citizen Science Principles in Action

The following case studies highlight examples of citizen science programs that are contributing to data and information gaps and environmental decision making in Alberta. The case studies are representative examples of:

- water, climate and biodiversity themes;
- different typologies of participation, from contributory (participants collect data) to co-created programs (participants involved in many aspects of the scientific process);
- a variety of geographic and temporal scales, from local community issues to global initiatives;
- different program purposes and environmental outcomes, such as long-term trend monitoring, generating new knowledge, informing conservation action, environmental management decisions or environmental policy; and
- one or more of the principles in action.

LakeWatch: Established in 1996 by the Alberta Lake Management Society (ALMS), LakeWatch engages Albertans in collecting water quality data that can be used to better understand and manage their local lake or reservoir. In partnership with Alberta Environment and Parks, municipal governments and community groups, LakeWatch has monitored water quality at over 100 unique lakes in Alberta, many over multiple years. Albertans are invited to submit their local lakes for sampling, with ALMS selecting approximately 30 for inclusion in the program each year. Participants assist trained ALMS technicians in taking water samples according to a standard protocol, recording data, and providing watercraft transportation. Data is uploaded to Alberta Environment and Parks' water quality database, and summary reports are compiled for each lake, which are freely available online. Information from LakeWatch reports have been used in water management plans, restoration programs and lake trend assessments across the province.

Alberta PlantWatch: Since 1987, this Albertan volunteer network has been collecting plant phenology information and contributing to the understanding of climate change effects on ecosystems. Alberta PlantWatch has expanded into a Canada-wide PlantWatch umbrella organization hosted by NatureWatch, which operates in partnership between Environment and Climate Change Canada, University of Ottawa, and Wilfrid Laurier University, with some volunteer coordinators working across Canada. Citizen scientists record flowering times and locations for selected plant species and report findings by mail, email, or on the PlantWatch website. Over three decades' worth of data collected by dedicated citizen scientists has contributed to six peer-reviewed scientific publications that document and analyze climate trends and corresponding changes in bloom times.

Pronghorn Xing: Launched in 2017 by the Miistakis Institute and Alberta Conservation Association, Pronghorn Xing is an international citizen science program that engages community members to collect wildlife observations while traveling highways in southeastern Alberta, southwestern Saskatchewan, and northern Montana. With the support of additional program partners, the National Wildlife Federation and Saskatchewan Ministry of Environment, wildlife sightings are submitted through an online mapping tool or a smartphone app. Pronghorn Xing was developed to identify hotspots of wildlife occurrence and mortality on the highway network, enabling the recommendation of key transportation mitigation sites to improve both human and wildlife safety. Pronghorn Xing will set the stage for action to be taken to support pronghorn mitigation through science based knowledge, building public support and engaging stakeholders in development of solutions early in the process.

Alberta Wolverine Project: A co-created citizen science partnership with the Alberta Trappers' Association and Alberta Conservation Association (ACA), the Alberta Wolverine Project collects wolverine data to better understand population status and habitat needs. Through a historical review of fur harvests, a survey distributed to trappers, and field data, the program has increased knowledge on the species, contributing to the sustainable management of the province's furbearer populations. As well, volunteer trappers inventory wolverines on their registered traplines, enabling access to remote areas. Results have mirrored the conclusions of the trapper survey, highlighting the value of the trappers' local traditional knowledge and experience. Results also enabled an independent report prepared by ACA and prompted additional wolverine research in northern Alberta, and resulted in a peer-reviewed scientific publication.



eBird: An international citizen science project managed by the Cornell Lab of Ornithology in partnership with hundreds of partner organizations, eBird harnesses the knowledge of birders around the world to record and share bird sightings. Participants enter details of their outings online or through a smartphone app, and fill out a checklist of birds seen and heard, enabling data collection of bird distribution, abundance, habitat use and trends. A data verification process consisting of automated and a network of regional expert reviewers ensure a high level of data quality. Freely accessible, eBird data has become a powerful resource, contributing to hundreds of peer-reviewed scientific publications and thousands of student projects¹. Further, eBird data has informed hundreds of conservation actions such as species and habitat management, habitat protection and the development, implementation and enforcement of laws and policies².



1 Sullivan, B.L., C.L. Wood, M.J. Iliff, R.E. Bonney, D. Fink, and S. Kelling. 2009. eBird: a citizen-based bird observation network in the biological sciences. *Biological Conservation* 142: 2282-2292. <http://dx.doi.org/10.1016/j.biocon.2009.05.006>

2 Sullivan, B. L., Phillips, T., Dayer, A. A., Wood, C. L., Farnsworth, A., Iliff, M. J., Kelling, S. (2017). Using open access observational data for conservation action: A case study for birds. *Biological Conservation*, 208, 5–14. <https://doi.org/10.1016/j.biocon.2016.04.031>

Advancing Citizen Science in Alberta:

Areas of Focus

Realizing the full potential of citizen science in Alberta requires appropriate collaboration, coordination and partnerships across organizations and research domains. Based on guidance and input from practitioners and researchers in Alberta and beyond, the following three areas are identified as starting points to advance citizen science through collective action.

1. Grow a citizen science community of practice

Participate in sharing knowledge, promoting standards of practice and innovation in the field of citizen science by supporting interactions, identification of common interests and a shared pool of resources.

Recognise the important roles external organizations, Alberta Environment and Parks staff and the Office of the Chief Scientist play in supporting and leveraging citizen science and actively pursue partnerships that advance or leverage common goals.

Areas for Advancement:

- Support and engage with the citizen science community of practice that is inclusive of a broad range of practitioners and issues.
- Promote cross-disciplinary collaboration on citizen science projects.
- Network, support and partner with organizations that have experience in or skills relevant to citizen science (i.e., designing, implementing, and supporting programming).
- Support existing citizen science programming through funding and/or in-kind contributions to leverage common goals.

2. Build capacity and tools

Enhance resources and skills available to citizens, practitioners and researchers in Alberta for engaging in citizen science initiatives.

Areas for Advancement:

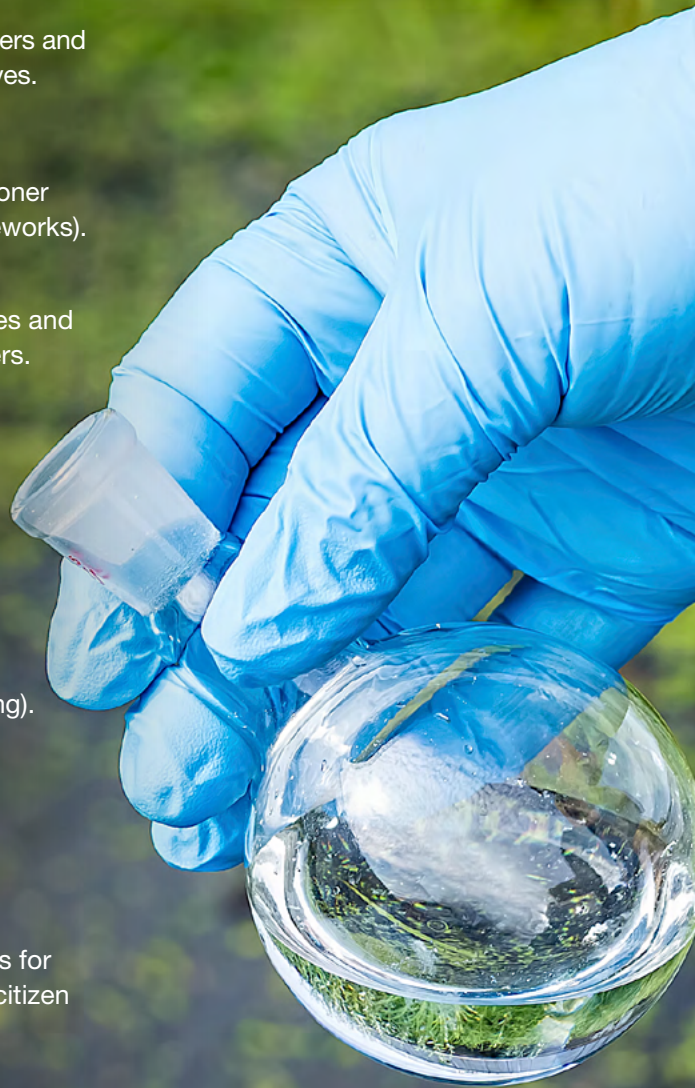
- Support citizen science capacity building (e.g., practitioner workshops, sharing resources such as tools and frameworks).
- Support an online platform to promote citizen science, including examples of good practice, practitioner guides and other documents to support citizen science practitioners.
- Foster development of open source, accessible citizen science tools favouring usability, interoperability and collaboration.
- Enable use of environmental monitors and sensors by testing accuracy of equipment, equipment calibration and sharing of equipment.
- Support opportunities for training in conventional environmental monitoring methods (e.g., water sampling).

3. Enable the use of citizen science data

Citizen science can contribute valuable information and fill data gaps to support environmental decision making. Areas for advancement are encouraged to help integrate the use of citizen science data.

Areas for Advancement:

- Identify and clearly articulate where citizen science could be considered as an appropriate approach to addressing information and knowledge gaps.
- Share appropriate protocols and standards for citizen science data collection.
- Provide guidance and communicate data quality needs for different data uses pertaining to airshed, watershed, biodiversity and other monitoring and science programs.
- Support the on-going profile of the use of citizen science data in environmental decision making.



This publication can be found at: <https://open.alberta.ca/publications/9781460146514>

Comments, questions, or suggestions regarding the content of this document may be directed to:
Office of the Chief Scientist, Alberta Environment and Parks

Email: aep.ocs@gov.ab.ca

Website: www.alberta.ca/office-chief-scientist.aspx

For media inquiries please visit: alberta.ca/news-spokesperson-contacts.aspx

Recommended citation:

Government of Alberta, Ministry of Environment and Parks. 2020. Citizen Science Principles of Good Practice.

ISBN 978-1-4601-4651-4. Available at: <https://open.alberta.ca/publications/9781460146514>.

© Her Majesty the Queen in Right of Alberta, as represented by the Minister of Alberta Environment and Parks, 2020.

This publication is issued under the Open Government Licence – Alberta open.alberta.ca/licence.

Date of publication: May 2020

ISBN 978-1-4601-4651-4

