A Case for a Modernized Atlas of Alberta Lakes

A discussion

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Who we are

- David Barrett
  - Research associate – University of Calgary
  - Cold-regions lake researcher
  - Manager of the aquatic ecology lab
  - Oil Sands Monitoring lake monitoring program design
  - Multiple other freshwater projects
- Bradley Peter
  - Needs no (further) introduction!

Who is here?

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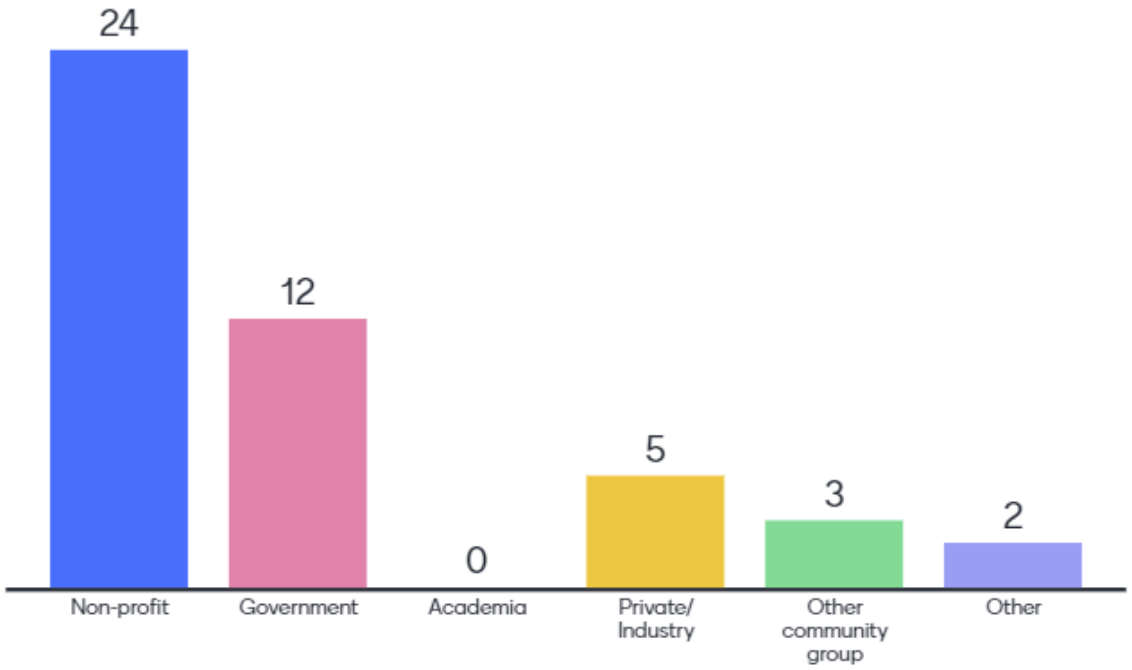
What type of organization are you representing?



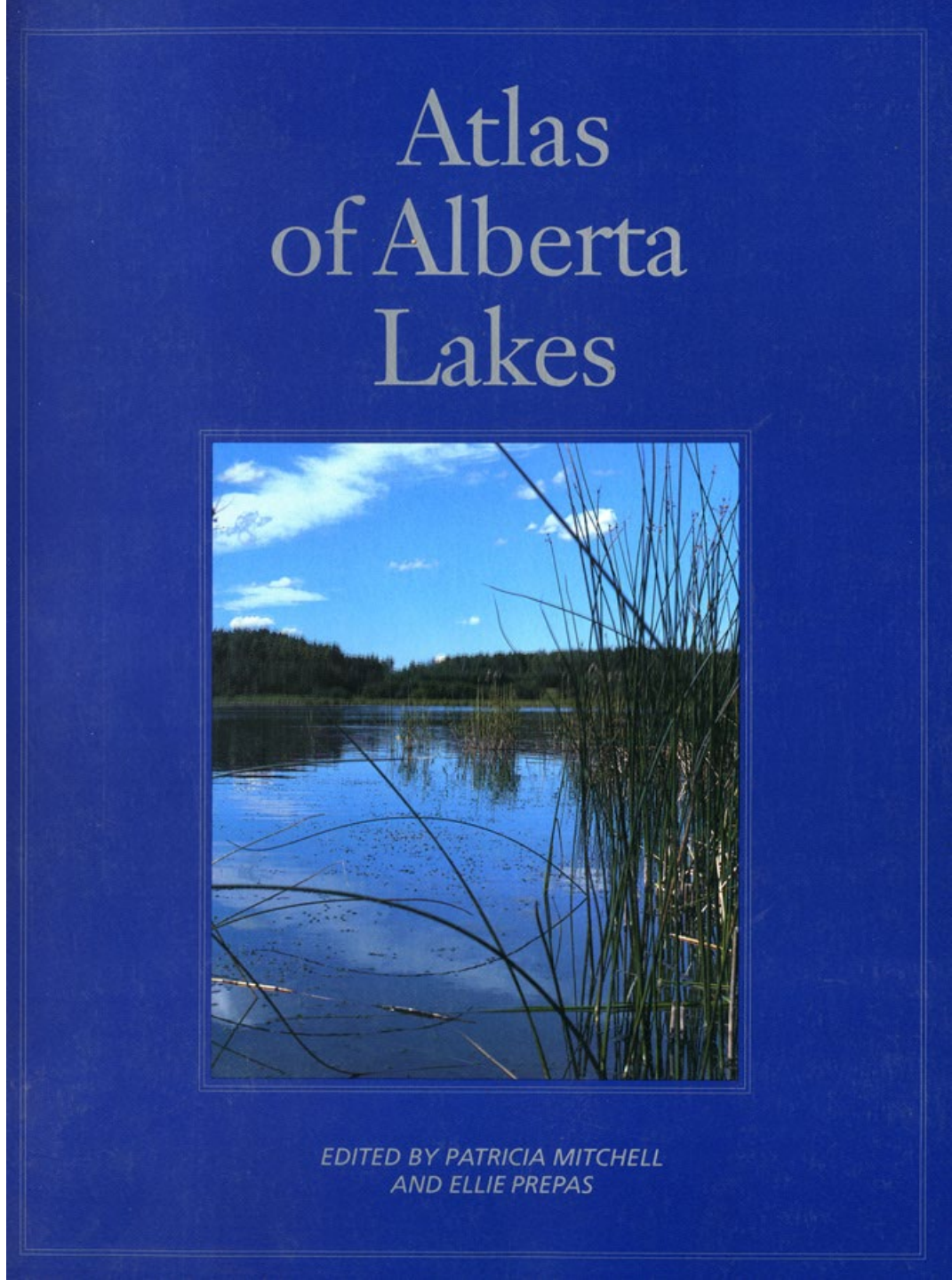
Are you familiar with the Atlas of Alberta Lakes?

Do you still use the atlas?

Print? Online?

What is the Atlas of Alberta Lakes?

- Published in 1990
- Edited by Patricia Mitchell (Alberta Environment) and Ellie Prepas (University of Alberta)
- Compendium of 100 lakes
  - Focus on data-rich and fishing/recreational lakes
- Produced in print form initially
  - Later modified to be hosted online (UofA)
  - Recently removed due to questions around relevancy of data
- By nature of the medium, a **static document**



What data were included?

- Physical parameters
  - Size
  - Drainage basin area
  - Control structure
  - Etc.
- Hydrological
  - Water Balances
- Recreational info
  - Presence of campground
  - Presence of boat launch
- Water Quality data
  - Trophic status
  - TP
  - Chlorophyll a biomass
  - TDS

Table 1. Characteristics of Sylvan Lake drainage basin.

area (excluding lake) (km^2)[a]	102
soil[b]	Orthic Gray and Dark Gray Luvisols
bedrock geology[c]	Paskapoo Formation (Tertiary): sandstone, siltstone, mudstone; thin limestone, coal and tuff beds; nonmarine
terrain[d]	undulating to rolling
ecoregion[d]	Moist Mixedwood Subregion of Boreal Mixedwood
dominant vegetation[d]	trembling aspen, now cleared for agriculture
mean annual inflow (m^3)[a, e]	6.54×10^6
mean annual sunshine (h)[f]	2 125

NOTE: [e]excluding groundwater inflow
SOURCES: [a]Alta. Envir. n.d.[b]; [b]Peters and Bowser 1960; Pedocan Ld. Eval. Ltd. 1985; [c]Alta. Res. Counc. 1972; [d]Strong and Leggat 1981; [f]Envir. Can. 1982

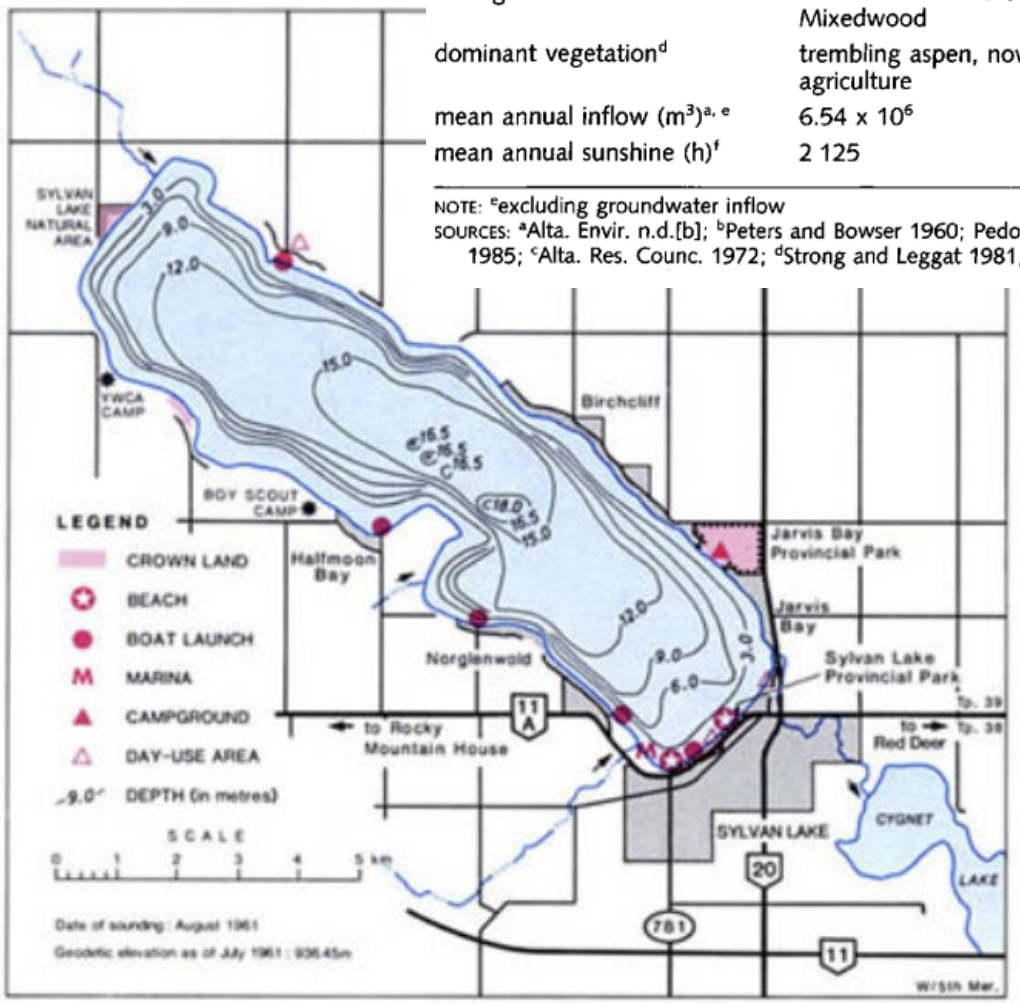


Figure 2. Bathymetry and shoreline features of Sylvan Lake.
BATHYMETRY SOURCE: Alta. Envir. n.d.[c].

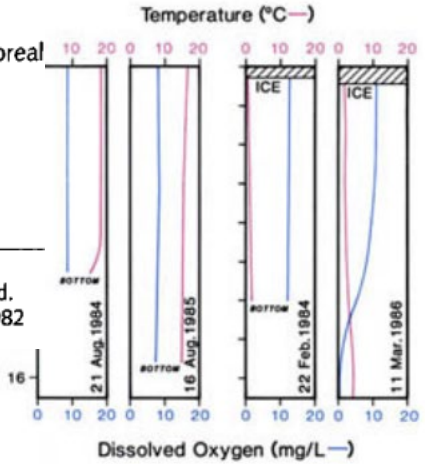


Figure 5. Temperature and dissolved oxygen in Sylvan Lake, 1984 and 1986.
SOURCE: Alta. Envir. n.d.[a].

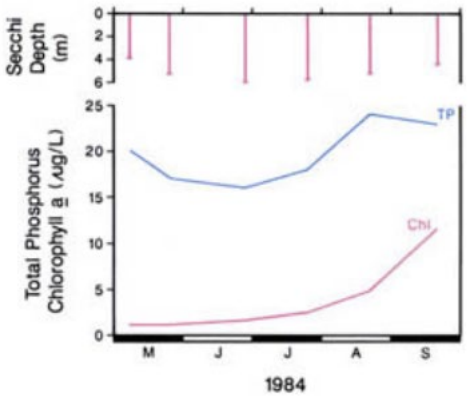


Figure 6. Total phosphorus, chlorophyll *a* and Secchi depth in Sylvan Lake, 1984.
SOURCE: Alta. Envir. n.d.[a].

What data were included

- Biological characteristics
  - Plants
  - Invertebrates
  - Fish
  - Wildlife
  - Phytoplankton Taxonomy

Biological Characteristics

Plants

The composition and abundance of phytoplankton in Sylvan Lake were studied in July and August 1976 during an Alberta Environment planning study (Table 5). Seventy-four species were identified. Throughout July and early August the phytoplankton community was dominated by golden-brown algae (Chrysophyta). In late August, blue-green algae (Cyanophyta), particularly *Aphanizomenon flos-aquae*, were very abundant. Colonies of the blue-green alga *Nostoc* sp. were commonly observed rolling in shallow water like green grapes on the sand.

Invertebrates

There are no data on the zooplankton in Sylvan Lake.

Benthic invertebrates were sampled in July 1976 by a consultant for Alberta Environment (Table 6). The dominant organism in the littoral zone was the amphipod *Hyalella azteca*; in some vegetated areas it reached densities of up to 12 000 animals/m² and represented 92% of the invertebrate community. The dominant invertebrates in the profundal zone were midge larvae (Chironomidae), which made up over half of the community. Sphaeriid clams (Pelecypoda) were abundant in both the profundal and littoral regions. Earlier accounts from 1939 and 1942 mentioned the abundance of both clams and snails in Sylvan Lake (Alta. For. Ld. Wild. n.d.; Miller 1942). In 1946, the snails *Lymnaea stagnalis* and *Physa* sp. from the Sylvan Lake pier area were infected with tiny immature forms of a parasitic worm, called cercaria, which can cause "swimmer's itch" (Miller 1946). Blue-green algae can also cause skin irritation in some people. Swimmer's itch occurs periodically in Sylvan Lake, particularly during warm, sunny summers (Smith 1988).

Fish

There are at least seven species of fish in Sylvan Lake. Northern pike are indigenous to the lake and support an active year-round sport fishery. Yellow perch were introduced annually to the lake by Fish and Wildlife Division from 1940 to 1945 (Hunt 1978). They are now a self-sustaining population; individuals grow to an admirable size and are a very popular target for anglers, particularly during winter (Table 7). In 1986, Alberta angling records reported that an exceptionally large perch of 53 cm and 1.6 kg was taken from Sylvan Lake. Walleye were stocked in 1926, 1929, 1934, 1938, 1943, 1945 and from 1960 to 1963. They have now established a self-sustaining population and contribute to the sport fishery (Lowe 1988). Burbot are also caught by anglers. Lake trout were stocked in 1943 and 1944 but none survived. Spottail shiners were stocked from 1942 to 1945 to increase the forage fish population. Native forage species likely include brook stickleback and fathead minnows (Lowe 1988). In 1987 and 1988, a total of 3 445 adult lake whitefish from Pigeon Lake were stocked in Sylvan Lake to provide a forage species for walleye and northern pike and eventually to contribute to winter sport fishing. It will be the early 1990s before it is known whether

An initial conversation took place in August 2022 with input from valued partners

Why update?

- Broadly, the we see a need to scope and design a new, dynamic Atlas of Alberta lakes:

"This project seeks to reimagine the Atlas of Alberta Lakes for a digital age. By engaging and consulting with key stakeholders from across Alberta, this project will use a collaborative and integrated approach to develop a roadmap for a digital, definitive, comprehensive, interactive, and modernized Atlas of Alberta Lakes. At the heart of the project is a framework for a reimagined Atlas of Alberta Lakes which is accessible to all Albertans."

- Many concerned parties expressed interest in the type of data presented in the Atlas – there's a demand for new and updated information
- The original atlas was very one-dimensional – hard/western-science and uses *only*
    - Selection criteria for lakes unclear

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If a new Atlas were created, what components would you want to see? What should the priorities be or what was missing?

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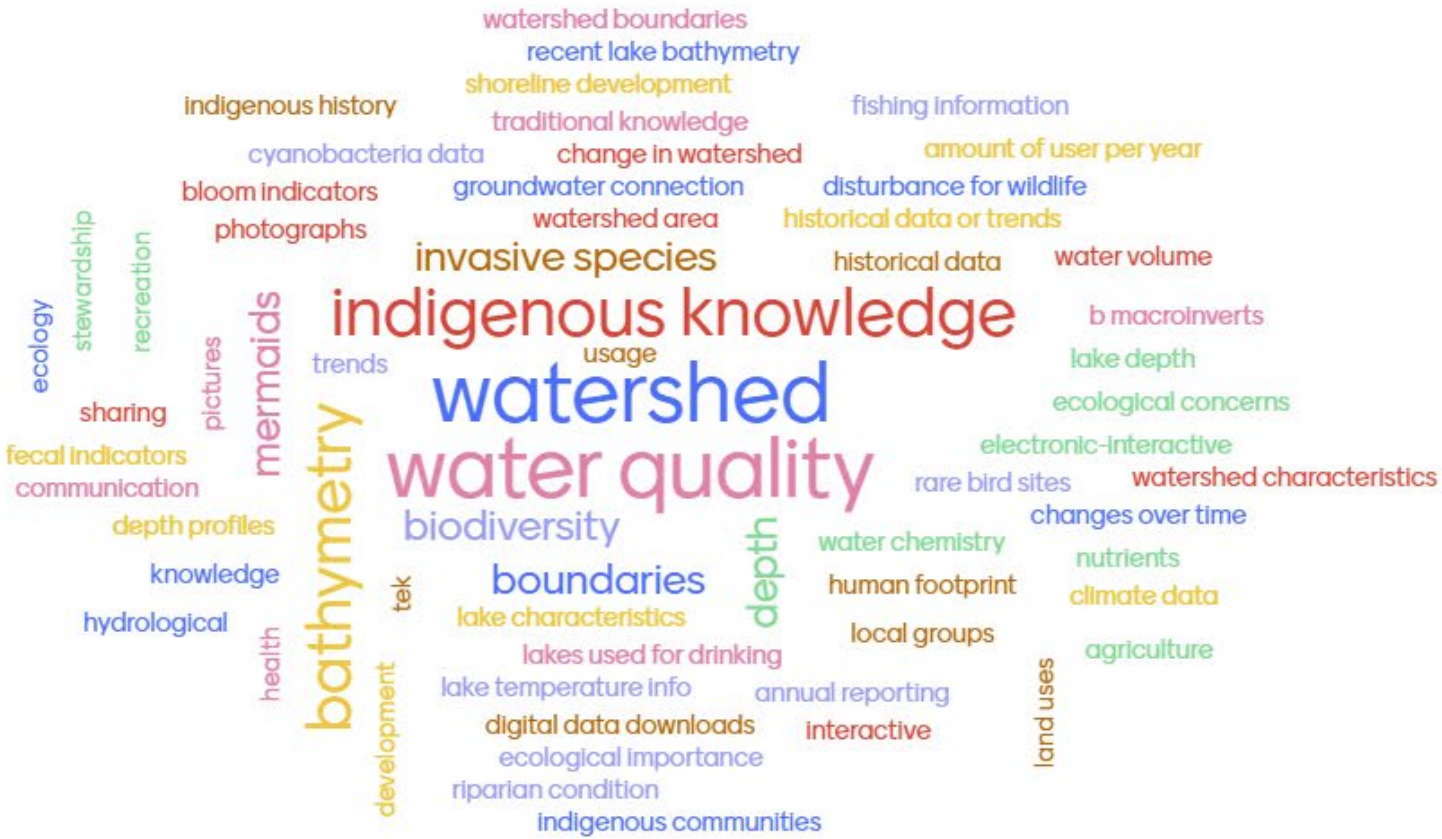
If a new Atlas were created, what components or priorities would you want to see included?

92 responses

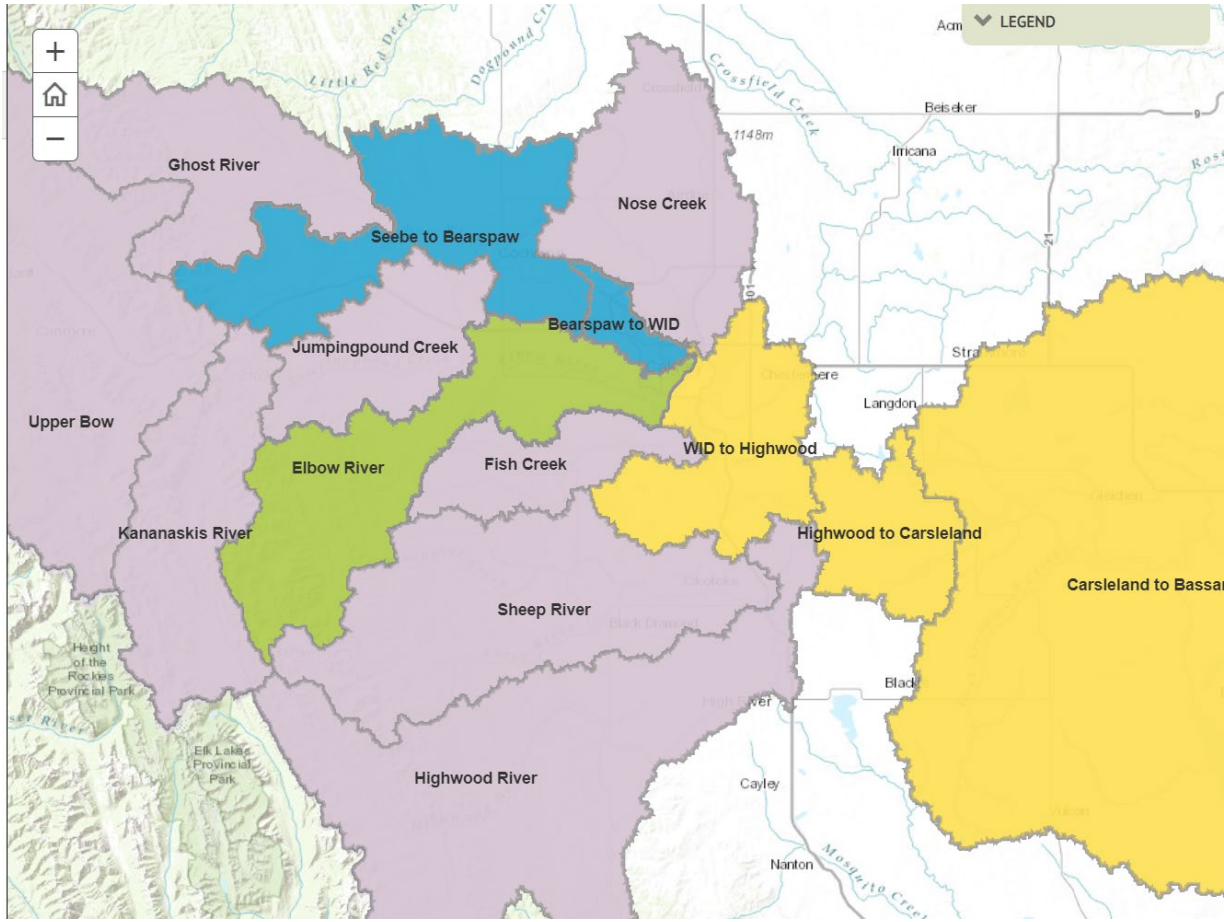


Our thoughts on updated priorities

- Developing a tool that is inclusive of Indigenous and local knowledge and is accessible to Indigenous communities.
- Creating one resource linked across multiple data sources
- Establishing a diverse network of stakeholders who can inform the functionalities of a modernized Atlas.
- Improving Condition of the Environment Reporting in Alberta.
- Creating a tool that allows for the visualization and interpretation of aquatic information.
- Rescuing data which exists only in a hardcopy text format.

What could an update Atlas look like?

- Living document
  - Ability to add and update more easily
- Can identify knowledge gaps for lakes
  - Inform monitoring, research, and citizen science
- Adaptable based on specific lakes and uses
- Connect water quality, hydrology, and biology
  - Relate water quality to watershed health

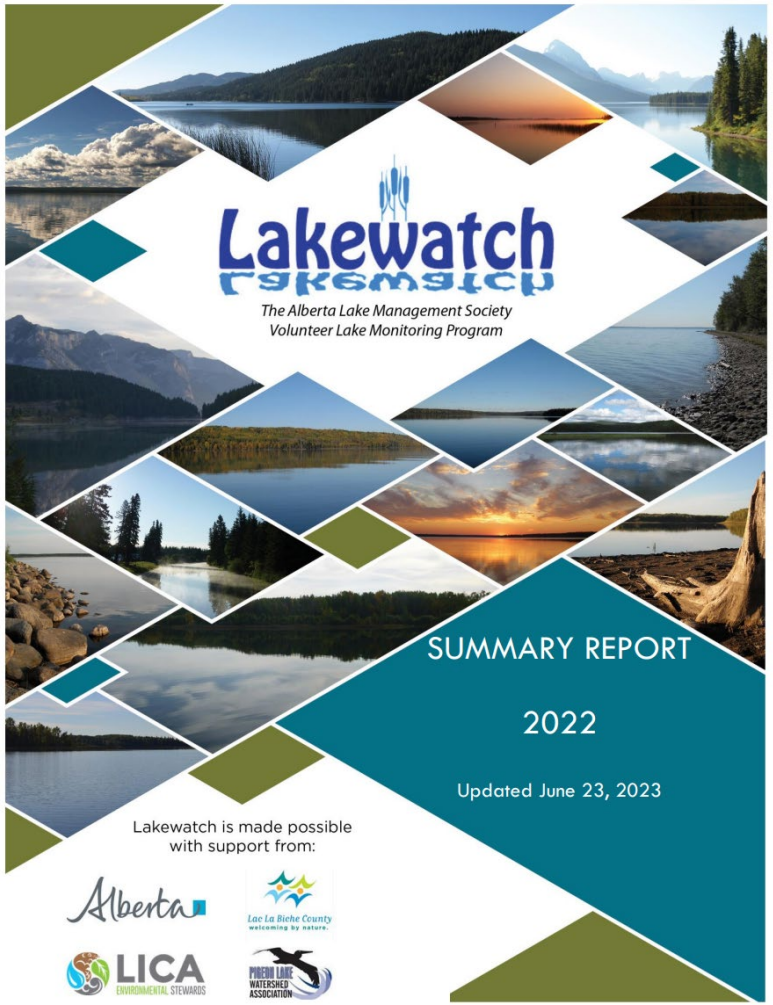


Examples

- https://www.salmonexplorer.ca/#!/
- https://mackenziedatastream.ca/explore/#/
- https://www.grnland.com/Decision-Support-Systems/THREATS.html
- https://watershedreports.wwf.ca/#canada/by/threat-overall/threat

How can a digital atlas improve effective reporting?

- ‘Traditional’ reporting has limited reach/engagement
  - Very time consuming to produce
  - Doesn’t necessarily meet all users' needs
  - Difficult to update
  - Comparison between years and lakes can be difficult
- State of Environment / Watershed reporting is an increasing expectation of non-profits
  - If/how can a digital lakes atlas support this requirement?



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Challenges to updating the Atlas

- Capacity/resourcing
- Explosion of data sources and availability
- New delivery options but associated decisions and maintenance challenges
- Sustainability
- Need for partners
- Proper engagement/feedback
- Funding

Photo: ALMS

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The *Atlas* was a highly ambitious project. It required cooperation from scientists and associates in a diverse group of agencies over a period of five years. The format was developed from the concept

What we're working on

- Moving forward on
  - Steering committee formation
    - Comprised of key partners and champions
  - Met with representatives of some similar digital platform-based reporting applications
  - Working to identify scoping resources and funding
  - Looking to organize in-person and virtual meetings with key stakeholders (short-term)

- Identifying funding sources for different 'phases' of work

Interested in continuing this discussion?

Reach out to Bradley at ALMS: info@alms.ca

Moving forward

- Proposed next steps (cont'd)
  - Data organization/salvage efforts (short-term)
    - Identify if/where data from the atlas is stored
    - Identify best method of data management
  - Exploring lakes from a traditional ecological perspective (long-term)
    - Identify how to incorporate Indigenous Knowledge and uses of lake systems
    - Identify best practices/methods for communicating lakes atlas outcomes to diverse communities
  - Identification of data gaps to better inform data collection efforts (long-term)
    - Determine which lakes have lack of data and would benefit from increased efforts
    - Updating bathymetry