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Water Quality Challenges and Opportunities in Elk Island National Park

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Elk Island National Park
Parks Canada Agency

September 25, 2025

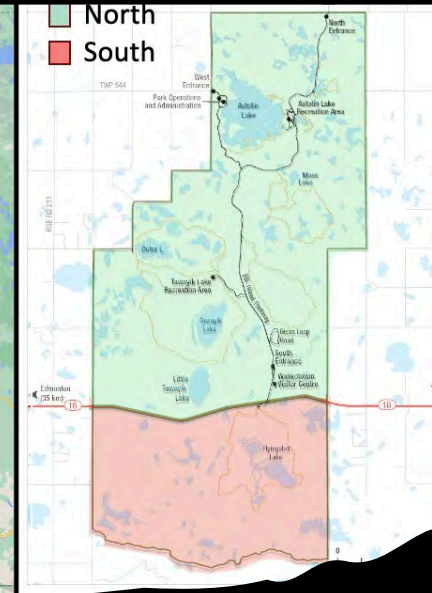


The first challenge is the EBNP Team working on the aquatics program:



The Solution: Partnerships





Elk Island National Park, Alberta

Area of 194 km²

Two fenced blocks

Habitat types: wetland, grassland, and aspen forest

Historically high densities of bison, elk, moose

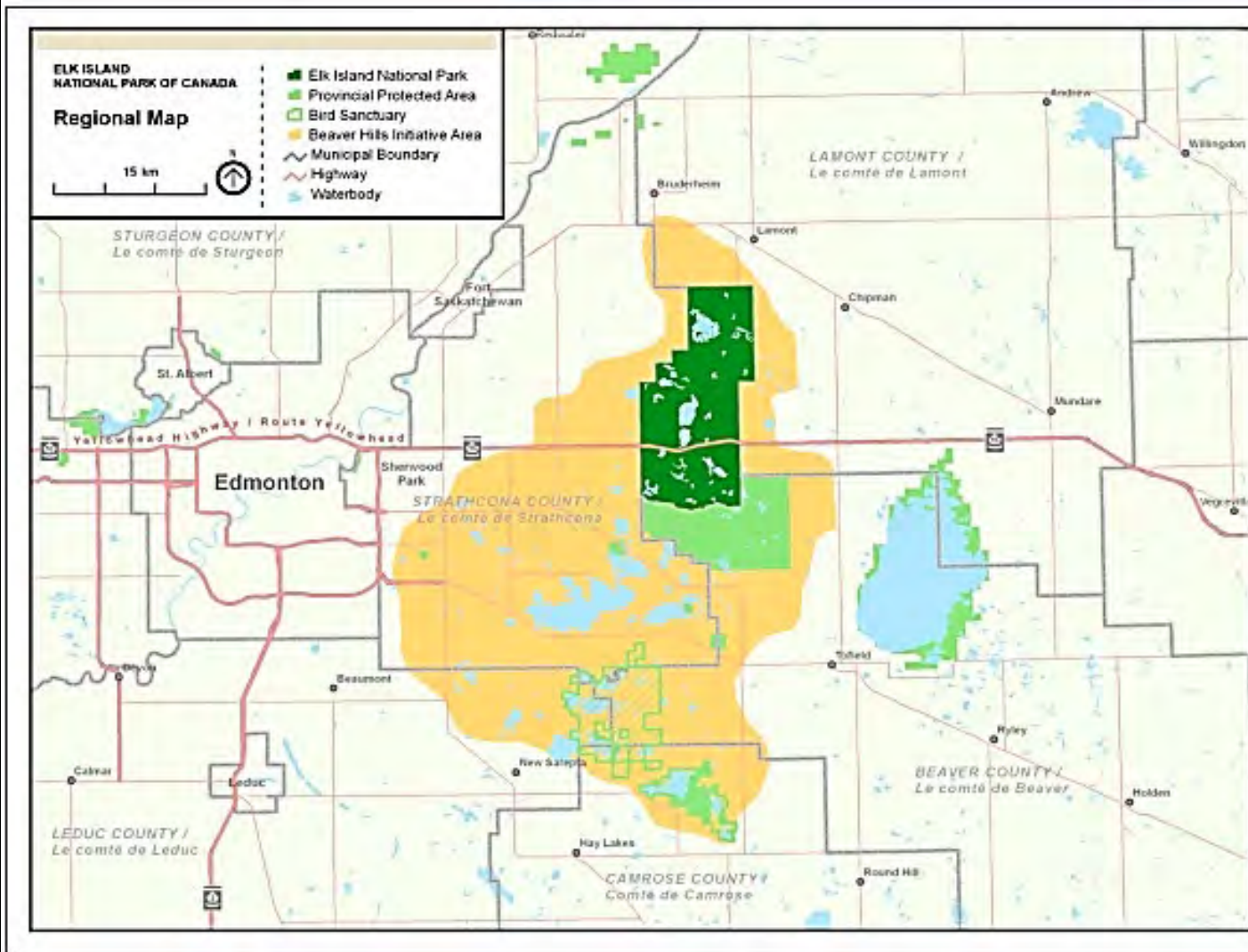
Elk Island National Park

Located 35 km east of Edmonton, along the Yellowhead Highway





Core Protected Area within Beaverhills Biosphere

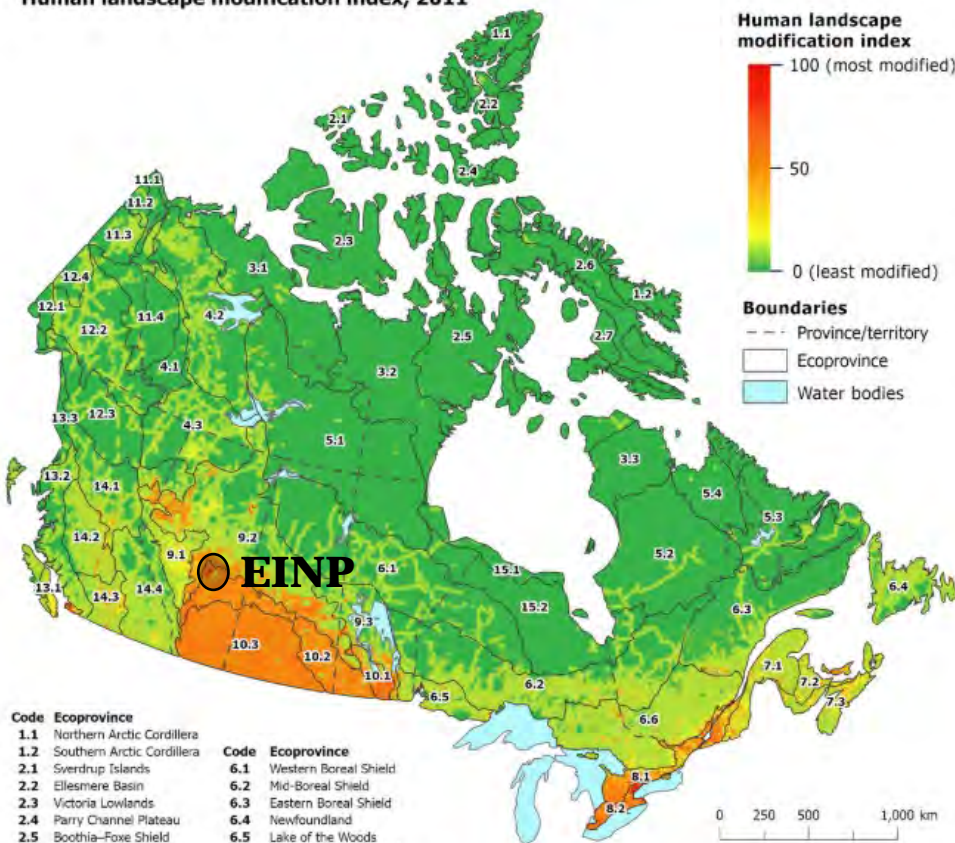




Aspen Parkland



Human landscape modification index, 2011



Code Ecoprovince

- 1.1 Northern Arctic Cordillera
- 1.2 Southern Arctic Cordillera
- 2.1 Sverdrup Islands
- 2.2 Ellesmere Basin
- 2.3 Victoria Lowlands
- 2.4 Parry Channel Plateau
- 2.5 Boothia-Foxe Shield
- 2.6 Baffin Uplands
- 2.7 Foxe-Boothia Lowlands
- 3.1 Amundsen Lowlands
- 3.2 Keewatin Lowlands
- 3.3 Ungava-Belcher
- 4.1 Mackenzie Foothills
- 4.2 Great Bear Lowlands
- 4.3 Hay-Slave Lowlands
- 5.1 Western Taiga Shield
- 5.2 Eastern Taiga
- 5.3 Labrador Uplands
- 5.4 Whale River Lowland

Code Ecoprovince

- 6.1 Western Boreal Shield
- 6.2 Mid-Boreal Shield
- 6.3 Eastern Boreal Shield
- 6.4 Newfoundland
- 6.5 Lake of the Woods
- 6.6 Southern Boreal Shield
- 7.1 Appalachian-Acadian Highlands
- 7.2 Northumberland Lowlands
- 7.3 Fundy Uplands
- 8.1 Great Lakes-St. Lawrence
- 8.2 Huron-Erie Plains
- 9.1 Boreal Foothills
- 9.2 Central Boreal Plains
- 9.3 Eastern Boreal Plains
- 10.1 Eastern Prairies
- 10.2 Parkland Prairies
- 10.3 Central Grassland

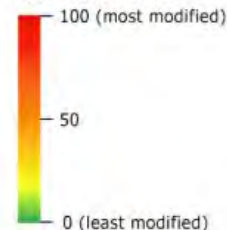
Code Ecoprovince

- 11.2 Old Crow-Eagle Plains
- 11.3 Ogilvie Mountains
- 11.4 Mackenzie-Selwyn Mountains
- 12.1 Wrangell Mountains
- 12.2 Northern Boreal Cordillera
- 12.3 Southern Boreal Cordillera
- 12.4 Western Boreal Cordillera
- 13.1 Georgia Depression
- 13.2 Southern Coastal Mountains

Code Ecoprovince

- 13.3 Northern Coastal Mountains
- 11.1 Northern Yukon Mountains
- 14.1 Northern Montane Cordillera
- 14.2 Central Montane Cordillera
- 14.3 Southern Montane Cordillera
- 14.4 Columbia Montane Cordillera
- 15.1 Hudson Bay Coastal Plains
- 15.2 Hudson-James Lowlands

Human landscape modification index



Boundaries

- Province/territory
- Ecoprovince
- Water bodies



Conservation status

The Aspen Parkland is the most altered ecozone in the Prairies, and one of the most impacted in all of Canada. At most, 21% natural cover remains.



There are few large intact blocks of natural habitat left. Many of the remaining natural areas occur on soils that are less suitable for agriculture.

Only 4% of the ecoregion is in conserved or protected areas and managed lands. The largest include provincial and national parks, and provincial pasture lands.



Commission on Ecosystem Management

Our work

Red List of Ecosystems

Aspen Parkland



LETTER | Open Access |

An ecosystem risk assessment of temperate and tropical forests of the Americas with an outlook on future conservation strategies

José Rafael Ferrer-Paris Irene Zager, David A. Keith, María A. Oliveira-Miranda, Jon Paul Rodríguez, Carmen Josse, Mario González-Gil, Rebecca M. Miller, Carlos Zambrana-Torrelío, Edmund Barrow

First published: 15 January 2019 | <https://doi.org/10.1111/conl.12623> | Citations: 71





Global, National and Provincial Significance

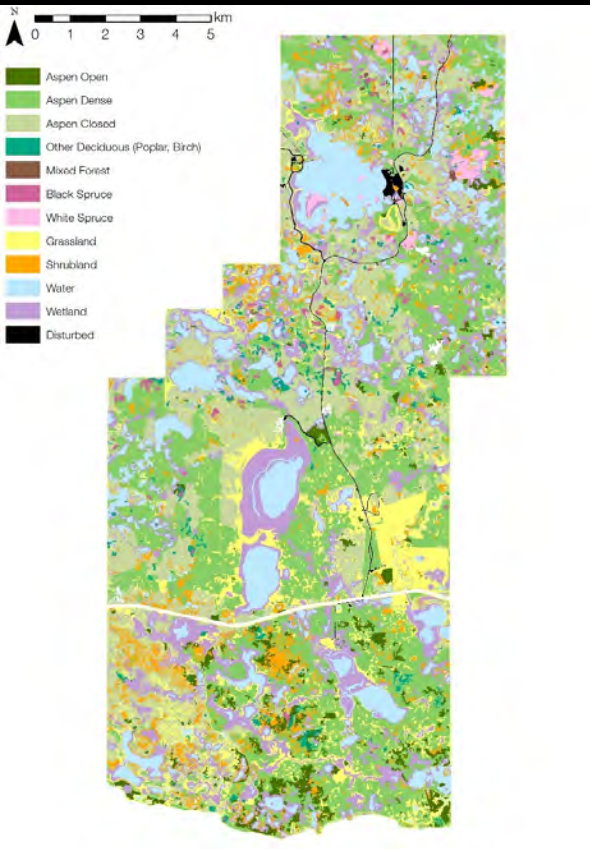
- Seed herds for ungulate and fisher reintroduction across North America
- IUCN Red List: Last of remnants of critically endangered aspen forest
- IUCN Biosphere
- Some watershed wetlands are Ramsar Site
- UNESCO Heritage Site
- Key Biodiversity Area Designation

- Within the core area of the Central Flyway
- All 4 flyways overlap in the Beaver Hills
- Over 200 Species-at-Risk (NatureServe, IUCN, Alberta, or under SARA)
- North Saskatchewan Canadian Heritage River Designation Initiative

- **Park and Biosphere punch significantly above their size class**



EINP's Aquatic Ecosystem: Quick Facts



- The aquatic ecosystems (lakes, wetlands, and creeks) comprise approximately **1/3 of the park**.
- Elk Island's waterbodies, formed by glacial activity.
- Crucial for supporting essential habitats for numerous species, including re-introduced **beavers**, **trumpeter swans**, and **species-at-risk**.
- Regulates water flow within the **North Saskatchewan River watershed**.
- Contributes to the broader **Beaver Hills Biosphere** ecosystem, offering **educational** and **recreational** opportunities.

SPRINGER NATURE Link

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Home > Wetlands > Article

The wetlands of Elk Island National Park: Vegetation classification, water chemistry, and hydrotopographic relationships

Published: June 1995

Volume 15, pages 119–133, (1995) [Cite this article](#)

Wetlands

[Aims and scope](#)

[Submit manuscript](#)



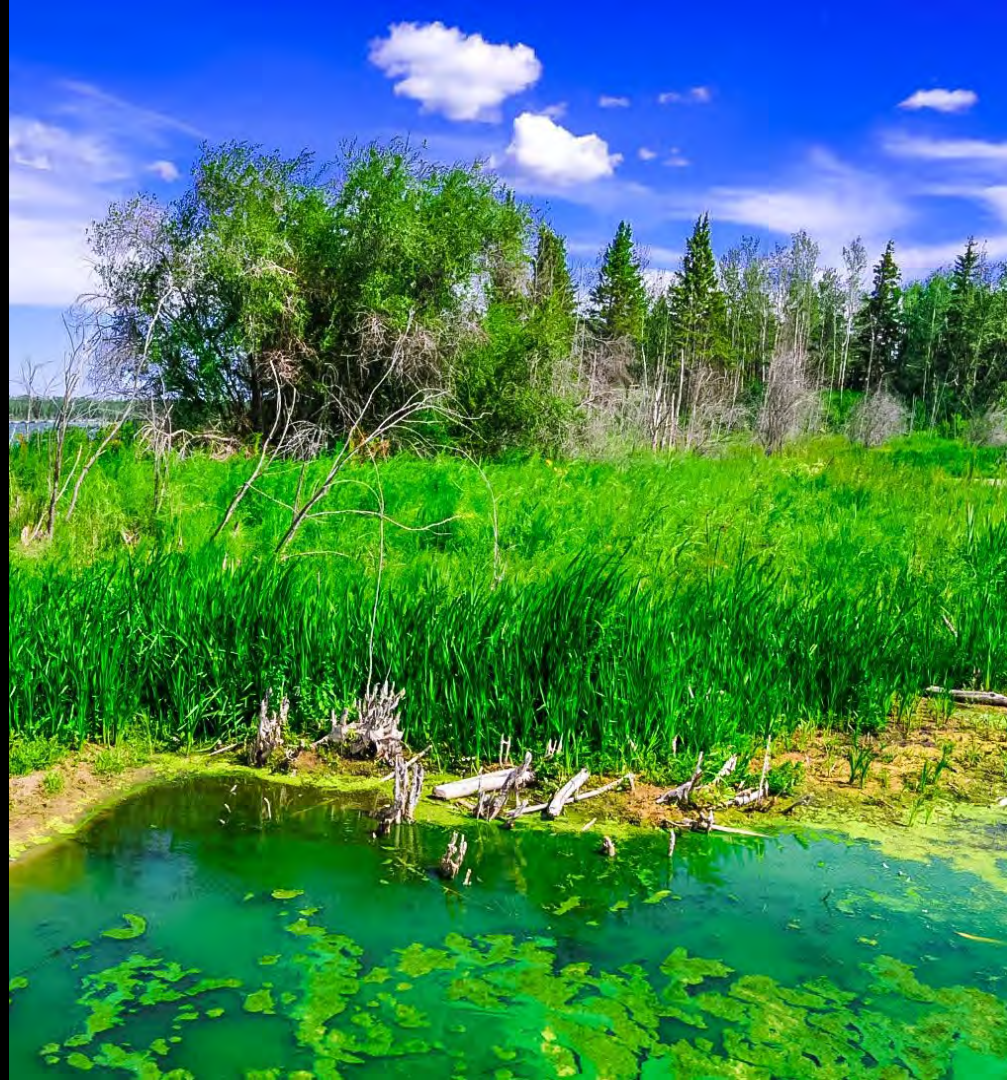
Aquatic Ecosystem Management

Monitoring Program

- Water quality
- Sediment core
- Open water
- Water level
- Amphibians
- Beavers

Active Management and Visitor Safety

- Visitation
- Aquatic Invasive Species
- Algae
- Connectivity
- Drained wetlands





Monitoring Program Summary



Map


Report


Search ...


Advanced Search


Digital Asset Search


Elk Island National Park of Canada


 Ecosystems

5 Forest 


4 Freshwater 

Open water areal extent and distribution  2022

Amphibian Occupancy  2025

Beaver Abundance  2025

Lake water quality  2025

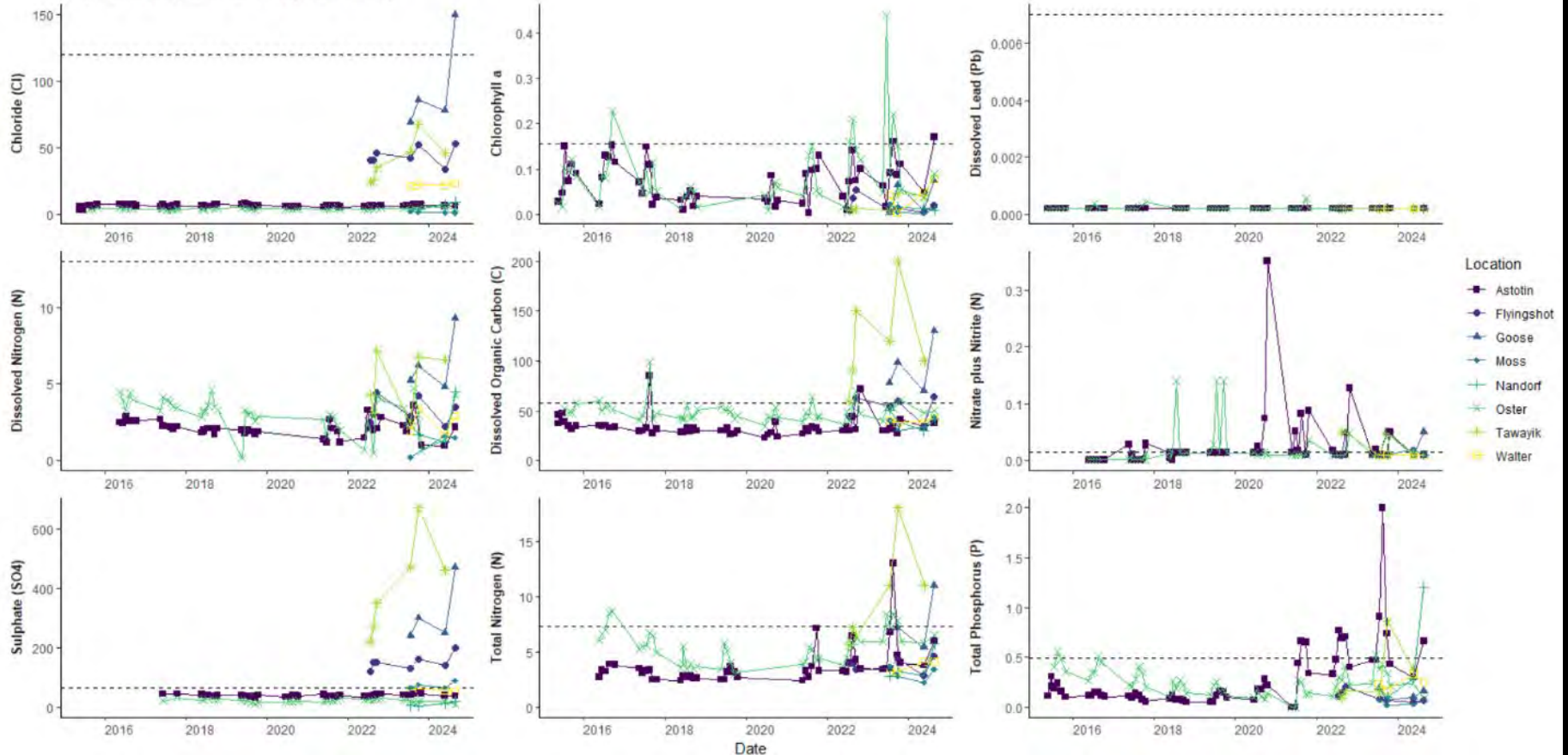
5 Grasslands 



Lake Water Quality Parameters and Trends

Water quality data for WQ Index ICE measure at EINP

Milligrams per Litre (dashed line = acceptable threshold)

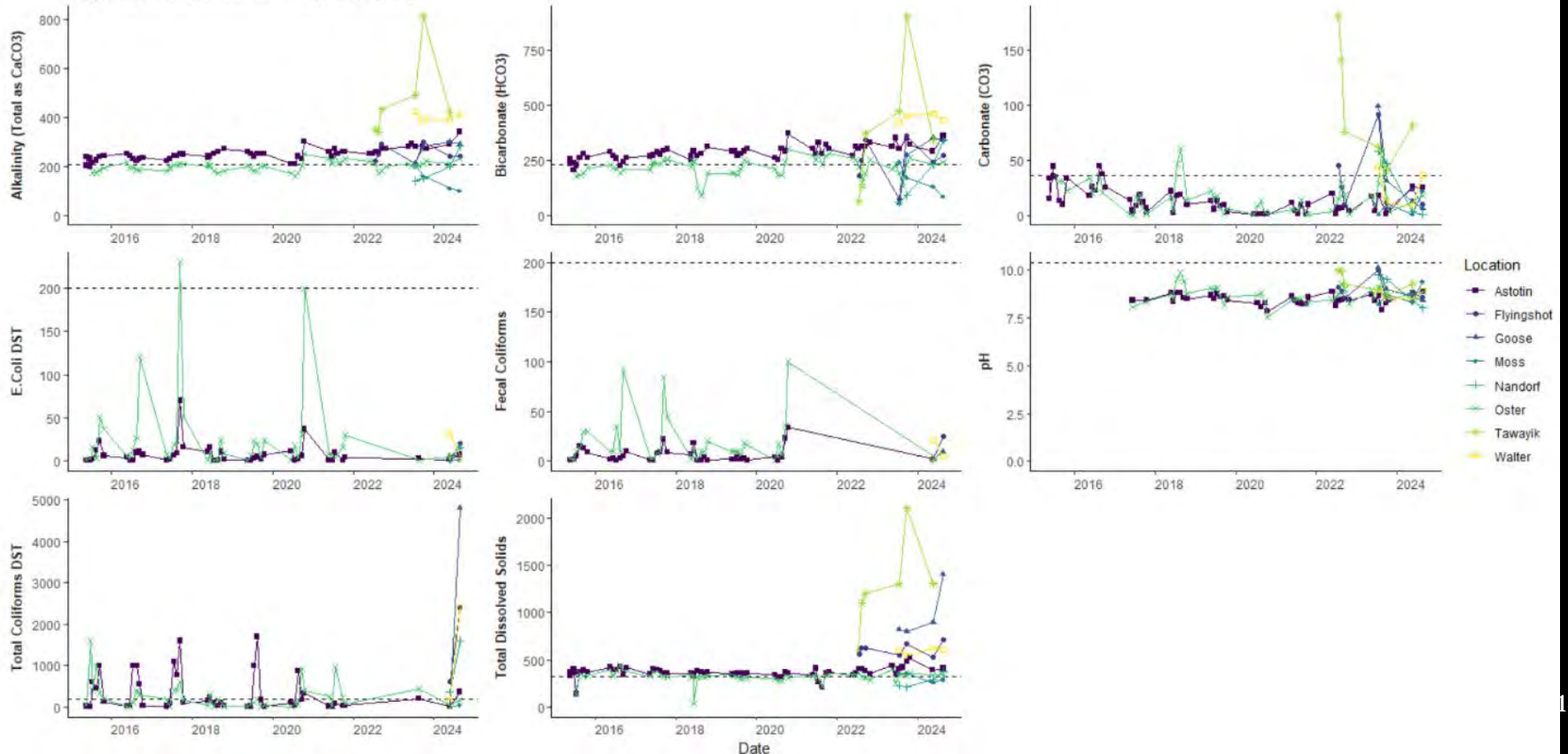




Lake Water Quality Parameters and Trends

Water quality data for WQ monitoring at EINP

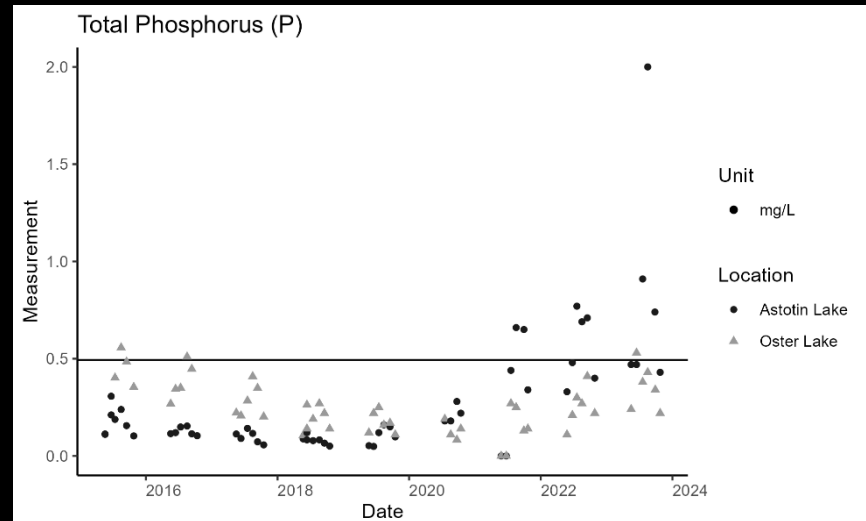
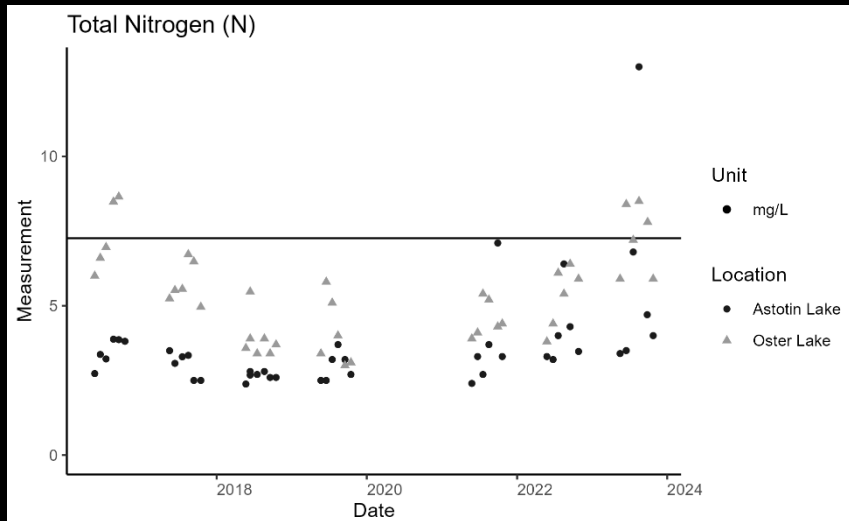
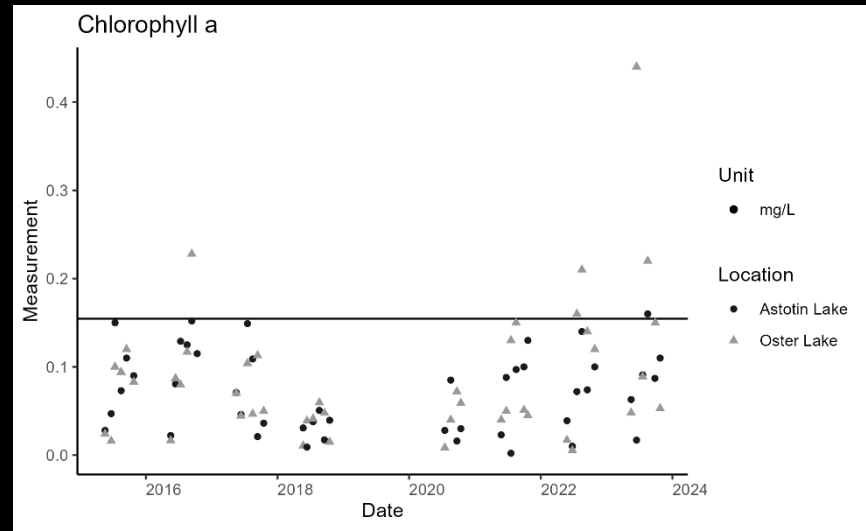
Milligrams per Litre (horizontal line = acceptable threshold)





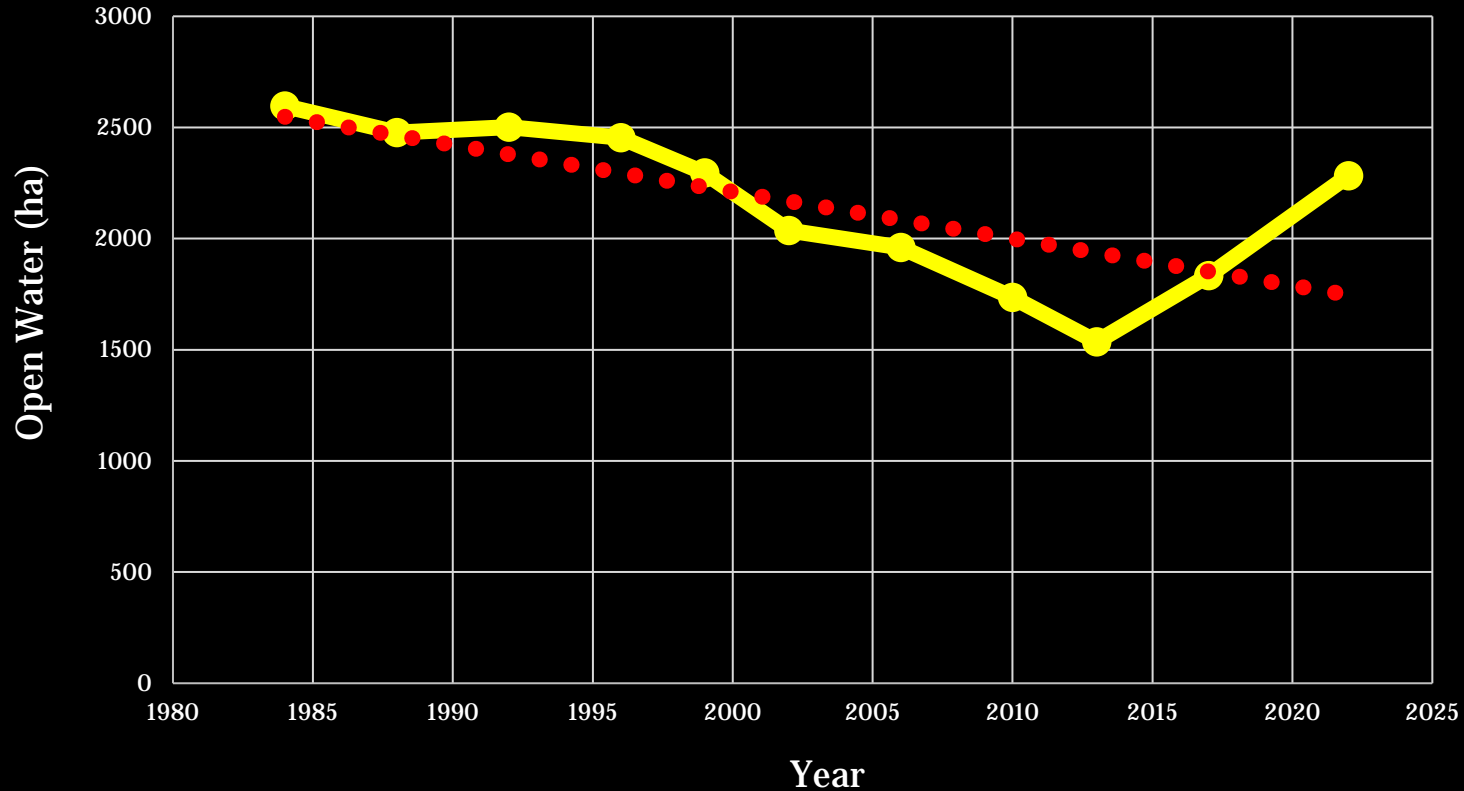
Trend in Water Quality Parameters:

- Total Nitrogen
- Chlorophyll a
- Total Phosphorus





Trends in the Amount of Open Water in EINP



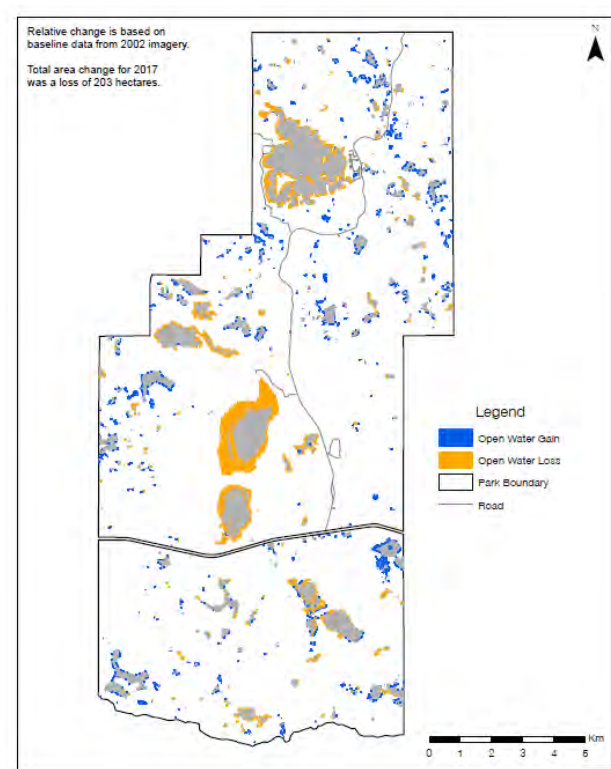
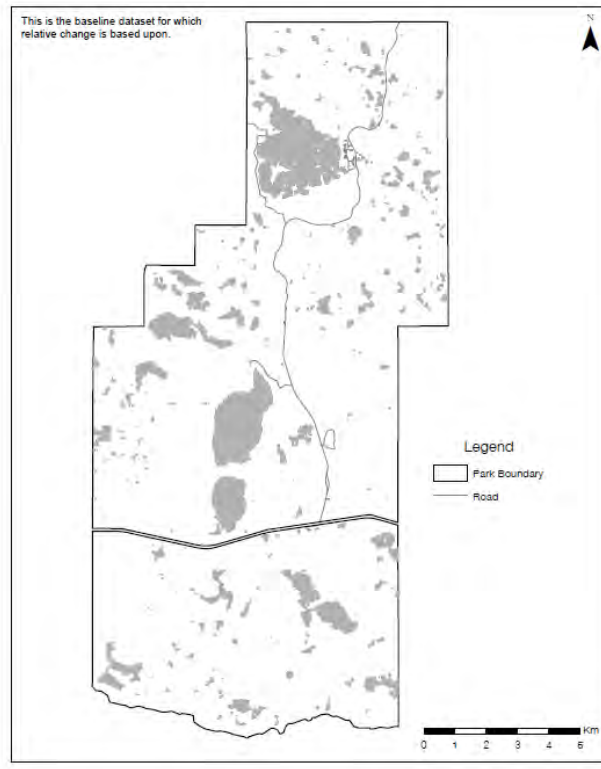
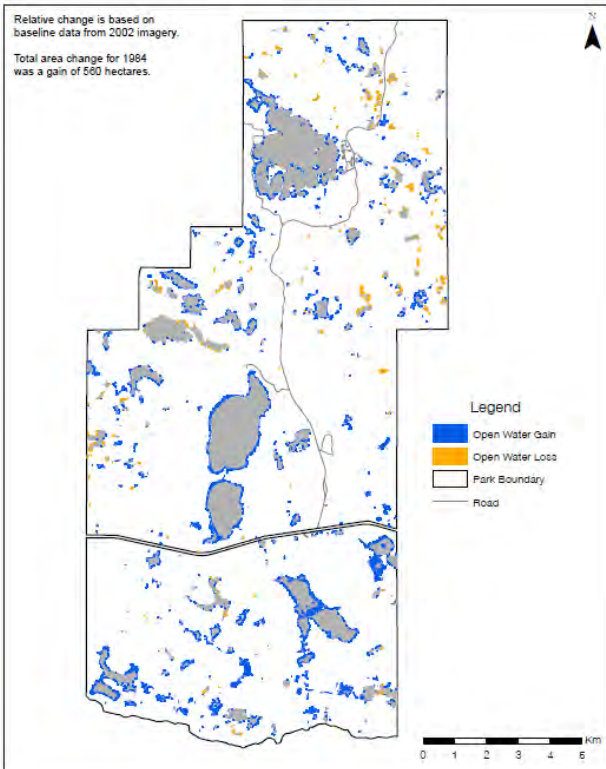


Change in the Amount of Open Water with 2002 Benchmark

1984

2002

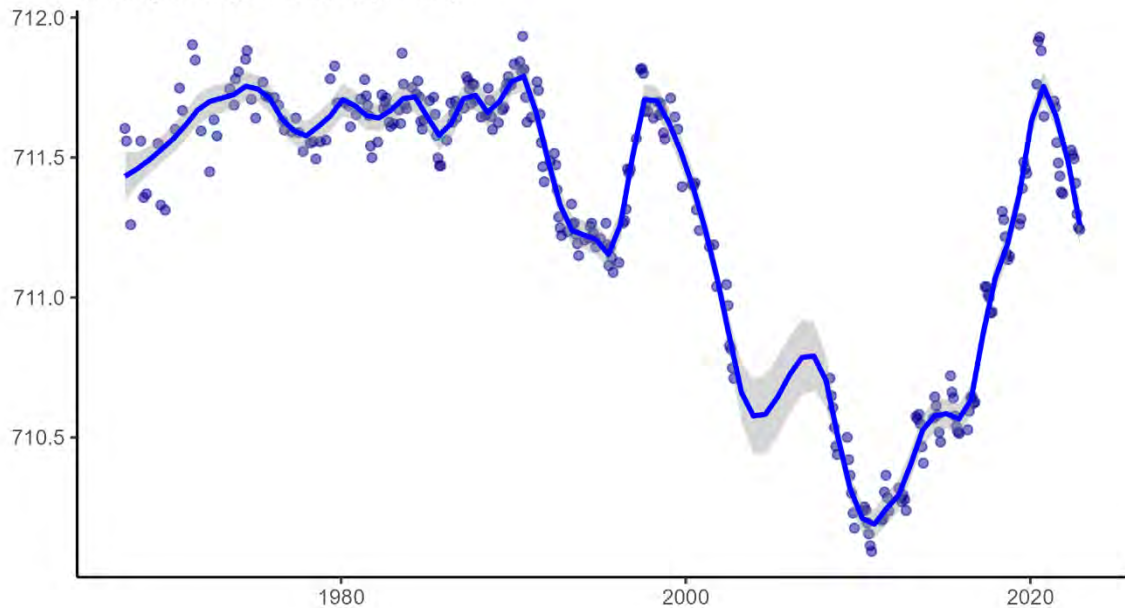
2017





Lake Water Levels in EINP

Water level of Astotin Lake
Monthly average elevation (m ASL)



Oster Lake



Goose Lake





History of Beavers in EINP

- Extirpated from the Beaver Hills by 1890
- Unsuccessful reintroduction to EINP attempted in 1907
- Successful reintroduction to EINP in 1941


C.D. 88

CANADIAN PACIFIC TELEGRAPHS

CLASS OF SERVICE	
Full Rate	
Day Letter	
Night Message	
Night Letter	

Please mark an X opposite the class of service desired.

MONEY TRANSFERRED BY
TELEGRAPH TO PRINCIPAL
POINTS IN CANADA AND
THE UNITED STATES



CABLE CONNECTIONS TO
ALL PARTS OF THE
WORLD
RADIOGRAMS TO SHIPS

TIME FILED
CHECK

W. D. NEIL, General Manager of Communications, Montreal

Send the following message, subject to the conditions on the back thereof, which are hereby agreed to.

Confirmation

Banff, Alberta,
September 13, 1941

SUPERINTENDENT?
ELK ISLAND PARK
LAPOFF ALBERTA.

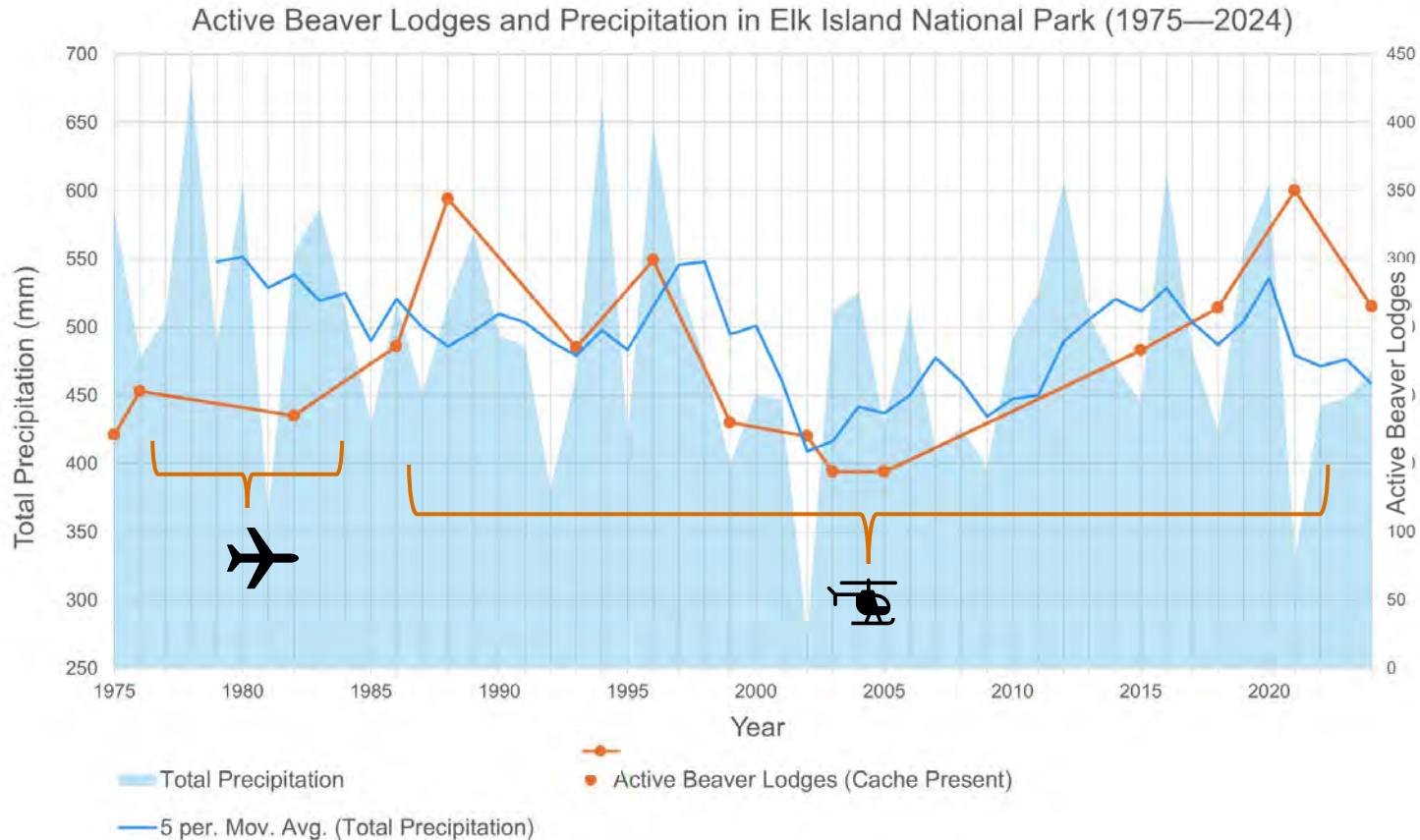
BEAVER SHIPPED C.P. EXPRESS TRAIN NUMBER FOUR TODAY
PLEASE MEET TRAIN STOP RETURN CRATE

SUPERINTENDENT

CHG. Supt Office.

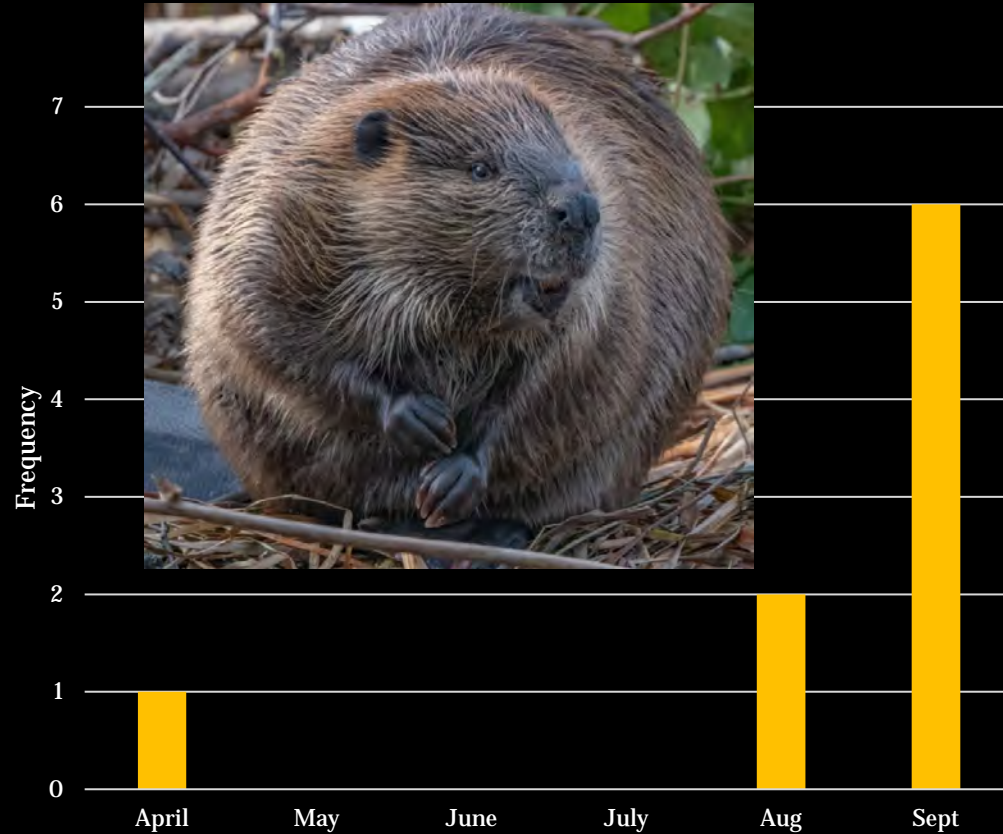


Aerial Survey: Historical Results





Predation and Scavenging on Beaver by Month





Visitation

2022 Visitor Survey -
15% of visitors are
boating on Astotin
Lake.

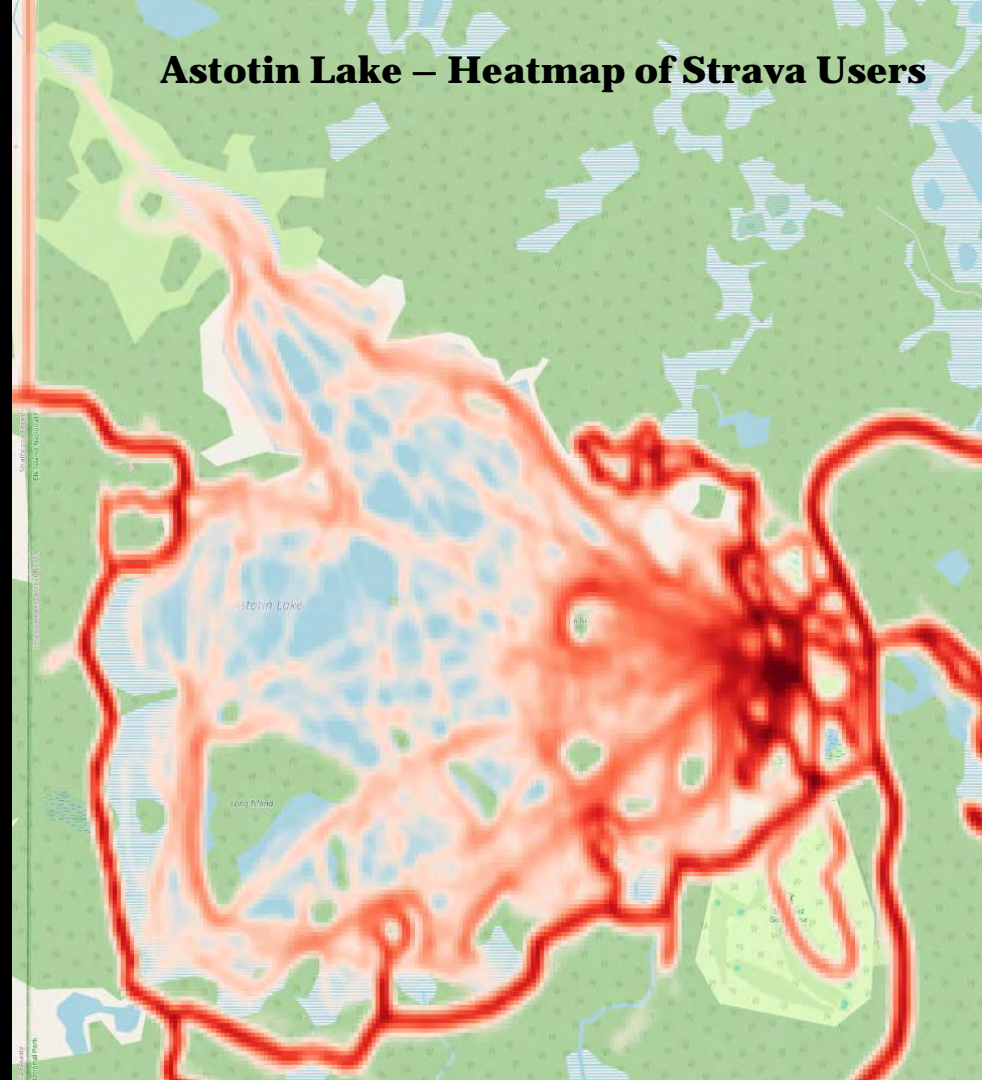
Average summer
visitation is 132,738.

Approximately 19,910
visitors boating on
Astotin Lake.

Impacts to shorebird
and waterfowl nesting

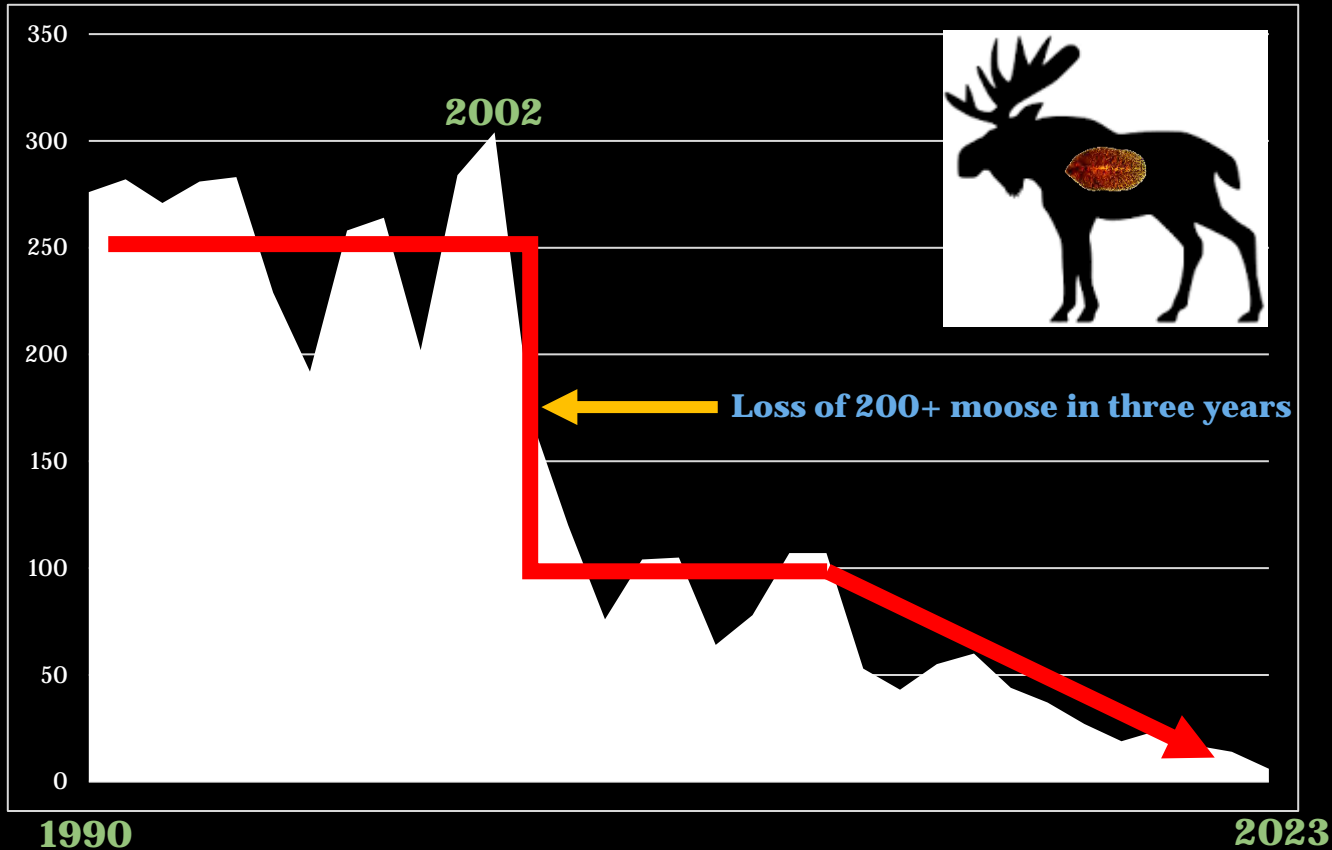
Potential for
introductions of AIS

Astotin Lake – Heatmap of Strava Users





Moose Population Trend – North Block





Algae

Blue-green algal bloom intensity, length and frequency has been consistently high since 2022 in many lakes throughout EINP

Edmonton

Pace of blue-green algae blooms in Alberta lakes so far 'a little bit concerning,' researcher says

Recent precipitation, hot weather make ideal growing conditions for cyanobacteria



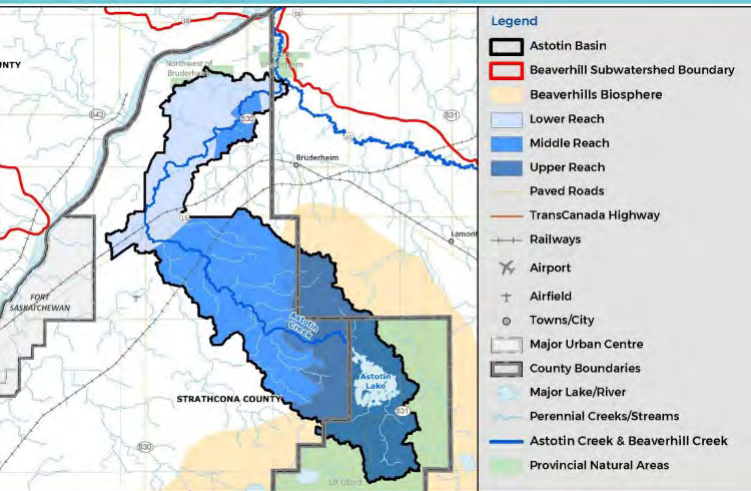
Thandiwe Konguavi · CBC News · Posted: Jun 29, 2023 2:00 AM MDT | Last Updated: June 29, 2023



Blue-green algae blooms at Astotin Lake in Elk Island National Park on June 12, 2023. (Wallis Snowdon/CBC)



Astotin Creek and Watershed Connectivity





Wetland Drainage

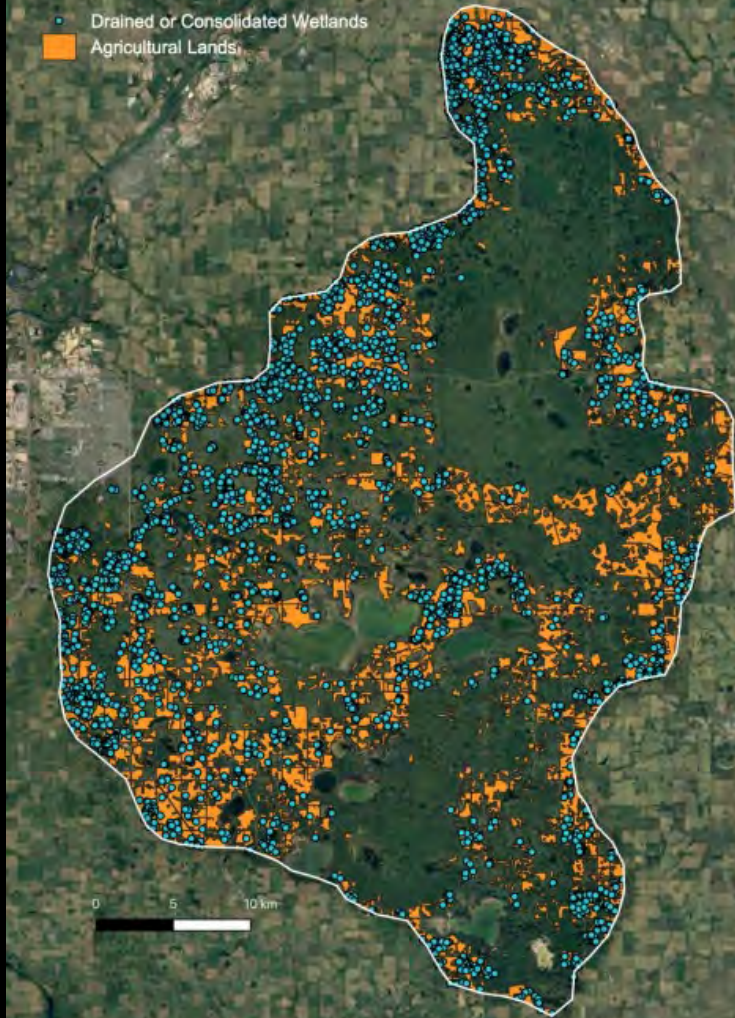
Just over 500 km² of wetland in the Biosphere

Approximately 3700 of the wetlands in the Biosphere have been drained or consolidated

Most are associated with agricultural lands

Impacts to water retention and lake levels within the region

● Drained or Consolidated Wetlands
■ Agricultural Lands





Active Management

Area closures of breeding bird habitat

Monitoring for AIS (eDNA, quagga mussels, BioBlitz)

Education programs and CD3 machine

Liver Fluke CoRe Program to treat cervids and burn high risk habitats

Rehabilitation of Astotin Creek and CP Rail Site

Wetland Restoration





Lake Sediment Coring Project

Sample sediment cores across the Biosphere

Develop a profile over time for:

- Water balance
- Ground to surface water interactions
- Water chemistry
- Floral and faunal assemblages
- Fecal markers
- Algae
- Pollutants
- Fire history

Correlate this information with:

- Tree ring data
- Archival land use information
- Weather/climate records

Integrate our understanding of recreational, social, and economic impacts

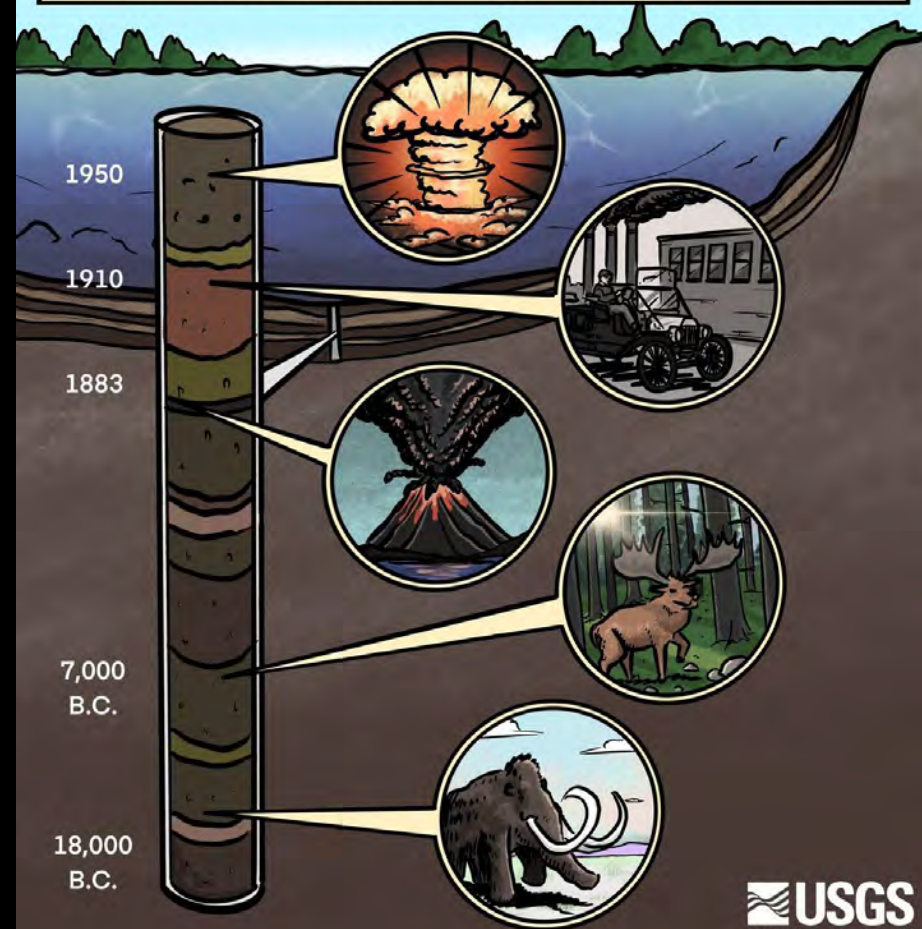




Lake Sediment Coring Project

- What should the threshold values be for phosphorus, chlorophyll a, nitrogen?
- How did human activities change the regional hydrology?
- How did changes to the hydrology affect regional biodiversity, and how did regional biodiversity affect hydrology and lake chemistry?
- Are there long-term hydrological cycles?
- How has climate impacted regional hydrological cycles?
- What aspects (e.g., surface versus ground water) of hydrology are being impacted by land use and climate?

Sediment cores provide snapshots of earth surface conditions through time. Changes in the environment around the water alter the particulate matter that settles to the bottom.





Lake Sediment Coring Project

Develop a more complex understanding of causes of lake level decline, water chemistry changes, algal bloom history, and changes to biodiversity.

Which would allow for forecasting and would support mitigation such as:

- Algae abatement
- Wetland restoration
- Water use allocation and planning
- Species conservation and reintroduction programs
- Climate resiliency programs





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Questions

