

Small Lakes of the Stony Plain Region: Preliminary Water Quality Results from the 2021 Summer Surveys Presented by David Trew



For more information on this project
please go to the MLMA web site

- Map: Lakes of the Carvel Pitted Delta
- Project Outline for 2021
- Briefing to Parkland County CSC May 2021
- Photo slideshow of lakes – beautiful!
- Plus this presentation - MLMA AGM 2021

Key messages

- ◆ Many beautiful small lakes....a unique lake district
- ◆ Most lakes have limited development, with intact shorelines and upland areas
- ◆ Preliminary observations indicate a wide range of depths
- ◆ Limited water quality data, but diverse conditions observed
- ◆ Limited aquatic ecosystem health data
- ◆ Landowners are conscientious and helpful - consider future stewardship opportunities

Technical topics - for future discussion

- 1) Expand water quality knowledge
- 2) Expand phytoplankton, zooplankton and zoobenthos knowledge
- 3) Investigate invasive species, and fecal contamination
- 4) Map macrophytes – emergent and submergent
- 5) Work with GOA to update sportfish potential
- 6) Assess overall aquatic ecosystem health
- 7) Define lake watershed boundaries
- 8) Conduct bathymetric mapping to obtain volumes, mean/max depths, water balances

Technical topics - for future discussion

- 9) Riparian zone assessment
 - 10) Land cover assessment in lake watersheds
 - 11) Multivariate statistical analyses to identify and map regional lake characteristics
 - 12) Further evaluate the groundwater surface water connection
 - 13) Further evaluate sediment geochemistry
- + Policy/Planning Topics?
- + Conservation/Stewardship Topics?

David Trew - Background

- ◆ Born and raised in Port Hope, Ontario
- ◆ Education: University of Guelph
- ◆ Dept. of Lands and Forests, Ontario
- ◆ Strathclyde University, Glasgow
- ◆ Scottish Marine Biological Association, Oban
- ◆ Fisheries Branch, Alberta Lands and Forests
- ◆ Water Sciences Branch, AENV
- ◆ North Saskatchewan Watershed Alliance
- ◆ Lived in Stony Plain/Spruce Grove since 1976

Many collaborators – thank you!

◆ Alberta Lake Management Society

- Brad Peter, Caleb Sinn

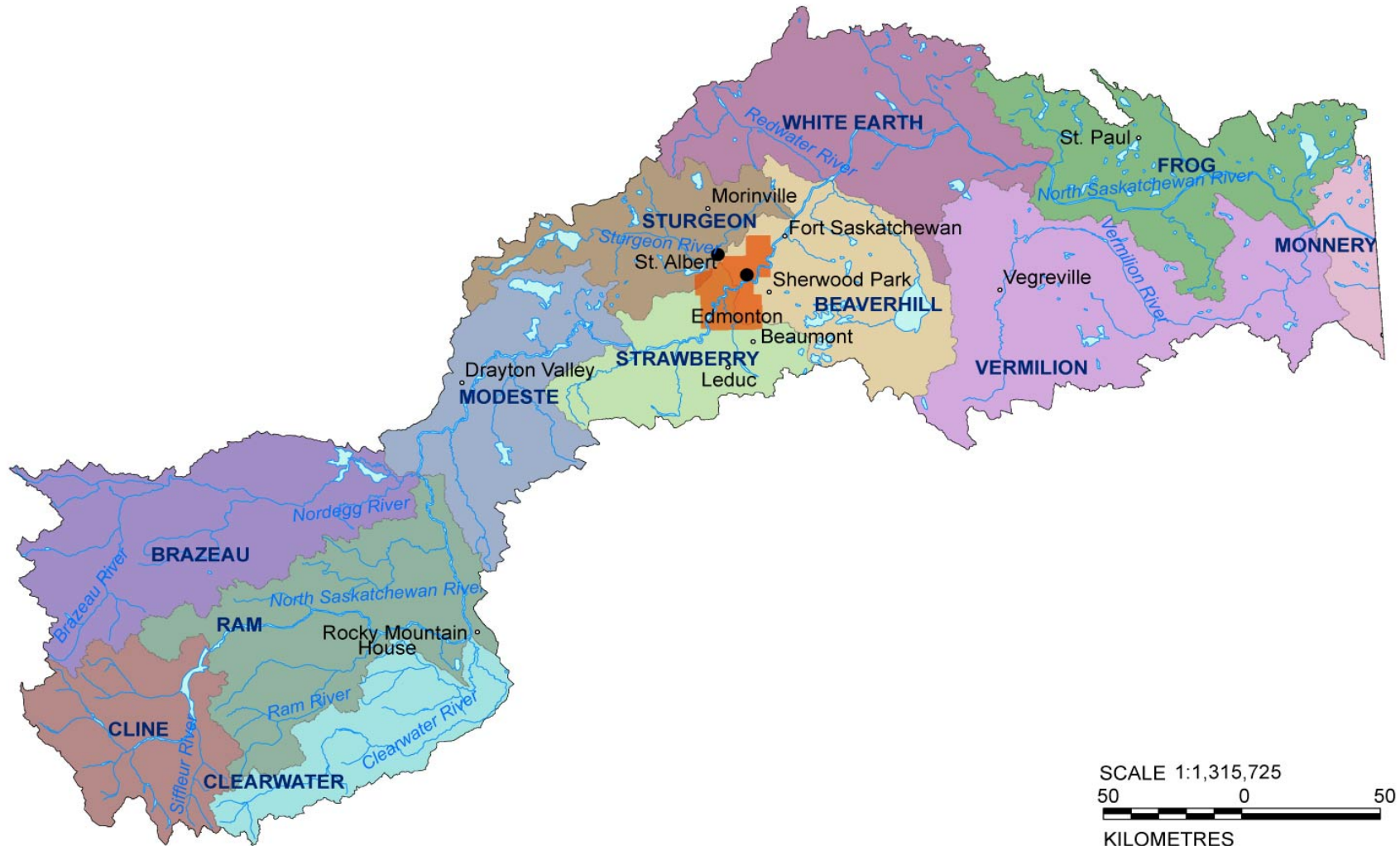
◆ University of Alberta

- Dr. Dan Alessi, Dr. Konstantin Von Gunten, Dr. Brian Smeardon, Jenna Maccagno

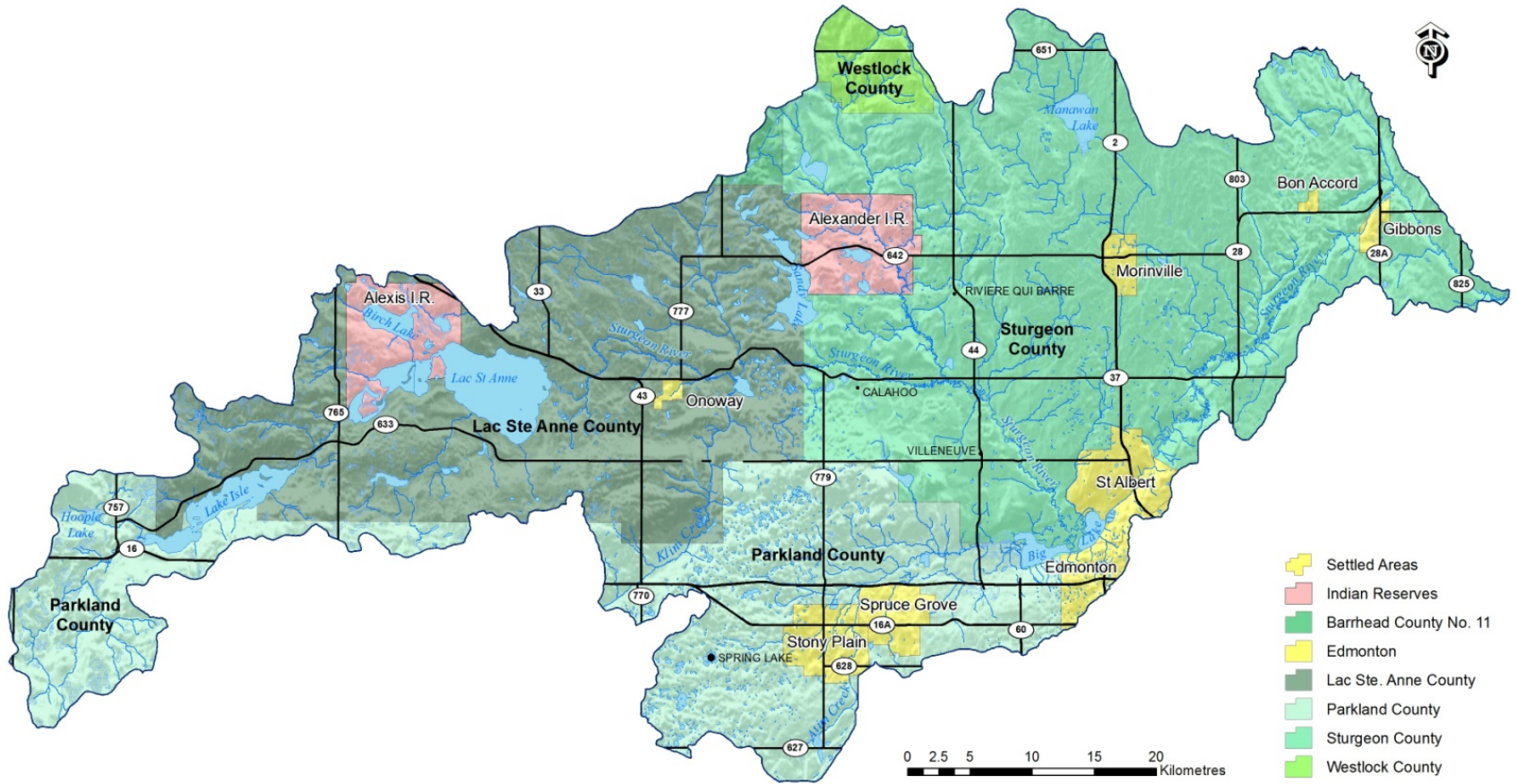
◆ Field Volunteers, Data Assistance

- **2020**: Alec MacDonald, Walt Neilson, Jennifer Regier, Eric Neilson, Mike Myshak, Alex Oiffer
- **2021**: Dale Loosemore, Tyler Shyry, Walt Neilson, Pauline Molnar, Dr. Steve Craik, Alvin Steinke, MaryEllen Shain

The North Saskatchewan River Basin: Twelve Subwatersheds

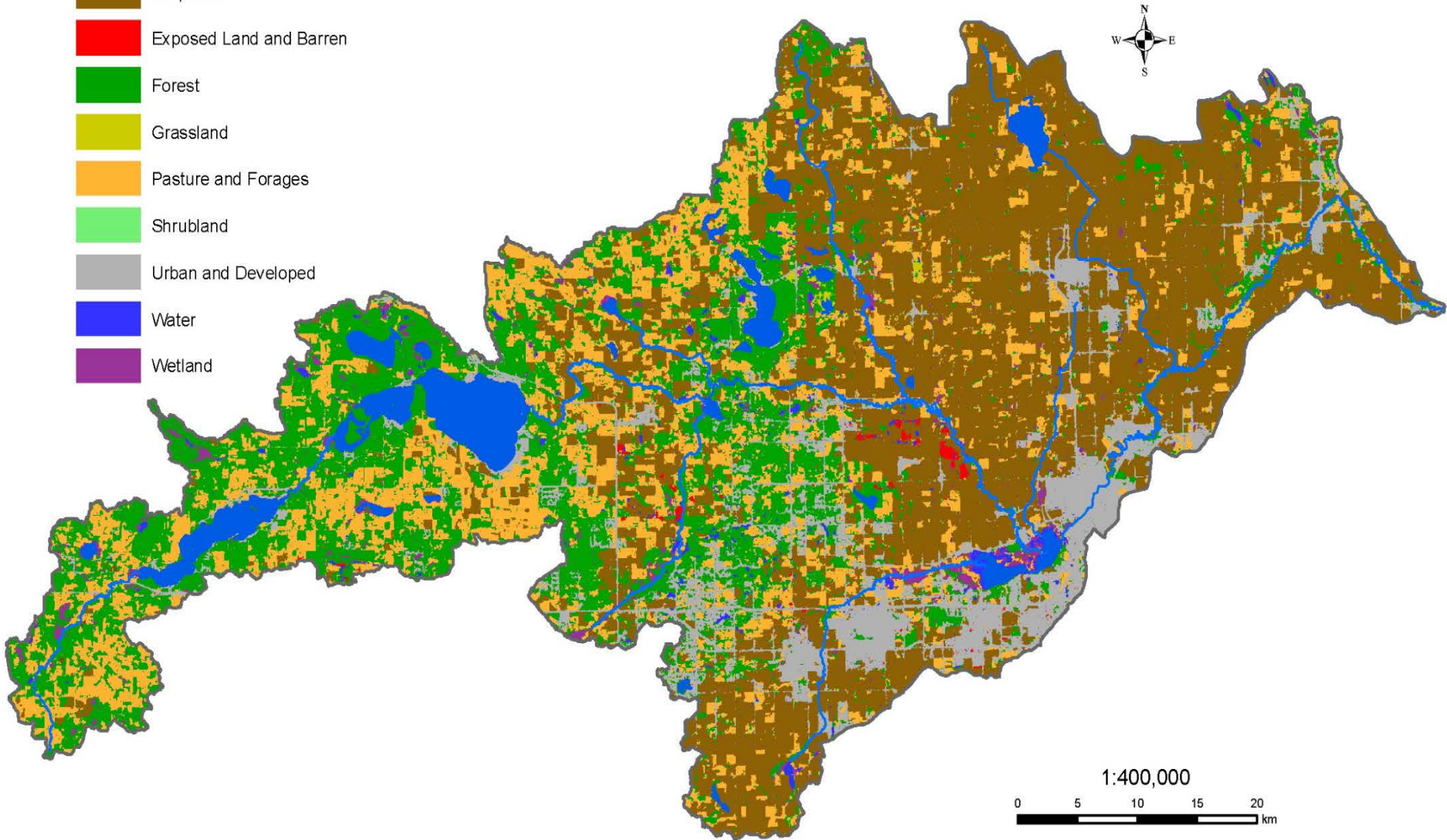


Sturgeon River Watershed: Municipalities



Sturgeon River Watershed: Land Cover

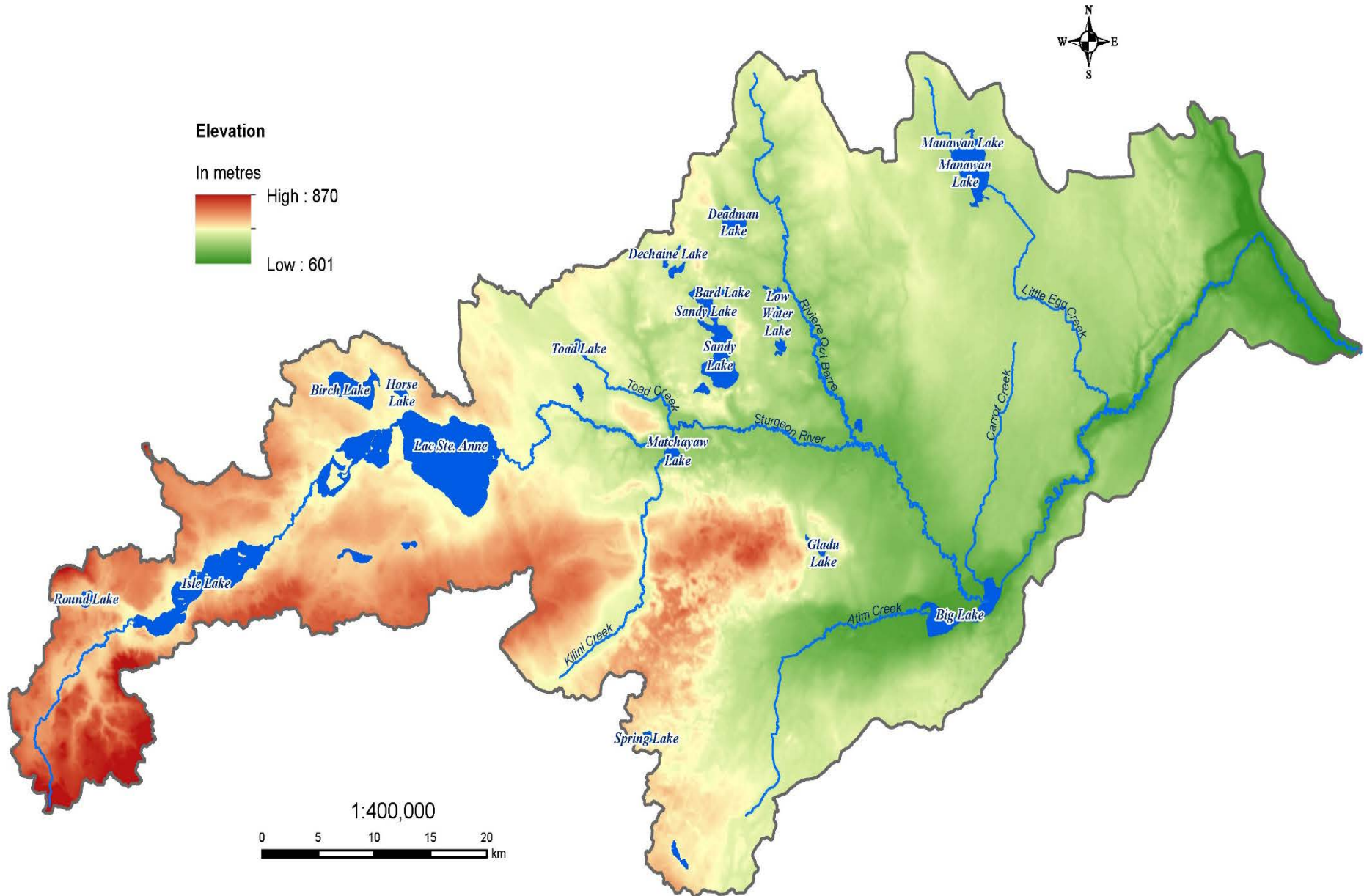
Land Cover Class



1:400,000



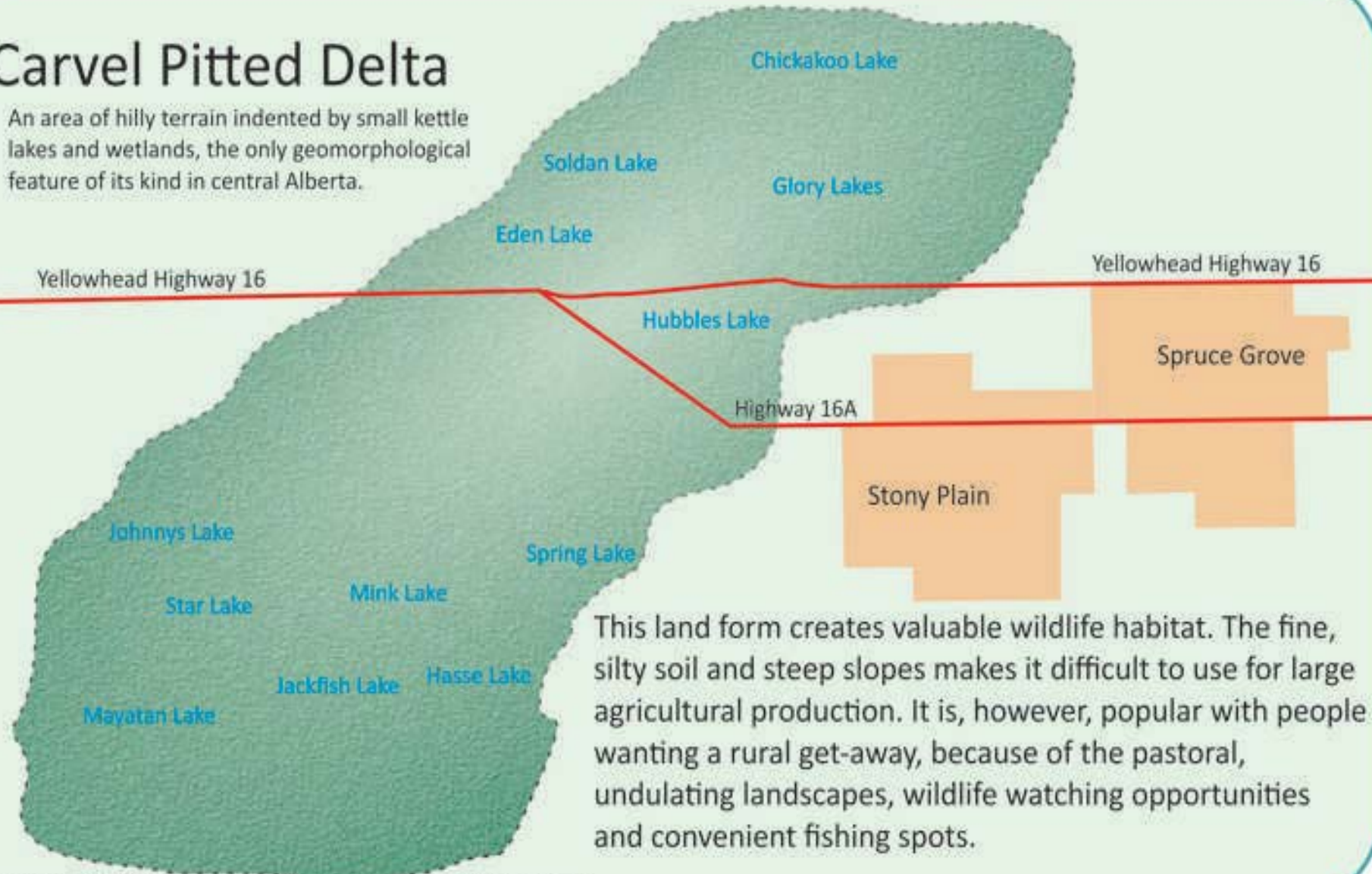
Sturgeon River Watershed: Topography



The Carvel Pitted Delta

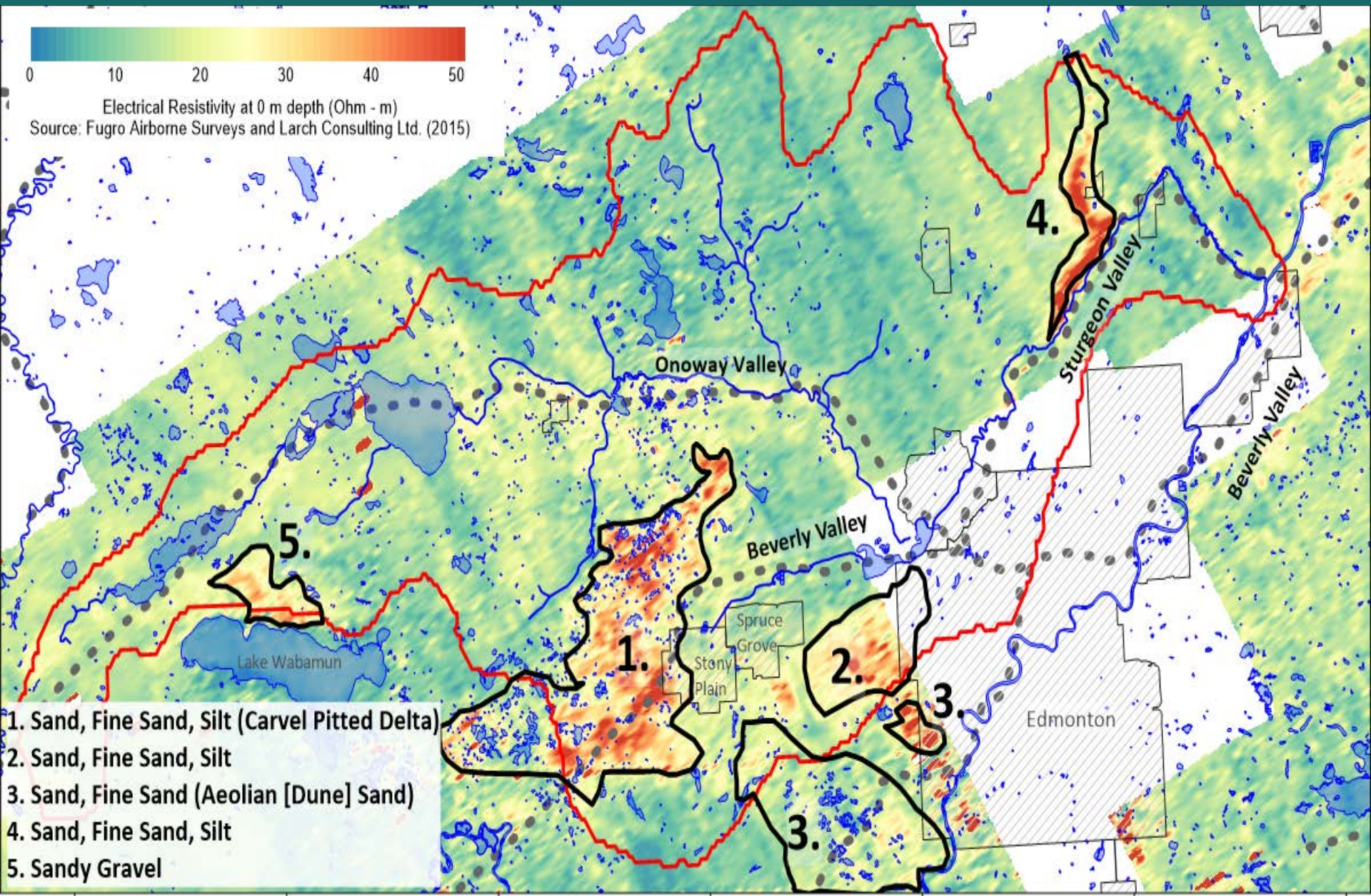
Carvel Pitted Delta

An area of hilly terrain indented by small kettle lakes and wetlands, the only geomorphological feature of its kind in central Alberta.



This land form creates valuable wildlife habitat. The fine, silty soil and steep slopes makes it difficult to use for large agricultural production. It is, however, popular with people wanting a rural get-away, because of the pastoral, undulating landscapes, wildlife watching opportunities and convenient fishing spots.

The Carvel Pitted Delta



Note on hydrological and geological boundaries

- ◆ Study lakes are actually located in both Sturgeon and Modeste sub-watersheds
- ◆ The Carvel Pitted Delta and lands up in the "Glory Hills" may have slightly differing pre-glacial and post-glacial histories.

The Carvel Pitted Delta

More information on this post-glacial landform and its unique hydrogeology can be found in the following NSW technical report:

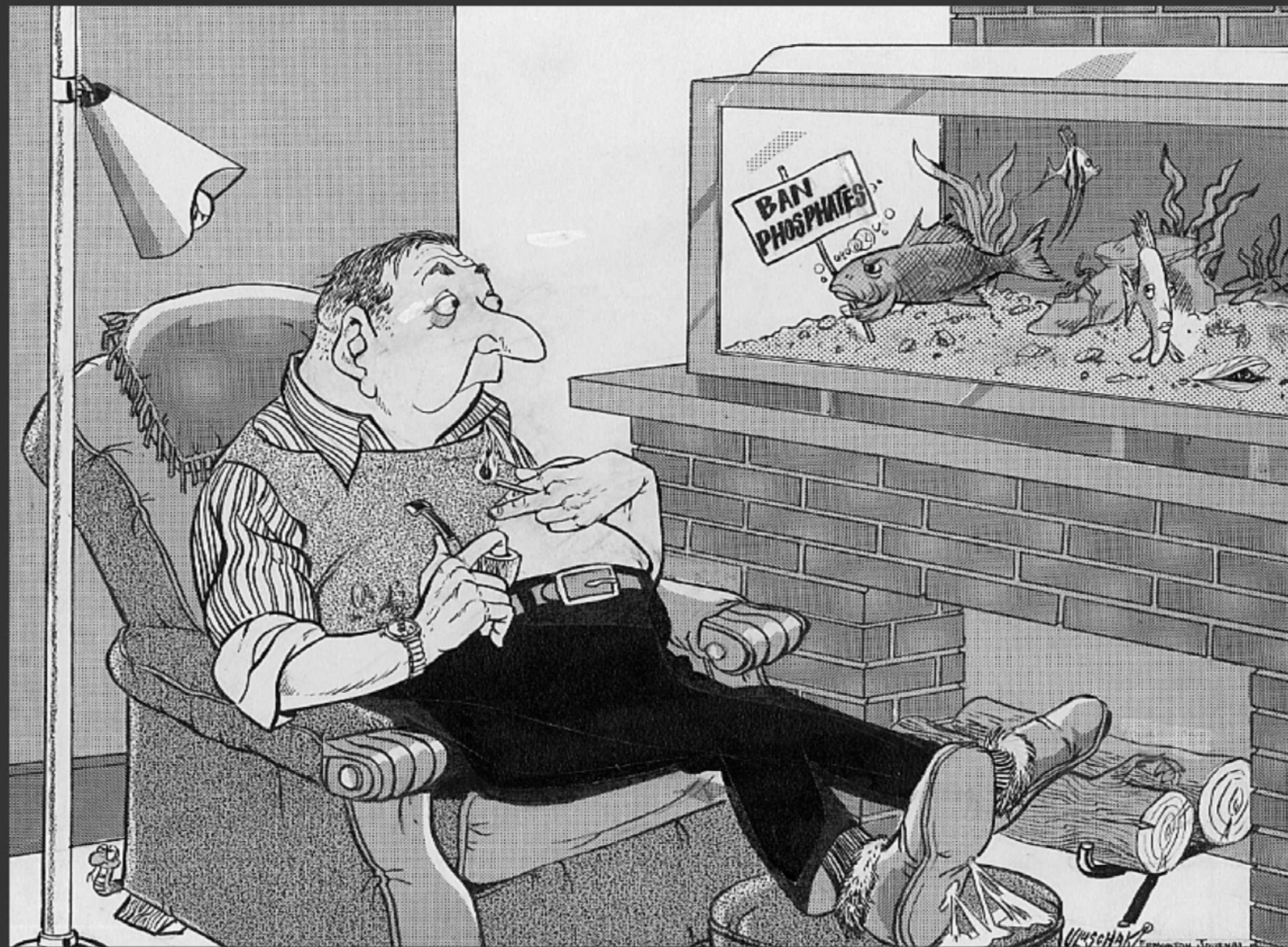
“Summary of Groundwater Conditions in the Sturgeon River Basin” (Alex Oiffer, 2019)

<https://www.nswa.ab.ca/resource/groundwater-conditions-sturgeon-river-basin/>

Alberta Lakes

Alberta lakes have been the subject of much scientific study over the past 70 years. Most of the research has been conducted to support fisheries and water quality management

The following editorial cartoons were published by Ed Ulaschuk (Edmonton Journal) in 1970, and illustrate that lakes and water pollution have been common topics of interest in Alberta for some time!





"We carry the latest fishing equipment... Geiger counters, mercury content meters, phosphate level indicators..."

THE FISHES
OF
ALBERTA

PAETZ
NELSON

FIRST EDITION

The Baptiste Lake Study 1976-79



- ◆ GOA needed a "model" to predict effects of watershed development
- ◆ Crisis at lake: too much development already
- ◆ Intensive study of lake and watershed nutrient sources, phytoplankton ecology, hydrology, paleolimnology

The Baptiste Lake Study Technical Report



Alberta
ENVIRONMENT

Reprinted from

Réimpression du

Canadian
Journal
of Fisheries
and Aquatic
Sciences

Journal
canadien
des sciences
halieutiques
et aquatiques

**Evaluation of the phosphorus–chlorophyll relationship for lakes
off the Precambrian Shield in western Canada**

E. E. PREPAS AND D. O. TREW

Volume 40 • Number 1 • 1983

27–35

Canada



Government of Canada
Fisheries and Oceans

Gouvernement du Canada
Pêches et Océans

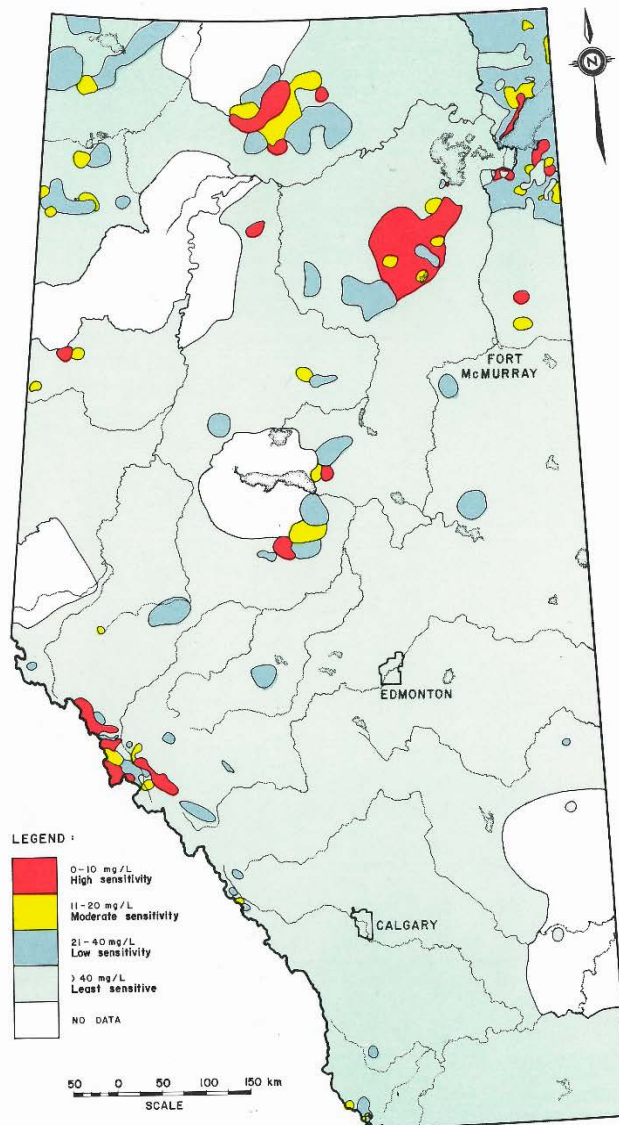
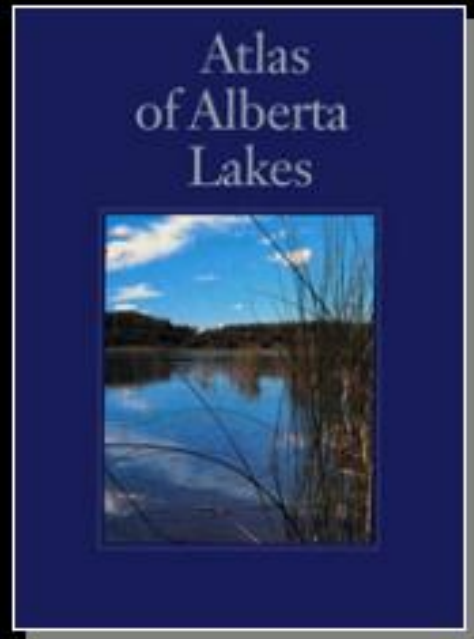


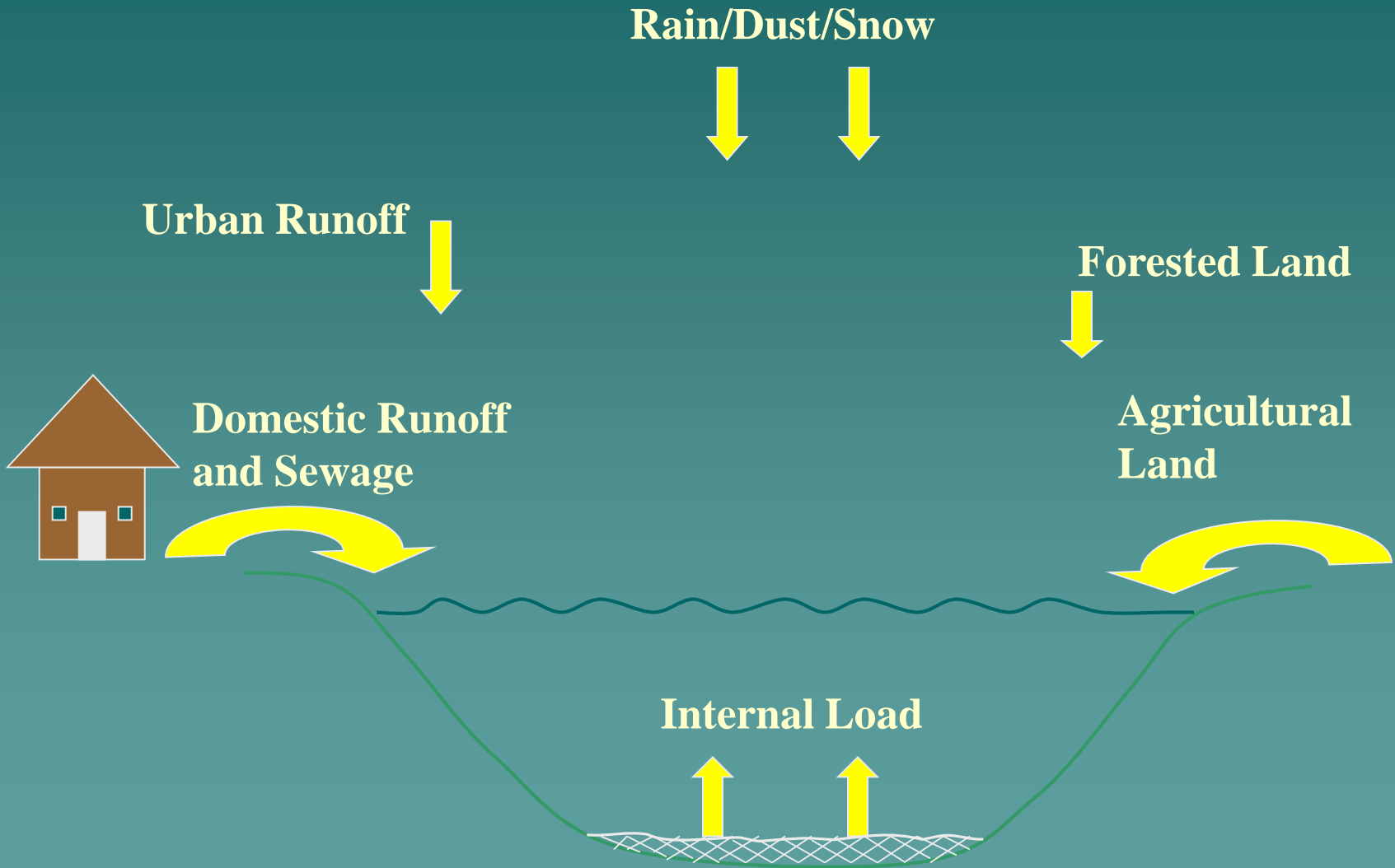
Figure 2 Sensitivity of Alberta lakes to acidification as determined by alkalinity values.



Algal growth in Alberta lakes is influenced by nutrient supply (phosphorus, nitrogen)



Phosphorus Sources - Alberta Lakes









The beginning of collaboration between NSW and MLMA



Integrated Watershed Management Plan for the North Saskatchewan River in Alberta



North Saskatchewan Watershed Alliance

Mayatan Lake State of the Watershed Report



August 2012

Mayatan Lake Watershed Management Plan



July 2016

**Jackfish Lake
State of the Watershed Report**



April 2016

**Isle Lake and Lac Ste Anne
State of the Watershed Report**



May 2017

**Hubbles Lake
State of the Watershed Report**



December 2018

Retirement - 2018



The Carvel lakes project started with an introduction to “Lake Idano” in 2018...

















Satellite and drone images confirmed
that the lake was also fed by three
upstream “fens”















“Lake Idano”

- ◆ The landowner expressed interest in the protection of this unique, unnamed lake
- ◆ Initial inspections of the lake and its watershed were carried out in **summer 2018**
- ◆ No previous water quality data were available
- ◆ Preliminary lake sampling was conducted in **August 2019**
 - The unique clarity of the lake and its extremely low nutrient/algal concentrations prompted much further discussion during winter **2019-20**
 - The lake had a continuous outflow, which suggested a potential groundwater influence

Question:

Are there other similar lakes in the Stony
Plain Region?

Information Review – Winter 2020

- ◆ The total number of small lakes in the Stony Plain region was estimated from 1:50,000 NTS maps
 - 26 named lakes were identified on the maps
 - 65+ unnamed waterbodies were also identified
- ◆ Preliminary review of historic water quality data
 - Data for 7 named lakes were published by Prepas and Trew (CJFAS 1983)
 - Some of these 7 lakes were also investigated by U. of A. graduate students in the mid-late 1980s
 - Five named lakes have been sampled by ALMS in recent years
 - 14 named lakes and 65+ unnamed waterbodies may not have any published water quality or hydrological information

Named Lakes (26)

- ◆ Atim
- ◆ Bell
- ◆ Byers
- ◆ Cameron
- ◆ Chickakoo*
- ◆ Cottage
- ◆ Eden*
- ◆ Gerharts*
- ◆ Gladu
- ◆ Glory
- ◆ Hasse*
- ◆ Hubbles*
- ◆ Jackfish*
- ◆ Johnny's
- ◆ Kettle
- ◆ Longhurst
- ◆ Mayatan*
- ◆ Mere
- ◆ Little Mere
- ◆ Mink*
- ◆ Muir*
- ◆ Sauer*
- ◆ Soldan
- ◆ Spring*
- ◆ Star*
- ◆ Whale

*(lakes with various/limited WQ data)

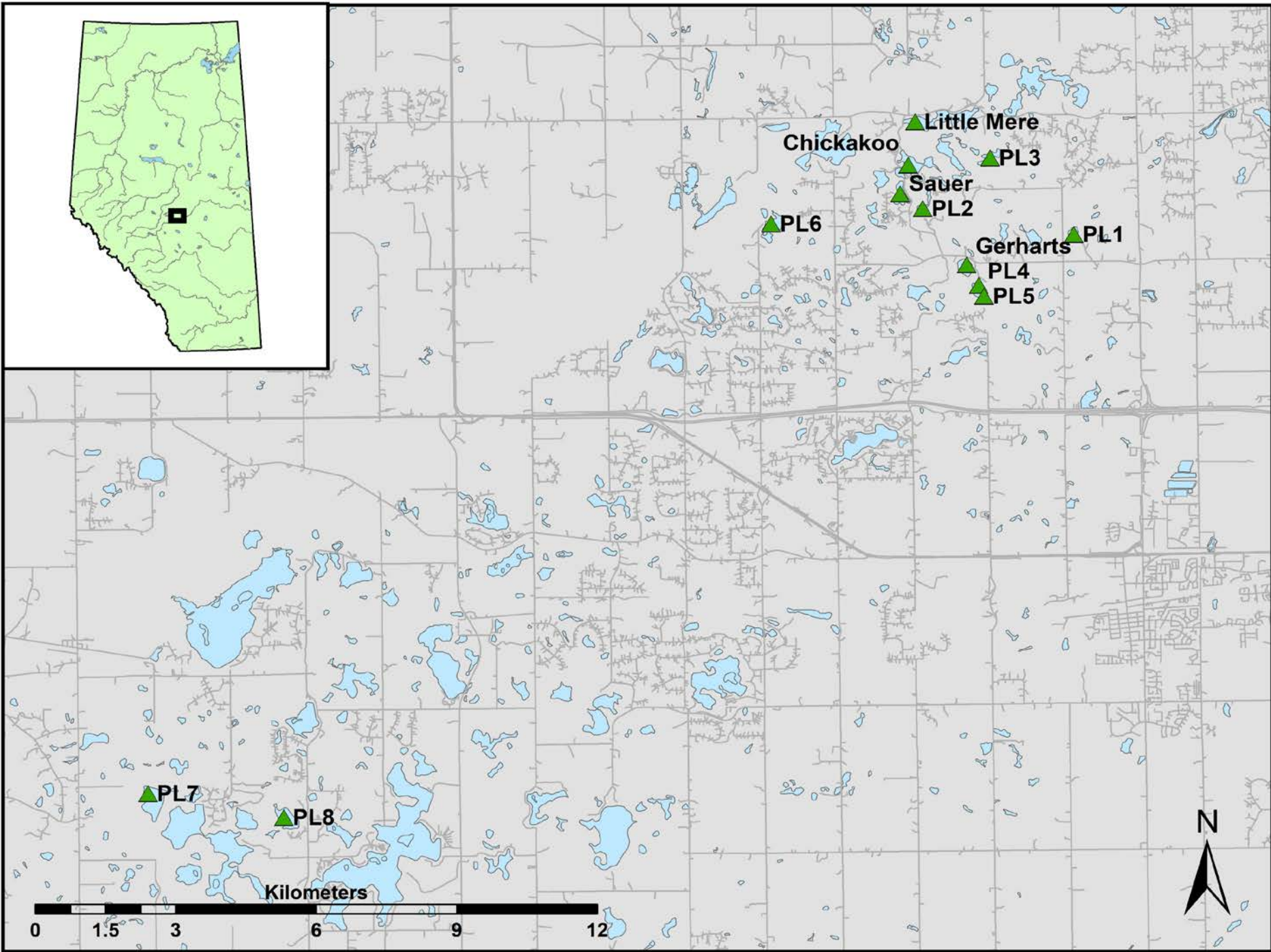
The 2020 Project: 12 Lakes

Named Lakes

- ◆ Gerharts Lake
- ◆ Little Mere Lake
- ◆ Chickakoo Lake
- ◆ Sauer Lake

Unnamed Lakes

- ◆ PL1 (Lake Idano)
- ◆ PL2 (Pete's Pond)
- ◆ PL3 (Troudt Lake)
- ◆ PL4 (Roi Lake Mid)
- ◆ PL5 (Roi Lake South)
- ◆ PL6 (Kinsey Cove)
- ◆ PL7 (McMorran Lake)
- ◆ PL8 (Neilson Lake)



The 2020 Sampling Team:

Alec MacDonald

Dr. Konstantin Von Gunten

Caleb Sinn

David Trew





SAUER
LAKE

INTEX

LAKE
SAUER











Photos of the 2020 study lakes

PL1 Idano



PL2 Pete's Pond



PL3 Troudt Lake



Gerharts Lake





PL4 Roi Lake Middle



PL5 Roi Lake South



PL6 Kinsey Cove



Little Mere Lake (west basin)



Sauer Lake



Chickakoo Lake



New Scientific Paper (2021)

*Natural phosphorus controls in
small lakes in central Alberta,
Canada (2021)*

Konstanin Von Gunten, David Trew, Brian
Smerdon, and Daniel S. Alessi

The 2021 Winter Sampling Team:

Walt Neilson

Dale Loosemore

Tyler Shyry

Alvin Steinke

David Trew































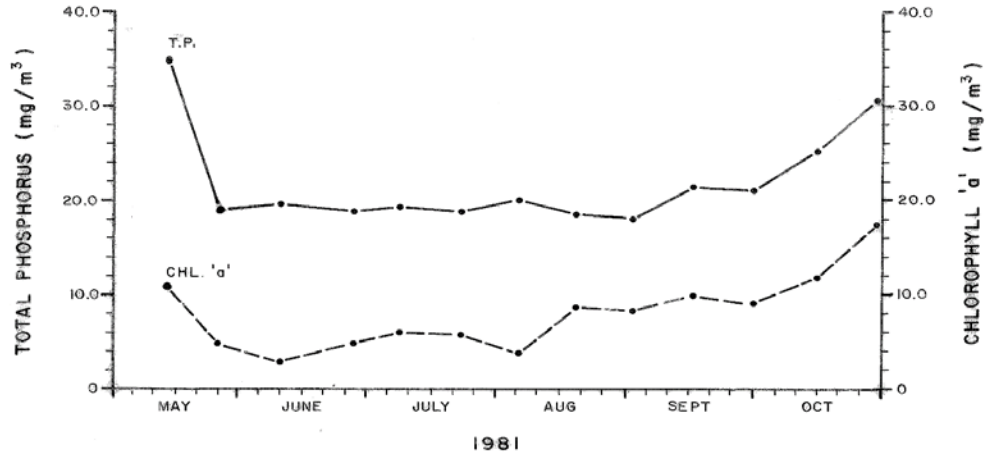
The 2021 Project

“The Overdue Overview”

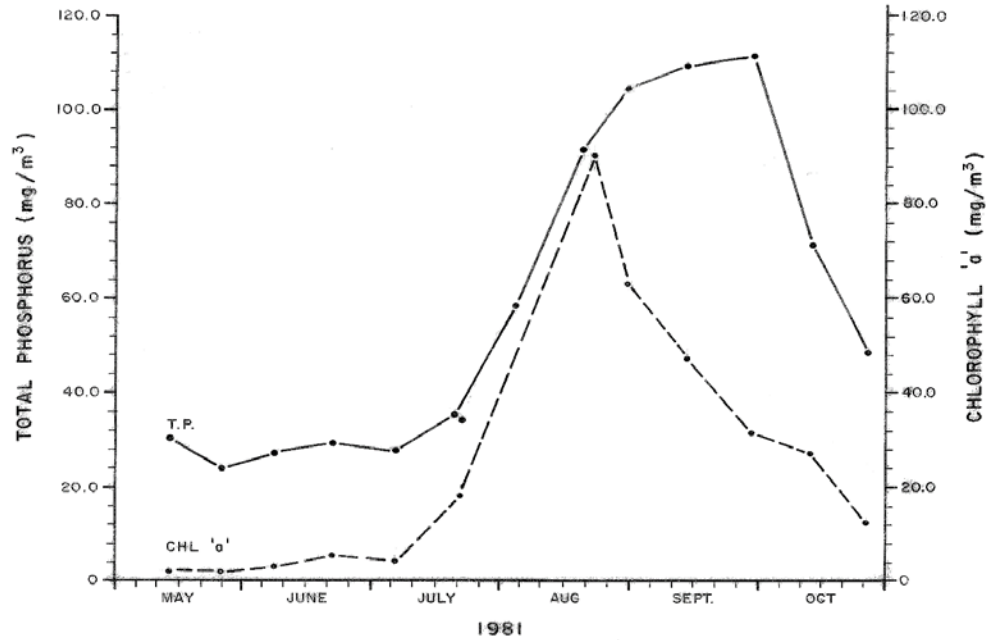
- ◆ Late winter [DO] surveys conducted on 19 lakes
- ◆ Late summer surveys conducted on 44 lakes (including 11 of those sampled in summer 2020)
- ◆ Funding and in-kind support received from
 - Land Stewardship Centre of Canada
 - Alberta Lake Management Society
 - Stony Plain Fish and Game Association
 - Mayatan Lake Management Association
 - North Saskatchewan Watershed Alliance

This synoptic survey was targeted to capture shallow lakes at their peak algal biomass, and deep lakes at their minimum algal biomass - typically in August/September

ETHEL LAKE



TUCKER LAKE



The 2021 Summer Sampling Team:

Walt Neilson

Pauline Molnar

David Trew





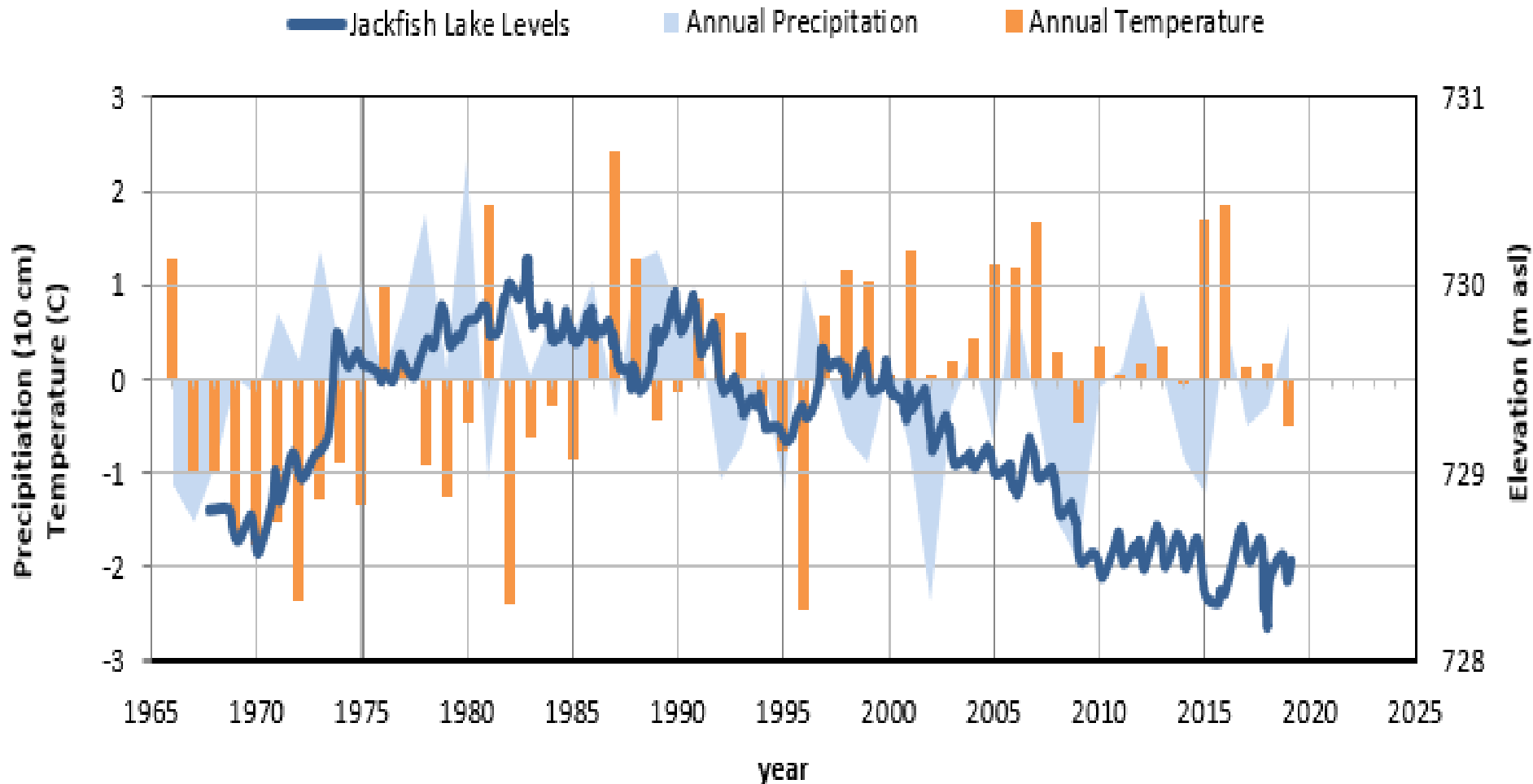


CASCO BAY
MICHIGAN

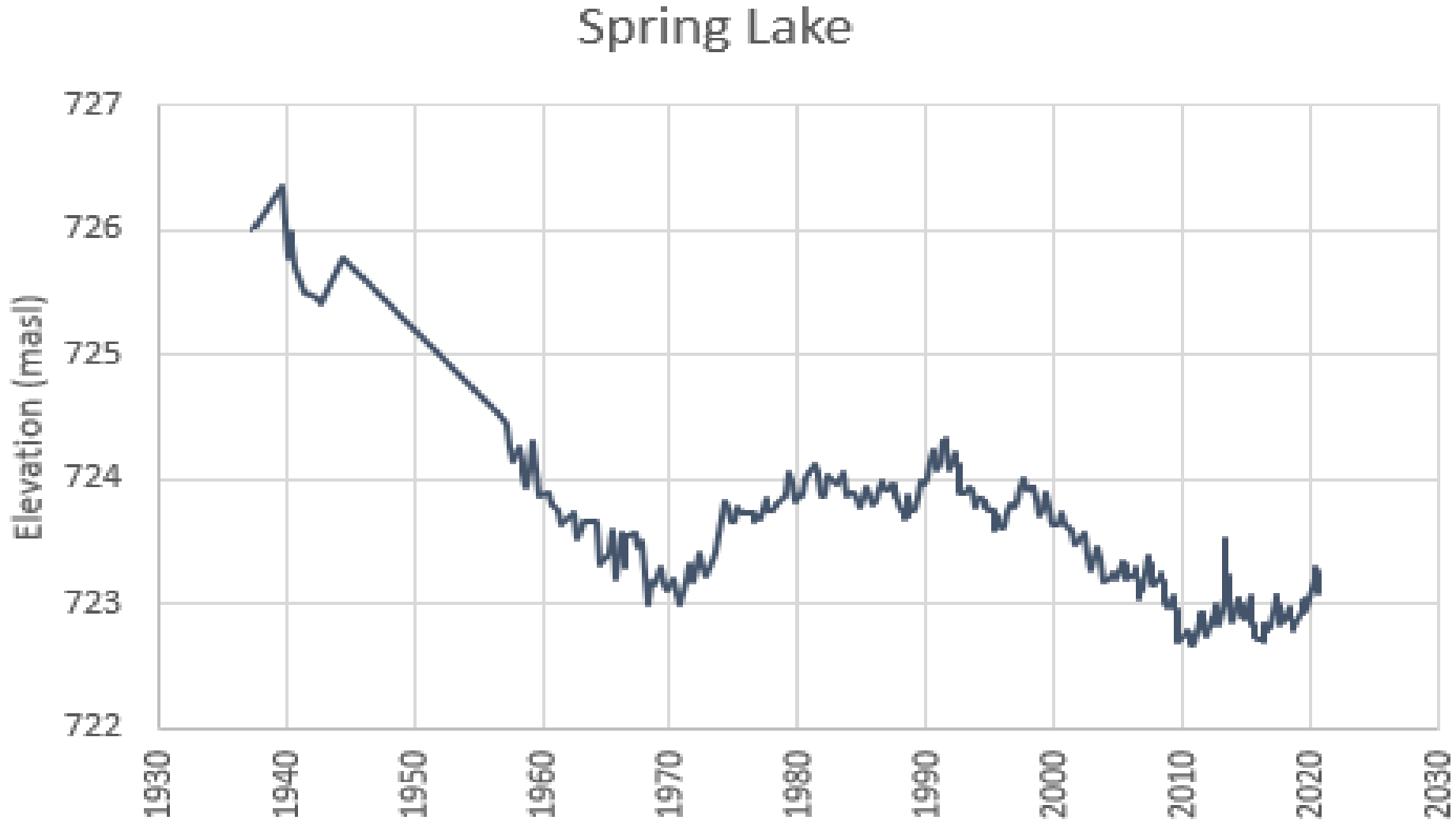
W

ME

Lake Level Trends at Jackfish Lake Compared with Climate Data (1968-2020)



Lake Level Trends at Spring Lake (1937-2020)



Casual observations on lake levels
- note impacts to cattails from
higher water levels in 2021

PL2 2020



PL2 2020



PL2 2021



PL2 2021



Little Mere 2020



Little Mere 2021



Little Mere 2021

Shoreline trees immersed



Little Mere 2021

Shoreline trees immersed



PL18 2020



PL18 2021







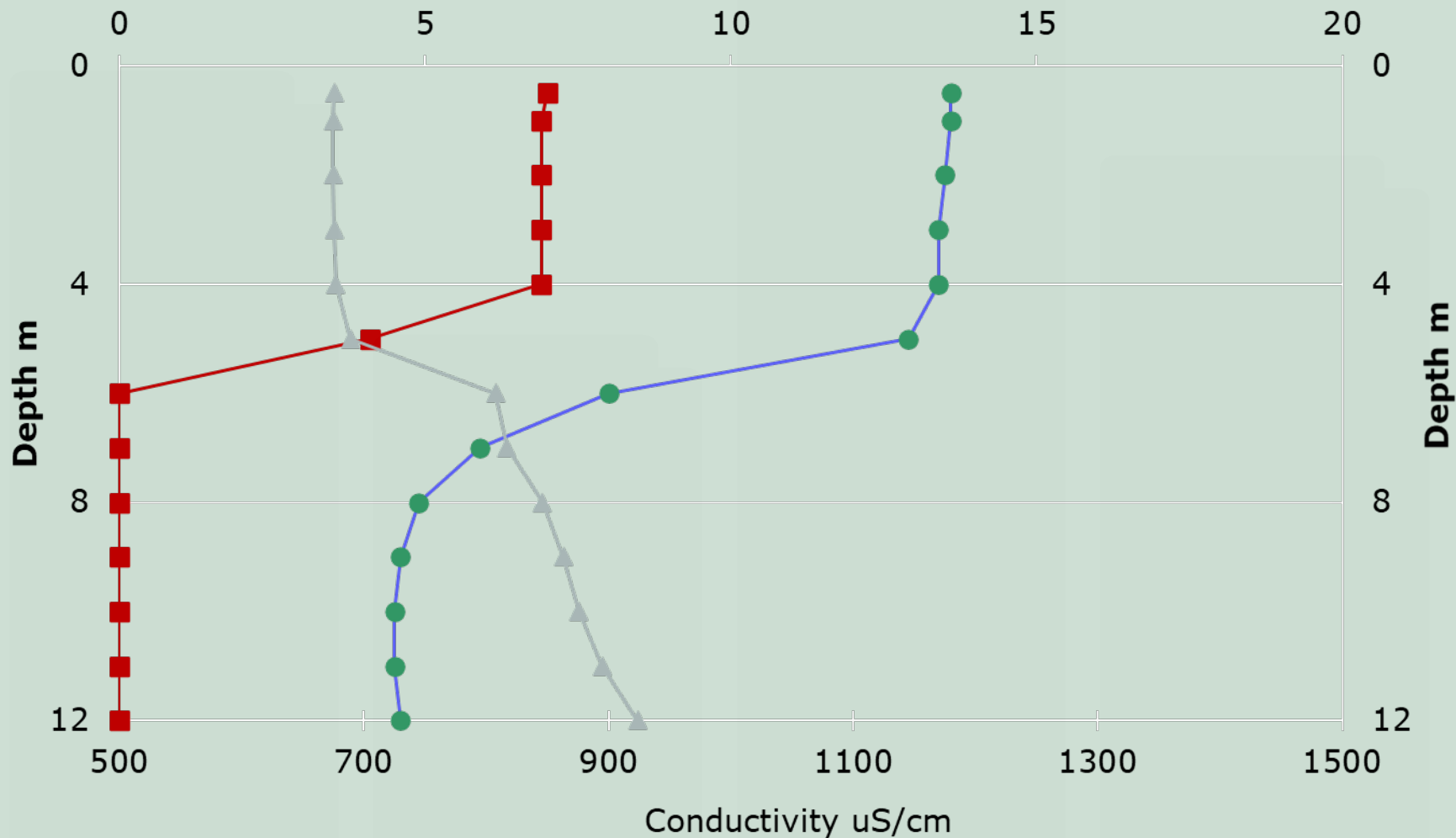
2021 Results

Late summer profile Data:
[DO], Temp, Cond

Special thanks to Dr. Steve Craik for
preparing the graphs

PL1 (Idano) Lake Profile (max depth = 12.1 m)

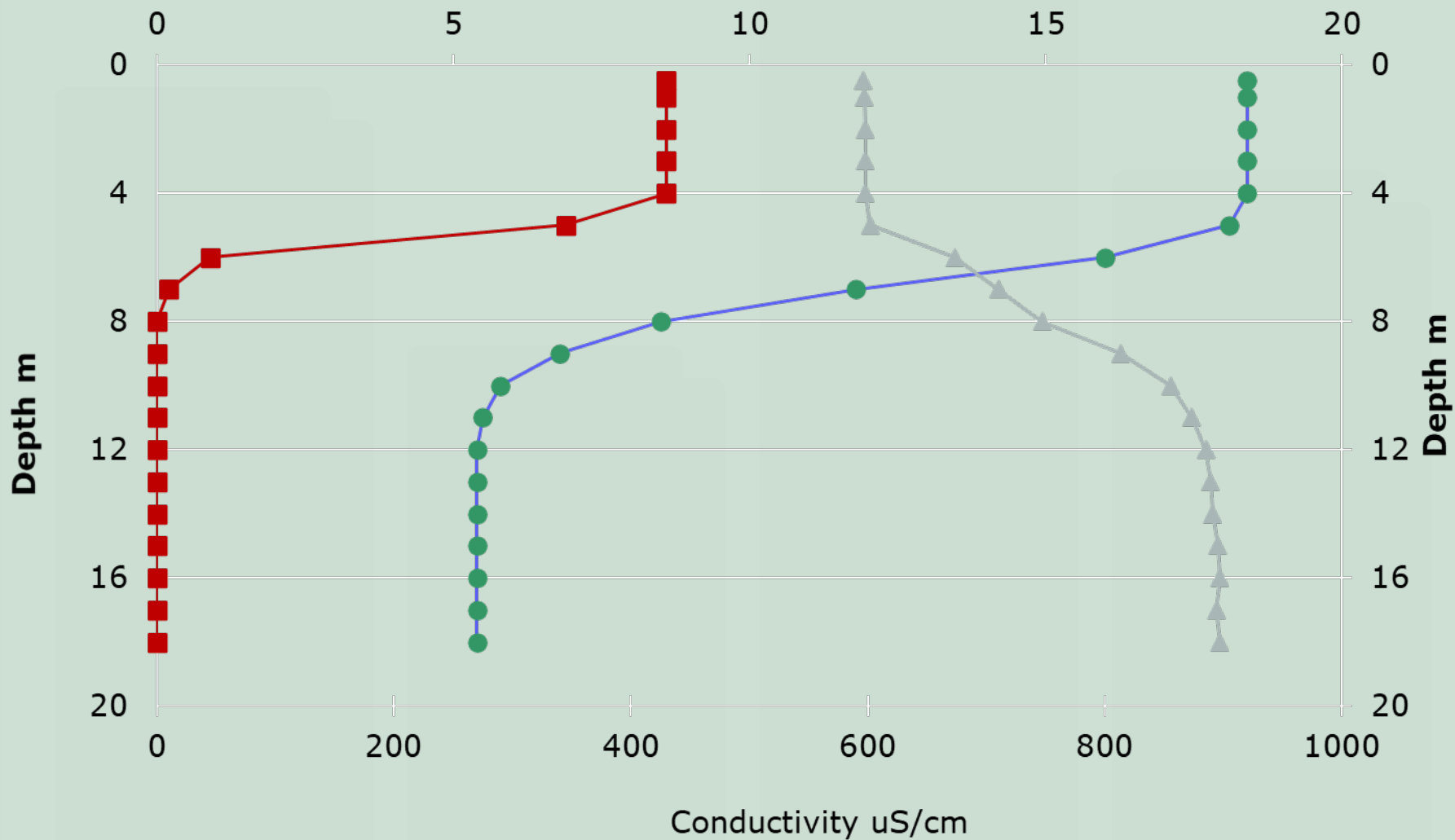
T °C, DO mg/L



● Temp ■ DO ▲ Cond

Gerharts Lake Profile (max depth = 18.2 m)

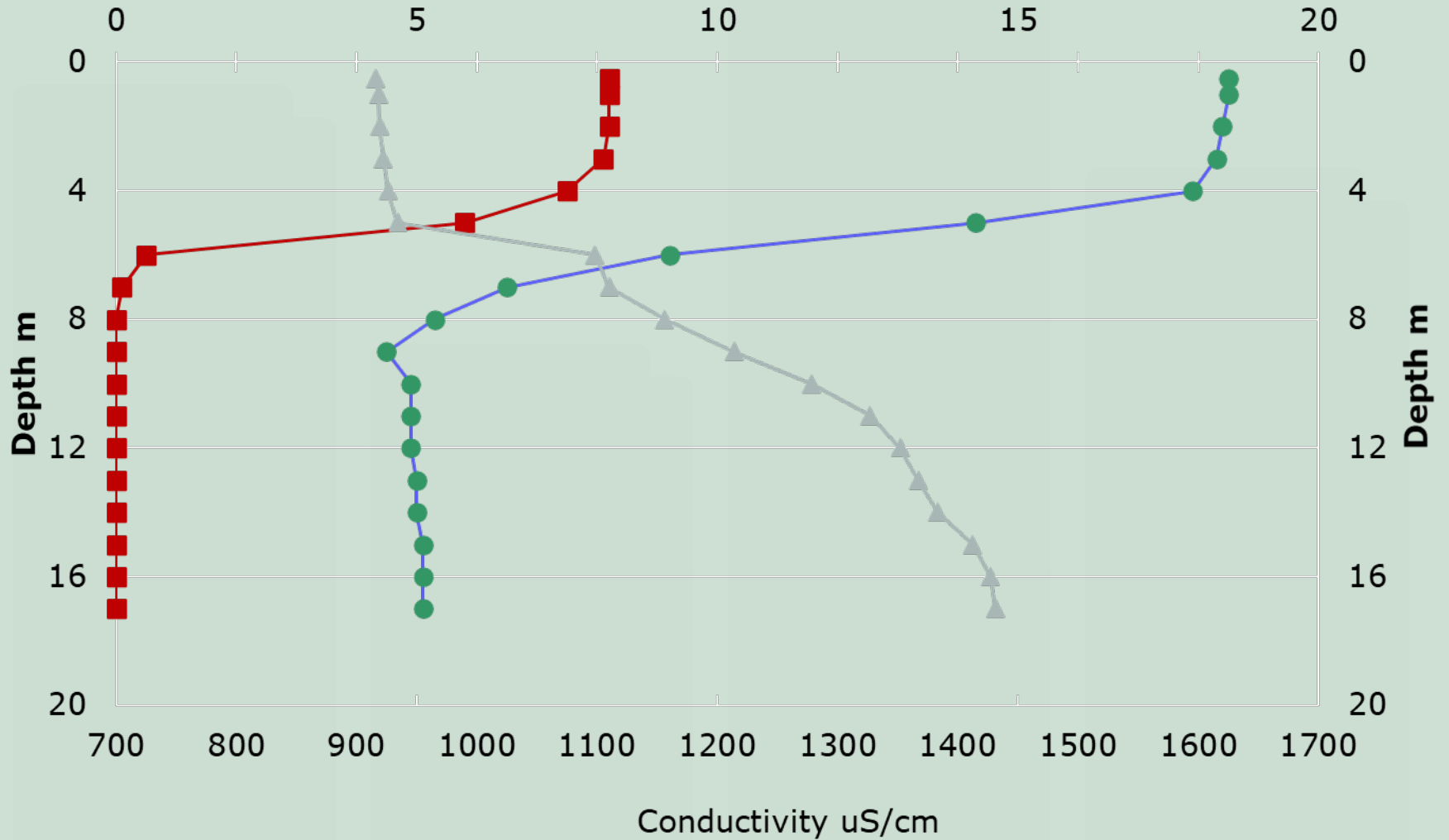
T °C, DO mg/L



● Temp ■ DO ▲ Cond

PL9 (Leo's) Lake Profile (max depth = 17.0 m)

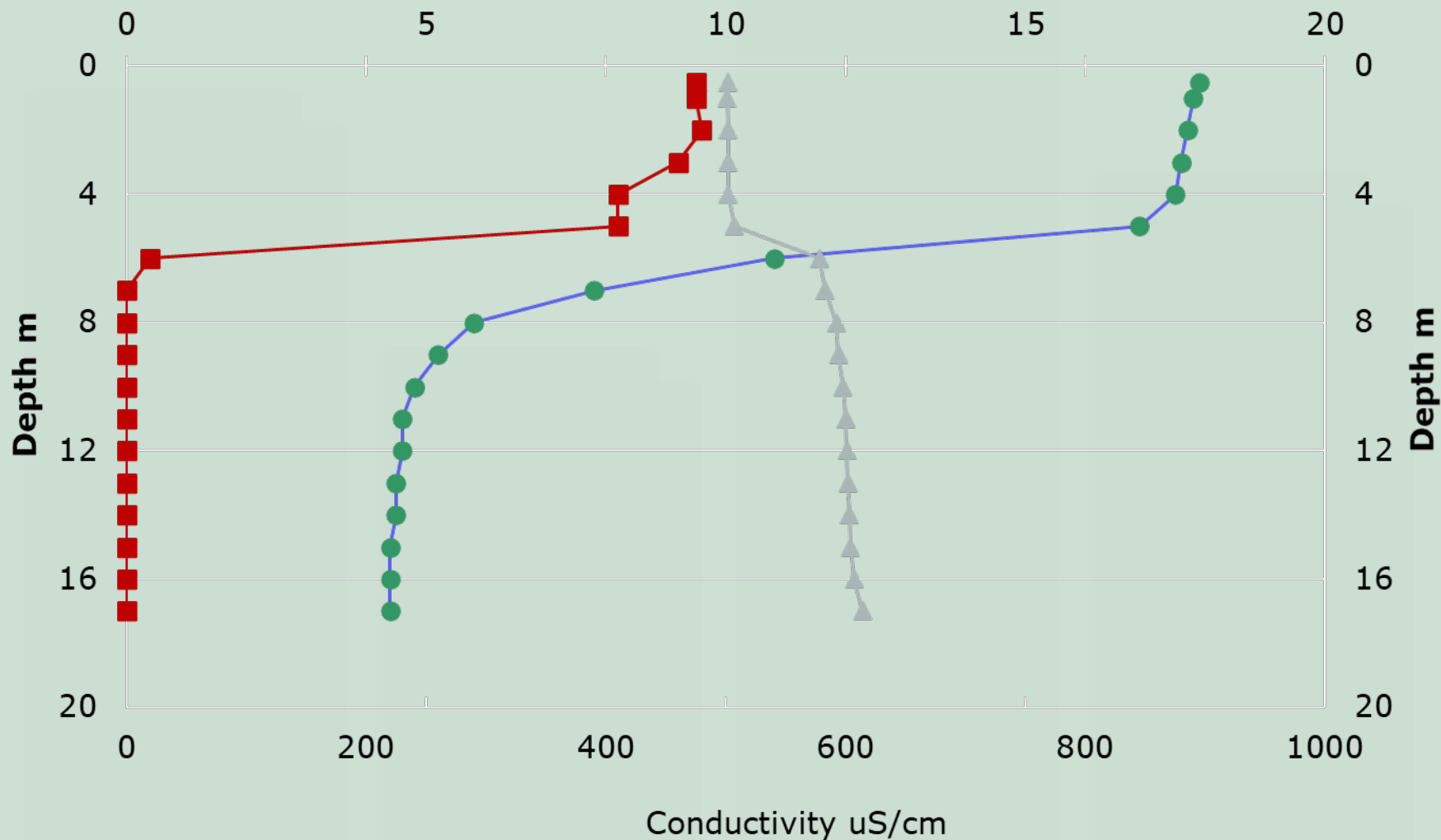
T °C, DO mg/L



● Temp ■ DO ▲ Cond

PL7 (McMorran) (max depth = 17.5 m)

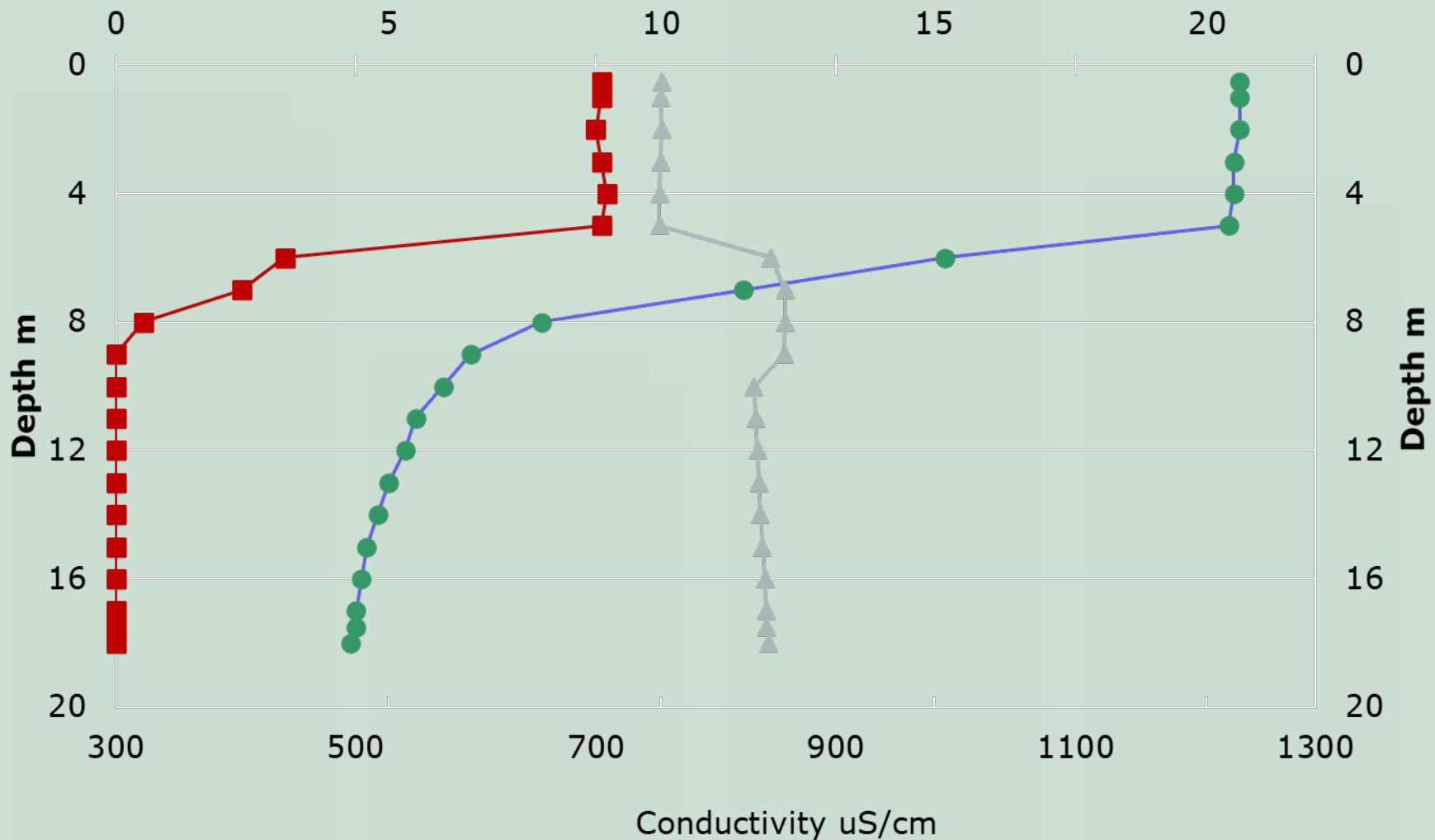
T °C, DO mg/L



● Temp ■ DO ▲ Cond

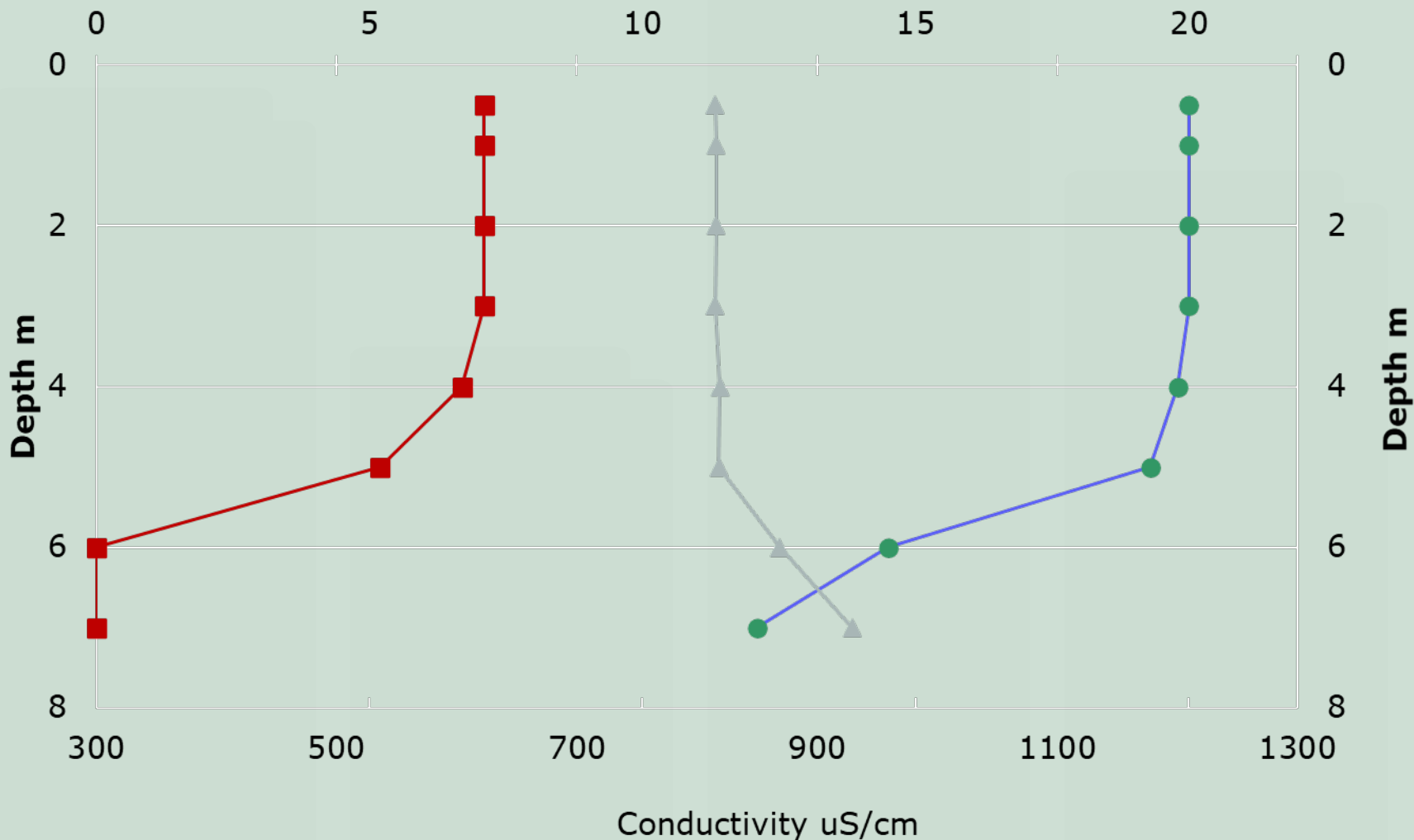
Mayatan West Profile (max depth = 18.1 m)

T °C, DO mg/L



Mayatan East Profile (max depth = 7.4 m)

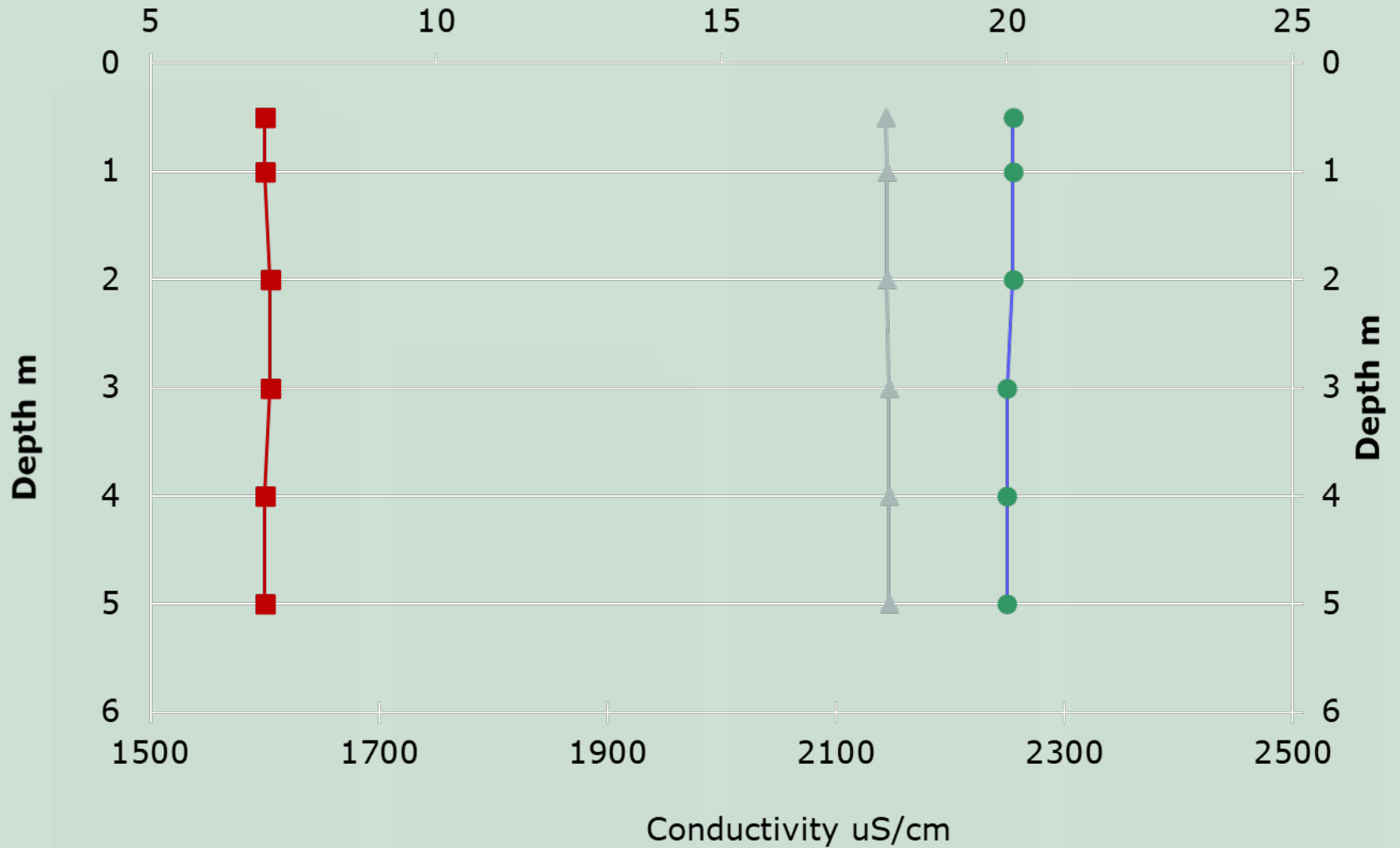
T °C, DO mg/L



● Temp ■ DO ▲ Cond

Mink Lake Profile (max depth = 5.1 m)

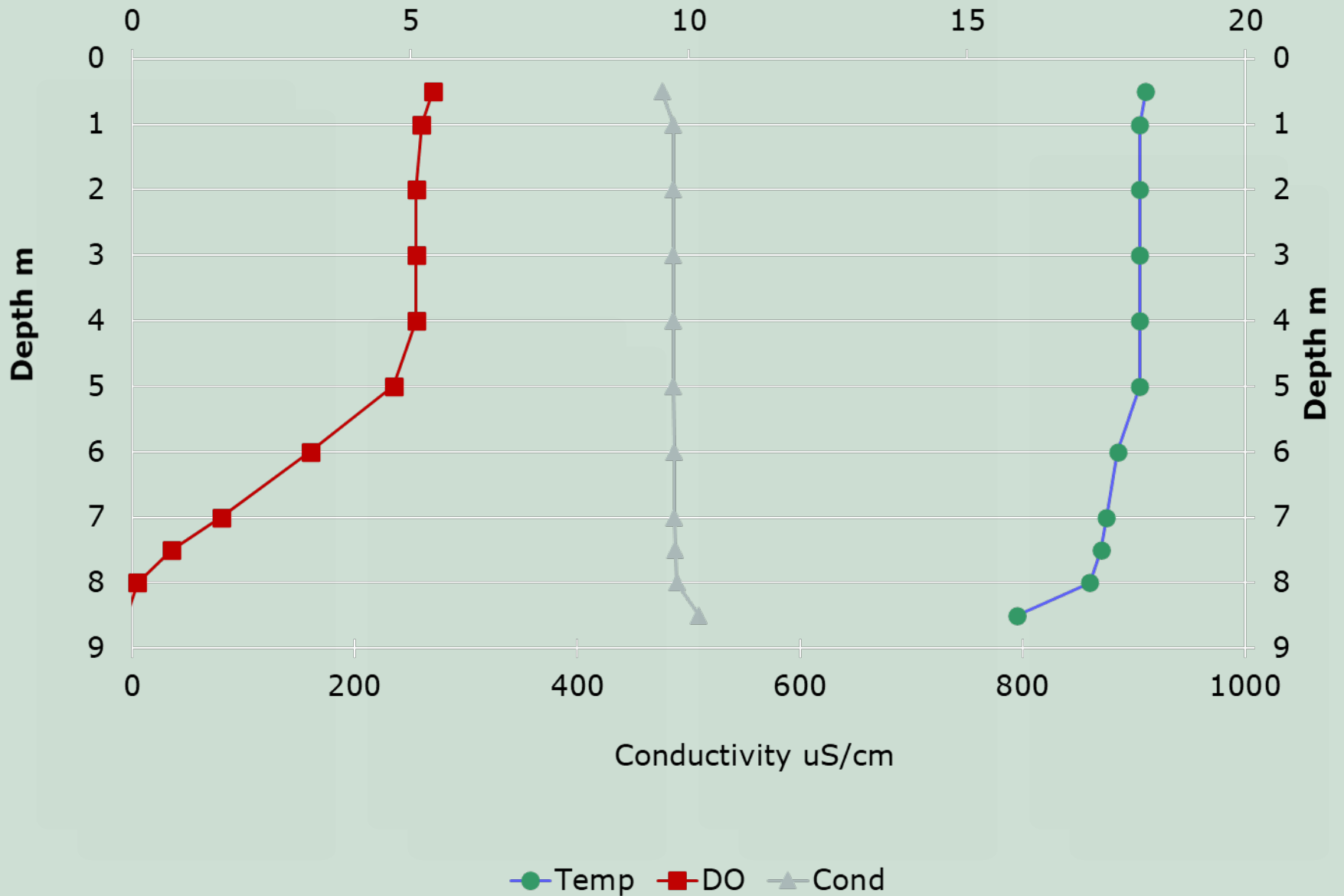
T °C, DO mg/L



● Temp ■ DO ▲ Cond

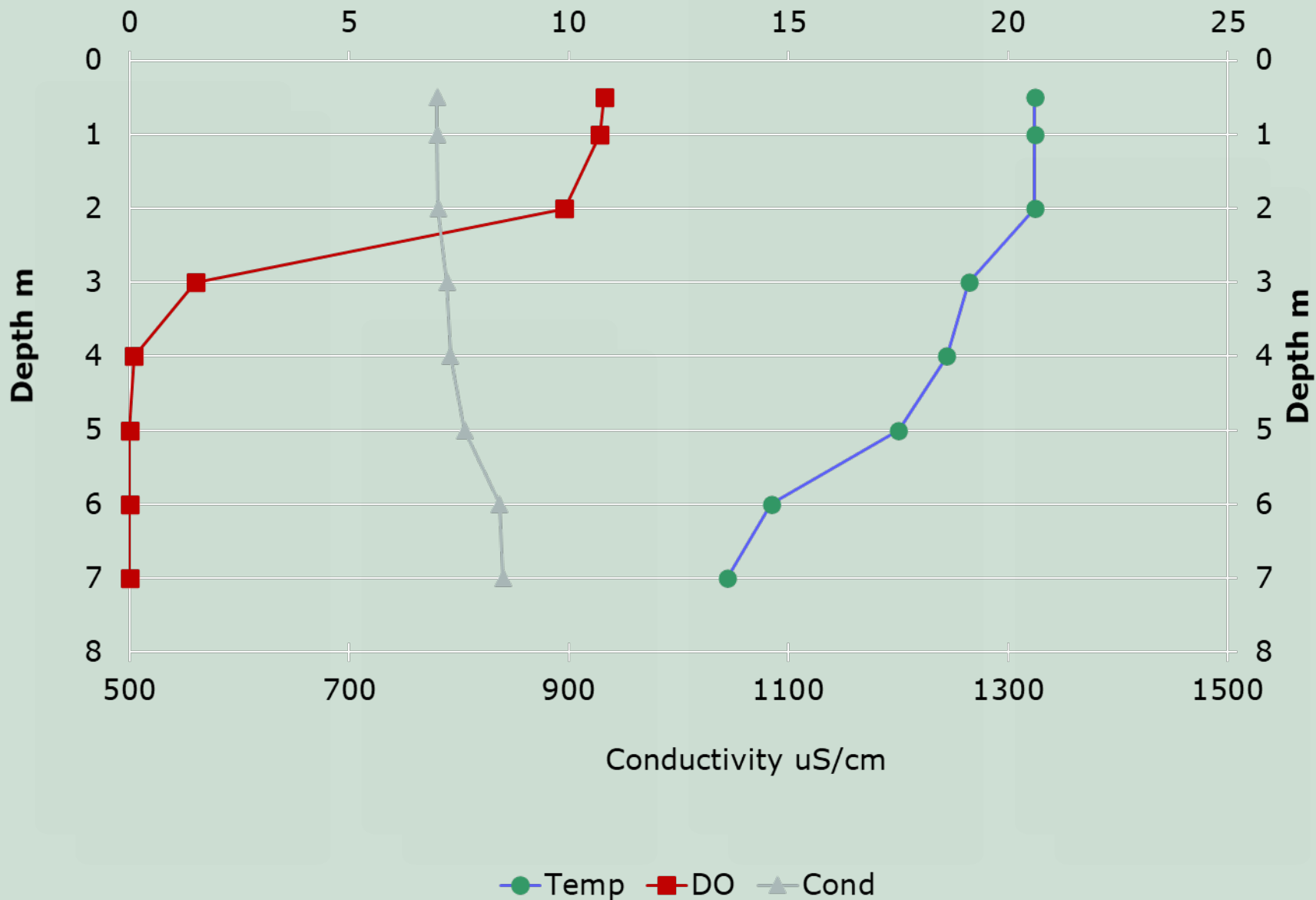
Chickakoo Lake Profile (max depth = 8.8 m)

T °C, DO mg/L



Hasse Lake Profile (max depth = 7.5 m)

T °C, DO mg/L



Change to Part B for
Chemical results