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

Presented by David Trew

Photo Credit: O2 Planning + Design Inc. and Parkland County

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?

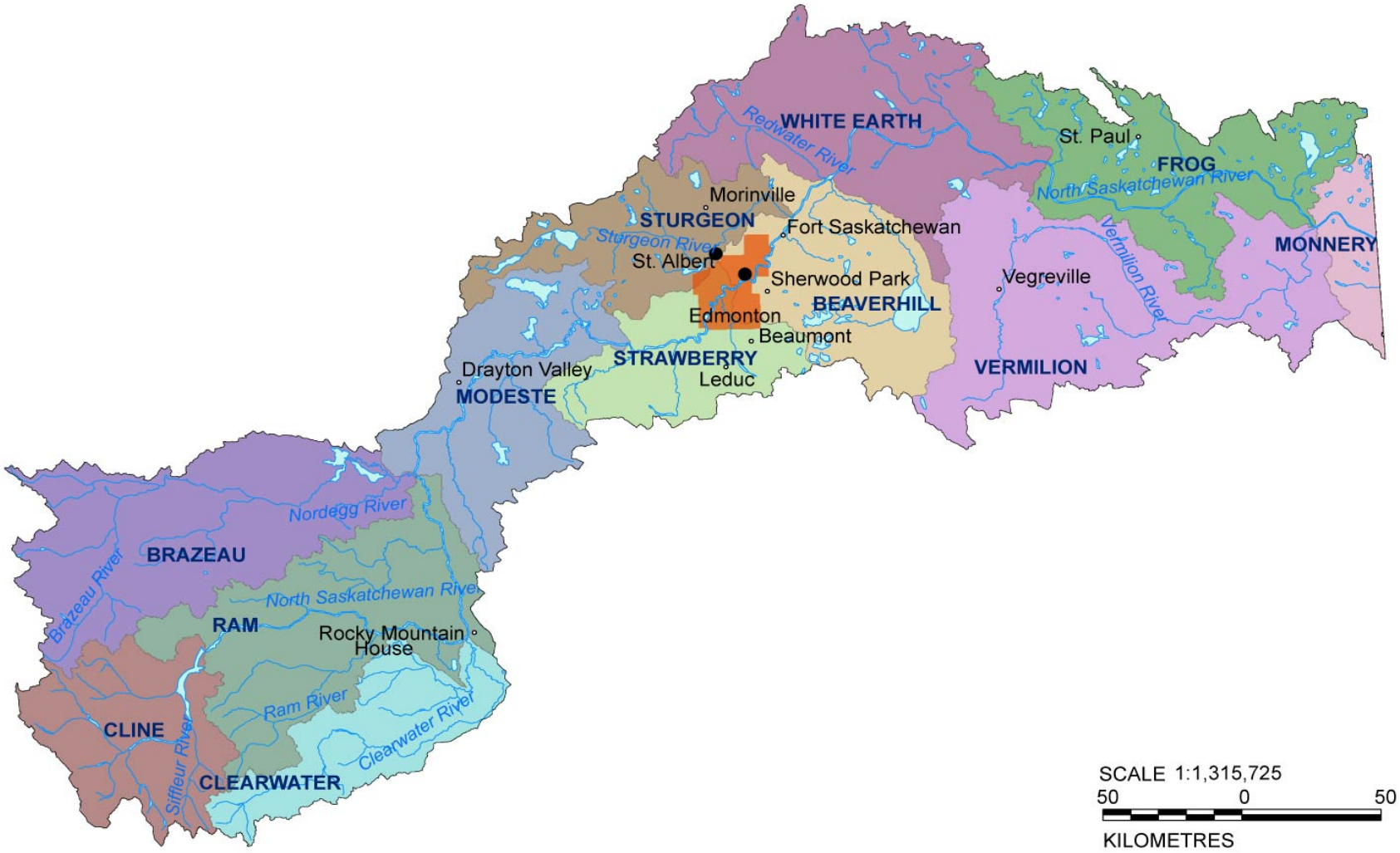
David Trew - Background

- 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

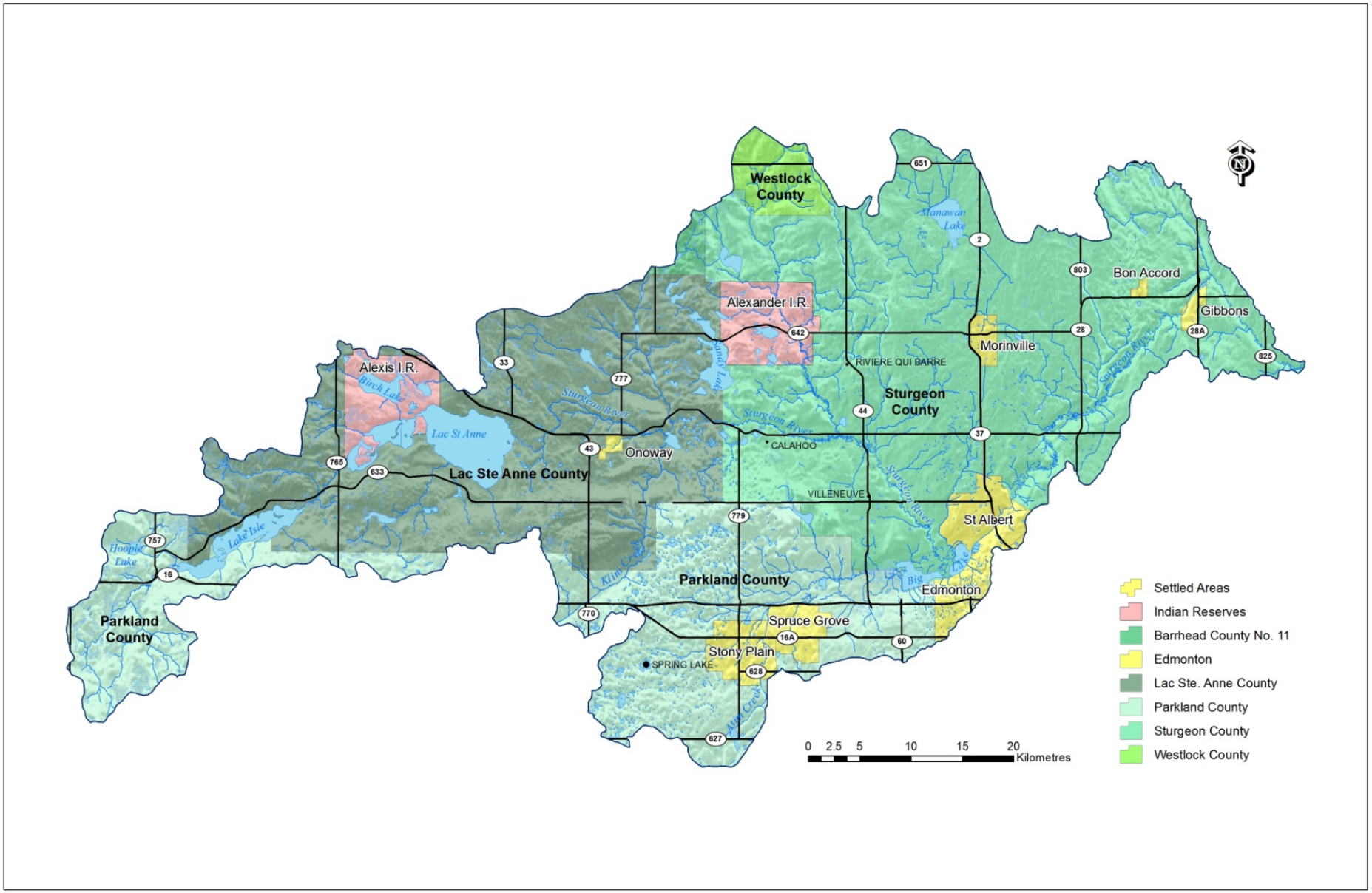
Many collaborators – thank you!

- 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

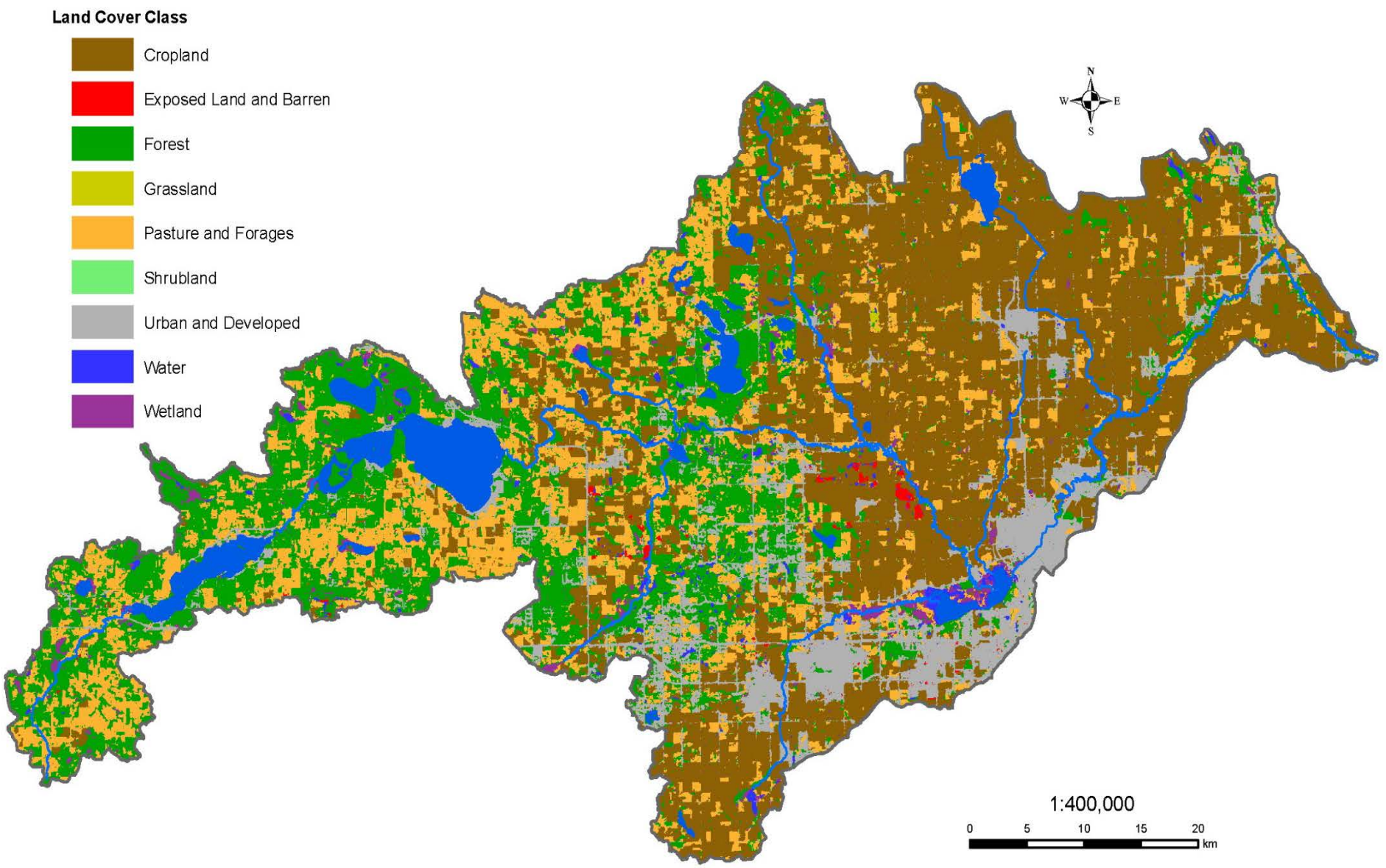
The North Saskatchewan River Basin: Twelve Subwatersheds



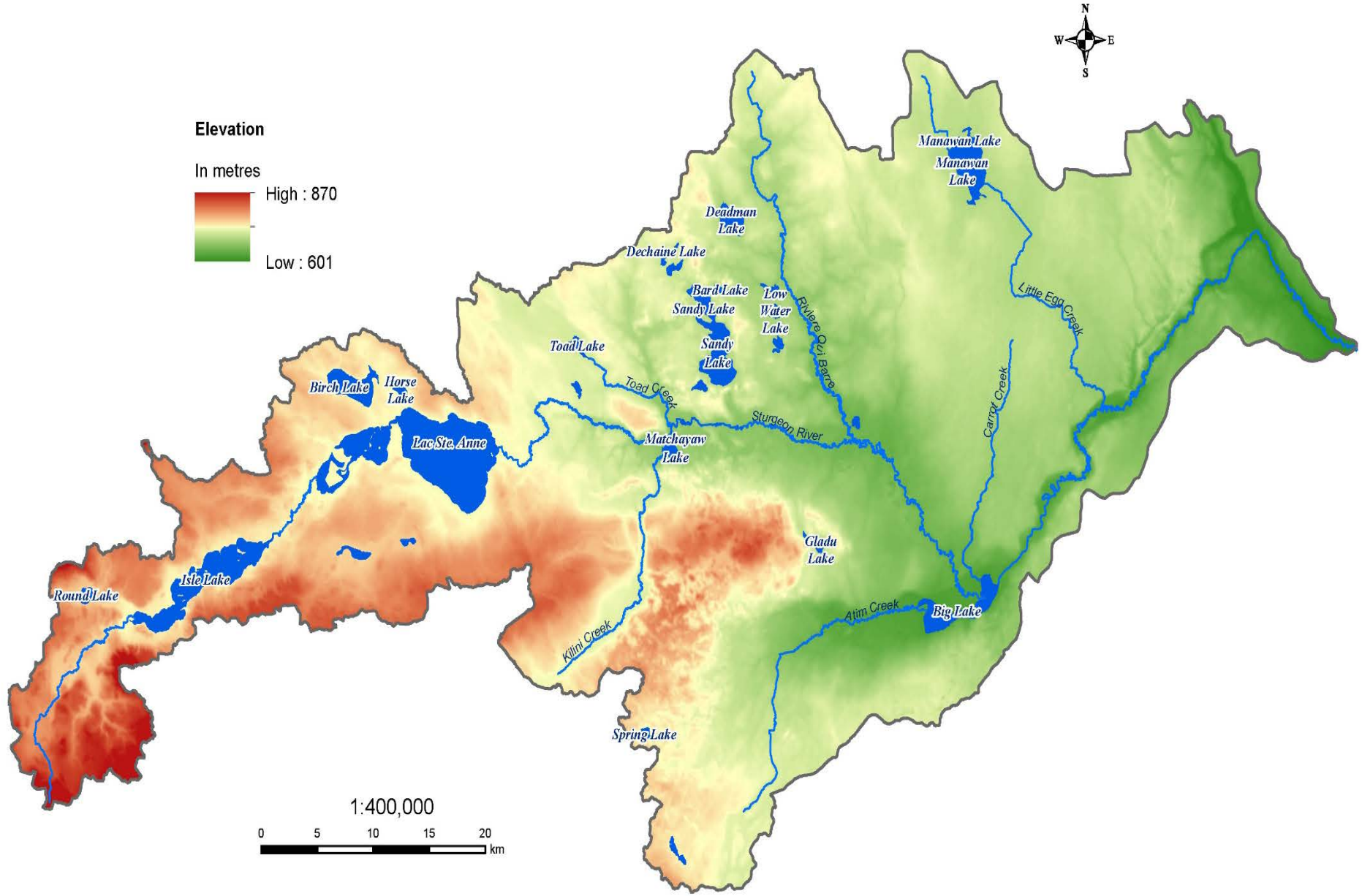
Sturgeon River Watershed: Municipalities



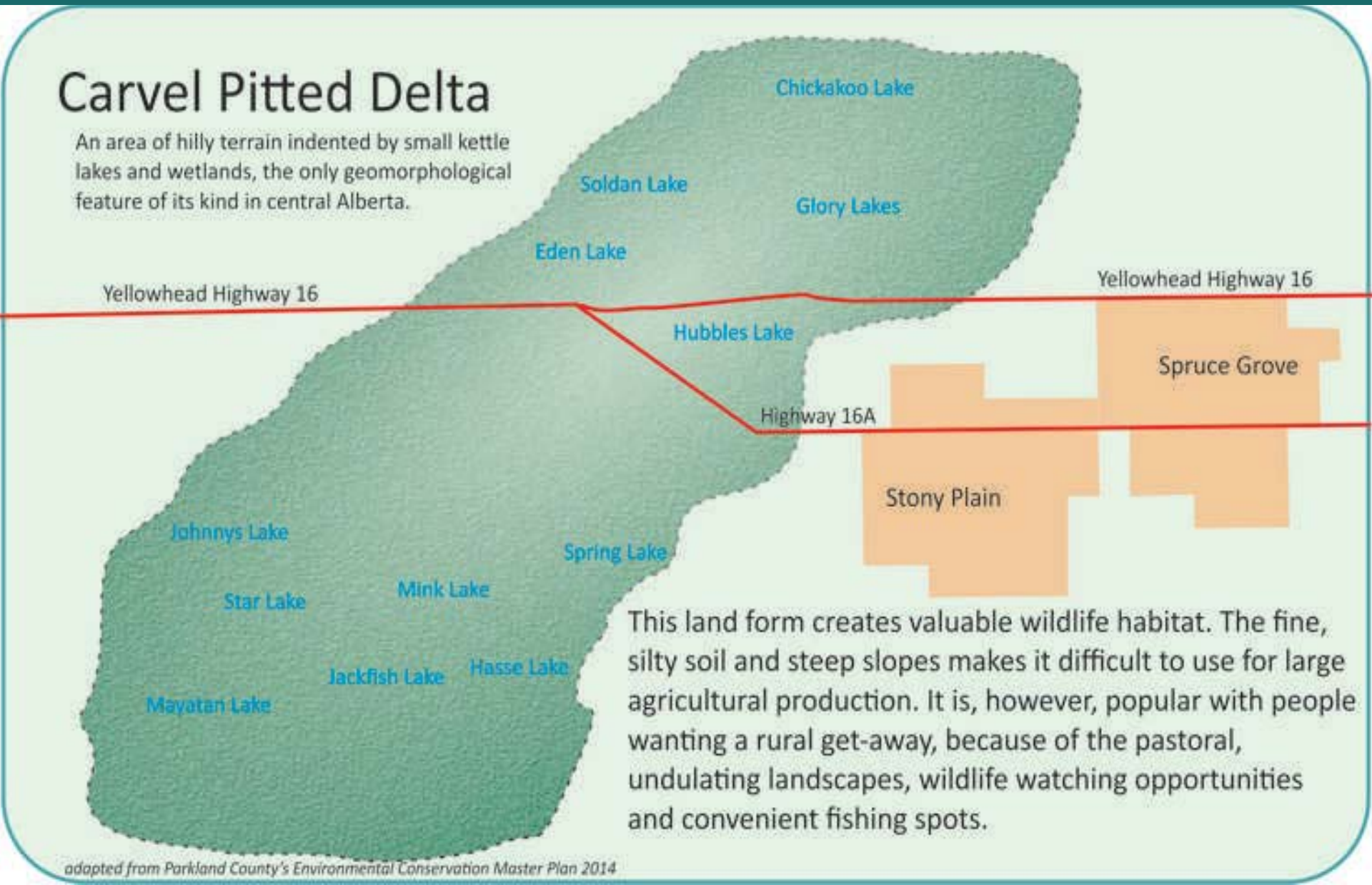
Sturgeon River Watershed: Land Cover



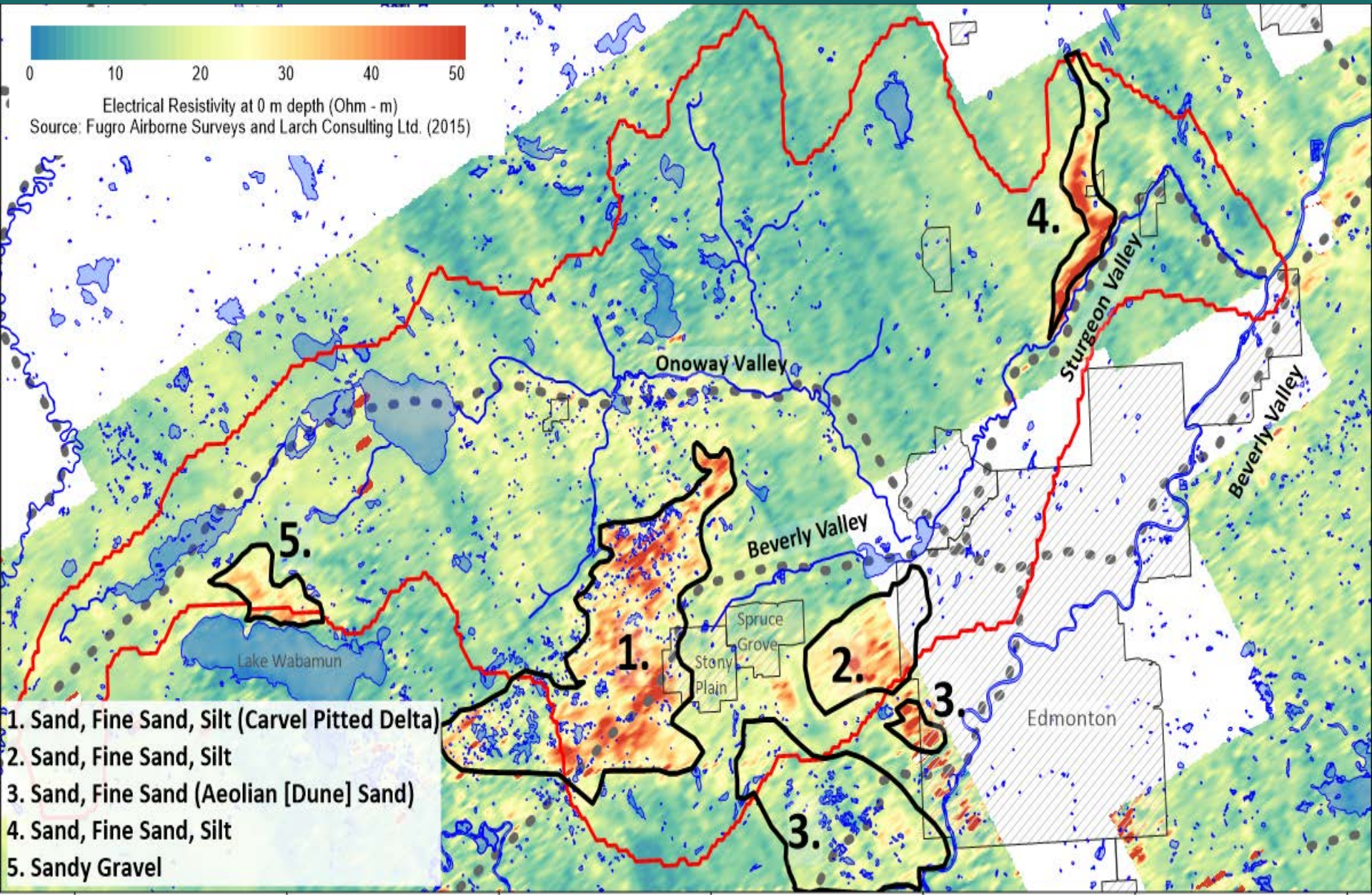
Sturgeon River Watershed: Topography



The Carvel Pitted Delta



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 NSWA technical report:

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

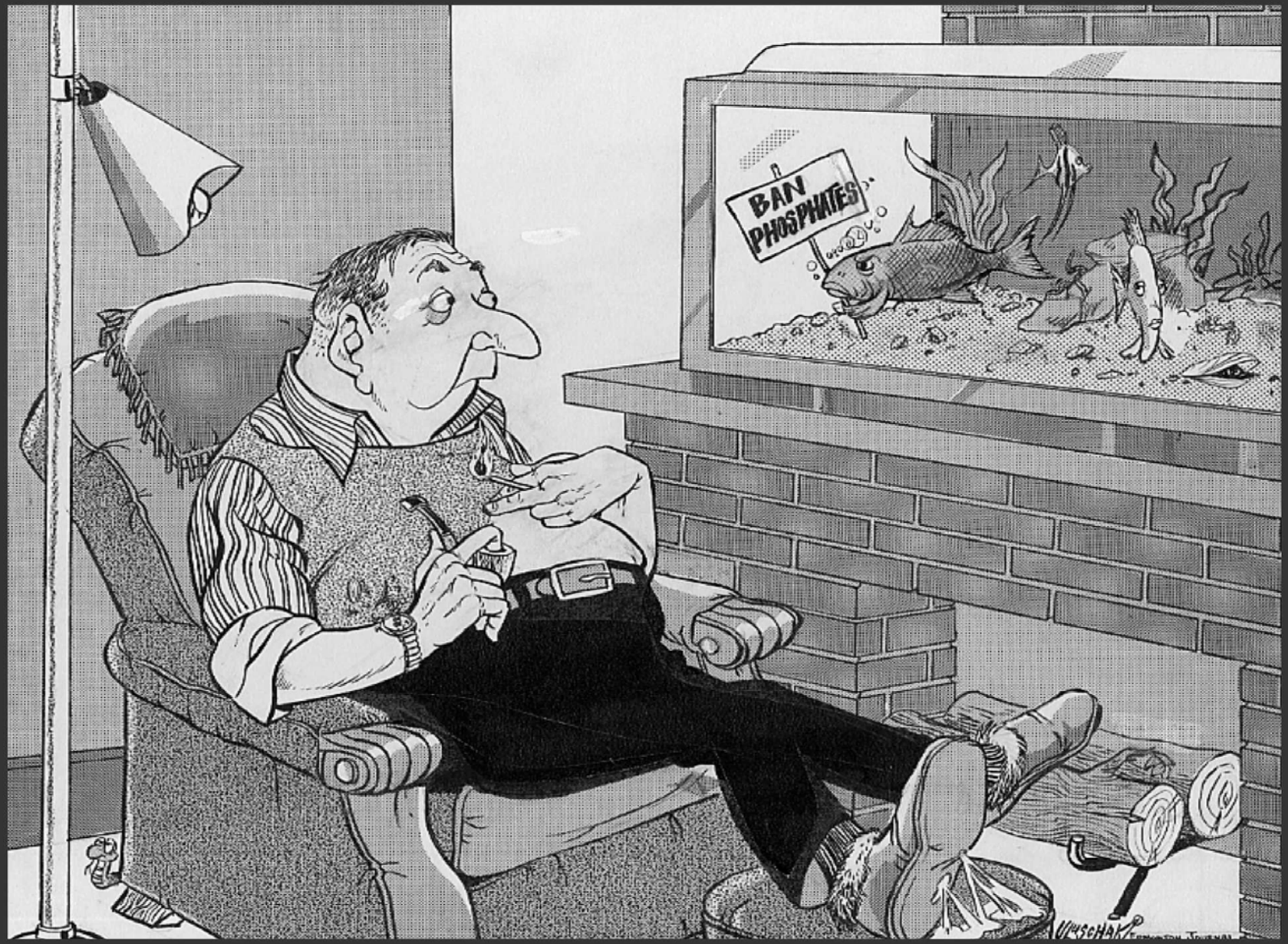
https://www.nswa.ab.ca/resource/groundwater-conditions-sturgeon-river-basin/

Alberta Lakes

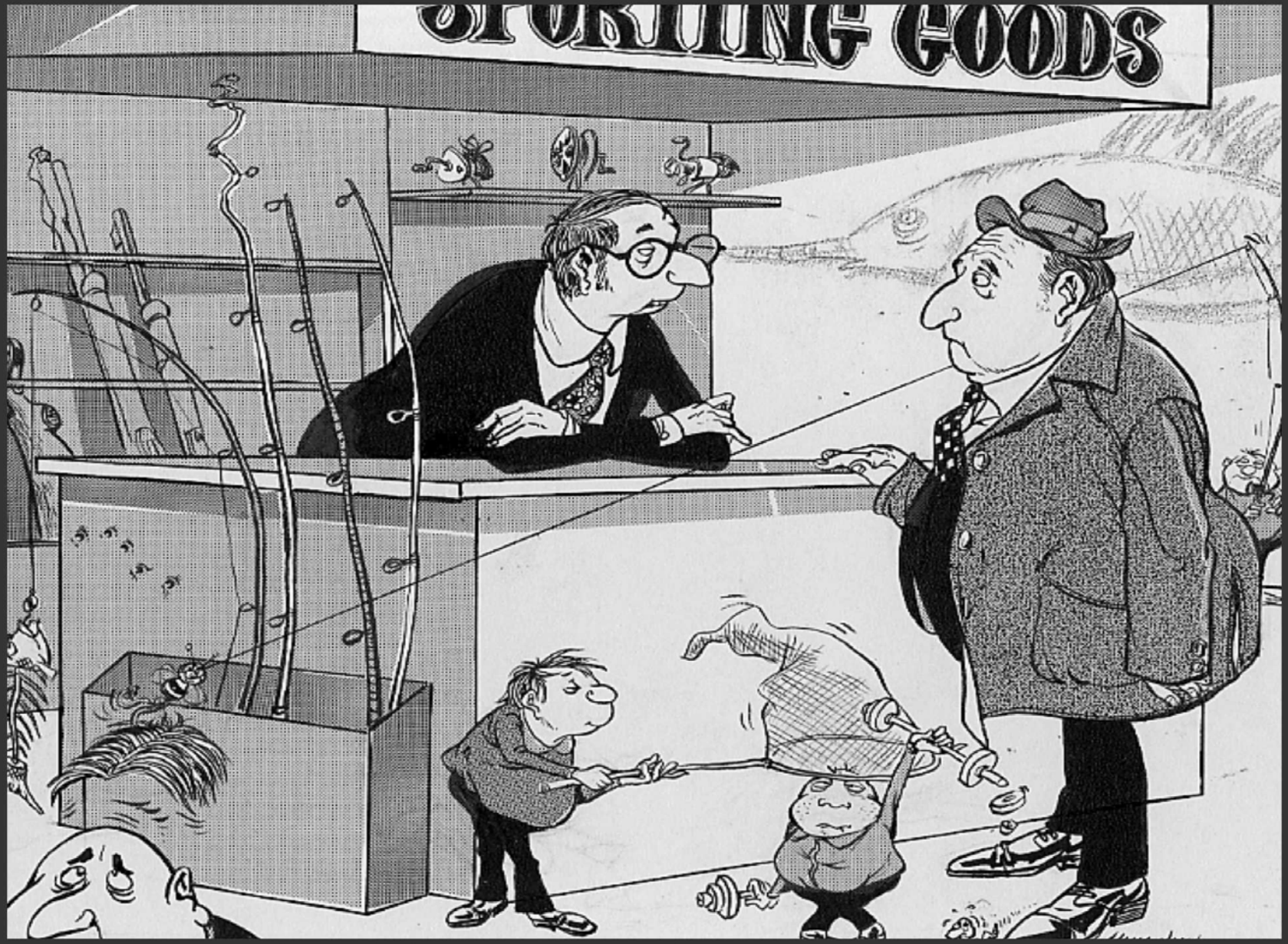
Alberta lakes have been the subject of much scientific study over the past 70 years. Most of the research has been conducted to support fisheries and water quality management

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!

Edmonton Journal - February 13, 1970



Edmonton Journal - May 12, 1970



"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

Canadian Journal of Fisheries and Aquatic Sciences

Réimpression du

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

Printed in Canada by K.G. Campbell Corporation

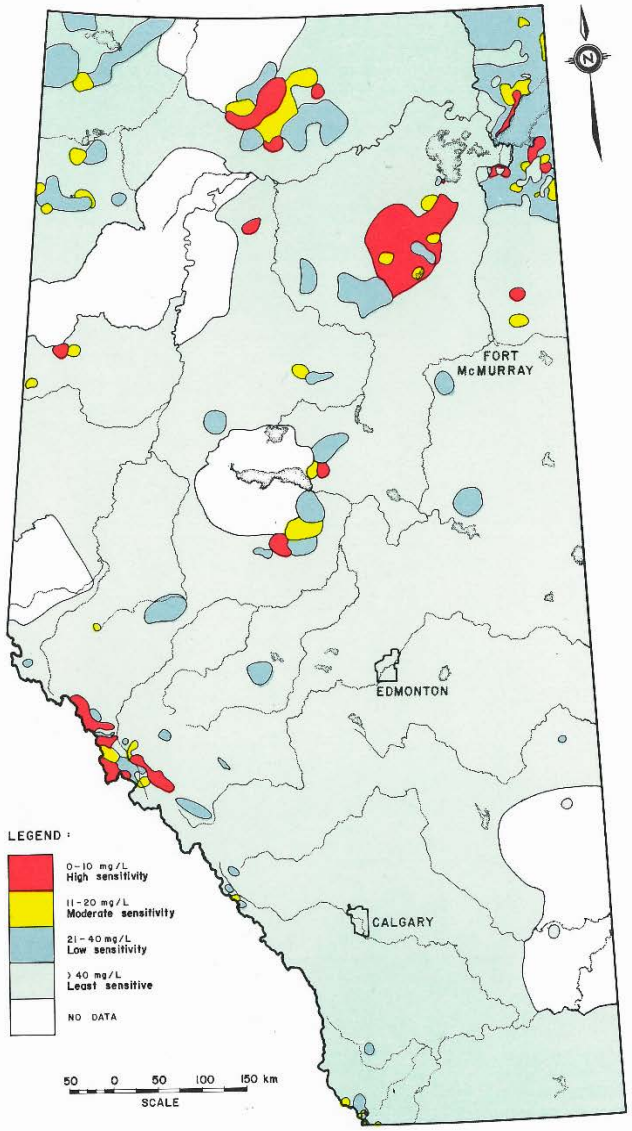
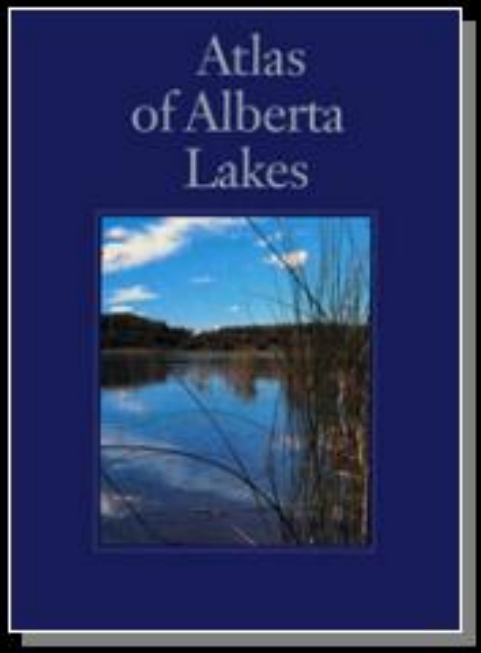


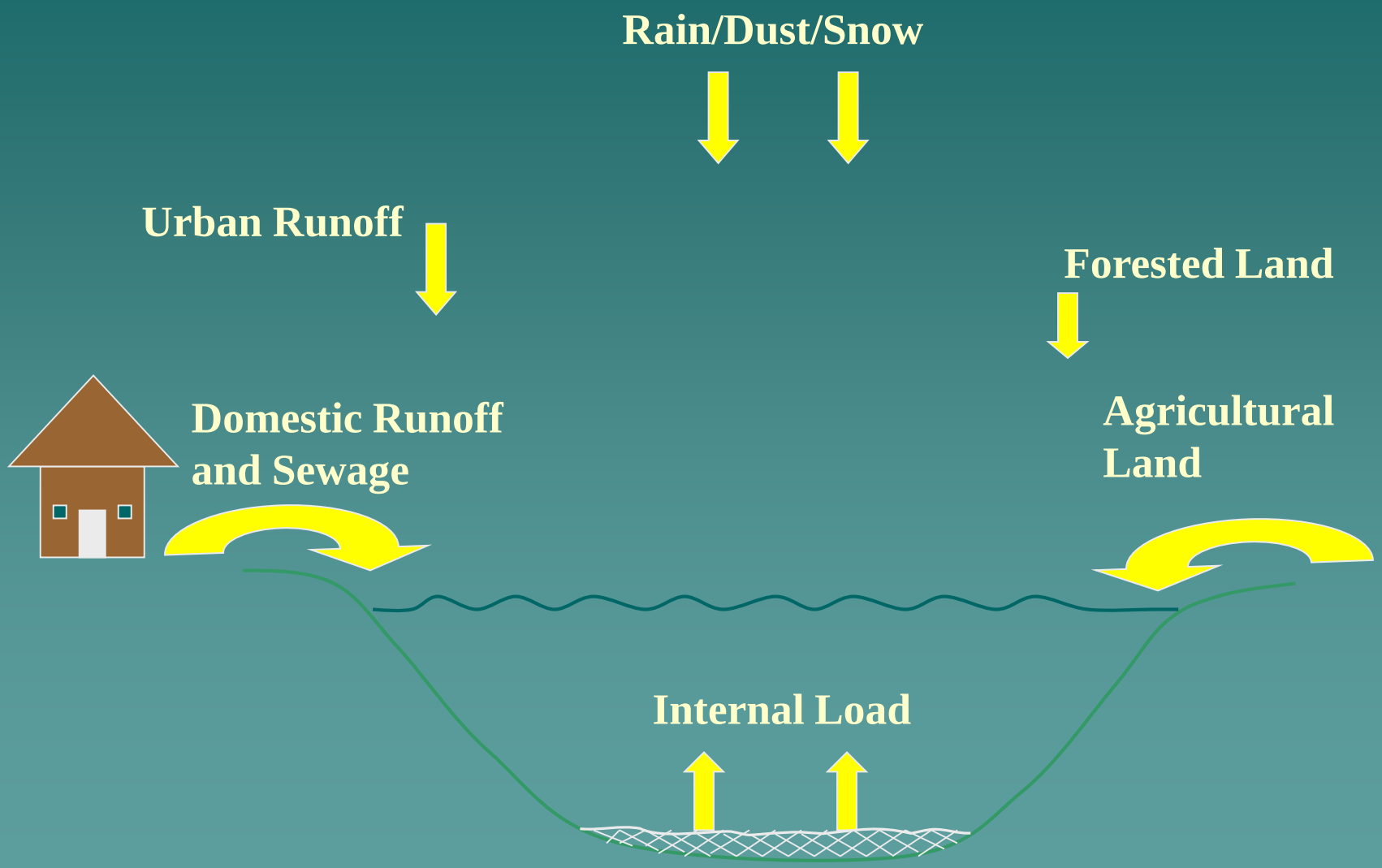
Figure 2 Sensitivity of Alberta lakes to acidification as determined by alkalinity values.

Alberta
ENVIRONMENT
Pollution Control Division
Water Quality Control Branch


Atlas
of Alberta
Lakes

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

Phosphorus Sources - Alberta Lakes



The beginning of collaboration between NSWA and MLMA

Integrated Watershed Management Plan for the North Saskatchewan River in Alberta

North Saskatchewan Watershed Alliance

North Saskatchewan Watershed Alliance

Mayatan Lake State of the Watershed Report

August 2012

North Saskatchewan Watershed Alliance

Mayatan Lake Watershed Management Plan

July 2016

North Saskatchewan Watershed Alliance

Jackfish Lake
State of the Watershed Report

April 2016

North Saskatchewan Watershed Alliance

Isle Lake and Lac Ste Anne
State of the Watershed Report

May 2017

NORTH SASKATCHEWAN WATERSHED ALLIANCE

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)

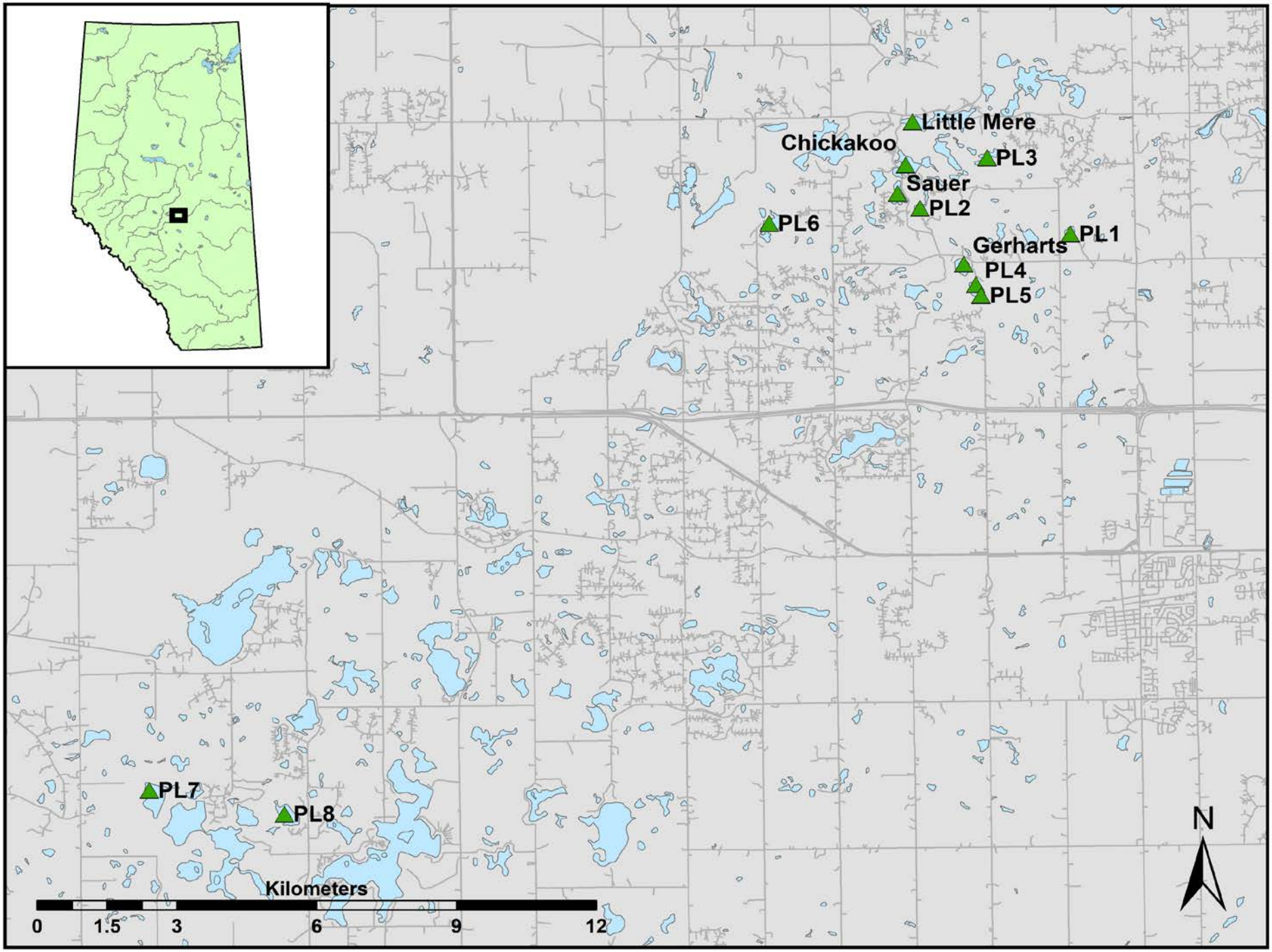
The 2020 Project: 12 Lakes

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)


Little Mere
Chickakoo
PL3
Sauer
PL2
PL6
PL1
Gerharts
PL4
PL5
PL7
PL8
Kilometers
0
1.5
3
6
9
12
N

The 2020 Sampling Team:

Alec MacDonald
Dr. Konstantin Von Gunten
Caleb Sinn
David Trew


RAM


SAUER
LAKE
INTEX


Keepers


Please enjoy it with respect

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


bollé


Lakewatch

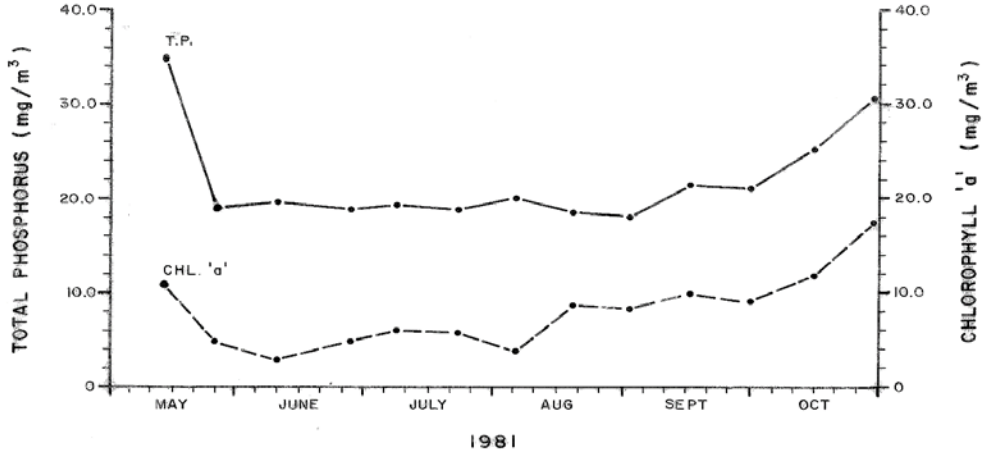

can-am

The 2021 Project
"The Overdue Overview"

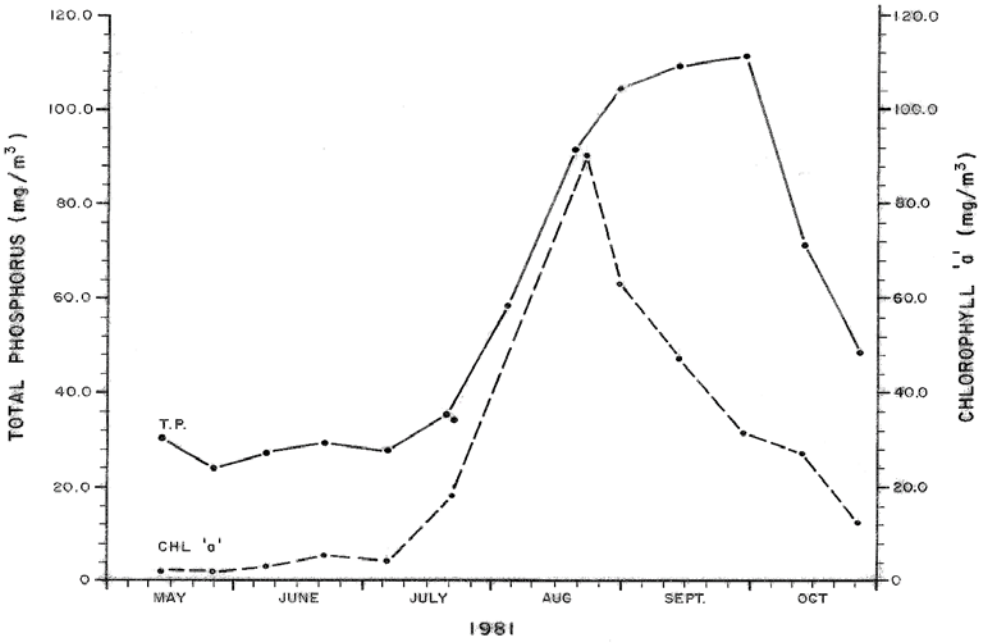
- Late winter [DO] surveys conducted on 19 lakes
- Late summer surveys conducted on 44 lakes (including 11 of those sampled in summer 2020)
- Funding and in-kind support received from
  - Land Stewardship Centre of Canada
  - Alberta Lake Management Society
  - Stony Plain Fish and Game Association
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



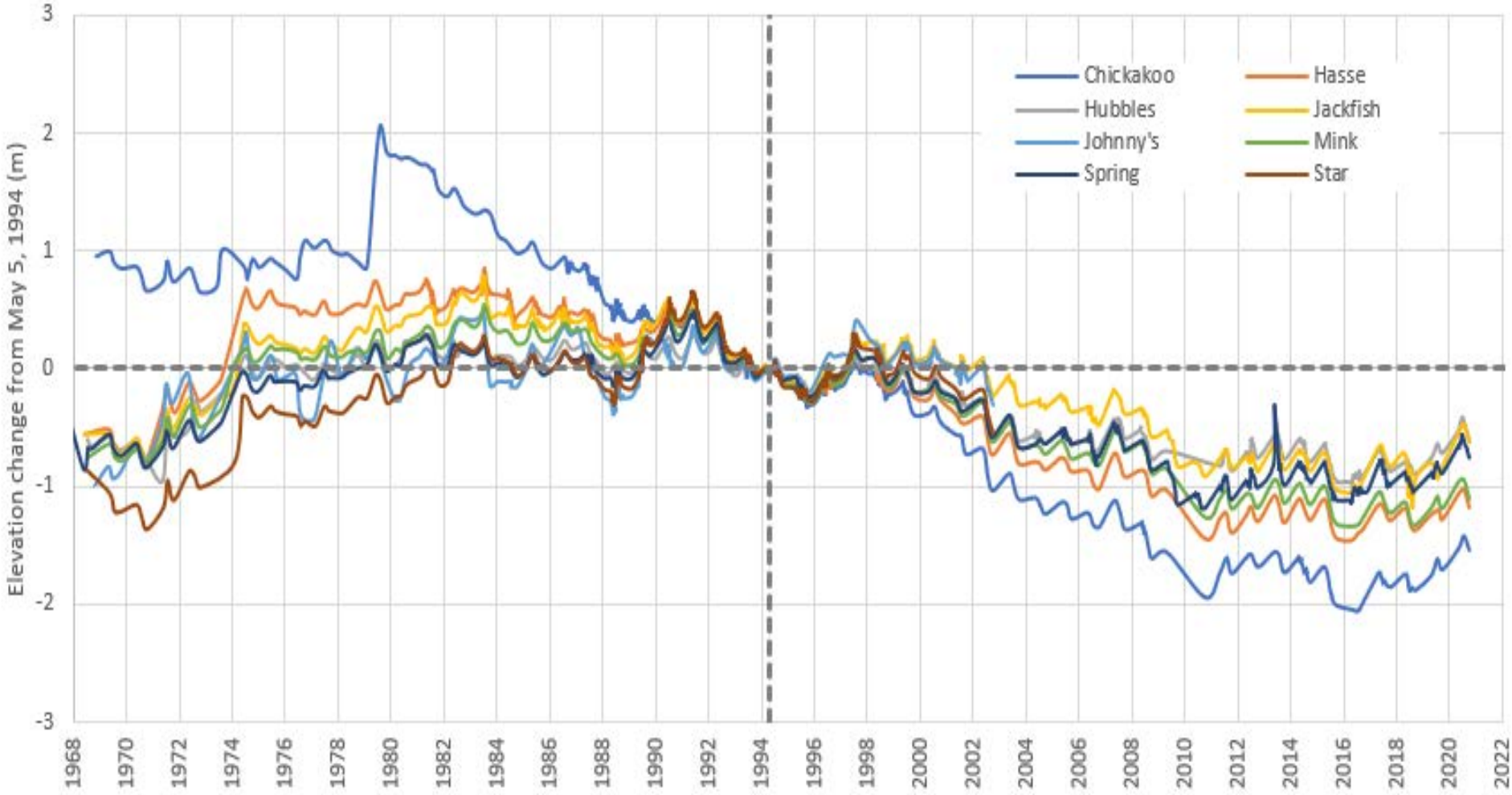
TUCKER LAKE



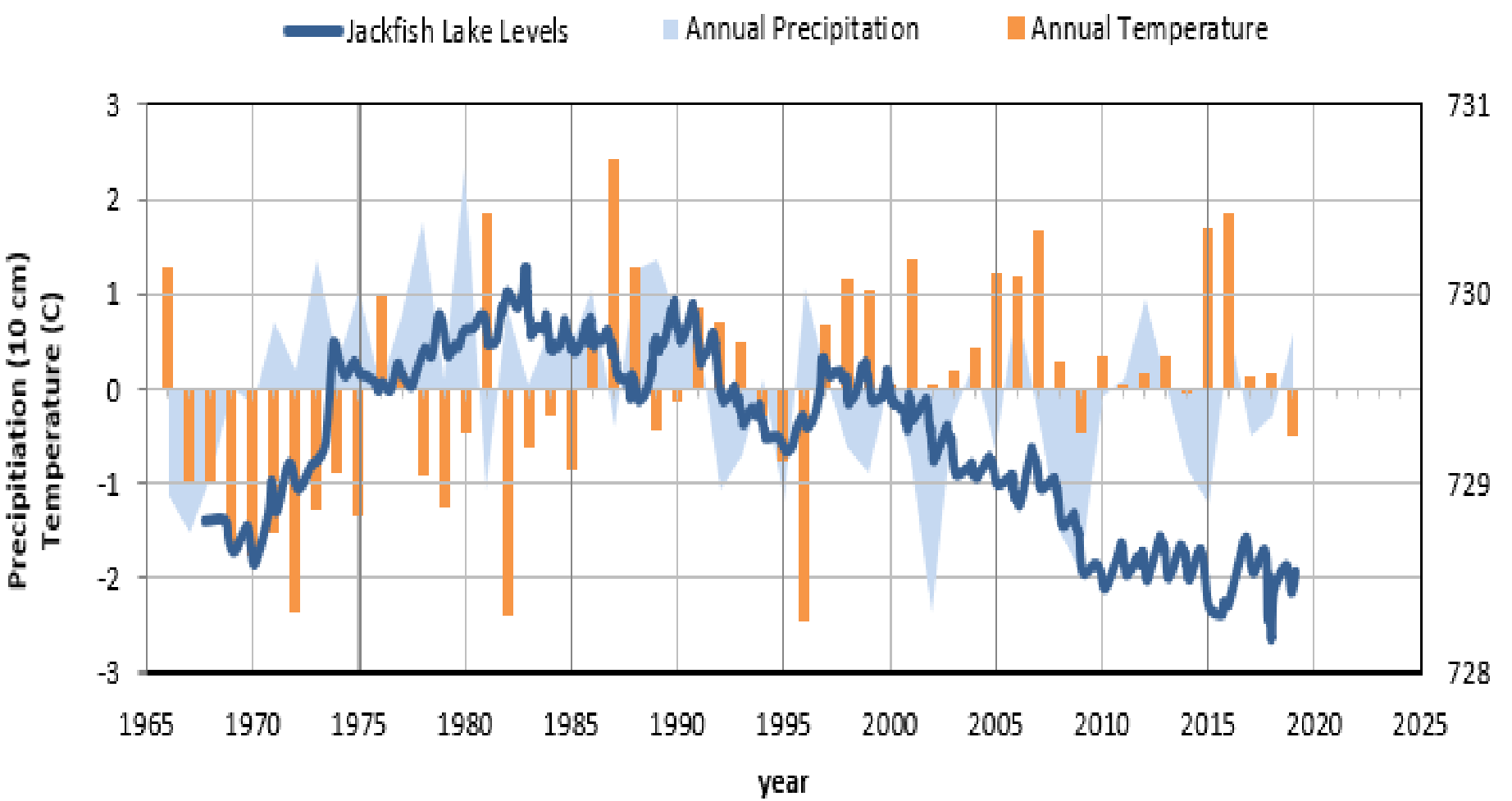
The 2021 Summer Sampling Team:

Walt Neilson
Pauline Molnar
David Trew

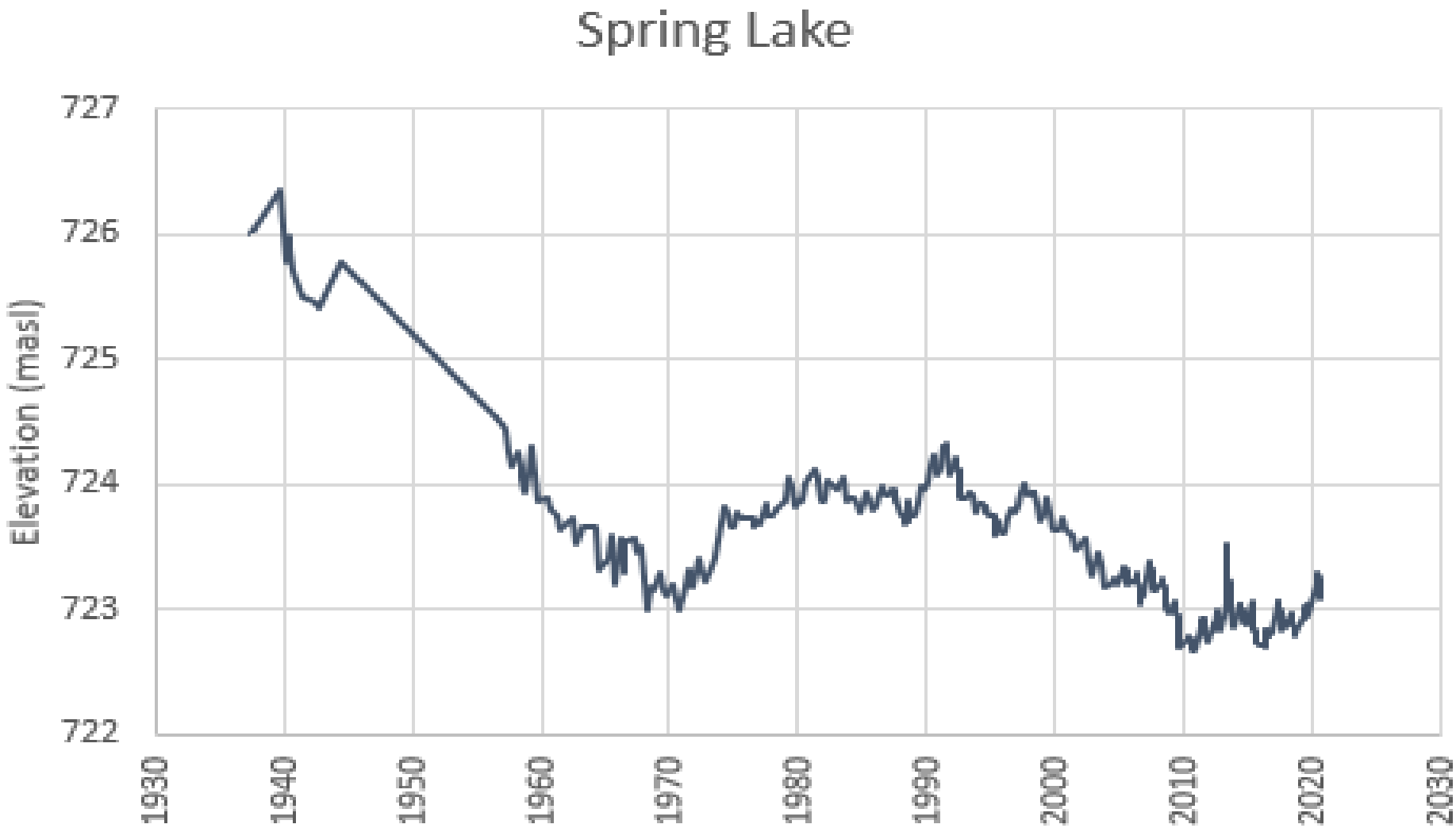
Historic Lake Level Trends for Regional Lakes (1968-2020)



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

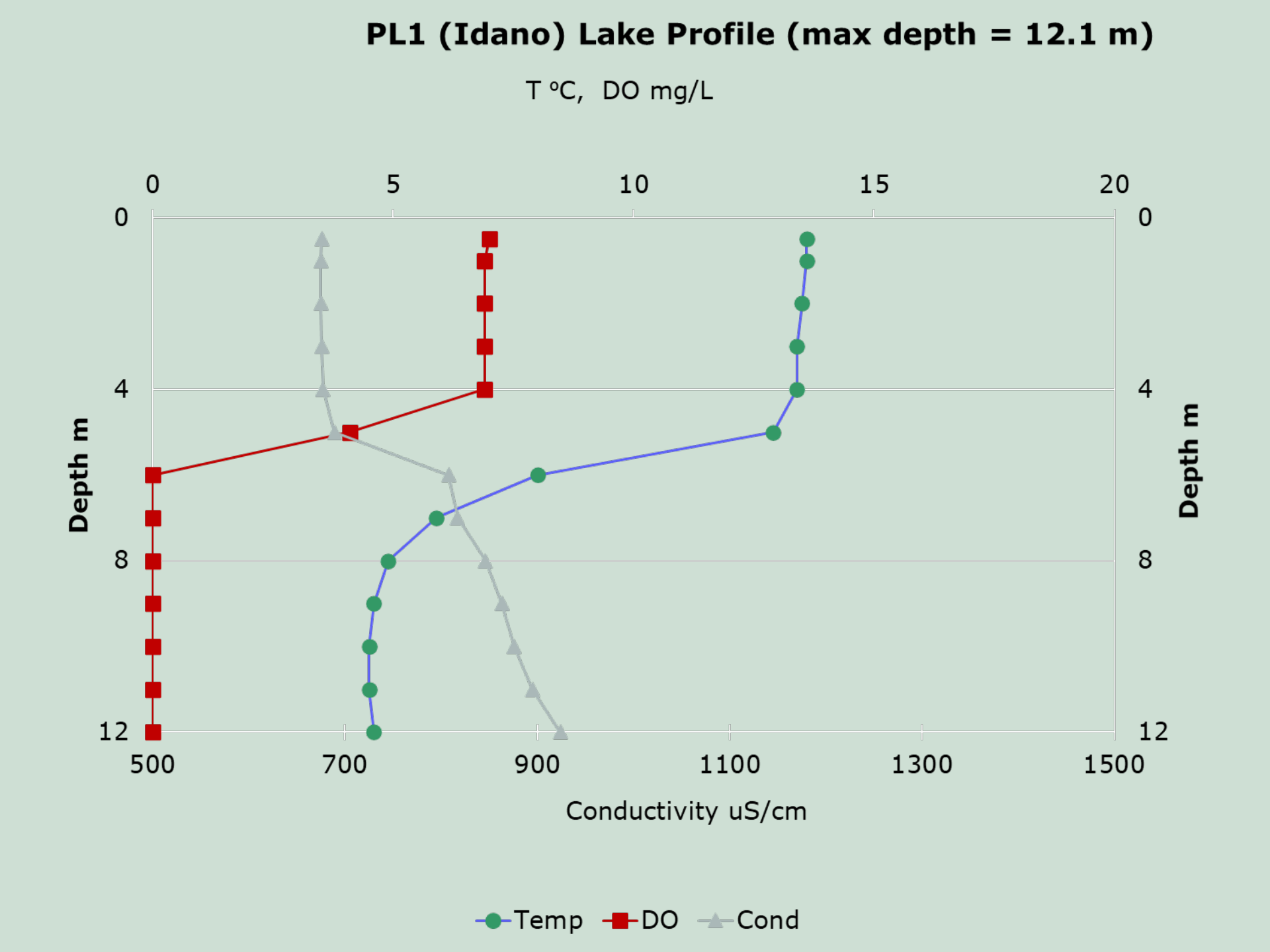

PL18 2020

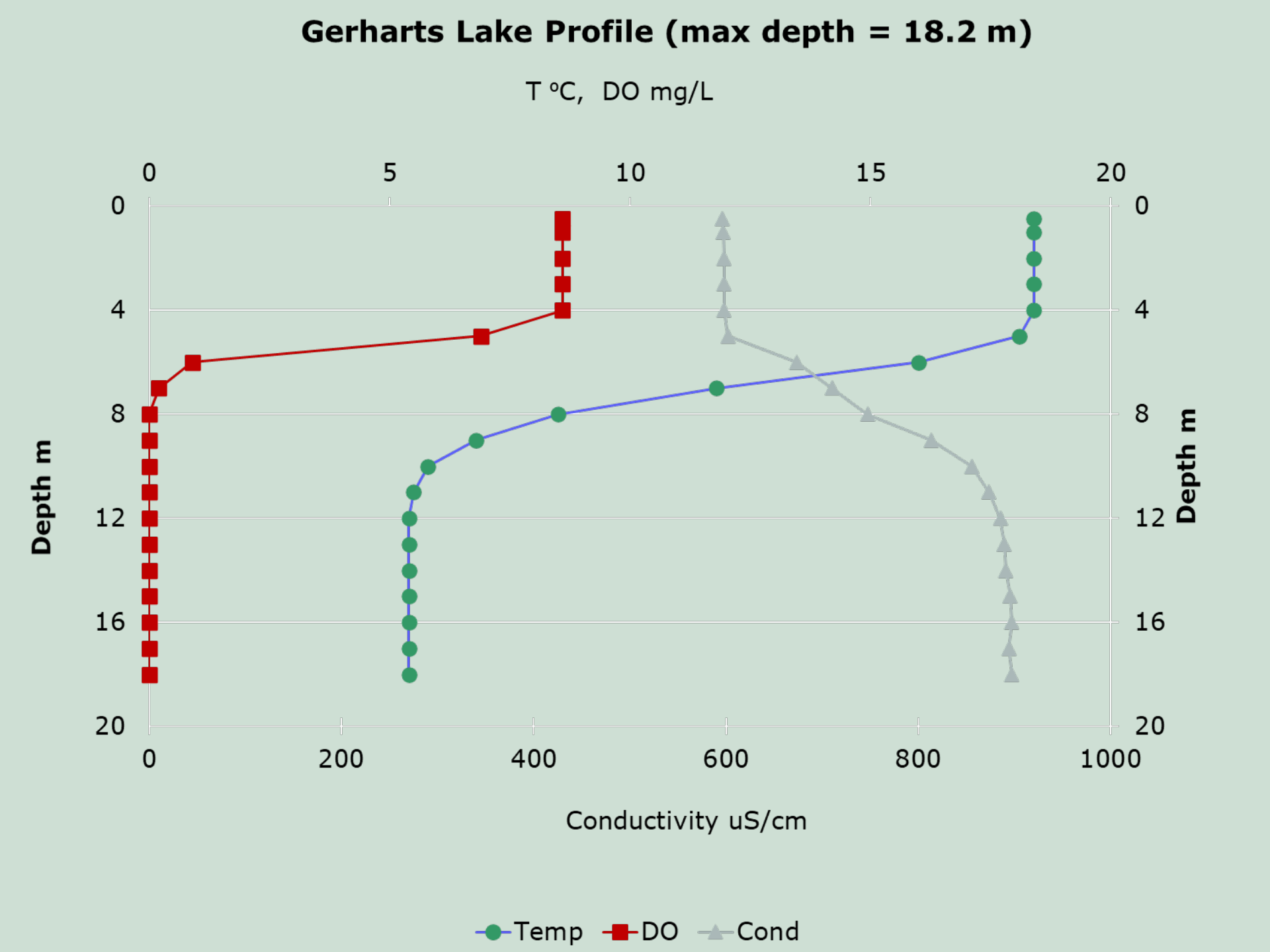

PL18 2021

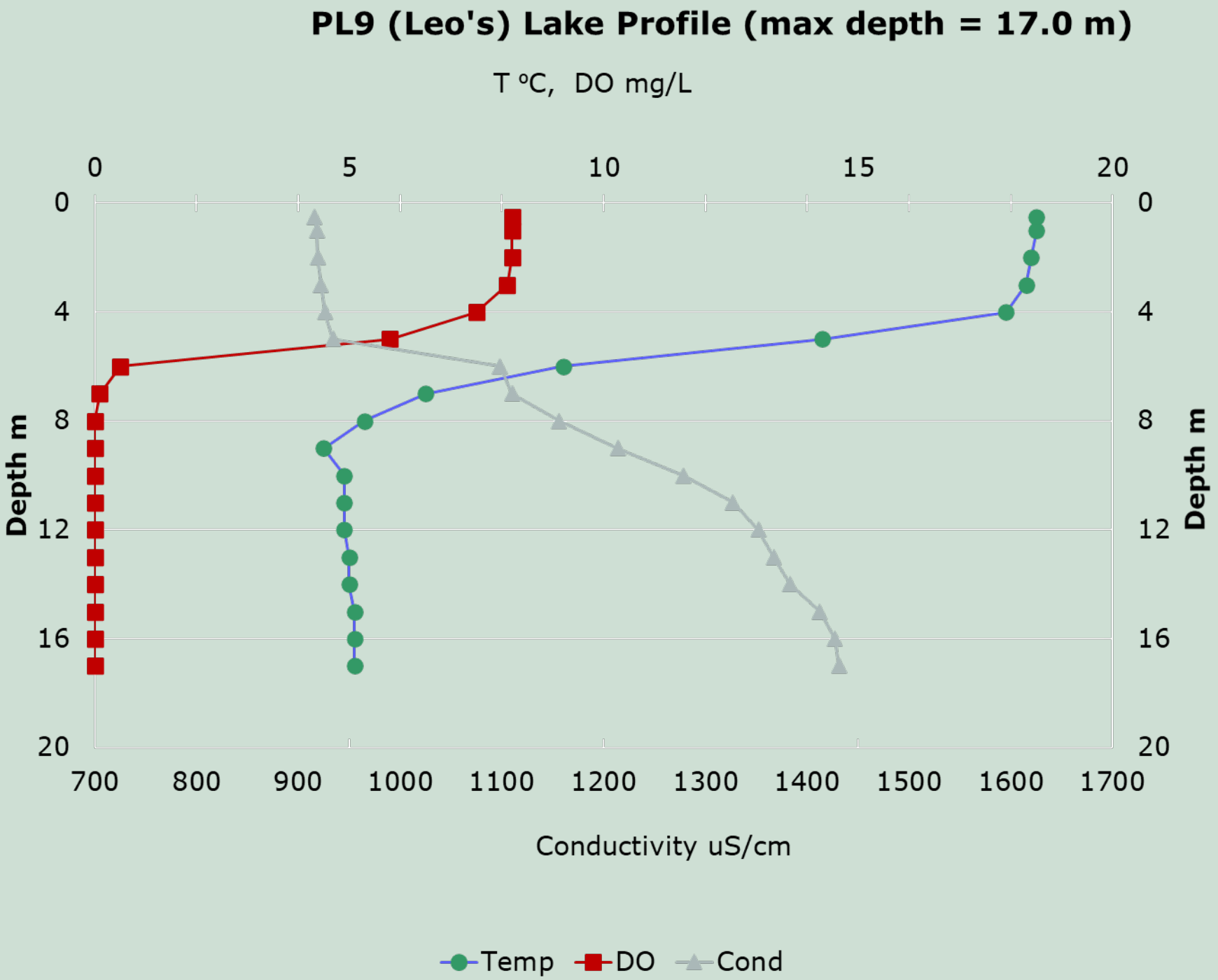
2021 Results

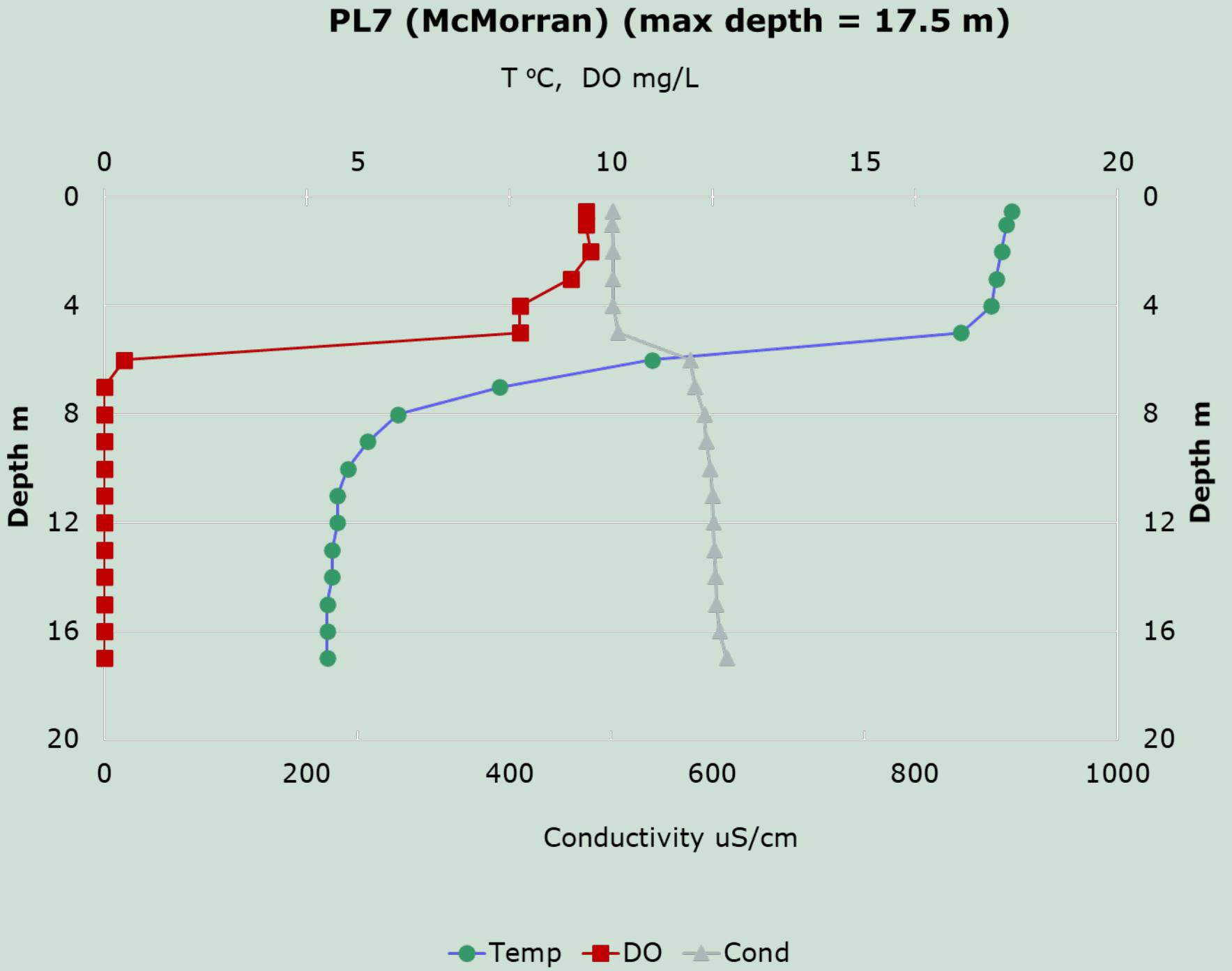
Late summer profile Data: [DO], Temp, Cond

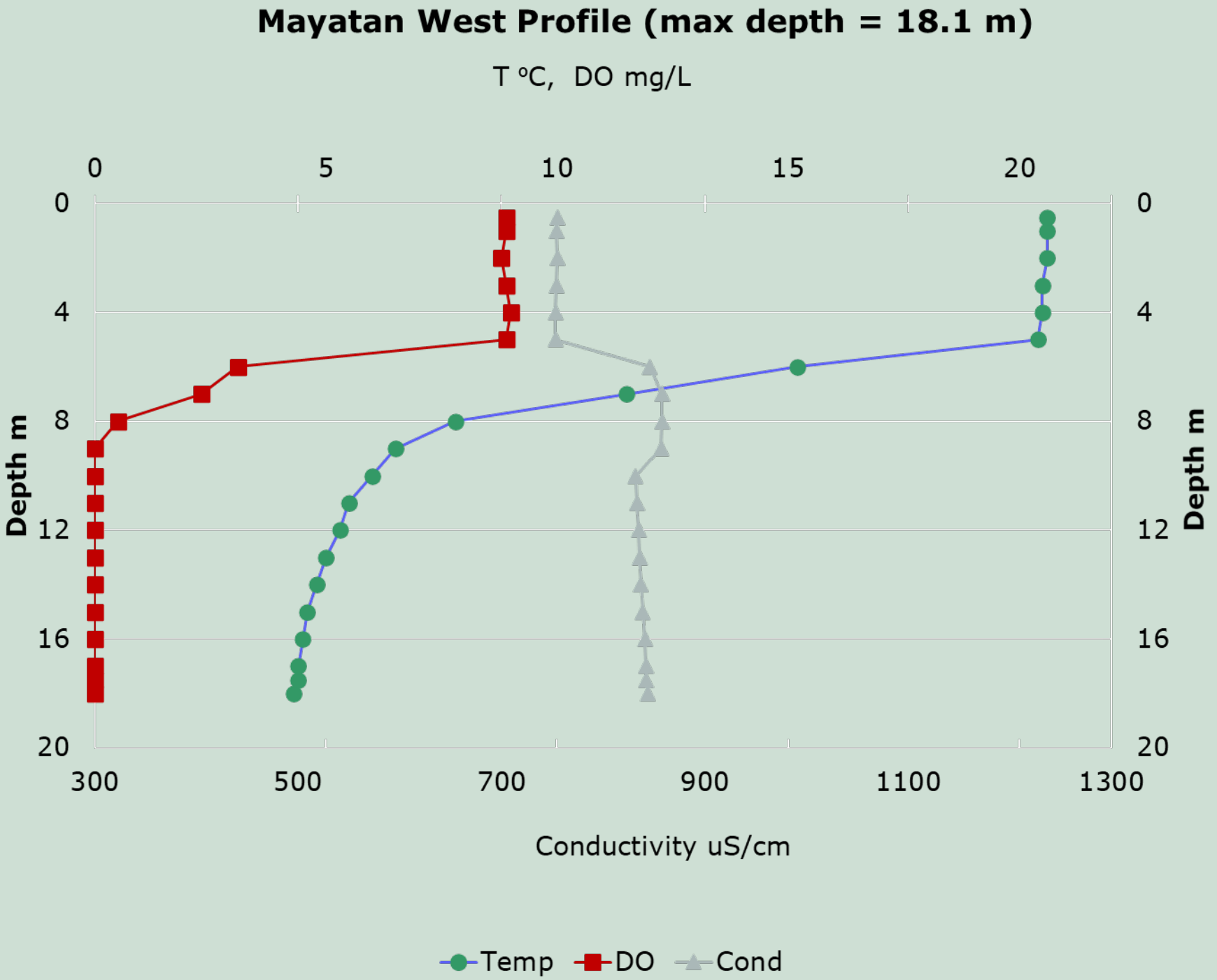
Special thanks to Dr. Steve Craik for preparing the graphs

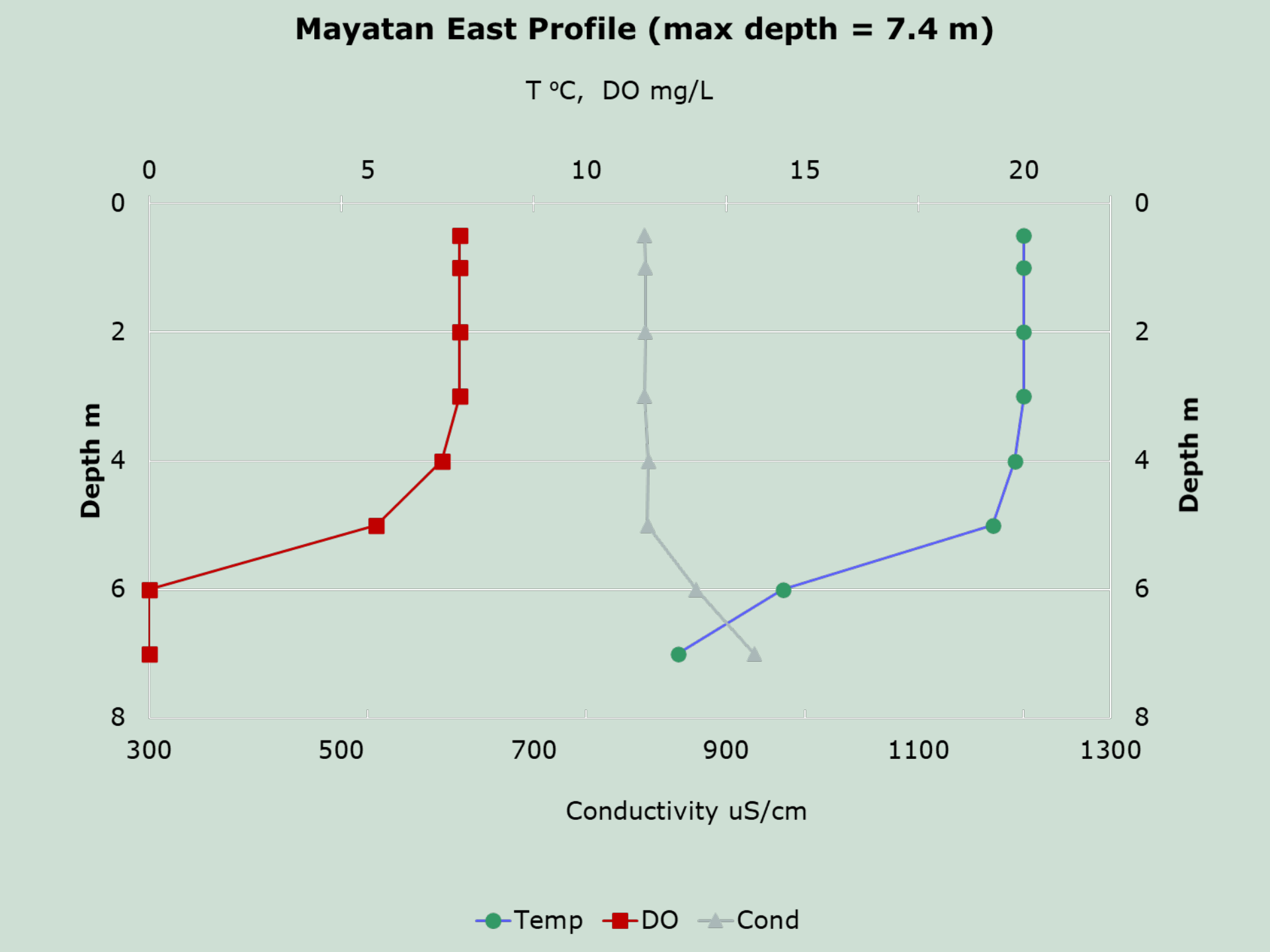

PL1 (Idano) Lake Profile (max depth = 12.1 m)
T °C, DO mg/L
0
5
10
15
20
0
4
8
12
Depth m
500
700
900
1100
1300
1500
Conductivity uS/cm
Temp
DO
Cond

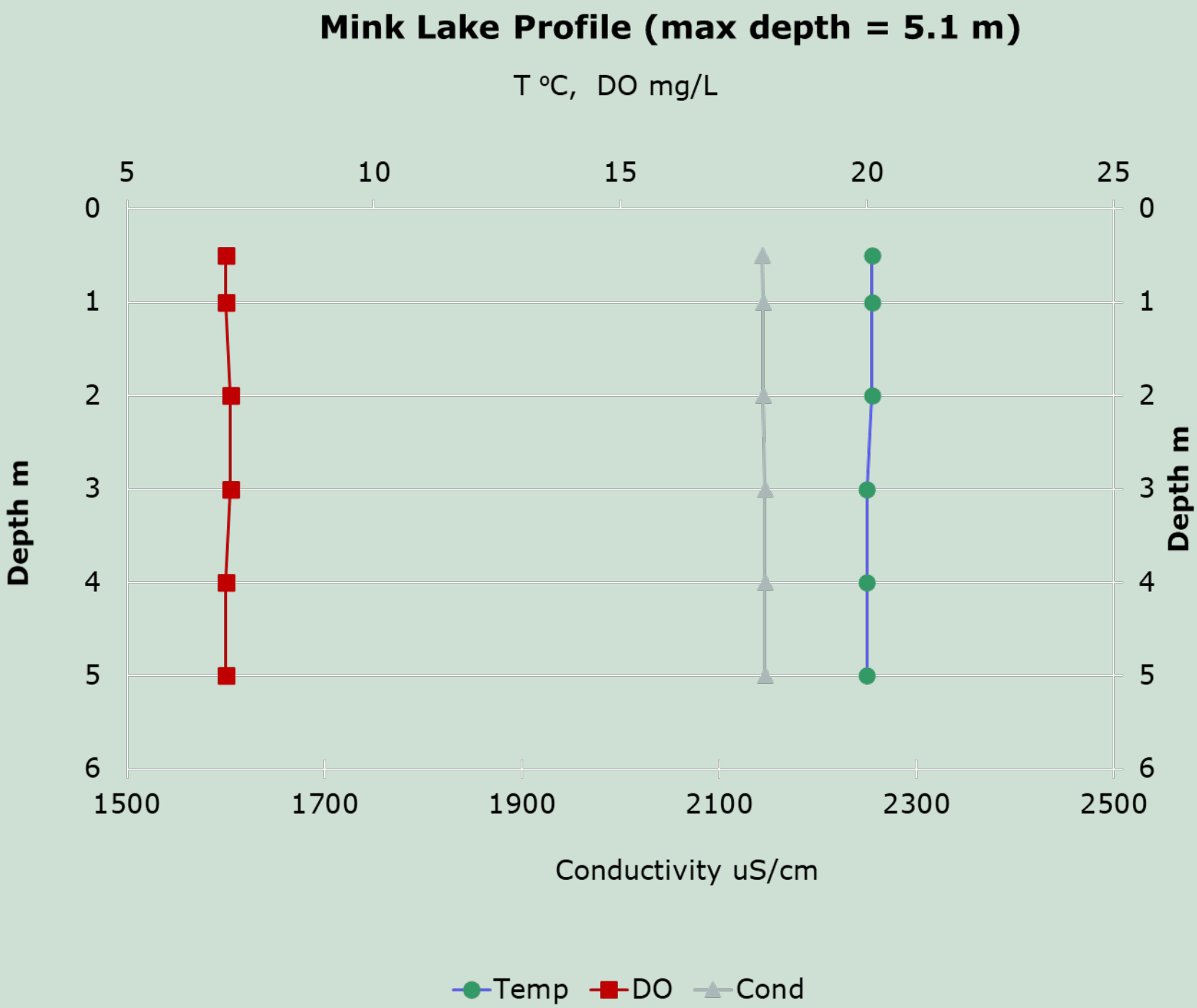

Gerharts Lake Profile (max depth = 18.2 m)
T °C, DO mg/L
0
5
10
15
20
Depth m
0
4
8
12
16
20
0
200
400
600
800
1000
Conductivity uS/cm
Temp
DO
Cond

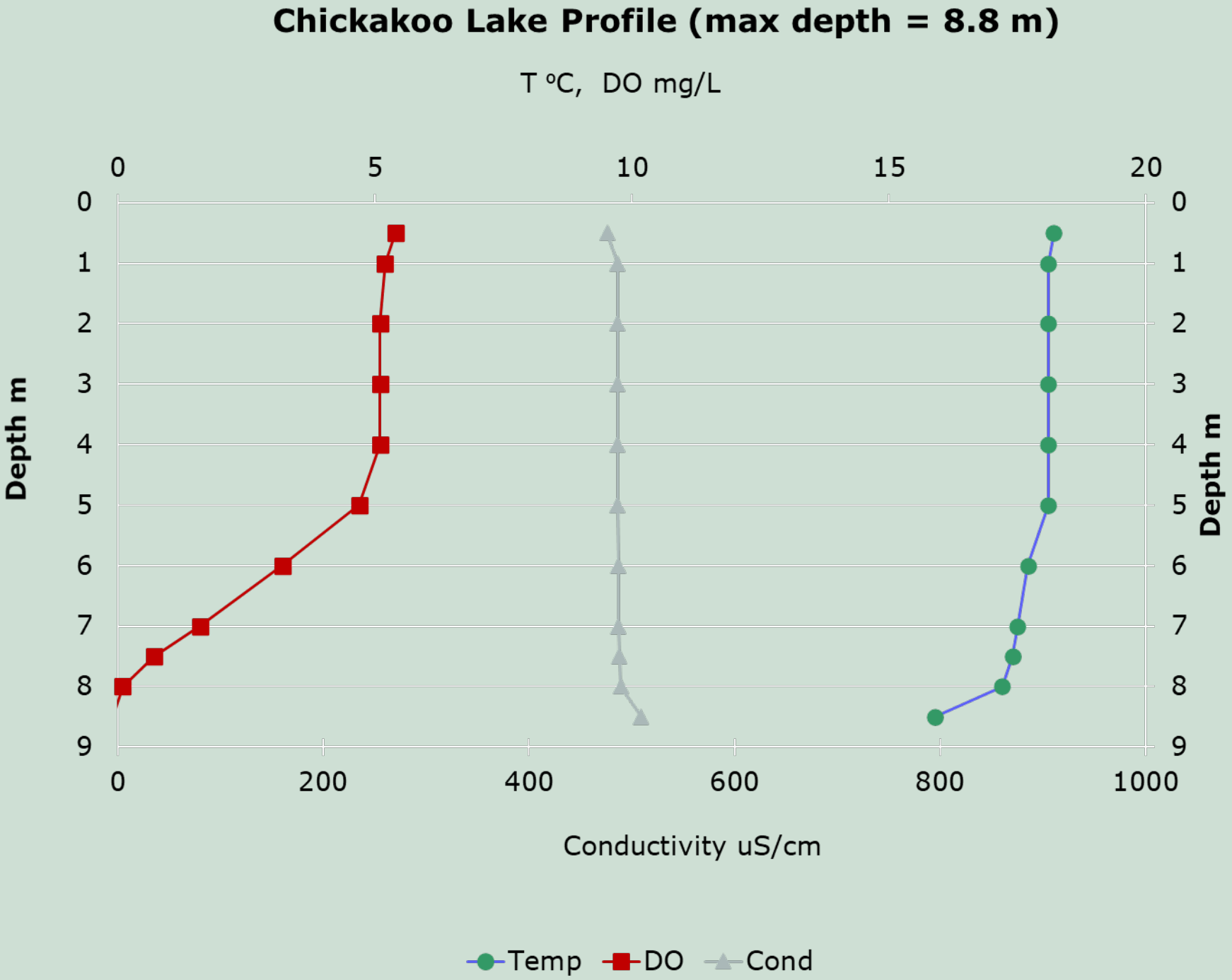

PL9 (Leo's) Lake Profile (max depth = 17.0 m)
T °C, DO mg/L
0
5
10
15
20
Depth m
0
4
8
12
16
20
700
800
900
1000
1100
1200
1300
1400
1500
1600
1700
Conductivity uS/cm
Temp
DO
Cond

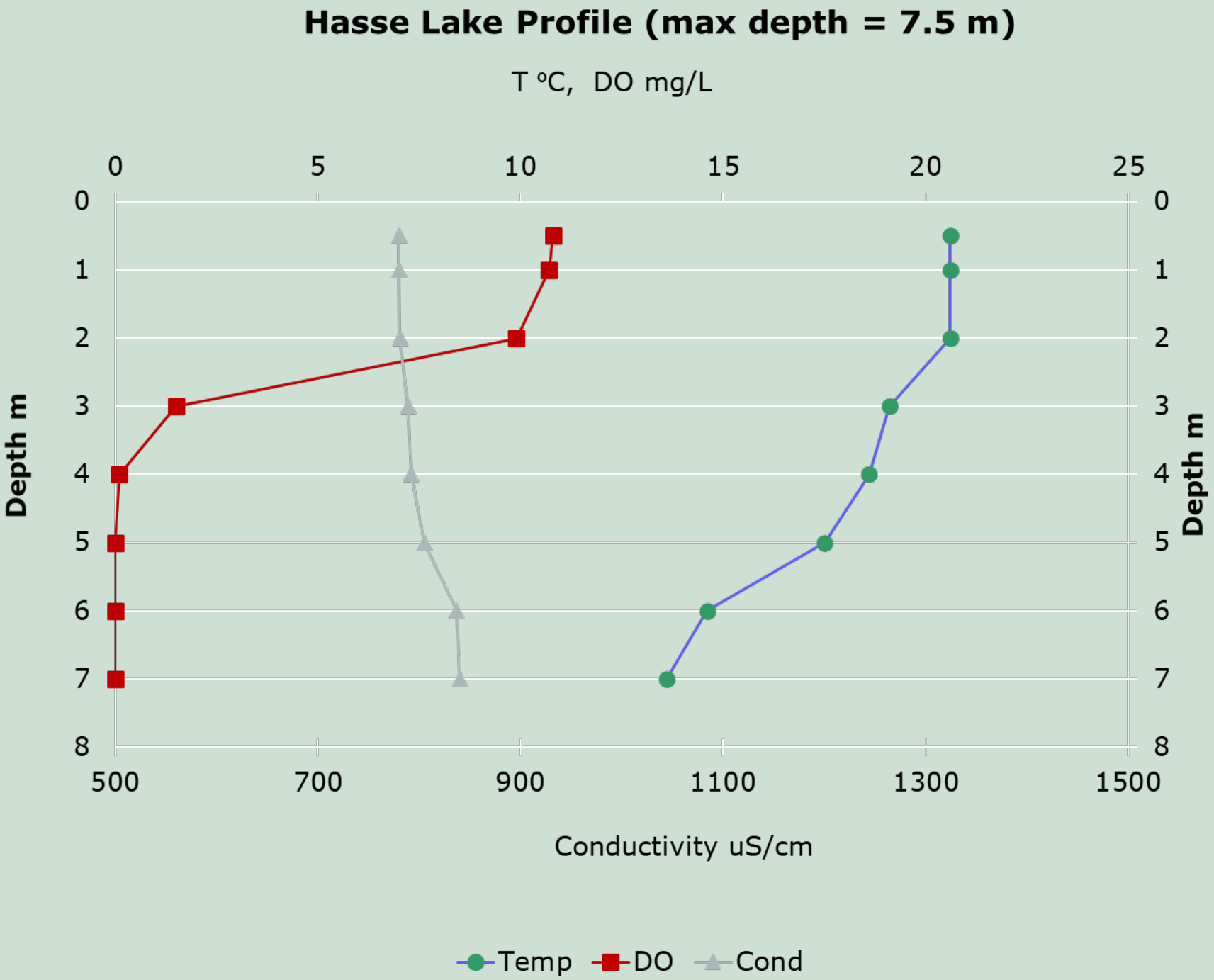

PL7 (McMorran) (max depth = 17.5 m)
T °C, DO mg/L
0
5
10
15
20
Depth m
0
4
8
12
16
20
0
200
400
600
800
1000
Conductivity uS/cm
Temp
DO
Cond


Mayatan West Profile (max depth = 18.1 m)
T °C, DO mg/L
0
5
10
15
20
Depth m
0
4
8
12
16
20
300
500
700
900
1100
1300
Conductivity uS/cm
Temp
DO
Cond


Mayatan East Profile (max depth = 7.4 m)
T °C, DO mg/L
0
5
10
15
20
Depth m
0
2
4
6
8
300
500
700
900
1100
1300
Conductivity uS/cm
Temp
DO
Cond


Mink Lake Profile (max depth = 5.1 m)
T °C, DO mg/L
5
10
15
20
25
0
1
2
3
4
5
6
Depth m
1500
1700
1900
2100
2300
2500
Conductivity uS/cm
Temp
DO
Cond


Chickakoo Lake Profile (max depth = 8.8 m)
T °C, DO mg/L
0
5
10
15
20
Depth m
0
1
2
3
4
5
6
7
8
9
0
200
400
600
800
1000
Conductivity uS/cm
Temp
DO
Cond


Hasse Lake Profile (max depth = 7.5 m)
T °C, DO mg/L
0
5
10
15
20
25
Depth m
0
1
2
3
4
5
6
7
8
500
700
900
1100
1300
1500
Conductivity uS/cm
Temp
DO
Cond

Change to Part B for Chemical results