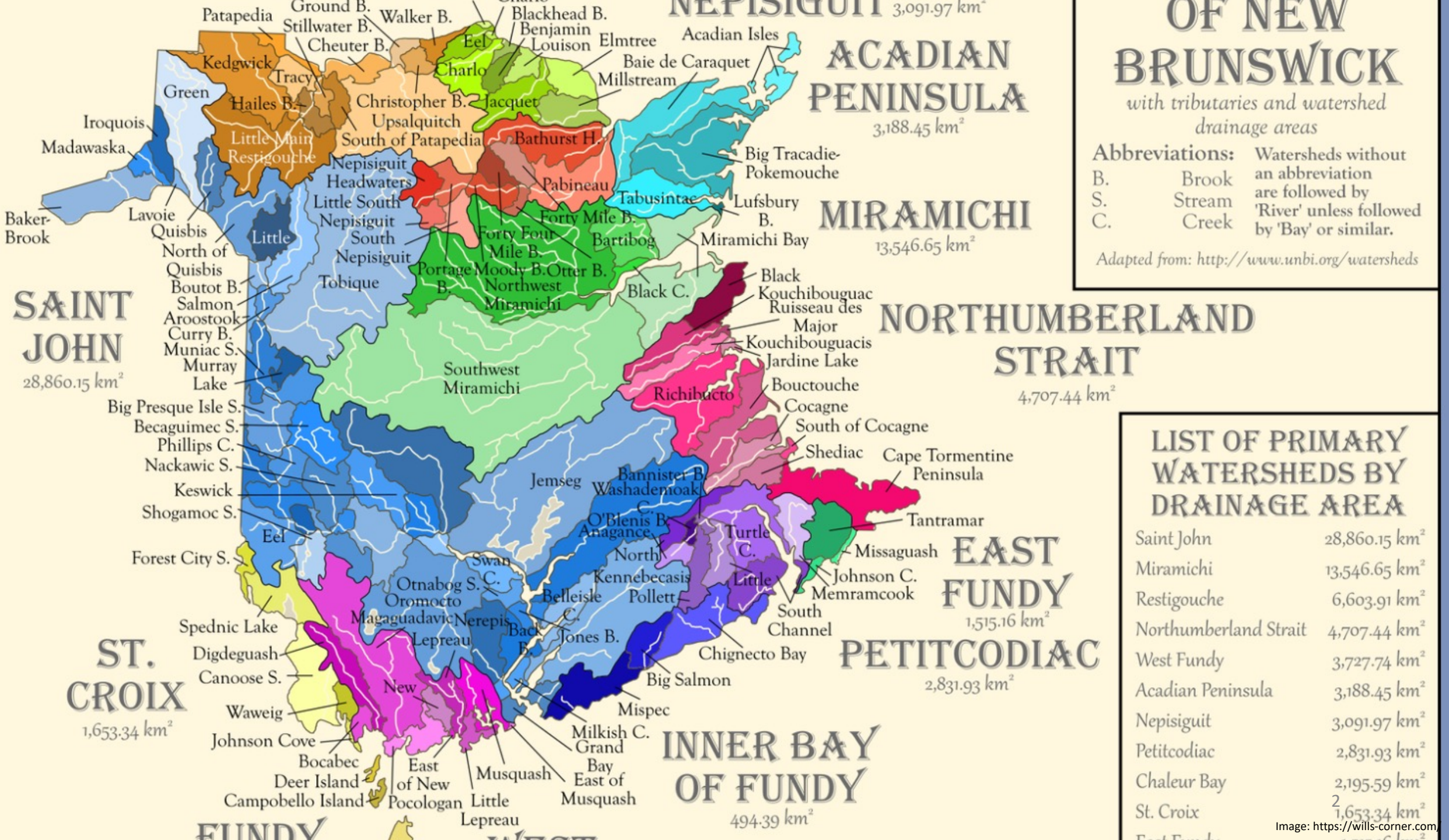
Jemseg Grand Lake Watershed Association

A healthy watershed ecosystem for all

Presentation to Minto Memorial High School

March 21, 2024

By: Greg Gillis



LIST OF PRIMARY WATERSHEDS BY DRAINAGE AREA

Saint John	28,860.15 km²
Miramichi	13,546.65 km²
Restigouche	6,603.91 km²
Northumberland Strait	4,707.44 km²
West Fundy	3,727.74 km²
Acadian Peninsula	3,188.45 km²
Nepisiguit	3,091.97 km²
Petitcodiac	2,831.93 km²
Chaleur Bay	2,195.59 km²
St. Croix	1,653.34 km²

Image: https://wills-corner.com/

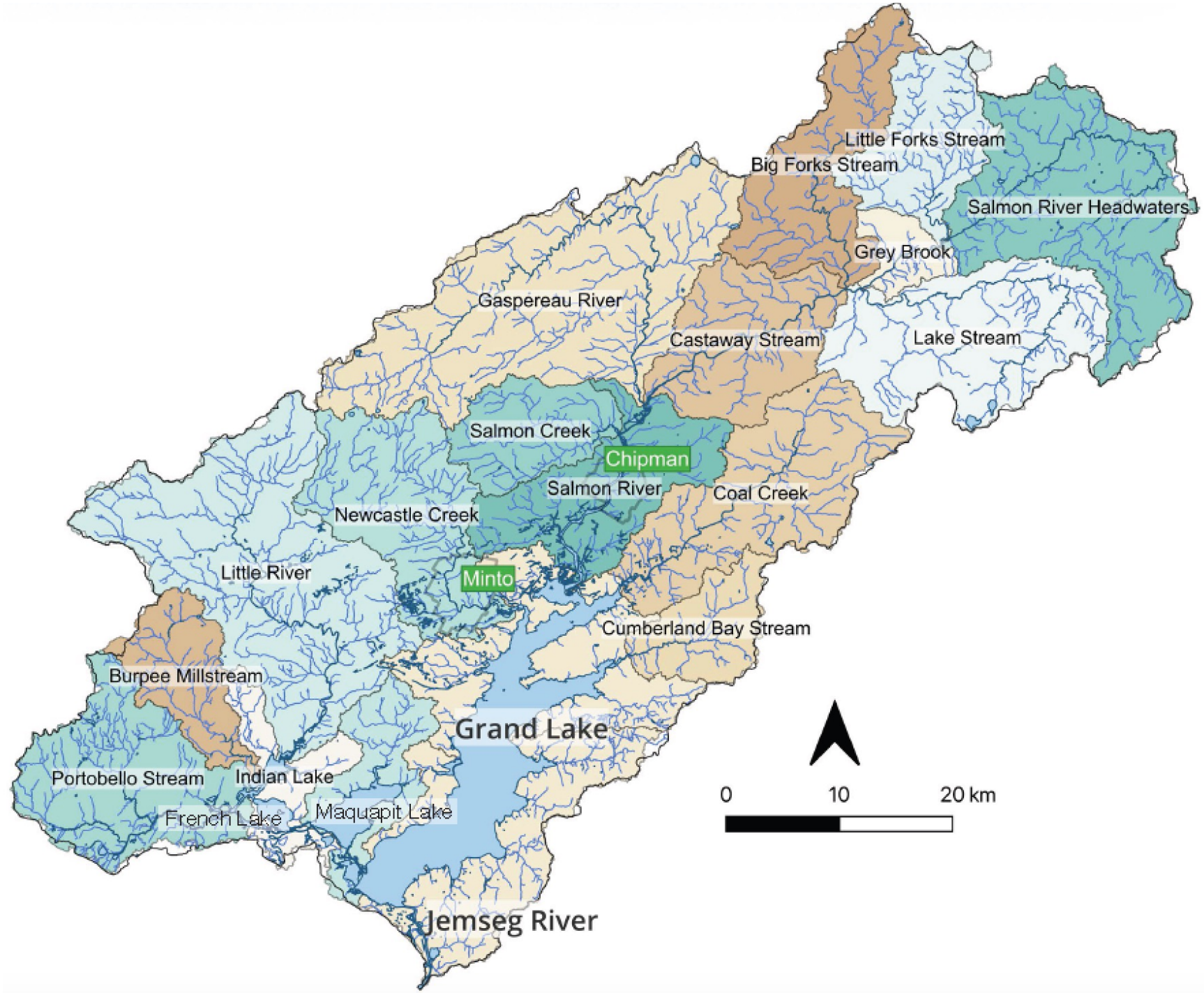

Little Forks Stream
Big Forks Stream
Salmon River Headwaters
Grey Brook
Gaspereau River
Castaway Stream
Lake Stream
Salmon Creek
Chipman
Salmon River
Coal Creek
Newcastle Creek
Little River
Minto
Cumberland Bay Stream
Burpee Millstream
Grand Lake
Portobello Stream
Indian Lake
French Lake
Maquapit Lake
Jemseg River
0
10
20 km

Table 2.1 Parameters and guideline concentrations used in the calculation of WQI.

Parameter Name	Lower limit	Upper limit	Unit	Reference / Comment
Ammonia (un-ionized)	0	0.0156	mg/L	CWQG; CCME, 1999
Arsenic	0	0.005	mg/L	CWQG; CCME, 1999
Chloride	0	120	mg/L	CWQG; CCME, 1999
Copper	0	0.002	mg/L	CWQG; CCME, 1999
Dissolved oxygen (DO)	6.5	Infinite	mg/L	CWQG; CCME, 1999
Iron	0	0.3	mg/L	CWQG; CCME, 1999
Nitrate	0	3	mg/L	CWQG; CCME, 1999
pH	6.5	9	-	CWQG; CCME, 1999
Phosphorus	0	0.02	mg/L	Provincial guideline (Culp et al. 2006)
Turbidity	0	10	NTU	Provincial guideline (DELG 2023)
Zinc	0	0.0075	mg/L	B.C. Ministry of Environment and Climate Change Strategy 2022

Table 2.2 Summary statistics of Grand Lake Surface Water Biophysical Characteristics in 2023. Due to problems with the YSI probe, few measures of Oxygen concentration were made, hence only averages from sites with at least three readings are presented here.

Station ID	Station Name	Oxygen mg/L	Water Temp ° C			pH			Conductivity µS/cm			Secchi (m)		
		Avg	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min	Avg	Max	Min
JGLP04	Grand Point Bar	8.5	18.4	23.8	14.2	6.9	7.3	6.4	67	70	58	1.5	1.75	1.2
JGLP05	Jemseg River	-	20.6	24.1	17.4	7.2	7.4	6.7	64	67	60	2.0	2.5	1.5
JGLP06	Maquapit Exit	-	20.6	25.8	16.7	6.3	6.7	5.9	34	37	31	1.0	1.25	0.75
JGLR02	Newcastle Creek	9.0	19.5	27.1	12.1	6.3	6.7	6.0	73	90	53	-	-	-
JGLR03	Lakeville Corner	-	21.0	25.6	15.6	6.1	6.4	5.8	32	34	28	-	-	-
JGLR05	Chipman Marina	8.7	18.2	23.0	11.8	6.4	6.5	6.2	34	37	28	-	-	-

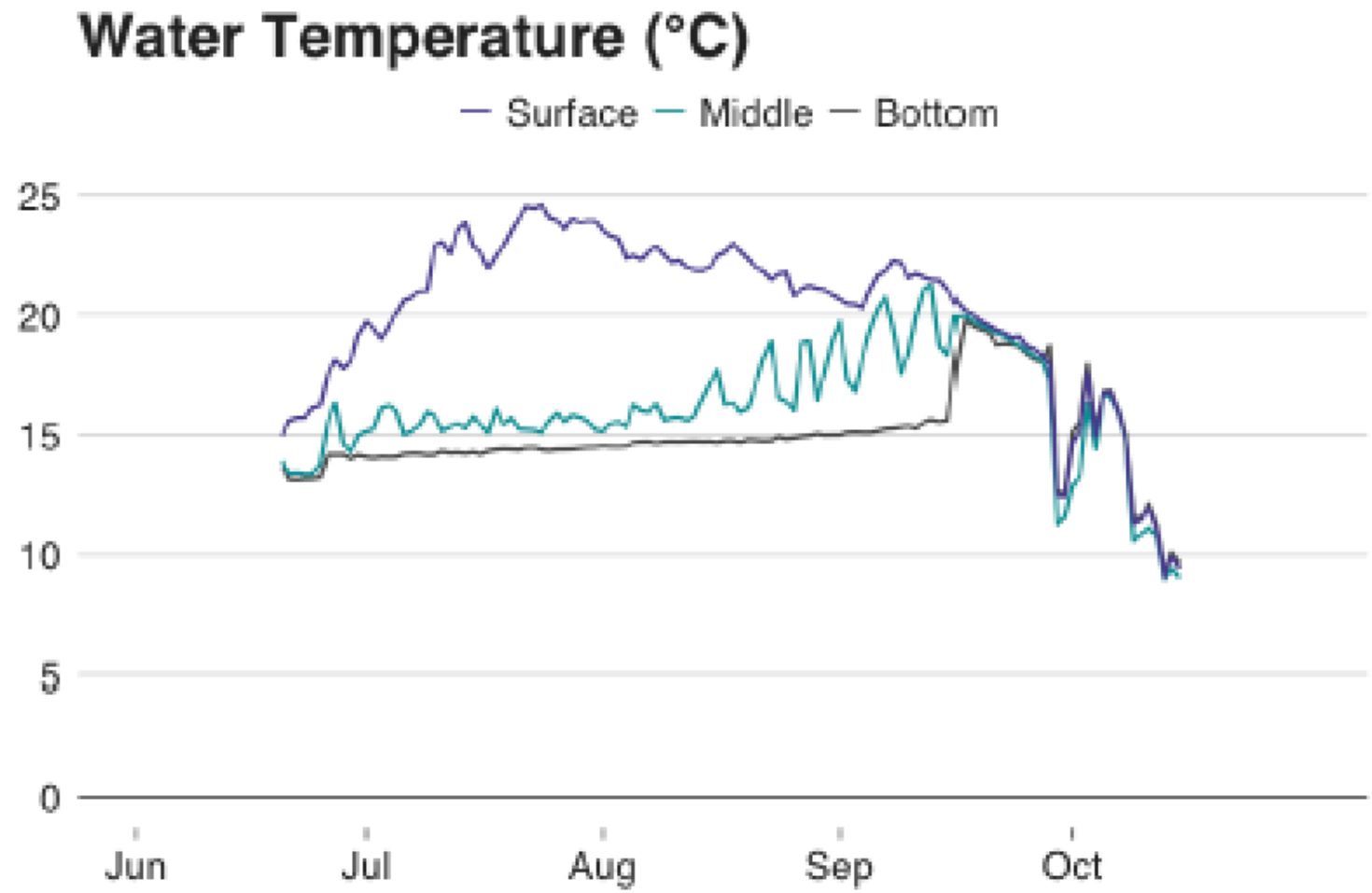


Figure 2.3 Daily average temperature from June 20 to October 15 at Grand Point Bar (JGLP04). Temperature shown from three depths: surface (2 m), mid (13 m), and bottom (21m).

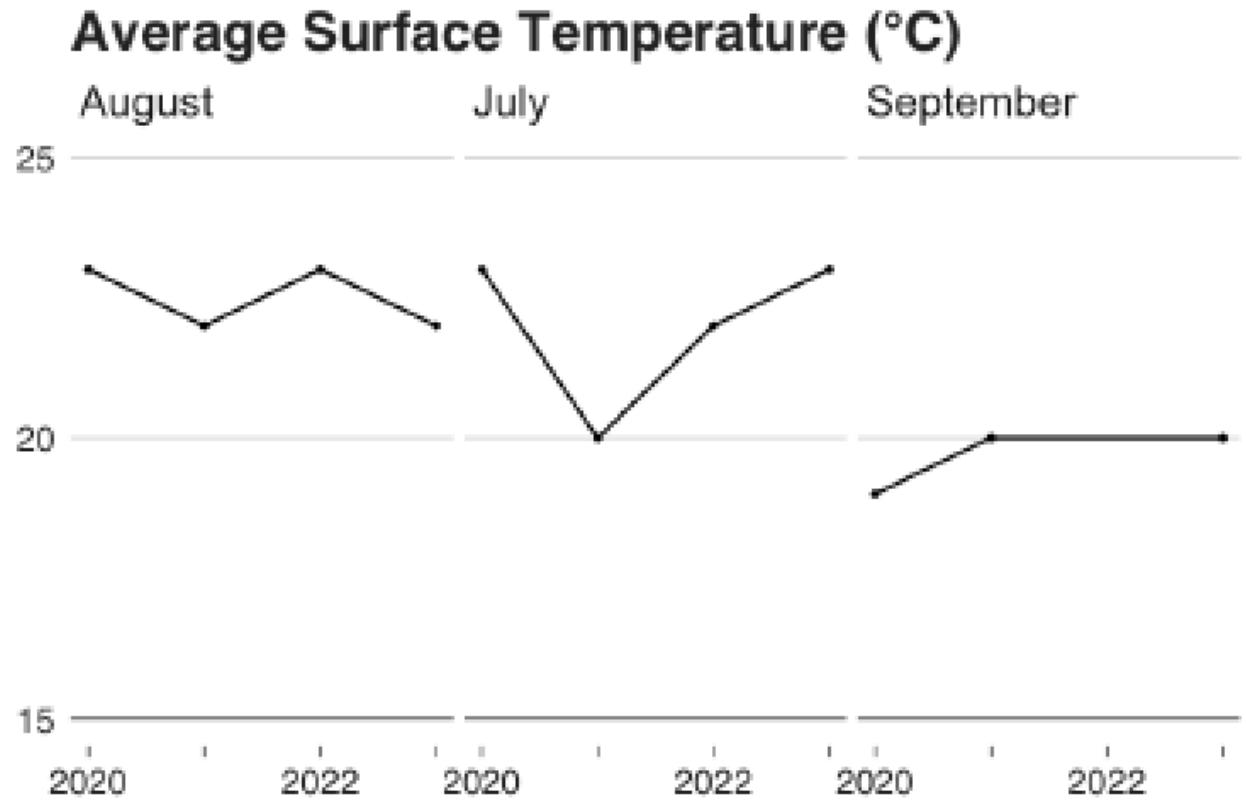


Figure 2.4 Average surface temperature for July, August, and September in the central parts of Grand Lake (Data for 2020-2022 are from Cumberland Point and for 2023 from Grand Point Bar).

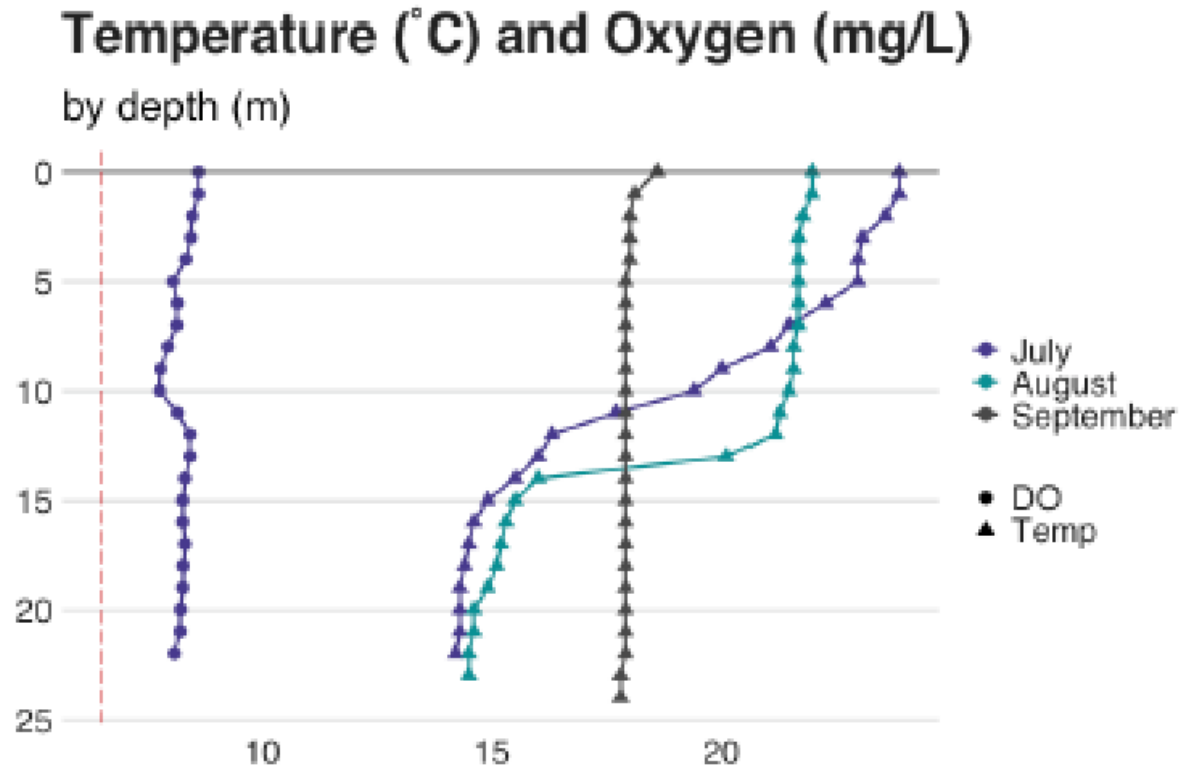


Figure 2.5 Vertical profiles of temperature and oxygen concentrations versus depth at Grand Point Bar for July, August and September, 2023. Oxygen is only available for July due to issues with the YSI probe. Red dashed line indicates critical oxygen concentration of 6.5 mg/L (CCME 1999).

Table 2.3 Average water quality results from surface water samples collected during June – September 2023. CWQG = Canadian Water Quality Guidelines for the Protection of Aquatic Life (CWQG; CCME, 1999). 1We used proposed total nitrogen and total phosphorus guidelines for the Saint John River Watershed instead of CWQG (Culp et. al. 2005). For zinc B.C. guidelines were used (B.C. Ministry of Environment and Climate Change Strategy 2022). Shaded values denote exceedance of guidelines.

					Grand Lake sites				River sites		
Analytes	Units	Reporting Limit	CWQG	Used in WQI?	JGLP04	JGLP04D	JGLP05	JGLP06	JGLR02	JGLR03	JGLR05
Alkalinity	mg/L	2		N	12.3	14.0	12.0	6.3	9.5	5.8	8.8
Aluminum	mg/L	0.001	Equation	N	0.07	0.06	0.07	0.17	0.22	0.26	0.20
Ammonia (as N) Un-ionized at 20 ℃	mg/L	0.05	0.0156	Y	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Arsenic	mg/L	0.001	0.005	Y	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Chloride	mg/L	0.5	120	Y	4.2	4.1	4.1	3.0	4.7	3.1	3.2
Chlorophyll-a	µg/L	0.5		N	2.8	1.9	2.5	3.2	5.5	5.6	1.7
Colour	TCU	5		N	62	63	60	121	172	177	177
Copper	mg/L	0.001	0.002	Y	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Dissolved Oxygen	mg/L	-	6.5	Y	8.8	NA	9.0	7.8	9.0	7.8	8.7
Iron	mg/L	0.02	0.3	Y	0.18	0.16	0.17	0.56	0.85	0.80	0.73
Nitrate (as N)	mg/L	0.05	3	Y	0.10	0.08	0.10	0.03	0.04	0.03	0.03
Nitrogen – Total	mg/L	0.2	0.5[1]	N	0.30	0.50	0.28	0.45	0.48	0.45	0.48
Phosphorus – Total	mg/L	0.002	0.03[1]	Y	0.01	0.01	0.01	0.03	0.05	0.04	0.03
Turbidity	NTU	0.1	10	Y	0.7	1.0	0.9	1.9	4.4	2.5	1.8
Zinc	mg/L	0.001	0.0075[2]	Y	0.001	0.009	0.001	0.003	0.003	0.003	0.002

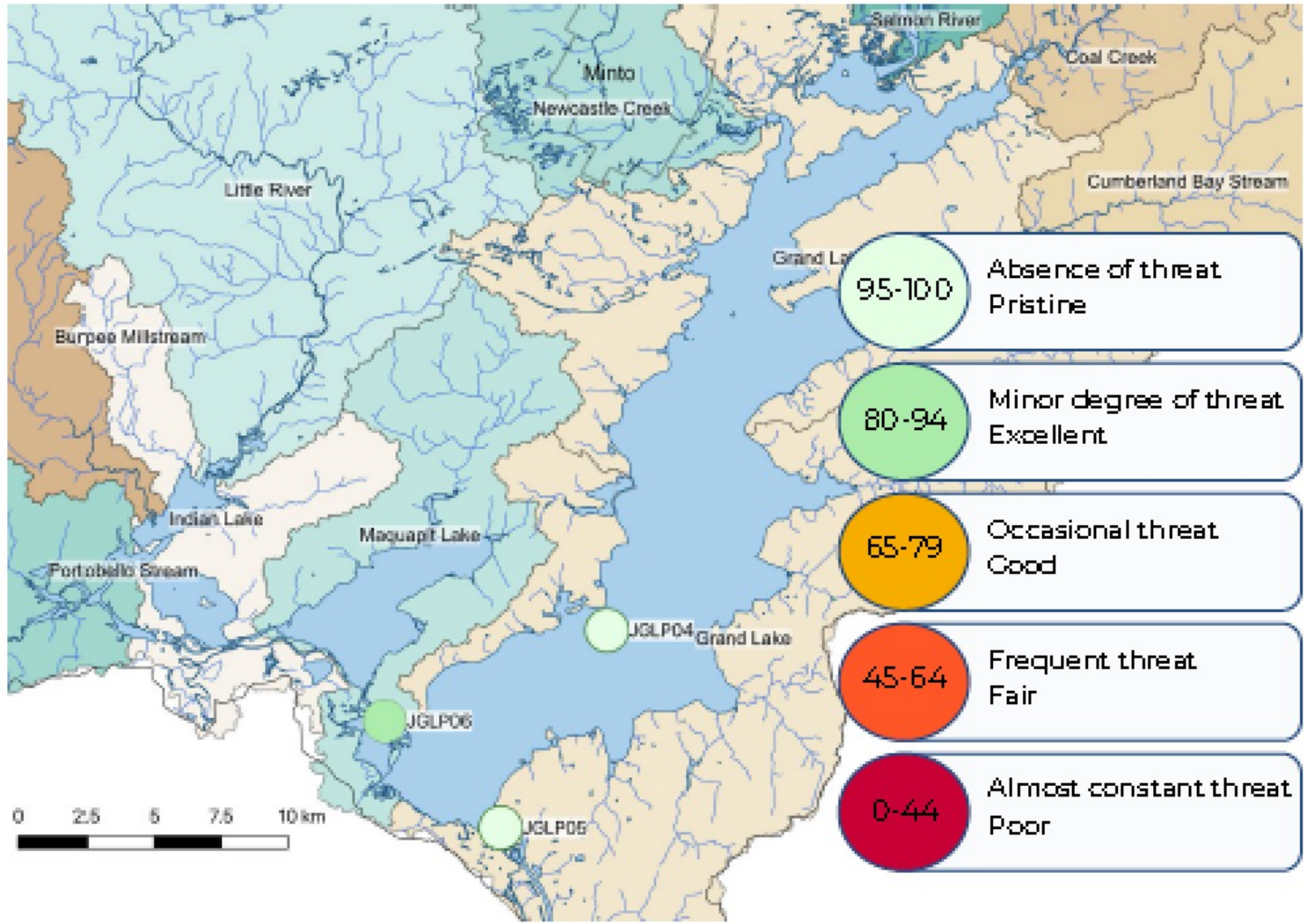


Figure 2.6 Water quality index class for the three lake sites.

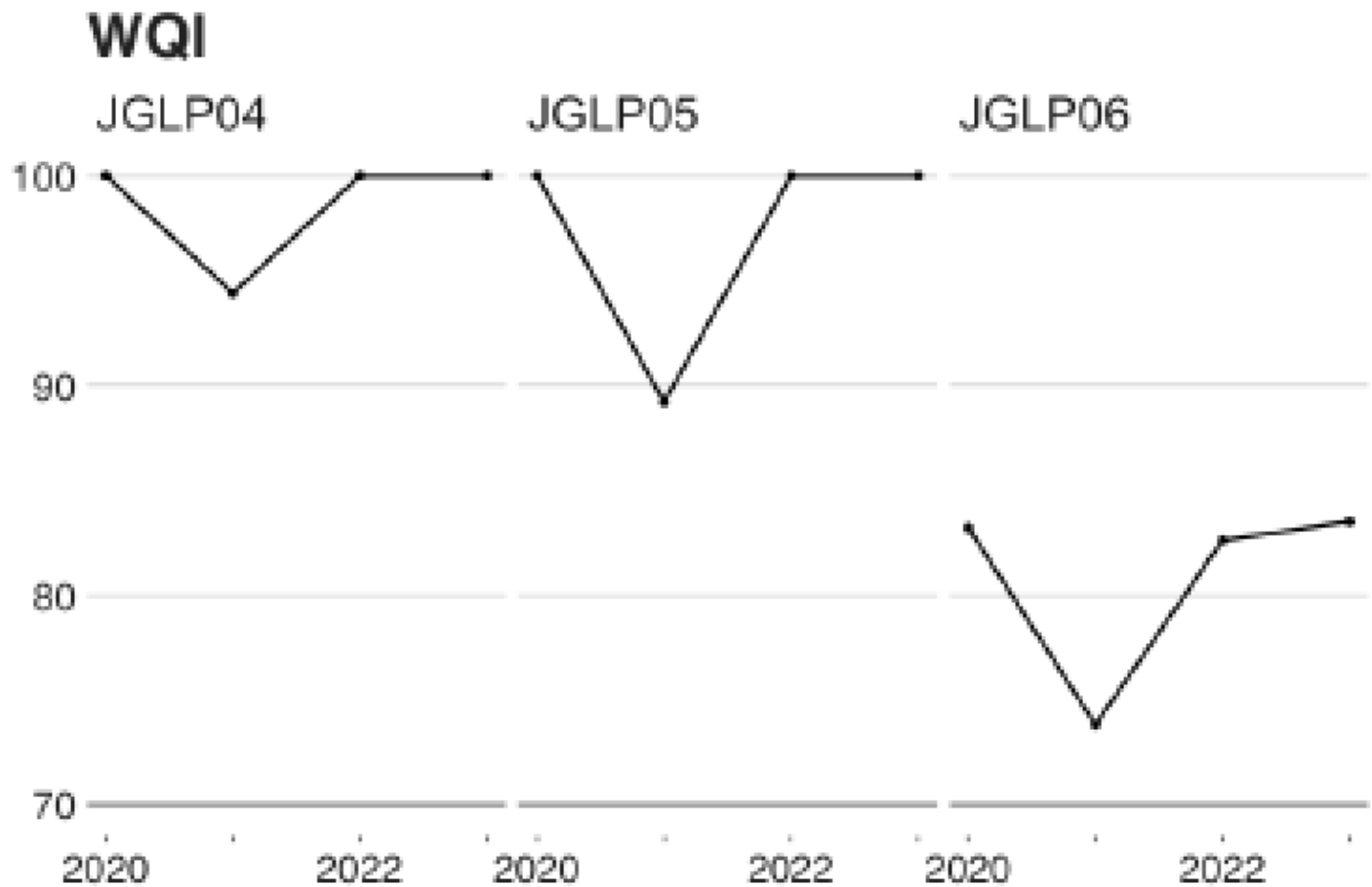


Figure 2.7 Water Quality Index scores from three Grand Lake Stations from the four years of JGWLA monitoring.

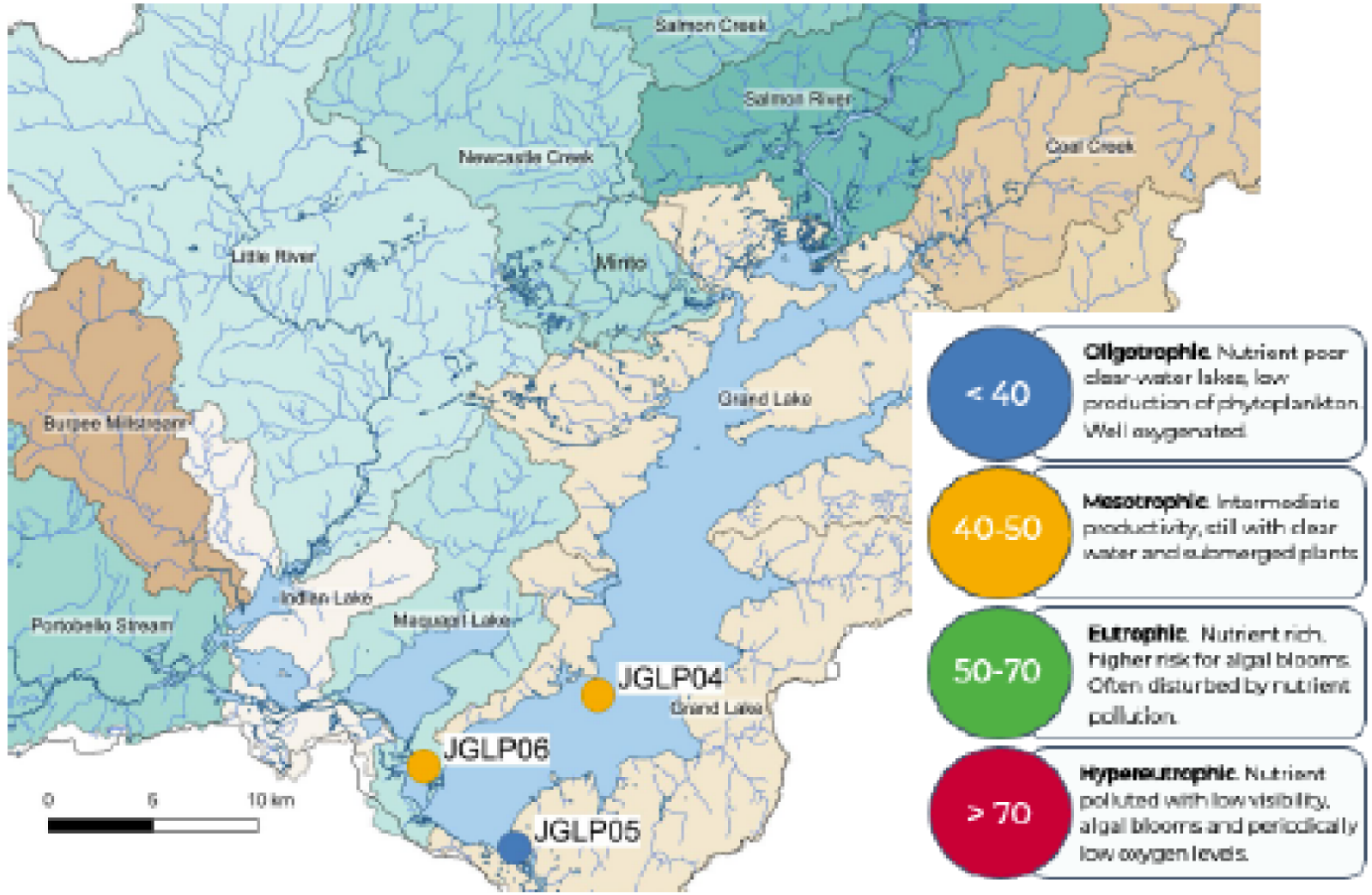


Figure 2.8 Trophic State Index colour score for the three lake sites on Grand Lake in 2023.

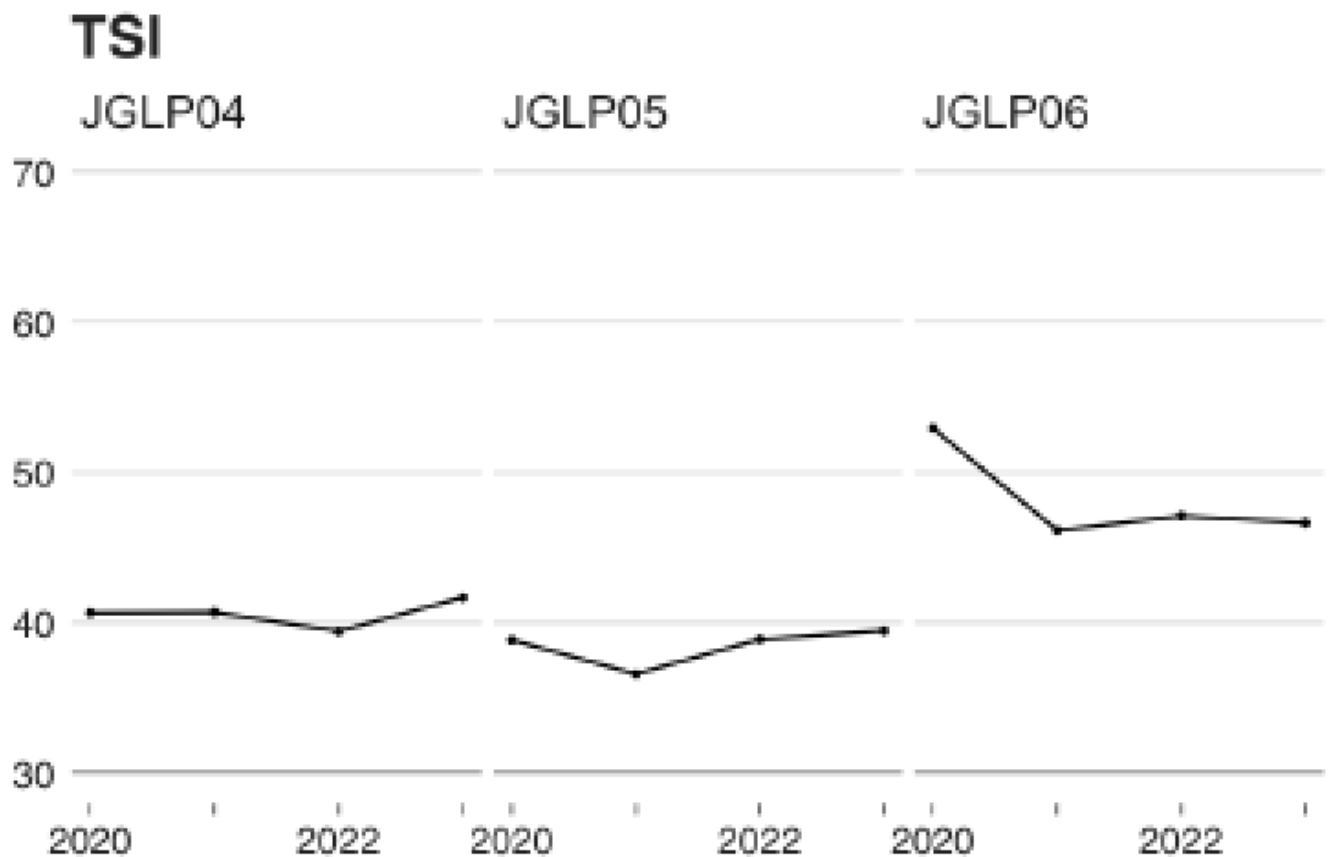


Figure 2.9 Time series of TSI scores for the three lake stations in Grand Lake that have data from the inception of the monitoring by the JGLWA.

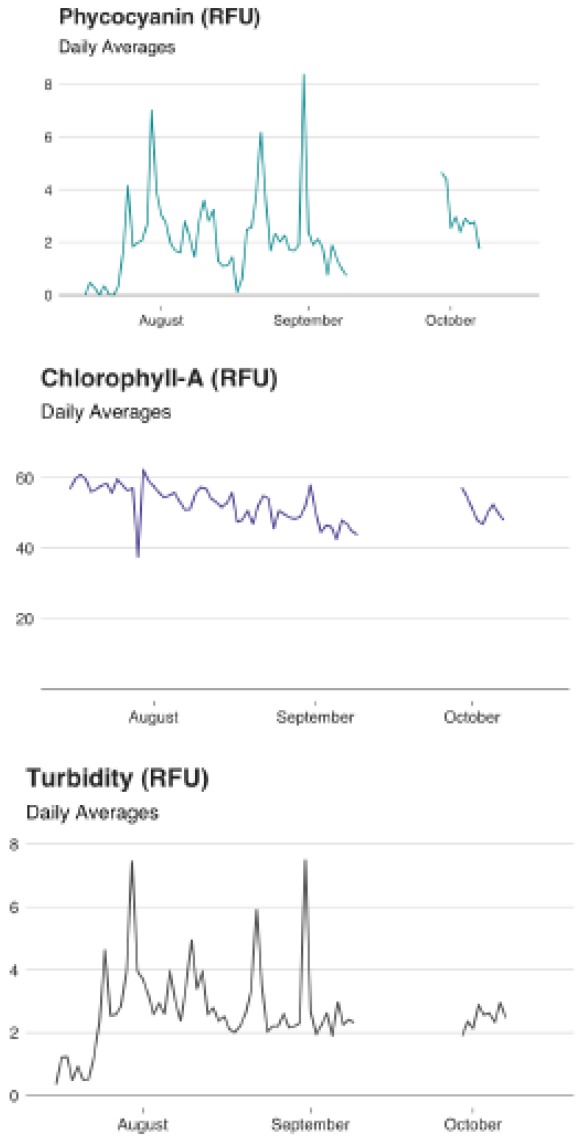


Figure 2.10 Daily averages of Phycocyanin, Chlorophyll-a, and Turbidity recorded by the algae tracker from mid-July to early October. Results are expressed in relative fluorescence units (RFU).

MONITORING AND REMOVAL OF EURASIAN WATERMILFOIL WITHIN GRAND LAKE

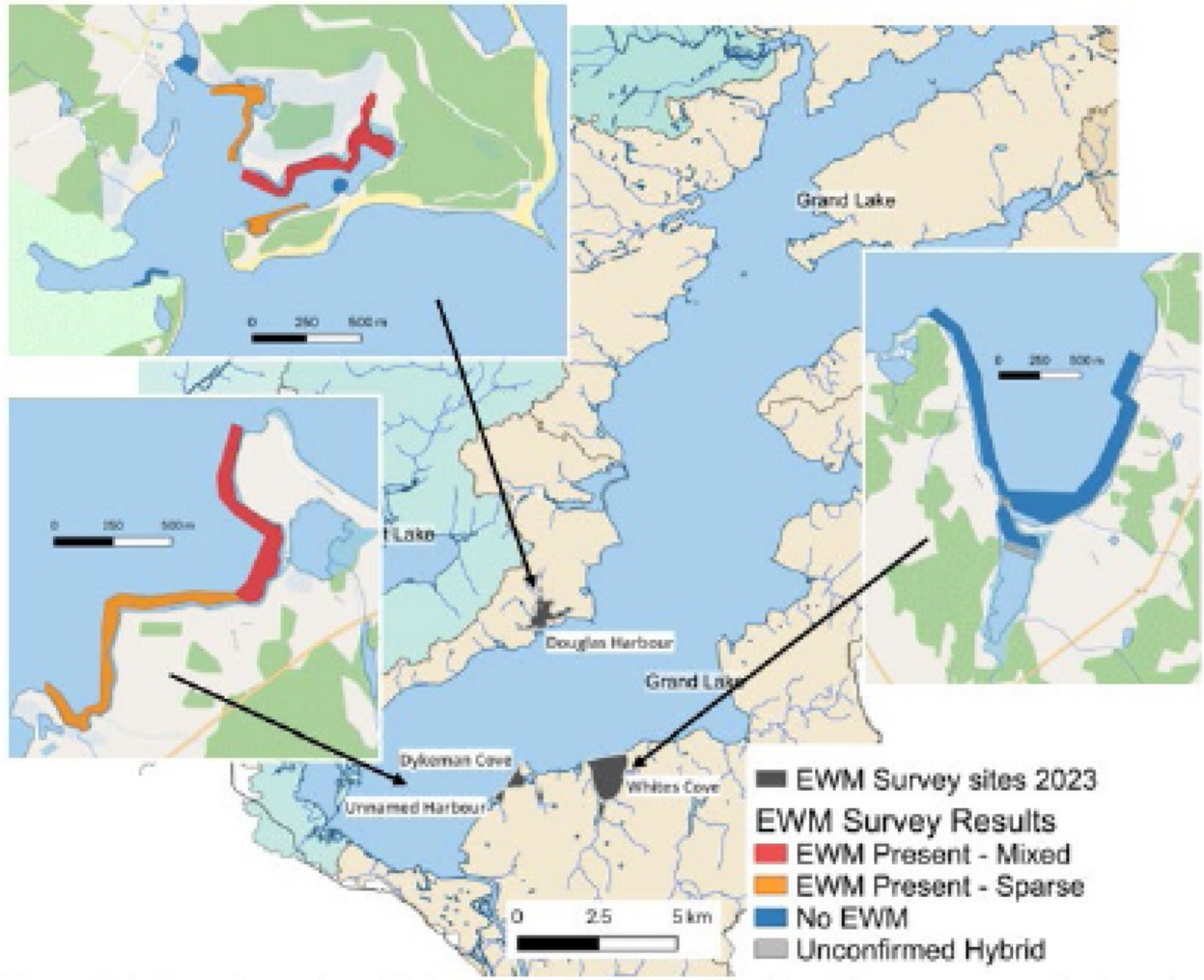


Figure 3.1. Eurasian watermilfoil survey sites 2023. Results of the survey are displayed in the three detailed insets. Hydrography: NB DERD (2022, open government license) Colour shading in the overview map indicate sub-watersheds (NCC, 2019 CC BY-NC 3.0). Background in details from © OpenStreetMap contributors.



Figure 11 Site for the Eurasian watermilfoil removal test in Dykeman Cove, Grand Lake. The black dot in one corner of each plot indicates the location of the recorded coordinate for that plot. Hydrography: NB DERD (2022, open government license) Background: © OpenStreetMap contributors.



The ROV used in underwater surveys.



EWM found in Douglas Harbour during ROV and visual surveys.

ENVIRONMENTAL DNA PILOT STUDY

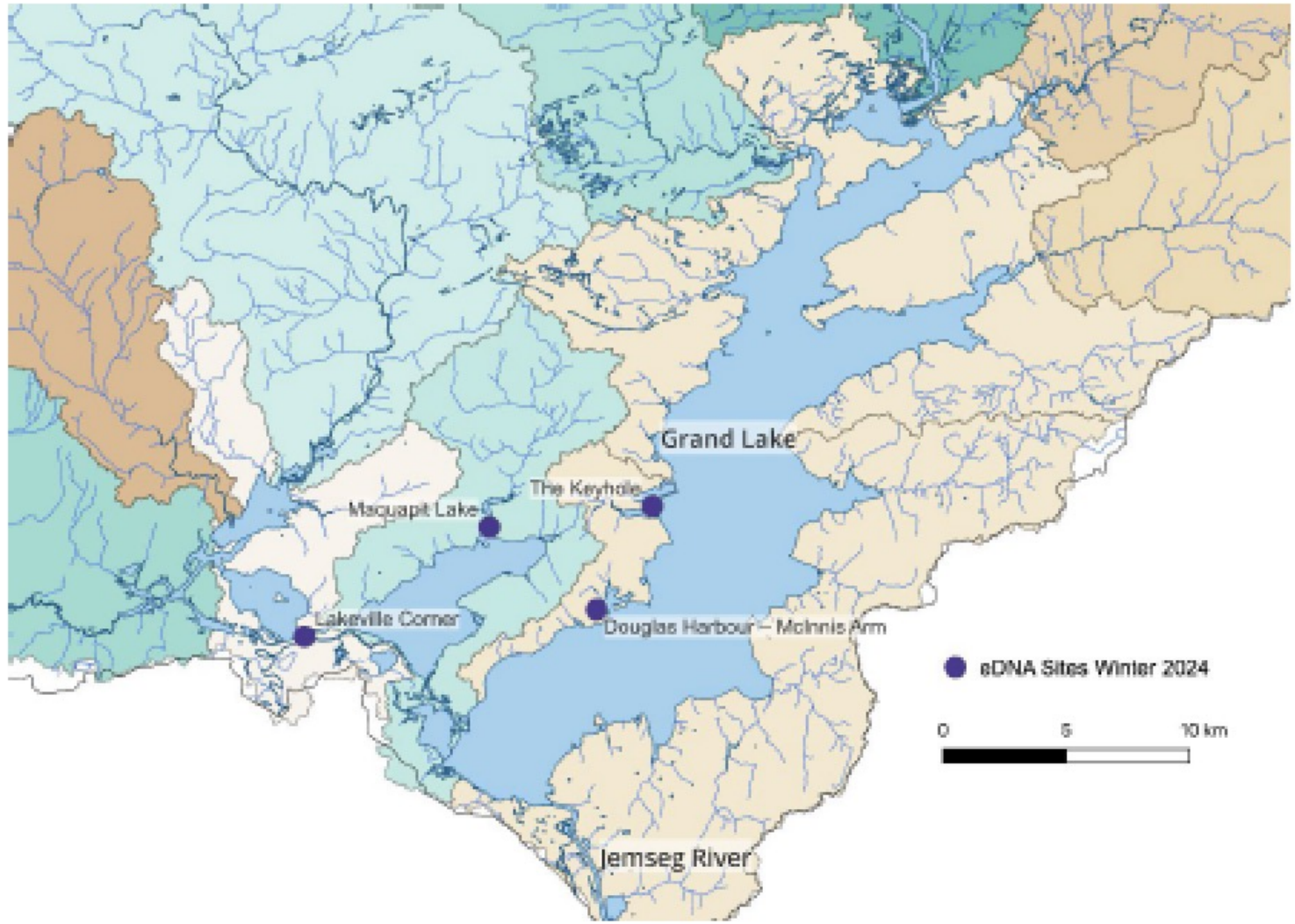


Figure 4.1. Sites where environmental DNA samples were collected from water sample collected under or beside ice in February 2024.

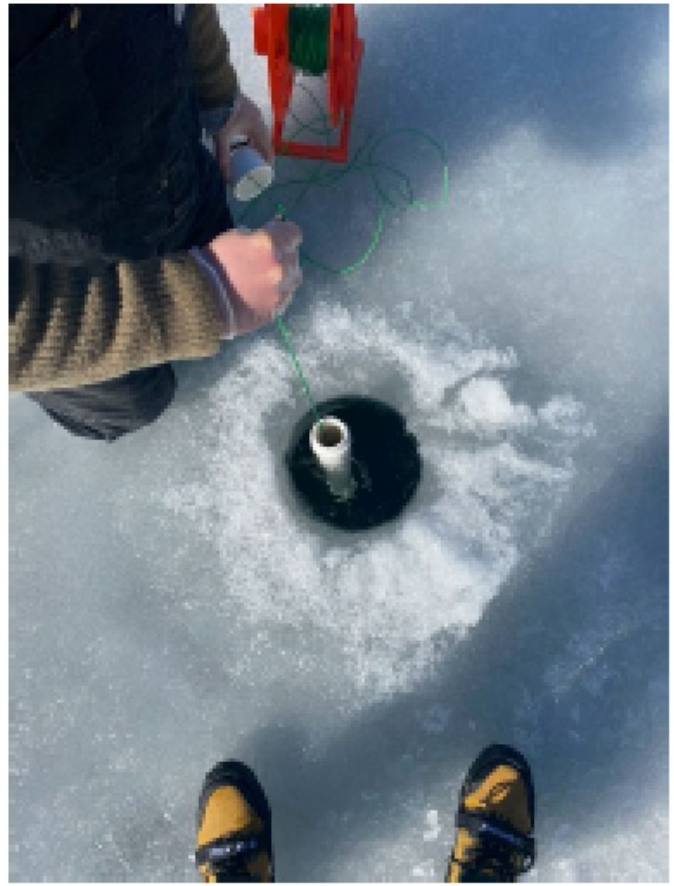


Photo 4.1 Water sampling for eDNA through ice.



Photo 4.2 A eDNA sample, showing particulate collected on a filter from a water sample.



INVASIVE SPECIES



Image: https://www.bayportmarina.com/zebra-mussels-invasive-species/



Image: https://biodiversityireland.ie/quagga-mussel-alert/

OTHER WATERBORNE RISKS



Image: https://www.cdc.gov/habs/illness-symptoms-freshwater.html

EROSION CONTROL





FINAL THOUGHTS



CLEAN DRAIN DRY

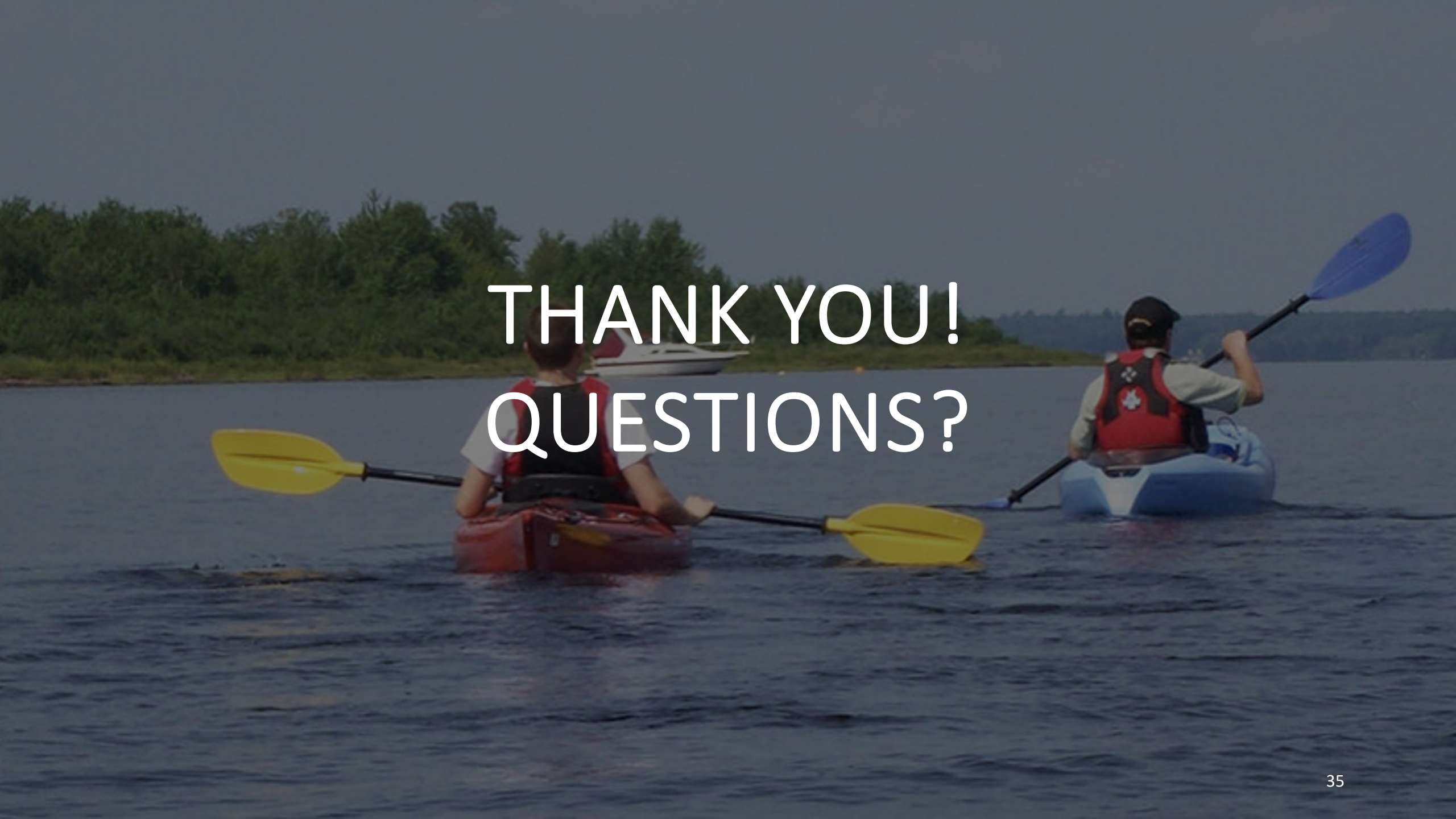
Prevent the Spread of Aquatic Invasive Species

https://canadainvasives.ca/programs/clean-drain-dry/



For more information on the Grand Lake Jemseg Watershed Association and to get involved visit:

www.jemseggrandlakewatershed.ca


THANK YOU!
QUESTIONS?