Water Quality Report

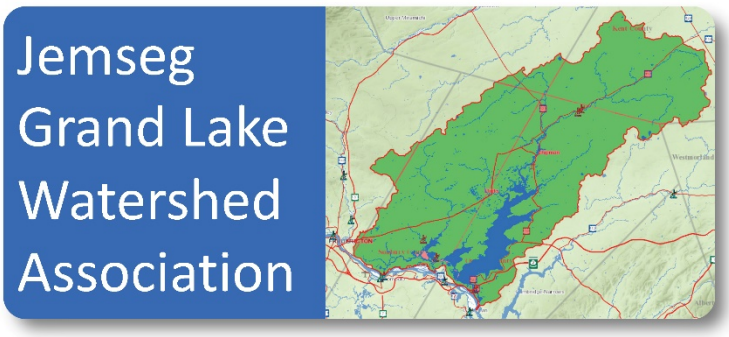
2020 FIELD SEASON

OUR ORGANIZATION

The Jemseg Grand Lake Watershed Association (JGLWA) was formed in October 2019. The Jemseg Grand Lake watershed covers 3,950 km^2 and is home to Grand Lake, the largest freshwater lake in the Maritimes at 171 km^2.

Goal: a healthy Jemseg Grand Lake watershed ecosystem for all.

Mission: to engage the attention, enthusiasm, & support of people, communities, businesses, and organizations inside the Jemseg Grand Lake watershed to provide a healthy watershed for all.



OUR WATERSHED



Maintaining good quality surface water is extremely important for ensuring a healthy Jemseg Grand Lake watershed. Clean water is one of New Brunswick's most important resources. We rely on it for drinking, growing food, manufacturing goods, producing electricity, and for recreational activities. The flora and fauna of the Jemseg Grand Lake watershed also rely on clean water.

The JGLWA began water quality monitoring in the summer of 2020. We monitor six sites monthly throughout the field season.

WHAT DO WE MEASURE?

Water Temperature — Water needs to be cold enough for some species (like salmon and trout) to survive

Dissolved Oxygen — Ecosystems need a minimum amount of oxygen in the water to support healthy aquatic life

Conductivity — This is the water's ability to transmit electricity- changes are due to dissolved solids, and may impair the survival of some species

Metals — Metals are introduced into water from weathering or erosion of soils or rocks either naturally or at an increased speed due to human activities

pH — This measures how acidic/basic the water is- neutral levels are best for fish. Changes to the natural pH might impact the nutrients or toxins in the water

Dissolved Solids — Dissolved solids can be anything from organic material, to minerals, to pollutants. Too many dissolved solids harm aquatic life and may indicate contaminated runoff.

Nutrients — While some nutrients are healthy, too many nutrients (like phosphorus and nitrogen) can cause algae and harm ecosystems. Nutrients often come from manure and fertilizer in runoff.

Chlorophyll-a — This is a measure of the photosynthetic pigment that causes the green colour in algae. The concentration is directly related to the phytoplankton abundance and biomass.

Secchi Depth (transparency) — A circular black and white disk is used to measure transparency of the water. The depth at which the disk is no longer visible is known as the Secchi depth and is related to water transparency.



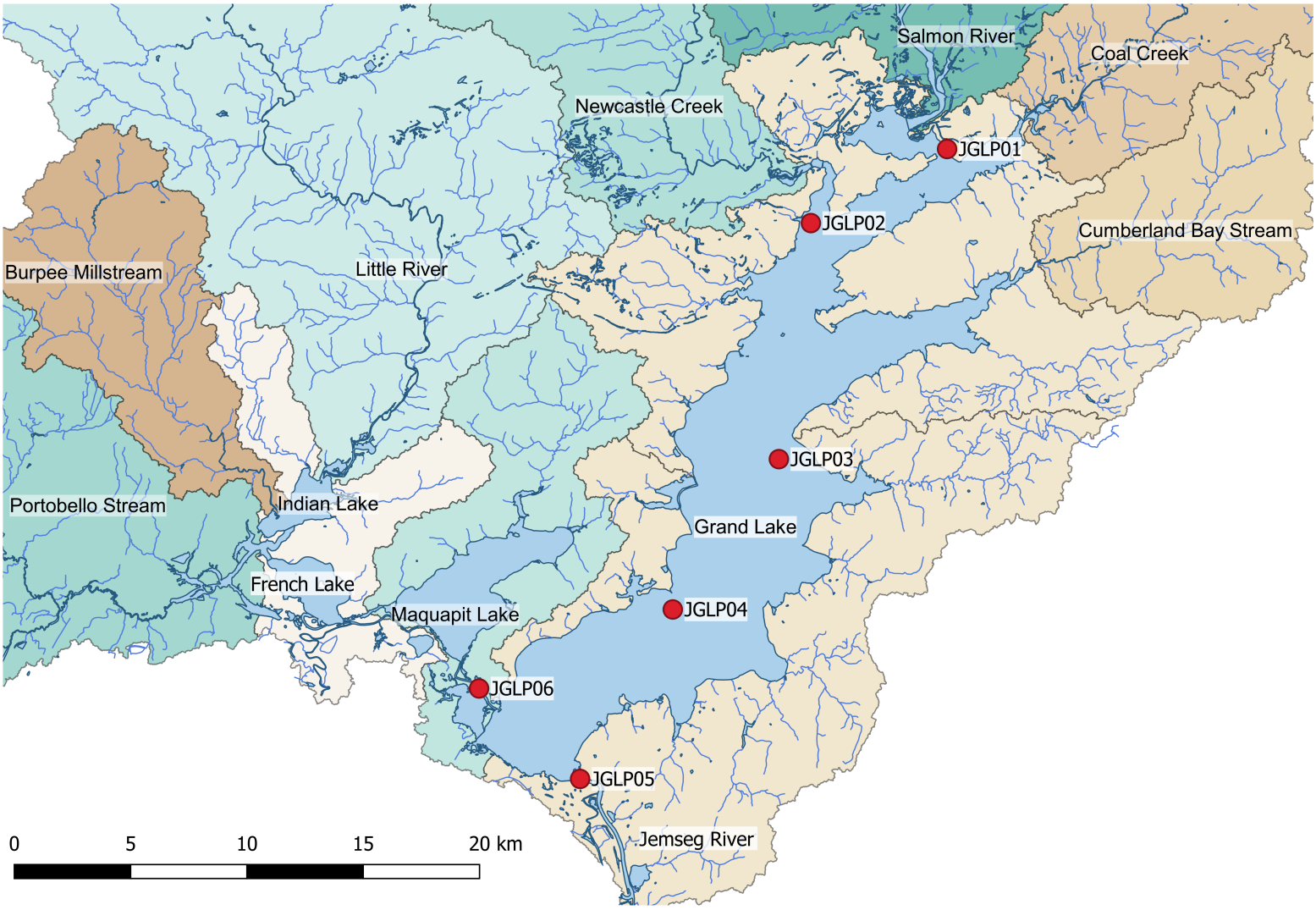


WATER QUALITY SAMPLING

OUR SAMPLING SITES

Six sampling locations were established on Grand Lake, including areas close to inflows, the outflow, and in the central deep basins of the lake. Sites were sampled four times between July and October, 2020. The different coloured areas on the maps in this report indicate subwatersheds of the Jemseg Grand Lake Watershed as defined by the National Hydrographic Network.

Site Name	Location	Depth (m)
JGLP01	Northeast Arm	3
JGLP02	Newcastle Bay	5
JGLP03	Cumberland Point	26
JGLP04	Grand Point Bar	25
JGLP05	Jemseg River	8
JGLP06	Maquapit Exit	4



LAKE TEMPERATURE & VERTICAL PROFILING

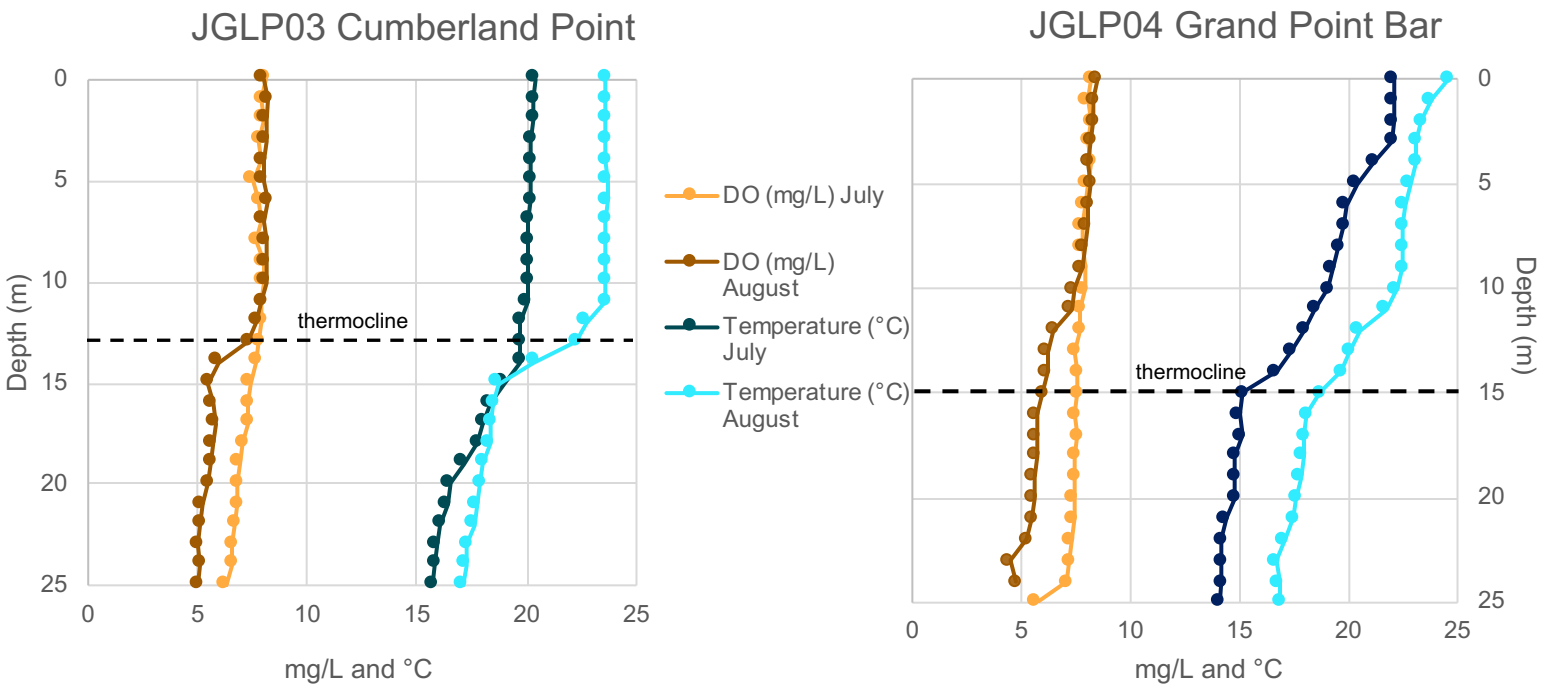
SURFACE TEMPERATURE

Surface water temperature (depth of 0.5 m) was measured every 30 minutes between 27 June and 5 October using a HOBO logger attached to a dock in Cumberland Bay. Summary statistics are as follows:

Month	Max Temp (ºC)	Min Temp (ºC)	Average (ºC)	No. days >23ºC
July	26.90	17.76	22.59	20
August	28.83	18.19	23.28	24
September	22.56	14.11	18.77	0
Overall	28.83	8.11	21.29	46

VERTICAL PROFILE

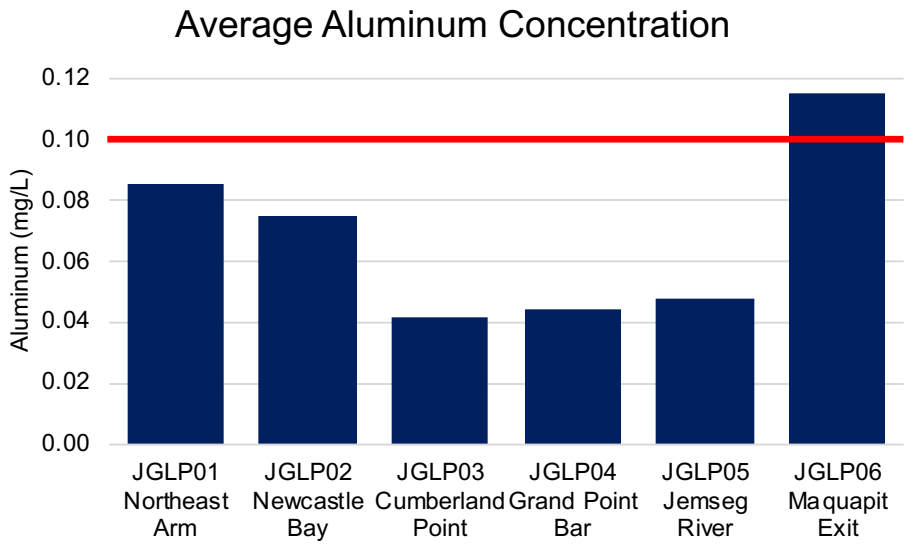
Vertical profiling (measurements of parameters at increasing depth) was completed at all six sites. A secchi disk depth was taken and temperature, pH, dissolved oxygen (DO), and conductivity were measured every metre starting at the surface. Results are shown for Cumberland Point and Grand Point Bar, the two deepest sites, for July and August only. The thermocline line is the transition between warm, less dense water at the surface and cooler, more dense water at the bottom that occurs during the summer months.

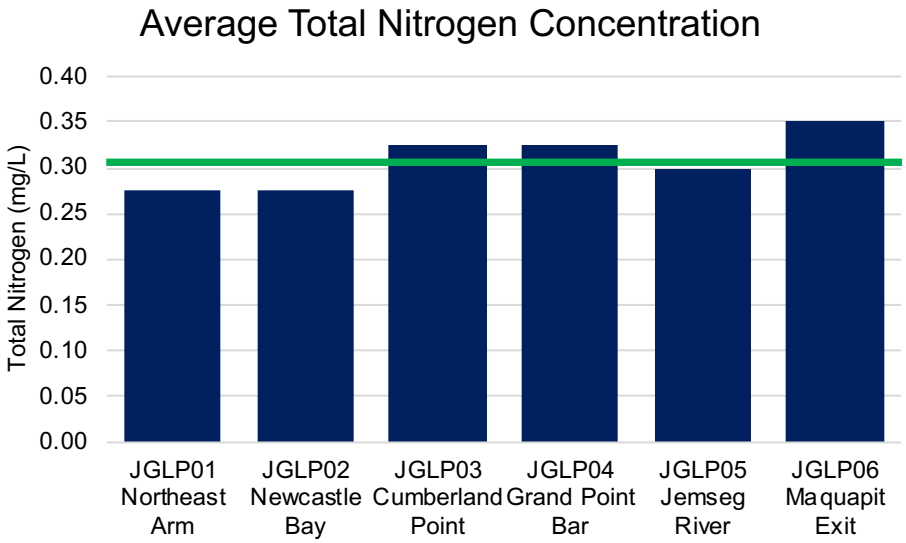


WATER QUALITY ANALYSIS

Average aluminum concentrations were below the CCME limit of 0.1 mg/L at all sites except Maquapit Exit.

Aluminum is found naturally in most rocks and soils and it can enter water via weathering (or erosion) of rocks. It can also be derived from mining, industrial processes, and wastewater. High levels of aluminum can negatively affect fish.



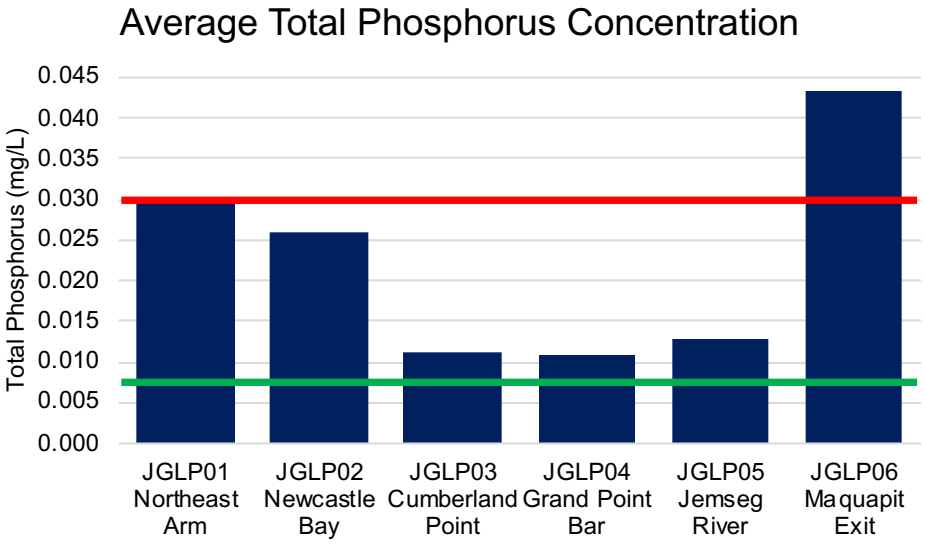


Total Nitrogen level were ideal (below 0.3 mg/L, the green line) for three sites and acceptable (0.31-0.5 mg/L) at the remaining three sites.

Nitrogen is an essential nutrient for plant life but too much of it can lead to low levels of oxygen. Anthropogenic sources of nitrogen include fertilizers, wastewater, failing septic systems, and organic wastes.

Phosphorus levels were highest at the Maquapit Exit (above the limit of “concern” of 0.03 mg/L, the red line). Average concentrations at all other sites fell into the “acceptable” value bounded by the red and green lines.

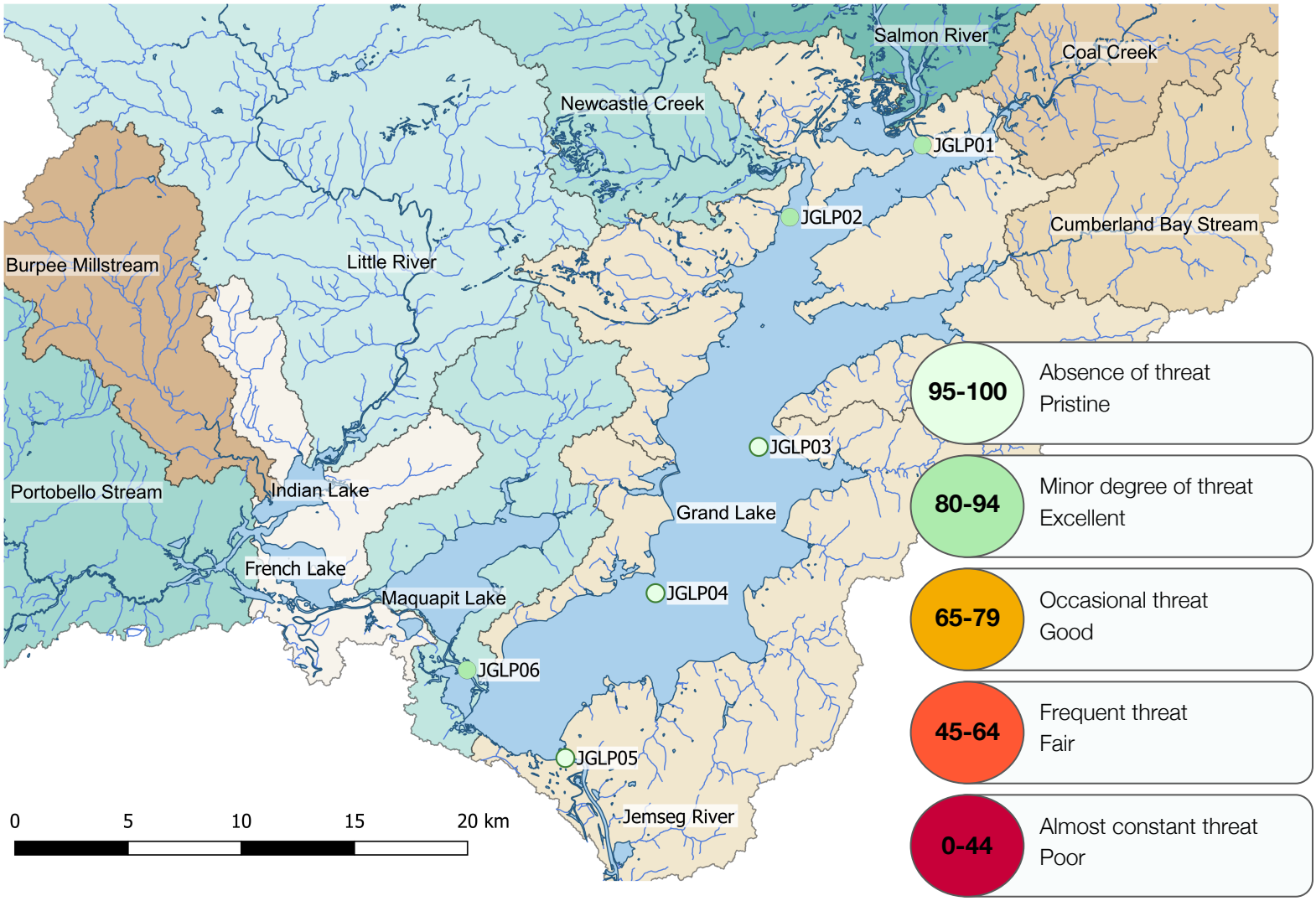
Phosphorus is an essential element for plant life. It can be derived from soil erosion. Anthropogenic sources of phosphorus include fertilizers, manure, and organic wastes. Elevated contents can lead to lower dissolved oxygen and eutrophication.

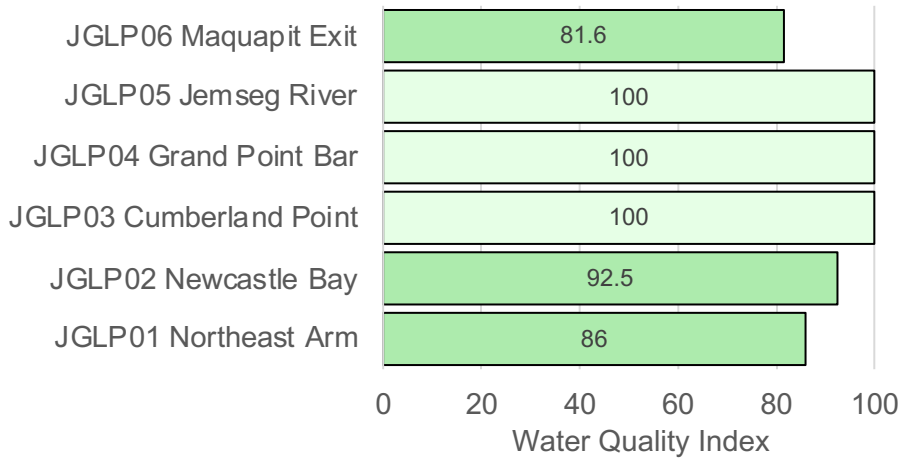


WATER QUALITY INDEX

Using the Canadian Council of Ministers of the Environment water quality guidelines, the Water Quality Index (WQI) combines multiple parameters into a single value that summarizes water quality at a site.

The WQI for each of the six sampling sites was calculated using the following parameters: arsenic, ammonia, chloride, dissolved oxygen (surface measurement), iron, nitrate, pH, total phosphorus, turbidity, and zinc. The calculation followed guidelines provided by the Atlantic Water Network.





The overall average water quality index for 2020 in Grand Lake was calculated to be 93.3 or “excellent”.

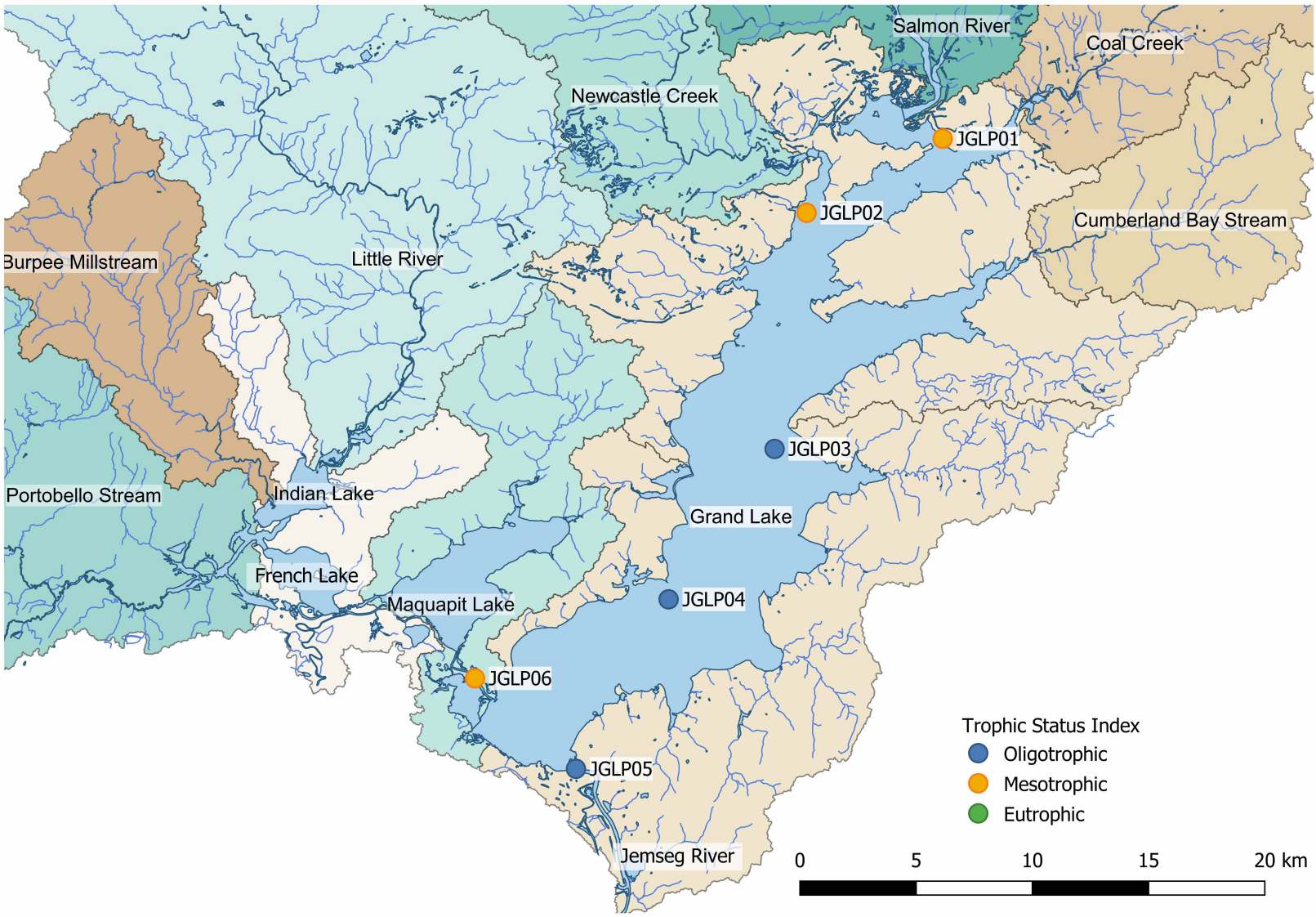
TROPHIC STATUS INDEX

The Trophic State Index (TSI) determines the biological productivity of a lake. Here we show the average TSI based on the total nitrogen, total phosphorus, and chlorophyll-a content in September and October. Each trophic class supports different fish and other organisms.

Mesotrophic lakes (TSI 40-50) have a moderate level of productivity and fair water quality. Attributes include clear water with increasing probability of anoxia during the summer.

Oligotrophic lakes (TSI < 40) have low primary productivity due to nutrient deficiency. They generally have good water quality.

Site	TSI	Status
JGLP01 Northeast Arm	46.3	Mesotrophic
JGLP02 Newcastle Bay	48.4	Mesotrophic
JGLP03 Cumberland Point	38.7	Oligotrophic
JGLP04 Grand Point Bar	38.5	Oligotrophic
JGLP05 Jemseg River	36.9	Oligotrophic
JGLP06 Maquapit Exit	49.4	Mesotrophic
Overall	**43.0**	**Mesotrophic**



GET INVOLVED IN YOUR WATERSHED!

How can you improve the water quality of the Jemseg Grand Lake watershed?

1. *Green the shoreline*: Plant native vegetation like willows along the shore to reduce erosion, filter run-off, provide habitat for wildlife, and shade the water.

2. *Keep sewage out of the river:* Ensure that your septic tanks are regularly maintained and clean up pet waste.

3. *Reduce pesticide and chemical use*: Use phosphate-free or biodegradable cleaning and personal care products. Reduce the use of pesticides on lawns and gardens.

4. *Improve water retention*: Use porous alternatives to pavement, collect runoff in a rain barrel or plant a rain garden.

5. Fence watercourses near farms: Livestock are a major source of E. coli and can erode riverbanks. Fencing the watercourse keeps our rivers and lakes healthier.

6. *Learn more about your watershed and its issues*.





Acknowledgements

Thank you to the NB Environmental Trust Fund for funding this project.

Thank you to the NB Alliance of Lake Associations and the Nashwaak Watershed Association who helped make this work possible! The report template was provided by the Atlantic Water Network