2.9 Ramsey Lake Subwatershed

General Description

- **Total Area:** At 42.6 km^2, this subwatershed is the smallest within the Conservation Sudbury jurisdiction.
- **Drainage:** Ramsey Lake is fed mostly through overland flow from its surrounding catchment area. It receives drainage from Minnow Lake and several creeks along its north shores (Frobisher Creek, Eugene Creek, Rogers Creek and Keast Creek), Lake Laurentian from the south and occasionally receives water from Bethel Lake during periods of high water. Ramsey Lake drains to Lily Creek, where it enters the Upper Junction Creek subwatershed, discharging into Robinson Lake and eventually Junction Creek itself. The remainder of the water supply is thought to originate from groundwater sources. There is uncertainty on the quantity of groundwater inputs to Ramsey Lake, but it is generally agreed that they do play an important role and are controlled mainly by geological features of the area.
- **Topography:** The area is characterized by undulating topography with areas of high bedrock with a topographic relief of less than 100m. The subwatershed has a mean elevation of 270.5 m.a.s.l with a maximum elevation of 343.3 m.a.s.l.
- **Geology :**
    - **Bedrock Geology:** Precambrian bedrock mainly of the Huronian province with intrusions of rock from the Superior province along the northern and southern extremities.
    - **Quaternary Geology:** Bedrock makes up the main material surrounding the lake, while the lake is underlain with glaciofluvial outwash deposits of gravel and sand.
- **Soils:** The primary surface substrate is bedrock under a thin layer of till. There are some localized areas of sand and loam, mainly to the north of the watershed.
- **Groundwater:** There are quite a few identified areas of highly vulnerable aquifers (HVA), mainly found in low-lying areas, where lakes and wetlands are present within the subwatershed.
- **Land Cover:**
    - Forest covers an area of 12.0 km^2, 28.2 % of the subwatershed.
    - Lakes cover an area of 10.3 km^2, 24.2% of the subwatershed.
    - Community/Infrastructure covers 9.8 km^2, 23.0 % of the subwatershed.
    - Exposed bedrock covers an area of 5.4 km^2, 12.6 % of the subwatershed.
    - Wetlands cover an area of 3.7 km^2, 8.6 % of the subwatershed.
- **Land Use Type:**
    - **Zoning:** 29.33 km^2 (68.8 %) of this subwatershed are subject to the City of Greater Sudbury's Zoning By-law, with lakes making up the remaining areas. Of the zoned areas, 8.7 km^2 (29.8 %) is open space, 7.3 km^2 (24.9 %) is residential, 4.56 km^2 (15.5 %) is park space, 2.6 km^2 (8.9 %) is institutional, 2.3 km^2 (7.8 %) is for future development, 1.6km^2 (5.4 %) is industrial and 1.35 km^2 (4.6%) is rural. The remainder are small areas designated as commercial and environmental protection lands.

Indigenous Communities and Traditional Territories

- This subwatersheds falls within the Robinson-Huron Treaty Area #61, of 1850. It also lies within the traditional territory of both the Wahnapitae First Nation and the Atikameksheng Anishnawbek First Nation.

Development Pressure

- **Overall:** High. This subwatershed has a strong urban impact, possessing one of the highest amounts of settlement area, relative to its size, of all subwatersheds. Historically, development within the subwatershed started with CPR line across the north shore of the lake. Over the years, it has also seen impacts from forestry and mineral exploration. In recent decades, urban development has become the main disturbance.
- **Settlement Area:** 27.8 km^2 (65.3 %) is designated as settlement area under the CGS's Official Plan, made up entirely by the community of Sudbury. This area includes a mix of residential, commercial and institutional land uses along the northern and southwestern shores of Ramsey Lake, while parks and open space occupy most of the southeast portion. A large area of future industrial and commercial development is present in the headwaters of the subwatershed.
- **Municipal Wastewater Facilities:** There are no municipal wastewater facilities within this subwatershed,
- **Forestry:** Located within the Sudbury Forest, there are no areas identified for harvest within this subwatershed, in the 2020-2030 Sudbury Forest Management Plan.
- **Aggregates:** There are currently 7 active and 1 inactive aggregate operations, covering an area of 1.34 km^2.
- **Mining :**
    - There are no current or historic producing mines in this subwatershed.
    - There are currently no active Mining Plans and Permits registered to this subwatershed.
    - Within the last year, there has been no reported exploration activities.

Recreational Use

- Ramsey Lake offers numerous recreational opportunities including fishing, swimming, sailing, boating, canoeing and kayaking. It hosts 2 municipal beaches and grooms a skating path during the winter months.
- The Lake Laurentian Conservation Area manages 60 km of trails for hiking, cycling, snowshoeing and cross-country skiing. Lake Laurentian is also frequently used by kayakers and canoeists, as it is a 'non-motorized' lake.
- The subwatershed also supports a variety of municipal walking trails, parks and green spaces.

Water use

- There is one active Permit to Take Water, held by the City of Greater Sudbury for the municipal water supply at the David Street Water Treatment Plant.

Notable Waterbodies

- **Ramsey Lake** is a medium urban lake measuring 792.2 hectares in size and a maximum depth of 20.5 meters. The lake is extensively developed, with 851 permanent and 31 seasonal residents.
- **Minnow Lake** is a small urban lake measuring 20.9 ha with a maximum depth of 3 meters. This central lake is known for its urban-impacted condition, and currently supports 105 permanent residents.
- **Bethel Lake** is another small urban lake measuring 31.2 hectares with a maximum depth of 4 meters. The lake has 56 permanent residents.
- **Laurentian Lake** is a medium sized lake, measuring 137.0 ha in size. The lake has one main basin and a maximum depth of 3.8 m. The lake is man made. A floating bog occupies much of the west side of the lake and both the southeast and northwest sides of the lake are under one meter in depth.

Previously Identified Management Issues

- **Water Budget:** There remains high uncertainty in many components of the Ramsey Lake water budget.
    - Streamflow discharge to Lily Creek, as well as discharge measurements of inflowing streams were identified as a data gaps that would allow for more precise water budgeting in the future (Source Protection Plan, 2014).
    - Information regarding groundwater gradients would improve understanding of groundwater contribution to Ramsey Lake (Source Protection Plan, 2014).
- **Drinking Water Quality:** Ramsey Lake is identified as a vulnerable water supply, mainly due to water quality threats. As a result, the Source Protection Plan (2014) states it may not be sustainable in the future. Water quality threats include contamination from sodium (road salts, septic systems etc.), microcystin LR, a toxin from blue green algae, which thrive in high nutrient situations, operation of a waste disposal site, stormwater runoff and transportation of hazardous substances on roadways and railways.
- **Urban Development:** Significant change in runoff and recharge is predicted to occur due to zoning changes, increased imperviousness, decreased evapotranspiration and generally increased runoff. Stormwater management retrofit opportunities should be adopted wherever possible to control the quality of water entering the lake (Ramsey Lake Subwatershed Study and Master Plan, 2022).
- **Shoreline Development:** The shoreline of Ramsey Lake has been heavily developed (infilling, dock construction, break wall construction), with approximately one third of all shorelines having been artificially hardened. (Ramsey Lake Subwatershed Study and Master Plan, 2022).

Natural Hazard Identification and Regulation

Hazards and features regulated by Conservation Sudbury include flood and erosion hazards, wetlands, unstable soils, rivers, streams, creeks, and small inland lakes. More on these regulations can be found in the Conservation Authorities Act, O. Reg. 686/21 that addresses the risks of natural hazards.

Floodplain mapping:

- The floodplain of Ramsey Lake was evaluated in the 1980 study of the Junction Creek system (downstream watershed). The regulatory flood elevation of Ramsey Lake is 251.1 m.
- Upstream tributaries to Ramsey creek including Eugene, Rogers, and Frobisher Creek were assessed for flood extends within the 2020 Ramsey Lake Subwatershed Study, but this evaluation was not adopted as regulatory mapping.
    - Elsewhere, in the absence of floodplain mapping, flood hazards are estimated based on site conditions. Typically, the extent of the flood hazard is estimated at 1.2 m above the bank full or high-water elevation.

Erosion hazard mapping:

- Currently, erosion hazards are evaluated based on the general guidance from the MNRF for confined and unconfined systems.

Water Control Structure

- **Lake Laurentian Dam:** Owned and operated by Conservation Sudbury for the purposes of controlling the quantity and quality of the water flowing into Ramsey Lake, the dam controls a drainage area of approximately 8 km^2. The flow into Ramsey Lake is generally restricted to the spring runoff period. Approximately 240m downstream of the dam, a weir is in place that creates a pond and wetland between the two structures.
- **Ramsey Lake Dam:** Owned and operated by the City of Greater Sudbury, this dam is used for flood control, recreational purposes, and lake water control for the municipal water supply intake. The dam controls a drainage area of 43m^2, where it then outlets into Lily Creek and eventually into Kelly Lake within the Upper Junction Creek subwatershed.

Drinking Water Source Protection

- Ramsey Lake is a water source within the Sudbury Drinking Water System. Raw water is treated at the David Street Water Treatment Plant and supplied to approximately 40% of residents. As a result, this subwatershed contains one of the city's primary drinking water systems and its corresponding Intake Protection Zones (1,2 and 3) and Issue Contributing Area for sodium and phosphorus.
    - Due to its importance as a drinking water source, numerous policies have been implemented to address existing and future threats to Ramsey Lake in the Source Protection Plan (2014).
    - In particular, activities related to road salt, snow storage, fertilizer, sewage and stormwater are managed closely through Source Protection Plan policies.

Water Quality Indicators

- **Ramsey Lake:** The lake is slightly alkaline, has moderate conductivity and high concentrations of dissolved oxygen. In the past, Ramsey Lake was spared from acidification due to its high natural alkalinity and buffering capacity. Historically oligotrophic, the lake is currently classified as meso-eutrophic with total phosphorus concentrations ranging between 10 and 17ug/L, due mainly to urban runoff. Septic systems are also suggested as a potential source of phosphorus, while high concentrations of nutrients have been observed to be entering the lake from groundwater sources in the west end of the lake. Excessive aquatic vegetation and algae growth has been reported in many of the shallower portions of the lake that are adjacent to urbanized land uses (Ramsey Lake Subwatershed Study and Master Plan, 2022). Increases of sodium and chloride in the lake have been a hot topic in the community, though these parameters appear to have stabilized and even decreased (chloride) in more recent years.

- **Total Phosphorus:** The City of Greater Sudbury's Lake Water Quality Program as well as samples collected through the Ministry of Environment, Conservation and Parks 'Lake Partner Program, have identified Minnow and Bethel Lake as eutrophic, with total phosphorus concentrations above provincial objectives.

- **Blue-green Algae Blooms** have been observed periodically in Ramsey Lake and regularly in Bethel Lake and are believed to be a result of the elevated phosphorus concentrations.

- **Lily Creek**: This outlet of Ramsey Lake is monitored monthly. Like many water bodies in the Sudbury area, copper and nickel concentrations are often above provincial objectives while iron only periodically surpasses these guidelines. Total phosphorus is also variable, surpassing the provincial water quality objectives during 1-2 sampling events each year. Sodium remains well below the 200mg/L aesthetic objective under the Canadian Water Quality Guidelines.

- **Lake Laurentian:** Previously a much smaller lake known as Mud Lake, Lake Laurentian was created after the installation of a dam. The lake was drained in 1982, and subsequently allowed to refill, when upgrades to the dam were required. As a result of the lakes location within the historically mine-impacted semi-barren zone, declines in water quality following these activities were observed. As a result, water levels within this reservoir must be carefully managed as to not increase metals and acidity stored in the sediment of the lake in the future.

Significant Features

- **Lake Laurentian Conservation Area:** This area, which was officially opened in 1967, includes 950 ha of green space with the objective of facilitating public access to nature, protecting the municipal water supply and providing environmental education opportunities for local teachers

and students. It includes Lake Laurentian as well as over 60 km of trails for hiking, cycling, snowshoeing and cross-country skiing.

- Candidate Regional or Local ANSIs identified in the City of Greater Sudbury's Official Plan include:
  - 2 Walleye spawning grounds within Ramsey Lake
  - Ramsey Lake Shatter Cones
  - Laurentian University Sudbury Breccia
- A small area (0.2 km^2) to the southwest falls within **Daisy Lake Uplands Provincial Park.**

Management and Stewardship

- **Wahnapitae First Nation** and **Atikameksheng Anishnawbek First Nation:** Their traditional territories include the area within these subwatersheds. They are land holders of the area and, as such, are stewards of the land.
- **City of Greater Sudbury Regreening Program and VETAC**: Areas of this subwatershed were damaged by poorly regulated mining activities in the mid 1900s, which included acid and sulphur depositions and soil erosion, taking place over several decades. Since then, many areas within the Sudbury 'barren' and 'semi-barren' zones have been revegetated thanks to the efforts of the CGS regreening program and have left the formerly barren landscapes covered in vegetation. Of the 10.6 million trees and shrubs that were planted in the impacted zone, almost 10% were planted in the Lake Laurentian Conservation Area, and 19.8 km^2 (46 %) of this watershed has been regreened.
- **Ramsey Lake Stewardship Committee**
- **Minnow Lake Restoration Group**

Data available

- **Provincial Stream Water Quality Monitoring Network:** Conservation Sudbury, in partnership with the Ministry of Environment, Conservation and Parks, has collected surface water quality at Lily Creek, the outflow of the Ramsey Lake subwatershed, since 2007.
- **Provincial Groundwater Monitoring Network:** Conservation Sudbury, in partnership with the Ministry of Environment, Conservation and Parks, have collected groundwater quantity and quality data at 2 wells:
  - Lake Laurentian Conservation Area – Well W482-1
  - Bancroft – Well W55-1
- **City of Greater Sudbury:**
  - Lake Water Quality Program collects spring total phosphorus data from Minnow Lake, Ramsey Lake and Bethel Lake.

- **Co-operative Freshwater Ecology Unit:** The following lakes were identified as 'Urban Lakes" and sampled by the CFEU at various intervals for various programs: Ramsey, Minnow, Bethel, Perch and Laurentian Lakes.

- **Lake Partner Program:** Ramsey Lake, Minnow Lake and Bethel Lake have been sampled for total phosphorus and occasionally secchi depth as part of this provincially run, volunteer-based program.
- **Public Health Sudbury and District:** Collects water samples from public beaches in the Sudbury area to identify any health hazards.

Supporting Documents

Wright et al. **Past, Present and Future of Lake Laurentian and its Watershed**, 2023

Aquafor Beech Ltd, **Ramsey Lake Subwatershed Study and Master Plan – Phase 2 Report**, February 2022

Conservation Sudbury, **Vermilion River Watershed Surface Water Quality Report on Current Conditions**, March 2017.

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AECOM, **Lake Laurentian Hydrology Report**, 2010.

J.L. Richards**, Ramsey Lake Dam LRIA Application Supplemental Information**, August 2011.

Aquapath Canada Limited, **Lake Ramsey Report on Fieldwork Conducted in July 2002**, July 2002.

Sein, R. **Lake Laurentian Urban Lakes Study**, 1991.

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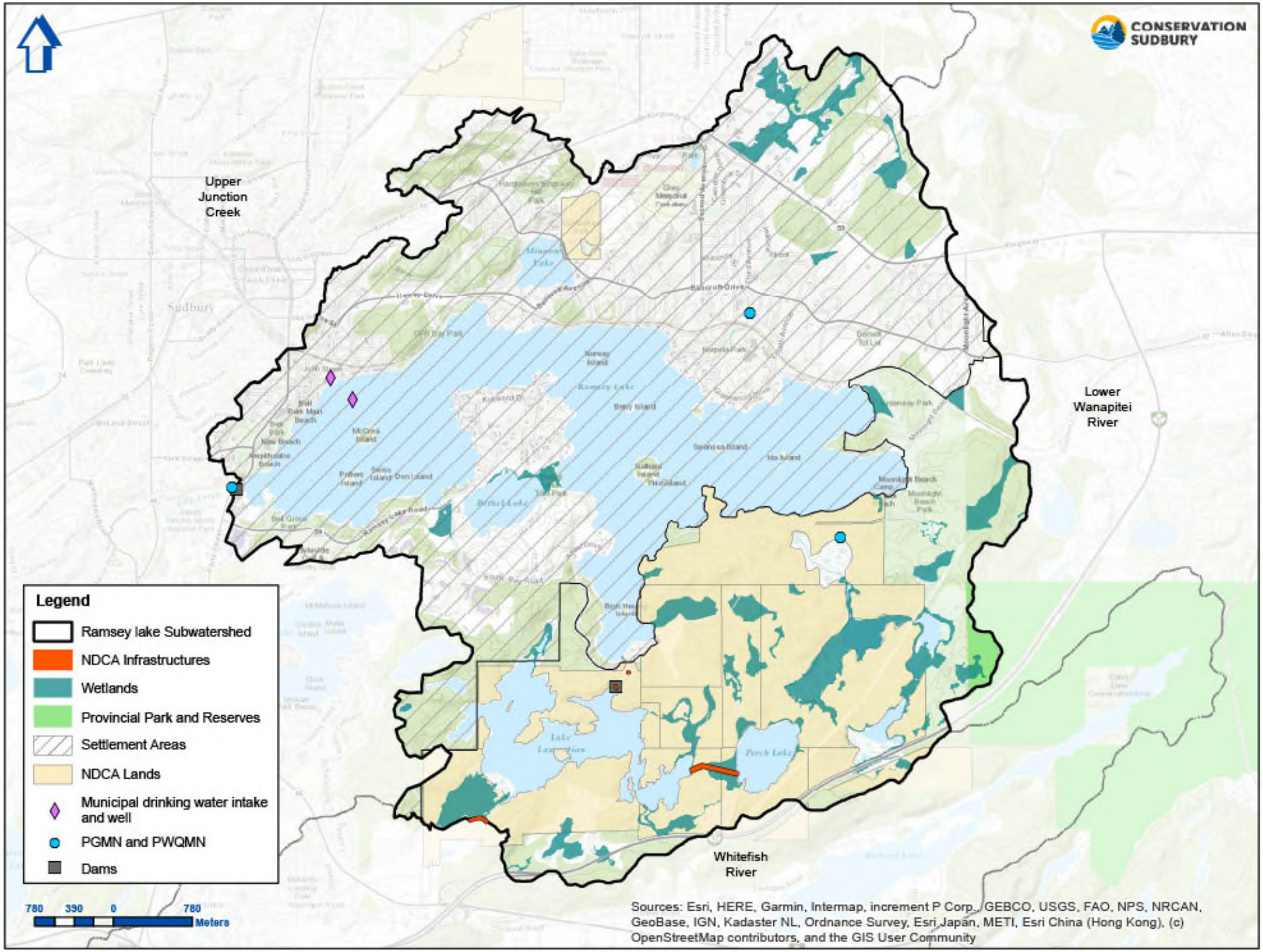
CONSERVATION SUDBURY
Upper Junction Creek
Lower Wanapitei River
Whitefish River
Legend
Ramsey lake Subwatershed
NDCA Infrastructures
Wetlands
Provincial Park and Reserves
Settlement Areas
NDCA Lands
Municipal drinking water intake and well
PGMN and PWQMN
Dams
780 390 0 780
Meters
Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community