

2.11 Lower Vermilion River Subwatershed



General Description

- **Total Area:** 374.6 km²
- **Drainage:** This final section of the Vermilion River starts approximately 12 km downstream of the mouth of Vermilion Lake and flows 66 km south and then southwest where it discharges into the Spanish River and eventually into Lake Huron.
- **Topography:** Characteristic of Northern Ontario, areas of bedrock outcrops display a relatively steep slope, while wetlands and low-lying valleys are often flat. As a result, ground elevations vary significantly throughout the subwatershed. In the downstream areas of the Vermilion River, an extremely flat topography is observed with several lakes of glacial origin. The flat topography results in the land on either side of the river being prone to extensive flooding.
- **Geology:**
 - **Bedrock Geology:** The northern reaches of the subwatershed fall within the Sudbury Igneous Complex while the remainder consists of Precambrian bedrock of the Superior Province.
 - **Quaternary Geology:** Bedrock makes up the main substrate within this subwatershed, with pockets of glacial materials throughout, including glaciolacustrine deposits of silt and clay, glaciolacustrine deposits of sand and gravel, and glaciofluvial outwash deposits of gravel and sand.
- **Soils:** The primary surface substrate is stable bedrock, with areas of sandy loam. Several smaller areas of silty loam are found throughout, often associated with watercourses, while many areas of organic soils are also peppered throughout.
- **Groundwater:** A few Significant Groundwater Recharge Areas occur throughout but are minimal. Most of these are located around Hwy 17. Similarly, areas identified as Highly Vulnerable Aquifers are minimal but scattered throughout the subwatershed.
- **Land Cover:**
 - Forest covers an area of 259.6 km², 69.3 % of the subwatershed.
 - Wetlands cover an area of 43.4 km², 11.6 % of the subwatershed.
 - Lakes cover an area of 38.8 km², 10.4 % of the subwatershed.
 - Community/Infrastructure covers 17.6 km², 4.7 % of the subwatershed.
 - Exposed bedrock covers an area of 16.5 km², 4.4 % of the subwatershed.
 - Mining and Extraction Operations cover an area of 1.9 km², 0.5 % of the subwatershed.
- **Land Use Type:**
 - **Zoning:** 277.1 km² (73.9 %) of this subwatershed is subject to the City of Greater Sudbury's Zoning By-law. Of this area, 211.9 km² (76.5 %) is rural and 38.9 km² (14.0 %) is industrial. The remainder are small areas designated as residential, park, open space, institutional, commercial, environmental protection and seasonal.

Indigenous Communities and Traditional Territories

- The community of Atikameksheng Anishnawbek First Nation occupies a small area along the south-central boundary of the subwatershed, covering an area of approximately 19.9 km². These indigenous lands make up 5.3% of this subwatershed.
- This subwatershed falls within the Robinson-Huron Treaty Area #61 of 1950 and the traditional territory of the Atikameksheng Anishnawbek First Nation.
- It also falls within the Mattawa/Lake Nipissing Métis traditional territory, Region 5.

Development Pressure

Overall: Low. The area is predominantly undeveloped, characterized primarily by forested areas, some exposed bedrock, and wetlands. Small communities and mining facilities are located throughout the basin.

- **Settlement Area:** Only 0.74 km² (0.2%) is designated as settlement area under the CGS's Official Plan. This includes the only settlement in the area, Whitefish. Other communities include Walden and Beaver Lake.
- **Municipal Wastewater Facilities:** There are no municipal wastewater facilities within this subwatershed, however 8 municipal wastewater treatment plants, 3 municipal sewage lagoons and 2 mine-operated sewage treatment plants are located upstream of this subwatershed, eventually discharging their effluent to the Lower Vermilion River.
- **Forestry:** Located within the Sudbury Forest, a small area is identified for harvest in the 2020-2030 Sudbury Forest Management Plan, located at the intersection of Lorne Twp, Louise Twp and Dieppe Twp.
- **Aggregates:** There are currently 7 active aggregate operations, covering an area of 1.34 km².
- **Mining:**
 - Currently, there are no producing mines. Historically, there were 6 mines in operation. Lockerby Mine and Lockerby East Mine are both noted to still contain reserves or resources, while Ellen Open Pit (Crean Hill), Crean Hill Mine, Vermilion Mine and Gertrude Mine contain no reserves or resources.
 - Recently (March 2024) two separate exploration activities were documented near Crean Hill.
 - There are currently 5 active Mining Plans and Permits registered to this subwatershed.

Recreational Use

- In past assessments, this subwatershed was identified as having one of the highest quality natural areas from the viewpoint of wildlife diversity and natural vegetation.
- The ease of access to the surrounding urban core ensures that a variety of recreational activities, such as fishing, hunting, crown land camping, hiking and nature appreciation

commonly take place within this subwatershed, especially along the Vermilion River and its associated lakes.

- Centennial Park Beach is 1 of 7 municipal beaches and is located on the Vermilion River.
- In developed areas, there are several municipal parks and groomed trails. This subwatershed also hosts the Walden Cross Country Ski Club, with over 23 km of ski trails and 10 km of snowshoe trails.

Water use

- There are currently 3 active Permits to Take Water, occupied by the City of Greater Sudbury and Wallbridge Mining Company Ltd.

Notable Waterbodies

- Some of the most notable lakes in this subwatershed are widenings of the Vermilion River, including:
 - **Wabagishik Lake**, with an area of 591.5 ha, it's well known for its beauty as captured by Franklin Carmicheal from the Group of Seven in 1928.
 - **Kusk Lake** (also known as Rat Lake) is a widening of the Vermilion River with an area of 174.9 ha. Kusk Lake has 32 permanent and 9 seasonal residents.
- Other lakes of interest include **Grassy Lake** and **Ella Lake**.

Previously Identified Management Issues

- **Flooding:** The extremely flat topography of the area results in land on both sides of the river being prone to flooding. Flooding has led to extensive damage in these isolated developments and is traced as far back as the early 1900s (Floodline Mapping Lower Vermilion River, 1984). Some of the most damaging floods occurred in May 1960 and June 1970.
- **Flooding – Fairbank Creek:** Following flood line mapping in 1984, it was identified that flooding in the Fairbank Creek area south of Ethel Lake is affected by man-made bottlenecks such as railways and road crossings, and that neither structural nor non-structural means are available which would significantly reduce the potential for flooding at a reasonable cost. (Fairbank Creek Flood Line Mapping, 1986).

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:

- Floodplain mapping was undertaken in 1984 for the Lower Vermilion, which identifies flood lines for the 2, 5, 10, 50, 100-year and Regional storm events. The study included reaches of the river between Hwy 17 and Lorne Falls.
- Flood line mapping for Fairbank Creek was completed in 1986, in the area south of Ethel Lake.
 - 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 bankfull 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 Structures

- **Wabagishik Dam and Generating Station**, owned and operated by Vale, the dam serves to control the flow of water from a head pond on the Vermilion River below Ella Lake, to the river reaches downstream while generating power. The facility, which was originally built in 1909, has undergone extensive upgrades in recent years.
- **Ethel Lake Dam** is a private dam, located on the boundary between Fairbank Lake subwatershed and the Lower Vermilion River subwatershed.

Drinking Water Source Protection

- The Vermilion River Drinking Water System is owned and operated by Vale Ltd. and is located just below Cascade Falls on the Vermilion River. The river water is pumped almost 9 km from the pumphouse to the Vermilion Water Treatment Plant where it makes its way to the City of Greater Sudbury's distribution system. The system services the areas of Copper Cliff, Lively, Mikkola, Naughton and Whitefish.
- The Intake Protection Zone (IPZ) for this drinking water intake also falls within this subwatershed.
 - All watercourses north of the Vermilion River water intake, and the lands immediately around them are classified as Intake Protection Zone 3 as the water ultimately drains towards the Vermilion River drinking water intake.

Water Quality Indicators

Surface Water:

- Historical records indicate that good water quality was maintained in this section of the Vermilion River, despite inputs from polluted tributaries. The volume of water running through the river at this point is enough to dilute the Onaping River approximately 4 times and the Junction Creek water by approximately 15 times, resulting in the preservation of healthy biota and water quality, although some evidence of organic enrichment was indicated. (Biological Survey of the Streams and Lakes of the Sudbury Area, 1968).

- Long-term data collected through the PWQMN program (see Data available section) on the Vermilion River, at the Vale pumphouse and municipal water intake, indicate that analyzed water quality parameters are mostly below Provincial Water Quality Objectives (PWQO), with the exception of iron, which periodically surpasses the PWQO.
 - Iron is extremely prevalent in rock-forming minerals. Higher concentrations of iron in surface water, when other heavy metals are absent, indicate that the source of iron is likely natural weathering of rocks and minerals
- Kusk lake was found to be mesotrophic under the City of Greater Sudbury's Lake Water Quality Monitoring program.
- Lake Partner Program samples from Kusk Lake, Grassy Lake, Big Beaver Lake, Little Beaver Lake, Ella Lake, and Little Ella Lake were all found to be mesotrophic.

Groundwater: There are currently no known sources of groundwater data within this subwatershed.

Significant Features

- There are no provincial parks, conservation reserves or ANSI ecological areas of interest in this subwatershed.
- Wildlife Values:
 - There are 79 moose related wildlife value areas, covering a total area of 3.54 km².
 - There are 5 Great Blue Heron nesting/heronry sites identified.
 - There is 1 deer related wildlife value area.
 - There are 2 wildlife value points for raptor nesting locations.

Management and Stewardship

- **Wahnapiatae First Nation and Atikameksheng Anishnawbek First Nation:** Their traditional territories include the area within this subwatershed. They are land holders of the area and, as such, are stewards of the land.
- **City of Greater Sudbury Regreening Program and VETAC:** The CGS's regreening program has completed regreening work on 7.6 km² (2.0 %) of this subwatershed.
- **Vermilion River Stewardship**
- **Grassy Lake Stewardship**

Data available

- **Conservation Sudbury** – Active Stream Gauging Stations:
 - McCharles Lake at Centennial Park station captures water levels (stage) where McCharles Lake/Junction Creek discharges into the Vermilion River.
- **Ministry of Natural Resources** – Climate Monitoring Station at Beaver Lake (air temperature, precipitation, humidity, and wind) since 2016.

- **Provincial Stream Water Quality Monitoring Network:** Conservation Sudbury, in partnership with the Ministry of Environment, Conservation and Parks, collects surface water quality data on the Vermilion River, near the drinking water intake.
- **City of Greater Sudbury:** Lake Water Quality Program collects spring total phosphorus data from Kusk Lake, Grassy Lake and Beaver Lake.
- **Vermilion River Stewardship:** Funded the collection of water quality samples from 27 sites within the Vermilion River watershed between 2013 and 2015, 9 of which were located within the Lower Junction Creek subwatershed.
- **Lake Partner Program:** Kusk Lake, Grassy Lake, Ella Lake, Little Beaver Lake, and Big Beaver Lake have all been sampled for total phosphorus and occasionally secchi depth as part of this provincially run, volunteer-based program.
- **Co-operative Freshwater Ecology Unit:** Margaret Lake was sampled as a Reference Lake in the CFEUs long term monitoring of lakes recovering from Sudbury's mining legacy.
- **Public Health Sudbury and District:** Collects water samples from public beaches in the Sudbury area to identify any health hazards.

Supporting Documents

Vale Canada Ltd., **Vale Waterpower Updates (Shared with Vermilion River Stewardship)**, December 2021.

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

Strangway et al., **Assessing landscape and contaminant point-sources as spatial determinants of water quality in the Vermilion River System, Ontario, Canada**. August 2017.

City of Greater Sudbury, **Water and Wastewater Master Plan – Existing Water Systems**, 2017.

Spanish & Vermilion Rivers Water Management Planning Team, **Spanish & Vermilion Rivers Water Management Plan**, November 2016.

Conservation Sudbury, **Greater Sudbury Source Protection Area - Assessment Report**, September 2, 2014.

S. A. Kirchhefer Ltd., **Flood Line Mapping - Fairbank Creek**, January 1986.

Albery, Pullerits, Dickson & Associates Consulting Engineers, **Floodline Mapping - Lower Vermilion River**, July 1984.

Nickel District Conservation Authority, **NDCA Watershed Inventory**, September 1980.

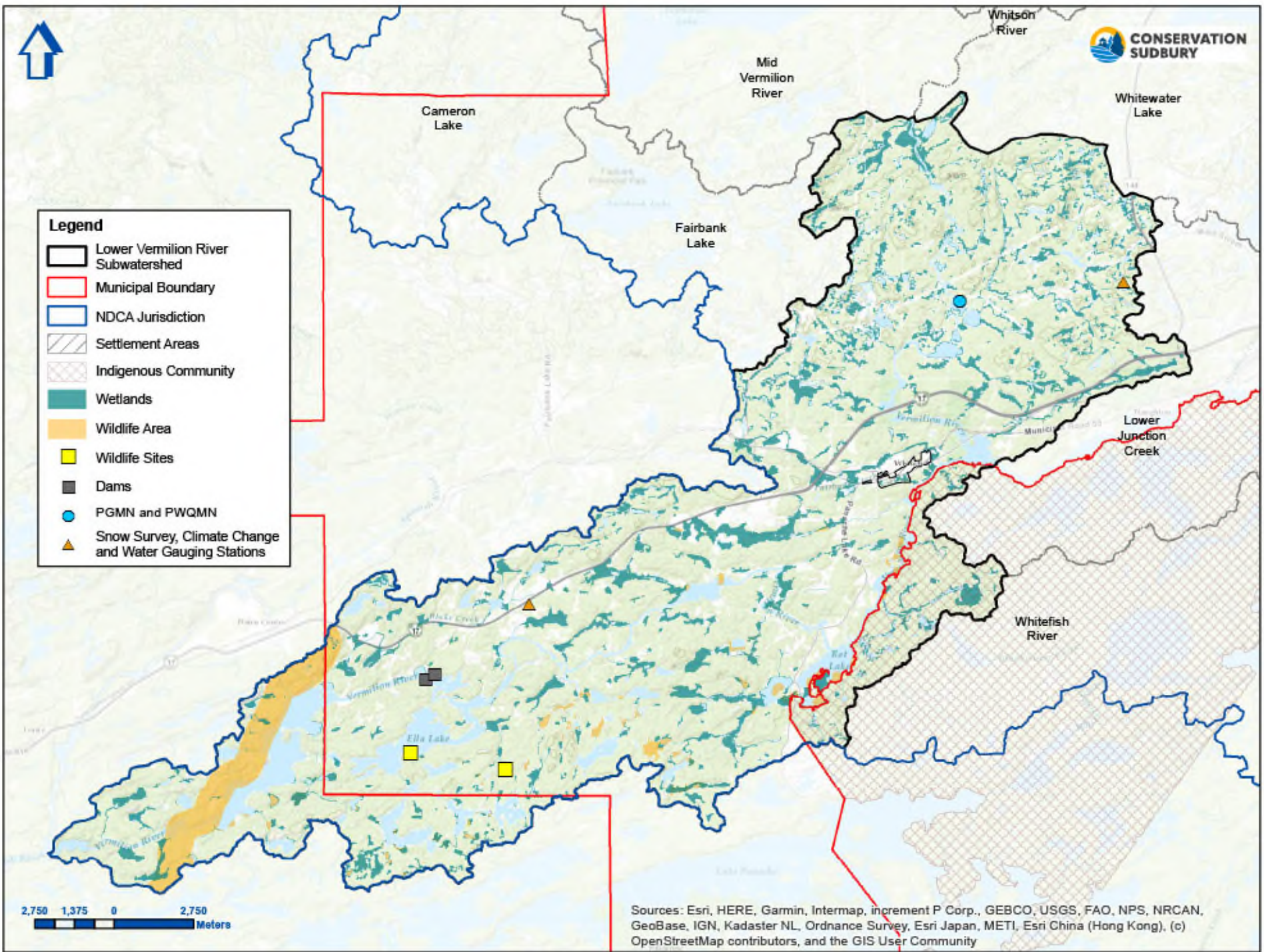
Lupton, A.A., **Reconnaissance Watershed Survey**, 1974.

Ontario Water Resource Commission, **Biological Survey of the Streams and Lakes of the Sudbury Area**, 1968.



Legend

- Lower Vermilion River Subwatershed
- Municipal Boundary
- NDCA Jurisdiction
- Settlement Areas
- Indigenous Community
- Wetlands
- Wildlife Area
- Wildlife Sites
- Dams
- PGMN and PWQMN
- Snow Survey, Climate Change and Water Gauging Stations



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