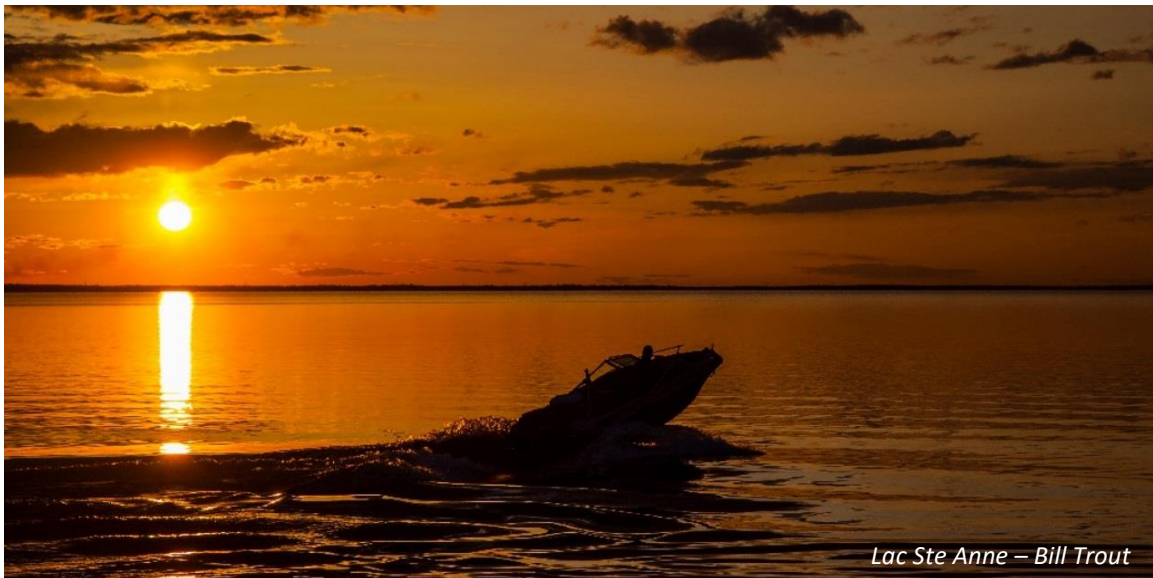


NSWA Technical Bulletin

Isle Lake and Lac Ste Anne State of the Watershed Report



Lac Ste Anne – Bill Trout

Introduction

Isle Lake and Lac Ste Anne are important recreational lakes in central Alberta. Due to their proximity to Edmonton the lakes are popular recreational destinations for activities including swimming, fishing, boating and camping. Lakeshore development is significant and continues to increase as demand for lakefront properties rises across Alberta. Lac Ste Anne is also the site of one of the largest religious pilgrimages in Canada due to a belief in its healing and sacred waters. The pilgrimage site was named a National Historic Site of Canada in 2004 because of its social and cultural importance.

The Lake Isle and Lac Ste Anne Water Quality Management Society (LILSA) was formed in 2013 to address concerns related to lake health. Residents at the lakes are concerned about deteriorating water quality, blue-green algal

blooms, invasive species, proliferation of aquatic vegetation and lake levels. In 2014, LILSA approached the North Saskatchewan Watershed Alliance (NSWA) to prepare a State of the Watershed (SOW) Report for Isle Lake and Lac Ste Anne.

The purpose of this bulletin is to summarize the findings of the SOW Report. The report characterized the environmental state of both lakes and their watersheds through the evaluation of key issues, biophysical information and watershed stressors.

Watershed Characteristics

The Isle Lake and Lac Ste Anne watersheds cover a combined area of approximately 865 km² and are located within the Sturgeon River watershed; a subwatershed of the North Saskatchewan River Basin (**Figure 1**).

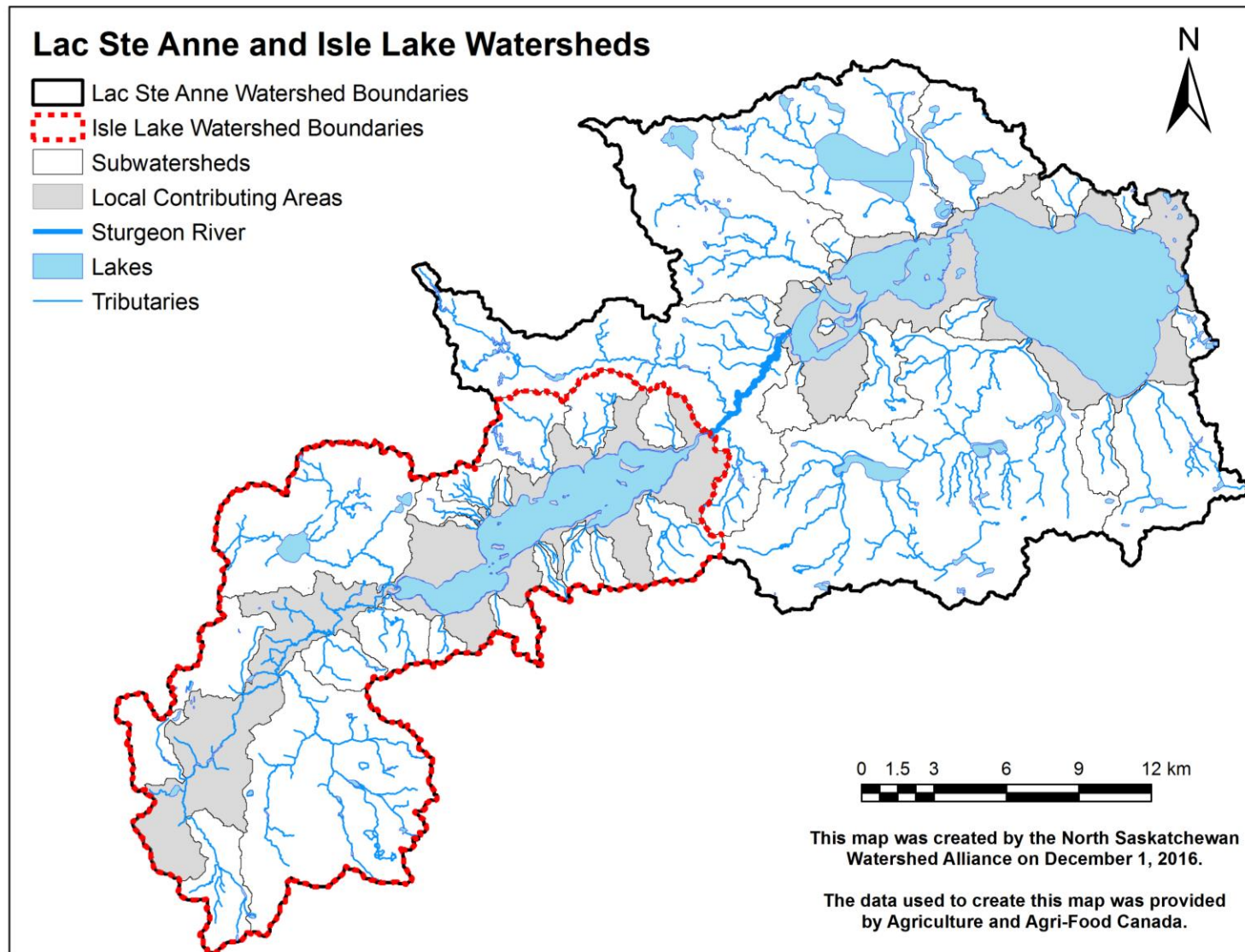


Figure 1. Lac Ste Anne and Isle Lake Watersheds

Lake Characteristics

Climate in the region is typical of the Dry Mixedwood Subregion, but an analysis of temperature and precipitation data in the region indicates a warming and drying trend in recent decades¹. The primary land uses in the watersheds are agricultural production and urban development which cover 76% and 8% of the “disturbed” land, respectively² (**Figure 2**). Aggregate extraction is the primary industrial activity in the watersheds.

Isle Lake and Lac Ste Anne are relatively shallow lakes that are well mixed throughout the year, resulting in uniform temperature and oxygen levels through the water column. However, on hot calm days both lakes may stratify, resulting in depleted oxygen levels near lake bottom. Blue-green algal blooms occurred in the lakes prior to European settlement. However, ongoing development in the watershed has increased eutrophication in these lakes³. Currently, Isle Lake is rated as hypereutrophic whereas Lac Ste Anne is rated as eutrophic in the east basin and hypereutrophic in the west basin.

Land Use in the Lac Ste. Anne and Isle Lake Watersheds 2014

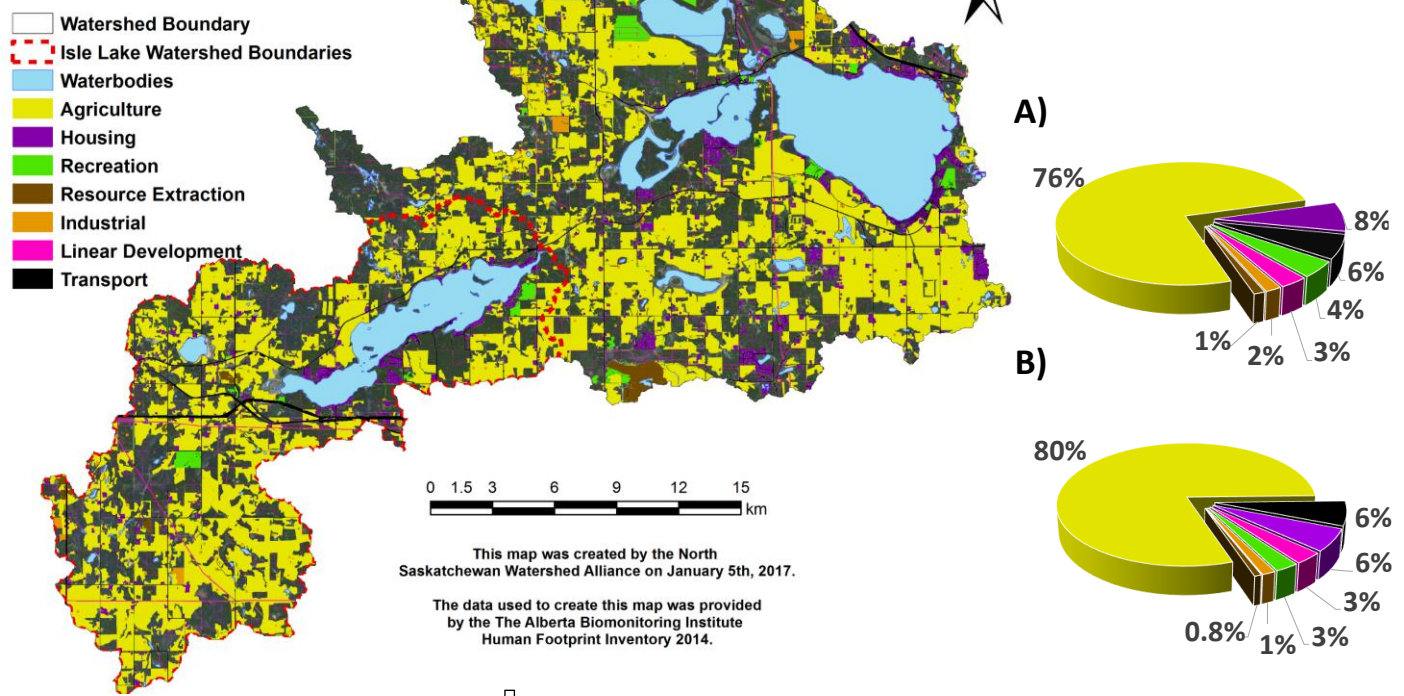


Figure 2. Land use in the (A) Lac Ste Anne and (B) Isle Lake watersheds. The boundary of the Isle Lake watershed is indicated in red. Land Use data is from the Human Footprint Inventory by the Alberta Biomonitoring Institute (2014).

¹ NSWA, 2016. *Climate change and land use effects on the flow regime of the Sturgeon River*. Inf. Bull.

² Alberta Biomonitoring Institute, 2014. Human Footprint Inventory 2014 Ver. 1

³ Blais et al., 2000. Recent eutrophication histories in Lac Ste Anne and Isle Lake, Alberta, Canada Inferred using Paleolimnological Methods. *Lake Reserv. Manag.* 16, 292-304.

Issues and Challenges

The collective findings of the SOW Report indicate that regional hydrology and water quality in the watersheds may be changing. An analysis of stream flow data from the Sturgeon River at Magnolia Bridge (WSC Gauging Station #05EA010) revealed a significant decline in stream flows over the past twenty years⁴. Lake levels at Isle Lake and Lac Ste Anne have also been on the decline since the 1990s. Nutrient and ion concentrations at Isle Lake appear to be increasing. A similar upward trend in ion concentrations is also evident at Lac Ste Anne.

Blue-green algal blooms are common at both lakes and Alberta Health commonly issues advisories, warning residents to use caution when recreating during bloom events. Fish kills are common at both lakes; winter and summer kills occur frequently at Isle Lake and winter kills occur intermittently at Lac Ste Anne. Declining lake levels and increasing nutrient concentrations have the potential to increase the frequency and severity of blue-green algae blooms and fish kills on both lakes. Flowering rush (*Butomus umbellatus*) (**Figure 3**) has also infested Isle Lake and could further exacerbate water quantity and water quality concerns by reducing lake inflow and outflow, choking out native plant species and reducing lake oxygen levels.

Knowledge Gaps

Several data gaps are identified in the SOW Report; these include riparian health, groundwater hydrology, water quality in the individual basins of Lac Ste Anne, and the extent of recreational pressure on the lakes. A Riparian Health Assessment has been initiated for Isle Lake but not yet for Lac Ste Anne. Riparian Health

Assessments are useful in directing management efforts for restoring lost riparian habitat.

Recent information is not available to fully evaluate groundwater trends in the watershed. Further investigation is warranted to characterize the connectivity between groundwater and surface water for both lakes.

Recent water quality data for Lac Ste Anne have been generated from whole-lake composite samples. Because of the very different morphometries of the east and west basins they should be sampled separately; this would also allow comparisons with historical data. Lastly, it would be useful to evaluate recreational pressure on both lakes, considering increased urban development around both lakeshores in the last fifty years.



Figure 3. A) Flowering Rush in bloom at Isle Lake, Alberta and B) Harvesting Flowering Rush (*Butomus umbellatus*) from Isle Lake, Alberta.

⁴ NSWA, 2016. *Climate change and land use effects on the flow regime of the Sturgeon River*. Inf. Bull.

Lake and Watershed Features

The overall health of the Isle Lake and Lac Ste Anne watersheds was assessed using a coarse-scale lake screening and assessment tool developed by the NSWA. The potential to influence or impact lake water quality is used as the end point for the screening criteria. The condition of the two lakes and their watersheds with respect to each factor is screened as low, medium or high concern, and then an overall interpretation is presented. Based on this approach, the condition of Isle Lake and Lac Ste Anne (and their watersheds) were considered moderately to highly sensitive to further human encroachment.

Recommendations

Action is needed to prevent further degradation of these watersheds, especially in light of declining water levels and changing water quality. Future recommendations for Isle Lake and Lac Ste Anne include:

- Address knowledge gaps
- Encourage participation in stewardship programs
- Manage watershed sources of nutrients
- Encourage shoreline naturalization and riparian restoration
- Develop a treatment plan to eradicate and/or control Flowering Rush
- Continue and expand public education programs

- Continue monitoring programs for invasive species at both lakes
- Reinstate real-time lake level monitoring at Isle Lake
- Continue periodic water quality monitoring at both lakes. Sample the east and west basin of Lac Ste Anne separately
- Evaluate and manage road salt use within the watershed
- Develop a suite of indicators to be used to monitor lake health

Conclusion

The NSWA recommends that a watershed management planning process be initiated to prevent further degradation of Isle Lake and Lac Ste Anne, and to promote restoration and conservation activities for key watershed features. The management plan would ideally align with the goals and directions of the larger Integrated Watershed Management Plan for the North Saskatchewan River in Alberta. The plan should address impacts from agricultural and industrial activities, urban, recreational and rural developments. The plan would be developed through engagement of key stakeholders, who should work collaboratively to address the range of issues at Isle Lake and Lac Ste Anne.

Sturgeon River by Karen Albert

