

What We Know About the Riparian Health of Wabamun Lake

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Wabamun Lake is located West of Edmonton, in Parkland County, and within the Northern portion of the Modeste watershed, a subwatershed of the North Saskatchewan River watershed (Figure 1). Wabamun is very popular in this region and has a long, interesting settlement history that has led to its current condition today (for more information, check out the Wabamun Lake Watershed Management Plan). In terms of the lake's riparian areas, or those transition areas between the aquatic and upland ecosystems (Figure 2), Wabamun is unique within Alberta, in that it has had not one, but two complete riparian health assessments over the last decade.

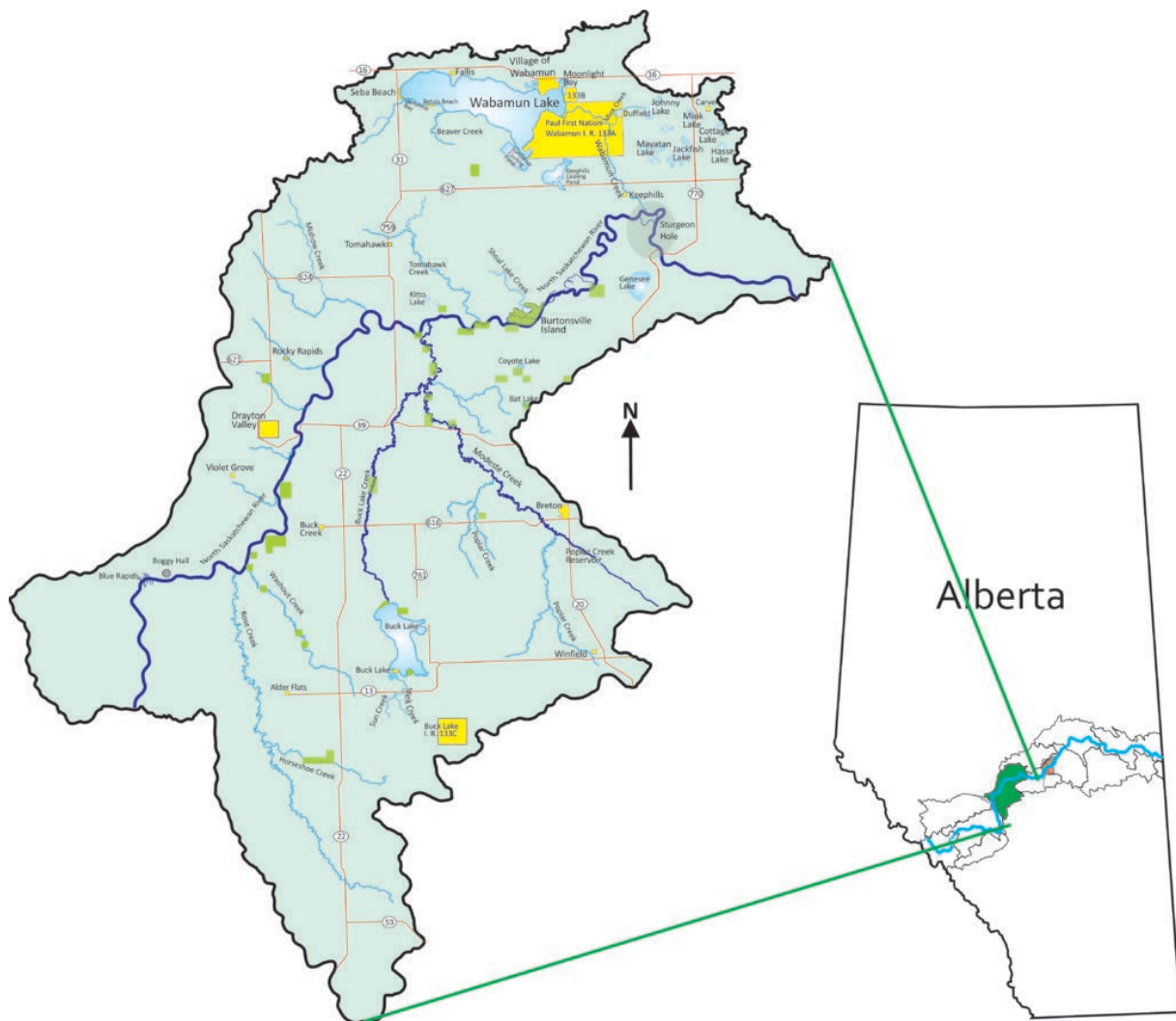


Figure 1. Map of the Modeste subwatershed of the North Saskatchewan River Watershed in Alberta.

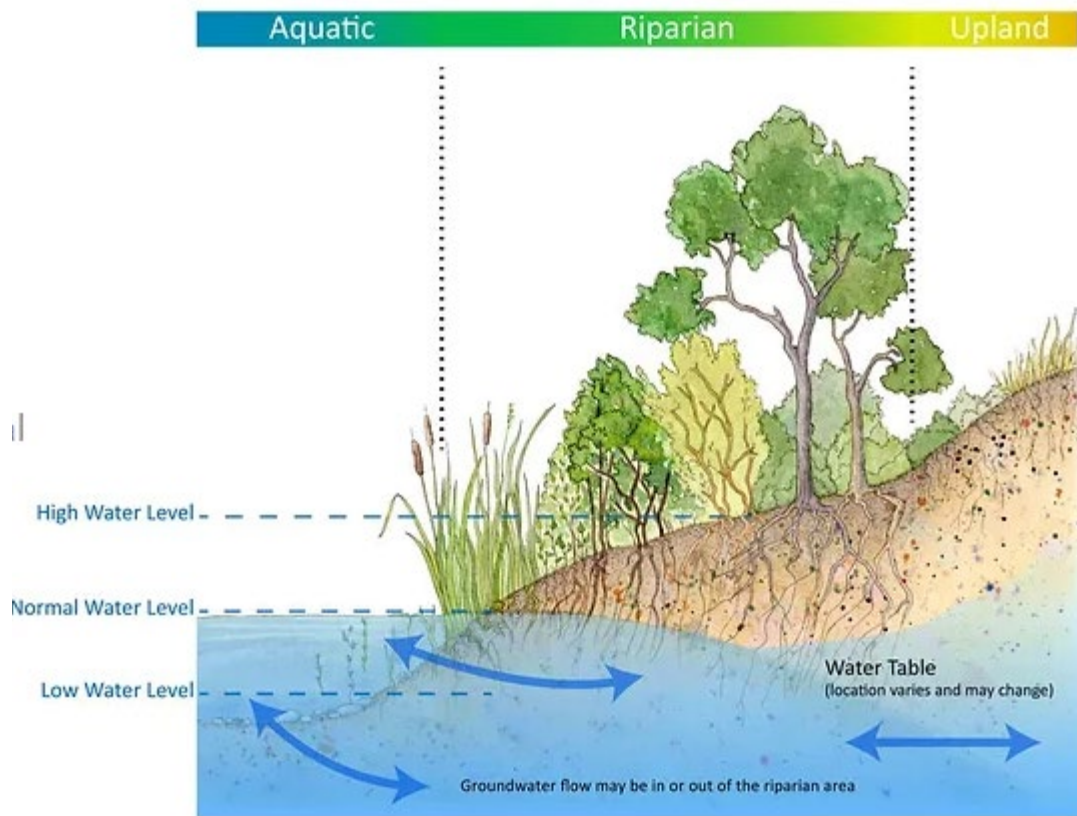


Figure 2. Illustration of a riparian area. The illustration shows the transition from upland to riparian to aquatic zones. Image: Cows and Fish

Riparian areas offer many benefits to humans and wildlife when functioning well. For instance, the fact that many of the plants that make up riparian areas have deep root systems to access water means they provide natural stabilizing structure to the banks of water bodies, like lakes, that help prevent erosion. There are multitudes of ecological functions that healthy riparian areas provide that make them a great asset for combatting the effects of climate change (Figure 3).

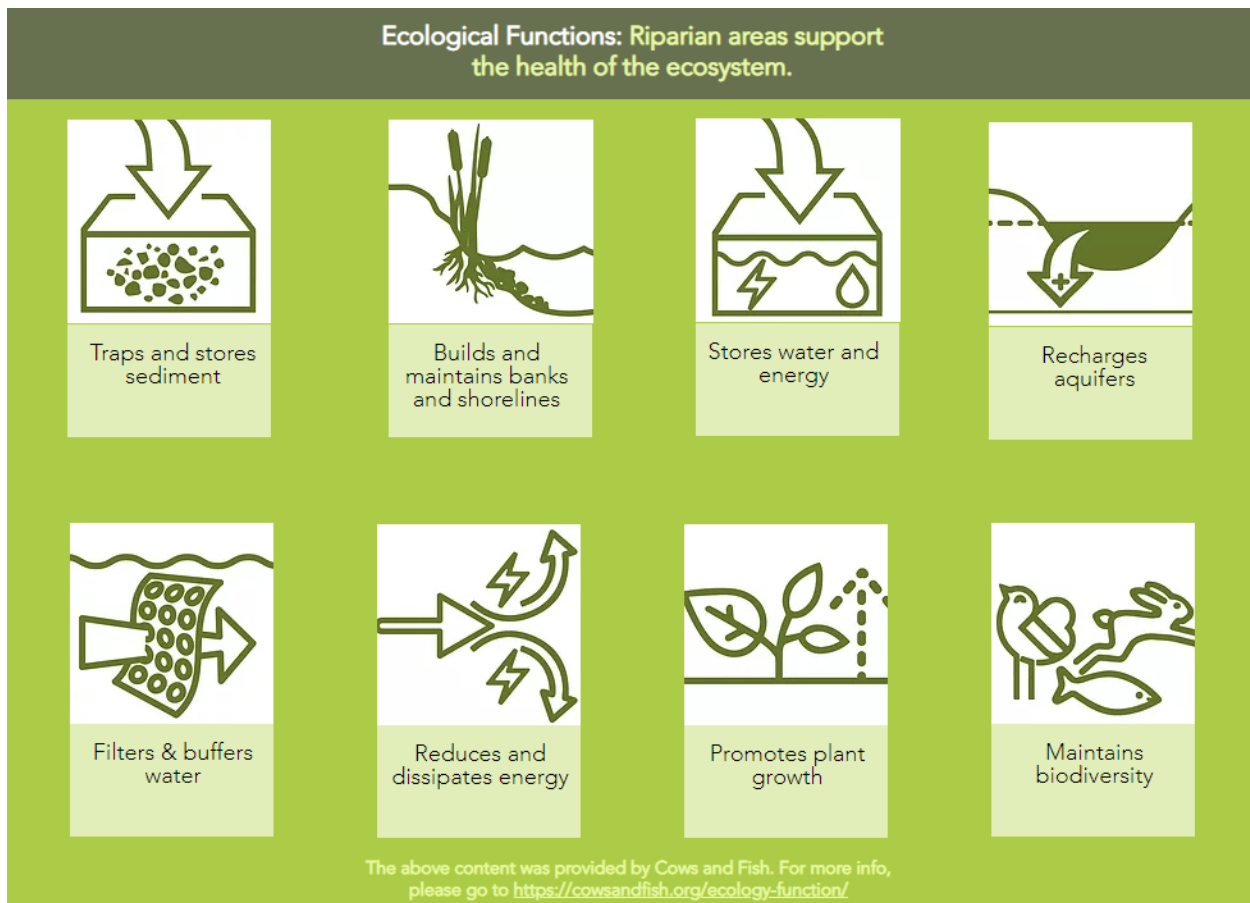


Figure 3. Ecological functions of riparian areas.

Riparian assessments are tools that estimate how healthy a riparian area is and how that might correspond to ecological function within a watershed. The results can be used to support decisions about where conservation or restoration is needed to help improve the natural functions of riparian areas. There are several methods available to assess riparian areas, ranging from: 1) on-ground methods that provide high detail, 2) aerial videography methods that provide medium detail and coverage, and 3) a satellite method that cover a large amount of area within a rapid timeframe (Figure 4). Each method has strengths and limitations, with the most important trade-offs occurring between degree of detail and coverage.



Figure 4 Comparison of three different methods for assessing riparian condition.

The field-based method is the gold standard because a great amount of detail can be gathered on riparian function. Here, someone physically visits the location and identifies specialized plants and characterizes soil health. Given that there are an estimated 1.3 million kilometres of riparian area in Alberta, this method can be limited by cost, available experts, and restrictions related to gaining permission from landowners to access riparian lands. Typically, one assessment covers one landowner’s property and offers excellent insights before and after restoration projects.

Aerial videography assessment methods offer an excellent complement to the field-based technique. These methods involve using imagery to assess an entire waterbody from a remote location. For the past two decades, aerial assessments have involved a desktop assessment using videography captured via helicopter or UAV (a.k.a drone). Some details, such as soil samples, are excluded from this assessment at the trade-off of gaining a wider assessed area. Wabamun Lake was assessed using this method in 2014 (NSWA, 2015).

The modernization of the aerial assessment method came a few years later. The availability of high-resolution satellite imagery allowed the assessments to include an even wider area. Furthermore, satellite imagery provided the capacity to assess upland areas that put pressure on riparian areas. These two datasets combine to indicate where more significant conservation and restoration efforts are needed on the landscape. Wabamun Lake was included, along with another 22 lakes and 28 creeks, in an innovative pilot project published in 2018 (Fiera, 2018). Excitingly, since that pilot project was completed, over 49,000 km of shoreline have been assessed using this new technique, filling a wide data gap about the condition of riparian areas in our watershed.

In this report:

The fact that Wabamun Lake had been assessed using two aerial assessment techniques offers a unique opportunity, unlike other lakes in the province. While these two methods were designed to be “comparable,” nuanced differences between them require a reader to use caution when attempting to find environmental trends between the results. However, both assessments offer unique insights about Wabamun Lake.

Results for the Aerial Videography Method:

In 2015, the NSWA published the “Riparian Health Assessment of Wabamun Lake: An Aerial Assessment Using an Unmanned Air Vehicle” in which high-definition video footage captured by a drone, along with ortho-rectified (geometrically corrected) photographs, were used to provide a coarse-scale riparian assessment. The assessment included the entire shoreline of Wabamun Lake and was broken down into 355 different segments for analysis. The results of this riparian health assessment indicated that approximately 57% of Wabamun Lake’s riparian area is in healthy condition, 9% of the area was considered moderately impaired, and 34% of the area was rated as highly impaired (Table 1).

“Impairment implies that a riparian area is partly or fully incapable of performing valuable ecological functions. The longest continuous stretch of impaired area was noted to be on the western shore adjacent to the Summer Village of Seba Beach. The longest continuous stretch of healthy area was on the eastern shore adjacent to the Paul Band First Nation territory.” (NSWA, 2015)

Results for the Satellite Data Method:

In 2021, as part of a larger assessment of the entire Modeste watershed, the shoreline of Wabamun Lake was again assessed for riparian health, this time using the satellite data method. A report on the methods used can be found in “Modeste Watershed Riparian Area Assessment” (2018) (<https://www.nswa.ab.ca/resource/modeste-riparian-assessment/>), though the results for Wabamun Lake were added after the report was finalized. The results can be found in a subsequent expansion report “Riparian Area Assessment of the North Saskatchewan & Battle River Watersheds” (2021) (<https://www.nswa.ab.ca/riparian-health-action-plan/phase-1-of-the-riparian-health-action-plan/>). Besides the methods for collecting riparian data being different, the analysis was also slightly different, in that the overall length of shoreline assessed was slightly larger (70km as opposed to 67km) but broken down into fewer segments (299 as opposed to 355) and categorized into four intactness categories: High, Moderate, Low, and Very Low. Intactness, in this case, meaning the extent to which habitat has been altered or impaired by human activity, with areas where there is no human development being classified as high intactness. The results of this riparian assessment showed that 46.5% of Wabamun Lake’s riparian area was highly intact, 13.2% was moderately intact, 11.6% had low intactness, and 28.7% were considered very low intactness (Table 1) (Figures 5 and 6). In addition to an assessment of riparian intactness, this study also included the assessment of watershed pressures (stress factors like slope, amount of development, etc.) (Figures 7 and 8) and an analysis of where

conservation or restoration could be prioritized to improve the natural functioning of these riparian areas (Figures 9 and 10).

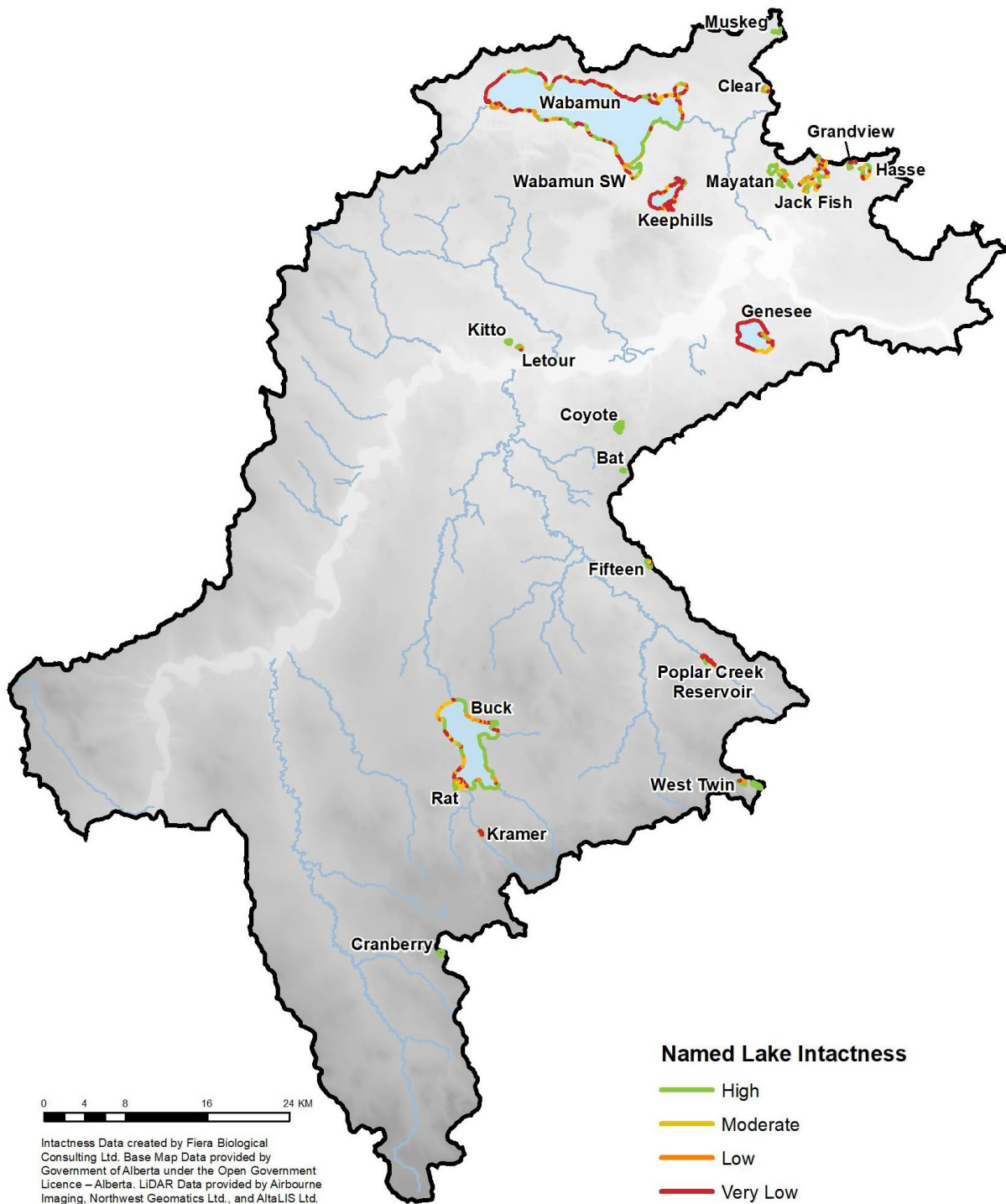


Figure 5. Intactness results for riparian areas within the Modeste subwatershed.

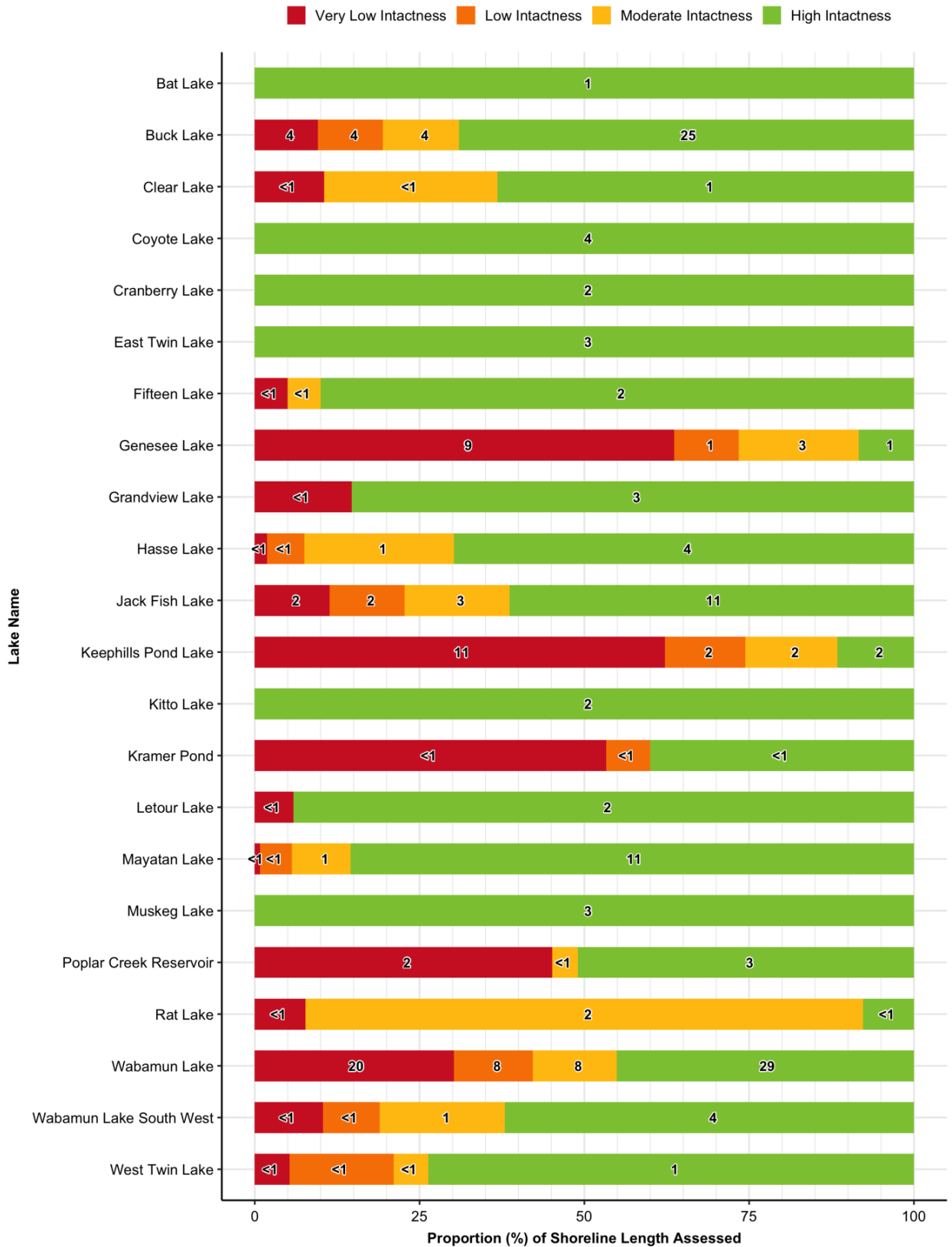


Figure 6. Comparison table of intactness in proportion to the shoreline length assessed for waterbodies in the Modeste subwatershed.

Table 1. Comparison of assessments and scores for the two different riparian health assessments at Wabamun Lake.

Riparian Health Action Plan (2021)					
Intactness Score	High	Moderate	Low	Very Low	Total
Assessment Segments	74	61	72	92	299
(Length)(m)	32978.2	9380	8250	20350	70958.2
Percent	46.5%	13.2%	11.6%	28.7%	

Wabamun Riparian Health Assessment (2015)				
Health Score	Healthy	Moderate	Highly Impaired	Total
Assessment Segments	107	66	182	355
(Length)(m)	38413.9	6040.1	22925.25	67379.25
Percent	57%	8.9%	34%	

A Discussion about Watershed Pressure

While residential development around Wabamun Lake is a major cause of impairment to riparian health, activities taking place in Wabamun’s surrounding watershed are placing additional pressure on riparian health. The pressure assessment considers both natural (e.g., slope, soil type, wetland loss, forest loss) and human-caused (e.g., density of roads, paved surfaces, intensity of land use such as mining, agriculture) factors. The assessment revealed that 92% of the Wabamun watershed or “catchment area” is under high pressure (Figures 7 and 8). So, what does this mean? It means that the areas that are the highest priority for restoration action are those areas where there is both high catchment pressure draining into areas of low and very low riparian intactness.

By prioritizing restoration in these areas, you can achieve a great benefit relative to the cost of the restoration project. For a lake, such as Wabamun, riparian health directly relates to water quality, in that, as a slow-moving waterbody with a longer residence time (i.e., the time a water molecule exists within the lake before moving downstream or into groundwater), it is more highly affected by siltation (from erosion) and input of nutrients and other contaminants, which influence the occurrence of cyanobacteria blooms and presence of increased vegetation and weeds.

Compared to the other 22 lakes assessed in the Modeste Sub-watershed, Wabamun Lake was ranked high in terms of need for restoration efforts (see figure 10).

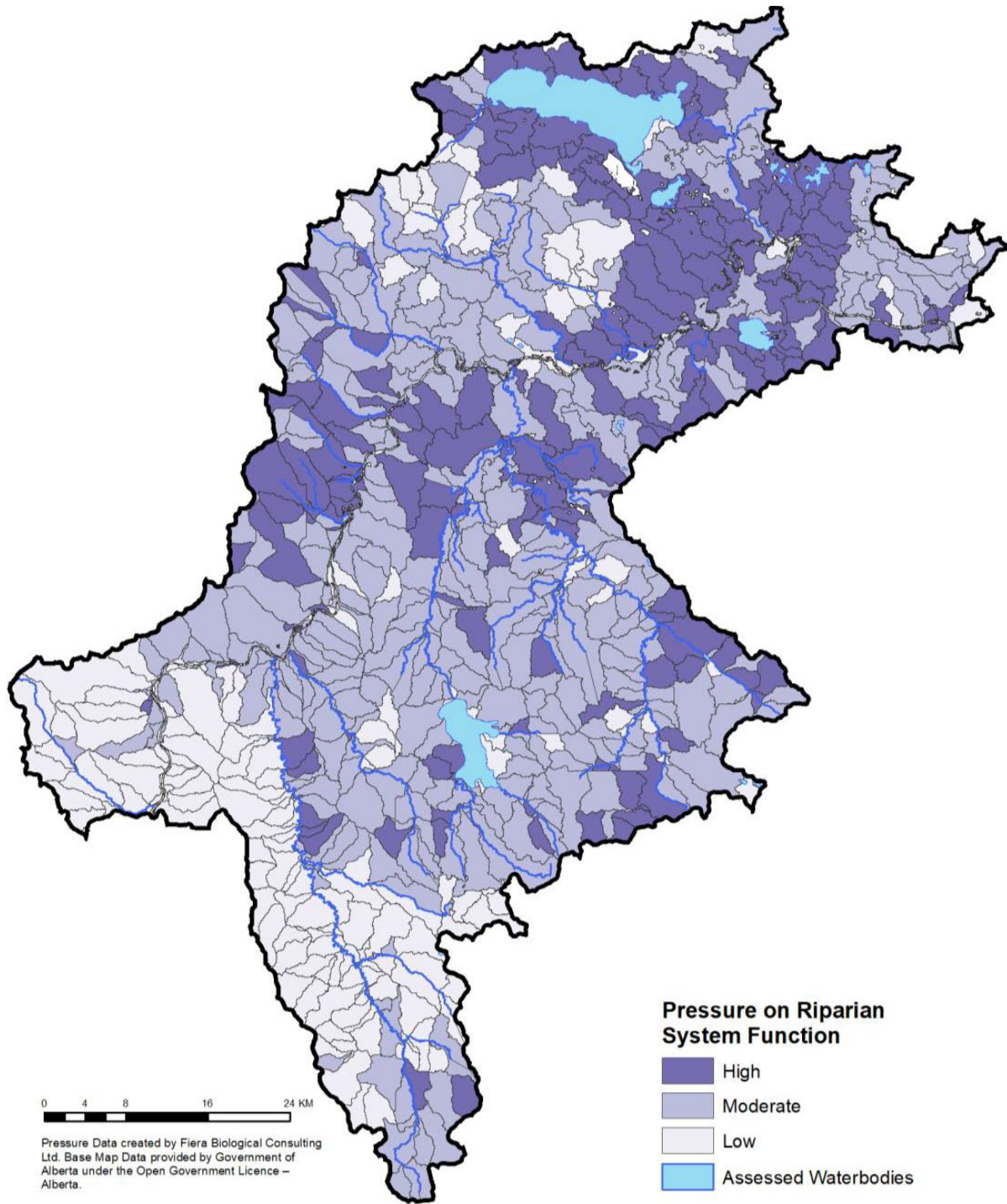


Figure 7. Pressure on riparian system function within the Modeste subwatershed.

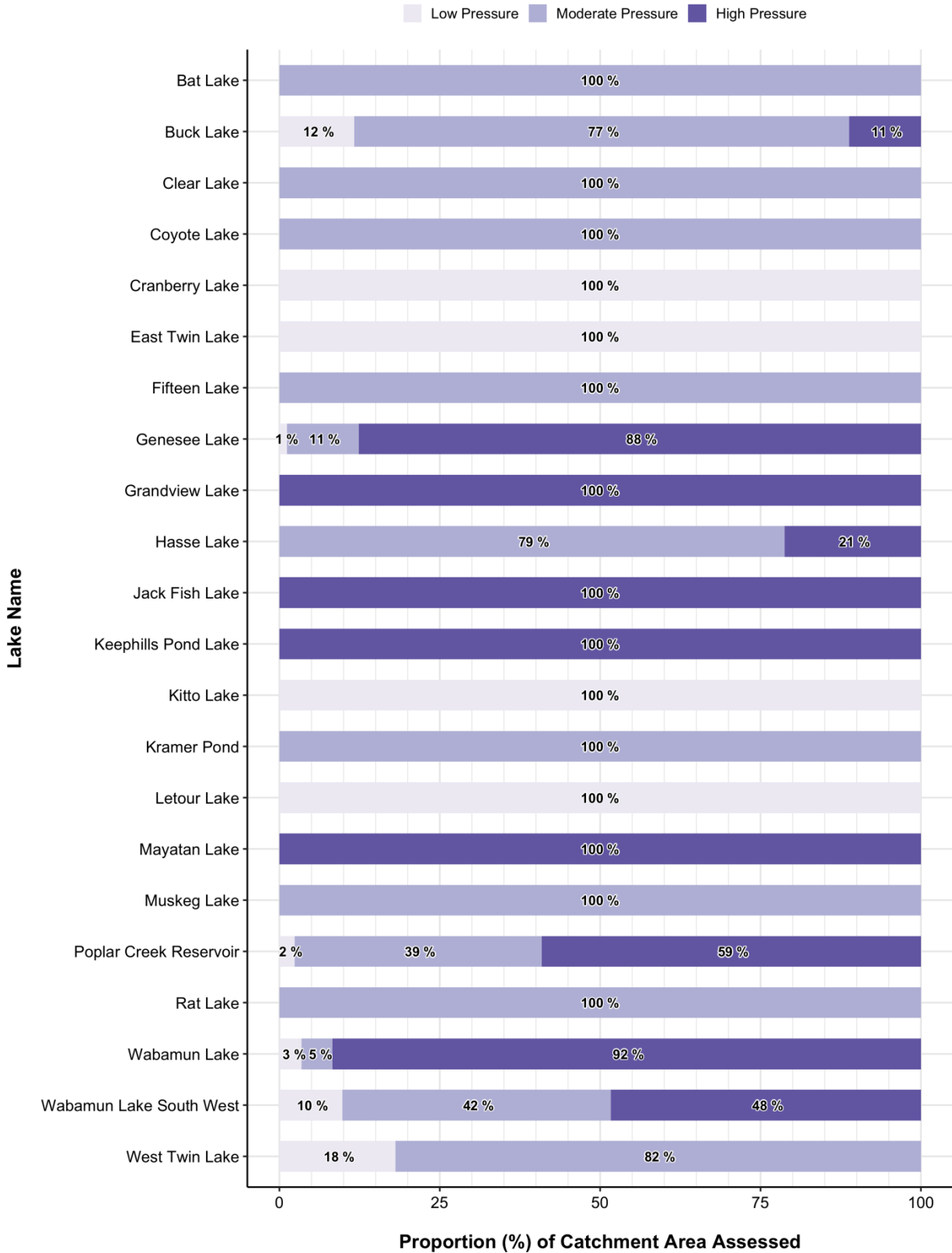


Figure 8. Pressure on riparian system function within the Modeste subwatershed as a proportion of the catchment area assessed.

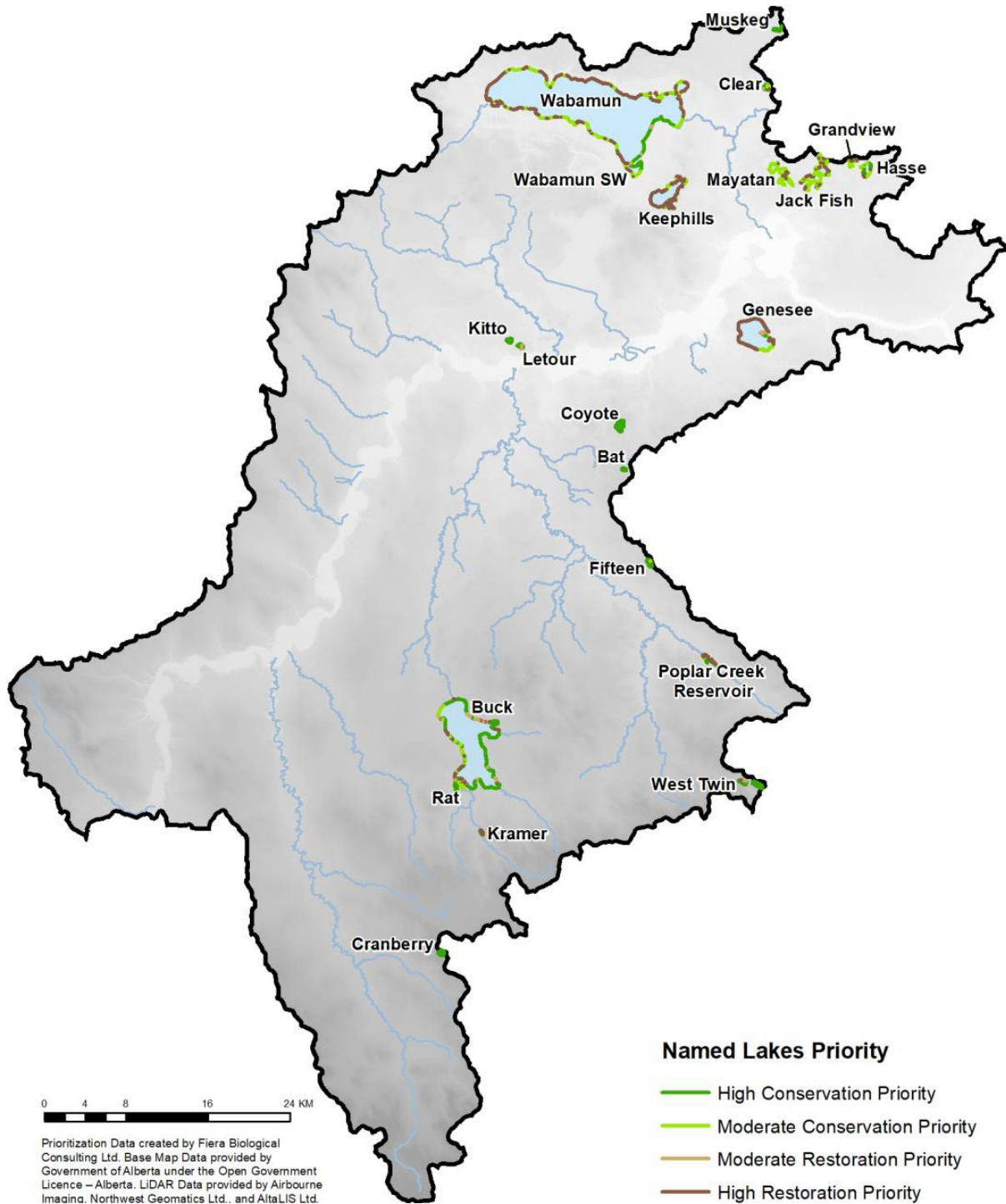
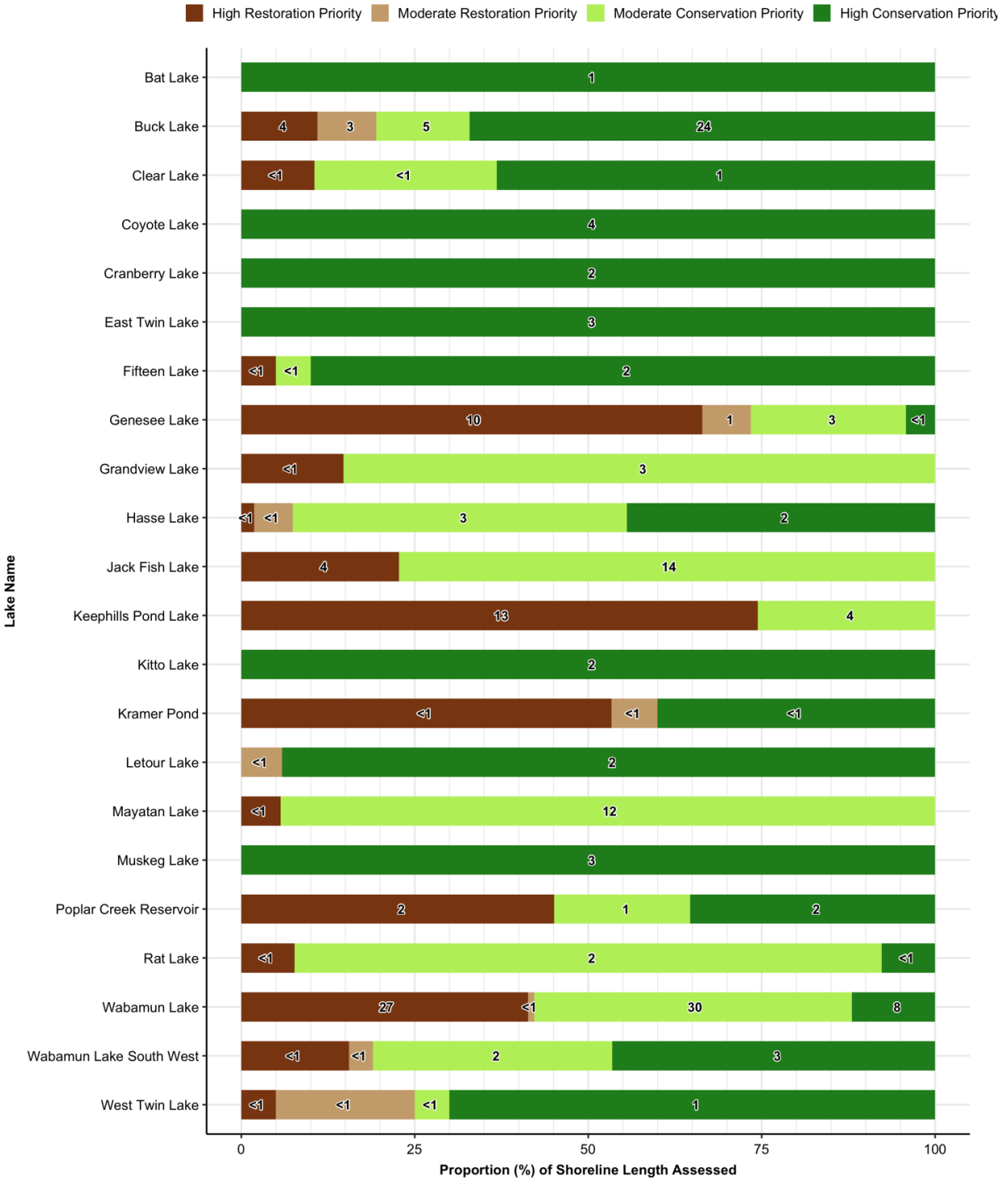


Figure 9. Conservation and Restoration priority scores for named lakes within the Modeste subwatershed.



NOTE: Numbers indicate the total length (km) of shoreline associated with each category.

Figure 10. Conservation and restoration priority scores for named lakes within the Modeste subwatershed as a proportion of the shoreline length assessed.

For the most part, the two assessments tell the same story: where there is development that has resulted in the removal of vegetation and/or the addition of hard surfaces, there has been greater impact on the riparian areas, which impacts how riparian areas function around Wabamun Lake (Figure 11).

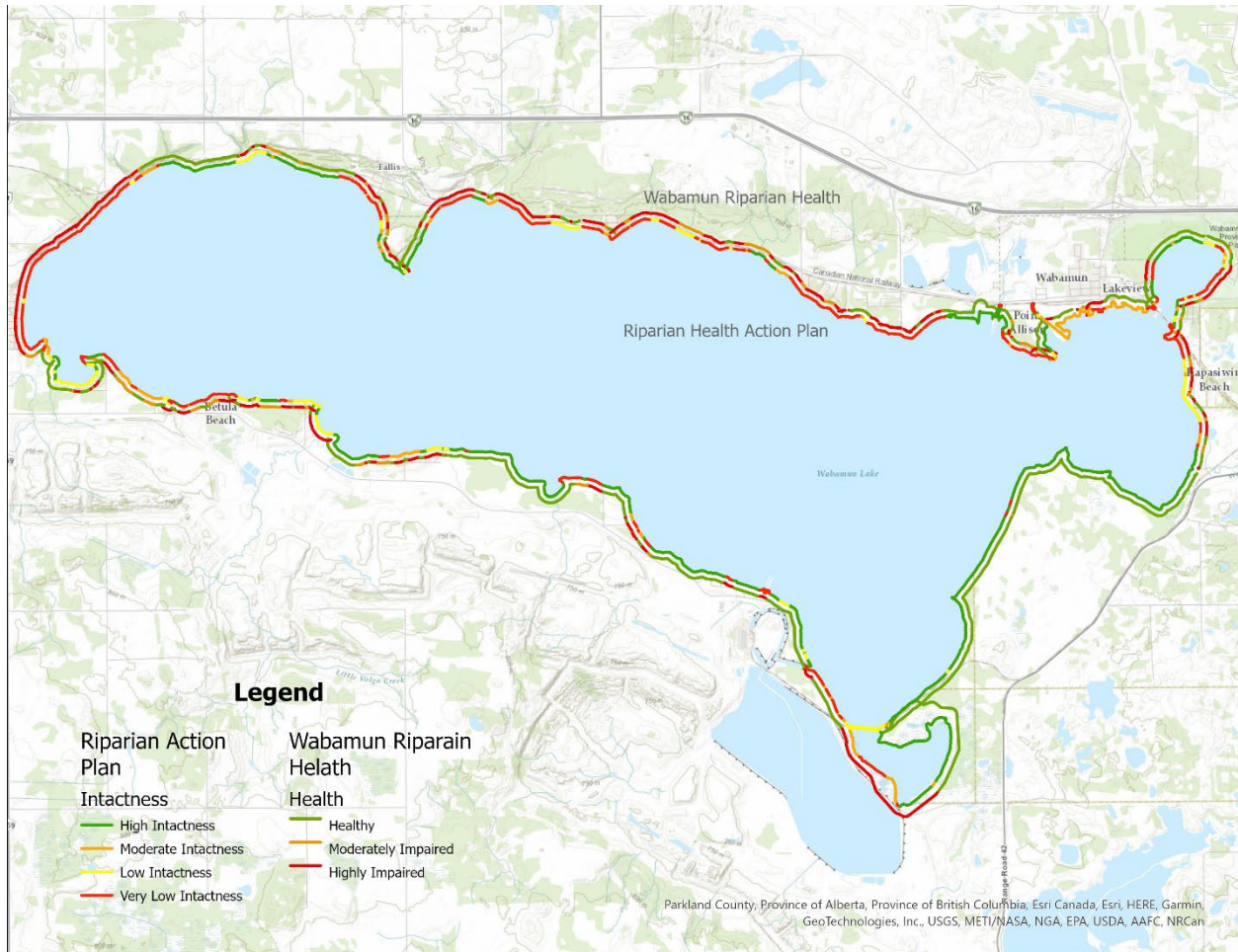


Figure 11. Map of Wabamun Lake showing the two different riparian assessment results as color-coded segments around the shoreline. The outermost line represents the 2015 assessment (Wabamun Riparian health), and the inner line represents the 2021 assessment (Riparian Health Action Plan). Color meanings are provided within the legend.

By and large, the results from the two assessment methods are agreeable. Where the two results disagree, this could be attributed to either a) a change in landscape over the 5-year period between the two assessments, or b) a difference between the methods for assessing riparian condition. Reasons for the differences in the assessment methods could be due to the difference in segment length and width, or due to a difference in the assessment criteria despite the effort to make them “comparable”. Overall, the difference between the two methods does not significantly change the results, as some areas show an improvement and other areas show a decline, but mostly, they are the same (Figure 12).

Both assessment methods provide a course-scale view of riparian condition to paint a picture of impacted areas in need of improvement across the lake.



Figure 12. Map of Wabamun Lake showing where riparian condition assessment results changed from 2015 to 2021. Dark green represents a change from Low health to High Intactness, light green is low health to moderate intactness, yellow is unchanged, orange is going from High health to Moderate Intactness and red is from either high health to low or very low or moderate health to very low intactness.

Neither assessment should be used as motivation to point fingers among neighbours, as this behaviour is counterproductive. The results are reflective of a long history of land management that was not informed by the science and planning now available to us. What these assessments can tell us is that we need to work together as a community, from individual landowners to business owners, industry, and government, we all need to strive towards a healthier environment as we are all responsible for the state of health of Wabamun lake and its riparian areas.

So, how do we improve the state of Wabamun Lake's riparian areas? There are multiple ways to do this from initiating residential restoration and conservation projects to municipal policy. The first assessment needed is a self-assessment to determine your role in the watershed. Are you a landowner? A business owner? A visitor? A municipal Councillor? Once you've determined your role-- and there may be several

roles-- then begin to imagine what stewardship actions you can take. Can you have an impact on municipal policy? Can you make a change to your personal property?

Do you want to learn more about riparian areas and what you can do? Check out the Riparian Web Portal at riparian.info for more information. Here, you can also check out an interactive map of the 2021 assessment results and look for stars indicating where restoration projects are in the works!

References:

Wabamun Lake Watershed Management Plan Steering Committee (2020). Wabamun Lake Watershed Management Plan. <https://www.nswa.ab.ca/resource/wabamun-lake-management-plan/>

Fiera Biological Consulting (2018). Modeste Watershed Riparian Area Assessment. (<https://www.nswa.ab.ca/resource/modeste-riparian-assessment/>)

Fiera Biological Consulting (2021). Riparian Area Assessment of the North Saskatchewan & Battle River Watersheds (<https://www.nswa.ab.ca/riparian-health-action-plan/phase-1-of-the-riparian-health-action-plan/>)

Riparian Web Portal (2021). <https://www.nswa.ab.ca/riparian-health-action-plan/phase-3-of-the-riparian-health-action-plan/>