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An Assessment of the Health and Integrity of Riparian Management Zones of Moose Lake and Lac La Biche, Alberta

Alberta Conservation Association

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An Assessment of the Health and Integrity of Riparian Management Zones of Moose Lake and Lac La Biche, Alberta.

Blake Mills
Alberta Conservation Association
#316, 5025 – 49 Ave
St. Paul, Alberta, Canada
T0A 3A4

Alberta Conservation Association

Report Series Co-editors

GARRY J. SCRIMGEOUR
Alberta Conservation Association
Baker Centre Postal Outlet
P.O. Box 40027
Edmonton, AB, T5J 4M9

DAVID FAIRLESS
Alberta Conservation Association
O.S. Longman Building
6909-116 Street
Edmonton, AB, T6H 4P2

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Alberta Conservation Association
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Toll Free: 1-877-969-9091
Tel: (780) 427-5192
Fax: (780) 422-6441
Email: info@ab-conservation.com
Website: www.ab-conservation.com

EXECUTIVE SUMMARY

Dramatic expansions in the number of lake-front cottages in Alberta since the 1970s have raised serious concerns about the effect human activities are having on lake fish communities in Alberta. The lack of current and comprehensive information on the status of riparian and littoral areas on entire lakes, and the extent of human disturbance is a formidable obstacle hampering the sustainable management of Alberta lakes.

The Alberta Conservation Association (ACA) developed and implemented the Riparian Habitat Assessment Project (RHAP) in an effort to quantify the status of riparian habitat at select locations. I applied a novel approach described by Mills and Scimgeour (2003) that used aerial videography to capture digital video of riparian zones at Moose Lake and Lac La Biche in July-August 2005, and then used a scorecard assessment to rank habitat quality (healthy, moderately impaired, highly impaired). This information was used as a pilot study to stimulate the development of a community-based riparian conservation group in the region.

The majority of the Riparian Management Area (hereafter riparian zone) at Moose Lake was classified as healthy (63% of the total length of the shoreline) with lesser proportions identified as moderately impaired (13%) or highly impaired (24%). At Lac La Biche, the majority of riparian zones were healthy (i.e., 70% of the shoreline) with lower proportions of riparian zones classified as either moderately impaired (10%) or highly impaired (20%). These findings were communicated to stakeholders representing each lake at meetings held between April and July, 2004 to support their activities in shoreline conservation. Toward that end, ACA has initiated a community development pilot program that provides facilitation to grass-root groups in order to improve shoreline health (i.e., the Lentic Riparian Recovery Project.)

ACKNOWLEDGEMENTS

I thank George Walker (Alberta Sustainable Resource Development) for his considerable contributions to the development of the aerial videography technique and for his ongoing support for the delivery of this project. Lakeland Counties financial contribution and operational guidance was greatly appreciated. Review and editing of this report was provided Stephanie Grossman, Doug Manzer, Garry Scrimgeour and an anonymous reviewer.

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1.0 INTRODUCTION

1.1 Background

Lentic riparian and littoral habitats and the fish and wildlife populations they support are under increasing pressure from human-caused disturbances across North America. These disturbances include physical changes to or removal of riparian and littoral vegetation and soils, point-source discharges (e.g., sewage inputs) and development of in-lake structures (e.g., docks) (Scrimgeour and Chambers 2000, Radomske and Goeman 2001). Changes in riparian and littoral habitats resulting from shoreline development, principally related to the loss of emergent macrophytes, have also degraded fish spawning, nursery and foraging habitats; reduced thermal and predator cover and generally reduced fish production (Robinson and Tonn 1989; Schindler and Scheuerell 2002; Pratt and Smokorowsk 2003).

Dramatic expansions in the number of lake-front cottages in Alberta since the 1970s have raised serious concerns about the effect human activities are having on lake fish communities in Alberta. The lack of current and comprehensive information on the status of riparian and littoral areas on entire lakes, and the extent of human disturbance is a formidable obstacle hampering the sustainable management of Alberta lakes.

The Alberta Conservation Association (ACA) though its Northeast Business Unit (NEBU) developed and implemented the Riparian Habitat Assessment Project (RHAP) in an effort to quantify the status of riparian habitat at select locations. I applied a novel approach described by Mills and Scimgeour (2003) that used aerial videography to capture a digital video of riparian zones and then applied a scorecard assessment to rank habitat quality in terms of three health categories (i.e., healthy, moderately impaired, highly impaired). The ACA was interested in using this information to stimulate development of community-based riparian conservation efforts at two pilot locations of Moose Lake and Lac La Biche.

1.2 Study rationale

I obtained data on the health of riparian lake habitat (*hereafter* the riparian zone) at Moose Lake and Lac La Biche to support information needs for initiating conservation

strategies with community groups. The community development program is described more thoroughly in the report titled Initiation and Facilitation of Community Based Lentic Riparian Recovery Project 2004 (LeRRP) Mills (2004). The objective of this report is to use information on riparian health to stimulate and guide local community-based riparian conservation at targeted lakes throughout Alberta.

1.2 Objectives of this report

This report describes the overall health of riparian zones at Moose Lake and Lac La Biche. These assessments were completed using aerial videography taken in 2004 and which was analyzed using the habitat scorecard previously described by Mills and Scrimgeour (2003).

2.0 STUDY AREA

Aerial videography was completed at Moose Lake and Lac La Biche, Alberta in summer (July-August) 2004. These lakes are located in northeastern Alberta adjacent to the towns of Bonnyville and Lac La Biche respectively (Figures 1 and 2). Ecoregion types and select lake and drainage area attributes for Moose Lake and Lac La Biche are shown in Table 1. Both waterbodies support sport fish populations comprised of walleye (*Sander vitreus*), yellow perch (*Perca flavescens*), northern pike (*Esox lucius*), lake whitefish (*Coregonus clupeaformis*) and burbot (*Lota lota*) (Mitchell and Prepas, 1990). Colonial nesting bird species found at both lakes include western grebe (*Aechmorphorus occidentalis*) and great blue heron (*Ardea herodias*). Lac La Biche is noted for its large populations of American white pelican (*Pelecanus erythrorhynchos*) and double-crested cormorant (*Phalacrocorax auritus*).

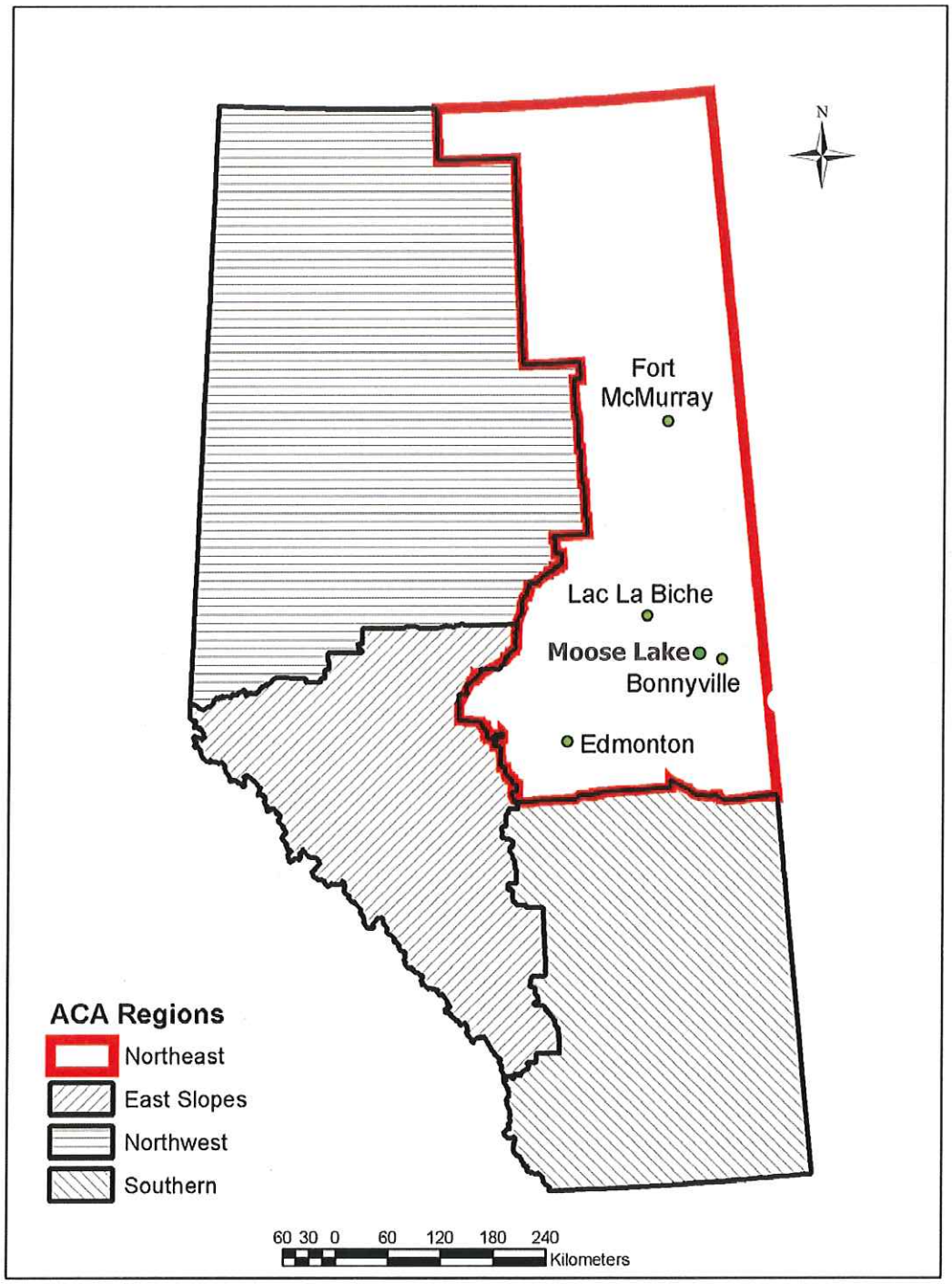

Figure 1. The location of Moose Lake and Lac La Biche in east-central Alberta.

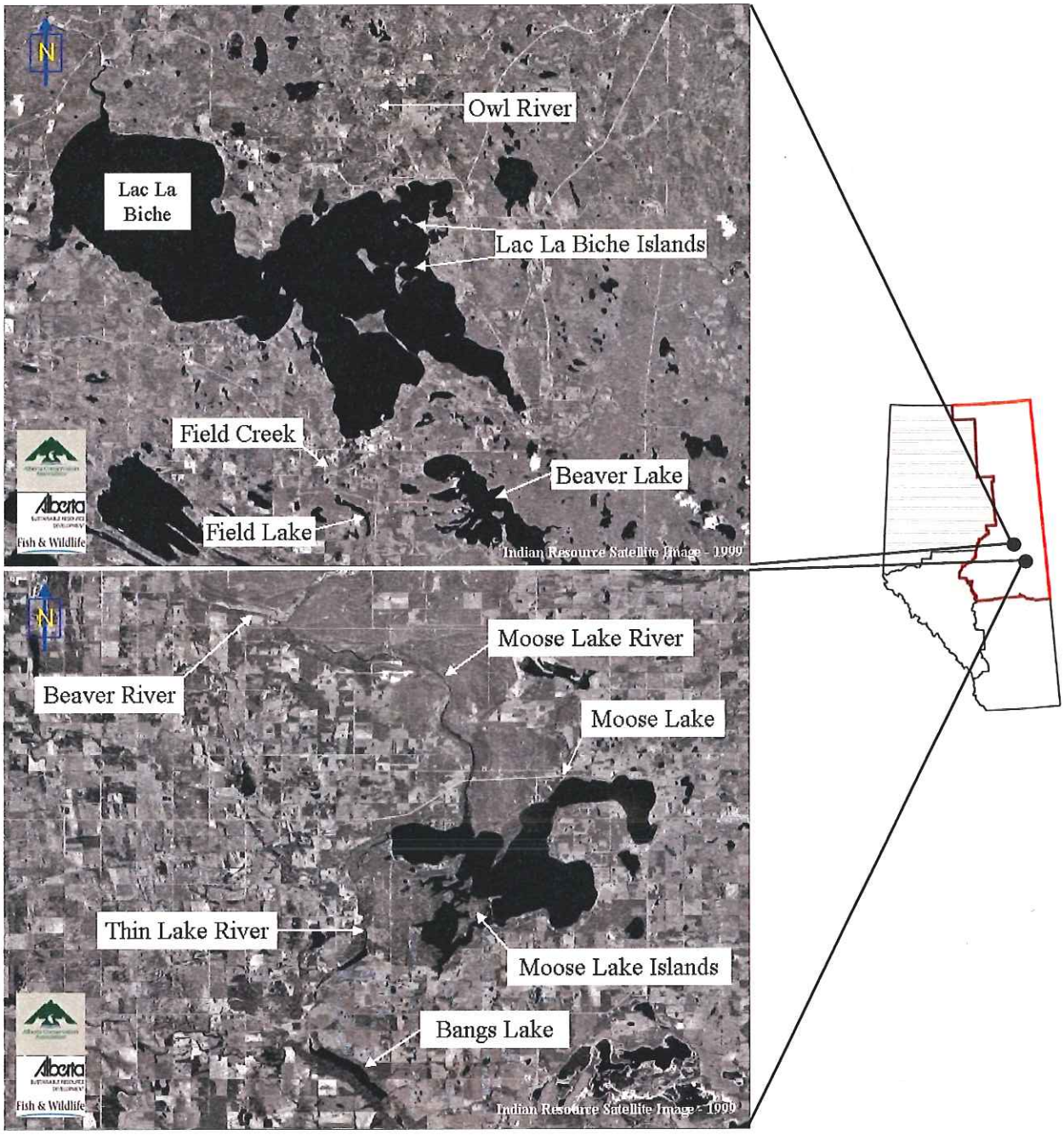

Figure 2. Indian Resource Satellite image of Moose Lake and Lac La Biche, Alberta.

Table 1. Ecoregion types and select lake and drainage attributes of Moose Lake and Lac La Biche, Alberta.

Lake	Ecoregion	Drainage area (km^2)	Lake surface area (km^2)	Shoreline length (km)	Maximum depth (m)	Mean depth (m)
Moose	Low Boreal Mixedwood	755	40.8	64.1	19.8	5.6
Lac La Biche	Mid Boreal Mixedwood	4,040	234	172	21.3	8.4

3.0 METHODS

Aerial videography of riparian zones were captured using a SeaWing ultralight aircraft, combined with a Sony DCR-TRV 900 digital camera and Red Hen Systems video geo-referencing hardware (Figures 3 to 5). Video was captured when the ultralight was flown at approximately 56 to 72 kph in a counter clockwise fashion, at a height of approximately 46 m. This height provided the best balance between aircraft height and camera zoom capabilities (i.e., decreased zoom coincides with increased stability of the video footage). GPS flight line information obtained from the camera and VMS 200 system and subsequent assessment information derived from the videography were mapped as individual GIS data layers using the Red Hen Systems Media-mapper (GIS) software. These layers were then exported to ESRI ArcView software and included with other standard GIS data layers (e.g., Indian Resource Satellite Imagery). Captured information was used to generate data outputs including ESRI based layers and maps.

Figure 3. The SeaWing amphibious weight-shift ultralight used to gather aerial videography of riparian zones.

Figure 4. Video capture configuration during aerial videography. Pilot is shown on the right and videographer on the left.

Figure 5. The Sony DCR-TRV 900 digital video camera and Red Hen Systems Global Positioning Systems mapping system used to record and geo-reference aerial videography.

3.1 Moose Lake

Low-level aerial videography was captured from the main shoreline of Moose Lake (64.1 km; Mitchell and Prepas 1990) during two two-hour flights on 13 and 15 July, 2005. The riparian zone associated with the island complex on Moose Lake (approximately 2.5 km), the Thin Lake River from Bangs Lake downstream to Moose Lake (approximately 11.3 km) and the Moose Lake River from Moose Lake downstream to its confluence with the Beaver River (approximately 15.5 km) were also captured by aerial videography (Figure 6).

3.2 Lac La Biche

Low-level aerial videography was captured from the main shoreline of Lac La Biche (172 km; Mitchell and Prepas 1990) during two two-hour flights 16 and 19 August, 2004. Four flights totalling approximately 3.5 hours were made between 24 and 26 August to capture footage of Lac La Biche islands (approximately 20.5 km), Field Lake and Field Lake Creek downstream to its confluence with Lac La Biche (approximately 13.0 km), Beaver Lake - NW subdivision (approximately 4.5 km), and Owl River from

NE 22-69-13-W4M downstream to its confluence with Lac La Biche (approximately 11.0 km; Figure 7).

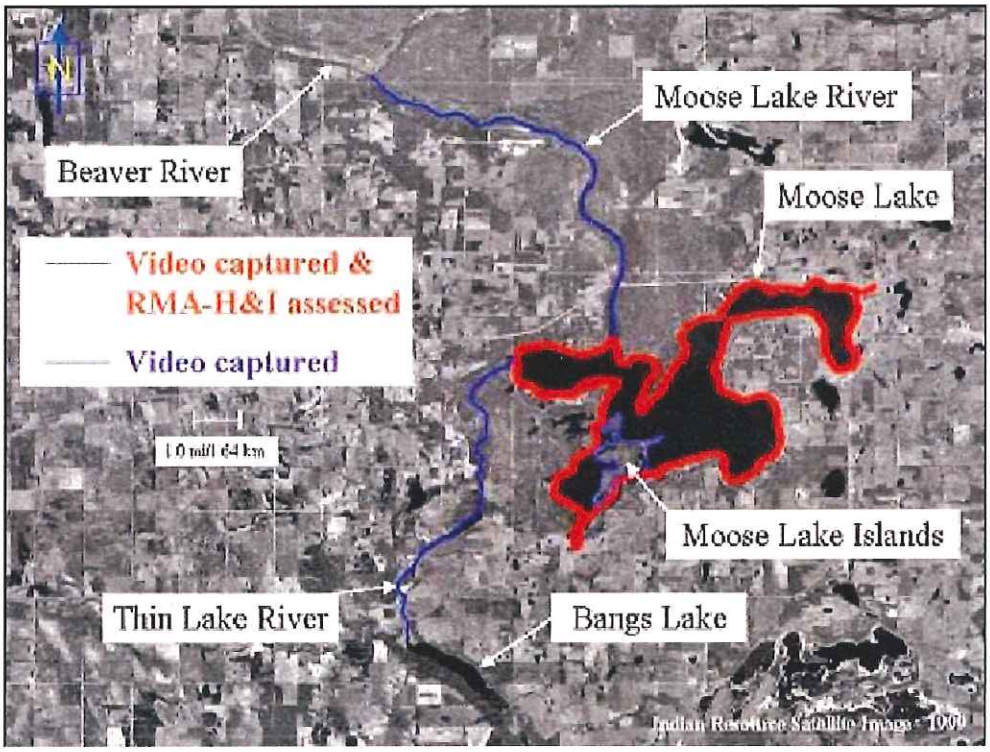

Figure 6. Riparian zones of Moose Lake assessed using aerial videography and areas of Moose Lake Islands, Thin Lake River (inflowing) and Moose Lake River (outflowing), Alberta captured on aerial videography.

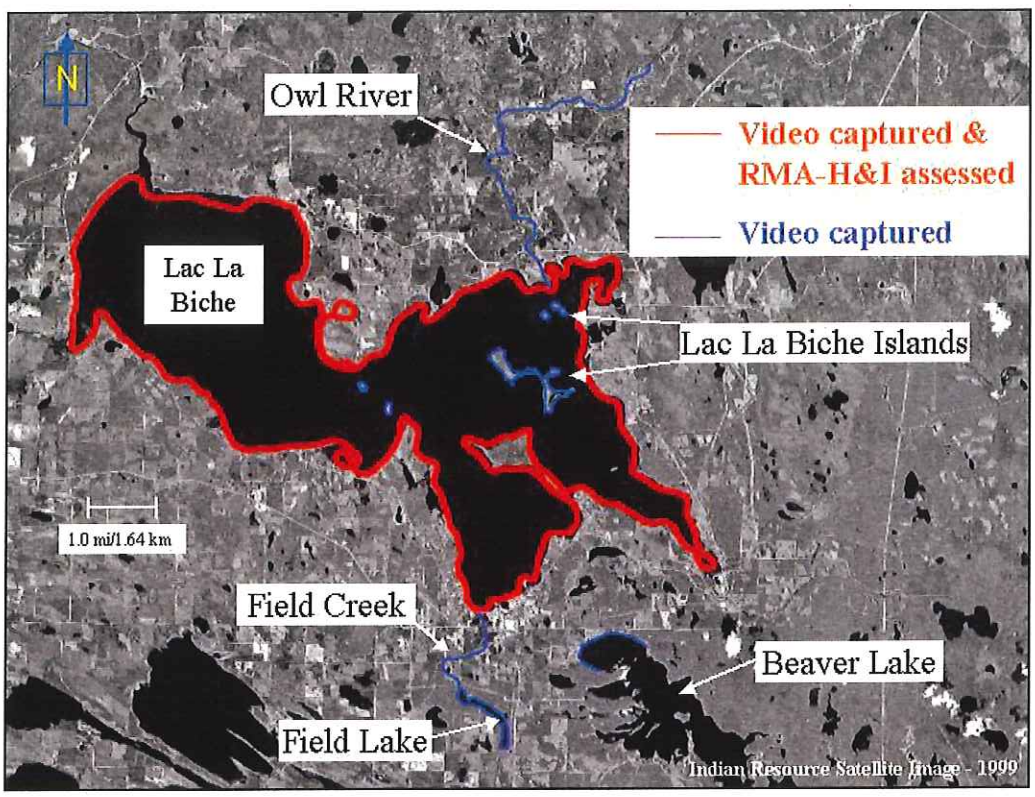

Figure 7. Riparian zones of Lac La Biche assessed using aerial videography and areasof Field Creek (inflowing), Owl River (inflowing), Field Lake, Beaver Lake and Lac La Biche Islands, Alberta captured on aerial videography.

4.0 RESULTS

4.1 The assessment scoring system

I assessed characteristics of riparian zones using aerial videography and its associated scorecard (Appendix 1). This scorecard uses weighted multiple-choice responses to eight focal questions regarding vegetation and human disturbance to determine the condition of riparian zones. The total available score is 13. A score of ≥9.5 results in a riparian zones being classified as healthy. A score of 7.0 to 9.0 equates to moderate impairment and 6.5 or less equates to highly impaired. Assessments of riparian zones and their boundaries (measured as linear distances (km) along the shoreline) are established when the answer to any one of the eight scorecard questions changes.

Only the main shoreline areas for both Moose Lake and Lac La Biche were assessed in this study. Assessment of other lentic areas captured will be performed as required.

4.2 Moose Lake

Results from aerial videography combined with application of the riparian health and integrity scorecard showed that the majority (63%) of riparian zones adjacent to Moose Lake are healthy with only 13% and 24% of shorelines defined as moderately impaired and highly impaired, respectively (Figure 8). In contrast, the majority (70%) of riparian zones adjacent to summer village were defined as highly impaired with only 11% and 19% of shorelines defined as healthy and moderately impaired, respectively (Figure 8). The vegetation and human disturbance categories required to generate these riparian health values are described in Appendix 1.

These findings were communicated to stakeholders between August, 2004 and March, 2005 through formal presentations and distribution of graphs and maps to assist with their shoreline management and conservation activities. As a result a core group of residents from the Summer Village of Pelican Narrows on Moose Lake formed the "Pelican Narrows Healthy Shoreline Committee" to address shoreline health concerns at their summer village The goal of this group is *"through the knowledgeable participation of Pelican Narrows residents, 75% of the Pelican Narrows shoreline is healthy by 2010"*. This community-led initiative and results from the riparian assessment at Moose Lake were also used to satisfy riparian information and community based conservation needs of the Moose Lake Watershed Management Plan under development by the Moose Lake Watershed Committee. This committee was formed under Alberta Environment's Water for Life Strategy (Alberta Environment 2003). The Minister of Environment approved the Terms of Reference for this watershed plan in November 2004 (Moose Lake Watershed Management Committee 2003).

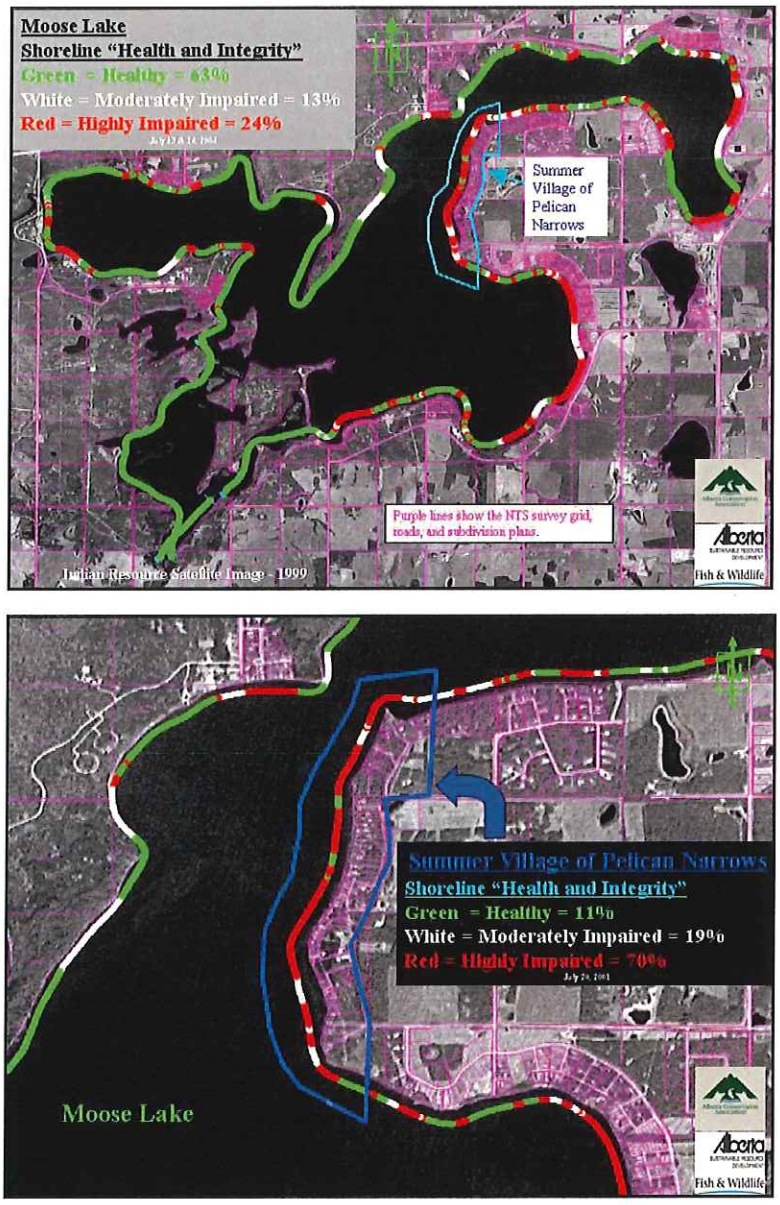

Figure 8. Graphical display of the results of the riparian health assessment showing healthy, moderately impaired and highly impaired areas in the riparian zones of Moose Lake and the Summer Village of Pelican Narrows, Moose Lake, Alberta July 2004.

4.3 Lac La Biche

The majority (70%) of riparian zones at Lac La Biche RMA were determined to be healthy, with only 10% and 20% of riparian zones defined as moderately impaired and

highly impaired, respectively (Figure 9). These findings were communicated to the public during presentations to the Lac La Biche Watershed Steering Committee, Lakeland County and other stakeholders to assist with their shoreline management and conservation activities. It is anticipated that these findings will be used by the Committee to satisfy the riparian information needs of its ongoing Lac La Biche Watershed Plan. This plan will be reviewed and approved by the Alberta Minister of Environment under the province's Water for Life Strategy. It is also expected that this information will also be used to guide the development and delivery of Lakeland County's 2005-2006 Riparian and Fish Habitat Stewardship Project.

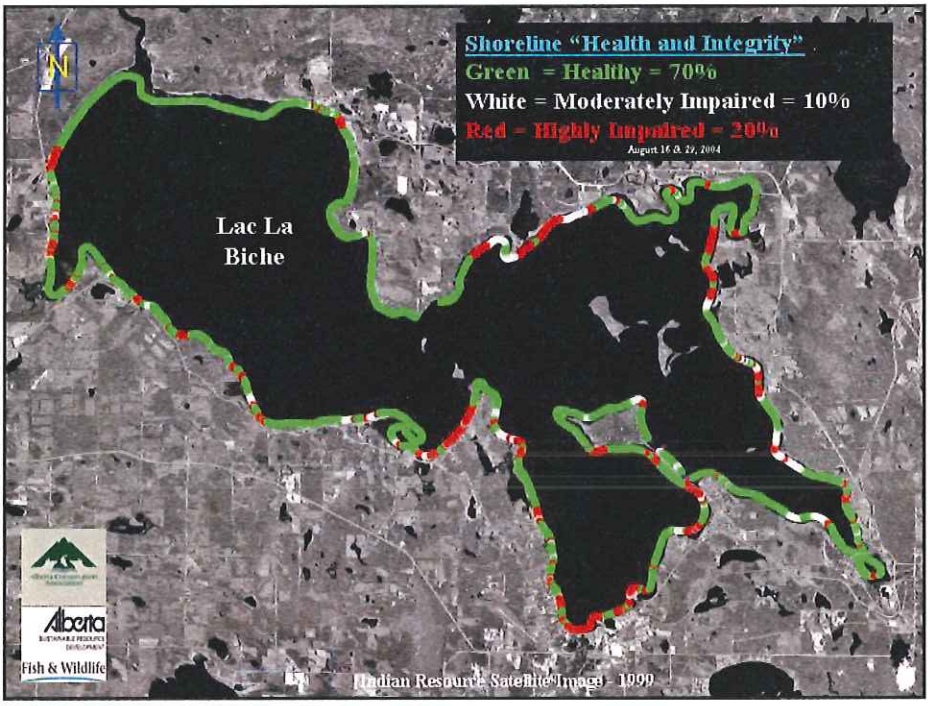

Figure 9. Graphical display of the results of the riparian health assessment showing healthy, moderately impaired and highly impaired areas in the riparian zone of Lac La Biche, Alberta in August 2004.

4.4 Future considerations

The low-level aerial videography combined with the simple assessment scorecard has been demonstrated to be a rapid and cost effective method to assess shoreline and littoral condition (Mills and Scrimgeour 2003). In addition to quantifying shoreline condition and vegetation communities, low-level videography provides a means to

achieve conservation goals through enhanced education and awareness, stimulation of conservation partnerships (e.g., lakeshore communities) and the development of reclamation and remediation initiatives (Mills and Scrimgeour 2003). This method supports the ACA's provincial riparian program objectives described in the Strategic Business Plan (Alberta Conservation Association 2005), 2005 Annual Operating Plan (Alberta Conservation Association 2005) and Conservation Program (Alberta Conservation Association 2005) and may be appropriate for application across the province.

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6.0 APPENDICES

6.1 Appendix 1. Aerial videography lentic health and integrity scoresheet (Riparian Habitat Assessment Project, 2003).

AERIAL VIDEOGRAPHY[1] - LENTIC RIPARIAN MANAGEMENT AREA HEALTH AND INTEGRITY ASSESSMENT SCORECARD [2, 3]

August 11, 2003
Draft for discussion purpose only, not for distribution.

Riparian areas have been described as pertaining to, situated or dwelling on the margin of a river or other water body. This term also describes banks on water bodies where sufficient soil moisture supports the growth of mesic vegetation that requires a moderate amount of moisture (Armantrout, 1998). The term riparian-wetland area has been used to describe an area that is saturated or inundated at a frequency and duration sufficient to produce vegetation typically adapted for life in saturated soil conditions. It is also the transitional area between permanently saturated wetlands and upland areas often referred to as a riparian area. (Prichard, 2003). The upland boundary of riparian-wetland areas is sometimes easily determined by abrupt changes in the landform and/or vegetation, but proper determination often depends on experienced interpretation of more subtle features (Cows and Fish, 2003). In north-central Alberta this landform break is often associated with a change in vegetation from lower woody shrubs to taller deciduous or coniferous trees. This break can also correspond to the waterbodies full supply level (i.e., high water mark).

This scorecard, when applied to low altitude aerial videography (< 200 ft) of the riparian/riparian-wetland area, provides a rapid method to produce rapid, "coarse filter" assessment of the integrity or health of the riparian/riparian-wetland area; and the role human activity plays in the results. This information can be used to direct conservation activities at those human activities negatively impacting the health or integrity of these areas. The extent of negative "human caused" impact in lentic riparian/riparian-wetland has been observed as increasing, or being more concentrated, closer to the waters edge. Historically, management activities (e.g., preservation, enforcement and rehabilitation, etc.) designed to address these negative impacts have been focused within this Riparian Management Area. The ability for the aerial video to capture the entire riparian/riparian-wetland area from all types of lakes is problematic. However, it is currently felt it can consistently capture the Riparian Management Area; the priority target area for conservation activities

Assessment Questions and Scoring.

1. 85% or more of the polygon area is covered with vegetation of any kind? (Polygon area does not include area covered by water).
   Yes___ (2 points) **No**____ (0 points)

2. Cattails and bulrushes are visibly growing in the littoral zone adjacent to the polygon area? (Identifying immature bulrush and cattail stands may be difficult. On some lakes these species do not grow because of site and/or climate conditions. It is important you know this prior to deciding if their absence is natural or human caused).
   Dense to Medium ____ (1 point), **Medium to Sparse** ____ (0.5 points), **None** ____ (0 points)

3. Woody plants like willow, birch or poplar cover 15% or more of the polygon area? (In some cases riparian areas do not have the potential for woody plants because of soil chemistry and other factors, i.e., saline and drainage. In some cases woody plants do not meet this threshold because of site and successional reasons).
   Yes___ (1 point) **No**____ (0 points)

4. Within the 15% woody zone, what is the abundance of woody plants? (If the answer to Question 3 is no, this question receives 0 points)
   Dense to Medium ___(1 point) or **Sparse to Medium** ___ (0.5 points)

5. 35% or more of the polygon show visual signs of human caused removal or alteration of vegetation? (e.g., includes conversion of native vegetation to lawn grass, mowing, grazing, etc.).
   Yes___ (2 points) **No**____ (0 points)

6. 35% or more of the polygon show visual signs of has human caused physical alterations or exposed soil surface? (e.g., removal of rocks, addition or removal of sand, harrowing beaches, retaining walls, boat houses, decks, patios, walking or ATV trails, cattle activity, etc.)
   Yes___ (3 points) **No**____ (0 points)

7. What picture does most of the polygon look like?
   Picture A? ___ (1 point) **Combination of A and B?**___ (0.5 points) **Picture B?**___ (0 points).

8. Does the lake have human caused water withdrawal (e.g., cottage, municipal, industrial, etc) or filling? (e.g., dams, weirs, drainage channel outflow) (This is a background question supported by the aerial videography but requiring local input or knowledge to answer).
   None ___ (2 points) **Minor**___ (1.0 points) **Moderate to Extreme**___ (0 points)

Total possible points = 13 . **Actual points (sum from questions above) =** _____.

Summary of Question Scorecard

If the score is **9.5 or more** it is likely the Riparian Management Area is **healthy.**
If the score is **7.0 to 9.0** it is likely the Riparian Management Area is **moderately impaired.**

If the score is **6.5 or less** it is likely the Riparian Management Area is **highly impaired**.

[1] Aerial videography developed by Blake Mills, Alberta Conservation Association and George Walker, Alberta Sustainable Resource Development, Fish & Wildlife Division.

[2] Prepared by Gerry Ehlert, Blake Mills, Wayne Nelson and George Walker of the Vincent Lake Working Group.

[3] This Score Card was adapted from the Alberta Lentic Wetland Health Assessment Survey, Cows and Fish, 2003.

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