Sundance Beach Biophysical Survey

Prepared for: Municipal Planning Services (MPS)
By: CPP Environmental – Théo Charette, Michelle Desaulniers & Angie Bouzetos

Date of Report: March 8, 2019

Introduction

CPP Environmental completed a terrestrial and aquatic survey in the Summer Village of Sundance and in adjacent aquatic areas on October 17, 2018 (**Figure 1**). The survey included a terrestrial assessment to classify land features such as ecosites and streams and the aquatic survey documented shoreline and aquatic conditions. Other biophysical features included a riparian health assessment and fish and wildlife observations and habitat types. In some cases, where information was previously collected by other parties, it was included in our report. A summary of terrestrial, watercourses, riparian, aquatic and fish and wildlife habitat conditions are described below.

Background

Prior to the field survey, a desktop survey of Alberta Environment and Parks (AEP) resources was completed, as follows:

- The Alberta Conservation Information Management System (ACIMS) was accessed to document rare plants within the project boundaries. One sensitive aquatic plant, widgeon-grass (*Ruppia cirrhosa*) was historically documented in Pigeon Lake along the shoreline of Sundance SV (**Appendix A**). It was not documented during the aquatic survey, but this may be due to the late timing of the survey (October).
- The Fish and Wildlife Internet Mapping Tool (FWIMT) was accessed to document previously recorded fish and wildlife observations (**Appendix B**).
- A Historical Resources report was generated to identify potential historical resources (**Appendix C**). Two areas have a Historical Resource Value of 5h, meaning that the sites are ***believed*** *to contain a historic resource from a historical period*, but no specific historic resource concerns have been identified within the SV. Hence if the discovery of historical resources is made, it should be reported to the Ministry of Culture and Tourism. Section 31 of the *Historical Resources Act* states that “a person who discovers a historic resource in the course of making an excavation for a purpose other than for the purpose of seeking historic resources shall forthwith notify the Minister of the discovery.” A map is also included in **Appendix C** documented the area of potential interest.
- The 2018 Pigeon Lake Watershed Management Plan is referenced throughout the report, particularly in reference to watershed and riparian health conditions (**Appendix D**).

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Terrestrial

The SV of Sundance is located within the Dry Mixedwood Subregion of the Boreal Forest Natural Region. The majority of the SV is developed especially along the lake shoreline; however, some areas remain natural, which provided the opportunity for ecosystem classification. Ecosites were identified in accordance with the *Field Guide to Ecosites of Northern Alberta* and occurred within all natural areas of the SV and a 50 m project buffer.[1]

Ecosite classification included the identification of plants and soils to determine the three levels of ecosite classification (ecosite phase, plant community type and soil classification), which was identified to the following code: BM-e1.2/SWm. The SV is located within the Boreal Mixedwood (BM) ecological area. The plant community was classified as a balsam poplar/ bracted honeysuckle/fern (e1.2) and soils were a wet/mineral type (SWm). The plant community is described in **Table 1** and pictures are included in **Appendix E.** The ground stratum was not assessed due to extensive leaf fall that skewed total percent cover, hence the plant community was identified with tree and shrub layers.

Table 1: Sundance SV plant community documented as BM-e1.2.

Stratum	Dominant Species	Sub-dominant Species
Tree	balsam poplar *(Populus balsamifera)*	trembling aspen (*Populus tremuloides)* and white spruce (*Picea glauca)*
Shrub	prickly wild rose (*Rosa acisularis*),	red osier dogwood (*Cornus stolenifera),* wild red raspberry (*Rubus idaeus),* low-bush cranberry *(Viburnum edule),* bracted honeysuckle *(Lonicera involucrate),* lady fern *(athyrium filix femina),* green alder (*Alnus crispa*), trembling aspen and balsam poplar

Soil characteristics comprise the last letters in the ecological code (SWm) that represent soil moisture and texture. The first letter of the code (S) is the soil identifier and the second letter (W) indicates moisture (wet in this case). The final number in the code (m) represents the mineral texture class, which was assessed at the surface (top 30 cm) and was identified as silty loam. SWm soil types tend to occur on level topography adjacent to lakes and streams where water table levels are often above the mineral surface for some portion of the growing season. The area is not classified as a wetland due to the presence of upland vegetation within the plant community and the absence of mottles/gleying within the soil profile. Dogwood ecosites are characteristic of hygric to mesic moisture regime and a medium to rich nutrient regime, meaning the soils contain a medium amount of moisture and a good amount of nutrients.

Watercourses & Crossings

Two watercourse crossings were identified within the SV boundaries on Lakeshore Drive over an unnamed and mapped tributary to Pigeon (**Figure 2**).

[1] Beckingham, J. D. 1996. Field Guide to ecosites of northern Alberta. University of British Columbia. Vancouver, B.C.

Crossing 1 – unnamed and mapped tributary to Pigeon Lake

Crossing 1 is single culvert crossing located on Lakeshore over a small permanent unnamed and unmapped tributary to Pigeon Lake. The stream had a bankfull width of 0.7 metres and was flowing at the time of assessment. The habitat was suitable for smaller bodied fish and offered potential foraging opportunities but otherwise was limited for over-wintering habitat due to the absence of deep pools. The culvert condition was poor as an outlet gap is too great and blocks fish passage. CPPENV recommends culvert replacement to restore upstream fish habitat.

Crossing 2 – unnamed and mapped tributary to Pigeon Lake

Crossing 2 is single culvert crossing located on an unnamed back alley over the same small permanent unnamed and mapped tributary to Pigeon Lake as crossing 1. The culvert is undersized as the diameter is smaller than the bankfull width of the crossing creating potential flooding and erosion issues but is otherwise in functioning condition.

Riparian Health

Riparian areas are the transitional ecological zones bordering rivers and lakes. They encompass areas of emergent aquatic vegetation, the shoreline, the bank and upwards to areas where plants remain tolerant of water saturated soils. These areas provide important ecological services, including stabilizing lake sediments and terrestrial soils to reduce shoreline erosion, filtering sediment and nutrients from runoff entering the lake, storing water during wet periods and releasing it during dry periods and providing essential habitat for fish and wildlife. Lakeside modification, including construction of buildings along the shoreline, clearing of aquatic and shoreline vegetation, installation and maintenance of lawns and artificial beaches, and placement of docks, boat lifts, concrete and riprap, can degrade riparian health. This can impact water quality and biodiversity by increasing shoreline erosion, degrading fish habitat and increasing nutrient input which may lead to algal blooms.

In 2002 and 2008, Alberta Sustainable Resource Development conducted riparian health assessments on Pigeon Lake.[2] In both assessment years, results classified the majority of Pigeon Lake's shoreline (65%) as highly impaired. In 2002, 24% of the shoreline was classified as healthy and the remaining 11% was considered moderately impaired. In 2008, riparian health improved slightly, with 29% of the shoreline considered healthy and 6% moderately impaired (**Appendix D**). This improvement in shoreline quality was likely the result of land purchases by the Government of Alberta along the northwest shore of the lake, although some improvement in riparian health was offset by poorer health scores elsewhere along the lake. Pigeon Lake's riparian impairment is largely a result of extensive riparian vegetation removal and shoreline modification.

If the SV would like to improve riparian health within and adjacent to its boundary, highly impaired areas should be targeted for restoration and healthy areas should be targeted for some form of protection and conservation. Residents should be encouraged to maintain healthy shorelines with native vegetation and avoid the removal of aquatic and shoreline vegetation.

[2] Alberta Sustainable Resource Development. 2008. User Guide to the Pigeon Lake Shoreline Video. Fish and Wildlife, Alberta Sustainable Resource Development. 8 pp.

Shoreline and Aquatic Biophysical Survey

The shoreline and aquatic biophysical survey was completed by kayak within 50 m of the lakeside boundary of the SV on October 17, 2018. Field measurements included percent cover of different substrate and vegetation types along reaches defined in the field. An individual reach was defined while travelling parallel to the shoreline, as follows. The first reach began at one end of the summer village. When a notable change in substrate, vegetation type or shoreline disturbance occurred, a waypoint was created to mark the end of the reach and the start of the next reach. At each waypoint, water quality was measured using an Aqua TROLL 600 multi-parameter probe at a depth of 0.5 m. Measured parameters included temperature, conductivity, turbidity, dissolved oxygen (D.O.) and pH. The survey was limited to a maximum depth of approximately 2 m due to water clarity restrictions.

The aquatic assessment resulted in a total of four reaches representing the entire near-shore area of the SV (**Figure 3**). Reaches were classified as either natural, moderately disturbed or highly disturbed. Reach 3 was the only natural reach and accounted for 3.25% of the project area. This reach was characterized by a relatively undisturbed shoreline with abundant natural riparian vegetation. Highly disturbed reaches included 1, 2 and 4 and accounted for approximately 96.75% of the project area. These reaches were characterized by abundant shoreline disturbance in the form of residential and recreational development, including buildings, docks, manicured lawns, rock placement and shoreline vegetation removal.

Despite differences in the degree of disturbance, water quality parameters were relatively similar in all reaches and were at levels suitable to support aquatic life.[3] Submergent vegetation cover was similar across all reaches and consisted primarily of sago pondweed (*Stuckenia pectinata*) and large-sheath pondweed (*Potamogeton vaginatus*). Emergent vegetation was not present within any of the study reaches at the time of assessment. Substrates throughout the study area were generally sand-dominated, although some coarser sediments, including cobble and boulder were present near shore. These coarser substrates may have been introduced as a result of rock and riprap placement on shore (**Table 2**).

[3] Alberta Environment and Parks. 2018. Environmental Quality Guidelines for Alberta Surface Waters. Water Policy Branch, Edmonton, Alberta.

Table 2: Survey data collected at each reach in near-shore areas along the SV.

Characteristics	Reach Number			
	1	2	3	4
Total Reach Length (m)	534.3	318.9	66.2	1116.9
Water Quality				
Temperature (°C)	6.28	6.29	6.30	6.30
Conductivity (µS/cm)	332	334	332	333
Turbidity (NTU)	24.8	20.2	24.0	21.3
Oxygen, dissolved (mg/L)	7.84	7.95	7.99	8.00
pH	8.37	8.36	8.35	8.36
Shoreline (Average)				
Sedges/Grasses (%)	50[a]	50[a]	25	50[a]
Shrubs (%)	15	15	35	15
Trees (%)	15	15	40	20
Disturbed (%)	80	80	15	80
Emergent Vegetation Zone (Average)				
Dominant Veg. Type	None	None	None	None
Emergent Veg. Zone Width (m)	0	0	0	0
Emergent Veg Cover (%)	0	0	0	0
Submergent Vegetation Zone (Average)				
Aquatic Veg. Cover (%)	45	45	45	45
Fines (%)	25	25	25	25
Sand (%)	40	40	40	40
Sm. Gravel (%)	5	5	5	5
Lg. Gravel (%)	5	5	5	5
Cobble (%)	15	15	15	15
Boulder (%)	10	10	10	10

[a] Grasses are lawns, thus representing a shoreline disturbance.

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Fish and Wildlife Habitat

Five species of sport fish inhabit Pigeon Lake, including burbot (*Lota lota*), lake whitefish (*Coregonus clupeaformis*), northern pike (*Esox lucius*), yellow perch (*Perca flavescens*), and walleye (*Sander vitreus*). Sucker and forage fish species, including white sucker (*Catostomus commersonii*), spottail shiner (*Notropis hudsonius*), emerald shiner (*Notropis atherinoides*), trout perch (*Percopsis omiscomaycus*), and Iowa darter (*Etheostoma exile*) have also been documented within the lake.

Fishes in Pigeon Lake are subject to environmental and anthropogenic pressures such as habitat modification, overfishing and hypoxia due to eutrophic conditions. Northern pike and walleye populations are often used as indicators of the fisheries status within lakes due to these species' value to the recreational fishery, position atop the aquatic food web and sensitivity to stressors such as angling. The population of walleye in Pigeon Lake is currently sustainable, although this is due to intensive stocking efforts in the 1990s which brought the population back from extirpation. Populations of northern pike in the lake are considered collapsed, likely a result of a combination of factors, including the extirpation of the species in the 1950s, loss of littoral spawning and feeding habitat, direct competition with reintroduced walleye, and overfishing. According to AEP, as of 2015, walleye populations within Pigeon Lake are at Very Low Risk while northern pike populations are considered Very High Risk due to weak recruitment and low survival.[4]

Results of the aquatic survey indicate that the majority of the Sundance Beach shoreline (96.75%) has been impaired by human disturbance. Submergent vegetation cover was moderately abundant throughout all reaches, however no emergent vegetation cover was present within the study area at the time of the assessment. These results suggest that the Sundance Beach littoral zone is unlikely to provide adequate spawning or rearing habitat for Northern Pike (*Esox lucius*), which rely heavily on vegetative cover for these activities. However, the submergent vegetative cover present is likely sufficient to provide foraging habitat for smaller-bodied fishes. Nearshore areas with coarser substrates could potentially provide spawning habitat for walleye, which require wave-washed gravelly shoals, although these areas are subject to a relatively high level of human disturbance which would likely act as a deterrent. Areas with sand-dominated substrates may be utilized as travel corridors between areas of more cover, as well as by certain forage fishes, such as trout-perch which feed nocturnally in open, sandy-bottomed shallows.

Wildlife habitat is available throughout the northern SV natural areas but is limited along the lake edge as forest habitat is scattered amongst built-up areas. Lakeshore Drive divides lake lot properties into two urban development types: housing to the north and docks/boat houses to the south. The division allows for greater coverage of natural vegetation along the shoreline, thereby increasing the forest cover and habitat availability for wildlife. The larger areas of intact natural riparian areas have the potential to provide foraging and nesting sites for waterfowl. Numerous sightings of waterfowl along the Sundance Beach shoreline occurred and included the following observations: groups of the American Coot (*Fulica americana*), Canada geese (*Branta Canadensis*), mallards (*Anas platyrhynchos*) and common goldeneye (*Bucephala clangula*).

[4] Pigeon Lake Fisheries Management Update. Available from http://aep.alberta.ca/fish-wildlife/fisheries-management/fall-index-netting/fall-index-netting-summaries/default.aspx.

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Bird observations included common local species such as the downy woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), American robin (*Turdus migratorius*), European starling (*Sturnus vulgaris*), Bohemian waxwings (*Bombycilla garrulous*) and black capped chickadee (*Poecile atricapillus*). All of these species, except the robin and the starling, are known to over winter in Canada and will rest in tree cavities and large white spruce trees throughout the winter. Many bird feeders and houses were documented throughout the SV and the forested areas provide habitat for songbirds and woodpeckers. Natural areas along the northern boundary may also provide foraging opportunities for whitetail and mule deer, moose and coyotes and also smaller mammals such as porcupines, skunks, weasels and squirrels.

Summary and Recommendations

The SV of Sundance is nestled within a surrounding forested area, offering wildlife use and viewing opportunities within the SV. Maintaining natural areas within the SV and increasing (in lots and along watercourses) the percent cover of natural vegetation overall will attract birds and other wildlife. To limit further nutrient loading to the lake, further land clearing within the riparian areas should be limited as much as possible, especially within the natural reach identified during the aquatic survey (reach 3) and along the unnamed and mapped tributary. Protecting the natural vegetation along diversity-rich areas, such as natural forested areas, watercourses, riparian zones and natural aquatic vegetation offers an excellent opportunity to maintain and improve fish and wildlife habitat, as well as water quality in the greater Pigeon Lake. If possible, a naturally vegetated buffer should be maintained on the lake and the unnamed watercourse to protect the ecological values that they offer. CPPENV also recommends replacing crossing 1 to improve fish habitat.

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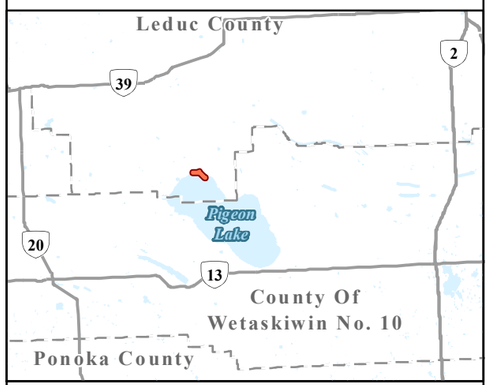
Sundance Beach (Pigeon Lake)

Figure 1: Overview

- Bathymetry
- Contour Line (1 m)
- Project Boundary
- Buffer (50 m)



Source: Contains information licensed under the Open Government Licences – Canada, Alberta, TerraColor and DigitalGlobe
Imagery acquisition date: June 20, 2016
Coordinates system: NAD 1983 UTM Zone 11N

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Date: February 1, 2019

Prepared by: R. Ok

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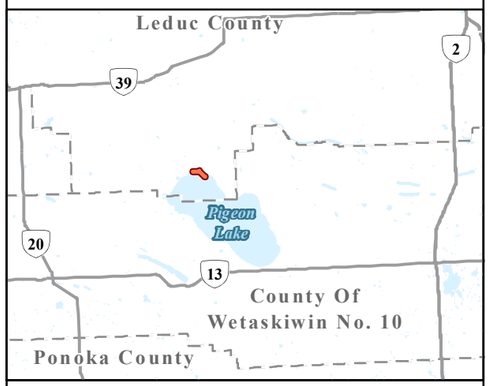
Sundance Beach (Pigeon Lake)

Figure 2: Terrestrial Assessment

- Watercourse Crossing
- Project Boundary
- Buffer (50 m)



Source: Contains information licensed under the Open Government Licences – Canada, Alberta, TerraColor and DigitalGlobe
Imagery acquisition date: June 20, 2016
Coordinates system: NAD 1983 UTM Zone 11N

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Date: February 27, 2019

Prepared by: R. Ok

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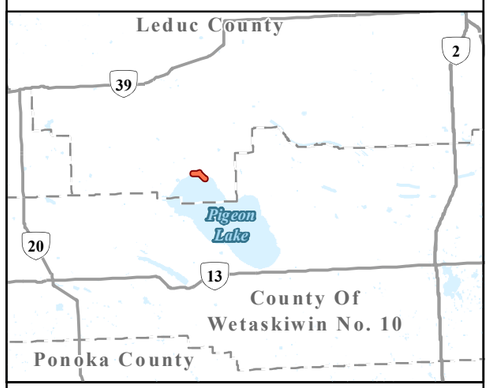
Sundance Beach (Pigeon Lake)

Figure 3: Aquatic Assessment

Bathymetry

Aquatic Assessment

- High Disturbance
- Natural / Low Disturbance
- Project Boundary



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Imagery acquisition date: June 20, 2016
Coordinates system: NAD 1983 UTM Zone 11N

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Date: February 27, 2019

Prepared by: R. Ok

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Sherwood Park, AB T8A 6A2

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Charette Pell Poscente

Appendix A: Alberta Conservation Information Management System (ACIMS) Rare Plant Results

Search ACIMS Data

Date: 15/8/2018
Requestor: Consultant
Reason for Request: Environmental Assessment
SEC: 29 **TWP:** 047 **RGE:** 01 **MER:** 5

Alberta Parks

Non-sensitive EOs: 1 (*Data Updated:October 2017*)

M-RR-TTT-SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D
5-01-047-29	17988	PMRUP01020	S3	Ruppia cirrhosa	widgeon-grass	1982-XX-XX

Next Steps: See FAQ

Sensitive EOs: 0 (*Data Updated:October 2017*)

M-RR-TTT	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D

No Sensitive EOs Found: Next Steps - See FAQ

Protected Areas: 0 (*Data Updated:October 2017*)

M-RR-TTT-SS	PROTECTED AREA NAME	TYPE	IUCN

No Protected Areas Found

Crown Reservations/Notations: 0 (*Data Updated:October 2017*)

M-RR-TTT-SS	NAME	TYPE

No Crown Reservations/Notations Found

Appendix B: Fish and Wildlife Internet Mapping Tool (FWIMT) Results

Alberta Environment and Parks

Fish and Wildlife Internet Mapping Tool (FWIMT)

(source database: Fish and Wildlife Management Information System (FWMIS))

Species Summary Report

Report Created: 15-Aug-2018 11:08

Species present within the current extent :

Fish Inventory	Wildlife Inventory	Stocked Inventory
EMERALD SHINER	No Species Found in Search Extent	No Species Found in Search Extent
IOWA DARTER		
LAKE WHITEFISH		
NORTHERN PIKE		
SPOTTAIL SHINER		
WALLEYE		
WHITE SUCKER		
YELLOW PERCH		

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Radius or Dimensions
559594, 5879392	10-TM AEP Forest	SE 29 47 1 5	3 kilometers

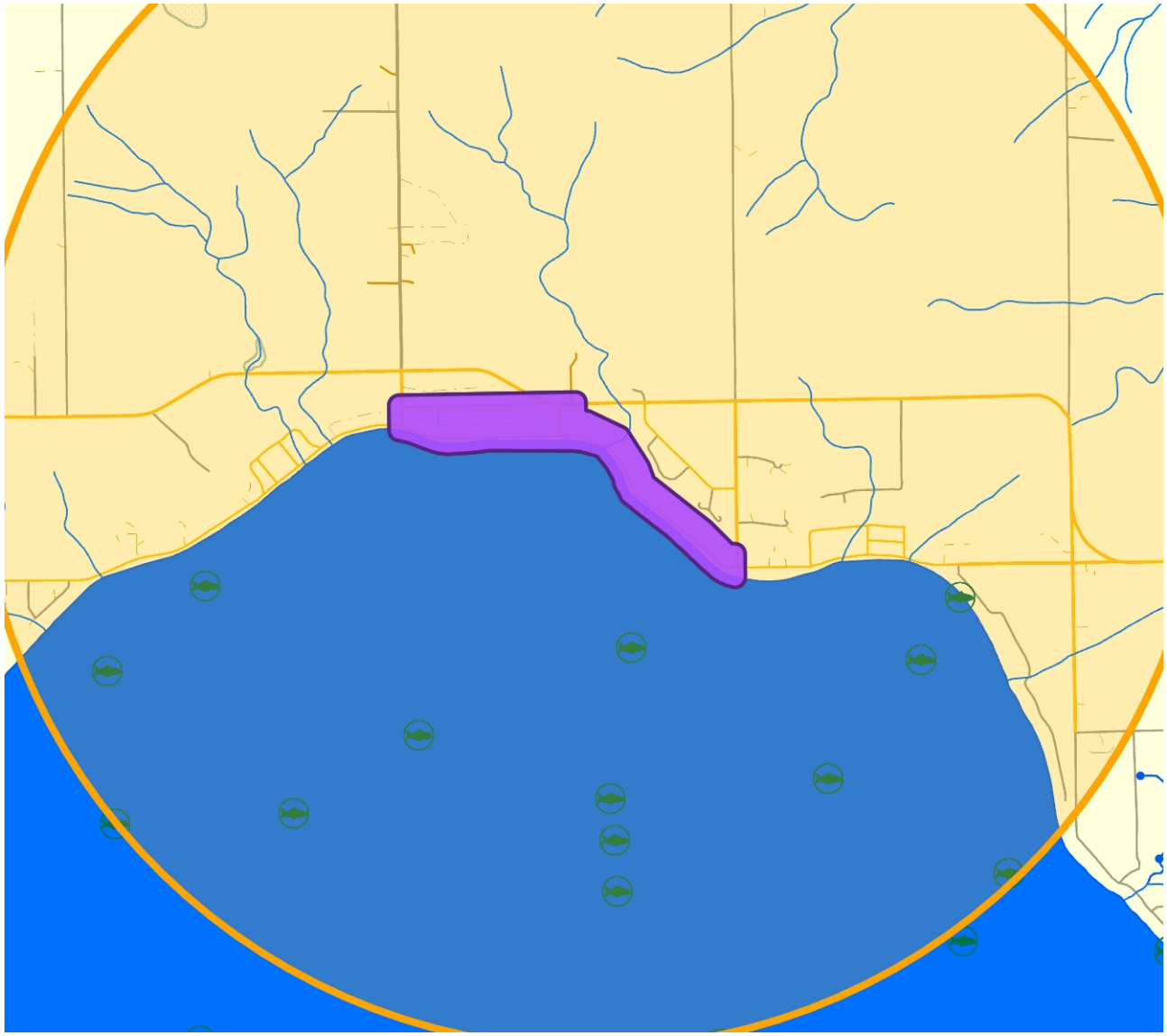
Contact Information

For contact information, please visit:

http://aep.alberta.ca/about-us/contact-us/fisheries-wildlife-management-area-contacts.aspx

15-Aug-2018 11:08

Map Results



Appendix C: Historical Resources Report

Online Permitting and Clearance
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Main Menu My Profile Log Off

Historic Resources Application

	MER	RGE	TWP	SEC	LSD List
☐	5	1	47	29	

☐ **Select All / Unselect All**

Rows 1

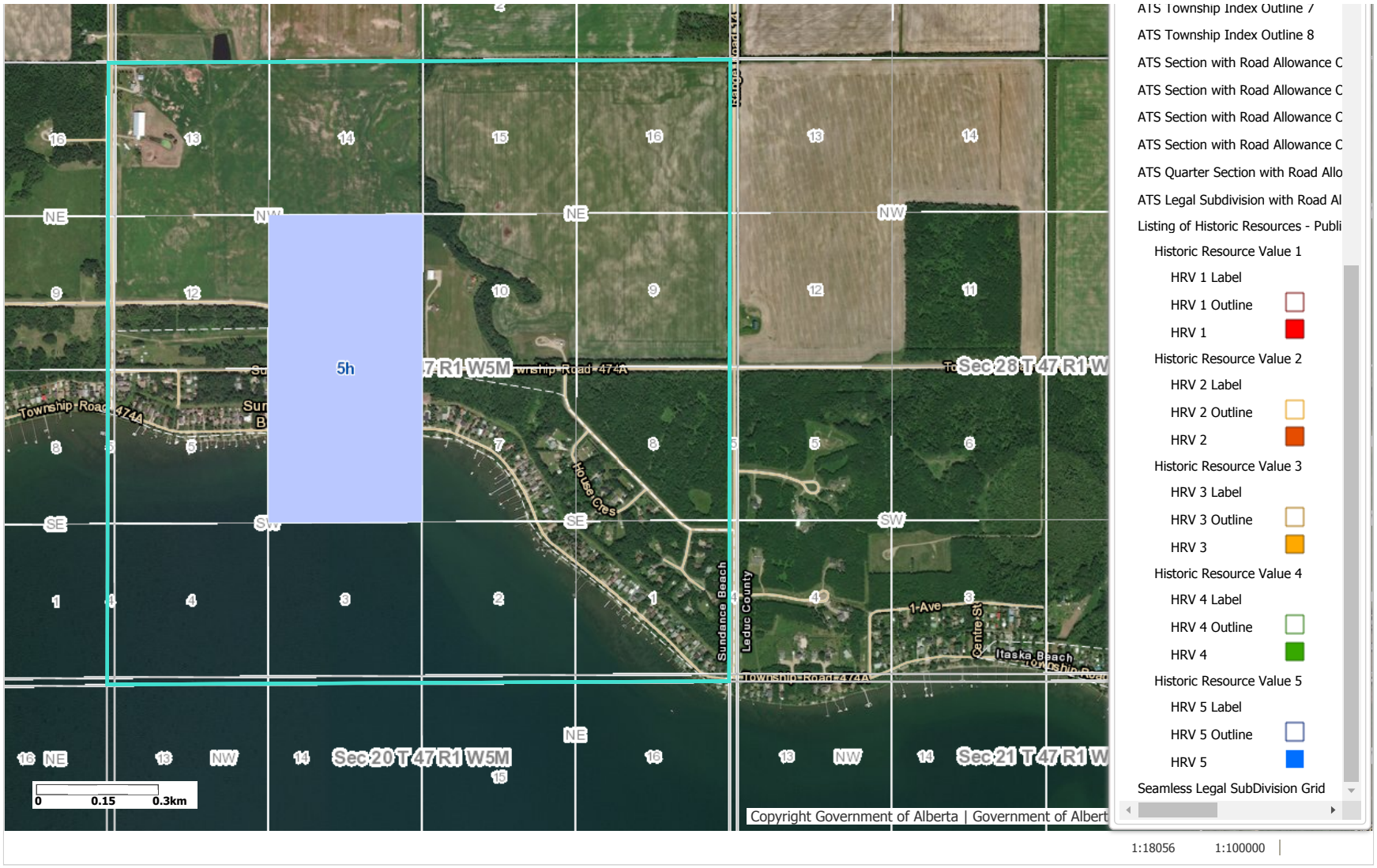
Uploaded / Created Date	Uploaded By	Type	Buffer (m)
File Name			

Choose File No file chosen *Use this button to upload shape files to update the development area.*

Online Permitting and Clearance
Welcome Mrs. Leslie A McCormack

Contact Us/Instructions

Main Menu My Profile Log Off



Listed Lands Affected

MER	RGE	TWP	SEC	LSD	HRV	Category
5	1	47	29	6	5	h
5	1	47	29	11	5	h

Appendix D: Riparian Health Assessment from the 2008 Watershed Assessment

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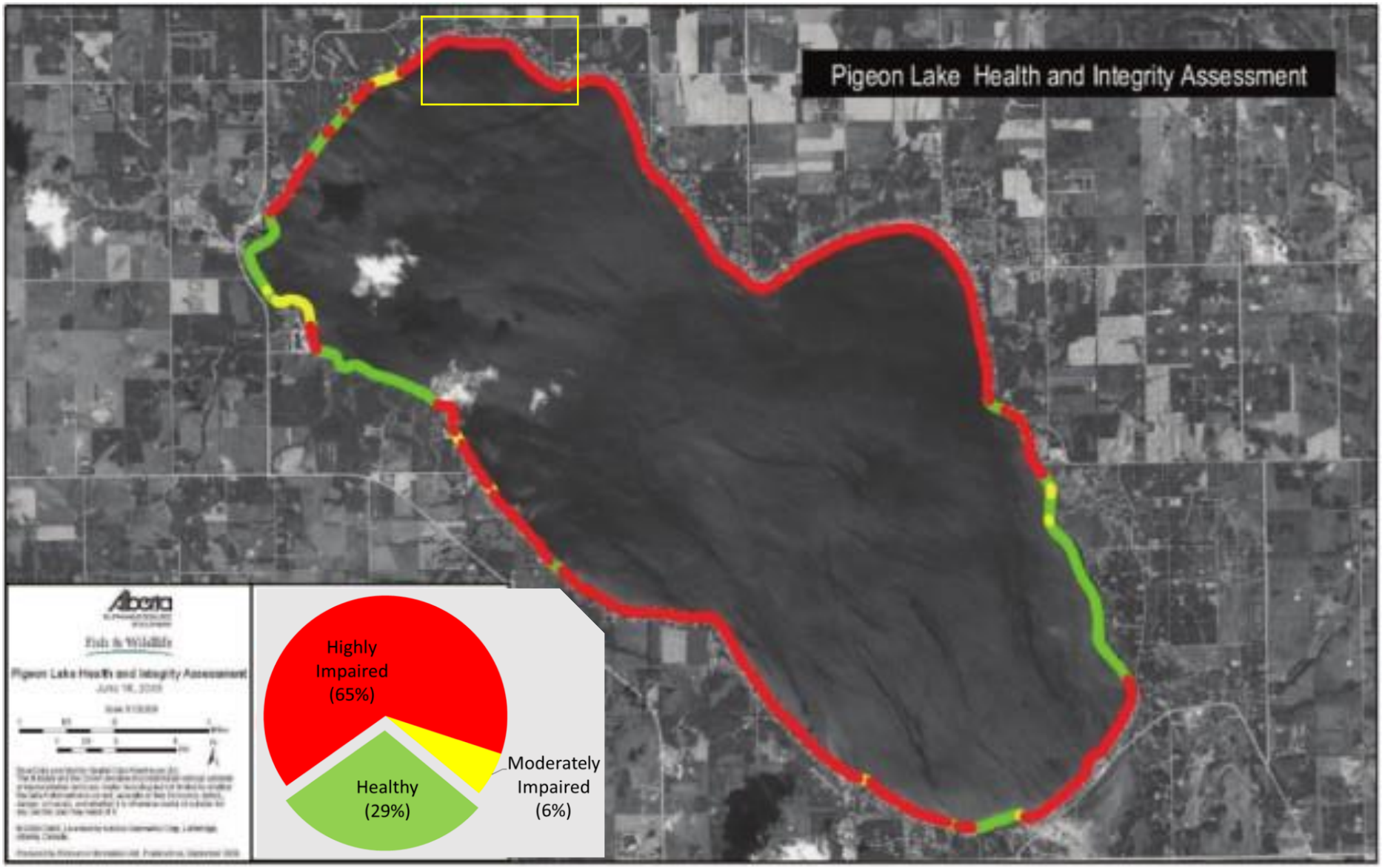

Sundance SV (yellow box) shoreline integrity assessment results from the June 2008 survey, indicating the extent of lakeshore degradation (SRD 2008).

Appendix E: Photographs

Terrestrial Assessment

Photo 1: View of extensive tree cover along Lakeshore Drive.

Photo 2: Aspen and balsam dominated stands, which was the most common tree cover in northern SV boundaries.

Photo 3: Shrub stratum showing prickly wild rose as the dominant cover.

Photo 4: Silty loam surface soils of the SV.

Photo 5: Crossing 1 culvert inlet.

Photo 6: Crossing 1 upstream view.

Photo 7: Crossing 1 downstream view.

Photo 8: Crossing 2 culvert outlet showing gap that is blocking fish passage and requires replacement.

Photo 9: Crossing 2 back alley view (~60 m N of crossing 1 and Lakeshore Drive).

Photo 10: Crossing 2 culvert inlet (under sized).

Photo 11: Crossing 2 downstream view with dense shrub cover.

Photo 12: Crossing 2 culvert outlet.

Photo 13: Stick nests were a common throughout the northern treed area.

Photo 14: Smaller cup nest of a songbird, located in northern project boundaries.

Photo 15: Common tree cavity nesting opportunities on tree snags.

Photo 16: Group of American Coots.

Photo 16: Bohemian waxwings utilize ditch drainage along Lakeshore Drive for bathing.

Photo 16: Bohemian waxwings taking rest in a mature tree along Lakeshore Drive.

Aquatic Assessment

Photo 1: Shoreline disturbance including buildings, lawns, rock placement and vegetation clearing within Reach 1.

Photo 2: Shoreline disturbance including buildings, lawns, rock placement and vegetation clearing within Reach 2.

Photo 3: Intact riparian vegetation within Reach 3.

Photo 4: Shoreline disturbance including buildings, lawns, rock placement and vegetation clearing within Reach 4.