Unit 154 Heritage Court
150 Chippewa Road
Sherwood Park, AB T8A 6A2

Silver 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 Silver Beach and in adjacent aquatic areas on October 18, 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. A few sensitive plants were previously documented in the SV (**Appendix A**). However, they were not documented during the aquatic or terrestrial surveys and may have been absent due to the 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**). The report documented no potential of historical resources value (HRV) within the project area.
- 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

Silver Beach is located within the Dry Mixedwood Subregion of the Boreal Forest Natural Region. The majority of the SV is developed and gated especially along the lake shoreline; however, areas along the eastern boundary remain natural, which provided the opportunity for ecosystem classification. One small area, 2.2 hectares, is designated as a reserve and is currently forested (**Figure 2**). Ecosites were identified in accordance with the *Field Guide to Ecosites of Northern Alberta* and occurred within all natural areas of the SV and the 50 m 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. 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.

Table 1: Silver Beach 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	red osier dogwood (*Cornus stolenifera)*	prickly wild rose (*Rosa acisularis*), wild red raspberry (*Rubus idaeus),* low-bush cranberry *(Viburnum edule),* bracted honeysuckle *(Lonicera involucrate),* willow *(Salix spp.),* 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 letter in the code (m) represents the mineral texture class, which was assessed at the surface (top 30 cm) and was identified as silty clay. 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, however due to the presence of upland vegetation within the plant community and the absence of mottles/gleying within the soil profile.

Watercourses & Crossings

Two watercourse crossings were identified within the SV on Silver Beach Road over unnamed and unmapped ephemeral drainages (**Figure 2**).

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

Crossing 1 – ephemeral

Crossing 1 is single culvert crossing located on Silver Beach Road over an ephemeral drainage site. Ephemerals flow periodically throughout the year, especially in the spring or during and after rain events. They do not contain defined channel bed and banks and the drainage pathway is often vegetated. Overall, the culvert is in poor condition and requires replacement in the near future.

Crossing 2 – ephemeral

Crossing 2 is a multiple culvert crossing (2) and is also located on Silver Beach Road over an ephemeral drainage site. The culvert is in poor condition and requires replacement in the near future. Fish habitat assessments do not apply to ephemeral drainage sites as it is not applicable. However, during higher flows in areas near the confluence of fish bearing waters, ephemeral drainages can potentially provide temporary foraging opportunities for smaller bodied fish, which maybe the case near Pigeon Lake shoreline.

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-logged 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 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 18, 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 six reaches representing the entire near-shore area of the SV (**Figure 3**). Reaches were classified as either natural, moderately disturbed or highly disturbed. Natural reaches included 3 and 6 and accounted for 7.4% of the project area. These reaches were characterized by relatively undisturbed shorelines with abundant natural riparian vegetation. Reaches 1, 2, 4 and 5 were documented as highly disturbed and accounted for approximately 92.6% 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 consisted primarily of sago pondweed (*Stuckenia pectinata*) and large-sheath pondweed (*Potamogeton vaginatus*). Percent cover of submergent vegetation was highest within Reach 1 (30%) and gradually decreased moving south across the length of the study area as sediments became coarser. Emergent vegetation was not present within any of the study reaches at the time of assessment. Substrates throughout the study area were generally coarser near shore, and dominated by cobble with gravel and some boulder. Moving away from shore, sediments transitioned to become sand-dominated. Substrates also became coarser moving south along the study area (**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**	**5**	**6**
Total Reach Length (m)	658.0	837.1	54.0	397.0	194.7	112.3
Water Quality						
Temperature (°C)	7.05	7.04	7.04	7.04	7.04	7.04
Conductivity (µS/cm)	334	334	335	335	335	334
Turbidity (NTU)	3.76	3.72	3.06	3.49	3.86	3.78
Oxygen, dissolved (mg/L)	8.04	8.11	8.15	8.22	8.10	8.09
pH	8.58	8.56	8.55	8.57	8.54	8.59
Shoreline (Average)						
Sedges/Grasses (%)	60	45	40	45	45	10
Shrubs (%)	5	10	15	10	10	20
Trees (%)	20	35	65	25	35	70
Disturbed (%)	75	70	10	75	70	0
Emergent Vegetation Zone (Average)						
Dominant Veg. Type	None	None	None	None	None	None
Emergent Veg. Zone Width (m)	0	0	0	0	0	0
Emergent Veg Cover (%)	0	0	0	0	0	0
Submergent Vegetation Zone (Average)						
Aquatic Veg. Cover (%)	30	20	15	15	15	10
Fines (%)	0	0	0	0	0	0
Sand (%)	40	30	25	25	25	20
Sm. Gravel (%)	10	10	10	10	10	10
Lg. Gravel (%)	20	20	20	20	20	20
Cobble (%)	25	30	35	35	35	40
Boulder (%)	5	10	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 Silver Beach shoreline (92.6%) has been impaired by human disturbance. Submergent vegetation cover was most abundant in Reach 1 and gradually declined moving southward toward Reach 6, where submergent vegetation was relatively scarce. No emergent vegetation cover was present within the study area at the time of the assessment. Results of the aquatic survey suggest that the Silver Beach littoral zone is unlikely to provide adequate spawning, rearing or foraging habitat for northern pike, which rely heavily on vegetative cover for these activities. Submergent vegetative cover may be sufficient to provide foraging habitat for smaller-bodied fishes, especially towards the northern end of the SV where submergent vegetative cover was most abundant. The cobble and gravel dominated nearshore substrates could potentially provide spawning habitat for walleye, which require wave-washed gravelly shoals, especially towards the southern end of the SV were cobble is more abundant and human disturbance was less intense. Areas with sand-dominated substrate 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 SV natural areas but is limited along the lake edge due urban development. The larger areas of natural riparian vegetation along the southern SV shoreline and to the east of built-up areas are important natural areas as they provide foraging and resting habitat for large and small mammals including porcupine, weasels, coyotes, squirrels, moose, and deer.

The Pigeon Lake shoreline along Silver Beach provides important resting and foraging habitat for migratory waterfowl. Numerous sightings occurred including groups of American white pelicans (*Pekecanus erythrorhynchos*), Canada geese (*Branta Canadensis*), trumpeter swans (*Cygnus*

[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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buccinators), mallards (*Anas platyrhynchos*), northern shovelers (*Anas clypeata),* common goldeneye (*Bucephala clangula*) and common mergansers (*Mergus merganser*).

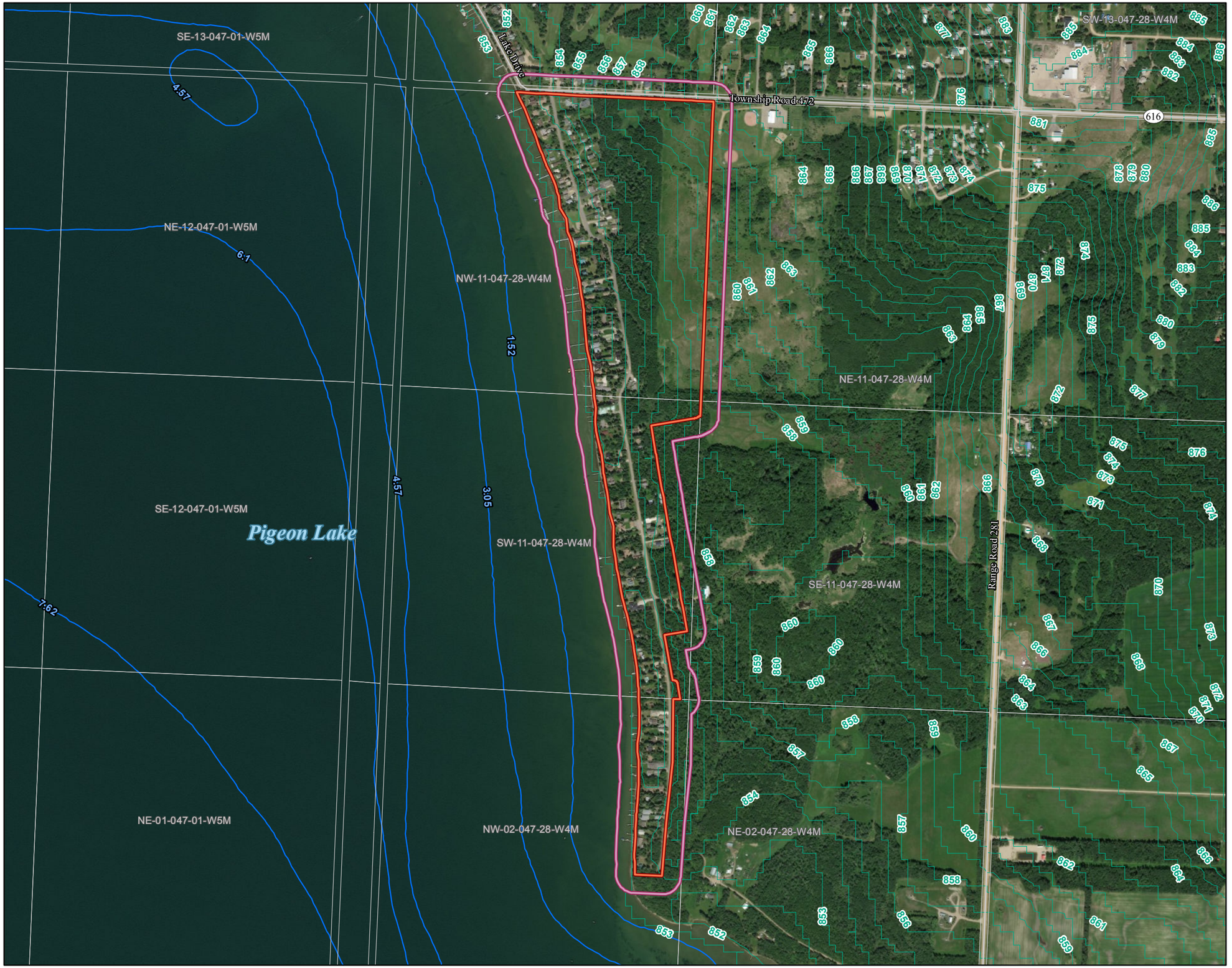
Bird observations included common local species such as the red breasted nuthatch (*Sitta Canadensis*), downy woodpecker (*Picoides pubescens*), blue jay (*Cyanocitta cristata*), black-billed magpie (*Pica pica*) and black capped chickadee (*Poecile atricapillus*). All of these species, are known to 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. Large mature balsam poplar provide potential nesting cavities for owls and other cavity nesters.

The FWMIS database documented a previous observation of the Canadian toad (*Bufo hemiophrys*) within Silver Beach SV boundaries. The Canadian toad is listed as *May be at Risk* under the Alberta *Wildlife Act* and has no status federally. Habitat includes the borders of waterbodies and breeding occurs in the shallows of lakes and sloughs or in temporary waterbodies from May to June.[5] In Alberta, the toad is active from April to September and otherwise hibernates underground. Hence the toad was not observed during the terrestrial survey and the best potential for habitat includes the ephemeral drainage areas as the pathway remains natural thus providing cover Canadian toad habitat. The intact riparian area at the southern SV border provides natural cover up to the shoreline, which also offers potential Canadian toad habitat.

Summary and Recommendations

The SV of Silver Beach 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, limiting further land clearing within the riparian area of the SV should also be limited inasmuch as possible, especially within the natural reaches identified during the aquatic survey (3 and 6) and along the ephemeral drainages. 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 (ideally 10 m or more) on the ephemeral drainages and the lake (ideally 30 m or more) would be ideal to protect the ecological values that the temporary waterbodies offer including Canadian toad habitat.

[5] AEP. 2019. Canadian Toad. http://aep.alberta.ca/fish-wildlife/wild-species/amphibians/toads/canadian-toad.aspx Accessed on 02/28/2019.



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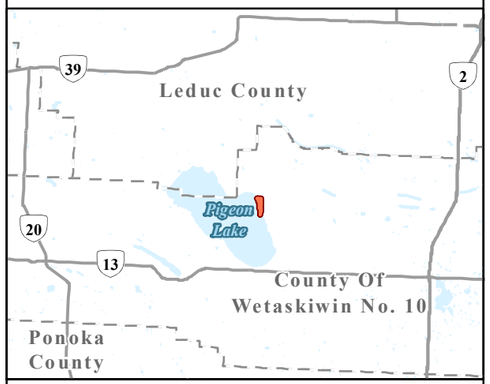
Silver Beach (Pigeon Lake)

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 12N

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Date: January 31, 2019

Prepared by: R. Ok

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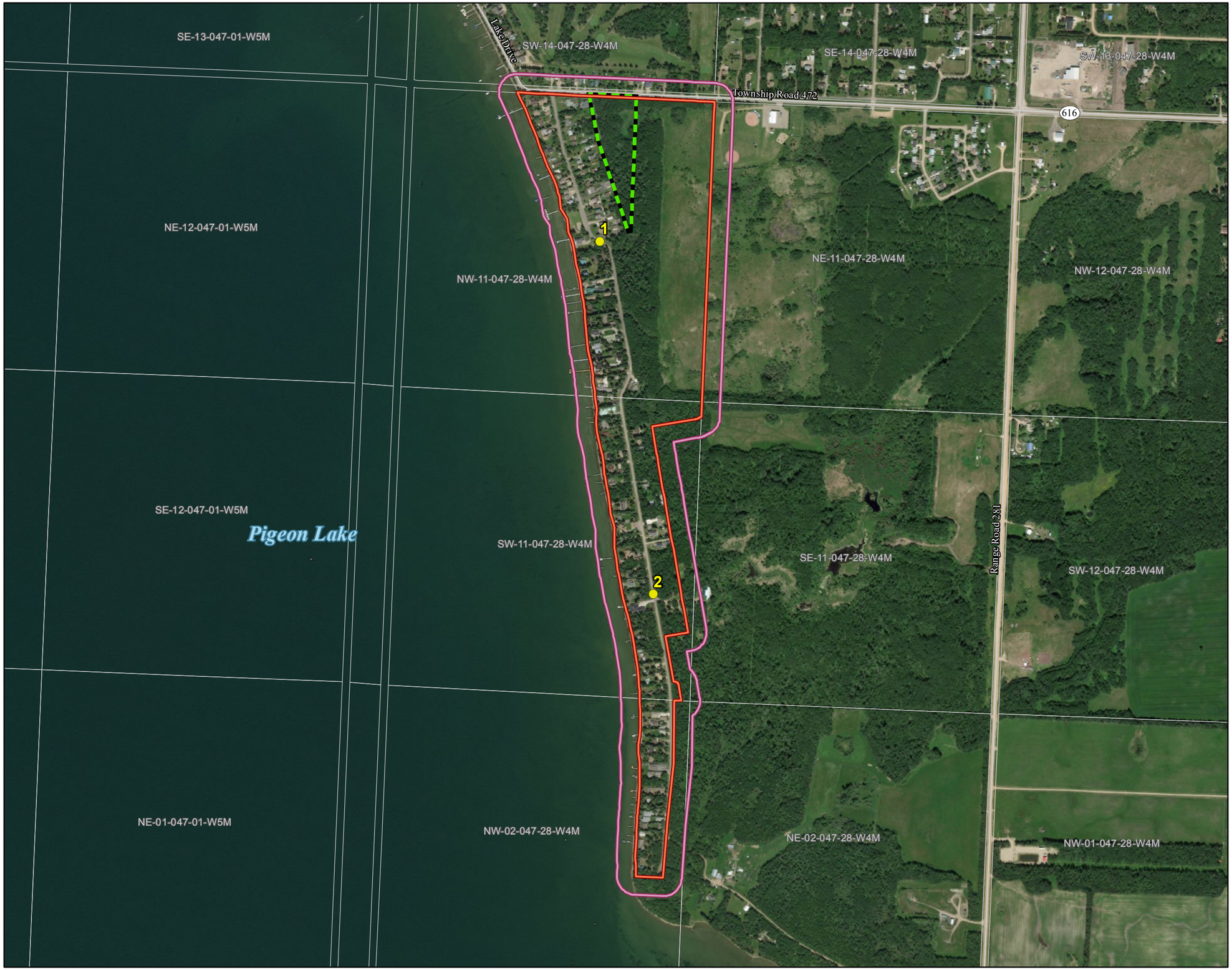

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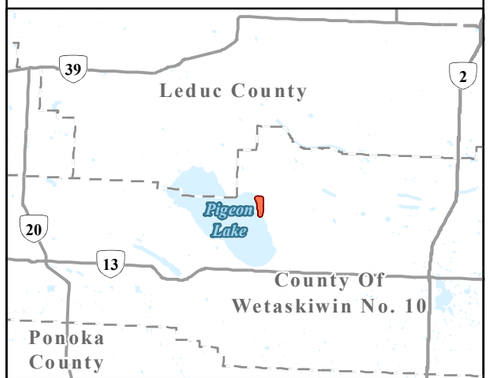
Silver Beach (Pigeon Lake)

Figure 2: Terrestrial Assessment

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



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Imagery acquisition date: June 20, 2016
Coordinates system: NAD 1983 UTM Zone 12N

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Date: February 27, 2019

Prepared by: R. Ok

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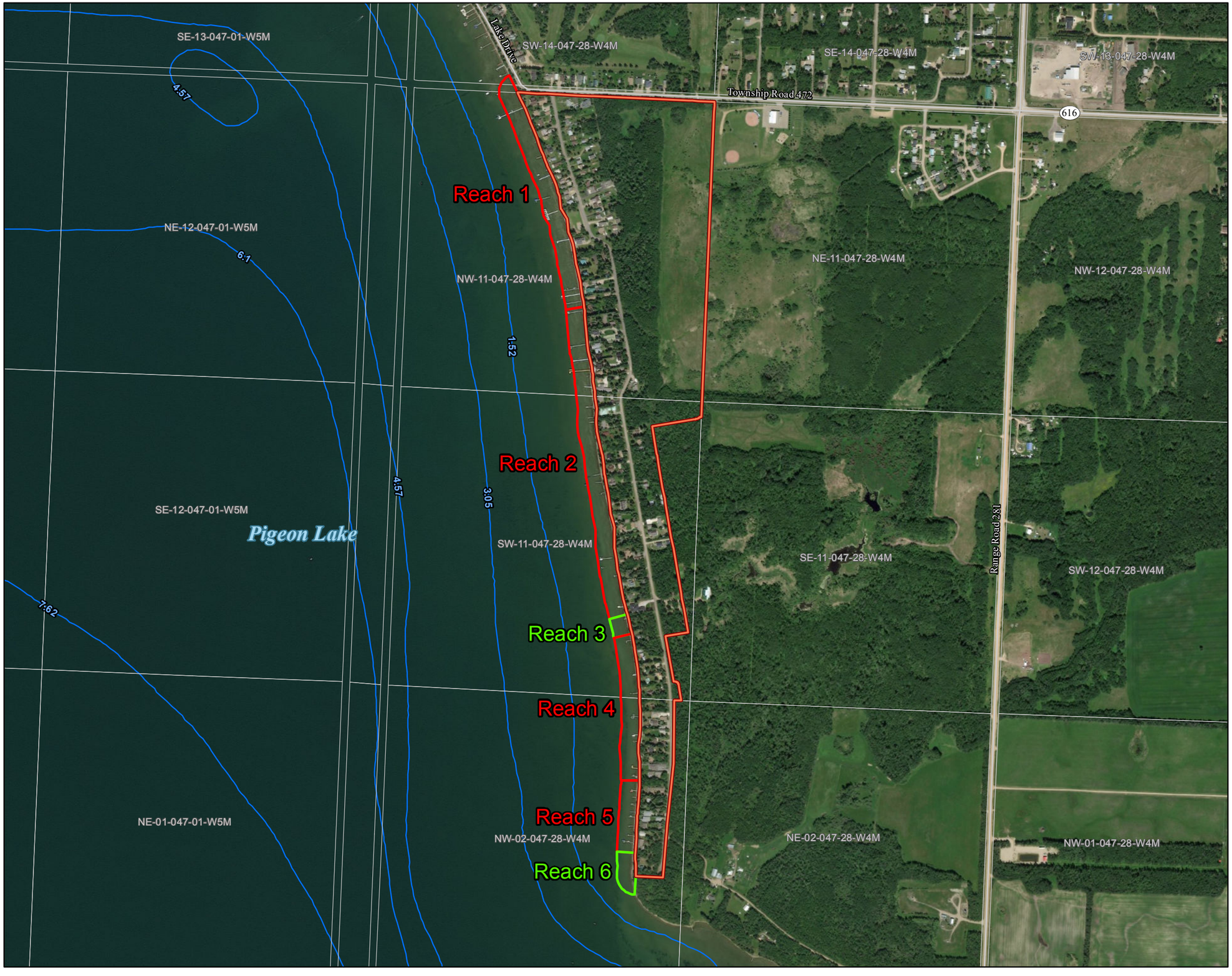

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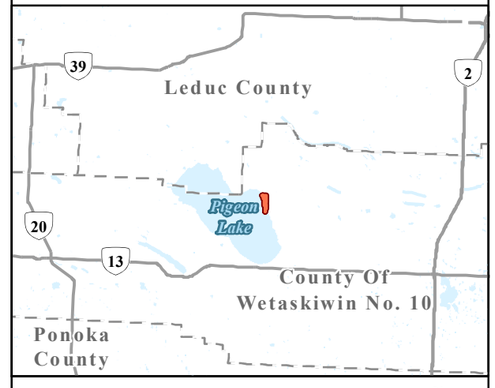
Silver Beach (Pigeon Lake)

Figure 3: Aquatic Assessment

Bathymetry

Aquatic Assessment

- High Disturbance
- Natural / Low Disturbance
- Project Boundary



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 12N

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Date: February 27, 2019

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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: -- **TWP:** 047 **RGE:** 28 **MER:** 4

Non-sensitive EOs: 13 (*Data Updated:October 2017*)

M-RR-TTT-SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D
4-28-047-01	13557	PMPOA4J030	S2	Piptatherum canadense	Canada rice grass	1947-07-31
4-28-047-01	9008	PDGER02070	S2	Geranium carolinianum	Carolina wild geranium	1957-07-04
4-28-047-01	3510	NBMUS2B0N0	S1S3	Dicranum tauricum	broken-leaf moss	1958-07-24
4-28-047-02	17988	PMRUP01020	S3	Ruppia cirrhosa	widgeon-grass	1982-XX-XX
4-28-047-02	9008	PDGER02070	S2	Geranium carolinianum	Carolina wild geranium	1957-07-04
4-28-047-02	3510	NBMUS2B0N0	S1S3	Dicranum tauricum	broken-leaf moss	1958-07-24
4-28-047-03	17988	PMRUP01020	S3	Ruppia cirrhosa	widgeon-grass	1982-XX-XX
4-28-047-10	17988	PMRUP01020	S3	Ruppia cirrhosa	widgeon-grass	1982-XX-XX
4-28-047-11	17988	PMRUP01020	S3	Ruppia cirrhosa	widgeon-grass	1982-XX-XX
4-28-047-11	3510	NBMUS2B0N0	S1S3	Dicranum tauricum	broken-leaf moss	1958-07-24
4-28-047-12	3510	NBMUS2B0N0	S1S3	Dicranum tauricum	broken-leaf moss	1958-07-24
4-28-047-14	17988	PMRUP01020	S3	Ruppia cirrhosa	widgeon-grass	1982-XX-XX

M-RR-TTT-SS	EO_ID	ECODE	S_RANK	SNAME	SCOMNAME	LAST_OBS_D
4-28-047-15	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 08:54

Species present within the current extent :

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

Buffer Extent

Centroid (X,Y):	Projection	Centroid: (Qtr Sec Twp Rng Mer)	Radius or Dimensions
567649, 5874668	10-TM AEP Forest	SW 11 47 28 4	3 kilometers

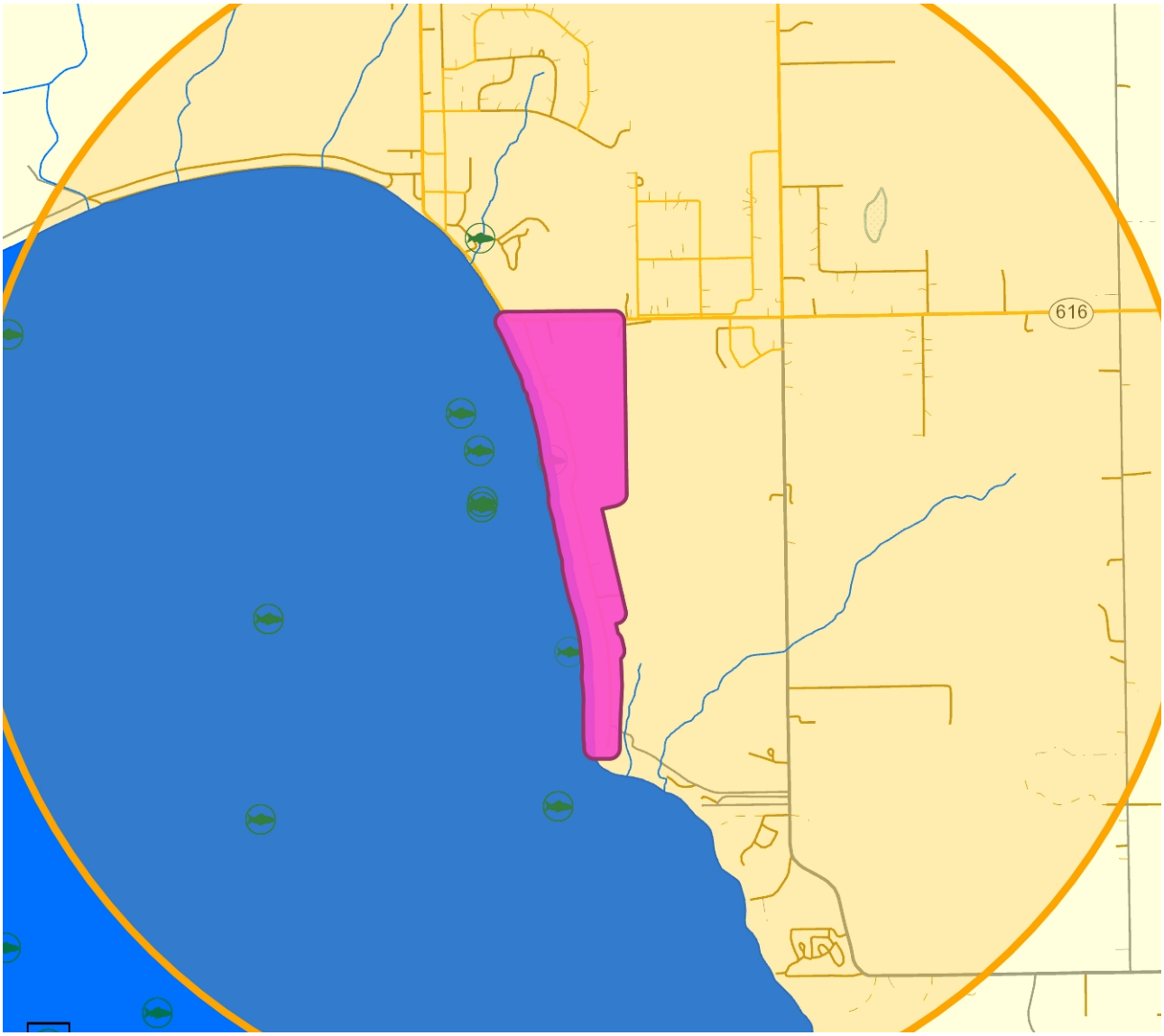
Contact Information

For contact information, please visit:

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

15-Aug-2018 08:54

Map Results



Appendix C: Historical Resources Report

Search the Listing of Historic Resources

Define Search Area(s)

Enter the legal description(s) you wish to search. Multiple Sections or LSDs must be separated by hyphens or commas.

MER	RGE	TWP	Section(s)	LSD List
4	28	47	11	2,3,6,7,10,11,14,15
4	28	47	2	11,14

Rows 1

Records found in search area

No records found.

Release 2.1.22, Screen ID: 65868

Appendix D: Riparian Health Assessment from the 2008 Watershed Assessment

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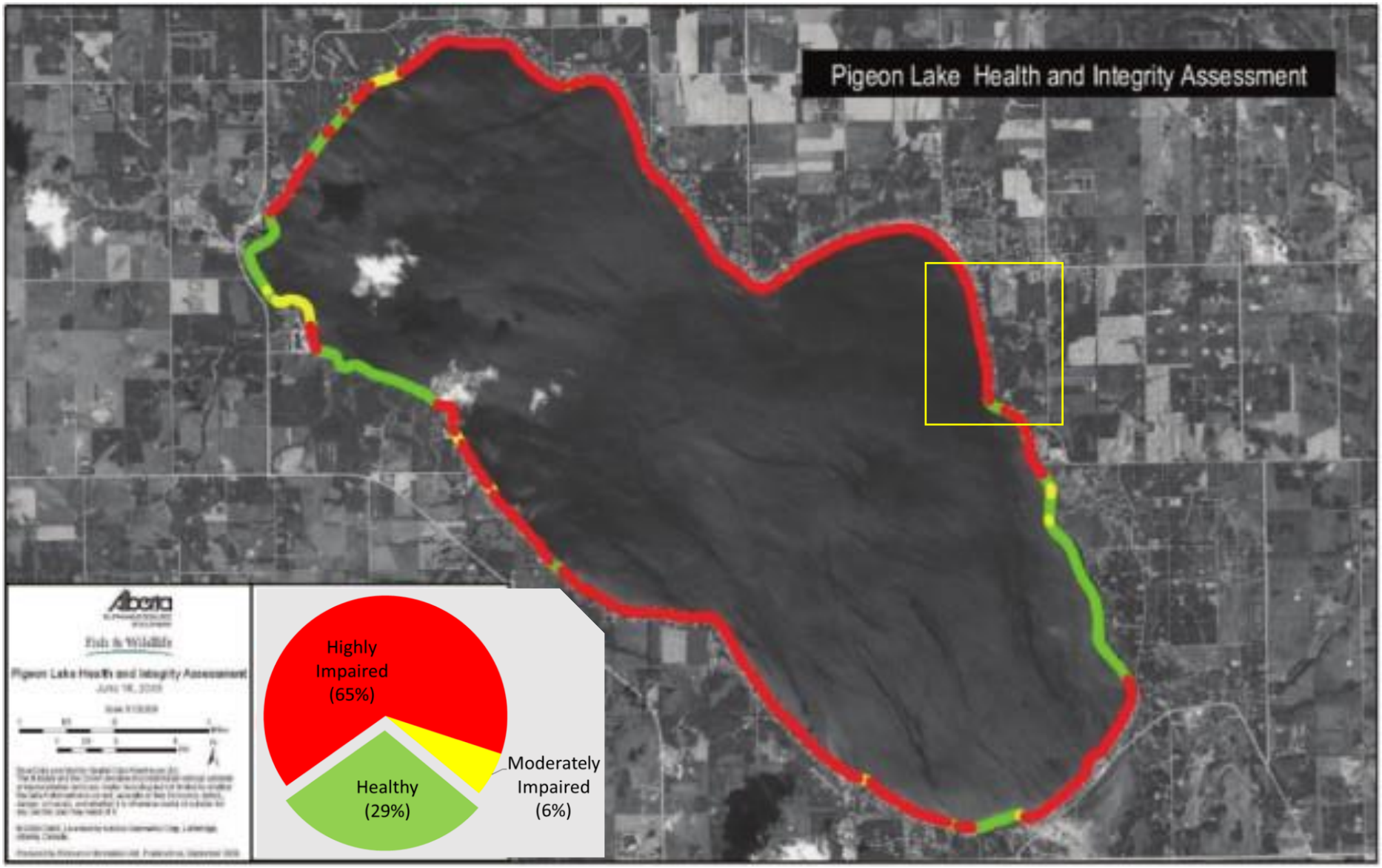

Silver Beach SV (yellow box) shoreline integrity assessment results from the June 2008 survey, indicating the extent of lakeshore degradation (SRD 2008).

Appendix E: Photographs

Terrestrial Assessment

Photo 1: View of extensive tree cover along Silver Beach Road.

Photo 2: Aspen and balsam dominated area, which was most common in the SV.

Photo 3: Mature areas of white spruce were documented throughout the SV.

Photo 4: Open field area in the NE SV boundary.

Photo 5: Downy woodpecker spotted in the treeline along the field.

Photo 6: Mineral soil of the SV.

Photo 7: View of the trail system throughout the eastern SV boundary.

Photo 8: Crossing 1 culvert inlet.

Photo 9: Upstream area of Crossing 1 showing the ephemeral drainage pathway.

Photo 10: Crossing 1 road view.

Photo 11: Crossing 2 road view.

Photo 12: Crossing 2 culvert inlet.

Photo 13: Crossing 2 culvert outlet.

Photo 14: Ephemeral drainage view downstream.

Photo 15: Trumpeter swans spotted within the 50 m buffer of Silver Beach.

Photo 16: Common mergansers spotted within the 50 m buffer of Silver Beach.

Aquatic Assessment

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

Photo 2: Submergent vegetation and substrate within Reach 1.

Photo 3: Shoreline disturbance including buildings, lawns, rock placement and vegetation clearing within Reach 2.

Photo 4: Intact riparian vegetation within Reach 3.

Photo 5: Shoreline disturbance including buildings, rock placement, lawns, and vegetation clearing within Reach 4.

Photo 6: Shoreline disturbance including buildings, rock placement, lawns, and vegetation clearing within Reach 5.

Photo 7: Intact riparian vegetation within Reach 6.