

Memorandum



To: Travis Ritchie, Yukon Energy Corporation
From: EDI Environmental Dynamics Inc.
Date: May 5, 2022
Project No: 22Y0197
Re: Marsh Lake Low Water Investigations - Monitoring Event 2 Fieldwork Summary

Monitoring Event 2

- Date of monitoring event: May 4, 2022
- Field staff: James McGrath, Ben Schonewille (EDI)
- Weather: Partly cloudy/Windy, 5°C
- Marsh Lake elevation (9 am to 5 pm average) = 653.755 m (0.045 m below low supply level)
- Areas monitored: Lewes Marsh area near Sawmill Road and Alaska Highway, Kettley's Canyon wetland, Yukon River connected wetland 3.7 km downstream of Marsh Lake, Marsh Lake at unnamed creek mouth and the north end of Marsh Lake (Map 1).

Methods

Drone imagery collection

Drone imagery was collected at each monitoring location along pre-determined flight paths at a consistent height of 80 m using a mini-drone (DJI Mavic Mini 2) by operators with a valid drone operators certificate. Identical flight paths will be used for subsequent monitoring events to ensure consistent imagery collection. During each flight, field staff monitored the imagery for areas of interest and recorded any wildlife observations. Following the completion of all monitoring events, the recorded imagery will be reviewed to compare conditions at different water levels throughout the duration of monitoring period.

Collection of bird and wildlife observations

Bird and wildlife observations were recorded by field staff on the ground and in the air (via drone) at each monitoring location. Species and number of individuals were recorded for each observation, as well as any signs of wildlife activity (tracks, muskrat push ups, etc.).



Remote camera deployment

Four additional remote cameras were deployed during monitoring event 2 bring the total number of deployed cameras to 6 in total. One camera was deployed at a ground water seep near site LM3A. Two cameras were deployed at the Yukon River connection at site LM1, with one camera pointing towards the mouth of the wetland connection and the other pointing into the wetland. One camera was deployed at the Kettley's canyon wetland connection at site LM2, facing the connection to the Yukon River. The time-lapse cameras are set to take a photo every hour between 09:00 and 21:00 during each day of deployment. Additional cameras may be deployed during future monitoring events to collect fine-scale information on wetland connectivity and possibly wildlife habitat utilization.

Results

General site conditions

Conditions were similar across all monitoring locations. Pockets of open water in the wetlands associated with creeks and ground water seeps continue to increase in size, with snow and ice still covering the majority of each area. The Yukon River open channel that extends from the outlet of Marsh Lake downstream through the Lewes Marsh is getting wider as ice begins to break up on the riverbanks. Representative photos of each site are shown in Photo 1 to Photo 10 included at the end of this summary.

The field crew observed some riverbank erosion adjacent to site LM6. The eroding bank is approximately 1.7 m in height, 150 m long and composed of silt and sand (Photo 11). Remnants of an old beaver house were also observed in this location. Photos of this location will continue to be collected during subsequent monitoring events.

Bird Observations

A total of 40 bird species were detected during the monitoring event (Table 1) including one Species at Risk (Horned Grebe) on the open water channel of the Yukon River. Given the seasonal timing, the bird species observed includes primarily migrants either passing through or using the area as stopover habitat. The bird species observed included a range of waterfowl/waterbirds using open water habitats, shorebirds using exposed mudflats, and other species either flying through the area (raptors) or using the riparian and surrounding forest areas (passerines). The open Yukon River channel continues to contain a relatively high diversity of waterfowl and waterbirds, particularly diving birds, with a total of 19 such species observed via zodiac between the Yukon River bridge and the wetland 3.7 km downstream of Marsh Lake.

Wildlife Observations

Wildlife observations were recorded at some sites during the monitoring event. Ten muskrat push ups were observed in the upper portion of the wetland at site LM1, with wolf tracks observed around the push ups. The crew also observed what looked to be bear scat but there were no tracks in the snow and ice. In addition,



two adult beavers were observed swimming in the river by the wetland connection at LM1. Approximately one kilometer downstream, the field crew observed what appeared to be an active beaver house, with tracks and scat located around the house. Two river otters were also seen in this location of the river (Lat: 60.57146, Long: -134.57211). Clusters of animal tracks were again observed at open water areas/areas of exposed mud in Lewes Marsh (LM3-A, LM2 and LM5). The exposed mud areas are increasing in size as warming temperatures continue to melt snow and ice from the areas.



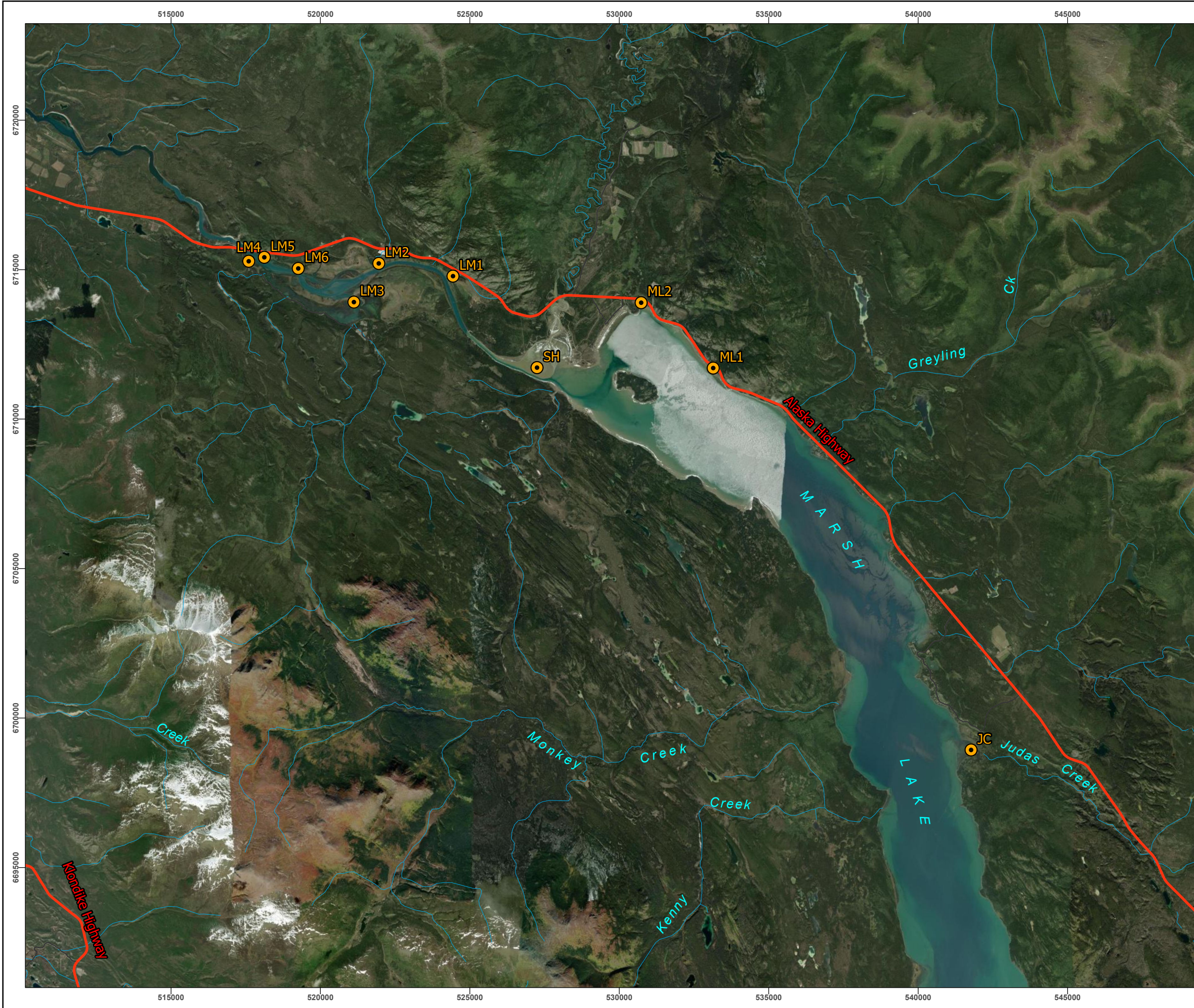
Table 1. Summary of bird species observed during the May 4, 2022 monitoring event.

Species	Bird Species Detected								
	LM1	LM2	LM3	LM4	LM5	LM 6	Yukon River channel	ML1	ML2
Canada Goose		✓	✓				✓		
Trumpeter Swan			✓				✓		
Tundra Swan			✓				✓		
Unidentified Swan			✓				✓		✓
Northern Shoveler							✓		
American Wigeon		✓	✓			✓	✓		✓
Mallard	✓	✓	✓			✓	✓		✓
Northern Pintail			✓				✓		
Green-winged Teal		✓	✓			✓	✓		
Unidentified dabbling duck			✓				✓		
Ring-necked Duck							✓		
Greater/Lesser Scaup							✓		
Bufflehead							✓		
Barrow's Goldeneye						✓	✓		
Common/Barrow's Goldeneye							✓		
Common Merganser							✓		
Unidentified diving duck							✓		
Horned Grebe							✓		
Unidentified 'peep' sandpiper									
Solitary Sandpiper			✓						
Lesser Yellowlegs	✓		✓				✓		✓
Greater/Lesser Yellowlegs									
Bonaparte's Gull			✓				✓		✓
Short-billed Gull		✓	✓			✓*	✓		✓
Herring Gull							✓		



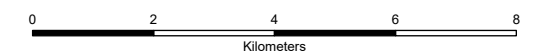
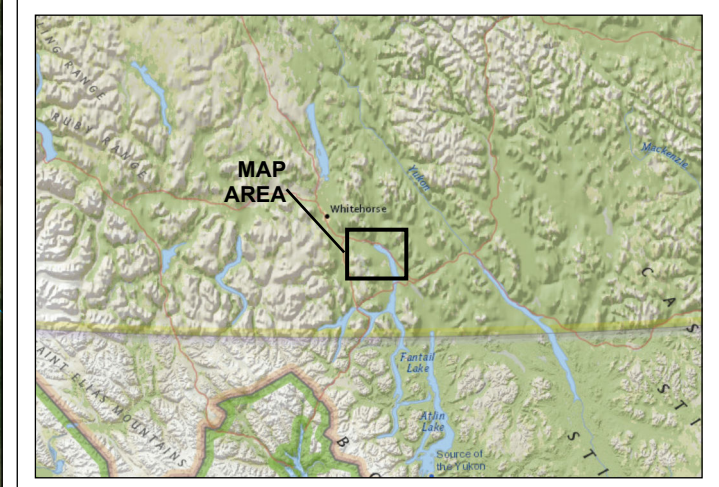
Species	Bird Species Detected								
	LM1	LM2	LM3	LM4	LM5	LM 6	Yukon River channel	ML1	ML2
Unidentified Gull							✓		
Common Loon	✓						✓		
Bald Eagle							✓		
Northern Flicker						✓			
Black-billed Magpie						✓			
Common Raven			✓						
Boreal Chickadee			✓						
Violet-green Swallow	✓	✓							
Ruby-crowned Kinglet			✓					✓	
Townsend's Solitaire	✓								
American Robin	✓	✓	✓						
Bohemian Waxwing	✓								
American Pipit	✓	✓	✓			✓			✓
Lapland Longspur			✓						
American Tree Sparrow		✓					✓	✓	✓
Fox Sparrow							✓		
Dark-eyed Junco							✓		
White-crowned Sparrow			✓				✓		✓
Savannah Sparrow							✓		✓
Yellow-rumped Warbler	✓		✓						
Wilson's Warbler								✓	

^a Flyover only.



Map 1. Overview of Marsh Lake low water investigation sites.

- Legend**
- Survey Points of Interest
 - Highway
 - Local Road/Access
 - Watercourse
 - Private Property Boundary



Map Scale = 1:125,000 (printed on 11 x 17)
 Map Projection: NAD 1983 UTM Zone 8N

Data Sources

- Inset Basemap, National Geographic World Map: National Geographic, Esri, Garmin, HERE, UNEP-WCMC, USGS, NASA, ESA, METI, NRCAN, GEBCO, NOAA, increment P Corp.
- Main Basemap, World Imagery: Earthstar Geographics

Disclaimer
 EDI Environmental Dynamics Inc. has made every effort to ensure this map is free of errors. Data has been derived from a variety of digital sources and, as such, EDI does not warrant the accuracy, completeness, or reliability of this map or its data.

Drawn: OL	Checked: BSc	Map 1	Date: 2022-05-05
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Path: L:\PROJECTS\2022\WH\219197_YEC_MarshLakeLowWater.mxd; Layout: 219197_MarshLakeLowWater_Overview_202204



Photo 1. View of conditions at monitoring site LM1 (Yukon River wetland 3.7 km downstream of Marsh Lake) on May 4, 2022.



Photo 2. View of conditions at monitoring site LM2 (Kettley's Canyon wetland) on May 4, 2022.



Photo 3. View of conditions at monitoring site LM3-A (Lewes Marsh adjacent to Sawmill Road) on May 4, 2022.



Photo 4. View of conditions at monitoring site LM3-B (Lewes Marsh adjacent to Sawmill Road) on May 4, 2022.



Photo 5. View of conditions at monitoring site LM3-C (Lewes Marsh adjacent to Sawmill Road) on May 4, 2022.



Photo 6. View of conditions at monitoring site LM4 (Lewes Marsh adjacent to Sawmill Road) on May 4, 2022.



Photo 7. View of conditions at monitoring site LM5 (Lewes Marsh) on May 4, 2022.



Photo 8. View of conditions at monitoring site LM6 (Lewes Marsh) on May 4, 2022.



Photo 9. View of conditions at monitoring site ML1 (unnamed creek mouth on Marsh Lake) on May 4, 2022.



Photo 10. View of conditions at monitoring site ML2 (north end of Marsh Lake) on May 4, 2022.



Photo 11. Eroding bank adjacent to monitoring site LM6 (Lewes Marsh) on May 4, 2022.