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Habitat Evaluation of the Saskatoon Freeway Project Through the Northeast and Small Swale Complexes

2020 Report

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Treaty 6 Territory and Homeland of the Métis

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Meewasin Valley Authority

Created in 1979 by an Act of the Province of Saskatchewan, *the Meewasin Valley Authority Act*, Meewasin is a conservation agency dedicated to conserving the cultural and natural resources of the South Saskatchewan River Valley. It is the means by which the three participating parties (City of Saskatoon, Government of Saskatchewan, and University of Saskatchewan) have chosen to best manage the Meewasin Valley in the South Saskatchewan River Basin. The creation of Meewasin is based on the concept that the partners working together through a single agency – Meewasin – can accomplish more than they could individually.

Photo Front Cover:

Small Swale Complex and the South Saskatchewan River Valley, facing southwest (2015)

Photo Back Cover:

Small Swale Complex and the South Saskatchewan River Valley, facing southwest (2015)



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1.0 Introduction

The Saskatoon region is enriched with natural areas and assets, both in planned growth areas and existing built up areas that may see infill development (Bouvier, 2019). These natural areas and assets are increasingly becoming integrated into the urban environment in Saskatoon, which is prompting concern related to conservation of natural areas and assets; the linkages between natural areas, the interface between natural and built up areas; the management of public perceptions; and shared use of natural areas with other facilities and infrastructure. The City of Saskatoon has developed a Green Infrastructure Strategy (City of Saskatoon, 2020), within which, 'green infrastructure' is understood as a system of natural, enhanced, and engineered assets that provide municipal and ecosystem services by protecting, restoring, or emulating nature. When green infrastructure is designed holistically, an interconnected Green Network enhances the urban environment and improves quality of life.

To address these concerns, the Ministry of Highways and Infrastructure has developed an Environmental and Heritage Technical Working Group as part of the initial planning for the Saskatoon Freeway Project. The alignment is proposed to cross four natural area Swale Complexes (Northeast Swale, Small Swale, Hudson Bay Slough, and West Swale) and the South Saskatchewan River. Functional Planning was initiated in 2019 and continuing through 2021. The Saskatchewan Ministry of Highways and Infrastructure invited Meewasin to evaluate habitat along the proposed Saskatoon Freeway through the Northeast and Small Swales to the South Saskatchewan River in northeast sector of Saskatoon.

1.1 Project Objectives

The objectives of the habitat evaluation will assist the Ministry of Highways and Infrastructure for the Saskatoon Freeway Project in the northeast sector of Saskatoon with:

1. Identification and mapping of habitat types along the proposed corridor of the Saskatoon Freeway through the Northeast Swale, Small Swale and South Saskatchewan River valley,
2. Identification and mapping of known locations of species at risk and rare species, including identification of potential habitat,
3. Engagement of local experts on their knowledge of the area including recording known information and in-field assessments,
4. Identification of potential wildlife movement corridors throughout the area,
5. Identification of areas of potential high habitat / ecological value.

1.3 Study Area

The Study Area for the Habitat Evaluation of the Saskatoon Freeway Project through the Small and Northeast Swales covers approximately 2,197 hectares of land, in the northeast sector of Saskatoon. The boundaries of the study area included the proposed alignment of the Saskatoon Freeway with a 250-meter, 550-meter and a 1000-meter buffer (Figure 2; Appendix A, Map 1). The 250-meter buffer is part of the right-of-way and represents the area of detailed habitat evaluation due to the proposed work area for the Saskatoon Freeway. The 550-meter buffer represents the area of study for further evaluation for wildlife, vegetation and soils, while the 1000-meter buffer represents the full extent of wildlife study.

For the purposes of this project, the desktop evaluation focused on the entire Study Area whereas the fieldwork focused within the three buffer areas north of the existing McOrmond Drive.

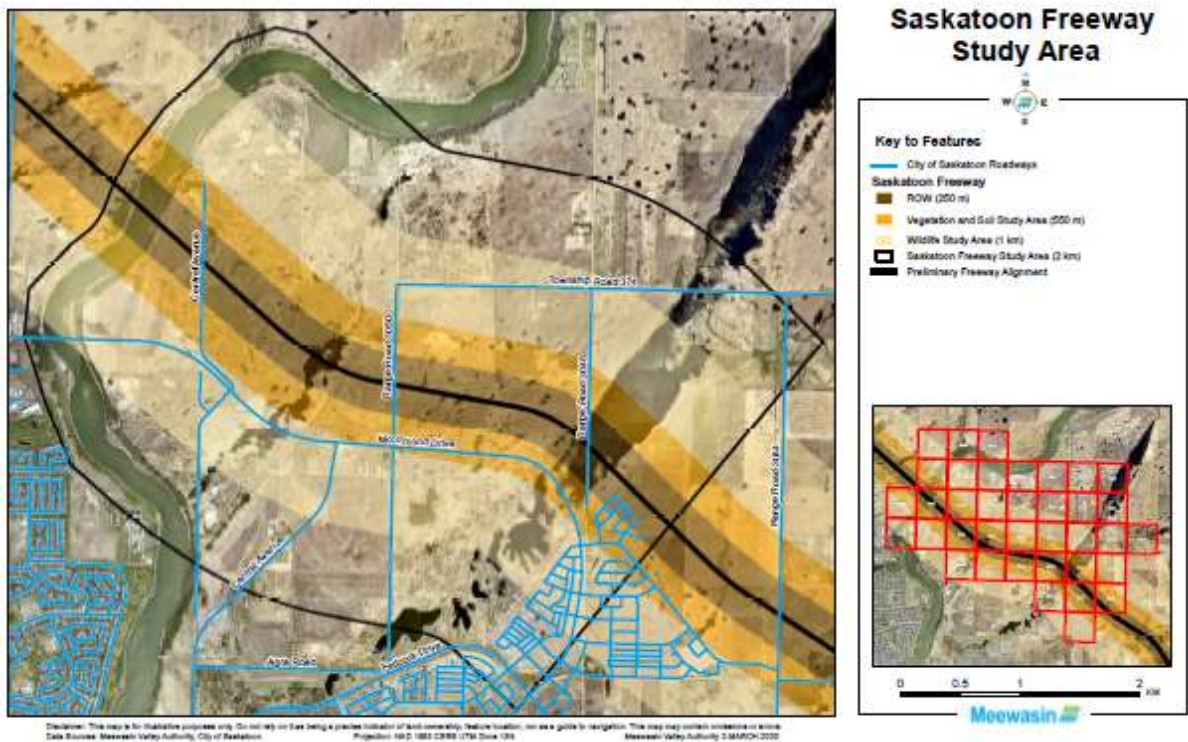


FIGURE 2. The Study Area

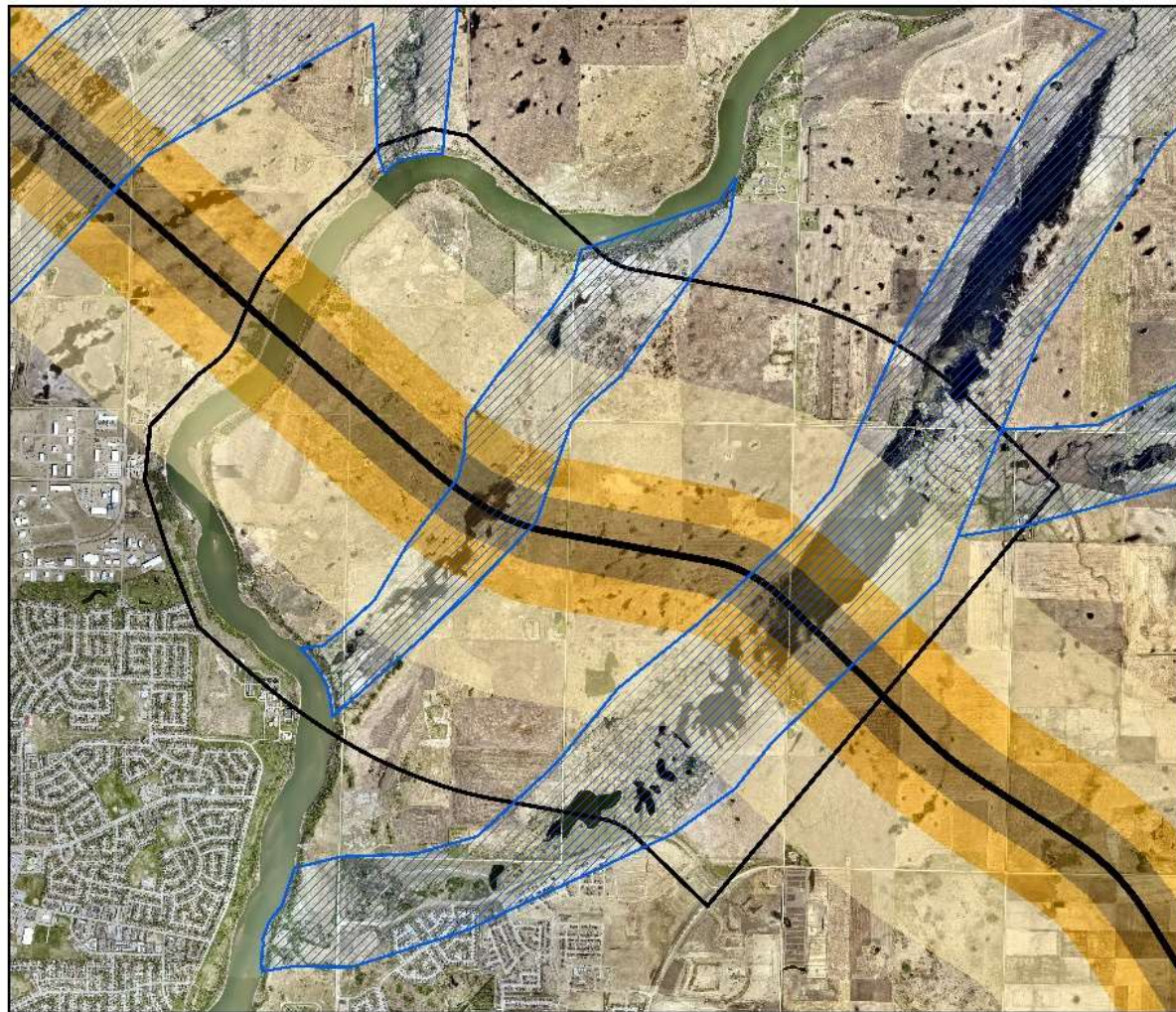
1.4 Significance of the Area

Swale Complexes are post-glacial channel scars of the South Saskatchewan River that are a mixture of native prairie and wetlands that have resulted from the scouring of glacial drainage. Post-glacial channel scars are defined by the deposition of glacial till resulting in rocky ridges and a high water table producing wet depressions in the landscape. This combination has deterred cultivation in most areas. The native prairie portions of these Swales may include moist-mixed prairie, fescue prairie, shrub-lands with a mixture of native species, and marginal aspen forests. The swales in and around Saskatoon serve many of the same ecological functions as wetlands and native grasslands. They provide necessary habitat for a variety of plant and animal species and provide forage for many different grazers. Additionally, swales act as corridors to move wildlife to and from the South Saskatchewan River.

The Northeast Swale (Figure 3; Appendix A, Map 2) is a post-glacial channel scar of the South Saskatchewan River that covers 2,800 ha of land running 26 km parallel along the South Saskatchewan River (Meewasin, 2016). The Northeast Swale has three outlets to the South Saskatchewan River: Peturrson's Ravine just east of Central Ave in Saskatoon, near Bosco Homes Camp north of Saskatoon, and north of Clarkborro Ferry west of Aberdeen. Within the limits of Saskatoon, the Northeast Swale covers approximately 300 ha from Central Ave northeast to McOrmond Drive, with the neighbourhoods of Silverspring, Evergreen and Aspen Ridge bordering the Swale. The Swale contains remnant native grasslands and wetlands, with rocky ridges and interspersed aspen stands. The area provides unique habitat for numerous species at risk and rare species.

The Small Swale (Figure 3; Appendix A, Map 2) is a smaller post-glacial channel scar of the South Saskatchewan River that covers approximately 268 hectares of land running approximately 4 km parallel to the South Saskatchewan River, west of the Northeast Swale. The Small Swale has two outlets to the South Saskatchewan River. The south outlet is at Peggy McKercher Conservation Area located south of McOrmond Drive on the old Central Ave and at the north end. The north outlet is west of Riverside Estates and across the river from Wanuskewin Heritage Park. This wetland and native prairie complex is relatively unexplored with limited official documentation of habitat and species; however, the unique marl wetlands located in the Small Swale provide habitat for several rare plant species.

The South Saskatchewan River valley through the study area includes river flood-plain on the east bank and steep coulee slopes on the west bank (Figure 3; Appendix A, Map 2). The river valley provides wildlife movement corridors instream and along the bank slopes, significant migratory bird habitat in the Green Ash Forest on the west bank, and upland patches of native prairie. The river itself and shoreline provides habitat for Species at Risk including Lake Sturgeon and Northern Leopard Frogs (Tomlinson et al., 2017).



Disclaimer: This map is for illustrative purposes only. Do not rely on it as being a precise indicator of land-ownership, feature location, nor as a guide to navigation. This map may contain omissions or errors.
 Data Sources: Meewasin Valley Authority, City of Saskatoon
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 2-MA-RC-1-2020

Saskatoon Freeway Study Area



Key to Features





-  Approximate Boundary of Known Swales (post-glacial channel scars)
- Saskatoon Freeway**
-  ROW (250 m)
-  Vegetation and Soil Study Area (550 m)
-  Wildlife Study Area (1 km)
-  Saskatoon Freeway Study Area (2 km)
-  Preliminary Freeway Alignment



FIGURE 3. The Approximate Location of the Northeast and Small Swales within the Study Area

2.0 The Process

The Habitat Evaluation of the Saskatoon Freeway Project through the Northeast and Small Swale Complexes included desktop evaluations and field investigations to provide a better ecological understanding of the Study Area and the interconnection between the different habitat complexes. Citizen Scientist volunteers assisted with the project through the collection of field data and sharing their expertise towards the project. The project involved numerous aspects including accessing various databases (provincial government and citizen science), air photo interpretation, wildlife cameras, and various on the ground sampling techniques. The process for data collection is described in this section.

2.1 Habitat Cover Assessment Mapping

Habitat Cover Assessment mapping was conducted for the proposed Saskatoon Freeway alignment, using classification system developed for Meewasin's upcoming 2018 State of the Valley (to be completed in late 2020) and the City of Saskatoon Natural Areas Inventory (Bouvier, 2019). The assessment for this project was limited to Quarter Sections intersecting the 2 kilometer Study Area, and was focused on the areas north of the newly developed section of McOrmond Drive. The land use / land cover information was primarily extracted from previously digitized Meewasin Valley Authority State of the Valley and Natural Areas Inventory of Saskatoon 2019 digitization work. Supplementary digitization was required to complete the intersecting Quarter Sections noted above for the scope of this report.

Land Use / Land Cover categories as described in Appendix B: Table 1 and Table 2 were formed to reflect the ecological communities being captured by the desktop analysis. Sub-categories determine the land cover and anthropogenic intensity of the site's land use. As a result, these natural areas are not necessarily representative of formal boundaries of zoning or dedicated lands. Green Space was similarly broken down into sub-categories, in an effort to more succinctly represent the balance of the on-the-ground land cover, as well as the human use of the site.

Where possible, the most current City of Saskatoon 2019 orthoimagery was the primary source for landcover classification and base map context. However, supplemental orthoimagery sets as indicated in Table 1 were used as an alternative for digitization and base map purposes, as the areal extent of the 2019 orthoimagery was not sufficient to cover the north east extent just beyond the 2 kilometer Study Area. Google Earth Imagery as well as the City of Saskatoon's 2013 and 2017 orthoimagery datasets were also used for multi-temporal comparisons during digitization. These comparisons of imagery captured across temporally diverse intervals was particularly useful for distinguishing grassland system types and understanding the history of disturbance on the landscape, since historical disturbance can be indicative of grassland naturalization and the presence of native species.

TABLE 1. Imagery Sources and Quality of Imagery Used for Habitat Cover Assessment

Data Layer	Type	Source	Year	Source Scale / Resolution
Wetlands	Vector Polygon	City of Saskatoon	2013	No Metadata
Annual Crop Inventory	Raster	Agriculture and Agri-Food Canada	2017	30 m
SotV 2008	Vector Polygon	Meewasin Valley Authority	2008	No Metadata
SotV 2013	Vector Polygon	Meewasin Valley Authority	2016	No Metadata
Google Earth Imagery	Raster	Google	2002-2018	Varied
2013 Orthophotos	Raster	City of Saskatoon	2013	0.075 m
SPOT Satellite Imagery	Raster	Saskatchewan Geospatial Imagery Collaborative	2016	1.5m
2017 Orthophotos	Raster	City of Saskatoon	2017	0.075 m
2019 Orthophotos	Raster	City of Saskatoon	2019	0.075 m
SotV 2018	Vector Polygon	Meewasin Valley Authority	2019	0.075 m
Natural Areas Inventory	Vector Polygon	Meewasin Valley Authority	2019	0.075 - 1.5m
<i>Projected Coordinate System Used: NAD 1983 CSRS UTM Zone 13N</i>				

2.2 Citizen Science and Incidental Observations

Incidental observations for flora, fauna, rare species and Species at Risk were compiled from various sources (Table 2) including: Citizen Science websites, provincial databases, Meewasin records, and data collected during Citizen Science volunteer events. Four volunteer events occurred from mid-August to early December with 176 volunteers engaged (Table 3). Volunteers were encouraged to document incidental observations on eBird or iNaturalist Citizen Science apps. Several Citizen Scientists provided additional fieldwork to assist with the project, namely Anna Leighton (botanist) and Meghan Mickelson (amateur naturalist and wildlife photographer) and several others. Meewasin staff, while conducting fieldwork, recorded incidental observations.

TABLE 2. Data Sources for Incidental Observations of Flora, Fauna, Species at Risk

Data Type	Source	Date Accessed	Date Specifications
Citizen Science	eBirds	03/11/2020	Presence Point Count Data
	Bird Studies Canada	03/10/2020	Daily Observation and Point Count Data
	iNaturalist	03/05/2020	Presence Point Count Data
	iMap Invasives	03/10/2020	Presence Point and Polygon Data
Technicians/ Subject Matter Experts	Meewasin Valley Authority	All project area data up to end of 2019 Field Season	Vegetation/Wildlife Surveys Point and Polygon Data, including Saskatchewan Activity Restriction Guidelines for Sensitive Species
Government of Saskatchewan Data	Habi-Sask	03/05/2020	Vegetation/Wildlife Polygon Data, including Saskatchewan Activity Restriction Guidelines for Sensitive Species

TABLE 3. Citizen Science Volunteer Events to Collect Data in the Study Area

Location	Date	Focus of the Event	# Volunteers
NE Swale – Area near Lek	08/17/2019	Grasslands around the Sharp-tailed Grouse lek; flora and fauna	25
Small Swale – South Portion	08/24/2019	Wetlands and native grasslands; flora and fauna	20
Green Ash Forest – West Riverbank	08/31/2019	Fall migration of forest migratory birds and riverbank shoreline	38
Small Swale – North Portion	09/07/2019	Wetlands and native grasslands; flora and fauna	15
Small Swale – Central Portion	12/01/2019	Snow tracking of animals	76
Total Volunteers			174

2.3 Wildlife Cameras

Wildlife cameras were installed along the proposed right-of-way of the Saskatoon Freeway within the Study Area. These cameras were installed in the period between August to September 2019 and removed in March 2020. There were 11 cameras (Moultrie S-50i units with 16 GB SD cards and Duracell AA Batteries) (Appendix A, Map 13) installed along the route inside “bird boxes” to hide them from the general public and reduce the risk of vandalism. Locations were randomly selected targeting locations along the route that met conditions of: accessibility, availability of an object to mount camera box to (i.e. tree, fence-post, power post), observation of game trails in the area, proximity to proposed alignment, and distance from other cameras. Four additional supplemental cameras (Moultrie M40 units with 16 GB SD cards and Duracell AA Batteries) were installed within the Small Swale

around wetlands in early December to provide supplemental data. An existing camera (Moultrie M-1100i with 16 GB SD cards and Duracell AA Batteries) at the Northeast Swale, north of McOrmond Drive, was included in the analysis. Cameras were checked periodically, except from January to mid-March, for functionality, battery storage, and data storage. Camera were set for no delay and a 3-shot burst of photos when triggered.

Additional wildlife cameras can be found within the Northeast Swale, south of McOrmond Drive and within the Study Area. For the purposes of this project, camera data was not analyzed from these cameras but is available for further review (Appendix A, Map 13).

2.4 Wildlife Tracking

Formal wildlife snow tracking was planned for mid-March 2020 but was cancelled due to the Covid-19 health crisis. A Citizen Science volunteer event on December 1, 2019 had 76 volunteers learn about winter wildlife tracks through a loosely supervised wildlife track-focused exploration of the wetlands around the Small Swale. Volunteers were encouraged to document their observations using iNaturalist.

2.5 Water Quality Sampling

Water quality was determined using standardized biological and chemical sampling techniques taken at each sampling location at the Small Swale (Appendix A, Map 13). Water samples (200ml) were collected at a depth of 0.5-m within 1.5-m from the shoreline. Samples were stored at 4 to 6°C within a refrigerator until processed. Ammonia, temperature, dissolved oxygen, pH, free and total chlorine, nitrate, nitrite, and phosphate were measured within the lab using an Hanna Instruments 83203 multi-parameter bench photometer.

Macroinvertebrate samples were collected at all sites using a 600-micron mesh kick-net within 2-m from the shoreline at a depth of 0.5-m and within the substrate. Samples were transported for lab analysis within glass containers. Samples were rinsed of fine sediment and placed in 90% isopropyl alcohol until identified. Samples were taken from wetlands in the Small Swale on August 28 and 29, 2019 (Appendix A, Map 3).

2.6 Dark-Sky Light Pollution Monitoring

Artificial skyglow caused by impeding light pollution is more commonly observed in densely populated areas and can be significantly amplified by local environmental and atmospheric conditions, such as cloud cover, landscape topography, and weather conditions. The ease of recording artificial skyglow measurements has increased due to more accurate measuring

techniques and systems that compensate for environmental and atmospheric variabilities. Due to the impacts on ecosystems, local biodiversity, observed biological behaviours, and human health, many monitoring projects are incorporating artificial skyglow measurements to determine local changes in biodiversity and causation. Research has indicated light pollution as a strong environmental stressor on numerous species including, terrestrial mammals, songbirds, amphibians, aquatic invertebrates, zooplankton, and microbial communities. Baseline monitoring efforts in combination with site-specific biological inventories allow local impacts to be assessed and monitored over time.

Two Dark sky meters were installed in late August 2019 and removed in early January 2020 (Appendix A, Map 13), located at the Small Swale (Site 1 – NW) and Northeast Swale (Site 2 – SE). Continuous monitoring of the zenith sky luminance was determined by two Unihedron Sky Quality Meters (SQM-L) installed within the expanse of the proposed freeway to measure the amount of artificial skyglow (i.e., light pollution) permeating into the site from the surrounding city and roadways. The SQM used an integrated lens to measure luminance of the night sky with an opening angle of 20°, a built-in silicon diode (TSL237S) and a band-pass filter (HOYA CM-500). Unit measurements were in mag/arcsec², which is a logarithmic scale that decreases with increasing brightness. SQM measurements were collected daily from August to December 2019 on 15-minute intervals. SQM devices were stored in a weatherproof housing and permanently mounted onsite and pointed directly at the night sky (0°).

2.7 Mapping and Other Data Sources

Numerous data sources were used to create a series of maps showing different aspects of the Study Area including ownership, archeological sites, soils, geographic landforms and several other maps (see Data Sources, Page 28).

2.8 Technical Advisory Committee Evaluation

A technical advisory committee was established by Meewasin with the objectives of determining what data was available for the Study Area, organize Citizen Scientist volunteers and assist with data collection and vetting. The Advisory Committee met on July 10, 2019 to review existing data sources, habitat assessment mapping (preliminary) and the scope of the project. Follow-up meetings with members of Wild About Saskatoon and Saskatoon Nature Society were conducted to plan Citizen Science volunteer events. Throughout the project, discussions with various members of the technical committee were held. Several members of the committee contributed additional volunteer time collecting field data at various sites namely Anna Leighton (botanist, Small Swale focus), Meghan Michelson (amateur biologist / photograph, Small Swale and NE Swale focus), and John Patterson and Stan Shadick (birders, Green Ash Forest).

A second meeting was planned with the Technical Advisory Committee for March 20, 2020 to discuss and review the findings of the assessment. Due to concerns with the Covid-19 health crisis, the meeting was cancelled.

2.9 Other Reports Not Incorporated into the Assessment

The City of Saskatoon, Lands Branch has commissioned an Environmental Assessment for the University Heights 3 proposed neighbourhood in 2019. This proposed neighbourhood is located from west of the Northeast Swale to the river, through the Small Swale, and north to the proposed Saskatoon Freeway alignment. A draft report was prepared for the City in February 2020 and was not available for public distribution by end of March 2020. The information provided in the report will provide additional information to the feasibility study of the Saskatoon Freeway Project through the Study Area.

The City of Saskatoon, Storm Water Management has been conducting water quality monitoring at the Northeast Swale wetlands north of McOrmond Drive from 2017 to 2019. The purpose of the monitoring was to measure the impacts of storm water drainage from the developing Aspen Ridge neighbourhood into the Northeast Swale through a forebay settling pond. Information from these annual reports will provide baseline information on water quality in the wetlands north of McOrmond Drive.

3.0 The Outcomes

The Habitat Evaluation of the Saskatoon Freeway Project through the Northeast and Small Swale Complexes process resulted in numerous outcomes described in the sections below.

3.1 Habitat Cover Assessment Mapping

Habitat Cover Assessment Mapping was completed through utilizing protocols developed by Meewasin for State of the Valley and Natural Areas Inventory for Saskatoon. This assessment produced a map (Appendix A, Map 13) indicating habitat cover types and an associated table (Table 4) indicating total area of each habitat type within the Study Area.

The Ecological Environment, within the Study Area, covers 83.78% of area (1840.52 ha), whereas the Built Environment covers 16.23% (356.59 ha). Aquatic Habitats provide 14.13% (310.46 ha), Known Prairie / Naturalized Grasslands provide 26.42% (580.29 ha) and Hayfields provide 13.75% (298.08 ha) of the Study Area. The findings from the habitat cover assessment is that the area provides significant natural and naturalized cover to the Study Area, which provides various degrees of habitat for wildlife, flora and fauna.

Table 4. Land Cover and Land Use within the Study Area

Land Use/Land Cover Summary (2 Kilometer Study Area)								
Category	Sub-Category 1	Sub-Category 2	Sub-Category 3	Sub-Category 4	Sub-Category 5	Area (Hectares)	Percent of Total	
Built	Agricultural Operations (AG)					0.84	0.04%	
	Exposed & Barren (EB)	Development (DEV)				281.06	12.79%	
		Informal Road & Trail (IRT)				6.52	0.30%	
	Industrial (IND)					7.08	0.32%	
	Outdoor Recreation Facility (RF)					2.24	0.10%	
	Road & Rail (RRW)					29.81	1.36%	
	Urban & Rural					29.04	1.32%	
Eco	Green Space (GS)	Formal Green Space (FGS)	Afforested (A)	Planting (P)		0.09	0.00%	
				Urban Tree Cover (UTC)		0.16	0.01%	
			Park & Recreation Lawn (PRL)				1.77	0.08%
		Informal Green Space (IGS)	Utility Right of Way (U)				0.12	0.01%
			Verge (V)				10.82	0.49%
	Outdoor Recreation (OR)	Golf Course (GC)				2.26	0.10%	
	Native & Naturalized (NNE)	Aquatic Systems	Creek (Creek)				0.28	0.01%
				River (R)				131.31
			Wetland (W)	Constructed (C)			6.59	0.30%
				Naturalized (N)			172.28	7.84%
		Forested & Shrubland Systems (FSS)	Native & Naturalized				138.57	6.31%
			Afforested (S)	Naturalized Planting (NP)			2.47	0.11%
				Shelterbelt (SB)			7.49	0.34%
		Grassland Systems (G)	Cropland (Crop)				487.49	22.19%
			Known Prairie (KP)	Known Prairie (KP)			4.10	0.19%
				Agricultural Production (AP)	Pasture (PSTR)			51.23
	Conservation Area (CA)					132.73	6.04%	
Naturalized Grass (NG)	Naturalized Grass (NG)			5.89	0.27%			

				Agricultural Production (AP)	Old Field (OF)	305.05	13.88%			
					Pasture (PSTR)	31.33	1.43%			
				Conservation Area (CA)	4.19	0.19%				
				Naturalized Green Space (NGS)	5.20	0.24%				
				Vegetated Margin (VM)	Field Edge (FE)	35.39	1.61%			
					Field Pocket (FP)	5.18	0.24%			
				Tame Forage (TF)	Agricultural Production (AP)	Forage Crop (FC)	182.18	8.29%		
						Old Field (OF)	78.08	3.55%		
						Pasture (PSTR)	14.95	0.68%		
					Vegetated Margin (VM)	Field Edge (FE)	13.74	0.63%		
			Field Pocket (FP)			9.13	0.42%			
			Naturally Non-Vegetated (NNV)			0.45	0.02%			
			Total Hectares						2197.12	

3.2 Flora and Fauna Observations

Compilation of various data sets (see Data Sources section), Citizen Science observations, and Meewasin field observations provides a picture of the unique habitats within the Study Area and the presence of numerous flora and fauna species including rare species and Species at Risk. Data for Invasives, Species Observations, Species at Risk and COSEWIC listed species is limited in some of the Project Study Area, as shown in the accompanying report maps. These areas have not been subject to regular formal survey at the intensity of the surrounding area due to matters of private property access, and lack of designated protected sites. The species presence shown does not predicate the lack of biota throughout the project area, but rather the necessity for calculated environmental and species survey to fully determine the biodiversity that occurs in this area. This will assist in properly understanding where diversion and mitigation efforts need to be exercised. The data shown in the Northeast Swale and surrounding areas where survey and monitoring efforts have occurred on a formal basis facilitate awareness of what biodiversity may exist within the adjacent Study Area.

3.2.1 Citizen Science Flora and Fauna Observations

Citizen Science observations were compiled in Appendix B, Table 9 and mapped in Appendix A, Map 9. A total of 199 species have been recorded in Citizen Science databases including iNaturalist and eBirds. Of these records, the majority are bird species. Macro-invertebrates observed during the water quality sampling of wetlands at the Small Swale in August 2019 were compiled in Appendix B, Table 10.

Appendix A, Map 9 also indicates observed stick nests, badger holes, and coyote dens during the Citizen Science events and Meewasin field investigations. These were not extensive surveys but were incidental observations. Of note, the stick nest located north of the proposed alignment, in an aspen stand, had an active nesting Great Horned Owl on March 23, 2019.

3.2.2 Flora Species Lists for Small Swale and Northeast Swale

Plant species lists have been compiled for the Northeast Swale (Appendix B, Table 12) and the Small Swale (Appendix B, Table 11). The Northeast Swale list was compiled by the Native Plant Society of Saskatchewan, with observations from 2011 to 2018, from Native Plant Society staff and volunteers, Citizen Science volunteers and Meewasin staff. The Small Swale list was compiled by Anna Leighton (botanist) with records from Dr. John Hudson (records from 1993) and field visits from Ms. Leighton from 2014 to 2019. These plant lists are based on ongoing incidental observation and not based on extensive plant surveys.

3.2.3 Species at Risk and Rare Species

Species at Risk and Rare Species records were compiled from various data sources including records from Saskatchewan's Habi-Sask database and observations from Citizen Scientists and Meewasin. Species at Risk and Rare Species observations were compiled in Appendix B, Table 8. Mapping of the Species at Risk and Rare Species occurrences is found in Appendix A, Map 11 with the Saskatchewan Activity Restriction Guidelines for Sensitive Species (Government of Saskatchewan, 2017) mapped with the recommended setbacks for the various species. This includes 30-m setback for rare plant species and 400-m setback for active Sharp-tailed Grouse leks. Four subset maps have been created to show the detail of the occurrences of Species at Risk and Rare Species within the Study Area (Appendix A, Maps 11A, 11B, 11C, 11D).

In the Study Area, based upon the Committee on the Status on Endangered Wildlife in Canada (COSEWIC) rankings, 18 bird species, 2 mammal species, 1 fish species, 1 insect species and 1 amphibian species have been recorded. Northern Leopard Frogs have been observed in the wetlands at the Northeast Swale, Small Swale and along the South Saskatchewan River bank; with potential critical wintering habitat in springs along the riverbank and deeper wetlands of the Small Swale and Northeast Swale (further investigation is required). Two mammal species include Little Brown Bat and American Badger, with numerous badger holes located throughout the Study Area. The South Saskatchewan River provides critical habitat for Lake Sturgeon. Monarch butterflies have been observed in the area, over the years. A total of 18 COSEWIC-listed bird species use the Study Area for either critical nesting habitat or stop-over areas during migrations. Grassland bird species including Loggerhead Shrike, Sprague's Pipit, Short-eared Owl, and Common Nighthawk are regularly observed within the Study Area. Yellow Rail has been observed on several occasions in the Small Swale over the last 4 years with Horned Grebe being a regular visitor to the large wetlands of the Northeast Swale.

Within the Study Area, there are two known Sharp-tailed Grouse breeding leks within the Study Area. One is located within the Northeast Swale and the other at the north end of the Small Swale. Incidental observations noted 24 breeding males in the Northeast Swale lek and 7 breeding males in the Small Swale lek in 2019. Members of the Saskatoon Nature Society have indicated there may be an additional lek located within the Small Swale complex, closer to the alignment of the proposed Saskatoon Freeway (further investigation is required).

Numerous rare plant species have been documented in the Small Swale and Northeast Swale. Within the Small Swale, during the Citizen Science volunteer events, numerous locations of Plains Rough Fescue, Crowfoot Violet, and Marsh Felwort were found within the proposed alignment. These plant species are rated as S3 rare species (less than 100 occurrences in Saskatchewan) with a recommended activity setback of 30-m for each occurrence. Due to the timing of the field work for this project, further investigation for rare

plants within the Small Swale (slopes and wetland margins) and Northeast Swale (wetland margins) is required.

During the study period (August 2019 to March 2020), the occurrences of Species at Risk and rare species were separately documented in Appendix A, Map 10. Species documented include Species at Risk Northern Leopard Frog and Short-eared Owl, with several occurrences of rare plant species including Plains Rough Fescue, Fringed Gentian and Crowfoot Violet, to name a few.

3.2.4 Culturally Significant Species

Appendix A, Map 8 shows the location of several culturally significant species and items within the Study Area. This map includes documented occurrences of plant species including Western Red Lily (Saskatchewan's Floral Emblem) and Sweetgrass, and the map also documents the locations of Bison Rubbing Stones observed in the study area. This map is based on incidental observations and not an extensive survey for these species. Of note, numerous Bison Rubbing Stones within the Northeast Swale have been observed but have not been formally documented by Meewasin staff. Further investigation may be required.

3.2.5 Invasive Species

Invasive species occurrences are documented in Appendix B, Table 7 and are mapped in Appendix A, Map 12. Occurrences have been recorded through Citizen Science outlets and Meewasin incidental field observations in addition to Meewasin's ongoing invasive species control program. Within the Study Area, a limited number of invasive species have been documented. As indicated on the Map, numerous invasive species are found within the area and therefore can be assumed to be found within the Study Area through more extensive investigations. Precautions should be taken to reduce the risk to further spread invasive species within the Study Area during further field investigations, pre-construction work, and during construction.

3.3 Wildlife Cameras

Eleven wildlife cameras were placed along the Saskatoon Freeway Project alignment, four supplemental cameras around the wetlands at the Small Swale, plus one existing camera in the Northeast Swale (See Section 2.3 for details; Appendix A, Map 13). Due to various issues related to technicalities (e.g. hardware issues, battery drainage, cold weather, tampering, and poor placement), some of the cameras did not perform as expected. However, information was collected from several cameras that paint a picture of wildlife usage of the Study Area (Appendix B, Table 6).

Wildlife Camera observations indicate the presence of a healthy White-tailed Deer and Mule Deer population in the area, with Mule Deer dominating the Northeast Swale area while White-tailed Deer are more common in the Small Swale area. Both deer species utilize both areas but prefer their “home territory”. Other species captured on wildlife cameras including Coyotes, Porcupine, Weasel, and Moose.

Further investigation with the wildlife camera data plus the additional Meewasin cameras in the area could provide information on movement patterns of wildlife in the Study Area. However, due to the scope of the project, this was not completed.

3.4 Wildlife Tracking

A formal wildlife snow tracking survey was not completed, as planned, in March 2020 due to concerns with Covid-19. However, incidental observation by Meewasin staff and other Citizen Science observers who regularly visit the Northeast Swale and Small Swale areas have indicated the Northeast Swale has mainly Mule Deer while the Small Swale has higher occurrence of White-tailed Deer.

3.5 Water Quality

Water quality sampling was conducted at several wetlands in the Small Swale (Appendix A, Map 13). The results of the sampling are found in Appendix B, Table 5. These results are meant to supplement the development of a baseline understanding of wetland water quality within the Small Swale, with further investigation required for long-term monitoring.

The City of Saskatoon has been conducting water quality monitoring of the Northeast Swale wetlands north of McOrmond Drive for the last several years. Results from that study were not provided in this report, but they provide a baseline for long-term monitoring of the Northeast Swale wetlands in the Study Area.

3.6 Dark Sky Light Pollution

Values for Site 1 (Small Swale) and Site 2 (Northeast Swale) ranged from 15.55 to 19.21 mag/arcsec² and 16.8 to 19.82 mag/arcsec² respectively (Figure 4). Clearly, variabilities due to weather, moon phases and atmospheric conditions can be seen to influence both sites extensively, creating differences in measurements up to roughly 20% (Figure 4). Monthly average values indicate the potential for darker conditions within Site 2, (Figure 5), although more research is needed to determine seasonal variabilities outside the current monitoring timeline. Compared to current research measurements for numerous urban, rural and suburban sites, both Site 1 and Site 2 (1.28 and 1.33 natural sky units, respectively) occur within significantly low sky glow categories for urban and suburban environments (> 10 – 15 natural sky units).

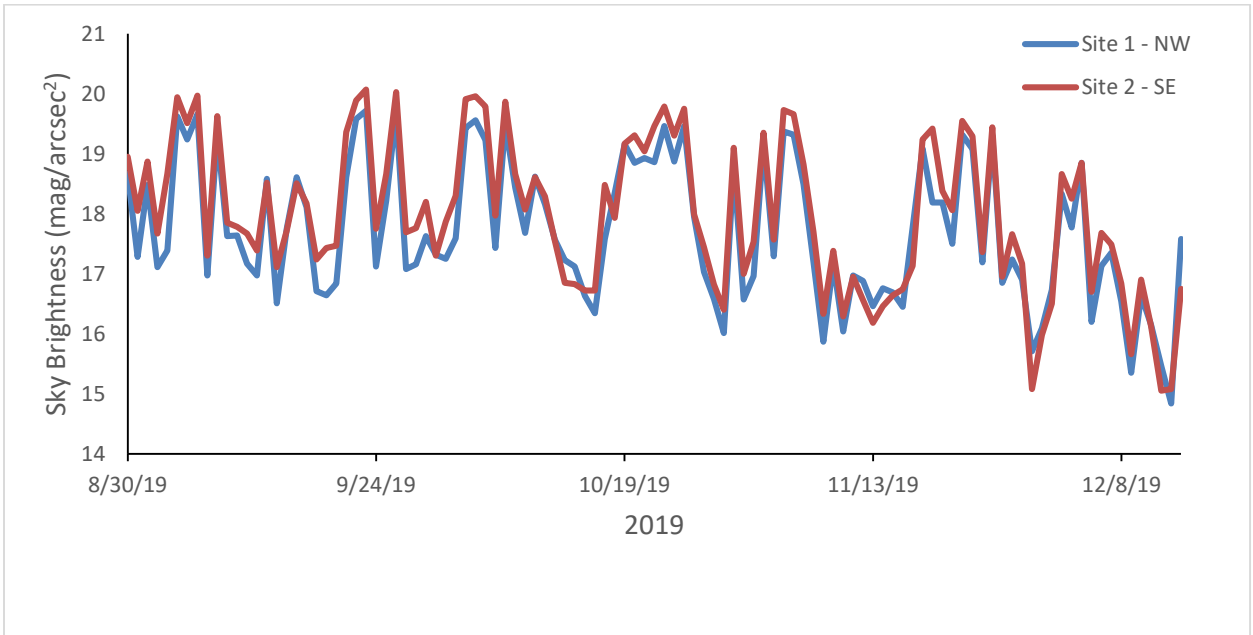


FIGURE 4. Night Sky Brightness Measurements from August 2019 to December 2019

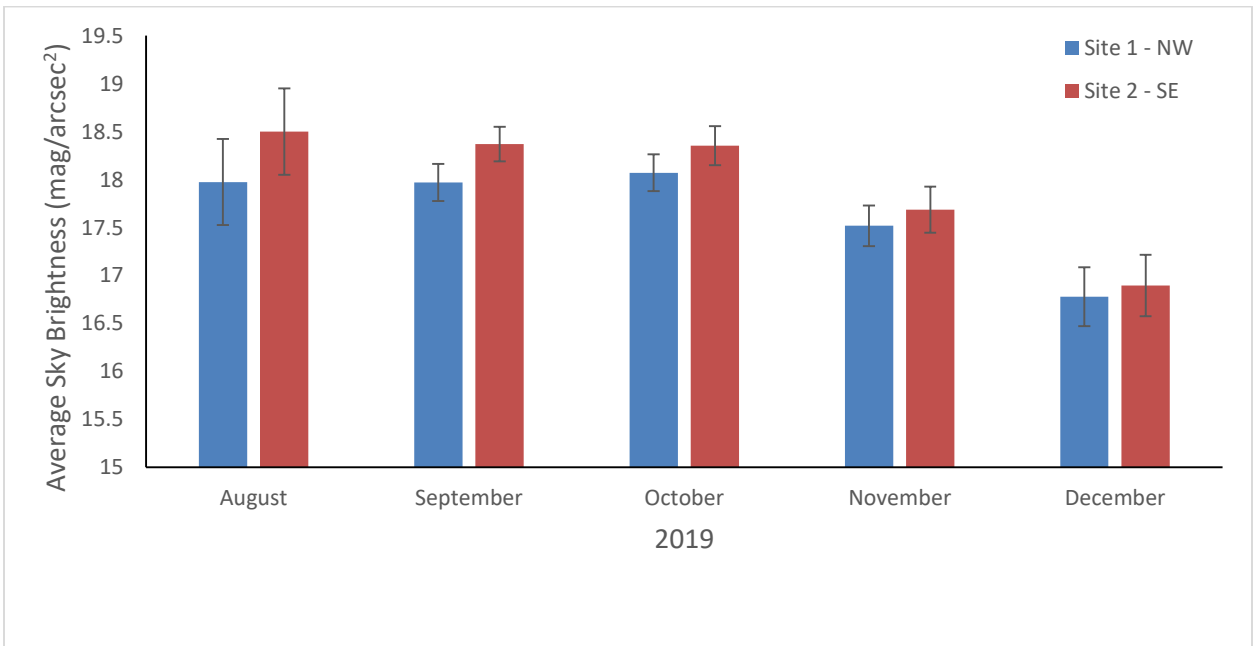


FIGURE 5. Monthly Average of Night Sky Brightness Measurements

3.7 Additional Mapping of Other Data Sources

As part of the project, several other data sources have been mapped and tabulated for the Study Area.

3.7.1 Land Ownership

Land parcel ownership was documented in Appendix B, Table 3 and mapped in Appendix A, Map 4. As indicated by Information Services Corporation data from 2018, the proposed alignment within the Study Area transverses City of Saskatoon owned property and several properties owned by private individuals and/or corporations.

A map showing individual quarter sections (Appendix A, Figure 3) was created to aid in directing ground fieldwork during the study.

3.7.2 Archeological, Paleontological and Historic Sites and Records

Several data sources were compiled to create a map showing Archeological, Paleontological and historic sites and records within and around the Study Area (Appendix A, Map 7; Appendix B, Table 4). The Study Area and surrounding landscape are rich in archeological and paleontological resources including Wanuskewin Heritage Park, the Moosewood to Batoche trail, lime kilns and old farm homesteads. Further investigation is required to confirm the location of the Moosewoods to Batoche Trail and document other resources in the study area.

3.7.3 Surficial Geology and Soil Types

Surficial geology was mapped for the Study Area (Appendix A, Figure 5). The post-glacial geomorphological makeup of the areas east of the Northeast Swale are predominately classified as glaciolacustrine plain, the Small Swale and Northeast Swale areas are morainal plain, and the areas west of the Small Swale and the river are meltwater channels.

Soil types for the Study Area (Appendix A, Figure 6) are predominately Loamy soils between the Swales and Overflow soils within the Swale complexes. The east side of the river bank has Sandy Loam soils, while east of the Northeast Swale is more Clay soils. The riverbank itself is Thin soils.

3.8 Compilation of Information

The Habitat Evaluation of the Saskatoon Freeway Project through the Northeast and Small Swale Complexes is a compilation of information from existing data sources, Citizen Science observations, Meewasin fieldwork and anecdotal evidence from regular visitors to the Study Area. The Study Area of this project contains several unique natural area complexes including the Northeast Swale, Small Swale, the South Saskatchewan River valley and the lands in-between that provide connectivity within and amongst these areas.

Within the Study Area, the Northeast Swale contains a large wetland complex that provides important fall migration habitat for waterfowl, potential wintering and breeding habitat for Northern Leopard Frog, habitat for species at risk birds like Loggerhead Shrike, and wildlife habitat for many species including Mule Deer. The Small Swale contains an unique complex of native / naturalized grasslands and unique wetlands that provide potential breeding and wintering habitats for Northern Leopard Frogs, potential breeding habitat for the Yellow Rail, habitat for several rare plant species including Crowfoot Violet and Marsh Felwort, and habitat for numerous wildlife species including White-tailed Deer. The South Saskatchewan River valley provides habitat for Lake Sturgeon in the river, potential breeding and wintering habitat for Northern Leopard Frog along the shoreline and at springs along the riverbank, and the unique Green Ash Forest along the west riverbank provides habitat for spring and fall migration of forest birds including Warblers and other species. Each of these natural areas also provide regional wildlife connectivity from urban to suburban to rural areas in a regional context.

This information has been compiled into a map found in Appendix A, Map 14. The Habitat Assessment Map provides an indication of where potential or known habitat for various species should be considered in the future planning of the Saskatoon Freeway Project.

As part of the project, Meewasin will provide the Saskatchewan Ministry of Highways and Infrastructure with all the ArcGIS shapefiles and associated tables of data to aid in the planned 2020/21 Feasibility Study for Phase 2 of the Saskatoon Freeway Project. The information will aid in directing field investigations and initial alignment planning for the Saskatoon Freeway Project.

4.0 Considerations

The Habitat Evaluation of the Saskatoon Freeway Project Through the Northeast and Small Swale Complexes provides a snapshot of the ecological significance of the area, for consideration for the upcoming feasibility study, future environmental assessments and designing of the Saskatoon Freeway Project. Provided below are considerations for short-term and long-term monitoring prior to design, construction, and considerations for alignment.

4.1 Short-term Monitoring Considerations

With the limitations of this project, due to timing, resource availability, and conditions, the following items should be considered for short-term data collection and monitoring in 2020 and 2021, as part of preliminary planning for the Saskatoon Freeway Project:

1. **Breeding Bird Surveys:** Conduct Breeding Bird Surveys at the Small Swale, Northeast Swale and West Riverbank locations. Recommended time-period is from mid-May to late-June, with a minimum of three visits per site with several locations within each site. Recommendation is to focus on species at risk bird species including grassland (e.g. Sprague's Pipit, Loggerhead Shrike) and wetland bird (e.g. Yellow Rail) species.
2. **Amphibian Surveys:** Conduct Amphibian Surveys along the South Saskatchewan River, Small Swale and Northeast Swale wetlands for both breeding and wintering habitats. Observations from the preliminary work found several locations of potential wintering habitat for Northern Leopard Frogs.
3. **Rare Plant Surveys:** Conduct Rare Plant Surveys, during the flowering season from late May (for Crowfoot Violet) to late August (for Marsh Feltwort), focusing on key habitats where potential rare plant species may be located.
4. **Sharp-tail Grouse Lek:** Investigate the potential for a Sharp-tailed Grouse Lek in the Small Swale area. Local birders have suggested that there may be a Lek located in the vicinity of the Small Swale, outside of the two known Leks in the area.

4.2 Long-term Monitoring

The following items should be considered for long-term data collection and monitoring for long-term information that will aid in the design considerations and mitigation strategy for the Saskatoon Freeway Project:

1. Ongoing Surveys: Ongoing Breeding Bird, Amphibian and Rare Plant Surveys to develop a long-term trend and determination of populations within the Study Area.
2. Citizen Science Engagement: Engage the Saskatoon Nature Society to conduct Spring Bird Count and Christmas Bird Counts within the vicinity of the proposed Saskatoon Freeway Project to develop a more detailed bird species list for the area.
3. Dark Sky Monitoring: Continue Dark Sky monitoring locations at the Small Swale and Northeast Swale to better understand changing light pollution within the alignment, to aid in the design of lighting and mitigation measures for the Saskatoon Freeway Project.
4. Water Quality Monitoring: Continue Water Quality monitoring to provide long-term baseline information on water quality of the Small Swale and Northeast Swale wetlands prior to construction to compare pre-construction, during construction, and post-construction of the Saskatoon Freeway Project.
5. Wildlife Monitoring: Continue long-term monitoring of wildlife in the area, through use of Wildlife Cameras and wildlife tracking. Wildlife Cameras, used in conjunction with cameras used for other projects in the area, will provide an opportunity to study wildlife population trends, occurrence of wildlife species, and wildlife movement within the area. An Urban Wildlife Information Network project is underway in Saskatoon, which will utilize 30 wildlife cameras to monitor wildlife usage in Saskatoon along two transects. It is a partnership project with the University of Saskatchewan, City of Saskatoon, Wild About Saskatoon, Saskatoon Nature Society and Meewasin. Meewasin and the University of Saskatchewan have submitted a proposal to the Saskatchewan Fish and Wildlife Development Fund to study wildlife movement in the area using wildlife collars on Mule and White - tailed Deer. The research project and continued wildlife tracking through cameras and track surveys will provide information to aid in the design of wildlife movement and mitigation measures for the Saskatoon Freeway Project.
6. Noise Monitoring: Conduct long-term Noise Monitoring to develop a baseline of noise levels within the alignment. Information collected could be used during the design of the Saskatoon Freeway Project to mitigate noise created by vehicle traffic on surrounding habitat, especially for breeding birds and amphibians.

4.3 Alignment Considerations

This project has highlighted several considerations regarding the alignment of the Saskatoon Freeway Project:

1. Northeast Swale. The Northeast Swale wetland provides a significant waterfowl staging area every fall. Considerations will need to incorporate strategies to mitigate impacts to this important fall migration habitat for water birds. The shoreline of the Northeast Swale wetland also provides habitat for species at risk (e.g. Northern Leopard Frog and Loggerhead Shrike) and rare plant species. One consideration would be for a cause-way over the wetland to reduce impact to the wetlands, with design features to reduce impacts with migrating bird species while allowing wildlife crossing underneath. Considerations should include human connectivity along the Northeast Swale and on either side of the Northeast Swale, as Meewasin expands the Meewasin Trail through the area (Meewasin, 2016).
2. Small Swale. The Small Swale wetlands provide habitat for several rare plant species, amphibians (including potential breeding and wintering habitat for Northern Leopard Frogs) and potential breeding habitat species at risk (e.g. Yellow Rail). The east slopes of the Small Swale uplands contain native prairie with several rare plant species and habitat for species at risk (including Loggerhead Shrike). One consideration could be for a cause-way over the Small Swale to reduce impact to the wetlands and native prairie slopes, with design features to reduce impacts with migrating bird species while allowing wildlife crossing underneath. Another consideration is to shift the alignment, approximately 200 to 300 meters to the north, between the wetlands, to reduce impacts to the wetlands. Considerations should include human connectivity along the Small Swale and on either side of the Small Swale, as Meewasin expands the Meewasin Trail through the area (Meewasin, 2016).
3. South Saskatchewan River. Consider design features that will reduce impact to habitat for species at risk in the river (e.g. Lake Sturgeon) and the river shoreline (e.g. Northern Leopard Frog) and to the Green Ash Forest on the west river bank. The Green Ash Forest provides a unique habitat for migrating forest song birds (e.g. warblers) in the spring and autumn. Considerations should also be made to provide opportunities for wildlife to move along the river bank on both sides of the river.
4. Entire Route. Along the entire route of the Saskatoon Freeway Project, provide considerations for wildlife movement corridors for large mammals (e.g. white-tailed deer, mule deer, and moose), small mammals (e.g. coyote, red fox, porcupine, and badger) and other species (e.g. amphibians, garter snakes). Provide considerations to reduce impacts from vehicles and other infrastructure related to noise and light pollution (dark-sky and dark-ground).

5.0 Conclusion

The Habitat Evaluation of the Saskatoon Freeway Project Through the Northeast and Small Swale Complexes provides a better understanding of the unique ecological habitats found within the study area. The area provides habitat for numerous Species at Risk and rare species, and provides a wildlife corridor for large and small mammals between the South Saskatchewan River, the Northeast Swale and the Small Swale and within each Swale complex. The unique characteristics of the Small Swale complex requires additional study to better understand the habitat this area provides for flora and fauna as well as its larger contribution to habitat connectivity within the region. Further inventories plus short-term and long-term monitoring is required to ensure sound decisions are made regarding Saskatoon Freeway Project design, development, and mitigation, as to minimize impact to this unique landscape in the Saskatoon Region.

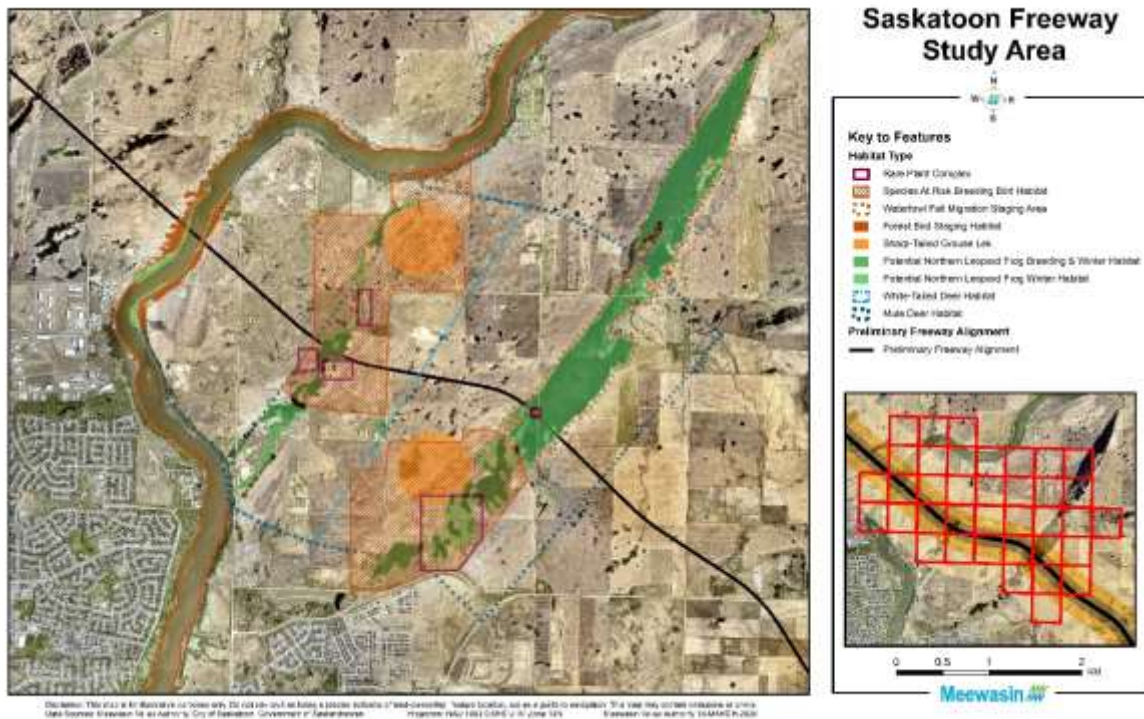


FIGURE 6. Habitat Assessment of the Saskatoon Freeway Project Through the Northeast Swale, Small Swale and the South Saskatchewan River.

References

- Bouvier, N. 2019. Natural Areas Inventory for the City of Saskatoon. Meewasin. Saskatoon, SK.
- City of Saskatoon. 2020. Saskatoon's Green Infrastructure Strategy: Towards an Interconnected Network. City of Saskatoon. Saskatoon, SK.
- Government of Saskatchewan. 2017. Saskatchewan Activity Restriction Guidelines for Sensitive Species. Government of Saskatchewan. Regina, SK.
- Meewasin. 2016. Meewasin Northeast Swale: A Connection to the Past and Future. Meewasin. Saskatoon, SK.
- Ministry of Highways and Infrastructure. Saskatoon Freeways Project. www.saskatoonfreeway.org Accessed: 03-20-2020
- Tomlinson, E., M. Braun and R. Grilz. 2017. Meewasin Valley-wide Resource Management Plan: 2017-2027. Meewasin. Saskatoon, SK.

Data Sources

Bird Studies Canada. (2020) Daily Observation and Point Count Data. [Data file]. Retrieved from <https://sk.birdatlas.ca/>.

City of Saskatoon. (2006). Moose Woods Batoche Trail. [Data File].

City of Saskatoon. (2013) 7.5 cm Orthophotos. [Data file].

City of Saskatoon. (2013). Wetlands. [Data File].

City of Saskatoon. (2017) 7.5 cm Orthophotos. [Data file].

City of Saskatoon. (2018). City Boundary 2018. [Data File].

City of Saskatoon. (2019) 7.5 cm Orthophotos. [Data file].

City of Saskatoon. (2019). Single Line Street Network Data. [Data file]. Retrieved from <http://opendata-saskatoon.cloudapp.net/>.

eBirds. (2020). Presence Point Count Data. [Data file]. Retrieved from ebird.org.

Government of Canada, Agriculture and Agri-Food Canada. (2017) Annual Crop Inventory. [Data file]. Retrieved from <https://open.canada.ca/data/en/dataset/ba2645d5-4458-414d-b196-6303ac06c1c9>.

Government of Canada, Natural Resources Canada. (2016) Digital Elevation Model. [Data file]. Retrieved from <https://open.canada.ca/data>.

Government of Canada, Soil Information Service. (2012) National Soil Database Detailed Soil Surveys - Version 3. [Data file]. Retrieved from <http://sis.agr.gc.ca/cansis/nsdb/dss/index.html>.

Government of Saskatchewan. (2019). Cadastre. [Data file]. Retrieved from <http://gis.saskatchewan.ca/arcgis/rest/services>.

Government of Saskatchewan, Department of Highways. (2019). Preliminary Freeway Alignment. [Data file].

Government of Saskatchewan, Heritage Conservation Branch. (2019). Archaeological Points [Data file].

Government of Saskatchewan, Heritage Conservation Branch (2019). Archaeological Polygons [Data file].

Government of Saskatchewan, Heritage Conservation Branch (2019). Archaeological Trails [Data file].

Government of Saskatchewan, Ministry of Energy and Resources. (2019). 250K Surficial Geology [Data file]. Retrieved from <http://gis.saskatchewan.ca/arcgis/rest/services>.

Government of Saskatchewan, Ministry of Environment, Fish, Wildlife and Lands Branch. (2017). Saskatchewan Activity Restriction Guidelines for Sensitive Species. Retrieved from <https://publications.saskatchewan.ca/#/products/79241>.

Government of Saskatchewan, Saskatchewan Conservation Data Centre. (2014). Taxa List: Non-Native Species. Retrieved from <http://biodiversity.sk.ca/SppList.htm>.

Government of Saskatchewan, Saskatchewan Conservation Data Centre. (2019). Taxa List: Invertebrates. Retrieved from <http://biodiversity.sk.ca/SppList.htm>.

Government of Saskatchewan, Saskatchewan Conservation Data Centre. (2019). Taxa List: Non-Vascular Plants. Retrieved from <http://biodiversity.sk.ca/SppList.htm>.

Government of Saskatchewan, Saskatchewan Conservation Data Centre. (2020). Rare and Endangered Species [Data file]. Retrieved from <http://gis.saskatchewan.ca/arcgis/rest/services>.

Government of Saskatchewan, Saskatchewan Conservation Data Centre. (2020). Taxa List: Vascular Plants. Retrieved from <http://biodiversity.sk.ca/SppList.htm>.

Government of Saskatchewan, Saskatchewan Conservation Data Centre. (2020). Taxa List: Vertebrates. Retrieved from <http://biodiversity.sk.ca/SppList.htm>.

Information Services Corporation. (2018) Surface Parcel Ownership. [Data file].

iMap Invasives (2020). Presence Point Count Data. [Data file]. Retrieved from <https://imapinvasives.natureserve.org>.

iMap Invasives (2020). Presence Polygon Data. [Data file]. Retrieved from <https://imapinvasives.natureserve.org>.

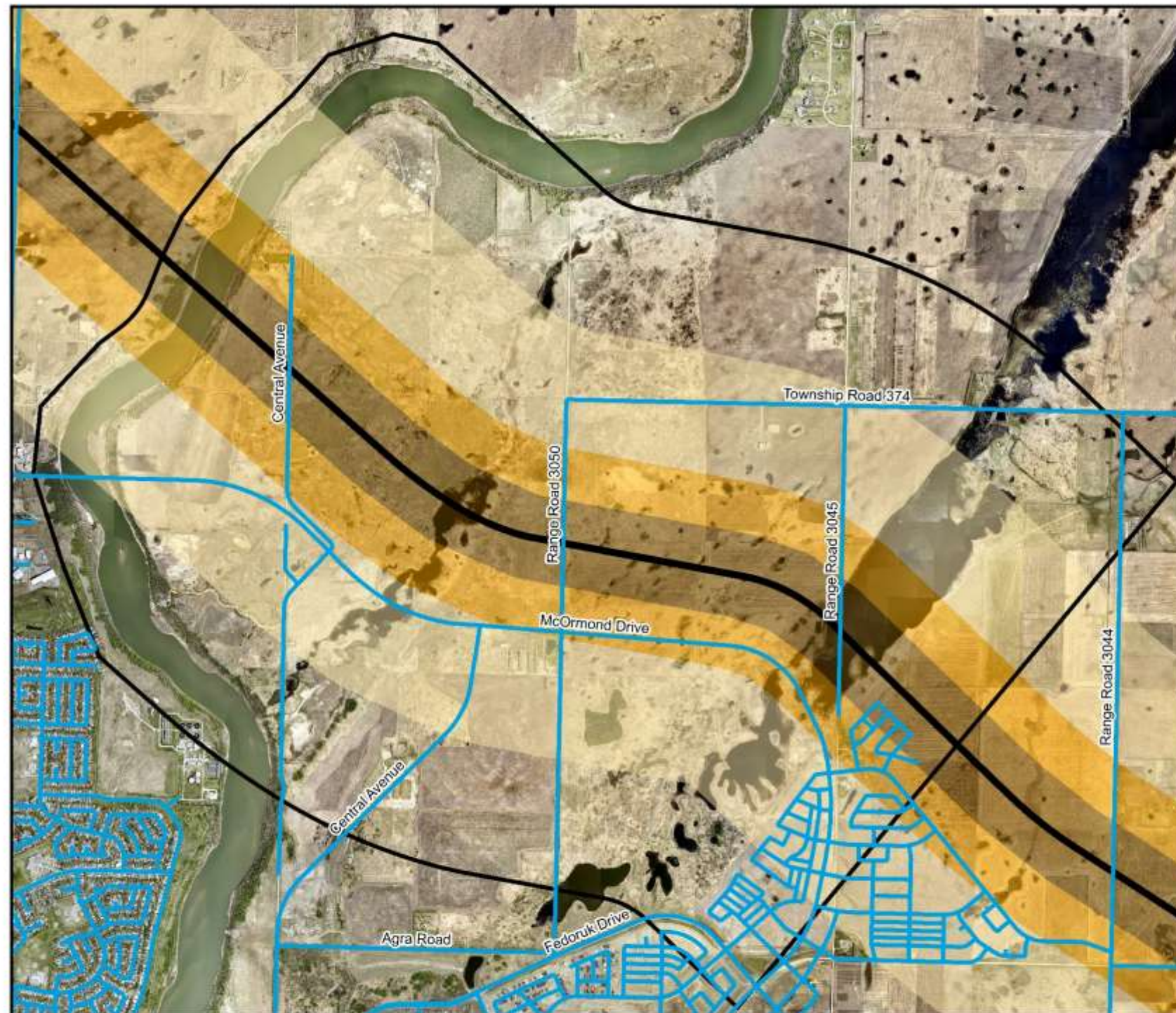
iNaturalist. (2020). Presence Point Count Data. [Data file]. Retrieved from <https://inaturalist.ca/observations>.

Saskatchewan Geospatial Imagery Collaborative. (2016). SPOT Satellite Imagery. [Data file]. Retrieved from <https://www.flysask2.ca/imagery/>.

Stantec Consulting. (2013) Historical Trails 1885. [Data file].

Appendix A: Maps

MAP 1: THE STUDY AREA: HABITAT EVALUATION OF THE SASKATOON FREEWAY PROJECT THROUGH THE SMALL AND NORTHEAST SWALES



Disclaimer: This map is for illustrative purposes only. Do not rely on it as being a precise indicator of land-ownership, feature location, nor as a guide to navigation. This map may contain omissions or errors.
 Data Sources: Meewasin Valley Authority, City of Saskatoon
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 2-MARCH-2020

Saskatoon Freeway Study Area



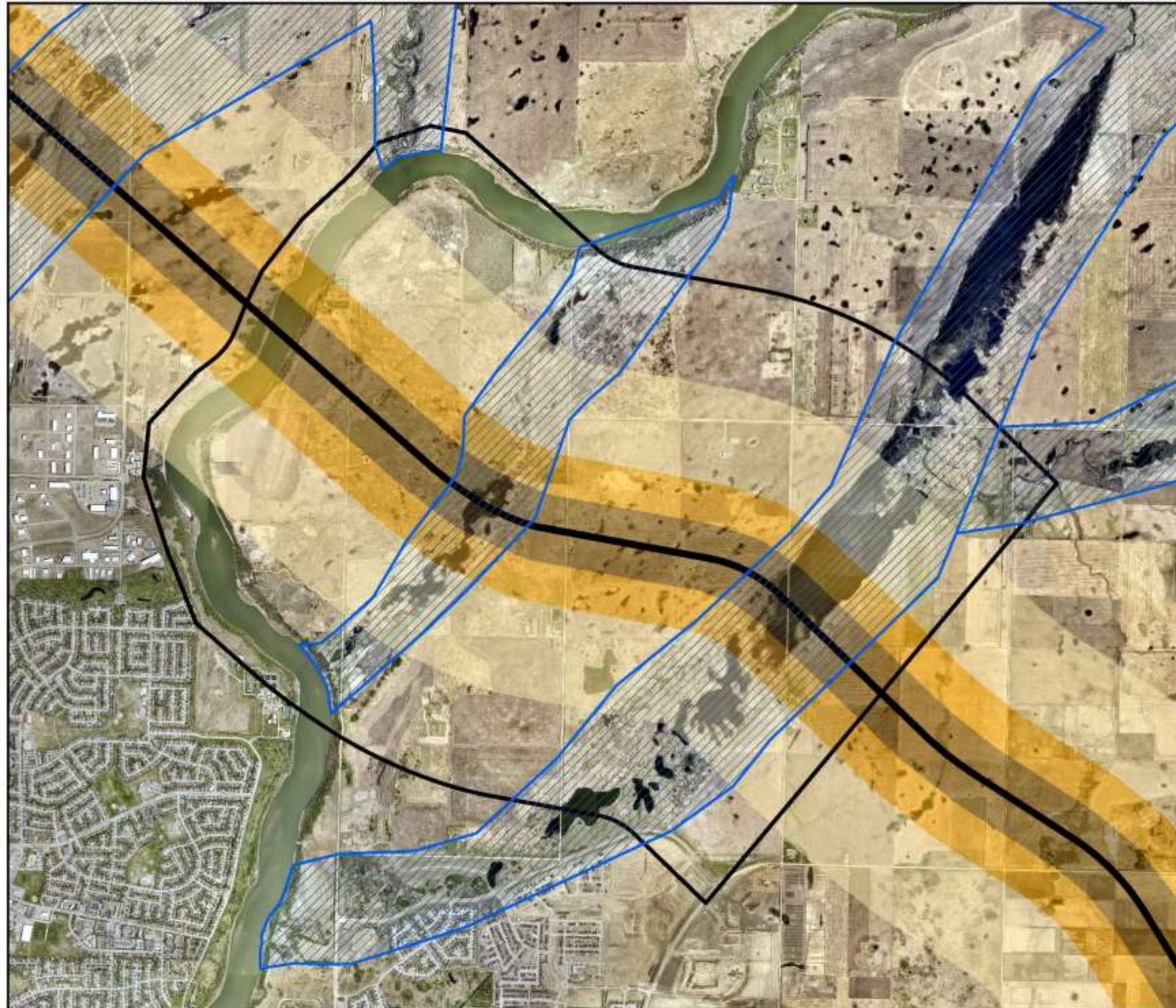
Key to Features

- City of Saskatoon Roadways
- Saskatoon Freeway**
- ROW (250 m)
- Vegetation and Soil Study Area (550 m)
- Wildlife Study Area (1 km)
- Saskatoon Freeway Study Area (2 km)
- Preliminary Freeway Alignment



Meewasin

MAP 2: THE APPROXIMATE LOCATION OF THE NORTHEAST AND SMALL SWALES WITHIN THE STUDY AREA



Disclaimer: This map is for illustrative purposes only. Do not rely on it as being a precise indicator of land-ownership, feature location, nor as a guide to navigation. This map may contain omissions or errors.
 Data Sources: Meewasin Valley Authority, City of Saskatoon
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 2-MARCH-2020

Saskatoon Freeway Study Area



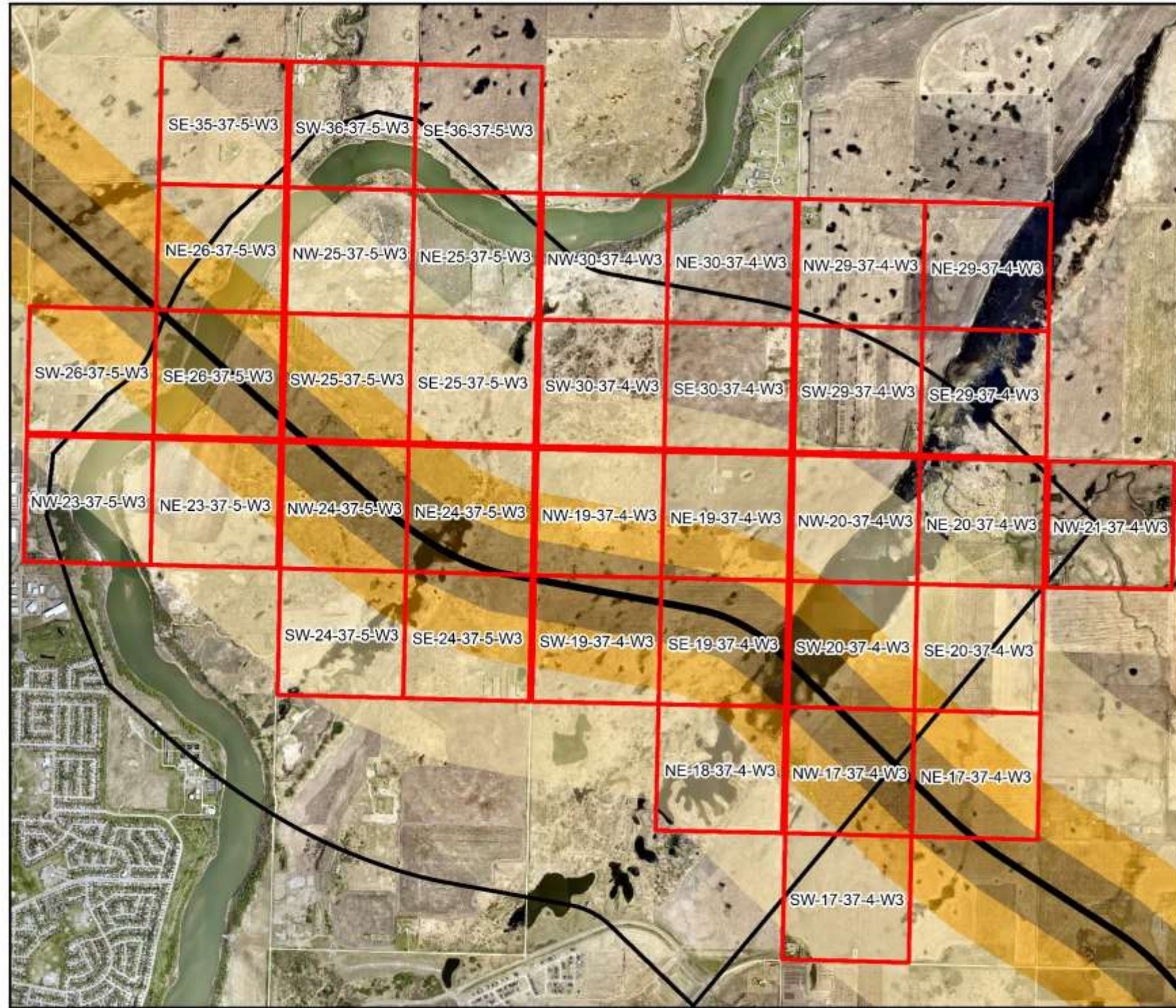
Key to Features

-  Approximate Boundary of Known Swales (post-glacial channel scars)
- Saskatoon Freeway**
-  ROW (250 m)
-  Vegetation and Soil Study Area (550 m)
-  Wildlife Study Area (1 km)
-  Saskatoon Freeway Study Area (2 km)
-  Preliminary Freeway Alignment



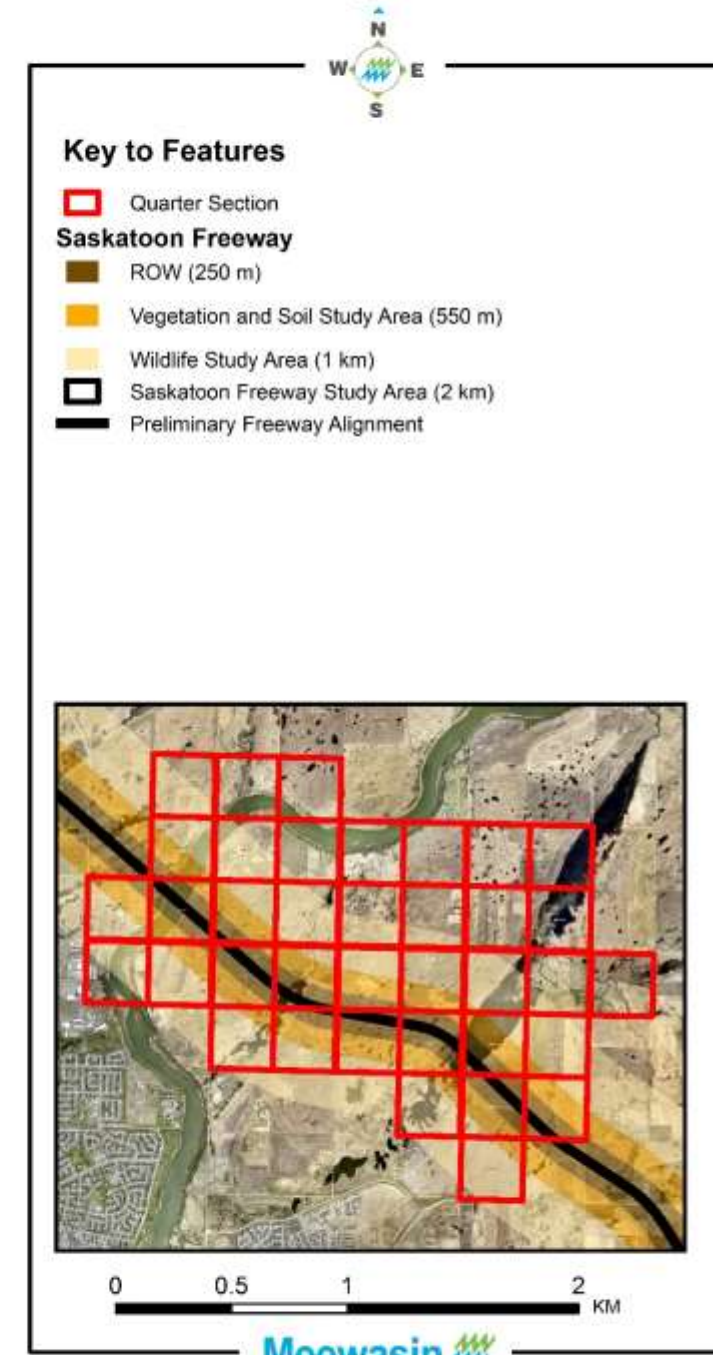
Meewasin 

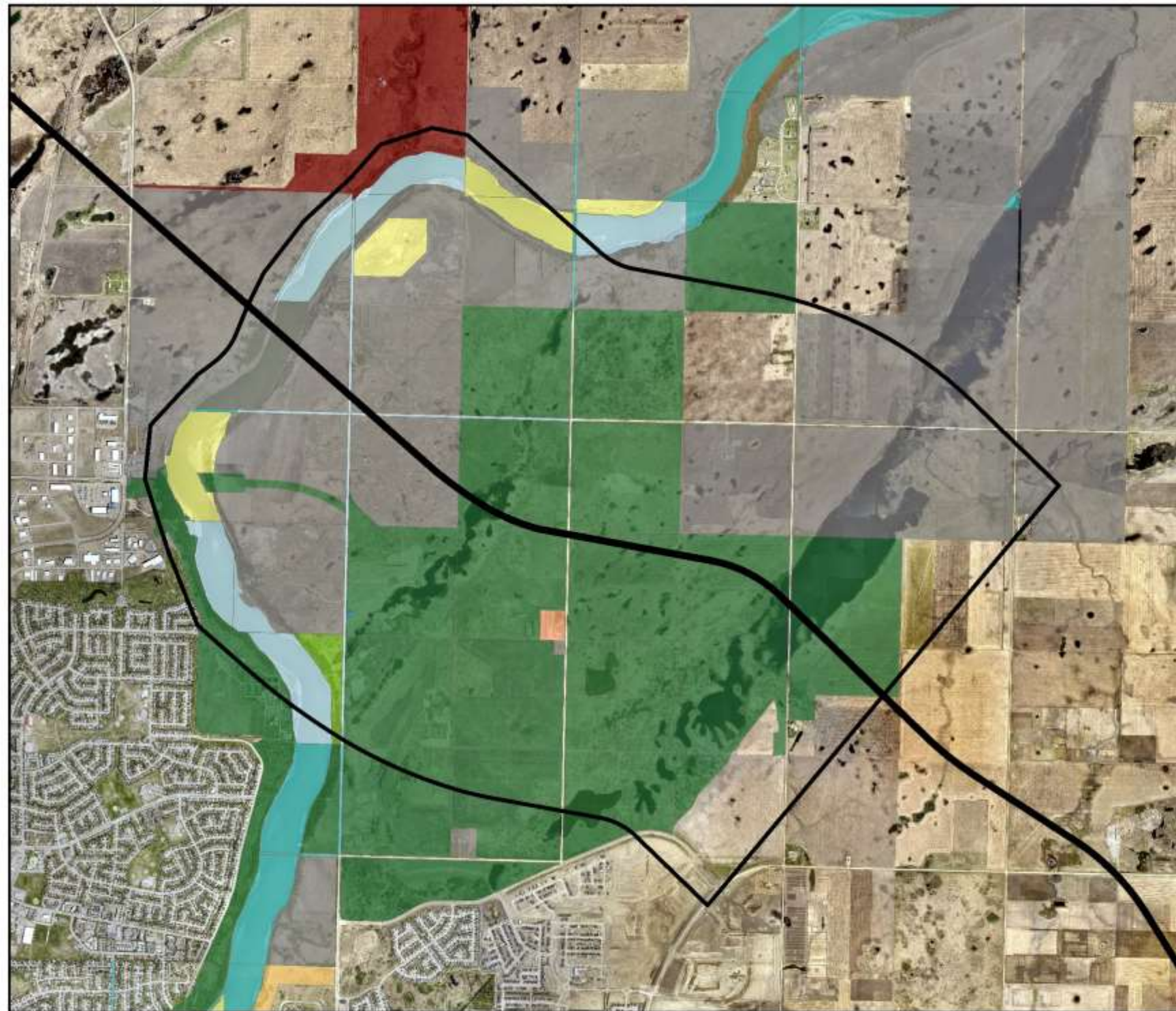
MAP 3: QUARTER SECTIONS WITHIN THE STUDY AREA



Disclaimer: This map is for illustrative purposes only. Do not rely on it as being a precise indicator of land-ownership, feature location, nor as a guide to navigation. This map may contain omissions or errors.
 Data Sources: Meewasin Valley Authority, City of Saskatoon, Government of Saskatchewan
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 2-MARCH-2020

Saskatoon Freeway Study Area





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 Data Sources: Meewasin Valley Authority, City of Saskatoon, Government of Saskatchewan
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 2-MARCH-2020

Saskatoon Freeway Study Area



Key to Features

Ownership, Owner

- Waterbody
- Private
- Private, SaskTel
- Public
- Public, City of Saskatoon
- Public, Government of Saskatchewan
- Public, Meewasin Valley Authority
- Public, RM of Corman Park
- Public, Saskatoon Wildlife Federation
- Public, University of Saskatchewan
- Public, Wanuskewin Heritage Park

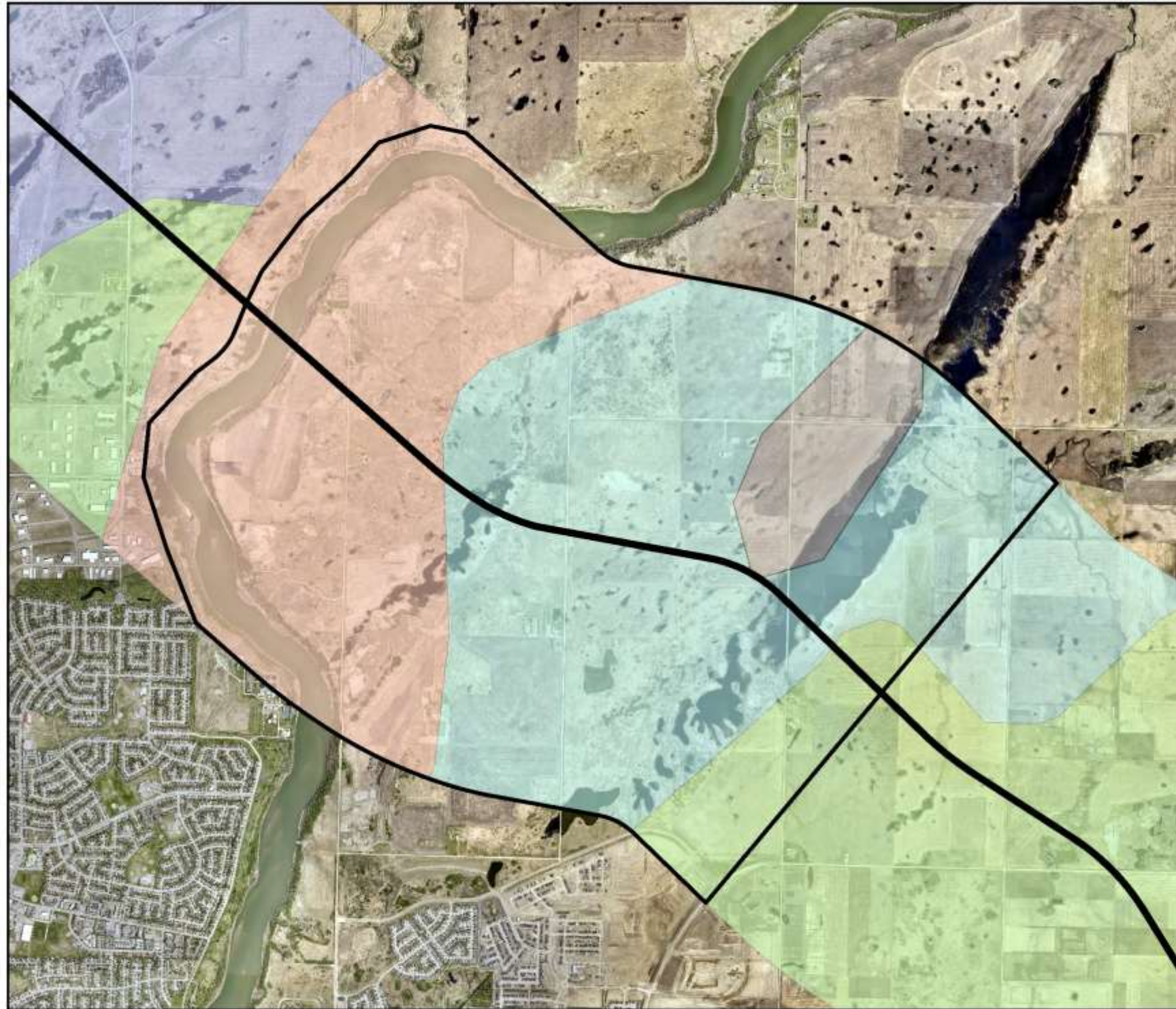
Saskatoon Freeway

- Saskatoon Freeway Study Area (2 km)
- Preliminary Freeway Alignment



0 0.5 1 2 KM





Disclaimer: This map is for illustrative purposes only. Do not rely on it as being a precise indicator of land-ownership, feature location, nor as a guide to navigation. This map may contain omissions or errors.
 Data Sources: Meewasin Valley Authority, City of Saskatoon, Government of Saskatchewan
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 2-MARCH-2020

Saskatoon Freeway Study Area



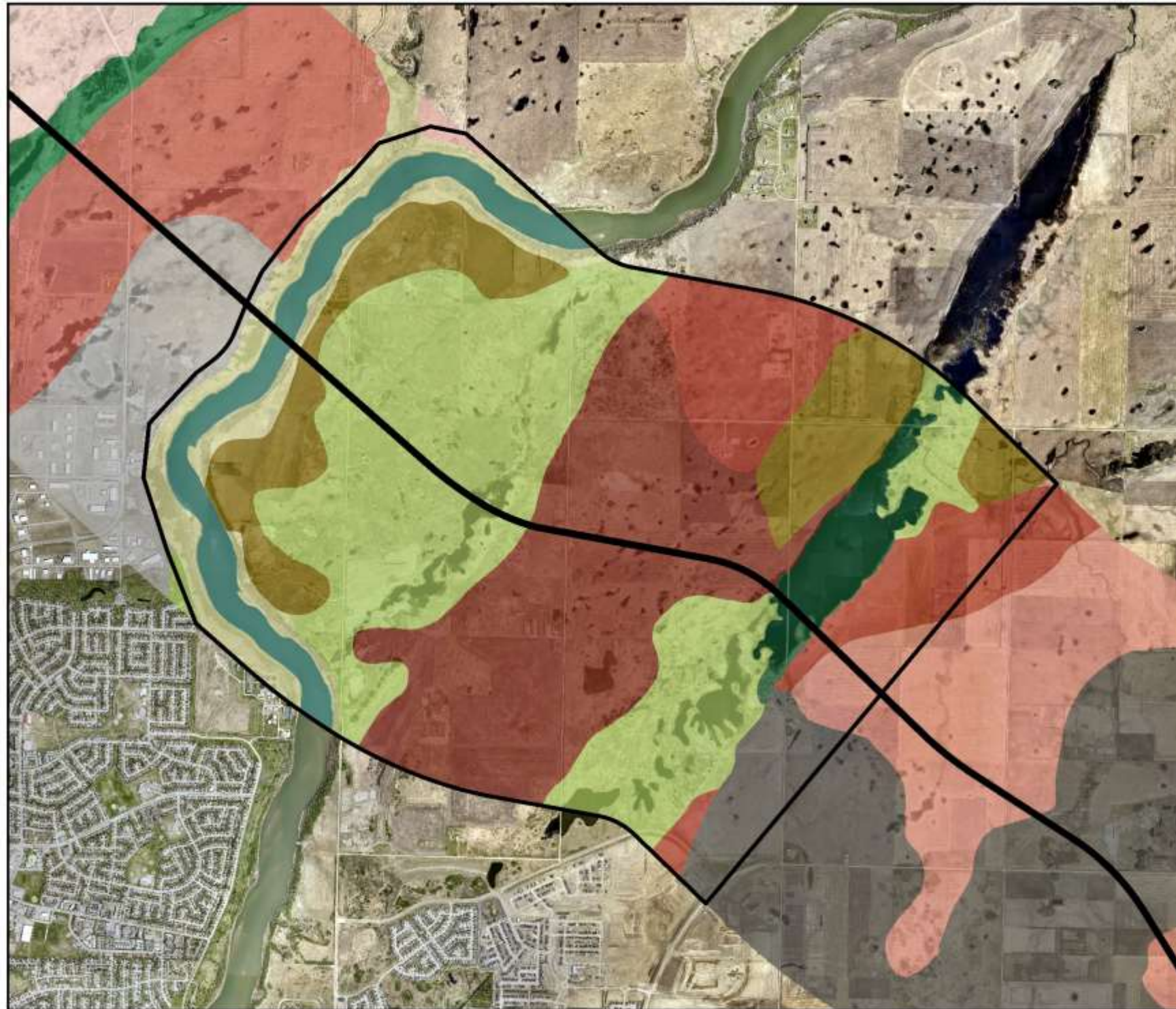
Key to Features

- Alluvial plain
- Glaciolacustrine delta
- Glaciolacustrine plain
- Major meltwater channel
- Moraine plain
- No Data

Saskatoon Freeway

- Saskatoon Freeway Study Area (2 km)
- Preliminary Freeway Alignment





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 Data Sources: Meewasin Valley Authority, City of Saskatoon, Government of Canada
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 2-MARCH-2020

Saskatoon Freeway Study Area



Key to Features

Soil Type

- | | |
|--------------------------|-------------------------|
| River; L | Sandy Loam; Aq 1 |
| Loam, Gravelly**; WrAq 1 | Clay; Su 2 |
| Loam; Br 1 | Clay; SuEw 1 |
| Loam; BrWr 8 | Marsh; Wz 2 |
| Loam; St 3 | Saline Wet Meadow; Av 6 |
| Loam; WrAq 2 | Overflow; Rw |
| Loam; WrBg 1 | Thin, Overflow; Hw |

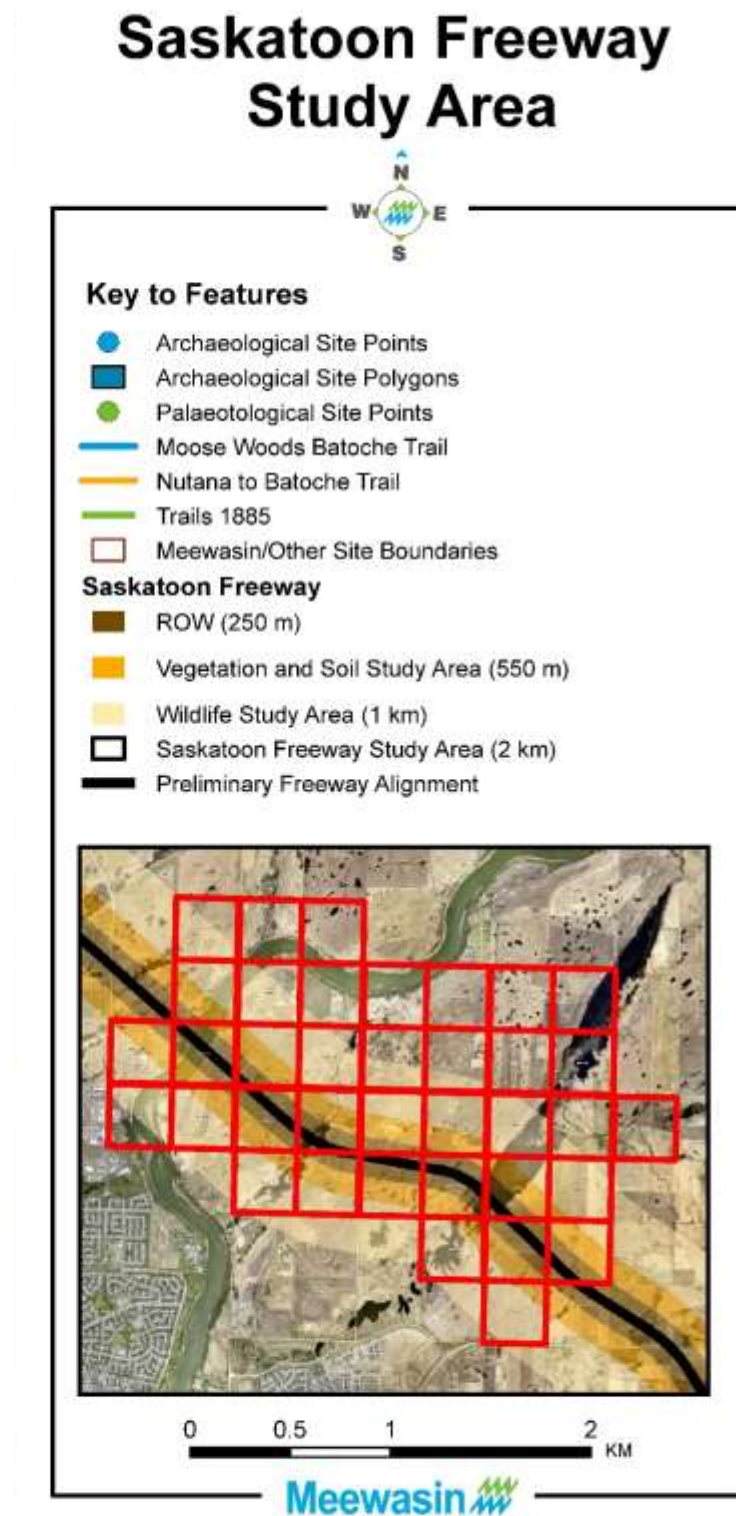
Saskatoon Freeway

- Saskatoon Freeway Study Area (2 km)
- Preliminary Freeway Alignment



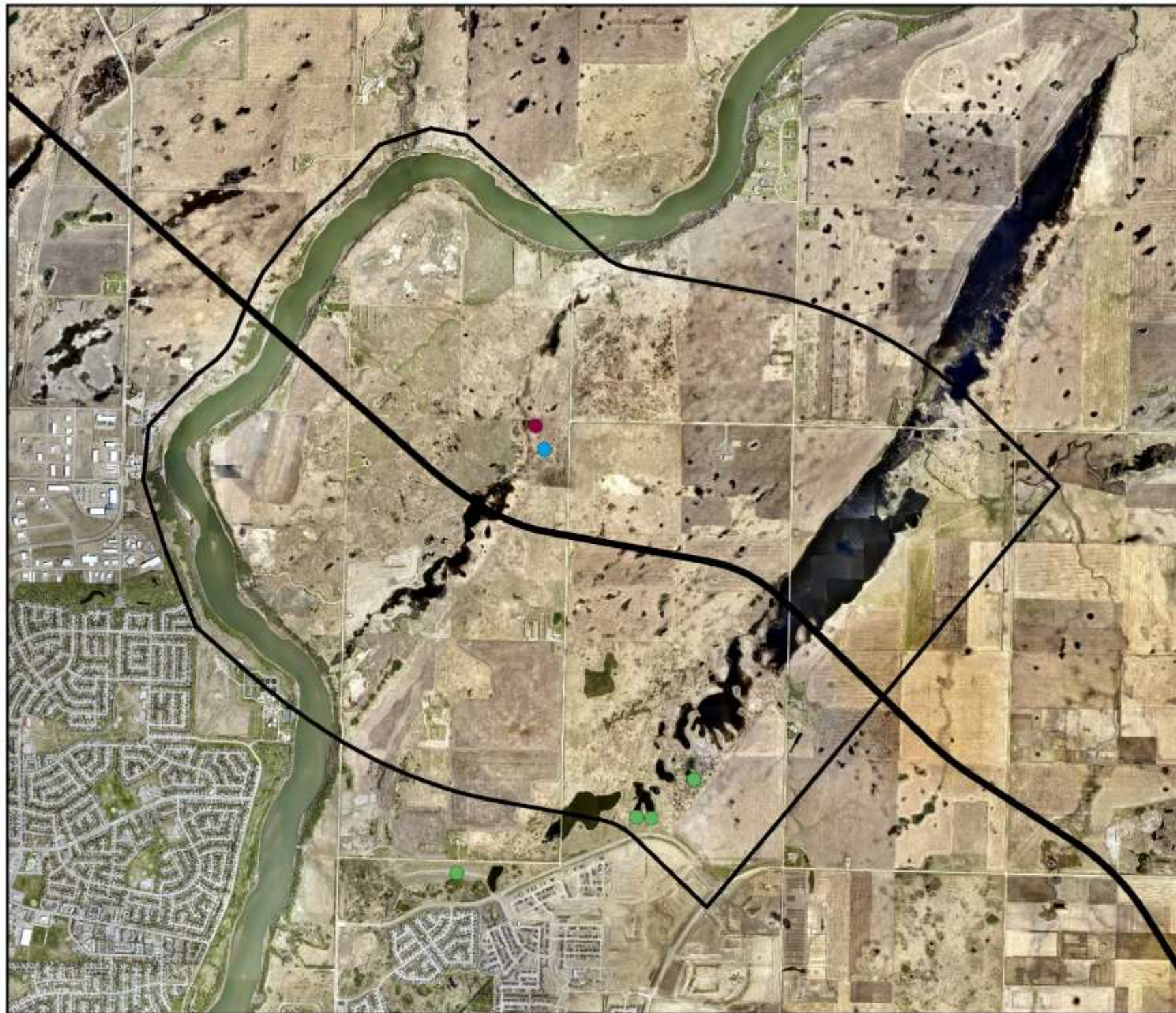
0 0.5 1 2 KM





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 Data Sources: Meewasin Valley Authority, City of Saskatoon, Government of Saskatchewan, Stantec Consulting Projection: NAD 1983 CSRS UTM Zone 13N Meewasin Valley Authority 17-MARCH-2020

Information redacted due to user rights restrictions



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 Meewasin Valley Authority 18-MARCH-2020

Saskatoon Freeway Study Area



Key to Features

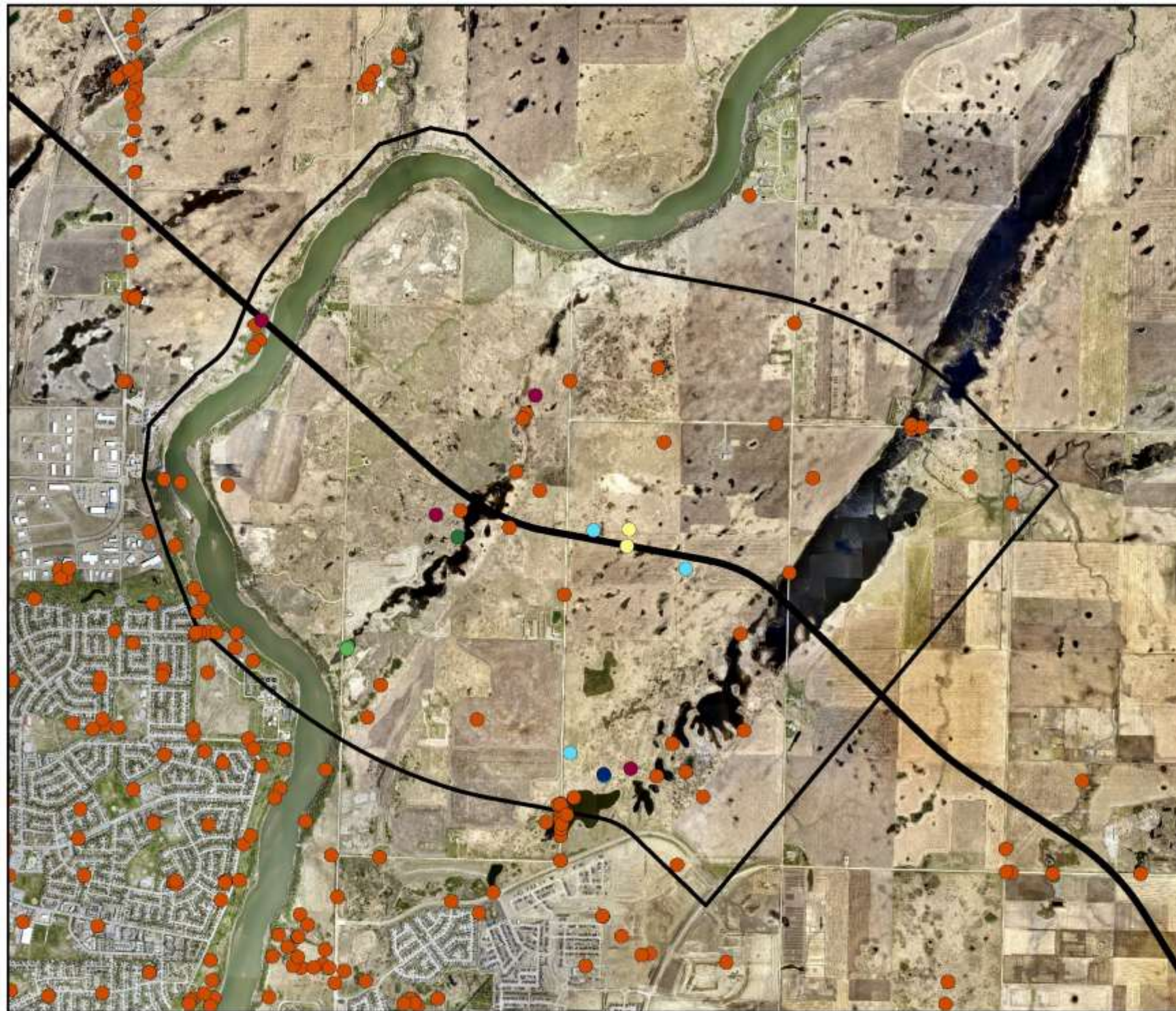
Culturally Significant Records

- Bison Rubbing Stone
- Western Red Lily
- Sweet Grass

Saskatoon Freeway

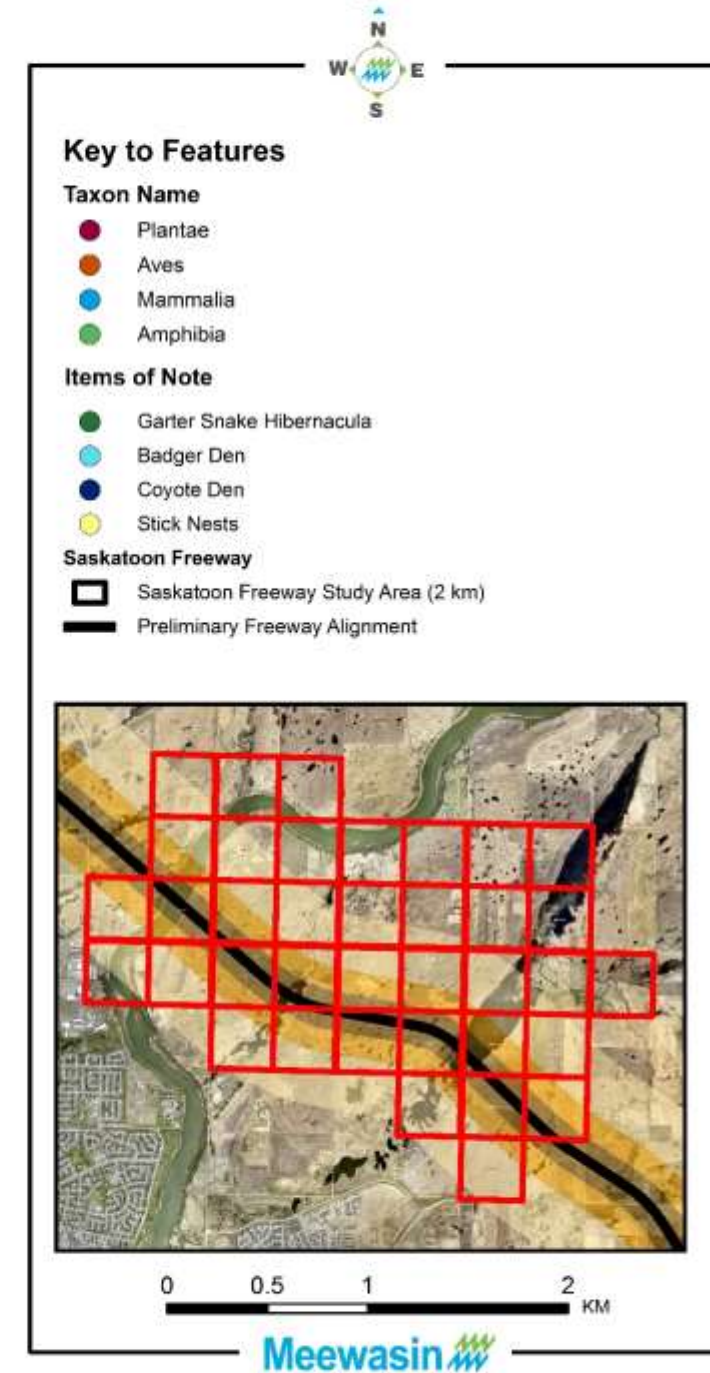
- Saskatoon Freeway Study Area (2)
- Preliminary Freeway

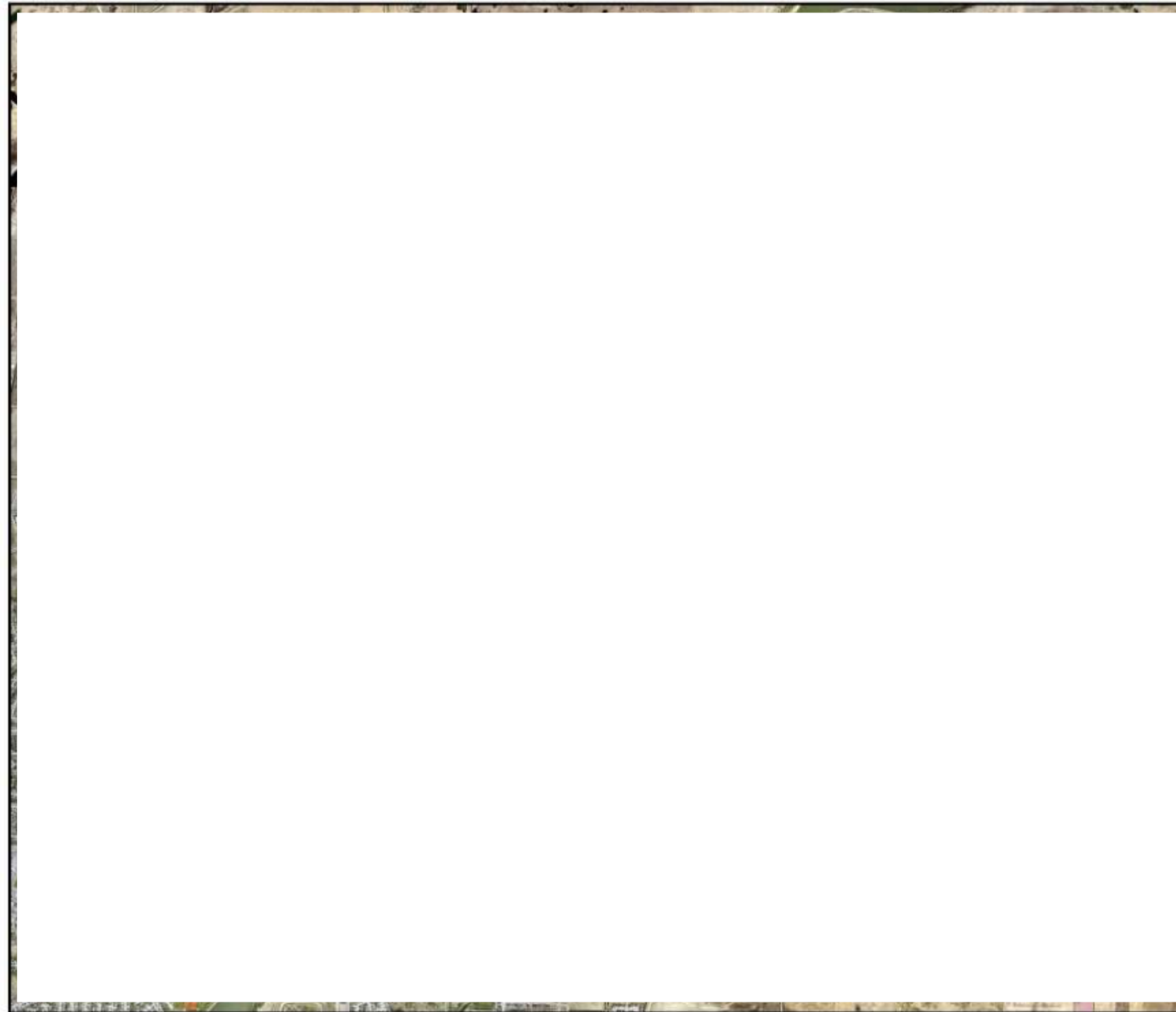




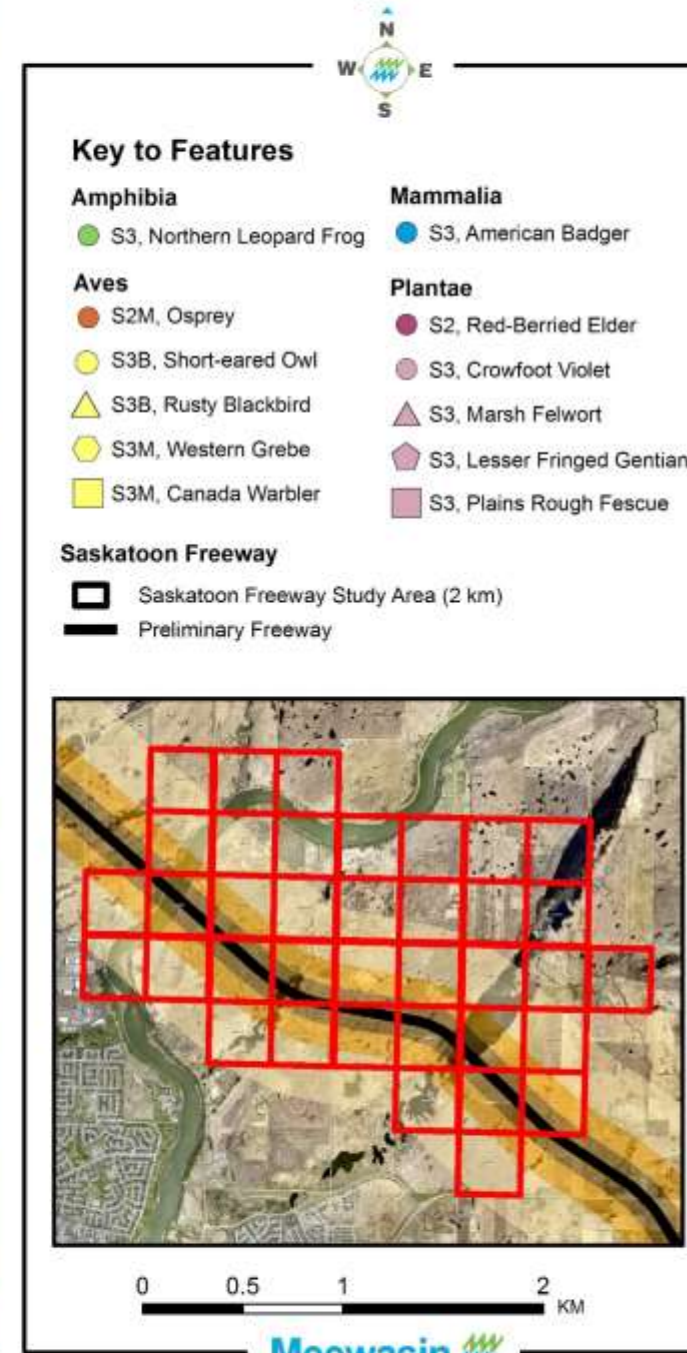
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Saskatoon Freeway Study Area





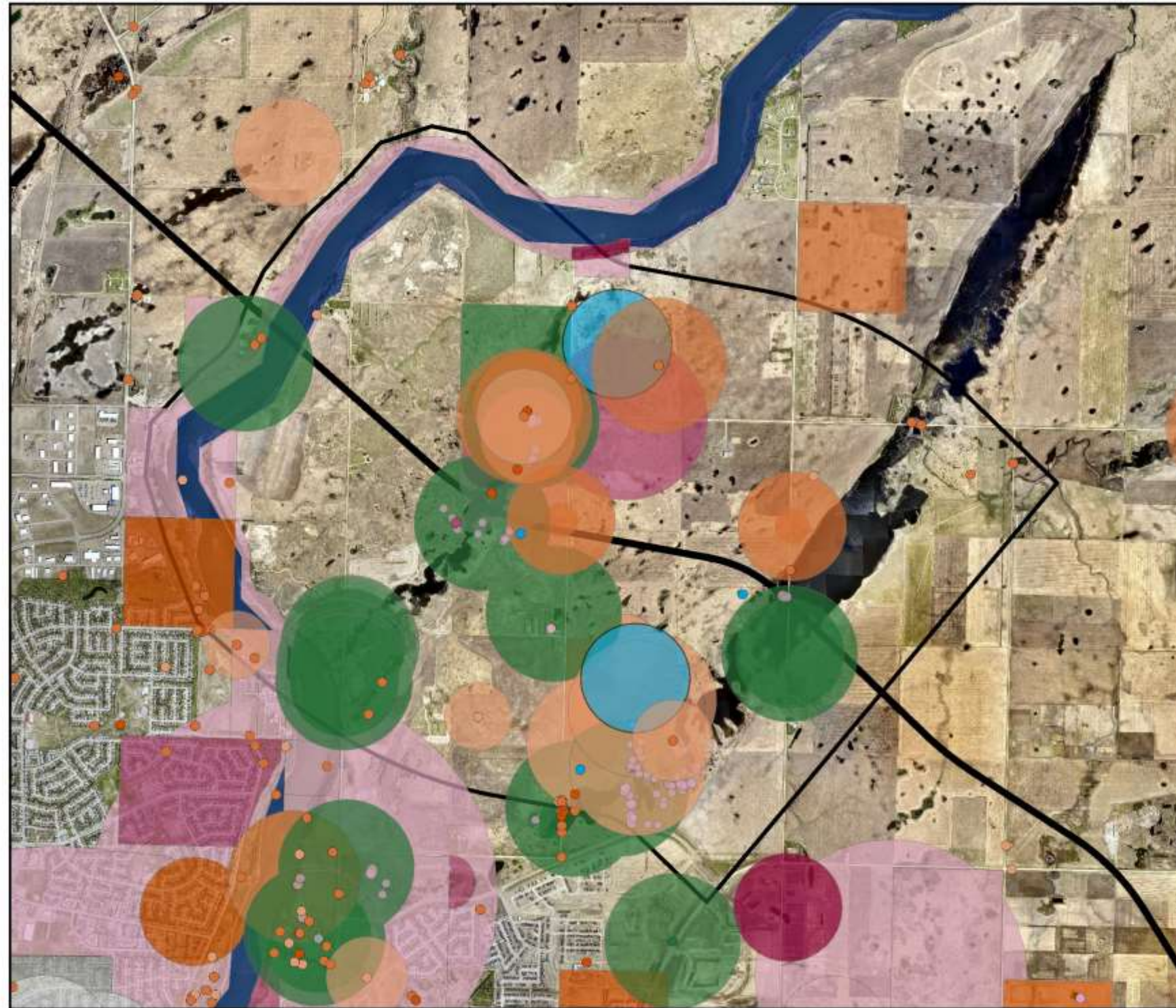
Saskatoon Freeway Study Area



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Redacted due to conservation purposes

MAP 11: SPECIES AT RISK AND RARE SPECIES OCCURENCES, WITH RECOMMENDED SETBACKS, WITHIN THE STUDY AREA



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Saskatoon Freeway Study Area

Key to Features

Item of Note

- Sharp-tailed Grouse Lek

Amphibia

- Amphibia, S3
- Amphibia, S3

Aves

- Aves, S1
- Aves, S1
- Aves, S2
- Aves, S2
- Aves, S3
- Aves, S3

Fishes

- Fishes, S2

Insecta

- Insecta, S2
- Insecta, S2
- Insecta, S3

Mammalia

- Mammalia, S3

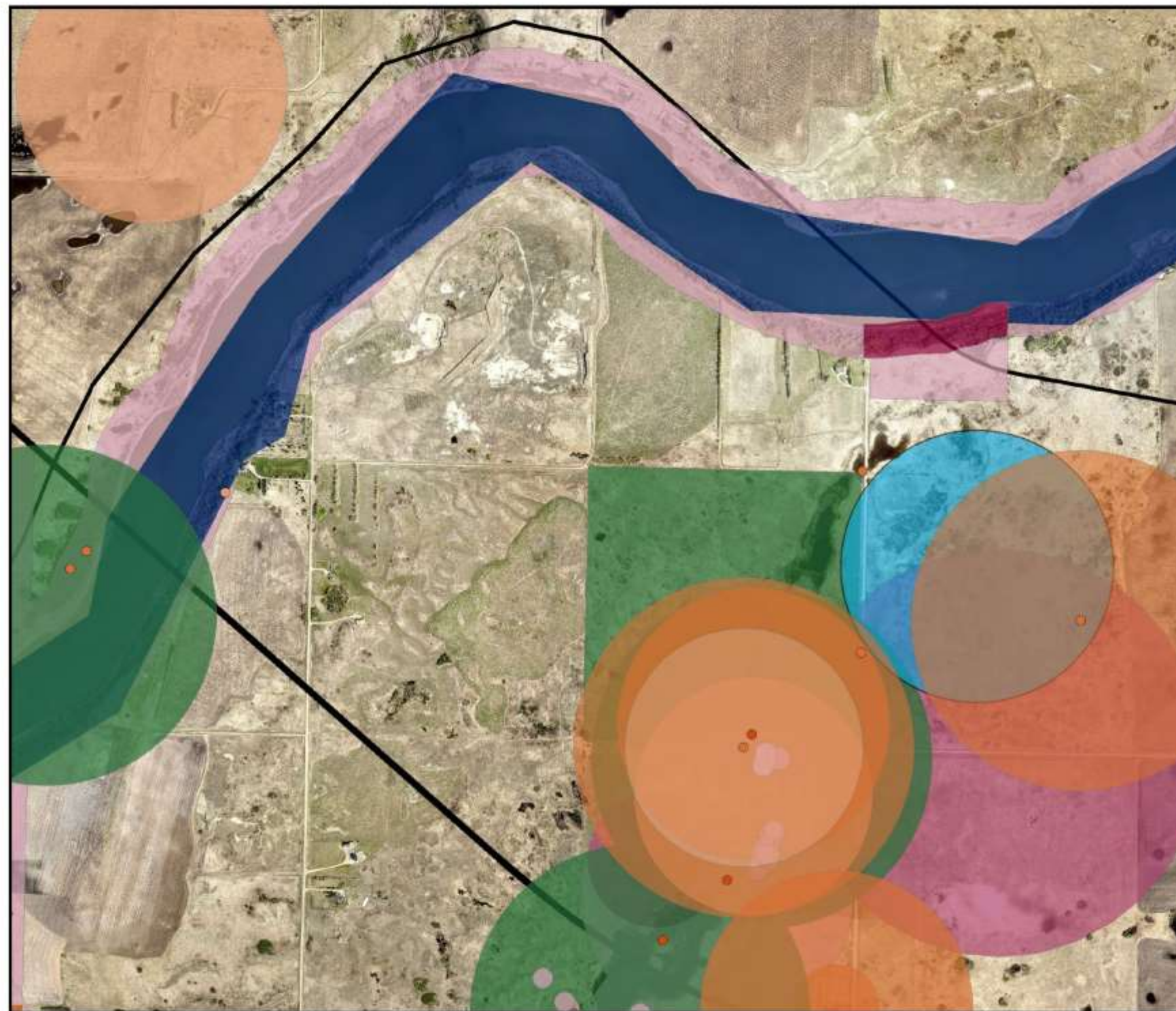
Plantae

- Plantae, S1
- Plantae, S1
- Plantae, S2
- Plantae, S2
- Plantae, S3
- Plantae, S3

Saskatoon Freeway

- Saskatoon Freeway Study Area (2)
- Preliminary Freeway

Meewasin



Saskatoon Freeway Study Area

Key to Features

Item of Note

- Sharp-tailed Grouse Lek

Amphibia

- Amphibia, S3
- Amphibia, S3

Aves

- Aves, S1
- Aves, S1
- Aves, S2
- Aves, S2
- Aves, S3
- Aves, S3

Fishes

- Fishes, S2

Insecta

- Insecta, S2
- Insecta, S2
- Insecta, S3

Mammalia

- Mammalia, S3

Plantae

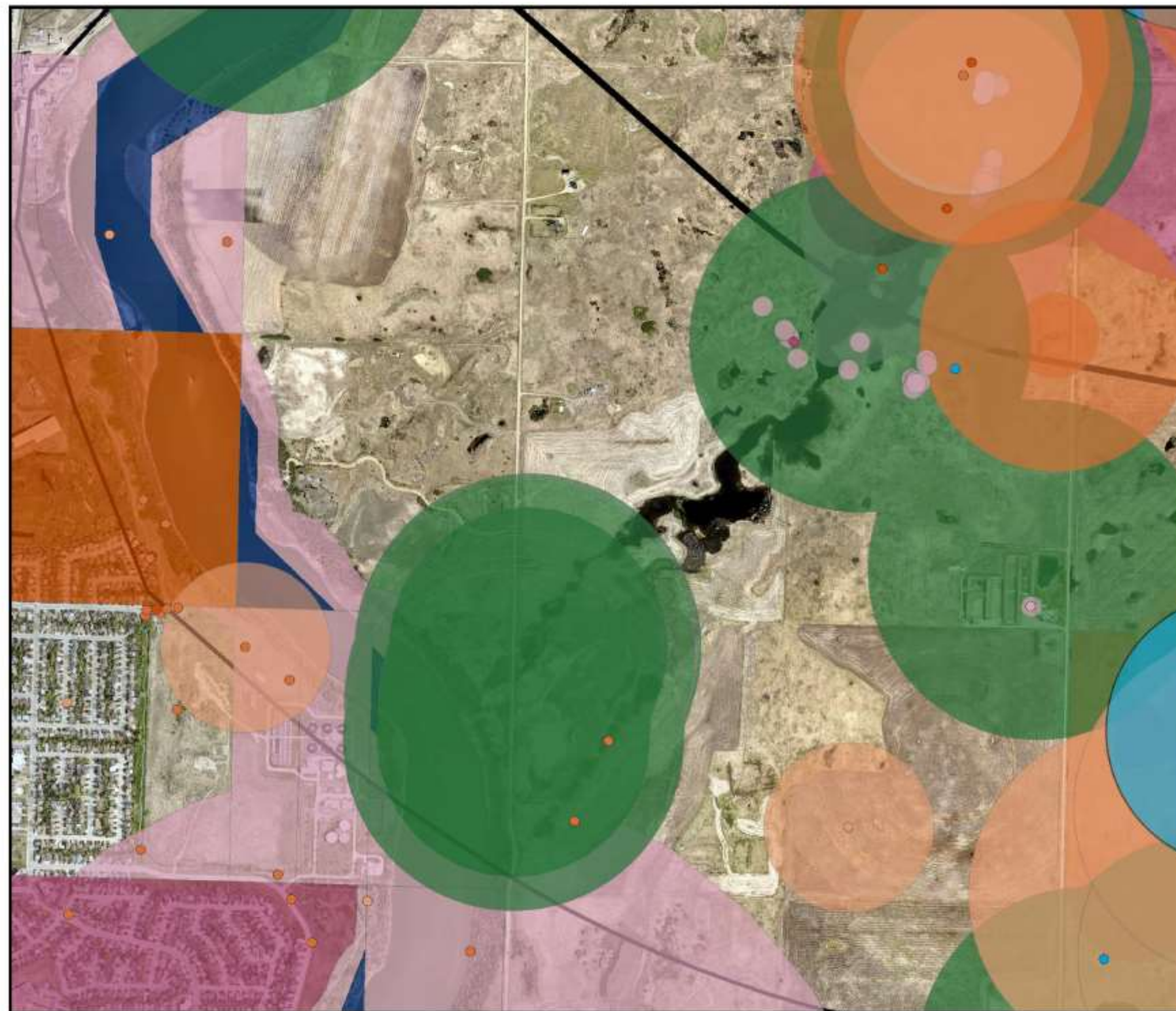
- Plantae, S1
- Plantae, S1
- Plantae, S2
- Plantae, S2
- Plantae, S3
- Plantae, S3

Saskatoon Freeway

- Saskatoon Freeway Study Area (2)
- Preliminary Freeway

Meewasin

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Saskatoon Freeway Study Area

Key to Features

Item of Note

- Sharp-tailed Grouse Lek

Amphibia

- Amphibia, S3
- Amphibia, S3

Aves

- Aves, S1
- Aves, S1
- Aves, S2
- Aves, S2
- Aves, S3
- Aves, S3

Fishes

- Fishes, S2

Insecta

- Insecta, S2
- Insecta, S2
- Insecta, S3

Mammalia

- Mammalia, S3

Plantae

- Plantae, S1
- Plantae, S1
- Plantae, S2
- Plantae, S2
- Plantae, S3
- Plantae, S3

Saskatoon Freeway

- Saskatoon Freeway Study Area (2)
- Preliminary Freeway

Meewasin

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Saskatoon Freeway Study Area



Key to Features

Item of Note

- Sharp-tailed Grouse Lek

Amphibia

- Amphibia, S3
- Amphibia, S3

Aves

- Aves, S1
- Aves, S1
- Aves, S2
- Aves, S2
- Aves, S3
- Aves, S3

Fishes

- Fishes, S2

Insecta

- Insecta, S2
- Insecta, S2
- Insecta, S3

Mammalia

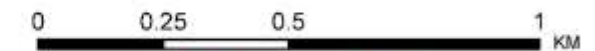
- Mammalia, S3

Plantae

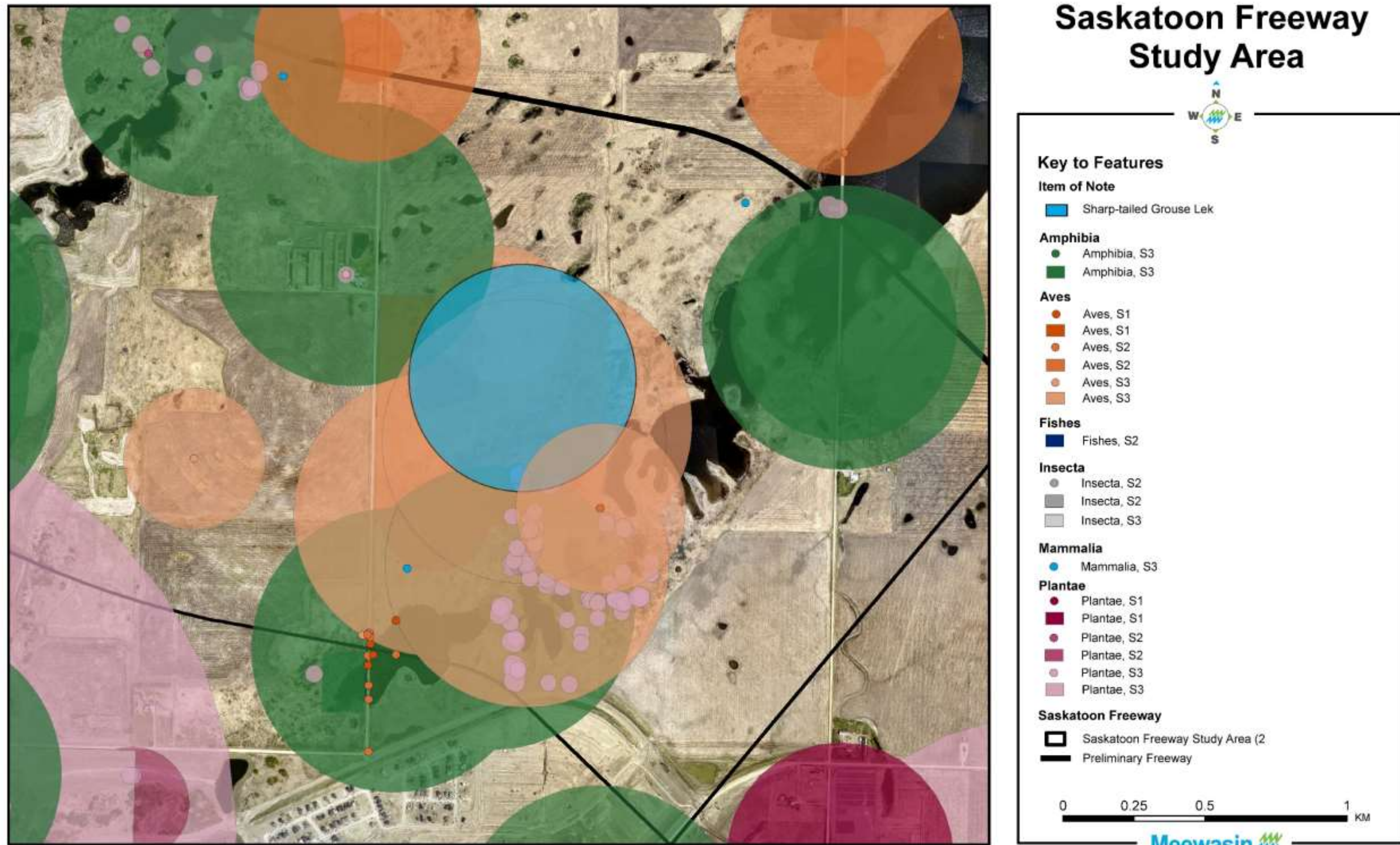
- Plantae, S1
- Plantae, S1
- Plantae, S2
- Plantae, S2
- Plantae, S3
- Plantae, S3

Saskatoon Freeway

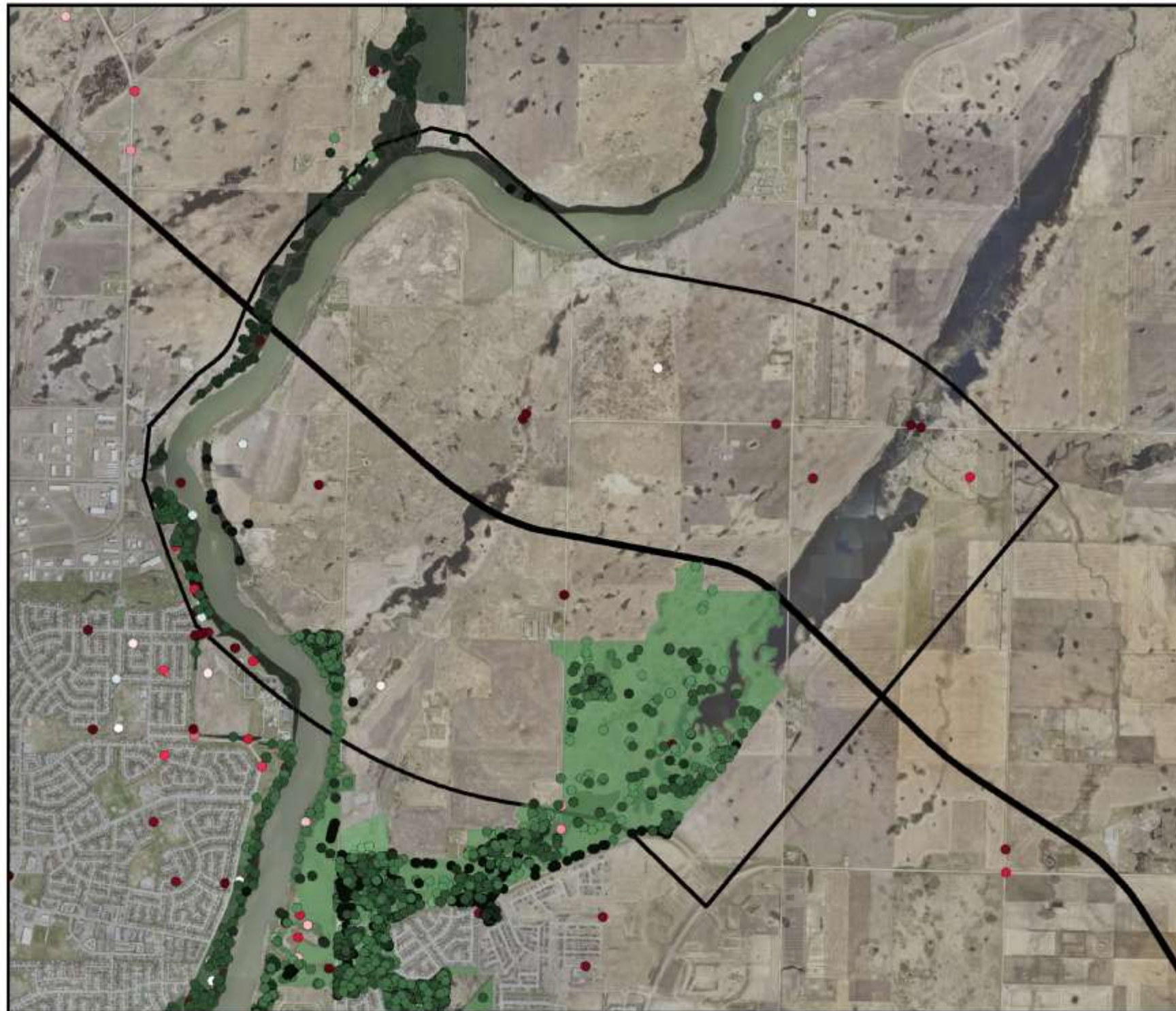
- Saskatoon Freeway Study Area (2)
- Preliminary Freeway



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 Data Sources: Meewasin Valley Authority, City of Saskatoon, IMap Invasives
 Projection: NAD 1983 CSRS UTM Zone 13N
 Meewasin Valley Authority 24-MARCH-2020

Saskatoon Freeway Study Area



Key to Features

Plantae

- Pre-2011
- Pre-2011
- 2013
- 2013
- 2014
- 2014
- 2015
- 2015
- 2016
- 2016
- 2017
- 2017
- 2018
- 2018
- 2019
- 2019

Aves

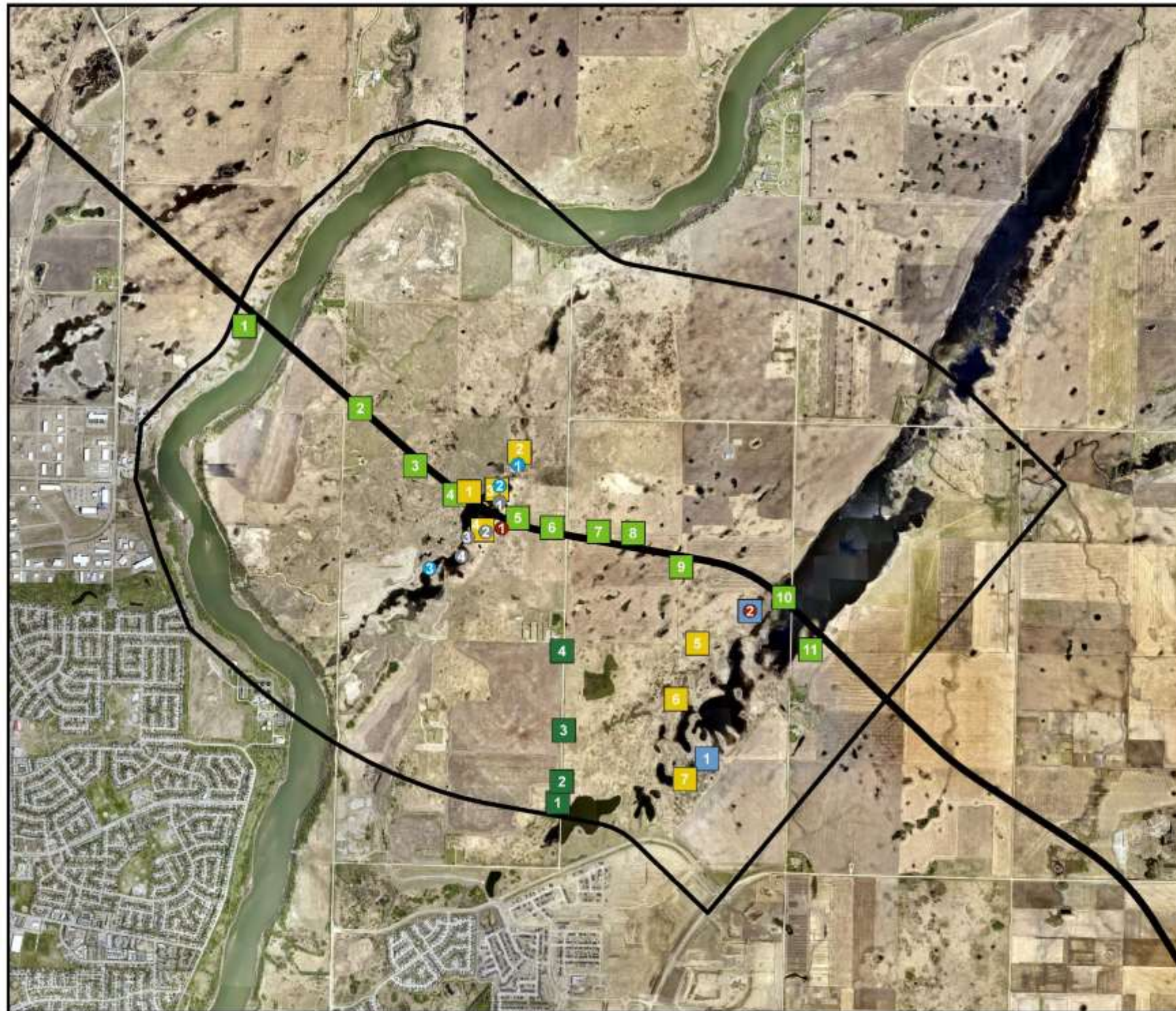
- Pre-2011
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020

- #### Saskatoon Freeway
- Saskatoon Freeway Study Area (2 km)
 - Preliminary Freeway Alignment



0 0.5 1 2 KM





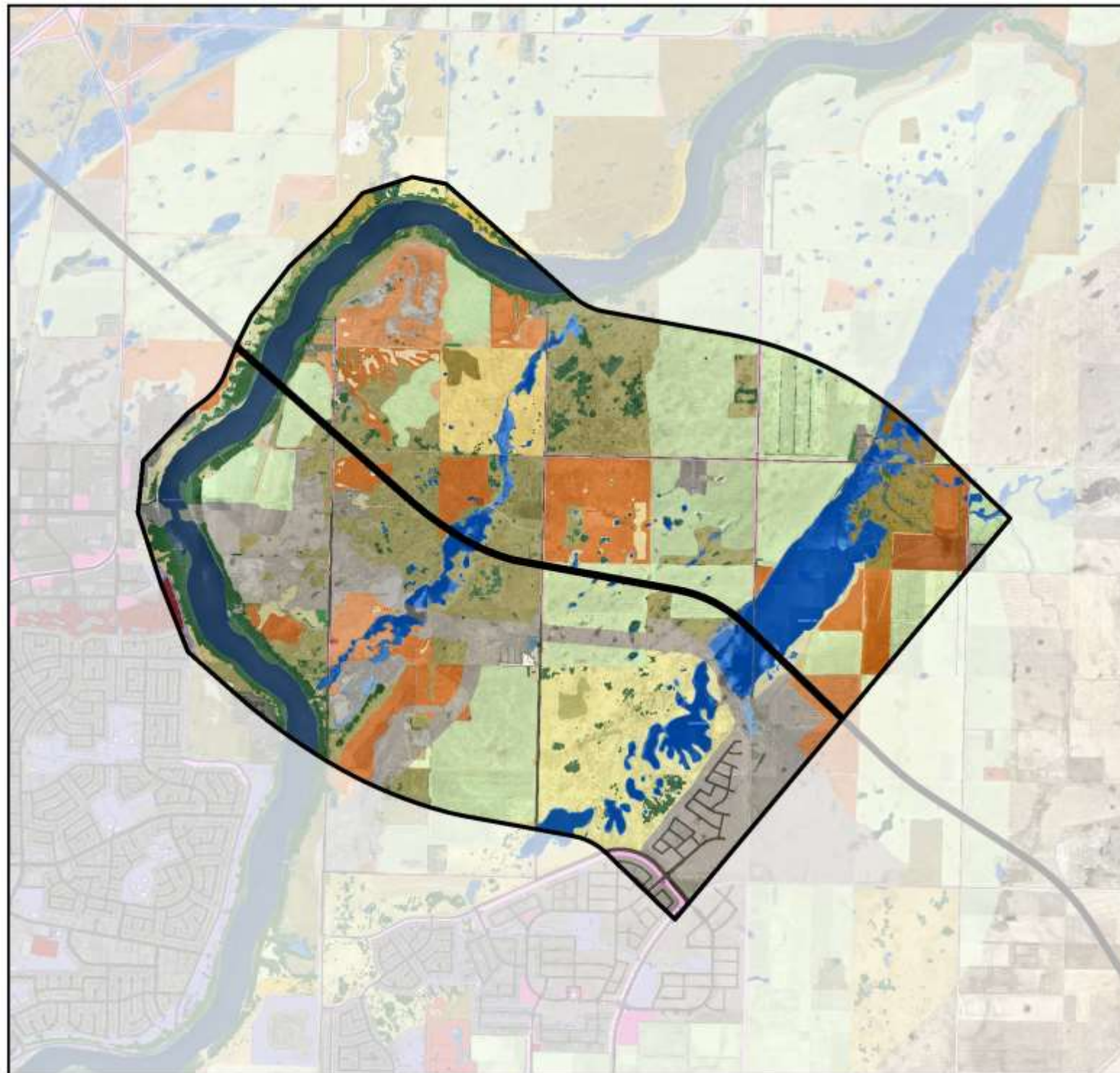
Saskatoon Freeway Study Area

Key to Features

Trail Camera Monitoring Locations		
Permanent Monitoring Plots	Low Road Project Monitoring	
1 TRCM-1020	1 LOWERD-XING04	
2 TRCM-1118	2 LOWERD-XING01	
Saskatoon Freeway Project		
1 TRCM-SFP-SE26A	3 LOWERD-XING02	
2 TRCM-SFP-SW26	4 LOWERD-XING03	
3 TRCM-SFP-NW24A	Temporary Monitoring	
4 TRCM-SFP-SW19C	1 TRCM02-SS-T-1219	
5 TRCM-SFP-SW19B	2 TRCM04-SS-T-1219	
6 TRCM-SPF-NE24A	3 TRCM03-SS-T-1219	
7 TRCM-SFP-SW19A	4 TRCM01-SS-T-1219	
8 TRCM-SFP-NW19A	5 TRCM03-0420	
9 TRCM-SPF-SE19B	6 TRCM02-0420	
10 TRCM-SFP-SE19A	7 TRCM-NES-1007	
11 TRCM-SFP-SW20A		
Water Quality & Macroinvertebrate Monitoring		
Water Quality	Water Quality & Macroinvertebrate	
1 North Oval Pond	1 Large Pond North #1	
2 Large Pond North #2	2 Tiny Pond	
3 Road Pond	3 Large Pond South	
	4 South Pond #1	
Dark Sky Meter Monitoring		
1 SQM-SS-001		
2 SQM-NES-001		
Saskatoon Freeway		
▭	Saskatoon Freeway Study Area (2 km)	
—	Preliminary Freeway Alignment	

Meewasin

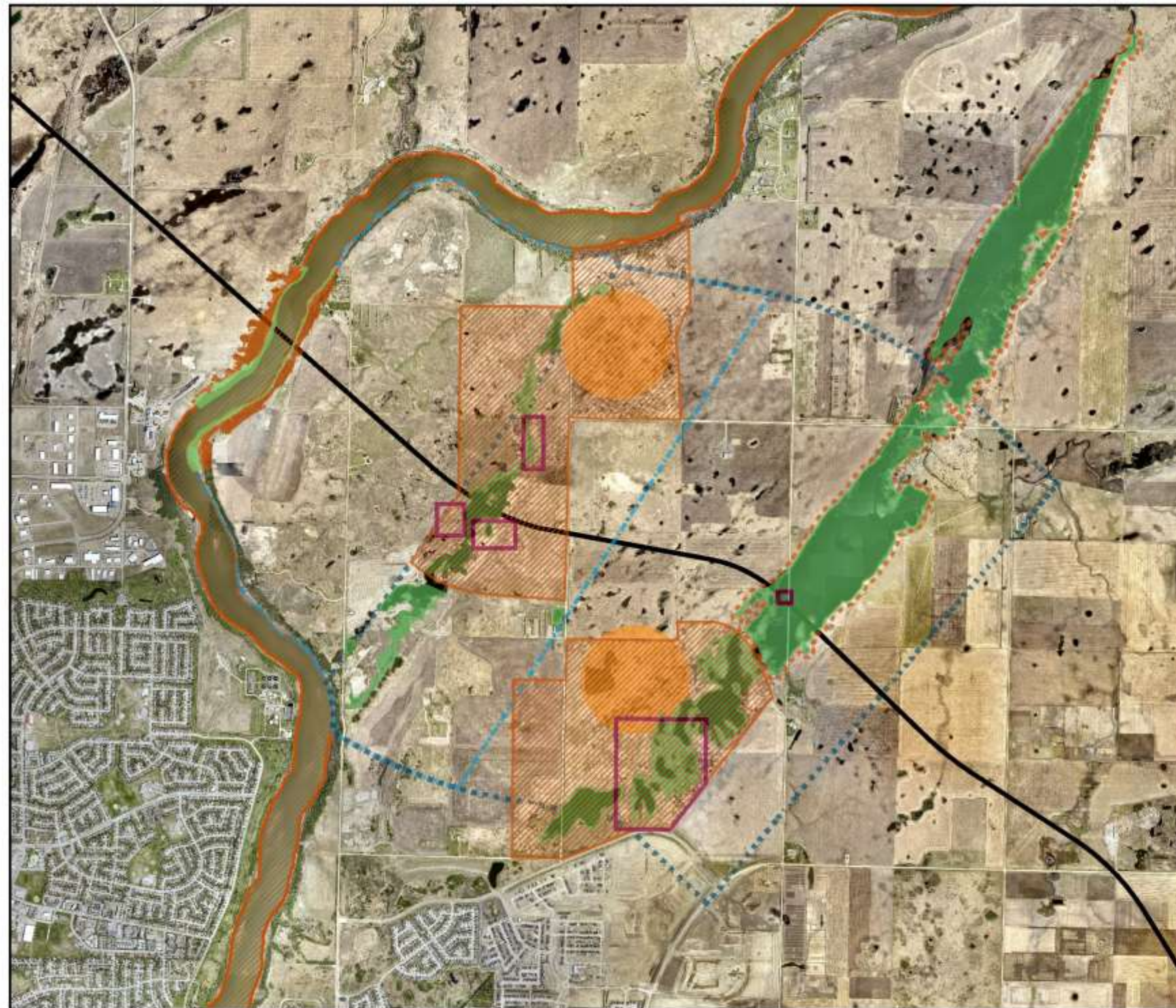
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 Meewasin Valley Authority 24-MARCH-2020



Saskatoon Freeway Study Area



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 Meewasin Valley Authority 2-MARCH-2020



Saskatoon Freeway Study Area



Key to Features

Habitat Type

-  Rare Plant Complex
-  Species At Risk Breeding Bird Habitat
-  Waterfowl Fall Migration Staging Area
-  Forest Bird Staging Habitat
-  Sharp-Tailed Grouse Lek
-  Potential Northern Leopard Frog Breeding & Winter Habitat
-  Potential Northern Leopard Frog Winter Habitat
-  White-Tailed Deer Habitat
-  Mule Deer Habitat

Preliminary Freeway Alignment

-  Preliminary Freeway Alignment



Meewasin 

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 Meewasin Valley Authority 18-MARCH-2020

Appendix B: Tables

TABLE 1: BUILT ENVIRONMENT LAND COVER ASSESSMENT CRITERIA

Category	Subcategory 1	Subcategory 2	Subcategory 3	Subcategory 4	Subcategory 5	Definition: Form, Management, Use, Ecological Value	Anthropogenic Intensity	Attribute Table Code	
Built Environment						Built Environment: An environment where artificial surfaces predominantly comprise the land cover. These surroundings are created for humans, by humans, to be used for human activity. While anthropogenic in nature, such spaces can support synanthropic species and include nested natural areas (ex. backyards, private property trees).		Built	
	Urban & Rural Development					Built environments within their respective urban and rural contexts. This category includes residential, commercial, and other land uses characterized by high degrees of modification and artificial surfaces, which are not otherwise captured by other built environment categories.	Modified Area	URD	
	Outdoor Recreation Facilities					A classification of the built environment that captures outdoor private and civic facilities nested within ecological environments. These spaces are characterized by their high degree of modification of the ecological environments they are constructed within and high levels of imperviousness or hard landscaping. The extent may be based upon the site foot print (ex. Shakespeare on the Saskatchewan) or the constructed facility footprint. (ex. skate park).	Modified Area	RF	
	Agricultural Operations					A classification of the built environment that captures agricultural production characterized by a high degree of modification to the natural areas and includes: farm yards which are distinct from single parcel country residential site footprints, agriculture research centres, manufacturing facilities related to agriculture, and intensive agricultural operations. The extent of the site footprint is determined by the presence of facilities, equipment, landscaping and maintenance.	Modified Area	AG	
	Industrial					A classification of the built environment that captures developed lands zoned or visibly used for the purposes of industrial operations.	Modified Area	IND	
	Road & Rail					A classification of the built environment that captures transportation network infrastructure including paved roadways and walkways, as well as railways and rail yards.	Modified Area	RRW	
	Exposed & Barren						Exposed & Barren: A classification of the built environment that captures recent or lasting human-made disturbances which have led to the exposure of soil and low levels of vegetation.		EB
		Development					An environment of exposed soil and relatively low levels of vegetation for the purposes of development and other anthropogenic uses.	Modified Area	DEV
Informal Road & Trail						An environment of exposed soil and relatively low levels of vegetation generated for or by human or motor vehicle traffic. This category includes informal roads and trails that are not paved (i.e. access roads).	Modified Area	RT	

TABLE 2: ECOLOGICAL ENVIRONMENT LAND COVER ASSESSMENT CRITERIA

Category	Subcategory 1	Subcategory 2	Subcategory 3	Subcategory 4	Subcategory 5	Definition: Form, Management, Use, Ecological Value	Anthropogenic Intensity	Attribute Table Code			
Ecological Environments	Native & Naturalized Environments	Grassland Systems				Ecological Environment: An environment where natural surfaces predominantly comprise the land cover. These surroundings are low in anthropogenic intensity/range.		Eco			
						Native & Naturalized Environments: Includes public and non-publicly accessible natural areas with lower degrees of anthropogenic intensity, as opposed to green space.		NNE			
						Grassland Systems: Ecosystem characterized by dominant grass cover.		G			
					Cropland			Land used for the commercial production of field crops (includes summer fallow), fruits, field vegetables, sod or nursery.	Modified Natural Area	Crop	
					Tame Forage			Tame Forage: Less Naturalized characteristics (i.e. shrub presence), dominant grass cover, less shrubs and other successional species present.	Modified Natural Area	TF	
						Agricultural Production		Agricultural Production: Grassland system production that supports agricultural operations.		AP	
							Forage Crop	A harvested crop of cultivated plants for use as feed for animals.	Modified Natural Area	FC	
							Pasture	Land used for grazing.	Modified Natural Area	PSTR	
							Old Field	Open areas that have been recreated by agriculture and other anthropogenic development. Lands may have been formerly designated as having been cultivated or grazed, but there are identifiable indicators of such into the present. Non-linear form.	Modified Natural Area	OF	
						Vegetated Margin		Vegetation Margin: Liminal, non-urban, grass dominated environments.	Modified Natural Area	YM	
					Field Pocket		Uncultivated pocket of predominantly grass vegetation within an agricultural field.		FP		
						Field Edge	Total area of these spaces is low. Form is linear and narrow includes field edges and other non-urban transitory grassy edges between land uses. These spaces have varying value dependent on adjacent land cover (between road and development or as a buffer between wetland and crop). Possible value as transitory/connective spaces.		FE		
					Known Prairie			Known Prairie: Identified sites of prairie.		KP	
						Agricultural Production		Agricultural Production: Grassland system maintenance that supports agricultural operations.	Natural Area	AP	
						Pasture		Land used for grazing.		PSTR	
						Conservation Area		Land designated for conservation.	Natural Area	CA	
					Naturalized Grass			Naturalized Grass: Dominant grass vegetation with indications of naturalization. Higher presence of shrubs is reflective of a naturalized state given presumed species heterogeneity and ecological succession. Sites have potential for native prairie species although the quality of the site is unknown. Imagery indicates a lack of continuing anthropogenic activity.		NG	
						Conservation Area		Land designated for conservation.	Natural Area	CA	
						Naturalized Green Space		Naturalized grass within urban areas, primarily formal park spaces. Distinct from anthropogenic intensity of formal green spaces with distinct native and naturalized characteristics.	Natural Area	NGS	
						Agricultural Production		Agricultural Production: Grassland system production and maintenance that supports agricultural operations		AP	
							Pasture		Land used for grazing.	Natural Area	PSTR
							Old Field		Open areas that have been recreated by agriculture and other anthropogenic development. Lands may have been formerly designated as having been cultivated or grazed, but there are identifiable indicators of such into the present. Non-linear form and higher shrub presence.	Natural Area	OF
					Vegetated Margin		Vegetated Margin: Liminal non-urban environments: field edges, uncultivated field pockets, transitory grassy edges between land uses etc.	Natural Area	VM		
		Field Pocket		Uncultivated pocket of predominantly grass with notable shrub presence within agricultural fields.			FP				
			Field Edge	Total area of these spaces is low. Form is linear and narrow includes field edges and other non-urban transitory grassy edges between land uses. These spaces have varying value dependent on adjacent land cover (between road and development or as a buffer between wetland and crop). Possible value as transitory/connective spaces.		FE					

Category	Subcategory 1	Subcategory 2	Subcategory 3	Subcategory 4	Subcategory 5	Definition: Form, Management, Use, Ecological Value	Anthropogenic Intensity	Attribute Table Code	
Ecological Environments, Continued	Native & Naturalized Environments, Continued	Aquatic Systems				Aquatic Systems: Water-based ecosystem.		AS	
			River			South Saskatchewan River channel, includes non-vegetated sand bars.	Natural Area	R	
			Creek			Naturally occurring watercourse with intermittent flows which is smaller than a river; acts as a drainage or tributary as part of a watershed.	Natural Area	Creek	
			Wetland			Wetland: Combination of aquatic and terrestrial vegetation in different intensities. Areas with soil permanently or periodically saturated with water and characteristic flora and fauna.		W	
				Natural		Naturally occurring.	Natural Area	N	
				Constructed		Constructed wetlands for storm water management, green spaces, or agricultural purposes.	Modified Natural Area	C	
					Drainage more linear in form; may be constructed but managed to be naturalized.	Modified Natural Area	ND		
		Naturally Non-Vegetated			Naturally occurring sparsely vegetated and non-vegetated areas, including sandy and rocky environments.	Natural Area	NNV		
		Forested and Shrubland Systems					Forested and Shrubland Systems: Native and naturalized tree and shrub cover. Primarily situated outside of urban areas, although known sites with understories that are not lawn, or proximity to river channel are also characteristic of a native and naturalized state. No limitation on sizes and extent to be considered a forested system.		FSS
			Native & Naturalized			Not visibly afforested and near to water body.	Natural Area	NAT	
			Afforested			Afforested: Notable planting pattern or absence of proximal water.	Natural Area	A	
				Shelterbelt		Linear planting adjacent to agricultural and rural sites.	Natural Area	SB	
	Naturalized Planting				Not a shelterbelt.	Natural Area	NP		
	Green Space	Formal Green Space				Green Space: Planned and designed for human use in built environments. Generally has lower ecological significance than native and naturalized environments, as emphasis is placed on an aesthetic landscape versus ecological integrity.		GS	
			Park & Recreation Lawn			Formal Green Space: Vegetated areas which provide ecological services but are actively managed and manicured for human use, often set apart for recreational or aesthetic purposes.		FGS	
			Urban Garden			Planted and maintained non-native grasses used for aesthetic landscaping and recreational purposes. Often publicly accessible and occurring within formal public spaces.	Modified Natural Area	PRL	
						Small scale community gardens, allotment gardens, and urban agriculture. Excludes larger scale urban agriculture within University lands.	Modified Natural Area	UG	
			Afforested			Afforested: Non-native or naturalized tree and shrub cover within formal or informal green spaces. Trees and shrubs would not be naturally occurring without anthropogenic intervention.		A	
				Plantings		Planting bed comprised of tree and shrub vegetation within planned green spaces. Vegetation density may vary and can be heavily comprised of woodchips and other similar materials.	Modified Natural Area	P	
				Urban Tree Cover		Planted trees and shrubs with understory of lawn or low value grass ecosystem within urban and rural yard sites.	Modified Natural Area	UTC	
		Informal Green Space				Informal Green Space: Liminal vegetated spaces within urban areas that are not formally recognized or managed as public spaces for aesthetic or recreational purposes. Ecological value varies within subclasses.		IGS	
			Verge			Grassy small, liminal and linear spaces along roads, railway tracks, or other built or natural elements. Formality varies boulevard to right of way. Public accessibility varies. Varied maintenance, but often is for safety and requirements rather than formal planning and design as a	Modified Natural Area	VG	
			Vacant Lots			Vegetated lot presently not used with irregular maintenance.	Modified Natural Area	VL	
			Utility ROW & Lot			Vegetated utility and infrastructure sites or ROWs, irregular maintenance.	Modified Natural Area	U	
		Outdoor Recreation				Outdoor Recreation: Vegetated areas with surfaces maintained for sport and recreational purposes. Predominantly publicly accessible.		OR	
			Golf Course			Public or private land golf course.	Modified Natural Area	GC	
			Zoological Park			Outdoor zoological enclosures and open space within the site.	Modified Natural Area	Z	
Sport & Recreation					Characterized by vegetated or porous surfaces, as opposed to paved surfaces.	Modified Natural Area	SRF		

TABLE 3: LAND OWNERSHIP BY PARCEL IN THE STUDY AREA

Study Area Ownership		
Owner Name	Ownership Type	Parcel Number
	Private	118974583
		118974594
		118974617
	Private	131677465
		131677476
	Private	203345692
	Private	135805440
	Private	131751334
	Private	135806249
	Private	135806261
City of Saskatoon	Public	118558132
		118558143
		118558154
		118558187
		118558558
		118974943
		118974954
		118974987
		118975090
		118975124
		118975135
		131598164
		135805462
		135805484
		135805507
		135805529
		135805552
		135805574
		135805596
		135806148
		135806182
		135806205
		135827411
		135827433
		135827455
		135827477
		135827523
		135827567
		135827950
		135907207

Study Area Ownership		
Owner Name	Ownership Type	Parcel Number
City of Saskatoon	Public	135917747
		162089789
		165215783
		203166828
		203204427
		203207149
		203242092
		203268911
		203290411
		203318894
		203345704
		135827916
	Private	166221176
	Private	118558200
	Private	166221165
	Private	135806238
		135907375
		135907410
		135907432
		135907487
		135907500
		135907522
		135907544
		203242081
		118558198
	Private	118558514
Her Majesty the Queen (Saskatchewan)	Public	118974516
		135806227
		140561377
		164031173
		164031184
		203345681
	Private	118512435
	Private	118974909
	Private	140561333
	Private	131676880
		135805967
		135805978

Study Area Ownership		
Owner Name	Ownership Type	Parcel Number
	Private	135805989
		135907454
		135907465
		203290365
		203290376
		203290387
		203290400
		203290422
		203290433
MEEWASIN VALLEY AUTHORITY	Public	135805664
ORASPPID	Public	182819841
		183302513
		184065880
		200979603
		201503371
QSECPPID	Public	201049208
		201049219
		201049220
		201514452

Study Area Ownership		
Owner Name	Ownership Type	Parcel Number
QSECPPID	Public	201516779
		201631755
		201631766
	Private	135806834
		135806889
		135806902
		164082337
	Private	135806047
		164288032
		164288043
Saskatoon Wildlife Federation	Public	118974639
	Private	162089758
	Private	140561355
	Private	131751367
	Private	131751389
		131794544
		131794566
The City of Saskatoon	Public	119063606
	Private	118974897
Wanuskewin Heritage Park Corporation	Public	118974628

TABLE 4: ARCHEOLOGICAL AND PALEONTOLOGICAL RECORDS WITHIN THE STUDY AREA

Archaeological Records		
Label	Site Name	Borden Number
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		

Archaeological Records		
Label	Site Name	Borden Number
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		
41		
42		
43		
44		
45		
46		

Palaeontological Sites		
Label	Site Name	SIT Site Number
47		

Trails	
Trail Name	Borden Number

Information redacted due to user rights restrictions

TABLE 5: WATER QUALITY MONITORING RESULTS AT THE SMALL SWALE WITHIN THE STUDY AREA

Water Quality Sample Results							
Sample ID	North Oval Pond	Large Pond North #2	Road Pond	Large Pond North #1	Tiny Pond	Large Pond South	South Pond #1
Sample Date	08/29/2019	08/29/2019	08/28/2019	08/28/2019	08/28/2019	08/29/2019	08/28/2019
Ammonia (NH ₄) mg/L	0.36	0.91	0.46	1.36	0.62	3.32	0.65
Dissolved Oxygen (O ₂) mg/L	9.75	11.26	6.25	4.75	6.9	5.45	12.5
Free Chlorine mg/L	0.17	0.11	0.13	0.11	0.19	0.11	0.04
Total Chlorine mg/L	0.05	0.08	0.12	3.09	0.78	0.28	0.14
Nitrate (NO ₃) mg/L	7.2	13	0.01	24.8	4.3	2.3	5.4
Nitrite (NO ₂) mg/L	15	11	30	19	23	16	8
pH	8.5	8.1	8.5	7.5	7.9	8.1	8.2
Phosphate (PO ₄ ³⁻)	0.07	0.17	0.1	0.71	0.27	0.74	0.32
Temperature (°C)	14.1	13	13.1	12.5	14.1	12.8	13.2

TABLE 6 WILDLIFE CAMERA MONITORING RESULTS IN THE STUDY AREA

Saskatoon Freeway Project - Wildlife Camera Data (09-2019 to 03-2020)							
Camera ID	Date	Time	Temperature (°C)	Species			
				Type	Gender	Number	Comments
NE 24A - SFP	12/5/2019	18:21	-11	Mule Deer	Buck	1	
NE 24B - SFP	12/6/2019	3:31	-10	White-tailed Deer	Doe	1	
	12/8/2019	8:13	-22	White-tailed Deer	Doe	2	Doe with Fawn
	12/12/2019	17:49	-17	White-tailed Deer	Doe	2	Doe with Fawn
	12/13/2019	2:06	-16	White-tailed Deer	Doe	3	
NE 24C - SFP	11/16/2019	8:26	-1	White-tailed Deer	Doe	2	
	11/17/2019	18:51	2	Coyote	Unknown	1	
	11/18/2019	6:34	4	White-tailed Deer	Doe	1	
	11/20/2019	17:32	-2	White-tailed Deer	Doe	1	
	11/21/2019	13:23	4	Coyote	Unknown	1	Tail on coyote looks like mange
	11/22/2019	2:50	-3	White-tailed Deer	Doe	1	
	11/22/2019	3:36	-3	White-tailed Deer	Doe	1	
	11/24/2019	6:06	0	White-tailed Deer	Buck	1	
	11/24/2019	18:23	6	White-tailed Deer	Doe	1	
	11/26/2019	7:33	-4	White-tailed Deer	Buck	1	
	11/27/2019	8:42	-7	Coyote	Unknown	1	
	12/2/2019	21:36	-5	Coyote	Unknown	1	
	12/6/2019	23:06	-9	White-tailed Deer	Doe	1	
	12/7/2019	10:32	-9	White-tailed Deer	Doe	1	
	12/7/2019	13:13	-6	White-tailed Deer	Doe	4	
	12/9/2019	20:57	-26	Coyote	Unknown	1	
	12/10/2019	17:46	-23	Deer sp.	Unknown	1	
	12/13/2019	17:30	-24	White-tailed Deer	Doe	2	
	1/1/2020	9:01	-8	White-tailed Deer	Doe	1	
	1/6/2020	20:21	-16	White-tailed Deer	Doe	1	
	1/13/2020	7:34	-31	White-tailed Deer	Doe	2	
	1/17/2020	7:40	-19	White-tailed Deer	Doe	1	
	1/18/2020	17:46	-23	White-tailed Deer	Doe	2	
	1/25/2020	19:10	-4	White-tailed Deer	Doe	1	
	2/26/2020	21:09	-7	White-tailed Deer	Doe	2	
	3/4/2020	23:19	-1	Coyote	Unknown	1	
	3/17/2020	2:38	-12	Jackrabbit	Unknown	1	
	3/18/2020	21:42	-16	White-tailed Deer	Doe	1	
	3/21/2020	3:21	-11	Coyote	Unknown	1	
	SW 25A - SFP	11/18/2019	5:31	4	Deer sp.	Unknown	1
11/18/2019		22:20	2	Deer sp.	Unknown	1	
NW 19A - SFP	11/22/2019	23:35	0	Deer sp.	Unknown	1	
	11/23/2019	1:16	1	Mule Deer	Doe	1	
	11/23/2019	1:16	1	Mule Deer	Buck	1	

Saskatoon Freeway Project - Wildlife Camera Data (09-2019 to 03-2020)

Camera ID	Date	Time	Temperature (°C)	Species			
				Type	Gender	Number	Comments
NW 24A - SFP	11/26/2019	16:56	-4	White-tailed Deer	Buck	1	
	9/7/2019	20:16	20	Mule Deer	Doe	2	Doe with Fawn
	9/8/2019	19:59	20	Mule Deer	Doe	2	Doe with Fawn
SE 19A - SFP	8/29/2019	21:08	14	Mule Deer	Doe	1	
	8/29/2019	21:17	14	Mule Deer	Doe	2	
	8/30/2019	1:07	8	Mule Deer	Buck	1	
	11/16/2019	7:40	0	Deer sp.	Buck	1	
	11/20/2019	7:53	-5	Deer sp.	Buck	1	
	11/22/2019	9:58	-3	White-tailed Deer	Buck	1	
	11/25/2019	12:31	-2	Mule Deer	Buck	1	
	11/25/2019	4:13	-2	White-tailed Deer	Buck	1	
	11/25/2019	16:49	-1	Mule Deer	Doe	1	
	11/27/2019	19:06	-5	Mule Deer	Buck	1	
	12/2/2019	23:31	-5	Mule Deer	Buck	1	
	12/7/2019	9:12	-16	Mule Deer	Doe	1	
	12/13/2019	11:36	-21	Coyote	Unknown	1	
	12/17/2019	16:57	-7	Mule Deer	Doe	1	
	12/17/2019	16:57	-7	White-tailed Deer	Doe	1	
	12/19/2019	8:26	-10	White-tailed Deer	Doe	2	
	12/19/2019	8:34	-10	Deer sp.	Doe	1	
12/19/2019	8:36	-10	Deer sp.	Buck	1		
12/25/2019	15:02	-1	Mule Deer	Buck	1		
SE 19B - SFP	8/28/2019	21:01	15	Mule Deer	Buck	3	
	11/11/2019	5:24	-21	Mule Deer	Buck	1	
	11/11/2019	7:09	-22	Mule Deer	Buck	1	
	11/14/2019	7:02	-2	Mule Deer	Buck	1	
	11/17/2019	18:23	3	Mule Deer	Buck	1	
	11/20/2019	6:12	-6	Mule Deer	Buck	1	
	11/21/2019	17:10	3	White-tailed Deer	Doe	1	
	11/22/2019	17:58	2	Mule Deer	Buck	1	Large buck
11/22/2019	18:06	2	Mule Deer	Buck	1	Small buck	
SW 19A - SFP	11/22/2019	18:34	0	Deer sp.	Doe	1	
	11/24/2019	3:56	1	White-tailed Deer	Doe	1	
	11/24/2019	5:04	1	White-tailed Deer	Buck	1	
	11/25/2019	5:10	1	White-tailed Deer	Doe	1	
	11/25/2019	5:27	-2	White-tailed Deer	Doe	1	
	11/26/2019	2:07	-3	White-tailed Deer	Buck	1	
	11/27/2019	7:11	-7	White-tailed Deer	Buck	1	
	11/27/2019	20:14	-6	White-tailed Deer	Buck	1	
	8/26/2019	13:39	21	White-tailed Deer	Doe	1	
	8/26/2019	13:40	21	White-tailed Deer	Buck	1	
	8/26/2019	18:22	14	White-tailed Deer	Doe	1	
	8/27/2019	1:15	12	White-tailed Deer	Doe	1	
8/27/2019	2:47	12	White-tailed Deer	Doe	1		

Saskatoon Freeway Project - Wildlife Camera Data (09-2019 to 03-2020)

Camera ID	Date	Time	Temperature (°C)	Species			
				Type	Gender	Number	Comments
Permanent Plot #7 - NE Swale	11/7/2019	18:41	-9	Mule Deer	Buck	1	
	11/23/2019	11:31	12	Mule Deer	Doe	1	
	11/23/2019	22:35	0	Mule Deer	Buck	1	
	11/30/2019	7:13	-10	Mule Deer	Doe	1	
	12/20/2019	12:47	-9	Mule Deer	Buck	1	
	1/5/2020	18:27	-12	White-tailed Deer	Doe	1	
	1/5/2020	18:44	-12	Mule Deer	Buck	1	
	1/8/2020	4:37	-18	White-tailed Deer	Doe	1	
	1/16/2020	11:21	-29	Mule Deer	Doe	1	
	1/20/2020	18:00	-8	Mule Deer	Doe	1	
	2/21/2020	5:54	-17	Mule Deer	Doe	1	
Small Swale - Temporary Camera #1	12/16/2019	5:12	-8	Coyote	Unknown	1	
	12/17/2019	4:13	-16	Deer sp.	Doe	1	
	1/5/2020	10:15	-10	Coyote	Unknown	1	
	1/9/2020	8:26	-20	Moose	Unknown	1	
	2/28/2020	7:49	-8	White-tailed Deer	Doe	6	
	3/4/2020	10:19	3	Weasel	Unknown	1	
	3/8/2020	3:44	-16	Jackrabbit	Unknown	1	
	3/8/2020	7:51	-18	Jackrabbit	Unknown	1	
	3/10/2020	2:55	-13	Coyote	Unknown	1	
	3/11/2020	21:42	-3	Porcupine	Unknown	1	
Small Swale - Temporary Camera #3	12/10/2019	8:35	-27	White-tailed Deer	Doe	2	
	12/13/2019	16:53	-21	White-tailed Deer	Doe	1	
	12/22/2019	12:52	-12	White-tailed Deer	Doe	3	
	12/23/2019	17:55	-7	White-tailed Deer	Doe	2	
	12/26/2019	21:46	-5	White-tailed Deer	Doe	1	
	12/28/2019	4:13	-14	White-tailed Deer	Doe	2	
	12/30/2019	7:40	-19	White-tailed Deer	Doe	1	
	12/30/2019	7:46	-18	White-tailed Deer	Buck	1	Young buck
	12/31/2019	6:52	-14	White-tailed Deer	Doe	1	
	1/6/2020	6:47	-8	White-tailed Deer	Doe	1	
1/11/2020	19:00	-15	White-tailed Deer	Doe	1		

Saskatoon Freeway Project - Wildlife Camera Data (09-2019 to 03-2020)							
Camera ID	Date	Time	Temperature (°C)	Species			
				Type	Gender	Number	Comments
Small Swale - Temporary Camera #2	12/5/2019	19:22	-12	White-tailed Deer	Doe	1	
	12/6/2019	12:22	-12	White-tailed Deer	Buck	1	
	12/6/2019	8:52	-8	White-tailed Deer	Doe	1	
	12/6/2019	17:29	-10	White-tailed Deer	Doe	1	
	12/6/2019	18:18	-11	White-tailed Deer	Doe	1	
	12/6/2019	22:52	-10	White-tailed Deer	Doe	1	
	12/7/2019	7:40	-12	White-tailed Deer	Doe	1	
	12/11/2019	8:43	-28	White-tailed Deer	Doe	1	
	12/13/2019	16:11	-14	White-tailed Deer	Doe	1	
	12/13/2019	16:22	-15	White-tailed Deer	Doe	4	
	12/15/2019	8:08	-14	White-tailed Deer	Doe	1	
	12/16/2019	3:55	-10	White-tailed Deer	Buck	1	
	12/17/2019	3:12	-17	White-tailed Deer	Doe	1	
	12/18/2019	2:34	-8	White-tailed Deer	Doe	2	
	12/20/2019	3:20	-17	White-tailed Deer	Doe	2	
	12/20/2019	20:23	-7	White-tailed Deer	Doe	1	
	12/21/2019	8:36	-15	White-tailed Deer	Buck	1	
	12/21/2019	8:39	-15	White-tailed Deer	Buck	1	Young buck
	12/21/2019	9:32	-14	White-tailed Deer	Buck	1	Young buck
	12/21/2019	23:19	-11	White-tailed Deer	Buck	1	
	12/23/2019	18:45	-7	White-tailed Deer	Doe	1	
	12/23/2019	22:03	-7	White-tailed Deer	Buck	1	
	12/24/2019	2:51	-7	White-tailed Deer	Doe	2	
	12/24/2019	6:39	-7	White-tailed Deer	Doe	1	
	12/27/2019	17:35	-13	White-tailed Deer	Buck	1	
	12/27/2019	22:47	-17	White-tailed Deer	Doe	1	
	12/28/2019	12:40	-17	Coyote	Unknown	1	
	12/29/2019	15:50	-2	Coyote	Unknown	1	
	1/1/2020	4:34	-9	White-tailed Deer	Doe	2	
	1/1/2020	6:03	-9	White-tailed Deer	Doe	1	
	1/1/2020	6:58	-9	White-tailed Deer	Doe	3	
	1/1/2020	7:38	-9	White-tailed Deer	Buck	1	
	1/3/2020	6:59	-6	White-tailed Deer	Doe	1	
	1/12/2020	5:28	-16	White-tailed Deer	Doe	1	
	1/15/2020	12:37	-21	Coyote	Unknown	1	
	1/20/2020	8:12	-19	White-tailed Deer	Doe	2	
	1/22/2020	7:41	-13	White-tailed Deer	Doe	1	
	1/23/2020	22:02	-11	White-tailed Deer	Doe	3	
	1/25/2020	8:05	-4	White-tailed Deer	Doe	1	
	1/25/2020	8:08	-3	White-tailed Deer	Buck	1	
	1/26/2020	1:48	-5	White-tailed Deer	Doe	2	
	2/2/2020	3:06	-2	Coyote	Unknown	1	
2/8/2020	7:54	-9	White-tailed Deer	Doe	3		
2/8/2020	8:17	-9	White-tailed Deer	Doe	2		
2/18/2020	16:32	-12	White-tailed Deer	Doe	1		
3/6/2020	6:17	-2	Jackrabbit	Unknown	1		
3/9/2020	3:38	-20	Jackrabbit	Unknown	1		
3/13/2020	4:04	-17	White-tailed Deer	Doe	1		
3/20/2020	22:20	-9	Porcupine	Unknown	1		
3/22/2020	5:58	-13	Jackrabbit	Unknown	1		

TABLE 7: INVASIVE SPECIES OCCURRENCES WITHIN THE STUDY AREA

Invasive Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
Pre-2011		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
Plantae	<i>Artemisia absinthium</i>	Absinthe
	<i>Euphorbia esula</i>	Leafy Spurge
	<i>Lythrum salicaria</i>	Purple Loosestrife
	<i>Tanacetum vulgare</i>	Common Tansy
2011		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Perdix perdix</i>	Gray Partridge
2012		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Perdix perdix</i>	Gray Partridge
	<i>Sturnus vulgaris</i>	European Starling
2013		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Perdix perdix</i>	Gray Partridge
	<i>Sturnus vulgaris</i>	European Starling
Plantae	<i>Hippophae rhamnoides</i>	Sea-buckthorn
	<i>Rheum rhabarbarum</i>	Rhubarb
2014		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Sturnus vulgaris</i>	European Starling
	<i>Carduus nutans</i>	Nodding Thistle
Plantae	<i>Euphorbia esula</i>	Leafy Spurge
	<i>Hesperis matronalis</i>	Dame's Rocket
	<i>Tanacetum vulgare</i>	Common Tansy
	<i>Tripleurospermum inodorum</i> ; <i>Matricaria perforata</i>	Scentless Chamomile
2015		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Perdix perdix</i>	Gray Partridge
Plantae	<i>Artemisia absinthium</i>	Absinthe
	<i>Astragalus cicer</i>	Cicer Milkvetch
	<i>Bromus inermis</i>	Smooth brome
	<i>Caragana arborescens</i>	Caragana
	<i>Carduus nutans</i>	Nodding Thistle

Invasive Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
2015, continued		
Plantae	<i>Cirsium arvense</i>	Canada Thistle
	<i>Elaeagnus angustifolia</i>	Russian Olive
	<i>Erodium cicutarium</i>	Stork's-bill
	<i>Eryngium planum</i>	Plain Coyote-thistle
	<i>Euphorbia esula</i>	Leafy Spurge
	<i>Geranium pratense</i>	Meadow Crane's-bill
	<i>Gypsophila paniculata</i>	Baby's-breath
	<i>Hesperis matronalis</i>	Dame's Rocket
	<i>Hippophae rhamnoides</i>	Sea-buckthorn
	<i>Lathyrus tuberosus</i>	Tuberous Vetchling
	<i>Lonicera tatarica</i>	Tatarian Honeysuckle
	<i>Lychnis chalconica</i>	Maltese-cross Campion
	<i>Malus spp. (species unknown)</i>	Crabapple (species unknown)
	<i>Malva moschata</i>	Musk Mallow
	<i>Rhamnus cathartica</i>	European Buckthorn
	<i>Saponaria officinalis</i>	Bouncing-bet
	<i>Sorbus aucuparia</i>	European Mountain-ash
<i>Syringa vulgaris</i>	Common Lilac	
<i>Tanacetum vulgare</i>	Common Tansy	
<i>Tripleurospermum inodorum</i> ; <i>Matricaria perforata</i>	Scentless Chamomile	
<i>Ulmus pumila</i>	Siberian Elm	
2016		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Streptopelia decaocto</i>	Eurasian Collared-Dove
	<i>Sturnus vulgaris</i>	European Starling
Plantae	<i>Armoracia rusticana</i>	Horseradish
	<i>Artemisia absinthium</i>	Absinthe
	<i>Asparagus officinalis</i>	Asparagus
	<i>Astragalus cicer</i>	Cicer Milkvetch
	<i>Campunula rapunculoides</i>	Creeping Bellflower
	<i>Caragana arborescens</i>	Caragana
	<i>Carduus nutans</i>	Nodding Thistle
	<i>Cotoneaster lucidus</i>	Shiny Cotoneaster
	<i>Delphinium sp</i>	Delphinium
	<i>Elaeagnus angustifolia</i>	Russian Olive
	<i>Eryngium planum</i>	Plain Coyote-thistle
	<i>Euphorbia esula</i>	Leafy Spurge
	<i>Hesperis matronalis</i>	Dame's Rocket
	<i>Impatiens glandulifera</i>	Himalayan Balsam

Invasive Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
2016, continued		
Plantae	<i>Iris sp</i>	Iris
	<i>Lamium sp</i>	Lamium
	<i>Linaria vulgaris</i>	Yellow Toadflax
	<i>Lonicera sp.</i>	Honeysuckle
	<i>Lonicera tatarica</i>	Tatarian Honeysuckle
	<i>Lotus comiculatus</i>	Bird's-foot Trefoil
	<i>Malva moschata</i>	Musk Mallow
	<i>Prunus tenella</i>	Dward Russian Almond
	<i>Rhamnus cathartica</i>	European Buckthorn
	<i>Rheum rhabarbarum</i>	Rhubarb
	<i>Tanacetum vulgare</i>	Common Tansy
	<i>Tripleurospermum inodorum;</i> <i>Matricaria perforata</i>	Scentless Chamomile
	<i>Ulmus pumila</i>	Siberian Elm
	<i>Verbascum thapsus</i>	Common Mullein
<i>Vicia cracca</i>	Bird Vetch	
2017		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Perdix perdix</i>	Gray Partridge
	<i>Sturnus vulgaris</i>	European Starling
Plantae	<i>Artemisia absinthium</i>	Absinthe
	<i>Asparagus officinalis</i>	Asparagus
	<i>Astragalus cicer</i>	Cicer Milkvetch
	<i>Caragana arborescens</i>	Caragana
	<i>Carduus nutans</i>	Nodding Thistle
	<i>Cirsium arvense</i>	Canada Thistle
	<i>Euphorbia esula</i>	Leafy Spurge
	<i>Hesperis matronalis</i>	Dame's Rocket
	<i>Iris sp</i>	Iris
	<i>Leucanthemum vulgare</i>	Oxeye Daisy
	<i>Linaria vulgaris</i>	Yellow Toadflax
	<i>Lychnis chalconica</i>	Maltese-cross Champion
	<i>Malva moschata</i>	Musk Mallow
	<i>Prunus virginiana 'Schubert'</i>	Western Chokecherry
	<i>Rhamnus cathartica</i>	European Buckthorn
	<i>Rheum rhabarbarum</i>	Rhubarb
	<i>Saponaria officinalis</i>	Bouncing-bet
	<i>Silene chalconica</i>	Maltese Cross
	<i>Silene latifolia</i>	Bladder Champion

Invasive Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
2017, continued		
Plantae	<i>Sorbus sp</i>	Mountain Ash
	<i>Tanacetum vulgare</i>	Common Tansy
	<i>Tripleurospermum inodorum;</i> <i>Matricaria perforata</i>	Scentless Chamomile
	<i>Ulmus pumila</i>	Siberian Elm
	<i>Vicia cracca</i>	Bird Vetch
2018		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Perdix perdix</i>	Gray Partridge
	<i>Sturnus vulgaris</i>	European Starling
Plantae	<i>Agropyron cristatum</i>	Crested Wheatgrass
	<i>Artemisia absinthium</i>	Absinthe
	<i>Asparagus officinalis</i>	Asparagus
	<i>Astragalus cicer</i>	Cicer Milkvetch
	<i>Caragana arborescens</i>	Caragana
	<i>Carduus nutans</i>	Nodding Thistle
	<i>Euphorbia esula</i>	Leafy Spurge
	<i>Hesperis matronalis</i>	Dame's Rocket
	<i>Leucanthemum vulgare</i>	Oxeye Daisy
	<i>Malva moschata</i>	Musk Mallow
	<i>Onobrychis viciifolia</i>	Common Sainfoin
	<i>Prunus virginiana 'Schubert'</i>	Western Chokecherry
	<i>Rhamnus cathartica</i>	European Buckthorn
	<i>Rheum rhabarbarum</i>	Rhubarb
	<i>Tanacetum vulgare</i>	Common Tansy
<i>Tripleurospermum inodorum</i>	Scentless Chamomile	
<i>Ulmus pumila</i>	Siberian Elm	
2019		
Aves	<i>Columba livia</i>	Rock Pigeon
	<i>Passer domesticus</i>	House Sparrow
	<i>Perdix perdix</i>	Gray Partridge
	<i>Streptopelia decaocto</i>	Eurasian Collared-Dove
	<i>Sturnus vulgaris</i>	European Starling
Plantae	<i>Asparagus officinalis</i>	Asparagus
	<i>Astragalus cicer</i>	Cicer Milkvetch
	<i>Caragana arborescens</i>	Caragana
	<i>Carduus nutans</i>	Nodding Thistle
	<i>Euphorbia esula</i>	Leafy Spurge
	<i>Hesperis matronalis</i>	Dame's Rocket

Invasive Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
2019, continued		
Plantae	<i>Lathyrus tuberosus</i>	Tuberous Vetchling
	<i>Lythrum salicaria</i>	Purple Loosestrife
	<i>Rhamnus cathartica</i>	European Buckthorn
	<i>Tanacetum vulgare</i>	Common Tansy
	<i>Tripleurospermum inodorum</i>	Scentless Chamomile

Invasive Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
2020		
Aves	<i>Columba livia</i>	Rock Pigeon

TABLE 8: SPECIES AT RISK AND RARE SPECIES OCCURENCES WITHIN THE STUDY AREA

Species At Risk and Rare Species					
Group	Scientific Name (Genus/Species)	Common Name	COWESIC	S-Rank	Record Count
Amphibia	<i>Lithobates pipiens</i>	Northern Leopard Frog	Special Concern	S3	63
Aves	<i>Falco sparverius</i>	American Kestrel		S5B,S1N,S5M	27
	<i>Mareca americana</i>	American Wigeon		S5B,S2N,S5M	64
	<i>Centronyx bairdii</i>	Baird's Sparrow	Special Concern	S4B	3
	<i>Riparia riparia</i>	Bank Swallow	Threatened	S4B,S5M	3
	<i>Hirundo rustica</i>	Barn Swallow	Threatened	S5B,S5M	57
	<i>Buteo platypterus</i>	Broad-winged Hawk		S4B,S3M	3
	<i>Certhia americana</i>	Brown Creeper		S4B,S3N,S4M	3
	<i>Calidris subruficollis</i>	Buff-breasted Sandpiper	Special Concern	S4M	2
	<i>Bucephala albeola</i>	Bufflehead		S5B,S1N,S3M	26
	<i>Branta hutchinsii/canadensis</i>	Cackling/Canada Goose		S5B,S2N,S5M; S5B	11
	<i>Branta canadensis</i>	Canada Goose		S5B,S2N,S5M	425
	<i>Cardellina canadensis</i>	Canada Warbler	Threatened	S4B,S3M	2
	<i>Aythya valisineria</i>	Canvasback		S5B,S2N,S5M	47
	<i>Bucephala clangula</i>	Common Goldeneye		S5B,S3N,S3M	87
	<i>Mergus merganser</i>	Common Merganser		S5B,S2N,S4M	29
	<i>Chordeiles minor</i>	Common Nighthawk	Special Concern	S4B,S4M	7
	<i>Accipiter cooperii</i>	Cooper's Hawk	Not at Risk	S4B,S2N,S2M	15
	<i>Mareca strepera</i>	Gadwall		S5B,S2N,S5M	62
	<i>Aquila chrysaetos</i>	Golden Eagle	Not at Risk	S3B,S3N,S4M	1
	<i>Aythya marila/affinis</i>	Greater/Lesser Scaup		S5M; S5B,S3N,S5M	14
	<i>Anas crecca</i>	Green-winged Teal		S5B,S2N,S5M	43
	<i>Zonotrichia querula</i>	Harris's Sparrow	Special Concern	SUB,S5M	22
	<i>Lophodytes cucullatus</i>	Hooded Merganser		S4B,S3M	1
	<i>Podiceps auritus</i>	Horned Grebe	Special Concern	S5B,S5M	25
	<i>Eremophila alpestris</i>	Horned Lark		S4B,S3N,SUM	9
	<i>Podiceps auritus/nigricollis</i>	Horned/Eared Grebe	Special Concern	S5B,S5M; S5B,S5M	3
	<i>Aythya affinis</i>	Lesser Scaup		S5B,S3N,S5M	66
	<i>Lanius ludovicianus excubitorides</i>	Loggerhead Shrike	Threatened	S2B,S2M	9
	<i>Lanius ludovicianus borealis</i>	Loggerhead/Northern Shrike	Threatened	S2B,S2M; S1B,S4N,S4M	1
	<i>Asio otus</i>	Long-eared Owl		S5B,S2N	4
Migratory Bird Concentration Site (Government of Saskatchewan Data)				S3	1
<i>Accipiter gentilis</i>	Northern Goshawk	Not at Risk	S4B,S3N,S4M	3	
<i>Lanius borealis</i>	Northern Shrike		S1B,S4N,S4M	10	
<i>Contopus cooperi</i>	Olive-sided Flycatcher	Special Concern	S4B,S4M	5	
<i>Pandion haliaetus</i>	Osprey		S2B,S2M	45	
<i>Falco peregrinus</i>	Peregrine Falcon	Not at Risk	S1B,SNRM	3	
<i>Dryocopus pileatus</i>	Pileated Woodpecker		S3	1	
<i>Pinicola enucleator</i>	Pine Grosbeak		S2B,S4N	5	
<i>Falco mexicanus</i>	Prairie Falcon	Not at Risk	S3B,S3N,S3M	1	

Species At Risk and Rare Species					
Group	Scientific Name (Genus/Species)	Common Name	COWESIC	S-Rank	Record Count
Aves	<i>Aythya americana</i>	Redhead		S5B,S2N,S5M	28
	<i>Buteo jamaicensis</i>	Red-tailed Hawk	Not at Risk	S5B,S1N,S5M	68
	<i>Euphagus carolinus</i>	Rusty Blackbird	Special Concern	S3B,SUN,S3M	8
	<i>Accipiter striatus</i>	Sharp-shinned Hawk		S4B,S2N,S4M	20
	<i>Tympanuchus phasianellus</i>	Sharp-tailed Grouse		S5	3
	<i>Asio flammeus</i>	Short-eared Owl	Special Concern	S3B,S2N,S3M	15
	<i>Anthus spragueii</i>	Sprague's Pipit	Threatened	S3B,S3M	2
	<i>Myadestes townsendi</i>	Townsend's Solitaire		S3N,S3M	1
	<i>Cathartes aura</i>	Turkey Vulture		S3B,S3M	7
	<i>Aechmophorus occidentalis</i>	Western Grebe	Special Concern	S3B,S3M	4
	<i>Loxia leucoptera</i>	White-winged Crossbill		S4B,S3N	5
	<i>Grus americana</i>	Whooping Crane	Endangered	SXB,S1M	4
	<i>Coturnicops noveboracensis</i>	Yellow Rail	Special Concern	S3B,S3M	4
Fishes	<i>Acipenser fulvescens</i>	Lake Sturgeon	Endangered	S2	1
Insecta	<i>Bembidion intermedium</i>	a ground beetle		S3	1
	<i>Bembidion rapidum</i>	a ground beetle		S3	1
	<i>Sunira bicolorago</i>	Bicolored Sallow Moth		S3	1
	<i>Harpalus fuscipalpis</i>	Brown Harpaline Beetle		S3	1
	<i>Bembidion patrulele</i>	Clay-beach Bembidion Beetle		S3	1
	<i>Bembidion rupicola</i>	Field Bembidion Beetle		S3	1
	<i>Danaus plexippus plexippus</i>	Monarch	Endangered	S2B	1
	<i>Bembidion insulatum</i>	Salt Bembidion Beetle		S3	1
	<i>Psyllobora vigintimaculata</i>	Twenty-spotted Lady Beetle		S2	1
	<i>Chilocorus stigma</i>	Twice-stabbed Lady Beetle		S3	1
	<i>Amphiagrion abbreviatum</i>	Western Red Damselfly		S2	4
Mammalia	<i>Taxidea taxus</i>	American Badger	Special Concern	S3	3
	<i>Myotis lucifugus</i>	Little Brown Myotis	Endangered	S4B,S4N	2
Plantae	<i>Iris versicolor</i>	Blueflag		S1	1
	<i>Carex eburnea</i>	Bristle-leaved Sedge		S3	2
	<i>Carex crawei</i>	Crawe's Sedge		S3	1
	<i>Viola pedatifida</i>	Crowfoot Violet		S3	423
	<i>Rorippa curvipes</i>	Curved Yellow-cress		S3	1
	<i>Potentilla concinna</i> var. <i>concinna</i>	Early Cinquefoil		S2	2
	<i>Almutaster pauciflorus</i>	Few-flowered Aster		S3	1
	<i>Corispermum hookeri</i> var. <i>hookeri</i>	Hooker's Bugseed		S2	1
	<i>Sceptridium multifidum</i>	Leathery Grape-fern		S3	1
	<i>Gentianopsis virgata</i>	Lesser Fringed Gentian		S3	2
	<i>Lomatogonium rotatum</i>	Marsh Felwort		S3	32
	<i>Silene menziesii</i>	Menzies' Catchfly		S3	2
	<i>Alisma gramineum</i>	Narrow-leaved Water Plantain		S3	2

Species At Risk and Rare Species

Group	Scientific Name (Genus/Species)	Common Name	COWESIC	S-Rank	Record Count
Plantae	<i>Botrychium pallidum</i>	Pale Moonwort		S1	1
	<i>Festuca hallii</i>	Plains Rough Fescue		S3	31
	<i>Botrychium campestre</i>	Prairie Dunewort		S2	2
	<i>Astragalus purshii</i> var. <i>purshii</i>	Pursh's Milk-vetch		S3	1
	<i>Blysmopsis rufa</i>	Red Bulrush		S3	2
	<i>Sambucus racemosa</i>	Red-Berried Elder		S2	1
	<i>Carex saximontana</i>	Rocky Mountain Sedge		S3	1
	<i>Potentilla lasiodonta</i>	Sandhills Cinquefoil		S2	2
	<i>Crepis runcinata</i> ssp. <i>hispidulosa</i>	Smooth Hawk's-beard		S1	1
	<i>Rosa blanda</i>	Smooth Wild Rose		S1	1
	<i>Corallorhiza striata</i> var. <i>striata</i>	Striped Coral-root		S3	1
	<i>Lactuca biennis</i>	Tall Blue Lettuce		S3	1
	<i>Lilium philadelphicum</i>	Wood Lily		S4	9
	<i>Cypripedium parviflorum</i> var. <i>makasin</i>	Yellow Lady Slipper		S3	16
	<i>Rhinanthus minor</i> ssp. <i>minor</i>	Yellow-rattle		S2	1

TABLE 9: FLORA AND FAUNA OBSERVATIONS, BASED ON CITIZEN SCIENCE, WITHIN THE STUDY AREA

Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
Amphibia	<i>Lithobates sylvaticus</i>	Wood Frog
Aves	<i>Acanthis flammea</i>	Common Redpoll
	<i>Acanthis flammea/hornemanni</i>	Common/Hoary Redpoll
	<i>Acanthis hornemanni</i>	Hoary Redpoll
	<i>Accipiter sp.</i>	Accipiter sp.
	<i>Accipitridae sp. (hawk sp.)</i>	hawk sp.
	<i>Actitis macularius</i>	Spotted Sandpiper
	<i>Aegolius acadicus</i>	Northern Saw-whet Owl
	<i>Agelaius phoeniceus</i>	Red-winged Blackbird
	<i>Ammodramus savannarum</i>	Grasshopper Sparrow
	<i>Ammospiza leconteii</i>	LeConte's Sparrow
	<i>Ammospiza nelsoni</i>	Nelson's Sparrow
	<i>Anas acuta</i>	Northern Pintail
	<i>Anas platyrhynchos</i>	Mallard
	<i>Anatinae sp.</i>	duck sp.
	<i>Anser albifrons</i>	Greater White-fronted Goose
	<i>Anser caerulescens</i>	Snow Goose
	<i>Anser caerulescens/rossii</i>	Snow/Ross's Goose
	<i>Anser rossii</i>	Ross's Goose
	<i>Anser/Branta sp.</i>	goose sp.
	<i>Anthus rubescens</i>	American Pipit
	<i>Antigone canadensis</i>	Sandhill Crane
	<i>Archilochus colubris</i>	Ruby-throated Hummingbird
	<i>Ardea herodias</i>	Great Blue Heron
	<i>Arenaria interpres</i>	Ruddy Turnstone
	<i>Aythya collaris</i>	Ring-necked Duck
	<i>Aythya marila</i>	Greater Scaup
	<i>Bartramia longicauda</i>	Upland Sandpiper
	<i>Bombycilla cedrorum</i>	Cedar Waxwing
	<i>Bombycilla garrulus</i>	Bohemian Waxwing
	<i>Botaurus lentiginosus</i>	American Bittern
	<i>Branta hutchinsii</i>	Cackling Goose
	<i>Branta sp.</i>	Branta sp.
	<i>Bubo scandiacus</i>	Snowy Owl
	<i>Bubo virginianus</i>	Great Horned Owl
	<i>Buteo lagopus</i>	Rough-legged Hawk
	<i>Buteo sp.</i>	Buteo sp.
	<i>Buteo swainsoni</i>	Swainson's Hawk
	<i>Butorides virescens</i>	Green Heron
	<i>Calcarius lapponicus</i>	Lapland Longspur

Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
Aves	<i>Calidris himantopus</i>	Stilt Sandpiper
	<i>Calidris melanotos</i>	Pectoral Sandpiper
	<i>Calidris minutilla</i>	Least Sandpiper
	<i>Calidris pusilla</i>	Semipalmated Sandpiper
	<i>Calidris sp. (peep sp.)</i>	peep sp.
	<i>Cardellina pusilla</i>	Wilson's Warbler
	<i>Catharus fuscescens</i>	Veery
	<i>Catharus guttatus</i>	Hermit Thrush
	<i>Catharus minimus</i>	Gray-cheeked Thrush
	<i>Catharus ustulatus</i>	Swainson's Thrush
	<i>Charadriiformes sp.</i>	shorebird sp.
	<i>Charadrius vociferus</i>	Killdeer
	<i>Chlidonias niger</i>	Black Tern
	<i>Chondestes grammacus</i>	Lark Sparrow
	<i>Chroicocephalus philadelphia</i>	Bonaparte's Gull
	<i>Circus hudsonius</i>	Northern Harrier
	<i>Cistothorus palustris</i>	Marsh Wren
	<i>Cistothorus platensis</i>	Sedge Wren
	<i>Colaptes auratus</i>	Northern Flicker
	<i>Contopus sordidulus</i>	Western Wood-Pewee
	<i>Corvus brachyrhynchos</i>	American Crow
	<i>Corvus corax</i>	Common Raven
	<i>Cyanocitta cristata</i>	Blue Jay
	<i>Cygnus columbianus</i>	Tundra Swan
	<i>Dryobates pubescens</i>	Downy Woodpecker
	<i>Dryobates pubescens/villosus</i>	Downy/Hairy Woodpecker
	<i>Dryobates villosus</i>	Hairy Woodpecker
	<i>Dumetella carolinensis</i>	Gray Catbird
	<i>Empidonax alnorum</i>	Alder Flycatcher
	<i>Empidonax alnorum/traillii</i>	Alder/Willow/Trail's Flycatcher
	<i>Empidonax flaviventris</i>	Yellow-bellied Flycatcher
	<i>Empidonax minimus</i>	Least Flycatcher
	<i>Empidonax sp.</i>	Empidonax sp.
	<i>Empidonax traillii</i>	Willow Flycatcher
	<i>Euphagus cyanocephalus</i>	Brewer's Blackbird
	<i>Falco columbarius</i>	Merlin
	<i>Falco sp.</i>	falcon sp.
	<i>Fulica americana</i>	American Coot
	<i>Gallinago delicata</i>	Wilson's Snipe
	<i>Gavia immer</i>	Common Loon

Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
Aves	<i>Geothlypis trichas</i>	Common Yellowthroat
	<i>Haemorhous mexicanus</i>	House Finch
	<i>Haemorhous purpureus</i>	Purple Finch
	<i>Haliaeetus leucocephalus</i>	Bald Eagle
	<i>Hirundinidae sp.</i>	swallow sp.
	<i>Icteridae sp.</i>	blackbird sp.
	<i>Icterus galbula</i>	Baltimore Oriole
	<i>Junco hyemalis</i>	Dark-eyed Junco
	<i>Larinae sp.</i>	gull sp.
	<i>Larus argentatus</i>	Herring Gull
	<i>Larus californicus</i>	California Gull
	<i>Larus delawarensis</i>	Ring-billed Gull
	<i>Larus sp.</i>	Larus sp.
	<i>Leiostyris celata</i>	Orange-crowned Warbler
	<i>Leiostyris peregrina</i>	Tennessee Warbler
	<i>Leiostyris ruficapilla</i>	Nashville Warbler
	<i>Leucophaeus pipixcan</i>	Franklin's Gull
	<i>Limnodromus griseus/scolopaceus</i>	Short/Long-billed Dowitcher
	<i>Limnodromus scolopaceus</i>	Long-billed Dowitcher
	<i>Limosa fedoa</i>	Marbled Godwit
	<i>Loxia curvirostra</i>	Red Crossbill
	<i>Megaceryle alcyon</i>	Belted Kingfisher
	<i>Melospiza georgiana</i>	Swamp Sparrow
	<i>Melospiza lincolni</i>	Lincoln's Sparrow
	<i>Melospiza melodia</i>	Song Sparrow
	<i>Mergus serrator</i>	Red-breasted Merganser
	<i>Mniotilta varia</i>	Black-and-white Warbler
	<i>Molothrus ater</i>	Brown-headed Cowbird
	<i>Nycticorax nycticorax</i>	Black-crowned Night-Heron
	<i>Oxyura jamaicensis</i>	Ruddy Duck
	<i>Parkesia noveboracensis</i>	Northern Waterthrush
	<i>Parulidae sp.</i>	warbler sp. (Parulidae sp.)
	<i>Passerculus sandwichensis</i>	Savannah Sparrow
	<i>Passerella iliaca</i>	Fox Sparrow
	<i>Passerellidae sp. (sparrow sp.)</i>	sparrow sp.
	<i>Passeriformes sp.</i>	passerine sp.
	<i>Pelecanus erythrorhynchos</i>	American White Pelican
	<i>Petrochelidon pyrrhonota</i>	Cliff Swallow
	<i>Phalacrocorax auritus</i>	Double-crested Cormorant
	<i>Phalaropus tricolor</i>	Wilson's Phalarope

Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
Aves	<i>Pheucticus ludovicianus</i>	Rose-breasted Grosbeak
	<i>Pica hudsonia</i>	Black-billed Magpie
	<i>Picidae sp.</i>	woodpecker sp.
	<i>Picoides dorsalis</i>	American Three-toed Woodpecker
	<i>Pipilo maculatus</i>	Spotted Towhee
	<i>Plectrophenax nivalis</i>	Snow Bunting
	<i>Podiceps grisegena</i>	Red-necked Grebe
	<i>Podiceps nigricollis</i>	Eared Grebe
	<i>Podilymbus podiceps</i>	Pied-billed Grebe
	<i>Poecile atricapillus</i>	Black-capped Chickadee
	<i>Poecile hudsonicus</i>	Boreal Chickadee
	<i>Poocetes gramineus</i>	Vesper Sparrow
	<i>Porzana carolina</i>	Sora
	<i>Progne subis</i>	Purple Martin
	<i>Quiscalus quiscula</i>	Common Grackle
	<i>Rallus limicola</i>	Virginia Rail
	<i>Recurvirostra americana</i>	American Avocet
	<i>Regulus calendula</i>	Ruby-crowned Kinglet
	<i>Regulus satrapa</i>	Golden-crowned Kinglet
	<i>Sayornis phoebe</i>	Eastern Phoebe
	<i>Sayornis saya</i>	Say's Phoebe
	<i>Seiurus aurocapilla</i>	Ovenbird
	<i>Setophaga coronata</i>	Yellow-rumped Warbler
	<i>Setophaga fusca</i>	Blackburnian Warbler
	<i>Setophaga magnolia</i>	Magnolia Warbler
	<i>Setophaga palmarum</i>	Palm Warbler
	<i>Setophaga pensylvanica</i>	Chestnut-sided Warbler
	<i>Setophaga petechia</i>	Yellow Warbler
	<i>Setophaga ruticilla</i>	American Redstart
	<i>Setophaga striata</i>	Blackpoll Warbler
	<i>Setophaga virens</i>	Black-throated Green Warbler
	<i>Sialia currucoides</i>	Mountain Bluebird
	<i>Sitta canadensis</i>	Red-breasted Nuthatch
	<i>Sitta carolinensis</i>	White-breasted Nuthatch
<i>Spatula clypeata</i>	Northern Shoveler	
<i>Spatula cyanoptera</i>	Cinnamon Teal	
<i>Spatula discors</i>	Blue-winged Teal	
<i>Sphyrapicus varius</i>	Yellow-bellied Sapsucker	
<i>Spinus pinus</i>	Pine Siskin	
<i>Spinus tristis</i>	American Goldfinch	

Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
Aves	<i>Spizella pallida</i>	Clay-colored Sparrow
	<i>Spizella passerina</i>	Chipping Sparrow
	<i>Spizelloides arborea</i>	American Tree Sparrow
	<i>Stelgidopteryx serripennis</i>	Northern Rough-winged Swallow
	<i>Sterna forsteri</i>	Forster's Tern
	<i>Sterna hirundo</i>	Common Tern
	<i>Sterninae sp.</i>	tern sp.
	<i>Sturnella neglecta</i>	Western Meadowlark
	<i>Tachycineta bicolor</i>	Tree Swallow
	<i>Tachycineta thalassina</i>	Violet-green Swallow
	<i>Tetraoninae sp.</i>	grouse sp.
	<i>Toxostoma rufum</i>	Brown Thrasher
	<i>Tringa flavipes</i>	Lesser Yellowlegs
	<i>Tringa melanoleuca</i>	Greater Yellowlegs
	<i>Tringa melanoleuca/flavipes</i>	Greater/Lesser Yellowlegs
	<i>Tringa semipalmata</i>	Willet
	<i>Tringa solitaria</i>	Solitary Sandpiper
	<i>Troglodytes aedon</i>	House Wren
	<i>Troglodytidae sp.</i>	wren sp.
	<i>Turdus migratorius</i>	American Robin
	<i>Tympanuchus phasianellus</i>	Sharp-tailed Grouse
	<i>Tyrannus tyrannus</i>	Eastern Kingbird
	<i>Tyrannus verticalis</i>	Western Kingbird
	<i>Vireo gilvus</i>	Warbling Vireo
	<i>Vireo olivaceus</i>	Red-eyed Vireo
	<i>Vireo philadelphicus</i>	Philadelphia Vireo
	<i>Vireo solitarius</i>	Blue-headed Vireo
	<i>Vireo sp.</i>	vireo sp.
	<i>Xanthocephalus xanthocephalus</i>	Yellow-headed Blackbird
	<i>Zenaida macroura</i>	Mourning Dove
<i>Zonotrichia albicollis</i>	White-throated Sparrow	
<i>Zonotrichia leucophrys</i>	White-crowned Sparrow	

Species Observations		
Group	Scientific Name (Genus/Species)	Common Name
Mammalia	<i>Canis latrans</i>	Coyote
	<i>Mustela frenata</i>	Long-tailed Weasel
	<i>Taxidea taxus</i>	American Badger
Plantae	<i>Astragalus lotiflorus</i>	Low Milkvetch
	<i>Fraxinus pennsylvanica</i>	Green Ash
	<i>Oxytropis campestris</i>	Yellow Oxytropis
	<i>Potentilla plattensis</i>	Platte River Cinquefoil
Reptilia	<i>Thamnophis sp</i>	Garter Snake Hibernacula

TABLE 10: MACRO-INVERTEBRATES OBSERVED DURING WATER QUALITY SAMPLING IN THE SMALL SWALE (AUGUST 2019)

Group	Scientific Name (Genus/Species)	Common Name
Amphipods	<i>Cladocera sp.</i>	Water Flea
	<i>Cyclops sp.</i>	Water Flea
	<i>Gammarus lacustris</i>	Freshwater Shrimp
Insects	<i>Belostomatinae sp.</i>	Giant Water Bug
	<i>Bexxia/Palpomyia</i>	Biting Midge
	<i>Caenis sp.</i>	Mayfly - nymph
	<i>Callicorixa audeni</i>	Water Boatman
	<i>Cenocorixa bifida</i>	Water Boatman
	<i>Chaoborus</i>	Glassworm Midge
	<i>Corisella tarsalis</i>	Water Boatman
	<i>Culicidae sp.</i>	Mosquitoes
	<i>Dystiscus</i>	Predacious Diving Beetle
	<i>Isoperla</i>	Stonefly
	<i>Limnephilus</i>	Caddisfly
	<i>Nepidae (f)</i>	Water Scorpion
	<i>Notonectidae (f)</i>	Backswimmer
	<i>Saldula</i>	Shore Bug
Mulloscs	<i>Lymnaeidae sp.</i>	Freshwater Snail

TABLE 11: FLORA OBSERVATIONS OF THE SMALL SWALE

(Source: Anna Leighton March 2020, with records from Dr. John Hudson 1993 and other sources)

Species Observations - Small Swale		
Group	Scientific Name	Common Name
Plantae	<i>Achillea millefolium ssp. lanulosa</i>	Common Yarrow
	<i>Agoseris glauca</i>	False Dandelion
	<i>Agropyron dasystachyum</i>	Quack Grass
	<i>Agropyron repens**</i>	Western Wheatgrass
	<i>Agropyron smithii</i>	Slender Wheatgrass
	<i>Agropyron subsecundum</i>	Aw ned Wheatgrass
	<i>Agropyron trachycaulum</i>	Slender Wheatgrass
	<i>Agrostis scabra</i>	Rough Hair Grass
	<i>Amelanchier alnifolia</i>	Saskatoon
	<i>Anemone patens</i>	Prairie Crocus
	<i>Antennaria microphylla</i>	Littleleaf Pussytoes
	<i>Antennaria parvifolia</i>	Small-leaved Pussytoes
	<i>Arabis hirsuta</i>	Hirsute Rock-cress
	<i>Arabis holboellii v. retrofracta</i>	Reflexed Rock-cress
	<i>Artemisia frigida</i>	Pasture Sage
	<i>Artemisia ludoviciana</i>	Prairie Sage
	<i>Aster brachyactis</i>	Rayless Aster
	<i>Aster ciliolatus</i>	Lindley's Blue Aster
	<i>Aster ericoides ssp. pansus</i>	Many-flow ered Aster
	<i>Aster falcatus</i>	White Prairie/Heath Aster
	<i>Aster hesperius</i>	Western Willow Aster
	<i>Aster laevis</i>	Smooth Blue Aster
	<i>Aster pauciflorus</i>	Alkali Marsh Aster
	<i>Aster ptarmicoides</i>	Upland White Aster
	<i>Astragalus crassicaarpus</i>	Ground Plum
	<i>Astragalus flexuosus</i>	Slender Milk-vetch
	<i>Axyris amaranthoides**</i>	Russian Pigweed
	<i>Betula pumila var glandulifera</i>	Bog Birch
	<i>Botrychium campestris</i>	Pale Dunew ort
	<i>Botrychium pallidum</i>	Pale Moonw ort
	<i>Bouteloua gracilis</i>	Blue Grama
	<i>Bromus inermis**</i>	Smooth Brome
	<i>Calamagrostis inexpansa</i>	Northern Reed Grass
	<i>Calamovilfa longifolia</i>	Sand Grass
	<i>Campanula rotundifolia</i>	Harebell
	<i>Carex aquatilis</i>	Water Sedge
	<i>Carex aurea</i>	Colden's Sedge
	<i>Carex crawei</i>	Craw e's Sedge
	<i>Carex filifolia</i>	Thread-leaved Sedge
	<i>Carex lanuginosa</i>	Wooly Sedge

Species Observations - Small Swale		
Group	Scientific Name	Common Name
Plantae	<i>Carex obtusata</i>	Blunt Sedge
	<i>Carex parryana</i>	Carex parryana
	<i>Carex pensylvanica</i>	Sun-loving Sedge
	<i>Carex praegracilis</i>	Graceful Sedge
	<i>Carex scirpoidea</i>	Northern Single-spike Sedge
	<i>Cerastium arvense</i>	Field Chickweed
	<i>Chenopodium fremontii</i>	Fremont's Goosefoot
	<i>Chenopodium salinum</i>	Oak-leaved Goosefoot
	<i>Cicuta maculata</i>	Spotted Water Hemlock
	<i>Cirsium arvense**</i>	Canada Thistle
	<i>Cirsium flodmanii</i>	Flodman's Thistle
	<i>Comandra umbellata v. umbellata</i>	Pale Comandra
	<i>Crepis runcinata</i>	Scapose Hawk's Beard
	<i>Crepis runcinata spp hispidula</i>	Scapose Hawk's Beard
	<i>Crepis tectorum**</i>	Narrow-leaved Hawk's Beard
	<i>Deschampsia caespitosa</i>	Tufted Hair Grass
	<i>Distichlis stricta</i>	Alkali Grass
	<i>Dodecatheon pauciflorum</i>	Saline Shooting-star
	<i>Elaeagnus commutata</i>	Wolf Willow
	<i>Eleocharis palustris</i>	Creeping Spike Rush
	<i>Eleocharis quinqueflora</i>	Few flower Spikerush
	<i>Epilobium palustre</i>	Marsh Willow-herb
	<i>Equisetum arvense</i>	Common Horse-tail
	<i>Equisetum laevigatum</i>	Smooth Scouring Rush
	<i>Erigeron asper</i>	Rough Fleabane
	<i>Erigeron lonchophyllus</i>	Hirsute Fleabane
	<i>Eriophorum angustifolium</i>	Eriophorum angustifolium
	<i>Erysimum cheiranthoides</i>	Wormseed Mustard
	<i>Festuca altaica ssp hallii</i>	Plains Rough Fescue
	<i>Gaillardia aristata</i>	Gaillardia
	<i>Galium boreale</i>	Northern Bedstraw
	<i>Gentiana affinis</i>	Prairie Gentian
	<i>Gentiana amarella</i>	Northern Gentian
	<i>Gentianopsis macounii</i>	Macoun's Fringed Gentian
	<i>Geum triflorum</i>	Three Flowered Avens
	<i>Glaux maritima</i>	Sea-milkwort
	<i>Glycyrrhiza lepidota</i>	Wild Licorice
	<i>Habenaria hyperborea</i>	Northern Green Orchid
	<i>Hackelia americana</i>	Nodding Stickseed
	<i>Helianthus nuttallii v. nuttallii</i>	Common Tall Sunflower

Species Observations - Small Swale		
Group	Scientific Name	Common Name
Plantae	<i>Prunus virginiana</i>	Choke Cherry
	<i>Psoralea argophylla</i>	Silver-leaf Psoralea
	<i>Psoralea esculenta</i>	Indian Breadroot
	<i>Puccinellia nuttalliana</i>	Nuttall's Salt-meadow
	<i>Ranunculus aquatilis</i>	Water Crow foot
	<i>Ranunculus cymbalaria</i>	Alkali Buttercup
	<i>Ranunculus gemlini</i>	Buttercup
	<i>Ranunculus macounii</i>	Macoun's Buttercup
	<i>Rhamnus cathartica</i> **	European Buckthorn
	<i>Ribes americanum</i>	Wild Black Currant
	<i>Ribes oxycanthoides</i> v.	Northern/Canada
	<i>oxyacanthoides</i>	Gooseberry
	<i>Rosa woodsii</i>	Wood's Rose
	<i>Rumex maritimus</i> v. <i>fueginus</i>	Golden Dock
	<i>Salix bebbiana</i>	Beaked Willow
	<i>Salix candida</i>	Sageleaf Willow
	<i>Salix petiolaris</i>	Basket Willow
	<i>Schizachyrium scoparium</i>	Little Bluestem
	<i>Scirpus americanus</i>	Chairmaker's Bulrush
	<i>Scirpus rufus</i> v. <i>neogaeus</i>	Red Bulrush
	<i>Senecio paupercaulis</i>	Balsam Ragwort
	<i>Shepherdia argentea</i>	Silver Buffaloberry
	<i>Sisyrinchium montanum</i>	Thorny Buffaloberry
	<i>Sium suave</i>	Blue-eyed Grass
	<i>Smilacina stellata</i>	Star Flowered Solomon's Seal
	<i>Solidago canadensis</i> v.	Canada Goldenrod
	<i>gilvocanescens</i>	
	<i>Solidago missouriensis</i>	Low Goldenrod
	<i>Solidago nemoralis</i>	Showy Goldenrod
	<i>Solidago rigida</i> var <i>humilis</i>	humilis Rigid Goldenrod
	<i>Sonchus arvensis</i> **	Perennial Sow-thistle
	<i>Spartina gracilis</i>	Alkali Cordgrass
	<i>Stachys palustre</i>	Marsh Hedge-nettle
	<i>Stipa comata</i>	Needle and Thread Grass
	<i>Suaeda depressa</i>	Western Sea Blite
	<i>Symphoricarpos occidentalis</i>	Western Snowberry
	<i>Taraxacum officinale</i> **	Common Dandelion
	<i>Thermopsis rhombifolia</i>	Golden-bean
	<i>Thlaspi arvense</i> **	Stinkweed
	<i>Tragopogon dubius</i> **	Yellow Goat's-beard
	<i>Triglochin maritima</i>	Seaside Arrow Grass
	<i>Triglochin palustris</i>	Marsh/Slender Arrow Grass
	<i>Typha latifolia</i>	Common Cattail
	<i>Urtica dioica</i> v. <i>procera</i>	Common Nettle
	<i>Viola adunca</i>	Early Blue Violet
	<i>Viola nephrophylla</i>	Bog Violet
	<i>Viola nuttallii</i>	Nuttall's Yellow Violet
	<i>Viola pedatifida</i>	Crow foot Violet
	<i>Zizia aptera</i>	Heart-leaved Alexander
	<i>Zygadenus elegans</i>	Smooth Camas

TABLE 12: FLORA OBSERVATIONS OF THE NORTHEAST SWALE
 (Source: Native Plant Society of Saskatchewan, March 2020, with records from 2011 to 2019)

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Acer negundo</i>	Manitoba Maple
	<i>Achillea millefolium</i>	Common Yarrow
	<i>Achillea sibirica</i>	Siberian Yarrow
	<i>Agoseris glauca</i>	False Dandelion
	<i>Agropyron cristatum*</i>	Crested Wheatgrass
	<i>Agropyron dasystachyum</i>	Northern Wheatgrass
	<i>Agropyron repens*</i>	Quack Grass
	<i>Agropyron smithii</i>	Western Wheatgrass
	<i>Agropyron subsecundum</i>	Awned Wheatgrass
	<i>Agropyron trachycaulum</i>	Slender Wheatgrass
	<i>Agropyron sp.</i>	Wheatgrass species
	<i>Agrostis scabra</i>	Rough Hair Grass
	<i>Allium textile</i>	Prairie Onion
	<i>Allium stellatum</i>	Pink Flowered Onion
	<i>Amelanchier alnifolia</i>	Saskatoon
	<i>Androsace septentrionalis</i>	Pygmy Flower
	<i>Anemone canadensis</i>	Canada Anemone
	<i>Anemone cylindrica</i>	Long-fruited Anemone
	<i>Anemone multifida</i>	Cut-leaved Anemone
	<i>Anemone patens</i>	Prairie Crocus
	<i>Antennaria neglecta</i>	Field Pussytoes
	<i>Antennaria parvifolia</i>	Small-leaved Pussytoes
	<i>Antennaria sp.</i>	Everlasting species
	<i>Apocynum androsaemifolium</i>	Spreading Dogbane
	<i>Apocynum cannabinum</i>	Indian Hemp
	<i>Arabis divaricarpa</i>	Purple Rock-cress
	<i>Arabis glabra</i>	Tower Mustard
	<i>Arabis hirsuta</i>	Hirsute Rock-cress
	<i>Arabis holbelii</i>	Reflexed Rock-cress
	<i>Arabis sp.</i>	Rock Cress species
	<i>Arenaria lateriflora</i>	Blunt-leaved Sandwort
	<i>Artemisia biennis</i>	Sagewort
	<i>Artemisia campestris</i>	Plains Wormwood
	<i>Artemisia dracuncululus</i>	Linear Leaved Wormwood
	<i>Artemisia frigida</i>	Pasture Sage
	<i>Artemisia ludoviciana</i>	Prairie Sage
	<i>Aster brachyactis</i>	Rayless Aster

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Aster ciliolatus</i>	Lindley's Blue Aster
	<i>Aster ericoides</i>	Many-flowered Aster
	<i>Aster falcatus</i>	White Prairie/Heath Aster
	<i>Aster hesperius</i>	Western Willow Aster
	<i>Aster laevis</i>	Smooth Blue Aster
	<i>Aster pansus</i>	Tufted White Prairie Aster
	<i>Astragalus adsurgens</i>	Ascending Purple Milk-vetch
	<i>Astragalus bisulcatus</i>	Two-grooved Milk-vetch
	<i>Astragalus canadensis</i>	Canadian Milk-vetch
	<i>Astragalus cicer*</i>	Cicer Milk-vetch
	<i>Astragalus crassicaulus</i>	Ground Plum
	<i>Astragalus flexuosus</i>	Slender Milk-vetch
	<i>Astragalus goniatus</i>	Purple Milk-vetch
	<i>Astragalus pectinatus</i>	Narrow-leaved Milk-Vetch
	<i>Astragalus sp.</i>	Milk-vetch species
	<i>Atriplex nuttallia</i>	Nuttall's Atriplex
	<i>Avena fatua</i>	Wild Oat
	<i>Axyris amaranthoides*</i>	Russian Pigweed
	<i>Beckmannia syzigachne</i>	Slough Grass
	<i>Betula occidentalis</i>	River Birch
	<i>Bidens cernua</i>	Nodding/Smooth Beggarticks
	<i>Bouteloua gracilis</i>	Blue Grama
	<i>Bromus ciliatus</i>	Fringed Brome
	<i>Bromus inermis*</i>	Smooth Brome
	<i>Calamagrostis canadensis</i>	Marsh Reed-grass
	<i>Calamagrostis inexpansa</i>	Northern Reed Grass
	<i>Calamagrostis montanensis</i>	Plains Reed Grass
	<i>Calamovilfa longifolia</i>	Sand Grass
	<i>Campanula rotundifolia</i>	Harebell
	<i>Capsella burasa-pastoris*</i>	Shepherd's Purse
	<i>Caragana arborescens*</i>	Caragana
	<i>Carduus nutans</i>	Nodding Thistle
	<i>Carex aquatilis</i>	Water Sedge
	<i>Carex aurea</i>	Colden's Sedge
	<i>Carex bebbii</i>	Bebb's Sedge
	<i>Carex eleocharis</i>	Low Sedge
	<i>Carex filifolia</i>	Thread-leaved Sedge
	<i>Carex lanuginosa</i>	Wooly Sedge
	<i>Carex obtusata</i>	Blunt Sedge
	<i>Carex pensylvanica</i>	Sun-loving Sedge
	<i>Carex praticola</i>	Pasture Sedge

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Carex praegracilis</i>	Graceful Sedge
	<i>Carex retrosa</i>	Turned Sedge
	<i>Carex rostrata</i>	Beaked Sedge
	<i>Carex siccata</i>	Hay Sedge
	<i>Carex spengelii</i>	Spengel's Sedge
	<i>Carex sp.</i>	Sedge species
	<i>Cerastium arvense</i>	Field Chickweed
	<i>Chamaerhodos erecta</i>	Bunge
	<i>Chenopodium album</i> *	Lamb's Quarters
	<i>Chenopodium rubrum</i>	Red Goosefoot
	<i>Chenopodium salinum</i>	Oak-leaved Goosefoot
	<i>Chenopodium subglabrum</i>	Arid Goosefoot
	<i>Cirsium arvense</i> *	Canada Thistle
	<i>Cirsium flodmanii</i>	Flodman's Thistle
	<i>Cirsium undulatum</i>	Wavy Leaf Thistle
	<i>Comandra umbellata</i>	Pale Comandra
	<i>Convolvulus arvensis</i> *	Field Bindweed
	<i>Corispermum hyssopifolium</i>	Bugseed
	<i>Corispermum orientale</i>	Villose Bugseed
	<i>Crataegus chrysoarpa</i>	Round-leaved/Firebelly Hawthorn
	<i>Crepis runcinata</i>	Scapose Hawk's Beard
	<i>Crepis tectorum</i> *	Narrow-leaved Hawk's Beard
	<i>Cruciferae sp.</i> *	Mustard species
	<i>Deschampsia caespitosa</i>	Tufted Hair Grass
	<i>Deschampsia sp.</i>	Hair Grass species
	<i>Descurainia richardsonii</i>	Gray Tansy Mustard
	<i>Descurainia sophia</i> *	Flixweed
	<i>Disporum trachycarpum</i>	Fairy Bells
	<i>Distichlis stricta</i>	Alkali Grass
	<i>Dodecatheon pauciflorum</i>	Saline Shooting-star
	<i>Dracocephalum parviflorum</i>	American Dragonhead
	<i>Echinochloa crusgalli</i> *	Barnyard Grass
	<i>Eleagnus commutata</i>	Wolf Willow
	<i>Eleocharis palustris</i>	Creeping Spike Rush
	<i>Elymus canadensis</i>	Canada Wild Rye
	<i>Epilobium angustifolium</i>	Fireweed
	<i>Epilobium palustre</i>	Marsh Willow-herb
	<i>Equisetum arvense</i>	Common Horse-tail
	<i>Equisetum hyemale var. affine</i>	Common Scouring Rush
	<i>Equisetum laevigatum</i>	Smooth Scouring Rush

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Equisetum sp.</i>	Horse-tail species
	<i>Erigeron asper</i>	Rough Fleabane
	<i>Erigeron caespitosus</i>	Tufted Fleabane
	<i>Erigeron canadensis</i>	Canada Fleabane
	<i>Erigeron glabellus</i>	Smooth Fleabane
	<i>Erigeron lonchophyllus</i>	Hirsute Fleabane
	<i>Erigeron philadelphicus</i>	Philadelphia Fleabane
	<i>Erucastrum gallicum*</i>	Dog Mustard
	<i>Erysimum cheiranthoides*</i>	Wormseed Mustard
	<i>Erysimum inconspicuum</i>	Small-flow ered Prairie Rocket
	<i>Euphorbia esula*</i>	Leafy Spurge
	<i>Fagopyrum esculentum</i>	Wild Buckw heat
	<i>Festuca altaica var. hallii</i>	Plains Rough Fescue
	<i>Festuca ovina*</i>	Sheep Fescue
	<i>Festuca saximontana</i>	Rocky Mountain Fescue
	<i>Fragaria vesca</i>	American Wild Straw berry
	<i>Fragaria virginiana</i>	Smooth Wild Straw berry
	<i>Fraxinus pennsylvanica</i>	Green Ash
	<i>Gaillardia aristata</i>	Gaillardia
	<i>Galium boreale</i>	Northern Bedstraw
	<i>Galium triflorum</i>	Sw eet Scented Bedstraw
	<i>Gaura coccinea</i>	Scarlet Gaura
	<i>Gentiana affinis</i>	Prairie Gentian
	<i>Gentianella amarella var. acuta</i>	Northern Gentian
	<i>Geum aleppicum</i>	Old Man's Whiskers
	<i>Geum macrophyllum var. perincisum</i>	Largeleaf Avens
	<i>Geum triflorum</i>	Three Flow ered Avens
	<i>Glaux maritima</i>	Sea-milkw ort
	<i>Glyceria striata</i>	Fow l Manna Grass
	<i>Glycyrrhiza lepidota</i>	Wild Licorice
	<i>Grindelia squarrosa</i>	Curly-cup Gumw eed

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
	<i>Gutierrezia sarothrae</i>	Common Broomweed
	<i>Happlopappus spinulosus</i>	Spiny Ironplant
	<i>Helenium autumnale</i>	Sneezeweed
	<i>Helianthus nuttallii</i>	Common Tall Sunflower
	<i>Helianthus petiolaris</i>	Shining Sunflower
	<i>Helianthus laetiflorus</i> var.	Beautiful Sunflower
	<i>Helianthus</i> sp.	Sunflower species
	<i>Helictotrichon hookeri</i>	Hooker's Oat-grass
	<i>Heterotheca villosa</i>	Hairy Golden-aster
	<i>Heuchera richardsonii</i>	Alum Root
	<i>Hieracium umbellatum</i>	Canada Hawkweed
	<i>Hierochloa odorata</i>	Sweet Grass
	<i>Hippophae rhamnoides</i>	Sea Buckthorn
	<i>Hordeum jubatum</i>	Wild Barley
	<i>Juncus balticus</i>	Baltic Rush
	<i>Juncus longistylis</i>	Long-styled Rush
	<i>Koeleria cristata</i>	June Grass
	<i>Labiatae</i> sp.	Mint species
	<i>Lactuca pulchella</i>	Blue Lettuce
	<i>Lactuca serriola</i> *	Lobed Prickly Lettuce
	<i>Lappula echinata</i>	Bluebur
	<i>Lappula redowskii occidentalis</i>	Western Bluebur
	<i>Lathyrus ochroleucus</i>	Cream-coloured Vetchling
	<i>Lathyrus venosus</i>	Wild Pea
	<i>Lemna minor</i>	Lesser Duckweed
	<i>Lepidium densiflorum</i> *	Common Pepper-grass
	<i>Lepidium ramosissimum</i> *	Branched Pepper-grass
	<i>Lesquerella arenosa</i>	Sand Bladderpod
	<i>Liatris ligulistylis</i>	Meadow Blazing-star
	<i>Liatris punctata</i>	Dotted Blazing-star
	<i>Lilium philadelphicum</i>	Western Red Lily
	<i>Linum lewisii</i>	Wild Blue Flax
	<i>Linum rigidum</i>	Yellow Flax
	<i>Lithospermum incisum</i>	Narrow-leaved Puccoon
	<i>Lobelia kalmii</i>	Kalm's Lobelia
	<i>Lolium perenne</i>	Perennial Rye Grass
	<i>Lomatium macrocarpum</i>	Long-fruited Wild Parsley
	<i>Lonicera dioica</i> var. <i>glaucescens</i>	Twining Honeysuckle
	<i>Lonicera tartarica</i> *	Tartarian Honeysuckle
	<i>Lycopus asper</i>	Western Water Horehound
	<i>Lygodesmia juncea</i>	Skeleton Weed

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Lysimachia ciliata</i>	Fringed Loosestrife
	<i>Malus sp.</i>	Prairiefire
	<i>Malvastrum coccineum</i>	Scarlet Mallow
	<i>Medicago lupulina*</i>	Black Medic
	<i>Medicago sativa ssp. falcata*</i>	Yellow Alfalfa
	<i>Medicago sativa ssp. sativa*</i>	Alfalfa
	<i>Melilotus alba*</i>	White Sweet-clover
	<i>Melilotus officinalis*</i>	Yellow Sweet-clover
	<i>Mentha arvensis</i>	Wild Mint
	<i>Mirabilis hirsuta</i>	Hairy Umbrellawort
	<i>Monarda fistulosa var. menthaefolia</i>	Western Wild Bergamot
	<i>Monolepis nuttalliana</i>	Spear-leaved Goosefoot
	<i>Muhlenbergia cuspidata</i>	Prairie Muhly
	<i>Muhlenbergia racemosa</i>	Mat Muhly
	<i>Musineon divaricatum</i>	Leafy Musineon
	<i>Oenothera biennis</i>	Yellow Evening-primrose
	<i>Oenothera nuttallii</i>	White Evening-primrose
	<i>Orthocarpus luteus</i>	Owl's Clover
	<i>Oryzopsis asperifolia</i>	White Grained Mountain Rice
	<i>Oryzopsis hymenoides</i>	Indian Rice Grass
	<i>Oxytropis campestris var. graciis</i>	Late Yellow Locoweed
	<i>Oxytropis sericea</i>	Early Yellow Locoweed
	<i>Oxytropis sp.</i>	Locoweed species
	<i>Penstemon gracilis</i>	Lilac-flowered Beardtongue
	<i>Penstemon nitidus</i>	Smooth Blue Beardtongue
	<i>Penstemon procerus</i>	Slender Beardtongue
	<i>Petalostemon candidum</i>	White Prairie Clover
	<i>Petalostemon purpureum</i>	Purple Prairie Clover
	<i>Phalaris arundinacea</i>	Reed Canary Grass
	<i>Phlox hoodii</i>	Moss Phlox
	<i>Physostegia parviflorum</i>	False Dragonhead
	<i>Plantago major*</i>	Common Plantain
	<i>Platanthera hyperborea</i>	Green Bog Orchid
	<i>Poa canbyi</i>	Canby Bluegrass
	<i>Poa cusickii</i>	Early Bluegrass
	<i>Poa compressa</i>	Canada Bluegrass
	<i>Poa palustris</i>	Sandberg's Bluegrass
	<i>Poa pratensis*</i>	Kentucky Bluegrass
	<i>Poa sandbergii</i>	Sandberg's Bluegrass
	<i>Poa sp.</i>	Bluegrass species
	<i>Polygonum convolvulus*</i>	Wild Buckwheat

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Populus balsamifera</i>	Balsam/Black poplar
	<i>Populus deltoides</i>	Western/Plains Cottonwood
	<i>Populus tremuloides</i>	Trembling Aspen
	<i>Potentilla anserina</i>	Silverweed
	<i>Potentilla arguta</i>	White Cinquefoil
	<i>Potentilla concinna</i>	Early Cinquefoil
	<i>Potentilla gracilis</i>	Graceful Cinquefoil
	<i>Potentilla gracilis var. fastigiata</i>	Slender Cinquefoil
	<i>Potentilla hippiana</i>	Wooly Cinquefoil
	<i>Potentilla pensylvanica</i>	Prairie Cinquefoil
	<i>Prunus pennsylvanica</i>	Pincherry
	<i>Prunus virginiana</i>	Choke Cherry
	<i>Psoralea argophylla</i>	Silver-leaf Psoralea
	<i>Psoralea esculenta</i>	Indian Breadroot
	<i>Psoralea lanceolata</i>	Lance Leaved Psoralea
	<i>Puccinellia nuttalliana</i>	Nuttall's Salt-meadow Grass
	<i>Pyrola asarifolia</i>	Pink Flowered Wintergreen
	<i>Ranunculus cymbalaria</i>	Alkali Buttercup
	<i>Ranunculus rhomboideus</i>	Prairie Buttercup
	<i>Ratibida columnifera</i>	Prairie Coneflower
	<i>Rhamnus cathartica</i> *	European Buckthorn
	<i>Rhus radicans var. rydbergii</i>	Poison Ivy
	<i>Ribes aureum</i>	Golden Currant
	<i>Ribes oxycanthoides</i>	Northern/Canada Gooseberry
	<i>Rosa arkansana</i>	Low Prairie Rose
	<i>Rosa woodsii</i>	Wood's Rose
	<i>Rubus idaeus</i>	idaeus Wild-red Raspberry
	<i>Rubus pubescens</i>	Dew berry
	<i>Rumex acetosa</i>	Green Sorrel
	<i>Rumex pseudonatronatus</i>	Field Dock
	<i>Salix bebbiana</i>	Beaked Willow
	<i>Salix interior</i>	Sandbar Willow
	<i>Salix petiolaris</i>	Basket Willow
	<i>Salsola kali tenuifolia</i> *	Russian Thistle
<i>Schizachne purpurascens</i>	Purple Oat Grass	
<i>Schizachyrium scoparium</i>	Little Bluestem	
<i>Scirpus acutus</i>	Viscid/Hard-stem Bulrush	
<i>Scirpus maritimus var. paludosus</i>	Cosmopolitan Bulrush	
<i>Scirpus validus</i>	Great Bulrush	
<i>Scutellaria galericulata</i>	Skull-cap	

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Selaginella densa</i>	Prairie selaginella/Spikemoss
	<i>Senecio canus</i>	Silvery Groundsel
	<i>Senecio congestus</i>	Marsh ragwort
	<i>Senecio integerrimus</i> var.	Entire-leaved Groundsel
	<i>Senecio</i> sp.	Groundsel species
	<i>Shepherdia argentea</i>	Thorny Buffaloberry
	<i>Shepherdia canadensis</i>	Canada Buffaloberry
	<i>Silene drummondii</i> var. <i>drummondii</i>	Drummond's Campion
	<i>Sisymbrium loeselii</i> *	Tall Hedge Mustard
	<i>Sisyrinchium montanum</i>	Blue-eyed Grass
	<i>Smilacina stellata</i>	Star Flowered Solomon's Seal
	<i>Solanum triflorum</i>	Wild Tomato
	<i>Solidago canadensis</i> var. <i>canadensis</i>	Canada Goldenrod
	<i>Solidago missouriensis</i>	Low Goldenrod
	<i>Solidago mollis</i>	Velvety Goldenrod
	<i>Solidago nemoralis</i> var. <i>longipetiolata</i>	Showy Goldenrod
	<i>Solidago ptarmicoides</i>	Upland White Goldenrod
	<i>Solidago rigida</i>	humilis Rigid Goldenrod
	<i>Solidago spathulata</i> var. <i>neomexicana</i>	Mountain Goldenrod
	<i>Solidago</i> sp.	Goldenrod species
	<i>Sonchus arvensis</i> *	Perennial Sow-thistle
	<i>Sorbus aucuparia</i> *	European Mountain Ash
	<i>Sphenopholis obtusata</i>	Prairie Wedge Grass
	<i>Spiraea alba</i>	Narrow-leaved Meadow Sweet
	<i>Sporobolus cryptandrus</i>	Sand Dropseed
	<i>Stachys palustris</i>	Marsh Hedge-nettle
	<i>Stellaria</i> sp.	Stitchwort species
	<i>Stipa comata</i>	Needle and Thread Grass
	<i>Stipa spartea</i> var. <i>curtiseta</i>	Western Porcupine Grass
	<i>Stipa viridula</i>	Green Needle Grass
	<i>Suaeda depressa</i>	Western Sea Blite
	<i>Symphoricarpos albus</i>	Northern Snow berry
	<i>Symphoricarpos occidentalis</i>	Western Snow berry
	<i>Taraxacum officinale</i> *	Common Dandelion
	<i>Thalictrum venulosum</i>	Early Meadow Rue
	<i>Thermopsis rhombifolia</i>	Golden-bean
	<i>Thlaspi arvense</i> *	Stinkweed
	<i>Tragopogon dubius</i> *	Yellow Goat's-beard
	<i>Triglochin maritima</i>	Seaside Arrow Grass
	<i>Triglochin palustris</i>	Marsh/Slender Arrow Grass
	<i>Typha latifolia</i>	Common Cattail

Species Observations - Northeast Swale		
Group	Scientific Name	Common Name
Plantae	<i>Ulmus americana</i>	American Elm
	<i>Ulmus pumila</i> *	Manchurian/Siberian Elm
	<i>Urtica dioica</i>	Common Nettle
	<i>Vicia americana</i>	American Vetch
	<i>Vicia americana var. minor</i>	Narrow Leaved Vetch
	<i>Viola adunca</i>	Early Blue Violet
	<i>Viola nephrophylla</i>	Bog Violet
	<i>Viola nuttallii</i>	Nuttall's Yellow Violet
	<i>Viola pedatifida</i>	Crow foot Violet
	<i>Viola rugulosa</i>	Western Canada Violet
	<i>Viola sp.</i>	Violet species
	<i>Zizia aptera</i>	Heart-leaved Alexander
	<i>Zygadenus elegans</i>	Smooth Camas
		* Introduced species

Appendix C: Photos

Photo Series 2: Flora and Fauna of the Northeast Swale



Photo1a. Waterfowl along a Wetland in Northeast Swale (Photo Credit: Meghan Michelson)



Photo 1b. Rusty Blackbird along a Wetland in Northeast Swale (Photo Credit: Meghan Michelson)



Photo1c. Shorebirds along a Wetlands in Northeast Swale (Photo Credit: Meghan Michelson)



Photo 1d. Snow Geese staging in a field adjacent to the Northeast Swale (Photo Credit: Meghan Michelson)



Photo1e. Northern Harrier Hunting over Wetlands Swale (Photo Credit: Meghan Michelson)



Photo 1f. Tundra Swans staging in wetland in NE the Northeast Swale (Photo Credit: Meghan Michelson)



Photo1g. Mule Deer at the Northeast Swale
(Photo Credit: Meghan Michelson)



Photo 1h. Mule Deer at the Northeast Swale
(Photo Credit: Meghan Michelson)

Photo Series 2: Flora and Fauna of the Small Swale



Photo 2a. Marsh Felwort at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2b. Northern Bog Orchid at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2c. Prairie Yellowjacket at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2d. Sedge Wren at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2e. Sharp-tailed Grouse at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2f. Swainson's Hawk at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2g. Swainson's Hawk Nest at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2h. Crowfoot Violet at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2i. Northern Leopard Frog at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2j. Northern Leopard Frog at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2k. Peregrine Falcon at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2l. Canada Geese Staging at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2m. Oblong-leaved Gentian at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2n. Osprey at Small Swale
(Photo Credit: Meghan Michelson)



Photo 2o. White-tailed Deer at the Small Swale
(Photo Credit: Meghan Michelson)

Photo 2p. White-tailed Deer at the Small Swale
(Photo Credit: Meghan Michelson)

Photos Series 3: Green Ash Forest along the South Saskatchewan River West Bank



Photo 3a. Green Ash Forest Along West Bank
of the South Saskatchewan River



Photo 3b. Green Ash Forest and Native Grasslands along
West bank of the South Saskatchewan River



Photo 3c. Northern Leopard Frog in a Spring along west bank of South Saskatchewan River



Photo 3d. Northern Leopard Frog in Green Ash Forest of along the West bank of the South Saskatchewan River

Photos Series 4: Passive Monitoring Equipment



Photo 4a. Dark-sky Meter Located at the Small Swale



Photo 4b. Wildlife Camera in a "Bird Box" located just west of Range Road 3050 along Proposed Route



Photo 4c. Wildlife Camera in a “Bird Box” located just west of Range Road 3045 at the NE Swale




Photo 4b. Wildlife Camera in a “Bird Box” located along the east slope fo the Small Swale

Photos Series 5: Wildlife Cameras Images





MOULTRIE  -8°C **MVA-SSWALE-02** **06 DEC 2019 08:52 am**



MOULTRIE  -12°C **MVA-SSWALE-02** **05 DEC 2019 07:22 pm**



MOULTRIE ☾ -2°C MVA-SSWALE-02 29 DEC 2019 03:50 pm



MOULTRIE ☾ -7°C MVA-SSWALE-02 23 DEC 2019 10:03 pm



MOULTRIE

☉ -15°C

MVA-SSWALE-02

13 DEC 2019 04:28 pm



MOULTRIE

☉ -20°C

MVA-SSWALE-01

09 JAN 2020 08:26 am



MOULTRIE



15°C 28.16inHg

MVA-SFP-SE19B

28 AUG 2019 09:01 pm



MOULTRIE



-16°C

MVA-SSWALE-01

08 MAR 2020 03:44 am



MOULTRIE ☉ -9°C MVA-SSWALE-02 08 FEB 2020 08:17 am



MOULTRIE ☉ -3°C MVA-SSWALE-01 11 MAR 2020 09:42 pm

Photos Series 6: Citizen Science Events



Photo 6a. Citizen Science Volunteers at the Green Ash Forest Event



Photo 6b. Green Ash Forest Volunteer Event in open native prairie adjacent to Green Ash Forest



Photo 6c. Green Ash Forest Volunteer Event Within the Green Ash Forest



Photo 6d. Green Ash Forest Volunteer Event along the West Bank of the South Saskatchewan River



Photo 6e. Small Swale Volunteer Even
(Photo Credit: Meghan Michelson)

Photo 6f. Small Mammal Traps Set-up at Small Swale for
Citizen Science Volunteer Event



Photo 6g. Citizen Science Volunteer Event at the
Small Swale

Photo 6h. Citizen Science Volunteer Event at the Small
Swale



Photo 6i. Snow Tracking Citizen Science Volunteer Event at the Small Swale



Photo 6j. Snow Tracking Citizen Science Volunteer Event at the Small Swale



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