

**APPENDIX G**  
**RAPTOR NEST SURVEY REPORT**

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# RAPTOR NEST SURVEY REPORT

**Riverbend Wind Energy Facility**

**Sanilac County, Michigan**

**October 2021**

TRC Project No. 428625.0000.0000



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**CONFIDENTIAL BUSINESS INFORMATION**

**Table of Contents**

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<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>3</b>
<b>2.0</b>	<b>METHODS .....</b>	<b>3</b>
2.1	EAGLE DESKTOP REVIEW.....	3
2.2	RAPTOR NEST SURVEY.....	5
	2.2.1 Ground-based Survey .....	6
	2.2.2 Aerial Survey.....	6
2.3	DATA COLLECTION .....	6
<b>3.0</b>	<b>RESULTS .....</b>	<b>8</b>
3.1	EAGLE DESKTOP REVIEW.....	8
	3.1.1 Eagle Occurrence Records .....	8
	3.1.2 Potential Eagle Habitat.....	8
	3.1.3 Previous Nest Information .....	9
3.2	FIELD SURVEY.....	9
	3.2.1 General Results.....	9
	3.2.2 Bald Eagle Nests.....	9
	3.2.3 Other Raptor Nests .....	10
<b>4.0</b>	<b>REFERENCES.....</b>	<b>14</b>

**List of Tables**

Table 1. Summary of raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan. ....	9
Table 2. Raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.....	12

**List of Figures**

Figure 1. Map of the Project Area and 3.2 km (2 mi) buffered Survey Area for the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan. ....	4
Figure 2. Raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.....	11

**List of Attachments**

Attachment 1. Nest data collected during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.	
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## 1.0 INTRODUCTION

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On behalf of Algonquin Power (MI Energy Developments), LLC, TRC Environmental Corporation (TRC) has prepared this Raptor Nest Survey Report (Report) as part of the environmental studies conducted for Riverbend Wind Energy Facility (Project). The proposed Project is in Sanilac County, Michigan, approximately 19.7 kilometers (km; 12.3 miles [mi]) south of Sandusky and 8.8 km (5.5 mi) east of Brown City in Sanilac County, Michigan. The Project Area is bounded by Sheridan Line Road on the north, Cribbins Road on the east, Fisher Road and the Sanilac/St Clair County line on the south, Mowerson Road to the west (Figure 1). The Project area encompasses approximately 15,052 hectares (ha; 37,194 acres [ac]) (Figure 1).

Pursuant to the US Fish and Wildlife Service's (USFWS) Land-based Wind Energy Guidelines (USFWS 2012), the USFWS Eagle Conservation Plan Guidance (USFWS 2013), Updated Eagle Nest Survey Protocol (USFWS 2021), and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016), a raptor nest survey including both ground-based and aerial methods was commissioned.

TRC was contracted in 2021 to conduct the survey using aerial and ground-based methods. The Survey Area consisted of the Project Area and a surrounding 3.2 km (2 mi) buffer. The Survey Area covered approximately 39,729 ha (99,169 ac) within Sanilac and St. Clair Counties (Figure 1).

## 2.0 METHODS

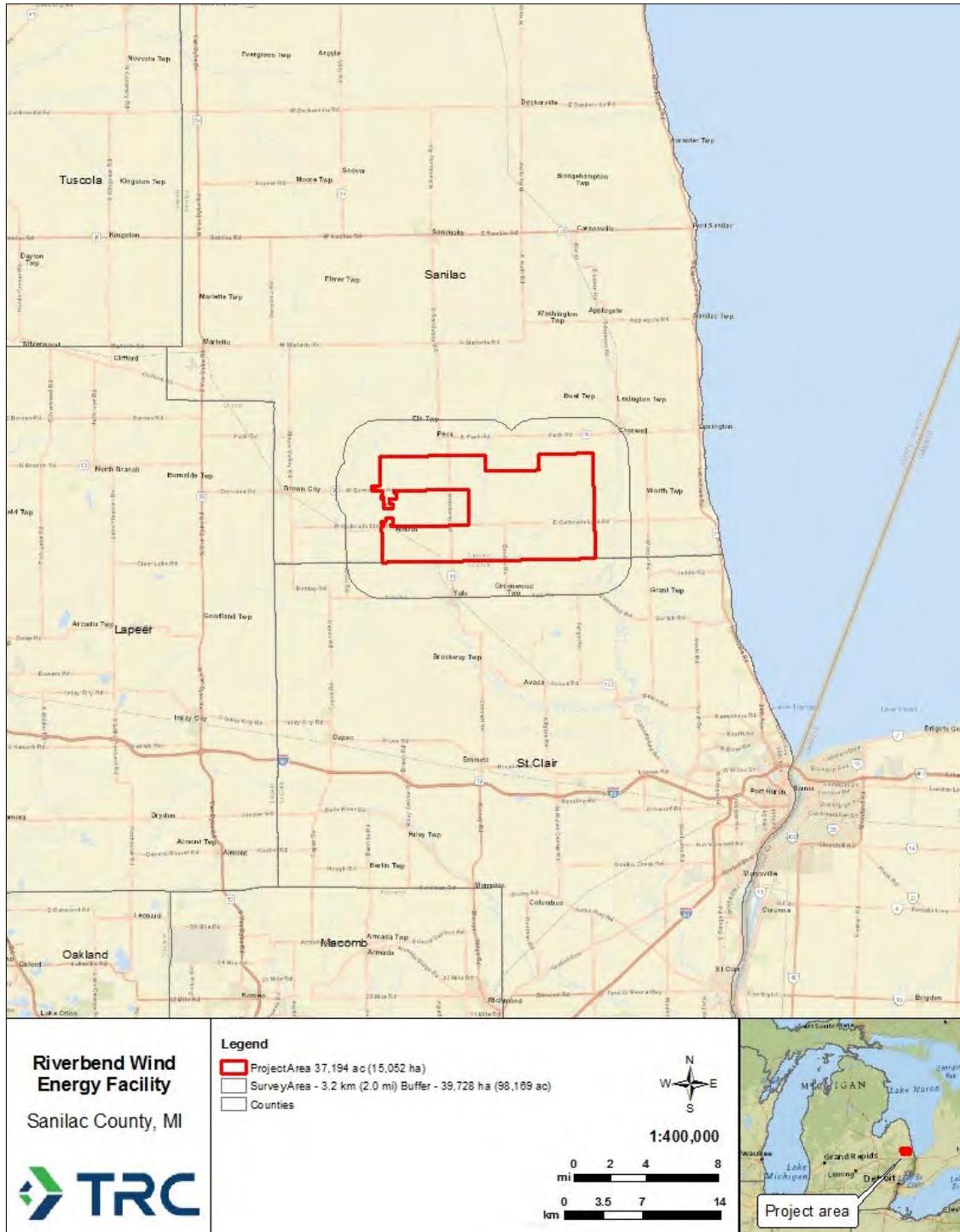
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### 2.1 EAGLE DESKTOP REVIEW

A review of publicly available and privately held information on eagle nest locations and region-specific habitat criteria within the counties encompassing the Survey Area was conducted prior to initiating site surveys. The focus of the desktop review included the following items:

- Determining which of the two North American eagle species, bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), have the potential to nest within the Survey Area
- Describing region-specific nest habitat criteria for each potential eagle species

- Identifying historic nesting and/or eagle occurrence records within the counties encompassing the Survey Area



- Evaluating potentially suitable eagle nesting habitat within the Survey Area, which was used to inform the logistics of the surveys

Eagle occurrence and habitat data sources for the desktop review included eBird (2021), USFWS Bald Eagle Nesting Data (USFWS 2019), Michigan Natural Features Inventory (MNFI 2021), The Second Michigan Breeding Bird Atlas (Chartier et al. 2011), species accounts from Birds of the World (Buehler 2020, Katzner et al. 2020), and data from prior and ongoing field studies at the Project (e.g. site characterization and avian use surveys; TRC 2021, TRC unpublished data). Spatial data gathered during the desktop process was reviewed using a geographic information system (GIS; ESRI ArcGIS®). Eagle occurrence information obtained from these sources was compared to the Survey Area boundary to determine whether any known bald eagle nests or occurrences were within the Survey Area.

The region-specific eagle nest habitat criteria (see Methods below) were compared with Survey Area conditions presented in aerial imagery, the National Landcover Database (NLCD, Homer et al. 2020), and the USFWS National Wetlands Inventory (USFWS 2014). Any portions of the Survey Area appearing to match the region-specific nest habitat criteria were considered potential eagle nest habitat.

## **2.2 RAPTOR NEST SURVEY**

The purpose of the 2021 raptor nest survey was to verify the status of any previously recorded eagle nests within the Survey Area and to locate any additional raptor nests of any species within the Survey Area.

Site surveys were performed on April 7 and 8, 2021. Ground-based site surveys were conducted from automobiles, and an aerial survey was conducted via helicopter. During the ground-based surveys, the full Survey Area was covered from public roads. A helicopter was used to survey the remaining potentially suitable eagle nest habitat that was not visible during ground-based surveys.

Raptors are known to construct nests on and utilize a variety of habitats including forests (trees, tree cavities, the ground), grasslands (ground-dwelling, towers, etc.), and developed areas (buildings, towers, etc.) (Coates et al. 2014, Dykstra et al. 2001, Berry et al. 1998, Kantrud and Higgins 1992, Titus and Mosher 1981). However, the predominant suitable raptor nesting habitat within the Project boundary was forest or large trees in residential areas.

### 2.2.1 Ground-based Survey

Visual scans of suitable habitat were performed from the vehicle and on foot along accessible roads using the naked eye, binoculars, and/or a spotting scope. The habitat information gathered during the desktop review was used to plan the initial ground-based survey routes. The planned survey route was adjusted during the site survey in response to the actual availability and location of suitable nest substrates for the targeted species.

### 2.2.2 Aerial Survey

Flight paths followed or circled areas considered potentially suitable nest habitat. Flight heights were approximately 152 – 366 meters (m, 500 – 1200 feet [ft]) above the ground and flight paths were adjusted during the site survey to provide the biologist with the best view of the habitat to be surveyed. If locations required a lengthier inspection, the aircraft hovered or was flown in a circling pattern until the biologists completed data collection or had completely surveyed the targeted area. To find nests, habitat was scanned by the naked eye and through binoculars. If a nest was observed, the nest status was confirmed using binoculars.

## 2.3 DATA COLLECTION

Data collection was completed digitally using the ESRI ArcGIS® Field Maps app.

When a nest was found during the aerial and ground-based surveys, the following information was recorded:

- *Location*: recorded as a point feature on the digital map
- *Date*: Date of nest discovery or observation
- *Nest ID*: For identification purposes, each nest found during the survey was assigned a number and species, if known (e.g., “RTHA-2” would indicate the second nest documented that was occupied by one or more Red-tailed Hawks [*Buteo jamaicensis*] in the Study Area). If species was unknown, it was recorded as Unknown Raptor, or UNRA.
- *Nest Type*: Stick, cavity, or ground
- *Nest Size*: Extra-large (eagle [e.g., bald eagle] nest; approximately  $\geq 1.2$  m [4 ft] in diameter), Large (eagle or buteo [e.g., red-tailed hawk] nest;  $\geq 0.9$  –  $< 1.2$  m [3 – 4 ft] in diameter), Medium (buteo nest;  $\geq 0.6$  –  $< 1.2$  m [2 – 3 ft] in diameter), Small (small buteo or accipiter [e.g., Cooper’s hawk] nest;  $\leq 0.3$  –  $0.6$  m [1 – 2 ft] in diameter), Unknown (cavity or burrow nest [e.g., American kestrel])

- *Species*: If a bird was observed at or near a nest, the species was recorded. If no bird was observed at or near the nest, the species was recorded as unknown
- *Nest Condition*: Excellent (solid bowl, recently lined and/or tended), Good (solid bowl, no lining or recent tending), Fair (bowl present, loose and clearly defined), Dilapidated (nest structure remains mostly intact, but no bowl shape clearly defined), Remnant (nest structure not intact, falling from substrate, no bowl structure), or Gone (relevant only if checking a previously documented nest)
- *Nest Substrate*: e.g., tree species, power pole, ground, etc.
- *Nest Substrate Slope Aspect*: North, Northeast, East, Southeast, South, Southwest, West, Northwest, or Flat
- *Substrate Height* (m): Height of the tree or structure which the nest was in
- *Nest Height* (m): Height of the nest in the substrate
- *Nest Exposure*: The cardinal direction that the nest was located within the substrate; North, Northeast, East, Southeast, South, Southwest, West, Northwest, or Open
- *Nest Habitat*: Land cover in area surrounding nest, described with NLCD classifications (Homer et al. 2020)
- *Nest Status*: Terminology adapted from Steenhof et al. (2017):
  - Unknown (nest not visible [e.g., cavity or burrow] and/or status unattainable without extensive viewing)
  - Occupied (pair of adult birds at or near nest, but either nesting has not yet been initiated or not known if eggs or young are in nest)
  - Occupied-Incubation (eggs)
  - Occupied-Brooding (young in the nest)
  - Occupied-Unknown (small young or eggs in the nest)
  - Occupied-Nestlings (occupied with nestlings that are old enough that full-time parental brooding is not required)
  - Occupied-Fledged (nest with young that have reached 80% of fledgling age for a given species or young have departed the nest)
  - Occupied-Failed (nest had pair of adults that initiated a nest [eggs laid and or young hatched] but that the eggs or young did not survive to fledge age)
  - Unoccupied (no adults seen near or at nest)
  - Unoccupied-alternate (unoccupied nest site within the territory of known breeding pair)

Observations of any eagles and other raptor species were recorded opportunistically during ground-based surveys. A complete record of field data associated with each nest was created in a spreadsheet. The full data record was used to tabulate and summarize the status (occupied, unoccupied) of nests by species and distance to the Project.

## 3.0 RESULTS

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### 3.1 EAGLE DESKTOP REVIEW

#### 3.1.1 Eagle Occurrence Records

Only bald eagles have potential to nest within the Survey Area. Golden eagles are not considered to have potential to nest within the Survey Area and have never been reported as nesting in Michigan (Chartier et al. 2011).

Golden eagles rear their chicks in June and July, and do not migrate during these months; a review of occurrence data from this period provides a means of assessing nesting potential (eBird 2021; Katzner et al. 2020). There is only one record of a golden eagle occurrence in Michigan during the months of June or July between 1900 and 2020, which was recorded in Crawford County in June 2015 (eBird 2021), indicating little-to-no presence during the breeding season.

Bald eagle occurrences and nesting records in Michigan were common and were reported in several sources. Bald eagles have been recorded year round in Sanilac County, including within the Project area (Chartier et al. 2011; eBird 2021; TRC Unpublished data). As of 2010, there was an estimated 630 nesting pairs of bald eagles in Michigan, and that the number of occupied nests has doubled each decade since the 1970's (Chartier et al 2011, USFWS 2019).

#### 3.1.2 Potential Eagle Habitat

Buehler (2020) notes bald eagles prefer to nest “in mature and old-growth forest with some habitat edge, relatively close (usually < 2.0 km [ $< 1.2$  mi]) to water with suitable foraging opportunities.” However, distances between nests and foraging opportunities vary by regional population and depend more upon the location of suitable nest substrate relative to quality foraging locations (Buehler 2020). Additionally, bald eagles have recently been detected, in a limited number of circumstances, nesting away from the large bodies of water they have been historically closely associated with; these “dry-land” habitats were previously considered unsuitable, and nesting occurrence within them is generally unlikely.

For purposes of evaluating potential nesting habitat within the Survey Area, we considered any forested areas within roughly 1.6 km (1.0 mi) of open water (ponds, lakes, rivers, streams) or emergent herbaceous wetlands as potential eagle nesting habitat. The desktop review identified

potential eagle nest habitat was concentrated along Black Creek, which runs to the east through the middle of the Project, and Black River, which runs to the south, outside of the Project area on the east side. However, there are other creeks and drainages throughout the Project area which may provide suitable foraging habitat needed to support breeding pairs in any forested patches within the Study area.

### 3.1.3 Previous Nest Information

No specific bald eagle nest locations were identified in Sanilac County the desktop review, though it was thought likely that bald eagles breed in Sanilac County based on occurrence records and the breeding range of bald eagles in Michigan (eBird 2021, Chartier et al. 2011, MNFI 2021).  
FIELD SURVEY

### 3.1.4 General Results

Four bald eagle nests, six red-tailed hawk nests, and 27 nests of unknown raptor species (but too small to be eagle nests) were discovered during the survey (Table 1). The complete dataset of nest information collected during the site survey is available in Attachment 1.

**Table 1. Summary of raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.**

Species	2021 Nest Status		Total
	Occupied	Unoccupied	
Bald Eagle	3	1	4
Red-tailed Hawk	6	0	6
Unknown raptor	0	27	27
<b>Total</b>	<b>9</b>	<b>28</b>	<b>37</b>

### 3.1.5 Bald Eagle Nests

Four bald eagle nests were discovered during the surveys on April 7 and 8 (Table 1, Figure 2). Three of the nests were occupied, one was unoccupied, and all four nests were outside the Project Area but within the 3.2 km (2.0 mi) buffered Survey Area.

BAEA-1 was an occupied nest in a wooded area on the west bank of the Black River, 2.7 km (1.7 mi) to the east of the Project boundary. BAEA-2 was a second occupied nest on the west bank of the Black River, approximately 6.3 km (4.0 mi) south of BAEA-1 and 2.7 km (1.7 mi) southeast of the Project area. BAEA-3 was an unoccupied eagle nest located <0.1 km (<0.1 mi) from the western boundary of the Project area in a tree line between agricultural fields to the northwest of

the town of Melvin. The nest structure was over 1.2 m (4 ft) in diameter and was composed of large sticks, indicating that it had been an eagle nest and not of a smaller raptor. There was active ground disturbance (use of a backhoe for excavation) in the immediate vicinity of the nest, and no eagles were observed at or near the nest. The nest was recorded as unoccupied due to the lack of eagle observations and ongoing disturbance. BAEA – 4 was an occupied eagle nest in a tree line in between agricultural fields located approximately 2.0 km (1.2 mi) to the west of the Project area, near the southern boundary of the Project.

### **3.1.6 Other Raptor Nests**

Thirty-three non-eagle raptor nests were recorded during the 2021 survey (Table 1, Table 2, Figure 2). Six of these nests were occupied by red-tailed hawks; one of which was in the southeast corner of the Project Area, four of which were outside the Project Area but within the 3.2 km (2.0 mi) buffered Study Area, and one which lay just outside the Study Area to the west.

Twenty-seven nests of unknown raptor nests were recorded as unoccupied or unknown status during the survey (Table 1, Table 2, Figure 2). Fourteen of these nests were located within the Project Area, twelve were located outside of the Project Area but within the 3.2 km (2 mi) buffer Study Area, and one was located just outside the Study Area to the east.

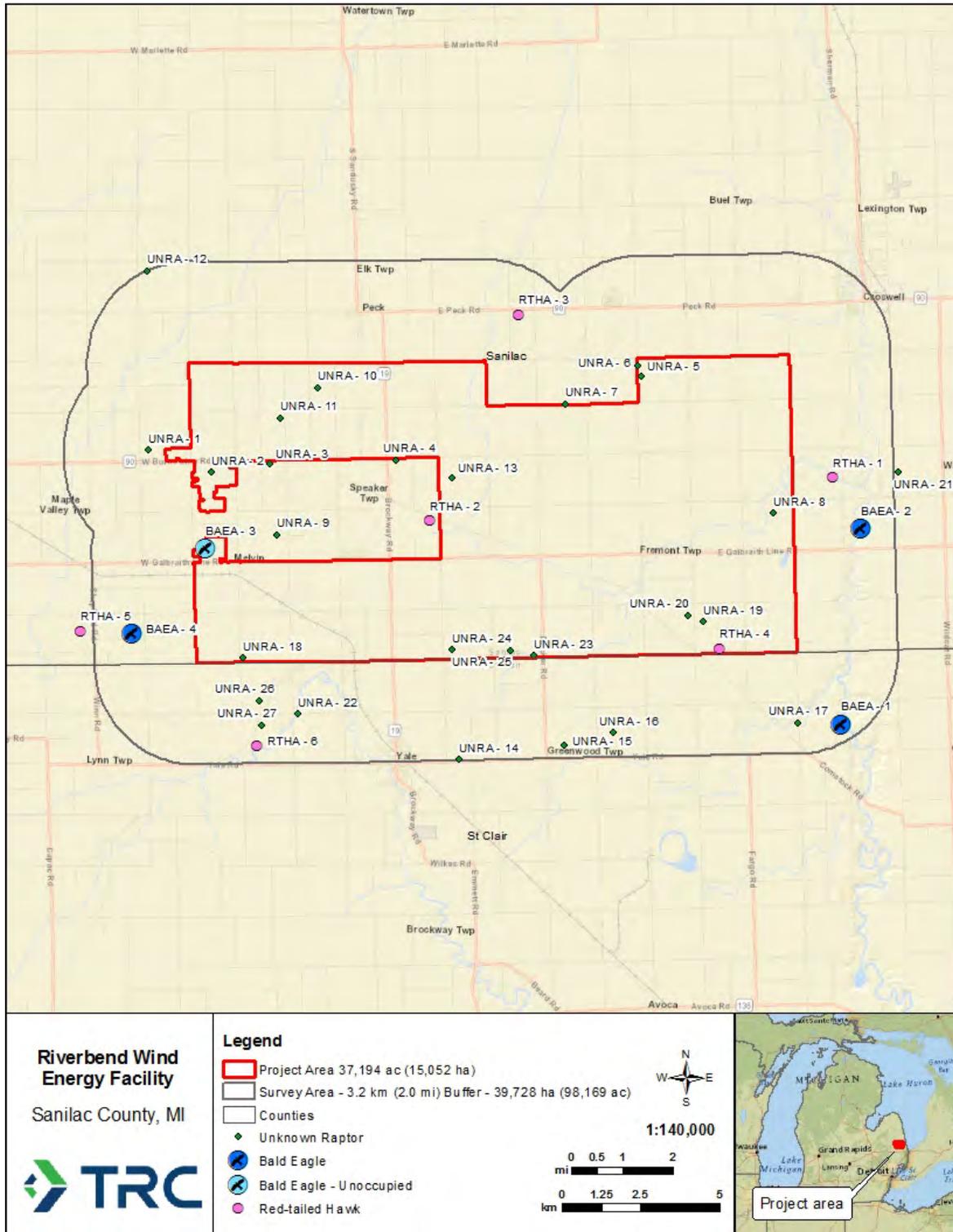


Figure 2. Raptor nests observed during the 2021 survey of Riverbend Wind Energy Facility, Sanilac County, Michigan.

**Table 2. All known raptor nests observed during the 2021, 2020, 2018, and 2016 raptor nest surveys of Riverbend Wind Energy Facility, Sanilac County, Michigan.**

Nest ID	Species	Latitude	Longitude	Nest Status	Within Project Area	Between Project Area and 3.2 km (2.0 mi) Buffer	Outside of 3.2 km (2.0 mi) Buffer
BAEA - 1	Bald Eagle	43.1435	-82.6254	Occupied		x	
BAEA - 2	Bald Eagle	43.1995	-82.6192	Occupied		x	
BAEA - 3	Bald Eagle	43.1899	-82.8745	Unoccupied		x	
BAEA - 4	Bald Eagle	43.1654	-82.9024	Occupied		x	
RTHA - 1	Red-tailed Hawk	43.2141	-82.6304	Occupied		x	
RTHA - 2	Red-tailed Hawk	43.1994	-82.7873	Occupied		x	
RTHA - 3	Red-tailed Hawk	43.2588	-82.7543	Occupied		x	
RTHA - 4	Red-tailed Hawk	43.1646	-82.673	Occupied	x		
RTHA - 5	Red-tailed Hawk	43.1658	-82.9224	Occupied			x
RTHA - 6	Red-tailed Hawk	43.1341	-82.8526	Occupied		x	
UNRA - 1	Unknown Raptor	43.2176	-82.8975	Unoccupied		x	
UNRA - 2	Unknown Raptor	43.2116	-82.8728	Unoccupied	x		
UNRA - 3	Unknown Raptor	43.2145	-82.8502	Unoccupied		x	
UNRA - 4	Unknown Raptor	43.2163	-82.8007	Unoccupied		x	
UNRA - 5	Unknown Raptor	43.2417	-82.7058	Unoccupied	x		
UNRA - 6	Unknown Raptor	43.2447	-82.7071	Unoccupied	x		
UNRA - 7	Unknown Raptor	43.2332	-82.7354	Unoccupied	x		
UNRA - 8	Unknown Raptor	43.2034	-82.6534	Unoccupied	x		
UNRA - 9	Unknown Raptor	43.1943	-82.8467	Unoccupied		x	
UNRA - 10	Unknown Raptor	43.2366	-82.8322	Unoccupied	x		
UNRA - 11	Unknown Raptor	43.2276	-82.8465	Unoccupied	x		
UNRA - 12	Unknown Raptor	43.2688	-82.8997	Unoccupied		x	
UNRA - 13	Unknown Raptor	43.2117	-82.7787	Unoccupied	x		
UNRA - 14	Unknown Raptor	43.1312	-82.7738	Unoccupied		x	
UNRA - 15	Unknown Raptor	43.1358	-82.733	Unoccupied		x	
UNRA - 16	Unknown Raptor	43.1398	-82.7138	Unknown		x	
UNRA - 17	Unknown Raptor	43.1436	-82.6421	Unknown		x	
UNRA - 18	Unknown Raptor	43.1588	-82.8587	Unoccupied	x		

Nest ID	Species	Latitude	Longitude	Nest Status	Within Project Area	Between Project Area and 3.2 km (2.0 mi) Buffer	Outside of 3.2 km (2.0 mi) Buffer
UNRA - 19	Unknown Raptor	43.172	-82.6796	Unoccupied	x		
UNRA - 20	Unknown Raptor	43.1737	-82.6859	Unoccupied	x		
UNRA - 21	Unknown Raptor	43.2159	-82.6047	Unknown			x
UNRA - 22	Unknown Raptor	43.1432	-82.837	Unoccupied		x	
UNRA - 23	Unknown Raptor	43.1614	-82.7457	Unoccupied	x		
UNRA - 24	Unknown Raptor	43.1626	-82.7547	Unknown	x		
UNRA - 25	Unknown Raptor	43.1627	-82.7777	Unknown	x		
UNRA - 26	Unknown Raptor	43.1469	-82.8521	Unoccupied		x	
UNRA - 27	Unknown Raptor	43.1398	-82.8511	Unoccupied		x	

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**Attachment 1. Nest data collected during the 2021 raptor nest survey of Riverbend Wind Energy Facility, Sanilac County, Michigan.**

Attachment 1. Nest data collected during the 2021 raptor nest survey of Riverbend Wind Energy Facility, Sanilac County, Michigan.

Project	Date	Observer(s)	Survey Ty	Nest ID	Coordinates (decimal degrees)	Species	Nest Statu	Nest Type	Nest Size	Nest Condition	Substrate	Nest Height (m)	Slope Aspect	Nest Exposure	Habitat	Notes
Riverbend	4/7/2021	K. Bardstead AND	Aerial	BAEA - 1	43.1435, -82.6254	Bald Eagle	Occupied	Stick	L	Excellent	Tree	40	E	E	Mixed Forest	Adult flew off the nest, wasn't able to determine if eggs or chicks present
Riverbend	4/7/2021	K. Bardstead JV	Aerial	BAEA - 2	43.1995, -82.6192	Bald Eagle	Occupied	Stick	XL	Excellent	Tree	45	E	E	Mixed Forest	Adult sitting on nest, white pine tree along Black River corridor
Riverbend	4/8/2021	K. Bardstead	Ground	BAEA - 3	43.1899, -82.8745	Bald Eagle	Unoccupied	Stick	XL	Good	Tree	45	E	S	Cultivated Crops	Nest structure has height of 2-3ft, substrate is a deciduous tree in forested buffer strip. Active disturbance (backhoe) in field directly adjacent
Riverbend	4/8/2021	J. VanderMeer	Ground	BAEA - 4	43.1654, -82.9024	Bald Eagle	Occupied	Stick	XL	Excellent	Tree	40		E	Deciduous Forest	adult baea on nest deciduous woodlot in agricultural field, 2nd adult perched on branch next to nest
Riverbend	4/7/2021	K. Bardstead JV	Aerial	RTHA - 1	43.2141, -82.6304	Red-tailed Hawk	Occupied	Stick	M	Excellent	Tree	40	E	N	Mixed Forest	Tree directly adjacent to emergent wetland along black creek
Riverbend	4/8/2021	K. Bardstead	Ground	RTHA - 2	43.1994, -82.7873	Red-tailed Hawk	Occupied	Stick	L	Excellent	Tree	25	SE	NE	Mixed Forest	Red-tailed adult actively defending nest with flight display and calls. Substrate is white pine located on field-first edge
Riverbend	4/8/2021	K. Bardstead	Ground	RTHA - 3	43.2588, -82.7543	Red-tailed Hawk	Occupied	Stick	L	Excellent	Tree	40	NW	SE	Evergreen Forest	White pine
Riverbend	4/7/2021	J. VanderMeer	Ground	RTHA - 4	43.1646, -82.673	Red-tailed Hawk	Occupied	Stick	M	Excellent	Tree	35		N	Deciduous Forest	adult on nest
Riverbend	4/8/2021	J. VanderMeer	Ground	RTHA - 5	43.1658, -82.9224	Red-tailed Hawk	Occupied	Stick	M	Excellent	Tree	35		E	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	RTHA - 6	43.1341, -82.8526	Red-tailed Hawk	Occupied	Stick	M	Good	Tree	40		W	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 1	43.2176, -82.8975	Unidentified Raptor	Unoccupied	Stick	S	Fair	Tree	25	N	W	Deciduous Forest	Nest in maple tree close to forest-field edge
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 10	43.2366, -82.8322	Unidentified Raptor	Unoccupied	Stick	L	Good	Tree	25	N	NE	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 11	43.2276, -82.8465	Unidentified Raptor	Unoccupied	Stick	L	Excellent	Tree	35	N	SW	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 12	43.2688, -82.8997	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	30	E	W	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 13	43.2117, -82.7787	Unidentified Raptor	Unoccupied	Stick	L	Fair	Tree	30	N	SE	Deciduous Forest	Deciduous tree, presumed oak, overlooking forested/emergent wetland area
Riverbend	4/7/2021	J. VanderMeer	Ground	UNRA - 14	43.1312, -82.7738	Unidentified Raptor	Unoccupied	Stick	M	Fair	Tree	25	W	W	Evergreen Forest	no activity seen
Riverbend	4/7/2021	J. VanderMeer	Ground	UNRA - 15	43.1358, -82.733	Unidentified Raptor	Unoccupied	Stick	M	Fair	Tree	30	N	S	Deciduous Forest	
Riverbend	4/7/2021	J. VanderMeer	Ground	UNRA - 16	43.1398, -82.7138	Unidentified Raptor	Unknown	Stick	M	Good	Tree	35	N	E	Deciduous Forest	
Riverbend	4/7/2021		Ground	UNRA - 17	43.1436, -82.6421	Unidentified Raptor	Unknown	Stick	S	Fair	Tree	10	E	E	Deciduous Forest	AMCR nearby
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 18	43.1588, -82.8587	Unidentified Raptor	Unoccupied	Stick	S	Good	Tree	35		S	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 19	43.172, -82.6796	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	40		W	Deciduous Forest	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 2	43.2116, -82.8728	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	25	E	W	Deciduous Forest	Very deep bowl. Almost conical at base. Near the crown of deciduous tree in beech-maple forest
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 20	43.1737, -82.6859	Unidentified Raptor	Unoccupied	Stick	M	Dilapitated	Tree	30		N	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 21	43.2159, -82.6047	Unidentified Raptor	Unknown	Stick	M	Good	Tree	40		W	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 22	43.1432, -82.837	Unidentified Raptor	Unoccupied	Stick	S	Excellent	Tree	30		W	Woody Wetlands	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 23	43.1614, -82.7457	Unidentified Raptor	Unoccupied	Stick	S	Fair	Tree	25		W	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 24	43.1626, -82.7547	Unidentified Raptor	Unknown	Stick	M	Fair	Tree	40		N	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 25	43.1627, -82.7777	Unidentified Raptor	Unknown	Stick	M	Fair	Tree	45		N	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 26	43.1469, -82.8521	Unidentified Raptor	Unoccupied	Stick	L	Excellent	Tree	45		S	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 27	43.1398, -82.8511	Unidentified Raptor	Unoccupied	Stick	M	Excellent	Tree	25		N	Deciduous Forest	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 3	43.2145, -82.8502	Unidentified Raptor	Unoccupied	Stick	L	Good	Tree	20	E	W	Deciduous Forest	Large stick nest within 10ft of crown of maple tree adjacent to ag. Land
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 4	43.2163, -82.8007	Unidentified Raptor	Unoccupied	Stick	M	Excellent	Tree	20	E	N	Deciduous Forest	Substrate provides open view of emergent wetland directly below and adjacent ag fields
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 5	43.2417, -82.7058	Unidentified Raptor	Unoccupied	Stick	S	Remnant	Tree	15	S	S	Cultivated Crops	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 6	43.2447, -82.7071	Unidentified Raptor	Unoccupied	Stick	S	Fair	Tree	15	S	N	Deciduous Forest	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 7	43.2332, -82.7354	Unidentified Raptor	Unoccupied	Stick	S	Good	Tree	10	W	E	Deciduous Forest	Built in crotch of tree branches in young maple tree along forest-field edge
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 8	43.2034, -82.6534	Unidentified Raptor	Unoccupied	Stick	M	Fair	Tree	40	E	NW	Deciduous Forest	Overlooking recently cleared area and ag fields. Substrate is aspen tree
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 9	43.1943, -82.8467	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	35	N	E	Grassland/Herbaceous	Mature oak tree along riparian buffer between grassland fields

**APPENDIX H**  
**SITE CHARACTERIZATION REPORT**

**CONFIDENTIAL: DO NOT DISTRIBUTE**

# SITE CHARACTERIZATION SURVEY REPORT

## Riverbend Wind Energy Facility Sanilac County, Michigan

October 2021

TRC Project No. 428625.0000.0000



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CONFIDENTIAL BUSINESS INFORMATION

## Table of Contents

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<b>1.0</b>	<b>INTRODUCTION.....</b>	<b>4</b>
1.1	PROJECT AREA SETTING .....	7
<b>2.0</b>	<b>METHODS .....</b>	<b>7</b>
2.1	EXISTING INFORMATION FROM AVAILABLE PUBLIC SOURCES.....	7
2.2	FIELD RECONNAISSANCE.....	10
<b>3.0</b>	<b>RESULTS .....</b>	<b>12</b>
3.1	SOILS.....	12
3.2	LAND COVER .....	12
3.3	WETLANDS AND OTHER WATERS .....	15
3.4	HABITAT DESCRIPTION .....	18
3.5	PLANT AND WILDLIFE SPECIES .....	18
3.5.1	FEDERALLY THREATENED, ENDANGERED, AND PROTECTED SPECIES .....	25
3.5.2	STATE-LISTED SPECIES.....	31
3.5.3	FEDERAL AND STATE SPECIES OF CONCERN .....	34
3.5.4	USGS BREEDING BIRD SURVEY.....	35
3.5.5	CHRISTMAS BIRD COUNTS .....	37
3.5.6	IMPORTANT BIRD AREAS .....	38
3.5.7	SPECIES OF HABITAT FRAGMENTATION CONCERN.....	38
3.5.8	WILDLIFE MIGRATION.....	39
3.5.9	WILDLIFE OBSERVATIONS .....	39
<b>4.0</b>	<b>PRECLUDED LANDS.....</b>	<b>43</b>
4.1.1	UNITED STATES FISH AND WILDLIFE SERVICE-DESIGNATED CRITICAL HABITAT .....	43
4.1.2	HIGH-PRIORITY CONSERVATION AREAS .....	43
4.1.3	FEDERAL OR TRIBAL LANDS .....	43
4.1.4	LOCAL, STATE, OR REGIONAL AREAS.....	43
<b>5.0</b>	<b>REFERENCES.....</b>	<b>46</b>

**List of Tables**

Table 1. National Land Cover Database Landcover Types within the Riverbend Wind Energy Facility area, the 2.0-mi [3.2-km] Project Buffer area, and Sanilac County, Michigan, 2021. .... 13

Table 2. National Wetlands Inventory Features within the Riverbend Wind Energy Facility area, Sanilac County, Michigan, 2021..... 15

Table 3. National Wetlands Inventory Wetland Types within the Riverbend Wind Energy Facility area and 2.0-Mile (3.2-Kilometer) Buffer Project Buffer area, Sanilac County, Michigan, 2021. .... 15

Table 4. NHD Features within the Riverbend Wind Energy Facility area, Sanilac County, Michigan, 2021. .... 16

Table 5. NHD Features within the Riverbend Wind Energy Facility area and 2.0-Mile (3.2-Kilometer) Project Buffer area, Sanilac County, Michigan, 2021. .... 16

Table 6. Special Status Wildlife Species, Their Current Status, Preferred Habitat, And Potential Seasonal Occurrence for Species That Are Known to Occur, Have Potential to Occur, or Have Limited Potential to Occur in the Riverbend Wind Energy Facility Area..... 20

Table 7. Ten Most Abundant Species and All Special Status Species Observed on the Deckerville USGS Breeding Bird Survey Route #49070, 1978–2019. .... 36

Table 8. Ten Most Abundant Species and All Special Status Species Observed on National Audubon Society’s Freeport Christmas Bird Counts, 1995–2019. .... 37

Table 9. Species Observations from the Riverbend Wind Energy Facility Field reconnaissance, Sanilac County, Michigan, 2021. .... 39

**List of Figures**

Figure 1. Project area of the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021. .... 5

Figure 2. USGS Map of the Project area for the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021..... 6

Figure 3. Level IV ecoregions in the vicinity of the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021..... 8

Figure 4. NLCD Map of the Project area at the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021..... 14

Figure 5. Wetland and Waterway features: NWI, NHD, and Desktop Review Map of the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021..... 17

Figure 6. Known Bald Eagle Nest Locations, USGS Breeding Bird Survey Routes, Audubon Important Bird Areas, Christmas bird count circles, at the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021..... 42

Figure 7. Precluded Lands in the vicinity of the Riverbend Wind Energy Facility,  
Sanilac County, Michigan, 2021.....45

**Appendices:**

Appendix 1: Wetlands and Other Water of the United States Desktop Mapping Report, Riverbend  
Wind Energy Facility, Sanilac County, Michigan

Appendix 2: Desktop Review of the Cultural and Historic Resources; Riverbend Wind Energy  
Facility, Sanilac County, Michigan

Appendix 3: MNFI and IPAC Reviews

## 1.0 INTRODUCTION

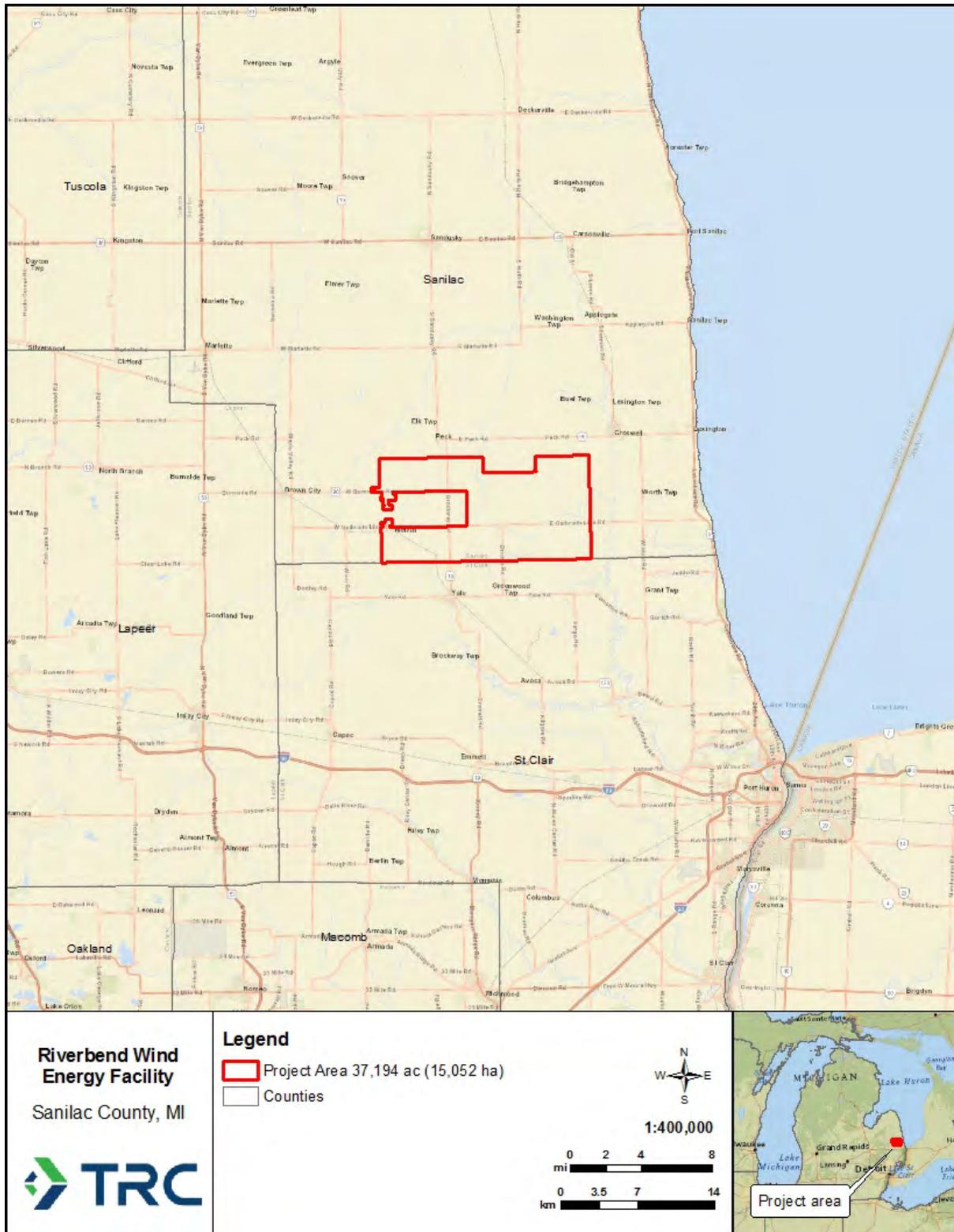
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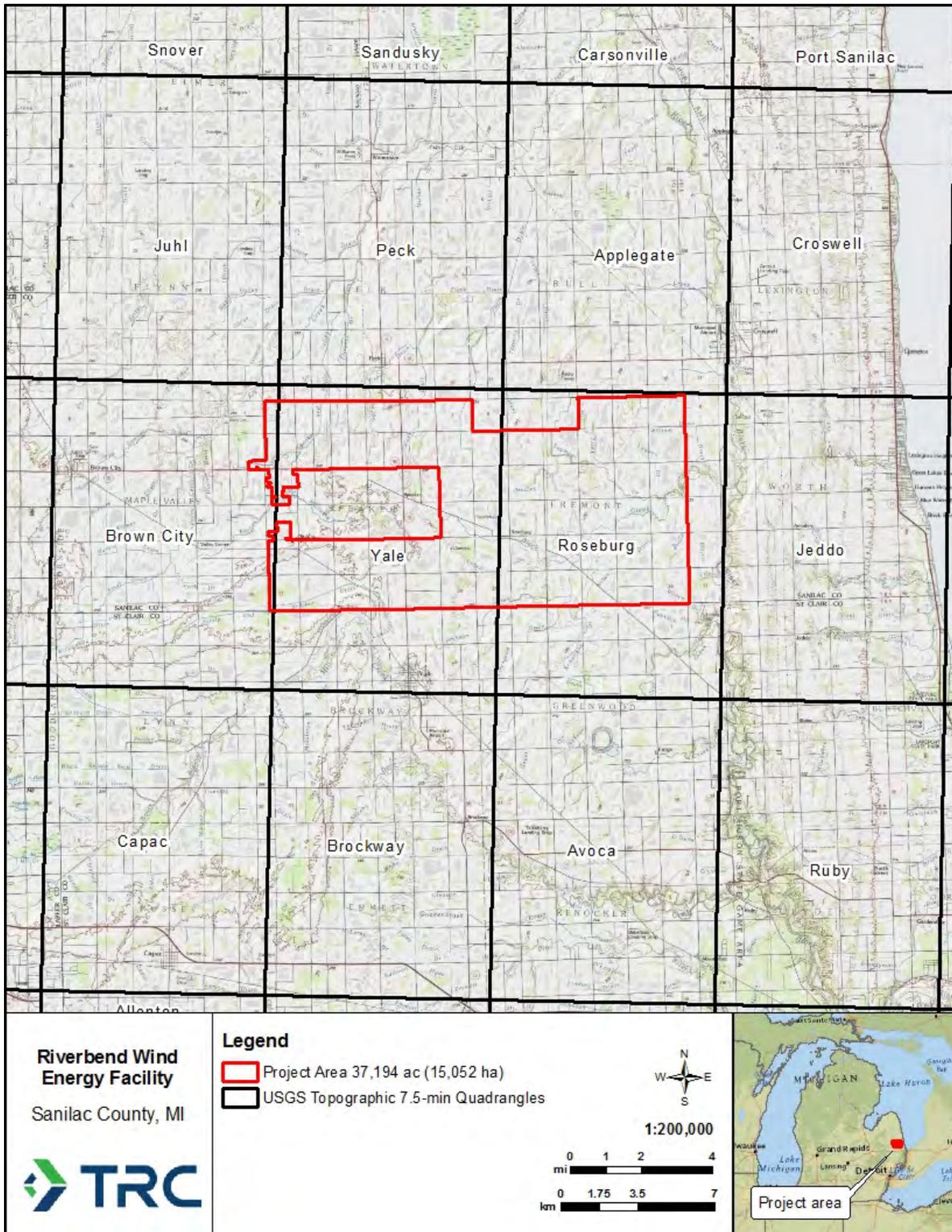
On behalf of Algonquin Power (MI Energy Developments), LLC, TRC Environmental Corporation (TRC) has prepared this Site Characterization Report (Report) as part of the environmental studies conducted for the Riverbend Wind Energy Facility (Project), located in Sanilac County, Michigan (Figure 1).

This Report provides information addressing questions within Tiers 1 and 2 of the United States Fish and Wildlife Service (USFWS) Land-based Wind Energy Guidelines (USFWS, 2012a). The Report methodology included a desktop review of available wildlife and habitat databases, followed by a field reconnaissance and habitat mapping effort in the spring of 2021.

The 37,194 acre (ac; 15,052-hectare [ha]) Project Area is located approximately 12.3 miles (mi; 19.7 kilometers [km]) south of Sandusky and 5.5 mi (8.8 km) east of Brown City in Sanilac County, Michigan. The Project Area is bounded by Sheridan Line Road on the north, Cribbins Road on the east, Fisher Road, and the Sanilac/St Clair County line on the south, Mowerson Road to the west (Figure 1). Project area lies within the USGS topographic 7.5-minute quadrangles of Brown City, Yale, And Roseburg, and elevation varies from 755 feet (ft; 230 meters [m]) to 820 ft (250 m) (Figure 2).

The Project area used for this Report's desktop evaluation consisted of the potential construction area and species- or natural resource-specific evaluation buffers (see Section 2.1 below). The field-based reconnaissance survey area covered the Project area which consisted primarily of cultivated cropland interspersed with small woodlots, farmsteads, and residential homes. All field reconnaissance surveys occurred from public roads or other publicly accessible areas.





## 1.1 PROJECT AREA SETTING

The Project lies within the Huron/Erie Level III Ecoregion, and the Saginaw Lake Plain Level IV Ecoregion (USEPA, 2013) (Figure 3). Historically, the native habitat was mostly forested, dominated by several hardwood species (including species of beech, maples, oaks) and evergreens such as hemlock and pines, with poorly drained, clayey soil, and extensive coastal marches and wet prairies along Saginaw Bay in Lake Huron. Today, the majority of the land is used to cultivate crops, dairy, and livestock (USEPA 2013). Primary crops in the region include corn, soybeans, white beans, and beets. Natural habitats remaining in the area are predominantly deciduous forests and woody wetlands (Homer et al 2020, USEPA 2013).

## 2.0 METHODS

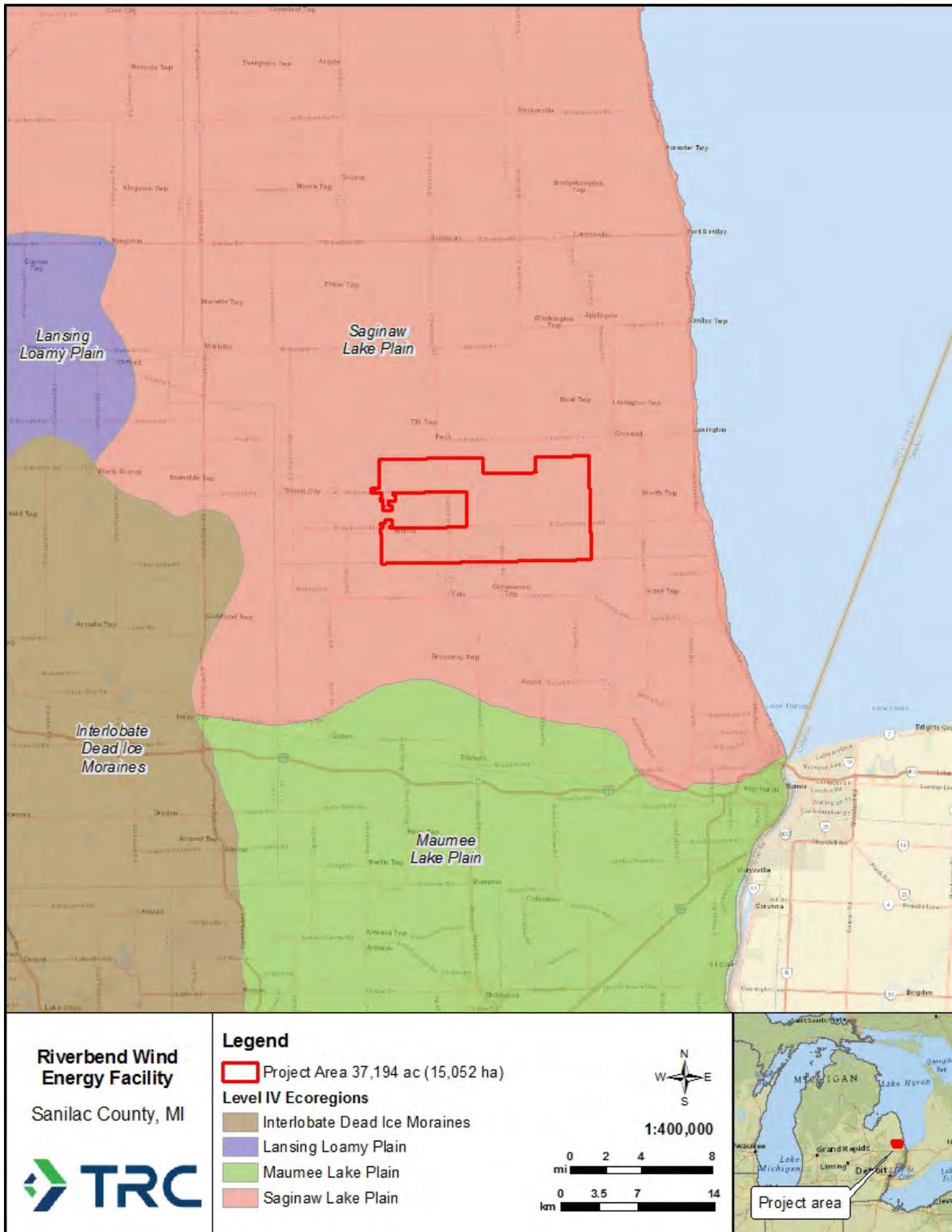
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The preliminary site assessment and site characterization were completed using a combination of 1) existing information obtained from available public sources including reports, published literature, online databases, agency consultation, and geographic information system (GIS) data, and 2) a field reconnaissance survey.

### 2.1 EXISTING INFORMATION FROM AVAILABLE PUBLIC SOURCES

Publicly available data sources were used to complete a desktop data review within the Project area and the surrounding area out to the following distances:

- 3.2 km (2 mi) for land cover and wetlands/waters
- 3.2 km (2 mi) for species of concern and their habitats
- 3.2 km (2 mi) for eagle nests, within the Project area for other raptor species
- 8 km (5 mi) for bat maternity colonies, but report nearest known regardless of distance
- Nearest known bat hibernacula regardless of distance
- 16.1 km (10 mi) for protected, federal, or state managed land.



The following data sources were used to complete this review:

- Level III and IV Ecoregions of Wisconsin (USEPA, 2013)
- eBird (eBird, 2021)
- Google Earth (Google Earth, 2020)
- National Audubon Society Important Bird Areas (National Audubon Society, 2020)
- Audubon Christmas Bird Counts (National Audubon, 2019)
- USGS Breeding Bird Survey data (USGS, 2020b)
- Michigan Natural Features Inventory (MNFI) Rare species review (Received May 1, 2021) (MNFI 2021a)
- MNFI Natural History Database (MNFI 2021b)
- National Land Cover Database (USGS, 2016)
- The Nature Conservancy, including the Site Wind Right tool (TNC) (TNC, 2020b)
- USDA, Natural Resources Conservation Service (NRCS) SSURGO Soil report (USDA NRCS, 2021)
- USFWS Land-based Wind Energy Guidelines (USFWS, 2012a)
- USFWS National Wildlife Refuges (USFWS, 2020a)
- USFWS National Wetlands Inventory (NWI) wetland database (USFWS, 2020c)
- USFWS Information for Planning and Conservation (IPaC) Review (USFWS, 2021a)
- USFWS Critical Habitat (USFWS, 2021b)
- USGS National Hydrology Dataset (NHD) (USGS, 2020a)
- USGS Protected Areas Database (PADUS) (PADUS, 2020)
- National Conservation Easements Database (NCED, 2021)

An additional level of desktop wetland review was conducted within the Project area. Each mapped wetland or other water feature (e.g., NWI and NHD features) was reviewed in a geographic information system (GIS) by a TRC wetlands biologist. The reviewing biologist used historic and contemporary aerial photographs (1992 to 2020) to adjust the publicly mapped feature boundaries and coarsely map any new potential features that appear to have characteristics (e.g., saturation visible, standing water, etc.) required for regulatory jurisdiction per federal and/or state definitions (See Attachment 1).

TRC evaluated the Project area and surrounding area for protected lands, parks, conservation easements, and other types of lands that may preclude development.

TRC also mapped Breeding Bird Survey Routes, Christmas Bird Count Circles, and Important Bird Areas Locations (Figure 6). TRC also generated a summary of special status species that occur or potentially occur in the Project area, along with their typical habitat requirements. Special status species include state and federally listed species (endangered, threatened or proposed for listing), USFWS birds of conservation concern, and Wisconsin species of special concern.

For additional information, a review of federally listed, protected, and other special status species was conducted using the MNFI and the USFWS IPaC tool to determine species distribution in Sanilac County, Michigan (MNFI 2021b, USFWS 2021a).

Based on this literature review and subsequent field reconnaissance (see Section 2.2 below), the likelihood of species occurrence within the Project area was determined by TRC. The following categories were used to describe likelihood of species occurrence:

- *Observed/Present*—directly observed in the Project area during the field reconnaissance, or existing data records confirm species presence in the Project area within the past 10 years
- *Potential to Occur*—existing data records confirmed species presence within counties encompassing the Project area in the past 25 years, and suitable habitat was observed within the Project area
- *Limited Potential to Occur*—within general range limits, but no data records of species presence within counties encompassing the Project area in the past 25 years, or no suitable habitat was observed within the Project area
- *Out of Range/No Potential to Occur*—no data records of species presence within encompassing counties in the past 25 years, and Project area is beyond typical range limits of species or contains no possible habitat for species

## 2.2 FIELD RECONNAISSANCE

A field reconnaissance of the Project Area from public roads or other publicly accessible areas was conducted in May 2021 to complete the following:

- Ground-truth NLCD land cover types and locations
- Document any land cover types that provide potential habitat for special status species

- Ground-truth the presence or absence of desktop mapped potential wetland features that can be observed from the roadside (high level, not a delineation of wetland boundaries)
- Document readily observable features that may serve to attract wildlife, if any
- Record incidental wildlife and habitat/plant community observations while in the Project Area.

During the field reconnaissance, the landcover classifications, including features identified in the National Land Cover Database (NLCD), National Wetlands Inventory (NWI), and National Heritage Database (NHD) databases, were either confirmed or reclassified. Readily identifiable land cover changes (e.g., areas that had been converted from forest to cultivated crops) were documented and mapped. Land cover changes were mapped based on vegetative structure and dominant species composition. The boundaries were mapped in the field using a global positioning system (GPS) and completed using current GIS and/or Google Earth™ imagery (Google Earth, 2020).

Data gathered during the desktop assessment was utilized during the field reconnaissance to document areas where land cover types may potentially provide suitable habitat for federal and state special status species. Land cover types were field-verified, and locations were documented if they provided potentially suitable habitat for special status species. For species with specific or narrowly defined habitat requirements, potentially suitable habitats were reviewed (where land parcel was accessible), and the presence or absence of the specific habitat requirements were documented.

Desktop mapped wetland locations within the Project area were assessed during field reconnaissance to attempt to ascertain the presence or absence of wetland vegetation and wetland hydrology (noting the predominant vegetative strata, dominant plant species, and type: stream, pond, lake, etc.). Areas that exhibit hydric soils, wetland hydrology, and a dominance of hydrophytic vegetation were considered potentially jurisdictional wetlands.

Readily observable features that could serve as suitable habitat for wildlife such as summer bat roosting habitat, caves, and wetlands were mapped and described. Additionally, animal and habitat type/plant community observations made during field reconnaissance were recorded for inclusion in this Report (Table 1).

## 3.0 RESULTS

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### 3.1 SOILS

According to the soil dataset acquired from the NRCS Web Soil Survey there were 71 soil units mapped within the Project Area. Thirty-two of the mapped soil units were listed as hydric soils or containing hydric inclusions (e.g., component of the soil unit found in depressions, floodplains, or drainageways), comprising approximately 34,340 (ac; 13,897-hectare [ha]) (92%) within the Project Area. Hydric soils are an indicator for potential wetland soils. Seventeen soil units were mapped as hydric, 25 soil units were mapped non-hydric containing hydric components, and 25 soil units were mapped as non-hydric (USDA, NRCS, Web Soil Survey 3.0, 2020).

### 3.2 LAND COVER

Land cover types within the Project area consisted primarily of cultivated crops (approximately 76%) (Table 1; Figure 4). Cultivated crops were more prevalent within the Project area compared to within the 3.2 km (2 mi) buffer around the Project area (68%) and Sanilac County overall (72%). Most other landcover types were more prevalent outside of the Project area (Figure 4, Table 1). During the field reconnaissance, the NLCD mapped landcover was determined to be a good representation of the current landcover and habitat types within the Project area. There were only minor discrepancies observed, such as strips of trees along streambeds that were not captured by the NLCD.

Table 1 below summarizes the area and percent cover of each landcover type as classified by the NLCD within the Project area, the Project Buffer area (a 2.0 mi [3.2 km] buffer surrounding the Project area, inclusive of the Project area), and Sanilac County.

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**Table 1. National Land Cover Database Landcover Types within the Riverbend Wind Energy Facility area, the 2.0-mi [3.2-km] Project Buffer area, and Sanilac County, Michigan, 2021.**

Landcover Type	Project area			Project Buffer area (2-mile Buffer)			Sanilac County		
	Hectares	Acres	% Composition	Hectares	Acres	% Composition	Hectares	Acres	% Composition
Cultivated Crops	11,373	28,103	76%	27,112	66,994	68%	180,124	445,096	72%
Woody Wetlands	1,173	2,899	8%	3,416	8,442	9%	24,318	60,092	10%
Deciduous Forest	1,145	2,829	8%	4,209	10,401	11%	18,829	46,528	8%
Developed, Open Space	478	1,180	3%	1,399	3,458	4%	8,721	21,549	3%
Hay/Pasture	418	1,034	3%	1,656	4,092	4%	4,581	11,320	2%
Developed, Low Intensity	285	704	2%	884	2,184	2%	5,294	13,082	2%
Mixed Forest	78	192	1%	399	986	1%	3,141	7,761	1%
Evergreen Forest	41	102	0%	182	450	0%	1,676	4,142	1%
Emergent Herbaceous Wetlands	31	77	0%	112	276	0%	831	2,054	0%
Herbaceous	11	27	0%	80	197	0%	447	1,103	0%
Open Water	8	20	0%	109	270	0%	569	1,407	0%
Shrub/Scrub	5	14	0%	23	58	0%	175	433	0%
Developed, Medium Intensity	5	12	0%	60	148	0%	602	1,488	0%
Barren Land	<1	1	0%	72	178	0%	84	207	0%
Developed, High Intensity	<1	0	0%	15	36	0%	240	592	0%
<b>Total</b>	<b>15,052</b>	<b>37,194</b>	<b>100%</b>	<b>39,728</b>	<b>98,169</b>	<b>100%</b>	<b>249,632</b>	<b>616,855</b>	<b>100%</b>

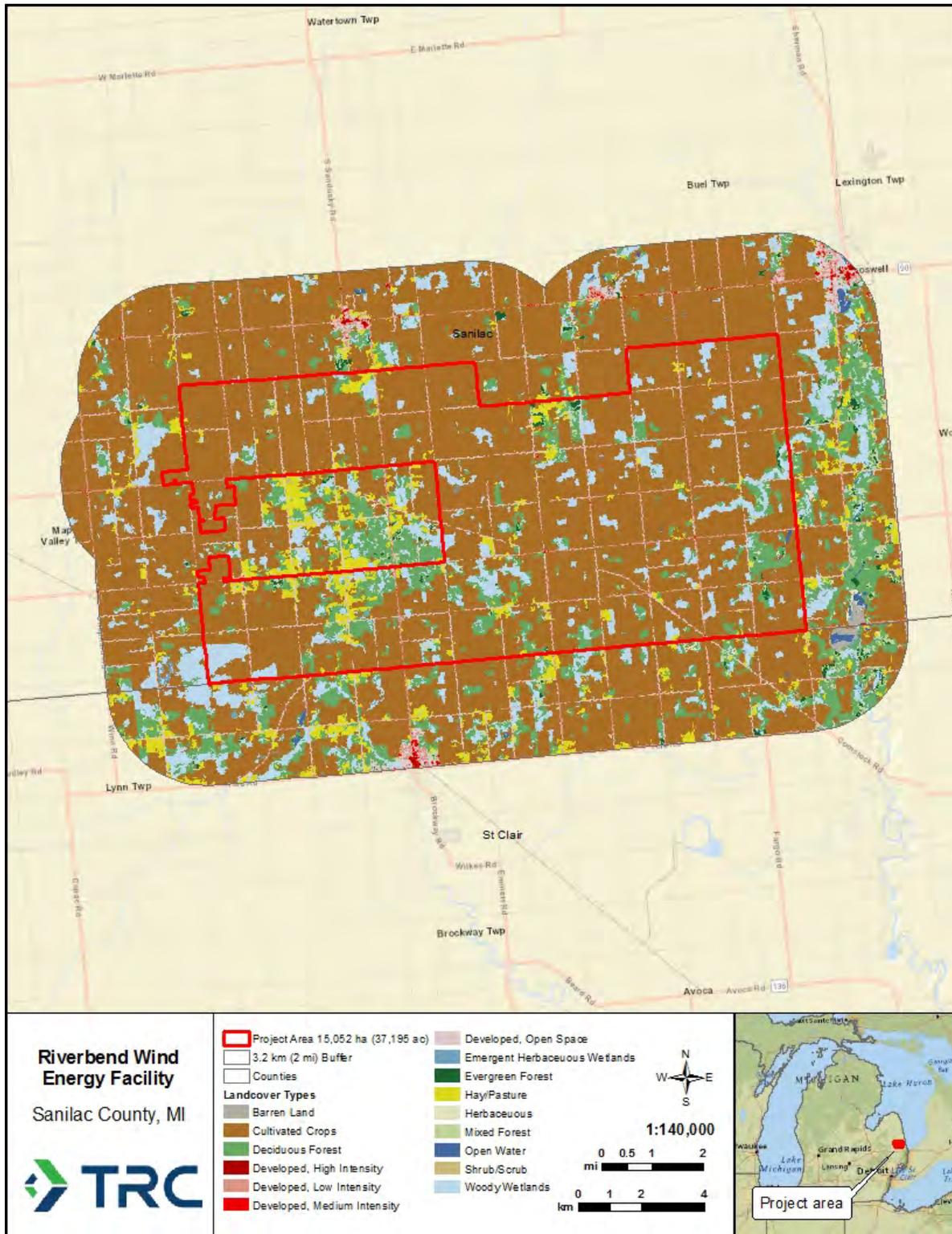


Figure 4. NLCD Map of the Project area and Project Buffer area at the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021.

### 3.3 WETLANDS AND OTHER WATERS

Table 2 below summarizes the 1,941.7 ac (785.8 ha) of NWI wetlands within the Project area, where there were 38 freshwater emergent wetlands (37.0 ac [19.0 ha]), 226 freshwater forested/shrub wetlands (1,870.9 ac [757.1 ha]), and 21 freshwater ponds (23.9 ac [9.7 ha]) (Figure 5) (USFWS, 2020c).

**Table 2. National Wetlands Inventory Features within the Riverbend Wind Energy Facility area, Sanilac County, Michigan, 2021.**

Wetland Type	Acres	Hectares	Number of Features
Freshwater Emergent Wetland	47.0	19.0	38
Freshwater Forested/Shrub Wetland	1,870.9	757.1	226
Freshwater Pond	23.9	9.7	21
<b>Total</b>	<b>1,941.7</b>	<b>785.8</b>	<b>285</b>

Table 3 summarizes the 878 NWI wetland features boundaries (totaling 5,910.6 ac [2,391.1 ha]) NWI boundaries within the Project area and Project Buffer area (USFWS, 2020c) (Figure 5).

**Table 3. National Wetlands Inventory Wetland Types within the Riverbend Wind Energy Facility area and 2.0-Mile (3.2-Kilometer) Buffer Project Buffer area, Sanilac County, Michigan, 2021.**

Wetland Type	Acres	Hectares	Number of Features
Freshwater Emergent Wetland	313.5	126.9	138
Freshwater Forested/Shrub Wetland	5376.6	2175.8	624
Freshwater Pond	206.4	83.5	114
Other	14.1	5.7	2
<b>Total</b>	<b>5,910.6</b>	<b>2,391.1</b>	<b>878</b>

Table 4 summarizes the 174 NHD features within the Project area (USGS, 2020a) (Figure 5). There were 23 named streams distributed throughout the Project area. The most significant of these are the Black Creek on the eastern edge of the Project, and the Sanilac and Saint Clair Drain in the southwest corner of the Project.

**Table 4. NHD Features within the Riverbend Wind Energy Facility area, Sanilac County, Michigan, 2021.**

NHD Feature Type	Number of Features	Length (mi)	Kilometers (km)
canal/ditch	119	93.6	150.6
stream/river	54	37.2	59.9
artificial path	1	0.0	0.1
<b>Total</b>	<b>174</b>	<b>130.8</b>	<b>210.6</b>

Table 5 below, summarizes the 436 NHD features within the Project area and the 2 mi (3.2 km) Project Buffer area.

**Table 5. NHD Features within the Riverbend Wind Energy Facility area and 2.0-Mile (3.2-Kilometer) Project Buffer area, Sanilac County, Michigan, 2021.**

NHD Feature Type	Number of Features	Length (Mi)	Length (Km)
Canal/Ditch	263	219.0	385.9
Stream/River	116	88.6	156.2
Artificial Path	57	20.0	35.6
<b>Total</b>	<b>436</b>	<b>327.6</b>	<b>577.7</b>

During the field reconnaissance conducted from public roads in May 2021, the wetland and waterway features identified within the Project area during desktop review were determined to be a relatively good representation of the extent and boundaries of these features with only minor modifications from the desktop mapped features. As this field reconnaissance was conducted only from the roads and areas with public access, and the wetland and waterway features were fairly extensive covering approximately 13% of the Project area, this evaluation was not a detailed delineation of the extent and boundaries of the wetlands and waterways within the Project Area.

The desktop wetland review, including the manual desktop review (see methods above), and limited field reconnaissance identified a total of approximately 4,939.3 ac (1,998.9 ha) of potential jurisdictional wetland and other water features within the Project area (Figure 5).

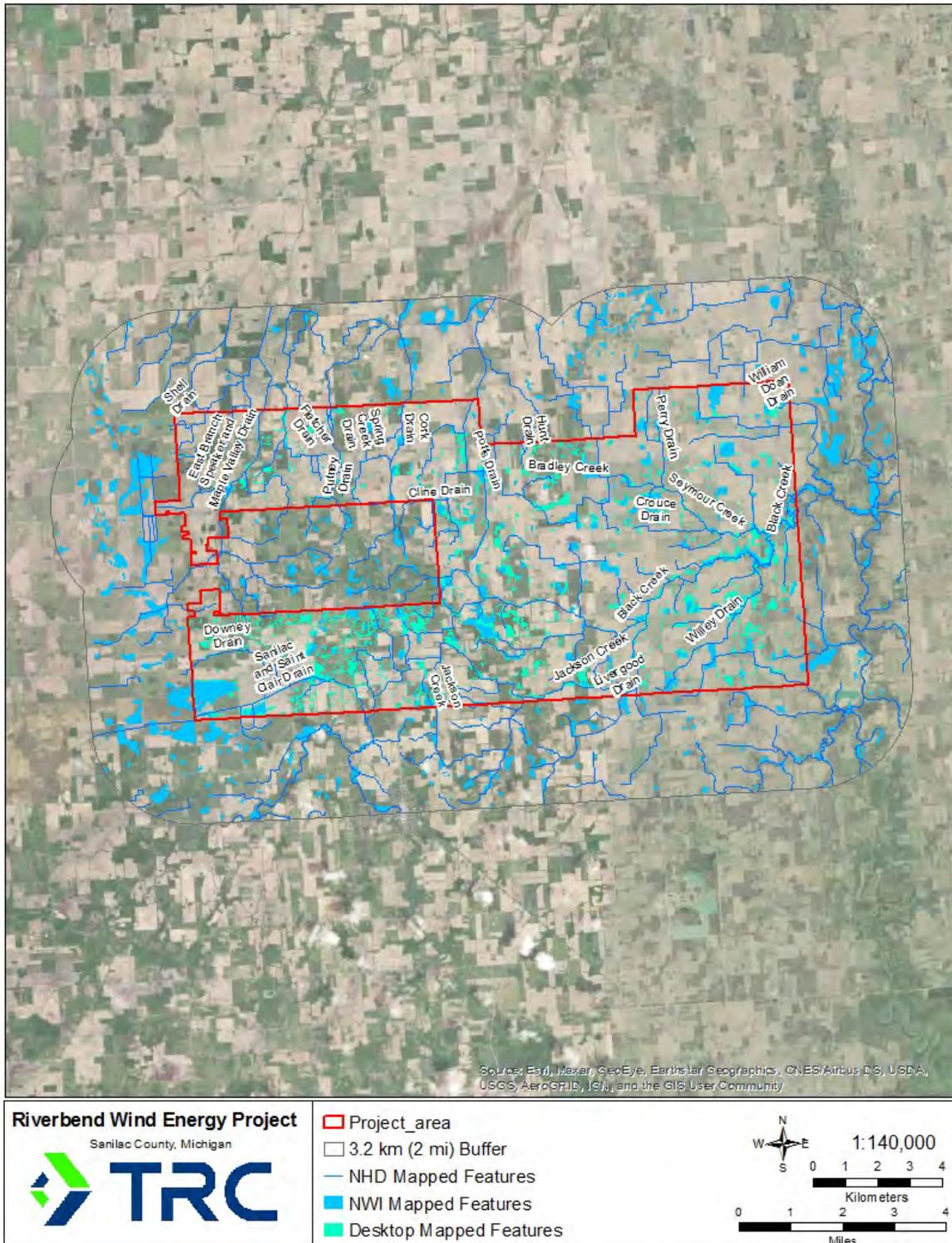


Figure 5. Wetland and Waterway features: NWI, NHD, and Desktop Review Map of the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021.

### 3.4 HABITAT DESCRIPTION

Habitat diversity within the Project area is low; the area is comprised primarily of agricultural fields with a corn (*Zea mays*) and soybean (*Glycine max*) monoculture (76%) that provides minimal suitable habitat for native plants or wildlife species. The second most common landcover in the Project area was woody wetlands, closely followed by deciduous forest (both 8%), which is scattered throughout the Project area, though more exists in the southwest quadrant of the Project area (Figure 3). There is significant pasture/hay landcover outside the Project Area to the southwest. Pasture/hay landcover can provide adequate habitat for grassland species that can tolerate moderate amounts of human disturbance.

Wooded areas were concentrated along the many streams that intersect the Project Area. There are several small areas of deciduous woodlots and tree lines, emergent, scrub/shrub and forested wetlands, streams, and grasslands that offer some potentially suitable habitat for native terrestrial and aquatic wildlife (Figure 4; Figure 5). These natural or semi-natural habitats cover approximately 6% of the Project area and are also concentrated in the center of the Project area along the Yellow River corridor. There are snags scattered throughout the Project area which could provide habitat for bird and bat species, as well as large trees that may be capable of supporting large raptor nests.

The landcover contained within the Project area is less diverse than the larger landscape including the 2 mi (3.2 km) buffer surrounding the Project area and in Sanilac County (Table 1). In particular, the landcover within the buffer has greater proportions of pasture/hay (10%) and deciduous forest (6%), than the Project area (Figure 3; Table 1).

In summary, the desktop review and field reconnaissance survey within the Project area and Project Buffer area results indicate a highly fragmented, highly disturbed, mostly agricultural landscape. The Project and 2 mi (3.2 km) buffer have minimal habitat diversity and are unlikely to support special status or protected/sensitive plants or animal species.

### 3.5 PLANT AND WILDLIFE SPECIES

According to the MNFI (MNFI 2021) and the IPaC (USFWS, 2021a), there were records of special status species within Sanilac County, Michigan, and other special status species with ranges that overlap the Project area.

The IPaC results indicate that the Project area is within the range of nine federally listed species including five listed as endangered and four listed as threatened (Table 6) (USFWS, 2021a). The MNFI reports 27 special status species at the state level that have been recorded in Sanilac County (MNFI 2021b), including 1 species that is also federally listed (Table 6). The IPaC results listed 6 additional bird species of conservation concern that may occur in the Project area (Table 6). The MNFI (MNFI 2021) reported occurrences of four listed species or species of concern within 1 mile of the Project area, including one record of the big water crayfish (*Cambarus robustus*), a state species of concern, within the boundary of the Project area in Black Creek. The federally and state endangered northern riffleshell (*Epioblasma torulosa rangiana*) has been recorded outside of the Project area, but within one mile, in the Black River to the east of the Project.

Table 6 summarizes the conservation status, habitat notes, and potential for occurrence for all species identified in the IPaC (USFWS, 2021a) and MNFI (MNFI 2021a) for the Project area, as well as all state listed species with records in Sanilac County as reported by MNFI (MNFI 2021b), and additional special status bird species determined to have *potential to occur* in the Project area using eBird records (eBird, 2021).

**Table 6. Special Status Wildlife Species, Their Current Status, Preferred Habitat, And Potential Seasonal Occurrence for Species That Are Known to Occur, Have Potential to Occur, or Have Limited Potential to Occur in the Riverbend Wind Energy Facility Area.**

Wildlife Type / Common Name	Scientific Name	Status <sup>1</sup>	Habitat	Seasons of Potential Occurrence and Likelihood of Occurrence in the Project area <sup>2</sup>			
				Spring	Summer	Fall	Winter
<b>PLANTS</b>							
Climbing Fumitory	<i>Adlumia fungosa</i>	SSC	Rocky lake shores, woods, dunes	L	L	L	L
Three-seed Sedge	<i>Carex billingsii</i>	SSC	Open sphagnum peatlands	L	L	L	L
Eastern Prairie Fringed Orchid	<i>Platanthera leucophaea</i>	FT, SE	Tallgrass prairie	L	L	L	L
<b>ARTHROPODS</b>							
Big Water Crayfish	<i>Cambarus robustus</i>	SSC	Medium/large rivers and streams with rocky substrates	O	O	O	O
Calico Crayfish	<i>Faxonius immunis</i>	SSC	Streams, lakes, ponds, ditches	P	P	P	P
<b>MOLLUSKS</b>							
Creek Heelsplitter	<i>Lasmigona compressa</i>	SSC	Creeks and small rivers	P	P	P	P
Elktoe	<i>Alasmidonta marginata</i>	SSC	Rivers in small streams to medium rivers	P	P	P	P
Flutedshell	<i>Lasmigona costata</i>	SSC	Small and medium rivers	P	P	P	P
Kidney Shell	<i>Ptychobranthus fasciolaris</i>	SSC	High quality creeks, rivers, lakes with swift current and sand/gravel substrate	L	L	L	L
Northern Riffleshell	<i>Epioblasma torulosa rangiana</i>	FE, SE	Riffles and runs with gravel substrate	P	P	P	P
Paper Pondshell	<i>Utterbackia imbecillis</i>	SSC	Lakes and ponds with mud or sand substrate	P	P	P	P

Wildlife Type / Common Name	Scientific Name	Status <sup>1</sup>	Habitat	Seasons of Potential Occurrence and Likelihood of Occurrence in the Project area <sup>2</sup>			
				Spring	Summer	Fall	Winter
Rainbow	<i>Villosa iris</i>	SSC	Small to medium streams with sand or gravel substrate	P	P	P	P
Rayed Bean	<i>Villosa favalis</i>	FE, SE	Small, shallow rivers, sand/gravel substrate	L	L	L	L
Round Pigtoe	<i>Pleurobema sintoxia</i>	SSC	Medium to large rivers	L	L	L	L
Salamander Mussel	<i>Simpsonaias ambigua</i>	SE	Medium to large rivers and lakes	L	L	L	L
Slippershell	<i>Alasmidonta viridis</i>	ST	Creeks and small rivers, sand, and gravel substrate	P	P	P	P
Snuffbox Mussel	<i>Epioblasma triquetra</i>	FE, SE	Sand/gravel substrates in swift, small, and medium rivers	L	L	L	L
Wavyrayed Lampmussel	<i>Lampsilis fasciola</i>	ST	Small to medium streams in riffles	P	P	P	P
<b>Reptiles &amp; Amphibians</b>							
Eastern Massasauga	<i>Sistrurus catenatus</i>	FT, SSC	Wet areas, including wet prairies, marshes and low-lying areas along rivers and lakes; adjacent uplands	L	L	L	L
Pickerel Frog	<i>Lithobates palustris</i>	SSC	Freshwater aquatic/wetland habitats	P	P	P	P
Blanding's Turtle	<i>Emydoidea blandingii</i>	SSC	Ponds, swamps, marshes, wet prairies, bogs, etc.	P	P	P	P
<b>FISH</b>							
Eastern Sand Darter	<i>Ammocrypta pellucida</i>	ST	Streams, rivers, lakes with sandy substrates	P	P	P	P

Wildlife Type / Common Name	Scientific Name	Status <sup>1</sup>	Habitat	Seasons of Potential Occurrence and Likelihood of Occurrence in the Project area <sup>2</sup>			
				Spring	Summer	Fall	Winter
<b>BIRDS</b>							
American Bittern	<i>Botaurus lentiginosus</i>	SSC	Freshwater emergent wetlands	P	P	L	-
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BGEPA, SSC	Nests in mature forest near open water; open areas including cultivated land	O	O	P	P
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	BCC	deciduous forest, shrub/scrub	P	P	P	-
Black-crowned Night-heron	<i>Nycticorax nycticorax</i>	SSC	Wetlands, lakes	P	P	P	-
Bobolink	<i>Dolichonyx oryzivorus</i>	BCC	Prairies/grasslands	P	P	P	-
Common Gallinule	<i>Gallinula galeata</i>	ST	Wetlands, ponds, lakes, canals, ditches	P	P	-	-
Common Nighthawk	<i>Chordeiles minor</i>	SSC	Open areas	P	P	P	-
Dickcissel	<i>Spiza americana</i>	SSC	Pastures, cultivated land	P	P	-	-
Forster's Tern	<i>Sterna forsteri</i>	ST	wetlands, edges of ponds, lakes, streams	P	P	P	-
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	SSC	Brushy habitats	P	L	-	-
Golden Eagle	<i>Aquila chrysaetos</i>	BGEPA	Mountains, grasslands	L	-	L	L
Grasshopper sparrow	<i>Ammodramus savannarum</i>	SSC	Prairies/grasslands, pasture/hay	P	P	-	-

Wildlife Type / Common Name	Scientific Name	Status <sup>1</sup>	Habitat	Seasons of Potential Occurrence and Likelihood of Occurrence in the Project area <sup>2</sup>			
				Spring	Summer	Fall	Winter
Henslow's sparrow	<i>Ammodramus henslowii</i>	SE	Grasslands	-	L	-	-
King rail	<i>Rallus elegans</i>	SE	Wetlands	-	L	-	-
Marsh wren	<i>Cistothorus palustris</i>	SSC	Variety of wetland habitats	P	P	P	-
Merlin	<i>Falco columbarius</i>	ST	Evergreen forest	P	P	P	P
Northern Harrier	<i>Circus hudsonius</i>	SSC	Grassland/herbaceous, pasture/hay, cultivated crops, freshwater emergent wetlands	P	P	P	P
Osprey	<i>Pandion haliaetus</i>	SSC	Open water and nearby forest	P	P	P	-
Peregrine Falcon	<i>Falco peregrinus</i>	SE	Cliffs, open habitats, coasts, mountains, developed areas	L	L	P	-
Piping Plover	<i>Charadrius melodus</i>	FE	Sandy beaches	L	L	-	-
Red Knot	<i>Calidris canutus</i>	FT	Tundra, shorelines	-	-	L	-
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	SSC	woody wetlands, open deciduous or evergreen forest	P	P	P	L
Red-shouldered Hawk	<i>Buteo lineatus</i>	ST	Mature forest, wet meadows, swamps	P	P	P	P
Rusty Blackbird	<i>Euphagus carolinus</i>	BCC	Riparian habitats, roadsides	P	-	P	-
Short-eared Owl	<i>Asio flammeus</i>	SE	Open Habitats	L	-	L	P

Wildlife Type / Common Name	Scientific Name	Status <sup>1</sup>	Habitat	Seasons of Potential Occurrence and Likelihood of Occurrence in the Project area <sup>2</sup>			
				Spring	Summer	Fall	Winter
Western meadowlark	<i>Sturnella neglecta</i>	SSC	Prairies/grasslands, pasture/hay	L	L	L	-
Willow Flycatcher	<i>Empidonax traillii</i>	BCC	Pastures, riparian habitats, forest edge	P	P	-	-
Wood Thrush	<i>Hylocichla mustelina</i>	BCC	deciduous and mixed forest	P	P	L	-
<b>MAMMALS</b>							
Indiana Bat	<i>Myotis sodalis</i>	SE, FE	Summer roosting in trees with loose bark over 5.0 inches (12.7 centimeters) in diameter; winters in hibernacula (e.g., caves)	L	L	L	-
Northern Long-eared Bat	<i>Myotis septentrionalis</i>	FT, SSC	Summer roosting in trees with loose bark over 3.0 inches (7.6 centimeters) in diameter; winters in hibernacula (e.g., caves)	L	L	L	-

<sup>1</sup> FE = Federally endangered, FT = Federally threatened, FC = Federal Candidate, SE = State endangered, ST = State threatened, SX = State Probably Extirpated, BCC = Federal Bird of Conservation Concern, SSC = State Species of Concern, BGEPA = Bald and Golden Eagle Protection Act

<sup>2</sup> Likelihood of occurrence Key: O = Observed/Present; P = Potential to Occur; L = Limited Potential to Occur; [-] = Out of Range/No Potential to Occur

### 3.5.1 FEDERALLY THREATENED, ENDANGERED, AND PROTECTED SPECIES

The IPaC results (USFWS, 2021a) indicate the Project area is within the range of the following federally listed species:

- Indiana bat (*Myotis sodalis*; federally and state endangered)
- Northern long-eared bat (*Myotis septentrionalis*; federally threatened, state species of concern)
- Piping Plover (*Charadrius melodus*; federally and state endangered)
- Red Knot (*Calidris canutus rufa*; federally threatened)
- Eastern Massasauga (*Sistrurus catenatus*; federally threatened, state species of concern)
- Northern Riffleshell (*Epioblasma torulosa rangiana*; federally and state endangered)
- Rayed Bean (*Villosa favalis*; federally and state endangered)
- Snufflebox Mussel (*Epioblasma triquetra*; federally and state endangered)
- Eastern prairie fringed orchid (*Platanthera leucophaea*; federally threatened, state endangered)

The IPaC also identified five non-listed birds of conservation concern that may occur in the Project area, and one species protected under BGEPA (Table 6). eBird records indicate that both North American eagle species, the bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), which are federally protected under the Bald and Golden Eagle Protection Act (BGEPA) occur in Sanilac County, though golden eagle occurrences are infrequent (eBird, 2021). The bald eagle is the only eagle species noted in the IPaC for the Project Area (USFWS, 2021a), but as golden eagles are occasionally observed in Sanilac County, information on both species is included below. The following sections provide detailed information on federally protected species and their likelihood of occurrence in the Project area.

#### Federally Threatened and Endangered Species

##### ***Indiana Bat***

The federally endangered (also state endangered) Indiana bat occurs over a range that extends from the east coast to the midwestern United States, including parts of Michigan, though they are not known to occur in Sanilac County (USFWS, 2021a). Indiana bats hibernate during winter in caves and mines, subsequently migrating to their summer habitat in wooded areas where they usually roost under loose tree bark on dead or dying trees. In spring through fall, Indiana bats utilize a variety of habitats to forage on flying insects found along rivers, lakes, open fields, and uplands (USFWS, 2021a).

Although there have been no documented records of Indiana bats in Sanilac County (INDR, 2020c), Indiana bat do have *limited potential to occur* within the Project area during spring/fall migration and during the summer and are *out of range/no potential* to occur during winter (Table 6). Eleven Indiana bat maternity colonies have been documented in Michigan in the following counties: Calhoun, Cass, Eaton, Hillsdale, Jackson, Lenawee (x2), Livingston, St. Joseph (x2), and Van Buren (USFWS, 2007). The nearest documented maternity colony to the Project area is the colony in Livingston County, which is >50 mi (80 km) southwest from the Project area (USFWS 2007). Because of the lack of documented summer activity in the county, but the presence of suitable summer roost and foraging habitat (i.e., deciduous forest and wetlands) within the Project area, there is *limited potential* for the Indiana bat to occupy within the Project Area in the summer and during migration.

Indiana bats are expected to be absent from the Project Area in the winter because of the lack of suitable habitat (i.e., no caves or mines). One known Indiana bat hibernacula is present in Michigan at the Tippy Dam in Manistee County, approximately 168 mi (270 km) northwest of the Project area (USFWS 2007). This is a small hibernaculum with an estimated population of 20 bats and is a priority level 4 hibernacula (USFWS 2007). The next closest known Indiana bat hibernacula is in Preble County, Ohio at the Livingston Mine, approximately 250 mi (402 km) to the south. This hibernaculum is designated as priority level 2 and has an estimated population of over 9,500 (USFWS 2007). The Indiana bat is presumed *out of range/no potential to occur* in the winter within the Project, as no known bat hibernacula are present.

### ***Northern Long-eared Bat***

The federally threatened (state threatened; federal status under review) northern long-eared bat range extends throughout most of southern Canada, the eastern and midwestern United States (excluding parts of the southeast United States) and is primarily associated with North American forests (USFWS, 2021a). Northern long-eared bats have been observed in 39 Michigan counties, though not in Sanilac County nor its neighboring counties; the nearest counties reporting northern long-eared bat occurrences are Livingston County to the southwest and Iosco County to the northwest (MNFI 2021b).

During the spring through fall active seasons, the northern long-eared bat forages over open fields near caves and forests (USFWS, 2021a). The northern long-eared bat is similar to the Indiana bat in its use of caves and mines for hibernation. The northern long-eared bat requires very high humidity in selected hibernacula. After hibernation, the bats are found in wooded or semi-wooded

habitats for the duration of the summer months. The northern long-eared bat utilizes crevices and loose bark on trees ( $\geq 7.6$  centimeters [3.0 inches]) in diameter at breast height) for roosting, although it is considered to be opportunistic and less selective than the Indiana bat (USFWS, 2021a). The northern long-eared bat primarily flies through the understory of forested areas foraging on a variety of insects.

The northern long-eared bat has *limited potential to occur* within the Project during summer or spring/fall migration, when they may use forested and wetland/riparian habitats to roost or forage. 125 occupied summer roost trees have been identified in Michigan (USFWS 2016). The precise locations of these roosts could not be identified during the desktop review; however, the nearest known northern long-eared bat roost tree is in Putnam township in Livingston County, approximately 78 mi (125 km) to the southwest of the Project area

Potentially suitable summer habitat (i.e., forested areas) occurs within the Project area, however during the desktop and field-based reconnaissance survey, suitable wooded habitat for roosting and foraging in the spring, summer, and fall was found to be limited in the Project area and restricted to the remnant small, and fragment forested areas.

There are no former coal mines within Sanilac County or the Project Area (MDNR 2000), however, there are numerous coal mines in the western half of Tuscola County, approximately 40 miles to the west of Sanilac County. There are 76 known northern long-eared bat hibernacula in Michigan (USFWS 2016), though the vast majority of these are in the upper peninsula of the state. The nearest known winter hibernaculum was Tippy Dam in Manistee County where Indiana bats also hibernate, approximately 168 mi (270 km) northwest of the Project area (USFWS 2016).

Based on the desktop review and field reconnaissance, northern long-eared bat has *limited potential to occur* within the Project area during spring, summer and fall, and is *out of range/no potential to occur* within the Project area during winter due to lack of suitable hibernacula (e.g., caves and mines) (Table 6).

### ***Eastern Prairie Fringed Orchid***

Eastern prairie fringed orchid (federally threatened, state endangered, also known as prairie white-fringed orchid) occurs mostly east of the Mississippi River in the Midwest and northeast, including in Michigan (USFWS, 2005). This species grows in wet habitats with full exposure to sunlight, such as open wetlands and mesic prairie (USFWS, 2005). The species was reported in the IPaC (USFWS, 2021a) because the Project area lies within the species overall range

boundaries. The MNFI (2021b) does not report any recorded occurrences of the species within Sanilac County, though it has been reported in the neighboring Huron, Tuscola, and St. Clair Counties. Based on the limited suitable habitat and lack of recorded occurrence in the region, the eastern prairie fringed orchid has *limited potential* to occur in the Project Area. (Table 6).

#### ***Northern Riffleshell***

Northern Riffleshell (*Epioblasma torulosa rangiana*; federally and state endangered) historically occurred throughout the Great Lakes and Ohio River drainages, but is now restricted to a few locations in Kentucky, Michigan, Ohio, and Pennsylvania due to habitat loss via damming and dredging for the mussel and its host fish, as well as proliferation of invasive zebra mussels. The northern riffleshell has been documented within one mile to the east of the Project Area in the Black River as recently as 2005 (MNFI 2021a), so there is *potential* for it to occur in its tributaries within the Project area.

#### ***Rayed Bean***

Rayed Bean (*Villosa fabalis*; federally endangered, state endangered) is a small mussel found in shallow headwater creeks and rivers and lake shores, often in or near aquatic vegetation. Native to parts of the eastern and midwestern United States and part of Ontario, Canada, its range has been greatly reduced compared to its historic occurrences. It's known occurrences in Michigan cover seven counties in the southeast part of the state but does not include Sanilac County (MNFI 2021b). Based on the lack of any county records, the Rayed Bean has limited potential to occur in the Project area (Table 6).

#### ***Snuffbox Mussel***

Snuffbox Mussel (*Epioblasma triquetra*; federally and state endangered) is a medium sized mussel which historically occurred throughout 18 states and Ontario but has experienced a 62% range-wide decline. The mussel occurs in swift sections of small and medium sized rivers with sand or gravel substrates and has been recorded in 20 counties in central and southern Michigan, though none have been recorded in Sanilac County. The snuffbox mussel has *limited potential to occur* in the Project area because of limited habitat suitability and because there are no records of its occurrence in Sanilac County.

#### ***Eastern Massasauga***

Eastern massasauga (*Sistrurus catenatus*; federally threatened, state species of concern) rattlesnake primarily occurs in wet areas, including wet prairies, marshes and low-lying areas along rivers and lakes, as well as in adjacent uplands during their life history (USFWS, 2021a).

Eastern massasauga rattlesnakes may hibernate in crayfish burrows, under logs and tree roots, or in small mammal burrows during hibernation from late October to late April (USFWS, 2021a). According to MNFI, the Project area lies outside of the Tier 1 and Tier 2 habitat for the species as designated by the USFWS. While there are records of the eastern massasauga throughout much of Michigan, there are no recorded occurrences within Sanilac County (MNFI 2021b). Therefore, the eastern massasauga rattlesnake has been classified as having *limited potential to occur* in the Project area (Table 6).

### ***Piping Plover***

The Piping Plover (*Charadrius melodus*; federally and state endangered) is a small shorebird that lives in open sandy beaches. There are three populations of piping plover, in the northern great plains, the great lakes, and the Atlantic coast. Their nesting range has been significantly degraded by development, particularly in the Great Lakes region. While the MNFI does not report any occurrences of the piping plover in Sanilac County (MNFI 2021b), there are three Sanilac County records reported in eBird, all within the last 10 years (eBird 2021). However, the piping plover has *limited potential to occur* in the Project area, because the project area lacks appropriate habitat, and any piping plovers in the region are likely to occur on the shores of the great lakes.

### ***Red Knot***

The Red Knot (*Calidris canutus rufa*; federally threatened) is a distinctively rufous, medium sized shore bird, which makes one of the longest known annual migrations from the Canadian arctic to the southern tip of South America. The red knot's population is threatened by historic overhunting, coastal development, and overharvest of prey species. While they breed and winter far from Michigan, the shores of the Great Lakes provide important migration stopover habitat. However, they are unlikely to venture inland as it lacks suitable habitat. Therefore, the red knot has only *limited potential to occur* in the project area during migration.

## **Bald and Golden Eagle Protection Act Species**

### ***Bald Eagle***

Bald eagle habitat typically includes estuaries, large lakes, reservoirs, rivers and some seacoasts and marshes where they forage for fish. Bald eagles will also feed on waterfowl, turtles, rabbits, snakes, other small animals, and carrion located in a variety of habitat (USFWS, 2021a). Bald eagles require a combination of readily available prey, perching areas, and nesting sites. In winter, bald eagles congregate near open water in tall trees for spotting prey and night roosts for shelter (USFWS, 2021a).

Bald eagles are found throughout Michigan and occur year-round. There are 6 known communal roosts used by bald eagles in Michigan, the closest being in Ionia County, approximately 105 mi (169 km) southwest of the Project area. The National Eagle Roost Registry (CCB, 2016) lists no known roost locations in Sanilac or its neighboring counties.

Sanilac County eBird (eBird, 2021) records show bald eagle observations every month of the year, with the frequency of observation lowest in June and July and highest in the winter months. Eagle activity in the county is slightly higher in the winter and lowest in the summer, because individuals migrate south from Canada to spend the winter in the Mid-western United States and there are also year-round residents.

Based on eagle observations during pre-construction avian use surveys conducted to date (through August 2021), data records from the region, and the presence of suitable habitat, bald eagle was *observed* in the spring and summer and is likely to (has *potential to*) occur in the Project area year-round (Table 6).

In general, the bald eagles in the area are expected to be breeding, migrating, wintering, or dispersing individuals. There are several small waterways in the Project area which may provide suitable foraging habitat for bald eagles year-round, and particularly in the winter. Lake Huron, which provides ample eagle habitat, lies 6.2 mi (10.0 km) to the east of the Project area.

There is suitable breeding habitat in the Project area for breeding bald eagles, which require large trees that can support the heavy nest, usually in close proximity to water. Compared to the surrounding landscape, suitable bald eagle habitat such as water bodies/corridors and forested patches are less prevalent with limited availability in the Project area. There are no known eagle nests within the boundary of the project area, however four bald eagle nests were observed during surveys of the Project area and surrounding 2 mi (3.2 km) buffer in April 2021 (TRC 2021, Figure 6).

### **Golden Eagle**

Golden eagles build nests on cliffs or in large trees that often provide an unobstructed view of the surrounding habitat. Outside of breeding season golden eagles use a variety of habitats, often with open spaces. Golden eagles are not known to breed/nest in Michigan

Data records of golden eagle in Michigan during migration or winter reflect infrequent occurrence throughout the state and including Sanilac County (eBird, 2021). The Christmas Bird Count data from the nearby Sanilac and Port Huron sites do not have any records of golden eagles (National

Audubon, 2019). Based on records from the region and the presence of suitable habitat, golden eagle has *potential to occur* in the Project area during winter, *limited potential to occur* during migration (late fall/early spring) and is *out of range/no potential to occur* in the summer (Table 6). Any occurrence in the Project area is expected to be infrequent and in low numbers.

### 3.5.2 STATE-LISTED SPECIES

The state of Michigan lists 120 threatened or endangered animal species, and 276 threatened or endangered plant species (MNFI 2021b). The MNFI indicates records of 9 state listed plant and animal species in Sanilac County (MNFI 2021b) including records of 3 bird species, 1 fish, and 5 freshwater mussels. TRC identified an additional 7 state listed bird species with *potential to occur* in the Project Area based on a review of eBird records and habitat availability (eBird, 2021) (Table 6).

The following narratives provide a brief review of the state listed species with seasonal *limited potential to occur* and *potential to occur* within the Project area (Table 6). Species that are also federally listed (piping plover, Indiana bat) were omitted from this section because they were discussed in section 3.5.1.

#### Birds

The MNFI identified 23 state-listed bird species in Michigan (MNFI 2021b), 9 of which were identified by the IPaC (USFWS 2021) or MNFI (MNFI 2021a) for the Project area or County and/or have *potential to occur* in the Project area during at least one season based on eBird records (eBird 2021). The remaining 14 species are *absent* or have *limited potential* to occur in the Project area based on habitat or range limitations and/or occurrence records.

#### Common Gallinule

Common gallinule (*Gallinula galeata*; state endangered) prefers freshwater emergent wetlands and freshwater ponds, lakes, and perennial watercourses with emergent vegetation (Birds of the World, 2020). The species was last observed in Sanilac County in 2020 (eBird, 2021). Common gallinule has *potential to occur* during spring and summer (Table 6), in the open water and woody wetlands land covers in the Project Area (Table 1, Figure 3).

#### Peregrine Falcon

The peregrine falcon (*Falco peregrinus*; state endangered) nests on cliffs or tall human structures and hunts around various open habitats including agricultural areas. Peregrine falcon was most

recently recorded in the county in 2020 (eBird 2021); it has *limited potential to occur* in the spring and summer, and *potential to occur* in the fall. It is not expected to nest in the Project area due to lack of suitable nest sites (e.g., cliffs or other tall structures) (Table 6).

### **Henslow's Sparrow**

The Henslow's sparrow (*Ammodramus henslowii*; state endangered) inhabits perennial grassland, sometimes with interspersed shrubs. Henslow's sparrow was reported in the county most recently in 2019 (eBird 2021). It has limited potential to occur in the Project Area during the summer and is not expected to occur in other seasons (Table 6).

### **Forster's Tern**

Forster's tern (*Sterna forsteri*; state endangered) prefers emergent wetlands and open water (Birds of the World, 2020). The species was last observed in Sanilac County in 2020 (eBird, 2021). Forster's tern has *potential to occur* during spring, summer, and fall (Table 6), in the freshwater emergent wetlands or open water in the Project area (Table 1; Figure 3).

### **Red-shouldered Hawk**

The red-shouldered hawk (*Buteo lineatus*; state threatened) typically inhabits mature forest and swamps; outside of breeding season, it also uses open habitats. Red-shouldered hawk has occurred in the county year-round and was last observed in 2021 (eBird 2021). The species has *potential to occur* in the Project Area year-round (Table 6).

### **Merlin**

The merlin (*Falco columbarius*; state threatened) typically nests in evergreens and uses a variety of open habitats. Merlin has occurred in the county year-round and was last recorded in 2021 (eBird 2021). It has the *potential to occur* in the Project area year-round (Table 6).

### **Short-eared Owl**

The short-eared owl (*Asio flammeus*; state endangered) typically inhabits grasslands and may hunt over agricultural fields. Short-eared owl has occurred in the county during fall, winter, and spring, and was last observed in 2021 (eBird 2021). The species has *potential to occur* in the Field Study Area in the winter, and *limited potential to occur* in spring and summer (Table 6).

### **King Rail**

The king rail (*Rallus elegans*; state endangered) typically inhabits coastal wetlands in the Great Lakes region. There are no eBird records of the king rail in the county (eBird 2021), however the

MNFI has a record of occurrence within 1 mile of the Project area dating from 1950. The species has *limited potential to occur* in the Project area in the summer (Table 6).

The remaining 14 state listed bird species have *limited potential* to occur in the Project Area in all seasons, or are considered out of range, because either 1) there are no documented observations of the species in Sanilac County, and/or 2) there is limited suitable habitat for the species within the Project area.

### **Fish**

The MNFI identified 18 state-listed fish species in the state of Michigan, 1 of which has been recorded in Sanilac County (MNFI 2021b).

#### **Eastern Sand Darter**

The eastern sand darter (*Ammocrypta pellucida*; state threatened) lives in streams and rivers with sandy substrates and was last reported in Sanilac County by the MNFI in 2009 (MNFI 2021b). This species has the *potential to occur* in the Project area year-round (Table 6).

### **Mollusks**

The MNFI identified 43 state-listed mollusk species, 6 of which may occur in the Project area including the Riffleshell, Rayed Bean, and Snuffbox mussels discussed in section 3.5.1. The other 37 state listed mollusks are presumed absent based on range/habitat limitations and/or occurrence records.

#### **Salamander Mussel**

The salamander mussel (*Simpsonaias ambigua*; state endangered) king rail typically inhabits medium and large rivers in silty or sandy substrates. The MNFI's most recent record of the species in Sanilac County was in 1998 (MNFI 2021b). The species has *limited potential to occur* in the Project area year-round (Table 6).

#### **Slippershell**

The slippershell (*Alasmidonta viridis*; state threatened) is a small mussel which lives in sand or gravel substrates of creeks and headwaters of rivers throughout much of the state of Michigan. The MNFI's most recent record of the species in Sanilac County was in 2010 (MNFI 2021b). The species has *potential to occur* in the Project area year-round (Table 6).

### Wavyrayed Lampmussel

The wavyrayed lampmussel (*Lampsilis fasciola*; state threatened) typically inhabits riffles in small and medium sized streams. It is found in much of southeastern Michigan including Sanilac County, with its most recent record of the species in 2005 (MNFI 2021b). The species has *potential to occur* in the Project area year-round (Table 6).

### Plants

The MNFI has identified 78 state endangered and 198 state threatened plant species in the state of Michigan but does not report occurrences of any of them in Sanilac County (Table 6) (MNFI 2021b). The IPaC (USFWS 2021) reports that the Project area falls within the range of the federally threatened and state endangered eastern prairie fringed orchid, which is discussed in Section 3.5.1 (Table 6).

### 3.5.3 FEDERAL AND STATE SPECIES OF CONCERN

The MNFI identifies state species of concern (SSC), which are not afforded legal protections, but which have declining or relict populations which may be recommended for threatened or endangered status should their populations continue to decline (MNFI 2021b). The MNFI does not indicate any records of any mammals with SSC status in Sanilac County. The MNFI identifies 41 bird species of concern, 11 of which have *potential to occur* in the Project area (MNFI 2021b, Table 6). The IPaC (USFWS, 2021a) indicated potential presence of six Birds of Conservation Concern (BCC) (Table 6). Below is a summary of the SSC with *potential to occur* in the Project area (minus the bald eagle, which is discussed in section 3.5.1), and all BCC species identified in the IPaC for the Project area (MNFI 2021b, USFWS 2021). Species of other taxa listed as SSC and have been recorded in Sanilac County are listed in Table 6.

The prevalence of open agricultural landscape within the Project area indicates that species which prefer grassland/herbaceous, pasture/hay, or cultivated crop land covers could occur. Among the non-listed species of concern, 5 primarily utilize these open habitats and have *potential to occur* in the Project area. These species include the following: common nighthawk (*Chordeiles minor*), grasshopper sparrow (*Ammodramus savannarum*), bobolink (*Dolichonyx oryzivorus*), western meadowlark (*Sturnella neglecta*; *only limited potential to occur*), dickcissel (*Spiza americana*), and northern harrier (*Circus hudsonius*) (MNFI 2021b, USFWS 2021, eBird 2021). Most of these species, such as dickcissel and western meadowlark, prefer to use native grassland/herbaceous habitat but have adapted to using pasture/hay fields or areas of cultivated crops to various

degrees (Birds of the World, 2020). The bobolink is primarily restricted to remnant prairie habitats but may occasionally occur in pasture habitats (Birds of the World, 2020).

The forested and shrub habitat within the Project area is fragmented, limited and only suitable for bird species that do not require large, contiguous tracts of habitat, and otherwise for short stops during migration only. Among the non-listed species of concern with *potential to occur* in the Project area, 5 primarily occur in forested and shrub habitats. These species include the following: black-billed cuckoo (*Coccyzus erythrophthalmus*), red-headed woodpecker (*Melanerpes erythrocephalus*), northern flicker (*Colaptes aura*), willow flycatcher (*Empidonax traillii*), wood thrush (*Hylocichla mustelina*), and golden-winged warbler (*Vermivora chrysoptera*). Species such as golden-winged warbler and red-headed woodpecker may breed in small forest patches and shrubby edges like those found in the Project area. Other species such as wood thrush require larger interior forest habitats for breeding and have *potential to occur* in the Project area in its larger forested habitats. (Birds of the World, 2020)

Wetland and riverine habitats are distributed throughout the Project area, and heavy rains in flat areas with cultivated fields provide additional temporary shallow water habitat. The water and wetland habitats available will predominantly attract species that prefer wet areas during migration. Among the non-listed species of concern, 5 have *potential to occur* primarily in these habitats within the Project area. These species include: American bittern (*Botaurus lentiginosus*), black-crowned night-heron (*Nycticorax nycticorax*), osprey (*Pandion haliaetus*), marsh wren (*Cistothorus palustris*), and rusty blackbird (*Euphagus carolinus*). Most shorebirds such as American bittern and black-crowned night heron prefer shallow wetlands, riverbanks, and lake edges for wading. Rusty blackbird and marsh wren use woody wetlands with shrubs and trees. (Birds of the World, 2020)

#### **3.5.4 USGS BREEDING BIRD SURVEY**

There were three United States Geological Survey (USGS) Breeding Bird Survey Routes (USGS, 2020b) which pass within 10 mi (16.1 km) of the Project area, including the Deckerville route (BBS Route 49070) to the northeast, the Tyre route (BBS Route 49071) to the north, and the Juniata route (BBS Route 49063) to the northwest (Figure 6). The Deckerville route data was summarized for this report because it is closest to the Project area (5.3 mi [8.5 km]) and because it has the most complete dataset (i.e., fewest missing years) in recent decades.

The Deckerville route begins approximately 18.4 mi (29.6 km) north of the Project area, heads east toward the coast of Lake Huron, and continues south, more or less paralleling the lakefront. The route was established in 1978 and has been surveyed in 34 of 42 years through 2019. There have been 124 species recorded across all years of the surveys, including 4 state listed species (common tern [*Sterna hirundo*], Henslow’s sparrow, merlin, and red-shouldered hawk), and 13 non-listed species of concern, as defined by the MNFI as state species of concern (2021b) and/or by the USFWS as birds of conservation concern in region 22 (black-billed cuckoo, bobolink, chimney swift (*Chaetura pelagica*), dickcissel, grasshopper sparrow, hooded warbler, northern harrier, osprey, red-headed woodpecker, western meadowlark, willow flycatcher, and wood thrush (MNFI 2021b, USFWS 2021b). The 10 most abundant species and all special status species documented on the survey route are presented in Table 7. The most abundant species include habitat generalists and those that typify open field and developed habitats.

**Table 7. Ten Most Abundant Species and All Special Status Species Observed on the Deckerville USGS Breeding Bird Survey Route #49070, 1978–2019.**

Common Name	Scientific Name	Status
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	-
American Robin	<i>Turdus migratorius</i>	-
Ring-billed Gull	<i>Larus delawarensis</i>	-
European Starling	<i>Sturnus vulgaris</i>	-
American Crow	<i>Corvus brachyrhynchos</i>	-
Mourning Dove	<i>Zenaida macroura</i>	-
Common Grackle	<i>Quiscalus quiscula</i>	-
Savannah Sparrow	<i>Passerculus sandwichensis</i>	-
Cedar Waxwing	<i>Bombycilla cedrorum</i>	-
Song Sparrow	<i>Melospiza melodia</i>	-
<b>Special Status Species</b>		
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	BCC
Bobolink	<i>Dolichonyx oryzivorus</i>	BCC
Chimney Swift	<i>Chaetura pelagica</i>	BCC
Common Nighthawk	<i>Chordeiles minor</i>	SSC
Common Tern	<i>Sterna hirundo</i>	ST
Dickcissel	<i>Spiza americana</i>	SSC
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	SSC
Henslow's Sparrow	<i>Ammodramus henslowii</i>	SE
Hooded Warbler	<i>Wilsonia citrina</i>	SSC
Merlin	<i>Falco columbarius</i>	ST
Northern Harrier	<i>Circus hudsonius</i>	SSC
Osprey	<i>Pandion haliaetus</i>	SSC
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	SSC
Red-shouldered Hawk	<i>Buteo lineatus</i>	ST

Common Name	Scientific Name	Status
Western Meadowlark	<i>Sturnella neglecta</i>	SSC
Willow Flycatcher	<i>Empidonax traillii</i>	BCC
Wood Thrush	<i>Hylocichla mustelina</i>	BCC

BCC = USFWS Bird of Conservation Concern, SSC = MNFI State Species of Concern, SE = State Endangered ST = State Threatened

### 3.5.5 CHRISTMAS BIRD COUNTS

The nearest Christmas Bird Count circle to the Project area is the Sanilac site, in the town of Carsonville approximately 12 mi (19.3 km) north of the Project area (Figure 6) (National Audubon, 2019), however as this site has only been surveyed since 2018, we summarized data from the second closest location, Port Huron in instead. The Port Huron Christmas Bird Count is approximately 17 mi (27.3 km) southeast of the Project area, near the town of Kimball. It was established in 1966 and was surveyed every year between 1966 and 2019.

There have been 174 species recorded during the count over 54 years, including 12 special status species including the bald eagle, common loon, long-eared owl, merlin, northern goshawk, northern harrier, peregrine falcon, red-headed woodpecker, red-shouldered hawk, rusty blackbird, short-eared owl, and yellow-headed blackbird (Table 8). The 10 most abundant species on the count and all special status species are presented in Table 8. The most abundant species include three non-native species, habitat generalists and those that are typically found in open fields and/or open water.

**Table 8. Ten Most Abundant Species and All Special Status Species Observed on National Audubon Society’s Freeport Christmas Bird Counts, 1995–2019.**

Common Name	Scientific Name	Status
European Starling	<i>Sturnus vulgaris</i>	-
Herring Gull	<i>Larus argentatus</i>	-
Canada Goose	<i>Branta canadensis</i>	-
House Sparrow	<i>Passer domesticus</i>	-
Redhead	<i>Aythya americana</i>	-
Ring-billed Gull	<i>Larus delawarensis</i>	-
Mallard	<i>Anas platyrhynchos</i>	-
Mourning Dove	<i>Zenaida macroura</i>	-
Canvasback	<i>Aythya valisineria</i>	-
Rock Dove	<i>Columba livia</i>	-
<b>Special Status Species</b>		
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BGEPA, SSC
Common Loon	<i>Gavia immer</i>	ST
Long-eared Owl	<i>Asio otus</i>	ST
Merlin	<i>Falco columbarius</i>	ST

Common Name	Scientific Name	Status
Northern Goshawk	<i>Accipiter gentilis</i>	SSC
Northern Harrier	<i>Circus hudsonius</i>	SSC
Peregrine Falcon	<i>Falco peregrinus</i>	SE
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	SSC
Red-shouldered hawk	<i>Buteo lineatus</i>	ST
Rusty Blackbird	<i>Euphagus carolinus</i>	BCC
Short-eared Owl	<i>Asio flammeus</i>	SE
Yellow-headed Blackbird	<i>Xanthocephalus</i>	SSC

SE = State Endangered; ST = State Threatened; BCC = USFWS Bird of Conservation Concern; SSC = State Species of Concern; BGEPA = Bald and Golden Eagle Protection Act

### 3.5.6 IMPORTANT BIRD AREAS

There are no designated Important Bird Areas (IBA) (National Audubon Society, 2020) within the Project area (Figure 6). The IBA for the Port Huron Hawk Watch lies within the 10 mi (16.1 km) buffer surrounding the Project area, the edge of which lies 3.5 mi (5.6 km) to the southeast of the Project. The core of this IBA is on the southwestern shore of Lake Huron and is the site of an annual raptor migration count which documents the northward migration of thousands of diurnal raptors each spring. This IBA is designated at the State priority level (National Audubon Society 2020). Other IBAs in the region include the Murphy Lake State Game Area, (state priority), which lies 27.8 mi (44.7 km) to the west; and Saginaw Bay (global priority), which lies 34 mi (54.7 km) to the northwest and supports large congregations of breeding and migrating shorebirds and waterfowl (National Audubon Society, 2020). (Figure 6)

### 3.5.7 SPECIES OF HABITAT FRAGMENTATION CONCERN

The Project area consists mainly of a matrix of agricultural monoculture of cropped fields and pasture/hay, traversed by channelized tributaries/ditches, with pockets of forest, herbaceous, and wetland habitat. The region was once dominated by shortgrass prairie however, land conversion to agricultural fields has left mostly small, highly fragmented areas of natural vegetation in the vicinity of the Project area. However, there are several larger patches of wooded areas (> 100 ac [40.5 ha]) within the Project area, primarily in the southern half, along the Black Creek and its tributaries. When adjacent wooded habitats are combined, there were twelve wooded features >100 ac (40.5 ha) mapped in the NLCD, ranging from 108 – 356 ac in area (44 -144 ha). Based on data reviewed and field reconnaissance, the Project area and surrounding lands may contain some habitat suitable for roosting, nesting, and foraging for species that require mid-sized (100 – 500 ac [40.5 – 202.3 ha] contiguous tracts of native or natural habitat. Due to the existing agricultural matrix and fragmented natural habitats, the Project area is unlikely to support species

that are dependent on large, contiguous tracts (>500 ac [202.3 ha]) of natural habitat and impacts from any potential additional fragmentation from Project development is expected to be minor.

### 3.5.8 WILDLIFE MIGRATION

Each spring and fall, many species of birds and bats, among other wildlife, make long-distance migratory movements between their wintering and breeding grounds. Bats are known to migrate through Michigan, although details of how they use the landscape during migration is not known (Kurta & Murray, 2002; Kurta, 2010). The forested habitat within the Project area may provide suitable bat habitat for roosting and foraging during summer and migration seasons.

According to eBird, 268 bird species have been recorded in Sanilac County (eBird, 2021). The migratory pathway of raptors, waterfowl, and other land birds is influenced by several factors, the most significant of which is geography. Two geographical features concentrate migrating birds: ridgelines and shorelines of water bodies. Updrafts form when prevailing wind flows across ridges; these updrafts and thermals created over land/water interfaces facilitate energy-efficient travel over long distances (Liguori, 2005). While the topography surrounding the Project area is relatively flat, it is near the western shore of Lake Huron (approximately 7.0 mi [11.2 km] to the east), which is part of the Mississippi Flyway, a major migratory flyway used by 325 species of migratory birds (National Audubon Society 2020). Due to the proximity to the Lake Huron, the Project area may experience heightened bird activity during the spring and fall migration.

Species that forage in cultivated crop landcover could be attracted to the Project area during migration because cultivated crops are found in greater proportion of area within the Project compared to the surrounding landscape (Figure 3; Table 1). Such species groups that could occur during migration include blackbirds, larks, some shorebirds or waterfowl, and some raptor species (Neimuth et al, 2006; Sherfy et al., 2011; Birds of the World, 2020).

### 3.5.9 WILDLIFE OBSERVATIONS

Table 9 shows the plant and animal species observed during the field reconnaissance and avian use surveys at the Project.

**Table 9 Species Observations from the Riverbend Wind Energy Facility Field reconnaissance, Sanilac County, Michigan, 2021.**

Common Name	Scientific Name	Listed Status <sup>1</sup>
<b>Birds</b>		
American Crow	<i>Corvus brachyrhynchos</i>	--
American Goldfinch	<i>Carduelis tristis</i>	--

<b>Common Name</b>	<b>Scientific Name</b>	<b>Listed Status<sup>1</sup></b>
American Kestrel	<i>Falco sparverius</i>	--
American Robin	<i>Turdus migratorius</i>	--
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BGEPA, SSC
Baltimore Oriole	<i>Icterus galbula</i>	--
Barn Swallow	<i>Hirundo rustica</i>	--
Black-capped Chickadee	<i>Poecile atricapillus</i>	--
Brown-headed Cowbird	<i>Molothrus ater</i>	--
Blue Jay	<i>Cyanocitta cristata</i>	--
Brown Thrasher	<i>Toxostoma rufum</i>	--
Canada Goose	<i>Branta canadensis</i>	--
Chipping Sparrow	<i>Spizella passerina</i>	--
Common Grackle	<i>Quiscalus quiscula</i>	--
Cooper's Hawk	<i>Accipiter cooperii</i>	--
Common Merganser	<i>Mergus merganser</i>	--
Dickcissel	<i>Spiza americana</i>	SSC
Downy Woodpecker	<i>Picoides pubescens</i>	--
Eastern Kingbird	<i>Tyrannus</i>	--
Eastern Meadowlark	<i>Sturnella magna</i>	--
European Starling	<i>Sturnus vulgaris</i>	--
Field Sparrow	<i>Spizella pusilla</i>	--
Great Blue Heron	<i>Ardea herodias</i>	--
Great Horned Owl	<i>Bubo virginianus</i>	--
Green Heron	<i>Butorides virescens</i>	--
Herring Gull	<i>Larus argentatus</i>	--
House Finch	<i>Carpodacus mexicanus</i>	--
Horned Lark	<i>Eremophila alpestris</i>	--
House Sparrow	<i>Passer domesticus</i>	--
Indigo Bunting	<i>Passerina cyanea</i>	--
Killdeer	<i>Charadrius vociferus</i>	--
Mallard	<i>Anas platyrhynchos</i>	--
Mourning Dove	<i>Zenaida macroura</i>	--
Northern Cardinal	<i>Cardinalis</i>	--
Northern Flicker	<i>Colaptes auratus</i>	--
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	--
Red-eyed Vireo	<i>Vireo olivaceus</i>	--
Ring-necked Pheasant	<i>Phasianus colchicus</i>	--
Rock Dove	<i>Columba livia</i>	--
Red-tailed Hawk	<i>Buteo jamaicensis</i>	--
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	--
Sandhill Crane	<i>Grus canadensis</i>	--
Savannah Sparrow	<i>Passerculus sandwichensis</i>	--
Scarlet Tanager	<i>Piranga olivacea</i>	--
Song Sparrow	<i>Melospiza melodia</i>	--
Sharp-shinned Hawk	<i>Accipiter striatus</i>	--
Tree Swallow	<i>Tachycineta bicolor</i>	--

<b>Common Name</b>	<b>Scientific Name</b>	<b>Listed Status<sup>1</sup></b>
Turkey Vulture	<i>Cathartes aura</i>	--
Wild Turkey	<i>Meleagris gallopavo</i>	--
Wood Duck	<i>Aix sponsa</i>	--
Yellow Warbler	<i>Dendroica petechia</i>	--
<b>Mammals</b>		
White-tailed Deer	<i>Odocoileus virginianus</i>	--
Coyote	<i>Canis latrans</i>	--
Eastern cottontail	<i>Sylvilagus floridanus</i>	--
Fox squirrel	<i>Sciurus niger</i>	--
Eastern Chipmunk	<i>Tamias striatus</i>	--
Red Fox	<i>Vulpes</i>	--
Groundhog	<i>Marmota monax</i>	--
<b>Reptiles &amp; Amphibians</b>		
Painted Turtle	<i>Chrysemys picta</i>	--
Common Snapping Turtle	<i>Chelydra serpentina</i>	--
Eastern Garter Snake	<i>Thamnophis sirtalis</i>	--
Leopard Frog	<i>Lithobates pipiens</i>	--

<sup>1</sup>SSC = State Species of Concern; BGEPA = Bald and Golden Eagle Protection Act;

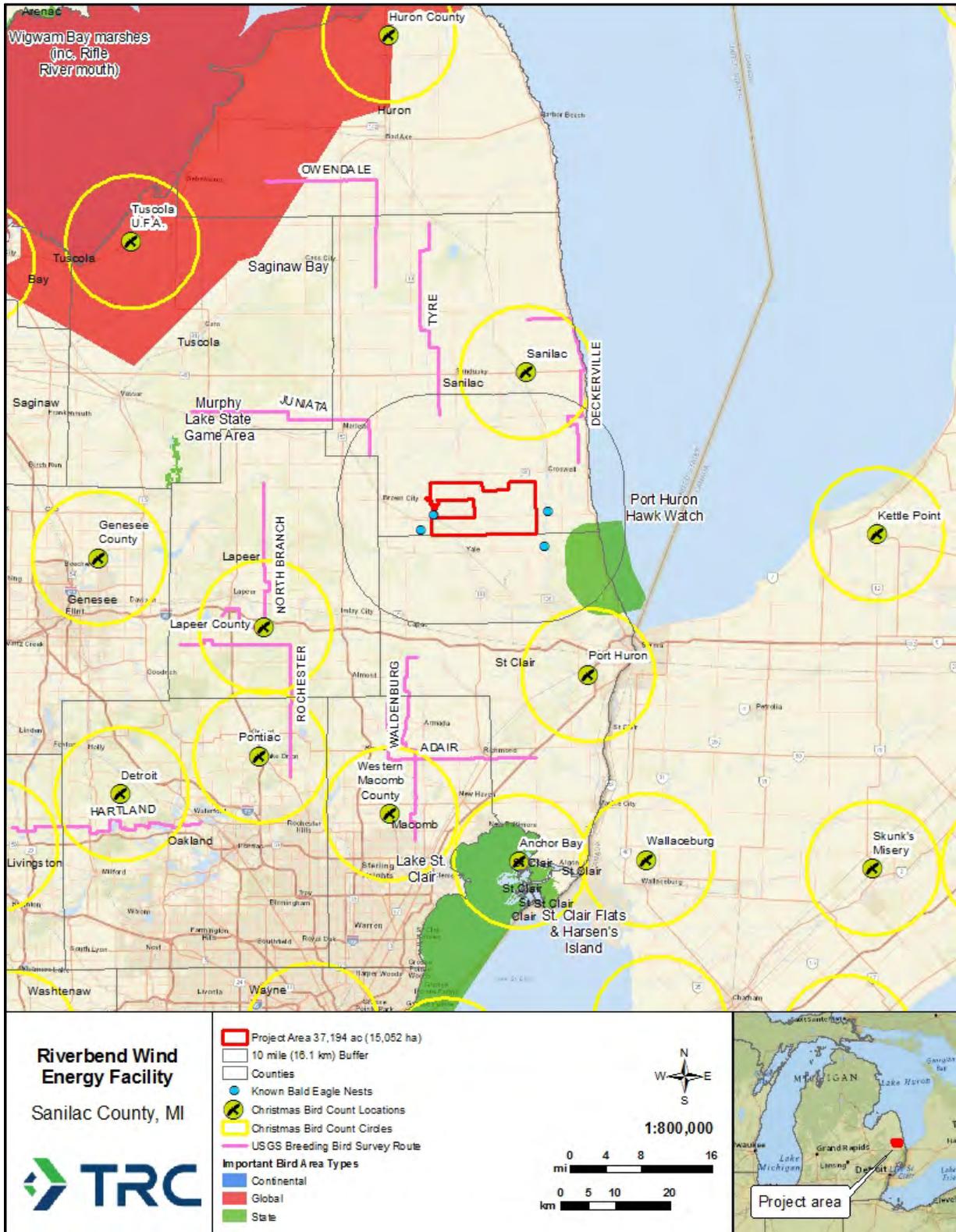


Figure 6. Known Bald Eagle Nest Locations, USGS Breeding Bird Survey Routes, Audubon Important Bird Areas, Christmas bird count circles, at the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021.

## 4.0 PRECLUDED LANDS

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### 4.1.1 UNITED STATES FISH AND WILDLIFE SERVICE-DESIGNATED CRITICAL HABITAT

No USFWS-designated critical habitat for any species occurs within the Project area or within 10 mi (16.1 km). The nearest designated critical habitat for any species is for the Poweshiek skipperling (*Orisma poweshiek*), a small butterfly which inhabits remnants of native prairies and fens. The critical habitat lies 36.5 mi (58.7 km) to the southwest of the Project area within the Holly State Game Area. The nearest designated critical habitat for Indiana bat is 311 mi (500 km) to the southwest in Bureau and LaSalle Counties in Illinois, which encompasses the Blackball Mine, a major Indiana and northern long-eared bat hibernaculum (USFWS, 2021b). The Blackball mine is approximately 340 mi (547 km) southwest of the Project area, but the designated critical habitat surrounding the mine encompasses the entirety of Bureau and LaSalle Counties in Illinois.

### 4.1.2 HIGH-PRIORITY CONSERVATION AREAS

The Nature Conservancy (TNC) has identified many priority conservation areas around the country through their TNC lands database (TNC, 2020a) and the Site Wind Right database (TNC, 2020b). None of these areas lie within the Project area, and no features from the TNC lands database lie within 16.1 km (10.0 mi) of the Project area nor within Sanilac County. The Site Wind Right database does not extend to the state of Michigan (TNC, 2020b).

### 4.1.3 FEDERAL OR TRIBAL LANDS

No federal or tribal lands occur within the Project area or within 10 miles of the site (PADUS, 2020). There are four small conservation easements within the Project area that are managed by the USFWS (NCED 2021). The federally owned and managed Michigan Islands National Wildlife Refuge lies partially within 10 mi (16.1 km) of the Project area, encompassing the entirety of the U.S.-owned areas of the Great Lakes. There are no other federal or tribal lands within 10 mi (16.1 km) of the Project area (Figure 7).

### 4.1.4 LOCAL, STATE, OR REGIONAL AREAS

There is state-managed conservation easement and the privately-owned Trombley Lazy T Ranch within the Project area (Figure 7). There are no other parks or conservations lands within the Project area, but several within 10 mi (16.1 km). The Protected Areas Database of the US (PADUS, 2020) identified 47 other protected/precluded land features within 10 mi (16.1 km) of

the Project area, consisting mostly of privately owned conservation easements managed by state or federal agencies, local parks managed by city and county governments, and a few state or NGO-managed parks and preserves (PADUS 2020, NCED 2020). The two most significant state-managed areas within 10 mi (16.1 km) are the Port Huron State Game Area (2.3 mi [3.7 km] southeast), and Lakeport State Park (7.4 mi [11.9 km] southeast). (Figure 7).

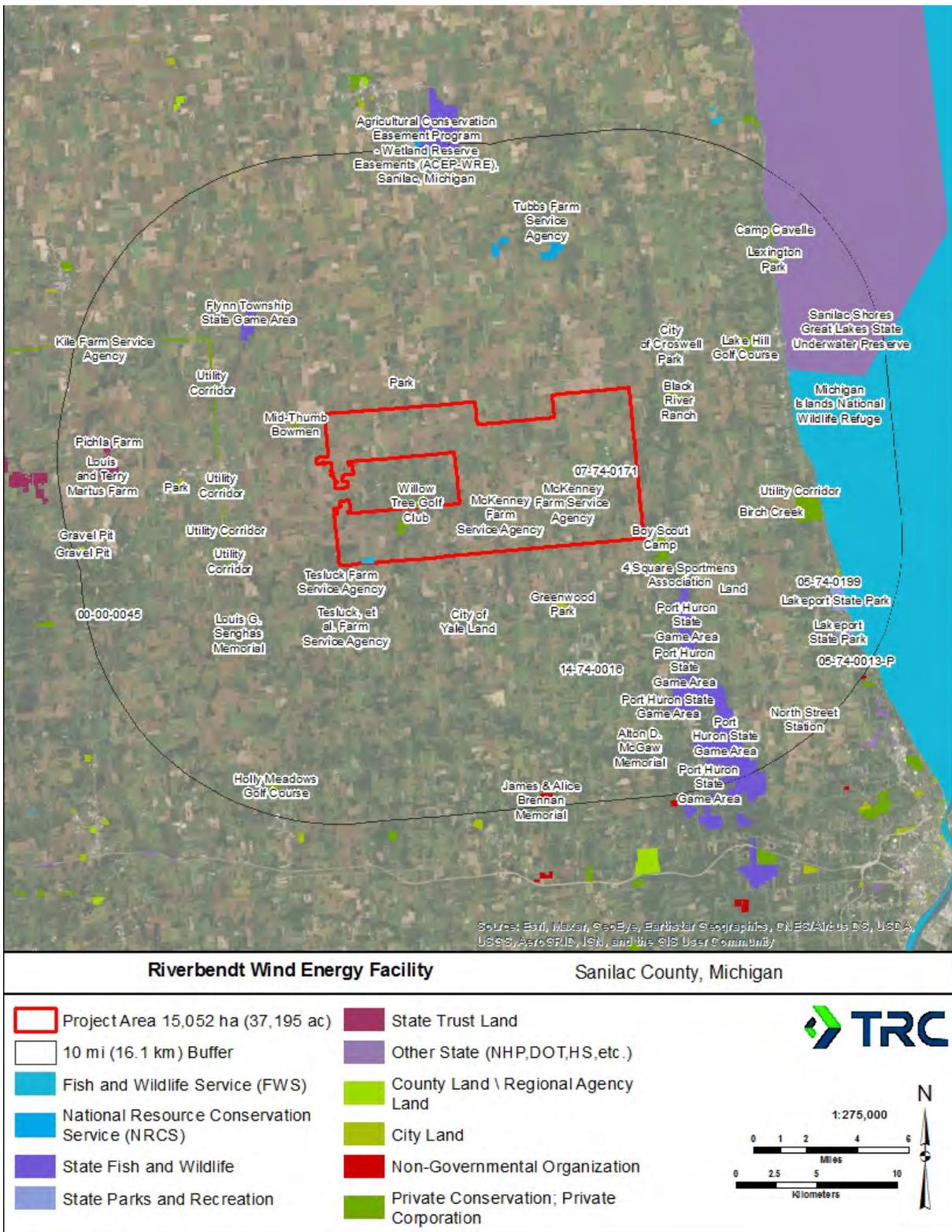


Figure 7. Precluded Lands in the vicinity of the Riverbend Wind Energy Facility, Sanilac County, Michigan, 2021.

## 5.0 References

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## **Preliminary Wetland and Other Waters Review: Appendix 1 to the Site Characterization Report; Riverbend Solar Energy Project, Sanilac County, Michigan**

TRC Environmental Corporation (TRC) conducted a desktop and limited field reconnaissance wetlands review of the proposed Riverbend Wind Energy Project (Project) located in Sanilac County, Michigan (Figure 1). The 37,194 acre (ac; 15,052-hectare [ha]) Project is located within the USGS topographic 7.5-minute quadrangles of Brown City, Yale, and Roseburg, and elevation varies from 755 feet (ft; 230 meters [m]) to 820 ft (250 m) (Figure 2).

The proposed Project is in a primarily agricultural landscape, with woodlots, farmsteads, forested and residential areas scattered throughout the Project area (Figure 1). This document summarizes the findings from the desktop and field reconnaissance review of potential wetland and other water features within an approximately 37,194-acre (ac; 15,052-hectare [ha]) Project area surrounding areas of proposed development.

### **METHODS**

Available reference data were assembled and evaluated prior to conducting field investigations. The digital review included USGS 7.5' Quadrangle Maps, National Wetlands Inventory (NWI), National Hydrography Dataset (NHD), aerial photographs, aerial imagery (e.g., Google Earth historic imagery, LiDAR derived terrain models), Federal Emergency Management Agency (FEMA) National Flood Hazard Layer, and the Michigan Environment, Great Lakes, & Energy (EGLE) database.

A Web Soil Survey report from the U.S. Department of Agriculture (USDA), Natural Resource Conservation Service (NRCS) was generated to identify soil types within the Project Area and determine presence and extent of hydric soils or soils with hydric components. Hydric soils are one of the characteristics used in the determination of wetlands by the U.S. Army Corps of Engineers (USACE).

Each mapped wetland or other water feature (e.g., NWI wetland, etc.) was manually reviewed in a geographic information system (GIS) by a TRC senior wetlands biologist. The reviewing biologist used historic and contemporary aerial photographs (1994 to 2016) to adjust the publicly mapped feature boundaries and also coarsely map new potential features because they appear to have characteristics (e.g., saturation visible, standing water, etc.) required for regulatory jurisdiction per federal and/or state definitions.

A field reconnaissance survey was conducted from public roads as part of a larger review of the potential natural resources in the Project Area. The reviewing biologist attempted to verify the extent and boundaries of the desktop mapped wetland or waterway features and add any other apparent wetland or waterway features.

## RESULTS

### Soils

According to the soil dataset acquired from the NRCS Web Soil Survey there were 71 soil units mapped within the Project Area. Thirty-two of the mapped soil units were listed as hydric soils or containing hydric inclusions (e.g., component of the soil unit found in depressions, floodplains, or drainageways), comprising approximately 34,340 (ac; 13,897-hectare [ha]) (92%) within the Project Area. Hydric soils are an indicator for potential wetland soils. Seventeen soil units were mapped as hydric, 25 soil units were mapped non-hydric containing hydric components, and 25 soil units were mapped as non-hydric (USDA, NRCS, Web Soil Survey 3.0, 2020).

### Federal Emergency Management Agency

The FEMA National Flood Hazard Map indicates there is one mapped Zone A floodplains within the Project Area (Figure 4). This floodplain lies almost entirely to the east of the Project area along Black Creek but extends slightly into the Project area along its eastern edge.

#### FEMA National Flood Hazard Map within the Riverbend Wind Energy Project, Sanilac County, Michigan, 2021.

Floodplain Type	Acres	Number of Features
Zone A	0.02	1
<b>Total</b>	<b>0.02</b>	<b>1</b>

### National Wetlands Inventory

There were 285 NWI wetland features mapped within the Project Area totaling 1941.7 acres (785.8 ha). The NWI consisted of freshwater forested/scrub shrub wetland features 1,870.90 ac (757.13 ha), 38 freshwater emergent wetland features 47.0 ac (19.02 ha), and 21 freshwater pond features 23.9 ac (23.9 ha) (Figure 5).

#### National Wetlands Inventory Features within the Riverbend Wind Energy Project, Sanilac County, Michigan, 2021.

Wetland Type	Acres	Number of Features
Freshwater Forested/Shrub Wetland	1,870.9	226
Freshwater Emergent Wetland	47.0	38
Freshwater Pond	23.9	21
<b>Total</b>	<b>1941.7</b>	<b>285</b>

### National Hydrography Dataset

The NHD watercourse features totaling approximately 130.8 mi (210.6 km) were identified within the Project Area; 119 canal/ditch features (93.6 mi [149.41 km]), 54 perennial features (37.2 mi [59.36 km]), and 1 artificial pathway (0.001 mi [0.01 km]) (Attachment 5). These watercourses generally overlap with the NWI riverine features.

**NHD Features within the Riverbend Wind Energy Project Area of Interest,  
 Sanilac County, Michigan, 2021.**

<b>NHD Type</b>	<b>Number of Features</b>	<b>Length (Mi)</b>	<b>Length (Km)</b>
Canal/Ditch	119	93.6	149.41
Perennial	54	37.2	59.36
Artificial Path	1	0.001	0.01
<b>Total</b>	174	130.8	210.6

**Michigan Environment, Great Lakes, & Energy (EGLE)**

The Michigan Environment, Great Lakes, & Energy (EGLE) database wetland features were mapped within the Project Area, consisting of approximately 1,882 features totaling 55,568.96 ac (7,061.32 ha) (Figure 6). These watercourses generally overlap with the NWI and NHD features but cover a significantly larger area within the Project Area because this dataset includes all areas mapped with hydric soil units, which are a potential indicator of wetland features.

**Desktop Mapping Field Reconnaissance**

The field reconnaissance survey was conducted on May 15-16, 2021. The wetland and waterway features identified within the Project Area during desktop review were determined to be a good representation of the extent and boundaries of these features with minor modifications to the desktop mapped data.

During the desktop wetland mapping many large and small, isolated, or intermittent/ephemeral wetlands were mapped. Given the reconnaissance survey occurred from public roads and outside the plant growing season, confirming the presence of all the small, isolated, intermittent, or ephemeral features, or features not visible from public roadways was not feasible. Therefore, the field effort was not a full evaluation of the presence of wetland or waterway features, particularly those not visible from public roadways or small, isolated, intermittent, or ephemeral features in the Project Area. Additionally, given that the reconnaissance occurred from public roads and outside the plant growing season, the exact boundaries of these potential wetland or waterway features could not be confirmed or delineated at a fine scale.

**Manual Review and Synthesis of Datasets**

Based on the manual review and synthesis of aerial imagery, NWI, NHD, and MDEQ databases (see Methods above for details), the potential wetlands and other waters in the Project Area were refined to an area covering approximately 4,969.88 ac (2,011.24 ha) (Figure 7).

**CONCLUSIONS**

Based on the desktop review, including the additional level of manual desktop assessment, and the field reconnaissance survey, approximately 4,969.88 ac (2,011.24-ha) of potential wetland or other water features were identified within the 37,194 ac (15,052 ha) Project Area (Figure 7).

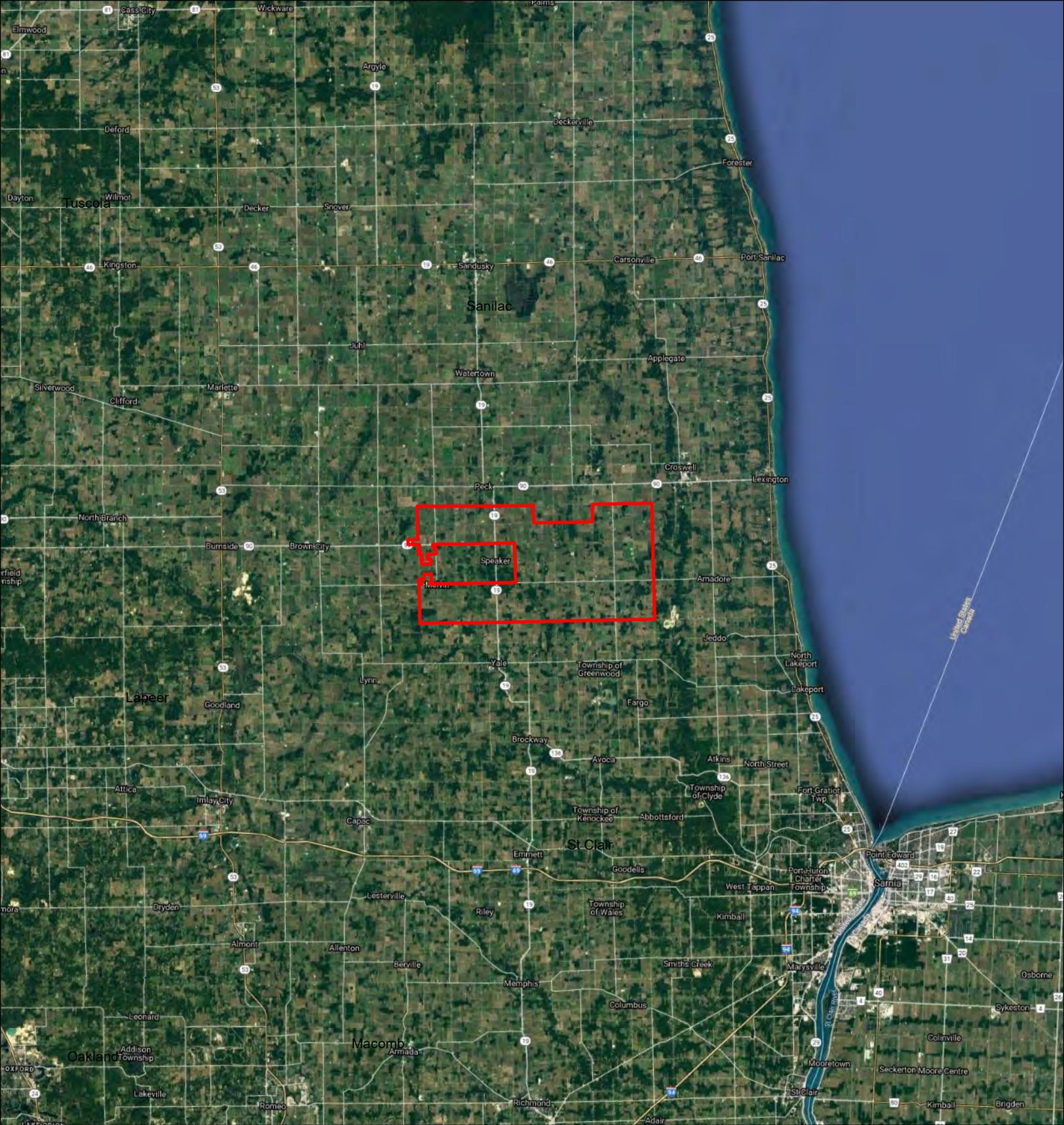
The desktop wetland and other waters and limited field reconnaissance review provided by TRC represents our best professional judgment regarding the probability of the presence of these wetlands, streams, and other water features within the Project Area.



A formal wetland delineation survey has not been conducted in the Project Area and the field reconnaissance was conducted from public roads outside the plant growing season; therefore, these determinations should be viewed as preliminary. TRC recommends that a formal wetland delineation be conducted prior to site plan development. This report does not constitute a regulated determination, as such determinations must be verified by the USACE and/or the Environment, Great Lakes & Energy. Verification of the presence and extent of regulated features can only be made following a delineation and submission of a report to the appropriate regulatory agencies for review and approval.

### **Figures**

- Figure 1. Riverbend Wind Aerial Image Site Location Map
- Figure 2. Riverbend Wind USGS Topography Site Location Map
- Figure 3. Riverbend Wind USDA Soil Report – Soil Units by Hydric Rating
- Figure 4. Riverbend Wind FEMA Features Map
- Figure 5. Riverbend Wind NWI and NHD Features Map
- Figure 6. Riverbend Wind MDEQ Features Map
- Figure 7. Riverbend Wind Final Wetlands and Waterways Map



# Riverbend Wind Energy Facility

Sanilac County, MI



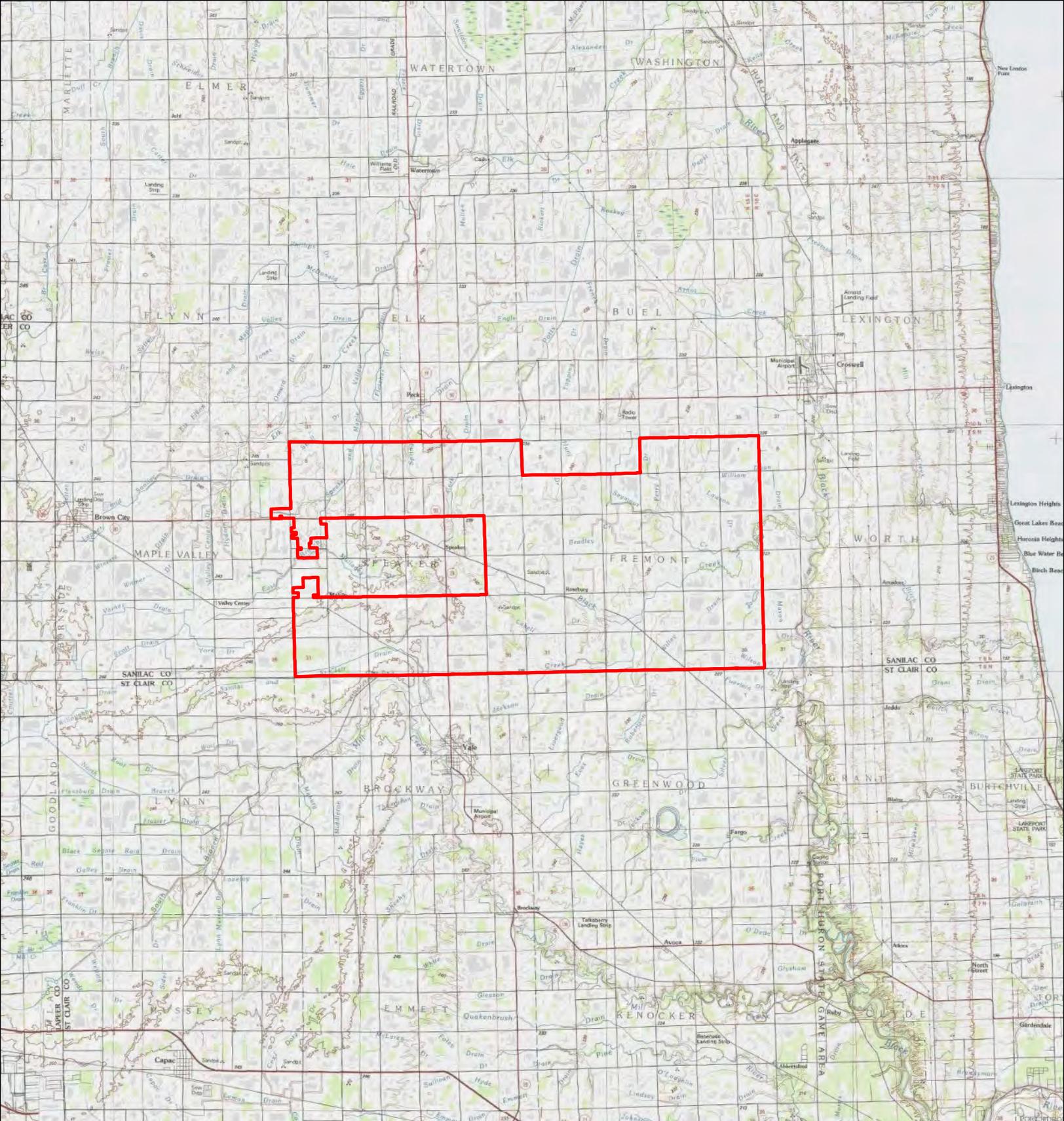
## Legend

- Project Area 37,194 ac (15,052 ha)
- Counties



1:400,000





**Riverbend Wind Energy Facility**  
Sanilac County, MI

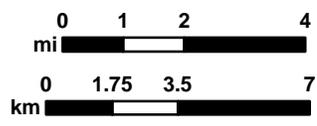


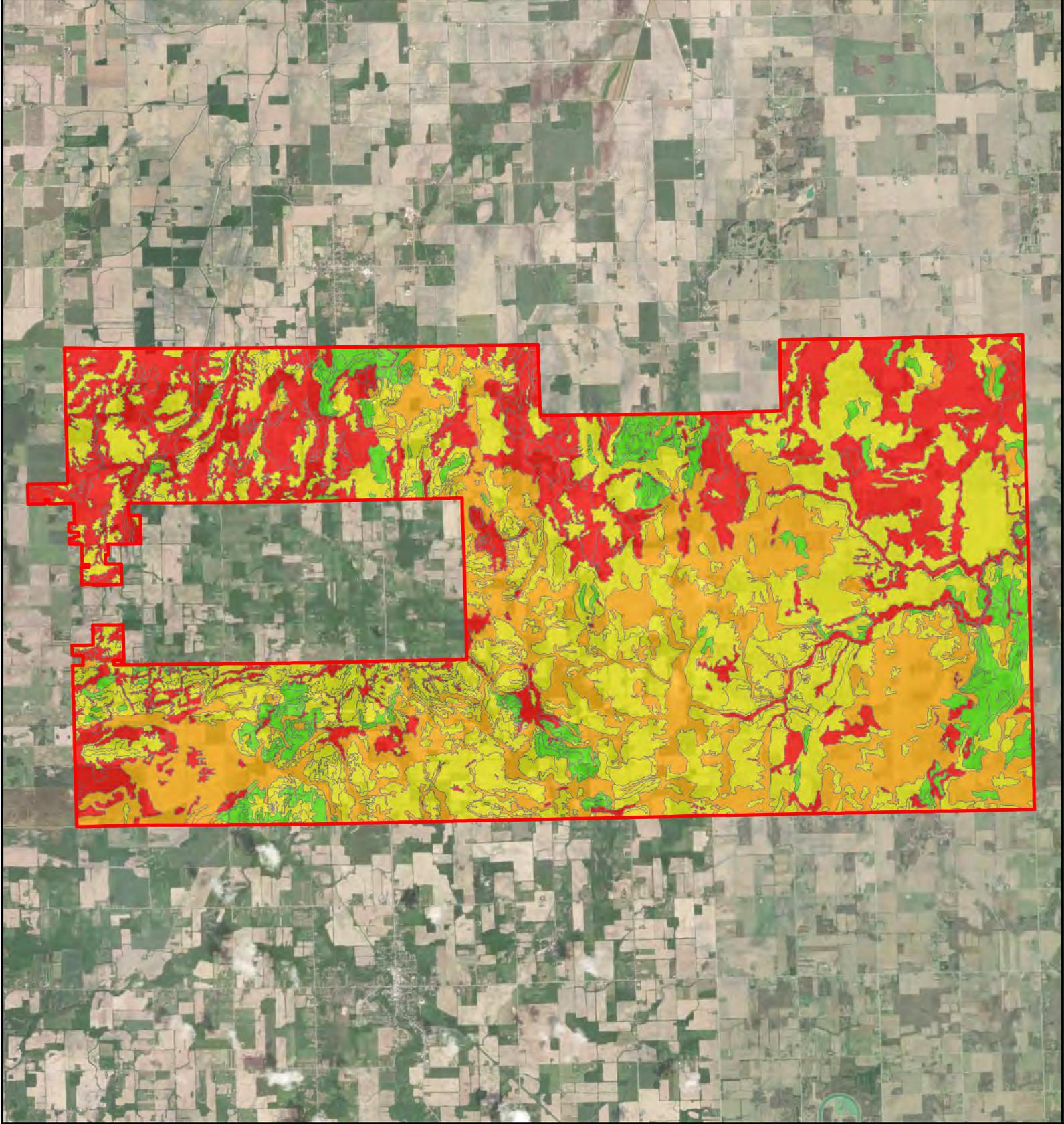
**Legend**

- Project Area 37,194 ac
- USGS Topographic 7.5-min Quadrangles



1:200,000



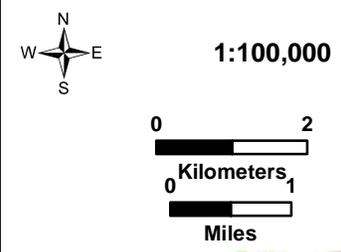


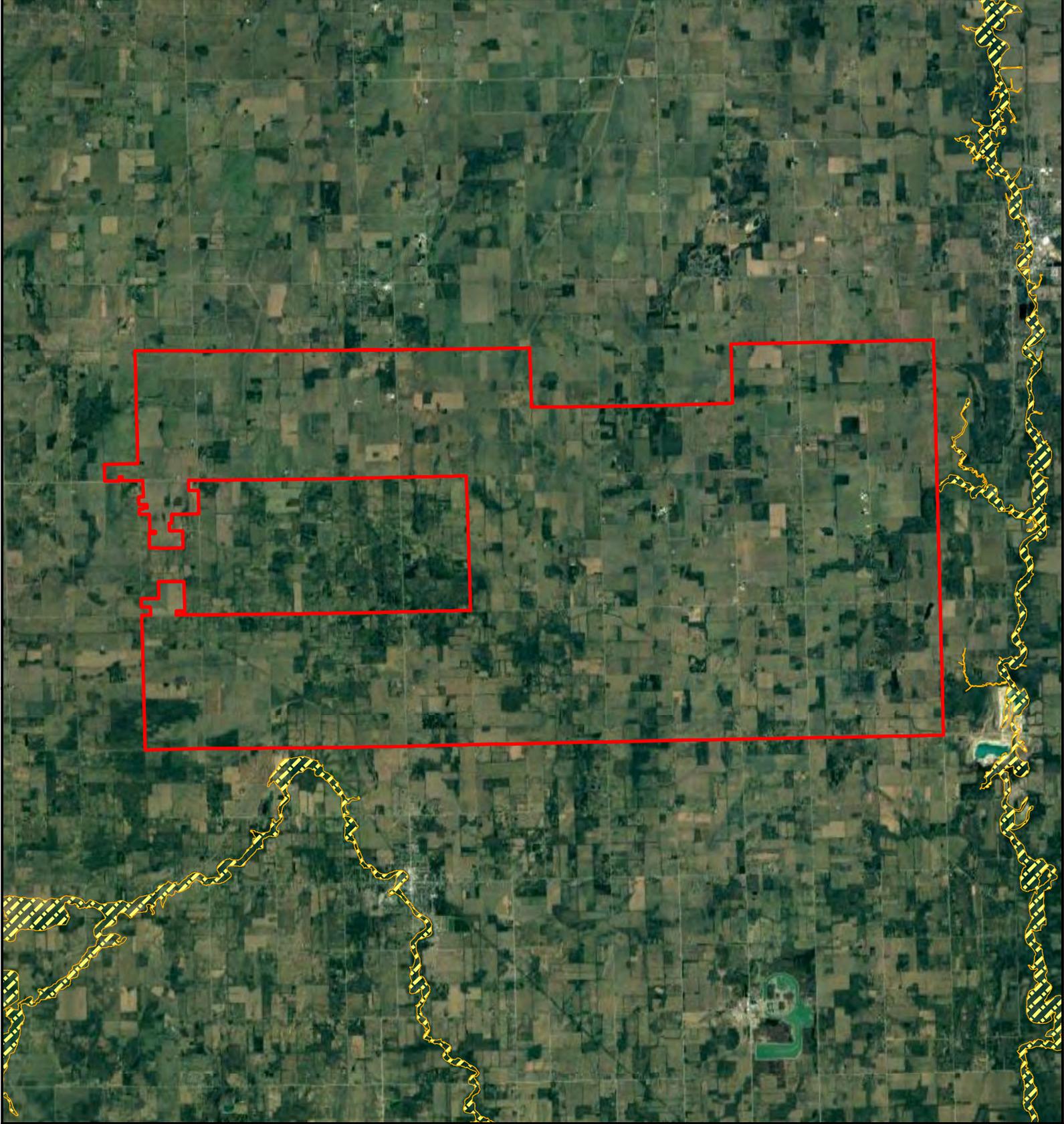
Riverbend Wind Energy Project

Sanilac County, Michigan



- Project Area 37,194 ac
- Hydric\_Typ**
- Hydric (100%)
- Predominantly Hydric (67% - 99%)
- Predominantly Non-hydric (1% - 33%)
- Non-Hydric (0%)





Riverbend Wind Energy Project

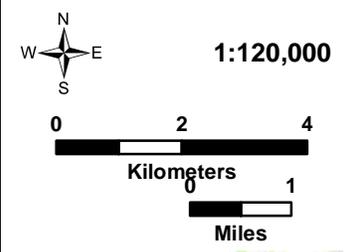
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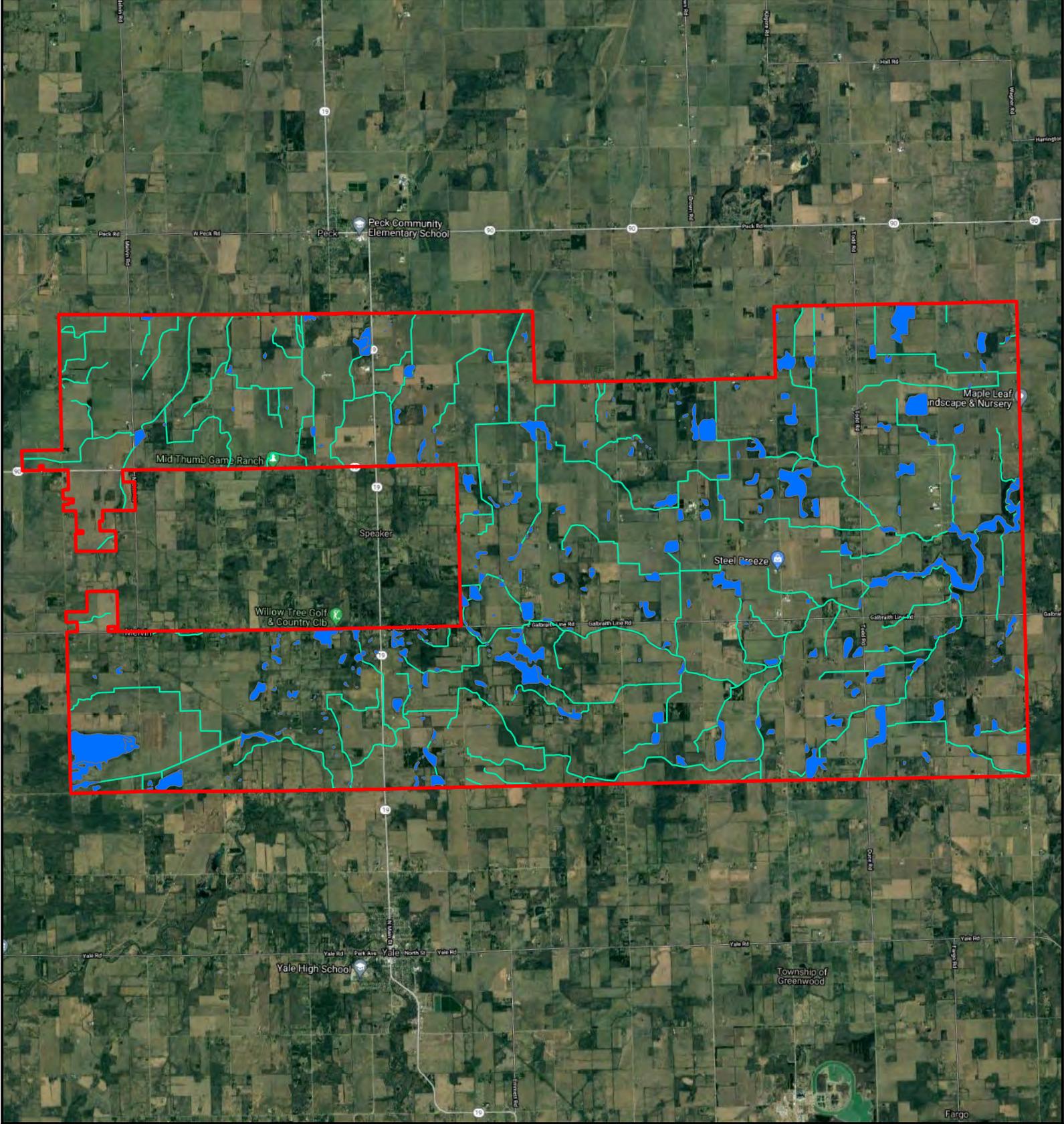


 Project Area 37,194 Ac.

**Flood Zone**

-  A
-  AE





Riverbend Wind Energy Project

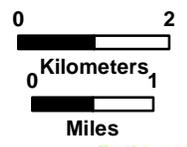
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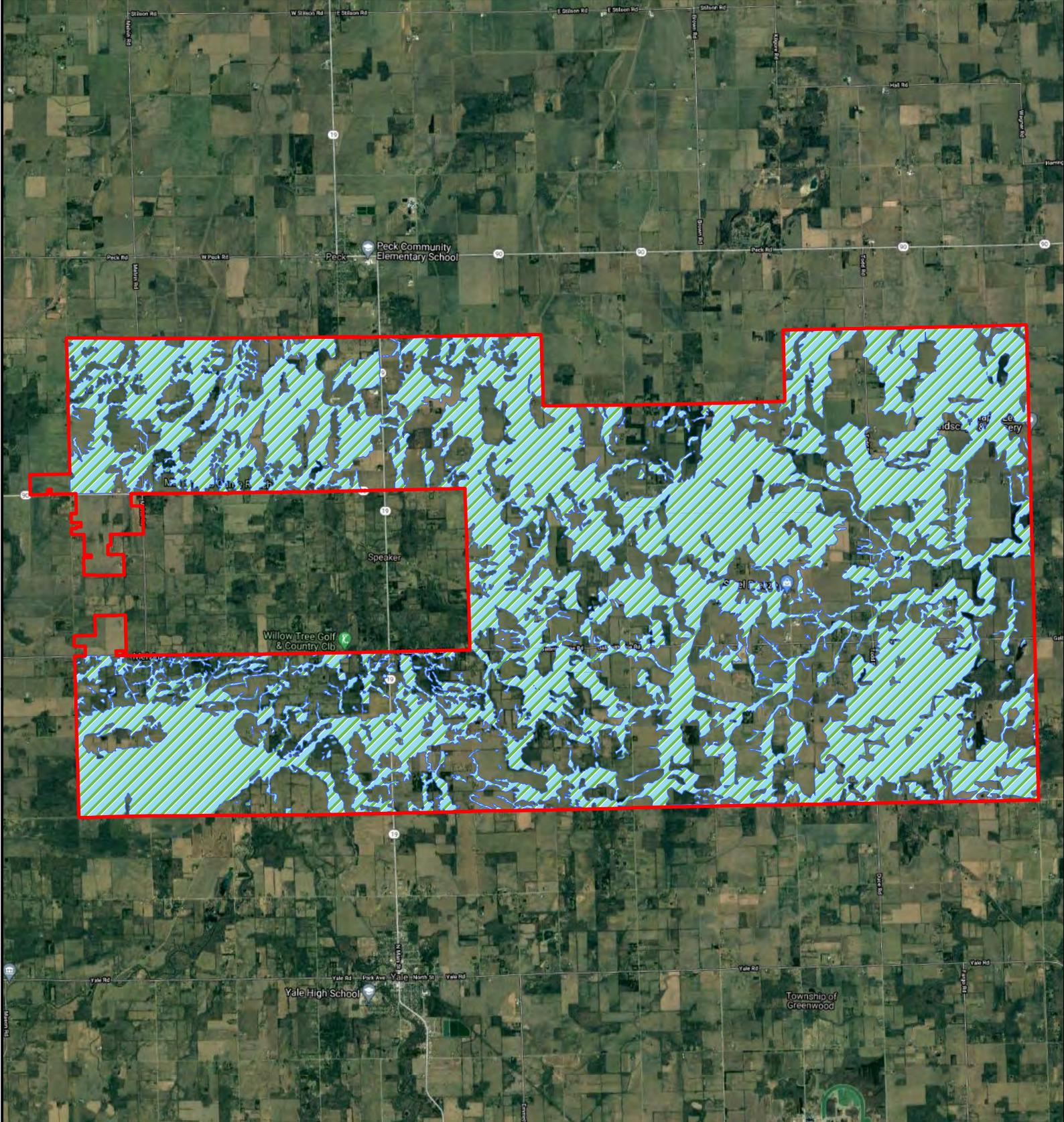


- Project Area 37,194 Ac.
- NWI
- NHD Flowline



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Riverbend Wind Energy Project

Sanilac County, Michigan



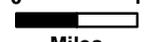
- Project Area 37,194 Ac.
- Michigan EGLE Wetlands



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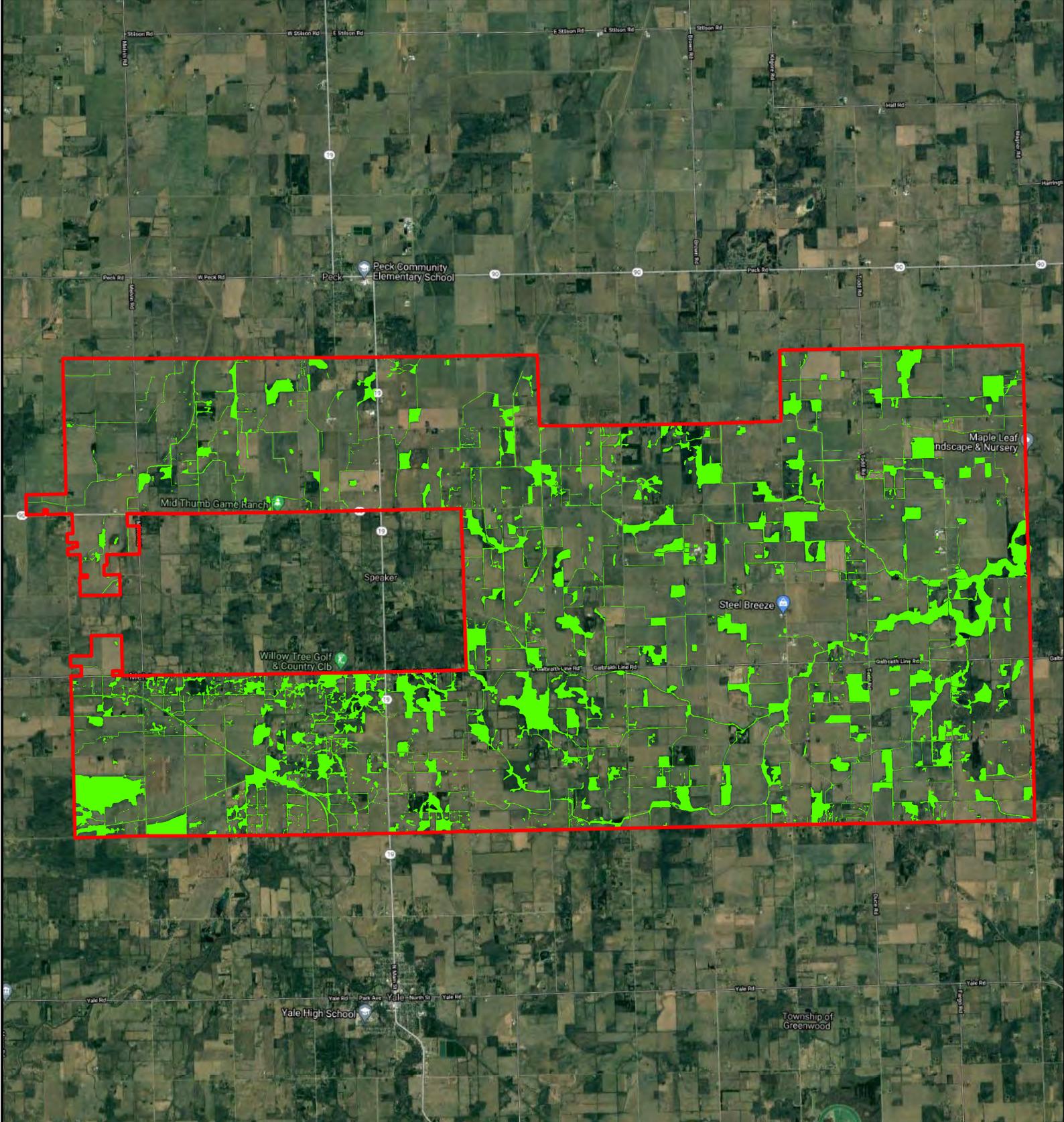


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Riverbend Wind Energy Project

Sanilac County, Michigan



- Project Area 37,194 Ac.
- Desktop WOUS



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Miles



## **Cultural Resources Technical Memorandum**

**To:** Olivia Neter, Algonquin Power (MI Energy Developments), LLC

**From:** Rachel L. Klabacka-Williams, Archaeologist  
Tracy Engle, Central Group Practice Leader  
TRC Environmental Corporation

**Subject:** Riverbend Wind Project – Desktop Review of the Archaeological and Historic Resources

**Date:** October 20, 2021

**Project No.:** 428625.0004.0000

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### **Introduction**

On behalf of Algonquin Power (MI Energy Developments), LLC, representing the Riverbend Wind Energy Facility (Riverbend), TRC archaeology staff conducted literature and archives research through the Michigan State Historic Preservation Office (SHPO) to determine if cultural resource sites are reported within the Project area, for the proposed location of a commercial-scale wind energy facility. The Riverbend Project area is in Sections 1-13 and 24-36, T9N, R14E in Speaker Township and 1-3 and 7-36, of T9N, R15E in Fremont Township, Sanilac County, Michigan. (Attachment 1).

The Project area is defined as the area of potential ground disturbance, encompassing a 37,194-acre (15,052 ha) area as depicted in Figure 1. This Project area will be refined to a smaller footprint once the project layout is determined. The archaeological review covered a Study area with a one-mile radius around the Project area. Research also included historic structures, cemeteries, and National Register of Historic Places (NRHP) sites within a one-mile radius around the Project area.

### **Method**

TRC requested and the SHPO provided file information for the known archaeological sites, historic cemeteries, historic structures or buildings, and previous archaeological and architectural surveys. A TRC archaeologist reviewed the SHPO files, and the NRHP inventory, old county atlases, US Geological Survey (USGS) 15-Minute and 7.5-Minute Topographic Quadrangle maps, historic aerial photographs, and other sources as deemed appropriate.

### **Results**

Figure 2 shows the Project area outlined in yellow, archaeological sites in red, historic sites in purple, cemeteries a white circle with a red cross, and the Study area in pale yellow dotted line. The 1955, 1959, 1982, 1999, 2005, 2009, 2010, 2012, 2014, 2016, and 2018 aerial photographs, not included here within, showed agricultural fields, pasture, wooded lots, residential and farmstead areas.

TRC's review of SHPO files noted that four archaeological sites are within the Project area (Table 1). NRHP significance has not been determined for any of the sites, however, site 20SL21 is a prehistoric mound group of unknown cultural affiliation and is protected under the Michigan Attorney General Opinion No. 6585 of 1989, *Cemeteries and Dead Bodies*. An additional five sites are within the Study area, but they will not be affected by the project as currently designed.

Table 1. Archaeological sites within the Project area				
Site #	Name	Other Name/#	Period	Status
20SL20	n/a	WESTON #73	unknown prehistoric	undetermined
20SL21	n/a	WESTON #74	unknown prehistoric	protected by Michigan Attorney General Opinion No. 6585 of 1989,
20SL107	Hunt	WESTON #43	unknown prehistoric	undetermined
20SL108	Hirons	WESTON #42	Woodland	undetermined

No previous archaeological surveys have been done within the Project area or the Study area.

Two cemeteries (Table 2) are in the Project area. Both are Euro-American cemeteries with undetermined status for listing on the NRHP. They are protected under the Michigan Attorney General Opinion No. 6585 of 1989, *Cemeteries and Dead Bodies*. Seven cemeteries are reported in the Study area but will not be affected by the project as it is currently designed.

Table 2. Historic cemeteries overlapping the Riverbend Project area			
Name	Other Name/#	Period	Status
Fremont Township Cemetery	Avery Cemetery	Historic Euro-American	undetermined
Immaculate Conception Catholic Cemetery	Seven Sorrows Cemetery	Historic Euro-American	undetermined

One historic structure is in the Project area, the Fargo Road Bridge over Black Creek (P61744). The bridge has been demolished and is no longer eligible for listing on the NRHP. There are no historic buildings or structures within the Study area.

## Conclusions

On behalf of Algonquin Power (MI Energy Developments), LLC, TRC archaeology staff conducted a desktop literature and archives review to determine if cultural resource sites are reported for the Project area and the proposed location of the Riverbend Wind Energy Facility. Riverbend is in sections 1-13 and 24-36, T9N, R14E in Speaker Township and sections 1-3 and 7-36, T9N, R15E in Fremont Township, Sanilac County, Michigan.

Four previously recorded archaeological sites, 20SL20, 20SL21, 20SL107, and 20SL108 are reported within the Project area as well as one historic structure (P61744) and two cemeteries.

TRC recommends that sites 20SL20, 20SL107, and 20SL108 be avoided, if these sites cannot be avoided then a Phase I Archaeological Survey may be required and a setback may be required.

Site 20SL21, the prehistoric mound group, Fremont Township Cemetery, and the Immaculate Conception Catholic Cemetery are protected under the Michigan Attorney General Opinion No. 6585 of 1989, *Cemeteries and Dead Bodies*. TRC recommends that these resources be avoided, if they cannot be avoided then consultation with the Michigan SHPO is required and a setback may be required by the SHPO.

The historic structure (P61744) has been demolished and no longer is eligible for listing on the NRHP. No further work recommended for this resource.

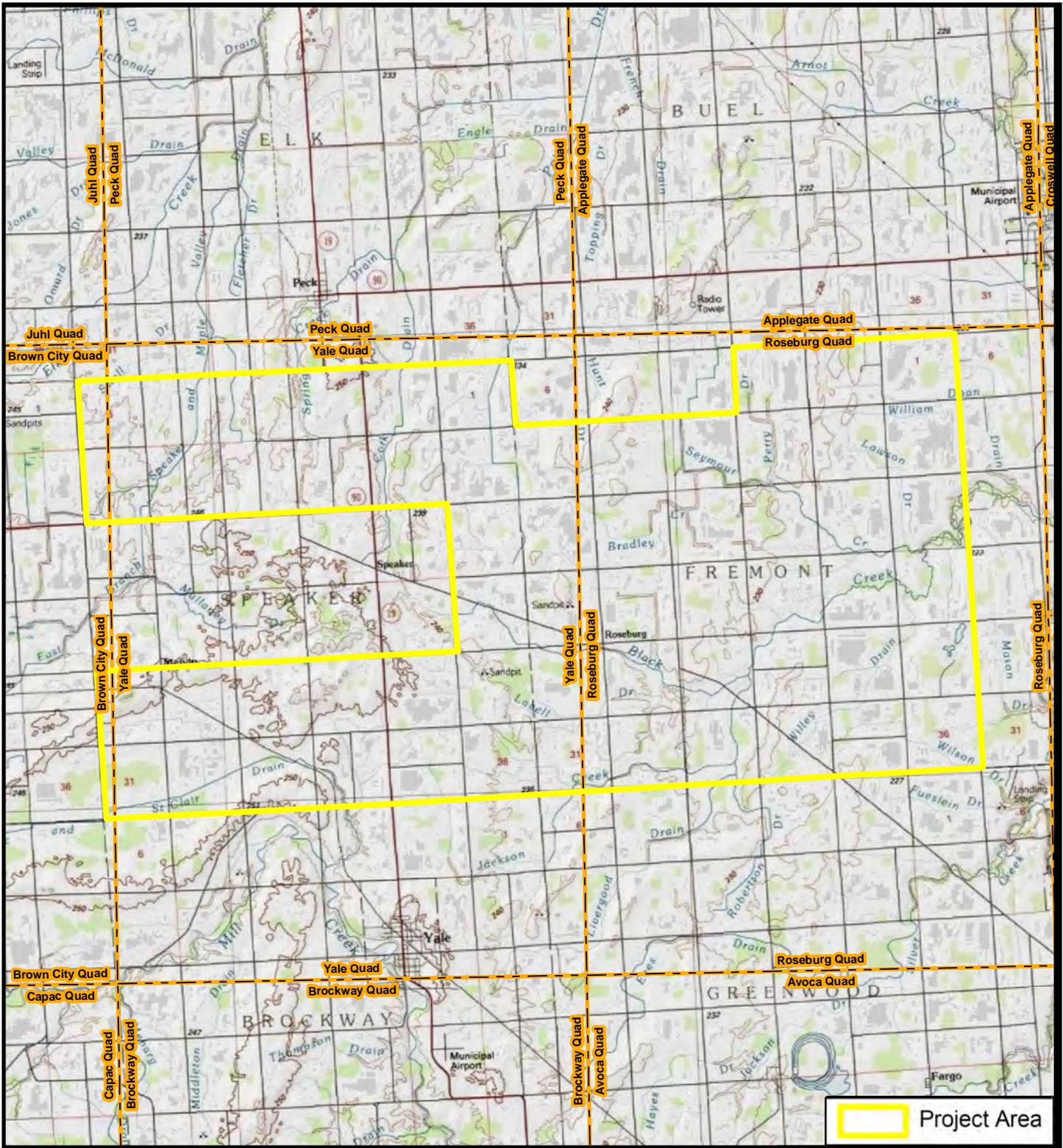
A total of five archaeological sites and seven cemeteries are reported in the Study area. There are no historic buildings or structures within the Study area. These cultural resources will not be affected by the project as it is shown in the KMZ provided by the client in April 2021, unless there is a federal nexus

and a federal agency determines that a survey is required, no additional archaeological work is required. If the limits of the project change, another cultural review may be necessary.

## **FIGURES**

**Figure 1: Riverbend Wind USGS Topographic Project Location Map**

**Figure 2: Riverbend Wind Cultural Overview Map**



BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



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Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

TRC - GIS

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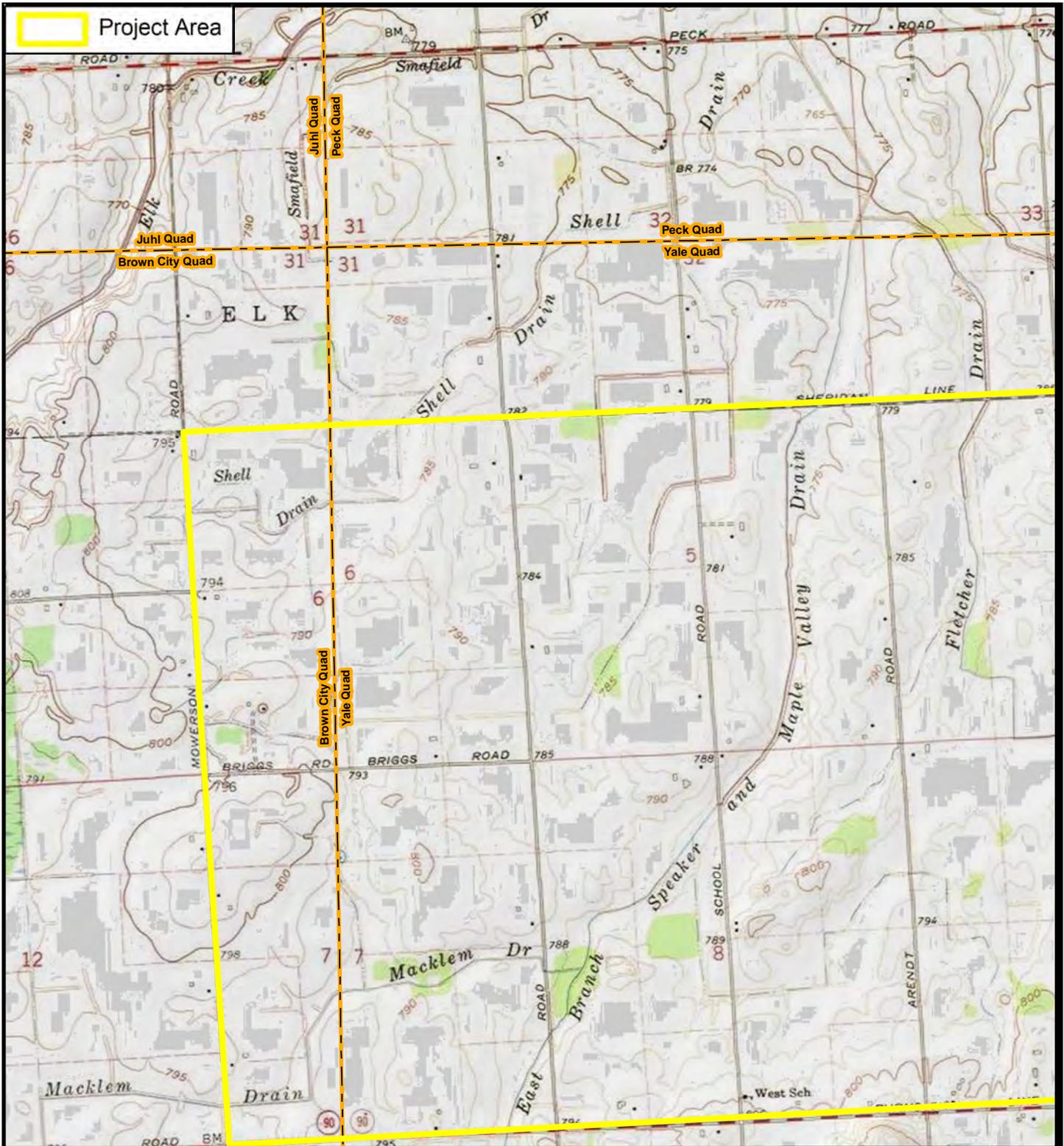
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 1**



BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.

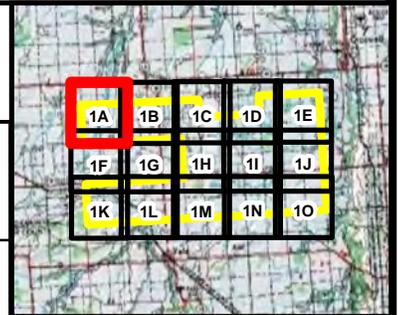


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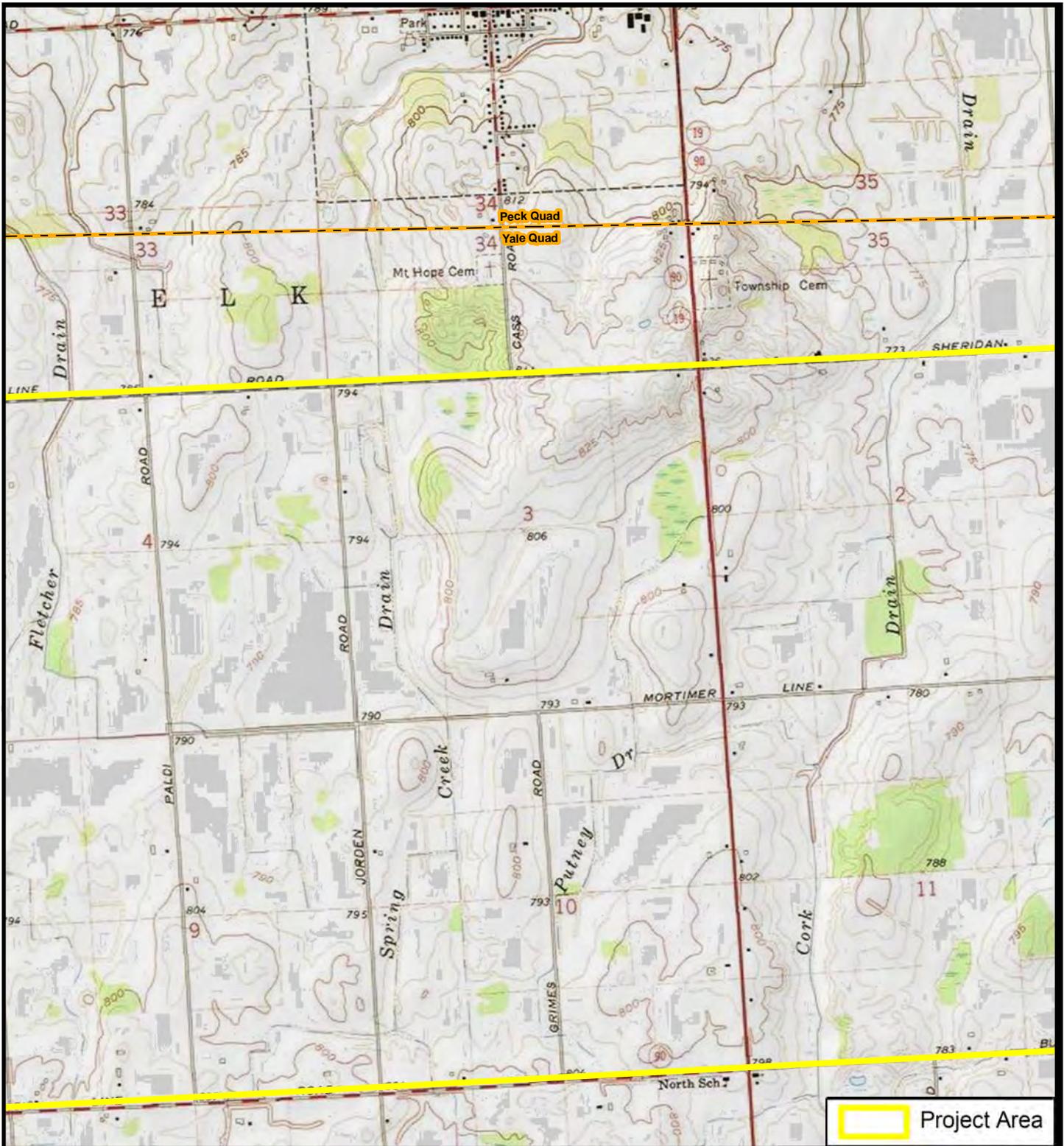
TRC - GIS

PROJECT: **ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE: **SITE LOCATION MAP**



**FIGURE 1A**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.

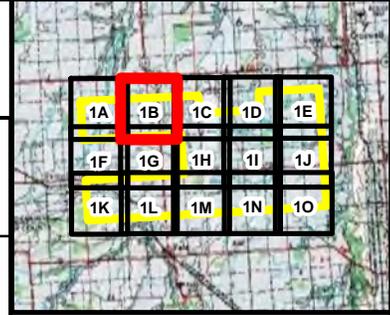



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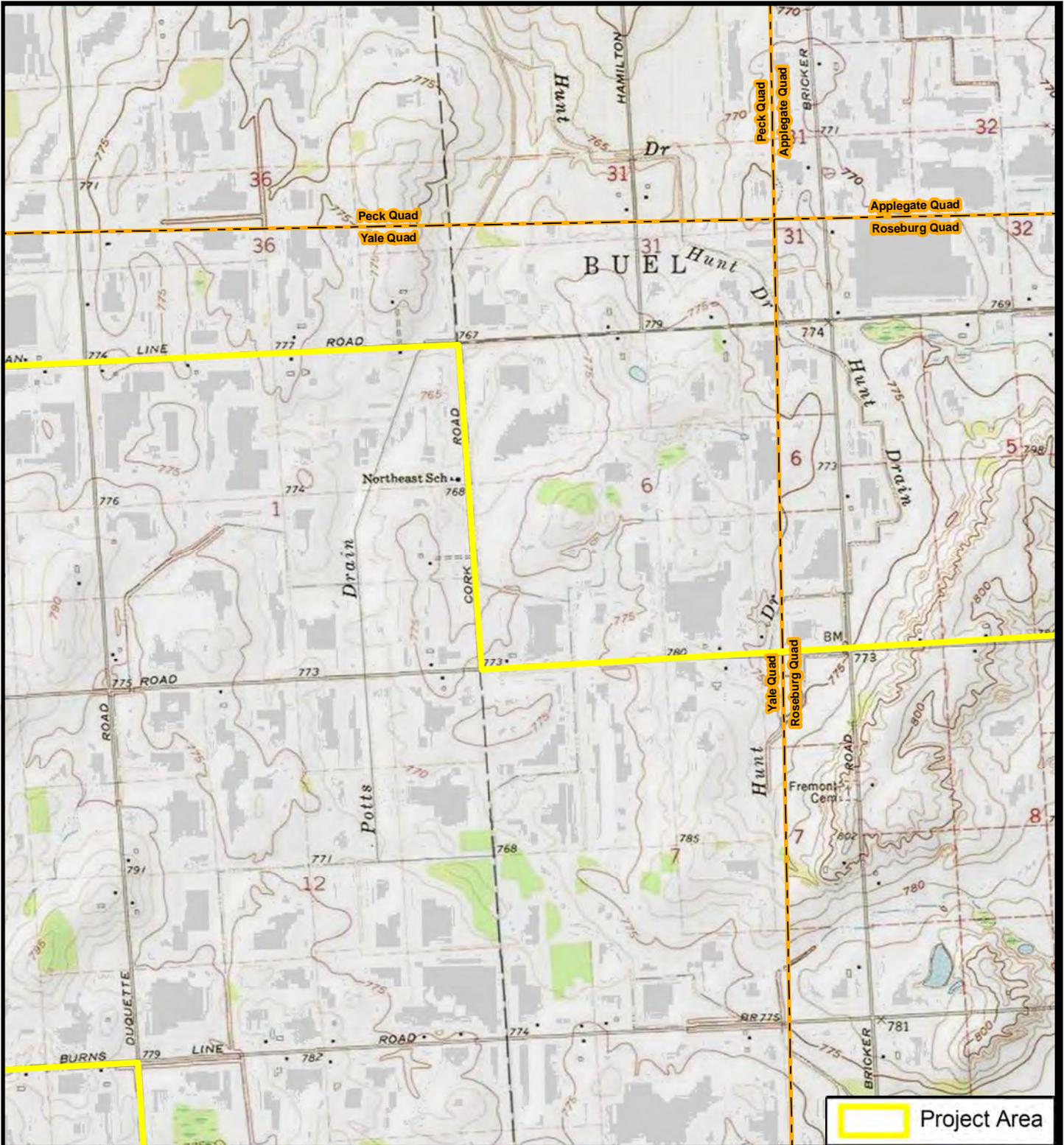
TRC - GIS

PROJECT: **ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE: **SITE LOCATION MAP**



**FIGURE 1B**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.

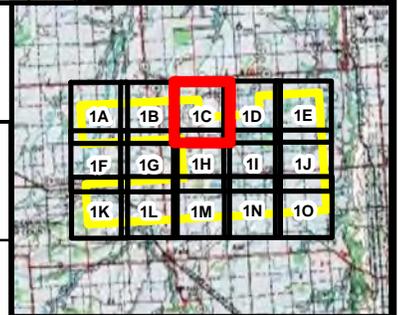


6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

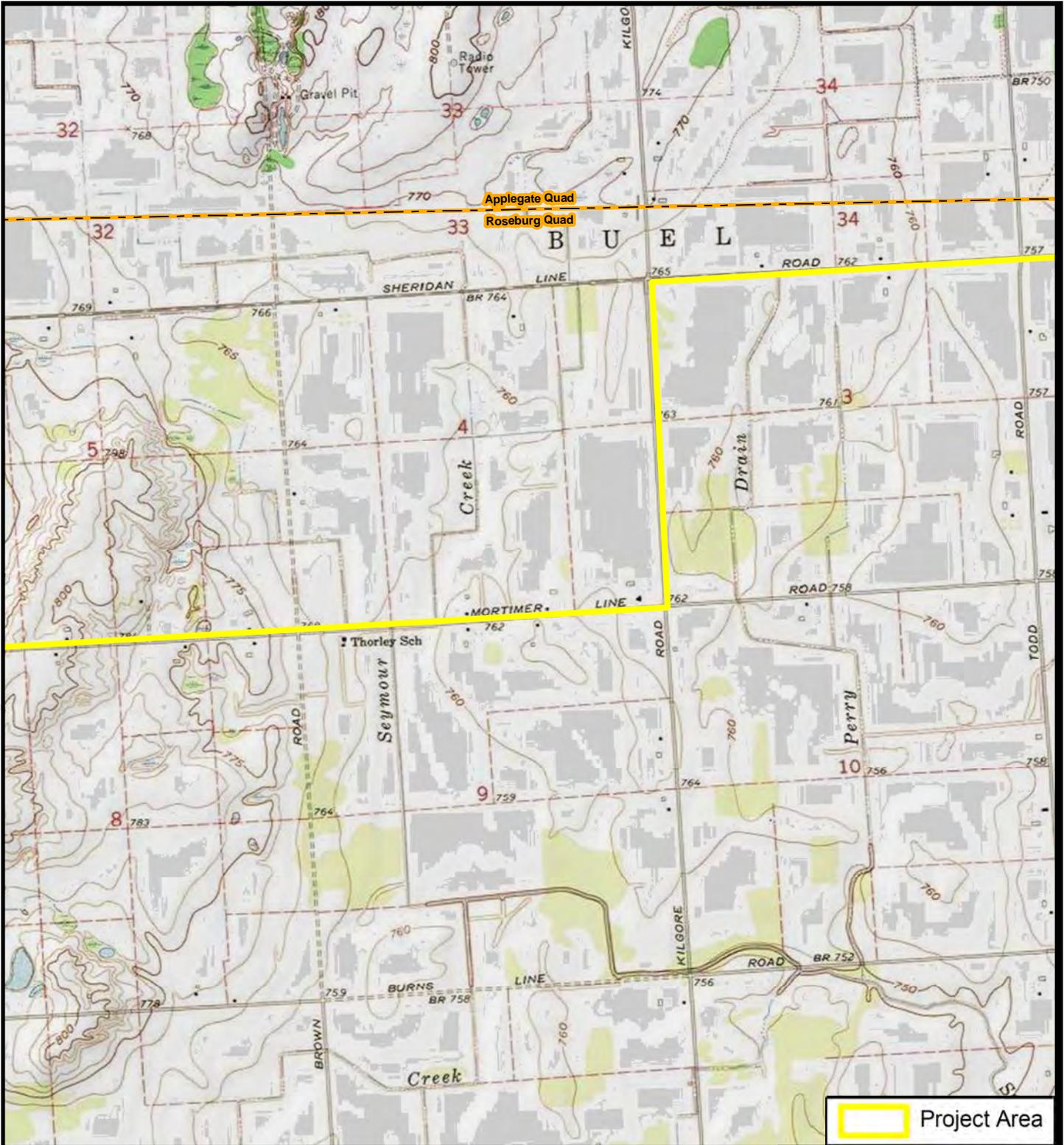
TRC - GIS

PROJECT: **ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE: **SITE LOCATION MAP**



**FIGURE 1C**



BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

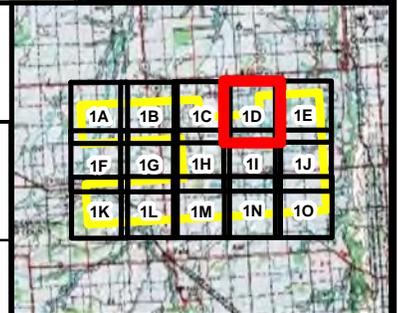
TRC - GIS

PROJECT:

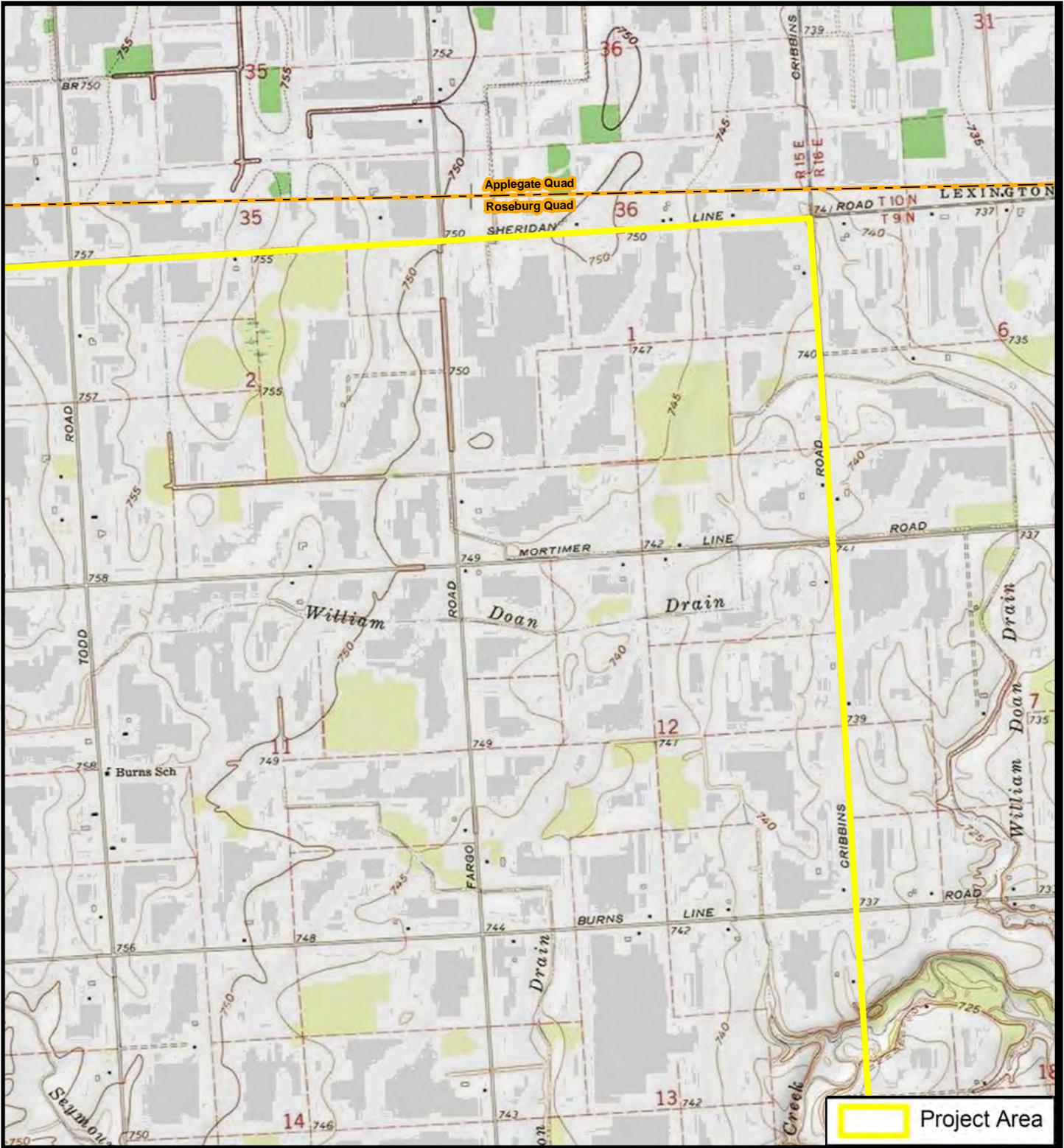
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 1D**



BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

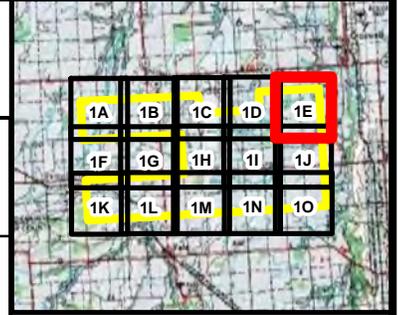
TRC - GIS

PROJECT:

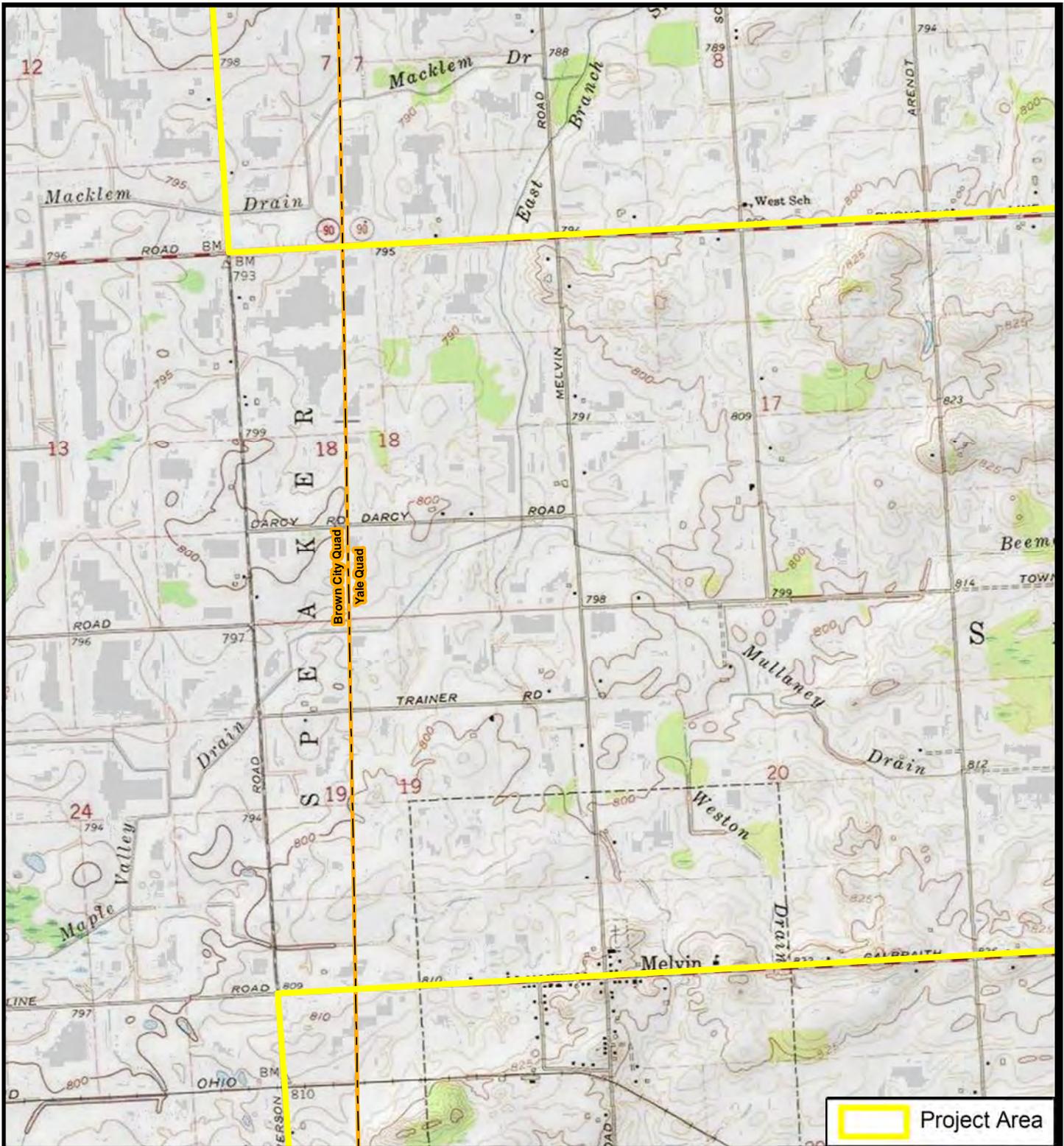
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 1E**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.

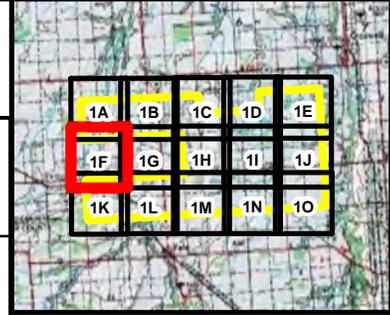



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

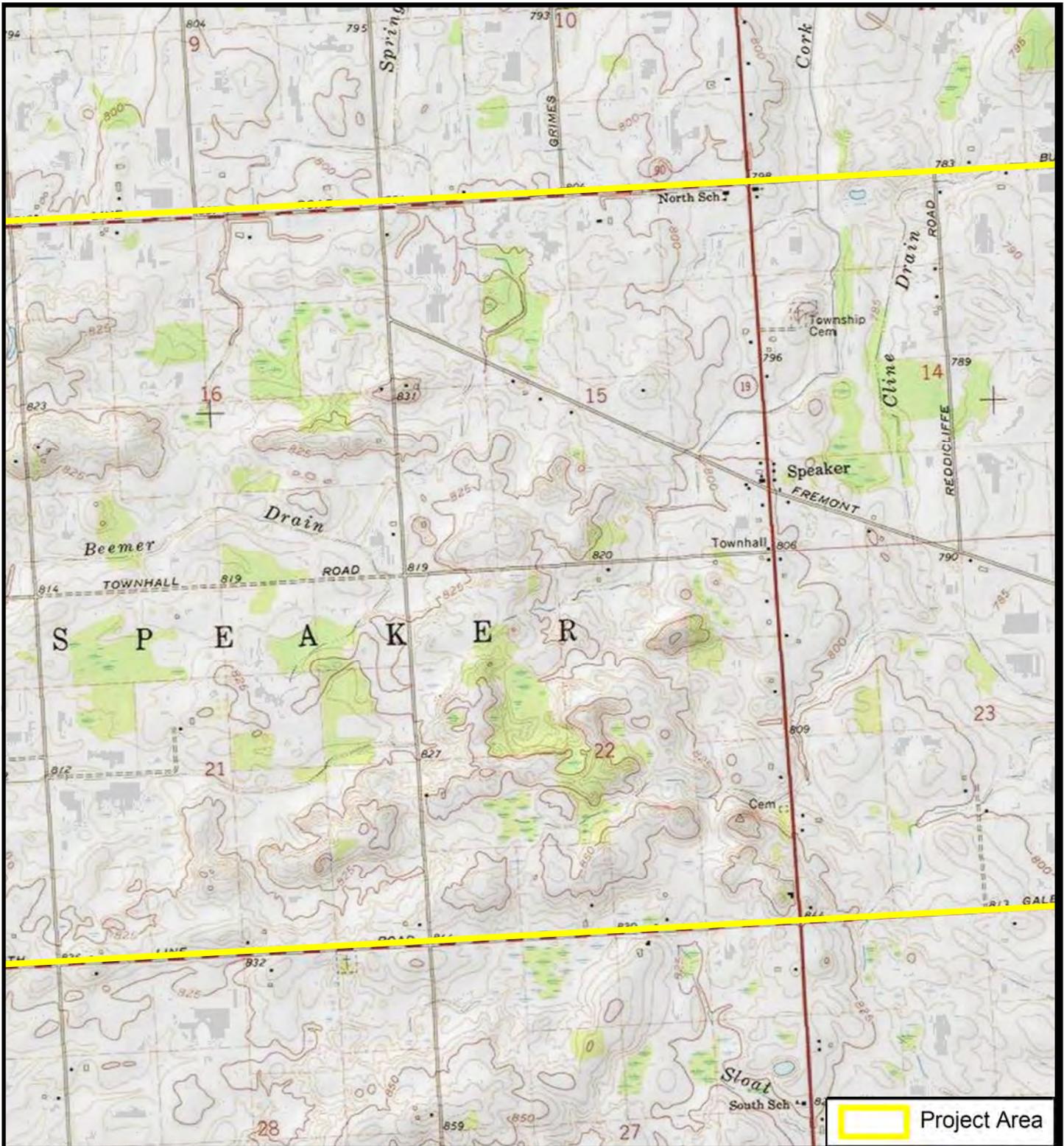
TRC - GIS

PROJECT: **ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE: **SITE LOCATION MAP**



**FIGURE 1F**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.

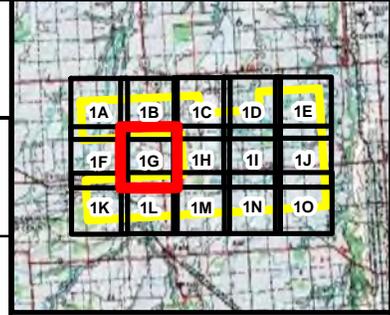



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

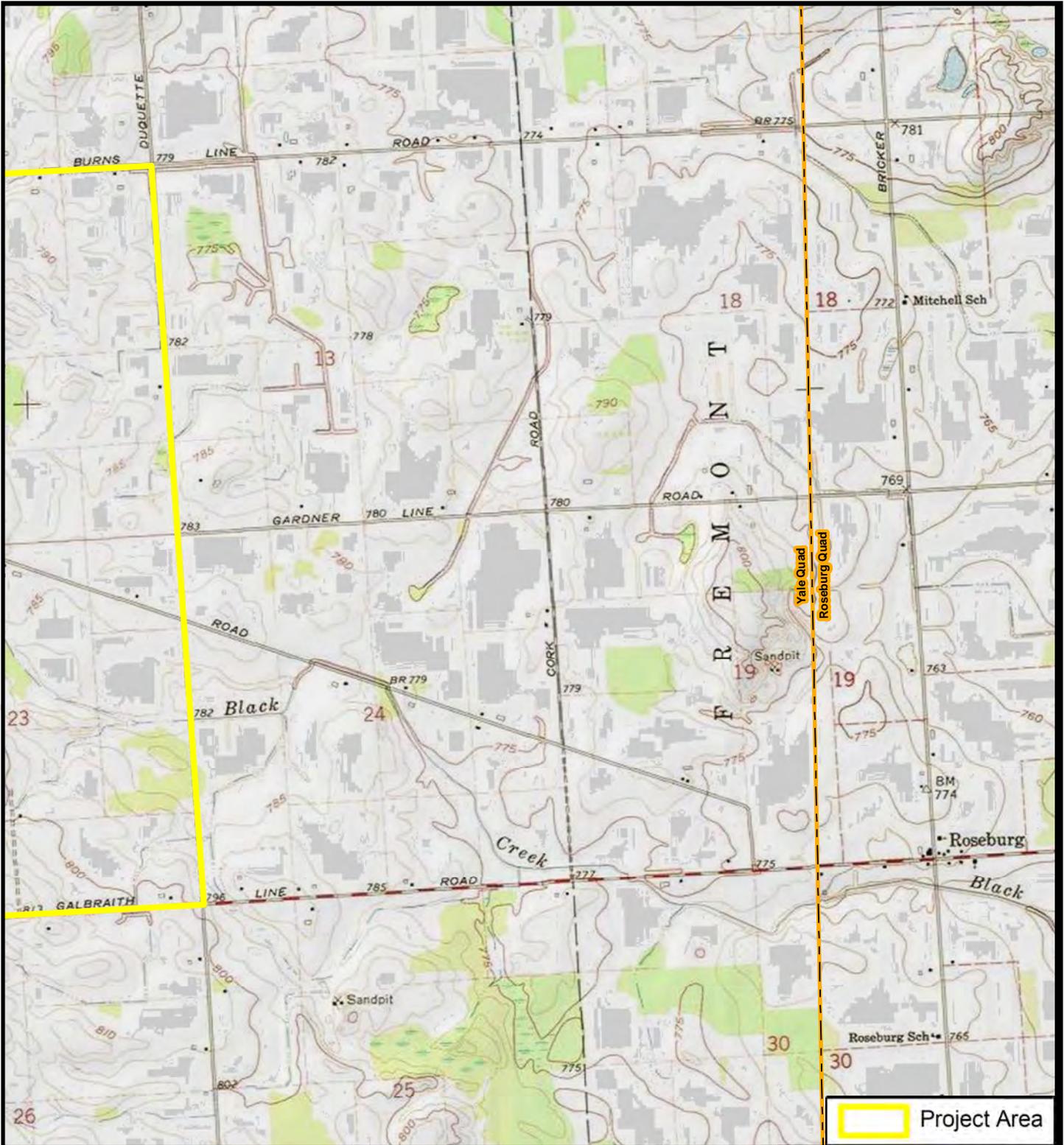
TRC - GIS

PROJECT: **ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE: **SITE LOCATION MAP**



**FIGURE 1G**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

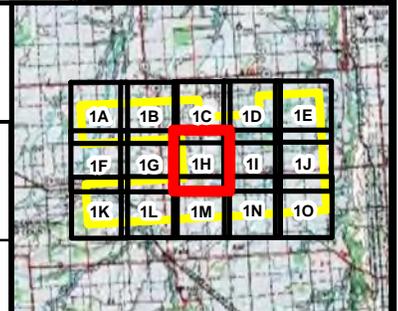
TRC - GIS

PROJECT:

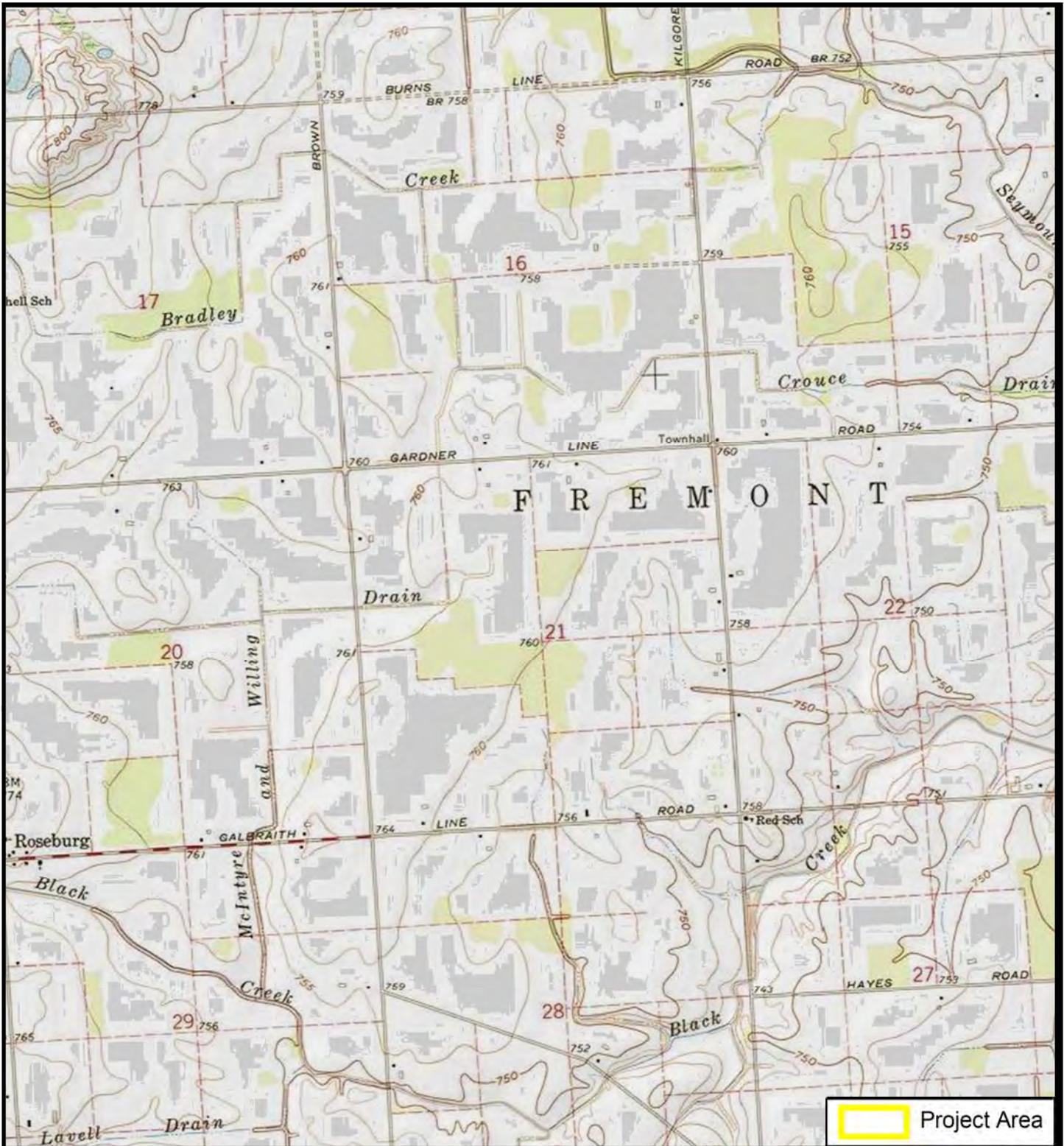
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 1H**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

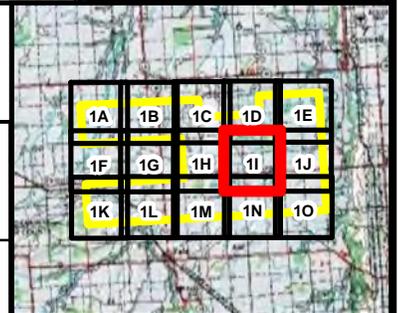
TRC - GIS

PROJECT:

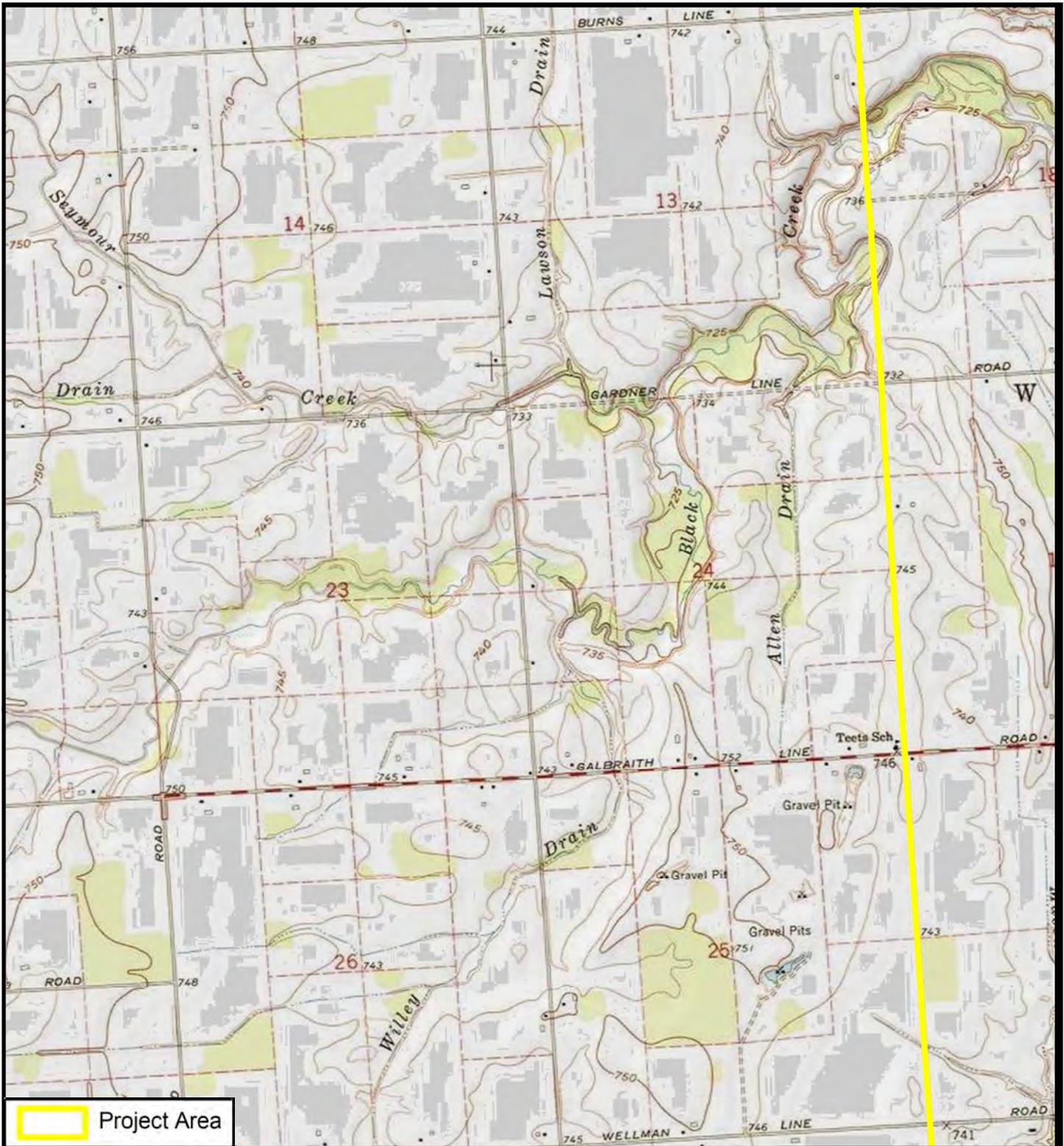
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 11**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

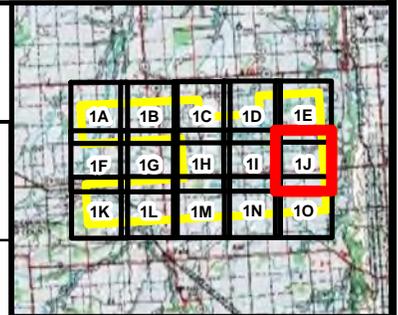
TRC - GIS

PROJECT:

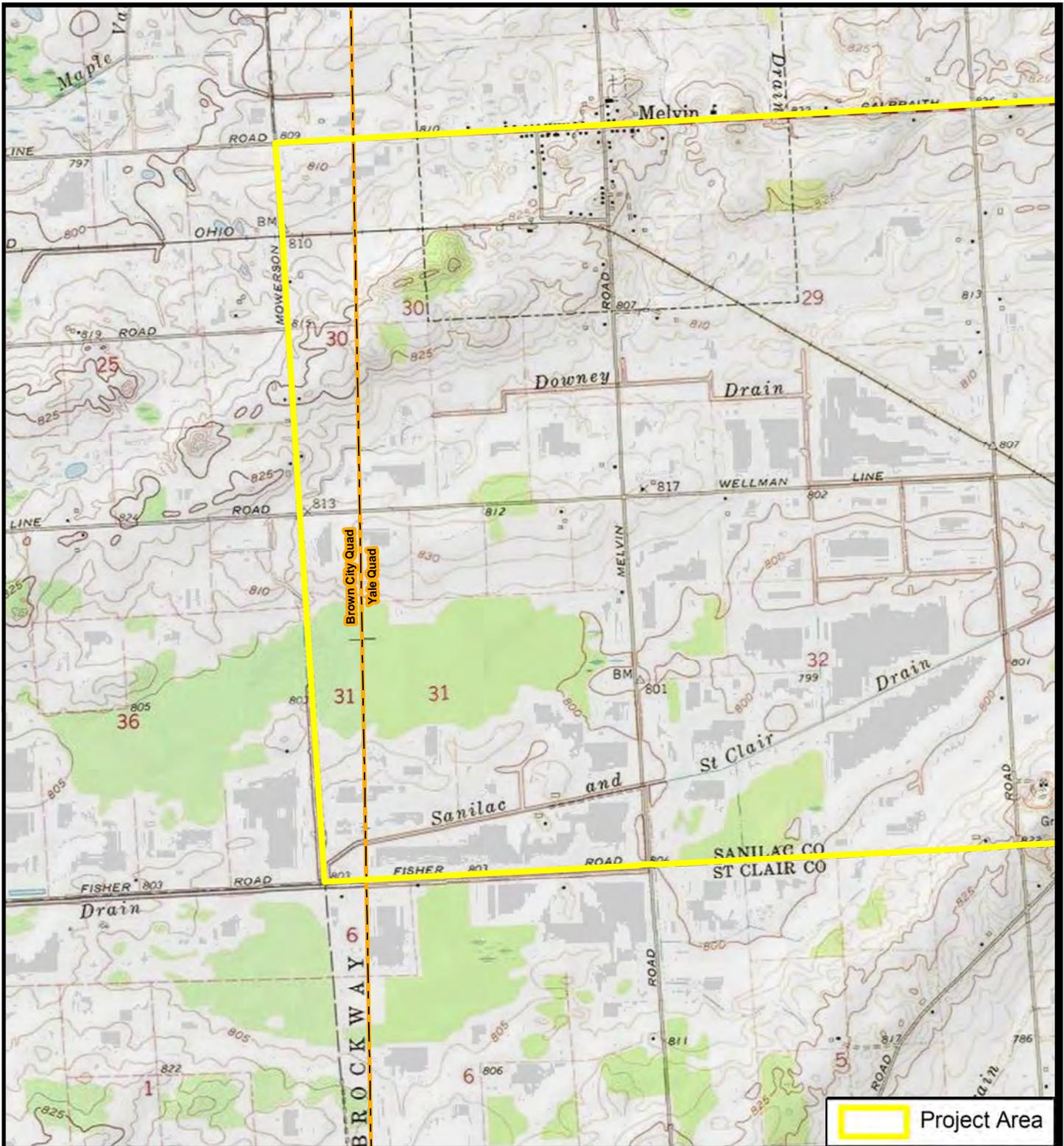
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 1J**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.

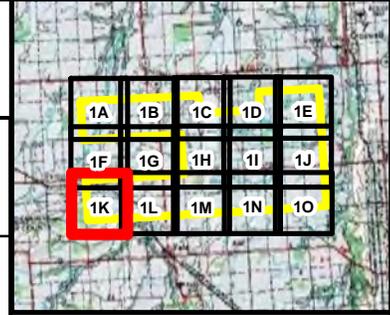



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

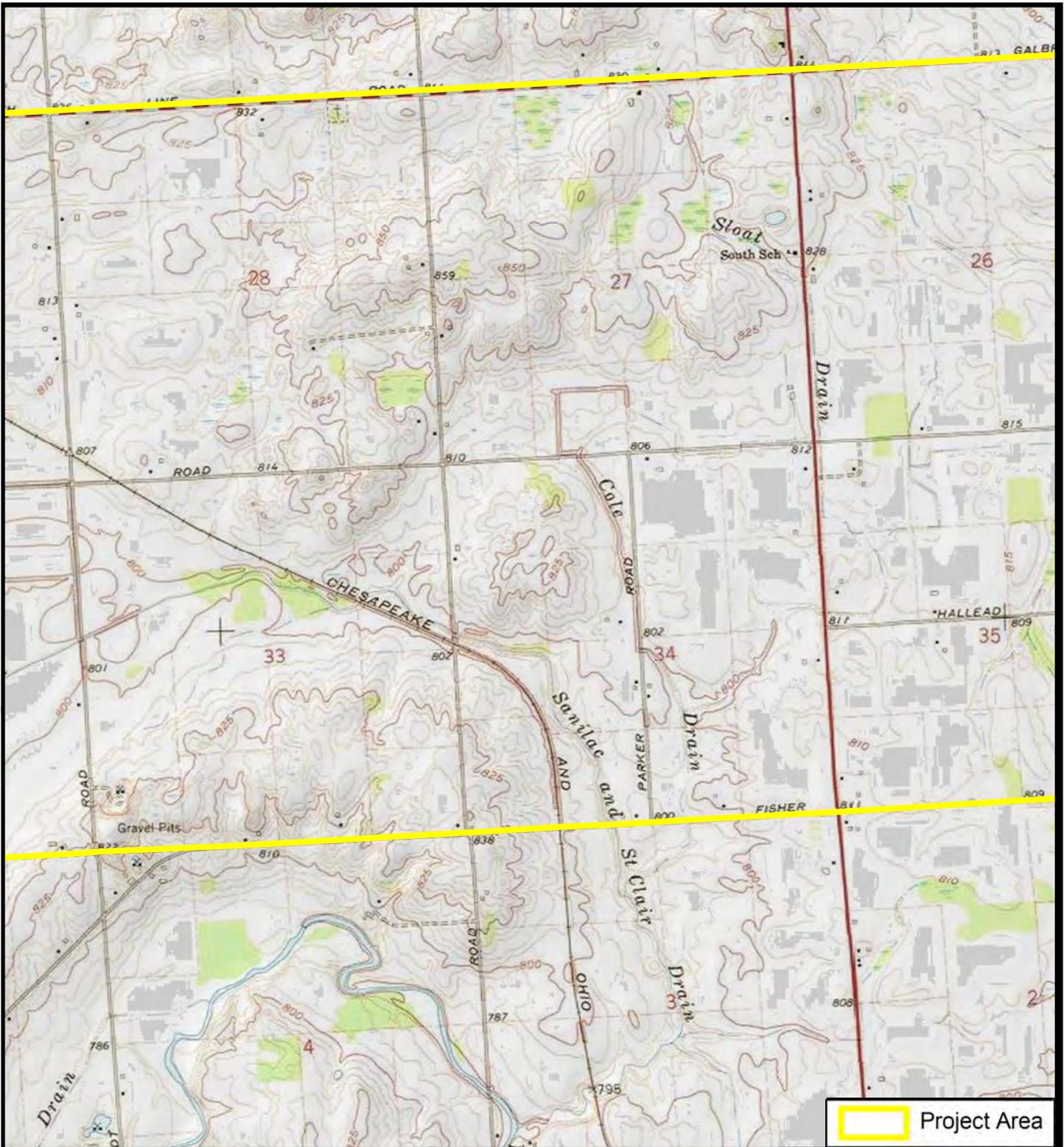
TRC - GIS

PROJECT: **ALGONQUIN POWER RIVERBEND SANILAC COUNTY, MICHIGAN**

TITLE: **SITE LOCATION MAP**



**FIGURE 1K**



BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

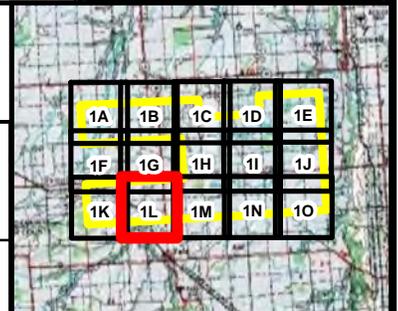
TRC - GIS

PROJECT:

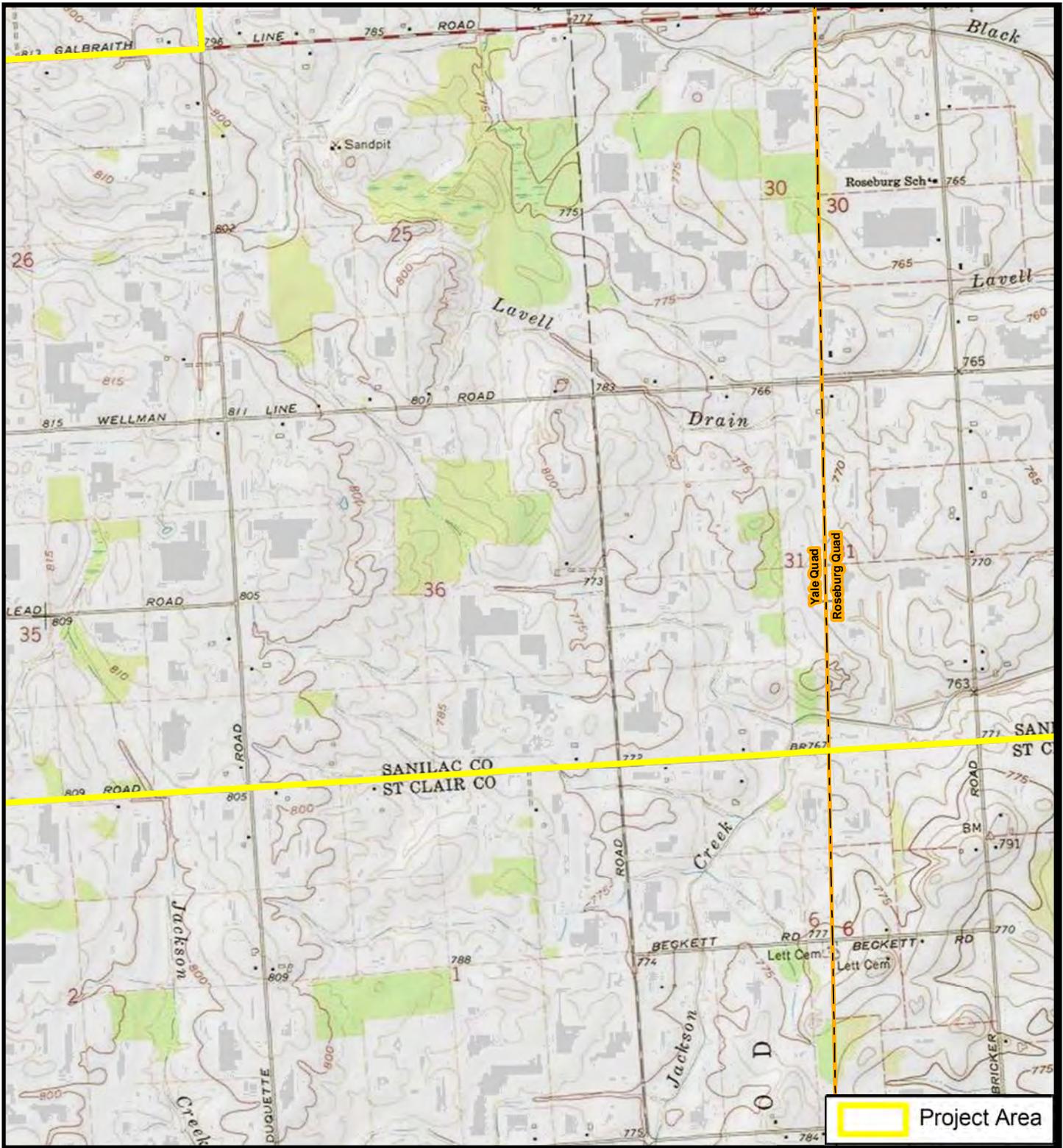
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 1L**



BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

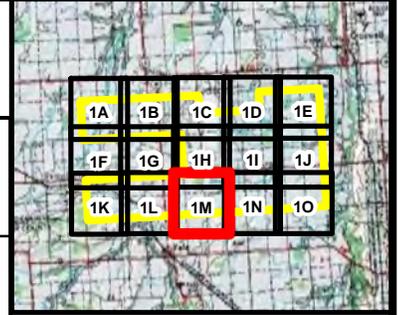
TRC - GIS

PROJECT:

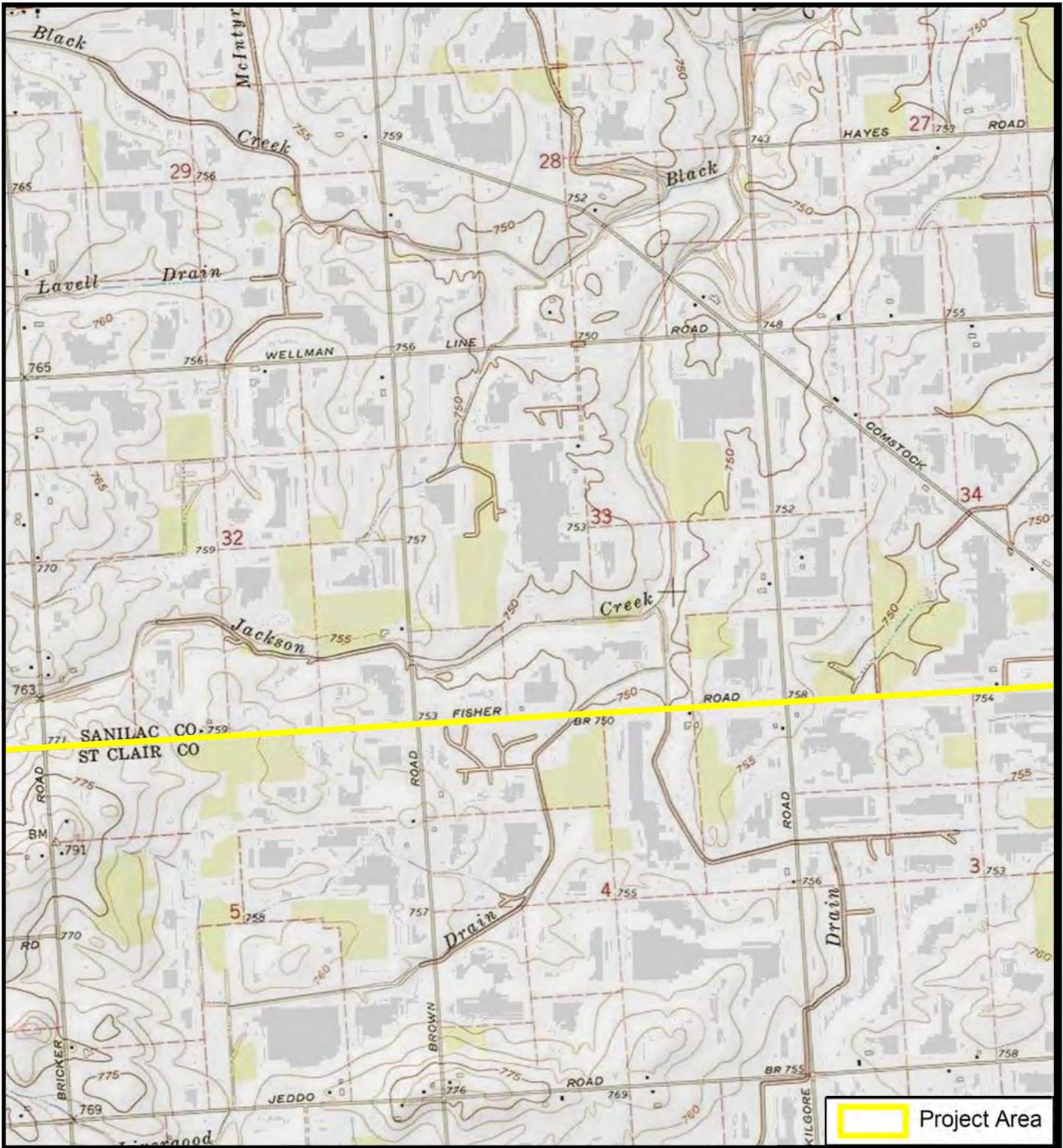
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

**SITE LOCATION MAP**



**FIGURE 1M**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.

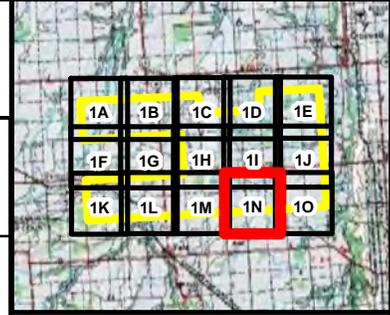



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

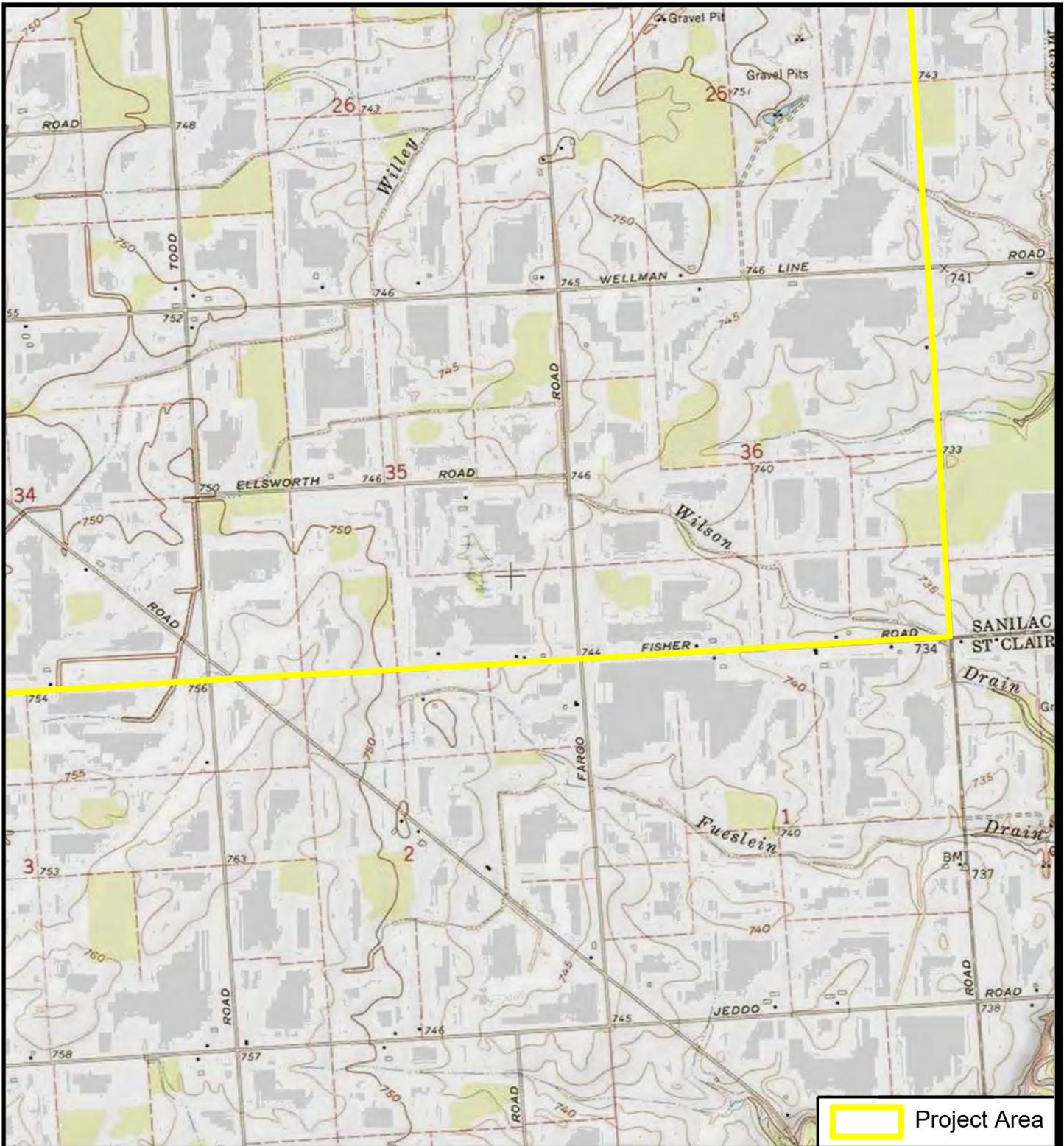
TRC - GIS

PROJECT: **ALGONQUIN POWER RIVERBEND SANILAC COUNTY, MICHIGAN**

TITLE: **SITE LOCATION MAP**



**FIGURE 1N**



 Project Area

BASE MAP FROM USGS TOPOGRAPHIC MAP WEB SERVICE.



6737 W Washington St.  
Suite 2100  
West Allis, WI 53214  
Phone: 262.879.1212

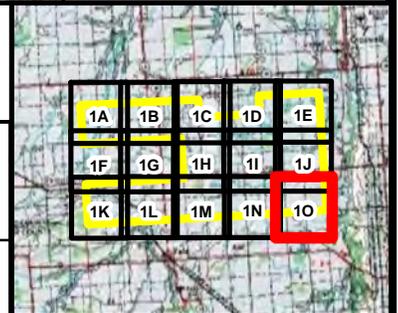
TRC - GIS

PROJECT:

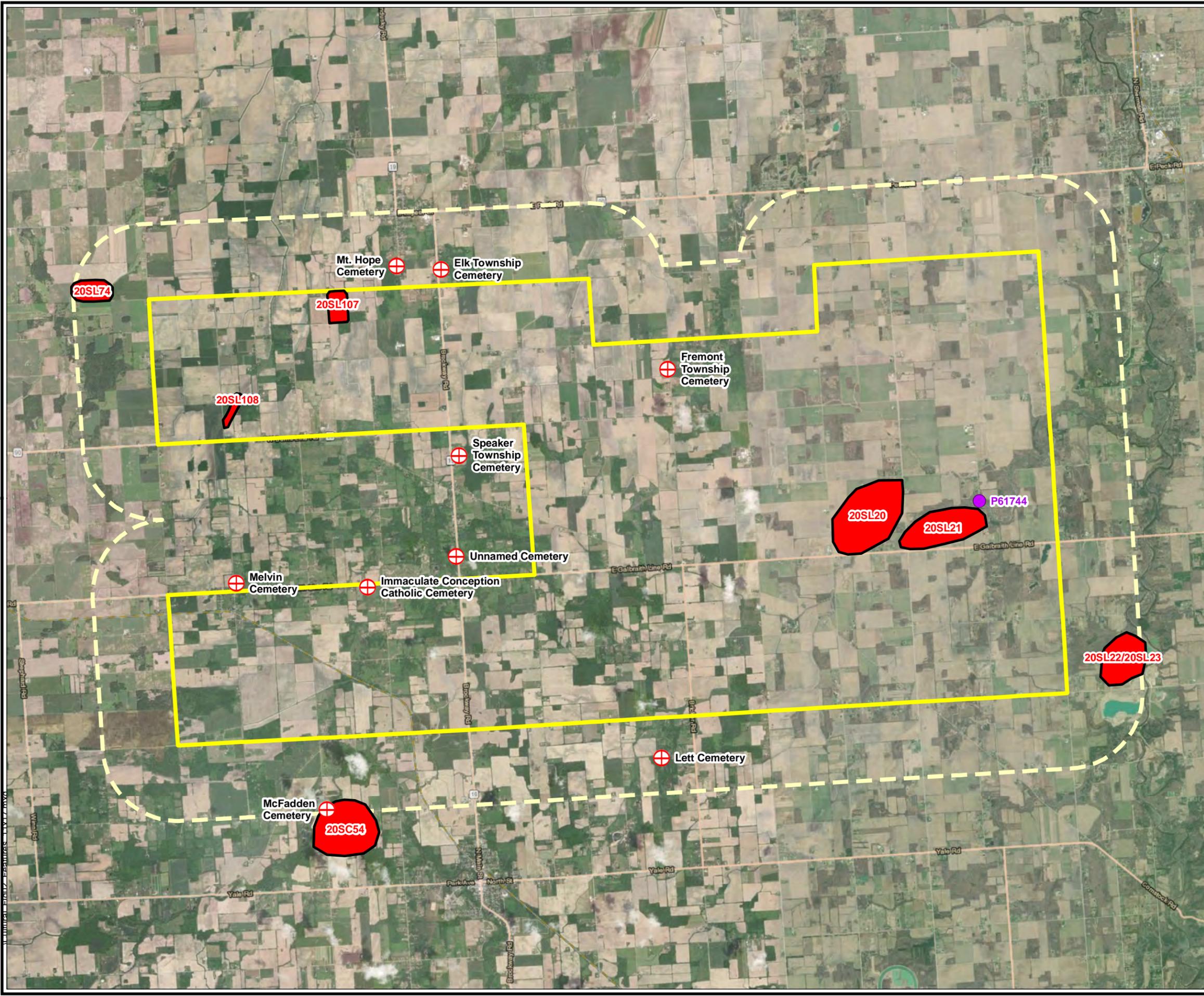
**ALGONQUIN POWER  
RIVERBEND  
SANILAC COUNTY, MICHIGAN**

TITLE:

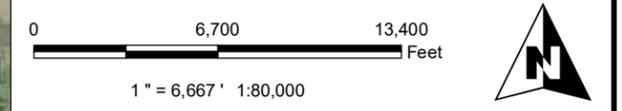
**SITE LOCATION MAP**



**FIGURE 10**



- PROJECT AREA
- STUDY AREA
- ⊕ CEMETERY
- HISTORIC SITE
- ARCHAEOLOGICAL SITE



<b>ALGONQUIN POWER RIVERBEND SANILAC COUNTY, MICHIGAN</b>	
<b>FIGURE 2 CULTURAL OVERVIEW MAP</b>	
	6737 W Washington St. Suite 2100 West Allis, WI 53214 Phone: 262.879.1212
AUGUST 2021	Cultural_Fig02_Features_11x17.mxd

Mr. Jeffrey Zirpoli  
TRC  
239 Main Street, Suite 301  
Dickson City, PA 18519

May 1, 2021

**Re: Rare Species Review #2889 – Riverbend Wind Energy Project, Sanilac County, Michigan.**

Mr. Zirpoli:

The location for the proposed project was checked against known localities for rare species and unique natural features, which are recorded in the Michigan Natural Features Inventory (MNFI) natural heritage database. This continuously updated database is a comprehensive source of existing data on Michigan's endangered, threatened, or otherwise significant plant and animal species, natural plant communities, and other natural features. Records in the database indicate that a qualified observer has documented the presence of special natural features. The absence of records in the database for a particular site may mean that the site has not been surveyed. The only way to obtain a definitive statement on the status of natural features is to have a competent biologist perform a complete field survey.

Under Act 451 of 1994, the Natural Resources and Environmental Protection Act, Part 365, Endangered Species Protection, "a person shall not take, possess, transport, ...fish, plants, and wildlife indigenous to the state and determined to be endangered or threatened," unless first receiving an Endangered Species Permit from the Michigan Department of Natural Resources (MDNR), Wildlife Division. Responsibility to protect endangered and threatened species is not limited to the lists below. Other species may be present that have not been recorded in the database.



**MSU EXTENSION**  
**Michigan Natural**  
**Features Inventory**

PO Box 13036  
Lansing MI 48901

(517) 284-6200  
Fax (517) 373-9566

mnfi.anr.msu.edu

SU is an affirmative-

Several at-risk species have been documented within 1 mile of the proposed activity **and it is possible that negative impacts will occur**. Keep in mind that MNFI cannot fully evaluate this project without visiting the project site. MNFI offers several levels of [Rare Species Reviews](#), including field surveys which I would be happy to discuss with you.

Sincerely,

*Michael A. Sanders*

Michael A. Sanders  
Environmental Review Specialist/Zoologist  
Michigan Natural Features Inventory

**Comments for Rare Species Review #2889:** It is important to note that it is the applicant’s responsibility to comply with both state and federal threatened and endangered species legislation. Therefore, if a state listed species occurs at a project site, and you think you need an endangered species permit please contact: Casey Reitz, Michigan DNR Wildlife Division, 517-284-6210, or [ReitzC@michigan.gov](mailto:ReitzC@michigan.gov). If a federally listed species is involved and, you think a permit is needed, please contact Carrie Tansy, Endangered Species Program, U.S. Fish and Wildlife Service, East Lansing office, 517-351-8375, or [Carrie\\_Tansy@fws.gov](mailto:Carrie_Tansy@fws.gov).

Please consult MNFI’s [Rare Species Explorer](#) for additional information on Michigan’s rare plants and animals.

**NOTE:** Michigan rivers and streams have been grouped according to existing information of mussel distribution and individual species conservation status. The **Black River** (to the east) has sections of Group 1 (state special concern occur or expected to occur), Group 2 (state threatened or state endangered occur or expected to occur), and Group 3 (federally threatened or federally endangered occur or expected to occur) Mussel Protocol Streams. Sections of **Mill Creek** (to the south) have stretches of Group 1 and Group 2. Depending on the group, specific survey protocols and relocation procedures apply. I encourage you to read the **Michigan Freshwater Mussel Survey Protocols and Relocation Procedures** publication if in-stream work and/or land clearing activities result in streambed disturbance and erosion and sedimentation into the river. A copy of the publication can be found at: <https://mnfi.anr.msu.edu/resources/michigan-mussels>

**NOTE:** Several rare freshwater mussels have been documented throughout the project area. Freshwater mussels (*Unionida*) require a fish host to complete their life cycle. Eggs are fertilized and develop into larvae within the gills of the female mussel. These larvae, called glochidia, are released into the water and must attach to a suitable fish host to survive and transform into the adult mussel.

**Table 1: Occurrences of threatened & endangered species within 1 mile of RSR #2889**

ELCAT	SNAME	SCOMNAME	USES	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS
Animal	<i>Rallus elegans</i>	King rail		E	G4	S2	1950	1950-07-18
Animal	<i>Epioblasma torulosa rangiana</i>	Northern riffleshell	LE	E	G1	S1	1900	2005-08
Animal	<i>Obovaria subrotunda</i>	Round hickorynut		E	G4	S1	1934	1934-07-18

**Comments for Table 1:**

**Northern riffleshell** - the federal and state endangered northern riffleshell (*Epioblasma torulosa rangiana*) mussel has been known to occur in the Black River, to the east of the project area (see project map). The northern riffleshell inhabits medium to large rivers in gravel riffles, where the water is highly oxygenated. This species was formerly widespread in the Midwest, but it has declined in range by more than 95% and now exists in only eight to ten isolated populations, most of which are small and peripheral.

*Conservation and Management:* members of the genus *Epioblasma* seem to be particularly sensitive to impacts from impoundment, which include population fragmentation and streamflow alteration. Other threats include habitat destruction (e.g. channelization, dredging, bulkheading), exotic species introductions, siltation, pollution, and modified streamflows due to wetland loss, dam operation, and intensive landscape modification. The other two subspecies of *E. torulosa*, *E. torulosa torulosa* and *E. torulosa gubernaculum*, appear to have already gone extinct due to modification and degradation of river systems.

**Table 2: Occurrences of special concern species & natural features within 1 mile of RSR #2889**

ELCAT	SNAME	SCOMNAME	USESA	SPROT	G_RANK	S_RANK	FIRSTOBS	LASTOBS
Animal	<i>Cambarus robustus</i>	Big water crayfish		SC	G5	S2?	2015-06-04	2015-06-04

**Comments for Table 2:**

**Big water crayfish** – the state special concern big water crayfish (*Cambarus robustus*) has been known to occur in Black Creek (see project map). Big water crayfish are most often found in medium to large, fast flowing rivers and streams with rocky substrates. They also can occasionally be found in lakes and ponds with rocky substrates. Big water crayfish are commonly found under large flat rocks, as they do not normally use burrows except to escape freezing temperatures or desiccation during hot weather. They can move over dry land short distances if required and tolerate a wide range of water temperature and pH.

*Management and Conservation:* Anthropogenic changes to river and lake ecosystems such as shoreline hardening, dredging, and point source discharges should be avoided when possible or minimized. Contamination from heavy metals and the introduction of non-native predatory fish can also negatively impact big water crayfish populations.

**NOTE:** special concern species and natural communities are not protected under endangered species legislation, but efforts should be taken to minimize any or all impacts.

**Codes to accompany Occurrence Tables:**

**State Protection Status Code Definitions (SPROT)**

- E: Endangered
- T: Threatened
- SC: Special concern

**Federal Protection Status Code Definitions (USESA)**

- LE = listed endangered
- LT = listed threatened

LELT = partly listed endangered and partly listed threatened

PDL = proposed delist

E(S/A) = endangered based on similarities/appearance

PS = partial status (federally listed in only part of its range)

C = species being considered for federal status

### **Global Heritage Status Rank Definitions (GRANK)**

The priority assigned by [NatureServe](#)'s national office for data collection and protection based upon the element's status throughout its entire world-wide range. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

G1 = critically imperiled globally because of extreme rarity (5 or fewer occurrences range-wide or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extinction.

G2 = imperiled globally because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extinction throughout its range.

G3: Either very rare and local throughout its range or found locally (even abundantly at some of its locations) in a restricted range (e.g. a single western state, a physiographic region in the East) or because of other factor(s) making it vulnerable to extinction throughout its range; in terms of occurrences, in the range of 21 to 100.

G4: Apparently secure globally, though it may be quite rare in parts of its range, especially at the periphery.

G5: Demonstrably secure globally, though it may be quite rare in parts of its range, especially at the periphery.

Q: Taxonomy uncertain

### **State Heritage Status Rank Definitions (SRANK)**

The priority assigned by the Michigan Natural Features Inventory for data collection and protection based upon the element's status within the state. Criteria not based only on number of occurrences; other critical factors also apply. Note that ranks are frequently combined.

S1: Critically imperiled in the state because of extreme rarity (5 or fewer occurrences or very few remaining individuals or acres) or because of some factor(s) making it especially vulnerable to extirpation in the state.

S2: Imperiled in state because of rarity (6 to 20 occurrences or few remaining individuals or acres) or because of some factor(s) making it very vulnerable to extirpation from the state.

S3: Rare or uncommon in state (on the order of 21 to 100 occurrences).

S4 = apparently secure in state, with many occurrences.

S5 = demonstrably secure in state and essentially ineradicable under present conditions.

SX = apparently extirpated from state.

# IPaC resource list

This resource (collected

IPaC is not working correctly in the state of Wisconsin. We are working on the issue and hope to have it resolved soon. ✕

habitat

jurisdiction that are known or expected to be on or near the project area referenced below. The list may also include trust resources that occur outside of the project area, but that could potentially be directly or indirectly affected by activities in the project area. However, determining the likelihood and extent of effects a project may have on trust resources typically requires gathering additional site-specific (e.g., vegetation/species surveys) and project-specific (e.g., magnitude and timing of proposed activities) information.

Below is a summary of the project information you provided and contact information for the USFWS office(s) with jurisdiction in the defined project area. Please read the introduction to each section that follows (Endangered Species, Migratory Birds, USFWS Facilities, and NWI Wetlands) for additional information applicable to the trust resources addressed in that section.

## Location

Sanilac and St. Clair counties, Michigan



## Local office

Michigan Ecological Services Field Office

☎ (517) 351-2555

📠 (517) 351-1443

2651 Coolidge Road Suite 101  
East Lansing, MI 48823-6360

<http://www.fws.gov/midwest/EastLansing/>

# Endangered species

**This resource list is for informational purposes only and does not constitute an analysis of project level impacts.**

The primary information used to generate this list is the known or expected range of each species. Additional areas of influence (AOI) for species are also considered. An AOI includes areas outside of the species range if the species could be indirectly affected by activities in that area (e.g., placing a dam upstream of a fish population even if that fish does not occur at the dam site, may indirectly impact the species by reducing or eliminating water flow downstream). Because species can move, and site conditions can change, the species on this list are not guaranteed to be found on or near the project area. To fully determine any potential effects to species, additional site-specific and project-specific information is often required.

Section 7 of the Endangered Species Act **requires** Federal agencies to "request of the Secretary information whether any species which is listed or proposed to be listed may be present in the area of such proposed action" for any project that is conducted, permitted, funded, or licensed by any Federal agency. A letter from the local office and a species list which fulfills this requirement can **only** be obtained by requesting an official species list from either the Regulatory Review section in IPaC (see directions below) or from the local field office directly.

For project evaluations that require USFWS concurrence/review, please return to the IPaC website and request an official species list by doing the following:

1. Draw the project location and click CONTINUE.
2. Click DEFINE PROJECT.
3. Log in (if directed to do so).
4. Provide a name and description for your project.
5. Click REQUEST SPECIES LIST.

Listed species<sup>1</sup> and their critical habitats are managed by the [Ecological Services Program](#) of the U.S. Fish and Wildlife Service (USFWS) and the fisheries division of the National Oceanic and Atmospheric Administration (NOAA Fisheries<sup>2</sup>).

Species and critical habitats under the sole responsibility of NOAA Fisheries are **not** shown on this list. Please contact [NOAA Fisheries](#) for [species under their jurisdiction](#).

1. Species listed under the [Endangered Species Act](#) are threatened or endangered; IPaC also shows species that are candidates, or proposed, for listing. See the [listing status page](#) for more information. IPaC only shows species that are regulated by USFWS (see FAQ).
2. [NOAA Fisheries](#), also known as the National Marine Fisheries Service (NMFS), is an office of the National Oceanic and Atmospheric Administration within the Department of Commerce.

The following species are potentially affected by activities in this location:

## Mammals

NAME

STATUS

**Indiana Bat** *Myotis sodalis* Endangered  
 Wherever found  
 There is **final** critical habitat for this species. The location of the critical habitat is not available.  
<https://ecos.fws.gov/ecp/species/5949>

**Northern Long-eared Bat** *Myotis septentrionalis* Threatened  
 Wherever found  
 No critical habitat has been designated for this species.  
<https://ecos.fws.gov/ecp/species/9045>

## Birds

NAME	STATUS
<b>Piping Plover</b> <i>Charadrius melodus</i> There is <b>final</b> critical habitat for this species. The location of the critical habitat is not available. <a href="https://ecos.fws.gov/ecp/species/6039">https://ecos.fws.gov/ecp/species/6039</a>	Endangered

<b>Red Knot</b> <i>Calidris canutus rufa</i> Wherever found This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> <li>• Only actions that occur along coastal areas during the Red Knot migratory window of MAY 1 - SEPTEMBER 30.</li> </ul> There is <b>proposed</b> critical habitat for this species. The location of the critical habitat is not available. <a href="https://ecos.fws.gov/ecp/species/1864">https://ecos.fws.gov/ecp/species/1864</a>	Threatened
--	------------

## Reptiles

NAME	STATUS
<b>Eastern Massasauga (=rattlesnake)</b> <i>Sistrurus catenatus</i> Wherever found This species only needs to be considered if the following condition applies: <ul style="list-style-type: none"> <li>• For all Projects: Project is within EMR Range</li> </ul> No critical habitat has been designated for this species. <a href="https://ecos.fws.gov/ecp/species/2202">https://ecos.fws.gov/ecp/species/2202</a>	Threatened

## Clams

NAME	STATUS
------	--------

**Northern Riffleshell** *Epioblasma torulosa rangiana* **Endangered**

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/527>

**Rayed Bean** *Villosa fabalis* **Endangered**

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/5862>

**Snuffbox Mussel** *Epioblasma triquetra* **Endangered**

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/4135>

## Flowering Plants

NAME

STATUS

**Eastern Prairie Fringed Orchid** *Platanthera leucophaea* **Threatened**

Wherever found

No critical habitat has been designated for this species.

<https://ecos.fws.gov/ecp/species/601>

## Critical habitats

Potential effects to critical habitat(s) in this location must be analyzed along with the endangered species themselves.

THERE ARE NO CRITICAL HABITATS AT THIS LOCATION.

## Migratory birds

Certain birds are protected under the Migratory Bird Treaty Act<sup>1</sup> and the Bald and Golden Eagle Protection Act<sup>2</sup>.

Any person or organization who plans or conducts activities that may result in impacts to migratory birds, eagles, and their habitats should follow appropriate regulations and consider implementing appropriate conservation measures, as described [below](#).

1. The [Migratory Birds Treaty Act](#) of 1918.
2. The [Bald and Golden Eagle Protection Act](#) of 1940.

Additional information can be found using the following links:

- Birds of Conservation Concern <http://www.fws.gov/birds/management/managed-species/birds-of-conservation-concern.php>
- Measures for avoiding and minimizing impacts to birds <http://www.fws.gov/birds/management/project-assessment-tools-and-guidance/conservation-measures.php>
- Nationwide conservation measures for birds <http://www.fws.gov/migratorybirds/pdf/management/nationwidestandardconservationmeasures.pdf>

The birds listed below are birds of particular concern either because they occur on the [USFWS Birds of Conservation Concern](#) (BCC) list or warrant special attention in your project location. To learn more about the levels of concern for birds on your list and how this list is generated, see the FAQ [below](#). This is not a list of every bird you may find in this location, nor a guarantee that every bird on this list will be found in your project area. To see exact locations of where birders and the general public have sighted birds in and around your project area, visit the [E-bird data mapping tool](#) (Tip: enter your location, desired date range and a species on your list). For projects that occur off the Atlantic Coast, additional maps and models detailing the relative occurrence and abundance of bird species on your list are available. Links to additional information about Atlantic Coast birds, and other important information about your migratory bird list, including how to properly interpret and use your migratory bird report, can be found [below](#).

For guidance on when to schedule activities or implement avoidance and minimization measures to reduce impacts to migratory birds on your list, click on the PROBABILITY OF PRESENCE SUMMARY at the top of your list to see when these birds are most likely to be present and breeding in your project area.

NAME

BREEDING SEASON (IF A BREEDING SEASON IS INDICATED FOR A BIRD ON YOUR LIST, THE BIRD MAY BREED IN YOUR PROJECT AREA SOMETIME WITHIN THE TIMEFRAME SPECIFIED, WHICH IS A VERY LIBERAL ESTIMATE OF THE DATES INSIDE WHICH THE BIRD BREEDS ACROSS ITS ENTIRE RANGE. "BREEDS ELSEWHERE" INDICATES THAT THE BIRD DOES NOT LIKELY BREED IN YOUR PROJECT AREA.)

Bald Eagle *Haliaeetus leucocephalus*

Breeds Dec 1 to Aug 31

This is not a Bird of Conservation Concern (BCC) in this area, but warrants attention because of the Eagle Act or for potential susceptibilities in offshore areas from certain types of development or activities.

<https://ecos.fws.gov/ecp/species/1626>

<p><b>Black-billed Cuckoo</b> <i>Coccyzus erythrophthalmus</i></p> <p>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p> <p><a href="https://ecos.fws.gov/ecp/species/9399">https://ecos.fws.gov/ecp/species/9399</a></p>	Breeds May 15 to Oct 10
<p><b>Bobolink</b> <i>Dolichonyx oryzivorus</i></p> <p>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p>	Breeds May 20 to Jul 31
<p><b>Rusty Blackbird</b> <i>Euphagus carolinus</i></p> <p>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p>	Breeds elsewhere
<p><b>Willow Flycatcher</b> <i>Empidonax traillii</i></p> <p>This is a Bird of Conservation Concern (BCC) only in particular Bird Conservation Regions (BCRs) in the continental USA</p> <p><a href="https://ecos.fws.gov/ecp/species/3482">https://ecos.fws.gov/ecp/species/3482</a></p>	Breeds May 20 to Aug 31
<p><b>Wood Thrush</b> <i>Hylocichla mustelina</i></p> <p>This is a Bird of Conservation Concern (BCC) throughout its range in the continental USA and Alaska.</p>	Breeds May 10 to Aug 31

## Probability of Presence Summary

The graphs below provide our best understanding of when birds of concern are most likely to be present in your project area. This information can be used to tailor and schedule your project activities to avoid or minimize impacts to birds. Please make sure you read and understand the FAQ "Proper Interpretation and Use of Your Migratory Bird Report" before using or attempting to interpret this report.

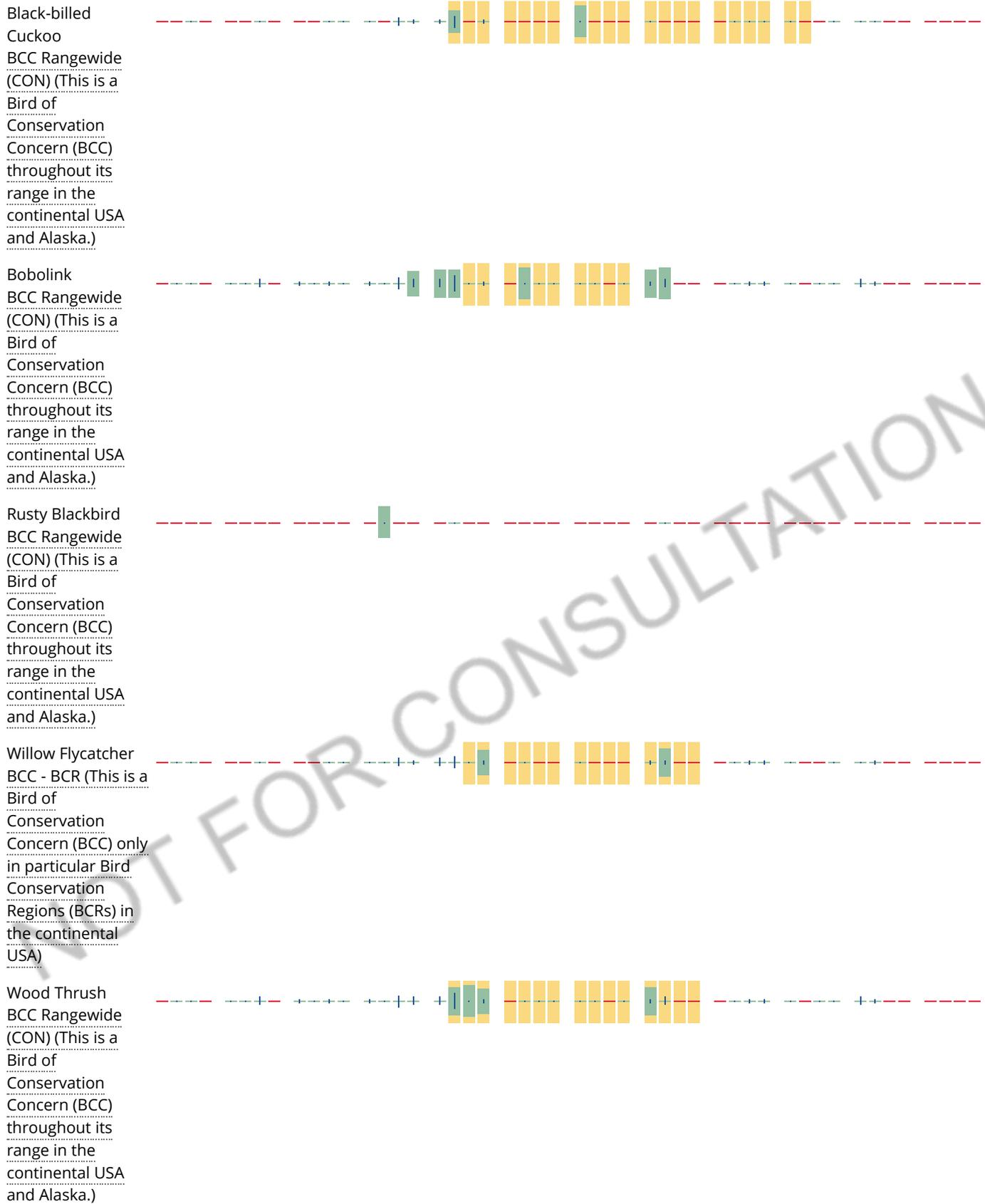
### Probability of Presence (■)

Each green bar represents the bird's relative probability of presence in the 10km grid cell(s) your project overlaps during a particular week of the year. (A year is represented as 12 4-week months.) A taller bar indicates a higher probability of species presence. The survey effort (see below) can be used to establish a level of confidence in the presence score. One can have higher confidence in the presence score if the corresponding survey effort is also high.

How is the probability of presence score calculated? The calculation is done in three steps:

1. The probability of presence for each week is calculated as the number of survey events in the week where the species was detected divided by the total number of survey events for that week. For example, if in week 12 there were 20 survey events and the Spotted Towhee was found in 5 of them, the probability of presence of the Spotted Towhee in week 12 is 0.25.
2. To properly present the pattern of presence across the year, the relative probability of presence is calculated. This is the probability of presence divided by the maximum probability of presence across all weeks. For example, imagine the probability of presence in week 20 for the Spotted Towhee is 0.05, and that the probability of presence at week 12 (0.25) is the maximum of any





**Tell me more about conservation measures I can implement to avoid or minimize impacts to migratory birds.**

[Nationwide Conservation Measures](#) describes measures that can help avoid and minimize impacts to all birds at any location year round. Implementation of these measures is particularly important when birds are most likely to occur in the project area. When birds may be breeding in the area, identifying the locations of any active nests and avoiding their destruction is a very helpful impact minimization measure. To see when birds are most likely to

occur and be breeding in your project area, view the Probability of Presence Summary. [Additional measures](#) or [permits](#) may be advisable depending on the type of activity you are conducting and the type of infrastructure or bird species present on your project site.

### What does IPaC use to generate the migratory birds potentially occurring in my specified location?

The Migratory Bird Resource List is comprised of USFWS [Birds of Conservation Concern \(BCC\)](#) and other species that may warrant special attention in your project location.

The migratory bird list generated for your project is derived from data provided by the [Avian Knowledge Network \(AKN\)](#). The AKN data is based on a growing collection of [survey, banding, and citizen science datasets](#) and is queried and filtered to return a list of those birds reported as occurring in the 10km grid cell(s) which your project intersects, and that have been identified as warranting special attention because they are a BCC species in that area, an eagle ([Eagle Act](#) requirements may apply), or a species that has a particular vulnerability to offshore activities or development.

Again, the Migratory Bird Resource list includes only a subset of birds that may occur in your project area. It is not representative of all birds that may occur in your project area. To get a list of all birds potentially present in your project area, please visit the [AKN Phenology Tool](#).

### What does IPaC use to generate the probability of presence graphs for the migratory birds potentially occurring in my specified location?

The probability of presence graphs associated with your migratory bird list are based on data provided by the [Avian Knowledge Network \(AKN\)](#). This data is derived from a growing collection of [survey, banding, and citizen science datasets](#).

Probability of presence data is continuously being updated as new and better information becomes available. To learn more about how the probability of presence graphs are produced and how to interpret them, go the Probability of Presence Summary and then click on the "Tell me about these graphs" link.

### How do I know if a bird is breeding, wintering, migrating or present year-round in my project area?

To see what part of a particular bird's range your project area falls within (i.e. breeding, wintering, migrating or year-round), you may refer to the following resources: [The Cornell Lab of Ornithology All About Birds Bird Guide](#), or (if you are unsuccessful in locating the bird of interest there), the [Cornell Lab of Ornithology Neotropical Birds guide](#). If a bird on your migratory bird species list has a breeding season associated with it, if that bird does occur in your project area, there may be nests present at some point within the timeframe specified. If "Breeds elsewhere" is indicated, then the bird likely does not breed in your project area.

### What are the levels of concern for migratory birds?

Migratory birds delivered through IPaC fall into the following distinct categories of concern:

1. "BCC Rangewide" birds are [Birds of Conservation Concern](#) (BCC) that are of concern throughout their range anywhere within the USA (including Hawaii, the Pacific Islands, Puerto Rico, and the Virgin Islands);
2. "BCC - BCR" birds are BCCs that are of concern only in particular Bird Conservation Regions (BCRs) in the continental USA; and
3. "Non-BCC - Vulnerable" birds are not BCC species in your project area, but appear on your list either because of the [Eagle Act](#) requirements (for eagles) or (for non-eagles) potential susceptibilities in offshore areas from certain types of development or activities (e.g. offshore energy development or longline fishing).

Although it is important to try to avoid and minimize impacts to all birds, efforts should be made, in particular, to avoid and minimize impacts to the birds on this list, especially eagles and BCC species of rangewide concern. For more information on conservation measures you can implement to help avoid and minimize migratory bird impacts and requirements for eagles, please see the FAQs for these topics.

## Details about birds that are potentially affected by offshore projects

For additional details about the relative occurrence and abundance of both individual bird species and groups of bird species within your project area off the Atlantic Coast, please visit the [Northeast Ocean Data Portal](#). The Portal also offers data and information about other taxa besides birds that may be helpful to you in your project review. Alternately, you may download the bird model results files underlying the portal maps through the [NOAA NCCOS Integrative Statistical Modeling and Predictive Mapping of Marine Bird Distributions and Abundance on the Atlantic Outer Continental Shelf](#) project webpage.

Bird tracking data can also provide additional details about occurrence and habitat use throughout the year, including migration. Models relying on survey data may not include this information. For additional information on marine bird tracking data, see the [Diving Bird Study](#) and the [nanotag studies](#) or contact [Caleb Spiegel](#) or [Pam Loring](#).

## What if I have eagles on my list?

If your project has the potential to disturb or kill eagles, you may need to [obtain a permit](#) to avoid violating the Eagle Act should such impacts occur.

## Proper Interpretation and Use of Your Migratory Bird Report

The migratory bird list generated is not a list of all birds in your project area, only a subset of birds of priority concern. To learn more about how your list is generated, and see options for identifying what other birds may be in your project area, please see the FAQ "What does IPaC use to generate the migratory birds potentially occurring in my specified location". Please be aware this report provides the "probability of presence" of birds within the 10 km grid cell(s) that overlap your project; not your exact project footprint. On the graphs provided, please also look carefully at the survey effort (indicated by the black vertical bar) and for the existence of the "no data" indicator (a red horizontal bar). A high survey effort is the key component. If the survey effort is high, then the probability of presence score can be viewed as more dependable. In contrast, a low survey effort bar or no data bar means a lack of data and, therefore, a lack of certainty about presence of the species. This list is not perfect; it is simply a starting point for identifying what birds of concern have the potential to be in your project area, when they might be there, and if they might be breeding (which means nests might be present). The list helps you know what to look for to confirm presence, and helps guide you in knowing when to implement conservation measures to avoid or minimize potential impacts from your project activities, should presence be confirmed. To learn more about conservation measures, visit the FAQ "Tell me about conservation measures I can implement to avoid or minimize impacts to migratory birds" at the bottom of your migratory bird trust resources page.

# Facilities

## Wildlife refuges and fish hatcheries

REFUGE AND FISH HATCHERY INFORMATION IS NOT AVAILABLE AT THIS TIME

# Wetlands in the National Wetlands Inventory

Impacts to [NWI wetlands](#) and other aquatic habitats may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal statutes.

For more information please contact the Regulatory Program of the local [U.S. Army Corps of Engineers District](#).

WETLAND INFORMATION IS NOT AVAILABLE AT THIS TIME

This can happen when the National Wetlands Inventory (NWI) map service is unavailable, or for very large projects that intersect many wetland areas. Try again, or visit the [NWI map](#) to view wetlands at this location.

#### Data limitations

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

#### Data exclusions

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tubercid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

#### Data precautions

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

**APPENDIX I**  
**YEAR ONE AVIAN USE REPORT**

**CONFIDENTIAL: DO NOT DISTRIBUTE**

# **Large and Small Bird Use Report 2021–2022**

## **Riverbend Wind Energy Facility Sanilac County, Michigan**

**Confidential Business Information**

PREPARED FOR:

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**April 2022**



## Table of Contents

1.0	Introduction .....	1
2.0	Background .....	3
2.1	General Site Description .....	3
2.2	Birds .....	7
3.0	Methods .....	9
3.1	Survey Point Locations, Timing, and Frequency .....	9
3.2	Data Collection .....	12
3.3	Data Analysis.....	13
4.0	Results .....	15
4.1	Survey Summary .....	15
4.2	Large Bird Use Surveys .....	15
4.3	Small Bird Use Surveys .....	22
4.4	Observations of Sensitive Species.....	28
4.5	Eagle Use .....	29
5.0	Summary.....	36
5.1	Large Bird Use Surveys .....	36
5.2	Small Bird Use Surveys .....	36
5.3	Observations of Sensitive Species.....	36
5.4	Eagle Use .....	36
6.0	References.....	37

## List of Tables

Table 1. National Land Cover Database land cover types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....	5
Table 2. National Wetlands Inventory wetland types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....	6
Table 3. National Hydrology Dataset watercourse types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....	7
Table 4. Bird species of concern and their seasons of potential occurrence in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. .	8
Table 5. Summary of the surveys completed for each visit during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....	15



Table 6. Summary of the listed, protected, and non-listed sensitive species observed during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....29

Table 7. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by month, season, and overall, during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. 30

Table 8. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....31

### List of Figures

Figure 1. Project Area for the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022..... 2

Figure 2. Land cover types, wetlands, and watercourses within the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. .... 4

Figure 3. Survey points, 2,625-ft (800-m) radius large bird plots, and 328-ft (100-m) radius small bird plots for the large and small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. ....11

Figure 4. Histograms of large bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species and for each of the five species with highest overall use during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022..... 18

Figure 5. Large bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by dashed line) by point during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....20

Figure 6. Map of large bird use (observations/plot/survey) and species diversity recorded at each point during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. ....21

Figure 7. Histograms of small bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species combined, for each of the five species with highest overall use, and for one species with the second-highest winter use during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....24

Figure 8. Small bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by vertical dashed line) by point during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....26

Figure 9. Map of small bird use (observations/plot/survey) and species diversity recorded at each point during the small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. ....27

Figure 10. Bald eagle use minutes per survey hour by season during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....32



Figure 11. Map of bald eagle use minutes documented during the large bird use surveys in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.....33

Figure 12. Map of bald eagle flight paths documented during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.....35

### List of Attachments

Attachment A. Weather data from each survey during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

Attachment B. Data tables of large birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

Attachment C. Data tables of small birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

### List of Contributors

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## 1.0 Introduction

This report summarizes the large and small bird use study (Study) conducted by TRC Environmental Corporation (TRC) at the proposed Riverbend Wind Energy Facility (Project) between March 2021 and February 2022. The Project was located on 37,194 acres (ac; 15,052 hectares [ha]) in Sanilac County, Michigan, approximately 12 miles (mi; 20 kilometers [km]) south of the city of Sandusky (Figure 1).

This pre-construction Study at the Project was conducted in compliance with the US Fish and Wildlife Service's (USFWS) Land-based Wind Energy Guidelines (WEG; USFWS 2012), the Eagle Conservation Plan Guidance Module 1—Land-based Wind Energy Version 2 (ECPG; USFWS 2013), and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016).

The Study included all bird species, but separate surveys were conducted for large and small birds. The species considered to be large birds included all raptors and any non-passerines of at least 10 inches (in; 25 centimeters [cm]) in length; the species considered to be small birds included all passerines and any non-passerines, excluding raptors, of less than 10 in (25 cm) in length (Sibley 2000). The size definitions for this Study were developed to be exhaustive yet simple and considered species behavior and ecology as well as size in order to assign bird species to a suitable category.

The objectives of the Study included: (1) developing a complete list of bird species observed in the Project area, including those observed incidentally, (2) assessing temporal and spatial use of large and small birds in the Project area, and (3) documenting use of the Project area by threatened, endangered, and other sensitive bird species. Sensitive bird species considered in this study include both federal and state listed species, eagles protected by the Bald and Golden Eagle Protection Act (BGEPA), non-listed state species of concern identified in the Michigan Natural Features Inventory (MNFI) online list (MNFI 2021), and non-listed federal species of concern identified in a Project-specific Information for Planning and Consultation (IPaC) report (USFWS 2021).

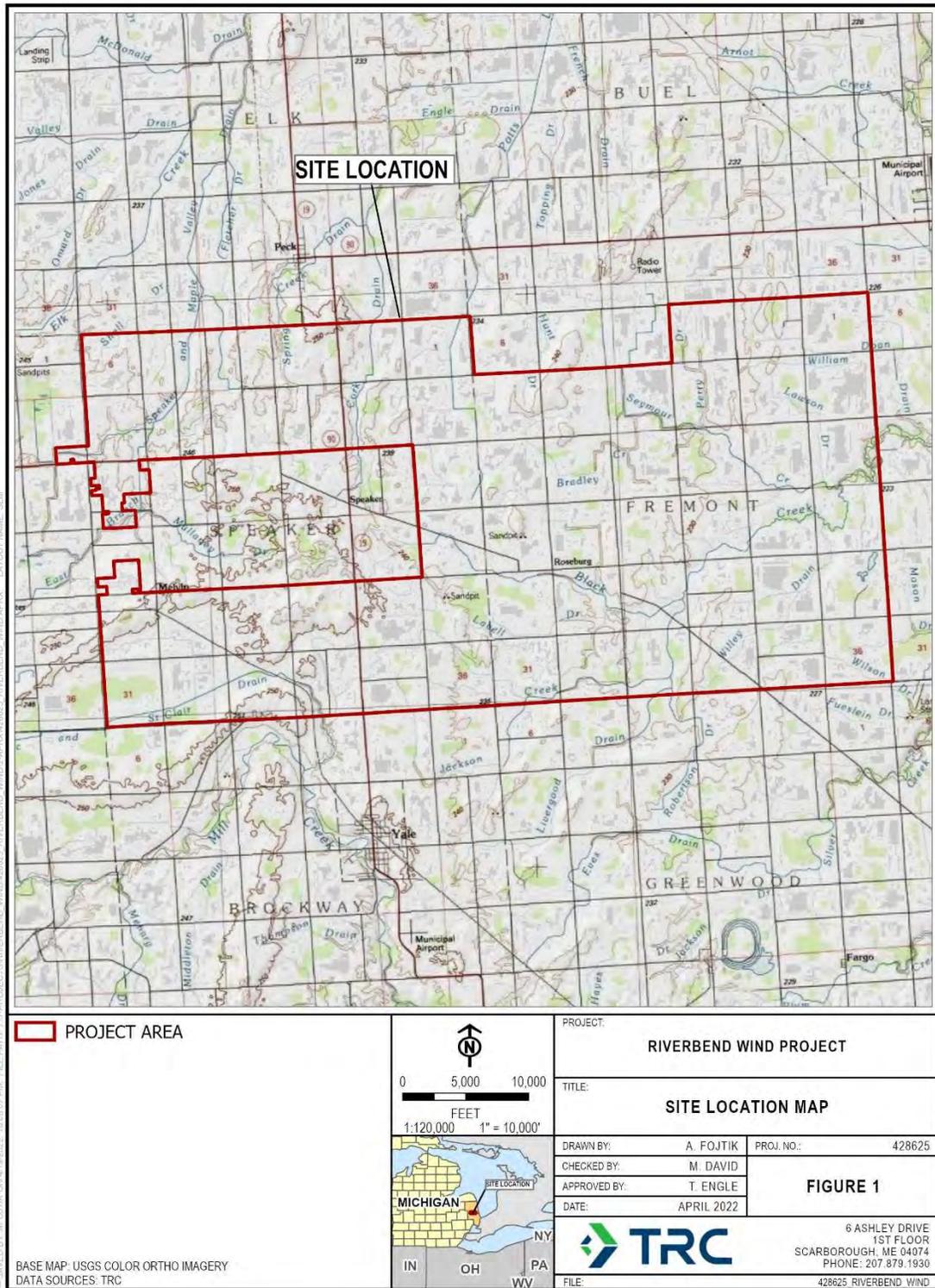


Figure 1. Project Area for the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.



## 2.0 Background

### 2.1 General Site Description

The Project lies within the Saginaw Lake Plain Level IV Ecoregion, which is characterized by clayey lake deposits, beach ridges, and dunes of low relief (USEPA 2021). Historically, the native habitat was mostly forested, with extensive coastal marches and wet prairies along Saginaw Bay in Lake Huron. Today, the majority of the land is used to cultivate crops, dairy, and livestock; natural habitats remaining in the area include swamp forest, wet prairie, and marsh (Albert 1995). Elevation within the Project area ranges from approximately 755 feet (ft; 230 meters [m]) to 820 ft (250 m) above mean sea level.

The National Land Cover Database (NLCD; Homer et al. 2020) characterized the Project area as 76% cultivated crops; 8% woody wetlands; 8% deciduous forest; 3% developed, open space; 3% pasture/hay; 2% developed, low intensity; and less than 1% each of mixed forest; evergreen forest; emergent herbaceous wetlands; grassland/herbaceous; open water; shrub/scrub; developed, medium intensity; barren land; and developed, high intensity (Figure 2; Table 1).

According to the USFWS National Wetlands Inventory, wetland features covered 1,942 ac (786 ha) of the Project area (USFWS 2014). These features included freshwater emergent wetlands (47 ac; 19 ha), freshwater forested/shrub wetlands (1,871 ac; 757 ha), and freshwater ponds (24 ac; 10 ha; Figure 2, Table 2).

The U.S. Geological Survey (USGS) National Hydrology Dataset (NHD) identified 130.8 mi (210.6 km) of watercourses within the Project area (USGS 2020; Figure 2; Table 3). The watercourses included 93.6 mi (150.6 km) of canal/ditches, 37.2 mi (59.9 km) of stream/rivers, and less than 0.1 mi (0.1 km) of artificial paths (Table 3). There were 23 named streams distributed throughout the Project area; the most significant of these are Black Creek on the eastern edge of the Project and Sanilac and Saint Clair Drain in the southwest corner of the Project (Figure 2).

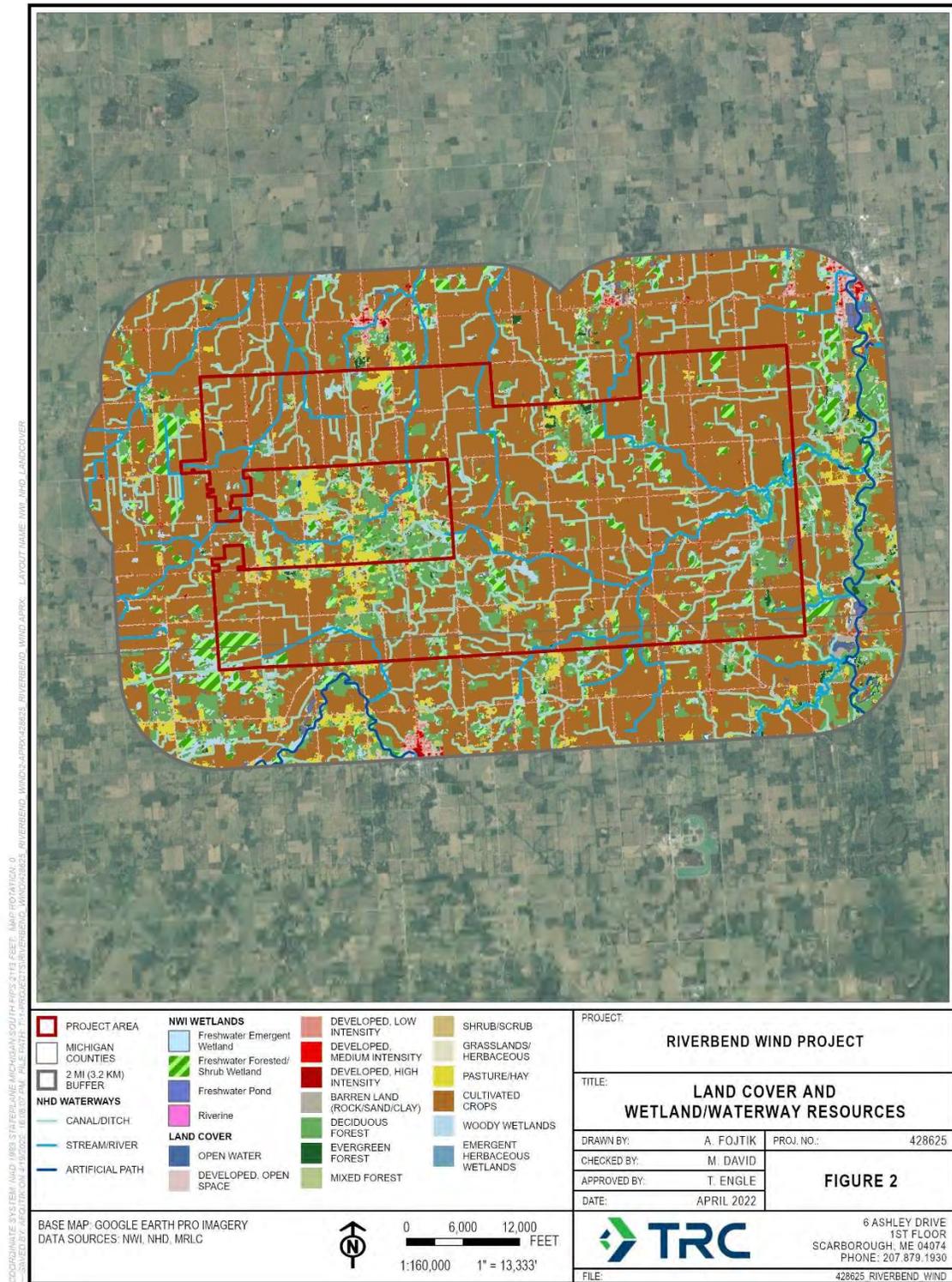


Figure 2. Land cover types, wetlands, and watercourses within the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.



**Table 1. National Land Cover Database land cover types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Land Cover Type <sup>1</sup>	Acres	Hectares	% Composition	Definition <sup>2</sup>
Cultivated Crops	28,103	11373	76%	Areas used for the production of annual crops (>20% of total vegetation) such as corn, soybeans, vegetables, tobacco, and cotton, as well as perennial woody crops (e.g., orchards and vineyards). This class also includes all land being actively tilled.
Woody Wetlands	2,899	1,173	8%	Areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
Deciduous Forest	2,829	1,145	8%	Dominated by trees generally greater than 16 ft (5 m) tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal changes.
Developed, Open Space	1,180	478	3%	Mixture of constructed materials, mostly vegetation in the form of lawn grasses. Impervious surfaces less than 20% of the total cover. Includes large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
Pasture/Hay	1,034	418	3%	Grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of the total vegetation.
Developed, Low Intensity	704	285	2%	A mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% of the total cover. These areas most commonly include single-family housing units.
Mixed Forest	192	78	< 1%	Dominated by trees generally greater than 16 ft (5 m) tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of the total tree cover.
Evergreen Forest	102	41	< 1%	Dominated by trees generally greater than 16 ft (5 m) tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
Emergent Herbaceous Wetlands	77	31	< 1%	Perennial herbaceous vegetation accounts for greater than 80% of vegetative cover, and the soil or substrate is periodically saturated with or covered with water.
Grassland/Herbaceous	27	11	< 1%	Dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management, such as tilling, but can be utilized for grazing.



**Table 1. National Land Cover Database land cover types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Land Cover Type <sup>1</sup>	Acres	Hectares	% Composition	Definition <sup>2</sup>
Open Water	20	8	< 1%	Open water, generally with less than 25% vegetation cover or soil.
Shrub/Scrub	14	5	< 1%	Dominated by shrubs less than 16 ft (5 m) tall, typically greater than 20% of the total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
Developed, Medium Intensity	12	5	< 1%	A mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
Barren Land	1	<1	< 1%	Bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of the total cover.
Developed, High Intensity	< 1	< 1	< 1%	Highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.
<b>Total:</b>	<b>37,194</b>	<b>15,052</b>	<b>100%</b>	

<sup>1</sup>Land cover data were obtained from the 2016 NLCD (Homer et al. 2020)

<sup>2</sup>Multi-Resolution Land Characteristic Consortium 2016

**Table 2. National Wetlands Inventory wetland types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Wetland Type <sup>1</sup>	Project Area Wetland Features		
	# of Features	Acres	Hectares
Freshwater Emergent Wetland	38	47	19
Freshwater Forested/Shrub Wetland	226	1,871	757
Freshwater Pond	21	24	10
<b>Total:</b>	<b>285</b>	<b>1,942</b>	<b>786</b>

<sup>1</sup>USFWS 2014

**Table 3. National Hydrology Dataset watercourse types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Watercourse Type <sup>1</sup>	Project Area Watercourse Features		
	# of Features	Miles	Kilometers
Canal/Ditch	119	93.6	150.6
Stream/River	54	37.2	59.9
Artificial Path	1	< 0.1	0.1
<b>Total:</b>	<b>174</b>	<b>130.8</b>	<b>210.6</b>

<sup>1</sup>National Hydrography Dataset; NHD Feature Catalog (USGS 2020)

## 2.2 Birds

The official bird list for Michigan currently contains 448 extant species, two extant species groups (pertaining to individuals identified only at a higher taxonomic level), and four extinct or extirpated species (Michigan Bird Records Committee [MBRC] 2022). The extant species and species groups represent 21 orders and 60 families. Out of the 450 extant species and species groups on the MBRC list, 193 fall under this Study’s definition of large bird species, representing 19 orders and 32 families, and 257 fall under this Study’s definition of small bird species, representing seven orders and 36 families (MBRC 2022).

The IPaC report (USFWS 2021), BGEPA, and MNFI (MNFI 2021) were used to assemble a list of listed and non-listed sensitive bird species that may be encountered during the Study.

The IPaC report identified two federal listed bird species that have a known or expected range which includes the Project area: piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*; USFWS 2021).

The IPaC also identified six non-listed federal species of concern (USFWS 2021). The MNFI, which identifies federal and state listed bird species and non-listed state species of concern in Michigan, included 46 species. The BGEPA federally protects bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), both of which may occur in the region (Table 4). Some bird species were returned from more than one of these sources.

Together, these sources designated 53 bird species of concern (USFWS 2021, MNFI 2021). Twenty-five of these species were classified as large for this Study and 28 were classified as small. The seasonal potential for occurrence within the Project area was determined for these 53 species by referencing county-level bar charts from eBird (eBird 2021). Seasons were defined as: spring (March–May), summer (June–August), fall (September–November), and winter (December–February).

Based on desktop evaluation, 39 species of concern, including one federal and 16 state listed species, were determined to have potential to occur in the Project area during at least one season (Table 4).

**Table 4. Bird species of concern and their seasons of potential occurrence in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Common Name	Scientific Name	Listing Status <sup>1</sup>	Seasons of Potential Occurrence in Project Area			
			Spring	Summer	Fall	Winter
<b>Anatidae (Ducks, Geese, &amp; Swans)</b>						
Trumpeter Swan	Cygnus buccinator	ST			X	X
<b>Cuculidae (Cuckoos)</b>						
Black-billed Cuckoo	Coccyzus erythrophthalmus	FSC	X	X	X	
<b>Caprimulgidae (Nightjars)</b>						
Common Nighthawk	Chordeiles minor	SSC	X	X	X	
Eastern Whip-poor-will	Antrostomus vociferus	SSC	X	X		
<b>Rallidae (Rails &amp; Allies)</b>						
Common Gallinule	Gallinula galeata	ST	X	X		
<b>Charadriidae (Plovers)</b>						
Piping Plover	Charadrius melodus	FE, SE	X	X		
<b>Scolopacidae (Sandpipers &amp; Allies)</b>						
Wilson's Phalarope	Phalaropus tricolor	SSC		X		
<b>Laridae (Gulls &amp; Allies)</b>						
Caspian Tern	Hydroprogne caspia	ST	X	X		
Black Tern	Chlidonias niger	SSC		X		
Common Tern	Sterna hirundo	ST	X	X	X	
Forster's Tern	Sterna forsteri	ST	X	X	X	
<b>Gaviidae (Loons)</b>						
Common Loon	Gavia immer	ST	X	X	X	X
<b>Ardeidae (Herons &amp; Allies)</b>						
American Bittern	Botaurus lentiginosus	SSC	X	X		
Least Bittern	Ixobrychus exilis	ST	X			
Black-crowned Night-Heron	Nycticorax nycticorax	SSC	X	X	X	
<b>Pandionidae (Osprey)</b>						
Osprey	Pandion haliaetus	SSC	X	X	X	
<b>Accipitridae (Hawks, Eagles, &amp; Kites)</b>						
Golden Eagle	Aquila chrysaetos	BGEPA	X			X
Northern Harrier	Circus hudsonius	SSC	X	X	X	X
Bald Eagle	Haliaeetus leucocephalus	BGEPA, SSC	X	X	X	X
Red-shouldered Hawk	Buteo lineatus	ST	X	X		X
<b>Strigidae (Owls)</b>						
Long-eared Owl	Asio otus	ST	X	X		X
Short-eared Owl	Asio flammeus	SE	X		X	X
<b>Picidae (Woodpeckers)</b>						
Red-headed Woodpecker	Melanerpes erythrocephalus	SSC	X	X	X	X

**Table 4. Bird species of concern and their seasons of potential occurrence in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Common Name	Scientific Name	Listing Status <sup>1</sup>	Seasons of Potential Occurrence in Project Area			
			Spring	Summer	Fall	Winter
<b>Falconidae (Falcons)</b>						
Merlin	<i>Falco columbarius</i>	ST	X	X	X	X
Peregrine Falcon	<i>Falco peregrinus</i>	SE	X	X	X	
<b>Tyrannidae (Flycatchers)</b>						
Willow Flycatcher	<i>Empidonax traillii</i>	FSC	X	X		
<b>Laniidae (Shrikes)</b>						
Loggerhead Shrike	<i>Lanius ludovicianus</i>	SE		X		
<b>Troglodytidae (Wrens)</b>						
Marsh Wren	<i>Cistothorus palustris</i>	SSC	X	X	X	
<b>Turdidae (Thrushes)</b>						
Wood Thrush	<i>Hylocichla mustelina</i>	FSC	X	X	X	
<b>Passerellidae (Sparrows &amp; Allies)</b>						
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	SSC	X	X		
Henslow's Sparrow	<i>Centronyx henslowii</i>	SE		X		
<b>Icteridae (Blackbirds &amp; Allies)</b>						
Yellow-headed Blackbird	<i>Xanthocephalus</i>	SSC	X	X		
Bobolink	<i>Dolichonyx oryzivorus</i>	FSC	X	X	X	
Rusty Blackbird	<i>Euphagus carolinus</i>	FSC	X		X	
<b>Parulidae (Wood-Warblers)</b>						
Louisiana Waterthrush	<i>Parkesia motacilla</i>	ST	X			
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	SSC	X	X		
Hooded Warbler	<i>Setophaga citrina</i>	SSC		X		
Cerulean Warbler	<i>Setophaga cerulea</i>	ST	X	X		
<b>Cardinalidae (Cardinals &amp; Allies)</b>						
Dickcissel	<i>Spiza americana</i>	SSC		X		

<sup>1</sup>Listing Status definitions: BGEPA = Bald and Golden Eagle Protection Act; FE = Federal Endangered; SE = State Endangered; ST = State Threatened; SX = State Probably Extirpated; SSC = Non-listed State Special Concern; FSC = Non-listed Federal Species of Concern

### 3.0 Methods

Study methods were based on the guidelines set forth in the USFWS Land-based Wind Energy Guidelines (WEG; USFWS 2012), the Eagle Conservation Plan Guidance Module 1—Land-based Wind Energy Version 2 (ECPG; USFWS 2013), and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016).

### **3.1 Survey Point Locations, Timing, and Frequency**

A fixed-radius point count method (Hutto et al. 1986) was used to survey the birds present within the Project area. Twenty-four survey points (termed points, hereafter) were distributed throughout the Project area with a minimum of 1.0 mi (1.6 km) spacing between points (Figure 3). The number of points was chosen to achieve 30% minimum coverage of the Project area by large bird survey plots (see section 3.1.1 below). Point locations were selected using aerial imagery based on accessibility, safety, viewshed, and coverage across the Project area. Locations were then inspected in the field to verify each as acceptable and adjusted if necessary. One set of surveys at all points was termed a visit (a visit would span multiple days). Surveys for large and small birds were conducted separately, but the same points were used for both survey types.

#### **3.1.1 Large Bird Surveys**

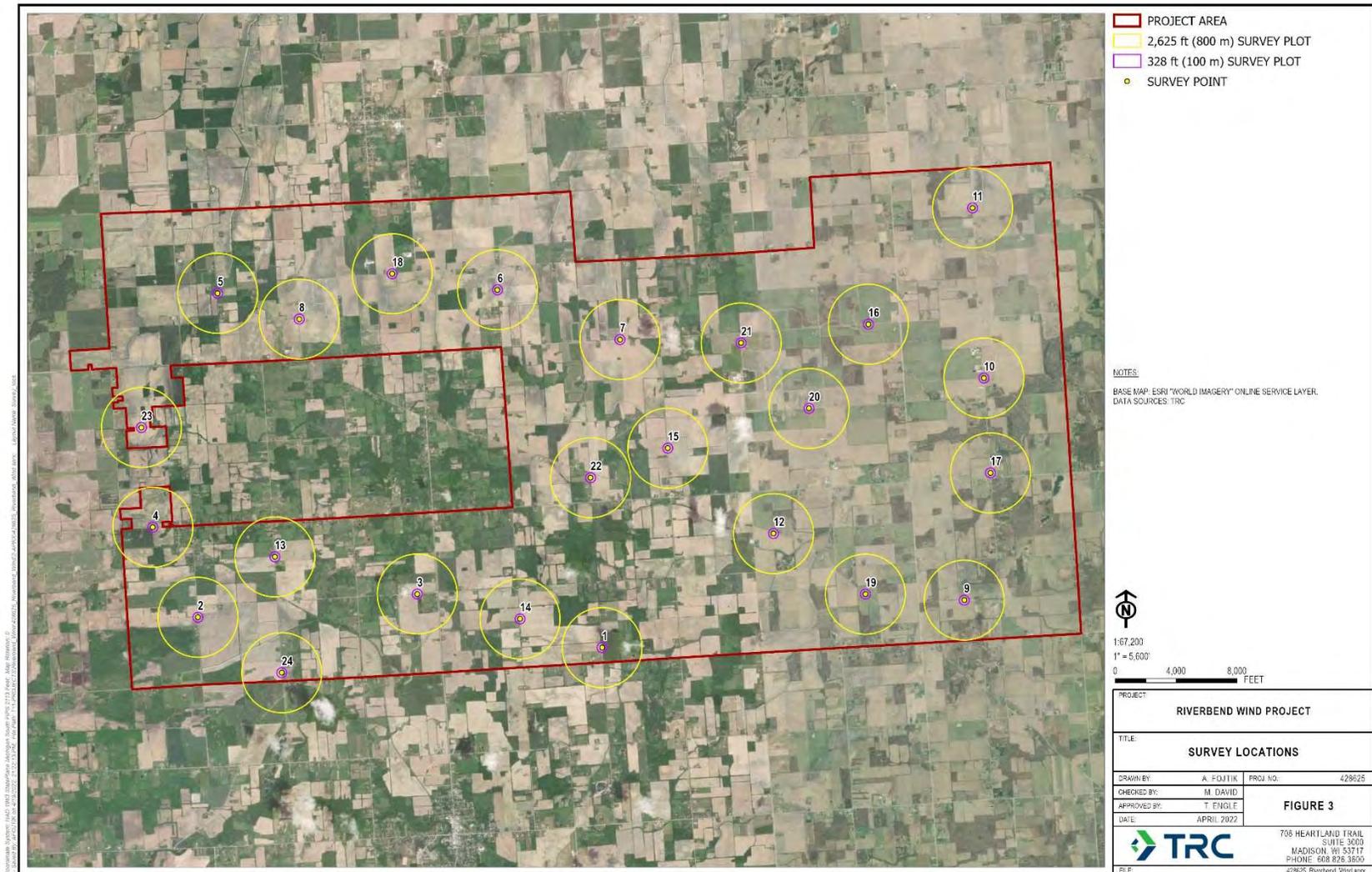
Survey visits were conducted 12 times between March 2021 and February 2022. One visit was conducted each month.

A 2,625-ft (800-m) radius circle was designated as the plot surrounding each point. Each survey was 60 minutes in duration, initiated after sunrise, and completed before sunset. The order in which points were surveyed was varied between visits to ensure each point was surveyed at different times of day.

#### **3.1.2 Small Bird Surveys**

Survey visits were conducted 12 times between March 2021 and February 2022 on the same schedule as large bird surveys. Each survey was typically conducted directly before a large bird survey at the same point; large bird and small bird surveys did not overlap.

A 328-ft (100-m) radius circle was designated as the plot surrounding each point. Each survey was 10 minutes in duration, initiated after sunrise, and completed before sunset.



**Figure 3. Survey points, 2,625-ft (800-m) radius large bird plots, and 328-ft (100-m) radius small bird plots for the large and small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

## **3.2 Data Collection**

### **3.2.1 Large and Small Bird Surveys**

The date, point number, start time, end time, and weather were documented for each survey. Weather data collected included temperature (degrees Celsius), wind speed (meters/second), wind direction (16-point compass directions), and cloud cover (0–25%, 25–75%, or 75–100%). Fog and precipitation were recorded if present.

Surveys were conducted during any weather unless fog or precipitation inhibited horizontal vision to 2,625 ft (800 m) or vertical vision to 656 ft (200 m). If the weather was unsafe (e.g., lightning) or not suitable for surveys, they were postponed until conditions were appropriate to continue.

Each time a bird or group of birds was detected (either visually or audibly) within the plot during the corresponding large or small bird survey, the observer collected the following information:

- Species
- Number of individuals
- Age; categorized as adult, subadult, juvenile, or unknown
- Sex; categorized as male, female, or unknown
- Estimated distance of a bird's closest approach to the point; categorized as 0–164 ft (0–50 m), 164–328 ft (50–100 m), 328–1,312 ft (100–400 m), or 1,312–2,625 ft (400–800 m); an additional distance category (> 2,625 ft [> 800 m]) was available for recording eagle minutes beyond the plot boundary and any incidental observations (see section 3.2.3 below)
- Behavior of the bird; categorized as flapping flight, soaring flight, gliding flight, eating/hunting, perched/landed, swimming, antagonistic interaction, breeding/nesting activity, singing, calling/other vocal sound, or drumming/non-vocal sound. All applicable behavior codes were assigned to a single observation.
- Flight height; categorized as less than 115 ft (35 m), 115–656 ft (35–200 m), or more than 656 ft (200 m) above ground level. Birds that occupied multiple flight height categories while within the plot were assigned all relevant flight heights.
- Habitat type(s) in which the bird was observed; categorized according to the NLCD land cover codes (Homer et al. 2020).

### **3.2.2 Eagle Observations**

Additional information was collected for all eagles, whether observed during a large bird survey or incidentally. For each individual observed, the observer recorded the total number of observation minutes and the eagle's distance from the point, flight height, and behavior during each minute of the observation. A sketch of the flight path and a written description of the observation were also recorded.

### **3.2.3 Incidental Observations**

Incidental bird observations were recorded with the objectives of (1) providing information on bird species of concern (see section 2.2) observed outside of the standard survey protocols and

(2) contributing to the complete lists of large and small bird species observed in the Project area. All observations of species of concern were recorded regardless of when they were encountered, as were any observations of species not yet recorded within the Project area. Incidental observations were recorded in a similar fashion to data collected during surveys. An additional distance category (> 2,625 ft [800 m]) was used for birds observed during a survey but beyond the survey plot, and for any birds observed within the Project area but not during a survey.

### **3.3 Data Analysis**

Large and small bird data were analyzed separately. All analyses described in Sections 3.3.2–3.3.5 were completed for both large and small birds. Data from incidental observations were not included in the analyses described in Sections 3.3.2–3.3.6 and are reported separately from data collected during standard surveys.

Survey data were compiled and summarized by species and taxonomic family. Families, unlike species, have no standardized common name equivalent to their scientific name; thus, we referred to families by scientific name.

#### **3.3.1 Weather**

Weather data for each survey were presented in tabular format.

#### **3.3.2 Observations, Relative Abundance, and Diversity**

Metrics were defined as follows:

- *observation*—each bird recorded
- *group*—one or more observations recorded together
- *relative abundance*—the percent of the total number of survey observations
- *diversity*—number of different species or families

Groups, observations, and diversity were calculated for the entire Study period and by season for all species combined. Groups, observations, and relative abundance were calculated for the entire Study period and by season for each species and family.

#### **3.3.3 Use, Frequency of Occurrence, and Spatial Distribution**

*Use* was defined for large birds as number of observations per 2,625-ft (800-m) plot per 60-minute survey, and for small birds as number of observations per 328-ft (100-m) plot per 10-minute survey (abbreviated as obs/plot/survey). *Use* and associated standard error (SE)<sup>1</sup> were calculated for all species combined in total, by season, and by point. *Use* and standard error by point were displayed on a bar chart.

*Use* was also calculated in total and by season for each species and family. For the five highest-use species recorded during the surveys, and for any additional species with the highest or second-highest use in any one season, a single-species SE was calculated in total and by

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<sup>1</sup> Standard error (SE) is defined as the sample standard deviation divided by the square root of the sample size.

season. Histograms of use and SE by season were created for each of these species and for all species combined.

*Frequency of occurrence* (abbreviated as *frequency*) was defined as the proportion of surveys during which one or more observations were made. Frequency was calculated in total and by season for each species, for each family, and for all species combined.

*Use* and *frequency* were also calculated by point for each species and family. Species and family *diversity* were also calculated for each point.

The spatial distribution of bird use within the Project area was evaluated by mapping use and species diversity by point in a geographic information system (GIS). In addition, for each point, it was determined how many families had their highest single-point use at that point. This analysis was repeated for frequency.

### **3.3.4 Flight Height**

Group and observation counts, use, and *percent of observations flying*—the percent of all observations that included flight behavior— were calculated for flying birds by species, family, and overall.

Observations were also calculated for each flight height category (see section 3.2.1 above.) Flight height category observations were divided by observations of flying birds to give *percent of flying observations in flight height categories* for each species, family, and overall. The flight height category of 115–656 ft (35–200 m) above the ground was considered the rotor-swept zone (RSZ). *Use* and *frequency* within the RSZ were calculated for each species, family, and overall.

### **3.3.5 Threatened or Endangered Species and Other Sensitive Species**

Observations of bird species that were federally or state listed as threatened or endangered, or were considered non-listed federal or state species of concern, were summed and tabulated. Use and frequency were reported in total, by season, and by point for each listed species observed during the surveys and for non-listed species of concern observed at two or more points. For non-listed species of concern that were observed at only one point, we detailed the location and timing of each observation instead of summarizing their use and frequency.

### **3.3.6 Eagle Use Minutes**

Each eagle observation was divided into 1-minute intervals (see section 3.2.2). Each eagle observation interval during a large bird survey in which the eagle was:

- 1) within the survey plot;
- 2) flying; and
- 3) at a height no more than 656 ft (200 m) above the ground;

was termed an *eagle use minute*. Eagle use minutes were summed and tabulated in total and by month, season, and point. The number of eagle use minutes per survey hour was also calculated for each of these categories. The eagle use minutes for each point were visually represented on a map created in a GIS.

### 3.3.7 Eagle Flight Paths

All flight paths and perch locations, which were sketched in the field for each eagle observation (including incidental observations), were digitized in a GIS and plotted on a map of the Project area. The flight paths and perch locations were examined qualitatively for any tendencies in flight direction/style or associations with land cover or terrain features.

## 4.0 Results

### 4.1 Survey Summary

In total, 283 large bird surveys and 286 small bird surveys were completed during 12 visits between March 2021 and February 2022 (Table 5). These totals exclude five scheduled large bird surveys and two scheduled small bird surveys which were performed but not fully completed between sunrise and sunset. Data from the excluded surveys were retained but all observations were designated as incidental.

Weather conditions for all surveys are presented in Attachment A. No scheduled surveys were canceled or interrupted due to unsuitable weather conditions.

**Table 5. Summary of the surveys completed for each visit during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Visit	Start Date	Finish Date	Large Bird Surveys Completed	Small Bird Surveys Completed
1	3/17/2021	3/19/2021	22	22
2	4/8/2021	4/11/2021	24	24
3	5/13/2021	5/15/2021	24	24
4	6/14/2021	6/16/2021	24	24
5	7/13/2021	7/15/2021	24	24
6	8/15/2021	8/17/2021	23	24
7	9/14/2021	9/16/2021	23	24
8	10/12/2021	10/15/2021	24	24
9	11/15/2021	11/18/2021	24	24
10	12/14/2021	12/17/2021	23	24
11	1/10/2022	1/13/2022	24	24
12	2/15/2022	2/18/2022	24	24
<b>Total:</b>			<b>283</b>	<b>286</b>

### 4.2 Large Bird Use Surveys

#### 4.2.1 Observations, Relative Abundance, and Diversity

During the surveys, 3,673 observations in 1,445 groups were recorded (Attachment B; Table B-1).<sup>2</sup> Observations by season consisted of 801 observations in 422 groups in spring, 746 observations in 377 groups in summer, 1,406 observations in 441 groups in fall, and 702 observations in 205 groups in winter (Table B-1).

<sup>2</sup> Tables B-1 to B-7 are provided in Attachment B.

The five most numerous large bird species observed during the surveys were mourning dove (*Zenaida macroura*; 1,349 observations), rock pigeon (*Columba livia*; 736 observations), turkey vulture (*Cathartes aura*; 574 observations), Canada goose (*Branta canadensis*; 311 observations), and killdeer (*Charadrius vociferus*; 184 observations; Table B-1). Relative abundances for these species were 36.7%, 20.0%, 15.6%, 8.5%, and 5.0% of all large bird observations, respectively (Table B-1). None of these five species are federally listed or state listed species.

The most-observed families were Columbidae (pigeons and doves; 2,085 observations), Cathartidae (vultures; 574 observations), and Anatidae (ducks, geese, and swans; 331 observations; Table B-1). Relative abundances for these families were 56.8%, 15.6%, and 9.0%, respectively (Table B-1).

Twenty-four species from 12 taxonomic families were recorded during the surveys, with 18 species observed in spring, 15 in summer, 19 in fall, and 10 in winter (Table B-1). Two additional species were recorded incidentally (Table B-2). In total, 26 large bird species from 12 families were recorded during the Study (Table B-2).

#### **4.2.2 Use and Frequency of Occurrence**

Overall use recorded during the surveys was 12.98 (SE = 0.85) obs/plot/survey (Table B-3). Mourning dove use was 4.77 (SE = 0.46) obs/plot/survey, rock pigeon use was 2.60 (SE = 0.48) obs/plot/survey, turkey vulture use was 2.03 (SE = 0.23) obs/plot/survey, Canada goose use was 1.10 (SE = 0.31) obs/plot/survey, and killdeer was 0.65 (SE = 0.08) obs/plot/survey (Table B-3; Figure 4).

Among families, Columbidae use was 7.37 obs/plot/survey, Cathartidae use was 2.03 obs/plot/survey, and Anatidae use was 1.17 obs/plot/survey (Table B-3).

The species with the highest frequency were mourning dove (0.72), red-tailed hawk (*Buteo jamaicensis*; 0.44), turkey vulture (0.43), rock pigeon (0.31), and killdeer (0.29; Table B-3).

Families with the highest frequency were Columbidae (0.84), Accipitridae (hawks, eagles, and kites; 0.53), and Cathartidae (0.43; Table B-3).

##### **4.2.2.1 Temporal Variation in Use**

Large bird use was 11.44 (SE = 1.01) obs/plot/survey in spring, 10.51 (SE = 1.02) obs/plot/survey in summer, 19.80 (SE = 2.41) obs/plot/survey in fall, and 10.14 (SE = 1.68) in winter (Figure 4). In spring, turkey vulture had the highest use, followed by killdeer; in summer, mourning dove had the highest use, followed by turkey vulture; in fall, mourning dove had the highest use, followed by rock pigeon; and in winter, rock pigeon had the highest use, followed by mourning dove (Figure 4; Table B-3).

Mourning dove use was 1.16 (SE = 0.21) obs/plot/survey in spring, 4.89 (SE = 0.71) obs/plot/survey in summer, 9.72 (SE = 1.41) obs/plot/survey in fall, and 3.25 (SE = 0.57) obs/plot/survey in winter (Figure 4). Mourning dove comprised 10.1% of spring, 46.5% of summer, 49.1% of fall, and 32.1% of winter observations (Table B-1). Frequency for the species was 0.49 in spring, 0.87 in summer, 0.87 in fall, and 0.65 in winter (Table B-3).

Rock pigeon use was 1.21 (SE = 0.24) obs/plot/survey in spring, 0.86 (SE = 0.24) obs/plot/survey in summer, 4.52 (SE = 1.62) obs/plot/survey in fall, and 3.79 (SE = 0.94)

obs/plot/survey in winter (Figure 4). Rock pigeon comprised 10.6% of spring, 8.2% of summer, 22.8% of fall, and 37.4% of winter observations (Table B-1). Frequency for the species was 0.31 in spring, 0.23 in summer, 0.34 in fall, and 0.37 in winter (Table B-3).

Turkey vulture use was 4.01 (SE = 0.61) obs/plot/survey in spring, 2.01 (SE = 0.36) obs/plot/survey in summer, and 2.11 (SE = 0.52) obs/plot/survey in fall; the species was not observed in winter (Figure 4). Turkey vulture comprised 35.1% of spring, 19.2% of summer, and 10.7% of fall observations (Table B-1). Frequency for the species was 0.74 in spring, 0.61 in summer, and 0.37 in fall (Table B-3).

Canada goose use was 1.14 (SE = 0.37) obs/plot/survey in spring, 0.39 (SE = 0.26) obs/plot/survey in summer, 1.58 (SE = 0.59) obs/plot/survey in fall, and 1.28 (SE = 0.97) in winter (Figure 4). Canada goose comprised 10.0% of spring, 3.8% of summer, 8.0% of fall, and 12.6% of winter observations (Table B-1). Frequency for the species was 0.26 in spring, 0.04 in summer, 0.18 in fall, and 0.04 in winter (Table B-3).

Killdeer use was 1.54 (SE = 0.23) obs/plot/survey in spring, 0.72 (SE = 0.15) obs/plot/survey in summer, and 0.35 (SE = 0.12) obs/plot/survey in fall; the species was not observed in winter (Figure 4). Killdeer comprised 13.5% of spring, 6.8% of summer, and 1.8% of fall observations (Table B-1). Frequency for the species was 0.57 in spring, 0.39 in summer, and 0.18 in fall (Table B-3).

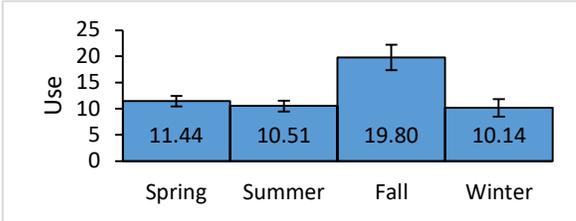
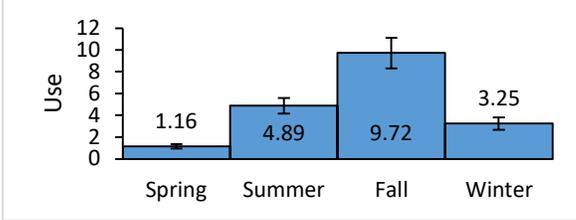
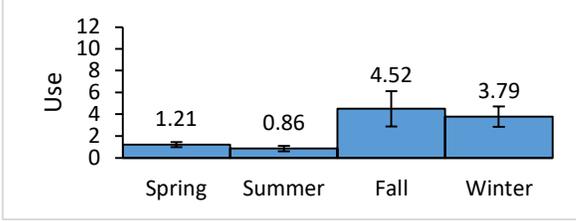
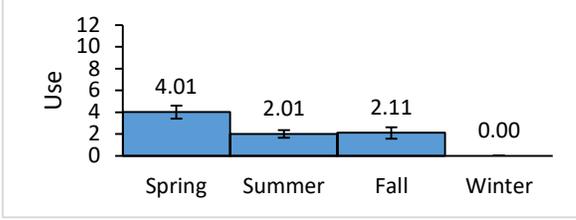
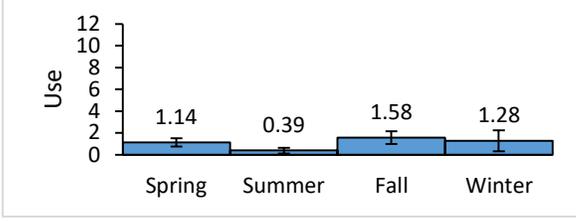
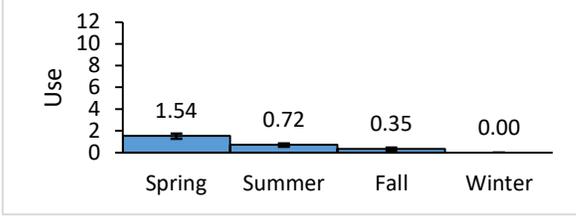
Common Name Scientific Name	Use Histogram	Use (Standard Error) for All Seasons Combined
All Large Bird Species		12.98 (0.85)
Mourning Dove <i>Zenaida macroura</i>		4.77 (0.46)
Rock Pigeon <i>Columba livia</i>		2.60 (0.48)
Turkey Vulture <i>Cathartes aura</i>		2.03 (0.23)
Canada Goose <i>Branta canadensis</i>		1.10 (0.31)
Killdeer <i>Charadrius vociferus</i>		0.65 (0.08)

Figure 4. Histograms of large bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species and for each of the five species with highest overall use during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

In spring, Cathartidae was the family with the highest use, at 4.01 obs/plot/survey (Table B-3). Relative abundance for Cathartidae was 35.1% in spring (Table B-1); frequency was 0.74 in spring (Table B-3). In summer, fall, and winter, Columbidae was the family with the highest use, at 5.75 obs/plot/survey in summer, 14.24 obs/plot/survey in fall, and 7.04 obs/plot survey in winter (Table B-3). Relative abundance for Columbidae was 54.7% in summer, 71.9% in fall, and 69.4% in winter (Table B-1). Frequency for Columbidae was 0.90 in summer, 0.94 in fall, and 0.85 in winter (Table B-3).

#### 4.2.2.2 Spatial Variation in Use and Diversity

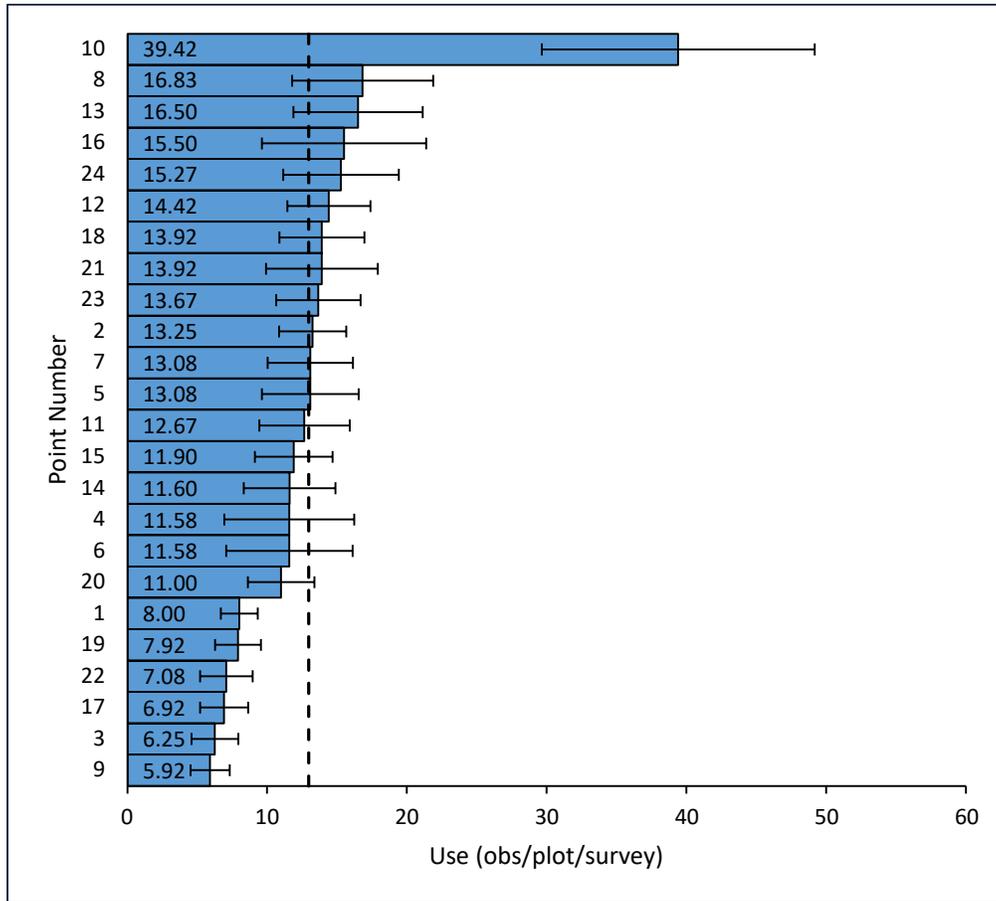
Comparisons among points in this section include results from all points; however, note that points 14 and 15 had ten surveys each and point 24 had 11 surveys, while the remaining points had 12 surveys each.

Overall large bird use was highest at point 10 (39.42 obs/plot/survey, SE = 9.77), followed by point 8 (16.83 obs/plot/survey, SE = 5.05) and point 13 (16.50 obs/plot/survey, SE = 4.62; Figure 5; Figure 6; Table B-4). Use was lowest at point 9 (5.92 obs/plot/survey, SE = 1.40), followed by point 3 (6.25 obs/plot/survey, SE = 1.67) and point 17 (6.92 obs/plot/survey, SE = 1.71; Figure 5; Figure 6; Table B-4).

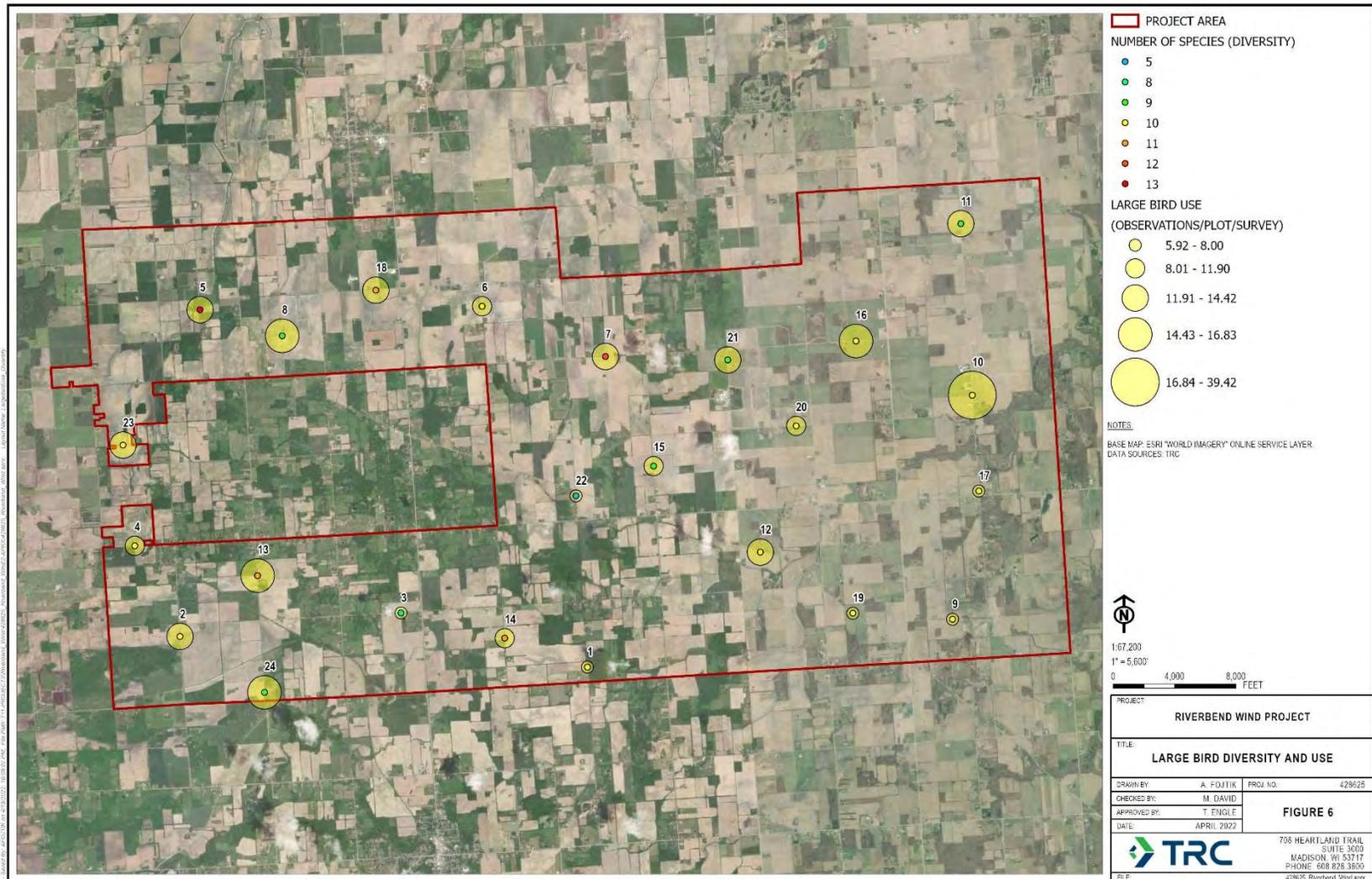
Point 5 had the highest species diversity (13 species), followed by point 7 (12 species) and points 13, 14, and 18 (11 species each; Figure 6; Table B-4). Point 22 had the lowest species diversity (5 species), followed by point 3 (8 species) and points 8, 11, 15, 21, and 24 (9 species each; Figure 6; Table B-4). Family diversity was highest at points 5 and 17 (9 families), followed by points 4, 6, 7, 10, 12, 14, 18, 19, and 24 (8 families each; Figure 6; Table B-4). Family diversity was lowest at points 8, 16, and 22 (5 families each; Figure 6; Table B-4).

When use by point for each family was examined, point 10 had the highest use for four families: Anatidae, Columbidae, Gruidae (cranes), and Laridae (gulls and their allies; Table B-4). Point 21 had the highest use for two families: Charadriidae (plovers) and Accipitridae (Table B-4). Points 4, 5, 13, 14, 15, 18 and 24 had the highest or tied-highest use for one family each: point 4 for Strigidae (owls), point 5 for Ardeidae (herons and their allies), point 13 for Falconidae (falcons), point 14 for Picidae (woodpeckers), point 15 for Picidae, point 18 for Cathartidae, and point 24 for Phasianidae (grouse and their allies; Table B-4).

When frequency by point for each family was examined, point 10 had the highest or tied-highest frequency for three families (Table B-5). Points 14, 15, and 21 had the highest or tied-highest frequency for two families each, and points 1, 2, 3, 4, 5, 7, 9, 13, 16, 17, 18, 19, 20, and 24 had the highest or tied-highest frequency for one family each (Table B-5).



**Figure 5. Large bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by dashed line) by point during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**



**Figure 6. Map of large bird use (observations/plot/survey) and species diversity recorded at each point during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

### 4.2.3 Flight Height Characteristics

During the surveys, 2,334 observations of flying birds in 1,042 groups were recorded (Table B-6). This represented 63.5% of all survey observations (Table B-6). Of all large birds observed flying, 23.6% (551 observations) were estimated to be within the height range for the RSZ (115–656 ft; 35–200 m; Table B-6).

Overall use within the RSZ was 1.95 obs/plot/survey (Table B-6). Species with the highest RSZ use were turkey vulture (1.37 obs/plot/survey), Canada goose (0.20 obs/plot/survey), sandhill crane (*Antigone canadensis*; 0.15 obs/plot/survey), and red-tailed hawk (0.12 obs/plot/survey; Table B-6). Use for all other species within the RSZ was  $\leq 0.04$  obs/plot/survey each (Table B-6).

## 4.3 Small Bird Use Surveys

### 4.3.1 Observations, Relative Abundance, and Diversity

During the surveys, 6,899 observations in 1,454 groups were recorded (Attachment C; Table C-1).<sup>3</sup> Observations by season consisted of 1,193 observations in 454 groups in spring, 1,070 observations in 507 groups in summer, 3,250 observations in 303 groups in fall, and 1,386 observations in 190 groups in winter (Table C-1).

The most numerous small bird species observed during the surveys were European starling (*Sturnus vulgaris*; 4,324 observations), red-winged blackbird (*Agelaius phoeniceus*; 907 observations), American robin (*Turdus migratorius*; 362 observations), horned lark (*Eremophila alpestris*; 265 observations), and barn swallow (*Hirundo rustica*; 238 observations; Table C-1). These observations made up 62.7%, 13.1%, 5.2%, 3.8%, and 3.4% of all small bird observations, respectively (Table C-1).

The most-observed families were Sturnidae (starlings; 4,324 observations), Icteridae (blackbirds and their allies; 1,080 observations), and Turdidae (thrushes; 366 observations; Table C-1). Relative abundances for these families were 62.7%, 15.7%, and 5.3%, respectively (Table C-1).

Forty-two species from 20 taxonomic families were recorded during the surveys, with 21 species observed in spring, 22 in summer, 27 in fall, and 14 in winter (Table C-1). One additional species was recorded incidentally; thus, in total, 43 small bird species from 20 families were recorded during the Study (Table C-2).

### 4.3.2 Use and Frequency of Occurrence

Overall use recorded during the surveys was 24.12 (SE = 2.72) obs/plot/survey (Table C-3). European starling use was 15.12 (SE = 2.72) obs/plot/survey, red-winged blackbird use was 3.17 (SE = 0.57) obs/plot/survey, American robin use was 1.27 (SE = 0.14) obs/plot/survey, horned lark use was 0.93 (SE = 0.11) obs/plot/survey, and barn swallow use was 0.83 (SE = 0.14) obs/plot/survey (Table C-3; Figure 7).

Among families, Sturnidae use was 15.12 obs/plot/survey, Icteridae use was 3.78 obs/plot/survey, and Turdidae use was 1.28 obs/plot/survey (Table C-3).

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<sup>3</sup> Tables C-1 to C-7 are provided in Attachment C.

The species with the highest frequency were American robin (0.44), red-winged blackbird (0.43), horned lark (0.37), European starling (0.35), and blue jay (*Cyanocitta cristata*; 0.24; Table C-3).

The families with the highest frequency were Icteridae (0.45), Turdidae (0.45), and Alaudidae (larks; 0.37; Table C-3).

#### 4.3.2.1 Temporal Variation in Use

Small bird use was 17.04 (SE = 1.67) obs/plot/survey in spring, 14.86 (SE = 2.23) obs/plot/survey in summer, 45.14 (SE = 8.95) obs/plot/survey in fall, and 19.25 (SE = 4.62) in winter (Figure 7). In spring, European starling had the highest use, followed by American robin; in summer, red-winged blackbird had the highest use, followed by barn swallow; in fall, European starling had the highest use, followed by horned lark; and in winter, European starling had the highest use, followed by American tree sparrow (*Spizelloides arborea*; Figure 7; Table C-3).

European starling use was 6.91 (SE = 1.57) obs/plot/survey in spring, 38.50 (SE = 9.04) obs/plot/survey in fall, and 14.83 (SE = 4.69) obs/plot/survey in winter; the species was not observed in summer (Figure 7). Relative abundance for European starling was 40.6% in spring, 85.3% in fall, and 77.1% in winter (Table C-1). Frequency for the species was 0.41 in spring, 0.61 in fall, and 0.38 in winter (Table C-3).

Red-winged blackbird use was 2.94 (SE = 0.57) obs/plot/survey in spring, 8.28 (SE = 2.02) obs/plot/survey in summer, and 1.46 (SE = 0.56) obs/plot/survey in fall; the species was not observed in winter (Figure 7). Relative abundance for red-winged blackbird was 17.3% in spring, 55.7% in summer, and 3.2% in fall (Table C-1). Frequency for the species was 0.69 in spring, 0.89 in summer, and 0.17 in fall (Table C-3).

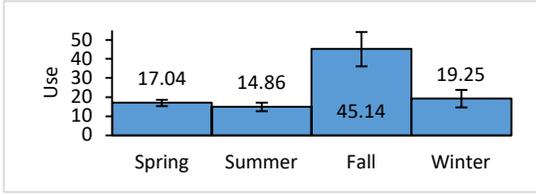
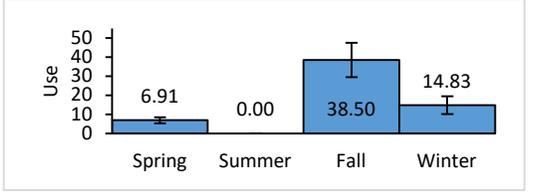
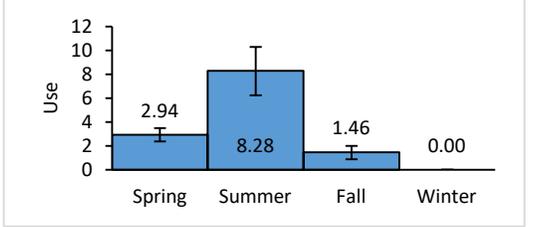
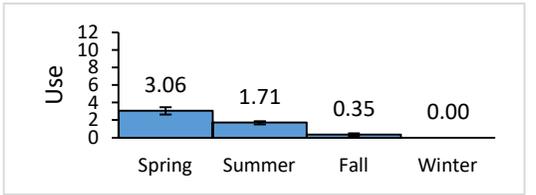
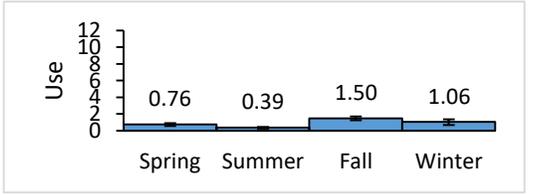
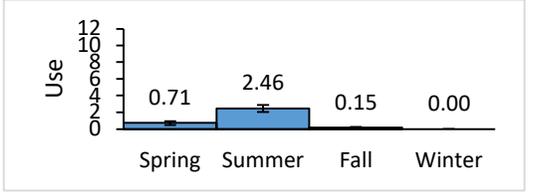
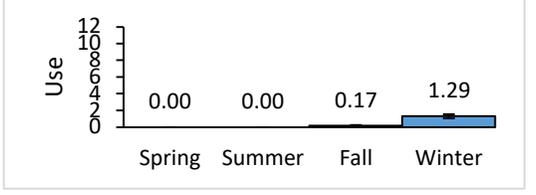
American robin use was 3.06 (SE = 0.41) obs/plot/survey in spring, 1.71 (SE = 0.18) obs/plot/survey in summer, and 0.35 (SE = 0.16) obs/plot/survey in fall; the species was not observed in winter (Figure 7). Relative abundance for American robin was 17.9% in spring, 11.5% in summer, and 0.8% in fall (Table C-1). Frequency for the species was 0.90 in spring, 0.78 in summer, and 0.11 in fall (Table C-3).

Horned lark use was 0.76 (SE = 0.16) obs/plot/survey in spring, 0.39 (SE = 0.10) obs/plot/survey in summer, 1.50 (SE = 0.22) obs/plot/survey in fall, and 1.06 (SE = 0.34) obs/plot/survey in winter (Figure 7). Relative abundance for horned lark was 4.4% in spring, 2.6% in summer, 3.3% in fall, and 5.5% in winter (Table C-1). Frequency for the species was 0.34 in spring, 0.25 in summer, 0.58 in fall, and 0.31 in winter (Table C-3).

Barn swallow use was 0.71 (SE = 0.22) obs/plot/survey in spring, 2.46 (SE = 0.43) obs/plot/survey in summer, and 0.15 (SE = 0.11) obs/plot/survey in fall; the species was not observed in winter (Figure 7). Relative abundance for barn swallow was 4.2% in spring, 16.5% in summer, and 0.3% in fall (Table C-1). Frequency for the species was 0.21 in spring, 0.64 in summer, and 0.03 in fall (Table C-3).

In spring, fall, and winter, Sturnidae was the family with the highest use. Use for Sturnidae was 6.91, 38.50, and 14.83 obs/plot/survey in spring, fall, and winter, respectively (Table C-3). Relative abundance for Sturnidae was 40.6% in spring, 85.3% in fall, and 77.1% in winter (Table C-1). Frequency for the species was 0.41 in spring, 0.61 in fall, and 0.38 in winter (Table C-3).

In summer, Icteridae was the family with the highest use, at 8.82 obs/plot/survey (Table C-3). Relative abundance for Icteridae was 59.3% in summer (Table C-1); frequency was 0.89 in summer (Table C-3).

Common Name Scientific Name	Use Histogram	Use (Standard Error) for All Seasons Combined
All Small Bird Species		24.12 (2.72)
European Starling <i>Sturnus vulgaris</i>		15.12 (2.72)
Red-winged Blackbird <i>Agelaius phoeniceus</i>		3.17 (0.57)
American Robin <i>Turdus migratorius</i>		1.27 (0.14)
Horned Lark <i>Eremophila alpestris</i>		0.93 (0.11)
Barn Swallow <i>Hirundo rustica</i>		0.83 (0.14)
American Tree Sparrow <i>Spizelloides arborea</i>		0.37 (0.07)

**Figure 7. Histograms of small bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species combined, for each of the five species with highest overall use, and for one species with the second-highest winter use during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

#### 4.3.2.2 Spatial Variation in Use and Diversity

Comparisons among points in this section include results from all points; however, note that points 14 and 24 had 11 surveys, while the remaining points had 12 surveys each.

Overall small bird use was highest at point 19 (54.92 obs/plot/survey, SE = 39.94), followed by point 10 (48.75 obs/plot/survey, SE = 12.91) and point 21 (44.08 obs/plot/survey, SE = 23.67; Figure 8; Figure 9; Table C-4). Use was lowest at point 23 (10.25 obs/plot/survey, SE = 2.07), followed by point 4 (10.75 obs/plot/survey, SE = 4.46) and point 20 (10.92 obs/plot/survey, SE = 5.55; Figure 8; Figure 9; Table C-4).

Point 5 had the highest species diversity (22 species), followed by point 24 (19 species) and point 17 (18 species; Figure 9; Table C-4). Point 16 had the lowest species diversity (8 species), followed by points 11 and 12 (11 species each; Figure 9; Table C-4). Family diversity was highest at point 5 (15 families), followed by point 17 (13 families) and points 1, 2, 23, and 24 (12 families each; Figure 9; Table C-4). Family diversity was lowest at points 10, 11, 16, and 20 (8 families each; Figure 9; Table C-4).

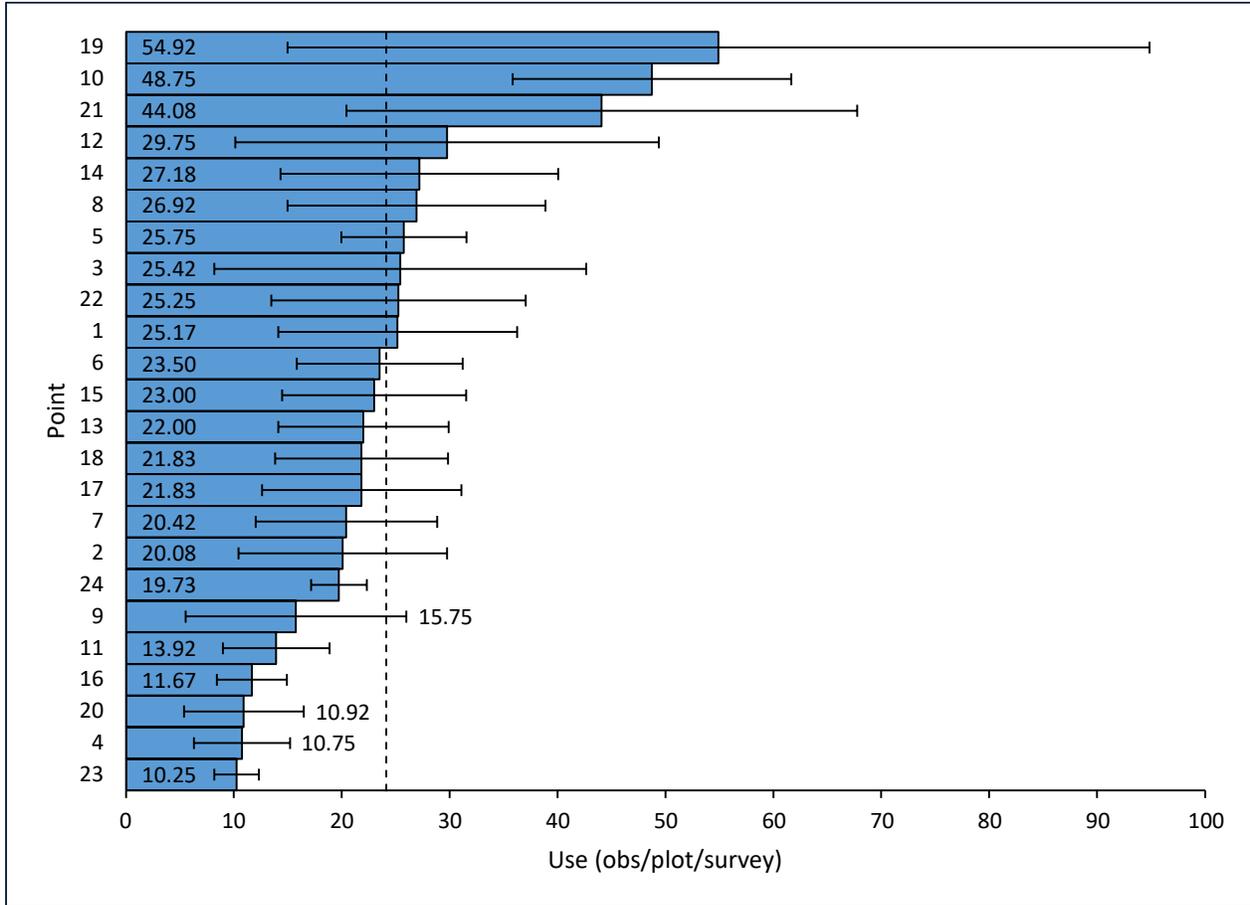
When use by point for each family was examined, point 5 had the highest or tied-highest use for five families: Tyrannidae (flycatchers), Vireonidae (vireos), Paridae (chickadees and titmice), Regulidae (kinglets), and Sittidae (nuthatches; Table C-4).

Point 19 had the highest or tied-highest use for three families: Corvidae (crows and their allies), Sturnidae, and Cardinalidae (cardinals and their allies; Table C-4).

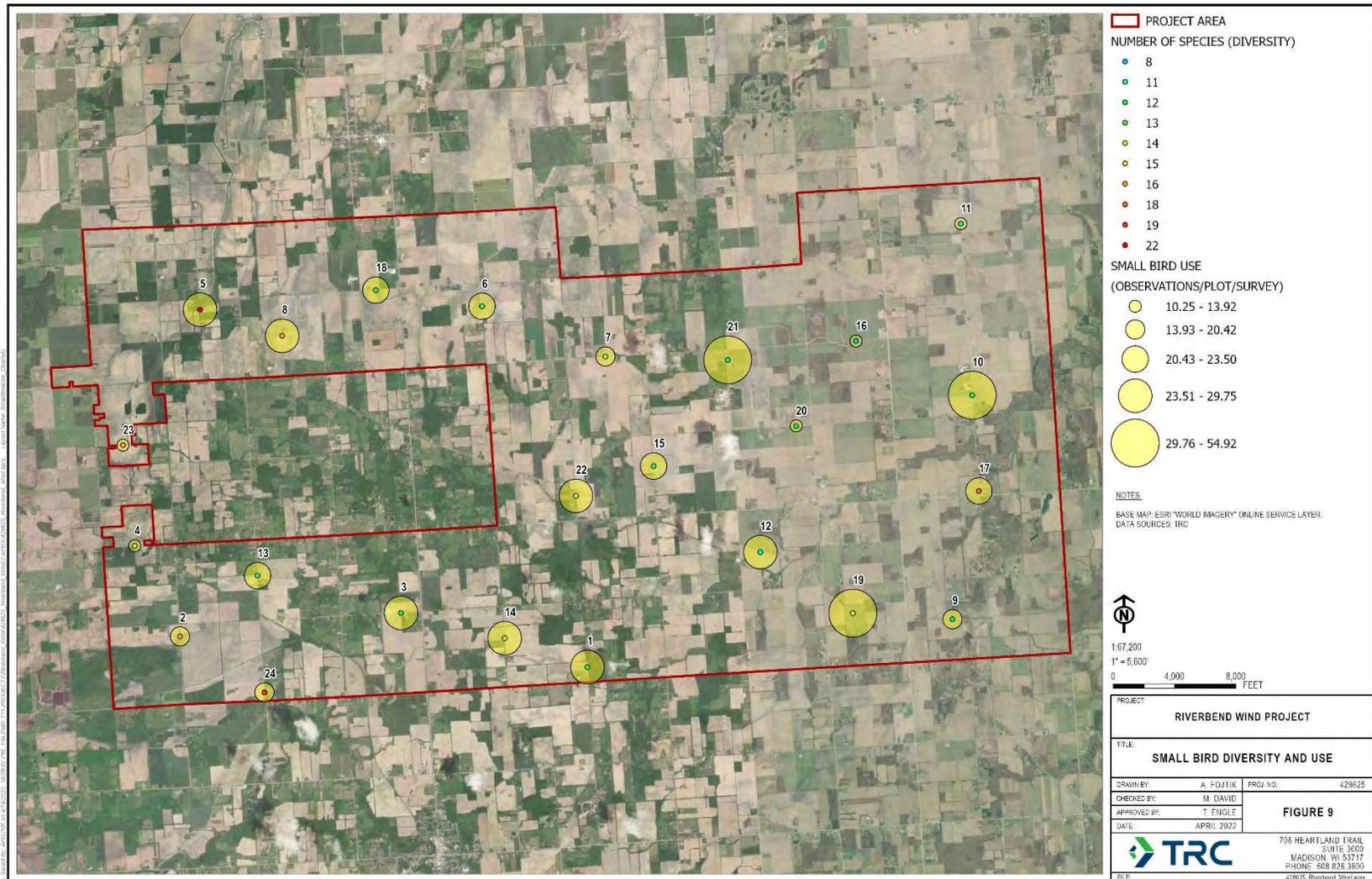
Points 1, 2, 10, 17, 18, and 24 had the highest or tied-highest use for two families each: point 1 for Paridae and Cardinalidae, point 2 for Picidae and Turdidae, point 10 for Passeridae (old world sparrows) and Icteridae, point 17 for Paridae and Parulidae (wood-warblers), point 18 for Fringillidae (finches) and Passerellidae (sparrows), and point 24 for Hirundinidae (swallows) and Calcariidae (longspurs and their allies; Table C-4).

Points 3, 9, 13, 21, and 23 had the highest or tied-highest use for one family each: point 3 for Paridae, point 9 for Sittidae, point 13 for Laniidae (shrikes), point 21 for Alaudidae, and point 23 for Mimidae (thrashers and their allies; Table C-4).

When frequency by point for each family was examined, point 5 had the highest or tied-highest frequency for five families (Table C-5). Point 24 had the highest frequency for four families (Table C-5). Points 1 and 18 had the highest or tied-highest frequency for three families each; points 13, 17, 22, and 23 did for two families each; and points 2, 3, 6, 9, 10, 16, and 21 did for one family each (Table C-5).



**Figure 8. Small bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by vertical dashed line) by point during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**



**Figure 9. Map of small bird use (observations/plot/survey) and species diversity recorded at each point during the small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

#### 4.3.2.3 Flight Height Characteristics

During the surveys, 5,477 observations of flying birds in 1,187 groups were recorded (Table C-6). This represented 79.4% of all survey observations (Table C-6). Of the small birds observed flying, 0.9% (48 observations) were estimated to be within the RSZ (Table C-6).

Overall use within the RSZ was 0.17 obs/plot/survey (Table C-7). The two species with use in the RSZ were red-winged blackbird (0.16 obs/plot/survey) and American robin (0.01 obs/plot/survey; Table C-6). Use for all other species within the RSZ was  $\leq 0.02$  obs/plot/survey each (Table C-7).

#### 4.4 Observations of Sensitive Species

No federally listed or state listed threatened or endangered species were observed during the Study. There were four protected or non-listed state special concern species observed: northern harrier (*Circus hudsonius*), bald eagle, grasshopper sparrow (*Ammodramus savannarum*), and dickcissel (*Spiza americana*; Table 6).

During the surveys, bald eagle was observed at 12 points, northern harrier was observed at four points, and grasshopper sparrow and dickcissel were observed at one point each (Tables B-4, C-4).

The highest number of sensitive species recorded at a single point was three at point 8, followed by two each at points 7, 13, and 16, and one each at points 1, 2, 10, 11, 15, 18, 20, 21, and 23 (Tables B-4, C-4).

Northern harrier was observed four times during the surveys (Table 6). Northern harrier use was 0.01 obs/plot/survey overall; seasonal use was 0.01 obs/plot/survey in fall and 0.04 obs/plot/survey in winter, with no observations in other seasons (Table B-3). Use by point was 0.08 obs/plot/survey at points 2, 7, 8, and 16, with no observations at other points (Table B-4). Northern harrier frequency was 0.01 overall; seasonal frequency was 0.01 in fall and 0.04 in winter (Table B-3). Frequency was 0.08 each at points 2, 7, 8, and 16 (Table B-5).

See Section 4.5 for details on bald eagle observations.

Grasshopper sparrow was observed two times during the surveys (Table 6). Both observations occurred at point 8 in fall (Tables C-1, C-4).

Dickcissel was observed once during the surveys (Table 6). The observation occurred at point 13 in summer (Tables C-1, C-4).

**Table 6. Summary of the listed, protected, and non-listed special concern species observed during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Common Name (Scientific Name)	Listing Status <sup>1</sup>	# Groups During Surveys	# Obs During Surveys	# Incidental Groups	# Incidental Obs	# Total Groups	# Total Obs
Northern Harrier ( <i>Circus hudsonius</i> )	SSC	4	4	0	0	4	4
Bald Eagle ( <i>Haliaeetus leucocephalus</i> )	BGEPA, SSC	19	26	2	2	21	28
Grasshopper Sparrow ( <i>Ammodramus savannarum</i> )	SSC	1	2	0	0	1	2
Dickcissel ( <i>Spiza americana</i> )	SSC	1	1	0	0	1	1

<sup>1</sup>Listing Status definitions: BGEPA = Bald and Golden Eagle Protection Act; SSC = Non-listed State Species of Concern

## 4.5 Eagle Use

### 4.5.1 Bald Eagles

Bald eagle was observed 26 times during the surveys, and two times incidentally (Table 6). Bald eagle use was 0.09 obs/plot/survey overall; seasonal use was 0.03 obs/plot/survey in spring, 0.06 obs/plot/survey in summer, 0.06 obs/plot/survey in fall, and 0.23 obs/plot/survey in winter (Table B-3). Use was highest at point 10 (0.50 obs/plot/survey; Table B-4). Bald eagle frequency was 0.06 overall; seasonal frequency was 0.03 in spring, 0.06 in summer, 0.04 in fall, and 0.13 in winter (Table B-3). Frequency was highest (0.25) at point 21 (Table B-5).

### 4.5.2 Golden Eagles

No golden eagles were observed during the Study.

### 4.5.3 Bald Eagle Use Minutes

For bald eagles, 50 use minutes were recorded during 26 observations over 283 survey hours (Table 7). There were also two incidental observations (Table 7).

During the surveys, bald eagle observations by season consisted of two in spring, four in summer, four in fall, and 16 in winter (Table 7). One incidental observation occurred in fall, and the other occurred in winter (Table 7). Bald eagle use minutes by season consisted of four use minutes during 70 survey hours in spring, 14 use minutes during 71 survey hours in summer, four use minutes during 71 survey hours in fall, and 28 use minutes during 71 survey hours in winter (Table 7).

Bald eagle use minutes per survey hour were 0.06 in spring, 0.20 in summer, 0.06 in fall, and 0.39 in winter (Table 7; Figure 10).

Bald eagle was observed at 12 points during the surveys: point 1 (four use minutes), point 7 (five use minutes), point 8 (four use minutes), point 10 (zero use minutes), point 11 (three use minutes), point 13 (seven use minutes), point 15 (five use minutes), point 16 (zero use minutes),



point 18 (five use minutes), point 20 (eight use minutes), point 21 (six use minutes), and point 23 (three use minutes; Table 8; Figure 11).

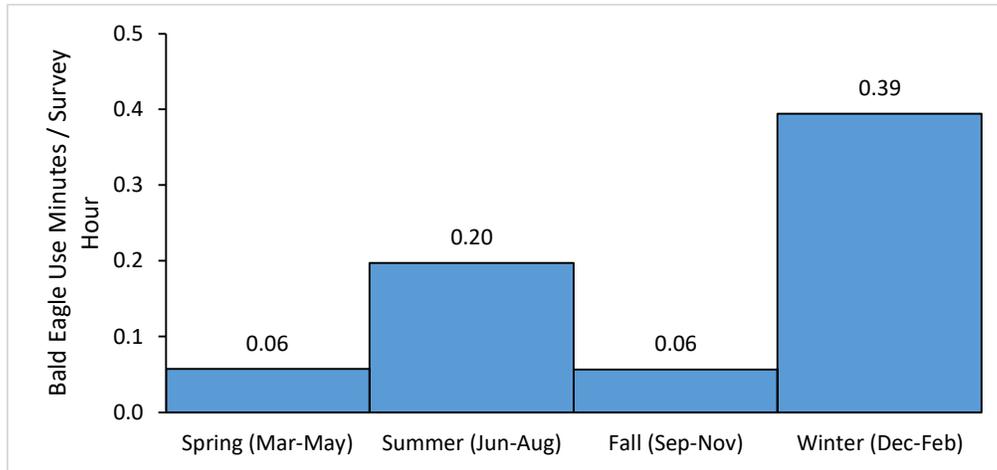
**Table 7. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by month, season, and overall, during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Month or Season	# Eagle Observations	# Eagle Use Minutes	Survey Hours	Eagle Minutes / Survey Hour	# Incidental Eagles
March	0	0	22	0.00	0
April	0	0	24	0.00	0
May	2	4	24	0.17	0
June	1	0	24	0.00	0
July	3	14	24	0.58	0
August	0	0	23	0.00	0
September	0	0	23	0.00	1
October	2	0	24	0.00	0
November	2	4	24	0.17	0
December	11	11	23	0.48	1
January	3	9	24	0.38	0
February	2	8	24	0.33	0
Spring (Mar-May)	2	4	70	0.06	0
Summer (Jun-Aug)	4	14	71	0.20	0
Fall (Sep-Nov)	4	4	71	0.06	1
Winter (Dec-Feb)	16	28	71	0.39	1
<b>All Seasons</b>	<b>26</b>	<b>50</b>	<b>283</b>	<b>0.18</b>	<b>2</b>

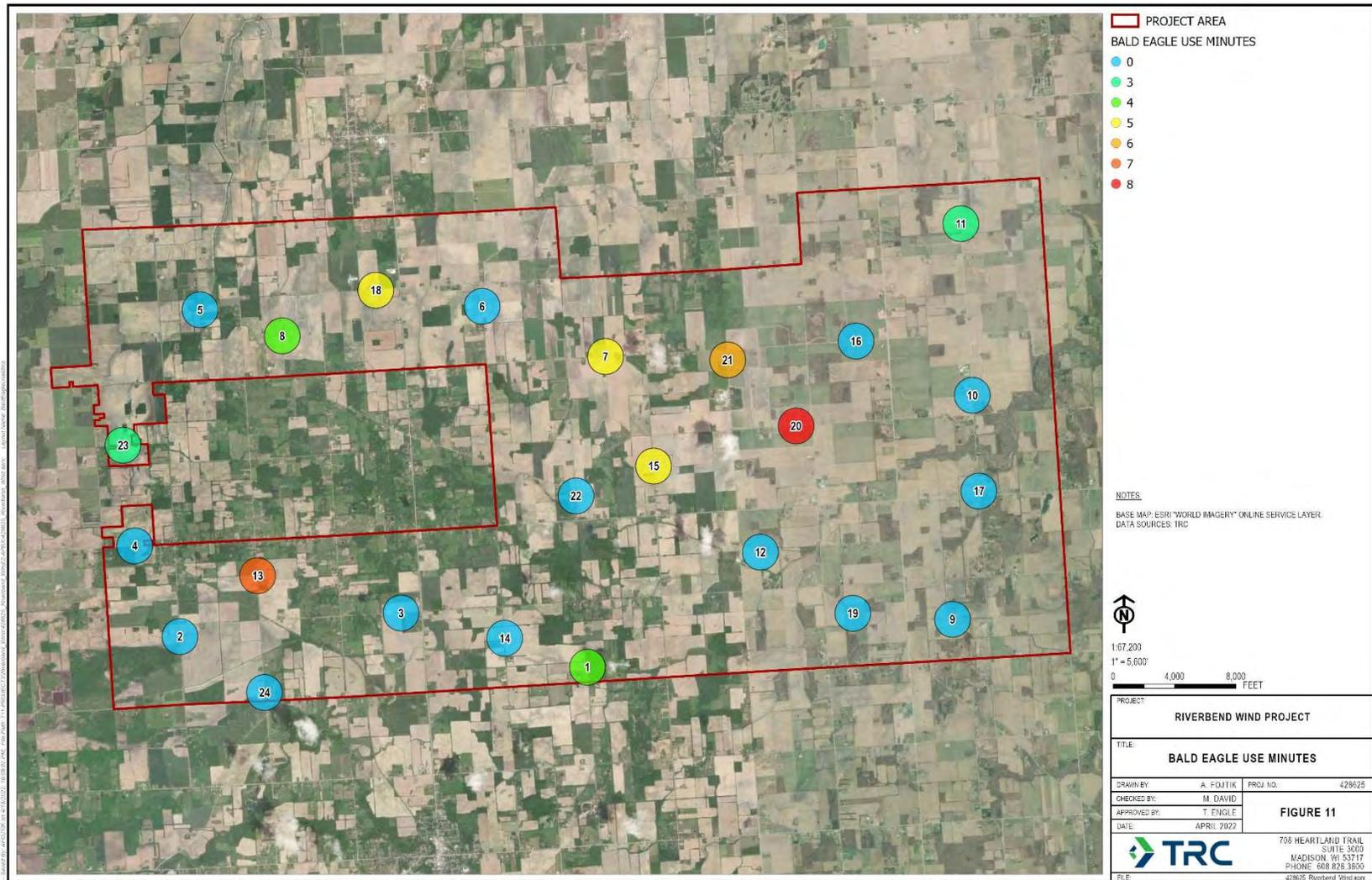


**Table 8. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Point	# Eagle Observations	# Eagle Use Minutes	Survey Hours	Eagle Minutes/Survey Hour
1	2	4	12	0.33
2	0	0	12	0.00
3	0	0	12	0.00
4	0	0	12	0.00
5	0	0	12	0.00
6	0	0	12	0.00
7	2	5	12	0.42
8	1	4	12	0.33
9	0	0	12	0.00
10	6	0	12	0.00
11	2	3	12	0.25
12	0	0	12	0.00
13	3	7	12	0.58
14	0	0	10	0.00
15	2	5	10	0.50
16	1	0	12	0.00
17	0	0	12	0.00
18	1	5	12	0.42
19	0	0	12	0.00
20	1	8	12	0.67
21	4	6	12	0.50
22	0	0	12	0.00
23	1	3	12	0.25
24	0	0	11	0.00
<b>Total</b>	<b>26</b>	<b>50</b>	<b>283</b>	<b>0.18</b>



**Figure 10. Bald eagle use minutes per survey hour by season during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**



**Figure 11. Map of bald eagle use minutes documented during the large bird use surveys in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

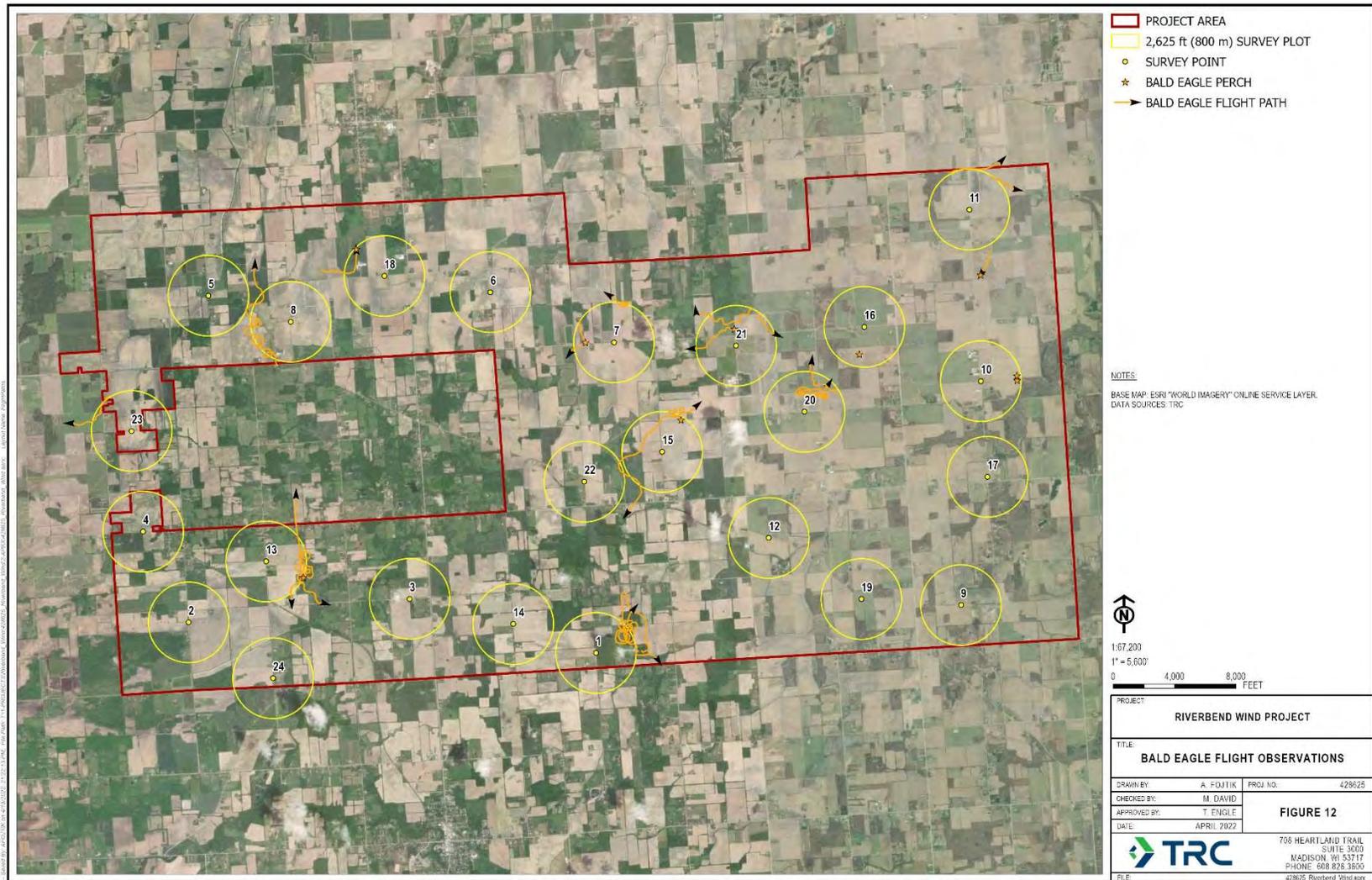


#### **4.5.4 Eagle Flight Paths and Perch Locations**

The eagle flight paths and perch locations documented during the Study are mapped in Figure 12.

Out of the 28 bald eagles observed during the study, including incidental observations, 15 observations (53.6%) included perching behavior, and 13 (46.4%) included only flight behaviors. Most flight paths included circling or direction changes; there were no apparent trends in overall flight directions.

Flight paths and perch locations were spread across most of the Project Area, but there were a few areas with a noticeably higher concentration. Six bald eagles were observed on the ground together east of point 10. This group was feeding on animal remains and were likely drawn to this temporary resource, though the area includes a forested riparian corridor which may have contributed to their presence. The other points with more than two observations were points 13 and 21. Land cover in these locations is more varied than in most of the Project Area and includes a patchwork of pasture/hay, forest, and woody wetland, with less cultivated crop cover.



**Figure 12. Map of bald eagle flight paths documented during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

## **5.0 Summary**

### **5.1 Large Bird Use Surveys**

In total, 283 60-minute large bird use surveys were conducted over 12 visits during the Study (Table 5).

During the surveys, 3,673 observations were recorded (Table B-1). The five most numerous large bird species observed during the surveys were, in order: mourning dove, rock pigeon, turkey vulture, Canada goose, and killdeer (Table B-1).

Twenty-four species were recorded during the surveys, and two others were observed incidentally (Table B-2).

Overall use recorded during the surveys was 12.98 (SE = 0.85) obs/plot/survey (Table B-3). Use was highest in fall, followed by spring, then summer, then winter (Figure 4). Use by point ranged from 5.92 (SE = 1.40) to 39.42 (SE = 9.77) obs/plot/survey (Table B-4).

### **5.2 Small Bird Use Surveys**

In total, 286 ten-minute surveys were conducted over 12 visits during the Year 1 surveys (Table 5). During the surveys, 6,899 observations were recorded (Table C-1). The five most numerous small bird species observed during the surveys were, in order: European starling, red-winged blackbird, American robin, horned lark, and barn swallow (Table C-1).

Forty-two species were recorded during the surveys, and one other was observed incidentally (Table C-2). Overall use recorded during the surveys was 24.12 (SE = 2.72) obs/plot/survey (Table C-3). Use was highest in fall, followed by winter, then spring, then summer (Figure 7).

### **5.3 Observations of Sensitive Species**

No federally or state listed threatened or endangered species were observed during the Study. There were four protected or non-listed state special concern species observed (Table 6).

### **5.4 Eagle Use**

For bald eagles, 50 use minutes were recorded during 26 survey observations; there were also two incidental observations (Table 7). Bald eagle use minutes per survey hour were highest in winter, then summer, then spring tied with fall (Table 7). Bald eagles were observed during surveys at 12 of the 24 survey points (Table 8).

No golden eagles were observed during the Study.

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**Attachment A. Weather data from each survey during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
1	1	3/17/2021	14 (57)	13 (55)	4 (9)	4 (8)	ENE	ENE	75-100	75-100	None	None
1	2	3/17/2021	12 (54)	9 (48)	4 (8)	6 (13)	ENE	ENE	75-100	75-100	None	None
1	3	3/17/2021	8 (46)	7 (45)	6 (13)	6 (14)	ENE	ENE	75-100	75-100	None	None
1	4	3/17/2021	6 (43)	4 (39)	6 (14)	4 (10)	NE	NE	75-100	75-100	None	None
1	5	3/18/2021	2 (36)	2 (36)	9 (20)	9 (20)	NE	NE	75-100	75-100	None	None
1	6	3/18/2021	2 (36)	3 (37)	9 (20)	9 (21)	NE	NNE	75-100	75-100	None	None
1	7	3/18/2021	2 (36)	3 (37)	9 (21)	10 (22)	NNE	NE	75-100	75-100	None	None
1	8	3/18/2021	3 (37)	4 (39)	11 (24)	11 (25)	NE	NE	75-100	75-100	None	None
1	9	3/18/2021	4 (39)	4 (39)	11 (25)	11 (24)	NNE	NNE	75-100	75-100	None	None
1	10	3/18/2021	5 (41)	4 (39)	11 (24)	11 (25)	NNE	NNE	75-100	75-100	None	None
1	11	3/18/2021	4 (39)	4 (39)	12 (26)	12 (26)	NNE	NNE	75-100	75-100	None	None
1	12	3/18/2021	2 (36)	2 (36)	12 (26)	13 (29)	N	N	75-100	75-100	None	None
1	13	3/18/2021	2 (36)	1 (34)	13 (29)	12 (26)	NNE	NNE	75-100	25-75	None	None
1	15	3/19/2021	-3 (27)	-1 (30)	8 (18)	8 (17)	NNE	NE	25-75	25-75	None	None
1	16	3/19/2021	0 (32)	2 (36)	8 (17)	7 (15)	NE	NE	25-75	25-75	None	None
1	17	3/19/2021	2 (36)	2 (36)	7 (15)	6 (14)	NE	NE	0-25	0-25	None	None
1	18	3/19/2021	7 (45)	6 (43)	4 (9)	3 (7)	NE	NE	0-25	0-25	None	None
1	19	3/19/2021	3 (37)	4 (39)	6 (13)	5 (12)	NE	NE	0-25	0-25	None	None
1	20	3/19/2021	4 (39)	4 (39)	5 (12)	4 (10)	NE	NE	0-25	0-25	None	None
1	21	3/19/2021	4 (39)	4 (39)	4 (10)	4 (10)	NNE	NNE	0-25	0-25	None	None
1	22	3/19/2021	6 (43)	6 (43)	4 (10)	4 (9)	NE	NE	0-25	0-25	None	None
1	23	3/19/2021	7 (45)	6 (43)	2 (5)	1 (2)	NE	ENE	0-25	0-25	None	None
2	1	4/8/2021	24 (75)	20 (68)	8 (17)	4 (8)	SSE	S	75-100	75-100	None	Rain
2	2	4/9/2021	13 (55)	14 (57)	4 (10)	6 (14)	S	S	75-100	75-100	None	None
2	3	4/9/2021	14 (57)	16 (61)	6 (14)	6 (13)	S	S	75-100	25-75	None	None
2	4	4/9/2021	18 (64)	19 (66)	6 (13)	7 (15)	S	S	25-75	25-75	None	None
2	5	4/9/2021	20 (68)	20 (68)	8 (18)	9 (21)	S	S	0-25	0-25	None	None
2	6	4/9/2021	21 (70)	21 (70)	9 (21)	10 (22)	S	S	25-75	25-75	None	None
2	7	4/9/2021	21 (70)	22 (72)	10 (22)	8 (18)	S	S	25-75	75-100	None	None
2	8	4/9/2021	21 (70)	21 (70)	10 (22)	9 (21)	S	SSE	25-75	25-75	None	None
2	9	4/9/2021	22 (72)	22 (72)	9 (21)	8 (18)	SSE	S	25-75	25-75	None	None
2	10	4/9/2021	22 (72)	20 (68)	4 (10)	6 (13)	S	S	75-100	75-100	None	None
2	11	4/10/2021	8 (46)	9 (48)	3 (6)	4 (8)	SSE	ESE	75-100	75-100	None	None
2	12	4/10/2021	13 (55)	16 (61)	4 (8)	3 (6)	ESE	SE	75-100	75-100	None	None
2	13	4/10/2021	17 (63)	18 (64)	3 (6)	3 (7)	ESE	ESE	25-75	25-75	None	None
2	14	4/10/2021	20 (68)	22 (72)	4 (8)	2 (5)	ESE	ESE	25-75	25-75	None	None
2	15	4/10/2021	22 (72)	22 (72)	2 (5)	4 (9)	ENE	ENE	25-75	25-75	None	None
2	16	4/10/2021	22 (72)	22 (72)	4 (9)	5 (12)	ENE	E	75-100	75-100	None	None
2	17	4/10/2021	22 (72)	20 (68)	6 (14)	5 (12)	E	E	75-100	75-100	None	None
2	18	4/10/2021	20 (68)	20 (68)	5 (12)	4 (8)	ESE	E	75-100	75-100	None	None
2	19	4/10/2021	18 (64)	18 (64)	4 (8)	3 (6)	E	E	75-100	75-100	None	None
2	20	4/11/2021	12 (54)	13 (55)	4 (9)	4 (8)	SSW	SSW	25-75	25-75	None	None
2	21	4/11/2021	12 (54)	13 (55)	4 (9)	4 (10)	SSW	SSW	25-75	25-75	None	None
2	22	4/11/2021	14 (57)	16 (61)	5 (12)	4 (9)	SW	SSW	25-75	25-75	None	None
2	23	4/11/2021	15 (59)	16 (61)	4 (9)	7 (16)	SSW	SSW	25-75	75-100	None	None
2	24	4/11/2021	17 (63)	17 (63)	7 (16)	6 (13)	SSW	S	25-75	25-75	None	None
3	1	5/13/2021	13 (55)	14 (57)	4 (8)	4 (10)	NNW	NW	0-25	0-25	None	None
3	2	5/13/2021	16 (61)	17 (63)	4 (10)	5 (12)	NW	NW	0-25	0-25	None	None
3	3	5/13/2021	17 (63)	18 (64)	5 (12)	5 (12)	NNW	NNW	0-25	0-25	None	None
3	4	5/13/2021	18 (64)	19 (66)	6 (13)	5 (12)	NW	NW	0-25	0-25	None	None
3	5	5/13/2021	19 (66)	19 (66)	5 (12)	5 (12)	N	NE	0-25	0-25	None	None
3	6	5/13/2021	19 (66)	18 (64)	5 (12)	6 (13)	E	E	0-25	0-25	None	None
3	7	5/13/2021	18 (64)	15 (59)	4 (10)	2 (5)	E	E	0-25	0-25	None	None
3	8	5/13/2021	17 (63)	15 (59)	2 (5)	3 (6)	E	ESE	0-25	0-25	None	None
3	9	5/14/2021	4 (39)	6 (43)	1 (3)	1 (3)	W	W	0-25	0-25	None	None
3	10	5/14/2021	7 (45)	11 (52)	2 (5)	4 (8)	W	W	0-25	0-25	None	None
3	11	5/14/2021	11 (52)	14 (57)	4 (8)	3 (6)	W	WNW	0-25	0-25	None	None
3	12	5/14/2021	14 (57)	18 (64)	3 (6)	4 (8)	WNW	NW	0-25	0-25	None	None
3	13	5/14/2021	20 (68)	20 (68)	2 (5)	3 (6)	NW	NW	0-25	0-25	None	None
3	14	5/14/2021	21 (70)	23 (73)	3 (6)	4 (10)	NW	NW	0-25	0-25	None	None
3	15	5/14/2021	21 (70)	23 (73)	4 (10)	3 (6)	E	E	25-75	25-75	None	None
3	16	5/14/2021	23 (73)	19 (66)	4 (9)	4 (8)	E	E	25-75	25-75	None	None
3	17	5/14/2021	20 (68)	20 (68)	4 (8)	3 (6)	E	SE	25-75	25-75	None	None
3	18	5/14/2021	20 (68)	19 (66)	3 (6)	3 (6)	SE	SE	25-75	25-75	None	None
3	22	5/14/2021	19 (66)	18 (64)	1 (2)	1 (2)	SE	SE	0-25	0-25	None	None
3	19	5/15/2021	5 (41)	9 (48)	3 (6)	0 (0)	W	WSW	0-25	0-25	None	None
3	20	5/15/2021	10 (50)	14 (57)	1 (3)	3 (6)	W	W	0-25	0-25	None	None
3	21	5/15/2021	17 (63)	19 (66)	3 (6)	1 (3)	W	W	0-25	0-25	None	None
3	23	5/15/2021	20 (68)	21 (70)	1 (3)	2 (5)	W	W	0-25	0-25	None	None
3	24	5/15/2021	22 (72)	22 (72)	4 (10)	4 (8)	W	WSW	25-75	25-75	None	None

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
4	1	6/14/2021	22 (72)	20 (68)	5 (12)	4 (10)	NNW	NNW	25-75	25-75	None	None
4	2	6/14/2021	20 (68)	19 (66)	4 (10)	4 (8)	NNW	NNE	25-75	25-75	None	None
4	3	6/14/2021	19 (66)	19 (66)	4 (9)	4 (9)	N	NW	25-75	25-75	None	None
4	4	6/14/2021	22 (72)	20 (68)	4 (9)	3 (6)	N	NNW	0-25	0-25	None	None
4	5	6/15/2021	15 (59)	17 (63)	8 (17)	8 (18)	NNW	N	25-75	25-75	None	None
4	6	6/15/2021	17 (63)	18 (64)	8 (18)	9 (21)	N	N	0-25	0-25	None	None
4	7	6/15/2021	18 (64)	19 (66)	9 (21)	8 (18)	N	N	0-25	0-25	None	None
4	8	6/15/2021	21 (70)	22 (72)	9 (20)	11 (25)	N	N	0-25	0-25	None	None
4	9	6/15/2021	22 (72)	22 (72)	11 (25)	11 (25)	N	N	0-25	25-75	None	None
4	10	6/15/2021	22 (72)	21 (70)	10 (23)	10 (22)	N	N	25-75	25-75	None	None
4	11	6/15/2021	21 (70)	20 (68)	10 (22)	9 (21)	N	NNE	25-75	25-75	None	None
4	12	6/15/2021	22 (72)	21 (70)	9 (21)	9 (20)	N	NNE	25-75	25-75	None	None
4	13	6/15/2021	20 (68)	19 (66)	7 (16)	6 (13)	NNE	NNE	25-75	25-75	None	None
4	14	6/15/2021	17 (63)	14 (57)	6 (13)	5 (12)	NNE	N	25-75	25-75	None	None
4	15	6/16/2021	7 (45)	11 (52)	3 (6)	3 (6)	N	NNE	25-75	25-75	None	None
4	16	6/16/2021	13 (55)	14 (57)	3 (6)	4 (8)	NE	NE	25-75	25-75	None	None
4	17	6/16/2021	16 (61)	18 (64)	3 (7)	3 (6)	N	NNE	25-75	25-75	None	None
4	18	6/16/2021	20 (68)	20 (68)	3 (6)	5 (12)	NNW	NNW	25-75	0-25	None	None
4	19	6/16/2021	20 (68)	21 (70)	5 (12)	7 (15)	NNW	NNW	0-25	0-25	None	None
4	20	6/16/2021	21 (70)	23 (73)	7 (15)	7 (16)	ENE	NE	0-25	0-25	None	None
4	21	6/16/2021	23 (73)	22 (72)	7 (16)	6 (14)	NE	NE	0-25	0-25	None	None
4	22	6/16/2021	22 (72)	20 (68)	6 (14)	6 (13)	NE	NE	0-25	0-25	None	None
4	23	6/16/2021	24 (75)	23 (73)	6 (13)	4 (10)	N	NNE	0-25	0-25	None	None
4	24	6/16/2021	19 (66)	18 (64)	4 (10)	3 (7)	E	ESE	0-25	0-25	None	None
5	1	7/13/2021	24 (75)	24 (75)	3 (6)	5 (12)	SSW	SSW	75-100	75-100	None	None
5	2	7/13/2021	24 (75)	23 (73)	6 (13)	4 (8)	SSW	SW	75-100	75-100	None	Drizzle
5	3	7/13/2021	22 (72)	21 (70)	4 (8)	1 (2)	SW	SW	75-100	75-100	None	None
5	4	7/13/2021	21 (70)	21 (70)	1 (2)	1 (3)	SW	SW	75-100	75-100	None	None
5	5	7/14/2021	18 (64)	19 (66)	4 (8)	3 (6)	W	W	25-75	0-25	None	None
5	6	7/14/2021	19 (66)	22 (72)	1 (3)	3 (7)	W	W	0-25	0-25	None	None
5	7	7/14/2021	22 (72)	23 (73)	3 (7)	3 (7)	WSW	WSW	0-25	0-25	None	None
5	8	7/14/2021	26 (79)	27 (81)	3 (7)	3 (7)	W	W	0-25	25-75	None	None
5	9	7/14/2021	26 (79)	27 (81)	3 (7)	3 (7)	W	WSW	25-75	25-75	None	None
5	10	7/14/2021	28 (82)	28 (82)	3 (7)	4 (8)	W	SW	25-75	25-75	None	None
5	11	7/14/2021	29 (84)	29 (84)	4 (8)	4 (9)	S	S	25-75	25-75	None	None
5	12	7/14/2021	29 (84)	28 (82)	5 (12)	5 (12)	SW	SW	25-75	25-75	None	None
5	13	7/14/2021	27 (81)	27 (81)	5 (12)	3 (7)	SW	SW	25-75	25-75	None	None
5	14	7/14/2021	27 (81)	26 (79)	3 (7)	3 (7)	SW	SW	25-75	25-75	None	None
5	15	7/15/2021	21 (70)	22 (72)	5 (12)	7 (15)	SSW	S	25-75	25-75	None	None
5	16	7/15/2021	22 (72)	23 (73)	7 (15)	7 (16)	S	SSW	25-75	25-75	None	None
5	17	7/15/2021	24 (75)	27 (81)	7 (16)	7 (15)	SSW	SSW	25-75	25-75	None	None
5	18	7/15/2021	27 (81)	27 (81)	7 (15)	5 (12)	SSW	SW	25-75	25-75	None	None
5	19	7/15/2021	26 (79)	26 (79)	5 (12)	6 (13)	SW	SW	25-75	25-75	None	None
5	20	7/15/2021	28 (82)	27 (81)	6 (14)	6 (14)	SW	SW	25-75	25-75	None	None
5	21	7/15/2021	27 (81)	27 (81)	6 (14)	6 (14)	SW	SW	25-75	25-75	None	None
5	22	7/15/2021	26 (79)	26 (79)	6 (14)	7 (16)	SW	SW	25-75	25-75	None	None
5	23	7/15/2021	24 (75)	24 (75)	7 (15)	4 (9)	WSW	W	25-75	25-75	None	None
5	24	7/15/2021	24 (75)	24 (75)	4 (9)	5 (12)	W	W	25-75	25-75	None	None
6	1	8/15/2021	24 (75)	25 (77)	4 (9)	4 (9)	ESE	ESE	25-75	25-75	None	None
6	2	8/15/2021	26 (79)	26 (79)	4 (9)	4 (8)	ESE	ENE	25-75	0-25	None	None
6	3	8/15/2021	26 (79)	24 (75)	4 (8)	3 (7)	ENE	ENE	0-25	0-25	None	None
6	4	8/15/2021	24 (75)	24 (75)	2 (5)	2 (5)	ENE	E	0-25	0-25	None	None
6	5	8/16/2021	13 (55)	14 (57)	1 (2)	2 (5)	E	ENE	25-75	0-25	None	None
6	6	8/16/2021	14 (57)	17 (63)	2 (5)	3 (6)	ENE	ENE	25-75	25-75	None	None
6	7	8/16/2021	17 (63)	21 (70)	3 (6)	2 (5)	ENE	ENE	25-75	25-75	None	None
6	8	8/16/2021	21 (70)	22 (72)	4 (9)	3 (7)	E	E	25-75	25-75	None	None
6	9	8/16/2021	22 (72)	23 (73)	3 (7)	3 (7)	ENE	ENE	25-75	25-75	None	None
6	10	8/16/2021	23 (73)	23 (73)	3 (7)	3 (7)	ENE	ENE	25-75	25-75	None	None
6	11	8/16/2021	23 (73)	24 (75)	3 (7)	1 (3)	ENE	E	25-75	75-100	None	None
6	12	8/16/2021	21 (70)	22 (72)	2 (5)	1 (3)	SE	SE	75-100	75-100	Drizzle	None
6	13	8/16/2021	21 (70)	22 (72)	2 (5)	3 (6)	SE	ESE	75-100	25-75	None	None
6	14	8/16/2021	22 (72)	22 (72)	1 (2)	1 (2)	ESE	E	25-75	25-75	None	None
6	15	8/16/2021	22 (72)	20 (68)	1 (2)	2 (5)	E	E	25-75	25-75	None	None
6	16	8/17/2021	15 (59)	16 (61)	2 (5)	2 (5)	NNW	WNW	25-75	25-75	None	None
6	17	8/17/2021	16 (61)	18 (64)	2 (5)	4 (8)	WNW	NW	25-75	25-75	None	None
6	18	8/17/2021	18 (64)	20 (68)	4 (9)	4 (8)	NW	WNW	25-75	25-75	None	None
6	19	8/17/2021	23 (73)	24 (75)	2 (5)	3 (7)	NE	E	25-75	25-75	None	None
6	20	8/17/2021	24 (75)	25 (77)	3 (7)	4 (8)	E	W	25-75	25-75	None	None
6	21	8/17/2021	26 (79)	27 (81)	4 (8)	3 (6)	E	W	25-75	25-75	None	None
6	22	8/17/2021	27 (81)	28 (82)	3 (6)	2 (5)	W	SW	25-75	0-25	None	None
6	23	8/17/2021	28 (82)	28 (82)	4 (8)	3 (7)	SW	ESE	0-25	0-25	None	None
6	24	8/17/2021	27 (81)	25 (77)	3 (7)	3 (7)	ESE	ESE	25-75	0-25	None	None

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
7	1	9/14/2021	27 (81)	28 (82)	6 (13)	9 (20)	SSW	SSW	75-100	75-100	None	None
7	2	9/14/2021	28 (82)	29 (84)	9 (20)	10 (23)	SSW	SW	75-100	75-100	None	None
7	3	9/14/2021	29 (84)	29 (84)	9 (21)	7 (16)	SW	SW	75-100	75-100	None	Rain
7	4	9/14/2021	24 (75)	23 (73)	7 (16)	7 (15)	WSW	SW	75-100	75-100	None	None
7	5	9/14/2021	23 (73)	23 (73)	7 (15)	3 (7)	SW	WSW	75-100	75-100	None	None
7	6	9/15/2021	15 (59)	15 (59)	4 (8)	2 (5)	W	W	25-75	25-75	None	None
7	7	9/15/2021	16 (61)	18 (64)	3 (6)	4 (8)	W	WNW	25-75	25-75	None	None
7	8	9/15/2021	18 (64)	19 (66)	4 (8)	4 (8)	W	WNW	25-75	25-75	None	None
7	9	9/15/2021	20 (68)	21 (70)	4 (8)	3 (6)	S	W	75-100	25-75	None	None
7	10	9/15/2021	23 (73)	23 (73)	3 (7)	0 (0)	NW	NW	75-100	75-100	None	None
7	11	9/15/2021	23 (73)	23 (73)	0 (0)	4 (8)	NW	E	25-75	25-75	None	None
7	12	9/15/2021	23 (73)	23 (73)	4 (8)	3 (7)	NW	NW	25-75	25-75	None	None
7	13	9/15/2021	22 (72)	22 (72)	4 (8)	3 (7)	NW	NW	25-75	25-75	None	None
7	14	9/15/2021	22 (72)	21 (70)	3 (7)	4 (10)	NNW	NNW	25-75	25-75	None	None
7	15	9/15/2021	20 (68)	19 (66)	4 (10)	3 (6)	NNW	NW	25-75	25-75	None	None
7	16	9/16/2021	11 (52)	12 (54)	2 (5)	2 (5)	ESE	ESE	25-75	25-75	None	None
7	17	9/16/2021	12 (54)	14 (57)	2 (5)	4 (9)	ESE	SE	25-75	25-75	None	None
7	18	9/16/2021	17 (63)	17 (63)	3 (6)	2 (5)	SE	SE	25-75	25-75	None	None
7	19	9/16/2021	23 (73)	23 (73)	4 (9)	2 (5)	SE	ESE	25-75	25-75	None	None
7	20	9/16/2021	24 (75)	24 (75)	2 (5)	3 (6)	SE	ESE	25-75	25-75	None	None
7	21	9/16/2021	24 (75)	24 (75)	4 (10)	2 (5)	S	S	25-75	25-75	None	None
7	22	9/16/2021	26 (79)	26 (79)	3 (7)	4 (10)	S	S	25-75	25-75	None	None
7	23	9/16/2021	26 (79)	24 (75)	1 (3)	6 (13)	SE	SSE	25-75	25-75	None	None
7	24	9/16/2021	24 (75)	24 (75)	6 (13)	4 (9)	SSE	SE	25-75	25-75	None	None
8	1	10/12/2021	21 (70)	21 (70)	7 (15)	8 (18)	SW	SW	75-100	75-100	None	None
8	2	10/12/2021	21 (70)	20 (68)	8 (18)	8 (17)	SW	SW	75-100	75-100	None	None
8	3	10/12/2021	20 (68)	20 (68)	8 (17)	6 (13)	SW	SW	75-100	75-100	None	None
8	4	10/12/2021	20 (68)	20 (68)	6 (13)	4 (9)	SW	SW	75-100	75-100	None	None
8	5	10/13/2021	16 (61)	16 (61)	3 (7)	3 (6)	WSW	WSW	0-25	0-25	None	None
8	6	10/13/2021	17 (63)	18 (64)	3 (7)	4 (9)	WSW	WSW	0-25	0-25	None	None
8	7	10/13/2021	18 (64)	19 (66)	4 (9)	4 (8)	SW	SW	0-25	0-25	None	None
8	8	10/13/2021	19 (66)	21 (70)	6 (14)	5 (12)	SW	SW	0-25	25-75	None	None
8	9	10/13/2021	21 (70)	21 (70)	5 (12)	4 (9)	SW	SW	25-75	25-75	None	None
8	10	10/13/2021	21 (70)	22 (72)	4 (9)	5 (12)	SW	SW	25-75	25-75	None	None
8	11	10/13/2021	22 (72)	22 (72)	4 (8)	3 (6)	SW	SW	25-75	25-75	None	None
8	12	10/13/2021	22 (72)	20 (68)	3 (6)	2 (5)	SW	SW	25-75	0-25	None	None
8	13	10/14/2021	17 (63)	17 (63)	4 (8)	3 (7)	S	SSW	75-100	75-100	None	None
8	14	10/14/2021	18 (64)	19 (66)	4 (8)	4 (8)	S	S	75-100	75-100	None	None
8	15	10/14/2021	20 (68)	22 (72)	4 (8)	4 (9)	S	SSW	75-100	25-75	None	None
8	16	10/14/2021	22 (72)	23 (73)	4 (10)	4 (10)	SSW	SSW	75-100	75-100	None	None
8	17	10/14/2021	23 (73)	24 (75)	4 (10)	5 (12)	SSW	SW	25-75	25-75	None	None
8	18	10/14/2021	25 (77)	25 (77)	4 (9)	5 (12)	SW	SW	25-75	25-75	None	None
8	19	10/14/2021	25 (77)	23 (73)	4 (10)	3 (7)	SW	WSW	75-100	75-100	None	None
8	20	10/14/2021	22 (72)	22 (72)	3 (7)	4 (10)	WSW	WSW	75-100	75-100	None	Rain
8	21	10/15/2021	13 (55)	14 (57)	3 (6)	3 (6)	SE	E	75-100	75-100	Drizzle	Drizzle
8	22	10/15/2021	14 (57)	14 (57)	2 (5)	0 (0)	E	WSW	75-100	75-100	Drizzle	Drizzle
8	23	10/15/2021	15 (59)	15 (59)	1 (2)	1 (3)	E	N	75-100	75-100	Drizzle	Drizzle
8	24	10/15/2021	14 (57)	14 (57)	1 (2)	1 (3)	N	NE	75-100	75-100	Drizzle	None
9	1	11/15/2021	2 (36)	2 (36)	6 (14)	6 (14)	WNW	WNW	75-100	75-100	None	None
9	2	11/15/2021	3 (37)	4 (39)	6 (14)	6 (14)	WNW	W	75-100	25-75	None	None
9	3	11/15/2021	4 (39)	4 (39)	6 (14)	7 (15)	W	W	25-75	25-75	None	None
9	4	11/15/2021	4 (39)	4 (39)	6 (13)	7 (15)	W	W	75-100	75-100	None	None
9	5	11/15/2021	3 (37)	3 (37)	7 (15)	4 (10)	W	W	25-75	25-75	None	None
9	6	11/16/2021	-2 (28)	0 (32)	1 (3)	3 (7)	W	W	25-75	25-75	None	None
9	7	11/16/2021	0 (32)	1 (34)	3 (7)	3 (6)	W	WNW	25-75	25-75	None	None
9	8	11/16/2021	1 (34)	3 (37)	3 (6)	3 (7)	W	W	25-75	25-75	None	None
9	9	11/16/2021	3 (37)	4 (39)	1 (3)	0 (0)	W	W	25-75	25-75	None	None
9	10	11/16/2021	5 (41)	6 (43)	0 (0)	1 (2)	S	S	25-75	25-75	None	None
9	11	11/16/2021	6 (43)	6 (43)	1 (2)	2 (5)	S	SE	25-75	25-75	None	None
9	13	11/16/2021	6 (43)	5 (41)	1 (2)	1 (3)	SSW	SSE	25-75	75-100	None	None
9	14	11/17/2021	8 (46)	8 (46)	5 (12)	4 (10)	S	S	75-100	75-100	Drizzle	Drizzle
9	15	11/17/2021	10 (50)	12 (54)	4 (9)	4 (9)	S	SSW	75-100	75-100	None	Drizzle
9	16	11/17/2021	12 (54)	13 (55)	4 (10)	5 (12)	SSW	SSW	75-100	75-100	Drizzle	None
9	17	11/17/2021	13 (55)	14 (57)	6 (14)	8 (17)	SSW	SSW	75-100	75-100	None	None
9	18	11/17/2021	14 (57)	15 (59)	8 (17)	7 (16)	SSW	SW	75-100	75-100	None	None
9	19	11/17/2021	15 (59)	15 (59)	7 (16)	6 (14)	SW	SSW	75-100	75-100	None	None
9	20	11/17/2021	16 (61)	14 (57)	7 (16)	8 (17)	SSW	SSW	75-100	75-100	Drizzle	None
9	12	11/18/2021	4 (39)	3 (37)	5 (12)	7 (15)	W	W	75-100	75-100	None	None
9	21	11/18/2021	3 (37)	2 (36)	4 (10)	4 (9)	WNW	W	75-100	75-100	None	None
9	22	11/18/2021	3 (37)	4 (39)	4 (9)	3 (7)	W	W	75-100	75-100	None	None
9	23	11/18/2021	4 (39)	4 (39)	3 (7)	4 (8)	W	W	75-100	25-75	None	None
9	24	11/18/2021	4 (39)	4 (39)	8 (17)	5 (12)	W	W	25-75	75-100	None	None

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
10	1	12/14/2021	-1 (30)	2 (36)	3 (6)	2 (5)	E	ESE	25-75	75-100	None	None
10	2	12/14/2021	3 (37)	5 (41)	2 (5)	3 (6)	ESE	E	25-75	25-75	None	None
10	3	12/14/2021	5 (41)	7 (45)	3 (6)	6 (13)	E	ESE	25-75	25-75	None	None
10	4	12/14/2021	6 (43)	7 (45)	6 (13)	4 (10)	E	ESE	25-75	25-75	None	None
10	5	12/14/2021	7 (45)	7 (45)	4 (10)	4 (8)	ESE	ESE	25-75	25-75	None	None
10	6	12/14/2021	7 (45)	7 (45)	5 (12)	4 (10)	ESE	ESE	25-75	25-75	None	None
10	7	12/14/2021	7 (45)	5 (41)	4 (10)	4 (9)	ESE	SE	25-75	25-75	None	None
10	8	12/15/2021	6 (43)	6 (43)	6 (14)	7 (16)	S	S	75-100	75-100	None	None
10	9	12/15/2021	7 (45)	7 (45)	6 (14)	7 (16)	S	S	75-100	75-100	None	None
10	10	12/15/2021	7 (45)	8 (46)	7 (16)	7 (16)	S	S	75-100	75-100	None	None
10	11	12/15/2021	9 (48)	10 (50)	7 (16)	7 (16)	S	S	75-100	75-100	None	None
10	12	12/15/2021	8 (46)	9 (48)	7 (16)	7 (16)	SSE	S	75-100	75-100	None	None
10	13	12/15/2021	10 (50)	11 (52)	6 (14)	6 (14)	S	S	75-100	75-100	None	None
10	14	12/15/2021	11 (52)	11 (52)	6 (14)	6 (13)	SSW	SSW	75-100	75-100	None	None
10	15	12/16/2021	14 (57)	14 (57)	13 (28)	15 (33)	SSW	SW	75-100	75-100	None	None
10	16	12/16/2021	14 (57)	15 (59)	15 (33)	13 (30)	SW	SW	75-100	75-100	None	None
10	17	12/16/2021	15 (59)	16 (61)	13 (30)	12 (26)	SW	SW	25-75	25-75	None	None
10	18	12/16/2021	17 (63)	15 (59)	13 (30)	11 (25)	SW	WSW	25-75	75-100	None	None
10	19	12/16/2021	17 (63)	15 (59)	12 (26)	11 (25)	WSW	WSW	75-100	75-100	None	None
10	20	12/16/2021	15 (59)	14 (57)	10 (22)	7 (16)	WSW	SW	75-100	25-75	None	None
10	21	12/16/2021	14 (57)	12 (54)	7 (16)	9 (21)	WSW	WSW	25-75	25-75	None	None
10	22	12/17/2021	-1 (30)	-1 (30)	3 (7)	4 (8)	WNW	WNW	25-75	25-75	None	None
10	23	12/17/2021	0 (32)	1 (34)	4 (9)	4 (10)	WNW	WNW	25-75	25-75	None	None
10	24	12/17/2021	1 (34)	2 (36)	4 (10)	2 (5)	WNW	WNW	25-75	25-75	None	None
11	1	1/10/2022	-10 (14)	-10 (14)	1 (3)	1 (2)	WNW	WNW	75-100	75-100	None	None
11	2	1/10/2022	-10 (14)	-10 (14)	1 (2)	0 (0)	WNW	WNW	75-100	75-100	None	None
11	3	1/10/2022	-10 (14)	-11 (12)	0 (0)	1 (3)	WNW	WNW	75-100	75-100	None	None
11	4	1/11/2022	-15 (5)	-14 (7)	3 (7)	2 (5)	WSW	SW	25-75	25-75	None	None
11	5	1/11/2022	-14 (7)	-12 (10)	2 (5)	6 (13)	SW	SSW	25-75	75-100	None	None
11	6	1/11/2022	-12 (10)	-11 (12)	4 (10)	4 (8)	SSW	SSW	75-100	75-100	None	None
11	7	1/11/2022	-9 (16)	-8 (18)	4 (8)	5 (12)	SSW	SSW	75-100	75-100	None	None
11	8	1/11/2022	-9 (16)	-8 (18)	5 (12)	4 (10)	SSW	SSW	25-75	25-75	None	None
11	9	1/11/2022	-8 (18)	-8 (18)	6 (13)	5 (12)	S	SSW	25-75	25-75	None	None
11	10	1/11/2022	-8 (18)	-8 (18)	5 (12)	5 (12)	S	S	25-75	75-100	None	None
11	11	1/12/2022	-1 (30)	-1 (30)	7 (15)	5 (12)	W	W	75-100	75-100	None	None
11	12	1/12/2022	0 (32)	1 (34)	5 (12)	6 (13)	W	W	75-100	75-100	None	None
11	13	1/12/2022	1 (34)	1 (34)	6 (13)	7 (15)	W	W	75-100	75-100	None	None
11	14	1/12/2022	1 (34)	1 (34)	7 (15)	6 (14)	W	W	75-100	75-100	None	None
11	15	1/12/2022	1 (34)	2 (36)	7 (15)	7 (15)	W	W	75-100	75-100	None	None
11	16	1/12/2022	2 (36)	2 (36)	6 (14)	7 (15)	W	W	75-100	75-100	None	None
11	17	1/12/2022	2 (36)	1 (34)	7 (15)	6 (13)	W	NW	75-100	75-100	None	None
11	18	1/13/2022	-2 (28)	-2 (28)	7 (15)	5 (12)	NNE	NNE	75-100	75-100	None	None
11	19	1/13/2022	-1 (30)	-1 (30)	6 (13)	6 (14)	NNE	NNE	75-100	75-100	None	None
11	20	1/13/2022	0 (32)	0 (32)	6 (13)	7 (16)	NE	NE	75-100	75-100	None	None
11	21	1/13/2022	0 (32)	0 (32)	7 (15)	7 (16)	NE	ENE	75-100	75-100	None	None
11	22	1/13/2022	0 (32)	0 (32)	7 (16)	7 (16)	ENE	N	75-100	75-100	None	None
11	23	1/13/2022	1 (34)	1 (34)	6 (13)	6 (13)	N	N	75-100	75-100	None	None
11	24	1/13/2022	1 (34)	0 (32)	6 (13)	4 (10)	NNW	N	75-100	75-100	None	None
12	1	2/15/2022	-2 (28)	-5 (23)	6 (14)	7 (15)	SE	SE	75-100	75-100	None	None
12	2	2/16/2022	2 (36)	3 (37)	12 (26)	10 (23)	SSW	SSW	75-100	75-100	None	None
12	3	2/16/2022	5 (41)	7 (45)	9 (20)	9 (20)	SSW	SSW	75-100	75-100	None	None
12	4	2/16/2022	7 (45)	8 (46)	9 (20)	8 (18)	SSW	S	75-100	75-100	None	None
12	5	2/16/2022	8 (46)	9 (48)	8 (17)	8 (18)	S	SSW	75-100	75-100	None	None
12	6	2/16/2022	9 (48)	10 (50)	8 (17)	7 (15)	SSW	SSW	75-100	75-100	None	None
12	7	2/16/2022	11 (52)	11 (52)	9 (20)	11 (24)	SSW	SSW	75-100	75-100	None	None
12	8	2/16/2022	10 (50)	10 (50)	10 (22)	10 (23)	SSW	SSW	75-100	75-100	None	None
12	9	2/16/2022	10 (50)	9 (48)	8 (18)	6 (13)	SSW	SSW	75-100	75-100	Drizzle	Rain
12	10	2/17/2022	2 (36)	0 (32)	1 (2)	2 (5)	NNE	NNE	75-100	75-100	Rain	None
12	11	2/17/2022	0 (32)	-1 (30)	1 (3)	1 (3)	NNE	N	75-100	75-100	None	None
12	12	2/17/2022	-1 (30)	-2 (28)	1 (3)	1 (3)	N	N	75-100	75-100	None	Drizzle
12	13	2/17/2022	-2 (28)	-2 (28)	1 (3)	2 (5)	N	N	75-100	75-100	None	None
12	14	2/17/2022	-2 (28)	-2 (28)	2 (5)	3 (6)	N	N	75-100	75-100	Drizzle	Snow
12	15	2/17/2022	-2 (28)	-3 (27)	3 (7)	4 (8)	N	N	75-100	75-100	Snow	Snow
12	16	2/17/2022	-3 (27)	-4 (25)	4 (8)	4 (8)	N	N	75-100	75-100	Snow	Snow
12	17	2/18/2022	-13 (9)	-13 (9)	4 (9)	4 (8)	WNW	WNW	25-75	25-75	None	None
12	18	2/18/2022	-12 (10)	-11 (12)	3 (6)	4 (8)	WNW	WNW	25-75	25-75	None	None
12	19	2/18/2022	-9 (16)	-9 (16)	4 (8)	4 (9)	WNW	WNW	25-75	25-75	None	None
12	20	2/18/2022	-8 (18)	-8 (18)	4 (9)	4 (9)	WNW	W	25-75	25-75	None	None
12	21	2/18/2022	-7 (19)	-6 (21)	3 (6)	4 (8)	WSW	SW	25-75	25-75	None	None
12	22	2/18/2022	-7 (19)	-6 (21)	4 (10)	6 (13)	SW	SW	0-25	25-75	None	None
12	23	2/18/2022	-6 (21)	-6 (21)	4 (10)	6 (13)	SW	SW	25-75	75-100	None	None
12	24	2/18/2022	-6 (21)	-7 (19)	5 (12)	6 (14)	SSW	S	25-75	25-75	None	None



**Attachment B. Data tables of large birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Table B-1. Group counts, observation counts, and relative abundance, by season, for each species and family observed during the large bird use surveys in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Spring: Mar–May			Summer: Jun–Aug			Fall: Sep–Nov			Winter: Dec–Feb			All Seasons		
			# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	27	80	10.0	3	28	3.8	15	112	8.0	10	91	12.6	55	311	8.5
	Wood Duck	<i>Aix sponsa</i>	1	2	0.2	0	0	0.0	0	0	0.0	0	0	0.0	1	2	0.1
	Mallard	<i>Anas platyrhynchos</i>	4	16	2.0	1	2	0.3	0	0	0.0	0	0	0.0	5	18	0.5
	<b>Family Subtotal:</b>		<b>32</b>	<b>98</b>	<b>12.2</b>	<b>4</b>	<b>30</b>	<b>4.0</b>	<b>15</b>	<b>112</b>	<b>8.0</b>	<b>10</b>	<b>91</b>	<b>12.6</b>	<b>61</b>	<b>331</b>	<b>9.0</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	9	44	5.5	8	17	2.3	3	21	1.5	6	48	6.7	26	130	3.5
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	3	4	0.5	4	8	1.1	1	2	0.1	0	0	0.0	8	14	0.4
	<b>Family Subtotal:</b>		<b>12</b>	<b>48</b>	<b>6.0</b>	<b>12</b>	<b>25</b>	<b>3.4</b>	<b>4</b>	<b>23</b>	<b>1.6</b>	<b>6</b>	<b>48</b>	<b>6.7</b>	<b>34</b>	<b>144</b>	<b>3.9</b>
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	31	85	10.6	19	61	8.2	39	321	22.8	39	269	37.4	128	736	20.0
	Mourning Dove	<i>Zenaida macroura</i>	55	81	10.1	148	347	46.5	207	690	49.1	76	231	32.1	486	1349	36.7
	<b>Family Subtotal:</b>		<b>86</b>	<b>166</b>	<b>20.7</b>	<b>167</b>	<b>408</b>	<b>54.7</b>	<b>246</b>	<b>1011</b>	<b>71.9</b>	<b>115</b>	<b>500</b>	<b>69.4</b>	<b>614</b>	<b>2085</b>	<b>56.8</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	3	49	6.1	6	35	4.7	2	6	0.4	0	0	0.0	11	90	2.5
	<b>Family Subtotal:</b>		<b>3</b>	<b>49</b>	<b>6.1</b>	<b>6</b>	<b>35</b>	<b>4.7</b>	<b>2</b>	<b>6</b>	<b>0.4</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>11</b>	<b>90</b>	<b>2.5</b>
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	73	108	13.5	46	51	6.8	17	25	1.8	0	0	0.0	136	184	5.0
	<b>Family Subtotal:</b>		<b>73</b>	<b>108</b>	<b>13.5</b>	<b>46</b>	<b>51</b>	<b>6.8</b>	<b>17</b>	<b>25</b>	<b>1.8</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>136</b>	<b>184</b>	<b>5.0</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	0	0	0.0	0	0	0.0	2	6	0.4	0	0	0.0	2	6	0.2
	Herring Gull	<i>Larus argentatus</i>	6	9	1.1	0	0	0.0	1	3	0.2	0	0	0.0	7	12	0.3
	<b>Family Subtotal:</b>		<b>6</b>	<b>9</b>	<b>1.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>3</b>	<b>9</b>	<b>0.6</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>9</b>	<b>18</b>	<b>0.5</b>
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	3	3	0.4	4	4	0.5	3	3	0.2	0	0	0.0	10	10	0.3
	Green Heron	<i>Butorides virescens</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.0
	<b>Family Subtotal:</b>		<b>4</b>	<b>4</b>	<b>0.5</b>	<b>4</b>	<b>4</b>	<b>0.5</b>	<b>3</b>	<b>3</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>11</b>	<b>11</b>	<b>0.3</b>
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	170	281	35.1	89	143	19.2	85	150	10.7	0	0	0.0	344	574	15.6
	<b>Family Subtotal:</b>		<b>170</b>	<b>281</b>	<b>35.1</b>	<b>89</b>	<b>143</b>	<b>19.2</b>	<b>85</b>	<b>150</b>	<b>10.7</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>344</b>	<b>574</b>	<b>15.6</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	0	0	0.0	0	0	0.0	1	1	0.1	3	3	0.4	4	4	0.1
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	2	2	0.2	0	0	0.0	2	2	0.1	0	0	0.0	4	4	0.1
	Cooper's Hawk	<i>Accipiter cooperii</i>	0	0	0.0	4	4	0.5	1	1	0.1	0	0	0.0	5	5	0.1
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	2	2	0.2	4	4	0.5	3	4	0.3	10	16	2.2	19	26	0.7
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	27	29	3.6	35	36	4.8	45	45	3.2	51	52	7.2	158	162	4.4
	Rough-legged Hawk	<i>Buteo lagopus</i>	0	0	0.0	0	0	0.0	0	0	0.0	6	6	0.8	6	6	0.2
<b>Family Subtotal:</b>		<b>31</b>	<b>33</b>	<b>4.1</b>	<b>43</b>	<b>44</b>	<b>5.9</b>	<b>52</b>	<b>53</b>	<b>3.8</b>	<b>70</b>	<b>77</b>	<b>10.7</b>	<b>196</b>	<b>207</b>	<b>5.6</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	0	0	0.0	1	1	0.1	0	0	0.0	0	0	0.0	1	1	0.0
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.0</b>
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	2	2	0.2	0	0	0.0	1	1	0.1	1	1	0.1	4	4	0.1
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	0	0	0.0	0	0	0.0	1	1	0.1	0	0	0.0	1	1	0.0
	<b>Family Subtotal:</b>		<b>2</b>	<b>2</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>2</b>	<b>0.1</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>5</b>	<b>5</b>	<b>0.1</b>
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	3	3	0.4	5	5	0.7	12	12	0.9	3	3	0.4	23	23	0.6
	<b>Family Subtotal:</b>		<b>3</b>	<b>3</b>	<b>0.4</b>	<b>5</b>	<b>5</b>	<b>0.7</b>	<b>12</b>	<b>12</b>	<b>0.9</b>	<b>3</b>	<b>3</b>	<b>0.4</b>	<b>23</b>	<b>23</b>	<b>0.6</b>
<b>Total:</b>			<b>422</b>	<b>801</b>	<b>100.0</b>	<b>377</b>	<b>746</b>	<b>100.0</b>	<b>441</b>	<b>1406</b>	<b>100.0</b>	<b>205</b>	<b>720</b>	<b>100.0</b>	<b>1445</b>	<b>3673</b>	<b>100.0</b>
<b>Species Diversity:</b>				<b>18</b>		<b>15</b>			<b>19</b>			<b>10</b>			<b>24</b>		

**Table B-2. Complete list of large bird species observed in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022**

Common Name	Scientific Name	Family	Incidental Observations Only
Canada Goose	<i>Branta canadensis</i>		
Wood Duck	<i>Aix sponsa</i>	Anatidae	
Mallard	<i>Anas platyrhynchos</i>		
Common Merganser	<i>Mergus merganser</i>		*
Wild Turkey	<i>Meleagris gallopavo</i>	Phasianidae	
Ring-necked Pheasant	<i>Phasianus colchicus</i>		
Rock Pigeon	<i>Columba livia</i>	Columbidae	
Mourning Dove	<i>Zenaida macroura</i>		
Sandhill Crane	<i>Antigone canadensis</i>	Gruidae	
Killdeer	<i>Charadrius vociferus</i>	Charadriidae	
Ring-billed Gull	<i>Larus delawarensis</i>	Laridae	
Herring Gull	<i>Larus argentatus</i>		
Great Blue Heron	<i>Ardea herodias</i>	Ardeidae	
Green Heron	<i>Butorides virescens</i>		
Turkey Vulture	<i>Cathartes aura</i>	Cathartidae	
Northern Harrier	<i>Circus hudsonius</i>	Accipitridae	
Sharp-shinned Hawk	<i>Accipiter striatus</i>		
Cooper's Hawk	<i>Accipiter cooperii</i>		
Bald Eagle	<i>Haliaeetus leucocephalus</i>		
Red-tailed Hawk	<i>Buteo jamaicensis</i>		
Rough-legged Hawk	<i>Buteo lagopus</i>		
Great Horned Owl	<i>Bubo virginianus</i>	Strigidae	
Snowy Owl	<i>Bubo scandiacus</i>		*
Northern Flicker	<i>Colaptes auratus</i>	Picidae	
Pileated Woodpecker	<i>Dryocopus pileatus</i>		
American Kestrel	<i>Falco sparverius</i>	Falconidae	

Table B-3. Use and frequency of occurrence, by season, for each species and family observed during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Use (observations/plot/survey)					Frequency				
			Spring	Summer	Fall	Winter	Total	Spring	Summer	Fall	Winter	Total
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	1.14	0.39	1.58	1.28	1.10	0.26	0.04	0.18	0.04	0.13
	Wood Duck	<i>Aix sponsa</i>	0.03	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	< 0.01
	Mallard	<i>Anas platyrhynchos</i>	0.23	0.03	0.00	0.00	0.06	0.06	0.01	0.00	0.00	0.02
		<b>Family Subtotal:</b>	<b>1.40</b>	<b>0.42</b>	<b>1.58</b>	<b>1.28</b>	<b>1.17</b>	<b>0.30</b>	<b>0.06</b>	<b>0.18</b>	<b>0.04</b>	<b>0.14</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	0.63	0.24	0.30	0.68	0.46	0.13	0.08	0.04	0.06	0.08
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	0.06	0.11	0.03	0.00	0.05	0.04	0.06	0.01	0.00	0.03
		<b>Family Subtotal:</b>	<b>0.69</b>	<b>0.35</b>	<b>0.32</b>	<b>0.68</b>	<b>0.51</b>	<b>0.17</b>	<b>0.13</b>	<b>0.06</b>	<b>0.06</b>	<b>0.10</b>
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	1.21	0.86	4.52	3.79	2.60	0.31	0.23	0.34	0.37	0.31
	Mourning Dove	<i>Zenaida macroura</i>	1.16	4.89	9.72	3.25	4.77	0.49	0.87	0.87	0.65	0.72
		<b>Family Subtotal:</b>	<b>2.37</b>	<b>5.75</b>	<b>14.24</b>	<b>7.04</b>	<b>7.37</b>	<b>0.66</b>	<b>0.90</b>	<b>0.94</b>	<b>0.85</b>	<b>0.84</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	0.70	0.49	0.08	0.00	0.32	0.04	0.07	0.03	0.00	0.04
		<b>Family Subtotal:</b>	<b>0.70</b>	<b>0.49</b>	<b>0.08</b>	<b>0.00</b>	<b>0.32</b>	<b>0.04</b>	<b>0.07</b>	<b>0.03</b>	<b>0.00</b>	<b>0.04</b>
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	1.54	0.72	0.35	0.00	0.65	0.57	0.39	0.18	0.00	0.29
		<b>Family Subtotal:</b>	<b>1.54</b>	<b>0.72</b>	<b>0.35</b>	<b>0.00</b>	<b>0.65</b>	<b>0.57</b>	<b>0.39</b>	<b>0.18</b>	<b>0.00</b>	<b>0.29</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	0.00	0.00	0.08	0.00	0.02	0.00	0.00	0.03	0.00	0.01
	Herring Gull	<i>Larus argentatus</i>	0.13	0.00	0.04	0.00	0.04	0.06	0.00	0.01	0.00	0.02
		<b>Family Subtotal:</b>	<b>0.13</b>	<b>0.00</b>	<b>0.13</b>	<b>0.00</b>	<b>0.06</b>	<b>0.06</b>	<b>0.00</b>	<b>0.04</b>	<b>0.00</b>	<b>0.02</b>
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	0.04	0.06	0.04	0.00	0.04	0.04	0.06	0.04	0.00	0.04
	Green Heron	<i>Butorides virescens</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
		<b>Family Subtotal:</b>	<b>0.06</b>	<b>0.06</b>	<b>0.04</b>	<b>0.00</b>	<b>0.04</b>	<b>0.06</b>	<b>0.06</b>	<b>0.04</b>	<b>0.00</b>	<b>0.04</b>
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	4.01	2.01	2.11	0.00	2.03	0.74	0.61	0.37	0.00	0.43
		<b>Family Subtotal:</b>	<b>4.01</b>	<b>2.01</b>	<b>2.11</b>	<b>0.00</b>	<b>2.03</b>	<b>0.74</b>	<b>0.61</b>	<b>0.37</b>	<b>0.00</b>	<b>0.43</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	0.00	0.00	0.01	0.04	0.01	0.00	0.00	0.01	0.04	0.01
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	0.03	0.00	0.03	0.00	0.01	0.03	0.00	0.03	0.00	0.01
	Cooper's Hawk	<i>Accipiter cooperii</i>	0.00	0.06	0.01	0.00	0.02	0.00	0.06	0.01	0.00	0.02
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	0.03	0.06	0.06	0.23	0.09	0.03	0.06	0.04	0.13	0.06
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	0.41	0.51	0.63	0.73	0.57	0.36	0.38	0.44	0.59	0.44
	Rough-legged Hawk	<i>Buteo lagopus</i>	0.00	0.00	0.00	0.08	0.02	0.00	0.00	0.00	0.08	0.02
		<b>Family Subtotal:</b>	<b>0.47</b>	<b>0.62</b>	<b>0.75</b>	<b>1.08</b>	<b>0.73</b>	<b>0.41</b>	<b>0.48</b>	<b>0.52</b>	<b>0.69</b>	<b>0.53</b>
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	0.00	0.01	0.00	0.00	< 0.01	0.00	0.01	0.00	0.00	< 0.01
		<b>Family Subtotal:</b>	<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>	<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	0.03	0.00	0.01	0.01	0.01	0.03	0.00	0.01	0.01	0.01
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	0.00	0.00	0.01	0.00	< 0.01	0.00	0.00	0.01	0.00	< 0.01
		<b>Family Subtotal:</b>	<b>0.03</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.02</b>	<b>0.03</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.02</b>
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	0.04	0.07	0.17	0.04	0.08	0.04	0.06	0.13	0.04	0.07
		<b>Family Subtotal:</b>	<b>0.04</b>	<b>0.07</b>	<b>0.17</b>	<b>0.04</b>	<b>0.08</b>	<b>0.04</b>	<b>0.06</b>	<b>0.13</b>	<b>0.04</b>	<b>0.07</b>
		<b>Total:</b>	<b>11.44</b>	<b>10.51</b>	<b>19.80</b>	<b>10.14</b>	<b>12.98</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>	<b>1.00</b>
		<b>Standard Error:</b>	<b>1.01</b>	<b>1.02</b>	<b>2.41</b>	<b>1.68</b>	<b>0.85</b>					

Table B-4. Use of each species and family observed at each point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Points	Use by Point Number																							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	20	0.50	1.83		3.58	0.17	2.25	0.08	0.92		6.75	1.92	0.83	3.58	0.90		0.25	0.25	0.33	0.17	0.25	0.17		0.67	0.73
	Wood Duck	<i>Aix sponsa</i>	1					0.17																			
	Mallard	<i>Anas platyrhynchos</i>	5					0.17								0.67	0.20		0.25		0.25						
	<b>Family Subtotal:</b>		<b>20</b>	<b>0.50</b>	<b>1.83</b>		<b>3.58</b>	<b>0.50</b>	<b>2.25</b>	<b>0.08</b>	<b>0.92</b>		<b>6.75</b>	<b>1.92</b>	<b>0.83</b>	<b>4.25</b>	<b>1.10</b>		<b>0.50</b>	<b>0.25</b>	<b>0.58</b>	<b>0.17</b>	<b>0.25</b>	<b>0.17</b>		<b>0.67</b>	<b>0.73</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	11	0.67	2.58	0.58	0.58			1.33			0.17			0.25	0.50								0.33	4.09	
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	7		0.17	0.17		0.33							0.08		0.20				0.08				0.17		
	<b>Family Subtotal:</b>		<b>14</b>	<b>0.67</b>	<b>2.75</b>	<b>0.75</b>	<b>0.58</b>	<b>0.33</b>	<b>1.33</b>		<b>0.17</b>				<b>0.33</b>	<b>0.50</b>	<b>0.20</b>			<b>0.08</b>	<b>0.08</b>				<b>0.50</b>	<b>4.09</b>	
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	22	1.33	2.00	1.08	0.42	2.50	2.50	1.50	7.33	0.67	19.17	2.75	1.50	1.25	1.30	4.30	2.42	0.17	2.33	0.33	2.00	2.33		3.08	
	Mourning Dove	<i>Zenaida macroura</i>	24	2.50	4.50	1.58	3.17	7.17	3.50	8.08	4.58	1.25	4.92	4.33	10.33	6.33	2.00	3.90	8.67	3.08	3.67	3.42	4.33	5.25	4.08	7.08	6.18
	<b>Family Subtotal:</b>		<b>24</b>	<b>3.83</b>	<b>6.50</b>	<b>2.67</b>	<b>3.58</b>	<b>9.67</b>	<b>6.00</b>	<b>9.58</b>	<b>11.92</b>	<b>1.92</b>	<b>24.08</b>	<b>7.08</b>	<b>11.83</b>	<b>7.58</b>	<b>3.30</b>	<b>8.20</b>	<b>11.08</b>	<b>3.25</b>	<b>6.00</b>	<b>3.75</b>	<b>6.33</b>	<b>7.58</b>	<b>4.08</b>	<b>10.17</b>	<b>6.18</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	8		0.83		1.92				0.17			3.50	0.08			0.20						0.17		0.73	
	<b>Family Subtotal:</b>		<b>8</b>		<b>0.83</b>		<b>1.92</b>				<b>0.17</b>			<b>3.50</b>	<b>0.08</b>			<b>0.20</b>						<b>0.17</b>		<b>0.73</b>	
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	24	0.25	0.42	1.42	0.33	0.83	0.50	0.33	0.17	0.08	0.92	0.17	0.17	0.67	1.20	1.30	0.33	1.17	0.92	1.00	0.50	1.50	1.00	0.25	0.36
	<b>Family Subtotal:</b>		<b>24</b>	<b>0.25</b>	<b>0.42</b>	<b>1.42</b>	<b>0.33</b>	<b>0.83</b>	<b>0.50</b>	<b>0.33</b>	<b>0.17</b>	<b>0.08</b>	<b>0.92</b>	<b>0.17</b>	<b>0.17</b>	<b>0.67</b>	<b>1.20</b>	<b>1.30</b>	<b>0.33</b>	<b>1.17</b>	<b>0.92</b>	<b>1.00</b>	<b>0.50</b>	<b>1.50</b>	<b>1.00</b>	<b>0.25</b>	<b>0.36</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	2	0.25																						0.25	
	Herring Gull	<i>Larus argentatus</i>	5			0.25				0.08		0.17	0.33								0.17						
	<b>Family Subtotal:</b>		<b>7</b>	<b>0.25</b>		<b>0.25</b>				<b>0.08</b>		<b>0.17</b>	<b>0.33</b>							<b>0.25</b>	<b>0.17</b>						
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	9					0.17	0.08					0.08		0.10		0.08	0.08	0.08			0.08	0.08			
	Green Heron	<i>Butorides virescens</i>	1					0.08																			
	<b>Family Subtotal:</b>		<b>9</b>					<b>0.25</b>	<b>0.08</b>					<b>0.08</b>		<b>0.10</b>		<b>0.08</b>	<b>0.08</b>	<b>0.08</b>			<b>0.08</b>	<b>0.08</b>			
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	24	1.58	0.58	0.67	1.00	0.75	0.67	1.83	2.83	2.58	2.67	2.75	0.67	2.17	5.10	1.70	2.75	0.92	5.42	1.67	2.83	3.17	1.42	1.25	2.18
	<b>Family Subtotal:</b>		<b>24</b>	<b>1.58</b>	<b>0.58</b>	<b>0.67</b>	<b>1.00</b>	<b>0.75</b>	<b>0.67</b>	<b>1.83</b>	<b>2.83</b>	<b>2.58</b>	<b>2.67</b>	<b>2.75</b>	<b>0.67</b>	<b>2.17</b>	<b>5.10</b>	<b>1.70</b>	<b>2.75</b>	<b>0.92</b>	<b>5.42</b>	<b>1.67</b>	<b>2.83</b>	<b>3.17</b>	<b>1.42</b>	<b>1.25</b>	<b>2.18</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	4		0.08					0.08	0.08																
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	4				0.08					0.08		0.08		0.08											
	Cooper's Hawk	<i>Accipiter cooperii</i>	5								0.08	0.08	0.08				0.10									0.08	
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	12	0.17							0.17	0.08		0.50	0.17		0.25		0.20	0.08		0.08		0.08	0.33	0.08	
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	24	0.67	0.25	0.50	0.42	0.58	0.50	0.58	0.75	0.67	0.58	0.42	0.33	0.67	0.30	0.20	0.58	0.83	0.58	0.92	0.58	0.83	0.50	0.67	0.73
	Rough-legged Hawk	<i>Buteo lagopus</i>	6	0.08					0.08										0.08			0.08	0.08				0.09
<b>Family Subtotal:</b>		<b>24</b>	<b>0.92</b>	<b>0.33</b>	<b>0.50</b>	<b>0.50</b>	<b>0.58</b>	<b>0.58</b>	<b>0.92</b>	<b>1.00</b>	<b>0.83</b>	<b>1.08</b>	<b>0.67</b>	<b>0.33</b>	<b>1.00</b>	<b>0.40</b>	<b>0.40</b>	<b>0.83</b>	<b>0.83</b>	<b>0.67</b>	<b>1.00</b>	<b>0.75</b>	<b>1.17</b>	<b>0.50</b>	<b>0.83</b>	<b>0.82</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	1				0.08																				
	<b>Family Subtotal:</b>		<b>1</b>				<b>0.08</b>																				
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	4					0.08								0.10			0.08		0.08						
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1														0.10										
	<b>Family Subtotal:</b>		<b>5</b>					<b>0.08</b>								<b>0.10</b>			<b>0.08</b>		<b>0.08</b>						
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	12					0.08	0.17	0.08		0.17	0.08		0.17	0.33		0.10				0.17	0.17	0.25		0.18	
	<b>Family Subtotal:</b>		<b>12</b>					<b>0.08</b>	<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.33</b>		<b>0.10</b>				<b>0.17</b>	<b>0.17</b>	<b>0.25</b>		<b>0.18</b>	
<b>Total:</b>				<b>8.00</b>	<b>13.25</b>	<b>6.25</b>	<b>11.58</b>	<b>13.08</b>	<b>11.58</b>	<b>13.08</b>	<b>16.83</b>	<b>5.92</b>	<b>39.42</b>	<b>12.67</b>	<b>14.42</b>	<b>16.50</b>	<b>11.60</b>	<b>11.90</b>	<b>15.50</b>	<b>6.92</b>	<b>13.92</b>	<b>7.92</b>	<b>11.00</b>	<b>13.92</b>	<b>7.08</b>	<b>13.67</b>	<b>15.27</b>
<b>Standard Error:</b>				<b>1.31</b>	<b>2.41</b>	<b>1.67</b>	<b>4.65</b>	<b>3.46</b>	<b>4.52</b>	<b>3.06</b>	<b>5.05</b>	<b>1.40</b>	<b>9.77</b>	<b>3.23</b>	<b>2.98</b>	<b>4.62</b>	<b>3.27</b>	<b>2.79</b>	<b>5.89</b>	<b>1.71</b>	<b>3.05</b>	<b>1.64</b>	<b>2.38</b>	<b>4.00</b>	<b>1.88</b>	<b>3.01</b>	<b>4.14</b>
<b>Species Diversity:</b>				<b>10</b>	<b>10</b>	<b>8</b>	<b>10</b>	<b>13</b>	<b>10</b>	<b>12</b>	<b>9</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>11</b>	<b>9</b>	<b>10</b>	<b>10</b>	<b>11</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>5</b>	<b>10</b>	<b>9</b>
<b>Family Diversity:</b>				<b>7</b>	<b>7</b>	<b>6</b>	<b>8</b>	<b>9</b>	<b>8</b>	<b>8</b>	<b>5</b>	<b>7</b>	<b>8</b>	<b>6</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>7</b>	<b>5</b>	<b>9</b>	<b>8</b>	<b>8</b>	<b>7</b>	<b>7</b>	<b>5</b>	<b>6</b>	<b>8</b>

Table B-5. Frequency of occurrence of each species and family observed at each point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Frequency by Point Number																							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	0.17	0.25		0.17	0.08	0.17	0.08	0.17		0.33	0.17	0.17	0.33	0.10		0.08	0.08	0.17	0.08	0.08	0.08	0.25	0.09	
	Wood Duck	<i>Aix sponsa</i>					0.08																			
	Mallard	<i>Anas platyrhynchos</i>					0.08								0.08	0.10		0.08		0.08						
	<b>Family Subtotal:</b>		<b>0.17</b>	<b>0.25</b>		<b>0.17</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>		<b>0.33</b>	<b>0.17</b>	<b>0.17</b>	<b>0.33</b>	<b>0.20</b>		<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.25</b>	<b>0.09</b>	
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	0.17	0.33	0.25	0.08		0.25			0.08			0.08	0.17				0.08					0.17	0.18	
	Ring-necked Pheasant	<i>Phasianus colchicus</i>		0.08	0.08		0.08							0.08		0.20				0.08				0.08		
	<b>Family Subtotal:</b>		<b>0.17</b>	<b>0.42</b>	<b>0.33</b>	<b>0.08</b>	<b>0.08</b>	<b>0.25</b>			<b>0.08</b>			<b>0.17</b>	<b>0.17</b>	<b>0.20</b>			<b>0.08</b>	<b>0.08</b>			<b>0.17</b>	<b>0.18</b>		
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	0.25	0.25	0.25	0.08	0.25	0.33	0.42	0.67	0.08	0.58	0.50	0.33	0.08	0.20	0.70	0.58	0.08	0.50	0.08	0.42	0.50		0.33	
	Mourning Dove	<i>Zenaida macroura</i>	0.75	0.75	0.58	0.58	0.75	0.58	0.67	0.58	0.67	0.83	0.67	0.83	0.92	0.60	0.70	0.92	0.67	0.83	0.75	0.83	0.33	0.83	0.75	0.91
	<b>Family Subtotal:</b>		<b>0.83</b>	<b>0.75</b>	<b>0.75</b>	<b>0.67</b>	<b>0.83</b>	<b>0.75</b>	<b>0.92</b>	<b>0.92</b>	<b>0.75</b>	<b>1.00</b>	<b>0.92</b>	<b>0.92</b>	<b>0.92</b>	<b>0.60</b>	<b>1.00</b>	<b>1.00</b>	<b>0.67</b>	<b>0.83</b>	<b>0.75</b>	<b>1.00</b>	<b>0.75</b>	<b>0.83</b>	<b>0.83</b>	<b>0.91</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>		0.17		0.08				0.08			0.08	0.08		0.10						0.08			0.18	
	<b>Family Subtotal:</b>			<b>0.17</b>		<b>0.08</b>				<b>0.08</b>			<b>0.08</b>	<b>0.08</b>		<b>0.10</b>						<b>0.08</b>			<b>0.18</b>	
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	0.17	0.25	0.33	0.08	0.25	0.25	0.25	0.17	0.08	0.42	0.17	0.17	0.17	0.60	0.30	0.25	0.42	0.33	0.42	0.33	0.58	0.42	0.25	0.27
	<b>Family Subtotal:</b>		<b>0.17</b>	<b>0.25</b>	<b>0.33</b>	<b>0.08</b>	<b>0.25</b>	<b>0.25</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.42</b>	<b>0.17</b>	<b>0.17</b>	<b>0.17</b>	<b>0.60</b>	<b>0.30</b>	<b>0.25</b>	<b>0.42</b>	<b>0.33</b>	<b>0.42</b>	<b>0.33</b>	<b>0.58</b>	<b>0.42</b>	<b>0.25</b>	<b>0.27</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	0.08																0.08							
	Herring Gull	<i>Larus argentatus</i>			0.08					0.08		0.08	0.08							0.08						
	<b>Family Subtotal:</b>		<b>0.08</b>		<b>0.08</b>					<b>0.08</b>		<b>0.08</b>	<b>0.08</b>						<b>0.08</b>	<b>0.08</b>						
Ardeidae (Heron & Allies)	Great Blue Heron	<i>Ardea herodias</i>					0.17	0.08						0.08		0.10		0.08	0.08	0.08		0.08	0.08			
	Green Heron	<i>Butorides virescens</i>					0.08																			
	<b>Family Subtotal:</b>						<b>0.25</b>	<b>0.08</b>						<b>0.08</b>		<b>0.10</b>		<b>0.08</b>	<b>0.08</b>	<b>0.08</b>		<b>0.08</b>	<b>0.08</b>			
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	0.42	0.17	0.17	0.25	0.33	0.25	0.33	0.42	0.58	0.58	0.58	0.25	0.42	0.20	0.50	0.42	0.42	0.58	0.58	0.58	0.67	0.58	0.42	0.55
	<b>Family Subtotal:</b>		<b>0.42</b>	<b>0.17</b>	<b>0.17</b>	<b>0.25</b>	<b>0.33</b>	<b>0.25</b>	<b>0.33</b>	<b>0.42</b>	<b>0.58</b>	<b>0.58</b>	<b>0.58</b>	<b>0.25</b>	<b>0.42</b>	<b>0.20</b>	<b>0.50</b>	<b>0.42</b>	<b>0.42</b>	<b>0.58</b>	<b>0.58</b>	<b>0.58</b>	<b>0.67</b>	<b>0.58</b>	<b>0.42</b>	<b>0.55</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>		0.08						0.08	0.08						0.08									
	Sharp-shinned Hawk	<i>Accipiter striatus</i>				0.08					0.08		0.08		0.08											
	Cooper's Hawk	<i>Accipiter cooperii</i>								0.08	0.08	0.08				0.10								0.08		
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	0.08							0.17	0.08		0.08	0.17		0.17		0.20	0.08		0.08		0.08	0.25	0.08	
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	0.42	0.25	0.50	0.33	0.58	0.42	0.58	0.58	0.50	0.50	0.25	0.33	0.25	0.30	0.20	0.58	0.58	0.42	0.75	0.42	0.42	0.42	0.42	0.55
	Rough-legged Hawk	<i>Buteo lagopus</i>	0.08					0.08										0.08			0.08	0.08			0.09	
<b>Family Subtotal:</b>		<b>0.50</b>	<b>0.33</b>	<b>0.50</b>	<b>0.42</b>	<b>0.58</b>	<b>0.42</b>	<b>0.75</b>	<b>0.75</b>	<b>0.67</b>	<b>0.50</b>	<b>0.50</b>	<b>0.33</b>	<b>0.42</b>	<b>0.40</b>	<b>0.30</b>	<b>0.75</b>	<b>0.58</b>	<b>0.50</b>	<b>0.83</b>	<b>0.50</b>	<b>0.58</b>	<b>0.42</b>	<b>0.50</b>	<b>0.55</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>				0.08																				
	<b>Family Subtotal:</b>					<b>0.08</b>																				
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>					0.08								0.10			0.08		0.08						
	Pileated Woodpecker	<i>Dryocopus pileatus</i>															0.10									
	<b>Family Subtotal:</b>						<b>0.08</b>								<b>0.10</b>		<b>0.10</b>	<b>0.08</b>		<b>0.08</b>						
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>					0.08	0.17	0.08		0.17	0.08		0.17	0.08		0.10				0.17	0.08	0.25		0.18	
	<b>Family Subtotal:</b>						<b>0.08</b>	<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.08</b>		<b>0.10</b>				<b>0.17</b>	<b>0.08</b>	<b>0.25</b>		<b>0.18</b>	

Table B-6. Flight height characteristics of each species and family observed during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Groups Flying	# Obs Flying	Flying Use	% Obs Flying	# (%) within Flight Height Categories			Use in RSZ	Frequency in RSZ
							< 35 m (115 ft)	RSZ: 35 - 200 m (115 - 656 ft)	> 200 m (656 ft)		
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	41	219	0.77	70.4	162 (74.0)	57 (26.0)	0 (0.0)	0.20	0.03
	Wood Duck	<i>Aix sponsa</i>	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Mallard	<i>Anas platyrhynchos</i>	4	16	0.06	88.9	16 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>46</b>	<b>237</b>	<b>0.84</b>	<b>71.6</b>	<b>180 (75.9)</b>	<b>57 (24.1)</b>	<b>0 (0.0)</b>	<b>0.20</b>	<b>0.03</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	1	1	< 0.01	0.8	1 (100.0)	0 (0.0)	0 (0.0)		
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	0	0	0.00	0.0	0 (-)	0 (-)	0 (-)		
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>0.7</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	84	448	1.58	60.9	448 (100.0)	0 (0.0)	0 (0.0)		
	Mourning Dove	<i>Zenaida macroura</i>	287	681	2.41	50.5	673 (98.8)	8 (1.2)	0 (0.0)	0.03	0.01
	<b>Family Subtotal:</b>		<b>371</b>	<b>1129</b>	<b>3.99</b>	<b>54.1</b>	<b>1121 (99.3)</b>	<b>8 (0.7)</b>	<b>0 (0.0)</b>	<b>0.03</b>	<b>0.01</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	8	81	0.29	90.0	39 (48.1)	42 (51.9)	0 (0.0)	0.15	< 0.01
	<b>Family Subtotal:</b>		<b>8</b>	<b>81</b>	<b>0.29</b>	<b>90.0</b>	<b>39 (48.1)</b>	<b>42 (51.9)</b>	<b>0 (0.0)</b>	<b>0.15</b>	<b>&lt; 0.01</b>
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	102	137	0.48	74.5	134 (97.8)	2 (1.5)	1 (0.7)	0.01	< 0.01
	<b>Family Subtotal:</b>		<b>102</b>	<b>137</b>	<b>0.48</b>	<b>74.5</b>	<b>134 (97.8)</b>	<b>2 (1.5)</b>	<b>1 (0.7)</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	2	6	0.02	100.0	6 (100.0)	0 (0.0)	0 (0.0)		
	Herring Gull	<i>Larus argentatus</i>	7	12	0.04	100.0	10 (83.3)	2 (16.7)	0 (0.0)	0.01	< 0.01
	<b>Family Subtotal:</b>		<b>9</b>	<b>18</b>	<b>0.06</b>	<b>100.0</b>	<b>16 (88.9)</b>	<b>2 (11.1)</b>	<b>0 (0.0)</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	10	10	0.04	100.0	9 (90.0)	1 (10.0)	0 (0.0)	< 0.01	< 0.01
	Green Heron	<i>Butorides virescens</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>11</b>	<b>11</b>	<b>0.04</b>	<b>100.0</b>	<b>10 (90.9)</b>	<b>1 (9.1)</b>	<b>0 (0.0)</b>	<b>&lt; 0.01</b>	<b>&lt; 0.01</b>
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	332	554	1.96	96.5	187 (33.8)	389 (70.2)	26 (4.7)	1.37	0.34
	<b>Family Subtotal:</b>		<b>332</b>	<b>554</b>	<b>1.96</b>	<b>96.5</b>	<b>187 (33.8)</b>	<b>389 (70.2)</b>	<b>26 (4.7)</b>	<b>1.37</b>	<b>0.34</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	4	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	4	4	0.01	100.0	2 (50.0)	2 (50.0)	0 (0.0)	0.01	0.01
	Cooper's Hawk	<i>Accipiter cooperii</i>	4	4	0.01	80.0	1 (25.0)	3 (75.0)	0 (0.0)	0.01	0.01
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	16	17	0.06	65.4	10 (58.8)	12 (70.6)	0 (0.0)	0.04	0.04
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	104	107	0.38	66.0	74 (69.2)	33 (30.8)	2 (1.9)	0.12	0.10
	Rough-legged Hawk	<i>Buteo lagopus</i>	4	4	0.01	66.7	4 (100.0)	0 (0.0)	0 (0.0)		
<b>Family Subtotal:</b>		<b>136</b>	<b>140</b>	<b>0.49</b>	<b>67.6</b>	<b>95 (67.9)</b>	<b>50 (35.7)</b>	<b>2 (1.4)</b>	<b>0.18</b>	<b>0.15</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>100.0</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	4	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>5</b>	<b>5</b>	<b>0.02</b>	<b>100.0</b>	<b>5 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	20	20	0.07	87.0	20 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>20</b>	<b>20</b>	<b>0.07</b>	<b>87.0</b>	<b>20 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
<b>Total</b>			<b>1042</b>	<b>2334</b>	<b>8.25</b>	<b>63.5</b>	<b>1809 (77.5)</b>	<b>551 (23.6)</b>	<b>29 (1.2)</b>	<b>1.95</b>	<b>0.44</b>



**Attachment C. Data tables of small birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Table C-1. Group counts, observation counts, and relative abundance, by season, for each species and family observed during the small bird use surveys in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Spring: Mar–May			Summer: Jun–Aug			Fall: Sep–Nov			Winter: Dec–Feb			All Seasons		
			# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	0	0	0.0	1	1	0.1	2	2	0.1	2	2	0.1	5	5	0.1
	Downy Woodpecker	<i>Dryobates pubescens</i>	2	2	0.2	4	4	0.4	4	4	0.1	5	5	0.4	15	15	0.2
	Hairy Woodpecker	<i>Dryobates villosus</i>	0	0	0.0	0	0	0.0	5	5	0.2	1	1	0.1	6	6	0.1
	<b>Family Subtotal:</b>		<b>2</b>	<b>2</b>	<b>0.2</b>	<b>5</b>	<b>5</b>	<b>0.5</b>	<b>11</b>	<b>11</b>	<b>0.3</b>	<b>8</b>	<b>8</b>	<b>0.6</b>	<b>26</b>	<b>26</b>	<b>0.4</b>
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	0	0	0.0	7	8	0.7	0	0	0.0	0	0	0.0	7	8	0.1
	Eastern Wood-Pewee	<i>Contopus virens</i>	0	0	0.0	0	0	0.0	1	3	0.1	0	0	0.0	1	3	< 0.1
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>7</b>	<b>8</b>	<b>0.7</b>	<b>1</b>	<b>3</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>8</b>	<b>11</b>	<b>0.2</b>
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	0	0	0.0	1	1	0.1	0	0	0.0	0	0	0.0	1	1	< 0.1
<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>&lt; 0.1</b>	
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.1	1	1	< 0.1
<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>1</b>	<b>1</b>	<b>&lt; 0.1</b>	
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	10	11	0.9	6	6	0.6	41	46	1.4	22	30	2.2	79	93	1.3
<b>Family Subtotal:</b>		<b>10</b>	<b>11</b>	<b>0.9</b>	<b>6</b>	<b>6</b>	<b>0.6</b>	<b>41</b>	<b>46</b>	<b>1.4</b>	<b>22</b>	<b>30</b>	<b>2.2</b>	<b>79</b>	<b>93</b>	<b>1.3</b>	
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	1	2	0.2	0	0	0.0	2	4	0.1	1	2	0.1	4	8	0.1
<b>Family Subtotal:</b>		<b>1</b>	<b>2</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>4</b>	<b>0.1</b>	<b>1</b>	<b>2</b>	<b>0.1</b>	<b>4</b>	<b>8</b>	<b>0.1</b>	
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	34	53	4.4	22	28	2.6	52	108	3.3	37	76	5.5	145	265	3.8
<b>Family Subtotal:</b>		<b>34</b>	<b>53</b>	<b>4.4</b>	<b>22</b>	<b>28</b>	<b>2.6</b>	<b>52</b>	<b>108</b>	<b>3.3</b>	<b>37</b>	<b>76</b>	<b>5.5</b>	<b>145</b>	<b>265</b>	<b>3.8</b>	
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	3	4	0.3	4	10	0.9	2	3	0.1	0	0	0.0	9	17	0.2
	Barn Swallow	<i>Hirundo rustica</i>	30	50	4.2	114	177	16.5	2	11	0.3	0	0	0.0	146	238	3.4
	<b>Family Subtotal:</b>		<b>33</b>	<b>54</b>	<b>4.5</b>	<b>118</b>	<b>187</b>	<b>17.5</b>	<b>4</b>	<b>14</b>	<b>0.4</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>155</b>	<b>255</b>	<b>3.7</b>
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	0	0	0.0	0	0	0.0	4	12	0.4	0	0	0.0	4	12	0.2
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	0	0	0.0	0	0	0.0	1	3	0.1	0	0	0.0	1	3	< 0.1
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>5</b>	<b>15</b>	<b>0.5</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>5</b>	<b>15</b>	<b>0.2</b>
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	0	0	0.0	0	0	0.0	0	0	0.0	2	2	0.1	2	2	< 0.1
<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>2</b>	<b>0.1</b>	<b>2</b>	<b>2</b>	<b>&lt; 0.1</b>	
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	1	1	0.1	2	2	0.2	0	0	0.0	0	0	0.0	3	3	< 0.1
<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>0.1</b>	<b>2</b>	<b>2</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>3</b>	<b>3</b>	<b>&lt; 0.1</b>	
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	39	484	40.6	0	0	0.0	105	2772	85.3	45	1068	77.1	189	4324	62.7
<b>Family Subtotal:</b>		<b>39</b>	<b>484</b>	<b>40.6</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>105</b>	<b>2772</b>	<b>85.3</b>	<b>45</b>	<b>1068</b>	<b>77.1</b>	<b>189</b>	<b>4324</b>	<b>62.7</b>	
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	0	0	0.0	0	0	0.0	1	4	0.1	0	0	0.0	1	4	0.1
	American Robin	<i>Turdus migratorius</i>	126	214	17.9	100	123	11.5	12	25	0.8	0	0	0.0	238	362	5.2
	<b>Family Subtotal:</b>		<b>126</b>	<b>214</b>	<b>17.9</b>	<b>100</b>	<b>123</b>	<b>11.5</b>	<b>13</b>	<b>29</b>	<b>0.9</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>239</b>	<b>366</b>	<b>5.3</b>
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	0	0	0.0	1	1	0.1	7	31	1.0	1	4	0.3	9	36	0.5
<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>7</b>	<b>31</b>	<b>1.0</b>	<b>1</b>	<b>4</b>	<b>0.3</b>	<b>9</b>	<b>36</b>	<b>0.5</b>	
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>	2	3	0.3	0	0	0.0	0	0	0.0	0	0	0.0	2	3	< 0.1
	American Goldfinch	<i>Spinus tristis</i>	5	8	0.7	28	38	3.6	10	18	0.6	0	0	0.0	43	64	0.9
	<b>Family Subtotal:</b>		<b>7</b>	<b>11</b>	<b>0.9</b>	<b>28</b>	<b>38</b>	<b>3.6</b>	<b>10</b>	<b>18</b>	<b>0.6</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>45</b>	<b>67</b>	<b>1.0</b>
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	0	0	0.0	0	0	0.0	2	16	0.5	1	19	1.4	3	35	0.5
<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>16</b>	<b>0.5</b>	<b>1</b>	<b>19</b>	<b>1.4</b>	<b>3</b>	<b>35</b>	<b>0.5</b>	
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	0	0	0.0	0	0	0.0	1	2	0.1	0	0	0.0	1	2	< 0.1
	Chipping Sparrow	<i>Spizella passerina</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	< 0.1
	Field Sparrow	<i>Spizella pusilla</i>	11	18	1.5	19	24	2.2	7	13	0.4	0	0	0.0	37	55	0.8
	American Tree Sparrow	<i>Spizelloides arborea</i>	0	0	0.0	0	0	0.0	4	12	0.4	45	93	6.7	49	105	1.5
	Dark-eyed Junco	<i>Junco hyemalis</i>	0	0	0.0	0	0	0.0	10	25	0.8	22	78	5.6	32	103	1.5
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	0	0	0.0	0	0	0.0	2	4	0.1	0	0	0.0	2	4	0.1
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	0	0	0.0	2	2	0.2	0	0	0.0	0	0	0.0	2	2	< 0.1
	Song Sparrow	<i>Melospiza melodia</i>	0	0	0.0	3	3	0.3	0	0	0.0	0	0	0.0	3	3	< 0.1
<b>Family Subtotal:</b>		<b>12</b>	<b>19</b>	<b>1.6</b>	<b>24</b>	<b>29</b>	<b>2.7</b>	<b>24</b>	<b>56</b>	<b>1.7</b>	<b>67</b>	<b>171</b>	<b>12.3</b>	<b>127</b>	<b>275</b>	<b>4.0</b>	
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	0	0	0.0	2	2	0.2	0	0	0.0	0	0	0.0	2	2	< 0.1
	Baltimore Oriole	<i>Icterus galbula</i>	1	2	0.2	0	0	0.0	0	0	0.0	0	0	0.0	1	2	< 0.1
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	136	206	17.3	171	596	55.7	20	105	3.2	0	0	0.0	327	907	13.1
	Brown-headed Cowbird	<i>Molothrus ater</i>	22	72	6.0	9	25	2.3	1	6	0.2	0	0	0.0	32	103	1.5
	Common Grackle	<i>Quiscalus quiscula</i>	17	46	3.9	4	12	1.1	1	8	0.2	0	0	0.0	22	66	1.0
<b>Family Subtotal:</b>		<b>176</b>	<b>326</b>	<b>27.3</b>	<b>186</b>	<b>635</b>	<b>59.3</b>	<b>22</b>	<b>119</b>	<b>3.7</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>384</b>	<b>1080</b>	<b>15.7</b>	
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	0	0	0.0	0	0	0.0	1	4	0.1	0	0	0.0	1	4	0.1
	Yellow Warbler	<i>Setophaga petechia</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	< 0.1
	Unidentified Warbler	-	0	0	0.0	0	0	0.0	1	2	0.1	0	0	0.0	1	2	< 0.1
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>6</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>3</b>	<b>7</b>	<b>0.1</b>
Cardinalidae (Cardinals & Allies)	Scarlet Tanager	<i>Piranga olivacea</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	< 0.1
	Northern Cardinal	<i>Cardinalis cardinalis</i>	10	12	1.0	5	5	0.5	2	2	0.1	5	5	0.4	22	24	0.3
	Indigo Bunting	<i>Passerina cyanea</i>	1	2	0.2	1	1	0.1	0	0	0.0	0	0	0.0	2	3	< 0.1
	Dickcissel	<i>Spiza americana</i>	0	0	0.0	1	1	0.1	0	0	0.0	0	0	0.0	1	1	< 0.1
	<b>Family Subtotal:</b>		<b>12</b>	<b>15</b>	<b>1.3</b>	<b>7</b>	<b>7</b>	<b>0.7</b>	<b>2</b>	<b>2</b>	<b>0.1</b>	<b>5</b>	<b>5</b>	<b>0.4</b>	<b>26</b>	<b>29</b>	<b>0.4</b>
<b>Total:</b>		<b>454</b>	<b>1193</b>	<b>100.0</b>	<b>507</b>	<b>1070</b>	<b>100.0</b>	<b>303</b>	<b>3250</b>	<b>100.0</b>	<b>190</b>	<b>1386</b>	<b>100.0</b>	<b>1454</b>	<b>6899</b>	<b>100.0</b>	
<b>Species Diversity:</b>			<b>21</b>			<b>22</b>			<b>27</b>			<b>14</b>			<b>42</b>		

**Table B-2. Complete list of small bird species observed in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022**

Common Name	Scientific Name	Family	Incidental Observations Only
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>		
Downy Woodpecker	<i>Dryobates pubescens</i>	Picidae	
Hairy Woodpecker	<i>Dryobates villosus</i>		
Eastern Kingbird	<i>Tyrannus tyrannus</i>		
Eastern Wood-Pewee	<i>Contopus virens</i>	Tyrannidae	
Red-eyed Vireo	<i>Vireo olivaceus</i>	Vireonidae	
Northern Shrike	<i>Lanius borealis</i>	Laniidae	
Blue Jay	<i>Cyanocitta cristata</i>		
American Crow	<i>Corvus brachyrhynchos</i>	Corvidae	*
Black-capped Chickadee	<i>Poecile atricapillus</i>	Paridae	
Horned Lark	<i>Eremophila alpestris</i>	Alaudidae	
Tree Swallow	<i>Tachycineta bicolor</i>		
Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	
Golden-crowned Kinglet	<i>Regulus satrapa</i>		
Ruby-crowned Kinglet	<i>Corthylio calendula</i>	Regulidae	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Sittidae	
Brown Thrasher	<i>Toxostoma rufum</i>	Mimidae	
European Starling	<i>Sturnus vulgaris</i>	Sturnidae	
Eastern Bluebird	<i>Sialia sialis</i>		
American Robin	<i>Turdus migratorius</i>	Turdidae	
House Sparrow	<i>Passer domesticus</i>	Passeridae	
House Finch	<i>Haemorhous mexicanus</i>		
American Goldfinch	<i>Spinus tristis</i>	Fringillidae	
Snow Bunting	<i>Plectrophenax nivalis</i>	Calcariidae	
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		
Chipping Sparrow	<i>Spizella passerina</i>		
Field Sparrow	<i>Spizella pusilla</i>		
American Tree Sparrow	<i>Spizelloides arborea</i>		
Dark-eyed Junco	<i>Junco hyemalis</i>	Passerellidae	
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>		
Savannah Sparrow	<i>Passerculus sandwichensis</i>		
Song Sparrow	<i>Melospiza melodia</i>		
Eastern Meadowlark	<i>Sturnella magna</i>		
Baltimore Oriole	<i>Icterus galbula</i>		
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Icteridae	
Brown-headed Cowbird	<i>Molothrus ater</i>		
Common Grackle	<i>Quiscalus quiscula</i>		
Cape May Warbler	<i>Setophaga tigrina</i>		
Yellow Warbler	<i>Setophaga petechia</i>	Parulidae	
Scarlet Tanager	<i>Piranga olivacea</i>		
Northern Cardinal	<i>Cardinalis cardinalis</i>		
Indigo Bunting	<i>Passerina cyanea</i>	Cardinalidae	
Dickcissel	<i>Spiza americana</i>		

Table C-3. Use and frequency of occurrence, by season, for each species and family observed during the small bird use surveys in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Use (observations/plot/survey)					Frequency				
			Spring	Summer	Fall	Winter	Total	Spring	Summer	Fall	Winter	Total
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	0.00	0.01	0.03	0.03	0.02	0.00	0.01	0.03	0.01	0.01
	Downy Woodpecker	<i>Dryobates pubescens</i>	0.03	0.06	0.06	0.07	0.05	0.03	0.06	0.06	0.07	0.05
	Hairy Woodpecker	<i>Dryobates villosus</i>	0.00	0.00	0.07	0.01	0.02	0.00	0.00	0.07	0.01	0.02
	<b>Family Subtotal:</b>		<b>0.03</b>	<b>0.07</b>	<b>0.15</b>	<b>0.11</b>	<b>0.09</b>	<b>0.03</b>	<b>0.07</b>	<b>0.15</b>	<b>0.08</b>	<b>0.08</b>
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	0.00	0.11	0.00	0.00	0.03	0.00	0.08	0.00	0.00	0.02
	Eastern Wood-Pewee	<i>Contopus virens</i>	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.11</b>	<b>0.04</b>	<b>0.00</b>	<b>0.04</b>	<b>0.00</b>	<b>0.08</b>	<b>0.01</b>	<b>0.00</b>	<b>0.02</b>
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	0.00	0.01	0.00	0.00	< 0.01	0.00	0.01	0.00	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>	<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	0.00	0.00	0.00	0.01	< 0.01	0.00	0.00	0.00	0.01	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>&lt; 0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	0.16	0.08	0.64	0.42	0.33	0.14	0.07	0.46	0.28	0.24
	<b>Family Subtotal:</b>		<b>0.16</b>	<b>0.08</b>	<b>0.64</b>	<b>0.42</b>	<b>0.33</b>	<b>0.14</b>	<b>0.07</b>	<b>0.46</b>	<b>0.28</b>	<b>0.24</b>
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	0.03	0.00	0.06	0.03	0.03	0.01	0.00	0.03	0.01	0.01
	<b>Family Subtotal:</b>		<b>0.03</b>	<b>0.00</b>	<b>0.06</b>	<b>0.03</b>	<b>0.03</b>	<b>0.01</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.01</b>
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	0.76	0.39	1.50	1.06	0.93	0.34	0.25	0.58	0.31	0.37
	<b>Family Subtotal:</b>		<b>0.76</b>	<b>0.39</b>	<b>1.50</b>	<b>1.06</b>	<b>0.93</b>	<b>0.34</b>	<b>0.25</b>	<b>0.58</b>	<b>0.31</b>	<b>0.37</b>
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	0.06	0.14	0.04	0.00	0.06	0.04	0.06	0.01	0.00	0.03
	Barn Swallow	<i>Hirundo rustica</i>	0.71	2.46	0.15	0.00	0.83	0.21	0.64	0.03	0.00	0.22
	<b>Family Subtotal:</b>		<b>0.77</b>	<b>2.60</b>	<b>0.19</b>	<b>0.00</b>	<b>0.89</b>	<b>0.23</b>	<b>0.67</b>	<b>0.04</b>	<b>0.00</b>	<b>0.23</b>
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	0.00	0.00	0.17	0.00	0.04	0.00	0.00	0.06	0.00	0.01
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.21</b>	<b>0.00</b>	<b>0.05</b>	<b>0.00</b>	<b>0.00</b>	<b>0.06</b>	<b>0.00</b>	<b>0.01</b>
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.03	0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	0.01	0.03	0.00	0.00	0.01	0.01	0.03	0.00	0.00	0.01
	<b>Family Subtotal:</b>		<b>0.01</b>	<b>0.03</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>	<b>0.03</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	6.91	0.00	38.50	14.83	15.12	0.41	0.00	0.61	0.38	0.35
	<b>Family Subtotal:</b>		<b>6.91</b>	<b>0.00</b>	<b>38.50</b>	<b>14.83</b>	<b>15.12</b>	<b>0.41</b>	<b>0.00</b>	<b>0.61</b>	<b>0.38</b>	<b>0.35</b>
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	American Robin	<i>Turdus migratorius</i>	3.06	1.71	0.35	0.00	1.27	0.90	0.78	0.11	0.00	0.44
	<b>Family Subtotal:</b>		<b>3.06</b>	<b>1.71</b>	<b>0.40</b>	<b>0.00</b>	<b>1.28</b>	<b>0.90</b>	<b>0.78</b>	<b>0.13</b>	<b>0.00</b>	<b>0.45</b>
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	0.00	0.01	0.43	0.06	0.13	0.00	0.01	0.08	0.01	0.03
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.01</b>	<b>0.43</b>	<b>0.06</b>	<b>0.13</b>	<b>0.00</b>	<b>0.01</b>	<b>0.08</b>	<b>0.01</b>	<b>0.03</b>
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>	0.04	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.01
	American Goldfinch	<i>Spinus tristis</i>	0.11	0.53	0.25	0.00	0.22	0.07	0.29	0.14	0.00	0.13
	<b>Family Subtotal:</b>		<b>0.16</b>	<b>0.53</b>	<b>0.25</b>	<b>0.00</b>	<b>0.23</b>	<b>0.09</b>	<b>0.29</b>	<b>0.14</b>	<b>0.00</b>	<b>0.13</b>
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	0.00	0.00	0.22	0.26	0.12	0.00	0.00	0.03	0.01	0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.22</b>	<b>0.26</b>	<b>0.12</b>	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.01</b>
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	Chipping Sparrow	<i>Spizella passerina</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
	Field Sparrow	<i>Spizella pusilla</i>	0.26	0.33	0.18	0.00	0.19	0.14	0.26	0.08	0.00	0.12
	American Tree Sparrow	<i>Spizelloides arborea</i>	0.00	0.00	0.17	1.29	0.37	0.00	0.00	0.06	0.47	0.13
	Dark-eyed Junco	<i>Junco hyemalis</i>	0.00	0.00	0.35	1.08	0.36	0.00	0.00	0.11	0.25	0.09
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.03	0.00	0.01
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	0.00	0.03	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.01
	<b>Family Subtotal:</b>		<b>0.27</b>	<b>0.40</b>	<b>0.78</b>	<b>2.38</b>	<b>0.96</b>	<b>0.16</b>	<b>0.33</b>	<b>0.26</b>	<b>0.60</b>	<b>0.34</b>
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	0.00	0.03	0.00	0.00	0.01	0.00	0.01	0.00	0.00	< 0.01
	Baltimore Oriole	<i>Icterus galbula</i>	0.03	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	< 0.01
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	2.94	8.28	1.46	0.00	3.17	0.69	0.89	0.17	0.00	0.43
	Brown-headed Cowbird	<i>Molothrus ater</i>	1.03	0.35	0.08	0.00	0.36	0.23	0.10	0.01	0.00	0.08
	<b>Family Subtotal:</b>		<b>4.66</b>	<b>8.82</b>	<b>1.65</b>	<b>0.00</b>	<b>3.78</b>	<b>0.74</b>	<b>0.89</b>	<b>0.19</b>	<b>0.00</b>	<b>0.45</b>
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	Yellow Warbler	<i>Setophaga petechia</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
	Unidentified Warbler	-	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.01</b>	<b>0.00</b>	<b>0.08</b>	<b>0.00</b>	<b>0.02</b>	<b>0.01</b>	<b>0.00</b>	<b>0.03</b>	<b>0.00</b>	<b>0.01</b>
Cardinalidae (Cardinals & Allies)	Scarlet Tanager	<i>Piranga olivacea</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
	Northern Cardinal	<i>Cardinalis cardinalis</i>	0.17	0.07	0.03	0.07	0.08	0.11	0.07	0.03	0.07	0.07
	Indigo Bunting	<i>Passerina cyanea</i>	0.03	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01
	Dickcissel	<i>Spiza americana</i>	0.00	0.01	0.00	0.00	< 0.01	0.00	0.01	0.00	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.21</b>	<b>0.10</b>	<b>0.03</b>	<b>0.07</b>	<b>0.10</b>	<b>0.13</b>	<b>0.10</b>	<b>0.03</b>	<b>0.07</b>	<b>0.08</b>
<b>Total:</b>			<b>17.04</b>	<b>14.86</b>	<b>45.14</b>	<b>19.25</b>	<b>24.12</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>	<b>1.00</b>
	<b>Standard Error:</b>		<b>1.67</b>	<b>2.23</b>	<b>8.95</b>	<b>4.62</b>	<b>2.72</b>					

Table B-4. Use of each species and family observed at each point during the small bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Points	Use by Point Number																							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	4	0.17															0.08					0.08	0.09		
	Downy Woodpecker	<i>Dryobates pubescens</i>	8	0.33				0.08		0.08									0.08		0.08			0.17	0.17	0.27	
	Hairy Woodpecker	<i>Dryobates villosus</i>	6			0.08				0.08					0.09			0.08		0.08		0.08					
	<b>Family Subtotal:</b>		<b>13</b>	<b>0.50</b>		<b>0.08</b>	<b>0.08</b>		<b>0.08</b>	<b>0.08</b>					<b>0.09</b>			<b>0.17</b>	<b>0.08</b>	<b>0.17</b>		<b>0.08</b>	<b>0.17</b>	<b>0.25</b>	<b>0.36</b>		
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	5	0.08				0.17												0.08	0.08				0.27		
	Eastern Wood-Pewee	<i>Contopus virens</i>	1					0.25																			
	<b>Family Subtotal:</b>		<b>5</b>	<b>0.08</b>				<b>0.42</b>												<b>0.08</b>	<b>0.08</b>				<b>0.27</b>		
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	1					0.08																			
<b>Family Subtotal:</b>		<b>1</b>						<b>0.08</b>																			
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	1																	0.08							
<b>Family Subtotal:</b>		<b>1</b>																									
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	23	0.17	0.58	0.17	0.25	0.58	0.17	0.17	0.08	0.50	0.08	0.33	0.33	0.36	0.33	0.08	0.50	0.17	0.83	0.42	0.08	0.50	0.50	0.64	
<b>Family Subtotal:</b>		<b>23</b>	<b>0.17</b>	<b>0.58</b>	<b>0.17</b>	<b>0.25</b>	<b>0.58</b>	<b>0.17</b>	<b>0.17</b>	<b>0.08</b>	<b>0.50</b>	<b>0.08</b>	<b>0.33</b>	<b>0.33</b>	<b>0.36</b>	<b>0.33</b>	<b>0.08</b>	<b>0.50</b>	<b>0.17</b>	<b>0.83</b>	<b>0.42</b>	<b>0.08</b>	<b>0.50</b>	<b>0.50</b>	<b>0.64</b>		
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	4	0.17		0.17		0.17												0.17							
<b>Family Subtotal:</b>		<b>4</b>	<b>0.17</b>		<b>0.17</b>		<b>0.17</b>																				
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	23	0.67	0.50	0.50	0.67	0.17	1.17	0.83	1.58	0.75	1.25	1.17	0.33	0.45	0.42	2.42	1.00	1.17	0.50	0.75	2.83	0.42	1.25	1.45	
<b>Family Subtotal:</b>		<b>23</b>	<b>0.67</b>	<b>0.50</b>	<b>0.50</b>	<b>0.67</b>	<b>0.17</b>	<b>1.17</b>	<b>0.83</b>	<b>1.58</b>	<b>0.75</b>	<b>1.25</b>	<b>1.17</b>	<b>0.33</b>	<b>0.45</b>	<b>0.42</b>	<b>2.42</b>	<b>1.00</b>	<b>1.17</b>	<b>0.50</b>	<b>0.75</b>	<b>2.83</b>	<b>0.42</b>	<b>1.25</b>	<b>1.45</b>		
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	6			0.08							0.08							0.25	0.50		0.08		0.45		
	Barn Swallow	<i>Hirundo rustica</i>	24	0.83	1.42	0.83	0.58	0.75	0.33	0.92	0.83	0.17	3.17	0.58	0.42	0.58	0.45	0.67	0.08	0.25	0.50	0.17	0.67	0.42	0.50	0.67	4.55
<b>Family Subtotal:</b>		<b>24</b>	<b>0.83</b>	<b>1.42</b>	<b>0.92</b>	<b>0.58</b>	<b>0.75</b>	<b>0.33</b>	<b>0.92</b>	<b>0.83</b>	<b>0.17</b>	<b>3.17</b>	<b>0.58</b>	<b>0.42</b>	<b>0.58</b>	<b>0.45</b>	<b>0.67</b>	<b>0.08</b>	<b>0.50</b>	<b>1.00</b>	<b>0.17</b>	<b>0.67</b>	<b>0.42</b>	<b>0.58</b>	<b>0.67</b>	<b>5.00</b>	
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4	0.25				0.50	0.17																		
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	1					0.25																			
<b>Family Subtotal:</b>		<b>4</b>	<b>0.25</b>				<b>0.75</b>	<b>0.17</b>																			
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	2					0.08				0.08															
<b>Family Subtotal:</b>		<b>2</b>						<b>0.08</b>				<b>0.08</b>															
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	2									0.08													0.17		
<b>Family Subtotal:</b>		<b>2</b>										<b>0.08</b>													<b>0.17</b>		
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	24	20.08	3.17	20.00	1.00	14.92	13.67	14.08	17.58	10.42	28.50	8.83	25.00	16.25	16.09	12.50	4.58	13.75	9.92	46.00	5.58	35.67	19.17	0.25	5.09
<b>Family Subtotal:</b>		<b>24</b>	<b>20.08</b>	<b>3.17</b>	<b>20.00</b>	<b>1.00</b>	<b>14.92</b>	<b>13.67</b>	<b>14.08</b>	<b>17.58</b>	<b>10.42</b>	<b>28.50</b>	<b>8.83</b>	<b>25.00</b>	<b>16.25</b>	<b>16.09</b>	<b>12.50</b>	<b>4.58</b>	<b>13.75</b>	<b>9.92</b>	<b>46.00</b>	<b>5.58</b>	<b>35.67</b>	<b>19.17</b>	<b>0.25</b>	<b>5.09</b>	
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	1									0.33															
	American Robin	<i>Turdus migratorius</i>	24	1.42	2.83	1.08	1.08	1.83	1.08	0.83	0.50	1.50	0.58	0.58	0.50	1.42	1.55	1.75	0.92	1.33	1.67	2.17	0.58	0.92	1.08	1.58	1.64
<b>Family Subtotal:</b>		<b>24</b>	<b>1.42</b>	<b>2.83</b>	<b>1.08</b>	<b>1.08</b>	<b>1.83</b>	<b>1.08</b>	<b>0.83</b>	<b>0.50</b>	<b>1.50</b>	<b>0.58</b>	<b>0.58</b>	<b>0.50</b>	<b>1.42</b>	<b>1.55</b>	<b>1.75</b>	<b>0.92</b>	<b>1.33</b>	<b>1.67</b>	<b>2.17</b>	<b>0.58</b>	<b>0.92</b>	<b>1.08</b>	<b>1.58</b>	<b>1.64</b>	
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	6	0.08						0.08	0.58		1.58							0.36							
<b>Family Subtotal:</b>		<b>6</b>	<b>0.08</b>							<b>0.08</b>	<b>0.58</b>		<b>1.58</b>							<b>0.36</b>							
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>	2									0.08													0.18		
	American Goldfinch	<i>Spinus tristis</i>	18	0.17	0.17			0.33	0.25	0.17	0.17			0.17	0.17	0.33	0.55	0.17	0.17	0.17	1.00	0.50		0.08	0.17	0.73	
<b>Family Subtotal:</b>		<b>19</b>	<b>0.17</b>	<b>0.17</b>			<b>0.33</b>	<b>0.25</b>	<b>0.17</b>	<b>0.17</b>			<b>0.08</b>	<b>0.17</b>	<b>0.17</b>	<b>0.33</b>	<b>0.55</b>	<b>0.17</b>	<b>0.17</b>	<b>0.17</b>	<b>1.00</b>	<b>0.50</b>		<b>0.08</b>	<b>0.17</b>	<b>0.91</b>	
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	3		0.33																				1.00	1.73	
<b>Family Subtotal:</b>		<b>3</b>		<b>0.33</b>																					<b>1.00</b>	<b>1.73</b>	
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus saviannarum</i>	1									0.17															
	Chipping Sparrow	<i>Spizella passerina</i>	1																	0.08							
	Field Sparrow	<i>Spizella pusilla</i>	20		0.25	0.17	0.17		0.25	0.08	0.42	0.17	0.17	0.08	0.08	0.08	0.09	0.42	0.33		0.67	0.17	0.25	0.42	0.08	0.25	
	American Tree Sparrow	<i>Spizelloides arborea</i>	20	0.08	0.08		0.58	0.42	0.50	0.33	0.67		0.17	0.08	0.17	0.08		0.75		0.75	1.50	0.83	0.50	0.50	0.25	0.33	0.18
	Dark-eyed Junco	<i>Junco hyemalis</i>	16		0.17	0.58	0.58	0.25	0.50				0.92	0.42	0.42	0.25		0.67	0.64	0.42		0.67	1.17		0.50	0.55	
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	2																						0.17	0.18	
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	2				0.08	0.08																			
Song Sparrow	<i>Melospiza melodia</i>	3				0.08	0.08									0.08											
<b>Family Subtotal:</b>		<b>24</b>	<b>0.08</b>	<b>0.50</b>	<b>0.75</b>	<b>1.50</b>	<b>0.83</b>	<b>1.25</b>	<b>0.42</b>	<b>2.17</b>	<b>0.58</b>	<b>0.75</b>	<b>0.42</b>	<b>0.25</b>	<b>0.83</b>	<b>0.73</b>	<b>1.67</b>	<b>0.33</b>	<b>0.83</b>	<b>2.83</b>	<b>2.17</b>	<b>0.75</b>	<b>0.92</b>	<b>0.50</b>	<b>1.08</b>	<b>0.91</b>	
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	1									0.17															
	Baltimore Oriole	<i>Icterus galbula</i>	1																					0.17			
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	24	0.83	9.83	1.17	5.33	3.83	4.50	1.33	2.42	0.67	11.75	1.75	2.17	1.83	4.73	5.33	3.08	1.67	3.42	1.83	1.17	2.50	1.83	1.92	1.18
	Brown-headed Cowbird	<i>Molothrus ater</i>	18	0.08	0.08	0.50	0.17	0.58	0.75	0.08	0.42	0.50	1.00	0.33	0.50		1.27			0.17	0.58		0.58	0.42	0.67		
Common Grackle	<i>Quiscalus quiscula</i>	14				0.17	0.17	1.33				0.42	0.08			0.17	0.45			0.67		0.17	0.17	0.17	1.17	0.27	
<b>Family Subtotal:</b>		<b>24</b>	<b>0.92</b>	<b>9.92</b>	<b>1.67</b>	<b>5.50</b>	<b>4.58</b>	<b>5.42</b>	<b>2.75</b>	<b>3.00</b>	<b>1.58</b>	<b>12.83</b>	<b>2.08</b>	<b>2.67</b>	<b>2.00</b>	<b>6.45</b>	<b>5.33</b>	<b>3.08</b>	<b>2.50</b>	<b>4.00</b>	<b>2.00</b>	<b>2.08</b>	<b>3.08</b>	<b>2.67</b>	<b>3.08</b>	<b>1.45</b>	
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	1																	0.33							
	Yellow Warbler	<i>Setophaga petechia</i>	1																						0.08		

Table B-5. Frequency of occurrence of each species and family observed at each point during the small bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Frequency by Point Number																								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>		0.08															0.08						0.08	0.09	
	Downy Woodpecker	<i>Dryobates pubescens</i>		0.33				0.08		0.08									0.08		0.08				0.17	0.17	0.27
	Hairy Woodpecker	<i>Dryobates villosus</i>				0.08					0.08					0.09			0.08		0.08		0.08				
		<b>Family Subtotal:</b>	<b>0.33</b>	<b>0.08</b>	<b>0.09</b>	<b>0.08</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.25</b>	<b>0.36</b>											
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>		0.08				0.08												0.08	0.08					0.18	
	Eastern Wood-Pewee	<i>Contopus virens</i>						0.08																			
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.18</b>	
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>						0.08																			
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>																	0.08								
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	0.17	0.50	0.17	0.17	0.33	0.17	0.17	0.08	0.33		0.08	0.33	0.33	0.27	0.25	0.08	0.42	0.08	0.33	0.25	0.08	0.50	0.33	0.27	
		<b>Family Subtotal:</b>	<b>0.17</b>	<b>0.50</b>	<b>0.17</b>	<b>0.17</b>	<b>0.33</b>	<b>0.17</b>	<b>0.17</b>	<b>0.08</b>	<b>0.33</b>	<b>0.08</b>	<b>0.33</b>	<b>0.33</b>	<b>0.27</b>	<b>0.25</b>	<b>0.08</b>	<b>0.42</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.08</b>	<b>0.50</b>	<b>0.33</b>	<b>0.27</b>	<b>0.27</b>	
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>		0.08			0.08													0.08							
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	0.25	0.25	0.33	0.25	0.08	0.42	0.42	0.50	0.25	0.58	0.67	0.17		0.36	0.25	0.75	0.25	0.50	0.42	0.50	0.58	0.25	0.50	0.36	
		<b>Family Subtotal:</b>	<b>0.25</b>	<b>0.25</b>	<b>0.33</b>	<b>0.25</b>	<b>0.08</b>	<b>0.42</b>	<b>0.42</b>	<b>0.50</b>	<b>0.25</b>	<b>0.58</b>	<b>0.67</b>	<b>0.17</b>	<b>0.36</b>	<b>0.25</b>	<b>0.75</b>	<b>0.25</b>	<b>0.50</b>	<b>0.42</b>	<b>0.50</b>	<b>0.58</b>	<b>0.25</b>	<b>0.50</b>	<b>0.36</b>	<b>0.36</b>	
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>			0.08								0.08							0.17	0.08			0.08		0.18	
	Barn Swallow	<i>Hirundo rustica</i>	0.25	0.25	0.25	0.33	0.17	0.08	0.25	0.33	0.08	0.33	0.25	0.17	0.33	0.18	0.25	0.08	0.17	0.17	0.08	0.33	0.25	0.17	0.17	0.36	
		<b>Family Subtotal:</b>	<b>0.25</b>	<b>0.25</b>	<b>0.33</b>	<b>0.33</b>	<b>0.17</b>	<b>0.08</b>	<b>0.25</b>	<b>0.33</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.17</b>	<b>0.33</b>	<b>0.18</b>	<b>0.25</b>	<b>0.08</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.25</b>	<b>0.17</b>	<b>0.45</b>	
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>		0.08				0.08	0.08																		
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>						0.08																			
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>						0.08					0.08														
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>											0.08													0.17	
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.17</b>	<b>0.17</b>	
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	0.33	0.25	0.33	0.17	0.50	0.42	0.42	0.42	0.17	0.50	0.25	0.42	0.33	0.27	0.42	0.25	0.50	0.50	0.42	0.17	0.58	0.33	0.08	0.36	
		<b>Family Subtotal:</b>	<b>0.33</b>	<b>0.25</b>	<b>0.33</b>	<b>0.17</b>	<b>0.50</b>	<b>0.42</b>	<b>0.42</b>	<b>0.42</b>	<b>0.17</b>	<b>0.50</b>	<b>0.25</b>	<b>0.42</b>	<b>0.33</b>	<b>0.27</b>	<b>0.42</b>	<b>0.25</b>	<b>0.50</b>	<b>0.50</b>	<b>0.42</b>	<b>0.17</b>	<b>0.58</b>	<b>0.33</b>	<b>0.08</b>	<b>0.36</b>	
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>											0.08														
	American Robin	<i>Turdus migratorius</i>	0.50	0.50	0.42	0.42	0.58	0.42	0.42	0.42	0.50	0.25	0.25	0.42	0.50	0.45	0.50	0.42	0.50	0.42	0.50	0.33	0.42	0.58	0.50	0.45	
		<b>Family Subtotal:</b>	<b>0.50</b>	<b>0.50</b>	<b>0.42</b>	<b>0.42</b>	<b>0.58</b>	<b>0.42</b>	<b>0.42</b>	<b>0.42</b>	<b>0.50</b>	<b>0.25</b>	<b>0.25</b>	<b>0.42</b>	<b>0.50</b>	<b>0.45</b>	<b>0.50</b>	<b>0.42</b>	<b>0.50</b>	<b>0.42</b>	<b>0.50</b>	<b>0.33</b>	<b>0.42</b>	<b>0.58</b>	<b>0.50</b>	<b>0.45</b>	
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>		0.08									0.08	0.08		0.25				0.08							
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.25</b>	<b>0.09</b>	<b>0.08</b>									
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>																								0.09	
	American Goldfinch	<i>Spinus tristis</i>	0.08	0.08			0.25	0.17	0.08	0.08					0.08	0.08	0.25	0.18	0.08	0.08	0.17	0.50	0.33	0.08	0.08	0.36	
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.25</b>	<b>0.18</b>	<b>0.08</b>	<b>0.08</b>	<b>0.17</b>	<b>0.50</b>	<b>0.33</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.36</b>	<b>0.36</b>							
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>		0.08																						0.08	0.09
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.09</b>	<b>0.09</b>
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>												0.08													
	Chipping Sparrow	<i>Spizella passerina</i>																		0.08							
	Field Sparrow	<i>Spizella pusilla</i>			0.17	0.08			0.17	0.08	0.08	0.08	0.17	0.08	0.08	0.08	0.09	0.25	0.17		0.42	0.17	0.17	0.25	0.08	0.17	
	American Tree Sparrow	<i>Spizelloides arborea</i>	0.08	0.08			0.17	0.17	0.25	0.17	0.08		0.08	0.08	0.08	0.08		0.25		0.17	0.33	0.17	0.17	0.25	0.08	0.25	0.18
	Dark-eyed Junco	<i>Junco hyemalis</i>		0.08	0.17	0.17	0.08	0.08			0.17	0.17	0.08	0.08		0.17	0.18	0.08			0.17	0.17			0.17	0.18	
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>																							0.08		0.09
	Savannah Sparrow	<i>Passerculus sandwichensis</i>					0.08	0.08																			
	Song Sparrow	<i>Melospiza melodia</i>					0.08	0.08										0.08									
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.58</b>	<b>0.33</b>	<b>0.42</b>	<b>0.25</b>	<b>0.25</b>	<b>0.25</b>	<b>0.33</b>	<b>0.25</b>	<b>0.17</b>	<b>0.33</b>	<b>0.27</b>	<b>0.58</b>	<b>0.17</b>	<b>0.25</b>	<b>0.75</b>	<b>0.33</b>	<b>0.33</b>	<b>0.50</b>	<b>0.25</b>	<b>0.50</b>	<b>0.36</b>	
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>												0.08													
	Baltimore Oriole	<i>Icterus galbula</i>																									
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	0.42	0.33	0.33	0.42	0.50	0.42	0.50	0.42	0.33	0.33	0.42	0.42	0.50	0.55	0.58	0.58	0.42	0.58	0.17	0.33	0.50	0.50	0.50	0.36	
	Brown-headed Cowbird	<i>Molothrus ater</i>	0.08	0.08	0.08	0.08	0.25	0.08	0.08																		

Table C-6. Flight height characteristics of each species and family observed during the small bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Groups Flying	# Obs Flying	Flying Use	% Obs Flying	# (%) within Flight Height Categories			Use in RSZ	Frequency in RSZ
							< 35 m (115 ft)	RSZ: 35 - 200 m (115 - 656 ft)	> 200 m (656 ft)		
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	5	5	0.02	100.0	5 (100.0)	0 (0.0)	0 (0.0)		
	Downy Woodpecker	<i>Dryobates pubescens</i>	15	15	0.05	100.0	15 (100.0)	0 (0.0)	0 (0.0)		
	Hairy Woodpecker	<i>Dryobates villosus</i>	6	6	0.02	100.0	6 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>26</b>	<b>26</b>	<b>0.09</b>	<b>100.0</b>	<b>26 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	4	4	0.01	50.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Eastern Wood-Pewee	<i>Contopus virens</i>	1	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>5</b>	<b>7</b>	<b>0.02</b>	<b>63.6</b>	<b>7 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>100.0</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>100.0</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	75	88	0.31	94.6	88 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>75</b>	<b>88</b>	<b>0.31</b>	<b>94.6</b>	<b>88 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	4	8	0.03	100.0	8 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>4</b>	<b>8</b>	<b>0.03</b>	<b>100.0</b>	<b>8 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	125	242	0.85	91.3	242 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>125</b>	<b>242</b>	<b>0.85</b>	<b>91.3</b>	<b>242 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	6	13	0.05	76.5	13 (100.0)	0 (0.0)	0 (0.0)		
	Barn Swallow	<i>Hirundo rustica</i>	139	219	0.77	92.0	219 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>145</b>	<b>232</b>	<b>0.81</b>	<b>91.0</b>	<b>232 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4	12	0.04	100.0	12 (100.0)	0 (0.0)	0 (0.0)		
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	1	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>5</b>	<b>15</b>	<b>0.05</b>	<b>100.0</b>	<b>15 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	2	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>2</b>	<b>2</b>	<b>0.01</b>	<b>100.0</b>	<b>2 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	2	2	0.01	66.7	2 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>2</b>	<b>2</b>	<b>0.01</b>	<b>66.7</b>	<b>2 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	148	3388	11.85	78.4	3388 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>148</b>	<b>3388</b>	<b>11.85</b>	<b>78.4</b>	<b>3388 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	1	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	American Robin	<i>Turdus migratorius</i>	181	268	0.94	74.0	266 (99.3)	2 (0.7)	0 (0.0)	0.01	< 0.01
		<b>Family Subtotal:</b>	<b>182</b>	<b>272</b>	<b>0.95</b>	<b>74.3</b>	<b>270 (99.3)</b>	<b>2 (0.7)</b>	<b>0 (0.0)</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	9	36	0.13	100.0	36 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>9</b>	<b>36</b>	<b>0.13</b>	<b>100.0</b>	<b>36 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>	2	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
	American Goldfinch	<i>Spinus tristis</i>	40	58	0.20	90.6	58 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>42</b>	<b>61</b>	<b>0.21</b>	<b>91.0</b>	<b>61 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	3	35	0.12	100.0	35 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>3</b>	<b>35</b>	<b>0.12</b>	<b>100.0</b>	<b>35 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Chipping Sparrow	<i>Spizella passerina</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	Field Sparrow	<i>Spizella pusilla</i>	34	51	0.18	92.7	51 (100.0)	0 (0.0)	0 (0.0)		
	American Tree Sparrow	<i>Spizelloides arborea</i>	46	102	0.36	97.1	102 (100.0)	0 (0.0)	0 (0.0)		
	Dark-eyed Junco	<i>Junco hyemalis</i>	30	96	0.34	93.2	96 (100.0)	0 (0.0)	0 (0.0)		
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	2	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	2	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
Song Sparrow	<i>Melospiza melodia</i>	3	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)			
		<b>Family Subtotal:</b>	<b>119</b>	<b>261</b>	<b>0.91</b>	<b>94.9</b>	<b>261 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	2	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Baltimore Oriole	<i>Icterus galbula</i>	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	232	662	2.31	73.0	616 (93.1)	46 (6.9)	0 (0.0)	0.16	0.01
	Brown-headed Cowbird	<i>Molothrus ater</i>	22	65	0.23	63.1	65 (100.0)	0 (0.0)	0 (0.0)		
	Common Grackle	<i>Quiscalus quiscula</i>	11	37	0.13	56.1	37 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>268</b>	<b>768</b>	<b>2.69</b>	<b>71.1</b>	<b>722 (94.0)</b>	<b>46 (6.0)</b>	<b>0 (0.0)</b>	<b>0.16</b>	<b>0.01</b>
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	1	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Yellow Warbler	<i>Setophaga petechia</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	Unidentified Warbler	-	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
		<b>Family Subtotal:</b>	<b>3</b>	<b>7</b>	<b>0.02</b>	<b>100.0</b>	<b>7 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Cardinalidae (Cardinals & Allies)	Scarlet Tanager	<i>Piranga olivacea</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	Northern Cardinal	<i>Cardinalis cardinalis</i>	19	21	0.07	87.5	21 (100.0)	0 (0.0)	0 (0.0)		
	Indigo Bunting	<i>Passerina cyanea</i>	2	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
	Dickcissel	<i>Spiza americana</i>	0	0	0.00	0.0	0 (-)	0 (-)	0 (-)		
		<b>Family Subtotal:</b>	<b>22</b>	<b>25</b>	<b>0.09</b>	<b>86.2</b>	<b>25 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
		<b>Total</b>	<b>1187</b>	<b>5477</b>	<b>19.15</b>	<b>79.4</b>	<b>5429 (99.1)</b>	<b>48 (0.9)</b>	<b>0 (0.0)</b>	<b>0.17</b>	<b>0.01</b>

**APPENDIX J**  
**YEAR TWO AVIAN USE REPORT**

**CONFIDENTIAL: DO NOT DISTRIBUTE**



# **YEAR TWO PRE-CONSTRUCTION AVIAN USE REPORT**

**AUGUST 2022 THROUGH JULY 2023**

**RIVERBEND WIND PROJECT  
SANILAC COUNTY, MICHIGAN**

*Prepared for*

**Riverbend Wind**  
354 Davis Road  
Oakville, Ontario L6J 2X1  
Canada

**Atwell Project No. 21003645**

***Submitted by Atwell, LLC***

**DRAFT  
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**September 2023**

## EXECUTIVE SUMMARY

This report summarizes the results of a second year of pre-construction avian studies conducted between August 2022 and July 2023 by Atwell, LLC on behalf of Riverbend Wind for the proposed Riverbend Wind Project (project) in Sanilac County, Michigan. Field studies were designed to document eagle and large-bodied bird use, as well as small-bodied bird use, within the project area. Results from the first year of surveys, conducted in 2021 and 2022, were presented under separate cover, including raptor nest surveys conducted for the project in April 2021.

Avian use studies were conducted in accordance with recommendations provided in the U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines (WEG), the Eagle Conservation Plan Guidance: Module 1 - Land-based Wind Energy, Version 2 (ECPG), and the Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (i.e., “final Eagle Rule”). The WEG recommend avian studies to document horizontal and vertical avian use, avian use by habitat type, raptor nest presence and activity, and presence and activity of species of concern. The ECPG recommends studies to document eagle use, including occurrence, use during spring and fall migration seasons, and nest territory occupancy. The avian studies summarized in this report were designed to collect data in accordance with these guidelines. As previously mentioned, results from raptor nest surveys are summarized under separate cover.

Year two pre-construction avian studies within the project area were comprised of long-duration (60-minute fixed point) eagle and large-bodied avian use surveys, as well as short-duration (10-minute fixed point) diurnal avian activity surveys that were conducted from August 2022 through July 2023. The objectives of these studies were to: 1) document and characterize seasonal and spatial avian use within the project area; 2) document species composition within the project area; and 3) document use of the project area by federally and state-listed threatened and endangered species.

The results of the surveys conducted during the 2022 to 2023 study period are summarized below.

### **Bald Eagle and Golden Eagle Use of the Project Area**

- Twenty-six observations of Bald Eagles (*Haliaeetus leucocephalus*) were recorded over the course of 312 hours of standardized eagle and large-bodied avian use surveys from August 2022 through July 2023. No Golden Eagles (*Aquila chrysaetos*) were detected during eagle and large-bodied avian use surveys or during diurnal avian activity surveys. In addition, seven observations of Bald Eagles were recorded incidentally to standardized surveys. Incidental detections include observations beyond the sample plot boundary, detections outside of the 60-minute long-duration survey window, and detections recorded while traveling between point count stations.

- Bald Eagle seasonal mean use rates during eagle and large-bodied avian use surveys were highest in the fall (0.144 Bald Eagle detections/60-minute survey/800 m plot), followed by the summer (0.096 Bald Eagle detections/60-minute survey/800 m plot), and then winter and spring (0.038 Bald Eagle detections/60-minute survey/800 m plot for both winter and spring).
- While Bald Eagle mean use was generally highest at point count station #6 in the north-central portion of the project area, point count stations #9 and #21 had the highest and second highest occurrence frequencies, respectively. Point count station #21 had the highest occurrence frequency during year one studies. These point count stations are in relatively close proximity to larger patches of woodlands.
- A total of 78 Bald Eagle-minutes (i.e., minutes flying within an 800 m-radius by 200 m-high sample plot) were recorded during standardized surveys. Most eagle minutes were recorded during the fall season, though fall and summer had an equal number of eagle-minutes on a per survey hour basis.
- Bald Eagle mean minimum and maximum flight heights were within a hypothetical 35 to 150 m rotor swept zone (RSZ).

#### **Large-Bodied Bird Use of the Project Area**

- The waterfowl species group accounted for a large proportion of overall large-bodied bird detections in the fall, winter, and spring, primarily driven by flocks of Canada Geese (*Branta canadensis*). Large-bodied corvids and raptors accounted for most large-bodied bird detections in the summer, primarily driven by American Crows (*Corvus brachyrhynchos*) and Turkey Vultures (*Cathartes aura*), respectively.
- Mean minimum and/or maximum flight heights during eagle and large-bodied avian use surveys were within a hypothetical 35 to 150 m RSZ for the raptor, waterbird, and waterfowl species groups. Non-eagle raptors with mean minimum and/or maximum flight heights within the RSZ included Red-tailed Hawk and Turkey Vulture, though all raptor species with more than one detection were observed within the RSZ at least once over the course of standardized surveys.
- No federally or state-listed threatened or endangered species were observed during large-bodied avian use surveys. Fourteen observations of Michigan special concern (SC) Northern Harriers (*Circus hudsonius*) were recorded over the course of standardized eagle and large-bodied avian use surveys, including five in both the fall and spring, two in the winter, and one in the summer. One observation of SC Merlin (*Falco columbarius*) was recorded over the course of standardized eagle and large-bodied avian use surveys. This

observation occurred during the winter season. Species are not afforded statutory protections through designation as SC.

### **Small-Bodied Bird Use of the Project Area**

- Small-bodied passerines accounted for most detections recorded during diurnal avian activity surveys. Species that are expected to be common in the cropland habitats that cover the project area composed the largest proportions of overall passerine detections, including European Starlings (*Sturnus vulgaris*), Red-winged Blackbirds (*Agelaius phoeniceus*), Mourning Doves (*Zenaida macroura*), and Horned Larks (*Eremophila alpestris*).
- Small-bodied avian species were detected within RSZ, though the proportion of flocks and individuals within RSZ was relatively low. Overall, 3.2% of flocks and 3.6% of individuals were detected within the RSZ. Seasonal proportions ranged from 0.3% to 5.6% of flocks or individuals within the RSZ. Red-winged Blackbirds were the most observed small-bodied species within RSZ overall and in the fall and spring. A single flock of 19 Snow Buntings (*Plectrophenax nivalis*) accounted for all winter small bird activity within the RSZ, whereas a single Barn Swallow (*Hirundo rustica*) accounted for all summer small bird activity within the RSZ.
- No federally or state-listed threatened or endangered species were observed during diurnal avian activity surveys. Observations of SC during diurnal avian activity surveys included one Red-headed Woodpecker (*Melanerpes erythrocephalus*; fall), one Dickcissel (*Spiza americana*; summer), one Wood Thrush (*Hylocichla mustelina*; summer), eight Eastern Meadowlarks (*Sturnella magna*; five in spring and three in summer), five Bald Eagles (fall), and two Northern harriers (one each in spring and summer).

## TABLE OF CONTENTS

<b>1</b>	<b>INTRODUCTION</b> .....	<b>1</b>
<b>2</b>	<b>PROJECT AREA</b> .....	<b>2</b>
<b>3</b>	<b>METHODS</b> .....	<b>3</b>
3.1	LONG-DURATION EAGLE AND LARGE-BODIED AVIAN USE SURVEYS.....	3
3.2	SHORT-DURATION DIURNAL AVIAN ACTIVITY SURVEYS .....	7
3.3	INCIDENTAL DATA COLLECTION AND LISTED SPECIES .....	9
3.4	STATISTICAL ANALYSIS.....	9
<b>4</b>	<b>RESULTS</b> .....	<b>11</b>
4.1	LONG-DURATION EAGLE AND LARGE-BODIED AVIAN USE SURVEYS.....	11
4.1.1	Use of the Project Area by Eagles.....	11
4.1.2	Use of the Project Area by Other Large-Bodied Bird Species.....	21
4.1.3	Species of Concern .....	29
4.2	SHORT-DURATION DIURNAL AVIAN ACTIVITY SURVEYS .....	30
4.2.1	General Avian Use .....	30
4.2.2	Species Group Use of the Project Area.....	32
4.2.3	Flight Heights by Species Group .....	33
4.2.4	Species of Concern .....	34
<b>5</b>	<b>DISCUSSION</b> .....	<b>36</b>
<b>6</b>	<b>REFERENCES</b> .....	<b>42</b>

## TABLES

- 1 Point Count Station Locations
- 2 Total Standardized Survey Effort by Point Count Station
- 3 Seasonal Mean Use Statistics—Long-Duration Eagle and Large-Bodied Avian Use Surveys
- 4 Seasonal and Annual Bald Eagle Mean Use by Point Count Station—Long-Duration Eagle and Large-Bodied Avian Use Surveys
- 5 Eagle-Minutes and Time within Rotor Swept Zone Summaries for Bald Eagles
- 6 Seasonal and Annual Raptor Mean Use by Point Count Station—Long-Duration Eagle and Large-Bodied Avian Use Surveys
- 7 Seasonal Mean Use by Species Group—Short-Duration Diurnal Avian Activity Surveys

## FIGURES

- 1 Site Location
- 2 Land Cover
- 3 Point Count Station Locations
- 4 Bald Eagle Observations
- 5 Raptor Flight Heights during Large-Bodied Avian Use Surveys
- 6 Species Group Flight Heights during Large-Bodied Avian Use Surveys

## APPENDICES

**A Year One TRC Avian Reports**

**B Species Observed during 2022 – 2023 Avian Use Surveys**

**C Seasonal Species Group Mean Use Statistics**

- C-1 Seasonal Mean Use Statistics for Small-Bodied Non-Passerines and Passerines (Diurnal Avian Activity Surveys)
- C-2 Seasonal Mean Use Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds (Diurnal Avian Activity Surveys)
- C-3 Seasonal Mean Use Statistics for Raptors (Diurnal Avian Activity Surveys)
- C-4 Seasonal Mean Use Statistics for Shorebirds, Waders, and Waterbirds (Diurnal Avian Activity Surveys)
- C-5 Seasonal Mean Use Statistics for Waterfowl (Diurnal Avian Activity Surveys)

## ACRONYMS AND ABBREVIATIONS

Atwell	Atwell, LLC
AWWI	American Wind Wildlife Institute
BGEPA	Bald and Golden Eagle Protection Act
CI	confidence interval
ECPG	United States Fish and Wildlife Service 2013 <i>Eagle Conservation Plan Guidance: Module 1 - Land-based Wind Energy Version 2</i>
ESA	Endangered Species Act
final Eagle Rule	United States Fish and Wildlife Service 2016 <i>Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests</i>
ft	foot/feet
km <sup>2</sup>	square kilometer(s)
m	meter(s)
MCP	minimum convex polygon
MNFI	Michigan Natural Features Inventory
MRLC	Multi-Resolution Land Characteristics Consortium
QA/QC	Quality Assurance/Quality Control
PCMM	post-construction mortality monitoring
project	Riverbend Wind Project
REWI	Renewable Energy Wildlife Institute
RSZ	rotor-swept zone
SC	Michigan Species of Special Concern
SD	standard deviation
TES	Threatened and Endangered Species
TRC	TRC Environmental Corporation
USFWS	United States Fish and Wildlife Service
WEG	United States Fish and Wildlife Service 2012 <i>Land-Based Wind Energy Guidelines</i>

## 1 INTRODUCTION

Atwell, LLC (Atwell) was contracted by Riverbend Wind to conduct a second year of avian studies for the proposed Riverbend Wind Project (project) in Sanilac County, Michigan (Figure 1). The proposed project includes the development of wind turbine generators, associated collection lines, access roads, and a collector substation.

The objectives of the studies summarized in this report were to document eagle and avian use of the project area. Survey protocols described herein were designed to adhere to voluntary recommendations established by the Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (i.e., “final Eagle Rule”; USFWS 2016), Tier 3 of the United States Fish and Wildlife Service (USFWS) 2012 Land-Based Wind Energy Guidelines (WEG; USFWS 2012), and Stage 2 assessments described in the USFWS Eagle Conservation Plan Guidance: Module 1 - Land-based Wind Energy Version 2 (ECPG; USFWS 2013). These references provide wind energy developers and operators guidance for adhering to the Migratory Bird Treaty Act and Bald and Golden Eagle Protection Act (BGEPA), respectively. Additionally, Atwell utilized industry standard approaches for avian use studies as recommended by the National Wind Wildlife Collaborative (Strickland et al. 2011).

By documenting eagle and avian use of the project area and its vicinity, the studies were able to identify use of the project area by special status avian species. Special status avian species include species proposed for or currently listed for federal protection under the Endangered Species Act (ESA) and species that are listed by the state of Michigan as endangered, threatened, or special concern under the Endangered Species Act of the State of Michigan. State-listed species of special concern (SC) are not afforded statutory protection under state law but are listed as SC due to declining or relict populations in the state (Michigan Natural Features Inventory; MNFI 2023).

This report summarizes results from a second year of pre-construction avian use studies for the project, including long-duration eagle and large-bodied avian use surveys and short-duration diurnal avian activity surveys. A first year of avian field studies was conducted by TRC Environmental Corporation (TRC) in 2021 – 2022, including a raptor nest survey in April 2021 and eagle and avian use surveys from March 2021 through February 2022. Results from the first year of surveys were presented under a separate cover (TRC 2021; TRC 2022) (Appendix A).

This report adheres to avian taxonomy outlined in the American Ornithological Society’s Online Checklist of North & Middle American Birds: 6th Supplement (Chesser et al. 2023).

## 2 PROJECT AREA

The project is in Speaker and Fremont townships, Sanilac County, Michigan (Figure 1). It is within a largely rural landscape with most land within the project boundaries (hereafter referred to as “project area”) dedicated to agricultural use. The Village of Melvin is in the western portion of the project area (Figure 1).

The general topography of the project area is relatively flat to gently rolling, with elevations ranging between approximately 705 to 870 feet above mean sea level. The project area is drained by a network of agricultural ditches, streams, and creeks. The Black River flows north-to-south approximately 0.8 miles east of the project area (Figure 1). Black Creek, a tributary of the Black River, intersects the eastern portion of the project area.

The 44,523-acre project area is dominated by agricultural cropland (Figure 2). The Multi-Resolution Land Characteristics Consortium’s (MRLC) 2019 National Land Cover Database (NLCD) – Land Use-Land Cover dataset (MRLC 2021) classifies 70.8% of the project area as cultivated crops with an additional 6.3% classified as developed (open space and low, medium, and high intensity), and 4.2% classified as hay/pasture. Woody wetlands and deciduous, evergreen, and mixed forest collectively account for 18.2% of the project area. Other land cover types found within the project area include emergent herbaceous wetlands, herbaceous cover, open water, scrub/shrub, and barren land, each comprising less than 1% of the project area (Figure 2).

### **3 METHODS**

#### **3.1 LONG-DURATION EAGLE AND LARGE-BODIED AVIAN USE SURVEYS**

A long-duration, fixed-point protocol (Strickland et al. 2011) was used to document seasonal activity and behavior of eagles and other large-bodied species within the project area. All eagle detections and other raptor detections within a three-dimensional cylindrical plot (the sample plot) were recorded, following a fixed-radius, point count survey approach (Hutto et al. 1986; Ralph et al. 1993) that is referenced in the ECPG (USFWS 2013). Sample plots measured 2,625 feet (ft; 800 meters [m]) in radius by 656 ft (200 m) in height, in accordance with the final Eagle Rule (USFWS 2016).

##### ***Study Period***

Eagle and large-bodied avian use surveys were conducted over one full year (Strickland et al. 2011). Each sample plot was visited for one hour each month, as described in the final Eagle Rule (USFWS 2016). Seasonal periods were defined as spring (March through May), summer (June and July), fall (August through November), and winter (January through February). The study period began on August 1, 2022, and ended on July 31, 2023.

##### ***Selection and Location of Point Count Stations***

Twenty-six point count stations (i.e., sample plots) were established within the project area (Figure 3; Table 1).

**Table 1. Point Count Station Locations**

Point Count Station	Latitude	Longitude
1	43.16316	-82.76131
2	43.16996	-82.86071
3	43.17342	-82.80658
4	43.18631	-82.87140
5	43.22819	-82.85441
6	43.22790	-82.78541
7	43.21852	-82.75545
8	43.22328	-82.83441
9	43.17040	-82.67189
10	43.21031	-82.66593
11	43.24097	-82.66789
12	43.18308	-82.71852
13	43.18057	-82.84147
14	43.16859	-82.78136
15	43.19882	-82.74417
16	43.22041	-82.69414
17	43.19321	-82.66479
18	43.23114	-82.81128
19	43.17184	-82.69620
20	43.20547	-82.70918
21	43.21749	-82.72559
22	43.19376	-82.76333
23	43.20428	-82.87380
24B <sup>a</sup>	43.17561	-82.73966
25 <sup>b</sup>	43.18456	-82.68421
26 <sup>b</sup>	43.23707	-82.76652

<sup>a</sup> Point count station #24 was relocated for year two surveys and represents a different set of data than year one surveys. Therefore, the point has been renamed "24B."

<sup>b</sup> Point count stations #25 and #26 are new locations added for year two surveys.

Guidelines in the final Eagle Rule (USFWS 2016) and Appendix C of the ECPG (USFWS 2013) recommend that sample plots should achieve 30% spatial coverage of the minimum convex polygon (MCP). The MCP encompasses the hazardous area around the turbines and their associated infrastructure. A turbine array had not yet been finalized prior to the start of surveys; therefore, Atwell established 26 sample plots to achieve at least 30% spatial coverage of a 37,102-acre MCP based on a preliminary turbine array provided on July 13, 2022. Sample plots for eagle and large-bodied bird use surveys covered approximately 31.2% (11,557.2 acres; 46.8 square

kilometers [km<sup>2</sup>]) of the MCP<sup>1</sup>. Similarly, sample plots covered approximately 28.5% (12,702.4 acres; 51.4 km<sup>2</sup>) of the project area.

Twenty-three of the 26 sample plot locations were also surveyed during year one studies (TRC 2022). Two sample plot locations (#25 and #26) were added for year two studies. One sample plot location surveyed during year one studies (#24) was relocated for year two studies and renamed #24B to indicate that it represents a different set of data than #24.

The following criteria were used to select point count station locations:

- Stations were located on low-traffic roadways for safety and to minimize the potential for noise disturbance during surveys.
- Stations were located within or adjacent to habitat types representative of the project area.
- Stations were located so that sample plots did not overlap.
- Stations provided a 360-degree view of the horizon to the extent feasible.
- Stations were located in areas accessible year-round to the extent feasible.

Atwell ground-truthed all 26 point count stations at the onset of surveys in August 2022. Stations with landowner conflicts, an inadequate viewshed, or anticipated poor observer access during heavy precipitation and/or during winter months were adjusted, as necessary, to the extent practicable.

Land cover types were reviewed during ground-truthing to confirm that the survey points were representative of habitats found within the project area. The sample plot survey areas obtained the following coverages within land cover types: 79.7% cultivated crops, 6.6% developed land, 1.9% hay/pasture, and 11.5% woody wetlands and deciduous, evergreen, and mixed forest (combined). The following land cover types each represented less than 1% of the area covered by survey point count stations: emergent herbaceous wetlands, shrub/scrub, herbaceous land cover, and open water.

### ***Survey Methodology***

Consistent with the final Eagle Rule, a one-hour survey duration was used throughout the study period for all visits for each sample plot (USFWS 2016).

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<sup>1</sup> While the turbine array has changed since the selection of survey points for year two avian use studies, the MCP remains similar as of the preparation of this report. Sample plots still achieve 31.2% of the current turbine array MCP (August 14, 2023).

Full data (described below) was recorded for all large-bodied bird species during the first 20 minutes of the 1-hour count. Full data for only Bald Eagles, Golden Eagles, non-eagle raptors, and large-bodied federally and state-listed threatened and endangered species (TES) were recorded during the subsequent 40 minutes of the 1-hour count, resulting in 60 minutes of eagle and non-eagle raptor use survey effort per point count survey. Only “essential data” (described below) was collected for other large-bodied bird species during the 40-minute segment. Surveys were conducted between dawn and dusk. Surveys were conducted in all weather conditions, provided that conditions were safe for the observer and that horizontal visibility was at least 800 m and vertical visibility was at least 200 m. A monitoring station was randomly selected from the 26 monitoring stations at the start of each of the 12 survey events across the year.

While broadly referred to here as point count surveys, the ECPG recognizes that eagle and raptor use surveys are more accurately described as a ‘point-based recording of activity duration (minutes of flight)’ within the sample plot (USFWS 2013).

Large-bodied bird species included raptors (hawks, eagles, falcons, kestrels, owls, vultures), waterfowl (ducks and geese), wading birds (herons, egrets, bitterns), waterbirds (pelicans, cormorants, coots, rails, grebes), shorebirds (plovers, sandpipers, avocets, stilts, snipes, woodcocks), upland gamebirds (Northern Bobwhite [*Colinus virginianus*], grouse, pheasants), pigeons and collared-doves, Pileated Woodpeckers (*Dryocopus pileatus*), and large corvids (American Crows [*Corvus brachyrhynchos*] and Common Ravens [*Corvus corax*]).

The following information (i.e., full data) was recorded for each large-bodied individual observed during the initial 20-minute segment (including eagles and non-eagle raptors) and for only eagle, non-eagle raptor, and large-bodied TES individuals during the subsequent 40-minute segment:

- Time of day at first and final observation within the sample plot
- Species or parent taxa group (e.g., *Accipiter* species in cases where identification to species was not possible)
- Horizontal distance to initial observation and closest observation in meters
- Count of individuals observed
- Flight height altitude within the sample plot (initial height, minimum height, maximum height in meters)
- Flight direction, assessed as the general direction of the vector of passage from initial location observed to final location observed
- Age (if known, with dependent juveniles not included in mean use analyses)
- Behavior

- Duration of flight within a hypothetical rotor-swept zone's (RSZ) portion of the sample plot (35 to 150 m in height), to the nearest 0.1 minute
- Duration of flight within the entire sample plot (0 to 200 m in height) for eagles only (i.e., eagle-minutes described in the ECPG [USFWS 2013])
- Habitat

Eagle activity data was gathered for each minute of Bald Eagle flight within the 800 m-radius x 200-m sample plot following guidelines in the ECPG (i.e., eagle-minutes). Eagle activity data included (for each minute):

- Time of day
- Horizontal distance at the start of the eagle minute and closest horizontal distance during the eagle-minute
- Flight height at the start of the eagle-minute
- Flight direction as a general passage vector during the eagle-minute
- Age
- Behavior
- Habitat

Flight paths through the sample plot were also mapped for eagles and federally and state-listed TES.

As mentioned above, only essential data was gathered for other large-bodied bird species during the final 40-minute segment of the point count. These included time of observation, species, initial and closest distance, count of individuals, and minimum flight height.

At the completion of each survey, the observer confirmed that datasheets were complete and legible prior to proceeding to the next point count station. Following completion of the surveys, data were reviewed and uploaded into the project database as part of the Quality Assurance/Quality Control (QA/QC) program.

## **3.2 SHORT-DURATION DIURNAL AVIAN ACTIVITY SURVEYS**

### ***Short-duration Point Count Surveys***

A short-duration, fixed-point protocol (Strickland et al. 2011) was used to characterize general avian use within the study area, consistent with the WEG (USFWS 2012). Short-duration point count surveys were used to estimate mean use and species richness, to determine presence of

species of concern, and to determine areas of concentrated avian use within the study area. These surveys are referred to as diurnal avian activity surveys hereafter.

Detections of small-bodied birds and large-bodied birds were recorded following a fixed point, variable circular plot approach (Reynolds et al. 1980; Ralph et al. 1993; Ralph et al. 1995). Small-bodied birds included hummingbirds, cuckoos, doves, swifts, woodpeckers, and most passerines. Large-bodied birds included upland game birds, waterfowl, waterbirds (wading birds, cormorants, pelicans, grebes), shorebirds, raptors, nightjars, pigeons, and large corvids. Individuals observed at all distances during each survey were recorded; however, data was truncated during statistical analysis to only include small-bodied bird species first detected within a 300 m (492 ft) radius and large-bodied bird species first detected within 800 m radius (section 3.4).

### ***Study Period and Study Area***

Diurnal avian activity surveys were completed during the fall (August through November 2022), winter (December 2022 and January through February 2023), spring (March through May 2023) and summer (June and July 2023). The same 26 point count station locations established for long-duration eagle and large-bodied avian use surveys were also used for short-duration avian use surveys (Figure 3).

### ***Survey Methodology***

Standardized diurnal avian activity surveys followed point count methodology described in Ralph et al. (1993; 1995), the WEG (USFWS 2012), and in standard industry recommendations (National Wind Coordinating Committee 1999; Strickland et al. 2011).

Surveys were 10 minutes in duration and typically occurred immediately prior to long-duration eagle and large-bodied avian use surveys. However, surveys occasionally occurred immediately following, rather than prior to, long-duration eagle and large-bodied avian use surveys.

All birds that were seen or heard during the survey were recorded. Surveys were conducted throughout the day.

The following information was recorded for each bird observed:

- Species or parent taxa group (e.g., sparrow species in cases where identification to species was not possible)
- Detection type (song, visual, call, other)
- Distance to initial detection
- Count of individuals observed
- Age (if known, with dependent juveniles not counted in mean use analyses)

- Flight height altitude at initial detection (coded as above RSZ, within RSZ, or below RSZ)
  - If a bird was initially detected outside of RSZ but later entered RSZ, it was ultimately coded as RSZ.
- Numeric flight height estimate was also recorded to accommodate analyses using a wider RSZ if desired
- Habitat
- Breeding observations (e.g., nesting material carry, food material carry, nest, copulation, etc.).

At the completion of each survey, the observer confirmed that datasheets were complete and legible prior to proceeding to the next point count station. Following completion of the surveys, data were reviewed and uploaded into the project database as part of the QA/QC program.

### **3.3 INCIDENTAL DATA COLLECTION AND LISTED SPECIES**

Incidental detections of federally and state-listed TES and eagles were recorded during survey activities. Incidental detections include observations recorded while en route to point count stations, observations recorded outside of the survey timeframe, small-bodied bird observations during long-duration avian use surveys, and observations outside of the sample plot during long-duration avian use surveys.

### **3.4 STATISTICAL ANALYSIS**

Mean use statistics were calculated for each species per survey period (e.g., standardized detections/60-minute survey for eagle and large-bodied avian use surveys and standardized detections/10-minute survey for diurnal avian activity surveys) per sample plot area (e.g., 800 m-radius plot for large-bodied birds during both long and short-duration surveys, and 300 m-radius plot for small-bodied birds during short-duration surveys). Mean use statistics provide estimates of the average number of detections per unit time and area but are not estimates of absolute abundance.

Occurrence frequency and species composition provide additional insight into the overall avian use diversity within the project area. Occurrence frequency is the proportion of point count surveys during which a particular species was recorded (e.g., Bald Eagle detections recorded during four different point count surveys over the three-month spring period [78 total point count surveys across 26 point count stations in the spring] yields an occurrence frequency of 0.05). Percent composition is the percentage of total number of detections comprised by a species or species group (e.g., 86 raptor detections out of 2,100 total bird detections yields a composition of 4.1%).

For eagle and large-bodied avian use surveys, mean use, occurrence frequency, and percent composition were calculated using both full data and essential data combined. This is because the number of individuals for each observation was recorded for both data types over the entire 60-minute survey period. For diurnal avian activity surveys, mean use, occurrence frequency, and percent composition were calculated based on all observations within the 800 m or 300 m-radius sample plot during the 10-minute survey window. Detections at all heights, including over 200 m, were used for these analyses.

Flights height statistics provide information on vertical use of the sample plot. Mean minimum and maximum flight heights were calculated using full data only. Therefore, flight height statistics for eagles and non-eagle raptors were based on a 60-minute survey period, whereas flight heights for other large-bodied bird species were based on the initial 20-minute survey period. Mean flight heights were based on groups (i.e., flocks) of birds observed in flight within the 800-m survey radius during the standardized survey rather than the total number of individuals. For example, a group of 50 Snow Geese in flight would be considered a single sample for the flight height analysis. Similarly, a lone Snow Goose (i.e., group size of one) flying through the sample plot would also be considered a single sample for the flight height analysis. As with the statistics previously mentioned, detections above 200 m in flight height were included for this analysis; however, birds that were not detected in flight (i.e., perched or heard-only) were excluded from analysis.

A list of all species detected within the project area over the course of year two surveys (including incidentally observed species) is provided in Appendix B.

## **4 RESULTS**

### **4.1 LONG-DURATION EAGLE AND LARGE-BODIED AVIAN USE SURVEYS**

The following sections summarize the results of the eagle and large-bodied avian use surveys.

#### **4.1.1 Use of the Project Area by Eagles**

Eagle use survey results, along with discussion regarding annual and seasonal patterns, spatial distribution of observations across the project area, individual eagles' directional movements at the time of observation, flight heights, and eagle minutes are presented below.

##### **4.1.1.1 Eagle Use Survey Effort**

Table 2 summarizes survey effort by point during the survey period. Eagle use surveys occurred over 312 total hours of standardized survey effort during the study period. Total effort included 78 hours of spring surveys, 52 hours of summer surveys, 104 hours of fall surveys, and 78 hours of winter surveys.

**Table 2. Total Standardized Survey Effort by Point Count Station**

Point Count Station	60 Minute Eagle and Large-Bird Use Survey Standardized Effort (hours)					10 Minute All-Bird Avian Use Survey Standardized Effort (hours)				
	Fall	Winter	Spring	Summer	Total Hours	Fall	Winter	Spring	Summer	Total Hours
1	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
2	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
3	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
4	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
5	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
6	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
7	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
8	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
9	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
10	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
11	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
12	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
13	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
14	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
15	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
16	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
17	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
18	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
19	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
20	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
21	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
22	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
23	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
24B	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
25	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
26	4	3	3	2	12	0.67	0.50	0.50	0.33	2.00
<b>Grand Total</b>	<b>104</b>	<b>78</b>	<b>78</b>	<b>52</b>	<b>312</b>	<b>17.42</b>	<b>13.00</b>	<b>13.00</b>	<b>8.58</b>	<b>52.00</b>

4.1.1.2 Cumulative Detections of Bald Eagles and Golden Eagles

Overall, 33 observations of Bald Eagles were documented during year two (Figure 4). Twenty-six of the 33 detections occurred as standardized observations within the current project area over 312 survey hours. An additional seven incidental observations of Bald Eagles were documented during the year two survey period (Figure 4). This is similar to results from year one surveys,

which also detected 26 Bald Eagles during standardized surveys, though over 283 survey hours (TRC 2022).

No Golden Eagles were detected over 312 hours of standardized eagle use surveys.

#### 4.1.1.3 Seasonality

Bald Eagles were observed in the fall, winter, spring, and summer. Most standardized detections (57.7%; 15 detections) occurred during the fall migratory period. Approximately 11.5% of detections (three detections) occurred in both the winter and spring, whereas approximately 19.2% of detections (five detections) occurred during the summer. Incidental observations of Bald Eagles consisted of six observations in the fall and one in the winter. Seasonal Bald Eagle mean use within the project area was:

- 0.144 Bald Eagle detections/60-minute survey/800 m plot (standard deviation [SD] = 0.598) during the fall survey period
- 0.038 Bald Eagle detections/60-minute survey/800 m plot (SD = 0.194) during the winter period
- 0.038 Bald Eagle detections/60-minute survey/800 m plot (SD = 0.252) during the spring survey period
- 0.096 Bald Eagle detections/60-minute survey/800 m plot (SD = 0.358) during the summer period (Table 3).

Accounting for the total eagle use survey effort across the project area during the year, the equivalent of one Bald Eagle observation was recorded for every 6.9 survey hours in the fall, 26.3 survey hours in the winter and spring, and 10.4 survey hours in the summer.

While year two surveys recorded the same number of standardized bald eagle detections as year one, seasonality tended to be different. Whereas eagle mean use was highest in the fall during year two, year one surveys recorded the highest mean use rate in the winter.

**Table 3. Seasonal Mean Use Statistics—Long-Duration Eagle and Large-Bodied Avian Use Surveys**

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
<b>RAPTORS</b>																				
American Kestrel	4	2.6	0.038	0.193	0.038	3	11.5	0.038	0.194	0.038	1	0.9	0.013	0.113	0.013	1	1.3	0.019	0.139	0.019
Bald Eagle <sup>f</sup>	15	9.6	0.144	0.598	0.087	3	11.5	0.038	0.194	0.038	3	2.7	0.038	0.252	0.026	5	6.3	0.096	0.358	0.077
Cooper's Hawk	4	2.6	0.038	0.193	0.038	2	7.7	0.026	0.159	0.026	0	-	-	-	-	2	2.5	0.038	0.194	0.038
Merlin	0	-	-	-	-	1	3.8	0.013	0.113	0.013	0	-	-	-	-	0	-	-	-	-
Northern Harrier	5	3.2	0.048	0.215	0.048	2	7.7	0.026	0.159	0.026	5	4.5	0.064	0.247	0.064	1	1.3	0.019	0.139	0.019
Red-tailed Hawk	36	23.1	0.346	0.620	0.279	15	57.7	0.192	0.511	0.141	10	9.0	0.128	0.373	0.115	11	13.9	0.212	0.536	0.154
Rough-legged Hawk	0	-	-	-	-	0	-	-	-	-	1	0.9	0.013	0.113	0.013	0	-	-	-	-
Sharp-shinned Hawk	1	0.6	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Turkey Vulture	91	58.3	0.875	2.250	0.308	0	-	-	-	-	90	81.1	1.154	2.145	0.385	59	74.7	1.135	1.804	0.423
Unknown Raptor	0	-	-	-	-	0	-	-	-	-	1	0.9	0.013	0.113	0.013	0	-	-	-	-
<b>All Raptors</b>	<b>156</b>	<b>7.8</b>	<b>1.500</b>	<b>2.430</b>	<b>0.587</b>	<b>26</b>	<b>2.3</b>	<b>0.333</b>	<b>0.617</b>	<b>0.269</b>	<b>111</b>	<b>12.6</b>	<b>1.423</b>	<b>2.219</b>	<b>0.513</b>	<b>79</b>	<b>27.7</b>	<b>1.519</b>	<b>1.945</b>	<b>0.558</b>
<b>All Raptors (Excluding Turkey Vulture)</b>	<b>65</b>	<b>3.4</b>	<b>0.625</b>	<b>0.987</b>	<b>0.404</b>	<b>26</b>	<b>2.3</b>	<b>0.333</b>	<b>0.617</b>	<b>0.269</b>	<b>21</b>	<b>2.6</b>	<b>0.269</b>	<b>0.501</b>	<b>0.244</b>	<b>20</b>	<b>8.8</b>	<b>0.385</b>	<b>0.690</b>	<b>0.269</b>
<b>LARGE-BODIED CORVIDS</b>																				
American Crow	449	100.0	4.317	11.258	0.538	256	100.0	3.282	9.155	0.769	114	100.0	1.462	2.118	0.667	87	100.0	1.673	2.299	0.635
<b>All Large-bodied Corvids</b>	<b>449</b>	<b>22.57</b>	<b>4.317</b>	<b>11.258</b>	<b>0.538</b>	<b>256</b>	<b>22.4</b>	<b>3.282</b>	<b>9.155</b>	<b>0.769</b>	<b>114</b>	<b>12.9</b>	<b>1.462</b>	<b>2.118</b>	<b>0.667</b>	<b>87</b>	<b>30.5</b>	<b>1.673</b>	<b>2.299</b>	<b>0.635</b>
<b>LARGE-BODIED NON-PASSERINES</b>																				
Pileated Woodpecker	2	2.0	0.019	0.138	0.019	1	0.6	0.013	0.113	0.013	1	1.7	0.013	0.113	0.013	1	5.9	0.019	0.139	0.019
Rock Pigeon	98	98.0	0.942	6.080	0.058	159	99.4	2.038	8.727	0.090	58	98.3	0.744	3.114	0.077	16	94.1	0.308	1.698	0.058
<b>All Large-Bodied Non-Passerines</b>	<b>100</b>	<b>5.0</b>	<b>0.962</b>	<b>6.079</b>	<b>0.077</b>	<b>160</b>	<b>14.0</b>	<b>2.051</b>	<b>8.725</b>	<b>0.103</b>	<b>59</b>	<b>6.7</b>	<b>0.756</b>	<b>3.113</b>	<b>0.090</b>	<b>17</b>	<b>6.0</b>	<b>0.327</b>	<b>1.700</b>	<b>0.077</b>
<b>UPLAND GAMEBIRDS</b>																				
Ring-necked Pheasant	1	1.2	0.010	0.098	0.010	2	1.4	0.026	0.226	0.013	6	60.0	0.077	0.268	0.077	7	43.8	0.135	0.345	0.135
Wild Turkey	81	98.8	0.779	5.686	0.029	139	98.6	1.782	8.929	0.051	4	40.0	0.051	0.453	0.013	9	56.3	0.173	0.648	0.096
<b>All Upland Gamebirds</b>	<b>82</b>	<b>4.1</b>	<b>0.788</b>	<b>5.685</b>	<b>0.038</b>	<b>141</b>	<b>12.4</b>	<b>1.808</b>	<b>8.927</b>	<b>0.064</b>	<b>10</b>	<b>1.1</b>	<b>0.128</b>	<b>0.519</b>	<b>0.090</b>	<b>16</b>	<b>5.61</b>	<b>0.308</b>	<b>0.729</b>	<b>0.212</b>
<b>SHOREBIRDS</b>																				
Greater Yellowlegs	1	0.5	0.010	0.098	0.010	0	-	-	-	-	1	1.7	0.013	0.113	0.013	0	-	-	-	-
Killdeer	192	99.5	1.846	8.305	0.154	1	100.0	0.013	0.113	0.013	50	84.7	0.641	0.624	0.577	34	91.9	0.654	0.711	0.519
Least Sandpiper	0	-	-	-	-	0	-	-	-	-	2	3.4	0.026	0.226	0.013	0	-	-	-	-
Lesser Yellowlegs	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	2.7	0.019	0.139	0.019
Spotted Sandpiper	0	-	-	-	-	0	-	-	-	-	5	8.5	0.064	0.336	0.038	2	5.4	0.038	0.194	0.038
Wilson's Snipe	0	-	-	-	-	0	-	-	-	-	1	1.7	0.013	0.113	0.013	0	-	-	-	-
<b>All Shorebirds</b>	<b>193</b>	<b>9.7</b>	<b>1.856</b>	<b>8.303</b>	<b>0.163</b>	<b>1</b>	<b>0.1</b>	<b>0.013</b>	<b>0.113</b>	<b>0.013</b>	<b>59</b>	<b>6.7</b>	<b>0.756</b>	<b>0.900</b>	<b>0.590</b>	<b>37</b>	<b>13.0</b>	<b>0.712</b>	<b>0.800</b>	<b>0.519</b>

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/60 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
<b>WADERS</b>																				
Great Blue Heron	3	11.5	0.029	0.168	0.029	1	33.3	0.013	0.113	0.013	1	11.1	0.013	0.113	0.013	3	21.4	0.058	0.235	0.058
Green Heron	1	3.8	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	1	7.1	0.019	0.139	0.019
Sandhill Crane	22	84.6	0.212	0.867	0.067	2	66.7	0.026	0.226	0.013	8	88.9	0.103	0.444	0.064	10	71.4	0.192	0.627	0.096
<b>All Waders</b>	<b>26</b>	<b>1.3</b>	<b>0.250</b>	<b>0.890</b>	<b>0.096</b>	<b>3</b>	<b>0.3</b>	<b>0.038</b>	<b>0.252</b>	<b>0.026</b>	<b>9</b>	<b>1.0</b>	<b>0.115</b>	<b>0.483</b>	<b>0.064</b>	<b>14</b>	<b>4.9</b>	<b>0.269</b>	<b>0.689</b>	<b>0.154</b>
<b>WATERBIRDS</b>																				
Bonaparte's Gull	6	9.2	0.058	0.588	0.010	0	-	-	-	-	25	13.8	0.321	2.611	0.026	0	-	-	-	-
Herring Gull	0	-	-	-	-	11	78.6	0.141	1.246	0.013	26	14.4	0.333	2.831	0.026	0	-	-	-	-
Ring-billed Gull	1	1.5	0.010	0.098	0.010	3	21.4	0.038	0.252	0.026	130	71.8	1.667	13.585	0.077	1	100.0	0.019	0.139	0.019
Unknown Gull	58	89.2	0.558	3.262	0.058	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
<b>All Waterbirds</b>	<b>65</b>	<b>3.27</b>	<b>0.625</b>	<b>3.526</b>	<b>0.067</b>	<b>14</b>	<b>1.2</b>	<b>0.179</b>	<b>1.266</b>	<b>0.038</b>	<b>181</b>	<b>20.5</b>	<b>2.321</b>	<b>16.859</b>	<b>0.090</b>	<b>1</b>	<b>0.4</b>	<b>0.019</b>	<b>0.139</b>	<b>0.019</b>
<b>WATERFOWL</b>																				
American Black Duck	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	2.9	0.019	0.139	0.019
Canada Goose	918	100.0	8.827	51.540	0.125	540	100.0	6.923	30.191	0.179	144	42.4	1.846	5.534	0.282	19	55.9	0.365	1.910	0.038
Mallard	0	-	-	-	-	0	-	-	-	-	9	2.6	0.115	0.603	0.038	14	41.2	0.269	1.941	0.019
Tundra Swan	0	-	-	-	-	0	-	-	-	-	183	53.8	2.346	15.140	0.051	0	-	-	-	-
Wood Duck	0	-	-	-	-	0	-	-	-	-	4	1.2	0.051	0.318	0.026	0	-	-	-	-
<b>All Waterfowl</b>	<b>918</b>	<b>46.2</b>	<b>8.827</b>	<b>51.540</b>	<b>0.125</b>	<b>540</b>	<b>47.3</b>	<b>6.923</b>	<b>30.191</b>	<b>0.179</b>	<b>340</b>	<b>38.5</b>	<b>4.359</b>	<b>19.052</b>	<b>0.333</b>	<b>34</b>	<b>11.9</b>	<b>0.654</b>	<b>2.786</b>	<b>0.058</b>

<sup>a</sup> Total Std. Detections is the total number of standardized individuals detected within the 800 m-radius survey station during standardized use surveys. Only birds recorded below 200 m high were included in the analyses presented in this table.

<sup>b</sup> % Comp. (i.e., percent composition) is the percent of a species group that a particular species comprises using total standardized detections. For rows summarizing species groups, percent composition is the percent of all birds represented by the species group.

<sup>c</sup> Mean Use is the total standardized detections per the total number of 60-minute point count surveys conducted within the season. It is reported as Bald Eagles/60-minute survey/800 m-radius plot.

<sup>d</sup> SD is the standard deviation of Mean Use.

<sup>e</sup> Occur. Freq. (i.e., Occurrence Frequency) is the proportion of point count surveys at which a particular species was detected during the season.

<sup>f</sup> Bald Eagle is protected under the Bald and Golden Eagle Protection Act

#### 4.1.1.4 Spatial Distribution of Detections

A majority of both standardized and incidental Bald Eagle observations occurred in the northern and eastern portions of the project area. The eastern boundary of the project area is approximately one-to-two miles from the Black River, tributaries of which intersect the project area. Two known Bald Eagle nests are located along the Black River less than two miles from the project's eastern boundary (TRC 2021) (Appendix A). Figure 4 depicts the locations of Bald Eagle observations recorded over the course of avian point count surveys, as well as the locations for in-use and historic (i.e., missing during raptor nest surveys) eagle nests located during raptor nest studies (TRC 2021) (Appendix A).

Table 4 provides a summary of seasonal and overall Bald Eagle use by point. A slight majority of standardized eagle observations (53%; 15 detections) occurred at the 12 survey points located in the northern half of the project area (i.e., north of Gardner Line Rd. See Figure 4). Most standardized eagle observations (19%; five detections) occurred at point count station #6, whereas an additional four detections (15%) occurred at point count station #21. All five observations at point count station #6 occurred during a single survey event on October 27, 2022. The four observations at point count station #21 occurred across three survey events, including three observations in the fall (two on August 18 and one on November 29, 2022) and one in the summer (July 12, 2023). Furthermore, an additional four detections (15%) occurred at point count station #9 in the southeastern portion of the project area (Figure 4). All four detections occurred during separate survey events, including two in the fall (September 1 and October 28, 2022) and two in the winter (January 17 and February 15, 2023). As such, this point had the highest occurrence frequency in year two with eagles recorded during 33% of surveys (Table 4).

While point count station #6 had the highest number of detections and mean use in year two, point count station #10 had the highest number of detections (six individuals) and mean use in year one. However, no Bald Eagles were detected at point count station #6 during year one surveys and only one Bald Eagle was detected at point count station #10 during year two surveys. In both years one and two, mean use rates at these survey points with the highest number of eagle detections were based on single survey events. Similar to point count station #6 in year two, all six detections at point count station #10 in year one were of eagles seen perched on the ground feeding on animal remains during a single survey event (TRC 2022).

Occurrence frequency for Bald Eagles was highest at point count station #21 in year one and second highest in year two. Over the course of 12 survey events at this survey point in both years one and two, Bald Eagles were recorded during 25% of surveys each year.

**Table 4. Seasonal and Annual Bald Eagle Mean Use by Point Count Station—Long-Duration Eagle and Large-Bodied Avian Use Surveys**

Point Count Station	Fall			Winter			Spring			Summer			Full Year		
	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>
1	0	-	-	1	0.333	0.577	0	-	-	0	-	-	1	0.083	0.289
2	1	0.250	0.500	0	-	-	0	-	-	0	-	-	1	0.083	0.289
3	1	0.250	0.500	0	-	-	0	-	-	0	-	-	1	0.083	0.289
4	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
5	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
6	5	1.250	2.500	0	-	-	0	-	-	0	-	-	5	0.417	1.443
7	0	-	-	0	-	-	0	-	-	2	1.000	1.414	2	0.167	0.577
8	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
9	2	0.500	0.577	2	0.667	0.577	0	-	-	0	-	-	4	0.333	0.492
10	0	-	-	0	-	-	0	-	-	1	0.500	0.707	1	0.083	0.289
11	0	-	-	0	-	-	1	0.333	0.577	0	-	-	1	0.083	0.289
12	0	-	-	0	-	-	0	-	-	1	0.500	0.707	1	0.083	0.289
13	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
14	0	-	-	0	-	-	2	0.667	1.155	0	-	-	2	0.167	0.577
15	2	0.500	1.000	0	-	-	0	-	-	0	-	-	2	0.167	0.577
16	1	0.250	0.500	0	-	-	0	-	-	0	-	-	1	0.083	0.289
17	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
18	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
19	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
20	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
21	3	0.750	0.957	0	-	-	0	-	-	1	0.500	0.707	4	0.333	0.651
22	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
23	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
24B	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

Point Count Station	Fall			Winter			Spring			Summer			Full Year		
	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>
25	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-
26	0	-	-	0	-	-	0	-	-	0	-	-	0	-	-

<sup>a</sup> Total Std. Detections is the total number of standardized individuals detected within the 800 m–radius survey cylinder during standardized use surveys.

<sup>b</sup> Mean Use is the total standardized detections at a particular point count station divided by the total number of 60-minute point count surveys conducted at that same station within the season. It is reported as Bald Eagles/60-minute survey/800 m-radius plot.

<sup>c</sup> SD is the standard deviation of Mean Use.

#### 4.1.1.5 Directional Movements

Ten of the 26 Bald Eagle detections (38%) recorded during standardized surveys appeared to represent birds in active migration. During the fall migration period, one adult and one subadult were seen flying to the southeast, and one adult was seen flying to the southwest at point count station #6 on October 27, 2022. An additional two adults were observed flying south on November 29, 2022, including one each at point counts station #15 and #21.

During the late winter, one subadult and one adult Bald Eagle were observed flying northwest and north, respectively. The subadult was observed at point count station #9 on February 15, 2023, whereas the adult was observed at point count station #1 on February 16, 2023.

During the spring migration period, one subadult was observed flying northeast at point count station #11 on May 17, 2023, whereas two adults were observed flying north at point count station #14 on May 18, 2023.

The remaining 16 individuals were either observed perched or flying in a direction not indicating active migration. No breeding behaviors indicating a potential nest within the immediate vicinity were observed.

#### 4.1.1.6 Flight Heights

Minimum and maximum flight heights were recorded for each eagle observed during eagle use surveys. Flight height data for eagles and non-eagle raptor species are summarized in Figure 5 as box plots that display the mean, median, interquartile range (i.e., the box portion of the graph, which represents the distribution of the middle 50% of the flight height observation data), outliers (defined as observations beyond 1.5 times the interquartile range), and minimum and maximum values (excluding outliers). Flight height box plots are also shown in relation to the 35 m to 150 m RSZ, depicted as horizontal black lines.

Mean minimum and maximum Bald Eagle flight heights were within the RSZ (Figure 5). Mean minimum flight height was approximately 63 m ( $n = 23$ ; 95% Confidence Interval [CI] = 36 – 91 m), whereas mean maximum Bald Eagle flight height was approximately 130 m ( $n = 23$ ; 95% CI = 88 – 173 m).

On a seasonal scale, mean minimum flight heights were within the RSZ each season, whereas mean maximum flight height was within RSZ in fall and winter, but above RSZ in spring and summer. Mean minimum and maximum flight heights for Bald Eagles each season were as follows:

- Fall ( $n = 13$ ): 52 m (95% CI = 14 – 91 m) and 120 m (95% CI = 62 – 179 m).
- Winter ( $n = 2$ ): 60 m (95% CI = 53 – 66 m) and 95 m (95% CI = 0 – 457 m).

- Spring ( $n = 3$ ): 109 m (95% CI = 0 – 273 m) and 146 m (95% CI = 0 – 357 m).
- Summer ( $n = 5$ ): 66 m (95% CI = 0 – 161 m) and 160 m (95% CI = 0 – 330 m).

Note that sample sizes for winter, spring, and summer were small, resulting in lower limit confidence intervals below 0. As negative flight heights are not possible, these values are reported as 0.

Table 5 summarizes seasonal totals of time spent within the RSZ by Bald Eagles during observation. Bald Eagles were observed within the RSZ for a total of 24.1 minutes (0.40 hours) over 312 hours of standardized survey effort across the year.

**Table 5. Eagle-Minutes and Time within Rotor-Swept Zone Summaries for Bald Eagles**

	Fall	Winter	Spring	Summer	Annual Total
Annual Survey Effort (hours)	104	78	78	52	312
<b>YEAR TWO EAGLE-MINUTES SUMMARY</b>					
BAEA Eagle-Minutes <sup>a</sup>	42	5	10	21	78
BAEA Eagle-Minutes per Survey Hour	0.404	0.064	0.128	0.404	0.250
<b>YEAR TWO MINUTES WITHIN ROTOR SWEEPED ZONE (RSZ) SUMMARY</b>					
BAEA minutes within RSZ <sup>b</sup>	10.5	3.6	3.4	6.6	24.1
BAEA minutes within RSZ per Survey Hour	0.101	0.046	0.044	0.127	0.077

<sup>a</sup> Flight minutes within the standardized 800 m-radius by 200 m-high sample plot as described by the ECPG and final Eagle Rule. Each individual observation is rounded to the next highest integer. For example, an eagle observed for 1.3 minutes in flight within the sample plot is assigned two eagle-minutes. Perched eagles and eagles outside of the sample plot are not assigned eagle-minutes.

<sup>b</sup> Minutes within the rotor swept zone (RSZ) is used as a metric of flight behavior that could expose a passing bird to collision with operating turbine blades. RSZ represents a predetermined range of above-ground heights within a hypothetical turbine blade sweep of 35 – 150 m within the 800 m-radius sample plot. Measured to the nearest 0.1 minute.

#### 4.1.1.7 Eagle-Minutes Summary

Eagle-minutes represent accrued minutes of eagle observations for flying eagles within the 800 m-radius by 200 m-high sample plot (USFWS 2013). Perched eagles or eagles observed outside of the sample plot are not assigned eagle-minutes. Eagle-minutes are summarized by season in Table 5.

Cumulatively, 78 total Bald Eagle-minutes were recorded over 312 hours of standardized survey effort across the year-long study period. Bald Eagle seasonal eagle-minute rates were highest in the fall and summer (0.404 Bald Eagle-minutes per hour of standardized eagle use observation in both fall and summer) compared to the spring and winter (0.128 and 0.064 Bald Eagle-minutes per hour of standardized eagle use observation, respectively; Table 5).

Most eagle-minutes were accrued from point count stations #6 and #21, with 14 and 13 eagle-minutes observed at each point count station, respectively. The 14 eagle-minutes at point count station #6 occurred during a single survey in the fall where three individual Bald Eagles (two adults and one subadult) were observed in flight on October 27, 2022. Two additional subadult Bald Eagles were observed perched during this survey but did not contribute to the cumulative eagle-minutes total. At point count station #21, 12 of the 13 eagle-minutes occurred in the fall, whereas one eagle-minute occurred during the summer. Of the 12 eagle-minutes recorded at point count station #21 in the fall, 11 eagle-minutes occurred during a single survey on August 8, 2022, where two individual Bald Eagles (one adult and one subadult) were observed.

Overall, more eagle-minutes were recorded in year two (78 minutes; 0.250 eagle-minutes per survey hour) compared to year one (50 eagle minutes; 0.177 eagle-minutes per hour). The seasonal distribution of eagle-minutes varied between the two years, with most eagle-minutes being recorded in fall during year two but winter in year one, and the least eagle-minutes being recorded in winter in year two but fall and spring in year one (TRC 2022). In total across the two years, 46 eagle-minutes were recorded during the fall season (0.232 eagle-minutes per hour), 33 eagle-minutes were recorded during the winter season (0.221 eagle-minutes per hour), 14 eagle-minutes were recorded during the spring season (0.095 eagle-minutes per hour), and 35 eagle-minutes were recorded during the summer season (0.350 eagle-minutes per hour).

#### **4.1.2 Use of the Project Area by Other Large-Bodied Bird Species**

A total of 4,298 large birds were observed over the course of standardized large-bodied avian use surveys, including 1,989 in the fall, 285 in the winter, 883 in the spring, and 1,141 in the summer. An additional 37 large birds were observed only above 200 m and subsequently excluded from mean use analysis for large birds (though retained for flight height analysis). Canada Goose (*Branta canadensis*), American Crow, Rock Pigeon (*Columba livia*), Killdeer (*Charadrius vociferus*), and Turkey Vulture (*Cathartes aura*) were the five most numerous large bird species recorded, representing approximately 38%, 21%, 8%, 6%, and 5.5% of all large bird detections during large-bodied avian use surveys. Four of the top five species most recorded species in year two (excluding American Crow) were also within the top five recorded species during year one, though relative abundances differed (TRC 2022). Mourning dove (*Zenaida macroura*), which was the most recorded species during large bird surveys in year one (TRC 2022), was considered a small bird during year two and therefore not recorded during large-bodied avian use surveys.

##### **4.1.2.1 Species Group Summaries**

#### **Raptors**

Raptors include vultures, Osprey (*Pandion haliaetus*), kites, harriers, hawks, eagles, owls, and falcons. Nine raptor species were detected during the study period, including Bald and Golden Eagle

Protection Act (BGEPA)-protected Bald Eagles, and Michigan SC Northern Harrier (*Circus hudsonius*) and Merlin (*Falco columbarius*). Bald Eagle is also considered Michigan SC. Species identified as SC are not afforded statutory protection under state law.

Mean raptor use was highest during the summer (1.519 raptors/60-minute survey/800 m plot) and fall (1.500 raptors/60-minute survey/800 m plot) survey periods, followed by the spring (1.423 raptors/60-minute survey/800 m plot) and winter (0.333 raptors/60-minute survey/800 m plot) (Table 3). Turkey Vultures had a strong influence on raptor mean use in all seasons except winter, accounting for 58.3%, 81.1%, and 74.7% of all raptor observations in fall, spring, and summer, respectively. When Turkey Vultures were excluded from mean use analysis, seasonal mean use noticeably decreased in fall, spring, and summer (Table 3). Red-tailed Hawks (*Buteo jamaicensis*) were detected the second-most following Turkey Vultures, accounting for 23.3%, 9.0%, and 13.9% of raptor detections during the fall, spring, and summer seasons, respectively. This species was the most frequently detected raptor during the winter (Table 3). This is similar to results from year one surveys, which reported Turkey Vultures and Red-tailed Hawks as having the highest mean use values (TRC 2022). Red-tailed Hawks and Turkey Vultures are abundant and expected in agricultural habitats in the thumb region of Michigan. While most standardized raptor detections were recorded in the fall, raptor percent composition (including Turkey Vultures) was highest in the spring and summer, representing approximately 12.6% and 27.7% of all spring and summer bird detections during eagle and large-bodied avian use surveys (Table 3).

A review of the entire raptor group across all point count stations shows that, in general, raptor observations were distributed relatively evenly across point count stations. Raptor observations occurred at 100% of point count stations across the entire year. Point count station #9 had the highest mean use (3.250 raptors/60-minute survey/800 m plot), followed by point count station #22 (2.250 raptors/60-minute survey/800 m plot; Table 6). Raptor use at both points was driven by a relatively high count of Turkey Vultures during single survey events, including 18 at point count station #9 on September 19, 2022, and 11 at point count station #22 on April 13, 2023.

**Table 6. Seasonal and Annual Raptor Mean Use by Point Count Station—Long-Duration Eagle and Large-Bodied Avian Use Surveys**

Point Count Station	Fall			Winter			Spring			Summer			Full Year		
	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>
1	4	1.000	1.155	2	0.667	0.577	2	0.667	0.577	2	1.000	1.414	10	0.833	0.835
2	6	1.500	1.291	0	-	-	13	4.333	5.132	1	0.500	0.707	20	1.667	2.871
3	4	1.000	1.414	1	0.333	0.577	2	0.667	1.155	5	2.500	3.536	12	1.000	1.595
4	6	1.500	1.291	0	-	-	1	0.333	0.577	0	-	-	7	0.583	0.996
5	3	0.750	0.957	1	0.333	0.577	5	1.667	2.887	2	1.000	1.414	11	0.917	1.505
6	8	2.000	2.708	1	0.333	0.577	1	0.333	0.577	3	1.500	2.121	13	1.083	1.782
7	1	0.250	0.500	0	-	-	6	2.000	3.464	2	1.000	1.414	9	0.750	1.765
8	6	1.500	1.915	1	0.333	0.577	1	0.333	0.577	2	1.000	0.000	10	0.833	1.193
9	26	6.500	8.505	4	1.333	1.528	7	2.333	3.215	2	1.000	1.414	39	3.250	5.311
10	3	0.750	0.957	0	-	-	2	0.667	0.577	4	2.000	0.000	9	0.750	0.866
11	2	0.500	1.000	0	-	-	5	1.667	1.155	6	3.000	4.243	13	1.083	1.832
12	5	1.250	2.500	4	1.333	0.577	1	0.333	0.577	3	1.500	2.121	13	1.083	1.564
13	8	2.000	1.155	1	0.333	0.577	7	2.333	2.517	6	3.000	1.414	22	1.833	1.642
14	11	2.750	3.096	0	-	-	7	2.333	3.215	0	-	-	18	1.500	2.505
15	5	1.250	0.500	0	-	-	0	-	-	6	3.000	2.828	11	0.917	1.443
16	7	1.750	1.500	2	0.667	1.155	3	1.000	1.000	0	-	-	12	1.000	1.206
17	5	1.250	1.258	2	0.667	0.577	5	1.667	2.887	1	0.500	0.707	13	1.083	1.505
18	4	1.000	1.414	1	0.333	0.577	1	0.333	0.577	2	1.000	1.414	8	0.667	0.985
19	13	3.250	4.717	2	0.667	1.155	6	2.000	1.732	1	0.500	0.707	22	1.833	2.887
20	3	0.750	0.957	0	-	-	3	1.000	1.000	1	0.500	0.707	7	0.583	0.793
21	8	2.000	2.160	3	1.000	0.000	0	-	-	9	4.500	4.950	20	1.667	2.425
22	10	2.500	1.000	0	-	-	11	3.667	6.351	6	3.000	2.828	27	2.250	3.223
23	2	0.500	0.577	1	0.333	0.577	3	1.000	1.000	3	1.500	2.121	9	0.750	0.965
24B	3	0.750	1.500	0	-	-	8	2.667	1.528	5	2.500	3.536	16	1.333	1.875

Point Count Station	Fall			Winter			Spring			Summer			Full Year		
	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>	Total Std. Det. <sup>a</sup>	Mean Use <sup>b</sup>	SD <sup>c</sup>
25	1	0.250	0.500	0	-	-	6	2.000	1.732	0	-	-	7	0.583	1.165
26	2	0.500	0.577	0	-	-	5	1.667	2.082	7	3.500	2.121	14	1.167	1.697

<sup>a</sup> Total Std. Det. is the total number of standardized individuals detected within the 800 m-radius survey cylinder during standardized use surveys. Bald Eagles are included in this analysis.

<sup>b</sup> Mean Use is the total standardized detections at a particular point count station divided by the total number of 60-minute point count surveys conducted at that same station within the season. It is reported as raptors/60-minute survey/800 m-radius plot.

<sup>c</sup> SD is the standard deviation of Mean Use.

### **Large-bodied Passerines (Large Corvids)**

Large-bodied passerine species (large perching birds) include large corvids such as crows and ravens. American Crows represented all large-bodied passerines (i.e., large corvids) that were detected during large-bodied avian use surveys. American Crow mean use rates were highest in the fall (4.317 detections/60-minute survey/800 m plot) and winter (3.282 detections/60-minute survey/800 m plot) (Table 3). Large corvid percent composition was highest in the summer, representing approximately 30.5% of all summer bird detections during eagle and large-bodied avian use surveys (Table 3). American Crows were not considered large-bodied species during year one surveys (TRC 2022).

### **Large-bodied Non-Passerines**

Large-bodied non-passerines include nightjars, Pileated Woodpeckers, Eurasian Collared-Doves (*Streptopelia decaocto*), and Rock Pigeons. Two large-bodied passerine species were detected during the study period, including Pileated Woodpecker and Rock Pigeon. Large-bodied non-passerine mean use was highest in the winter (2.051 detections/60-minute survey/800 m plot) (Table 3). Rock Pigeons primarily drove large-bodied non-passerine mean use year-round, representing 98.0%, 99.4%, 98.3%, and 94.1% and 35.4% of large-bodied non-passerines, in the fall, winter, spring, and summer, respectively. Rock Pigeon mean use during the fall, winter, spring, and summer was 0.962 detections/60-minute survey/800 m plot, 2.038 detections/60-minute survey/800 m plot, 0.744 detections/60-minute survey/800 m plot, and 0.038 detections/60-minute survey/800 m plot, respectively. Only two Pileated Woodpeckers were detected in the fall and only one each in winter, spring, and summer. Large-bodied non-passerine percent composition was highest in the winter, representing 14% all winter bird detections during eagle and large-bodied avian use surveys, respectively (Table 3). While large-bodied non-passerine and, specifically, Rock Pigeon, mean use was greatest in the winter during year two surveys, it was greatest in the fall, followed by the winter during year one surveys. Similar to year two surveys, Pileated Woodpecker use was very low with only one detection over the course of a year (TRC 2022).

### **Upland Gamebirds**

The upland gamebird group includes partridge, prairie-chickens, grouse, bobwhite, and turkey. Two upland gamebird species were detected during the study period, Ring-necked Pheasant (*Phasianus colchicus*) and Wild Turkey (*Meleagris gallopavo*). Upland gamebird mean use was highest in the winter with 1.808 detections/60-minute survey/800 m plot (Table 3). Mean use for upland gamebirds was primarily driven by Wild Turkey in the fall and winter (98.8% and 98.6% of fall and winter upland gamebird observations, respectively). Compared to Ring-necked Pheasant, which were usually encountered in groups of one or two, Wild Turkey were more frequently

encountered in larger groups, ranging six to 59 individuals in the fall and winter. Upland gamebird percent composition was highest in the winter, representing approximately 12.4% of all winter bird detections during eagle and large-bodied avian use surveys (Table 3). While upland gamebird mean use was greatest in the winter followed by the fall during year two surveys, it was greatest in the spring and winter during year one surveys (TRC 2022).

### **Shorebirds**

Shorebirds include stilts, avocets, plovers, curlews, godwits, turnstones, knots, sandpipers, dowitchers, woodcocks, snipes, and phalaropes. Six shorebird species were detected during the study period. Shorebird mean use rates recorded during eagle and large-bodied avian use surveys were highest in the fall (1.856 detections/60-minute survey/800 m plot) followed by the spring (0.756 detections/60-minute survey/800 m plot), then summer (0.712 detections/60-minute survey/800 m plot) (Table 3). Killdeer were the primary drivers of shorebird mean use, accounting for 99.5%, 100.0%, 84.7% and 91.9% of shorebird detections in fall, winter, spring, and summer, respectively. In particular, five fall survey events had the greatest influence on fall mean use, with more than 20 individual Killdeer being recorded during each of these survey events. A total of 21 individuals were recorded at point count station #19 and #1 on August 17 and 19, 2022, 48 individuals at point count station #11 on October 28, 2022, 61 individuals at point count station #20 on October 28, 2022, and 22 individuals on October 29, 2022. Shorebird percent composition was highest in the summer, representing approximately 13.0% of all summer detections during eagle and large-bodied avian use surveys (Table 3). Killdeer was the only shorebird species recorded during year one studies. While Killdeer mean use was greatest in the fall followed by the summer and spring during year two surveys, it was greatest in the spring, followed by the summer then fall during year one surveys (TRC 2022).

### **Waders**

The waders group includes cranes, bitterns, herons, and egrets. Three wader species were detected over the course of year two surveys, including Great Blue Heron (*Ardea herodias*), Green Heron (*Butorides virescens*), and Sandhill Crane (*Grus canadensis*). Wader mean use rates and percent composition recorded during eagle and large-bodied avian use surveys were highest in the summer (0.269 detections/60-minute survey/800 m plot; 4.9% of standardized large bird detections) and fall (0.250 detections/60-minute survey/800 m plot; 1.3% of standardized large bird detections), followed by the spring (0.115 detections/60-minute survey/800 m plot; 1.0% of standardized large bird detections), then winter (0.038 detections/60-minute survey/800 m plot; 0.3% of standardized large bird detections). Sandhill Cranes drove wader mean use, accounting for 88.9%, 84.6% 71.4%, and 66.7% of waders in spring, fall, summer, and winter, respectively (Table 3). While wader and, specifically, Sandhill Crane, mean use was greatest in the summer and fall during year two surveys, it was greatest in the spring, followed by the summer then fall during

year one surveys. Sandhill Cranes were the only wader species detected during year one surveys (TRC 2022).

### **Waterbirds**

The waterbirds group includes loons, grebes, cormorants, and gulls. Three waterbird species were detected over the study period, including Bonaparte's Gull (*Chroicocephalus philadelphia*), Herring Gull (*Larus argentatus*), and Ring-billed Gull (*Larus delawarensis*). Waterbird use of the project area was highest in the spring (2.321 detections/60-minute survey/800 m plot; 20.5% of large bird detections), followed by fall (0.625 detections/60-minute survey/800 m plot; 3.3% of large bird detections), then winter (0.179 detections/60-minute survey/800 m plot; 1.2% of large bird detections), then summer (0.019 detections/60-minute survey/800 m plot; 0.4% of large bird detections). Ring-billed Gulls drove waterbird use in the spring, accounting for 71.8% of spring waterbird detections. This was primarily the result of a single flock of 120 Ring-billed Gulls (92% of spring Ring-billed Gull detections and 66% of spring waterbird detections) observed at Point Count Station #16 on April 12, 2023. Bonaparte's and Herring Gulls accounted for the remaining 28.2% in roughly equal proportions. Detections of both these species occurred during two survey events each in the spring. A total of 23 and two Bonaparte's Gulls were observed at point count stations #11 and 16#, respectively on April 12, 2023. The Herring Gull detections both occurred at point count station #16, with one individual observed on March 15, 2023, and 25 individuals observed on April 12, 2023. Fall waterbird use was driven by unknown gull species (likely Ring-billed Gulls), which accounted for 89.2% of fall waterbird use. All waterbird use in the winter occurred during three survey events. Ring-billed Gulls were observed at point count stations #21 (two individuals) and #11 (one individual) on December 14 and 15, 2022, respectively, whereas all 11 Herring Gull observations occurred at point count station #21 on February 16, 2023. Waterbird use during year two surveys was generally similar to year one in that mean use was highest in the spring and fall. However, seasonal waterbird mean use rates were higher in year two compared to year one.

### **Waterfowl**

The waterfowl species group refers to the taxonomic order Anseriformes, including geese, ducks, and swans. Five waterfowl species were detected over the study period, including American Black Duck (*Anas rubripes*), Canada Goose, Mallard (*Anas platyrhynchos*), Tundra Swan (*Cygnus columbianus*), and Wood Duck (*Aix sponsa*). Waterfowl mean use rates were higher than mean use rates of any other species group during the fall, winter, and spring seasons, and waterfowl comprised a large majority of fall (46.2%), winter (47.3%), and spring (38.5%) detections (Table 3). Across all seasons, waterfowl comprised 42.6% of all detections during eagle and large-bodied avian use surveys.

Waterfowl mean use rates were highest in the spring (8.827 detections/60-minute survey/800 m plot), followed by the winter (6.923 detections/60-minute survey/800 m plot) then spring (4.359 detections/60-minute survey/800 m plot). Fall and winter mean use was entirely driven by Canada Geese. Nearly 53% of all fall waterfowl observations (485 Canada Goose detections) occurred during a single survey event on October 30, 2022, at point count station #13. An additional 18% of fall waterfowl observations (168 Canada Goose detections) occurred at point count station #10 on September 21, 2022. Similarly, 45% of winter waterfowl observations (244 Canada Goose detections) occurred during a single survey event on January 18, 2023, at point count station #16. While Canada Goose had a strong influence on spring waterfowl use (42.4% of spring waterfowl detections), Tundra Swan comprised a greater proportion of spring waterfowl detections (53.8%). However, 71% of Tundra Swan observations (130 detections) occurred during a single survey event on March 16, 2023, at point count station #11. Waterfowl mean use during the summer was only 0.654 detections/60-minute survey/800 m plot and comprised 11.9% of all summer large bird detections (Table 3).

Large groups of hundreds of geese were observed moving northward on multiple occasions within the project area in the late winter and early spring. Most waterfowl observed (87% in fall, 97% in winter, 81% in spring, and 100% in summer) consisted of individuals flying over the project area. The project area generally lacks significant water resources (i.e., large lakes or reservoirs) or physiographic features that might be expected to concentrate geese during migration, and it appeared that these moving flocks could have been observed at any location within the study area. Cultivated croplands can provide an important food resource for migrating waterfowl throughout North America and cropland habitats within the project area may provide foraging or staging opportunities for waterfowl during migration. However, foraging geese were rarely observed during standardized eagle and large-bodied avian use surveys.

Waterfowl use of the project area in year two was broadly similar to year one in that Canada Goose had the greatest influence on mean use rates, and Canada Goose mean use was highest in the fall, followed by the spring, winter, then summer. However, considerably higher mean use rates were recorded for Canada Goose in year two compared to year one. Overall, waterfowl relative abundance was also much greater in year two compared to year one (TRC 2022).

#### 4.1.2.2 Flight Heights

Flight height data for each species group are summarized in Figure 6 as box plots that display the mean, median, interquartile range, outliers, and range (excluding outliers) in relation to the 35 m to 150 m RSZ. Mean minimum and maximum flight heights during eagle and large-bodied avian use surveys were within the RSZ for raptors, waterbirds, and waterfowl (Figure 6). Mean minimum and maximum flight heights were below the RSZ for all other species groups, though

individual flight heights within the RSZ were observed on occasion for large-bodied corvids and shorebirds during eagle and large-bodied avian use surveys.

Figure 5 depicts the mean of minimum and maximum flight heights for individual raptor species detected in flight during standardized eagle use surveys. Most raptor species, including American Kestrel (*Falco sparverius*), Bald Eagle, Cooper's Hawk (*Accipiter cooperii*), Northern Harrier, Red-tailed Hawk, and Turkey Vulture, were detected within the RSZ at least once over the course of standardized eagle and large-bodied avian use surveys. Both mean minimum and maximum flight heights were within the RSZ for Bald Eagles and Turkey Vultures. Both mean minimum and maximum flight heights were below RSZ for American Kestrel, Cooper's Hawk, Northern Harrier, Merlin, Rough-legged Hawk (*Buteo lagopus*), and Sharp-shinned Hawk (*Accipiter striatus*). The latter three species were only detected below the RSZ, though the sample size for these species were low ( $n = 1$  for each of these three species). Mean maximum was within RSZ, whereas mean minimum was below RSZ, for Red-tailed Hawk.

#### 4.1.3 Species of Concern

No federally or state-listed threatened or endangered species were observed over the course of long-duration eagle and large-bodied avian use surveys. One Merlin was observed at point count station #17 on December 15, 2022, resulting in a winter mean use of 0.013 detections/60-minute survey/800 m plot and representing 3.8% of all raptor detections during the winter. Merlin was considered a state-listed threatened species in Michigan until March 2023, at which point it was downlisted to SC (MNFI 2023).

Northern Harrier is SC in Michigan. A total of 14 observations of Northern Harriers were documented during the eagle and large-bodied avian use surveys, including five in the fall, two in the winter, six in the spring, and one in the summer, representing 3.2%, 7.7%, 4.5% and 1.3% of all raptor detections in the fall, winter, spring, and summer, respectively. During fall 2022, Northern Harrier detections occurred at point count stations #6, #11, #16, #20 and #7 on September 21, October 28, and November 29 (three detections), respectively, resulting in a fall mean use value of 0.048 detections/60-minute survey/800 m plot. In the winter, Northern Harrier detections occurred at point count stations #12 and #8 on December 15 and 16, 2022, resulting in a fall mean use value of 0.026 detections/60-minute survey/800 m. During spring 2023, Northern Harrier detections occurred at point count stations #24b (two detections), #23, #8, #11, and #9 on March 6, April 10 (two detections), April 12 (two detections), and May 17, resulting in a spring mean use value of 0.064 detections/60-minute survey/800 m plot. During summer, a single Northern Harrier detection occurred at point count station #13 on July 12, 2023, resulting in a spring mean use value of 0.019 detections/60-minute survey/800 m plot. While this species was occasionally observed within the RSZ, the overall mean minimum and maximum flight heights were below RSZ (Figure 5).

## 4.2 SHORT-DURATION DIURNAL AVIAN ACTIVITY SURVEYS

The following sections summarize the results of the diurnal avian activity surveys.

### 4.2.1 General Avian Use

Diurnal avian activity surveys occurred over 13.00 spring survey hours, 8.58 summer survey hours, 17.42 fall survey hours, and 13.00 winter survey hours at 26 point count stations during the study period (Table 2). As previously described, short-duration diurnal avian activity surveys were conducted for all bird species year-round. While all birds detected during these surveys were recorded, data analysis was truncated to only include small-bodied bird species first detected within 300 m, and large-bodied bird species first detected within 800 m. As such, a total of 3,180 observations representing 83 species were retained for analysis, including 1,386 in the fall (51 species), 600 in the winter (21 species), 558 in the spring (51 species), and 636 in the summer (50 species) (Table 7). Mean use statistics for all 83 species observed during diurnal avian activity surveys and retained for analysis are presented in Appendix C. A list of all species observed over the course of both eagle and large-bodied avian use surveys and diurnal avian activity surveys (including incidentally observed species; 98 species total) is included in Appendix B.

Table 7 summarizes the mean use statistics for each species group recorded during diurnal avian activity surveys. In general, mean use was highest in the fall (13.327 birds/10-minute survey/survey plot) and summer (12.231 birds/10-minute survey/survey plot) compared to the winter (7.692 birds/10-minute survey/survey plot) and spring (7.154 birds/10-minute survey/survey plot). Passerines accounted for most detections during diurnal avian activity surveys, including 52.5% of observations in the fall, 62.8% in the winter, 81.2% in the spring, and 84.3% in the summer.

**Table 7. Seasonal Mean Use by Species Group–Short-Duration Diurnal Avian Activity Surveys**

Species Group	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
Large-bodied Corvid	147	10.6	1.413	5.812	0.250	9	1.5	0.115	0.603	0.038	17	3.0	0.218	0.573	0.154	43	6.8	0.827	4.668	0.058
Non-passerine (large)	85	6.1	0.817	5.902	0.029	147	24.5	1.885	10.705	0.038	15	2.7	0.192	1.588	0.026	0	-	-	-	-
Non-passerine (small)	114	8.2	1.096	2.722	0.346	64	10.7	0.821	7.019	0.038	25	4.5	0.321	0.747	0.205	49	7.7	0.942	1.862	0.423
Passerine	727	52.5	6.990	20.467	0.798	377	62.8	4.833	27.960	0.436	453	81.2	5.808	13.083	0.859	536	84.3	10.308	18.663	1.000
Raptor	23	1.7	0.221	0.574	0.154	3	0.5	0.038	0.252	0.026	2	0.4	0.026	0.159	0.026	4	0.6	0.077	0.334	0.058
Shorebird	98	7.1	0.942	5.704	0.029	0	-	-	-	-	14	2.5	0.179	0.619	0.115	3	0.5	0.058	0.308	0.038
Upland Gamebird	54	3.9	0.519	5.295	0.010	0	-	-	-	-	1	0.2	0.013	0.113	0.013	1	0.2	0.019	0.139	0.019
Wader	2	0.1	0.019	0.196	0.010	0	-	-	-	-	3	0.5	0.038	0.252	0.026	0	-	-	-	-
Waterbird	13	0.9	0.125	0.772	0.038	0	-	-	-	-	3	0.5	0.038	0.252	0.026	0	-	-	-	-
Waterfowl	123	8.9	1.183	12.061	0.010	0	-	-	-	-	25	4.5	0.321	2.831	0.013	0	-	-	-	-
<b>ALL BIRDS</b>	<b>1386</b>	<b>100.0</b>	<b>13.327</b>	<b>30.932</b>	<b>0.856</b>	<b>600</b>	<b>100.0</b>	<b>7.692</b>	<b>37.082</b>	<b>0.526</b>	<b>558</b>	<b>100.0</b>	<b>7.154</b>	<b>15.883</b>	<b>0.949</b>	<b>636</b>	<b>100.0</b>	<b>12.231</b>	<b>19.207</b>	<b>1.000</b>

<sup>a</sup> Total Std. Detections is the total number of standardized individuals detected within a 300-m radius (small-bodied species) or 800-m radius (large-bodied species) of the point count station during standardized use surveys. Because small-bodied bird species are the primary focus of diurnal avian use surveys, birds detected at all flight heights were recorded, analyzed, and presented in this table.

<sup>b</sup> % Comp. (i.e., percent composition) is the proportion of all birds that a particular species group comprises during the season using total standardized detections. Small bird species detected beyond 300 m and large bird species detected beyond 800 m were excluded from analysis.

<sup>c</sup> Mean Use is the total standardized detections divided by the total number of 10-minute point count surveys conducted within the season. It is reported as birds/10-minute survey/survey plot, where the survey plot size varies as described in footnote a.

<sup>d</sup> SD is the standard deviation of Mean Use.

<sup>e</sup> Occur. Freq. (i.e., Occurrence Frequency) is the proportion of point count surveys at which a particular species group was detected within the designated 300 m or 800 m-radius survey plot during the season.

## 4.2.2 Species Group Use of the Project Area

Diurnal avian activity surveys are primarily focused on characterizing use of the project area by small-bodied birds (which are not recorded during standardized eagle and large-bodied avian use surveys). As such, only small-bodied species groups are discussed below, though mean use statistics for large-bodied birds recorded during short-duration diurnal avian activity surveys are provided in Appendix C. Large-bodied species groups in the context of long-duration eagle and large-bodied avian use surveys are discussed in section 4.1.2. Long-duration surveys consist of a greater amount of survey effort and, therefore, likely provide a more accurate representation of avian use for large-bodied bird species within the project area compared to short-duration surveys.

### Small-bodied Non-Passerines

Small-bodied non-passerines include Mourning Doves, cuckoos, swifts, hummingbirds, kingfishers, and woodpeckers. Seven small-bodied non-passerine species were detected over the course of diurnal avian activity surveys (Appendix C-1). This species group comprised 8.2%, 10.7%, 4.5%, and 7.7% of all bird detections during diurnal avian activity surveys in the fall, winter, spring, and summer, respectively (Table 7). Small-bodied non-passerine mean use within the project area was relatively similar in the fall (1.096 detections/10-minute survey/300 m plot), winter (0.821 detections/10-minute survey/300 m plot), and summer (0.942 detections/10-minute survey/300 m plot), and lowest in the spring (.321 detections/10-minute survey/300 m plot) (Table 7). Mourning Doves were the most observed small-bodied non-passerine species, comprising 86.0%, 98.4%, 88.0%, and 75.5% of small-bodied non-passerine detections in fall, winter, spring, and summer, respectively (Appendix C-1). While Mourning Doves were considered a small-bodied species for year two surveys, they were the most frequently recorded species during year one large bird use surveys.

### Passerines (including Small-bodied Corvids)

Passerine species (small perching birds), including small-bodied corvids (e.g., Blue Jay [*Cyanocitta cristata*]), accounted for the largest proportion of all avian detections during diurnal avian activity surveys year-round, as described in section 4.2.1 (Table 7). When all seasons are combined, passerines accounted for 65.8% of all detections during diurnal avian activity surveys. A total of 57 small-bodied passerine species were detected during the study period (Appendix C-1). Seasonal mean use rates for all 57 species of passerines (plus three unknown passerine taxa) are summarized in Appendix C-1.

When including all passerine data (i.e., including observations greater than 300 m), European Starling (*Sturnus vulgaris*), Red-winged Blackbird (*Agelaius phoeniceus*), Horned Lark (*Eremophila alpestris*), American Goldfinch (*Spinus tristis*), and Barn Swallow (*Hirundo rustica*) were the five

most numerous small-bodied passerine species recorded, representing approximately 43%, 11%, 9%, 4%, and 4% of all small-bodied passerine bird detections during year two diurnal avian activity surveys. Four of the top five species most recorded species in year two (excluding American Goldfinch) were also within the top five recorded species during year one, with broadly similar relative abundances (TRC 2022). When observations beyond 300 m are excluded, European Starling, Red-winged Blackbird, Horned Lark, and American Goldfinch remain the top four most recorded species; however, the fifth most recorded species is Song Sparrow (*Melospiza melodia*) rather than Barn Swallow. These species are generally expected to be common within a landscape dominated by cultivated cropland and no unique local habitat or physiographic attributes appeared to concentrate particularly large numbers of these passerine species in specific portions of the project area.

Passerine mean use rates were highest in the summer (10.308 passerines/10-minute survey/300 m plot), followed by the fall (6.990 passerines/10-minute survey/300 m plot), spring (5.808 passerines/10-minute survey/300 m plot), then winter (4.833 passerines/10-minute survey/300 m plot) (Table 7). European Starlings had the largest influence on mean use in fall, winter, and summer, and the third-largest influence in spring, accounting for 52.4%, 65%, 27.1% and 11.7% of passerines in fall, winter, summer, and spring, respectively. However, European Starling use in the winter was entirely driven by a single group of 245 individuals observed at point count station #10 on December 15, 2022. Red-winged Blackbirds also contributed notably to spring and summer passerine mean use, representing 22.1% and 22.8% of spring and summer passerines, respectively. Horned Larks accounted for the highest proportion of passerines during the spring (30%), though most spring Horned Lark observations (63%; 86 detections) occurred during a single survey even at point count station #7 on March 16, 2023.

#### **4.2.3 Flight Heights by Species Group**

Large-bodied bird flight heights in the context of long-duration eagle and large-bodied avian use surveys are discussed in section 4.1.2. Flight heights were not evaluated for large-bodied birds during diurnal avian activity data analysis. As previously mentioned, survey effort during eagle and large-bodied avian use surveys was higher than during diurnal avian activity surveys. Therefore, long-duration large-bodied avian use surveys likely characterize flight profiles more accurately for large-bodied bird species within the project area.

For small-bodied birds (passerines and small-bodied non passerines), nine of 284 flocks (3.2%) entered the RSZ overall during diurnal avian activity surveys. Broken down by season, five of 93 (5.4%) fall flocks, one of 18 winter flocks (5.6%), two of 86 spring flocks (2.3%), and one of 87 (1.1%) summer flocks entered the RSZ during diurnal avian activity surveys. Blackbirds (including Red-winged Blackbirds and unknown blackbird species) were the primary small-bodied bird species detected within the RSZ, accounting for four of the nine (44%) flocks within RSZ.

When considering counts of individual small-bodied birds instead of flocks, 36 of 1418 individuals (3.6%) were observed within RSZ, including 12 of 333 (3.6%) fall detections, 19 of 404 (4.7%) winter detections, 4 of 325 (1.2%) spring detections, and 1 of 356 (0.3%) summer detections. Overall, blackbirds accounted for 11 of 36 (31%) individuals detected within the RSZ. Seasonally, blackbirds comprised 75% (9 individuals) of small-bodied birds detected within the RSZ in the fall and 50% (2 individuals) in the spring. Winter small-bodied bird detections within RSZ consisted of a single flock of 19 Snow Buntings, whereas summer small-bodied bird detections within the RSZ consisted of a single Barn Swallow.

#### 4.2.4 Species of Concern

No federally or state-listed threatened or endangered species were observed over the course of diurnal avian activity surveys, though six SC were detected, including two raptor species (Bald Eagle and Northern Harrier), one non passerine species (Red-headed Woodpecker [*Melanerpes erythrocephalus*]) and three passerine species (Eastern Meadowlark [*Sturnella magna*], Wood Thrush [*Hylocichla mustelina*], and Dickcissel [*Spiza americana*]). As previously mentioned, SC are not afforded statutory protection under state law but are listed as such due to declining or relict populations in the state (MNFI 2023).

A total of five Bald Eagle observations were documented during diurnal avian activity surveys, all of which were detected in the fall and represented 21.7% of all raptor detections in the fall. During fall 2022, Bald Eagle detections occurred at point count stations #21 on August 18, #20 on August 19, #6 on October 27 (two detections), and #2 on October 30, resulting in a fall mean use value of 0.048 detections/10-minute survey/800 m plot (Appendix C-3).

Two observations of Northern Harrier were documented during diurnal avian activity surveys, including one each in the spring and summer. These observations represented 50.0% and 25.0% of raptor detections during diurnal avian activity surveys in the spring and summer, respectively. The spring Northern Harrier detection occurred at point count station #24B on March 16, 2023, resulting in a mean use value of 0.013 detections/10-minute survey/800 m plot. The summer Northern Harrier detection occurred at point count station #11 on June 14, 2023, resulting in a mean use value of 0.019 detections/10-minute survey/800 m plot (Appendix C-3).

A single Red-headed Woodpecker was observed at point count station #26 on August 18, 2022. This observation represented 0.9% of small-bodied non-passerine detections in the fall and resulted in a mean use value of 0.010 detections/10-minute survey/300 m plot (Appendix C-1).

A single Dickcissel was observed at point count station #2 on July 12, 2023. This observation represented 0.2% of passerine detections in the summer and resulted in a mean use value of 0.019 detections/10-minute survey/300 m plot (Appendix C-1).

A total of eight Eastern Meadowlark observations were documented during diurnal avian activity surveys, including five in the spring and three in the summer, representing 1.1% and 0.6% of all passerine detections in the spring and summer, respectively. Spring observations consisted of two detections at point count station #5 on April 10 and May 16, 2023, two detections at point count station #2 on April 13 and May 18, 2023, and one detection at point count station #13 on April 14, 2023. These detections resulted in a mean use value of 0.064 detections/10-minute survey/300 m plot (Appendix C-1). Summer Eastern Meadowlark observations consisted of one detection at point count station #5 on June 15, 2023, and two detections at point count station #12 on July 12, 2023. These detections resulted in a mean use value of 0.058 detections/10-minute survey/300 m plot (Appendix C-1).

A single Wood Thrush was observed at point count station #25 on June 15, 2023. This observation represented 0.2% of passerine detections in the summer and resulted in a mean use value of 0.019 detections/10-minute survey/300 m plot (Appendix C-1). An additional Wood Thrush was observed at point count station #20 on July 12, 2023, but was excluded from mean use analysis as it was greater than 300 m from the survey point.

## 5 DISCUSSION

A total of 98 species were observed during the 2022 to 2023 pre-construction avian studies summarized in this report (Appendix B). No federal ESA or state-listed threatened or endangered species were detected within the project area over the course of both eagle and large-bodied avian use surveys and diurnal avian activity surveys. Seven SC were recorded within the project area during standardized eagle and large-bodied avian use surveys and diurnal avian activity surveys, including Bald Eagle, Merlin, Northern Harrier, Red-headed Woodpecker, Dickcissel, Eastern Meadowlark, and Wood Thrush. The SC designation does not afford statutory protection but species are listed as such due to declining or relict populations in the state (MNFI 2023).

The overall impacts to birds, particularly species of concern, as a result of project development is expected to be relatively low. Impacts to most avian species due to habitat loss is expected to be relatively minimal as over 77.1% of the project area is classified as cultivated cropland or developed, and few notable water resources are present within the project area (MRLC 2019). While woodlands account for 18.2% of the project area, much of this land cover type is concentrated in the west-central portion of the project, which project infrastructure is expected to avoid. However, woodlands in the eastern portion of the project area, especially those associated with Black Creek, as well as well as larger woodlots in the southern and north-central portions of the project area, may support a higher degree of avian resources compared to the primarily agricultural portions of the project area (MRLC 2019). Avian mortality at the project via turbine collision is likely to reflect national and regional trends and significant adverse impacts to populations of eagles and other species of concern are not expected to occur. Raptors, waterbirds, waterfowl, and small-bodied birds (particularly small-bodied passerines) are most likely to experience a greater risk of collision at the project based on mean flight heights within the RSZ, moderate mean use values, and known mortality trends from post-construction mortality monitoring (PCMM) studies, though risk may vary seasonally. A discussion of potential impacts to species of concern and species groups most at risk for collision is provided below.

### **Bald Eagles**

During year two surveys, 26 observations of Bald Eagles were documented over 312 hours of standardized eagle and large-bodied avian use surveys, and seven additional observations of Bald Eagles were documented incidental to the eagle and large-bodied avian use surveys. Over the course of two years of standardized surveys, a total of 52 Bald Eagles were recorded across 595 hours, resulting in an overall two-year mean use of 0.087 Bald Eagles detections/60-minute survey/800 m plot. In general, risk of collision is relatively low for Bald Eagles. In year two, Bald Eagles were detected at 5.8% of all surveys, with seasonal occurrence frequencies ranging between 2.6% and 8.7% of survey events (Table 3). Mean use was relatively low, as well, with an overall year two mean use rate of 0.083 Bald Eagle detections/60-minute survey/800 m plot, and

seasonal mean use rates ranging from 0.038 to 0.144 Bald Eagle detections/60-minute survey/800 m plot.

Bald Eagles were observed flying within a hypothetical 35 – 150 m RSZ, with both mean minimum and mean maximum flight heights falling within the RSZ (Figure 5). Eagles were observed within the RSZ for an average of 0.077 minutes per survey hour and accumulated a total of 0.250 eagle-minutes (i.e., minutes of flight within 800 m and below 200 m) per survey hour (Table 5) during year two. Collision risk for Bald Eagles seems to vary seasonally, though detections were spread throughout the project area without any particular concentration points. Point count station #21 appeared to have the most consistent Bald Eagle use as the highest occurrence and second-highest occurrence frequencies were recorded at this point in year one and year two, respectively. Relatively large blocks of woodland habitat are adjacent to the north, west, and east of point count station #21. Bald Eagle occurrence frequency was highest at point count station #9 in year two, which may have been due to its proximity to the Black River and two known Bald Eagle nests along the Black River, as well as more extensive woodland habitat features within the southeastern portion of the project area.

Based on year one and year two surveys, Bald Eagle collision risk appears to be highest in the winter and fall when use of the project area was at its highest, and lowest in the spring when mean use rates were lowest. The average number of accumulated eagle-minutes between years one and two, and the average time spent flying within the RSZ in year two, was highest in the summer, suggesting that the summer season may also present relatively higher collision risk. Two in-use Bald Eagle nests are known from along the Black River, east of the project area, whereas one is located outside of the southwest portion of the project area (TRC 2021). Recent USFWS eagle survey guidance indicates that breeding Bald Eagles are not expected to range beyond two miles from their territories' centers (USFWS 2020). As such, the risk of locally breeding individuals colliding with turbines is likely reduced during the summer, though it is worth noting that two-mile buffers around all known Bald Eagle nests do intersect the project area to different extents (Figure 4).

Bald eagle collision mortality within the U.S. has not been widely documented (Bay et al. 2016; USFWS 2018). In 2020, the Renewable Energy Wildlife Institute (REWI; formerly American Wind Wildlife institute, or AWWI) summarized bird fatality data from 227 wind energy projects (336 PCMM studies) between 2002 and 2018 for avifaunal biomes across the United States (AWWI 2020). Of the 9,573 fatalities recorded in REWI's database (excluding projects using curtailment at low wind speeds), only two were bald eagles (0.02%). Similarly, between 1997 and June 2012, Pagel et al. (2013) reviewed eagle mortality at wind farms within the contiguous United States, excluding the Altamont Pass Wind Resource Area in California. The review indicated that six Bald Eagle fatalities were found at six separate facilities in Iowa, Maryland, and Wyoming. However,

the limited number of found Bald Eagle fatalities may be related to landscape features (e.g., row crops) that make discovery more difficult, particularly east of the 100<sup>th</sup> meridian (Pagel et al. 2013).

## Raptors

The raptor species group tends to have a moderate risk of collision with turbines. This species group tended to have a low-to-moderate mean use during most seasons (Table 3), but raptors were, on average, flying within the RSZ (Figure 5). According to REWI, diurnal raptors (excluding vultures) accounted for 4.8% of unadjusted bird fatalities in the prairie biome (based on 133 studies) and 1.1% of unadjusted bird fatalities in the northern forest biome (based on 22 studies). The prairie and northern forest biomes encompass the thumb region of Michigan. Vultures accounted for an additional 4.2% of unadjusted bird fatalities in the prairie biome and 0.4% of unadjusted bird fatalities in the northern forest biome. REWI estimated that the adjusted median raptor fatality rate for the prairie biome (based on 47 studies total) was 0.07 raptors/MW, with studies from this region reporting between 0.00 and 1.00 raptors/MW (AWWI 2020). For non-eagle raptors, Red-tailed Hawks and Turkey Vultures are generally the most at risk given their overall use of the project area compared to other raptor species and their tendency to fly within the RSZ.

Northern Harriers (SC) are often found within open landscapes, including agricultural environments, and therefore may experience a higher degree of collision risk due to occupying habitat often used for renewable energy development. However, the overall risk of collision with project turbines is relatively low. Northern Harrier mean use of the project area was relatively low over the course of year one and year two surveys and the project area is not expected to attract this species at rate greater than the surrounding landscape. Furthermore, this species tends to fly at heights closer to the ground (Smith et al. 2011); mean flight heights during year two surveys tended to be below the RSZ (Figure 5). Collision mortality through operation of wind energy centers is generally relatively low for the Northern Harrier (Johnson and Erickson 2011; Smith et al. 2011). Based on unadjusted fatality data summarized by REWI (excluding projects using curtailment at low wind speeds), 20 Northern Harriers were located during scheduled PCMM searches, representing 0.21% of unadjusted fatalities found across all regions (AWWI 2020). Northern Harriers prefer to nest in large, undisturbed tracts of wetlands or grasslands (Smith et al. 2011), which are limited within the project area. Given the lack of breeding habitat, as well as generally low flight heights and seasonal presence, the likelihood of significant adverse impacts to Northern Harrier populations due to project construction and operation is expected to be low.

One Merlin was detected during year two eagle and large-bodied avian use surveys. This species will typically use open landscapes for hunting (Warkentin et al. 2005), including agricultural environments, and therefore may be at risk of collision with turbines. However, given the scarcity

of detections over two years of surveys, the likelihood of collision is low. Based on unadjusted fatality data summarized by REWI (excluding projects using curtailment at low wind speeds), three Northern Harriers were located during scheduled PCMM searches, representing 0.03% of unadjusted fatalities found across all regions (AWWI 2020).

### **Waterbirds**

Waterbird mean use during year two eagle and large-bodied avian use surveys was moderately high during the spring (Table 3) and mean minimum and maximum flight heights for this species group were within the RSZ (Figure 6). Waterbird use of the project area was driven entirely by gull species, particularly Ring-billed Gulls. Single flocks of 120 Ring-billed Gulls, 25 Herring Gulls, and 23 Bonaparte's Gulls significantly influenced waterbird mean use in the spring. These three flocks accounted for 92% of spring waterbird use and occurred during two survey events. Overall, waterbird occurrence frequency year-round was low, ranging from 1.9% to 9.0% of survey events each season. As such, the risk of collision with project turbines is expected to be relatively low for waterbirds, with Ring-billed Gull being most at risk. According to REWI, gull fatalities were not reported within REWI's database for the prairie or northern forest biomes at the time of its summary publication, and Ring-billed Gulls only accounted for 0.08% of unadjusted bird fatalities across all regions. (AWWI 2020). While operation of the project could result in waterbird fatalities, significant impacts are not expected.

### **Waterfowl**

The waterfowl species group accounted for the greatest proportion of birds detected during eagle and large-bodied avian use surveys and typically had high mean use values in the fall, winter, and spring. As such, the risk of collision with turbines is likely relatively moderate given that mean flight heights were within the RSZ (Figure 6). For waterfowl flocks observed in flight during the "full data" survey period, 50.0% were observed within the RSZ, 44.1% were below the RSZ, and 5.9% were above the RSZ. Waterfowl mean use was strongly influenced by Canada Geese, including some large flocks that drove seasonal mean use, indicating that this species may be the waterfowl species most at risk of collision. REWI found that waterfowl accounted for 2.3% of unadjusted bird fatalities in the prairie biome and 0.7% of unadjusted bird fatalities in the northern forest biome. Based on unadjusted fatality data summarized by REWI (excluding projects using curtailment at low wind speeds), 14 Canada Geese were located during scheduled PCMM searches, representing 0.14% of unadjusted fatalities found across all regions (AWWI 2020). While temporarily flooded agricultural fields may attract waterfowl during migration, the overall lack of water resources and high flight heights suggests that significant adverse impacts to waterfowl as a result of the project are likely to be low.

## Small-bodied Passerines and Non-Passerines

Overall, small-bodied passerines comprised most detections during diurnal avian activity surveys, primarily consisting of European Starlings, Red-winged Blackbirds, and Horned Larks—species generally expected to be found in agricultural settings. While a relatively low proportion of small-bodied bird flocks were observed within RSZ during both year one and two diurnal avian activity surveys, small-bodied passerines are typically one of the most commonly found fatalities at operating wind facilities (Erickson et al. 2014; AWWI 2020) and similar patterns are expected for the project. Small passerines accounted for 56.3% of unadjusted bird fatalities in the prairie biome and 87.8% of small passerines in the northern forest biome. REWI estimated that the adjusted mean small bird fatality rate for the prairie and northern forest biomes (based on 87 and eight studies, respectively) was 1.86 and 1.98 small birds/MW, respectively, with studies from this region reporting between 0 and 11 small birds/MW for the prairie biome and 0 and 5 small birds/MW for the northern forest biome. The median small bird fatality rate estimate for the prairie and northern forest biomes was 1.27 and 1.5 small birds/MW, respectively (AWWI 2020).

Horned Lark is often one of the most impacted small bird species at operating wind farms. Erickson et al. (2014) estimated that this species comprises 13.7% of all bird fatalities whereas REWI similarly found that this species comprises 13.2% of all bird fatalities (AWWI 2020). Horned Lark is generally a common species within open agricultural and grassland habitats (Beason 2020). While Horned Lark was not the most commonly detected small bird species during year one or year two diurnal avian activity surveys, this species often performs “skylarking” displays (Beason 2020), a breeding behavior that involves a relatively high-altitude flight that might put individuals within the rotor-swept zone and particularly susceptible to collisions with turbines (Erickson et al. 2014). While operation of the project could result in small-bird fatalities, significant impacts are not expected.

Four non-passerine and passerine small-bodied SC were detected during year two diurnal avian activity surveys, including Red-headed Woodpecker, Dickcissel, Eastern Meadowlark, and Wood Thrush. Mean use of the project area by these species was low (Appendix C-1), and only single detections were observed within 300 m of the survey point for these species, except for Eastern Meadowlark. Based on unadjusted fatality data summarized by REWI (excluding projects using curtailment at low wind speeds), 21 Dickcissels and Wood Thrush were located during scheduled PCMM searches, each representing 0.22% of unadjusted fatalities found across all regions. A total of eight Eastern Meadowlarks were located during PCMM searches, representing 0.08% of unadjusted fatalities found across all regions; however, Western Meadowlark, which exhibits similar behaviors and occupies similar habitat as Eastern Meadowlark, but in the western United States, accounted for 3.4% of unadjusted fatalities (324 individuals) (AWWI 2020). No Red-headed

Woodpeckers were reported within REWI's database at the time of its summary publication (AWWI 2020).

## 6 REFERENCES

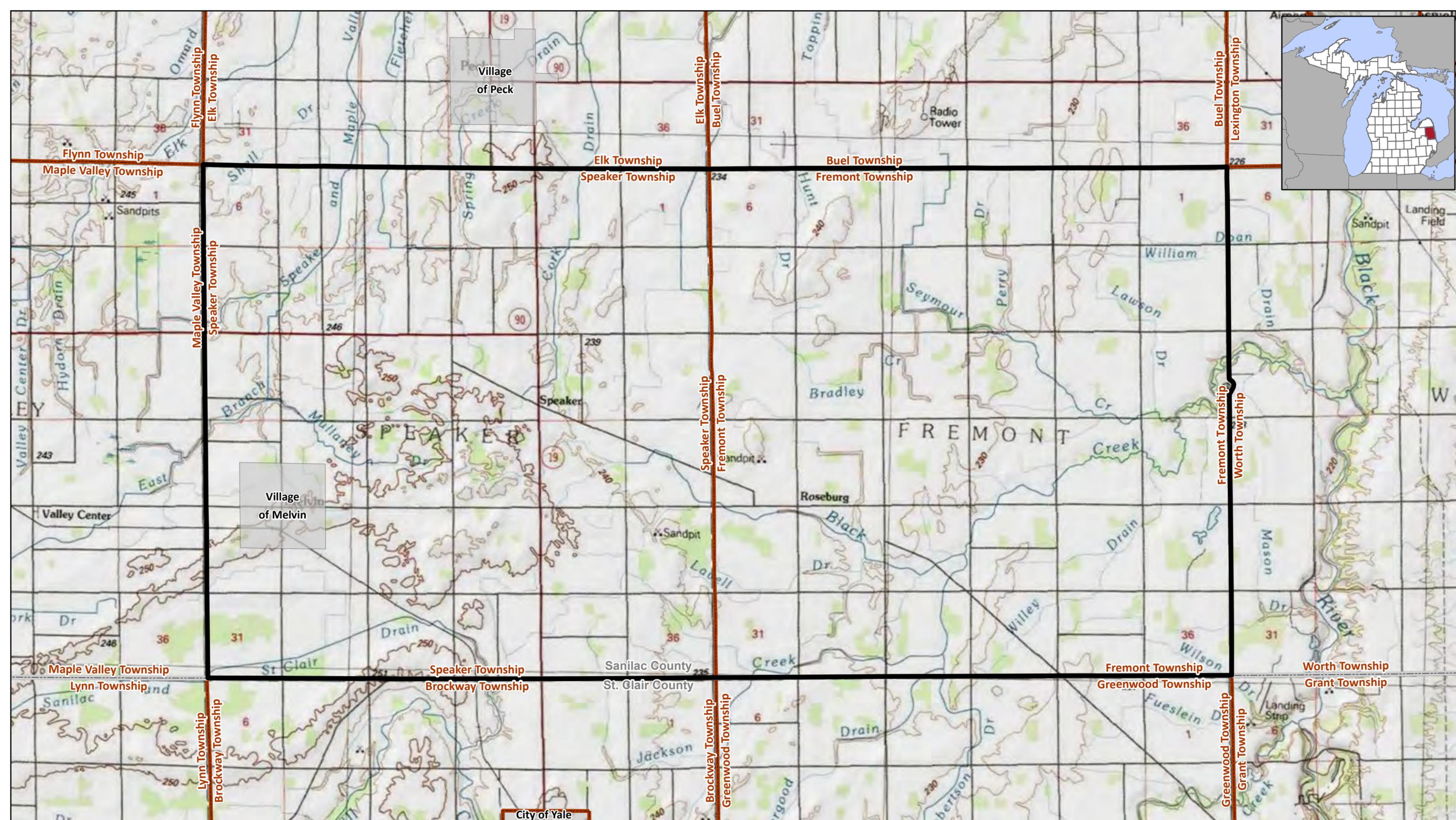
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## **FIGURES**

**CONFIDENTIAL: DO NOT DISTRIBUTE**



Year 2 Avian Use Report  
 Riverbend Wind Project  
 21003645  
 April 05, 2023  
 DRAFT/Confidential

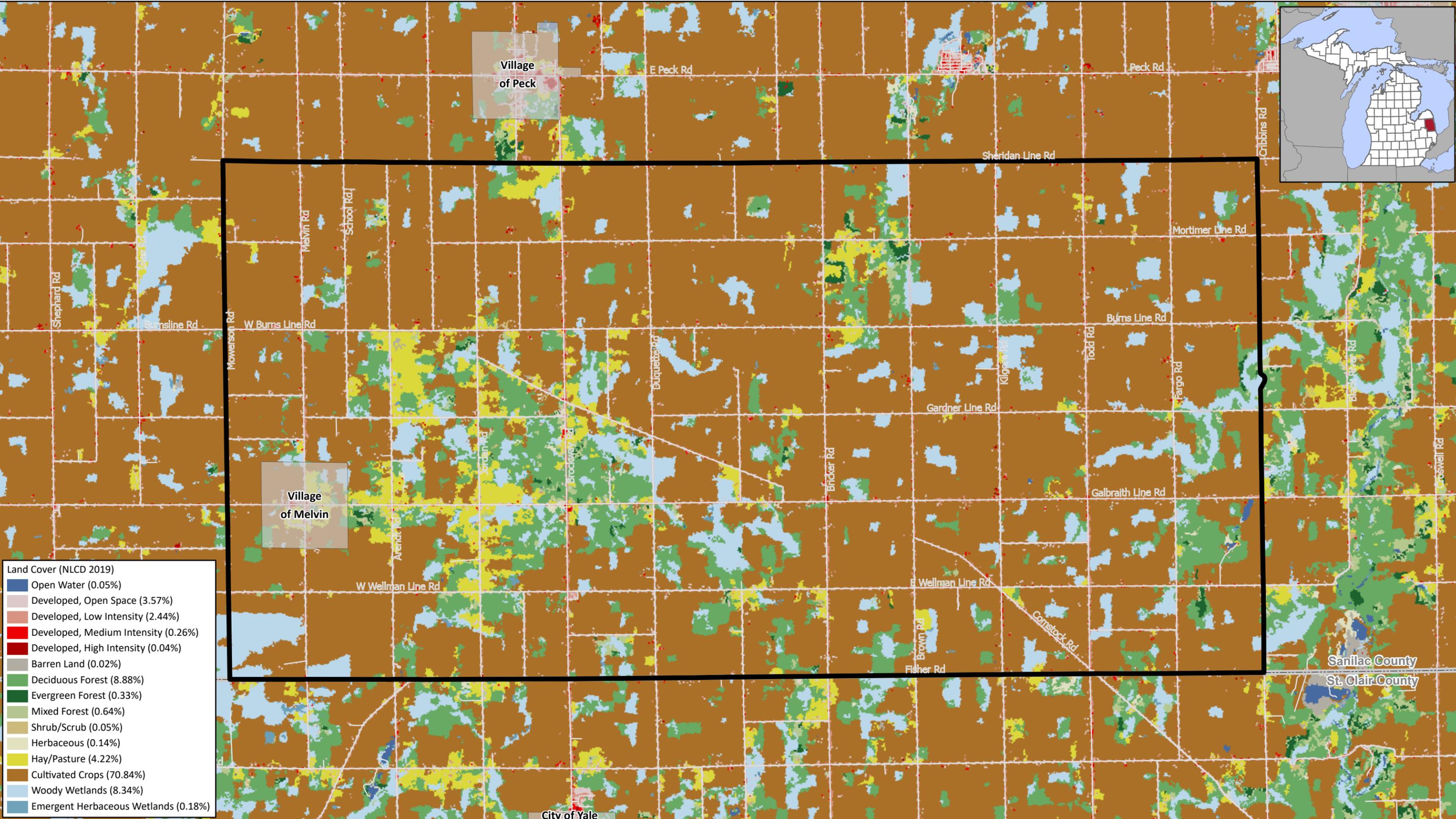


- Project Area (8/30/2022, ~44,523 acres)
- County
- Township
- City/Village



Source: USGS Topographic Maps (2019)  
 Elevations depicted in meters

**Figure 1**  
**Site Location**  
 Speaker and Fremont Townships  
 Sanilac County, Michigan



**Land Cover (NLCD 2019)**

Open Water	(0.05%)
Developed, Open Space	(3.57%)
Developed, Low Intensity	(2.44%)
Developed, Medium Intensity	(0.26%)
Developed, High Intensity	(0.04%)
Barren Land	(0.02%)
Deciduous Forest	(8.88%)
Evergreen Forest	(0.33%)
Mixed Forest	(0.64%)
Shrub/Scrub	(0.05%)
Herbaceous	(0.14%)
Hay/Pasture	(4.22%)
Cultivated Crops	(70.84%)
Woody Wetlands	(8.34%)
Emergent Herbaceous Wetlands	(0.18%)



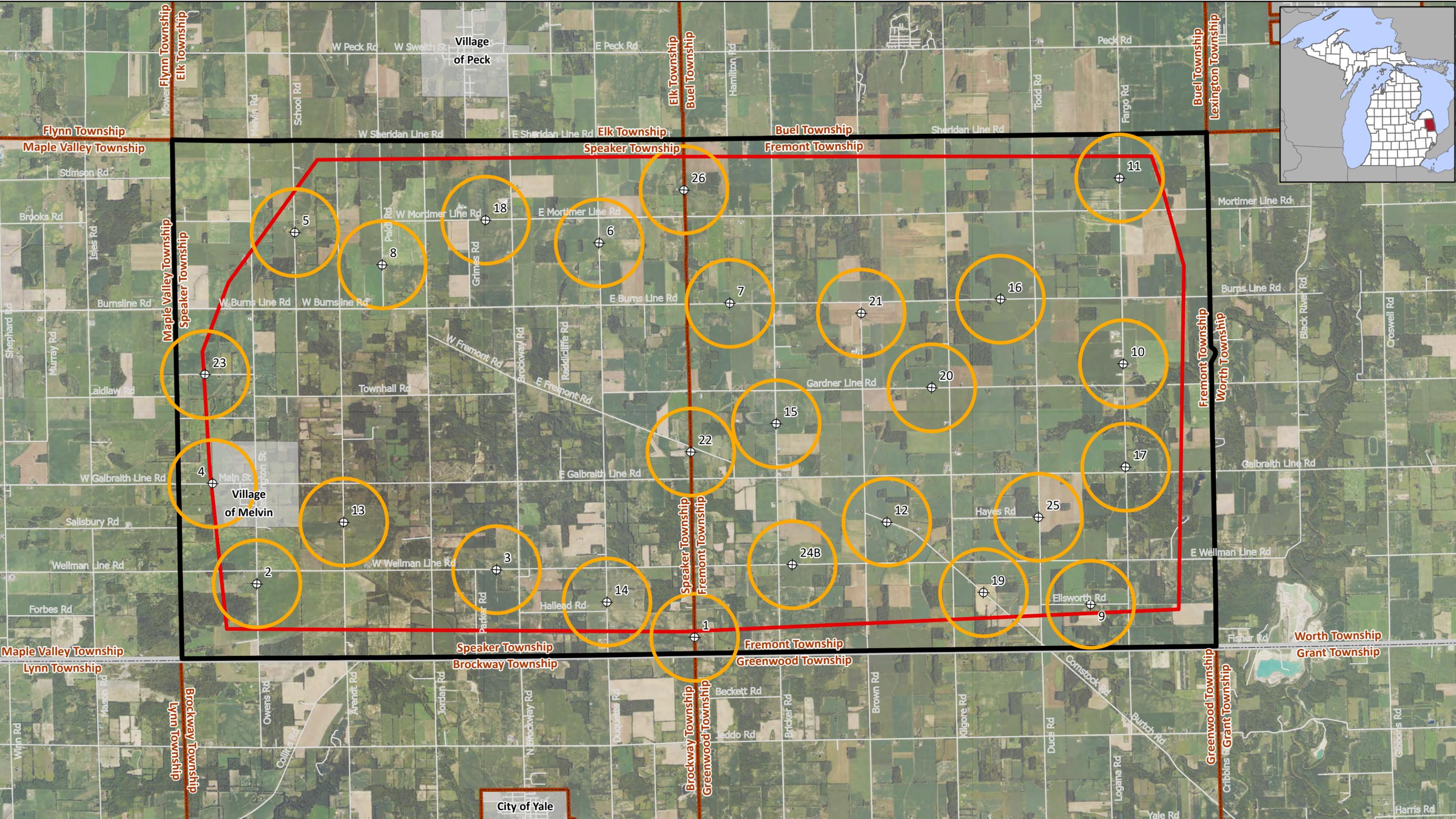
Year 2 Avian Use Report  
 Riverbend Wind Project  
 21003645  
 April 05, 2023  
 DRAFT/Confidential



- Project Area (8/30/2022, ~44,523 acres)
- County
- City/Village
- Road

Source: National Land Cover Database (2019)

**Figure 2**  
**Land Cover**  
 Speaker and Fremont Townships  
 Sanilac County, Michigan



**ATWELL**

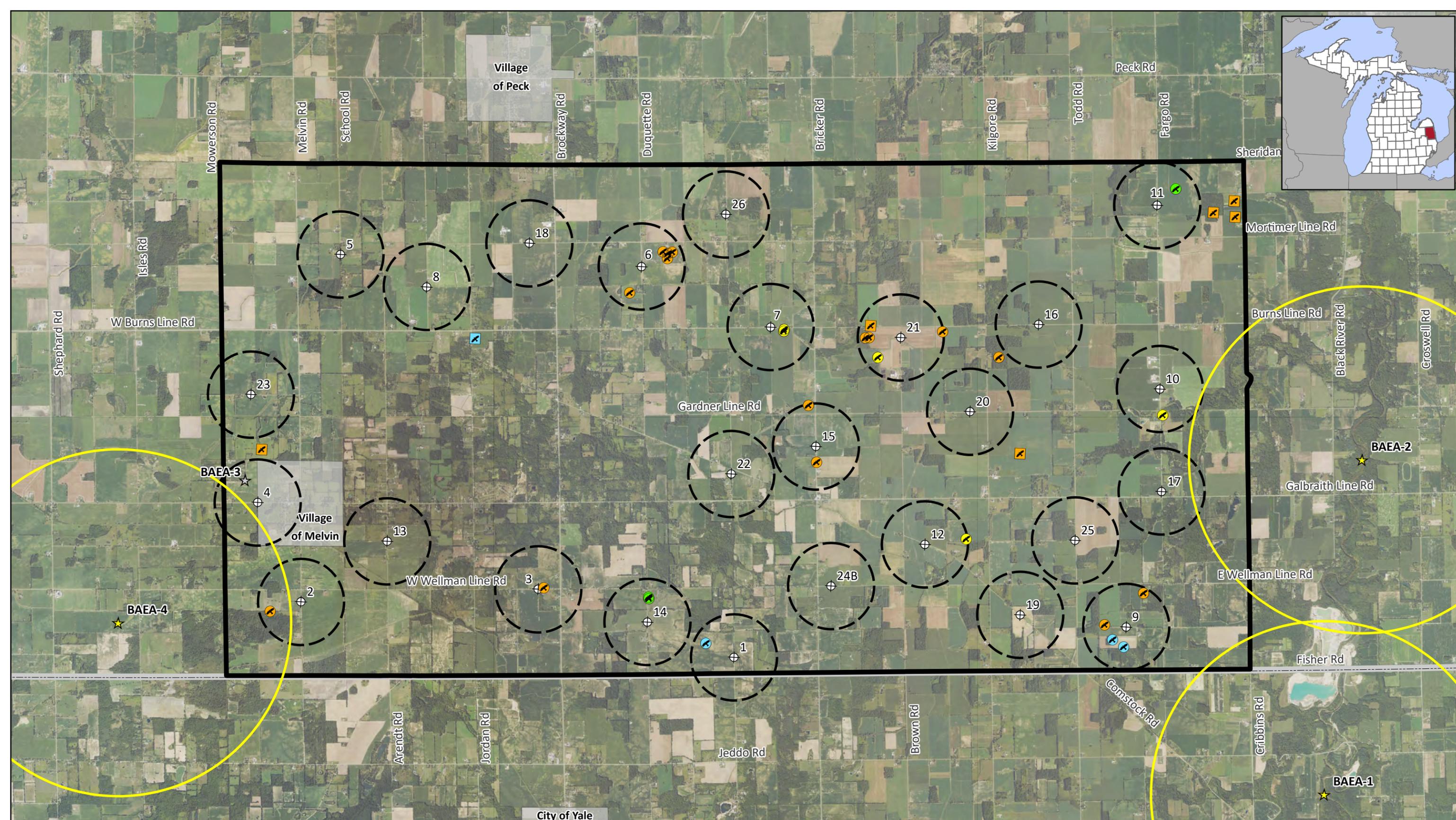
Year 2 Avian Use Report  
 Riverbend Wind Project  
 21003645  
 September 12, 2023  
 DRAFT/Confidential

0 0.5 1 Miles

- Point Count Station Location
- 800-meter Survey Point Buffer
- Turbine Layout MCP (7/13/2022, ~37,102 acres)
- Project Area (8/30/2022, ~44,523 acres)
- Road
- City/Village
- Township
- County

Source: Esri World Imagery (2022)

**Figure 3**  
**Point Count Station Locations**  
 Speaker and Fremont Townships  
 Sanilac County, Michigan



**ATWELL**

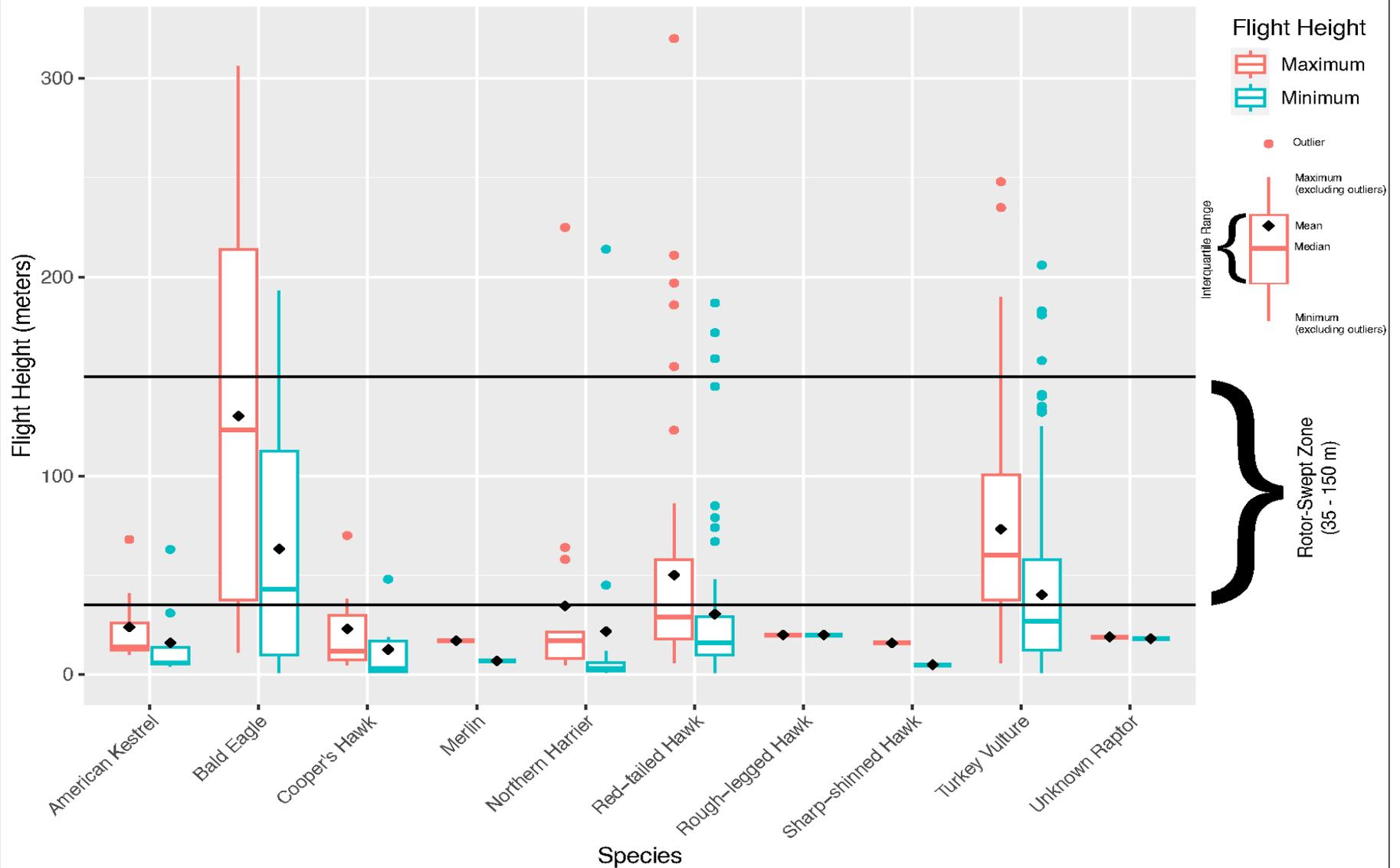
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0 0.5 1  
Miles

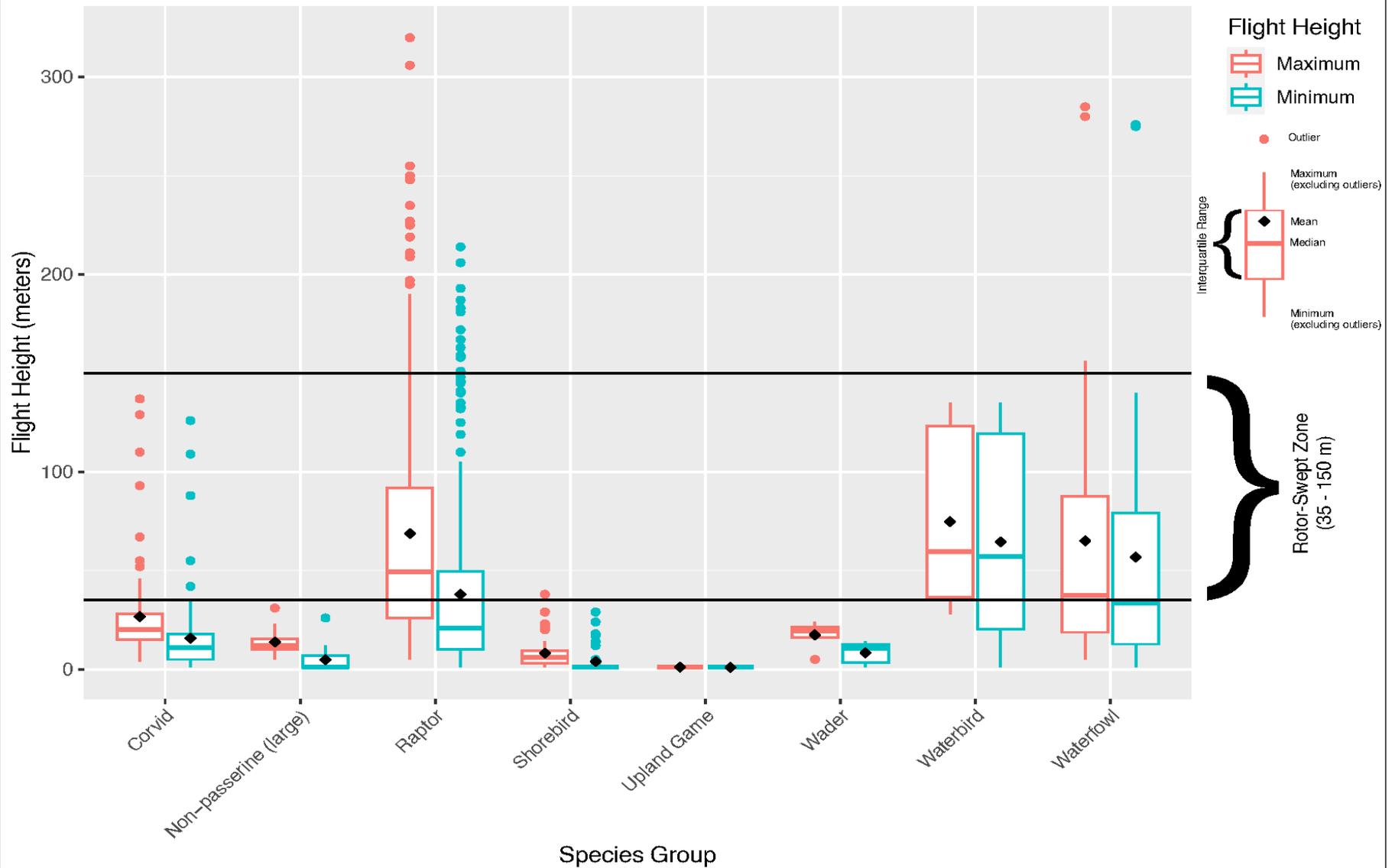
★ In-use, Occupied Bald Eagle Nest (TRC 2021)	Species	Season	⊕ Point Count Station Location
○ In-use Eagle Nest 2-mile Buffer	🦅 Bald Eagle - Standardized	● Fall	⊖ 800-meter Survey Point Buffer
☆ Historic, Unoccupied Bald Eagle Nest (TRC 2021)	🦅 Bald Eagle - Incidental	● Spring	▭ Project Area (8/30/2022) (~44,523 acres)
		● Winter	▭ City/Village
		● Summer	

Figure 4  
**Bald Eagle Observations**  
Speaker and Fremont Townships  
Sanilac County, Michigan

### Raptor Flight Heights during Large-Bodied Bird Use Surveys



### Species Group Flight Heights during Large-Bodied Bird Use Surveys



# **APPENDICES**

**CONFIDENTIAL: DO NOT DISTRIBUTE**

**APPENDIX A**  
**YEAR ONE TRC AVIAN REPORTS**

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# RAPTOR NEST SURVEY REPORT

**Riverbend Wind Energy Facility**

**Sanilac County, Michigan**

**October 2021**

TRC Project No. 428625.0000.0000



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Biologist



**CONFIDENTIAL BUSINESS INFORMATION**

## Table of Contents

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<b>1.0</b>	<b>INTRODUCTION</b> .....	<b>3</b>
<b>2.0</b>	<b>METHODS</b> .....	<b>3</b>
2.1	EAGLE DESKTOP REVIEW .....	3
2.2	RAPTOR NEST SURVEY.....	5
2.2.1	Ground-based Survey .....	6
2.2.2	Aerial Survey.....	6
2.3	DATA COLLECTION .....	6
<b>3.0</b>	<b>RESULTS</b> .....	<b>8</b>
3.1	EAGLE DESKTOP REVIEW .....	8
3.1.1	Eagle Occurrence Records .....	8
3.1.2	Potential Eagle Habitat.....	8
3.1.3	Previous Nest Information .....	9
3.2	FIELD SURVEY.....	9
3.2.1	General Results.....	9
3.2.2	Bald Eagle Nests.....	9
3.2.3	Other Raptor Nests .....	10
<b>4.0</b>	<b>REFERENCES</b> .....	<b>14</b>

### List of Tables

Table 1. Summary of raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan. ....	9
Table 2. Raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.....	12

### List of Figures

Figure 1. Map of the Project Area and 3.2 km (2 mi) buffered Survey Area for the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan. ....	4
Figure 2. Raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.....	11

### List of Attachments

Attachment 1. Nest data collected during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.	
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## 1.0 INTRODUCTION

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On behalf of Algonquin Power (MI Energy Developments), LLC, TRC Environmental Corporation (TRC) has prepared this Raptor Nest Survey Report (Report) as part of the environmental studies conducted for Riverbend Wind Energy Facility (Project). The proposed Project is in Sanilac County, Michigan, approximately 19.7 kilometers (km; 12.3 miles [mi]) south of Sandusky and 8.8 km (5.5 mi) east of Brown City in Sanilac County, Michigan. The Project Area is bounded by Sheridan Line Road on the north, Cribbins Road on the east, Fisher Road and the Sanilac/St Clair County line on the south, Mowerson Road to the west (Figure 1). The Project area encompasses approximately 15,052 hectares (ha; 37,194 acres [ac]) (Figure 1).

Pursuant to the US Fish and Wildlife Service's (USFWS) Land-based Wind Energy Guidelines (USFWS 2012), the USFWS Eagle Conservation Plan Guidance (USFWS 2013), Updated Eagle Nest Survey Protocol (USFWS 2021), and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016), a raptor nest survey including both ground-based and aerial methods was commissioned.

TRC was contracted in 2021 to conduct the survey using aerial and ground-based methods. The Survey Area consisted of the Project Area and a surrounding 3.2 km (2 mi) buffer. The Survey Area covered approximately 39,729 ha (99,169 ac) within Sanilac and St. Clair Counties (Figure 1).

## 2.0 METHODS

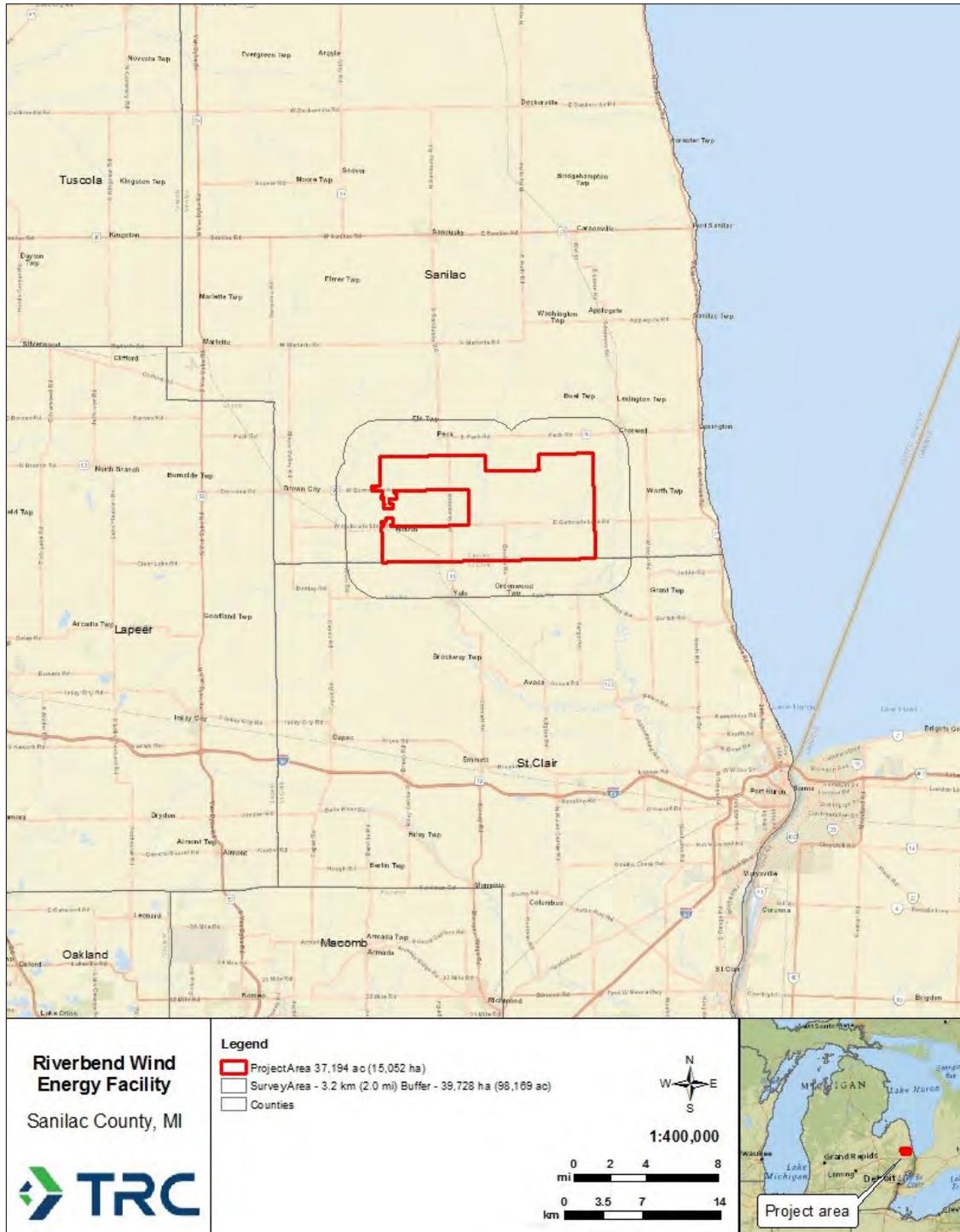
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### 2.1 EAGLE DESKTOP REVIEW

A review of publicly available and privately held information on eagle nest locations and region-specific habitat criteria within the counties encompassing the Survey Area was conducted prior to initiating site surveys. The focus of the desktop review included the following items:

- Determining which of the two North American eagle species, bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), have the potential to nest within the Survey Area
- Describing region-specific nest habitat criteria for each potential eagle species

- Identifying historic nesting and/or eagle occurrence records within the counties encompassing the Survey Area



- Evaluating potentially suitable eagle nesting habitat within the Survey Area, which was used to inform the logistics of the surveys

Eagle occurrence and habitat data sources for the desktop review included eBird (2021), USFWS Bald Eagle Nesting Data (USFWS 2019), Michigan Natural Features Inventory (MNFI 2021), The Second Michigan Breeding Bird Atlas (Chartier et al. 2011), species accounts from Birds of the World (Buehler 2020, Katzner et al. 2020), and data from prior and ongoing field studies at the Project (e.g. site characterization and avian use surveys; TRC 2021, TRC unpublished data). Spatial data gathered during the desktop process was reviewed using a geographic information system (GIS; ESRI ArcGIS®). Eagle occurrence information obtained from these sources was compared to the Survey Area boundary to determine whether any known bald eagle nests or occurrences were within the Survey Area.

The region-specific eagle nest habitat criteria (see Methods below) were compared with Survey Area conditions presented in aerial imagery, the National Landcover Database (NLCD, Homer et al. 2020), and the USFWS National Wetlands Inventory (USFWS 2014). Any portions of the Survey Area appearing to match the region-specific nest habitat criteria were considered potential eagle nest habitat.

## **2.2 RAPTOR NEST SURVEY**

The purpose of the 2021 raptor nest survey was to verify the status of any previously recorded eagle nests within the Survey Area and to locate any additional raptor nests of any species within the Survey Area.

Site surveys were performed on April 7 and 8, 2021. Ground-based site surveys were conducted from automobiles, and an aerial survey was conducted via helicopter. During the ground-based surveys, the full Survey Area was covered from public roads. A helicopter was used to survey the remaining potentially suitable eagle nest habitat that was not visible during ground-based surveys.

Raptors are known to construct nests on and utilize a variety of habitats including forests (trees, tree cavities, the ground), grasslands (ground-dwelling, towers, etc.), and developed areas (buildings, towers, etc.) (Coates et al. 2014, Dykstra et al. 2001, Berry et al. 1998, Kantrud and Higgins 1992, Titus and Mosher 1981). However, the predominant suitable raptor nesting habitat within the Project boundary was forest or large trees in residential areas.

### 2.2.1 Ground-based Survey

Visual scans of suitable habitat were performed from the vehicle and on foot along accessible roads using the naked eye, binoculars, and/or a spotting scope. The habitat information gathered during the desktop review was used to plan the initial ground-based survey routes. The planned survey route was adjusted during the site survey in response to the actual availability and location of suitable nest substrates for the targeted species.

### 2.2.2 Aerial Survey

Flight paths followed or circled areas considered potentially suitable nest habitat. Flight heights were approximately 152 – 366 meters (m, 500 – 1200 feet [ft]) above the ground and flight paths were adjusted during the site survey to provide the biologist with the best view of the habitat to be surveyed. If locations required a lengthier inspection, the aircraft hovered or was flown in a circling pattern until the biologists completed data collection or had completely surveyed the targeted area. To find nests, habitat was scanned by the naked eye and through binoculars. If a nest was observed, the nest status was confirmed using binoculars.

## 2.3 DATA COLLECTION

Data collection was completed digitally using the ESRI ArcGIS® Field Maps app.

When a nest was found during the aerial and ground-based surveys, the following information was recorded:

- *Location*: recorded as a point feature on the digital map
- *Date*: Date of nest discovery or observation
- *Nest ID*: For identification purposes, each nest found during the survey was assigned a number and species, if known (e.g., “RTHA-2” would indicate the second nest documented that was occupied by one or more Red-tailed Hawks [*Buteo jamaicensis*] in the Study Area). If species was unknown, it was recorded as Unknown Raptor, or UNRA.
- *Nest Type*: Stick, cavity, or ground
- *Nest Size*: Extra-large (eagle [e.g., bald eagle] nest; approximately  $\geq 1.2$  m [4 ft] in diameter), Large (eagle or buteo [e.g., red-tailed hawk] nest;  $\geq 0.9 - < 1.2$  m [3 – 4 ft] in diameter), Medium (buteo nest;  $\geq 0.6 - < 1.2$  m [2 – 3 ft] in diameter), Small (small buteo or accipiter [e.g., Cooper’s hawk] nest;  $\leq 0.3 - 0.6$  m [1 – 2 ft] in diameter), Unknown (cavity or burrow nest [e.g., American kestrel])

- *Species*: If a bird was observed at or near a nest, the species was recorded. If no bird was observed at or near the nest, the species was recorded as unknown
- *Nest Condition*: Excellent (solid bowl, recently lined and/or tended), Good (solid bowl, no lining or recent tending), Fair (bowl present, loose and clearly defined), Dilapidated (nest structure remains mostly intact, but no bowl shape clearly defined), Remnant (nest structure not intact, falling from substrate, no bowl structure), or Gone (relevant only if checking a previously documented nest)
- *Nest Substrate*: e.g., tree species, power pole, ground, etc.
- *Nest Substrate Slope Aspect*: North, Northeast, East, Southeast, South, Southwest, West, Northwest, or Flat
- *Substrate Height* (m): Height of the tree or structure which the nest was in
- *Nest Height* (m): Height of the nest in the substrate
- *Nest Exposure*: The cardinal direction that the nest was located within the substrate; North, Northeast, East, Southeast, South, Southwest, West, Northwest, or Open
- *Nest Habitat*: Land cover in area surrounding nest, described with NLCD classifications (Homer et al. 2020)
- *Nest Status*: Terminology adapted from Steenhof et al. (2017):
  - Unknown (nest not visible [e.g., cavity or burrow] and/or status unattainable without extensive viewing)
  - Occupied (pair of adult birds at or near nest, but either nesting has not yet been initiated or not known if eggs or young are in nest)
  - Occupied-Incubation (eggs)
  - Occupied-Brooding (young in the nest)
  - Occupied-Unknown (small young or eggs in the nest)
  - Occupied-Nestlings (occupied with nestlings that are old enough that full-time parental brooding is not required)
  - Occupied-Fledged (nest with young that have reached 80% of fledgling age for a given species or young have departed the nest)
  - Occupied-Failed (nest had pair of adults that initiated a nest [eggs laid and or young hatched] but that the eggs or young did not survive to fledge age)
  - Unoccupied (no adults seen near or at nest)
  - Unoccupied-alternate (unoccupied nest site within the territory of known breeding pair)

Observations of any eagles and other raptor species were recorded opportunistically during ground-based surveys. A complete record of field data associated with each nest was created in a spreadsheet. The full data record was used to tabulate and summarize the status (occupied, unoccupied) of nests by species and distance to the Project.

## **3.0 RESULTS**

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### **3.1 EAGLE DESKTOP REVIEW**

#### **3.1.1 Eagle Occurrence Records**

Only bald eagles have potential to nest within the Survey Area. Golden eagles are not considered to have potential to nest within the Survey Area and have never been reported as nesting in Michigan (Chartier et al. 2011).

Golden eagles rear their chicks in June and July, and do not migrate during these months; a review of occurrence data from this period provides a means of assessing nesting potential (eBird 2021; Katzner et al. 2020). There is only one record of a golden eagle occurrence in Michigan during the months of June or July between 1900 and 2020, which was recorded in Crawford County in June 2015 (eBird 2021), indicating little-to-no presence during the breeding season.

Bald eagle occurrences and nesting records in Michigan were common and were reported in several sources. Bald eagles have been recorded year round in Sanilac County, including within the Project area (Chartier et al. 2011; eBird 2021; TRC Unpublished data). As of 2010, there was an estimated 630 nesting pairs of bald eagles in Michigan, and that the number of occupied nests has doubled each decade since the 1970's (Chartier et al 2011, USFWS 2019).

#### **3.1.2 Potential Eagle Habitat**

Buehler (2020) notes bald eagles prefer to nest “in mature and old-growth forest with some habitat edge, relatively close (usually < 2.0 km [ $< 1.2$  mi]) to water with suitable foraging opportunities.” However, distances between nests and foraging opportunities vary by regional population and depend more upon the location of suitable nest substrate relative to quality foraging locations (Buehler 2020). Additionally, bald eagles have recently been detected, in a limited number of circumstances, nesting away from the large bodies of water they have been historically closely associated with; these “dry-land” habitats were previously considered unsuitable, and nesting occurrence within them is generally unlikely.

For purposes of evaluating potential nesting habitat within the Survey Area, we considered any forested areas within roughly 1.6 km (1.0 mi) of open water (ponds, lakes, rivers, streams) or emergent herbaceous wetlands as potential eagle nesting habitat. The desktop review identified

potential eagle nest habitat was concentrated along Black Creek, which runs to the east through the middle of the Project, and Black River, which runs to the south, outside of the Project area on the east side. However, there are other creeks and drainages throughout the Project area which may provide suitable foraging habitat needed to support breeding pairs in any forested patches within the Study area.

### 3.1.3 Previous Nest Information

No specific bald eagle nest locations were identified in Sanilac County the desktop review, though it was thought likely that bald eagles breed in Sanilac County based on occurrence records and the breeding range of bald eagles in Michigan (eBird 2021, Chartier et al. 2011, MNFI 2021).  
FIELD SURVEY

### 3.1.4 General Results

Four bald eagle nests, six red-tailed hawk nests, and 27 nests of unknown raptor species (but too small to be eagle nests) were discovered during the survey (Table 1). The complete dataset of nest information collected during the site survey is available in Attachment 1.

**Table 1. Summary of raptor nests observed during the 2021 raptor nest survey of the Riverbend Wind Energy Facility, Sanilac County, Michigan.**

Species	2021 Nest Status		Total
	Occupied	Unoccupied	
Bald Eagle	3	1	4
Red-tailed Hawk	6	0	6
Unknown raptor	0	27	27
<b>Total</b>	<b>9</b>	<b>28</b>	<b>37</b>

### 3.1.5 Bald Eagle Nests

Four bald eagle nests were discovered during the surveys on April 7 and 8 (Table 1, Figure 2). Three of the nests were occupied, one was unoccupied, and all four nests were outside the Project Area but within the 3.2 km (2.0 mi) buffered Survey Area.

BAEA-1 was an occupied nest in a wooded area on the west bank of the Black River, 2.7 km (1.7 mi) to the east of the Project boundary. BAEA-2 was a second occupied nest on the west bank of the Black River, approximately 6.3 km (4.0 mi) south of BAEA-1 and 2.7 km (1.7 mi) southeast of the Project area. BAEA-3 was an unoccupied eagle nest located <0.1 km (<0.1 mi) from the western boundary of the Project area in a tree line between agricultural fields to the northwest of

the town of Melvin. The nest structure was over 1.2 m (4 ft) in diameter and was composed of large sticks, indicating that it had been an eagle nest and not of a smaller raptor. There was active ground disturbance (use of a backhoe for excavation) in the immediate vicinity of the nest, and no eagles were observed at or near the nest. The nest was recorded as unoccupied due to the lack of eagle observations and ongoing disturbance. BAEA – 4 was an occupied eagle nest in a tree line in between agricultural fields located approximately 2.0 km (1.2 mi) to the west of the Project area, near the southern boundary of the Project.

### **3.1.6 Other Raptor Nests**

Thirty-three non-eagle raptor nests were recorded during the 2021 survey (Table 1, Table 2, Figure 2). Six of these nests were occupied by red-tailed hawks; one of which was in the southeast corner of the Project Area, four of which were outside the Project Area but within the 3.2 km (2.0 mi) buffered Study Area, and one which lay just outside the Study Area to the west.

Twenty-seven nests of unknown raptor nests were recorded as unoccupied or unknown status during the survey (Table 1, Table 2, Figure 2). Fourteen of these nests were located within the Project Area, twelve were located outside of the Project Area but within the 3.2 km (2 mi) buffer Study Area, and one was located just outside the Study Area to the east.

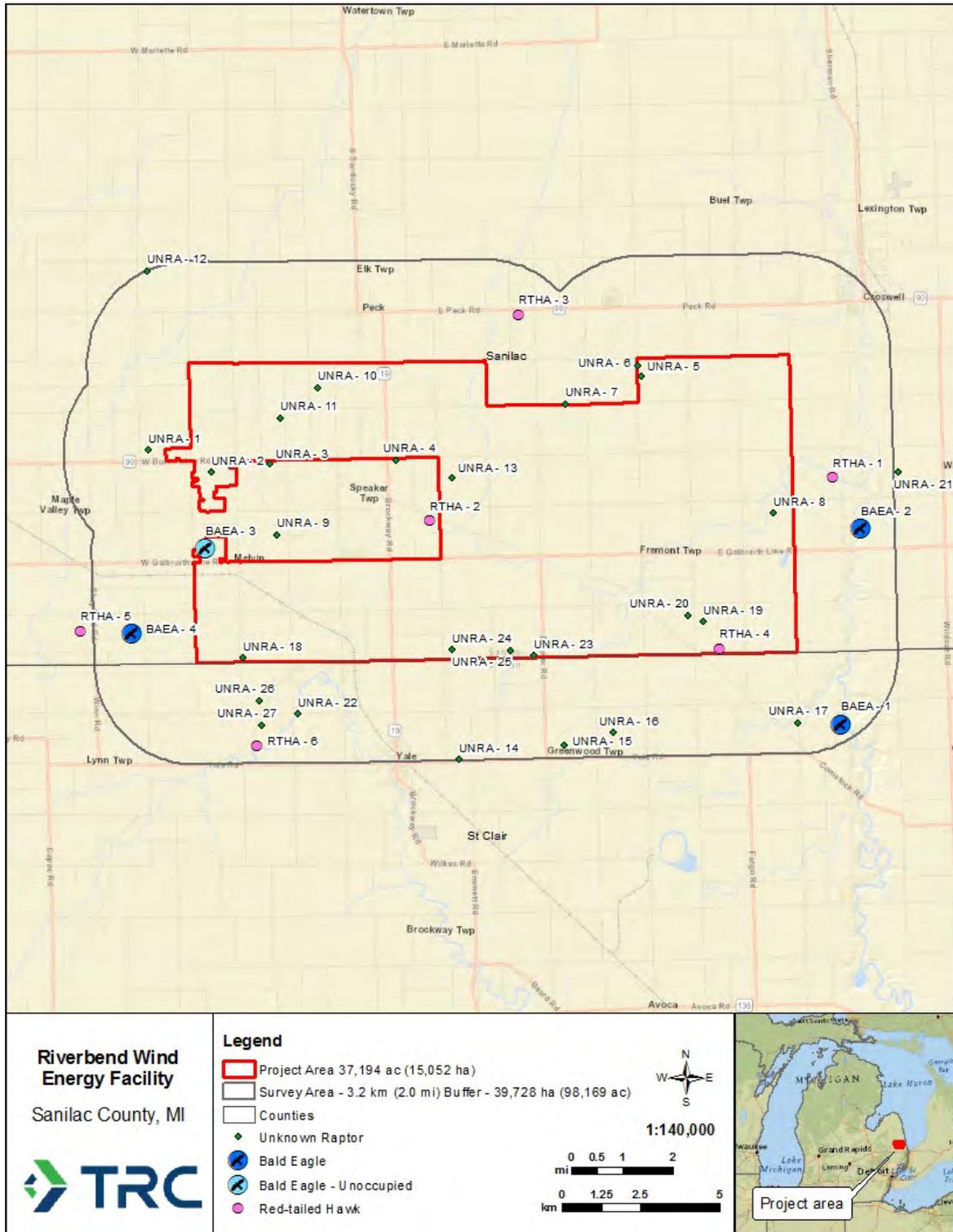


Figure 2. Raptor nests observed during the 2021 survey of Riverbend Wind Energy Facility, Sanilac County, Michigan.

**Table 2. All known raptor nests observed during the 2021, 2020, 2018, and 2016 raptor nest surveys of Riverbend Wind Energy Facility, Sanilac County, Michigan.**

Nest ID	Species	Latitude	Longitude	Nest Status	Within Project Area	Between Project Area and 3.2 km (2.0 mi) Buffer	Outside of 3.2 km (2.0 mi) Buffer
BAEA - 1	Bald Eagle	43.1435	-82.6254	Occupied		x	
BAEA - 2	Bald Eagle	43.1995	-82.6192	Occupied		x	
BAEA - 3	Bald Eagle	43.1899	-82.8745	Unoccupied		x	
BAEA - 4	Bald Eagle	43.1654	-82.9024	Occupied		x	
RTHA - 1	Red-tailed Hawk	43.2141	-82.6304	Occupied		x	
RTHA - 2	Red-tailed Hawk	43.1994	-82.7873	Occupied		x	
RTHA - 3	Red-tailed Hawk	43.2588	-82.7543	Occupied		x	
RTHA - 4	Red-tailed Hawk	43.1646	-82.673	Occupied	x		
RTHA - 5	Red-tailed Hawk	43.1658	-82.9224	Occupied			x
RTHA - 6	Red-tailed Hawk	43.1341	-82.8526	Occupied		x	
UNRA - 1	Unknown Raptor	43.2176	-82.8975	Unoccupied		x	
UNRA - 2	Unknown Raptor	43.2116	-82.8728	Unoccupied	x		
UNRA - 3	Unknown Raptor	43.2145	-82.8502	Unoccupied		x	
UNRA - 4	Unknown Raptor	43.2163	-82.8007	Unoccupied		x	
UNRA - 5	Unknown Raptor	43.2417	-82.7058	Unoccupied	x		
UNRA - 6	Unknown Raptor	43.2447	-82.7071	Unoccupied	x		
UNRA - 7	Unknown Raptor	43.2332	-82.7354	Unoccupied	x		
UNRA - 8	Unknown Raptor	43.2034	-82.6534	Unoccupied	x		
UNRA - 9	Unknown Raptor	43.1943	-82.8467	Unoccupied		x	
UNRA - 10	Unknown Raptor	43.2366	-82.8322	Unoccupied	x		
UNRA - 11	Unknown Raptor	43.2276	-82.8465	Unoccupied	x		
UNRA - 12	Unknown Raptor	43.2688	-82.8997	Unoccupied		x	
UNRA - 13	Unknown Raptor	43.2117	-82.7787	Unoccupied	x		
UNRA - 14	Unknown Raptor	43.1312	-82.7738	Unoccupied		x	
UNRA - 15	Unknown Raptor	43.1358	-82.733	Unoccupied		x	
UNRA - 16	Unknown Raptor	43.1398	-82.7138	Unknown		x	
UNRA - 17	Unknown Raptor	43.1436	-82.6421	Unknown		x	
UNRA - 18	Unknown Raptor	43.1588	-82.8587	Unoccupied	x		

Nest ID	Species	Latitude	Longitude	Nest Status	Within Project Area	Between Project Area and 3.2 km (2.0 mi) Buffer	Outside of 3.2 km (2.0 mi) Buffer
UNRA - 19	Unknown Raptor	43.172	-82.6796	Unoccupied	x		
UNRA - 20	Unknown Raptor	43.1737	-82.6859	Unoccupied	x		
UNRA - 21	Unknown Raptor	43.2159	-82.6047	Unknown			x
UNRA - 22	Unknown Raptor	43.1432	-82.837	Unoccupied		x	
UNRA - 23	Unknown Raptor	43.1614	-82.7457	Unoccupied	x		
UNRA - 24	Unknown Raptor	43.1626	-82.7547	Unknown	x		
UNRA - 25	Unknown Raptor	43.1627	-82.7777	Unknown	x		
UNRA - 26	Unknown Raptor	43.1469	-82.8521	Unoccupied		x	
UNRA - 27	Unknown Raptor	43.1398	-82.8511	Unoccupied		x	

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**Attachment 1. Nest data collected during the 2021 raptor nest survey of Riverbend Wind Energy Facility, Sanilac County, Michigan.**

Attachment 1. Nest data collected during the 2021 raptor nest survey of Riverbend Wind Energy Facility, Sanilac County, Michigan.

Project	Date	Observer(s)	Survey Ty	Nest ID	Coordinates (decimal degrees)	Species	Nest Statu	Nest Type	Nest Size	Nest Condition	Substrate	Nest Height (m)	Slope Aspect	Nest Exposure	Habitat	Notes
Riverbend	4/7/2021	K. Bardstead AND	Aerial	BAEA - 1	43.1435, -82.6254	Bald Eagle	Occupied	Stick	L	Excellent	Tree	40	E	E	Mixed Forest	Adult flew off the nest, wasn't able to determine if eggs or chicks present
Riverbend	4/7/2021	K. Bardstead JV	Aerial	BAEA - 2	43.1995, -82.6192	Bald Eagle	Occupied	Stick	XL	Excellent	Tree	45	E	E	Mixed Forest	Adult sitting on nest, white pine tree along Black River corridor
Riverbend	4/8/2021	K. Bardstead	Ground	BAEA - 3	43.1899, -82.8745	Bald Eagle	Unoccupied	Stick	XL	Good	Tree	45	E	S	Cultivated Crops	Nest structure has height of 2-3ft, substrate is a deciduous tree in forested buffer strip. Active disturbance (backhoe) in field directly adjacent
Riverbend	4/8/2021	J. VanderMeer	Ground	BAEA - 4	43.1654, -82.9024	Bald Eagle	Occupied	Stick	XL	Excellent	Tree	40		E	Deciduous Forest	adult baea on nest deciduous woodlot in agricultural field, 2nd adult perched on branch next to nest
Riverbend	4/7/2021	K. Bardstead JV	Aerial	RTHA - 1	43.2141, -82.6304	Red-tailed Hawk	Occupied	Stick	M	Excellent	Tree	40	E	N	Mixed Forest	Tree directly adjacent to emergent wetland along black creek
Riverbend	4/8/2021	K. Bardstead	Ground	RTHA - 2	43.1994, -82.7873	Red-tailed Hawk	Occupied	Stick	L	Excellent	Tree	25	SE	NE	Mixed Forest	Red-tailed adult actively defending nest with flight display and calls. Substrate is white pine located on field-first edge
Riverbend	4/8/2021	K. Bardstead	Ground	RTHA - 3	43.2588, -82.7543	Red-tailed Hawk	Occupied	Stick	L	Excellent	Tree	40	NW	SE	Evergreen Forest	White pine
Riverbend	4/7/2021	J. VanderMeer	Ground	RTHA - 4	43.1646, -82.673	Red-tailed Hawk	Occupied	Stick	M	Excellent	Tree	35		N	Deciduous Forest	adult on nest
Riverbend	4/8/2021	J. VanderMeer	Ground	RTHA - 5	43.1658, -82.9224	Red-tailed Hawk	Occupied	Stick	M	Excellent	Tree	35		E	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	RTHA - 6	43.1341, -82.8526	Red-tailed Hawk	Occupied	Stick	M	Good	Tree	40		W	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 1	43.2176, -82.8975	Unidentified Raptor	Unoccupied	Stick	S	Fair	Tree	25	N	W	Deciduous Forest	Nest in maple tree close to forest-field edge
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 10	43.2366, -82.8322	Unidentified Raptor	Unoccupied	Stick	L	Good	Tree	25	N	NE	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 11	43.2276, -82.8465	Unidentified Raptor	Unoccupied	Stick	L	Excellent	Tree	35	N	SW	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 12	43.2688, -82.8997	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	30	E	W	Deciduous Forest	
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 13	43.2117, -82.7787	Unidentified Raptor	Unoccupied	Stick	L	Fair	Tree	30	N	SE	Deciduous Forest	Deciduous tree, presumed oak, overlooking forested/emergent wetland area
Riverbend	4/7/2021	J. VanderMeer	Ground	UNRA - 14	43.1312, -82.7738	Unidentified Raptor	Unoccupied	Stick	M	Fair	Tree	25	W	W	Evergreen Forest	no activity seen
Riverbend	4/7/2021	J. VanderMeer	Ground	UNRA - 15	43.1358, -82.733	Unidentified Raptor	Unoccupied	Stick	M	Fair	Tree	30	N	S	Deciduous Forest	
Riverbend	4/7/2021	J. VanderMeer	Ground	UNRA - 16	43.1398, -82.7138	Unidentified Raptor	Unknown	Stick	M	Good	Tree	35	N	E	Deciduous Forest	
Riverbend	4/7/2021		Ground	UNRA - 17	43.1436, -82.6421	Unidentified Raptor	Unknown	Stick	S	Fair	Tree	10	E	E	Deciduous Forest	AMCR nearby
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 18	43.1588, -82.8587	Unidentified Raptor	Unoccupied	Stick	S	Good	Tree	35		S	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 19	43.172, -82.6796	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	40		W	Deciduous Forest	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 2	43.2116, -82.8728	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	25	E	W	Deciduous Forest	Very deep bowl. Almost conical at base. Near the crown of deciduous tree in beech-maple forest
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 20	43.1737, -82.6859	Unidentified Raptor	Unoccupied	Stick	M	Dilapidated	Tree	30		N	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 21	43.2159, -82.6047	Unidentified Raptor	Unknown	Stick	M	Good	Tree	40		W	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 22	43.1432, -82.837	Unidentified Raptor	Unoccupied	Stick	S	Excellent	Tree	30		W	Woody Wetlands	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 23	43.1614, -82.7457	Unidentified Raptor	Unoccupied	Stick	S	Fair	Tree	25		W	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 24	43.1626, -82.7547	Unidentified Raptor	Unknown	Stick	M	Fair	Tree	40		N	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 25	43.1627, -82.7777	Unidentified Raptor	Unknown	Stick	M	Fair	Tree	45		N	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 26	43.1469, -82.8521	Unidentified Raptor	Unoccupied	Stick	L	Excellent	Tree	45		S	Deciduous Forest	
Riverbend	4/8/2021	J. VanderMeer	Ground	UNRA - 27	43.1398, -82.8511	Unidentified Raptor	Unoccupied	Stick	M	Excellent	Tree	25		N	Deciduous Forest	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 3	43.2145, -82.8502	Unidentified Raptor	Unoccupied	Stick	L	Good	Tree	20	E	W	Deciduous Forest	Large stick nest within 10ft of crown of maple tree adjacent to ag. Land
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 4	43.2163, -82.8007	Unidentified Raptor	Unoccupied	Stick	M	Excellent	Tree	20	E	N	Deciduous Forest	Substrate provides open view of emergent wetland directly below and adjacent ag fields
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 5	43.2417, -82.7058	Unidentified Raptor	Unoccupied	Stick	S	Remnant	Tree	15	S	S	Cultivated Crops	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 6	43.2447, -82.7071	Unidentified Raptor	Unoccupied	Stick	S	Fair	Tree	15	S	N	Deciduous Forest	
Riverbend	4/7/2021	K. Bardstead	Ground	UNRA - 7	43.2332, -82.7354	Unidentified Raptor	Unoccupied	Stick	S	Good	Tree	10	W	E	Deciduous Forest	Built in crotch of tree branches in young maple tree along forest-field edge
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 8	43.2034, -82.6534	Unidentified Raptor	Unoccupied	Stick	M	Fair	Tree	40	E	NW	Deciduous Forest	Overlooking recently cleared area and ag fields. Substrate is aspen tree
Riverbend	4/8/2021	K. Bardstead	Ground	UNRA - 9	43.1943, -82.8467	Unidentified Raptor	Unoccupied	Stick	M	Good	Tree	35	N	E	Grassland/Herbaceous	Mature oak tree along riparian buffer between grassland fields

# **Large and Small Bird Use Report 2021–2022**

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**April 2022**



## Table of Contents

1.0	Introduction .....	1
2.0	Background .....	3
2.1	General Site Description .....	3
2.2	Birds .....	7
3.0	Methods .....	9
3.1	Survey Point Locations, Timing, and Frequency .....	9
3.2	Data Collection .....	12
3.3	Data Analysis.....	13
4.0	Results .....	15
4.1	Survey Summary .....	15
4.2	Large Bird Use Surveys .....	15
4.3	Small Bird Use Surveys .....	22
4.4	Observations of Sensitive Species.....	28
4.5	Eagle Use .....	29
5.0	Summary.....	36
5.1	Large Bird Use Surveys .....	36
5.2	Small Bird Use Surveys .....	36
5.3	Observations of Sensitive Species.....	36
5.4	Eagle Use .....	36
6.0	References.....	37

## List of Tables

Table 1. National Land Cover Database land cover types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....	5
Table 2. National Wetlands Inventory wetland types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....	6
Table 3. National Hydrology Dataset watercourse types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....	7
Table 4. Bird species of concern and their seasons of potential occurrence in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. .	8
Table 5. Summary of the surveys completed for each visit during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....	15



Table 6. Summary of the listed, protected, and non-listed sensitive species observed during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....29

Table 7. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by month, season, and overall, during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. 30

Table 8. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022. ....31

### List of Figures

Figure 1. Project Area for the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022..... 2

Figure 2. Land cover types, wetlands, and watercourses within the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. .... 4

Figure 3. Survey points, 2,625-ft (800-m) radius large bird plots, and 328-ft (100-m) radius small bird plots for the large and small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. ....11

Figure 4. Histograms of large bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species and for each of the five species with highest overall use during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022..... 18

Figure 5. Large bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by dashed line) by point during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....20

Figure 6. Map of large bird use (observations/plot/survey) and species diversity recorded at each point during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. ....21

Figure 7. Histograms of small bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species combined, for each of the five species with highest overall use, and for one species with the second-highest winter use during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....24

Figure 8. Small bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by vertical dashed line) by point during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....26

Figure 9. Map of small bird use (observations/plot/survey) and species diversity recorded at each point during the small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022. ....27

Figure 10. Bald eagle use minutes per survey hour by season during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.....32



Figure 11. Map of bald eagle use minutes documented during the large bird use surveys in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.....33

Figure 12. Map of bald eagle flight paths documented during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.....35

**List of Attachments**

Attachment A. Weather data from each survey during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

Attachment B. Data tables of large birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

Attachment C. Data tables of small birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

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## 1.0 Introduction

This report summarizes the large and small bird use study (Study) conducted by TRC Environmental Corporation (TRC) at the proposed Riverbend Wind Energy Facility (Project) between March 2021 and February 2022. The Project was located on 37,194 acres (ac; 15,052 hectares [ha]) in Sanilac County, Michigan, approximately 12 miles (mi; 20 kilometers [km]) south of the city of Sandusky (Figure 1).

This pre-construction Study at the Project was conducted in compliance with the US Fish and Wildlife Service's (USFWS) Land-based Wind Energy Guidelines (WEG; USFWS 2012), the Eagle Conservation Plan Guidance Module 1—Land-based Wind Energy Version 2 (ECPG; USFWS 2013), and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016).

The Study included all bird species, but separate surveys were conducted for large and small birds. The species considered to be large birds included all raptors and any non-passerines of at least 10 inches (in; 25 centimeters [cm]) in length; the species considered to be small birds included all passerines and any non-passerines, excluding raptors, of less than 10 in (25 cm) in length (Sibley 2000). The size definitions for this Study were developed to be exhaustive yet simple and considered species behavior and ecology as well as size in order to assign bird species to a suitable category.

The objectives of the Study included: (1) developing a complete list of bird species observed in the Project area, including those observed incidentally, (2) assessing temporal and spatial use of large and small birds in the Project area, and (3) documenting use of the Project area by threatened, endangered, and other sensitive bird species. Sensitive bird species considered in this study include both federal and state listed species, eagles protected by the Bald and Golden Eagle Protection Act (BGEPA), non-listed state species of concern identified in the Michigan Natural Features Inventory (MNFI) online list (MNFI 2021), and non-listed federal species of concern identified in a Project-specific Information for Planning and Consultation (IPaC) report (USFWS 2021).

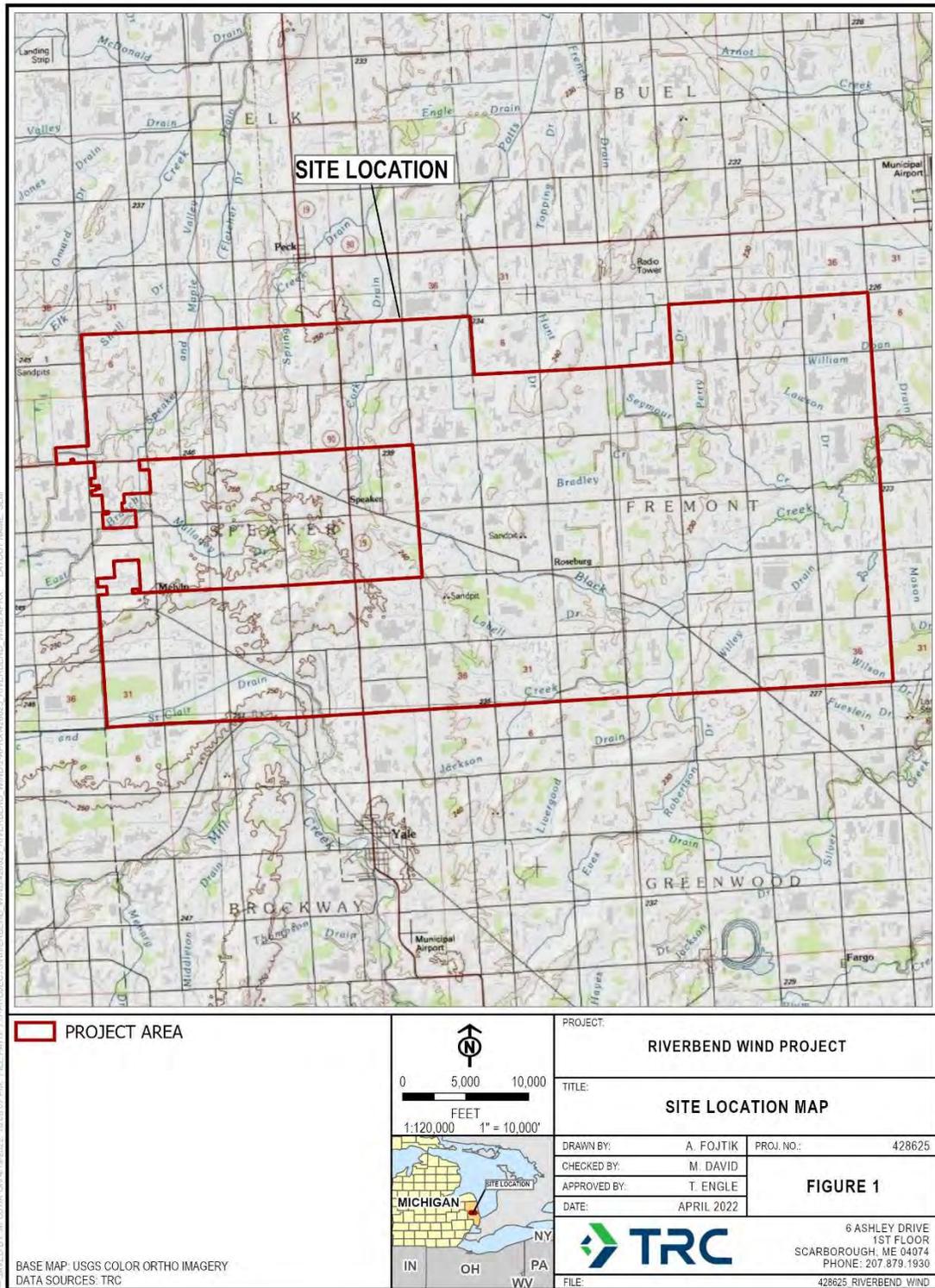


Figure 1. Project Area for the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.



## 2.0 Background

### 2.1 General Site Description

The Project lies within the Saginaw Lake Plain Level IV Ecoregion, which is characterized by clayey lake deposits, beach ridges, and dunes of low relief (USEPA 2021). Historically, the native habitat was mostly forested, with extensive coastal marches and wet prairies along Saginaw Bay in Lake Huron. Today, the majority of the land is used to cultivate crops, dairy, and livestock; natural habitats remaining in the area include swamp forest, wet prairie, and marsh (Albert 1995). Elevation within the Project area ranges from approximately 755 feet (ft; 230 meters [m]) to 820 ft (250 m) above mean sea level.

The National Land Cover Database (NLCD; Homer et al. 2020) characterized the Project area as 76% cultivated crops; 8% woody wetlands; 8% deciduous forest; 3% developed, open space; 3% pasture/hay; 2% developed, low intensity; and less than 1% each of mixed forest; evergreen forest; emergent herbaceous wetlands; grassland/herbaceous; open water; shrub/scrub; developed, medium intensity; barren land; and developed, high intensity (Figure 2; Table 1).

According to the USFWS National Wetlands Inventory, wetland features covered 1,942 ac (786 ha) of the Project area (USFWS 2014). These features included freshwater emergent wetlands (47 ac; 19 ha), freshwater forested/shrub wetlands (1,871 ac; 757 ha), and freshwater ponds (24 ac; 10 ha; Figure 2, Table 2).

The U.S. Geological Survey (USGS) National Hydrology Dataset (NHD) identified 130.8 mi (210.6 km) of watercourses within the Project area (USGS 2020; Figure 2; Table 3). The watercourses included 93.6 mi (150.6 km) of canal/ditches, 37.2 mi (59.9 km) of stream/rivers, and less than 0.1 mi (0.1 km) of artificial paths (Table 3). There were 23 named streams distributed throughout the Project area; the most significant of these are Black Creek on the eastern edge of the Project and Sanilac and Saint Clair Drain in the southwest corner of the Project (Figure 2).

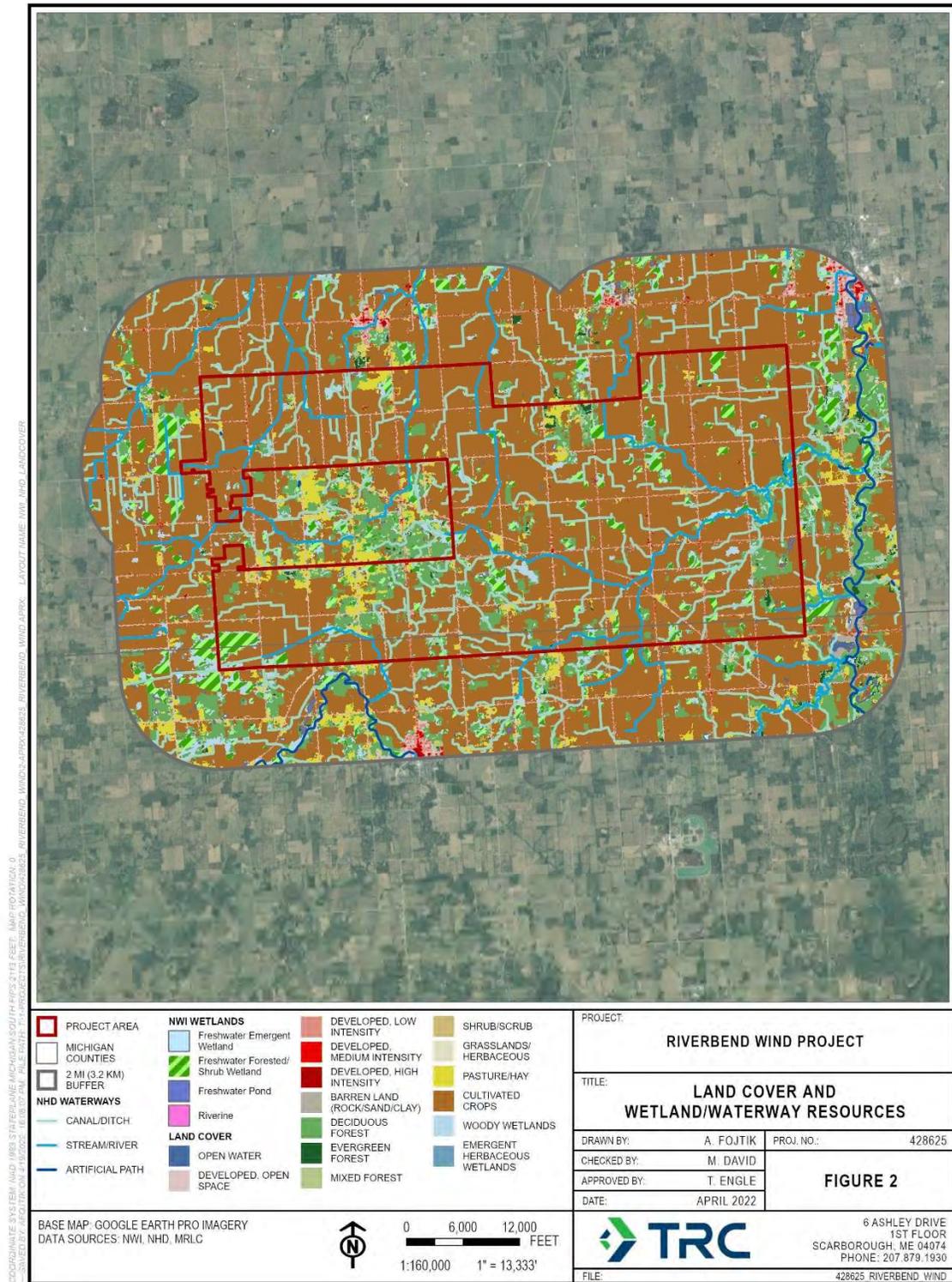


Figure 2. Land cover types, wetlands, and watercourses within the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.



**Table 1. National Land Cover Database land cover types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Land Cover Type <sup>1</sup>	Acres	Hectares	% Composition	Definition <sup>2</sup>
Cultivated Crops	28,103	11373	76%	Areas used for the production of annual crops (>20% of total vegetation) such as corn, soybeans, vegetables, tobacco, and cotton, as well as perennial woody crops (e.g., orchards and vineyards). This class also includes all land being actively tilled.
Woody Wetlands	2,899	1,173	8%	Areas where forest or shrubland vegetation accounts for greater than 20% of vegetative cover and the soil or substrate is periodically saturated with or covered with water.
Deciduous Forest	2,829	1,145	8%	Dominated by trees generally greater than 16 ft (5 m) tall, and greater than 20% of total vegetation cover. More than 75% of the tree species shed foliage simultaneously in response to seasonal changes.
Developed, Open Space	1,180	478	3%	Mixture of constructed materials, mostly vegetation in the form of lawn grasses. Impervious surfaces less than 20% of the total cover. Includes large-lot single-family housing units, parks, golf courses, and vegetation planted in developed settings for recreation, erosion control, or aesthetic purposes.
Pasture/Hay	1,034	418	3%	Grasses, legumes, or grass-legume mixtures planted for livestock grazing or the production of seed or hay crops, typically on a perennial cycle. Pasture/hay vegetation accounts for greater than 20% of the total vegetation.
Developed, Low Intensity	704	285	2%	A mixture of constructed materials and vegetation. Impervious surfaces account for 20% to 49% of the total cover. These areas most commonly include single-family housing units.
Mixed Forest	192	78	< 1%	Dominated by trees generally greater than 16 ft (5 m) tall, and greater than 20% of total vegetation cover. Neither deciduous nor evergreen species are greater than 75% of the total tree cover.
Evergreen Forest	102	41	< 1%	Dominated by trees generally greater than 16 ft (5 m) tall, and greater than 20% of total vegetation cover. More than 75% of the tree species maintain their leaves all year. Canopy is never without green foliage.
Emergent Herbaceous Wetlands	77	31	< 1%	Perennial herbaceous vegetation accounts for greater than 80% of vegetative cover, and the soil or substrate is periodically saturated with or covered with water.
Grassland/Herbaceous	27	11	< 1%	Dominated by graminoid or herbaceous vegetation, generally greater than 80% of total vegetation. These areas are not subject to intensive management, such as tilling, but can be utilized for grazing.



**Table 1. National Land Cover Database land cover types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Land Cover Type <sup>1</sup>	Acres	Hectares	% Composition	Definition <sup>2</sup>
Open Water	20	8	< 1%	Open water, generally with less than 25% vegetation cover or soil.
Shrub/Scrub	14	5	< 1%	Dominated by shrubs less than 16 ft (5 m) tall, typically greater than 20% of the total vegetation. This class includes true shrubs, young trees in an early successional stage, or trees stunted from environmental conditions.
Developed, Medium Intensity	12	5	< 1%	A mixture of constructed materials and vegetation. Impervious surfaces account for 50% to 79% of the total cover. These areas most commonly include single-family housing units.
Barren Land	1	<1	< 1%	Bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits, and other accumulations of earthen material. Generally, vegetation accounts for less than 15% of the total cover.
Developed, High Intensity	< 1	< 1	< 1%	Highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses and commercial/industrial. Impervious surfaces account for 80% to 100% of the total cover.
<b>Total:</b>	<b>37,194</b>	<b>15,052</b>	<b>100%</b>	

<sup>1</sup>Land cover data were obtained from the 2016 NLCD (Homer et al. 2020)

<sup>2</sup>Multi-Resolution Land Characteristic Consortium 2016

**Table 2. National Wetlands Inventory wetland types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Wetland Type <sup>1</sup>	Project Area Wetland Features		
	# of Features	Acres	Hectares
Freshwater Emergent Wetland	38	47	19
Freshwater Forested/Shrub Wetland	226	1,871	757
Freshwater Pond	21	24	10
<b>Total:</b>	<b>285</b>	<b>1,942</b>	<b>786</b>

<sup>1</sup>USFWS 2014

**Table 3. National Hydrology Dataset watercourse types within the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Watercourse Type <sup>1</sup>	Project Area Watercourse Features		
	# of Features	Miles	Kilometers
Canal/Ditch	119	93.6	150.6
Stream/River	54	37.2	59.9
Artificial Path	1	< 0.1	0.1
<b>Total:</b>	<b>174</b>	<b>130.8</b>	<b>210.6</b>

<sup>1</sup>National Hydrography Dataset; NHD Feature Catalog (USGS 2020)

## 2.2 Birds

The official bird list for Michigan currently contains 448 extant species, two extant species groups (pertaining to individuals identified only at a higher taxonomic level), and four extinct or extirpated species (Michigan Bird Records Committee [MBRC] 2022). The extant species and species groups represent 21 orders and 60 families. Out of the 450 extant species and species groups on the MBRC list, 193 fall under this Study’s definition of large bird species, representing 19 orders and 32 families, and 257 fall under this Study’s definition of small bird species, representing seven orders and 36 families (MBRC 2022).

The IPaC report (USFWS 2021), BGEPA, and MNFI (MNFI 2021) were used to assemble a list of listed and non-listed sensitive bird species that may be encountered during the Study.

The IPaC report identified two federal listed bird species that have a known or expected range which includes the Project area: piping plover (*Charadrius melodus*) and red knot (*Calidris canutus rufa*; USFWS 2021).

The IPaC also identified six non-listed federal species of concern (USFWS 2021). The MNFI, which identifies federal and state listed bird species and non-listed state species of concern in Michigan, included 46 species. The BGEPA federally protects bald eagle (*Haliaeetus leucocephalus*) and golden eagle (*Aquila chrysaetos*), both of which may occur in the region (Table 4). Some bird species were returned from more than one of these sources.

Together, these sources designated 53 bird species of concern (USFWS 2021, MNFI 2021). Twenty-five of these species were classified as large for this Study and 28 were classified as small. The seasonal potential for occurrence within the Project area was determined for these 53 species by referencing county-level bar charts from eBird (eBird 2021). Seasons were defined as: spring (March–May), summer (June–August), fall (September–November), and winter (December–February).

Based on desktop evaluation, 39 species of concern, including one federal and 16 state listed species, were determined to have potential to occur in the Project area during at least one season (Table 4).

**Table 4. Bird species of concern and their seasons of potential occurrence in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Common Name	Scientific Name	Listing Status <sup>1</sup>	Seasons of Potential Occurrence in Project Area			
			Spring	Summer	Fall	Winter
<b>Anatidae (Ducks, Geese, &amp; Swans)</b>						
Trumpeter Swan	<i>Cygnus buccinator</i>	ST			X	X
<b>Cuculidae (Cuckoos)</b>						
Black-billed Cuckoo	<i>Coccyzus erythrophthalmus</i>	FSC	X	X	X	
<b>Caprimulgidae (Nightjars)</b>						
Common Nighthawk	<i>Chordeiles minor</i>	SSC	X	X	X	
Eastern Whip-poor-will	<i>Antrostomus vociferus</i>	SSC	X	X		
<b>Rallidae (Rails &amp; Allies)</b>						
Common Gallinule	<i>Gallinula galeata</i>	ST	X	X		
<b>Charadriidae (Plovers)</b>						
Piping Plover	<i>Charadrius melodus</i>	FE, SE	X	X		
<b>Scolopacidae (Sandpipers &amp; Allies)</b>						
Wilson's Phalarope	<i>Phalaropus tricolor</i>	SSC		X		
<b>Laridae (Gulls &amp; Allies)</b>						
Caspian Tern	<i>Hydroprogne caspia</i>	ST	X	X		
Black Tern	<i>Chlidonias niger</i>	SSC		X		
Common Tern	<i>Sterna hirundo</i>	ST	X	X	X	
Forster's Tern	<i>Sterna forsteri</i>	ST	X	X	X	
<b>Gaviidae (Loons)</b>						
Common Loon	<i>Gavia immer</i>	ST	X	X	X	X
<b>Ardeidae (Herons &amp; Allies)</b>						
American Bittern	<i>Botaurus lentiginosus</i>	SSC	X	X		
Least Bittern	<i>Ixobrychus exilis</i>	ST	X			
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	SSC	X	X	X	
<b>Pandionidae (Osprey)</b>						
Osprey	<i>Pandion haliaetus</i>	SSC	X	X	X	
<b>Accipitridae (Hawks, Eagles, &amp; Kites)</b>						
Golden Eagle	<i>Aquila chrysaetos</i>	BGEPA	X			X
Northern Harrier	<i>Circus hudsonius</i>	SSC	X	X	X	X
Bald Eagle	<i>Haliaeetus leucocephalus</i>	BGEPA, SSC	X	X	X	X
Red-shouldered Hawk	<i>Buteo lineatus</i>	ST	X	X		X
<b>Strigidae (Owls)</b>						
Long-eared Owl	<i>Asio otus</i>	ST	X	X		X
Short-eared Owl	<i>Asio flammeus</i>	SE	X		X	X
<b>Picidae (Woodpeckers)</b>						
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	SSC	X	X	X	X

**Table 4. Bird species of concern and their seasons of potential occurrence in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Common Name	Scientific Name	Listing Status <sup>1</sup>	Seasons of Potential Occurrence in Project Area			
			Spring	Summer	Fall	Winter
<b>Falconidae (Falcons)</b>						
Merlin	<i>Falco columbarius</i>	ST	X	X	X	X
Peregrine Falcon	<i>Falco peregrinus</i>	SE	X	X	X	
<b>Tyrannidae (Flycatchers)</b>						
Willow Flycatcher	<i>Empidonax traillii</i>	FSC	X	X		
<b>Laniidae (Shrikes)</b>						
Loggerhead Shrike	<i>Lanius ludovicianus</i>	SE		X		
<b>Troglodytidae (Wrens)</b>						
Marsh Wren	<i>Cistothorus palustris</i>	SSC	X	X	X	
<b>Turdidae (Thrushes)</b>						
Wood Thrush	<i>Hylocichla mustelina</i>	FSC	X	X	X	
<b>Passerellidae (Sparrows &amp; Allies)</b>						
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	SSC	X	X		
Henslow's Sparrow	<i>Centronyx henslowii</i>	SE		X		
<b>Icteridae (Blackbirds &amp; Allies)</b>						
Yellow-headed Blackbird	<i>Xanthocephalus</i>	SSC	X	X		
Bobolink	<i>Dolichonyx oryzivorus</i>	FSC	X	X	X	
Rusty Blackbird	<i>Euphagus carolinus</i>	FSC	X		X	
<b>Parulidae (Wood-Warblers)</b>						
Louisiana Waterthrush	<i>Parkesia motacilla</i>	ST	X			
Golden-winged Warbler	<i>Vermivora chrysoptera</i>	SSC	X	X		
Hooded Warbler	<i>Setophaga citrina</i>	SSC		X		
Cerulean Warbler	<i>Setophaga cerulea</i>	ST	X	X		
<b>Cardinalidae (Cardinals &amp; Allies)</b>						
Dickcissel	<i>Spiza americana</i>	SSC		X		

<sup>1</sup>Listing Status definitions: BGEPA = Bald and Golden Eagle Protection Act; FE = Federal Endangered; SE = State Endangered; ST = State Threatened; SX = State Probably Extirpated; SSC = Non-listed State Special Concern; FSC = Non-listed Federal Species of Concern

### 3.0 Methods

Study methods were based on the guidelines set forth in the USFWS Land-based Wind Energy Guidelines (WEG; USFWS 2012), the Eagle Conservation Plan Guidance Module 1—Land-based Wind Energy Version 2 (ECPG; USFWS 2013), and Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests (USFWS 2016).

### **3.1 Survey Point Locations, Timing, and Frequency**

A fixed-radius point count method (Hutto et al. 1986) was used to survey the birds present within the Project area. Twenty-four survey points (termed points, hereafter) were distributed throughout the Project area with a minimum of 1.0 mi (1.6 km) spacing between points (Figure 3). The number of points was chosen to achieve 30% minimum coverage of the Project area by large bird survey plots (see section 3.1.1 below). Point locations were selected using aerial imagery based on accessibility, safety, viewshed, and coverage across the Project area. Locations were then inspected in the field to verify each as acceptable and adjusted if necessary. One set of surveys at all points was termed a visit (a visit would span multiple days). Surveys for large and small birds were conducted separately, but the same points were used for both survey types.

#### **3.1.1 Large Bird Surveys**

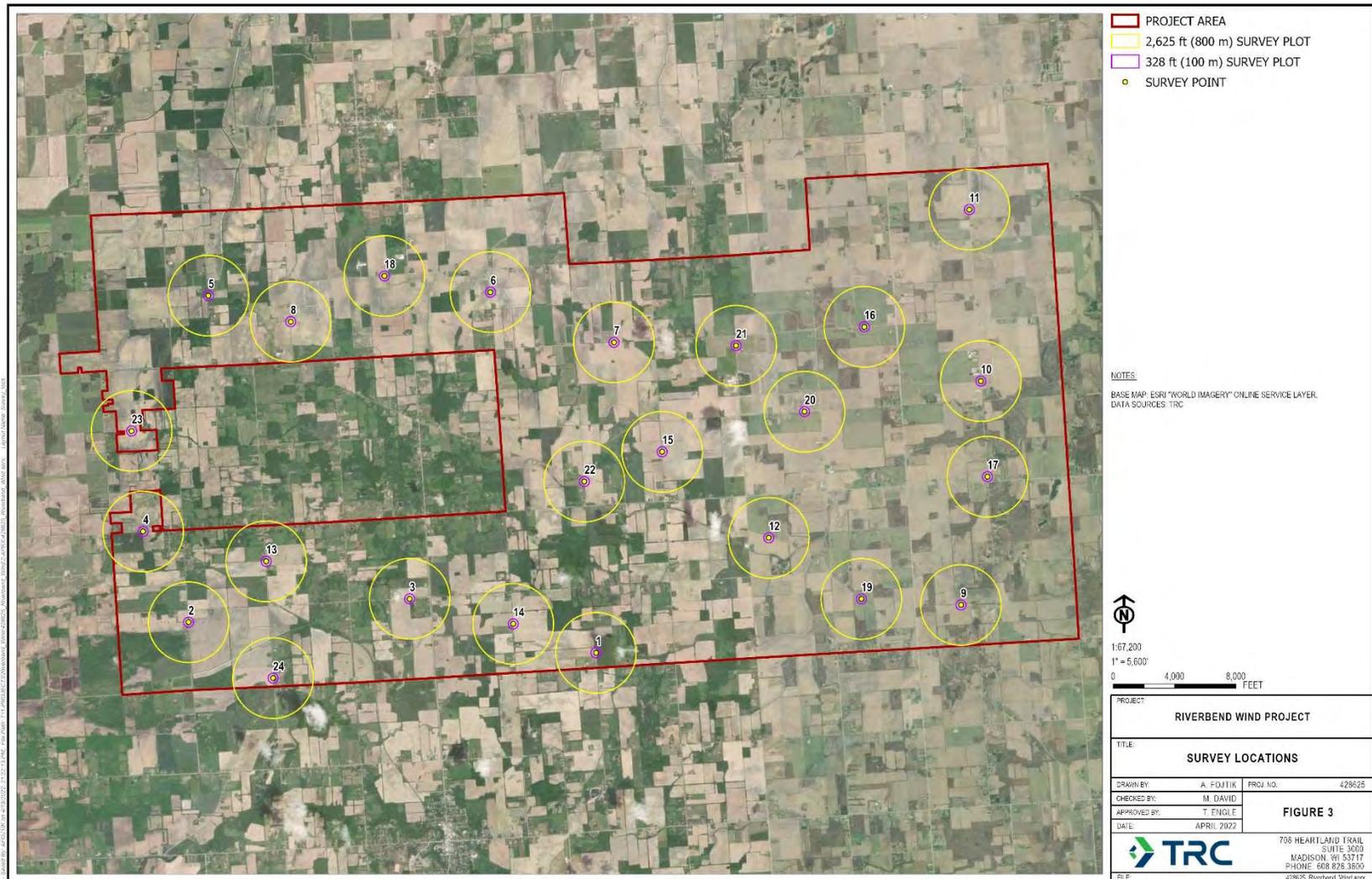
Survey visits were conducted 12 times between March 2021 and February 2022. One visit was conducted each month.

A 2,625-ft (800-m) radius circle was designated as the plot surrounding each point. Each survey was 60 minutes in duration, initiated after sunrise, and completed before sunset. The order in which points were surveyed was varied between visits to ensure each point was surveyed at different times of day.

#### **3.1.2 Small Bird Surveys**

Survey visits were conducted 12 times between March 2021 and February 2022 on the same schedule as large bird surveys. Each survey was typically conducted directly before a large bird survey at the same point; large bird and small bird surveys did not overlap.

A 328-ft (100-m) radius circle was designated as the plot surrounding each point. Each survey was 10 minutes in duration, initiated after sunrise, and completed before sunset.



**Figure 3. Survey points, 2,625-ft (800-m) radius large bird plots, and 328-ft (100-m) radius small bird plots for the large and small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

## **3.2 Data Collection**

### **3.2.1 Large and Small Bird Surveys**

The date, point number, start time, end time, and weather were documented for each survey. Weather data collected included temperature (degrees Celsius), wind speed (meters/second), wind direction (16-point compass directions), and cloud cover (0–25%, 25–75%, or 75–100%). Fog and precipitation were recorded if present.

Surveys were conducted during any weather unless fog or precipitation inhibited horizontal vision to 2,625 ft (800 m) or vertical vision to 656 ft (200 m). If the weather was unsafe (e.g., lightning) or not suitable for surveys, they were postponed until conditions were appropriate to continue.

Each time a bird or group of birds was detected (either visually or audibly) within the plot during the corresponding large or small bird survey, the observer collected the following information:

- Species
- Number of individuals
- Age; categorized as adult, subadult, juvenile, or unknown
- Sex; categorized as male, female, or unknown
- Estimated distance of a bird's closest approach to the point; categorized as 0–164 ft (0–50 m), 164–328 ft (50–100 m), 328–1,312 ft (100–400 m), or 1,312–2,625 ft (400–800 m); an additional distance category (> 2,625 ft [> 800 m]) was available for recording eagle minutes beyond the plot boundary and any incidental observations (see section 3.2.3 below)
- Behavior of the bird; categorized as flapping flight, soaring flight, gliding flight, eating/hunting, perched/landed, swimming, antagonistic interaction, breeding/nesting activity, singing, calling/other vocal sound, or drumming/non-vocal sound. All applicable behavior codes were assigned to a single observation.
- Flight height; categorized as less than 115 ft (35 m), 115–656 ft (35–200 m), or more than 656 ft (200 m) above ground level. Birds that occupied multiple flight height categories while within the plot were assigned all relevant flight heights.
- Habitat type(s) in which the bird was observed; categorized according to the NLCD land cover codes (Homer et al. 2020).

### **3.2.2 Eagle Observations**

Additional information was collected for all eagles, whether observed during a large bird survey or incidentally. For each individual observed, the observer recorded the total number of observation minutes and the eagle's distance from the point, flight height, and behavior during each minute of the observation. A sketch of the flight path and a written description of the observation were also recorded.

### **3.2.3 Incidental Observations**

Incidental bird observations were recorded with the objectives of (1) providing information on bird species of concern (see section 2.2) observed outside of the standard survey protocols and

(2) contributing to the complete lists of large and small bird species observed in the Project area. All observations of species of concern were recorded regardless of when they were encountered, as were any observations of species not yet recorded within the Project area. Incidental observations were recorded in a similar fashion to data collected during surveys. An additional distance category (> 2,625 ft [800 m]) was used for birds observed during a survey but beyond the survey plot, and for any birds observed within the Project area but not during a survey.

### **3.3 Data Analysis**

Large and small bird data were analyzed separately. All analyses described in Sections 3.3.2–3.3.5 were completed for both large and small birds. Data from incidental observations were not included in the analyses described in Sections 3.3.2–3.3.6 and are reported separately from data collected during standard surveys.

Survey data were compiled and summarized by species and taxonomic family. Families, unlike species, have no standardized common name equivalent to their scientific name; thus, we referred to families by scientific name.

#### **3.3.1 Weather**

Weather data for each survey were presented in tabular format.

#### **3.3.2 Observations, Relative Abundance, and Diversity**

Metrics were defined as follows:

- *observation*—each bird recorded
- *group*—one or more observations recorded together
- *relative abundance*—the percent of the total number of survey observations
- *diversity*—number of different species or families

Groups, observations, and diversity were calculated for the entire Study period and by season for all species combined. Groups, observations, and relative abundance were calculated for the entire Study period and by season for each species and family.

#### **3.3.3 Use, Frequency of Occurrence, and Spatial Distribution**

*Use* was defined for large birds as number of observations per 2,625-ft (800-m) plot per 60-minute survey, and for small birds as number of observations per 328-ft (100-m) plot per 10-minute survey (abbreviated as obs/plot/survey). *Use* and associated standard error (SE)<sup>1</sup> were calculated for all species combined in total, by season, and by point. *Use* and standard error by point were displayed on a bar chart.

*Use* was also calculated in total and by season for each species and family. For the five highest-use species recorded during the surveys, and for any additional species with the highest or second-highest use in any one season, a single-species SE was calculated in total and by

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<sup>1</sup> Standard error (SE) is defined as the sample standard deviation divided by the square root of the sample size.

season. Histograms of use and SE by season were created for each of these species and for all species combined.

*Frequency of occurrence* (abbreviated as *frequency*) was defined as the proportion of surveys during which one or more observations were made. Frequency was calculated in total and by season for each species, for each family, and for all species combined.

*Use* and *frequency* were also calculated by point for each species and family. Species and family *diversity* were also calculated for each point.

The spatial distribution of bird use within the Project area was evaluated by mapping use and species diversity by point in a geographic information system (GIS). In addition, for each point, it was determined how many families had their highest single-point use at that point. This analysis was repeated for frequency.

### **3.3.4 Flight Height**

Group and observation counts, use, and *percent of observations flying*—the percent of all observations that included flight behavior— were calculated for flying birds by species, family, and overall.

Observations were also calculated for each flight height category (see section 3.2.1 above.) Flight height category observations were divided by observations of flying birds to give *percent of flying observations in flight height categories* for each species, family, and overall. The flight height category of 115–656 ft (35–200 m) above the ground was considered the rotor-swept zone (RSZ). *Use* and *frequency* within the RSZ were calculated for each species, family, and overall.

### **3.3.5 Threatened or Endangered Species and Other Sensitive Species**

Observations of bird species that were federally or state listed as threatened or endangered, or were considered non-listed federal or state species of concern, were summed and tabulated. Use and frequency were reported in total, by season, and by point for each listed species observed during the surveys and for non-listed species of concern observed at two or more points. For non-listed species of concern that were observed at only one point, we detailed the location and timing of each observation instead of summarizing their use and frequency.

### **3.3.6 Eagle Use Minutes**

Each eagle observation was divided into 1-minute intervals (see section 3.2.2). Each eagle observation interval during a large bird survey in which the eagle was:

- 1) within the survey plot;
- 2) flying; and
- 3) at a height no more than 656 ft (200 m) above the ground;

was termed an *eagle use minute*. Eagle use minutes were summed and tabulated in total and by month, season, and point. The number of eagle use minutes per survey hour was also calculated for each of these categories. The eagle use minutes for each point were visually represented on a map created in a GIS.

### 3.3.7 Eagle Flight Paths

All flight paths and perch locations, which were sketched in the field for each eagle observation (including incidental observations), were digitized in a GIS and plotted on a map of the Project area. The flight paths and perch locations were examined qualitatively for any tendencies in flight direction/style or associations with land cover or terrain features.

## 4.0 Results

### 4.1 Survey Summary

In total, 283 large bird surveys and 286 small bird surveys were completed during 12 visits between March 2021 and February 2022 (Table 5). These totals exclude five scheduled large bird surveys and two scheduled small bird surveys which were performed but not fully completed between sunrise and sunset. Data from the excluded surveys were retained but all observations were designated as incidental.

Weather conditions for all surveys are presented in Attachment A. No scheduled surveys were canceled or interrupted due to unsuitable weather conditions.

**Table 5. Summary of the surveys completed for each visit during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Visit	Start Date	Finish Date	Large Bird Surveys Completed	Small Bird Surveys Completed
1	3/17/2021	3/19/2021	22	22
2	4/8/2021	4/11/2021	24	24
3	5/13/2021	5/15/2021	24	24
4	6/14/2021	6/16/2021	24	24
5	7/13/2021	7/15/2021	24	24
6	8/15/2021	8/17/2021	23	24
7	9/14/2021	9/16/2021	23	24
8	10/12/2021	10/15/2021	24	24
9	11/15/2021	11/18/2021	24	24
10	12/14/2021	12/17/2021	23	24
11	1/10/2022	1/13/2022	24	24
12	2/15/2022	2/18/2022	24	24
<b>Total:</b>			<b>283</b>	<b>286</b>

### 4.2 Large Bird Use Surveys

#### 4.2.1 Observations, Relative Abundance, and Diversity

During the surveys, 3,673 observations in 1,445 groups were recorded (Attachment B; Table B-1).<sup>2</sup> Observations by season consisted of 801 observations in 422 groups in spring, 746 observations in 377 groups in summer, 1,406 observations in 441 groups in fall, and 702 observations in 205 groups in winter (Table B-1).

<sup>2</sup> Tables B-1 to B-7 are provided in Attachment B.

The five most numerous large bird species observed during the surveys were mourning dove (*Zenaida macroura*; 1,349 observations), rock pigeon (*Columba livia*; 736 observations), turkey vulture (*Cathartes aura*; 574 observations), Canada goose (*Branta canadensis*; 311 observations), and killdeer (*Charadrius vociferus*; 184 observations; Table B-1). Relative abundances for these species were 36.7%, 20.0%, 15.6%, 8.5%, and 5.0% of all large bird observations, respectively (Table B-1). None of these five species are federally listed or state listed species.

The most-observed families were Columbidae (pigeons and doves; 2,085 observations), Cathartidae (vultures; 574 observations), and Anatidae (ducks, geese, and swans; 331 observations; Table B-1). Relative abundances for these families were 56.8%, 15.6%, and 9.0%, respectively (Table B-1).

Twenty-four species from 12 taxonomic families were recorded during the surveys, with 18 species observed in spring, 15 in summer, 19 in fall, and 10 in winter (Table B-1). Two additional species were recorded incidentally (Table B-2). In total, 26 large bird species from 12 families were recorded during the Study (Table B-2).

#### **4.2.2 Use and Frequency of Occurrence**

Overall use recorded during the surveys was 12.98 (SE = 0.85) obs/plot/survey (Table B-3). Mourning dove use was 4.77 (SE = 0.46) obs/plot/survey, rock pigeon use was 2.60 (SE = 0.48) obs/plot/survey, turkey vulture use was 2.03 (SE = 0.23) obs/plot/survey, Canada goose use was 1.10 (SE = 0.31) obs/plot/survey, and killdeer was 0.65 (SE = 0.08) obs/plot/survey (Table B-3; Figure 4).

Among families, Columbidae use was 7.37 obs/plot/survey, Cathartidae use was 2.03 obs/plot/survey, and Anatidae use was 1.17 obs/plot/survey (Table B-3).

The species with the highest frequency were mourning dove (0.72), red-tailed hawk (*Buteo jamaicensis*; 0.44), turkey vulture (0.43), rock pigeon (0.31), and killdeer (0.29; Table B-3).

Families with the highest frequency were Columbidae (0.84), Accipitridae (hawks, eagles, and kites; 0.53), and Cathartidae (0.43; Table B-3).

##### **4.2.2.1 Temporal Variation in Use**

Large bird use was 11.44 (SE = 1.01) obs/plot/survey in spring, 10.51 (SE = 1.02) obs/plot/survey in summer, 19.80 (SE = 2.41) obs/plot/survey in fall, and 10.14 (SE = 1.68) in winter (Figure 4). In spring, turkey vulture had the highest use, followed by killdeer; in summer, mourning dove had the highest use, followed by turkey vulture; in fall, mourning dove had the highest use, followed by rock pigeon; and in winter, rock pigeon had the highest use, followed by mourning dove (Figure 4; Table B-3).

Mourning dove use was 1.16 (SE = 0.21) obs/plot/survey in spring, 4.89 (SE = 0.71) obs/plot/survey in summer, 9.72 (SE = 1.41) obs/plot/survey in fall, and 3.25 (SE = 0.57) obs/plot/survey in winter (Figure 4). Mourning dove comprised 10.1% of spring, 46.5% of summer, 49.1% of fall, and 32.1% of winter observations (Table B-1). Frequency for the species was 0.49 in spring, 0.87 in summer, 0.87 in fall, and 0.65 in winter (Table B-3).

Rock pigeon use was 1.21 (SE = 0.24) obs/plot/survey in spring, 0.86 (SE = 0.24) obs/plot/survey in summer, 4.52 (SE = 1.62) obs/plot/survey in fall, and 3.79 (SE = 0.94)

obs/plot/survey in winter (Figure 4). Rock pigeon comprised 10.6% of spring, 8.2% of summer, 22.8% of fall, and 37.4% of winter observations (Table B-1). Frequency for the species was 0.31 in spring, 0.23 in summer, 0.34 in fall, and 0.37 in winter (Table B-3).

Turkey vulture use was 4.01 (SE = 0.61) obs/plot/survey in spring, 2.01 (SE = 0.36) obs/plot/survey in summer, and 2.11 (SE = 0.52) obs/plot/survey in fall; the species was not observed in winter (Figure 4). Turkey vulture comprised 35.1% of spring, 19.2% of summer, and 10.7% of fall observations (Table B-1). Frequency for the species was 0.74 in spring, 0.61 in summer, and 0.37 in fall (Table B-3).

Canada goose use was 1.14 (SE = 0.37) obs/plot/survey in spring, 0.39 (SE = 0.26) obs/plot/survey in summer, 1.58 (SE = 0.59) obs/plot/survey in fall, and 1.28 (SE = 0.97) in winter (Figure 4). Canada goose comprised 10.0% of spring, 3.8% of summer, 8.0% of fall, and 12.6% of winter observations (Table B-1). Frequency for the species was 0.26 in spring, 0.04 in summer, 0.18 in fall, and 0.04 in winter (Table B-3).

Killdeer use was 1.54 (SE = 0.23) obs/plot/survey in spring, 0.72 (SE = 0.15) obs/plot/survey in summer, and 0.35 (SE = 0.12) obs/plot/survey in fall; the species was not observed in winter (Figure 4). Killdeer comprised 13.5% of spring, 6.8% of summer, and 1.8% of fall observations (Table B-1). Frequency for the species was 0.57 in spring, 0.39 in summer, and 0.18 in fall (Table B-3).

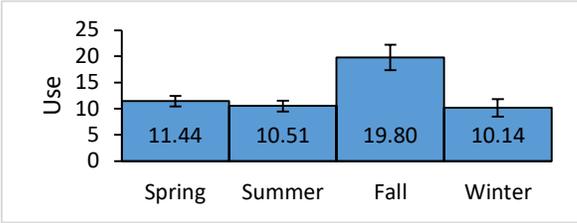
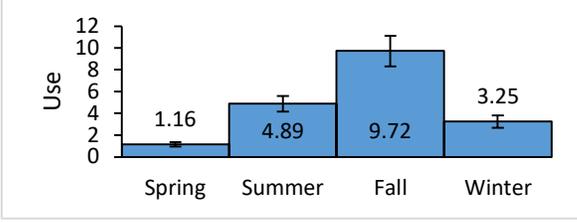
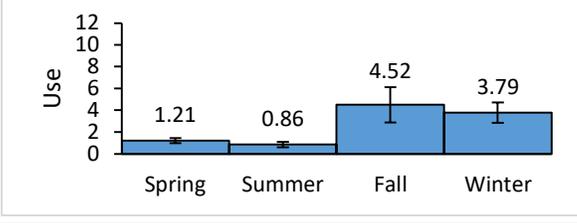
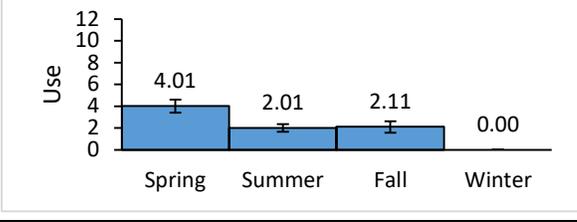
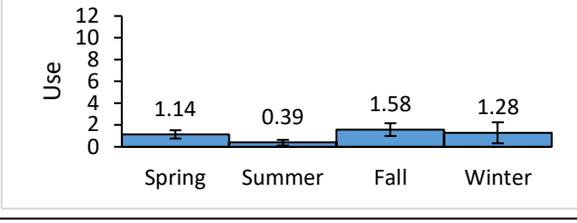
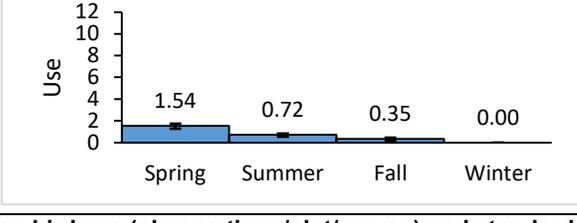
Common Name Scientific Name	Use Histogram	Use (Standard Error) for All Seasons Combined
All Large Bird Species		12.98 (0.85)
Mourning Dove <i>Zenaida macroura</i>		4.77 (0.46)
Rock Pigeon <i>Columba livia</i>		2.60 (0.48)
Turkey Vulture <i>Cathartes aura</i>		2.03 (0.23)
Canada Goose <i>Branta canadensis</i>		1.10 (0.31)
Killdeer <i>Charadrius vociferus</i>		0.65 (0.08)

Figure 4. Histograms of large bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species and for each of the five species with highest overall use during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.

In spring, Cathartidae was the family with the highest use, at 4.01 obs/plot/survey (Table B-3). Relative abundance for Cathartidae was 35.1% in spring (Table B-1); frequency was 0.74 in spring (Table B-3). In summer, fall, and winter, Columbidae was the family with the highest use, at 5.75 obs/plot/survey in summer, 14.24 obs/plot/survey in fall, and 7.04 obs/plot survey in winter (Table B-3). Relative abundance for Columbidae was 54.7% in summer, 71.9% in fall, and 69.4% in winter (Table B-1). Frequency for Columbidae was 0.90 in summer, 0.94 in fall, and 0.85 in winter (Table B-3).

#### 4.2.2.2 Spatial Variation in Use and Diversity

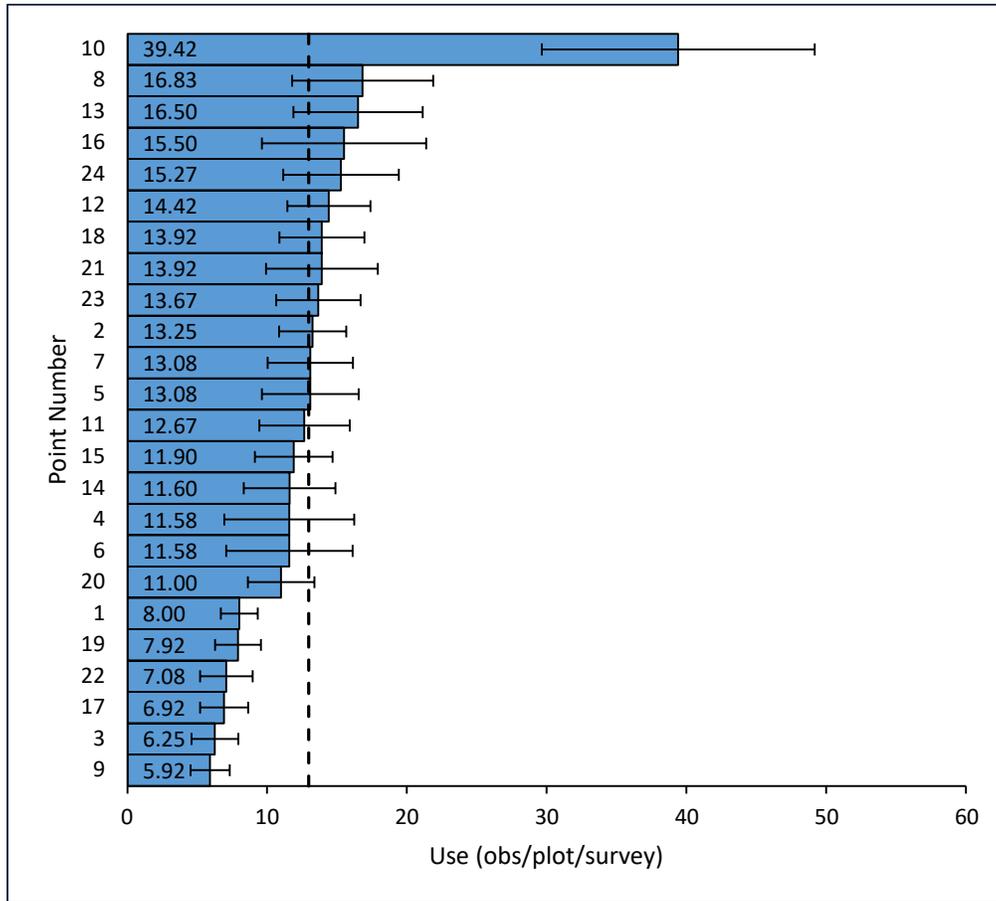
Comparisons among points in this section include results from all points; however, note that points 14 and 15 had ten surveys each and point 24 had 11 surveys, while the remaining points had 12 surveys each.

Overall large bird use was highest at point 10 (39.42 obs/plot/survey, SE = 9.77), followed by point 8 (16.83 obs/plot/survey, SE = 5.05) and point 13 (16.50 obs/plot/survey, SE = 4.62; Figure 5; Figure 6; Table B-4). Use was lowest at point 9 (5.92 obs/plot/survey, SE = 1.40), followed by point 3 (6.25 obs/plot/survey, SE = 1.67) and point 17 (6.92 obs/plot/survey, SE = 1.71; Figure 5; Figure 6; Table B-4).

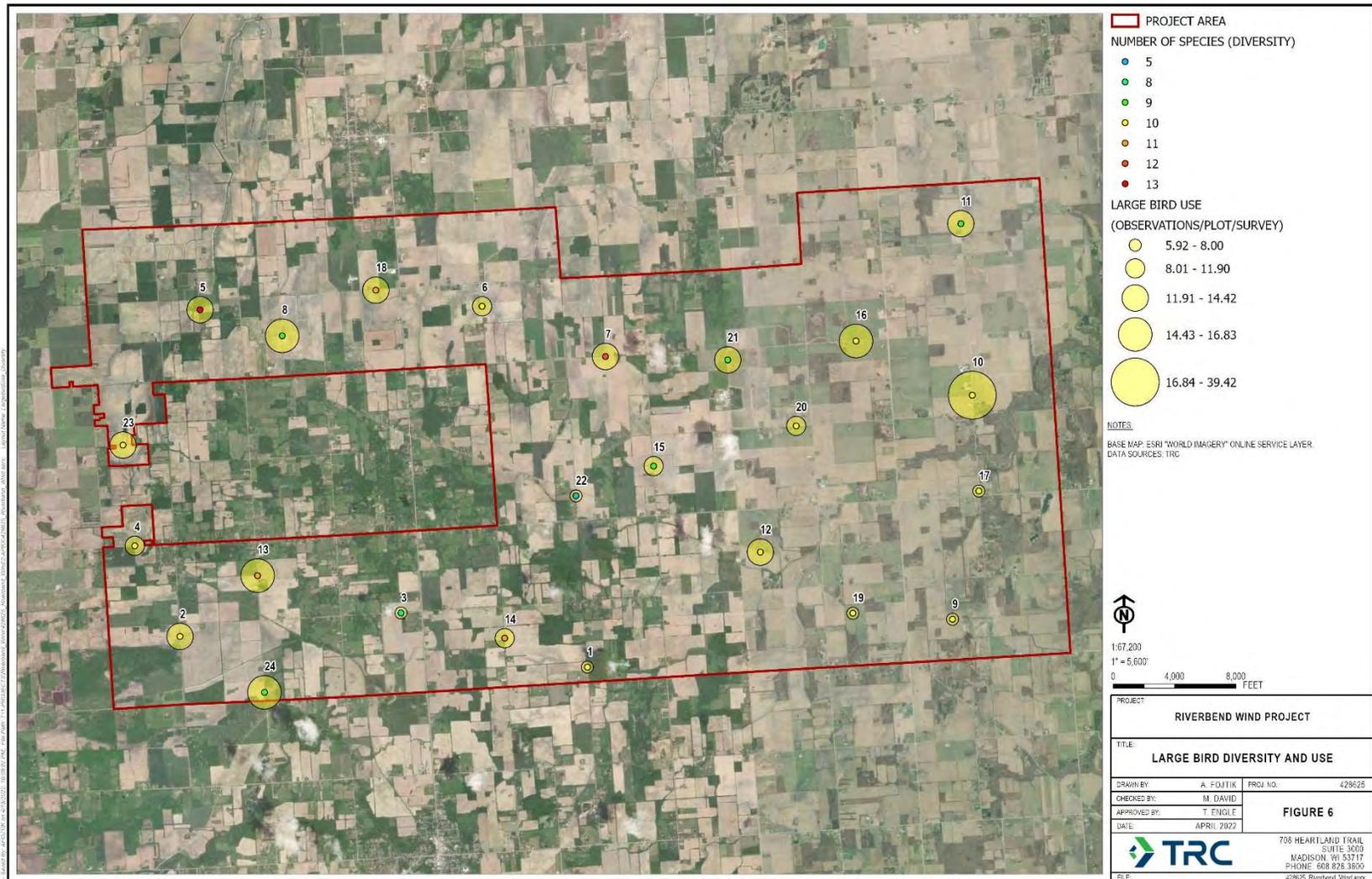
Point 5 had the highest species diversity (13 species), followed by point 7 (12 species) and points 13, 14, and 18 (11 species each; Figure 6; Table B-4). Point 22 had the lowest species diversity (5 species), followed by point 3 (8 species) and points 8, 11, 15, 21, and 24 (9 species each; Figure 6; Table B-4). Family diversity was highest at points 5 and 17 (9 families), followed by points 4, 6, 7, 10, 12, 14, 18, 19, and 24 (8 families each; Figure 6; Table B-4). Family diversity was lowest at points 8, 16, and 22 (5 families each; Figure 6; Table B-4).

When use by point for each family was examined, point 10 had the highest use for four families: Anatidae, Columbidae, Gruidae (cranes), and Laridae (gulls and their allies; Table B-4). Point 21 had the highest use for two families: Charadriidae (plovers) and Accipitridae (Table B-4). Points 4, 5, 13, 14, 15, 18 and 24 had the highest or tied-highest use for one family each: point 4 for Strigidae (owls), point 5 for Ardeidae (herons and their allies), point 13 for Falconidae (falcons), point 14 for Picidae (woodpeckers), point 15 for Picidae, point 18 for Cathartidae, and point 24 for Phasianidae (grouse and their allies; Table B-4).

When frequency by point for each family was examined, point 10 had the highest or tied-highest frequency for three families (Table B-5). Points 14, 15, and 21 had the highest or tied-highest frequency for two families each, and points 1, 2, 3, 4, 5, 7, 9, 13, 16, 17, 18, 19, 20, and 24 had the highest or tied-highest frequency for one family each (Table B-5).



**Figure 5. Large bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by dashed line) by point during the large bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**



**Figure 6. Map of large bird use (observations/plot/survey) and species diversity recorded at each point during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

### 4.2.3 Flight Height Characteristics

During the surveys, 2,334 observations of flying birds in 1,042 groups were recorded (Table B-6). This represented 63.5% of all survey observations (Table B-6). Of all large birds observed flying, 23.6% (551 observations) were estimated to be within the height range for the RSZ (115–656 ft; 35–200 m; Table B-6).

Overall use within the RSZ was 1.95 obs/plot/survey (Table B-6). Species with the highest RSZ use were turkey vulture (1.37 obs/plot/survey), Canada goose (0.20 obs/plot/survey), sandhill crane (*Antigone canadensis*; 0.15 obs/plot/survey), and red-tailed hawk (0.12 obs/plot/survey; Table B-6). Use for all other species within the RSZ was  $\leq 0.04$  obs/plot/survey each (Table B-6).

## 4.3 Small Bird Use Surveys

### 4.3.1 Observations, Relative Abundance, and Diversity

During the surveys, 6,899 observations in 1,454 groups were recorded (Attachment C; Table C-1).<sup>3</sup> Observations by season consisted of 1,193 observations in 454 groups in spring, 1,070 observations in 507 groups in summer, 3,250 observations in 303 groups in fall, and 1,386 observations in 190 groups in winter (Table C-1).

The most numerous small bird species observed during the surveys were European starling (*Sturnus vulgaris*; 4,324 observations), red-winged blackbird (*Agelaius phoeniceus*; 907 observations), American robin (*Turdus migratorius*; 362 observations), horned lark (*Eremophila alpestris*; 265 observations), and barn swallow (*Hirundo rustica*; 238 observations; Table C-1). These observations made up 62.7%, 13.1%, 5.2%, 3.8%, and 3.4% of all small bird observations, respectively (Table C-1).

The most-observed families were Sturnidae (starlings; 4,324 observations), Icteridae (blackbirds and their allies; 1,080 observations), and Turdidae (thrushes; 366 observations; Table C-1). Relative abundances for these families were 62.7%, 15.7%, and 5.3%, respectively (Table C-1).

Forty-two species from 20 taxonomic families were recorded during the surveys, with 21 species observed in spring, 22 in summer, 27 in fall, and 14 in winter (Table C-1). One additional species was recorded incidentally; thus, in total, 43 small bird species from 20 families were recorded during the Study (Table C-2).

### 4.3.2 Use and Frequency of Occurrence

Overall use recorded during the surveys was 24.12 (SE = 2.72) obs/plot/survey (Table C-3). European starling use was 15.12 (SE = 2.72) obs/plot/survey, red-winged blackbird use was 3.17 (SE = 0.57) obs/plot/survey, American robin use was 1.27 (SE = 0.14) obs/plot/survey, horned lark use was 0.93 (SE = 0.11) obs/plot/survey, and barn swallow use was 0.83 (SE = 0.14) obs/plot/survey (Table C-3; Figure 7).

Among families, Sturnidae use was 15.12 obs/plot/survey, Icteridae use was 3.78 obs/plot/survey, and Turdidae use was 1.28 obs/plot/survey (Table C-3).

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<sup>3</sup> Tables C-1 to C-7 are provided in Attachment C.

The species with the highest frequency were American robin (0.44), red-winged blackbird (0.43), horned lark (0.37), European starling (0.35), and blue jay (*Cyanocitta cristata*; 0.24; Table C-3).

The families with the highest frequency were Icteridae (0.45), Turdidae (0.45), and Alaudidae (larks; 0.37; Table C-3).

#### 4.3.2.1 Temporal Variation in Use

Small bird use was 17.04 (SE = 1.67) obs/plot/survey in spring, 14.86 (SE = 2.23) obs/plot/survey in summer, 45.14 (SE = 8.95) obs/plot/survey in fall, and 19.25 (SE = 4.62) in winter (Figure 7). In spring, European starling had the highest use, followed by American robin; in summer, red-winged blackbird had the highest use, followed by barn swallow; in fall, European starling had the highest use, followed by horned lark; and in winter, European starling had the highest use, followed by American tree sparrow (*Spizelloides arborea*; Figure 7; Table C-3).

European starling use was 6.91 (SE = 1.57) obs/plot/survey in spring, 38.50 (SE = 9.04) obs/plot/survey in fall, and 14.83 (SE = 4.69) obs/plot/survey in winter; the species was not observed in summer (Figure 7). Relative abundance for European starling was 40.6% in spring, 85.3% in fall, and 77.1% in winter (Table C-1). Frequency for the species was 0.41 in spring, 0.61 in fall, and 0.38 in winter (Table C-3).

Red-winged blackbird use was 2.94 (SE = 0.57) obs/plot/survey in spring, 8.28 (SE = 2.02) obs/plot/survey in summer, and 1.46 (SE = 0.56) obs/plot/survey in fall; the species was not observed in winter (Figure 7). Relative abundance for red-winged blackbird was 17.3% in spring, 55.7% in summer, and 3.2% in fall (Table C-1). Frequency for the species was 0.69 in spring, 0.89 in summer, and 0.17 in fall (Table C-3).

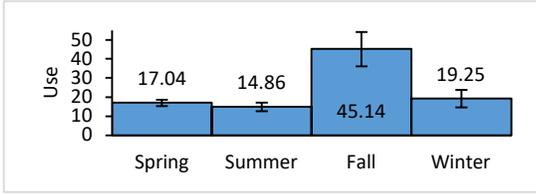
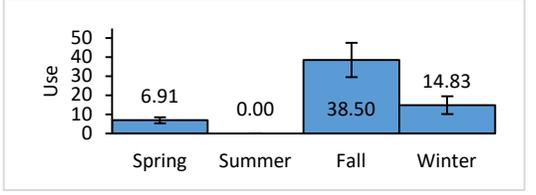
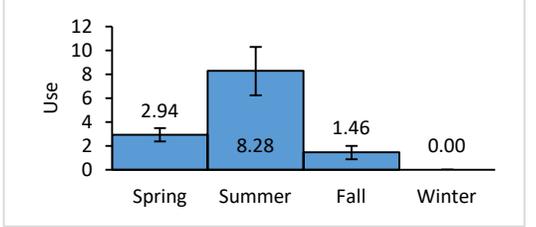
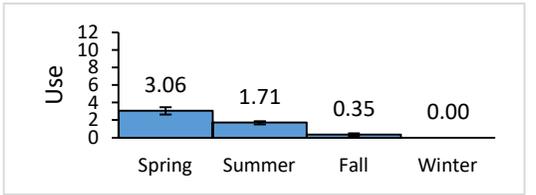
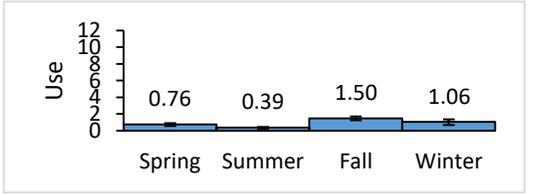
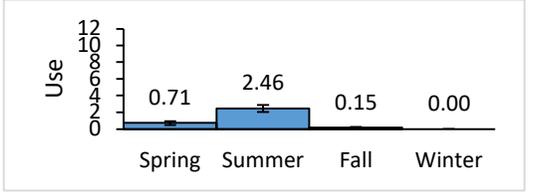
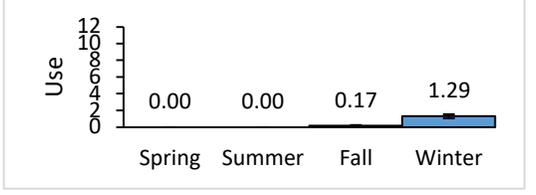
American robin use was 3.06 (SE = 0.41) obs/plot/survey in spring, 1.71 (SE = 0.18) obs/plot/survey in summer, and 0.35 (SE = 0.16) obs/plot/survey in fall; the species was not observed in winter (Figure 7). Relative abundance for American robin was 17.9% in spring, 11.5% in summer, and 0.8% in fall (Table C-1). Frequency for the species was 0.90 in spring, 0.78 in summer, and 0.11 in fall (Table C-3).

Horned lark use was 0.76 (SE = 0.16) obs/plot/survey in spring, 0.39 (SE = 0.10) obs/plot/survey in summer, 1.50 (SE = 0.22) obs/plot/survey in fall, and 1.06 (SE = 0.34) obs/plot/survey in winter (Figure 7). Relative abundance for horned lark was 4.4% in spring, 2.6% in summer, 3.3% in fall, and 5.5% in winter (Table C-1). Frequency for the species was 0.34 in spring, 0.25 in summer, 0.58 in fall, and 0.31 in winter (Table C-3).

Barn swallow use was 0.71 (SE = 0.22) obs/plot/survey in spring, 2.46 (SE = 0.43) obs/plot/survey in summer, and 0.15 (SE = 0.11) obs/plot/survey in fall; the species was not observed in winter (Figure 7). Relative abundance for barn swallow was 4.2% in spring, 16.5% in summer, and 0.3% in fall (Table C-1). Frequency for the species was 0.21 in spring, 0.64 in summer, and 0.03 in fall (Table C-3).

In spring, fall, and winter, Sturnidae was the family with the highest use. Use for Sturnidae was 6.91, 38.50, and 14.83 obs/plot/survey in spring, fall, and winter, respectively (Table C-3). Relative abundance for Sturnidae was 40.6% in spring, 85.3% in fall, and 77.1% in winter (Table C-1). Frequency for the species was 0.41 in spring, 0.61 in fall, and 0.38 in winter (Table C-3).

In summer, Icteridae was the family with the highest use, at 8.82 obs/plot/survey (Table C-3). Relative abundance for Icteridae was 59.3% in summer (Table C-1); frequency was 0.89 in summer (Table C-3).

Common Name Scientific Name	Use Histogram	Use (Standard Error) for All Seasons Combined
All Small Bird Species		24.12 (2.72)
European Starling <i>Sturnus vulgaris</i>		15.12 (2.72)
Red-winged Blackbird <i>Agelaius phoeniceus</i>		3.17 (0.57)
American Robin <i>Turdus migratorius</i>		1.27 (0.14)
Horned Lark <i>Eremophila alpestris</i>		0.93 (0.11)
Barn Swallow <i>Hirundo rustica</i>		0.83 (0.14)
American Tree Sparrow <i>Spizelloides arborea</i>		0.37 (0.07)

**Figure 7. Histograms of small bird use (observations/plot/survey) and standard error of use (indicated by error bars) for all species combined, for each of the five species with highest overall use, and for one species with the second-highest winter use during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

#### 4.3.2.2 Spatial Variation in Use and Diversity

Comparisons among points in this section include results from all points; however, note that points 14 and 24 had 11 surveys, while the remaining points had 12 surveys each.

Overall small bird use was highest at point 19 (54.92 obs/plot/survey, SE = 39.94), followed by point 10 (48.75 obs/plot/survey, SE = 12.91) and point 21 (44.08 obs/plot/survey, SE = 23.67; Figure 8; Figure 9; Table C-4). Use was lowest at point 23 (10.25 obs/plot/survey, SE = 2.07), followed by point 4 (10.75 obs/plot/survey, SE = 4.46) and point 20 (10.92 obs/plot/survey, SE = 5.55; Figure 8; Figure 9; Table C-4).

Point 5 had the highest species diversity (22 species), followed by point 24 (19 species) and point 17 (18 species; Figure 9; Table C-4). Point 16 had the lowest species diversity (8 species), followed by points 11 and 12 (11 species each; Figure 9; Table C-4). Family diversity was highest at point 5 (15 families), followed by point 17 (13 families) and points 1, 2, 23, and 24 (12 families each; Figure 9; Table C-4). Family diversity was lowest at points 10, 11, 16, and 20 (8 families each; Figure 9; Table C-4).

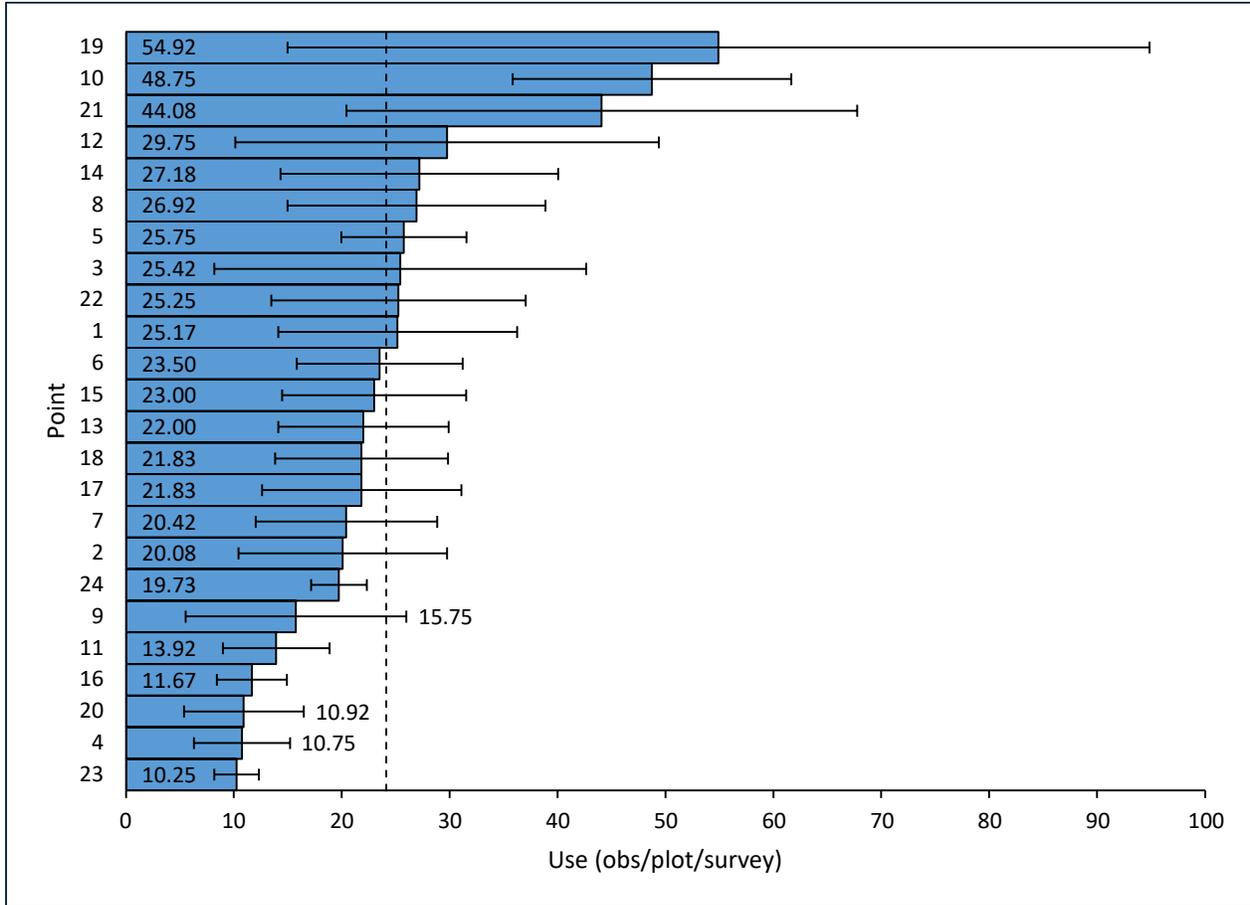
When use by point for each family was examined, point 5 had the highest or tied-highest use for five families: Tyrannidae (flycatchers), Vireonidae (vireos), Paridae (chickadees and titmice), Regulidae (kinglets), and Sittidae (nuthatches; Table C-4).

Point 19 had the highest or tied-highest use for three families: Corvidae (crows and their allies), Sturnidae, and Cardinalidae (cardinals and their allies; Table C-4).

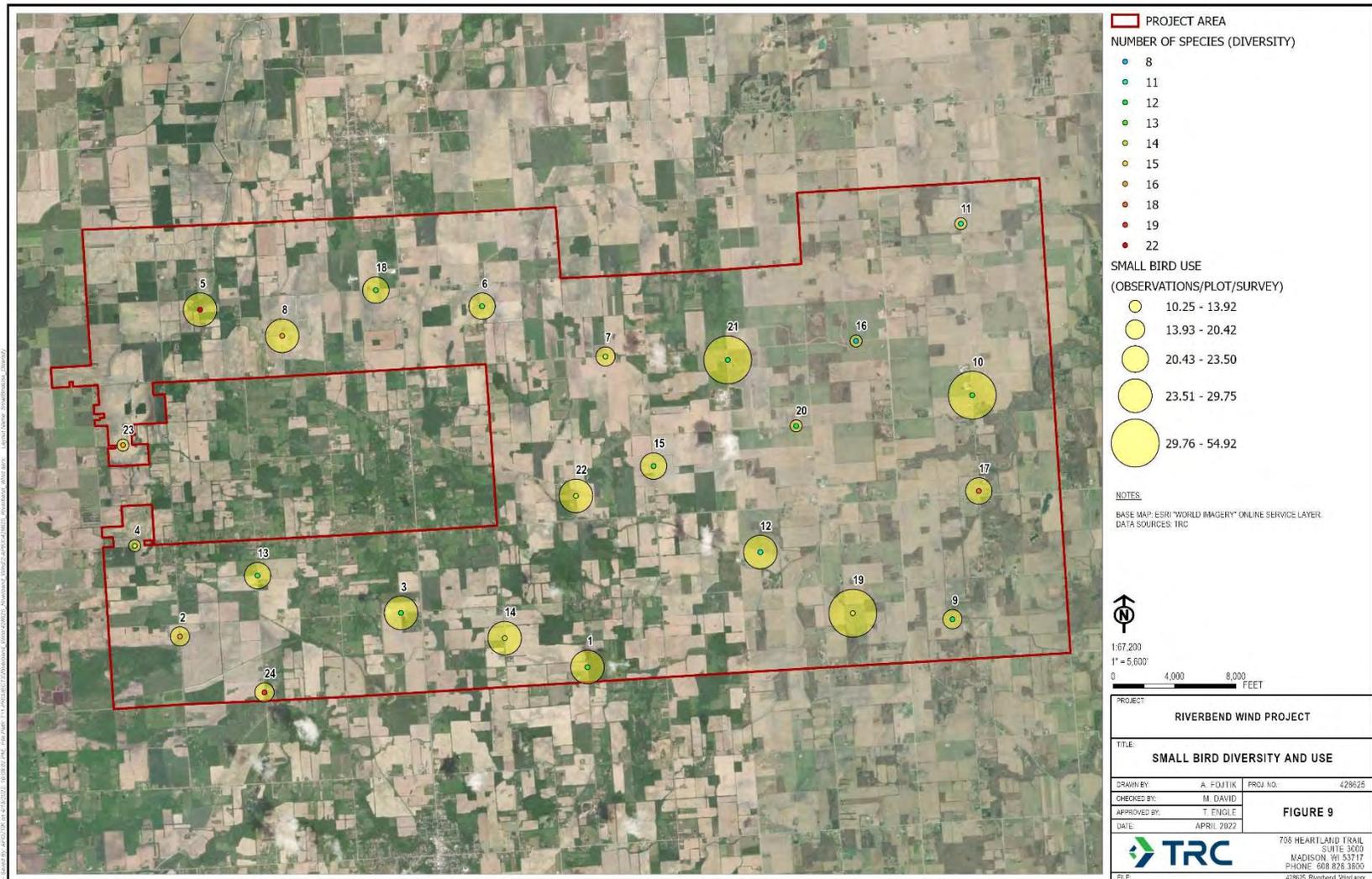
Points 1, 2, 10, 17, 18, and 24 had the highest or tied-highest use for two families each: point 1 for Paridae and Cardinalidae, point 2 for Picidae and Turdidae, point 10 for Passeridae (old world sparrows) and Icteridae, point 17 for Paridae and Parulidae (wood-warblers), point 18 for Fringillidae (finches) and Passerellidae (sparrows), and point 24 for Hirundinidae (swallows) and Calcariidae (longspurs and their allies; Table C-4).

Points 3, 9, 13, 21, and 23 had the highest or tied-highest use for one family each: point 3 for Paridae, point 9 for Sittidae, point 13 for Laniidae (shrikes), point 21 for Alaudidae, and point 23 for Mimidae (thrashers and their allies; Table C-4).

When frequency by point for each family was examined, point 5 had the highest or tied-highest frequency for five families (Table C-5). Point 24 had the highest frequency for four families (Table C-5). Points 1 and 18 had the highest or tied-highest frequency for three families each; points 13, 17, 22, and 23 did for two families each; and points 2, 3, 6, 9, 10, 16, and 21 did for one family each (Table C-5).



**Figure 8. Small bird use (observations/plot/survey), standard error of use (represented by error bars), and average use (represented by vertical dashed line) by point during the small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**



**Figure 9. Map of small bird use (observations/plot/survey) and species diversity recorded at each point during the small bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

#### 4.3.2.3 Flight Height Characteristics

During the surveys, 5,477 observations of flying birds in 1,187 groups were recorded (Table C-6). This represented 79.4% of all survey observations (Table C-6). Of the small birds observed flying, 0.9% (48 observations) were estimated to be within the RSZ (Table C-6).

Overall use within the RSZ was 0.17 obs/plot/survey (Table C-7). The two species with use in the RSZ were red-winged blackbird (0.16 obs/plot/survey) and American robin (0.01 obs/plot/survey; Table C-6). Use for all other species within the RSZ was  $\leq 0.02$  obs/plot/survey each (Table C-7).

#### 4.4 Observations of Sensitive Species

No federally listed or state listed threatened or endangered species were observed during the Study. There were four protected or non-listed state special concern species observed: northern harrier (*Circus hudsonius*), bald eagle, grasshopper sparrow (*Ammodramus savannarum*), and dickcissel (*Spiza americana*; Table 6).

During the surveys, bald eagle was observed at 12 points, northern harrier was observed at four points, and grasshopper sparrow and dickcissel were observed at one point each (Tables B-4, C-4).

The highest number of sensitive species recorded at a single point was three at point 8, followed by two each at points 7, 13, and 16, and one each at points 1, 2, 10, 11, 15, 18, 20, 21, and 23 (Tables B-4, C-4).

Northern harrier was observed four times during the surveys (Table 6). Northern harrier use was 0.01 obs/plot/survey overall; seasonal use was 0.01 obs/plot/survey in fall and 0.04 obs/plot/survey in winter, with no observations in other seasons (Table B-3). Use by point was 0.08 obs/plot/survey at points 2, 7, 8, and 16, with no observations at other points (Table B-4). Northern harrier frequency was 0.01 overall; seasonal frequency was 0.01 in fall and 0.04 in winter (Table B-3). Frequency was 0.08 each at points 2, 7, 8, and 16 (Table B-5).

See Section 4.5 for details on bald eagle observations.

Grasshopper sparrow was observed two times during the surveys (Table 6). Both observations occurred at point 8 in fall (Tables C-1, C-4).

Dickcissel was observed once during the surveys (Table 6). The observation occurred at point 13 in summer (Tables C-1, C-4).

**Table 6. Summary of the listed, protected, and non-listed special concern species observed during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Common Name (Scientific Name)	Listing Status <sup>1</sup>	# Groups During Surveys	# Obs During Surveys	# Incidental Groups	# Incidental Obs	# Total Groups	# Total Obs
Northern Harrier ( <i>Circus hudsonius</i> )	SSC	4	4	0	0	4	4
Bald Eagle ( <i>Haliaeetus leucocephalus</i> )	BGEPA, SSC	19	26	2	2	21	28
Grasshopper Sparrow ( <i>Ammodramus savannarum</i> )	SSC	1	2	0	0	1	2
Dickcissel ( <i>Spiza americana</i> )	SSC	1	1	0	0	1	1

<sup>1</sup>Listing Status definitions: BGEPA = Bald and Golden Eagle Protection Act; SSC = Non-listed State Species of Concern

## 4.5 Eagle Use

### 4.5.1 Bald Eagles

Bald eagle was observed 26 times during the surveys, and two times incidentally (Table 6). Bald eagle use was 0.09 obs/plot/survey overall; seasonal use was 0.03 obs/plot/survey in spring, 0.06 obs/plot/survey in summer, 0.06 obs/plot/survey in fall, and 0.23 obs/plot/survey in winter (Table B-3). Use was highest at point 10 (0.50 obs/plot/survey; Table B-4). Bald eagle frequency was 0.06 overall; seasonal frequency was 0.03 in spring, 0.06 in summer, 0.04 in fall, and 0.13 in winter (Table B-3). Frequency was highest (0.25) at point 21 (Table B-5).

### 4.5.2 Golden Eagles

No golden eagles were observed during the Study.

### 4.5.3 Bald Eagle Use Minutes

For bald eagles, 50 use minutes were recorded during 26 observations over 283 survey hours (Table 7). There were also two incidental observations (Table 7).

During the surveys, bald eagle observations by season consisted of two in spring, four in summer, four in fall, and 16 in winter (Table 7). One incidental observation occurred in fall, and the other occurred in winter (Table 7). Bald eagle use minutes by season consisted of four use minutes during 70 survey hours in spring, 14 use minutes during 71 survey hours in summer, four use minutes during 71 survey hours in fall, and 28 use minutes during 71 survey hours in winter (Table 7).

Bald eagle use minutes per survey hour were 0.06 in spring, 0.20 in summer, 0.06 in fall, and 0.39 in winter (Table 7; Figure 10).

Bald eagle was observed at 12 points during the surveys: point 1 (four use minutes), point 7 (five use minutes), point 8 (four use minutes), point 10 (zero use minutes), point 11 (three use minutes), point 13 (seven use minutes), point 15 (five use minutes), point 16 (zero use minutes),



point 18 (five use minutes), point 20 (eight use minutes), point 21 (six use minutes), and point 23 (three use minutes; Table 8; Figure 11).

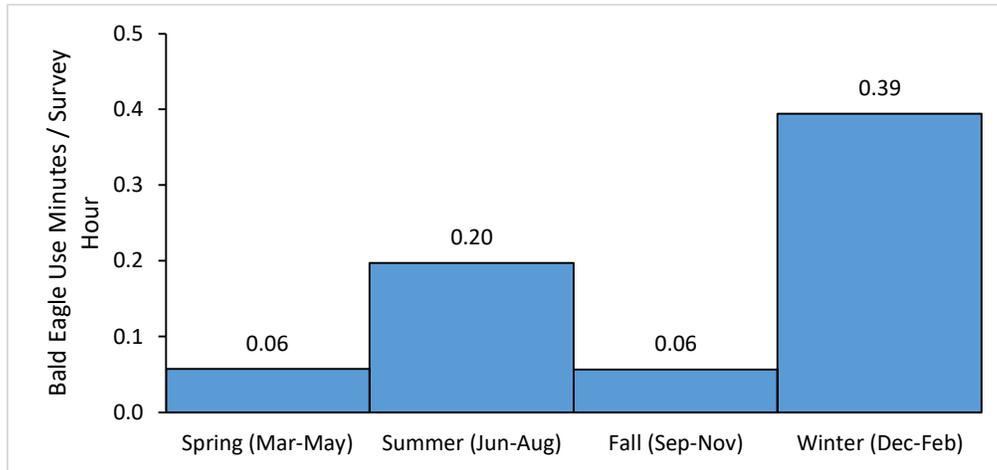
**Table 7. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by month, season, and overall, during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Month or Season	# Eagle Observations	# Eagle Use Minutes	Survey Hours	Eagle Minutes / Survey Hour	# Incidental Eagles
March	0	0	22	0.00	0
April	0	0	24	0.00	0
May	2	4	24	0.17	0
June	1	0	24	0.00	0
July	3	14	24	0.58	0
August	0	0	23	0.00	0
September	0	0	23	0.00	1
October	2	0	24	0.00	0
November	2	4	24	0.17	0
December	11	11	23	0.48	1
January	3	9	24	0.38	0
February	2	8	24	0.33	0
Spring (Mar-May)	2	4	70	0.06	0
Summer (Jun-Aug)	4	14	71	0.20	0
Fall (Sep-Nov)	4	4	71	0.06	1
Winter (Dec-Feb)	16	28	71	0.39	1
<b>All Seasons</b>	<b>26</b>	<b>50</b>	<b>283</b>	<b>0.18</b>	<b>2</b>

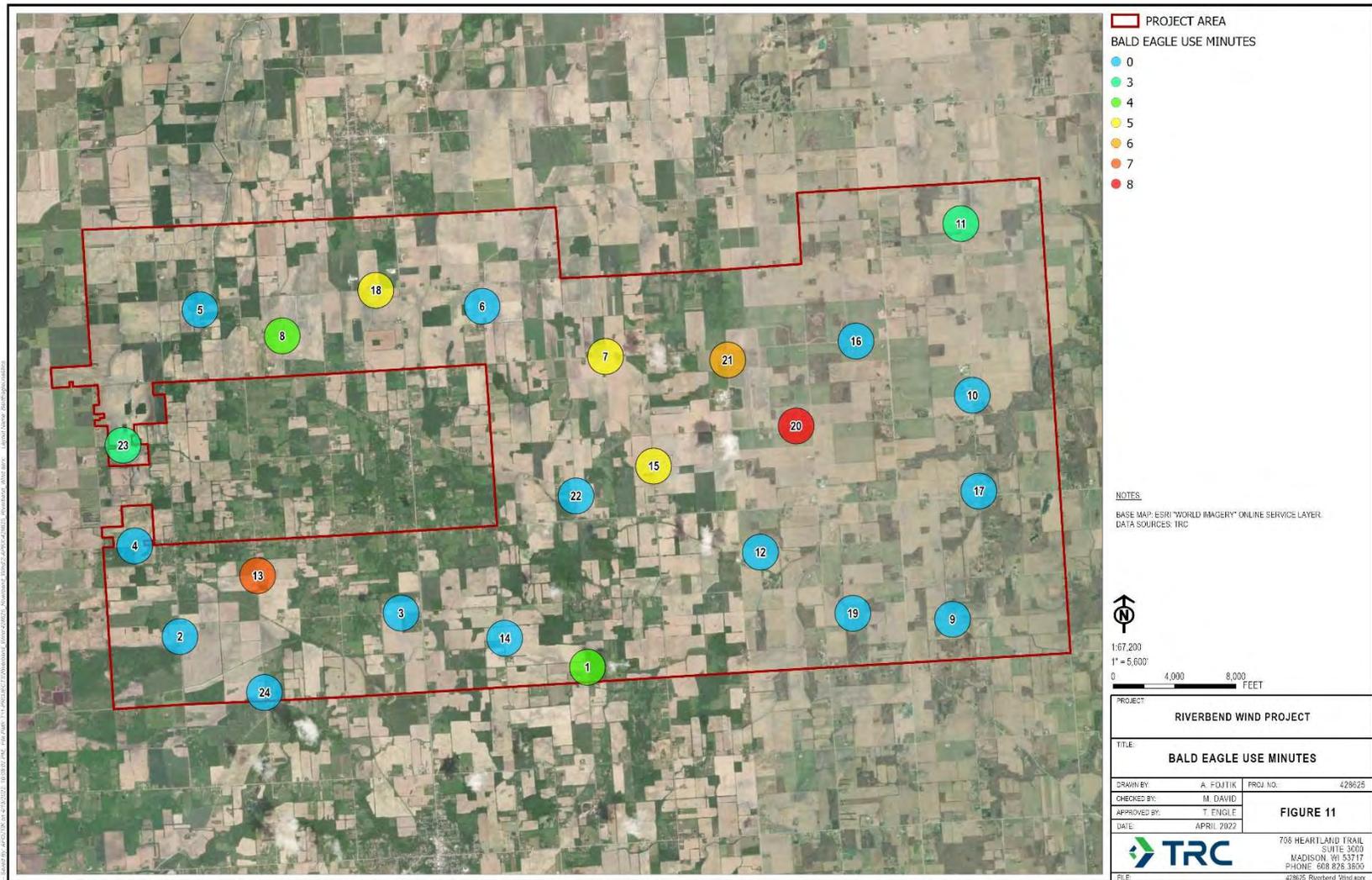


**Table 8. Number of bald eagle observations, use minutes, survey hours, and use minutes per survey hour by point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Point	# Eagle Observations	# Eagle Use Minutes	Survey Hours	Eagle Minutes/Survey Hour
1	2	4	12	0.33
2	0	0	12	0.00
3	0	0	12	0.00
4	0	0	12	0.00
5	0	0	12	0.00
6	0	0	12	0.00
7	2	5	12	0.42
8	1	4	12	0.33
9	0	0	12	0.00
10	6	0	12	0.00
11	2	3	12	0.25
12	0	0	12	0.00
13	3	7	12	0.58
14	0	0	10	0.00
15	2	5	10	0.50
16	1	0	12	0.00
17	0	0	12	0.00
18	1	5	12	0.42
19	0	0	12	0.00
20	1	8	12	0.67
21	4	6	12	0.50
22	0	0	12	0.00
23	1	3	12	0.25
24	0	0	11	0.00
<b>Total</b>	<b>26</b>	<b>50</b>	<b>283</b>	<b>0.18</b>



**Figure 10. Bald eagle use minutes per survey hour by season during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**



**Figure 11. Map of bald eagle use minutes documented during the large bird use surveys in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

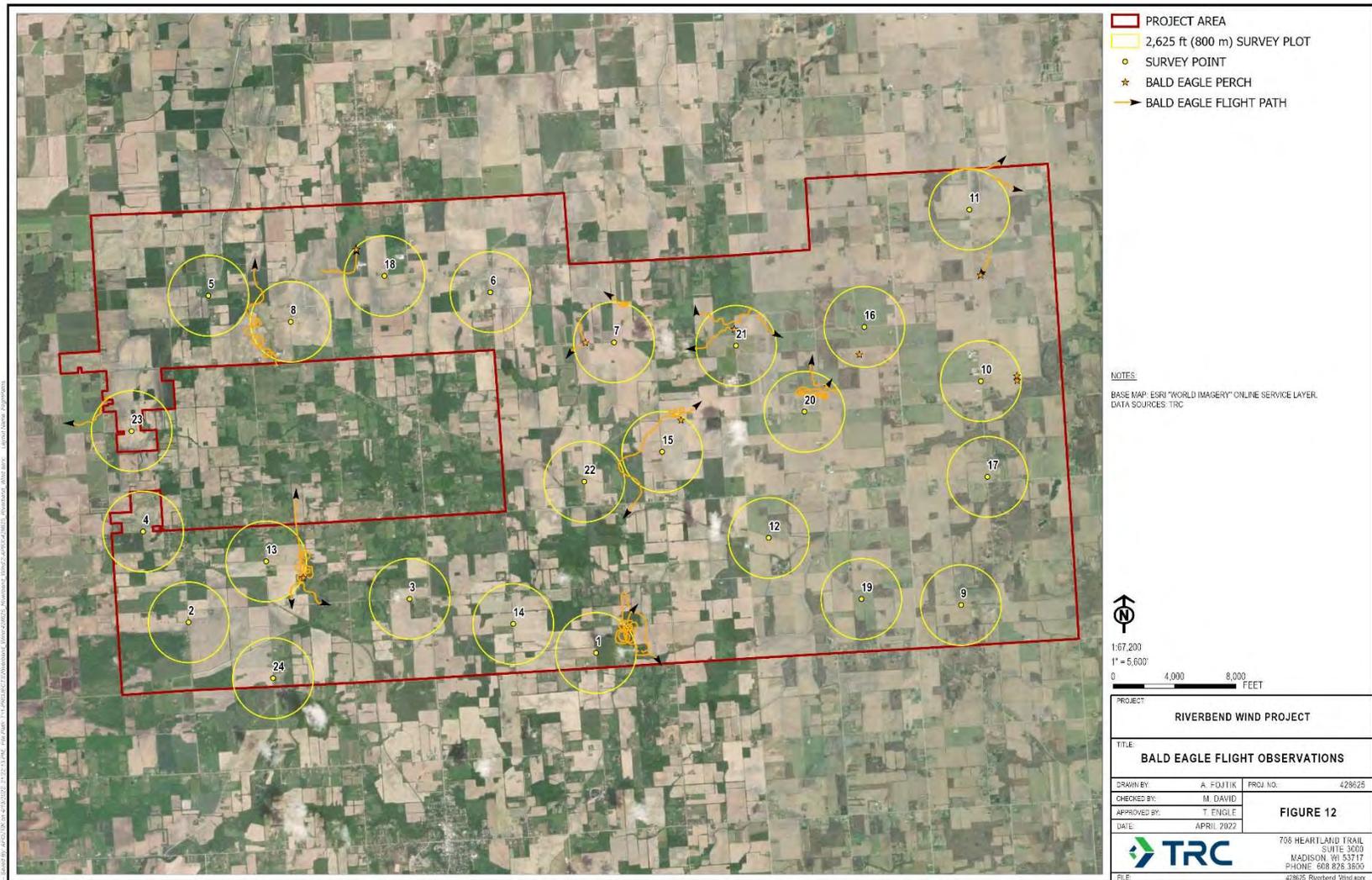


#### **4.5.4 Eagle Flight Paths and Perch Locations**

The eagle flight paths and perch locations documented during the Study are mapped in Figure 12.

Out of the 28 bald eagles observed during the study, including incidental observations, 15 observations (53.6%) included perching behavior, and 13 (46.4%) included only flight behaviors. Most flight paths included circling or direction changes; there were no apparent trends in overall flight directions.

Flight paths and perch locations were spread across most of the Project Area, but there were a few areas with a noticeably higher concentration. Six bald eagles were observed on the ground together east of point 10. This group was feeding on animal remains and were likely drawn to this temporary resource, though the area includes a forested riparian corridor which may have contributed to their presence. The other points with more than two observations were points 13 and 21. Land cover in these locations is more varied than in most of the Project Area and includes a patchwork of pasture/hay, forest, and woody wetland, with less cultivated crop cover.



**Figure 12. Map of bald eagle flight paths documented during the large bird use study in the proposed Riverbend Wind Energy Facility, Sanilac County, Michigan, March 2021–February 2022.**

## 5.0 Summary

### 5.1 Large Bird Use Surveys

In total, 283 60-minute large bird use surveys were conducted over 12 visits during the Study (Table 5).

During the surveys, 3,673 observations were recorded (Table B-1). The five most numerous large bird species observed during the surveys were, in order: mourning dove, rock pigeon, turkey vulture, Canada goose, and killdeer (Table B-1).

Twenty-four species were recorded during the surveys, and two others were observed incidentally (Table B-2).

Overall use recorded during the surveys was 12.98 (SE = 0.85) obs/plot/survey (Table B-3). Use was highest in fall, followed by spring, then summer, then winter (Figure 4). Use by point ranged from 5.92 (SE = 1.40) to 39.42 (SE = 9.77) obs/plot/survey (Table B-4).

### 5.2 Small Bird Use Surveys

In total, 286 ten-minute surveys were conducted over 12 visits during the Year 1 surveys (Table 5). During the surveys, 6,899 observations were recorded (Table C-1). The five most numerous small bird species observed during the surveys were, in order: European starling, red-winged blackbird, American robin, horned lark, and barn swallow (Table C-1).

Forty-two species were recorded during the surveys, and one other was observed incidentally (Table C-2). Overall use recorded during the surveys was 24.12 (SE = 2.72) obs/plot/survey (Table C-3). Use was highest in fall, followed by winter, then spring, then summer (Figure 7).

### 5.3 Observations of Sensitive Species

No federally or state listed threatened or endangered species were observed during the Study. There were four protected or non-listed state special concern species observed (Table 6).

### 5.4 Eagle Use

For bald eagles, 50 use minutes were recorded during 26 survey observations; there were also two incidental observations (Table 7). Bald eagle use minutes per survey hour were highest in winter, then summer, then spring tied with fall (Table 7). Bald eagles were observed during surveys at 12 of the 24 survey points (Table 8).

No golden eagles were observed during the Study.

## 6.0 References

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**Attachment A. Weather data from each survey during the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
1	1	3/17/2021	14 (57)	13 (55)	4 (9)	4 (8)	ENE	ENE	75-100	75-100	None	None
1	2	3/17/2021	12 (54)	9 (48)	4 (8)	6 (13)	ENE	ENE	75-100	75-100	None	None
1	3	3/17/2021	8 (46)	7 (45)	6 (13)	6 (14)	ENE	ENE	75-100	75-100	None	None
1	4	3/17/2021	6 (43)	4 (39)	6 (14)	4 (10)	NE	NE	75-100	75-100	None	None
1	5	3/18/2021	2 (36)	2 (36)	9 (20)	9 (20)	NE	NE	75-100	75-100	None	None
1	6	3/18/2021	2 (36)	3 (37)	9 (20)	9 (21)	NE	NNE	75-100	75-100	None	None
1	7	3/18/2021	2 (36)	3 (37)	9 (21)	10 (22)	NNE	NE	75-100	75-100	None	None
1	8	3/18/2021	3 (37)	4 (39)	11 (24)	11 (25)	NE	NE	75-100	75-100	None	None
1	9	3/18/2021	4 (39)	4 (39)	11 (25)	11 (24)	NNE	NNE	75-100	75-100	None	None
1	10	3/18/2021	5 (41)	4 (39)	11 (24)	11 (25)	NNE	NNE	75-100	75-100	None	None
1	11	3/18/2021	4 (39)	4 (39)	12 (26)	12 (26)	NNE	NNE	75-100	75-100	None	None
1	12	3/18/2021	2 (36)	2 (36)	12 (26)	13 (29)	N	N	75-100	75-100	None	None
1	13	3/18/2021	2 (36)	1 (34)	13 (29)	12 (26)	NNE	NNE	75-100	25-75	None	None
1	15	3/19/2021	-3 (27)	-1 (30)	8 (18)	8 (17)	NNE	NE	25-75	25-75	None	None
1	16	3/19/2021	0 (32)	2 (36)	8 (17)	7 (15)	NE	NE	25-75	25-75	None	None
1	17	3/19/2021	2 (36)	2 (36)	7 (15)	6 (14)	NE	NE	0-25	0-25	None	None
1	18	3/19/2021	7 (45)	6 (43)	4 (9)	3 (7)	NE	NE	0-25	0-25	None	None
1	19	3/19/2021	3 (37)	4 (39)	6 (13)	5 (12)	NE	NE	0-25	0-25	None	None
1	20	3/19/2021	4 (39)	4 (39)	5 (12)	4 (10)	NE	NE	0-25	0-25	None	None
1	21	3/19/2021	4 (39)	4 (39)	4 (10)	4 (10)	NNE	NNE	0-25	0-25	None	None
1	22	3/19/2021	6 (43)	6 (43)	4 (10)	4 (9)	NE	NE	0-25	0-25	None	None
1	23	3/19/2021	7 (45)	6 (43)	2 (5)	1 (2)	NE	ENE	0-25	0-25	None	None
2	1	4/8/2021	24 (75)	20 (68)	8 (17)	4 (8)	SSE	S	75-100	75-100	None	Rain
2	2	4/9/2021	13 (55)	14 (57)	4 (10)	6 (14)	S	S	75-100	75-100	None	None
2	3	4/9/2021	14 (57)	16 (61)	6 (14)	6 (13)	S	S	75-100	25-75	None	None
2	4	4/9/2021	18 (64)	19 (66)	6 (13)	7 (15)	S	S	25-75	25-75	None	None
2	5	4/9/2021	20 (68)	20 (68)	8 (18)	9 (21)	S	S	0-25	0-25	None	None
2	6	4/9/2021	21 (70)	21 (70)	9 (21)	10 (22)	S	S	25-75	25-75	None	None
2	7	4/9/2021	21 (70)	22 (72)	10 (22)	8 (18)	S	S	25-75	75-100	None	None
2	8	4/9/2021	21 (70)	21 (70)	10 (22)	9 (21)	S	SSE	25-75	25-75	None	None
2	9	4/9/2021	22 (72)	22 (72)	9 (21)	8 (18)	SSE	S	25-75	25-75	None	None
2	10	4/9/2021	22 (72)	20 (68)	4 (10)	6 (13)	S	S	75-100	75-100	None	None
2	11	4/10/2021	8 (46)	9 (48)	3 (6)	4 (8)	SSE	ESE	75-100	75-100	None	None
2	12	4/10/2021	13 (55)	16 (61)	4 (8)	3 (6)	ESE	SE	75-100	75-100	None	None
2	13	4/10/2021	17 (63)	18 (64)	3 (6)	3 (7)	ESE	ESE	25-75	25-75	None	None
2	14	4/10/2021	20 (68)	22 (72)	4 (8)	2 (5)	ESE	ESE	25-75	25-75	None	None
2	15	4/10/2021	22 (72)	22 (72)	2 (5)	4 (9)	ENE	ENE	25-75	25-75	None	None
2	16	4/10/2021	22 (72)	22 (72)	4 (9)	5 (12)	ENE	E	75-100	75-100	None	None
2	17	4/10/2021	22 (72)	20 (68)	6 (14)	5 (12)	E	E	75-100	75-100	None	None
2	18	4/10/2021	20 (68)	20 (68)	5 (12)	4 (8)	ESE	E	75-100	75-100	None	None
2	19	4/10/2021	18 (64)	18 (64)	4 (8)	3 (6)	E	E	75-100	75-100	None	None
2	20	4/11/2021	12 (54)	13 (55)	4 (9)	4 (8)	SSW	SSW	25-75	25-75	None	None
2	21	4/11/2021	12 (54)	13 (55)	4 (9)	4 (10)	SSW	SSW	25-75	25-75	None	None
2	22	4/11/2021	14 (57)	16 (61)	5 (12)	4 (9)	SW	SSW	25-75	25-75	None	None
2	23	4/11/2021	15 (59)	16 (61)	4 (9)	7 (16)	SSW	SSW	25-75	75-100	None	None
2	24	4/11/2021	17 (63)	17 (63)	7 (16)	6 (13)	SSW	S	25-75	25-75	None	None
3	1	5/13/2021	13 (55)	14 (57)	4 (8)	4 (10)	NNW	NW	0-25	0-25	None	None
3	2	5/13/2021	16 (61)	17 (63)	4 (10)	5 (12)	NW	NW	0-25	0-25	None	None
3	3	5/13/2021	17 (63)	18 (64)	5 (12)	5 (12)	NNW	NNW	0-25	0-25	None	None
3	4	5/13/2021	18 (64)	19 (66)	6 (13)	5 (12)	NW	NW	0-25	0-25	None	None
3	5	5/13/2021	19 (66)	19 (66)	5 (12)	5 (12)	N	NE	0-25	0-25	None	None
3	6	5/13/2021	19 (66)	18 (64)	5 (12)	6 (13)	E	E	0-25	0-25	None	None
3	7	5/13/2021	18 (64)	15 (59)	4 (10)	2 (5)	E	E	0-25	0-25	None	None
3	8	5/13/2021	17 (63)	15 (59)	2 (5)	3 (6)	E	ESE	0-25	0-25	None	None
3	9	5/14/2021	4 (39)	6 (43)	1 (3)	1 (3)	W	W	0-25	0-25	None	None
3	10	5/14/2021	7 (45)	11 (52)	2 (5)	4 (8)	W	W	0-25	0-25	None	None
3	11	5/14/2021	11 (52)	14 (57)	4 (8)	3 (6)	W	WNW	0-25	0-25	None	None
3	12	5/14/2021	14 (57)	18 (64)	3 (6)	4 (8)	WNW	NW	0-25	0-25	None	None
3	13	5/14/2021	20 (68)	20 (68)	2 (5)	3 (6)	NW	NW	0-25	0-25	None	None
3	14	5/14/2021	21 (70)	23 (73)	3 (6)	4 (10)	NW	NW	0-25	0-25	None	None
3	15	5/14/2021	21 (70)	23 (73)	4 (10)	3 (6)	E	E	25-75	25-75	None	None
3	16	5/14/2021	23 (73)	19 (66)	4 (9)	4 (8)	E	E	25-75	25-75	None	None
3	17	5/14/2021	20 (68)	20 (68)	4 (8)	3 (6)	E	SE	25-75	25-75	None	None
3	18	5/14/2021	20 (68)	19 (66)	3 (6)	3 (6)	SE	SE	25-75	25-75	None	None
3	22	5/14/2021	19 (66)	18 (64)	1 (2)	1 (2)	SE	SE	0-25	0-25	None	None
3	19	5/15/2021	5 (41)	9 (48)	3 (6)	0 (0)	W	WSW	0-25	0-25	None	None
3	20	5/15/2021	10 (50)	14 (57)	1 (3)	3 (6)	W	W	0-25	0-25	None	None
3	21	5/15/2021	17 (63)	19 (66)	3 (6)	1 (3)	W	W	0-25	0-25	None	None
3	23	5/15/2021	20 (68)	21 (70)	1 (3)	2 (5)	W	W	0-25	0-25	None	None
3	24	5/15/2021	22 (72)	22 (72)	4 (10)	4 (8)	W	WSW	25-75	25-75	None	None

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
4	1	6/14/2021	22 (72)	20 (68)	5 (12)	4 (10)	NNW	NNW	25-75	25-75	None	None
4	2	6/14/2021	20 (68)	19 (66)	4 (10)	4 (8)	NNW	NNE	25-75	25-75	None	None
4	3	6/14/2021	19 (66)	19 (66)	4 (9)	4 (9)	N	NW	25-75	25-75	None	None
4	4	6/14/2021	22 (72)	20 (68)	4 (9)	3 (6)	N	NNW	0-25	0-25	None	None
4	5	6/15/2021	15 (59)	17 (63)	8 (17)	8 (18)	NNW	N	25-75	25-75	None	None
4	6	6/15/2021	17 (63)	18 (64)	8 (18)	9 (21)	N	N	0-25	0-25	None	None
4	7	6/15/2021	18 (64)	19 (66)	9 (21)	8 (18)	N	N	0-25	0-25	None	None
4	8	6/15/2021	21 (70)	22 (72)	9 (20)	11 (25)	N	N	0-25	0-25	None	None
4	9	6/15/2021	22 (72)	22 (72)	11 (25)	11 (25)	N	N	0-25	25-75	None	None
4	10	6/15/2021	22 (72)	21 (70)	10 (23)	10 (22)	N	N	25-75	25-75	None	None
4	11	6/15/2021	21 (70)	20 (68)	10 (22)	9 (21)	N	NNE	25-75	25-75	None	None
4	12	6/15/2021	22 (72)	21 (70)	9 (21)	9 (20)	N	NNE	25-75	25-75	None	None
4	13	6/15/2021	20 (68)	19 (66)	7 (16)	6 (13)	NNE	NNE	25-75	25-75	None	None
4	14	6/15/2021	17 (63)	14 (57)	6 (13)	5 (12)	NNE	N	25-75	25-75	None	None
4	15	6/16/2021	7 (45)	11 (52)	3 (6)	3 (6)	N	NNE	25-75	25-75	None	None
4	16	6/16/2021	13 (55)	14 (57)	3 (6)	4 (8)	NE	NE	25-75	25-75	None	None
4	17	6/16/2021	16 (61)	18 (64)	3 (7)	3 (6)	N	NNE	25-75	25-75	None	None
4	18	6/16/2021	20 (68)	20 (68)	3 (6)	5 (12)	NNW	NNW	25-75	0-25	None	None
4	19	6/16/2021	20 (68)	21 (70)	5 (12)	7 (15)	NNW	NNW	0-25	0-25	None	None
4	20	6/16/2021	21 (70)	23 (73)	7 (15)	7 (16)	ENE	NE	0-25	0-25	None	None
4	21	6/16/2021	23 (73)	22 (72)	7 (16)	6 (14)	NE	NE	0-25	0-25	None	None
4	22	6/16/2021	22 (72)	20 (68)	6 (14)	6 (13)	NE	NE	0-25	0-25	None	None
4	23	6/16/2021	24 (75)	23 (73)	6 (13)	4 (10)	N	NNE	0-25	0-25	None	None
4	24	6/16/2021	19 (66)	18 (64)	4 (10)	3 (7)	E	ESE	0-25	0-25	None	None
5	1	7/13/2021	24 (75)	24 (75)	3 (6)	5 (12)	SSW	SSW	75-100	75-100	None	None
5	2	7/13/2021	24 (75)	23 (73)	6 (13)	4 (8)	SSW	SW	75-100	75-100	None	Drizzle
5	3	7/13/2021	22 (72)	21 (70)	4 (8)	1 (2)	SW	SW	75-100	75-100	None	None
5	4	7/13/2021	21 (70)	21 (70)	1 (2)	1 (3)	SW	SW	75-100	75-100	None	None
5	5	7/14/2021	18 (64)	19 (66)	4 (8)	3 (6)	W	W	25-75	0-25	None	None
5	6	7/14/2021	19 (66)	22 (72)	1 (3)	3 (7)	W	W	0-25	0-25	None	None
5	7	7/14/2021	22 (72)	23 (73)	3 (7)	3 (7)	WSW	WSW	0-25	0-25	None	None
5	8	7/14/2021	26 (79)	27 (81)	3 (7)	3 (7)	W	W	0-25	25-75	None	None
5	9	7/14/2021	26 (79)	27 (81)	3 (7)	3 (7)	W	WSW	25-75	25-75	None	None
5	10	7/14/2021	28 (82)	28 (82)	3 (7)	4 (8)	W	SW	25-75	25-75	None	None
5	11	7/14/2021	29 (84)	29 (84)	4 (8)	4 (9)	S	S	25-75	25-75	None	None
5	12	7/14/2021	29 (84)	28 (82)	5 (12)	5 (12)	SW	SW	25-75	25-75	None	None
5	13	7/14/2021	27 (81)	27 (81)	5 (12)	3 (7)	SW	SW	25-75	25-75	None	None
5	14	7/14/2021	27 (81)	26 (79)	3 (7)	3 (7)	SW	SW	25-75	25-75	None	None
5	15	7/15/2021	21 (70)	22 (72)	5 (12)	7 (15)	SSW	S	25-75	25-75	None	None
5	16	7/15/2021	22 (72)	23 (73)	7 (15)	7 (16)	S	SSW	25-75	25-75	None	None
5	17	7/15/2021	24 (75)	27 (81)	7 (16)	7 (15)	SSW	SSW	25-75	25-75	None	None
5	18	7/15/2021	27 (81)	27 (81)	7 (15)	5 (12)	SSW	SW	25-75	25-75	None	None
5	19	7/15/2021	26 (79)	26 (79)	5 (12)	6 (13)	SW	SW	25-75	25-75	None	None
5	20	7/15/2021	28 (82)	27 (81)	6 (14)	6 (14)	SW	SW	25-75	25-75	None	None
5	21	7/15/2021	27 (81)	27 (81)	6 (14)	6 (14)	SW	SW	25-75	25-75	None	None
5	22	7/15/2021	26 (79)	26 (79)	6 (14)	7 (16)	SW	SW	25-75	25-75	None	None
5	23	7/15/2021	24 (75)	24 (75)	7 (15)	4 (9)	WSW	W	25-75	25-75	None	None
5	24	7/15/2021	24 (75)	24 (75)	4 (9)	5 (12)	W	W	25-75	25-75	None	None
6	1	8/15/2021	24 (75)	25 (77)	4 (9)	4 (9)	ESE	ESE	25-75	25-75	None	None
6	2	8/15/2021	26 (79)	26 (79)	4 (9)	4 (8)	ESE	ENE	25-75	0-25	None	None
6	3	8/15/2021	26 (79)	24 (75)	4 (8)	3 (7)	ENE	ENE	0-25	0-25	None	None
6	4	8/15/2021	24 (75)	24 (75)	2 (5)	2 (5)	ENE	E	0-25	0-25	None	None
6	5	8/16/2021	13 (55)	14 (57)	1 (2)	2 (5)	E	ENE	25-75	0-25	None	None
6	6	8/16/2021	14 (57)	17 (63)	2 (5)	3 (6)	ENE	ENE	25-75	25-75	None	None
6	7	8/16/2021	17 (63)	21 (70)	3 (6)	2 (5)	ENE	ENE	25-75	25-75	None	None
6	8	8/16/2021	21 (70)	22 (72)	4 (9)	3 (7)	E	E	25-75	25-75	None	None
6	9	8/16/2021	22 (72)	23 (73)	3 (7)	3 (7)	ENE	ENE	25-75	25-75	None	None
6	10	8/16/2021	23 (73)	23 (73)	3 (7)	3 (7)	ENE	ENE	25-75	25-75	None	None
6	11	8/16/2021	23 (73)	24 (75)	3 (7)	1 (3)	ENE	E	25-75	75-100	None	None
6	12	8/16/2021	21 (70)	22 (72)	2 (5)	1 (3)	SE	SE	75-100	75-100	Drizzle	None
6	13	8/16/2021	21 (70)	22 (72)	2 (5)	3 (6)	SE	ESE	75-100	25-75	None	None
6	14	8/16/2021	22 (72)	22 (72)	1 (2)	1 (2)	ESE	E	25-75	25-75	None	None
6	15	8/16/2021	22 (72)	20 (68)	1 (2)	2 (5)	E	E	25-75	25-75	None	None
6	16	8/17/2021	15 (59)	16 (61)	2 (5)	2 (5)	NNW	WNW	25-75	25-75	None	None
6	17	8/17/2021	16 (61)	18 (64)	2 (5)	4 (8)	WNW	NW	25-75	25-75	None	None
6	18	8/17/2021	18 (64)	20 (68)	4 (9)	4 (8)	NW	WNW	25-75	25-75	None	None
6	19	8/17/2021	23 (73)	24 (75)	2 (5)	3 (7)	NE	E	25-75	25-75	None	None
6	20	8/17/2021	24 (75)	25 (77)	3 (7)	4 (8)	E	W	25-75	25-75	None	None
6	21	8/17/2021	26 (79)	27 (81)	4 (8)	3 (6)	E	W	25-75	25-75	None	None
6	22	8/17/2021	27 (81)	28 (82)	3 (6)	2 (5)	W	SW	25-75	0-25	None	None
6	23	8/17/2021	28 (82)	28 (82)	4 (8)	3 (7)	SW	ESE	0-25	0-25	None	None
6	24	8/17/2021	27 (81)	25 (77)	3 (7)	3 (7)	ESE	ESE	25-75	0-25	None	None

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
7	1	9/14/2021	27 (81)	28 (82)	6 (13)	9 (20)	SSW	SSW	75-100	75-100	None	None
7	2	9/14/2021	28 (82)	29 (84)	9 (20)	10 (23)	SSW	SW	75-100	75-100	None	None
7	3	9/14/2021	29 (84)	29 (84)	9 (21)	7 (16)	SW	SW	75-100	75-100	None	Rain
7	4	9/14/2021	24 (75)	23 (73)	7 (16)	7 (15)	WSW	SW	75-100	75-100	None	None
7	5	9/14/2021	23 (73)	23 (73)	7 (15)	3 (7)	SW	WSW	75-100	75-100	None	None
7	6	9/15/2021	15 (59)	15 (59)	4 (8)	2 (5)	W	W	25-75	25-75	None	None
7	7	9/15/2021	16 (61)	18 (64)	3 (6)	4 (8)	W	WNW	25-75	25-75	None	None
7	8	9/15/2021	18 (64)	19 (66)	4 (8)	4 (8)	W	WNW	25-75	25-75	None	None
7	9	9/15/2021	20 (68)	21 (70)	4 (8)	3 (6)	S	W	75-100	25-75	None	None
7	10	9/15/2021	23 (73)	23 (73)	3 (7)	0 (0)	NW	NW	75-100	75-100	None	None
7	11	9/15/2021	23 (73)	23 (73)	0 (0)	4 (8)	NW	E	25-75	25-75	None	None
7	12	9/15/2021	23 (73)	23 (73)	4 (8)	3 (7)	NW	NW	25-75	25-75	None	None
7	13	9/15/2021	22 (72)	22 (72)	4 (8)	3 (7)	NW	NW	25-75	25-75	None	None
7	14	9/15/2021	22 (72)	21 (70)	3 (7)	4 (10)	NNW	NNW	25-75	25-75	None	None
7	15	9/15/2021	20 (68)	19 (66)	4 (10)	3 (6)	NNW	NW	25-75	25-75	None	None
7	16	9/16/2021	11 (52)	12 (54)	2 (5)	2 (5)	ESE	ESE	25-75	25-75	None	None
7	17	9/16/2021	12 (54)	14 (57)	2 (5)	4 (9)	ESE	SE	25-75	25-75	None	None
7	18	9/16/2021	17 (63)	17 (63)	3 (6)	2 (5)	SE	SE	25-75	25-75	None	None
7	19	9/16/2021	23 (73)	23 (73)	4 (9)	2 (5)	SE	ESE	25-75	25-75	None	None
7	20	9/16/2021	24 (75)	24 (75)	2 (5)	3 (6)	SE	ESE	25-75	25-75	None	None
7	21	9/16/2021	24 (75)	24 (75)	4 (10)	2 (5)	S	S	25-75	25-75	None	None
7	22	9/16/2021	26 (79)	26 (79)	3 (7)	4 (10)	S	S	25-75	25-75	None	None
7	23	9/16/2021	26 (79)	24 (75)	1 (3)	6 (13)	SE	SSE	25-75	25-75	None	None
7	24	9/16/2021	24 (75)	24 (75)	6 (13)	4 (9)	SSE	SE	25-75	25-75	None	None
8	1	10/12/2021	21 (70)	21 (70)	7 (15)	8 (18)	SW	SW	75-100	75-100	None	None
8	2	10/12/2021	21 (70)	20 (68)	8 (18)	8 (17)	SW	SW	75-100	75-100	None	None
8	3	10/12/2021	20 (68)	20 (68)	8 (17)	6 (13)	SW	SW	75-100	75-100	None	None
8	4	10/12/2021	20 (68)	20 (68)	6 (13)	4 (9)	SW	SW	75-100	75-100	None	None
8	5	10/13/2021	16 (61)	16 (61)	3 (7)	3 (6)	WSW	WSW	0-25	0-25	None	None
8	6	10/13/2021	17 (63)	18 (64)	3 (7)	4 (9)	WSW	WSW	0-25	0-25	None	None
8	7	10/13/2021	18 (64)	19 (66)	4 (9)	4 (8)	SW	SW	0-25	0-25	None	None
8	8	10/13/2021	19 (66)	21 (70)	6 (14)	5 (12)	SW	SW	0-25	25-75	None	None
8	9	10/13/2021	21 (70)	21 (70)	5 (12)	4 (9)	SW	SW	25-75	25-75	None	None
8	10	10/13/2021	21 (70)	22 (72)	4 (9)	5 (12)	SW	SW	25-75	25-75	None	None
8	11	10/13/2021	22 (72)	22 (72)	4 (8)	3 (6)	SW	SW	25-75	25-75	None	None
8	12	10/13/2021	22 (72)	20 (68)	3 (6)	2 (5)	SW	SW	25-75	0-25	None	None
8	13	10/14/2021	17 (63)	17 (63)	4 (8)	3 (7)	S	SSW	75-100	75-100	None	None
8	14	10/14/2021	18 (64)	19 (66)	4 (8)	4 (8)	S	S	75-100	75-100	None	None
8	15	10/14/2021	20 (68)	22 (72)	4 (8)	4 (9)	S	SSW	75-100	25-75	None	None
8	16	10/14/2021	22 (72)	23 (73)	4 (10)	4 (10)	SSW	SSW	75-100	75-100	None	None
8	17	10/14/2021	23 (73)	24 (75)	4 (10)	5 (12)	SSW	SW	25-75	25-75	None	None
8	18	10/14/2021	25 (77)	25 (77)	4 (9)	5 (12)	SW	SW	25-75	25-75	None	None
8	19	10/14/2021	25 (77)	23 (73)	4 (10)	3 (7)	SW	WSW	75-100	75-100	None	None
8	20	10/14/2021	22 (72)	22 (72)	3 (7)	4 (10)	WSW	WSW	75-100	75-100	None	Rain
8	21	10/15/2021	13 (55)	14 (57)	3 (6)	3 (6)	SE	E	75-100	75-100	Drizzle	Drizzle
8	22	10/15/2021	14 (57)	14 (57)	2 (5)	0 (0)	E	WSW	75-100	75-100	Drizzle	Drizzle
8	23	10/15/2021	15 (59)	15 (59)	1 (2)	1 (3)	E	N	75-100	75-100	Drizzle	Drizzle
8	24	10/15/2021	14 (57)	14 (57)	1 (2)	1 (3)	N	NE	75-100	75-100	Drizzle	None
9	1	11/15/2021	2 (36)	2 (36)	6 (14)	6 (14)	WNW	WNW	75-100	75-100	None	None
9	2	11/15/2021	3 (37)	4 (39)	6 (14)	6 (14)	WNW	W	75-100	25-75	None	None
9	3	11/15/2021	4 (39)	4 (39)	6 (14)	7 (15)	W	W	25-75	25-75	None	None
9	4	11/15/2021	4 (39)	4 (39)	6 (13)	7 (15)	W	W	75-100	75-100	None	None
9	5	11/15/2021	3 (37)	3 (37)	7 (15)	4 (10)	W	W	25-75	25-75	None	None
9	6	11/16/2021	-2 (28)	0 (32)	1 (3)	3 (7)	W	W	25-75	25-75	None	None
9	7	11/16/2021	0 (32)	1 (34)	3 (7)	3 (6)	W	WNW	25-75	25-75	None	None
9	8	11/16/2021	1 (34)	3 (37)	3 (6)	3 (7)	W	W	25-75	25-75	None	None
9	9	11/16/2021	3 (37)	4 (39)	1 (3)	0 (0)	W	W	25-75	25-75	None	None
9	10	11/16/2021	5 (41)	6 (43)	0 (0)	1 (2)	S	S	25-75	25-75	None	None
9	11	11/16/2021	6 (43)	6 (43)	1 (2)	2 (5)	S	SE	25-75	25-75	None	None
9	13	11/16/2021	6 (43)	5 (41)	1 (2)	1 (3)	SSW	SSE	25-75	75-100	None	None
9	14	11/17/2021	8 (46)	8 (46)	5 (12)	4 (10)	S	S	75-100	75-100	Drizzle	Drizzle
9	15	11/17/2021	10 (50)	12 (54)	4 (9)	4 (9)	S	SSW	75-100	75-100	None	Drizzle
9	16	11/17/2021	12 (54)	13 (55)	4 (10)	5 (12)	SSW	SSW	75-100	75-100	Drizzle	None
9	17	11/17/2021	13 (55)	14 (57)	6 (14)	8 (17)	SSW	SSW	75-100	75-100	None	None
9	18	11/17/2021	14 (57)	15 (59)	8 (17)	7 (16)	SSW	SW	75-100	75-100	None	None
9	19	11/17/2021	15 (59)	15 (59)	7 (16)	6 (14)	SW	SSW	75-100	75-100	None	None
9	20	11/17/2021	16 (61)	14 (57)	7 (16)	8 (17)	SSW	SSW	75-100	75-100	Drizzle	None
9	12	11/18/2021	4 (39)	3 (37)	5 (12)	7 (15)	W	W	75-100	75-100	None	None
9	21	11/18/2021	3 (37)	2 (36)	4 (10)	4 (9)	WNW	W	75-100	75-100	None	None
9	22	11/18/2021	3 (37)	4 (39)	4 (9)	3 (7)	W	W	75-100	75-100	None	None
9	23	11/18/2021	4 (39)	4 (39)	3 (7)	4 (8)	W	W	75-100	25-75	None	None
9	24	11/18/2021	4 (39)	4 (39)	8 (17)	5 (12)	W	W	25-75	75-100	None	None

**Attachment A. Weather data from each survey during the bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Survey Event	Point ID	Date	Temperature °C (°F)		Wind Speed m/s (mph)		Wind Direction		Cloud Cover (%)		Precipitation	
			Start	End	Start	End	Start	End	Start	End	Start	End
10	1	12/14/2021	-1 (30)	2 (36)	3 (6)	2 (5)	E	ESE	25-75	75-100	None	None
10	2	12/14/2021	3 (37)	5 (41)	2 (5)	3 (6)	ESE	E	25-75	25-75	None	None
10	3	12/14/2021	5 (41)	7 (45)	3 (6)	6 (13)	E	ESE	25-75	25-75	None	None
10	4	12/14/2021	6 (43)	7 (45)	6 (13)	4 (10)	E	ESE	25-75	25-75	None	None
10	5	12/14/2021	7 (45)	7 (45)	4 (10)	4 (8)	ESE	ESE	25-75	25-75	None	None
10	6	12/14/2021	7 (45)	7 (45)	5 (12)	4 (10)	ESE	ESE	25-75	25-75	None	None
10	7	12/14/2021	7 (45)	5 (41)	4 (10)	4 (9)	ESE	SE	25-75	25-75	None	None
10	8	12/15/2021	6 (43)	6 (43)	6 (14)	7 (16)	S	S	75-100	75-100	None	None
10	9	12/15/2021	7 (45)	7 (45)	6 (14)	7 (16)	S	S	75-100	75-100	None	None
10	10	12/15/2021	7 (45)	8 (46)	7 (16)	7 (16)	S	S	75-100	75-100	None	None
10	11	12/15/2021	9 (48)	10 (50)	7 (16)	7 (16)	S	S	75-100	75-100	None	None
10	12	12/15/2021	8 (46)	9 (48)	7 (16)	7 (16)	SSE	S	75-100	75-100	None	None
10	13	12/15/2021	10 (50)	11 (52)	6 (14)	6 (14)	S	S	75-100	75-100	None	None
10	14	12/15/2021	11 (52)	11 (52)	6 (14)	6 (13)	SSW	SSW	75-100	75-100	None	None
10	15	12/16/2021	14 (57)	14 (57)	13 (28)	15 (33)	SSW	SW	75-100	75-100	None	None
10	16	12/16/2021	14 (57)	15 (59)	15 (33)	13 (30)	SW	SW	75-100	75-100	None	None
10	17	12/16/2021	15 (59)	16 (61)	13 (30)	12 (26)	SW	SW	25-75	25-75	None	None
10	18	12/16/2021	17 (63)	15 (59)	13 (30)	11 (25)	SW	WSW	25-75	75-100	None	None
10	19	12/16/2021	17 (63)	15 (59)	12 (26)	11 (25)	WSW	WSW	75-100	75-100	None	None
10	20	12/16/2021	15 (59)	14 (57)	10 (22)	7 (16)	WSW	SW	75-100	25-75	None	None
10	21	12/16/2021	14 (57)	12 (54)	7 (16)	9 (21)	WSW	WSW	25-75	25-75	None	None
10	22	12/17/2021	-1 (30)	-1 (30)	3 (7)	4 (8)	WNW	WNW	25-75	25-75	None	None
10	23	12/17/2021	0 (32)	1 (34)	4 (9)	4 (10)	WNW	WNW	25-75	25-75	None	None
10	24	12/17/2021	1 (34)	2 (36)	4 (10)	2 (5)	WNW	WNW	25-75	25-75	None	None
11	1	1/10/2022	-10 (14)	-10 (14)	1 (3)	1 (2)	WNW	WNW	75-100	75-100	None	None
11	2	1/10/2022	-10 (14)	-10 (14)	1 (2)	0 (0)	WNW	WNW	75-100	75-100	None	None
11	3	1/10/2022	-10 (14)	-11 (12)	0 (0)	1 (3)	WNW	WNW	75-100	75-100	None	None
11	4	1/11/2022	-15 (5)	-14 (7)	3 (7)	2 (5)	WSW	SW	25-75	25-75	None	None
11	5	1/11/2022	-14 (7)	-12 (10)	2 (5)	6 (13)	SW	SSW	25-75	75-100	None	None
11	6	1/11/2022	-12 (10)	-11 (12)	4 (10)	4 (8)	SSW	SSW	75-100	75-100	None	None
11	7	1/11/2022	-9 (16)	-8 (18)	4 (8)	5 (12)	SSW	SSW	75-100	75-100	None	None
11	8	1/11/2022	-9 (16)	-8 (18)	5 (12)	4 (10)	SSW	SSW	25-75	25-75	None	None
11	9	1/11/2022	-8 (18)	-8 (18)	6 (13)	5 (12)	S	SSW	25-75	25-75	None	None
11	10	1/11/2022	-8 (18)	-8 (18)	5 (12)	5 (12)	S	S	25-75	75-100	None	None
11	11	1/12/2022	-1 (30)	-1 (30)	7 (15)	5 (12)	W	W	75-100	75-100	None	None
11	12	1/12/2022	0 (32)	1 (34)	5 (12)	6 (13)	W	W	75-100	75-100	None	None
11	13	1/12/2022	1 (34)	1 (34)	6 (13)	7 (15)	W	W	75-100	75-100	None	None
11	14	1/12/2022	1 (34)	1 (34)	7 (15)	6 (14)	W	W	75-100	75-100	None	None
11	15	1/12/2022	1 (34)	2 (36)	7 (15)	7 (15)	W	W	75-100	75-100	None	None
11	16	1/12/2022	2 (36)	2 (36)	6 (14)	7 (15)	W	W	75-100	75-100	None	None
11	17	1/12/2022	2 (36)	1 (34)	7 (15)	6 (13)	W	NW	75-100	75-100	None	None
11	18	1/13/2022	-2 (28)	-2 (28)	7 (15)	5 (12)	NNE	NNE	75-100	75-100	None	None
11	19	1/13/2022	-1 (30)	-1 (30)	6 (13)	6 (14)	NNE	NNE	75-100	75-100	None	None
11	20	1/13/2022	0 (32)	0 (32)	6 (13)	7 (16)	NE	NE	75-100	75-100	None	None
11	21	1/13/2022	0 (32)	0 (32)	7 (15)	7 (16)	NE	ENE	75-100	75-100	None	None
11	22	1/13/2022	0 (32)	0 (32)	7 (16)	7 (16)	ENE	N	75-100	75-100	None	None
11	23	1/13/2022	1 (34)	1 (34)	6 (13)	6 (13)	N	N	75-100	75-100	None	None
11	24	1/13/2022	1 (34)	0 (32)	6 (13)	4 (10)	NNW	N	75-100	75-100	None	None
12	1	2/15/2022	-2 (28)	-5 (23)	6 (14)	7 (15)	SE	SE	75-100	75-100	None	None
12	2	2/16/2022	2 (36)	3 (37)	12 (26)	10 (23)	SSW	SSW	75-100	75-100	None	None
12	3	2/16/2022	5 (41)	7 (45)	9 (20)	9 (20)	SSW	SSW	75-100	75-100	None	None
12	4	2/16/2022	7 (45)	8 (46)	9 (20)	8 (18)	SSW	S	75-100	75-100	None	None
12	5	2/16/2022	8 (46)	9 (48)	8 (17)	8 (18)	S	SSW	75-100	75-100	None	None
12	6	2/16/2022	9 (48)	10 (50)	8 (17)	7 (15)	SSW	SSW	75-100	75-100	None	None
12	7	2/16/2022	11 (52)	11 (52)	9 (20)	11 (24)	SSW	SSW	75-100	75-100	None	None
12	8	2/16/2022	10 (50)	10 (50)	10 (22)	10 (23)	SSW	SSW	75-100	75-100	None	None
12	9	2/16/2022	10 (50)	9 (48)	8 (18)	6 (13)	SSW	SSW	75-100	75-100	Drizzle	Rain
12	10	2/17/2022	2 (36)	0 (32)	1 (2)	2 (5)	NNE	NNE	75-100	75-100	Rain	None
12	11	2/17/2022	0 (32)	-1 (30)	1 (3)	1 (3)	NNE	N	75-100	75-100	None	None
12	12	2/17/2022	-1 (30)	-2 (28)	1 (3)	1 (3)	N	N	75-100	75-100	None	Drizzle
12	13	2/17/2022	-2 (28)	-2 (28)	1 (3)	2 (5)	N	N	75-100	75-100	None	None
12	14	2/17/2022	-2 (28)	-2 (28)	2 (5)	3 (6)	N	N	75-100	75-100	Drizzle	Snow
12	15	2/17/2022	-2 (28)	-3 (27)	3 (7)	4 (8)	N	N	75-100	75-100	Snow	Snow
12	16	2/17/2022	-3 (27)	-4 (25)	4 (8)	4 (8)	N	N	75-100	75-100	Snow	Snow
12	17	2/18/2022	-13 (9)	-13 (9)	4 (9)	4 (8)	WNW	WNW	25-75	25-75	None	None
12	18	2/18/2022	-12 (10)	-11 (12)	3 (6)	4 (8)	WNW	WNW	25-75	25-75	None	None
12	19	2/18/2022	-9 (16)	-9 (16)	4 (8)	4 (9)	WNW	WNW	25-75	25-75	None	None
12	20	2/18/2022	-8 (18)	-8 (18)	4 (9)	4 (9)	WNW	W	25-75	25-75	None	None
12	21	2/18/2022	-7 (19)	-6 (21)	3 (6)	4 (8)	WSW	SW	25-75	25-75	None	None
12	22	2/18/2022	-7 (19)	-6 (21)	4 (10)	6 (13)	SW	SW	0-25	25-75	None	None
12	23	2/18/2022	-6 (21)	-6 (21)	4 (10)	6 (13)	SW	SW	25-75	75-100	None	None
12	24	2/18/2022	-6 (21)	-7 (19)	5 (12)	6 (14)	SSW	S	25-75	25-75	None	None



**Attachment B. Data tables of large birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Table B-1. Group counts, observation counts, and relative abundance, by season, for each species and family observed during the large bird use surveys in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Spring: Mar–May			Summer: Jun–Aug			Fall: Sep–Nov			Winter: Dec–Feb			All Seasons		
			# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	27	80	10.0	3	28	3.8	15	112	8.0	10	91	12.6	55	311	8.5
	Wood Duck	<i>Aix sponsa</i>	1	2	0.2	0	0	0.0	0	0	0.0	0	0	0.0	1	2	0.1
	Mallard	<i>Anas platyrhynchos</i>	4	16	2.0	1	2	0.3	0	0	0.0	0	0	0.0	5	18	0.5
	<b>Family Subtotal:</b>		<b>32</b>	<b>98</b>	<b>12.2</b>	<b>4</b>	<b>30</b>	<b>4.0</b>	<b>15</b>	<b>112</b>	<b>8.0</b>	<b>10</b>	<b>91</b>	<b>12.6</b>	<b>61</b>	<b>331</b>	<b>9.0</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	9	44	5.5	8	17	2.3	3	21	1.5	6	48	6.7	26	130	3.5
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	3	4	0.5	4	8	1.1	1	2	0.1	0	0	0.0	8	14	0.4
	<b>Family Subtotal:</b>		<b>12</b>	<b>48</b>	<b>6.0</b>	<b>12</b>	<b>25</b>	<b>3.4</b>	<b>4</b>	<b>23</b>	<b>1.6</b>	<b>6</b>	<b>48</b>	<b>6.7</b>	<b>34</b>	<b>144</b>	<b>3.9</b>
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	31	85	10.6	19	61	8.2	39	321	22.8	39	269	37.4	128	736	20.0
	Mourning Dove	<i>Zenaida macroura</i>	55	81	10.1	148	347	46.5	207	690	49.1	76	231	32.1	486	1349	36.7
	<b>Family Subtotal:</b>		<b>86</b>	<b>166</b>	<b>20.7</b>	<b>167</b>	<b>408</b>	<b>54.7</b>	<b>246</b>	<b>1011</b>	<b>71.9</b>	<b>115</b>	<b>500</b>	<b>69.4</b>	<b>614</b>	<b>2085</b>	<b>56.8</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	3	49	6.1	6	35	4.7	2	6	0.4	0	0	0.0	11	90	2.5
	<b>Family Subtotal:</b>		<b>3</b>	<b>49</b>	<b>6.1</b>	<b>6</b>	<b>35</b>	<b>4.7</b>	<b>2</b>	<b>6</b>	<b>0.4</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>11</b>	<b>90</b>	<b>2.5</b>
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	73	108	13.5	46	51	6.8	17	25	1.8	0	0	0.0	136	184	5.0
	<b>Family Subtotal:</b>		<b>73</b>	<b>108</b>	<b>13.5</b>	<b>46</b>	<b>51</b>	<b>6.8</b>	<b>17</b>	<b>25</b>	<b>1.8</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>136</b>	<b>184</b>	<b>5.0</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	0	0	0.0	0	0	0.0	2	6	0.4	0	0	0.0	2	6	0.2
	Herring Gull	<i>Larus argentatus</i>	6	9	1.1	0	0	0.0	1	3	0.2	0	0	0.0	7	12	0.3
	<b>Family Subtotal:</b>		<b>6</b>	<b>9</b>	<b>1.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>3</b>	<b>9</b>	<b>0.6</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>9</b>	<b>18</b>	<b>0.5</b>
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	3	3	0.4	4	4	0.5	3	3	0.2	0	0	0.0	10	10	0.3
	Green Heron	<i>Butorides virescens</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.0
	<b>Family Subtotal:</b>		<b>4</b>	<b>4</b>	<b>0.5</b>	<b>4</b>	<b>4</b>	<b>0.5</b>	<b>3</b>	<b>3</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>11</b>	<b>11</b>	<b>0.3</b>
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	170	281	35.1	89	143	19.2	85	150	10.7	0	0	0.0	344	574	15.6
	<b>Family Subtotal:</b>		<b>170</b>	<b>281</b>	<b>35.1</b>	<b>89</b>	<b>143</b>	<b>19.2</b>	<b>85</b>	<b>150</b>	<b>10.7</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>344</b>	<b>574</b>	<b>15.6</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	0	0	0.0	0	0	0.0	1	1	0.1	3	3	0.4	4	4	0.1
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	2	2	0.2	0	0	0.0	2	2	0.1	0	0	0.0	4	4	0.1
	Cooper's Hawk	<i>Accipiter cooperii</i>	0	0	0.0	4	4	0.5	1	1	0.1	0	0	0.0	5	5	0.1
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	2	2	0.2	4	4	0.5	3	4	0.3	10	16	2.2	19	26	0.7
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	27	29	3.6	35	36	4.8	45	45	3.2	51	52	7.2	158	162	4.4
	Rough-legged Hawk	<i>Buteo lagopus</i>	0	0	0.0	0	0	0.0	0	0	0.0	6	6	0.8	6	6	0.2
<b>Family Subtotal:</b>		<b>31</b>	<b>33</b>	<b>4.1</b>	<b>43</b>	<b>44</b>	<b>5.9</b>	<b>52</b>	<b>53</b>	<b>3.8</b>	<b>70</b>	<b>77</b>	<b>10.7</b>	<b>196</b>	<b>207</b>	<b>5.6</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	0	0	0.0	1	1	0.1	0	0	0.0	0	0	0.0	1	1	0.0
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.0</b>
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	2	2	0.2	0	0	0.0	1	1	0.1	1	1	0.1	4	4	0.1
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	0	0	0.0	0	0	0.0	1	1	0.1	0	0	0.0	1	1	0.0
	<b>Family Subtotal:</b>		<b>2</b>	<b>2</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>2</b>	<b>0.1</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>5</b>	<b>5</b>	<b>0.1</b>
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	3	3	0.4	5	5	0.7	12	12	0.9	3	3	0.4	23	23	0.6
	<b>Family Subtotal:</b>		<b>3</b>	<b>3</b>	<b>0.4</b>	<b>5</b>	<b>5</b>	<b>0.7</b>	<b>12</b>	<b>12</b>	<b>0.9</b>	<b>3</b>	<b>3</b>	<b>0.4</b>	<b>23</b>	<b>23</b>	<b>0.6</b>
<b>Total:</b>			<b>422</b>	<b>801</b>	<b>100.0</b>	<b>377</b>	<b>746</b>	<b>100.0</b>	<b>441</b>	<b>1406</b>	<b>100.0</b>	<b>205</b>	<b>720</b>	<b>100.0</b>	<b>1445</b>	<b>3673</b>	<b>100.0</b>
<b>Species Diversity:</b>				<b>18</b>		<b>15</b>			<b>19</b>			<b>10</b>			<b>24</b>		

**Table B-2. Complete list of large bird species observed in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022**

Common Name	Scientific Name	Family	Incidental Observations Only
Canada Goose	<i>Branta canadensis</i>		
Wood Duck	<i>Aix sponsa</i>	Anatidae	
Mallard	<i>Anas platyrhynchos</i>		
Common Merganser	<i>Mergus merganser</i>		*
Wild Turkey	<i>Meleagris gallopavo</i>	Phasianidae	
Ring-necked Pheasant	<i>Phasianus colchicus</i>		
Rock Pigeon	<i>Columba livia</i>	Columbidae	
Mourning Dove	<i>Zenaida macroura</i>		
Sandhill Crane	<i>Antigone canadensis</i>	Gruidae	
Killdeer	<i>Charadrius vociferus</i>	Charadriidae	
Ring-billed Gull	<i>Larus delawarensis</i>	Laridae	
Herring Gull	<i>Larus argentatus</i>		
Great Blue Heron	<i>Ardea herodias</i>	Ardeidae	
Green Heron	<i>Butorides virescens</i>		
Turkey Vulture	<i>Cathartes aura</i>	Cathartidae	
Northern Harrier	<i>Circus hudsonius</i>	Accipitridae	
Sharp-shinned Hawk	<i>Accipiter striatus</i>		
Cooper's Hawk	<i>Accipiter cooperii</i>		
Bald Eagle	<i>Haliaeetus leucocephalus</i>		
Red-tailed Hawk	<i>Buteo jamaicensis</i>		
Rough-legged Hawk	<i>Buteo lagopus</i>		
Great Horned Owl	<i>Bubo virginianus</i>	Strigidae	
Snowy Owl	<i>Bubo scandiacus</i>		*
Northern Flicker	<i>Colaptes auratus</i>	Picidae	
Pileated Woodpecker	<i>Dryocopus pileatus</i>		
American Kestrel	<i>Falco sparverius</i>	Falconidae	

Table B-3. Use and frequency of occurrence, by season, for each species and family observed during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Use (observations/plot/survey)					Frequency				
			Spring	Summer	Fall	Winter	Total	Spring	Summer	Fall	Winter	Total
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	1.14	0.39	1.58	1.28	1.10	0.26	0.04	0.18	0.04	0.13
	Wood Duck	<i>Aix sponsa</i>	0.03	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	< 0.01
	Mallard	<i>Anas platyrhynchos</i>	0.23	0.03	0.00	0.00	0.06	0.06	0.01	0.00	0.00	0.02
		<b>Family Subtotal:</b>	<b>1.40</b>	<b>0.42</b>	<b>1.58</b>	<b>1.28</b>	<b>1.17</b>	<b>0.30</b>	<b>0.06</b>	<b>0.18</b>	<b>0.04</b>	<b>0.14</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	0.63	0.24	0.30	0.68	0.46	0.13	0.08	0.04	0.06	0.08
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	0.06	0.11	0.03	0.00	0.05	0.04	0.06	0.01	0.00	0.03
		<b>Family Subtotal:</b>	<b>0.69</b>	<b>0.35</b>	<b>0.32</b>	<b>0.68</b>	<b>0.51</b>	<b>0.17</b>	<b>0.13</b>	<b>0.06</b>	<b>0.06</b>	<b>0.10</b>
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	1.21	0.86	4.52	3.79	2.60	0.31	0.23	0.34	0.37	0.31
	Mourning Dove	<i>Zenaida macroura</i>	1.16	4.89	9.72	3.25	4.77	0.49	0.87	0.87	0.65	0.72
		<b>Family Subtotal:</b>	<b>2.37</b>	<b>5.75</b>	<b>14.24</b>	<b>7.04</b>	<b>7.37</b>	<b>0.66</b>	<b>0.90</b>	<b>0.94</b>	<b>0.85</b>	<b>0.84</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	0.70	0.49	0.08	0.00	0.32	0.04	0.07	0.03	0.00	0.04
		<b>Family Subtotal:</b>	<b>0.70</b>	<b>0.49</b>	<b>0.08</b>	<b>0.00</b>	<b>0.32</b>	<b>0.04</b>	<b>0.07</b>	<b>0.03</b>	<b>0.00</b>	<b>0.04</b>
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	1.54	0.72	0.35	0.00	0.65	0.57	0.39	0.18	0.00	0.29
		<b>Family Subtotal:</b>	<b>1.54</b>	<b>0.72</b>	<b>0.35</b>	<b>0.00</b>	<b>0.65</b>	<b>0.57</b>	<b>0.39</b>	<b>0.18</b>	<b>0.00</b>	<b>0.29</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	0.00	0.00	0.08	0.00	0.02	0.00	0.00	0.03	0.00	0.01
	Herring Gull	<i>Larus argentatus</i>	0.13	0.00	0.04	0.00	0.04	0.06	0.00	0.01	0.00	0.02
		<b>Family Subtotal:</b>	<b>0.13</b>	<b>0.00</b>	<b>0.13</b>	<b>0.00</b>	<b>0.06</b>	<b>0.06</b>	<b>0.00</b>	<b>0.04</b>	<b>0.00</b>	<b>0.02</b>
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	0.04	0.06	0.04	0.00	0.04	0.04	0.06	0.04	0.00	0.04
	Green Heron	<i>Butorides virescens</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
		<b>Family Subtotal:</b>	<b>0.06</b>	<b>0.06</b>	<b>0.04</b>	<b>0.00</b>	<b>0.04</b>	<b>0.06</b>	<b>0.06</b>	<b>0.04</b>	<b>0.00</b>	<b>0.04</b>
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	4.01	2.01	2.11	0.00	2.03	0.74	0.61	0.37	0.00	0.43
		<b>Family Subtotal:</b>	<b>4.01</b>	<b>2.01</b>	<b>2.11</b>	<b>0.00</b>	<b>2.03</b>	<b>0.74</b>	<b>0.61</b>	<b>0.37</b>	<b>0.00</b>	<b>0.43</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	0.00	0.00	0.01	0.04	0.01	0.00	0.00	0.01	0.04	0.01
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	0.03	0.00	0.03	0.00	0.01	0.03	0.00	0.03	0.00	0.01
	Cooper's Hawk	<i>Accipiter cooperii</i>	0.00	0.06	0.01	0.00	0.02	0.00	0.06	0.01	0.00	0.02
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	0.03	0.06	0.06	0.23	0.09	0.03	0.06	0.04	0.13	0.06
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	0.41	0.51	0.63	0.73	0.57	0.36	0.38	0.44	0.59	0.44
	Rough-legged Hawk	<i>Buteo lagopus</i>	0.00	0.00	0.00	0.08	0.02	0.00	0.00	0.00	0.08	0.02
		<b>Family Subtotal:</b>	<b>0.47</b>	<b>0.62</b>	<b>0.75</b>	<b>1.08</b>	<b>0.73</b>	<b>0.41</b>	<b>0.48</b>	<b>0.52</b>	<b>0.69</b>	<b>0.53</b>
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	0.00	0.01	0.00	0.00	< 0.01	0.00	0.01	0.00	0.00	< 0.01
		<b>Family Subtotal:</b>	<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>	<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	0.03	0.00	0.01	0.01	0.01	0.03	0.00	0.01	0.01	0.01
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	0.00	0.00	0.01	0.00	< 0.01	0.00	0.00	0.01	0.00	< 0.01
		<b>Family Subtotal:</b>	<b>0.03</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.02</b>	<b>0.03</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.02</b>
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	0.04	0.07	0.17	0.04	0.08	0.04	0.06	0.13	0.04	0.07
		<b>Family Subtotal:</b>	<b>0.04</b>	<b>0.07</b>	<b>0.17</b>	<b>0.04</b>	<b>0.08</b>	<b>0.04</b>	<b>0.06</b>	<b>0.13</b>	<b>0.04</b>	<b>0.07</b>
		<b>Total:</b>	<b>11.44</b>	<b>10.51</b>	<b>19.80</b>	<b>10.14</b>	<b>12.98</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>	<b>1.00</b>
		<b>Standard Error:</b>	<b>1.01</b>	<b>1.02</b>	<b>2.41</b>	<b>1.68</b>	<b>0.85</b>					

Table B-4. Use of each species and family observed at each point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Points	Use by Point Number																							
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	20	0.50	1.83		3.58	0.17	2.25	0.08	0.92		6.75	1.92	0.83	3.58	0.90		0.25	0.25	0.33	0.17	0.25	0.17		0.67	0.73
	Wood Duck	<i>Aix sponsa</i>	1					0.17																			
	Mallard	<i>Anas platyrhynchos</i>	5					0.17								0.67	0.20		0.25		0.25						
	<b>Family Subtotal:</b>		<b>20</b>	<b>0.50</b>	<b>1.83</b>		<b>3.58</b>	<b>0.50</b>	<b>2.25</b>	<b>0.08</b>	<b>0.92</b>		<b>6.75</b>	<b>1.92</b>	<b>0.83</b>	<b>4.25</b>	<b>1.10</b>		<b>0.50</b>	<b>0.25</b>	<b>0.58</b>	<b>0.17</b>	<b>0.25</b>	<b>0.17</b>		<b>0.67</b>	<b>0.73</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	11	0.67	2.58	0.58	0.58			1.33			0.17			0.25	0.50								0.33	4.09	
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	7		0.17	0.17		0.33								0.08		0.20			0.08				0.17		
	<b>Family Subtotal:</b>		<b>14</b>	<b>0.67</b>	<b>2.75</b>	<b>0.75</b>	<b>0.58</b>	<b>0.33</b>	<b>1.33</b>				<b>0.17</b>			<b>0.33</b>	<b>0.50</b>	<b>0.20</b>		<b>0.08</b>	<b>0.08</b>				<b>0.50</b>	<b>4.09</b>	
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	22	1.33	2.00	1.08	0.42	2.50	2.50	1.50	7.33	0.67	19.17	2.75	1.50	1.25	1.30	4.30	2.42	0.17	2.33	0.33	2.00	2.33		3.08	
	Mourning Dove	<i>Zenaida macroura</i>	24	2.50	4.50	1.58	3.17	7.17	3.50	8.08	4.58	1.25	4.92	4.33	10.33	6.33	2.00	3.90	8.67	3.08	3.67	3.42	4.33	5.25	4.08	7.08	6.18
	<b>Family Subtotal:</b>		<b>24</b>	<b>3.83</b>	<b>6.50</b>	<b>2.67</b>	<b>3.58</b>	<b>9.67</b>	<b>6.00</b>	<b>9.58</b>	<b>11.92</b>	<b>1.92</b>	<b>24.08</b>	<b>7.08</b>	<b>11.83</b>	<b>7.58</b>	<b>3.30</b>	<b>8.20</b>	<b>11.08</b>	<b>3.25</b>	<b>6.00</b>	<b>3.75</b>	<b>6.33</b>	<b>7.58</b>	<b>4.08</b>	<b>10.17</b>	<b>6.18</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	8		0.83		1.92				0.17			3.50	0.08			0.20						0.17		0.73	
	<b>Family Subtotal:</b>		<b>8</b>		<b>0.83</b>		<b>1.92</b>				<b>0.17</b>			<b>3.50</b>	<b>0.08</b>			<b>0.20</b>						<b>0.17</b>		<b>0.73</b>	
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	24	0.25	0.42	1.42	0.33	0.83	0.50	0.33	0.17	0.08	0.92	0.17	0.17	0.67	1.20	1.30	0.33	1.17	0.92	1.00	0.50	1.50	1.00	0.25	0.36
	<b>Family Subtotal:</b>		<b>24</b>	<b>0.25</b>	<b>0.42</b>	<b>1.42</b>	<b>0.33</b>	<b>0.83</b>	<b>0.50</b>	<b>0.33</b>	<b>0.17</b>	<b>0.08</b>	<b>0.92</b>	<b>0.17</b>	<b>0.17</b>	<b>0.67</b>	<b>1.20</b>	<b>1.30</b>	<b>0.33</b>	<b>1.17</b>	<b>0.92</b>	<b>1.00</b>	<b>0.50</b>	<b>1.50</b>	<b>1.00</b>	<b>0.25</b>	<b>0.36</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	2	0.25																0.25							
	Herring Gull	<i>Larus argentatus</i>	5			0.25				0.08	0.17	0.33									0.17						
	<b>Family Subtotal:</b>		<b>7</b>	<b>0.25</b>		<b>0.25</b>				<b>0.08</b>	<b>0.17</b>	<b>0.33</b>								<b>0.25</b>	<b>0.17</b>						
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	9					0.17	0.08					0.08		0.10		0.08	0.08	0.08		0.08	0.08		0.08	0.08	
	Green Heron	<i>Butorides virescens</i>	1					0.08																			
	<b>Family Subtotal:</b>		<b>9</b>					<b>0.25</b>	<b>0.08</b>					<b>0.08</b>		<b>0.10</b>		<b>0.08</b>	<b>0.08</b>	<b>0.08</b>		<b>0.08</b>	<b>0.08</b>		<b>0.08</b>	<b>0.08</b>	
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	24	1.58	0.58	0.67	1.00	0.75	0.67	1.83	2.83	2.58	2.67	2.75	0.67	2.17	5.10	1.70	2.75	0.92	5.42	1.67	2.83	3.17	1.42	1.25	2.18
	<b>Family Subtotal:</b>		<b>24</b>	<b>1.58</b>	<b>0.58</b>	<b>0.67</b>	<b>1.00</b>	<b>0.75</b>	<b>0.67</b>	<b>1.83</b>	<b>2.83</b>	<b>2.58</b>	<b>2.67</b>	<b>2.75</b>	<b>0.67</b>	<b>2.17</b>	<b>5.10</b>	<b>1.70</b>	<b>2.75</b>	<b>0.92</b>	<b>5.42</b>	<b>1.67</b>	<b>2.83</b>	<b>3.17</b>	<b>1.42</b>	<b>1.25</b>	<b>2.18</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	4		0.08					0.08	0.08									0.08							
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	4				0.08					0.08		0.08		0.08											
	Cooper's Hawk	<i>Accipiter cooperii</i>	5							0.08	0.08	0.08					0.10								0.08		
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	12	0.17							0.17	0.08		0.50	0.17		0.25		0.20	0.08		0.08		0.08	0.33	0.08	
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	24	0.67	0.25	0.50	0.42	0.58	0.50	0.58	0.75	0.67	0.58	0.42	0.33	0.67	0.30	0.20	0.58	0.83	0.58	0.92	0.58	0.83	0.50	0.67	0.73
	Rough-legged Hawk	<i>Buteo lagopus</i>	6	0.08					0.08										0.08			0.08	0.08				0.09
<b>Family Subtotal:</b>		<b>24</b>	<b>0.92</b>	<b>0.33</b>	<b>0.50</b>	<b>0.50</b>	<b>0.58</b>	<b>0.58</b>	<b>0.92</b>	<b>1.00</b>	<b>0.83</b>	<b>1.08</b>	<b>0.67</b>	<b>0.33</b>	<b>1.00</b>	<b>0.40</b>	<b>0.40</b>	<b>0.83</b>	<b>0.83</b>	<b>0.67</b>	<b>1.00</b>	<b>0.75</b>	<b>1.17</b>	<b>0.50</b>	<b>0.83</b>	<b>0.82</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	1				0.08																				
	<b>Family Subtotal:</b>		<b>1</b>				<b>0.08</b>																				
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	4					0.08								0.10			0.08		0.08						
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1														0.10										
	<b>Family Subtotal:</b>		<b>5</b>					<b>0.08</b>								<b>0.10</b>			<b>0.08</b>		<b>0.08</b>						
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	12					0.08	0.17	0.08		0.17	0.08		0.17	0.33		0.10				0.17	0.17	0.25		0.18	
	<b>Family Subtotal:</b>		<b>12</b>					<b>0.08</b>	<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.33</b>		<b>0.10</b>			<b>0.17</b>	<b>0.17</b>	<b>0.25</b>		<b>0.18</b>		
<b>Total:</b>				<b>8.00</b>	<b>13.25</b>	<b>6.25</b>	<b>11.58</b>	<b>13.08</b>	<b>11.58</b>	<b>13.08</b>	<b>16.83</b>	<b>5.92</b>	<b>39.42</b>	<b>12.67</b>	<b>14.42</b>	<b>16.50</b>	<b>11.60</b>	<b>11.90</b>	<b>15.50</b>	<b>6.92</b>	<b>13.92</b>	<b>7.92</b>	<b>11.00</b>	<b>13.92</b>	<b>7.08</b>	<b>13.67</b>	<b>15.27</b>
<b>Standard Error:</b>				<b>1.31</b>	<b>2.41</b>	<b>1.67</b>	<b>4.65</b>	<b>3.46</b>	<b>4.52</b>	<b>3.06</b>	<b>5.05</b>	<b>1.40</b>	<b>9.77</b>	<b>3.23</b>	<b>2.98</b>	<b>4.62</b>	<b>3.27</b>	<b>2.79</b>	<b>5.89</b>	<b>1.71</b>	<b>3.05</b>	<b>1.64</b>	<b>2.38</b>	<b>4.00</b>	<b>1.88</b>	<b>3.01</b>	<b>4.14</b>
<b>Species Diversity:</b>				<b>10</b>	<b>10</b>	<b>8</b>	<b>10</b>	<b>13</b>	<b>10</b>	<b>12</b>	<b>9</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>11</b>	<b>9</b>	<b>10</b>	<b>10</b>	<b>11</b>	<b>10</b>	<b>10</b>	<b>9</b>	<b>5</b>	<b>10</b>	<b>9</b>
<b>Family Diversity:</b>				<b>7</b>	<b>7</b>	<b>6</b>	<b>8</b>	<b>9</b>	<b>8</b>	<b>8</b>	<b>5</b>	<b>7</b>	<b>8</b>	<b>6</b>	<b>8</b>	<b>7</b>	<b>8</b>	<b>7</b>	<b>5</b>	<b>9</b>	<b>8</b>	<b>8</b>	<b>7</b>	<b>7</b>	<b>5</b>	<b>6</b>	<b>8</b>

Table B-5. Frequency of occurrence of each species and family observed at each point during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Frequency by Point Number																							
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	0.17	0.25		0.17	0.08	0.17	0.08	0.17		0.33	0.17	0.17	0.33	0.10		0.08	0.08	0.17	0.08	0.08	0.08	0.25	0.09	
	Wood Duck	<i>Aix sponsa</i>					0.08																			
	Mallard	<i>Anas platyrhynchos</i>					0.08								0.08	0.10		0.08		0.08						
	<b>Family Subtotal:</b>		<b>0.17</b>	<b>0.25</b>		<b>0.17</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>		<b>0.33</b>	<b>0.17</b>	<b>0.17</b>	<b>0.33</b>	<b>0.20</b>		<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.25</b>	<b>0.09</b>	
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	0.17	0.33	0.25	0.08		0.25			0.08			0.08	0.17				0.08					0.17	0.18	
	Ring-necked Pheasant	<i>Phasianus colchicus</i>		0.08	0.08		0.08							0.08		0.20				0.08				0.08		
	<b>Family Subtotal:</b>		<b>0.17</b>	<b>0.42</b>	<b>0.33</b>	<b>0.08</b>	<b>0.08</b>	<b>0.25</b>			<b>0.08</b>			<b>0.17</b>	<b>0.17</b>	<b>0.20</b>			<b>0.08</b>	<b>0.08</b>			<b>0.17</b>	<b>0.18</b>		
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	0.25	0.25	0.25	0.08	0.25	0.33	0.42	0.67	0.08	0.58	0.50	0.33	0.08	0.20	0.70	0.58	0.08	0.50	0.08	0.42	0.50		0.33	
	Mourning Dove	<i>Zenaida macroura</i>	0.75	0.75	0.58	0.58	0.75	0.58	0.67	0.58	0.67	0.83	0.67	0.83	0.92	0.60	0.70	0.92	0.67	0.83	0.75	0.83	0.33	0.83	0.75	0.91
	<b>Family Subtotal:</b>		<b>0.83</b>	<b>0.75</b>	<b>0.75</b>	<b>0.67</b>	<b>0.83</b>	<b>0.75</b>	<b>0.92</b>	<b>0.92</b>	<b>0.75</b>	<b>1.00</b>	<b>0.92</b>	<b>0.92</b>	<b>0.92</b>	<b>0.60</b>	<b>1.00</b>	<b>1.00</b>	<b>0.67</b>	<b>0.83</b>	<b>0.75</b>	<b>1.00</b>	<b>0.75</b>	<b>0.83</b>	<b>0.83</b>	<b>0.91</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>		0.17		0.08				0.08			0.08	0.08		0.10						0.08			0.18	
	<b>Family Subtotal:</b>			<b>0.17</b>		<b>0.08</b>				<b>0.08</b>			<b>0.08</b>	<b>0.08</b>		<b>0.10</b>						<b>0.08</b>			<b>0.18</b>	
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	0.17	0.25	0.33	0.08	0.25	0.25	0.25	0.17	0.08	0.42	0.17	0.17	0.17	0.60	0.30	0.25	0.42	0.33	0.42	0.33	0.58	0.42	0.25	0.27
	<b>Family Subtotal:</b>		<b>0.17</b>	<b>0.25</b>	<b>0.33</b>	<b>0.08</b>	<b>0.25</b>	<b>0.25</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.42</b>	<b>0.17</b>	<b>0.17</b>	<b>0.17</b>	<b>0.60</b>	<b>0.30</b>	<b>0.25</b>	<b>0.42</b>	<b>0.33</b>	<b>0.42</b>	<b>0.33</b>	<b>0.58</b>	<b>0.42</b>	<b>0.25</b>	<b>0.27</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	0.08																0.08							
	Herring Gull	<i>Larus argentatus</i>			0.08					0.08		0.08	0.08							0.08						
	<b>Family Subtotal:</b>		<b>0.08</b>		<b>0.08</b>					<b>0.08</b>		<b>0.08</b>	<b>0.08</b>						<b>0.08</b>	<b>0.08</b>						
Ardeidae (Hérons & Allies)	Great Blue Heron	<i>Ardea herodias</i>					0.17	0.08						0.08		0.10		0.08	0.08	0.08		0.08	0.08			
	Green Heron	<i>Butorides virescens</i>					0.08																			
	<b>Family Subtotal:</b>						<b>0.25</b>	<b>0.08</b>						<b>0.08</b>		<b>0.10</b>		<b>0.08</b>	<b>0.08</b>	<b>0.08</b>		<b>0.08</b>	<b>0.08</b>			
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	0.42	0.17	0.17	0.25	0.33	0.25	0.33	0.42	0.58	0.58	0.58	0.25	0.42	0.20	0.50	0.42	0.42	0.58	0.58	0.58	0.67	0.58	0.42	0.55
	<b>Family Subtotal:</b>		<b>0.42</b>	<b>0.17</b>	<b>0.17</b>	<b>0.25</b>	<b>0.33</b>	<b>0.25</b>	<b>0.33</b>	<b>0.42</b>	<b>0.58</b>	<b>0.58</b>	<b>0.58</b>	<b>0.25</b>	<b>0.42</b>	<b>0.20</b>	<b>0.50</b>	<b>0.42</b>	<b>0.42</b>	<b>0.58</b>	<b>0.58</b>	<b>0.58</b>	<b>0.67</b>	<b>0.58</b>	<b>0.42</b>	<b>0.55</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>		0.08						0.08	0.08						0.08									
	Sharp-shinned Hawk	<i>Accipiter striatus</i>				0.08					0.08		0.08		0.08											
	Cooper's Hawk	<i>Accipiter cooperii</i>								0.08	0.08	0.08				0.10								0.08		
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	0.08							0.17	0.08		0.08	0.17		0.17		0.20	0.08		0.08		0.08	0.25	0.08	
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	0.42	0.25	0.50	0.33	0.58	0.42	0.58	0.58	0.50	0.50	0.25	0.33	0.25	0.30	0.20	0.58	0.58	0.42	0.75	0.42	0.42	0.42	0.42	0.55
	Rough-legged Hawk	<i>Buteo lagopus</i>	0.08					0.08										0.08			0.08	0.08				0.09
<b>Family Subtotal:</b>		<b>0.50</b>	<b>0.33</b>	<b>0.50</b>	<b>0.42</b>	<b>0.58</b>	<b>0.42</b>	<b>0.75</b>	<b>0.75</b>	<b>0.67</b>	<b>0.50</b>	<b>0.50</b>	<b>0.33</b>	<b>0.42</b>	<b>0.40</b>	<b>0.30</b>	<b>0.75</b>	<b>0.58</b>	<b>0.50</b>	<b>0.83</b>	<b>0.50</b>	<b>0.58</b>	<b>0.42</b>	<b>0.50</b>	<b>0.55</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>				0.08																				
	<b>Family Subtotal:</b>					<b>0.08</b>																				
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>					0.08								0.10			0.08		0.08						
	Pileated Woodpecker	<i>Dryocopus pileatus</i>															0.10									
	<b>Family Subtotal:</b>						<b>0.08</b>								<b>0.10</b>		<b>0.10</b>	<b>0.08</b>		<b>0.08</b>						
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>					0.08	0.17	0.08		0.17	0.08		0.17	0.08		0.10				0.17	0.08	0.25		0.18	
	<b>Family Subtotal:</b>					<b>0.08</b>	<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.08</b>		<b>0.17</b>	<b>0.08</b>		<b>0.10</b>				<b>0.17</b>	<b>0.08</b>	<b>0.25</b>		<b>0.18</b>		

Table B-6. Flight height characteristics of each species and family observed during the large bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Groups Flying	# Obs Flying	Flying Use	% Obs Flying	# (%) within Flight Height Categories			Use in RSZ	Frequency in RSZ
							< 35 m (115 ft)	RSZ: 35 - 200 m (115 - 656 ft)	> 200 m (656 ft)		
Anatidae (Ducks, Geese, & Swans)	Canada Goose	<i>Branta canadensis</i>	41	219	0.77	70.4	162 (74.0)	57 (26.0)	0 (0.0)	0.20	0.03
	Wood Duck	<i>Aix sponsa</i>	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Mallard	<i>Anas platyrhynchos</i>	4	16	0.06	88.9	16 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>46</b>	<b>237</b>	<b>0.84</b>	<b>71.6</b>	<b>180 (75.9)</b>	<b>57 (24.1)</b>	<b>0 (0.0)</b>	<b>0.20</b>	<b>0.03</b>
Phasianidae (Grouse & Allies)	Wild Turkey	<i>Meleagris gallopavo</i>	1	1	< 0.01	0.8	1 (100.0)	0 (0.0)	0 (0.0)		
	Ring-necked Pheasant	<i>Phasianus colchicus</i>	0	0	0.00	0.0	0 (-)	0 (-)	0 (-)		
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>0.7</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Columbidae (Pigeons & Doves)	Rock Pigeon	<i>Columba livia</i>	84	448	1.58	60.9	448 (100.0)	0 (0.0)	0 (0.0)		
	Mourning Dove	<i>Zenaida macroura</i>	287	681	2.41	50.5	673 (98.8)	8 (1.2)	0 (0.0)	0.03	0.01
	<b>Family Subtotal:</b>		<b>371</b>	<b>1129</b>	<b>3.99</b>	<b>54.1</b>	<b>1121 (99.3)</b>	<b>8 (0.7)</b>	<b>0 (0.0)</b>	<b>0.03</b>	<b>0.01</b>
Gruidae (Cranes)	Sandhill Crane	<i>Antigone canadensis</i>	8	81	0.29	90.0	39 (48.1)	42 (51.9)	0 (0.0)	0.15	< 0.01
	<b>Family Subtotal:</b>		<b>8</b>	<b>81</b>	<b>0.29</b>	<b>90.0</b>	<b>39 (48.1)</b>	<b>42 (51.9)</b>	<b>0 (0.0)</b>	<b>0.15</b>	<b>&lt; 0.01</b>
Charadriidae (Plovers)	Killdeer	<i>Charadrius vociferus</i>	102	137	0.48	74.5	134 (97.8)	2 (1.5)	1 (0.7)	0.01	< 0.01
	<b>Family Subtotal:</b>		<b>102</b>	<b>137</b>	<b>0.48</b>	<b>74.5</b>	<b>134 (97.8)</b>	<b>2 (1.5)</b>	<b>1 (0.7)</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Laridae (Gulls & Allies)	Ring-billed Gull	<i>Larus delawarensis</i>	2	6	0.02	100.0	6 (100.0)	0 (0.0)	0 (0.0)		
	Herring Gull	<i>Larus argentatus</i>	7	12	0.04	100.0	10 (83.3)	2 (16.7)	0 (0.0)	0.01	< 0.01
	<b>Family Subtotal:</b>		<b>9</b>	<b>18</b>	<b>0.06</b>	<b>100.0</b>	<b>16 (88.9)</b>	<b>2 (11.1)</b>	<b>0 (0.0)</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Ardeidae (Herons & Allies)	Great Blue Heron	<i>Ardea herodias</i>	10	10	0.04	100.0	9 (90.0)	1 (10.0)	0 (0.0)	< 0.01	< 0.01
	Green Heron	<i>Butorides virescens</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>11</b>	<b>11</b>	<b>0.04</b>	<b>100.0</b>	<b>10 (90.9)</b>	<b>1 (9.1)</b>	<b>0 (0.0)</b>	<b>&lt; 0.01</b>	<b>&lt; 0.01</b>
Cathartidae (Vultures)	Turkey Vulture	<i>Cathartes aura</i>	332	554	1.96	96.5	187 (33.8)	389 (70.2)	26 (4.7)	1.37	0.34
	<b>Family Subtotal:</b>		<b>332</b>	<b>554</b>	<b>1.96</b>	<b>96.5</b>	<b>187 (33.8)</b>	<b>389 (70.2)</b>	<b>26 (4.7)</b>	<b>1.37</b>	<b>0.34</b>
Accipitridae (Hawks, Eagles, & Kites)	Northern Harrier	<i>Circus hudsonius</i>	4	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Sharp-shinned Hawk	<i>Accipiter striatus</i>	4	4	0.01	100.0	2 (50.0)	2 (50.0)	0 (0.0)	0.01	0.01
	Cooper's Hawk	<i>Accipiter cooperii</i>	4	4	0.01	80.0	1 (25.0)	3 (75.0)	0 (0.0)	0.01	0.01
	Bald Eagle	<i>Haliaeetus leucocephalus</i>	16	17	0.06	65.4	10 (58.8)	12 (70.6)	0 (0.0)	0.04	0.04
	Red-tailed Hawk	<i>Buteo jamaicensis</i>	104	107	0.38	66.0	74 (69.2)	33 (30.8)	2 (1.9)	0.12	0.10
	Rough-legged Hawk	<i>Buteo lagopus</i>	4	4	0.01	66.7	4 (100.0)	0 (0.0)	0 (0.0)		
<b>Family Subtotal:</b>		<b>136</b>	<b>140</b>	<b>0.49</b>	<b>67.6</b>	<b>95 (67.9)</b>	<b>50 (35.7)</b>	<b>2 (1.4)</b>	<b>0.18</b>	<b>0.15</b>	
Strigidae (Owls)	Great Horned Owl	<i>Bubo virginianus</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>100.0</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Picidae (Woodpeckers)	Northern Flicker	<i>Colaptes auratus</i>	4	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Pileated Woodpecker	<i>Dryocopus pileatus</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>5</b>	<b>5</b>	<b>0.02</b>	<b>100.0</b>	<b>5 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Falconidae (Falcons)	American Kestrel	<i>Falco sparverius</i>	20	20	0.07	87.0	20 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>20</b>	<b>20</b>	<b>0.07</b>	<b>87.0</b>	<b>20 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
<b>Total</b>			<b>1042</b>	<b>2334</b>	<b>8.25</b>	<b>63.5</b>	<b>1809 (77.5)</b>	<b>551 (23.6)</b>	<b>29 (1.2)</b>	<b>1.95</b>	<b>0.44</b>



**Attachment C. Data tables of small birds from the large and small bird use study in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022.**

Table C-1. Group counts, observation counts, and relative abundance, by season, for each species and family observed during the small bird use surveys in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Spring: Mar–May			Summer: Jun–Aug			Fall: Sep–Nov			Winter: Dec–Feb			All Seasons		
			# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)	# Groups	# Obs	Rel. Abund. (%)
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	0	0	0.0	1	1	0.1	2	2	0.1	2	2	0.1	5	5	0.1
	Downy Woodpecker	<i>Dryobates pubescens</i>	2	2	0.2	4	4	0.4	4	4	0.1	5	5	0.4	15	15	0.2
	Hairy Woodpecker	<i>Dryobates villosus</i>	0	0	0.0	0	0	0.0	5	5	0.2	1	1	0.1	6	6	0.1
	<b>Family Subtotal:</b>		<b>2</b>	<b>2</b>	<b>0.2</b>	<b>5</b>	<b>5</b>	<b>0.5</b>	<b>11</b>	<b>11</b>	<b>0.3</b>	<b>8</b>	<b>8</b>	<b>0.6</b>	<b>26</b>	<b>26</b>	<b>0.4</b>
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	0	0	0.0	7	8	0.7	0	0	0.0	0	0	0.0	7	8	0.1
	Eastern Wood-Pewee	<i>Contopus virens</i>	0	0	0.0	0	0	0.0	1	3	0.1	0	0	0.0	1	3	< 0.1
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>7</b>	<b>8</b>	<b>0.7</b>	<b>1</b>	<b>3</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>8</b>	<b>11</b>	<b>0.2</b>
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	0	0	0.0	1	1	0.1	0	0	0.0	0	0	0.0	1	1	< 0.1
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>&lt; 0.1</b>
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.1	1	1	< 0.1
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>1</b>	<b>1</b>	<b>&lt; 0.1</b>
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	10	11	0.9	6	6	0.6	41	46	1.4	22	30	2.2	79	93	1.3
	<b>Family Subtotal:</b>		<b>10</b>	<b>11</b>	<b>0.9</b>	<b>6</b>	<b>6</b>	<b>0.6</b>	<b>41</b>	<b>46</b>	<b>1.4</b>	<b>22</b>	<b>30</b>	<b>2.2</b>	<b>79</b>	<b>93</b>	<b>1.3</b>
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	1	2	0.2	0	0	0.0	2	4	0.1	1	2	0.1	4	8	0.1
	<b>Family Subtotal:</b>		<b>1</b>	<b>2</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>4</b>	<b>0.1</b>	<b>1</b>	<b>2</b>	<b>0.1</b>	<b>4</b>	<b>8</b>	<b>0.1</b>
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	34	53	4.4	22	28	2.6	52	108	3.3	37	76	5.5	145	265	3.8
	<b>Family Subtotal:</b>		<b>34</b>	<b>53</b>	<b>4.4</b>	<b>22</b>	<b>28</b>	<b>2.6</b>	<b>52</b>	<b>108</b>	<b>3.3</b>	<b>37</b>	<b>76</b>	<b>5.5</b>	<b>145</b>	<b>265</b>	<b>3.8</b>
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	3	4	0.3	4	10	0.9	2	3	0.1	0	0	0.0	9	17	0.2
	Barn Swallow	<i>Hirundo rustica</i>	30	50	4.2	114	177	16.5	2	11	0.3	0	0	0.0	146	238	3.4
	<b>Family Subtotal:</b>		<b>33</b>	<b>54</b>	<b>4.5</b>	<b>118</b>	<b>187</b>	<b>17.5</b>	<b>4</b>	<b>14</b>	<b>0.4</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>155</b>	<b>255</b>	<b>3.7</b>
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	0	0	0.0	0	0	0.0	4	12	0.4	0	0	0.0	4	12	0.2
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	0	0	0.0	0	0	0.0	1	3	0.1	0	0	0.0	1	3	< 0.1
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>5</b>	<b>15</b>	<b>0.5</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>5</b>	<b>15</b>	<b>0.2</b>
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	0	0	0.0	0	0	0.0	0	0	0.0	2	2	0.1	2	2	< 0.1
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>2</b>	<b>0.1</b>	<b>2</b>	<b>2</b>	<b>&lt; 0.1</b>
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	1	1	0.1	2	2	0.2	0	0	0.0	0	0	0.0	3	3	< 0.1
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>0.1</b>	<b>2</b>	<b>2</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>3</b>	<b>3</b>	<b>&lt; 0.1</b>
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	39	484	40.6	0	0	0.0	105	2772	85.3	45	1068	77.1	189	4324	62.7
	<b>Family Subtotal:</b>		<b>39</b>	<b>484</b>	<b>40.6</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>105</b>	<b>2772</b>	<b>85.3</b>	<b>45</b>	<b>1068</b>	<b>77.1</b>	<b>189</b>	<b>4324</b>	<b>62.7</b>
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	0	0	0.0	0	0	0.0	1	4	0.1	0	0	0.0	1	4	0.1
	American Robin	<i>Turdus migratorius</i>	126	214	17.9	100	123	11.5	12	25	0.8	0	0	0.0	238	362	5.2
	<b>Family Subtotal:</b>		<b>126</b>	<b>214</b>	<b>17.9</b>	<b>100</b>	<b>123</b>	<b>11.5</b>	<b>13</b>	<b>29</b>	<b>0.9</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>239</b>	<b>366</b>	<b>5.3</b>
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	0	0	0.0	1	1	0.1	7	31	1.0	1	4	0.3	9	36	0.5
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>1</b>	<b>1</b>	<b>0.1</b>	<b>7</b>	<b>31</b>	<b>1.0</b>	<b>1</b>	<b>4</b>	<b>0.3</b>	<b>9</b>	<b>36</b>	<b>0.5</b>
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>	2	3	0.3	0	0	0.0	0	0	0.0	0	0	0.0	2	3	< 0.1
	American Goldfinch	<i>Spinus tristis</i>	5	8	0.7	28	38	3.6	10	18	0.6	0	0	0.0	43	64	0.9
	<b>Family Subtotal:</b>		<b>7</b>	<b>11</b>	<b>0.9</b>	<b>28</b>	<b>38</b>	<b>3.6</b>	<b>10</b>	<b>18</b>	<b>0.6</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>45</b>	<b>67</b>	<b>1.0</b>
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	0	0	0.0	0	0	0.0	2	16	0.5	1	19	1.4	3	35	0.5
	<b>Family Subtotal:</b>		<b>0</b>	<b>0</b>	<b>0.0</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>16</b>	<b>0.5</b>	<b>1</b>	<b>19</b>	<b>1.4</b>	<b>3</b>	<b>35</b>	<b>0.5</b>
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	0	0	0.0	0	0	0.0	1	2	0.1	0	0	0.0	1	2	< 0.1
	Chipping Sparrow	<i>Spizella passerina</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	< 0.1
	Field Sparrow	<i>Spizella pusilla</i>	11	18	1.5	19	24	2.2	7	13	0.4	0	0	0.0	37	55	0.8
	American Tree Sparrow	<i>Spizelloides arborea</i>	0	0	0.0	0	0	0.0	4	12	0.4	45	93	6.7	49	105	1.5
	Dark-eyed Junco	<i>Junco hyemalis</i>	0	0	0.0	0	0	0.0	10	25	0.8	22	78	5.6	32	103	1.5
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	0	0	0.0	0	0	0.0	2	4	0.1	0	0	0.0	2	4	0.1
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	0	0	0.0	2	2	0.2	0	0	0.0	0	0	0.0	2	2	< 0.1
	Song Sparrow	<i>Melospiza melodia</i>	0	0	0.0	3	3	0.3	0	0	0.0	0	0	0.0	3	3	< 0.1
<b>Family Subtotal:</b>		<b>12</b>	<b>19</b>	<b>1.6</b>	<b>24</b>	<b>29</b>	<b>2.7</b>	<b>24</b>	<b>56</b>	<b>1.7</b>	<b>67</b>	<b>171</b>	<b>12.3</b>	<b>127</b>	<b>275</b>	<b>4.0</b>	
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	0	0	0.0	2	2	0.2	0	0	0.0	0	0	0.0	2	2	< 0.1
	Baltimore Oriole	<i>Icterus galbula</i>	1	2	0.2	0	0	0.0	0	0	0.0	0	0	0.0	1	2	< 0.1
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	136	206	17.3	171	596	55.7	20	105	3.2	0	0	0.0	327	907	13.1
	Brown-headed Cowbird	<i>Molothrus ater</i>	22	72	6.0	9	25	2.3	1	6	0.2	0	0	0.0	32	103	1.5
	Common Grackle	<i>Quiscalus quiscula</i>	17	46	3.9	4	12	1.1	1	8	0.2	0	0	0.0	22	66	1.0
<b>Family Subtotal:</b>		<b>176</b>	<b>326</b>	<b>27.3</b>	<b>186</b>	<b>635</b>	<b>59.3</b>	<b>22</b>	<b>119</b>	<b>3.7</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>384</b>	<b>1080</b>	<b>15.7</b>	
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	0	0	0.0	0	0	0.0	1	4	0.1	0	0	0.0	1	4	0.1
	Yellow Warbler	<i>Setophaga petechia</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	< 0.1
	Unidentified Warbler	-	0	0	0.0	0	0	0.0	1	2	0.1	0	0	0.0	1	2	< 0.1
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>0.1</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>2</b>	<b>6</b>	<b>0.2</b>	<b>0</b>	<b>0</b>	<b>0.0</b>	<b>3</b>	<b>7</b>	<b>0.1</b>
Cardinalidae (Cardinals & Allies)	Scarlet Tanager	<i>Piranga olivacea</i>	1	1	0.1	0	0	0.0	0	0	0.0	0	0	0.0	1	1	< 0.1
	Northern Cardinal	<i>Cardinalis cardinalis</i>	10	12	1.0	5	5	0.5	2	2	0.1	5	5	0.4	22	24	0.3
	Indigo Bunting	<i>Passerina cyanea</i>	1	2	0.2	1	1	0.1	0	0	0.0	0	0	0.0	2	3	< 0.1
	Dickcissel	<i>Spiza americana</i>	0	0	0.0	1	1	0.1	0	0	0.0	0	0	0.0	1	1	< 0.1
	<b>Family Subtotal:</b>		<b>12</b>	<b>15</b>	<b>1.3</b>	<b>7</b>	<b>7</b>	<b>0.7</b>	<b>2</b>	<b>2</b>	<b>0.1</b>	<b>5</b>	<b>5</b>	<b>0.4</b>	<b>26</b>	<b>29</b>	<b>0.4</b>
<b>Total:</b>			<b>454</b>	<b>1193</b>	<b>100.0</b>	<b>507</b>	<b>1070</b>	<b>100.0</b>	<b>303</b>	<b>3250</b>	<b>100.0</b>	<b>190</b>	<b>1386</b>	<b>100.0</b>	<b>1454</b>	<b>6899</b>	<b>100.0</b>
<b>Species Diversity:</b>				<b>21</b>			<b>22</b>			<b>27</b>			<b>14</b>			<b>42</b>	

**Table B-2. Complete list of small bird species observed in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022**

Common Name	Scientific Name	Family	Incidental Observations Only
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>		
Downy Woodpecker	<i>Dryobates pubescens</i>	Picidae	
Hairy Woodpecker	<i>Dryobates villosus</i>		
Eastern Kingbird	<i>Tyrannus tyrannus</i>		
Eastern Wood-Pewee	<i>Contopus virens</i>	Tyrannidae	
Red-eyed Vireo	<i>Vireo olivaceus</i>	Vireonidae	
Northern Shrike	<i>Lanius borealis</i>	Laniidae	
Blue Jay	<i>Cyanocitta cristata</i>		
American Crow	<i>Corvus brachyrhynchos</i>	Corvidae	*
Black-capped Chickadee	<i>Poecile atricapillus</i>	Paridae	
Horned Lark	<i>Eremophila alpestris</i>	Alaudidae	
Tree Swallow	<i>Tachycineta bicolor</i>		
Barn Swallow	<i>Hirundo rustica</i>	Hirundinidae	
Golden-crowned Kinglet	<i>Regulus satrapa</i>		
Ruby-crowned Kinglet	<i>Corthylio calendula</i>	Regulidae	
White-breasted Nuthatch	<i>Sitta carolinensis</i>	Sittidae	
Brown Thrasher	<i>Toxostoma rufum</i>	Mimidae	
European Starling	<i>Sturnus vulgaris</i>	Sturnidae	
Eastern Bluebird	<i>Sialia sialis</i>		
American Robin	<i>Turdus migratorius</i>	Turdidae	
House Sparrow	<i>Passer domesticus</i>	Passeridae	
House Finch	<i>Haemorhous mexicanus</i>		
American Goldfinch	<i>Spinus tristis</i>	Fringillidae	
Snow Bunting	<i>Plectrophenax nivalis</i>	Calcariidae	
Grasshopper Sparrow	<i>Ammodramus savannarum</i>		
Chipping Sparrow	<i>Spizella passerina</i>		
Field Sparrow	<i>Spizella pusilla</i>		
American Tree Sparrow	<i>Spizelloides arborea</i>		
Dark-eyed Junco	<i>Junco hyemalis</i>	Passerellidae	
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>		
Savannah Sparrow	<i>Passerculus sandwichensis</i>		
Song Sparrow	<i>Melospiza melodia</i>		
Eastern Meadowlark	<i>Sturnella magna</i>		
Baltimore Oriole	<i>Icterus galbula</i>		
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	Icteridae	
Brown-headed Cowbird	<i>Molothrus ater</i>		
Common Grackle	<i>Quiscalus quiscula</i>		
Cape May Warbler	<i>Setophaga tigrina</i>		
Yellow Warbler	<i>Setophaga petechia</i>	Parulidae	
Scarlet Tanager	<i>Piranga olivacea</i>		
Northern Cardinal	<i>Cardinalis cardinalis</i>		
Indigo Bunting	<i>Passerina cyanea</i>	Cardinalidae	
Dickcissel	<i>Spiza americana</i>		

Table C-3. Use and frequency of occurrence, by season, for each species and family observed during the small bird use surveys in the Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Use (observations/plot/survey)					Frequency				
			Spring	Summer	Fall	Winter	Total	Spring	Summer	Fall	Winter	Total
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	0.00	0.01	0.03	0.03	0.02	0.00	0.01	0.03	0.01	0.01
	Downy Woodpecker	<i>Dryobates pubescens</i>	0.03	0.06	0.06	0.07	0.05	0.03	0.06	0.06	0.07	0.05
	Hairy Woodpecker	<i>Dryobates villosus</i>	0.00	0.00	0.07	0.01	0.02	0.00	0.00	0.07	0.01	0.02
	<b>Family Subtotal:</b>		<b>0.03</b>	<b>0.07</b>	<b>0.15</b>	<b>0.11</b>	<b>0.09</b>	<b>0.03</b>	<b>0.07</b>	<b>0.15</b>	<b>0.08</b>	<b>0.08</b>
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	0.00	0.11	0.00	0.00	0.03	0.00	0.08	0.00	0.00	0.02
	Eastern Wood-Pewee	<i>Contopus virens</i>	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.11</b>	<b>0.04</b>	<b>0.00</b>	<b>0.04</b>	<b>0.00</b>	<b>0.08</b>	<b>0.01</b>	<b>0.00</b>	<b>0.02</b>
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	0.00	0.01	0.00	0.00	< 0.01	0.00	0.01	0.00	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>	<b>0.00</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>&lt; 0.01</b>
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	0.00	0.00	0.00	0.01	< 0.01	0.00	0.00	0.00	0.01	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>&lt; 0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	0.16	0.08	0.64	0.42	0.33	0.14	0.07	0.46	0.28	0.24
	<b>Family Subtotal:</b>		<b>0.16</b>	<b>0.08</b>	<b>0.64</b>	<b>0.42</b>	<b>0.33</b>	<b>0.14</b>	<b>0.07</b>	<b>0.46</b>	<b>0.28</b>	<b>0.24</b>
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	0.03	0.00	0.06	0.03	0.03	0.01	0.00	0.03	0.01	0.01
	<b>Family Subtotal:</b>		<b>0.03</b>	<b>0.00</b>	<b>0.06</b>	<b>0.03</b>	<b>0.03</b>	<b>0.01</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.01</b>
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	0.76	0.39	1.50	1.06	0.93	0.34	0.25	0.58	0.31	0.37
	<b>Family Subtotal:</b>		<b>0.76</b>	<b>0.39</b>	<b>1.50</b>	<b>1.06</b>	<b>0.93</b>	<b>0.34</b>	<b>0.25</b>	<b>0.58</b>	<b>0.31</b>	<b>0.37</b>
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	0.06	0.14	0.04	0.00	0.06	0.04	0.06	0.01	0.00	0.03
	Barn Swallow	<i>Hirundo rustica</i>	0.71	2.46	0.15	0.00	0.83	0.21	0.64	0.03	0.00	0.22
	<b>Family Subtotal:</b>		<b>0.77</b>	<b>2.60</b>	<b>0.19</b>	<b>0.00</b>	<b>0.89</b>	<b>0.23</b>	<b>0.67</b>	<b>0.04</b>	<b>0.00</b>	<b>0.23</b>
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	0.00	0.00	0.17	0.00	0.04	0.00	0.00	0.06	0.00	0.01
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	0.00	0.00	0.04	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.21</b>	<b>0.00</b>	<b>0.05</b>	<b>0.00</b>	<b>0.00</b>	<b>0.06</b>	<b>0.00</b>	<b>0.01</b>
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	0.00	0.00	0.00	0.03	0.01	0.00	0.00	0.00	0.03	0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	0.01	0.03	0.00	0.00	0.01	0.01	0.03	0.00	0.00	0.01
	<b>Family Subtotal:</b>		<b>0.01</b>	<b>0.03</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>	<b>0.01</b>	<b>0.03</b>	<b>0.00</b>	<b>0.00</b>	<b>0.01</b>
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	6.91	0.00	38.50	14.83	15.12	0.41	0.00	0.61	0.38	0.35
	<b>Family Subtotal:</b>		<b>6.91</b>	<b>0.00</b>	<b>38.50</b>	<b>14.83</b>	<b>15.12</b>	<b>0.41</b>	<b>0.00</b>	<b>0.61</b>	<b>0.38</b>	<b>0.35</b>
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	American Robin	<i>Turdus migratorius</i>	3.06	1.71	0.35	0.00	1.27	0.90	0.78	0.11	0.00	0.44
	<b>Family Subtotal:</b>		<b>3.06</b>	<b>1.71</b>	<b>0.40</b>	<b>0.00</b>	<b>1.28</b>	<b>0.90</b>	<b>0.78</b>	<b>0.13</b>	<b>0.00</b>	<b>0.45</b>
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	0.00	0.01	0.43	0.06	0.13	0.00	0.01	0.08	0.01	0.03
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.01</b>	<b>0.43</b>	<b>0.06</b>	<b>0.13</b>	<b>0.00</b>	<b>0.01</b>	<b>0.08</b>	<b>0.01</b>	<b>0.03</b>
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>	0.04	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.01
	American Goldfinch	<i>Spinus tristis</i>	0.11	0.53	0.25	0.00	0.22	0.07	0.29	0.14	0.00	0.13
	<b>Family Subtotal:</b>		<b>0.16</b>	<b>0.53</b>	<b>0.25</b>	<b>0.00</b>	<b>0.23</b>	<b>0.09</b>	<b>0.29</b>	<b>0.14</b>	<b>0.00</b>	<b>0.13</b>
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	0.00	0.00	0.22	0.26	0.12	0.00	0.00	0.03	0.01	0.01
	<b>Family Subtotal:</b>		<b>0.00</b>	<b>0.00</b>	<b>0.22</b>	<b>0.26</b>	<b>0.12</b>	<b>0.00</b>	<b>0.00</b>	<b>0.03</b>	<b>0.01</b>	<b>0.01</b>
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	Chipping Sparrow	<i>Spizella passerina</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
	Field Sparrow	<i>Spizella pusilla</i>	0.26	0.33	0.18	0.00	0.19	0.14	0.26	0.08	0.00	0.12
	American Tree Sparrow	<i>Spizelloides arborea</i>	0.00	0.00	0.17	1.29	0.37	0.00	0.00	0.06	0.47	0.13
	Dark-eyed Junco	<i>Junco hyemalis</i>	0.00	0.00	0.35	1.08	0.36	0.00	0.00	0.11	0.25	0.09
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.03	0.00	0.01
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	0.00	0.03	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.01
	<b>Family Subtotal:</b>		<b>0.27</b>	<b>0.40</b>	<b>0.78</b>	<b>2.38</b>	<b>0.96</b>	<b>0.16</b>	<b>0.33</b>	<b>0.26</b>	<b>0.60</b>	<b>0.34</b>
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	0.00	0.03	0.00	0.00	0.01	0.00	0.01	0.00	0.00	< 0.01
	Baltimore Oriole	<i>Icterus galbula</i>	0.03	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.00	< 0.01
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	2.94	8.28	1.46	0.00	3.17	0.69	0.89	0.17	0.00	0.43
	Brown-headed Cowbird	<i>Molothrus ater</i>	1.03	0.35	0.08	0.00	0.36	0.23	0.10	0.01	0.00	0.08
	<b>Family Subtotal:</b>		<b>4.66</b>	<b>8.82</b>	<b>1.65</b>	<b>0.00</b>	<b>3.78</b>	<b>0.74</b>	<b>0.89</b>	<b>0.19</b>	<b>0.00</b>	<b>0.45</b>
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	0.00	0.00	0.06	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	Yellow Warbler	<i>Setophaga petechia</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
	Unidentified Warbler	-	0.00	0.00	0.03	0.00	0.01	0.00	0.00	0.01	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.01</b>	<b>0.00</b>	<b>0.08</b>	<b>0.00</b>	<b>0.02</b>	<b>0.01</b>	<b>0.00</b>	<b>0.03</b>	<b>0.00</b>	<b>0.01</b>
Cardinalidae (Cardinals & Allies)	Scarlet Tanager	<i>Piranga olivacea</i>	0.01	0.00	0.00	0.00	< 0.01	0.01	0.00	0.00	0.00	< 0.01
	Northern Cardinal	<i>Cardinalis cardinalis</i>	0.17	0.07	0.03	0.07	0.08	0.11	0.07	0.03	0.07	0.07
	Indigo Bunting	<i>Passerina cyanea</i>	0.03	0.01	0.00	0.00	0.01	0.01	0.01	0.00	0.00	0.01
	Dickcissel	<i>Spiza americana</i>	0.00	0.01	0.00	0.00	< 0.01	0.00	0.01	0.00	0.00	< 0.01
	<b>Family Subtotal:</b>		<b>0.21</b>	<b>0.10</b>	<b>0.03</b>	<b>0.07</b>	<b>0.10</b>	<b>0.13</b>	<b>0.10</b>	<b>0.03</b>	<b>0.07</b>	<b>0.08</b>
	<b>Total:</b>		<b>17.04</b>	<b>14.86</b>	<b>45.14</b>	<b>19.25</b>	<b>24.12</b>	<b>1.00</b>	<b>1.00</b>	<b>1.00</b>	<b>0.99</b>	<b>1.00</b>
	<b>Standard Error:</b>		<b>1.67</b>	<b>2.23</b>	<b>8.95</b>	<b>4.62</b>	<b>2.72</b>					

Table B-4. Use of each species and family observed at each point during the small bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Points	Use by Point Number																								
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	4	0.17															0.08					0.08	0.09			
	Downy Woodpecker	<i>Dryobates pubescens</i>	8	0.33				0.08		0.08									0.08		0.08			0.17	0.17	0.27		
	Hairy Woodpecker	<i>Dryobates villosus</i>	6			0.08				0.08					0.09			0.08		0.08		0.08						
	<b>Family Subtotal:</b>		<b>13</b>	<b>0.50</b>		<b>0.08</b>	<b>0.08</b>		<b>0.08</b>	<b>0.08</b>					<b>0.09</b>			<b>0.17</b>	<b>0.08</b>	<b>0.17</b>		<b>0.08</b>	<b>0.17</b>	<b>0.25</b>	<b>0.36</b>			
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	5	0.08				0.17												0.08	0.08				0.27			
	Eastern Wood-Pewee	<i>Contopus virens</i>	1					0.25																				
	<b>Family Subtotal:</b>		<b>5</b>	<b>0.08</b>				<b>0.42</b>												<b>0.08</b>	<b>0.08</b>				<b>0.27</b>			
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	1					0.08																				
<b>Family Subtotal:</b>		<b>1</b>						<b>0.08</b>																				
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	1																	0.08								
<b>Family Subtotal:</b>		<b>1</b>																		<b>0.08</b>								
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	23	0.17	0.58	0.17	0.25	0.58	0.17	0.17	0.08	0.50	0.08	0.33	0.33	0.36	0.33	0.08	0.50	0.17	0.83	0.42	0.08	0.50	0.50	0.64		
<b>Family Subtotal:</b>		<b>23</b>	<b>0.17</b>	<b>0.58</b>	<b>0.17</b>	<b>0.25</b>	<b>0.58</b>	<b>0.17</b>	<b>0.17</b>	<b>0.08</b>	<b>0.50</b>	<b>0.08</b>	<b>0.33</b>	<b>0.33</b>	<b>0.36</b>	<b>0.33</b>	<b>0.08</b>	<b>0.50</b>	<b>0.17</b>	<b>0.83</b>	<b>0.42</b>	<b>0.08</b>	<b>0.50</b>	<b>0.50</b>	<b>0.64</b>			
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	4	0.17		0.17		0.17																				
<b>Family Subtotal:</b>		<b>4</b>	<b>0.17</b>		<b>0.17</b>		<b>0.17</b>																					
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	23	0.67	0.50	0.50	0.67	0.17	1.17	0.83	1.58	0.75	1.25	1.17	0.33		0.45	0.42	2.42	1.00	1.17	0.50	0.75	2.83	0.42	1.25	1.45	
<b>Family Subtotal:</b>		<b>23</b>	<b>0.67</b>	<b>0.50</b>	<b>0.50</b>	<b>0.67</b>	<b>0.17</b>	<b>1.17</b>	<b>0.83</b>	<b>1.58</b>	<b>0.75</b>	<b>1.25</b>	<b>1.17</b>	<b>0.33</b>		<b>0.45</b>	<b>0.42</b>	<b>2.42</b>	<b>1.00</b>	<b>1.17</b>	<b>0.50</b>	<b>0.75</b>	<b>2.83</b>	<b>0.42</b>	<b>1.25</b>	<b>1.45</b>		
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	6			0.08														0.25	0.50			0.08		0.45		
	Barn Swallow	<i>Hirundo rustica</i>	24	0.83	1.42	0.83	0.58	0.75	0.33	0.92	0.83	0.17	3.17	0.58	0.42	0.58	0.45	0.67	0.08	0.25	0.50	0.17	0.67	0.42	0.50	0.67	4.55	
<b>Family Subtotal:</b>		<b>24</b>	<b>0.83</b>	<b>1.42</b>	<b>0.92</b>	<b>0.58</b>	<b>0.75</b>	<b>0.33</b>	<b>0.92</b>	<b>0.83</b>	<b>0.17</b>	<b>3.17</b>	<b>0.58</b>	<b>0.42</b>	<b>0.58</b>	<b>0.45</b>	<b>0.67</b>	<b>0.08</b>	<b>0.50</b>	<b>1.00</b>	<b>0.17</b>	<b>0.67</b>	<b>0.42</b>	<b>0.58</b>	<b>0.67</b>	<b>5.00</b>		
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4	0.25				0.50	0.17																			
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	1					0.25																				
<b>Family Subtotal:</b>		<b>4</b>	<b>0.25</b>				<b>0.75</b>	<b>0.17</b>																				
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	2					0.08					0.08															
<b>Family Subtotal:</b>		<b>2</b>						<b>0.08</b>					<b>0.08</b>															
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	2										0.08													0.17		
<b>Family Subtotal:</b>		<b>2</b>											<b>0.08</b>												<b>0.17</b>			
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	24	20.08	3.17	20.00	1.00	14.92	13.67	14.08	17.58	10.42	28.50	8.83	25.00	16.25	16.09	12.50	4.58	13.75	9.92	46.00	5.58	35.67	19.17	0.25	5.09	
<b>Family Subtotal:</b>		<b>24</b>	<b>20.08</b>	<b>3.17</b>	<b>20.00</b>	<b>1.00</b>	<b>14.92</b>	<b>13.67</b>	<b>14.08</b>	<b>17.58</b>	<b>10.42</b>	<b>28.50</b>	<b>8.83</b>	<b>25.00</b>	<b>16.25</b>	<b>16.09</b>	<b>12.50</b>	<b>4.58</b>	<b>13.75</b>	<b>9.92</b>	<b>46.00</b>	<b>5.58</b>	<b>35.67</b>	<b>19.17</b>	<b>0.25</b>	<b>5.09</b>		
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	1										0.33															
	American Robin	<i>Turdus migratorius</i>	24	1.42	2.83	1.08	1.08	1.83	1.08	0.83	0.83	1.50	0.58	0.58	0.50	1.42	1.55	1.75	0.92	1.33	1.67	2.17	0.58	0.92	1.08	1.58	1.64	
<b>Family Subtotal:</b>		<b>24</b>	<b>1.42</b>	<b>2.83</b>	<b>1.08</b>	<b>1.08</b>	<b>1.83</b>	<b>1.08</b>	<b>0.83</b>	<b>0.83</b>	<b>1.50</b>	<b>0.58</b>	<b>0.58</b>	<b>0.50</b>	<b>1.42</b>	<b>1.55</b>	<b>1.75</b>	<b>0.92</b>	<b>1.33</b>	<b>1.67</b>	<b>2.17</b>	<b>0.58</b>	<b>0.92</b>	<b>1.08</b>	<b>1.58</b>	<b>1.64</b>		
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	6	0.08							0.08	0.58	1.58								0.36							
<b>Family Subtotal:</b>		<b>6</b>	<b>0.08</b>								<b>0.08</b>	<b>0.58</b>	<b>1.58</b>								<b>0.36</b>							
Fringillidae (Finches)	House Finch	<i>Haemorrhous mexicanus</i>	2										0.08													0.18		
	American Goldfinch	<i>Spinus tristis</i>	18	0.17	0.17			0.33	0.25	0.17	0.17				0.17	0.17	0.33	0.55	0.17	0.17	0.17	1.00	0.50		0.08	0.17	0.73	
<b>Family Subtotal:</b>		<b>19</b>	<b>0.17</b>	<b>0.17</b>			<b>0.33</b>	<b>0.25</b>	<b>0.17</b>	<b>0.17</b>				<b>0.08</b>	<b>0.17</b>	<b>0.17</b>	<b>0.33</b>	<b>0.55</b>	<b>0.17</b>	<b>0.17</b>	<b>0.17</b>	<b>1.00</b>	<b>0.50</b>		<b>0.08</b>	<b>0.17</b>	<b>0.91</b>	
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	3			0.33																				1.00	1.73	
<b>Family Subtotal:</b>		<b>3</b>			<b>0.33</b>																					<b>1.00</b>	<b>1.73</b>	
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	1										0.17															
	Chipping Sparrow	<i>Spizella passerina</i>	1																	0.08								
	Field Sparrow	<i>Spizella pusilla</i>	20		0.25	0.17	0.17		0.25	0.08	0.42	0.17	0.17	0.08	0.08	0.08	0.09	0.42	0.33		0.67	0.17	0.25	0.42	0.08	0.25		
	American Tree Sparrow	<i>Spizelloides arborea</i>	20	0.08	0.08		0.58	0.42	0.50	0.33	0.67		0.17	0.08	0.17	0.08		0.75			0.75	1.50	0.83	0.50	0.50	0.25	0.33	0.18
	Dark-eyed Junco	<i>Junco hyemalis</i>	16		0.17	0.58	0.58	0.25	0.50			0.92	0.42	0.42	0.25		0.67	0.64	0.42				0.67	1.17		0.50	0.55	
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	2																							0.17	0.18	
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	2				0.08	0.08																				
Song Sparrow	<i>Melospiza melodia</i>	3				0.08	0.08										0.08											
<b>Family Subtotal:</b>		<b>24</b>	<b>0.08</b>	<b>0.50</b>	<b>0.75</b>	<b>1.50</b>	<b>0.83</b>	<b>1.25</b>	<b>0.42</b>	<b>2.17</b>	<b>0.58</b>	<b>0.75</b>	<b>0.42</b>	<b>0.25</b>	<b>0.83</b>	<b>0.73</b>	<b>1.67</b>	<b>0.33</b>	<b>0.83</b>	<b>2.83</b>	<b>2.17</b>	<b>0.75</b>	<b>0.92</b>	<b>0.50</b>	<b>1.08</b>	<b>0.91</b>		
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	1										0.17															
	Baltimore Oriole	<i>Icterus galbula</i>	1																						0.17			
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	24	0.83	9.83	1.17	5.33	3.83	4.50	1.33	2.42	0.67	11.75	1.75	2.17	1.83	4.73	5.33	3.08	1.67	3.42	1.83	1.17	2.50	1.83	1.92	1.18	
	Brown-headed Cowbird	<i>Molothrus ater</i>	18	0.08	0.08	0.50	0.17	0.58	0.75	0.08	0.42	0.50	1.00	0.33	0.50		1.27				0.17	0.58		0.58	0.42	0.67		
Common Grackle	<i>Quiscalus quiscula</i>	14					0.17	0.17	1.33		0.42	0.08				0.17	0.45			0.67		0.17	0.17	0.17	1.17	0.27		
<b>Family Subtotal:</b>		<b>24</b>	<b>0.92</b>	<b>9.92</b>	<b>1.67</b>	<b>5.50</b>	<b>4.58</b>	<b>5.42</b>	<b>2.75</b>	<b>3.00</b>	<b>1.58</b>	<b>12.83</b>	<b>2.08</b>	<b>2.67</b>	<b>2.00</b>	<b>6.45</b>	<b>5.33</b>	<b>3.08</b>	<b>2.50</b>	<b>4.00</b>	<b>2.00</b>	<b>2.08</b>	<b>3.08</b>	<b>2.67</b>	<b>3.08</b>	<b>1.45</b>		
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	1																									
	Yellow Warbler	<i>Setophaga petechia</i>	1																							0.08		
	Unidentified Warbler	-	1																									

Table B-5. Frequency of occurrence of each species and family observed at each point during the small bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	Frequency by Point Number																								
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>		0.08															0.08						0.08	0.09	
	Downy Woodpecker	<i>Dryobates pubescens</i>		0.33				0.08		0.08									0.08		0.08				0.17	0.17	0.27
	Hairy Woodpecker	<i>Dryobates villosus</i>				0.08					0.08					0.09			0.08		0.08		0.08				
		<b>Family Subtotal:</b>	<b>0.33</b>	<b>0.08</b>	<b>0.09</b>	<b>0.08</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.08</b>	<b>0.17</b>	<b>0.25</b>	<b>0.36</b>											
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>		0.08				0.08												0.08	0.08					0.18	
	Eastern Wood-Pewee	<i>Contopus virens</i>							0.08																		
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.18</b>	
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>						0.08																			
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>																	0.08								
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	0.17	0.50	0.17	0.17	0.33	0.17	0.17	0.08	0.33		0.08	0.33	0.33	0.27	0.25	0.08	0.42	0.08	0.33	0.25	0.08	0.50	0.33	0.27	
		<b>Family Subtotal:</b>	<b>0.17</b>	<b>0.50</b>	<b>0.17</b>	<b>0.17</b>	<b>0.33</b>	<b>0.17</b>	<b>0.17</b>	<b>0.08</b>	<b>0.33</b>	<b>0.08</b>	<b>0.33</b>	<b>0.33</b>	<b>0.27</b>	<b>0.25</b>	<b>0.08</b>	<b>0.42</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.08</b>	<b>0.50</b>	<b>0.33</b>	<b>0.27</b>	<b>0.27</b>	
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>		0.08		0.08														0.08							
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	0.25	0.25	0.33	0.25	0.08	0.42	0.42	0.50	0.25	0.58	0.67	0.17		0.36	0.25	0.75	0.25	0.50	0.42	0.50	0.58	0.25	0.50	0.36	
		<b>Family Subtotal:</b>	<b>0.25</b>	<b>0.25</b>	<b>0.33</b>	<b>0.25</b>	<b>0.08</b>	<b>0.42</b>	<b>0.42</b>	<b>0.50</b>	<b>0.25</b>	<b>0.58</b>	<b>0.67</b>	<b>0.17</b>	<b>0.36</b>	<b>0.25</b>	<b>0.75</b>	<b>0.25</b>	<b>0.50</b>	<b>0.42</b>	<b>0.50</b>	<b>0.58</b>	<b>0.25</b>	<b>0.50</b>	<b>0.36</b>	<b>0.36</b>	
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>			0.08								0.08							0.17	0.08			0.08		0.18	
	Barn Swallow	<i>Hirundo rustica</i>	0.25	0.25	0.25	0.33	0.17	0.08	0.25	0.33	0.08	0.33	0.25	0.17	0.33	0.18	0.25	0.08	0.17	0.17	0.08	0.33	0.25	0.17	0.17	0.36	
		<b>Family Subtotal:</b>	<b>0.25</b>	<b>0.25</b>	<b>0.33</b>	<b>0.33</b>	<b>0.17</b>	<b>0.08</b>	<b>0.25</b>	<b>0.33</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.17</b>	<b>0.33</b>	<b>0.18</b>	<b>0.25</b>	<b>0.08</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.25</b>	<b>0.17</b>	<b>0.45</b>	
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>		0.08				0.08	0.08																		
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>							0.08																		
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>						0.08						0.08													
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>											0.08													0.17	
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.17</b>	<b>0.17</b>	
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	0.33	0.25	0.33	0.17	0.50	0.42	0.42	0.42	0.17	0.50	0.25	0.42	0.33	0.27	0.42	0.25	0.50	0.50	0.42	0.17	0.58	0.33	0.08	0.36	
		<b>Family Subtotal:</b>	<b>0.33</b>	<b>0.25</b>	<b>0.33</b>	<b>0.17</b>	<b>0.50</b>	<b>0.42</b>	<b>0.42</b>	<b>0.42</b>	<b>0.17</b>	<b>0.50</b>	<b>0.25</b>	<b>0.42</b>	<b>0.33</b>	<b>0.27</b>	<b>0.42</b>	<b>0.25</b>	<b>0.50</b>	<b>0.50</b>	<b>0.42</b>	<b>0.17</b>	<b>0.58</b>	<b>0.33</b>	<b>0.08</b>	<b>0.36</b>	
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>											0.08														
	American Robin	<i>Turdus migratorius</i>	0.50	0.50	0.42	0.42	0.58	0.42	0.42	0.42	0.50	0.25	0.25	0.42	0.50	0.45	0.50	0.42	0.50	0.42	0.50	0.33	0.42	0.58	0.50	0.45	
		<b>Family Subtotal:</b>	<b>0.50</b>	<b>0.50</b>	<b>0.42</b>	<b>0.42</b>	<b>0.58</b>	<b>0.42</b>	<b>0.42</b>	<b>0.42</b>	<b>0.50</b>	<b>0.25</b>	<b>0.25</b>	<b>0.42</b>	<b>0.50</b>	<b>0.45</b>	<b>0.50</b>	<b>0.42</b>	<b>0.50</b>	<b>0.42</b>	<b>0.50</b>	<b>0.33</b>	<b>0.42</b>	<b>0.58</b>	<b>0.50</b>	<b>0.45</b>	
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>		0.08									0.08	0.08		0.25				0.08							
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>																								0.09	
	American Goldfinch	<i>Spinus tristis</i>	0.08	0.08			0.25	0.17	0.08	0.08					0.08	0.08	0.25	0.18	0.08	0.08	0.17	0.50	0.33	0.08	0.08	0.36	
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.25</b>	<b>0.17</b>	<b>0.08</b>	<b>0.25</b>	<b>0.18</b>	<b>0.08</b>	<b>0.08</b>	<b>0.17</b>	<b>0.50</b>	<b>0.33</b>	<b>0.08</b>	<b>0.08</b>	<b>0.36</b>								
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>		0.08																						0.08	0.09
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.08</b>	<b>0.09</b>	<b>0.09</b>
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>												0.08													
	Chipping Sparrow	<i>Spizella passerina</i>																		0.08							
	Field Sparrow	<i>Spizella pusilla</i>			0.17	0.08			0.17	0.08	0.08	0.08	0.17	0.08	0.08	0.08	0.09	0.25	0.17		0.42	0.17	0.17	0.25	0.08	0.17	
	American Tree Sparrow	<i>Spizelloides arborea</i>	0.08	0.08			0.17	0.17	0.25	0.17	0.08		0.08	0.08	0.08	0.08		0.25		0.17	0.33	0.17	0.17	0.25	0.08	0.25	0.18
	Dark-eyed Junco	<i>Junco hyemalis</i>		0.08	0.17	0.17	0.08	0.08			0.17	0.17	0.08	0.08		0.17	0.18	0.08			0.17	0.17			0.17	0.18	
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>																							0.08		0.09
	Savannah Sparrow	<i>Passerculus sandwichensis</i>				0.08	0.08																				
	Song Sparrow	<i>Melospiza melodia</i>				0.08	0.08											0.08									
		<b>Family Subtotal:</b>	<b>0.08</b>	<b>0.33</b>	<b>0.25</b>	<b>0.58</b>	<b>0.33</b>	<b>0.42</b>	<b>0.25</b>	<b>0.25</b>	<b>0.25</b>	<b>0.33</b>	<b>0.25</b>	<b>0.17</b>	<b>0.33</b>	<b>0.27</b>	<b>0.58</b>	<b>0.17</b>	<b>0.25</b>	<b>0.75</b>	<b>0.33</b>	<b>0.33</b>	<b>0.50</b>	<b>0.25</b>	<b>0.50</b>	<b>0.36</b>	
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>												0.08													
	Baltimore Oriole	<i>Icterus galbula</i>																									
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	0.42	0.33	0.33	0.42	0.50	0.42	0.50	0.42	0.33	0.33	0.42	0.42	0.50	0.55	0.58	0.58	0.42	0.58	0.17	0.33	0.50	0.50	0.50	0.36	
	Brown-headed Cowbird	<i>Molothrus ater</i>	0.08	0.08	0.08	0.08	0.25	0.08	0.08																		

Table C-6. Flight height characteristics of each species and family observed during the small bird use surveys in the proposed Riverbend Wind Energy Project area, Sanilac County, Michigan, March 2021–February 2022

Family (Description)	Common Name	Scientific Name	# Groups Flying	# Obs Flying	Flying Use	% Obs Flying	# (%) within Flight Height Categories			Use in RSZ	Frequency in RSZ
							< 35 m (115 ft)	RSZ: 35 - 200 m (115 - 656 ft)	> 200 m (656 ft)		
Picidae (Woodpeckers)	Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	5	5	0.02	100.0	5 (100.0)	0 (0.0)	0 (0.0)		
	Downy Woodpecker	<i>Dryobates pubescens</i>	15	15	0.05	100.0	15 (100.0)	0 (0.0)	0 (0.0)		
	Hairy Woodpecker	<i>Dryobates villosus</i>	6	6	0.02	100.0	6 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>26</b>	<b>26</b>	<b>0.09</b>	<b>100.0</b>	<b>26 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Tyrannidae (Flycatchers)	Eastern Kingbird	<i>Tyrannus tyrannus</i>	4	4	0.01	50.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Eastern Wood-Pewee	<i>Contopus virens</i>	1	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>5</b>	<b>7</b>	<b>0.02</b>	<b>63.6</b>	<b>7 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Vireonidae (Vireos)	Red-eyed Vireo	<i>Vireo olivaceus</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>100.0</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Laniidae (Shrikes)	Northern Shrike	<i>Lanius borealis</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>1</b>	<b>1</b>	<b>&lt; 0.01</b>	<b>100.0</b>	<b>1 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Corvidae (Crows & Allies)	Blue Jay	<i>Cyanocitta cristata</i>	75	88	0.31	94.6	88 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>75</b>	<b>88</b>	<b>0.31</b>	<b>94.6</b>	<b>88 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Paridae (Chickadees & Titmice)	Black-capped Chickadee	<i>Poecile atricapillus</i>	4	8	0.03	100.0	8 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>4</b>	<b>8</b>	<b>0.03</b>	<b>100.0</b>	<b>8 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Alaudidae (Larks)	Horned Lark	<i>Eremophila alpestris</i>	125	242	0.85	91.3	242 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>125</b>	<b>242</b>	<b>0.85</b>	<b>91.3</b>	<b>242 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Hirundinidae (Swallows)	Tree Swallow	<i>Tachycineta bicolor</i>	6	13	0.05	76.5	13 (100.0)	0 (0.0)	0 (0.0)		
	Barn Swallow	<i>Hirundo rustica</i>	139	219	0.77	92.0	219 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>145</b>	<b>232</b>	<b>0.81</b>	<b>91.0</b>	<b>232 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Regulidae (Kinglets)	Golden-crowned Kinglet	<i>Regulus satrapa</i>	4	12	0.04	100.0	12 (100.0)	0 (0.0)	0 (0.0)		
	Ruby-crowned Kinglet	<i>Corthylio calendula</i>	1	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>5</b>	<b>15</b>	<b>0.05</b>	<b>100.0</b>	<b>15 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Sittidae (Nuthatches)	White-breasted Nuthatch	<i>Sitta carolinensis</i>	2	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>2</b>	<b>2</b>	<b>0.01</b>	<b>100.0</b>	<b>2 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Mimidae (Thrashers & Allies)	Brown Thrasher	<i>Toxostoma rufum</i>	2	2	0.01	66.7	2 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>2</b>	<b>2</b>	<b>0.01</b>	<b>66.7</b>	<b>2 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Sturnidae (Starlings)	European Starling	<i>Sturnus vulgaris</i>	148	3388	11.85	78.4	3388 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>148</b>	<b>3388</b>	<b>11.85</b>	<b>78.4</b>	<b>3388 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Turdidae (Thrushes)	Eastern Bluebird	<i>Sialia sialis</i>	1	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	American Robin	<i>Turdus migratorius</i>	181	268	0.94	74.0	266 (99.3)	2 (0.7)	0 (0.0)	0.01	< 0.01
	<b>Family Subtotal:</b>		<b>182</b>	<b>272</b>	<b>0.95</b>	<b>74.3</b>	<b>270 (99.3)</b>	<b>2 (0.7)</b>	<b>0 (0.0)</b>	<b>0.01</b>	<b>&lt; 0.01</b>
Passeridae (Old World Sparrows)	House Sparrow	<i>Passer domesticus</i>	9	36	0.13	100.0	36 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>9</b>	<b>36</b>	<b>0.13</b>	<b>100.0</b>	<b>36 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Fringillidae (Finches)	House Finch	<i>Haemorhous mexicanus</i>	2	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
	American Goldfinch	<i>Spinus tristis</i>	40	58	0.20	90.6	58 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>42</b>	<b>61</b>	<b>0.21</b>	<b>91.0</b>	<b>61 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Calcariidae (Longspurs & Allies)	Snow Bunting	<i>Plectrophenax nivalis</i>	3	35	0.12	100.0	35 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>3</b>	<b>35</b>	<b>0.12</b>	<b>100.0</b>	<b>35 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Passerellidae (Sparrows & Allies)	Grasshopper Sparrow	<i>Ammodramus savannarum</i>	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Chipping Sparrow	<i>Spizella passerina</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	Field Sparrow	<i>Spizella pusilla</i>	34	51	0.18	92.7	51 (100.0)	0 (0.0)	0 (0.0)		
	American Tree Sparrow	<i>Spizelloides arborea</i>	46	102	0.36	97.1	102 (100.0)	0 (0.0)	0 (0.0)		
	Dark-eyed Junco	<i>Junco hyemalis</i>	30	96	0.34	93.2	96 (100.0)	0 (0.0)	0 (0.0)		
	White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	2	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Savannah Sparrow	<i>Passerculus sandwichensis</i>	2	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
Song Sparrow	<i>Melospiza melodia</i>	3	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)			
	<b>Family Subtotal:</b>		<b>119</b>	<b>261</b>	<b>0.91</b>	<b>94.9</b>	<b>261 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Icteridae (Blackbirds & Allies)	Eastern Meadowlark	<i>Sturnella magna</i>	2	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Baltimore Oriole	<i>Icterus galbula</i>	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	Red-winged Blackbird	<i>Agelaius phoeniceus</i>	232	662	2.31	73.0	616 (93.1)	46 (6.9)	0 (0.0)	0.16	0.01
	Brown-headed Cowbird	<i>Molothrus ater</i>	22	65	0.23	63.1	65 (100.0)	0 (0.0)	0 (0.0)		
	Common Grackle	<i>Quiscalus quiscula</i>	11	37	0.13	56.1	37 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>268</b>	<b>768</b>	<b>2.69</b>	<b>71.1</b>	<b>722 (94.0)</b>	<b>46 (6.0)</b>	<b>0 (0.0)</b>	<b>0.16</b>	<b>0.01</b>
Parulidae (Wood-Warblers)	Cape May Warbler	<i>Setophaga tigrina</i>	1	4	0.01	100.0	4 (100.0)	0 (0.0)	0 (0.0)		
	Yellow Warbler	<i>Setophaga petechia</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	Unidentified Warbler	-	1	2	0.01	100.0	2 (100.0)	0 (0.0)	0 (0.0)		
	<b>Family Subtotal:</b>		<b>3</b>	<b>7</b>	<b>0.02</b>	<b>100.0</b>	<b>7 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
Cardinalidae (Cardinals & Allies)	Scarlet Tanager	<i>Piranga olivacea</i>	1	1	< 0.01	100.0	1 (100.0)	0 (0.0)	0 (0.0)		
	Northern Cardinal	<i>Cardinalis cardinalis</i>	19	21	0.07	87.5	21 (100.0)	0 (0.0)	0 (0.0)		
	Indigo Bunting	<i>Passerina cyanea</i>	2	3	0.01	100.0	3 (100.0)	0 (0.0)	0 (0.0)		
	Dickcissel	<i>Spiza americana</i>	0	0	0.00	0.0	0 (-)	0 (-)	0 (-)		
	<b>Family Subtotal:</b>		<b>22</b>	<b>25</b>	<b>0.09</b>	<b>86.2</b>	<b>25 (100.0)</b>	<b>0 (0.0)</b>	<b>0 (0.0)</b>		
<b>Total</b>			<b>1187</b>	<b>5477</b>	<b>19.15</b>	<b>79.4</b>	<b>5429 (99.1)</b>	<b>48 (0.9)</b>	<b>0 (0.0)</b>	<b>0.17</b>	<b>0.01</b>

**APPENDIX B**

**SPECIES OBSERVED DURING 2022 – 2023 AVIAN USE  
SURVEYS**

**CONFIDENTIAL: DO NOT DISTRIBUTE**

**Appendix B. Species Observed during 2022 – 2023 Avian Use Surveys**

Common Name	Scientific Name	Season <sup>a</sup>				Conservation Listing Status	
		Fall	Winter	Spring	Summer	State Status <sup>b</sup>	Federal Status <sup>c</sup>
American Black Duck	<i>Anas rubripes</i>				X	-	-
American Crow	<i>Corvus brachyrhynchos</i>	X	X	X	X	-	-
American Goldfinch	<i>Spinus tristis</i>	X	X	X	X	-	-
American Kestrel	<i>Falco sparverius</i>	X	X	X	X	-	-
American Pipit	<i>Anthus rubescens</i>	X				-	-
American Robin	<i>Turdus migratorius</i>	X		X	X	-	-
American Tree Sparrow	<i>Spizelloides arborea</i>	X	X	X		-	-
Bald Eagle	<i>Haliaeetus leucocephalus</i>	X	X	X	X	SC	BGEPA
Baltimore Oriole	<i>Icterus galbula</i>	X		X		-	-
Bank Swallow	<i>Riparia riparia</i>			X	X	-	-
Barn Swallow	<i>Hirundo rustica</i>	X		X	X	-	-
Black-capped Chickadee	<i>Poecile atricapillus</i>	X	X			-	-
Blue Jay	<i>Cyanocitta cristata</i>	X	X	X	X	-	-
Bobolink	<i>Dolichonyx oryzivorus</i>	X		X	X	-	-
Bonaparte's Gull	<i>Chroicocephalus philadelphia</i>	X		X		-	-
Brown Thrasher	<i>Toxostoma rufum</i>			X	X	-	-
Brown-headed Cowbird	<i>Molothrus ater</i>	X		X	X	-	-
Canada Goose	<i>Branta canadensis</i>	X	X	X	X	-	-
Cedar Waxwing	<i>Bombycilla cedrorum</i>	X			X	-	-
Chimney Swift	<i>Chaetura pelagica</i>				X	-	-
Chipping Sparrow	<i>Spizella passerina</i>			X	X	-	-
Clay-colored Sparrow	<i>Spizella pallida</i>				X	-	-
Cliff Swallow	<i>Petrochelidon pyrrhonota</i>	X		X	X	-	-
Common Grackle	<i>Quiscalus quiscula</i>	X		X	X	-	-
Common Yellowthroat	<i>Geothlypis trichas</i>	X			X	-	-

**Appendix B. Species Observed during 2022 – 2023 Avian Use Surveys**

Common Name	Scientific Name	Season <sup>a</sup>				Conservation Listing Status	
		Fall	Winter	Spring	Summer	State Status <sup>b</sup>	Federal Status <sup>c</sup>
Cooper's Hawk	<i>Accipiter cooperii</i>	X	X	X	X	-	-
Dark-eyed Junco	<i>Junco hyemalis</i>	X	X			-	-
Dickcissel	<i>Spiza americana</i>				X	SC	-
Downy Woodpecker	<i>Dryobates pubescens</i>	X			X	-	-
Eastern Bluebird	<i>Sialia sialis</i>	X	X	X	X	-	-
Eastern Kingbird	<i>Tyrannus tyrannus</i>				X	-	-
Eastern Meadowlark	<i>Sturnella magna</i>			X	X	SC	-
Eastern Phoebe	<i>Sayornis phoebe</i>	X				-	-
Eastern Towhee	<i>Pipilo erythrophthalmus</i>			X		-	-
Eastern Wood-Pewee	<i>Contopus virens</i>	X			X	-	-
European Starling	<i>Sturnus vulgaris</i>	X	X	X	X	-	-
Field Sparrow	<i>Spizella pusilla</i>			X	X	-	-
Gray Catbird	<i>Dumetella carolinensis</i>	X		X	X	-	-
Great Blue Heron	<i>Ardea herodias</i>	X	X	X	X	-	-
Great Crested Flycatcher	<i>Myiarchus crinitus</i>				X	-	-
Greater Yellowlegs	<i>Tringa melanoleuca</i>	X		X		-	-
Green Heron	<i>Butorides virescens</i>	X			X	-	-
Hairy Woodpecker	<i>Dryobates villosus</i>	X				-	-
Herring Gull	<i>Larus argentatus</i>		X	X		-	-
Horned Lark	<i>Eremophila alpestris</i>	X	X	X	X	-	-
House Finch	<i>Haemorhous mexicanus</i>	X	X	X	X	-	-
House Sparrow	<i>Passer domesticus</i>	X	X	X	X	-	-
House Wren	<i>Troglodytes aedon</i>				X	-	-
Indigo Bunting	<i>Passerina cyanea</i>	X		X	X	-	-
Killdeer	<i>Charadrius vociferus</i>	X	X	X	X	-	-

**Appendix B. Species Observed during 2022 – 2023 Avian Use Surveys**

Common Name	Scientific Name	Season <sup>a</sup>				Conservation Listing Status	
		Fall	Winter	Spring	Summer	State Status <sup>b</sup>	Federal Status <sup>c</sup>
Lapland Longspur	<i>Calcarius lapponicus</i>	X	X	X		-	-
Least Sandpiper	<i>Calidris minutilla</i>			X		-	-
Lesser Yellowlegs	<i>Tringa flavipes</i>				X	-	-
Mallard	<i>Anas platyrhynchos</i>			X	X	-	-
Magnolia Warbler	<i>Setophaga magnolia</i>			Incidental		-	-
Merlin	<i>Falco columbarius</i>		X			SC	-
Mourning Dove	<i>Zenaidra macroura</i>	X	X	X	X	-	-
Nashville Warbler	<i>Oreothlypis ruficapilla</i>			X		-	-
Northern Cardinal	<i>Cardinalis cardinalis</i>	X		X	X	-	-
Northern Flicker	<i>Colaptes auratus</i>	X		X	X	-	-
Northern Harrier	<i>Circus hudsonius</i>	X	X	X	X	SC	-
Northern Rough-winged Swallow	<i>Stelgidopteryx serripennis</i>			X		-	-
Northern Shrike	<i>Lanius borealis</i>		Incidental			-	-
Orchard Oriole	<i>Icterus spurius</i>				Incidental	-	-
Palm Warbler	<i>Setophaga palmarum</i>	X				-	-
Pileated Woodpecker	<i>Dryocopus pileatus</i>	X	X	X	X	-	-
Purple Martin	<i>Progne subis</i>	X				-	-
Red-bellied Woodpecker	<i>Melanerpes carolinus</i>	X	X	X	X	-	-
Red-eyed Vireo	<i>Vireo olivaceus</i>				X	-	-
Red-headed Woodpecker	<i>Melanerpes erythrocephalus</i>	X				SC	-
Red-tailed Hawk	<i>Buteo jamaicensis</i>	X	X	X	X	-	-
Red-winged Blackbird	<i>Agelaius phoeniceus</i>	X	X	X	X	-	-
Ring-billed Gull	<i>Larus delawarensis</i>	X	X	X	X	-	-
Ring-necked Pheasant	<i>Phasianus colchicus</i>	X	X	X	X	-	-
Rock Pigeon	<i>Columba livia</i>	X	X	X	X	-	-

**Appendix B. Species Observed during 2022 – 2023 Avian Use Surveys**

Common Name	Scientific Name	Season <sup>a</sup>				Conservation Listing Status	
		Fall	Winter	Spring	Summer	State Status <sup>b</sup>	Federal Status <sup>c</sup>
Rose-breasted Grosbeak	<i>Pheucticus ludovicianus</i>			X		-	-
Rough-legged Hawk	<i>Buteo lagopus</i>			X		-	-
Sandhill Crane	<i>Antigone canadensis</i>	X	X	X	X	-	-
Savannah Sparrow	<i>Passerculus sandwichensis</i>	X		X	X	-	-
Scarlet Tanager	<i>Piranga olivacea</i>			X	X	-	-
Sharp-shinned Hawk	<i>Accipiter striatus</i>	X				-	-
Snow Bunting	<i>Plectrophenax nivalis</i>		X	Incidental		-	-
Song Sparrow	<i>Melospiza melodia</i>	X		X	X	-	-
Spotted Sandpiper	<i>Actitis macularius</i>			X	X	-	-
Tennessee Warbler	<i>Oreothlypis peregrina</i>			X		-	-
Tufted Titmouse	<i>Baeolophus bicolor</i>			X	X	-	-
Tundra Swan	<i>Cygnus columbianus</i>			X		-	-
Turkey Vulture	<i>Cathartes aura</i>	X		X	X	-	-
Vesper Sparrow	<i>Pooecetes gramineus</i>	X		X	X	-	-
Warbling Vireo	<i>Vireo gilvus</i>			X	X	-	-
White-breasted Nuthatch	<i>Sitta carolinensis</i>	X	X	X	X	-	-
White-crowned Sparrow	<i>Zonotrichia leucophrys</i>	X				-	-
Wild Turkey	<i>Meleagris gallopavo</i>	X	X	X	X	-	-
Willow Flycatcher	<i>Empidonax traillii</i>				X	-	-
Wilson's Snipe	<i>Gallinago delicata</i>			X		-	-
Wood Duck	<i>Aix sponsa</i>			X		-	-
Wood Thrush	<i>Hylocichla mustelina</i>				X	SC	-
Yellow Warbler	<i>Setophaga petechia</i>			X		-	-

**Appendix B. Species Observed during 2022 – 2023 Avian Use Surveys**

Common Name	Scientific Name	Season <sup>a</sup>				Conservation Listing Status	
		Fall	Winter	Spring	Summer	State Status <sup>b</sup>	Federal Status <sup>c</sup>

<sup>a</sup> An "X" within a particular seasonal column indicates that species has been detected at least once within the project area over the course of standardized field studies (i.e., long-duration or short-duration surveys). Species marked with "Incidental" indicate that the species was observed incidentally within the project area during the season. While diurnal avian activity survey data were truncated at a distance of 300 m and 800 m for small and large bird analysis, respectively, all birds were recorded as standardized during these surveys and are therefore given an "X" if detected at any distance during diurnal avian activity surveys. As a result, some species may receive an "X" in the table above and be excluded from tables in Appendix C since the species was only detected beyond the 300 m or 800 m cut-offs.

<sup>b</sup> State Status Codes: SC = Species of Special Concern.

<sup>c</sup> Federal Status Codes: BGEPA = Bald and Golden Eagle Protection Act; No federally threatened or endangered species were detected within the project area over the course of Year 2 avian studies.

## **APPENDIX C**

### **SEASONAL SPECIES GROUP MEAN USE STATISTICS**

**CONFIDENTIAL: DO NOT DISTRIBUTE**

**Appendix C-1. Seasonal Mean Use Statistics for Small-Bodied Non-Passerines and Passerines (Diurnal Avian Activity Surveys)**

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
<b>SMALL-BODIED NON-PASSERINES</b>																				
Chimney Swift	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	2.0	0.019	0.139	0.019
Downy Woodpecker	3	2.6	0.029	0.168	0.029	0	-	-	-	-	0	-	-	-	-	1	2.0	0.019	0.139	0.019
Hairy Woodpecker	3	2.6	0.029	0.168	0.029	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Mourning Dove	98	86.0	0.942	2.669	0.269	63	98.4	0.808	7.020	0.026	22	88.0	0.282	0.737	0.167	37	75.5	0.712	1.808	0.269
Northern Flicker	3	2.6	0.029	0.168	0.029	0	-	-	-	-	3	12.0	0.038	0.194	0.038	8	16.3	0.154	0.364	0.154
Red-bellied Woodpecker	6	5.3	0.058	0.234	0.058	1	1.6	0.013	0.113	0.013	0	-	-	-	-	2	4.1	0.038	0.194	0.038
Red-headed Woodpecker	1	0.9	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
<b>ALL SMALL-BODIED NON-PASSERINES</b>	<b>114</b>	<b>8.2</b>	<b>1.096</b>	<b>2.722</b>	<b>0.346</b>	<b>64</b>	<b>10.7</b>	<b>0.821</b>	<b>7.019</b>	<b>0.038</b>	<b>25</b>	<b>4.5</b>	<b>0.321</b>	<b>0.747</b>	<b>0.205</b>	<b>49</b>	<b>7.7</b>	<b>0.942</b>	<b>1.862</b>	<b>0.423</b>
<b>PASSERINES</b>																				
American Goldfinch	60	8.3	0.577	1.863	0.317	26	6.9	0.333	2.719	0.038	8	1.8	0.103	0.345	0.090	12	2.2	0.231	0.469	0.212
American Pipit	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
American Robin	11	1.5	0.106	0.339	0.096	0	-	-	-	-	19	4.2	0.244	0.488	0.218	27	5.0	0.519	0.542	0.500
American Tree Sparrow	3	0.4	0.029	0.218	0.019	14	3.7	0.179	1.365	0.038	3	0.7	0.038	0.252	0.026	0	-	-	-	-
Baltimore Oriole	1	0.1	0.010	0.098	0.010	0	-	-	-	-	2	0.4	0.026	0.159	0.038	0	-	-	-	-
Bank Swallow	0	-	-	-	-	0	-	-	-	-	1	0.2	0.013	0.113	0.013	5	0.9	0.096	0.358	0.077
Barn Swallow	22	3.0	0.212	0.889	0.106	0	-	-	-	-	4	0.9	0.051	0.274	0.038	42	7.8	0.808	3.581	0.192
Black-capped Chickadee	5	0.7	0.048	0.215	0.048	1	0.3	0.013	0.113	0.013	0	-	-	-	-	0	-	-	-	-
Blue Jay	39	5.4	0.375	0.578	0.356	1	0.3	0.013	0.113	0.026	6	1.3	0.077	0.268	0.077	4	0.7	0.077	0.269	0.077
Bobolink	1	0.1	0.010	0.098	0.010	0	-	-	-	-	2	0.4	0.026	0.159	0.026	3	0.6	0.058	0.235	0.058
Brown Thrasher	0	-	-	-	-	0	-	-	-	-	1	0.2	0.013	0.113	0.013	2	0.4	0.038	0.194	0.038
Brown-headed Cowbird	5	0.7	0.048	0.490	0.010	0	-	-	-	-	5	1.1	0.064	0.247	0.064	2	0.4	0.038	0.194	0.038
Cedar Waxwing	40	5.5	0.385	3.380	0.019	0	-	-	-	-	0	-	-	-	-	7	1.3	0.135	0.627	0.058
Chipping Sparrow	0	-	-	-	-	0	-	-	-	-	7	1.5	0.090	0.288	0.090	10	1.9	0.192	0.398	0.192
Clay-colored Sparrow	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	0.2	0.019	0.139	0.019
Cliff Swallow	1	0.1	0.010	0.098	0.010	0	-	-	-	-	1	0.2	0.013	0.113	0.013	3	0.6	0.058	0.308	0.038
Common Grackle	13	1.8	0.125	1.180	0.019	0	-	-	-	-	7	1.5	0.090	0.401	0.051	11	2.1	0.212	0.957	0.058
Common Yellowthroat	3	0.4	0.029	0.218	0.019	0	-	-	-	-	0	-	-	-	-	6	1.1	0.115	0.323	0.115
Dark-eyed Junco	1	0.1	0.010	0.098	0.010	3	0.8	0.038	0.194	0.038	0	-	-	-	-	0	-	-	-	-
Dickcissel	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	0.2	0.019	0.139	0.019
Eastern Bluebird	10	1.4	0.096	0.407	0.067	1	0.3	0.013	0.113	0.013	3	0.7	0.038	0.194	0.038	1	0.2	0.019	0.139	0.019
Eastern Kingbird	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	3	0.6	0.058	0.235	0.058
Eastern Meadowlark	0	-	-	-	-	0	-	-	-	-	5	1.1	0.064	0.247	0.064	3	0.6	0.058	0.308	0.038
Eastern Phoebe	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Eastern Towhee	0	-	-	-	-	0	-	-	-	-	1	0.2	0.013	0.113	0.013	0	-	-	-	-
Eastern Wood-Pewee	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	2	0.4	0.038	0.194	0.038

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
European Starling	381	52.4	3.663	19.684	0.221	245	65.0	3.141	27.741	0.013	53	11.7	0.679	3.261	0.064	145	27.1	2.788	13.571	0.173
Field Sparrow	0	-	-	-	-	0	-	-	-	-	2	0.4	0.026	0.159	0.026	0	-	-	-	-
Gray Catbird	1	0.1	0.010	0.098	0.010	0	-	-	-	-	1	0.2	0.013	0.113	0.013	4	0.7	0.077	0.269	0.077
Great Crested Flycatcher	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	0.2	0.019	0.139	0.019
Horned Lark	22	3.0	0.212	0.534	0.163	22	5.8	0.282	0.556	0.231	136	30.0	1.744	9.737	0.423	27	5.0	0.519	0.779	0.365
House Finch	1	0.1	0.010	0.098	0.010	2	0.5	0.026	0.159	0.026	4	0.9	0.051	0.222	0.051	5	0.9	0.096	0.298	0.096
House Sparrow	44	6.1	0.423	2.591	0.058	6	1.6	0.077	0.419	0.038	4	0.9	0.051	0.357	0.026	6	1.1	0.115	0.379	0.096
House Wren	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	10	1.9	0.192	0.398	0.192
Indigo Bunting	2	0.3	0.019	0.196	0.010	0	-	-	-	-	1	0.2	0.013	0.113	0.013	8	1.5	0.154	0.364	0.154
Lapland Longspur	1	0.1	0.010	0.098	0.010	7	1.9	0.090	0.514	0.038	29	6.4	0.372	2.950	0.038	0	-	-	-	-
Nashville Warbler	0	-	-	-	-	0	-	-	-	-	1	0.2	0.013	0.113	0.013	0	-	-	-	-
Northern Cardinal	7	1.0	0.067	0.320	0.058	0	-	-	-	-	3	0.7	0.038	0.194	0.064	1	0.2	0.019	0.139	0.019
Northern Rough-winged Swallow	0	-	-	-	-	0	-	-	-	-	2	0.4	0.026	0.226	0.013	0	-	-	-	-
Palm Warbler	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Purple Martin	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Red-eyed Vireo	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	2	0.4	0.038	0.194	0.038
Red-winged Blackbird	25	3.4	0.240	1.038	0.077	25	6.6	0.321	2.831	0.013	100	22.1	1.282	1.999	0.577	122	22.8	2.346	5.884	0.596
Rose-breasted Grosbeak	0	-	-	-	-	0	-	-	-	-	1	0.2	0.013	0.113	0.013	0	-	-	-	-
Savannah Sparrow	1	0.1	0.010	0.098	0.010	0	-	-	-	-	7	1.5	0.090	0.288	0.090	15	2.8	0.288	0.498	0.269
Scarlet Tanager	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	0.2	0.019	0.139	0.019
Snow Bunting	0	-	-	-	-	21	5.6	0.269	2.160	0.026	0	-	-	-	-	0	-	-	-	-
Song Sparrow	17	2.3	0.163	0.559	0.106	0	-	-	-	-	22	4.9	0.282	0.532	0.244	34	6.3	0.654	0.590	0.596
Tennessee Warbler	0	-	-	-	-	0	-	-	-	-	2	0.4	0.026	0.159	0.026	0	-	-	-	-
Tufted Titmouse	0	-	-	-	-	1	0.3	0.013	0.113	0.013	2	0.4	0.026	0.159	0.026	0	-	-	-	-
Unknown Blackbird	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Unknown Passerine	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Unknown Sparrow	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Vesper Sparrow	1	0.1	0.010	0.098	0.010	0	-	-	-	-	1	0.2	0.013	0.113	0.013	3	0.6	0.058	0.235	0.058
Warbling Vireo	0	-	-	-	-	0	-	-	-	-	2	0.4	0.026	0.159	0.026	4	0.7	0.077	0.269	0.077
White-breasted Nuthatch	0	-	-	-	-	2	0.5	0.026	0.159	0.026	1	0.2	0.013	0.113	0.013	1	0.2	0.019	0.139	0.019
White-crowned Sparrow	1	0.1	0.010	0.098	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Willow Flycatcher	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	0.2	0.019	0.139	0.019
Wood Thrush	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-	1	0.2	0.019	0.139	0.019
Yellow Warbler	0	-	-	-	-	0	-	-	-	-	4	0.9	0.051	0.222	0.051	0	-	-	-	-
<b>ALL PASSERINES</b>	<b>727</b>	<b>52.5</b>	<b>6.990</b>	<b>20.467</b>	<b>0.798</b>	<b>377</b>	<b>62.8</b>	<b>4.833</b>	<b>27.960</b>	<b>0.436</b>	<b>453</b>	<b>81.2</b>	<b>5.808</b>	<b>13.083</b>	<b>0.859</b>	<b>536</b>	<b>84.3</b>	<b>10.308</b>	<b>18.663</b>	<b>1.000</b>

<sup>a</sup>Total Std. Detections is the total number of standardized detections within a 300-m radius of the point count station during standardized diurnal avian activity surveys. Birds detected at all flight heights were recorded, analyzed, and presented in this table.

<sup>b</sup>% Comp. (i.e., percent composition) is the percent of a particular species group that a particular species comprises during the season using total standardized detections. For rows summarizing species groups, percent composition is the percent of all birds represented by the species group.

<sup>c</sup>Mean Use is the total standardized detections divided by the total number of 10-minute point count surveys conducted within the season.

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>

<sup>d</sup>SD is the standard deviation of Mean Use.

<sup>e</sup>Occur. Freq. (i.e., Occurrence Frequency) is the proportion of diurnal avian activity point count surveys at which a particular species was detected during the season.

**Appendix C-2. Seasonal Mean Use Statistics for Large-Bodied Corvids, Large-Bodied Non-Passerines, and Upland Gamebirds (Diurnal Avian Activity Surveys)**

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
<b>LARGE-BODIED CORVIDS</b>																				
American Crow	147	100.0	1.413	5.812	0.250	9	100.0	0.115	0.603	0.038	17	100.0	0.218	0.573	0.154	43	100.0	0.827	4.668	0.058
<b>ALL LARGE-BODIED CORVIDS</b>	<b>147</b>	<b>10.6</b>	<b>1.413</b>	<b>5.812</b>	<b>0.250</b>	<b>9</b>	<b>1.5</b>	<b>0.115</b>	<b>0.603</b>	<b>0.038</b>	<b>17</b>	<b>3.0</b>	<b>0.218</b>	<b>0.573</b>	<b>0.154</b>	<b>43</b>	<b>6.8</b>	<b>0.827</b>	<b>4.668</b>	<b>0.058</b>
<b>LARGE-BODIED NON-PASSERINES</b>																				
Pileated Woodpecker	1	1.2	0.010	0.098	0.010	0	0.0	0.000	0.000	0.000	0	0.0	0.000	0.000	0.000	0	-	-	-	-
Rock Pigeon	84	98.8	0.808	5.902	0.019	147	100.0	1.885	10.705	0.038	15	100.0	0.192	1.588	0.026	0	-	-	-	-
<b>ALL LARGE-BODIED NON-PASSERINES</b>	<b>85</b>	<b>6.1</b>	<b>0.817</b>	<b>5.902</b>	<b>0.029</b>	<b>147</b>	<b>24.5</b>	<b>1.885</b>	<b>10.705</b>	<b>0.038</b>	<b>15</b>	<b>2.7</b>	<b>0.192</b>	<b>1.588</b>	<b>0.026</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>UPLAND GAMEBIRDS</b>																				
Ring-necked Pheasant	0	-	-	-	-	0	-	-	-	-	1	100.0	0.013	0.113	0.013	1	100.0	0.019	0.139	0.019
Wild Turkey	54	100.0	0.519	5.295	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
<b>ALL UPLAND GAMEBIRDS</b>	<b>54</b>	<b>3.9</b>	<b>0.519</b>	<b>5.295</b>	<b>0.010</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>0.2</b>	<b>0.013</b>	<b>0.113</b>	<b>0.013</b>	<b>1</b>	<b>0.2</b>	<b>0.019</b>	<b>0.139</b>	<b>0.019</b>

<sup>a</sup>Total Std. Detections is the total number of standardized detections within a 800-m radius of the point count station during standardized diurnal avian activity surveys. Birds detected at all flight heights were recorded, analyzed, and presented in this table.

<sup>b</sup>% Comp. (i.e., percent composition) is the percent of a particular species group that a particular species comprises during the season using total standardized detections. For rows summarizing species groups, percent composition is the percent of all birds represented by the species group.

<sup>c</sup>Mean Use is the total standardized detections divided by the total number of 10-minute point count surveys conducted within the season.

<sup>d</sup>SD is the standard deviation of Mean Use.

<sup>e</sup>Occur. Freq. (i.e., Occurrence Frequency) is the proportion of diurnal avian activity point count surveys at which a particular species was detected during the season.

**Appendix C-3. Seasonal Mean Use Statistics for Raptors (Diurnal Avian Activity Surveys)**

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
American Kestrel	0	-	-	-	-	1	33.3	0.013	0.113	0.013	0	-	-	-	-	1	25.0	0.019	0.139	0.019
Bald Eagle <sup>f</sup>	5	21.7	0.048	0.256	0.038	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Cooper's Hawk	4	17.4	0.038	0.193	0.038	0	-	-	-	-	1	50.0	0.013	0.113	0.013	0	-	-	-	-
Northern Harrier	0	-	-	-	-	0	-	-	-	-	1	50.0	0.013	0.113	0.013	1	25.0	0.019	0.139	0.019
Red-tailed Hawk	5	21.7	0.048	0.256	0.038	2	66.7	0.026	0.226	0.013	0	-	-	-	-	1	25.0	0.019	0.139	0.019
Turkey Vulture	9	39.1	0.087	0.315	0.077	0	-	-	-	-	0	-	-	-	-	1	25.0	0.019	0.139	0.019
<b>ALL RAPTORS</b>	<b>23</b>	<b>1.7</b>	<b>0.221</b>	<b>0.574</b>	<b>0.154</b>	<b>3</b>	<b>0.5</b>	<b>0.038</b>	<b>0.252</b>	<b>0.026</b>	<b>2</b>	<b>0.4</b>	<b>0.026</b>	<b>0.159</b>	<b>0.026</b>	<b>4</b>	<b>0.6</b>	<b>0.077</b>	<b>0.334</b>	<b>0.058</b>

<sup>a</sup> Total Std. Detections is the total number of standardized detections within a 800-m radius of the point count station during standardized diurnal avian activity surveys. Birds detected at all flight heights were recorded, analyzed, and presented in this table.

<sup>b</sup> % Comp. (i.e., percent composition) is the percent of a particular species group that a particular species comprises during the season using total standardized detections. For rows summarizing species groups, percent composition is the percent of all birds represented by the species group.

<sup>c</sup> Mean Use is the total standardized detections divided by the total number of 10-minute point count surveys conducted within the season.

<sup>d</sup> SD is the standard deviation of Mean Use.

<sup>e</sup> Occur. Freq. (i.e., Occurrence Frequency) is the proportion of diurnal avian activity point count surveys at which a particular species was detected during the season.

<sup>f</sup> Bald Eagle is protected under the Bald and Golden Eagle Protection Act

**Appendix C-4. Seasonal Mean Use Statistics for Shorebirds, Waders, and Waterbirds (Diurnal Avian Activity Surveys)**

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
<b>SHOREBIRDS</b>																				
Killdeer	98	100.0	0.942	5.704	0.029	0	-	-	-	-	13	92.9	0.167	0.545	0.115	3	100.0	0.058	0.308	0.038
Wilson's Snipe	0	-	-	-	-	0	-	-	-	-	1	7.1	0.013	0.113	0.013	0	-	-	-	-
<b>ALL SHOREBIRDS</b>	<b>98</b>	<b>7.1</b>	<b>0.942</b>	<b>5.704</b>	<b>0.029</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>14</b>	<b>2.5</b>	<b>0.179</b>	<b>0.619</b>	<b>0.115</b>	<b>3</b>	<b>0.5</b>	<b>0.058</b>	<b>0.308</b>	<b>0.038</b>
<b>WADERS</b>																				
Great Blue Heron	0	-	-	-	-	0	-	-	-	-	1	33.3	0.013	0.113	0.013	0	-	-	-	-
Sandhill Crane	2	100.0	0.019	0.196	0.010	0	-	-	-	-	2	66.7	0.026	0.226	0.013	0	-	-	-	-
<b>ALL WADERS</b>	<b>2</b>	<b>0.1</b>	<b>0.019</b>	<b>0.196</b>	<b>0.010</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>0.5</b>	<b>0.038</b>	<b>0.252</b>	<b>0.026</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>
<b>WATERBIRDS</b>																				
Herring Gull	0	-	-	-	-	0	-	-	-	-	1	33.3	0.013	0.113	0.013	0	-	-	-	-
Ring-billed Gull	6	46.2	0.058	0.588	0.010	0	-	-	-	-	2	66.7	0.026	0.226	0.013	0	-	-	-	-
Unknown Gull	7	53.8	0.067	0.376	0.038	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
<b>ALL WATERBIRDS</b>	<b>13</b>	<b>0.9</b>	<b>0.125</b>	<b>0.772</b>	<b>0.038</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>3</b>	<b>0.5</b>	<b>0.038</b>	<b>0.252</b>	<b>0.026</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

<sup>a</sup>Total Std. Detections is the total number of standardized detections within a 800-m radius of the point count station during standardized diurnal avian activity surveys. Birds detected at all flight heights were recorded, analyzed, and presented in this table.

<sup>b</sup>% Comp. (i.e., percent composition) is the percent of a particular species group that a particular species comprises during the season using total standardized detections. For rows summarizing species groups, percent composition is the percent of all birds represented by the species group.

<sup>c</sup>Mean Use is the total standardized detections divided by the total number of 10-minute point count surveys conducted within the season.

<sup>d</sup>SD is the standard deviation of Mean Use.

<sup>e</sup>Occur. Freq. (i.e., Occurrence Frequency) is the proportion of diurnal avian activity point count surveys at which a particular species was detected during the season.

**Appendix C-5. Seasonal Mean Use Statistics for Waterfowl (Diurnal Avian Activity Surveys)**

Common Name	Fall					Winter					Spring					Summer				
	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>	Total Std. Detections <sup>a</sup>	% Comp. <sup>b</sup>	Mean Use (birds/10 min. survey) <sup>c</sup>	SD <sup>d</sup>	Occur. Freq. <sup>e</sup>
Canada Goose	123	100.0	1.183	12.061	0.010	0	-	-	-	-	0	-	-	-	-	0	-	-	-	-
Tundra Swan	0	-	-	-	-	0	-	-	-	-	25	100.0	0.321	2.831	0.013	0	-	-	-	-
<b>ALL WATERFOWL</b>	<b>123</b>	<b>8.9</b>	<b>1.183</b>	<b>12.061</b>	<b>0.010</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>25</b>	<b>4.5</b>	<b>0.321</b>	<b>2.831</b>	<b>0.013</b>	<b>0</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>

<sup>a</sup>Total Std. Detections is the total number of standardized detections within a 800-m radius of the point count station during standardized diurnal avian activity surveys. Birds detected at all flight heights were recorded, analyzed, and presented in this table.

<sup>b</sup>% Comp. (i.e., percent composition) is the percent of a particular species group that a particular species comprises during the season using total standardized detections. For rows summarizing species groups, percent composition is the percent of all birds represented by the species group.

<sup>c</sup>Mean Use is the total standardized detections divided by the total number of 10-minute point count surveys conducted within the season.

<sup>d</sup>SD is the standard deviation of Mean Use.

<sup>e</sup>Occur. Freq. (i.e., Occurrence Frequency) is the proportion of diurnal avian activity point count surveys at which a particular species was detected during the season.