EXHIBIT 9-2 COMPREHENSIVE WILDLIFE REPORT

Comprehensive Wildlife Report

Western Maine Renewable Energy Project
Somerset County, Maine

Prepared For:

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EXECUTIVE SUMMARY

Western Maine Renewables, LLC is working to develop the Western Maine Renewable Energy Project (Project), a commercial wind energy project at the decommissioned Moscow Air Force Station Transmit Site in the Town of Moscow, Somerset County, Maine (Project Area). As currently envisioned, the Project would consist of approximately 14 Vestas 4.2-megawatt wind turbines on 105-meter towers generating a total of 58.8 megawatts of energy. A substation will be located within the Project Area and power from the wind turbines will be transmitted from the Project substation via an existing 115-kilovolt transmission line to the existing Wyman Hydro Substation. The Project Area, excluding the 115-kilovolt transmission right-of-way (ROW), is approximately 390 acres. The Project is in the planning process and will require permits from the United States Army Corps of Engineers, the Maine Department of Environmental Protection, and the Town of Moscow.

As part of Project planning, informal consultation with the U.S. Fish and Wildlife Service (USFWS) Maine Field Office, and recommendations from Maine Department of Inland Fisheries and Wildlife (MDIFW), a suite of natural resource assessments and field surveys were performed in the Project Area. Field studies were performed according to MDIFW's Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize bat Mortality and other relevant guidance and protocols.

Avian radar was not required, but a desktop analysis was performed that determined that the maximum blade tip heights of the turbines sited on artificially elevated terrain surrounding the Moscow Air Force Station will mostly be below the target flight heights for both spring and fall migrants, as measured by radar in 2012. A helicopter survey was flown and it was determined that there are no eagle or great blue heron nests within a 4-mile radius of the Project Area boundaries, although one great blue heron was observed incidentally during another survey. Breeding bird surveys did not detect any state or federally listed species in the Project Area. However, 11 Maine Species of Special Concern and 23 Species of Greatest Conservation Need were documented. Despite past records, no upland sandpipers (*Bartramia longicauda*) were observed in the Project Area in 2020 and it is likely that the available habitat is not suitable for the species. No suitable habitat for overwintering bats was identified in the Project Area. A summer bat acoustic survey confirmed the presence of five bat species in the Project Area: big brown bat (*Eptesicus fuscus*), eastern red bat (*Lasiurus borealis*), hoary bat (*Lasiurus cinereus*), silver-haired bat (*Lasionycteris noctivagans*), and little brown bat (*Myotis lucifugus*). Roaring Brook mayfly (*Epeorus frisoni*) and northern bog lemming (*Synaptomys borealis*) were not found in the Project Area, but northern spring salamander (*Gyrinophilus porphyriticus porphyriticus*) was confirmed present in Bassett Brook. Canada lynx (*Lynx canadensis*) were also confirmed present in the Project Area through camera trap surveys and tracking. Twelve (12) species of raptors were observed in the Project Area including one golden eagle (*Aquila chrysaetos*) that was observed passing through, and 15 bald eagles.

In addition to this Comprehensive Wildlife Report, full reports have been prepared for bat acoustics, Canada Lynx, and eagle use. A separate report for wetlands, vernal pools, and waterbodies has also been prepared.

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1.0 INTRODUCTION

Western Maine Renewables, LLC is working to develop the Western Maine Renewable Energy Project (Project), a commercial wind energy project at the decommissioned Moscow Air Force Station Transmit Site in the Town of Moscow, Somerset County, Maine (Project Area). As currently envisioned, the Project would consist of approximately 14 Vestas 4.2-megawatt wind turbines on 105-meter towers generating a total of 58.8 megawatts of energy. A substation will be located within the Project Area and power from the wind turbines will be transmitted from the Project substation via an existing 115-kilovolt transmission line to the existing Wyman Hydro Substation. The Project Area, excluding the 115-kilovolt transmission right-of-way (ROW), is approximately 390 acres. The Project is in the planning process and will require permits from the United States Army Corps of Engineers, the Maine Department of Environmental Protection, and the Town of Moscow.

As part of Project planning, informal consultation with the U.S. Fish and Wildlife Service (USFWS) Maine Field Office, and recommendations from Maine Department of Inland Fisheries and Wildlife (MDIFW), a Study Plan was developed to outline and describe natural resource surveys to be conducted in the Project Area (Tetra Tech 2020). The Study Plan was developed based on MDIFW's Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendations to Avoid/Minimize bat Mortality (Maine Wind Power Guidance), updated March 5, 2018 (MDIFW 2018); and MDIFW's Project-specific Preliminary Resource Survey Recommendations (MDIFW 2020a).

The structure of this Comprehensive Wildlife Report parallels MDIFW's Preliminary Resource Survey Recommendations letter and describes the actions performed to address each recommendation. This report describes studies performed in the Project Area in 2020 for eagle nests, breeding birds, upland sandpiper (*Bartramia longicauda*), bats, Roaring Brook mayfly (*Epeorus frisoni*), northern spring salamander (*Gyrinophilus porphyriticus porphyriticus*), northern bog lemming (*Synaptomys borealis*), golden eagle (*Aquila chrysaetos*), and great blue heron (*Ardea herodias*). In addition, this report provides summaries of the studies requested by the USFWS which include northern long-eared bat (*Myotis septentrionalis*) and Canada lynx (*Lynx canadensis*). Seven Appendices provide supporting information and data for the studies.

2.0 AVIAN RADAR

MDIFW did not request an avian radar study for the Project Area for 2020. In 2012, an avian radar study was performed in the Project Area for a previous proposal for a wind energy project. At MDIFW's request, that report was submitted to the agency along with three radar reports from the Canton Mountain Wind Project. MDIFW requested an update on the estimated maximum blade tip height for the proposed turbines for the Project, and an evaluation of the maximum blade tip heights in relation to the surrounding natural terrain. The proposed Project will utilize 14 Vestas 4.2-megawatt wind turbines on 105-meter towers. These turbines will have a rotor diameter of 150 meters. All other things held constant, each of these turbines will have a maximum blade tip height of 180 meters. MDIFW's concern is that the project will feature possibly eight turbines (Turbines 1–8) that will be on terrain that has been artificially elevated during the construction of the Moscow Air Force Station. The primary objective of this analysis was to determine how the additional elevation of each turbine pad impacts the maximum blade tip height for each turbine. These revised turbine heights can then be compared to the target flight heights measured by radar in 2012.

Based on an analysis using Google Earth and available contour information, the elevations of the proposed turbine locations ranges from 387 meters above sea level at Turbine 8 to 427 meters above sea level at

Turbine 1 (Table 1). Although benchmark elevations are available for larger land features like mountains and some hills (Figure 1), they are not available for smaller features. Thus, Google Earth was used to measure elevations around each turbine pad out to a 500-meter radius. Based on this desktop exercise, for Turbines 1–8 the difference in elevation between turbine pads and the surrounding natural landscape is estimated to range from 0 to 15 meters.

The known maximum turbine height for the models that will be used for the Project were combined with the approximate elevation of each turbine pad in order to calculate revised heights. The new heights, which will form the basis of comparison with target flight heights, ranges from 576 meters above sea level at Turbine 8 to 607 meters above sea level for Turbine 1 (Table 1).

Table 1. Turbine Pad Elevations and Maximum Blade Tip Heights Above Sea Level at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Turbine	Elevation (meters above sea level)	Turbine MBTH (meters)	MBTH (meters above sea level)
T1	427	180	607
T2	421	180	601
T3	421	180	601
T4	414	180	594
T5	403	180	583
T6	400	180	580
T7	400	180	580
T8	396	180	576
T9	450	180	630
T10	454	180	634
T11	440	180	620
T12	439	180	619
T13	451	180	631
T14	403	180	583
Radar Elevation (2012–2013)	**437**		

According to the 2012 radar data, nightly target flight heights range from 169 meters to 1,757 meters above ground level during fall migration and 170 meters to 563 meters above ground level during spring migration. It is important to note, however, that the radar unit measures height at the elevation at which the radar sits. In this case, the radar unit was situated at 437 meters above sea level. Thus, the target flight heights must also be adjusted in order to normalize the comparison between flight heights and the adjusted maximum blade tip heights (Table 2).

Table 2. Turbine Pad Elevations and Maximum Blade Tip Heights Above Sea Level at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Season	High Flight Height (meters above sea level)	Low Flight Height (meters above sea level)	Mean Flight Height (meters above sea level)
Fall	2,194	606	787
Spring	1,000	607	811

Based on this analysis, the maximum blade tip heights of the turbines sited on the artificially elevated terrain surrounding the Moscow Air Force Station (Turbines 1–8) will mostly be below the target flight heights for both spring and fall migrants, as measured by radar, with the exception of Turbine 1 (Figure 2). Turbines 9–13, which will be located on a natural ridge, extend slightly into the low flight height range for both spring and fall (Figure 2).

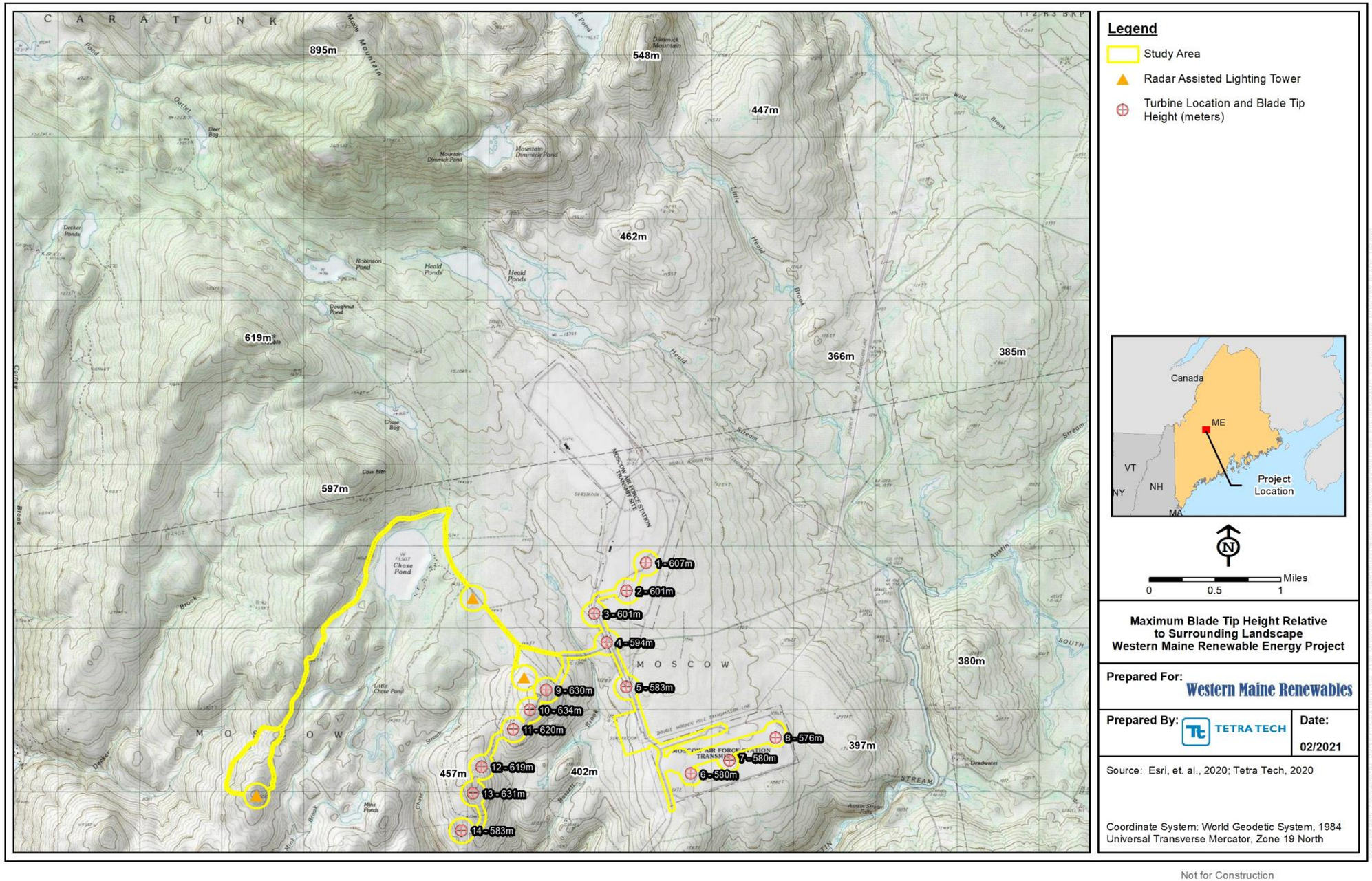


Figure 1. **Maximum Blade Tip Height Relative to Surrounding Landscape for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.**

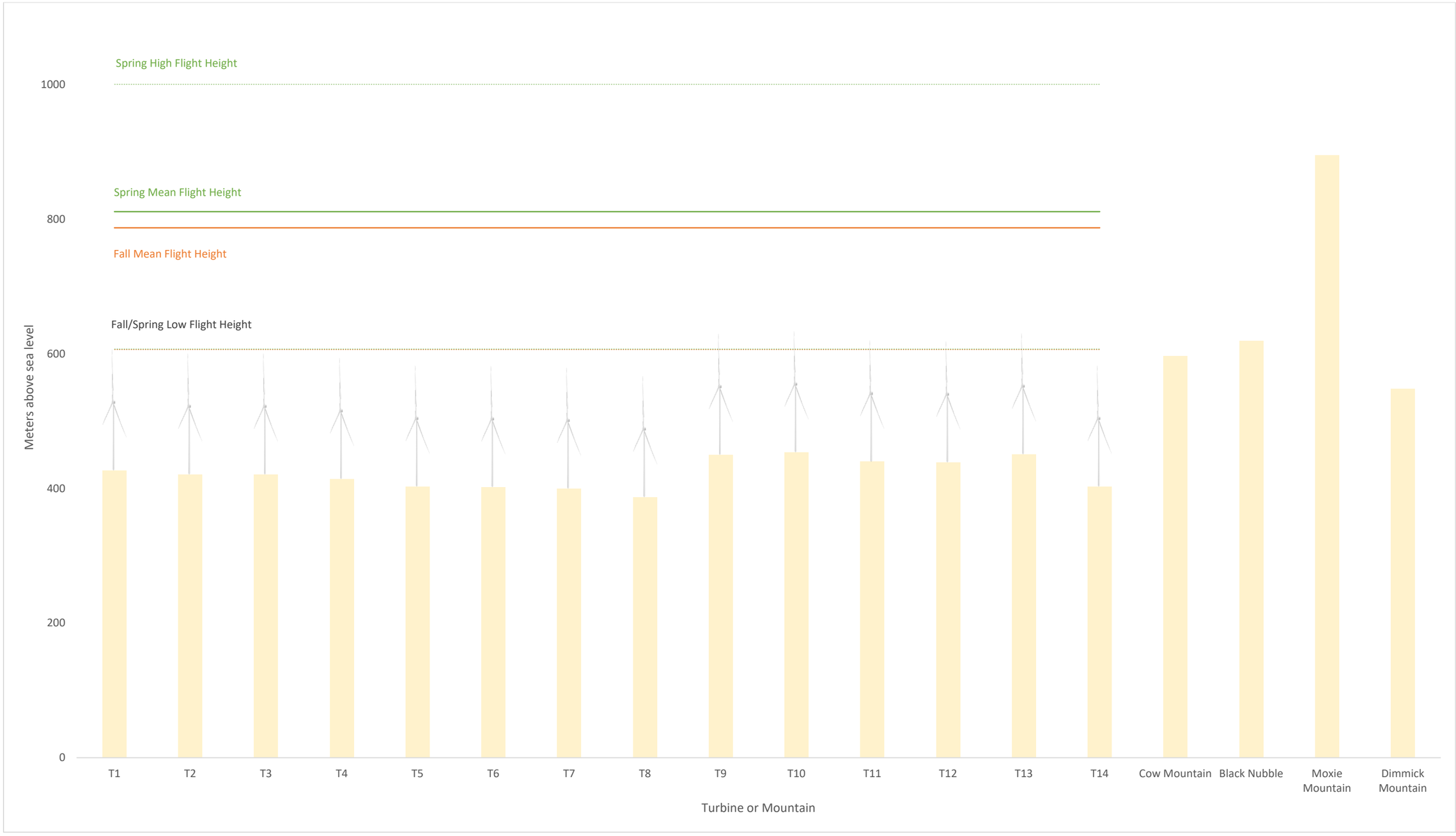


Figure 2. Maximum Blade Tip Height Relative to Bird Flight Heights for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

3.0 EAGLE NEST SURVEY

3.1 Introduction

Based on guidance from MDIFW (2020), the eagle nest survey was coordinated through the USFWS Maine Field Office and with the eagle coordinator for the USFWS Northeast Region. The USFWS recommended an aerial eagle nest survey within a 4-mile radius of the Project Area boundaries to look for new and existing nests. This survey updated a previous survey conducted on April 16, 2013. The 2013 survey used a 10-mile radius and identified three active bald eagle nests, and one active nest just outside the 10-mile radius area. All four of these nests were previously mapped by MDIFW, and all four nests were located in large, super-canopy eastern white pines (*Pinus strobus*) along the banks of the Kennebec River. There were no eagle nests found within the Project Area. The closest nest to the boundary of the Project Area (as previously proposed) was 5.4 miles (8.7 kilometers), and the mean inter-nest distance between the four nests was 7.08 miles (11.4 kilometers; Tetra Tech 2015).

3.2 Methods

Prior to fieldwork, Tetra Tech reviewed available information from the USFWS Maine Field Office Bald Eagle Map Tool (USFWS 2020a) and the 2013 survey results. The 2020 field survey was conducted by helicopter (Bell 206B Jet Ranger; Maine Helicopters out of Whitefield, ME) with one biologist in a 1-day effort, on May 20, 2020 in conjunction with the great blue heron survey (Section 11.0). The flight path ensured all wetland areas and all areas that showed forested areas with trees large enough to support an eagle nest were checked out to 4 miles from the current Project Area (Figure 3). The 4-mile search area is twice the survey or buffer distance recommended by the USFWS updated eagle nest survey protocol for wind energy projects (USFWS 2020b). The aerial survey included multiple passes along Wyman Lake (Kennebec River) to the southwest of the Project Area which was considered the best habitat for eagle nesting. The survey also included one stop in Greenville, Maine for refueling. Data collection parameters for the survey included GPS location, condition of the nest (i.e. active, inactive, not found), activity observed (i.e. incubating adult, number of eggs/nestlings), and number of adults present. Data on nests was collected using an Apple iPad and flight path was recorded using a Garmin 60CSx GPS unit. If eagle nests were observed, they were photographed using a Canon EOS-7D digital camera with a 100–400-millimeter telephoto lens.

3.3 Results

The USFWS Maine Field Office Bald Eagle Map Tool webpage and the 2013 survey did not identify any bald or golden eagle nests within 4 miles of the Project Area. All wetland and forested areas of interest were checked during the 2020 helicopter survey. No bald or golden eagle nests were found within the Project Area or within 4 miles of the Project Area. In addition, no bald eagles were observed flying or perched during the helicopter survey. Weather on the day of the survey was sunny and clear with visibility of at least 50 miles. The majority of the Project Area contains trees that are unsuitable to support a bald eagle nest.

3.4 Discussion

No bald or golden eagle nests were observed during the 2020 survey. The USFWS Bald Eagle Map Tool and the 2013 survey identified three active bald eagle nests within 10 miles of the Project Area (Tetra Tech 2015, USFWS 2020a). The closest of these nests to the current Project Area boundary was 5.4 miles (8.7 kilometers) which is outside of the current 4-mile survey area (Tetra Tech 2015). The results of the 2020 survey and the 2013 survey suggest that the Project Area is a low risk to nesting eagles.

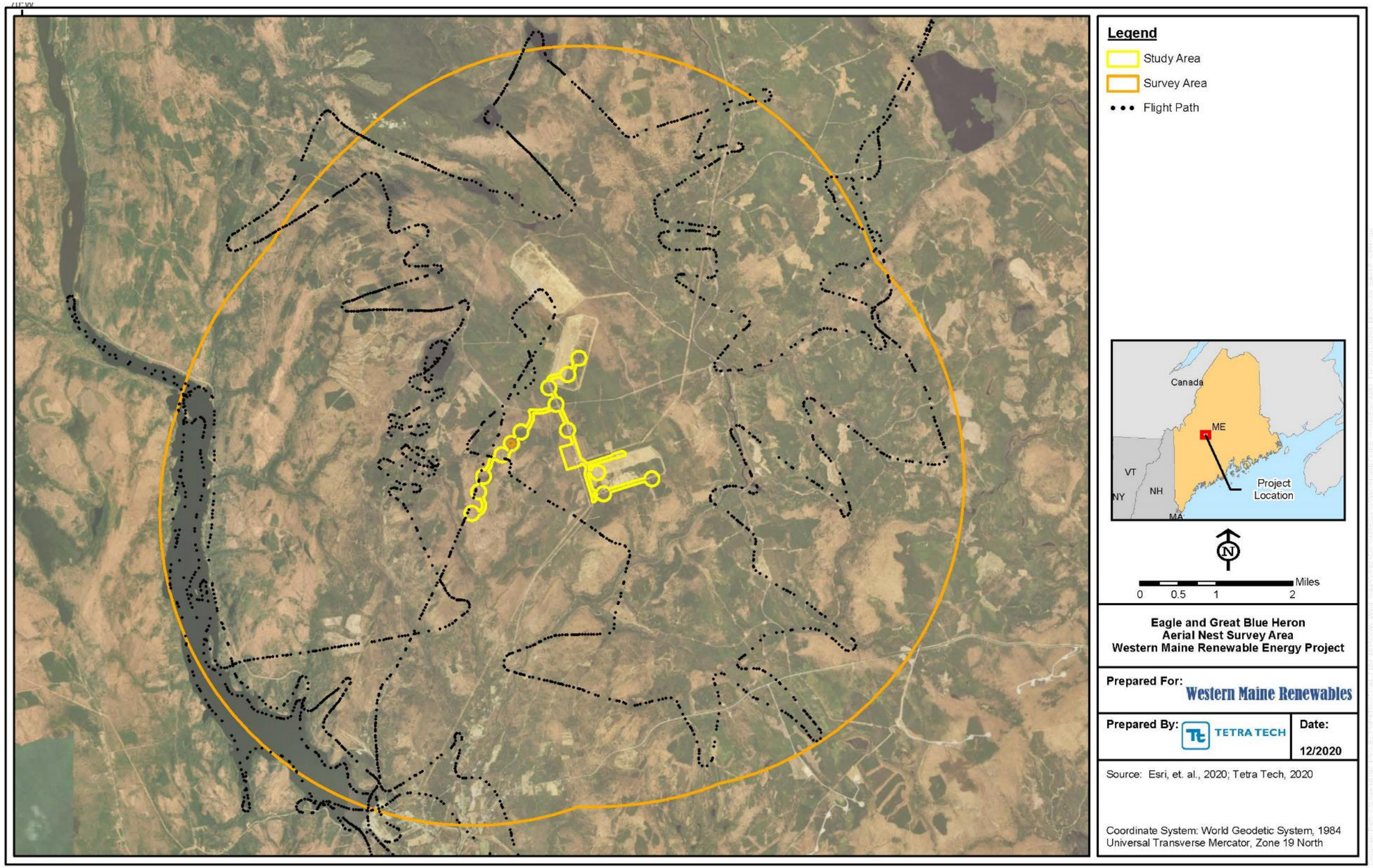


Figure 3. Eagle and Great Blue Heron Aerial Nest Survey Area and Flight Path for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

4.0 RAPTOR MIGRATION; RAPTOR USE

Raptor migration and raptor use surveys were previously conducted in the Project Area 2012–2013. MDIFW did not request additional raptor migration surveys but raptor data was collected by field biologists while conducting golden eagle surveys (Section 9.0)

5.0 BREEDING BIRD SURVEY

5.1 Introduction

In consideration of the time that has elapsed since the previous breeding bird survey was conducted (Tetra Tech 2015), MDIFW requested a new breeding bird survey be conducted in the Project Area (MDIFW 2020a). Breeding bird surveys focusing on listed or Species of Special Concern are a standard component of the Maine Wind Power Guidance (MDIFW 2018) and fulfill Tier 3 preconstruction field study recommendations of the USFWS Wind Energy Guidelines (USFWS 2012).

Multiple methodologies are used to monitor avian populations but the most practiced method, in part due to efficiency and ability to make comparisons between datasets, is the use of point count data (Robbins et al. 1986, Ralph et al. 1995). Standard use of point counts began in 1965 in response to widespread use of pesticides with the implementation of the *Breeding Bird Survey*, which aimed to establish a regional data set to calculate population trends using linear regression on logarithmic trend transformed data (Robbins et al. 1986). Point counts are now used to monitor patterns in avian abundance over time to identify relationships between specific species and habitat types, to determine population responses to environmental change or management, and to estimate species diversity. Point count surveys are conducted at established sites where observers record all individual birds detected by songs, calls, or visual cues within a fixed time interval (Young et al. 2007). On average, 70–90 percent of the total observations are auditory detections (Simons et al. 2007). Sites are typically surveyed multiple times a season to ensure consistency in sampling and to increase probability of detecting all species present (Royle and Nichols 2003, Sauer et al. 2010).

The objective of this survey was to provide information on species abundance and composition at representative habitats within the Project Area with a focus on grassland birds and listed species. The following sections provide details on survey methods, quantitative results, and implications of those results. Descriptions and photos of point count stations are provided in Appendix A.

5.2 Methods

Following MDIFW Recommendations (MDIFW 2018), surveys were conducted in May and June of 2020 when each station was visited on three occasions. Twenty-five (25) point count stations were established throughout the Project Area to provide thorough coverage and represent all habitat types (Figure 4; Appendix A). Stations were located greater than 200 meters apart to avoid double counting. Surveys were conducted between 5:00 am and 10:00 am under favorable conditions with no precipitation and calm to light winds. The order in which stations were surveyed was reversed between visits to vary survey times. Point counts lasted 10 minutes and all individuals observed visually or aurally during that time were recorded. Observations were sketched to track individuals throughout the survey to avoid double counting. Additional variables including distance at detection, type of observation and behaviors were also recorded.

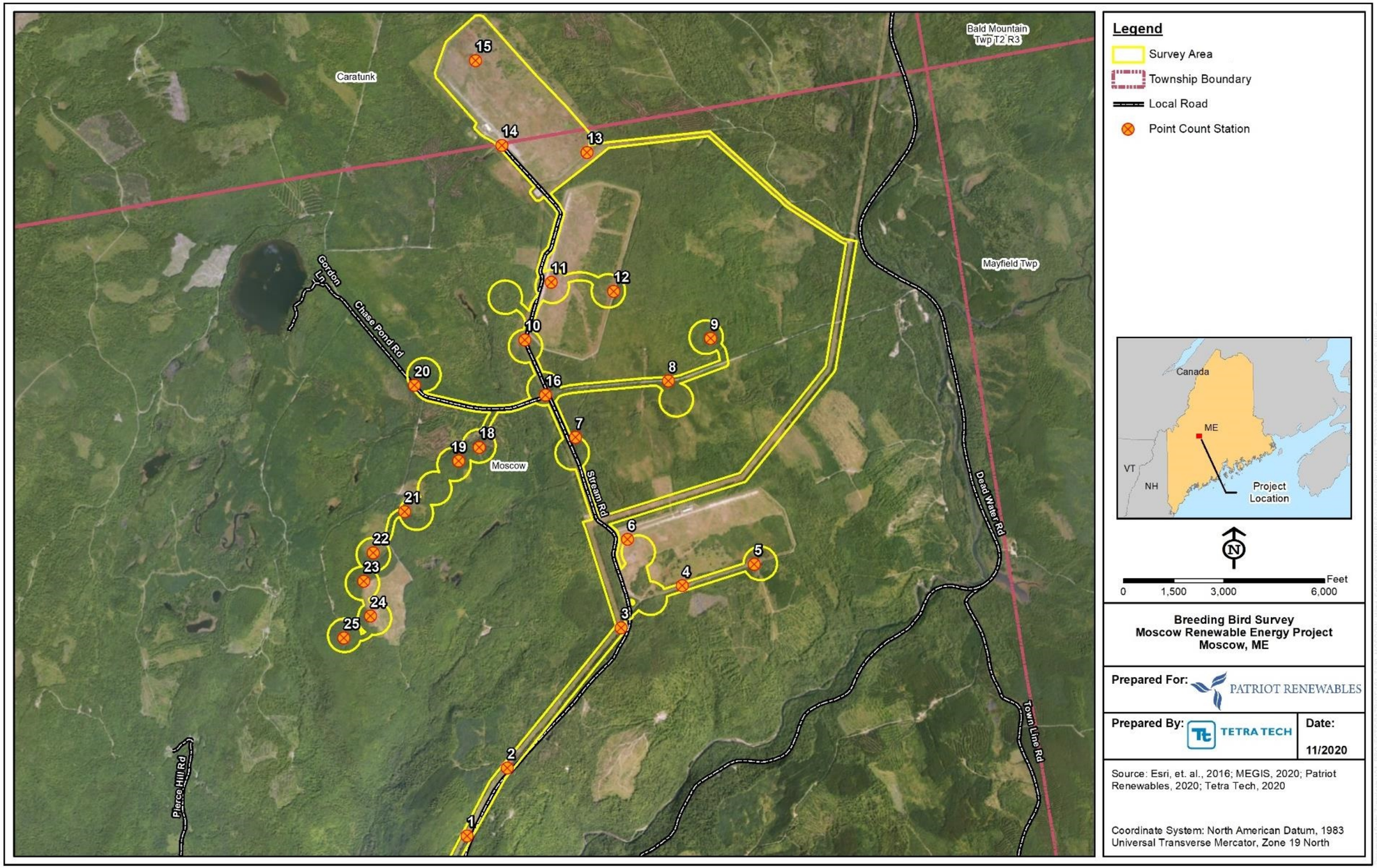


Figure 4. **Breeding Bird Survey Point Count Locations for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.**

5.3 Results

Three rounds of breeding bird surveys were conducted at 25 point count stations in May and June of 2020, totaling 750 minutes of survey effort (Table 3). Sixty-nine (69) species and 1,032 individual birds were cumulatively observed during the surveys (Table 4). The total number of individuals observed at each station (abundance) ranged from 16 individuals at Station 25 to 65 individuals at Station 4. The total number of species (richness) ranged from 7 species at Station 25 to 24 species observed at Stations 1, 2, 7, and 13.

The number of individuals observed by species varied greatly with multiple instances of only one or two individuals recorded during the survey to other species with over 50 individuals recorded. The five species with the most individuals recorded were white-throated sparrow (*Zonotrichia albicollis*; 104); common yellow-throat (*Geothlypis trichas*; 91); ovenbird (*Seiurus aurocapilla*; 90); song sparrow (*Melospiza melodia*; 45); and American robin (*Turdus migratorius*; 43). Raw, observed abundance is somewhat confounded by detection (see discussion). Frequency of occurrence is an alternative measure to indicate how common or rare a species is. Frequency of occurrence is the percentage of instances a species is recorded as present over the duration of all three survey visits (the number of stations a species was recorded present divided by the total number of stations).

No state or federally listed species were observed. Eleven (11) species are listed as Species of Special Concern in Maine and 23 species have a Species of Greatest Conservation Need (SGCN) Tier ranking (MDIFW 2015a). Species such as eastern wood pee-wee (*Contopus virens*), Canada warbler (*Cardellina canadensis*), wood thrush (*Hylocichla mustelina*), and scarlet tanager (*Piranga olivacea*) had a low frequency of occurrence (less than 0.08) while others such as the white-throated sparrow, black throated blue warbler (*Setophaga caerulescens*), black throated green warbler (*Setophaga virens*), and black-and-white warbler (*Mniotilta varia*) were quite common (greater than 0.32). See Appendix B for a complete list of species recorded during the survey and the conservation status for each species. Appendix C presents the survey results by date.

Stations located in habitats dominated by deciduous forest and had an edge feature, such as Stations 1, 2, and 7, had the greatest species richness with 24 species. Stations with a mixed forest habitat with edge features or open habitats, such as Stations 3, 4, and 10, had the greatest abundance of birds with over 60 individuals recorded at those points.

Table 3. Summary of Breeding Bird Survey Effort for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Date	Survey Visit	Station Numbers	Species Total	Survey minutes
5/21/2020	1	1–15	48	150
5/29/2020	1	16–25	25	100
6/3/2020	2	1–15	49	150
6/4/2020	2	16–25	25	100
6/16/2020	3	1–15	48	150
6/17/2020	3	16–25	23	100
Overall	**6**	**25**	**72***	**750**

*Represents the total number of unique species observed during all surveys, not the sum of species observed on each survey date.

Table 4. Cumulative Breeding Bird Survey Results for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Species	Point Count Station																								Species Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Alder Flycatcher				3	1					2	2		1	3	3											15
American Crow	1	1	4	1	1			1			2		2	1		1										15
American Goldfinch	1										1		3		1											6
American Kestrel														1												1
American Robin	2	4	1	9	5	3	1				5	3	1		3	2	1		1	1				1		43
American Woodcock							1																			1
Black-and-white Warbler					2	1	1			1		1				1	2	3		1				1		14
Blackburnian Warbler							1				1															2
Black-capped Chickadee	3				1	1	2			2		1				1	3	2	1							17
Black-throated Blue Warbler	3		1				1		1	1								2		1					2	12
Black-throated Green Warbler	1				2		4		4			1	2				3	1	4	2		1			1	26
Blue Jay	2	2	2		2	2	3	1	1		2	1	1		1				1			2	3			26
Blue-headed Vireo		3					1	1			1	1					2	1	1				1			12
Blue-winged Warbler		1			1													1								3
Broad-winged Hawk	1							1																		2
Brown Creeper				1																						1
Brown Thrasher											4	1	2	3	2											12
Canada Goose									1																	1
Canada Warbler				1																1						2
Cedar Waxwing		1																								1
Chestnut-sided Warbler		1	3		1	2	3		3								3	3	1	5		1				26
Chipping Sparrow				1									1		1											3
Common Grackle				1																						1
Common Loon								1			1						2									4
Common Raven						2								1	2											5
Common Yellowthroat	6	5	4	7	5	5	2		3	6	5	5	5	2	6	6	6	2		5		2	1	3		91
Downy Woodpecker		1																								1
Eastern Wood-Pewee	1																			1						2
Field Sparrow											1				2											3
Golden-crowned Kinglet								3	1				1			1	1	1	1				1			10
Hairy Woodpecker	1																									1
Hermit Thrush		2	1		2		2	1	6	2						1	3		2	1		1		2	1	27
Indigo Bunting	1																									1
Least Flycatcher			1	2	4					3		1	1							1						13
Magnolia Warbler								2						2		1	2		2	1		2		3		15
Nashville Warbler			4	1	2	1	4	4	2	5	1		2	1	2	6	2	2	1	5		1	2	3		51
Northern Flicker		1	2			2	1						1	1	1											9
Northern Parula	1	3	2				1				1			1												9

Species	Point Count Station																									Species Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	
Ovenbird	6	4	5		4	6	9	1	8	1	2		4	3		3	3	5	3	3	6	3	5	1	5	90
Palm Warbler				3	2					4		1	1	3	3								1			18
Philadelphia Vireo							1					1			1					1	1				1	6
Pileated Woodpecker		1																						1		2
Purple Finch		1				1						1					2		1			1				7
Red-breasted Nuthatch		1	1			1	1					1					2				2					9
Red-eyed Vireo	1	2	3			3	4	2	1	1		1	1	2	1	1	1	2	1	1	5	2	1	2	4	42
Red-winged Blackbird				9																						9
Rose-breasted Grosbeak	1	1																								2
Ruby-crowned Kinglet								4					1				2									7
Ruby-throated Hummingbird			1																							1
Ruffed Grouse				2																						2
Savannah Sparrow						9					4	3	4	1	3											24
Scarlet Tanager	1	2																								3
Song Sparrow	2	2		4		4	1			5	6	1	6	6	7					1						45
Swainson's Thrush		1		1	1			1		2		1		2		3		3	1	3	1		1		2	23
Swamp Sparrow													1													1
Tree Swallow				1							1			1												3
Unidentified Warbler	1								1																	2
Veery	1	1																								2
White-breasted Nuthatch																					1					1
White-throated Sparrow		2	8	4	9	4	3	4	4	7	4	4	3	4	5	6	4	4	1	9	2	2	4	7		104
White-winged Crossbill			9	7	7		6		1							1		4			1					36
Wild Turkey	1		1							15	1															18
Willow Flycatcher							2			2	2		1	2	1					2						12
Wilson's Snipe			1	5	1	1				1	1	1	2	2	4											19
Winter Wren			2					1		2			1	1			1			2						10
Wood Duck														1												1
Wood Thrush	1																									1
Yellow Warbler					1							1														2
Yellow-bellied Sapsucker	1	6	4			1																				12
Yellow-rumped Warbler	1		1	2	3	3	2	4		2	3	3				1	1	1	3	1		1	1	1		34
Total # of Individuals (Abundance)	**41**	**49**	**61**	**65**	**57**	**52**	**57**	**32**	**37**	**64**	**51**	**34**	**48**	**44**	**49**	**35**	**46**	**37**	**25**	**48**	**19**	**19**	**21**	**25**	**16**	**1032**
Total # of Species (Richness)	**24**	**24**	**22**	**20**	**21**	**19**	**24**	**16**	**14**	**19**	**22**	**21**	**24**	**22**	**19**	**15**	**20**	**17**	**16**	**21**	**8**	**12**	**11**	**11**	**7**	**72**

5.4 Discussion

Surveys conducted in the spring of 2020 provided thorough coverage of the Project Area and ROW. Sample locations were representative of habitats within the Project Area including habitats preferred by focal species such as grasslands, wetlands, and early successional habitat (Appendix A: photos 8, 12, and 14). No upland sandpipers (Section 5.0), rusty blackbirds (*Euphagus carolinus*), or other listed species were observed but 23 of the species detected are SGCN in Maine. While rusty blackbird occur throughout Maine, there are a lack of detections in the vicinity of the Project Area (eBird 2020). Preferred breeding habitat in the northeast includes dense stands of regenerating softwood, particularly fir 2–4 meters in height, which can be associated with regenerating clear cuts or disturbances such as beaver activity (Avery 2020). Stands are present in the Project Area that meet these structural requirements but may have too high of a hardwood or cedar component.

Measures of species abundance and frequency of occurrence are strongly influenced by the probability of detection for a given species (Royle and Nichols 2003). American robin, song sparrow, common yellow-throat, and white-throated sparrow were observed at the highest abundances and frequency of occurrence. These species all have distinguishable, loud songs, that carry over long distances. Whereas species such as brown creeper (*Certhia americana*) have thin, quiet songs that have a lower probability of detection and may therefore be underrepresented in the survey. Note that relative abundance (i.e., mean number of observations per sampling period), a common metric used to summarize point count data, is used to normalize for sampling effort. If sampling effort (the number of visits and time surveyed) is equal among stations, using relative abundance is moot and was therefore not presented for this dataset.

Species richness was fairly high within the Project Area due to the assemblage of diverse habitat types and forest conditions. The former Moscow Air Force Station contributed to open and field habitats, which are not common in this region (Appendix A: photos 23-30), and ongoing logging operations created stands of varying compositions and successional states (Appendix A: photos 33-48). Areas with long-term even-age stand management (i.e., clear cuts) often have the highest avian species composition (DeGraff et al. 1998).

6.0 UPLAND SANDPIPER

6.1 Introduction

Upland sandpipers, a state-listed threatened species (MDIFW 2015b), were previously recorded in the Project Area in 2013 (Tetra Tech 2015). MDIFW recommended updated surveys to determine whether they are still present, whether they are breeding and, if so, in which areas (MDIFW 2020a). The upland sandpiper is considered an obligate grassland species that prefers dry grasslands "with low to moderate forb cover, low woody cover, moderate grass cover, moderate to high litter cover, and little bare ground" (Dechant et al. 2002). Most of the breeding population occurs from southern Canada south to the central U.S. (Fink et al. 2020). Distribution of the breeding range does extend to the northeast with airports being the favored upland sandpiper habitat in the region (Houston et al. 2020). Although the species has been documented in commercial blueberry barrens in Maine (Vickery et al. 1994, Vickery et al. 2010). During migration, cultivated fields, hayfields and pastures are the primary habitats used for staging and stopovers (Vickery et al. 2010). The objectives of this survey were to provide information on the potential presence of upland sandpiper, determine seasonal use, and describe the suitability of current habitat within the Project Area.

6.2 Methods

Surveys were conducted within grassland, barren, or bog habitats that were most likely to support breeding upland sandpipers during the months of June, July, August, and September (Figure 5). Additional

survey effort and focus was directed in areas where the species was detected in 2013 (Tetra Tech 2015). Two survey events were conducted monthly with each event consisting of two survey periods: the first at dusk (6:00–8:30 pm) and the second occurring the following morning at dawn (4:15–6:15 am). Surveys consisted of meandering transects on foot and point count stations to record visual observations or audible calls. All upland sandpiper observations were recorded as well as the presence of other incidental avian species (i.e. species counts were not tallied). Survey variables including location, date, time, temperature, wind speed, and weather conditions were recorded during each outing. Habitat descriptions and photos were also collected during surveys to evaluate suitability for upland sandpiper.

6.3 Results

No upland sandpipers were observed in the Project Area. Sixteen (16) independent surveys were conducted from June through September, totaling 30 hours of survey effort (Table 5). Survey dates and times varied slightly from the intended two survey events per month and very early morning time intervals due to unfavorable weather conditions (e.g., end of June and early September) and logistics associated with travel to and within the Project Area during meandering transects. Survey efforts focused on five general areas: North field, North ROW, Middle ROW, South Field, and South ROW (Figure 5). Five fixed point-count stations were established in areas with the most suitable habitat and in the vicinity of previous upland sandpiper observations in 2013 (Tetra Tech 2015). The meandering transects covered all other areas with potential upland sandpiper habitat. In addition to transects by foot, a driving transect was conducted on August 27 consisting of intermittent stops along the south ROW and three fields where 10-minute point counts were conducted. Furthermore, both the center and south fields were covered extensively because these were also two of the point count stations used for eagle observations (Section 9.0).

Overall, habitat within the Project Area is not suitable for upland sandpiper. Remnant patches with suitable vegetation structure do occur within and around the three fields but may not be large enough to attract breeding birds or migratory stopovers (Appendix D: photo 23). These small patches appeared to be in areas with disturbed, compacted, or thin soil types along roadways and on drier knobs within the ROW which were insufficient to support shrubs, tall grasses, or forbs (Appendix D: photos 1–4). The dominant open habitat within the Project Area are wetlands that support a mixture of tall grasses, forbs and shrubs; but these do not provide preferred habitat for upland sandpiper (Appendix D: photos 5, 6, 13–21).

Multiple natural resource surveys coincided with upland sandpiper survey efforts in 2020 including: breeding birds, eagle use, golden eagles, vernal pools, wetlands, and Canada lynx. Staff who carried out upland sandpiper surveys also participated in all other survey tasks. Collectively, this was a large amount of time spent afield in 2020 which covered the entire survey year and many habitat types. No upland sandpipers were incidentally observed in 2020 in the Project Area. In addition, other survey efforts did influence focal areas for upland sandpiper surveys. For example, although the center field was a large tract of open habitat like the north and south fields, surveys were not concentrated in this area because there were no previous detections in that specific field and this field was surveyed extensively throughout during eagle use and golden eagle surveys.

A total of 43 avian species were incidentally observed visually or aurally during surveys (Appendix E). Three species (great blue heron, Lincoln's sparrow [*Melospiza lincolnii*], and yellow-billed cuckoo [*Coccyzus americanus*]) were novel observations not previously encountered during breeding bird or eagle surveys. Six species are state-listed as Species of Special Concern and 15 species are state-listed as SGCN in Maine (MDIFW 2015b; Appendix B). Lincoln's sparrow, a Tier 3 SGCN, was observed singing on a signpost in the ROW adjacent to the south field and was photographed and videoed as evidence of presence. This was the only Lincoln's sparrow observation made during natural resource surveys in the Project Area in 2020.

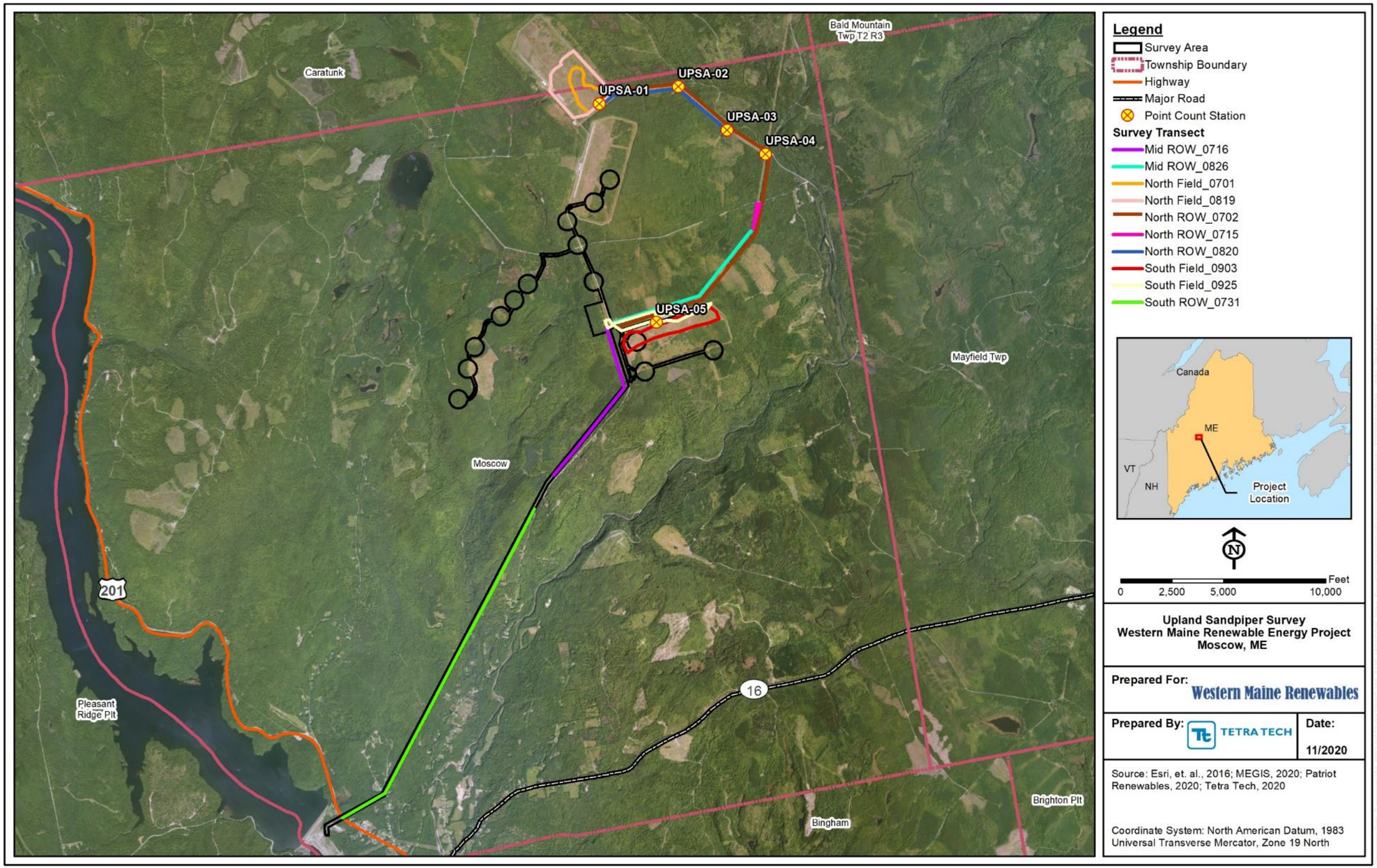


Figure 5. **Upland Sandpiper Survey Locations for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.**

Table 5. Summary of Upland Sandpiper Surveys for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Date	Route Name	Survey Type	Survey Event	Start	End	Survey Minutes	UPSA Observed
6/16/20	UPSA_01	Point Count	1	2000	2130	90	0
6/17/20	UPSA_01	Point Count	1	400	445	45	0
6/17/20	UPSA_03	Point Count	1	930	945	15	0
6/17/20	UPSA_02	Point Count	1	1000	1015	15	0
7/1/20	North Field_0701	Transect	2	2015	2130	75	0
7/2/20	North ROW_0702	Transect	2	500	830	210	0
7/15/20	North ROW_0715	Transect	3	2000	2030	30	0
7/15/20	UPSA_04	Point Count	3	2045	2115	30	0
7/16/20	UPSA_05	Point Count	3	415	515	60	0
7/16/20	Mid ROW_0716	Transect	3	545	845	180	0
7/30/20	UPSA_03	Point Count	4	2100	2200	60	0
7/30/20	UPSA_04	Point Count	4	2205	2035	30	0
7/31/20	South ROW_0731	Transect	4	700	930	150	0
8/19/20	North Field_0819	Transect	5	2130	2230	60	0
8/20/20	North ROW_0820	Transect	5	600	830	150	0
8/26/20	Mid ROW_0826	Transect	6	1800	1930	90	0
8/27/20	Access Roads[1]	Transect	6	800	1000	120	0
9/3/20	South Field_0903	Transect	7	600	830	150	0
9/24/20	UPSA_05	Point Count	8	1800	1930	90	0
9/25/20	South Field_0925	Transect	8	600	830	150	0
Overall			**16**	**1800 minutes or 30 hours**			**0**

[1] Driving route with multiple point locations not displayed on Figure 5.

6.4 Discussion

Despite focusing efforts in areas where upland sandpipers were previously detected and in the most suitable open habitat types in the Project Area, no upland sandpipers were detected in the 2020 surveys and thus the species is presumed to be absent. The primary factor influencing the presumed absence of upland sandpiper is that the Project Area is on the fringe of the breeding range for the species. Secondarily, the Project Area and the surrounding region generally lacks suitable habitat for the species.

The current core of the breeding range for upland sandpipers lies in the grasslands of the central U.S. extending into southern Canada (Fink et al. 2020, Houston et al. 2020). Much of the breeding range that extends to the eastern and into the northeastern U.S., however, mirrors anthropogenic land uses that function as grassland habitats such as pastures, hayfields, and airports. As farmland continues to be lost to reforestation and development in the east, the range of the species is contracting to what was thought to be the historic upland sandpiper range in the grasslands of the central U.S. (Foss 1994, Houston et al. 2020). The nearest eBird records to the Project Area occur over 50 miles to the west in the Rangeley area and 50 miles to the south along the Kennebec River, near dairy farms south of Skowhegan, which are the most current and viable observations (Aversa 2020). Density of observations increase farther south towards the coast with the highest densities in Maine occurring in the Downeast blueberry region (eBird 2020).

Secondarily and related to the species distribution, lack of suitable habitat likely contributes to the absence of upland sandpiper detections in the Project Area. Open habitats within the Project Area are a legacy of the Moscow Air Force Station. Transmission fields were installed by scouring topsoil which were then lined with a wire mesh to aid in radio transmission. Fields were then maintained until the station was decommissioned in 2002. The last date of mowing is 2015. Currently, woody stems and small trees are well established in the fields and reforestation is underway. At present, willow (*Salix sp.*) and alder (*Alder sp*.) species, eastern white cedar (*Thuja occidentalis*), tamarack (*Larix laricina*), and big tooth aspen (*Populus grandidentata*) occur in pockets and are up to 2 meters tall. The reforestation process is likely taking longer than natural sites due to the disturbed soils and altered hydrology. A portion of the fields are classified as wetlands. Preferred vegetation around upland sandpiper nest sites is 10–64 centimeters tall and consists of 30–99 percent dead vegetation. Nest sites for upland sandpiper are generally *not* associated with wetlands (Houston et al. 2020). Therefore, most of the open habitats within the Project Area and ROW would not be considered suitable breeding habitat due to the tall vegetation structure consisting of lush grasses, forbs, and woody stems and the preponderance of wetland habitats and associated vegetation (Appendix D: photos 5, 6). Small pockets of suitable habitat with short, sparse vegetation are sprinkled throughout the Project Area and ROW. These pockets are associated with highly disturbed soils in the fields and along the edges of roads (Appendix D: photo24), and higher and drier sites within the ROW (Appendix D: photos 1–4). While pockets of suitable habitat are within or adjacent to the Project Area, they are likely too small for upland sandpiper as the species prefers fields of at least 100 acres (Atwood et al. no date). It is possible that in 2013, Project Area fields were at an earlier successional stage and may have been suitable for upland sandpiper at that time. Given that the fields in the Project Area have been infrequently managed (i.e. mowed) to maintain early successional habitat and that reforestation is underway, the fields are no longer suitable for upland sandpiper.

In addition to the 30 hours of focused upland sandpiper surveys, field staff were present in the Project Area for multiple tasks throughout 2020, totaling hundreds of combined hours; still, no upland sandpipers were observed. Therefore, presence is unlikely during the breeding season in the Project Area, although it is possible the site may be briefly used as a stopover location during migration when breeding birds from the St. Lawrence valley push through the region (eBird2020).

7.0 BAT ACOUSTIC SURVEY

7.1 Introduction

MDIFW no longer recommends bat acoustic surveys for wind energy projects (MDIFW 2018, MDIFW 2020a). A bat acoustic survey was previously conducted in the Project Area 2012–2013. Although a follow-up 2020 survey was not requested by MDIFW for this Project; a northern long-eared bat (*Myotis septentrionalis*) presence/absence acoustic survey was conducted in July 2020 in the Project Area in coordination with the USFWS Maine Field Office (below). According to the agency's Wind Power Guidance project proponents should document rocky features ≥ 0.5-acre (2,023 square meters) in size within 3 miles (5 kilometers) of wind projects (MDIFW 2018). Some species of bats (northern long-eared bat, little brown bat [*M. lucifugus*], and eastern small-footed bat [*M. leibii*]) are known to use rocky features (e.g. talus slopes, rocky outcrops, cliffs) in the winter in Maine (Divoll 2013, Ingalls et al. 2017). The objective of this survey was to identify rocky features with the potential to provide suitable winter habitat for bats and, if found, to conduct acoustic surveys of those rocky features.

7.2 Methods

A GIS model provided by MDIFW was used to develop a working map of potential rocky features within the Project Area (Study Area; Figure 6). Talus ID, mean slope, mean aspect, elevation, and area were extracted from the GIS data and summarized in a table. Canopy closure and canopy type were estimated for each rocky feature using the latest available Google Earth aerial photography. However, since most of the Study Area consists of managed timberland subject to logging and both natural and managed regrowth, field-based reconnaissance needed to be performed. Due to landowner concerns, however, a majority of the rocky features could not be accessed on foot. A drone was flown by a licensed pilot from Maine Imaging in coordination with a biologist to capture photography of rocky features from publicly accessible areas at altitudes of approximately 400 feet (122 meters) above ground level. Based on the drone photography, rocky features with the most potential to support wintering bats and where landowner permission could be obtained were visited on foot.

7.3 Results

Forty-nine (n=49) rocky features were identified in the Study Area. Of these, 29 features had a southerly aspect. Mean elevation ranged from 676 feet (206 meters) to 1,804 feet (550 meters) and area ranged from 0.22 acre (890 square meters) to 53.18 acres (215,213 square meters). For all features, canopy closure was estimated to be 81–100 percent closed. Canopy type was mostly a mix of coniferous and deciduous trees (n=28), followed by mostly deciduous trees (n=15), with the remaining features covered mostly by coniferous trees (n=6). Features that were visited on foot were confirmed to only provide marginal winter habitat for bats. Additional maps, photos, and site descriptions were previously submitted to MDIFW for approval on October 20 and November 9, 2020.

7.4 Discussion

The species of bats that will use rocky features as winter habitat prefer sites that are naturally protected (i.e. high elevation, steep slope) with good sun exposure (i.e. south-facing, minimal tree cover; Moosman et al. 2015, Ingalls et al. 2017). All the rocky features identified in the GIS model likely have sufficient elevation and slope to provide natural protection from predators with several features exhibiting a southerly aspect to maximize solar exposure. In Virginia, Moosman et al. (2015) selected south-facing study sites with elevations ranging from 1,739 to 1,969 feet (530–600 meters) at the bases of talus slopes to 2,297 to 2,625 feet (700–800 meters) at the tops of talus slopes. In Acadia National Park, Ingalls et al. (2017) found rock roosts with average south-southeast aspects at elevations ranging from 194 to 823 feet (59–251 meters) with a mean of 446 feet (136 meters).

One key difference in the Virginia and Acadia National Park studies compared to the current study, however, is percent canopy cover. Researchers suggest that thermoregulation drives roost selection and that canopy cover may block solar radiation (Moosman et al. 2019). Moosman et al. (2015, 2019) selected completely exposed study sites (zero percent canopy cover) while Ingalls et al. (2017) found rock roosts at sites ranging from 0 to 100 percent canopy cover with an average of 30 percent cover. Furthermore, MDIFW's *Representative Photographs of Suitable Bat Rock-Roosting Sites* (MDIFW no date) mostly depict features that are completely exposed. For eastern small-footed bat, no studies have documented roosts on talus slopes within a closed canopy or with leaf litter (Moosman et al. 2015).

Use is still plausible, however, in locations that offer sun exposure and microclimates with elevated temperatures for basking and thermoregulation (Moosman et al. 2015). The most promising rocky feature in the Study Area with sun exposure and a suitable microclimate is Talus ID 4413, which has a mean south-southwest aspect and a mean elevation of 1,220 feet (372 meters). Although this feature is described as approximately 2 acres (8,105 square meters), only a small portion of exposed rock is visible based on drone photography (Attachment 4). While this feature may provide suitable habitat, it is not unique or likely to be preferential within the broader landscape. Although they are considered local migrants, northern long-eared bat, little brown bat, and eastern small-footed bat have been documented to migrate distances of 35 miles (56 kilometers; Nagorsen and Brigham 1993), 172 miles (277 kilometers; Davis and Hitchcock 1965), and 12 miles (20 kilometers; Hitchcock 1955), respectively. Thus, it is likely that bats will migrate to areas with better habitat for the winter.

7.5 Summary of Northern Long-eared Bat Presence/Absence Survey

The 2012 – 2013 bat acoustic survey was conducted in accordance with the standardized protocols established for pre-construction passive acoustic surveys to evaluate bat species risk at wind energy facilities in Maine, and elsewhere (Tetra Tech 2015). These protocols were approved by MDIFW prior to the survey, as at that time northern long-eared bat had not been formally listed by the USFWS and USFWS standardized protocols were not available. Five detectors were used to record bat calls during the 2012/2013 survey. Northern long-eared bat and little brown bat were definitively identified, as were silver-haired bat (*Lasionycteris noctivagans*), hoary bat (*Lasiurus cinereus*), eastern red bat (*Lasiurus borealis*), big brown bat (*Eptesicus fuscus*), and tri-colored bat (*Perimyotis subflavus*).

During the 2020 field season, a northern long-eared bat presence/absence survey was conducted in coordination with the USFWS Maine Field Office following the 2020 USFWS *Range-wide Indiana Bat Summer Survey Guidelines for Indiana Bat and Northern Long-eared Bat* for linear projects (USFWS 2020c). Thirty (30) Wildlife Acoustics full-spectrum bat detectors were deployed for a total of 177 detector nights. Data was processed using Kaleidoscope Pro version 4.2.0 (Wildlife Acoustics, Inc.). Eighteen (18) bat passes were auto-classified as the federally listed threatened northern long-eared bat by analysis software, but presence was not confirmed during manual vetting. All northern long-eared bat, eastern small-footed bat (*Myotis leibeii*), tri-colored bat, and little brown bat auto-classifications by the software were manually reviewed for false negatives. The presence of five species were confirmed at the Project Area during the survey including big brown bat, eastern red bat, hoary bat, silver-haired bat, and little brown bat.

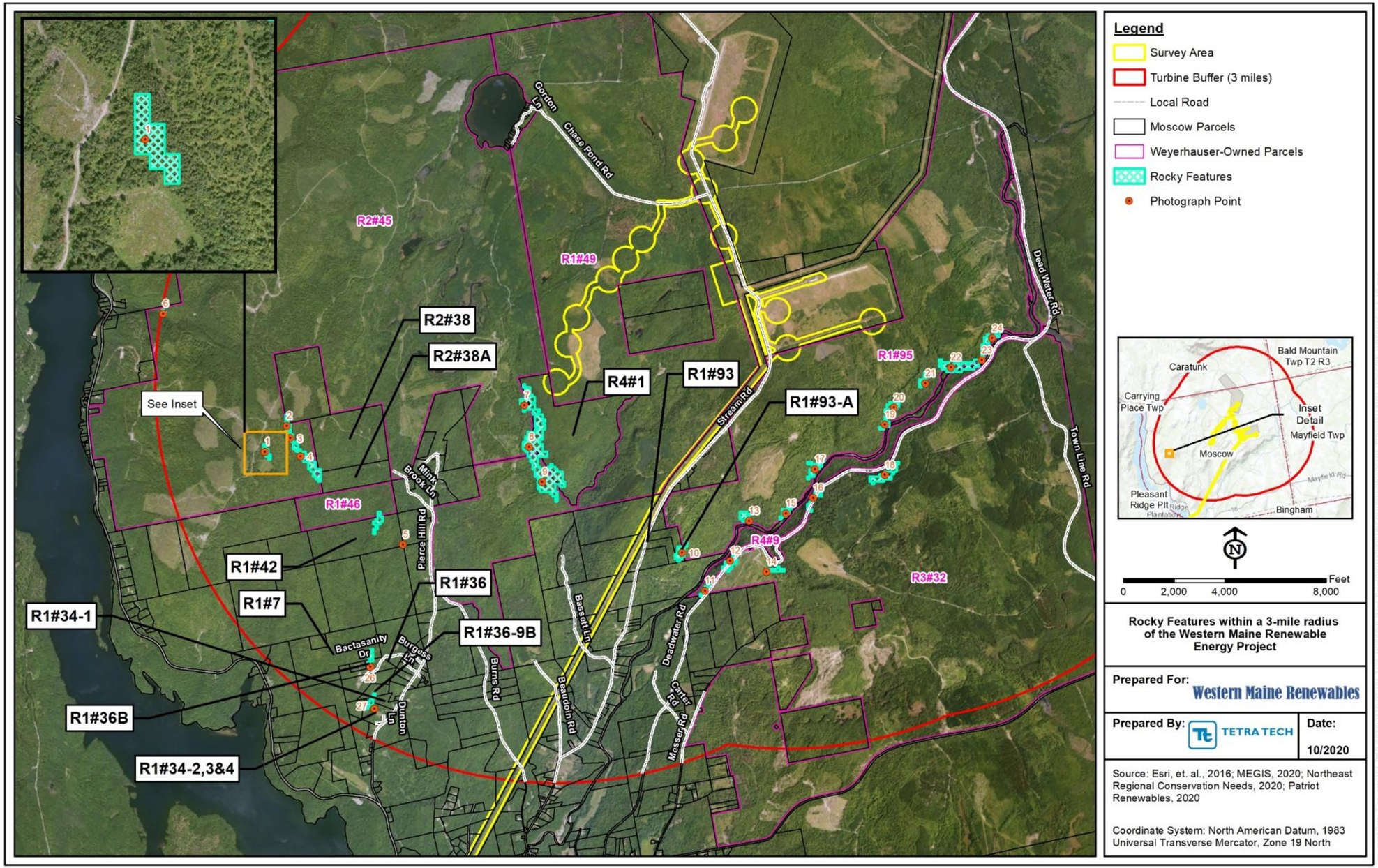


Figure 6. **Rocky Features within a 3-mile Radius of the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.**

8.0 SENSITIVE SPECIES; RARE, THREATENED, ENDANGERED SPECIES

MDIFW indicated that the state-listed threatened Roaring Brook mayfly and the northern spring salamander, a state-listed species of special concern, have the potential to exist in the Project Area (MDIFW 2020a). MDIFW also noted that Roaring Brook mayflies are known to be present in Caratunk. Portions of the Project Area were also noted as being at elevations where northern bog lemmings may be found. These three studies are described below.

8.1 Roaring Brook Mayfly

The Roaring Brook mayfly is a rare stream species that appears to be restricted to high elevation streams within the northern Appalachian Mountain Range. It has only been collected in cold, high elevation streams that remain watered during the summer, although water levels may be low. The species was first collected from Roaring Brook on Mt. Katahdin in 1939 and has since been found in the mountains of western and central Maine, the White Mountains of New Hampshire, and Vermont. The only stream within the Project Area that meets the habitat criteria is Bassett Brook, a tributary to Chase Stream (Figure 7). The Project Area intersects with Bassett Brook along Chase Pond Road (also referred to as Ripple Road) in Moscow.

Field work was performed on September 16, 2020 at four sampling locations in the upper reaches of Bassett Brook and all were at elevations above 1,300 feet (Figure 7). Site characteristics are provided below (Table 6). Both field work and subsequent laboratory analyses of specimens were performed by Lotic Inc following MDIFW's revised *Recommended Survey Protocol for the Roaring Brook Mayfly* (MDIFW 2020b). Due to the drought conditions in the Project Area, this protocol was modified in two ways: sample locations were selected based on presence of flowing water, rather than the length and location of stream reaches, and; the majority of samples were collected by washing rocks and leaf packs directly into a white plastic pan for sorting. Mayflies of the family *Heptageniidae* were closely examined to determine the number of cerci, which is a distinguishing characteristic for the genus *Epeorus*. Representative macroinvertebrate specimens were collected and preserved in 70 percent ethanol for identification in the laboratory. Water temperature was measured with a Hach HQ40D multi meter with an optical dissolved oxygen probe.

No Roaring Brook mayflies were found in Bassett Brook. Although water levels were low, Bassett Brook still had high *Ephemeroptera*, *Plecoptera* and *Trichoptera* richness, which indicates good water quality. Results of the study were submitted by Lotic Inc. to MDIFW on October 13, 2020. MDIFW concurred on October 27, 2020 that there are no further concerns for the species regarding the Project.

Table 6. Bassett Brook Characteristics at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Land Use	Upland hardwood/conifer
Terrain	Mountainous
Canopy Cover	Dense
Substrate	10% bedrock, 50% boulder, 20% cobble, 15% gravel, 5% sand/silt
Wetted Width	10–20 centimeters
Bank-full Width	2–5 meters
Depth	5–10 centimeters
Flow	Not measurable
Temperature	11.4 degrees celsius

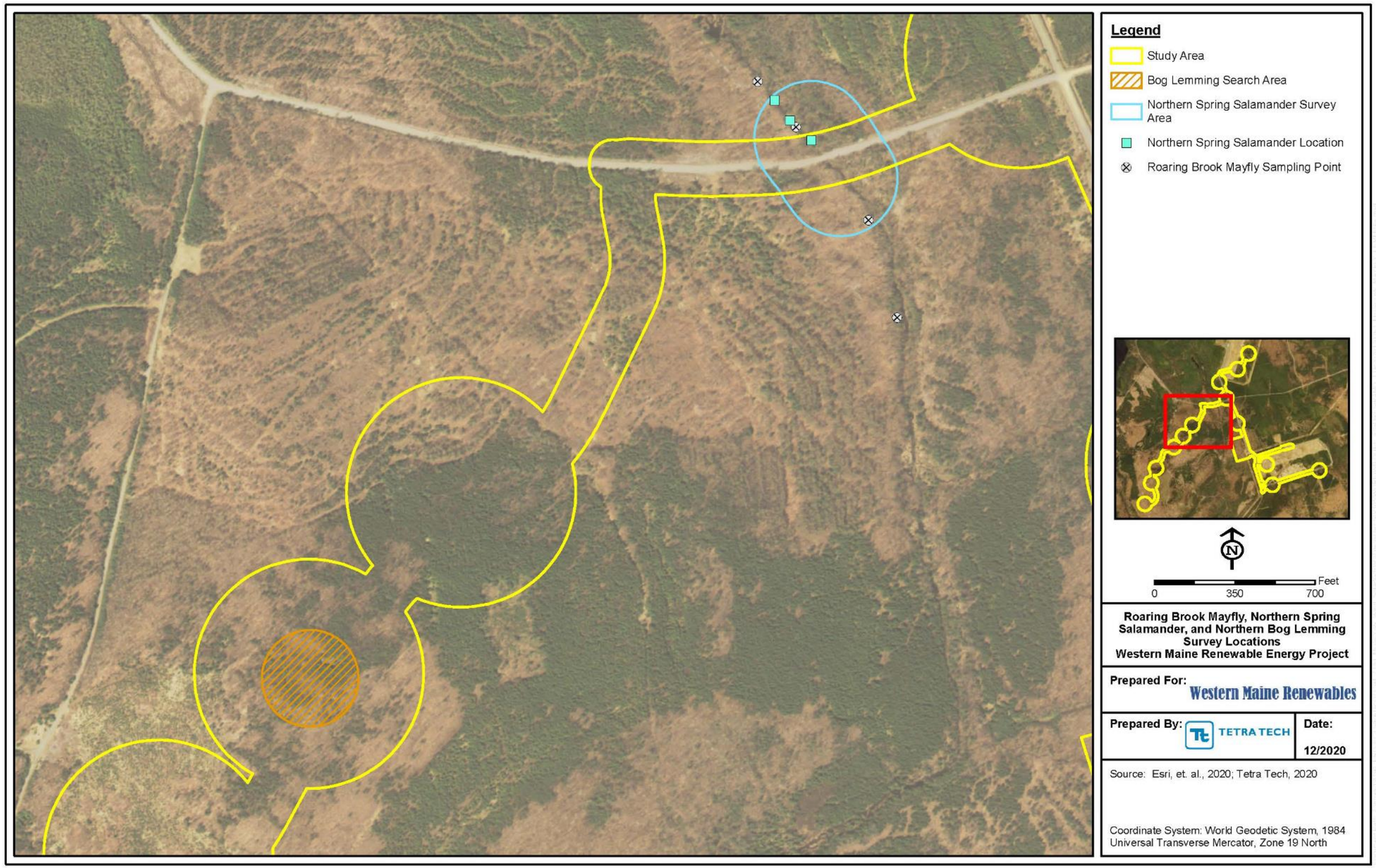


Figure 7. Survey Points and Locations for Sensitive Species at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

8.2 Northern Spring Salamander

Northern spring salamanders use clear, cold, mountain streams underlain by coarse substrates at or above 500 feet and bordered by hardwood or mixed wood forests. The species typically occurs in moderate to fast gradient first or second order streams. They can also occur in larger third-order streams and rivers with similar habitat characteristics. The only stream within the Project Area that meets the habitat criteria is Bassett Brook, a tributary to Chase Stream (Figure 7). The Project Area intersects with Bassett Brook along Chase Pond Road (also referred to as Ripple Road) in Moscow.

Field work was performed on July 22, 2020 in the upper reaches of Bassett Brook following MDIFWs Northern Spring Salamander Survey Protocols (MDIFW 2019). Stream searchers were performed by walking long Bassett Brook and looking under stones and rocks alongside and within the stream. Multiple sections of the stream were searched with each section searched for a minimum of 30 minutes. Rocks of various shapes and sizes were searched. Biologists wore polarized sunglasses to aid in seeing underwater. All salamanders were caught and placed in enamel pans with stream water to aid and confirm identification.

Northern spring salamanders were detected in multiple locations in Bassett Brook (Figure 7). Representative photos of Bassett Brook and a salamander collected during the survey are presented in Figure 8

Northern spring salamander habitat (left) near the intersection of Bassett Brook and Chase Pond Road. Salamanders were placed in enamel pans to aid in photographing and identifcation (right).

Figure 8. Representative Photos of Northern Spring Salamander Habitat and Adult Salamander at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

8.3 Northern Bog Lemming

Northern bog lemming habitat consists of alpine sedge meadows, krummholz, spruce-fir forest with dense herbaceous and mossy ground cover, acidic wet meadows, and mossy stream-sides that are at or above 1,000 feet elevation in the western mountain and northern areas of Maine. Most of the Project Area is above 1,000 feet. Suitable habitat for northern bog lemming was documented and evaluated during other field surveys, especially vernal pool surveys and wetland delineation. One site within the Project Area was identified as potential habitat (Figure 7). This area was revisited on September 2, 2020 and searched using meandering transects to document the presence of green scats, latrines, and runways. No signs of northern bog lemming were observed.

9.0 CANADA LYNX

Based on guidance from MDIFW (2020), the Canada lynx (*Lynx canadensis*) survey was coordinated through the USFWS Maine Field Office. The objective of this survey was to provide information on presence of Canada lynx in representative habitats within the Project Area and to document other mammal species detected. A full report of this survey, including maps and figures, was submitted to the USFWS Maine Field Office for review. A summary of the work conducted is presented below.

Nine camera trap stations were deployed from January 10, 2020 to October 8, 2020 for a total of 1,668 camera nights. Each camera station featured a long-range visual attractant, a short-range visual attractant, an olfactory attractant applied to a small piece of carpet, a marked wooden stake, and a deer hide to capture and hold a predator's attention. Camera stations recorded a total of 737 individual mammals during the 2020 survey, including 18 Canada lynx and 387 snowshoe hare (*Lepus americanus*), the preferred prey of Canada lynx. Canada lynx tracks were also observed and documented. Surveys were successful in documenting the presence of Canada lynx within the Project Area. Camera surveys were an efficient method to meet survey objectives while providing far more ancillary information on seasonal use and other species than other methods such as snow tracking alone.

Implications of detecting a federally listed threatened species within the Project Area are not specifically outlined and will likely be resolved through consultation with the USFWS Maine Field office. Habitat loss or fragmentation are the two primary concerns regarding impacts on Canada lynx which may be influenced by Project design and construction. Habitat loss related to Project development will likely be marginal in the context of the broader landscape and is driven by regional forest management practices and resulting patterns of softwood regeneration. It is likely that as long as habitats adjacent to turbines and access roads continue to support high densities of snowshoe hare, Canada lynx will continue to utilize these areas.

10.0 GOLDEN EAGLE (INCLUDES BALD EAGLE AND OTHER RAPTORS)

10.1 Introduction

Golden eagles are a state-listed endangered species (MDIFW 2015). MDIFW requested golden eagle surveys via email on February 21, 2020 (Bob Stratton, personal communication) and in the agency's preliminary resource survey recommendations for the Project (MDIFW 2020a). The increased development of wind energy facilities has caused concern for potential direct and indirect (i.e., collision or displacement caused by altered habitats) impacts it may have on avian species (Piorkowski et al. 2012). To address concerns, the USFWS established the *Land-Based Wind Energy Guidelines* (WEG) to provide a standardized process for assessing potential wildlife impacts caused by wind energy development (USFWS 2012). Tier 3, question 3 of the WEG addresses questions related to preconstruction bird distribution, abundance, behavior and site use. In addition, MDIFW released their Maine Wind Power Guidance (MDIFW 2018).

Due to the elevated conservation status of golden eagles in Maine, there is increased focus on factors that may put the species at risk. While it is recognized that breeding pairs no longer occur in Maine and the likelihood of establishing a breeding populations in the U.S. is limited (Todd 2000, Miller et al. 2017), there is still a commitment by MDIFW to maintain the species as part of Maine's traditional wildlife heritage and to mitigate risks to the species as it traverses Maine from its core breeding region in eastern Canada to wintering areas in the Appalachians. Telemetry data illustrates that golden eagles travel through western Maine in the vicinity of the Project Area and the species has also been sighted in the region (Katzner et al. 2012a, MDIFW 2018, CCB 2020).

In accordance with Tier 3 of the WEG and recommendations by MDIFW, Tetra Tech conducted golden eagle surveys following the raptor migration protocol described in MDIFW's Maine Wind Power Guidance (MDIFW 2018) throughout 2020 to address three primary objectives: 1) Document volume and characteristics of eagle use in the vicinity of the Project, 2) Collect baseline information on raptor spatio-temporal use within the vicinity of the Project Area, and 3) Document the level of migratory activity by raptors. This report presents information specifically for survey efforts following the golden eagle recommendations. Additional eagle use surveys were conducted in the Project Area in 2020. This information is included in a separate eagle use report for the USFWS Maine Field office and the USFWS northeast region eagle coordinator.

10.2 Methods

Visual counts of migrating raptors were conducted from three observation points within the Project Area (Figure 9). Point 1 was in the center radar field of the Moscow Air Force Station. Terrain was flat and the vegetation was low, thus providing a relatively unobstructed vantage to approximately 5 kilometers to the north and south and 10 kilometers to the east. Views to the west were limited to the horizon approximately 1 kilometer from the site due to a slight ridgeline. Point 2 was in the southern radar field. Like the center field, the flat terrain and low vegetation provided an unobstructed view approximately 7 kilometers to the north and south and 13 kilometers to the east. Views to the west were limited to the horizon approximately 1 kilometer from site due to a slight ridgeline. At Points 1 and 2, partial southerly and easterly views extended to the ridgeline of the Bingham Wind Project. Point 3 was located just east of the ridgeline for the western string of proposed turbine locations. This ridge itself was completely forested with no clearings therefore the survey point was established on a slight rise adjacent to the ridge which provided the most comprehensive vantage of the proposed western turbine string. Views were somewhat obstructed to the east and south by mature mixed forest stands and to the west by the ridgetop above a pine plantation approximately 650 meters from the survey point. Views to the north were greater than 800 meters. Photographs and descriptions of survey points are provided in Appendix F.

Following MDIFW's preliminary resource survey recommendations for the Project (MDIFW 2020a), the raptor migration protocol described in the agency's Maine Wind Power Guidance (MDIFW 2018) was implemented for the golden eagle surveys. Surveys were conducted twice a week, alternating among survey locations, February 15–June 15, 2020 to capture spring movements and August 1–December 15, 2020 to capture fall movements. For all eagle observations the following information was collected digitally on an iPad using electronic data forms or the ArcGIS Collector application: number of individuals, distance at detection, low flight height, high flight height, behavior (e.g., soaring, powered flight, territorial display), and flight paths. Other raptor species were also recorded but flight paths were only mapped for eagles. Incidental (non-raptor) bird species were noted to add to the bird observations for the Project Area. Dates with favorable migration conditions (i.e., north winds, clear skies, and moderate temperatures) were targeted for survey events. BirdCast, a forecast of migratory movements issued by the Cornell Lab of Ornithology, was carefully monitored to facilitate planning survey events when pulses of migratory movements were predicted (BirdCast 2020).

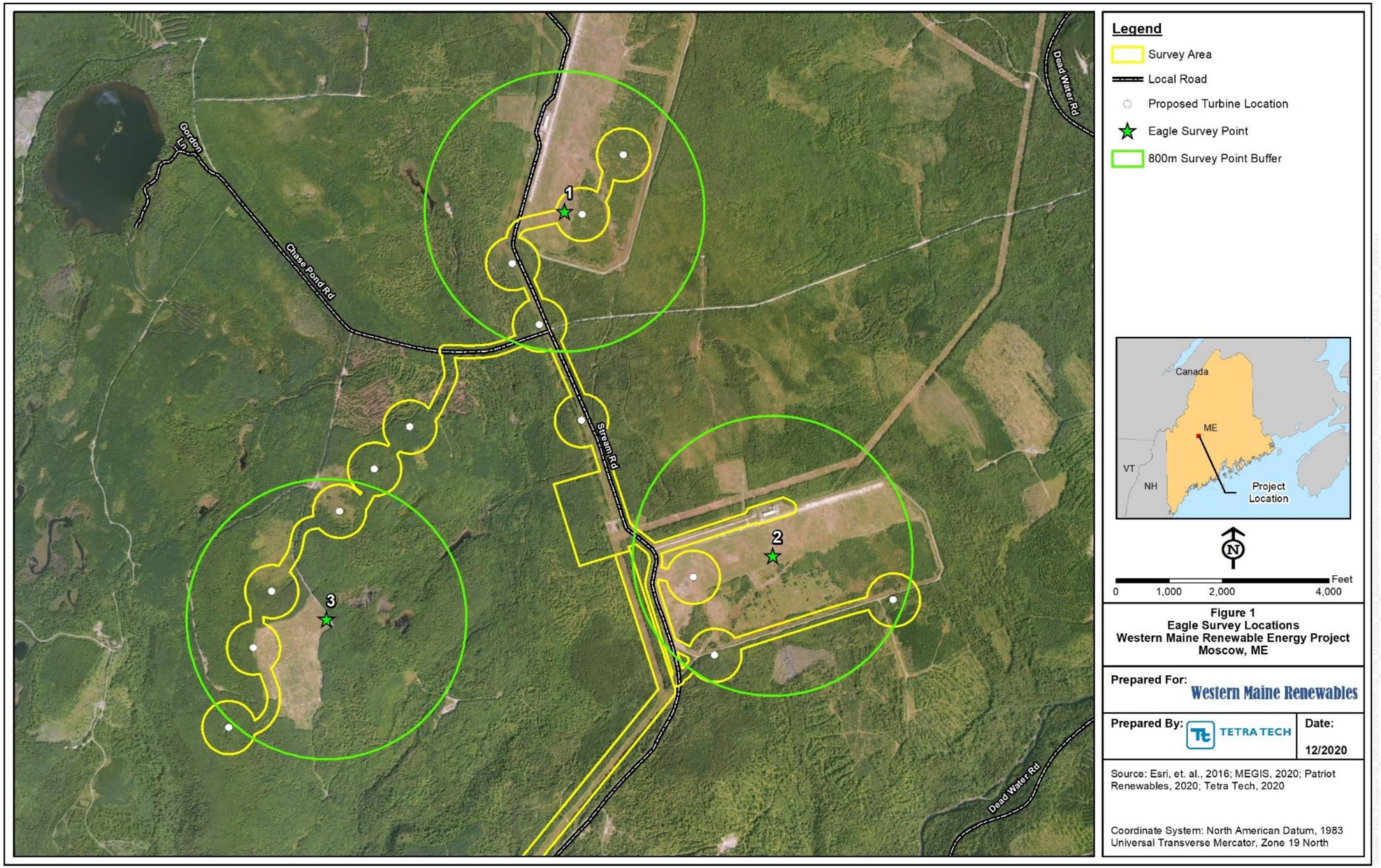


Figure 9. Eagle Survey Points and Buffers for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

10.3 Results

The survey effort for the 2020 golden eagle surveys totaled 479.58 hours of direct, visual observation with 25 events at Points 1 and 2 and 17 events at Point 3 for a total of 67 days between March 4, 2020 and December 16, 2020 (Table 7).

Table 7. Site Descriptions and Survey Effort for the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Survey Point	Site Description	Survey Dates	# of Survey Events	Total Survey Hours
1	Center radar field. Extensive view to horizon north to south. Views limited south to north to approximately 1 kilometer.	March 4–December 16, 2020	25	186.17
2	South radar field. Extensive view to horizon north to south. Views limited south to north to approximately 1 kilometer.	March 5–December 15, 2020	25	175.00
3	East of pine plantation and slight ridge. Views limited to approximately 600 meters in all directions.	August 6–December 3, 2020	17	118.42
		All Stations Combined	**67**	**479.58**

10.3.1 Golden Eagles

A single, juvenile golden eagle was observed from Point 1 on April 7, 2020. This individual was detected 200 meters from the survey location traveling north at 12:45 pm during 5 mile per hour west winds (Figure 10). The lowest height the individual was observed was 150 meters and the highest height was 400 meters. The individual was within the 800-meter horizontal and 205-meter vertical buffer for 1 minute and was observed for 14 minutes outside of the buffer. The eagle soared over the field for an extended period allowing for species identification and multiple photos, but quickly gained altitude above 200 meters, thus reducing the time spent within the rotor sweep zone.

Profile view (left) demonstrates head protrusion and buff coloring while ventral view (middle, right) demonstrates white wing patches on inner primaries and white inner tail band with black distal on tail feathers. Buff coloring on head is more apparent with less backlight (right).

Figure 10. Golden Eagle Observation at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

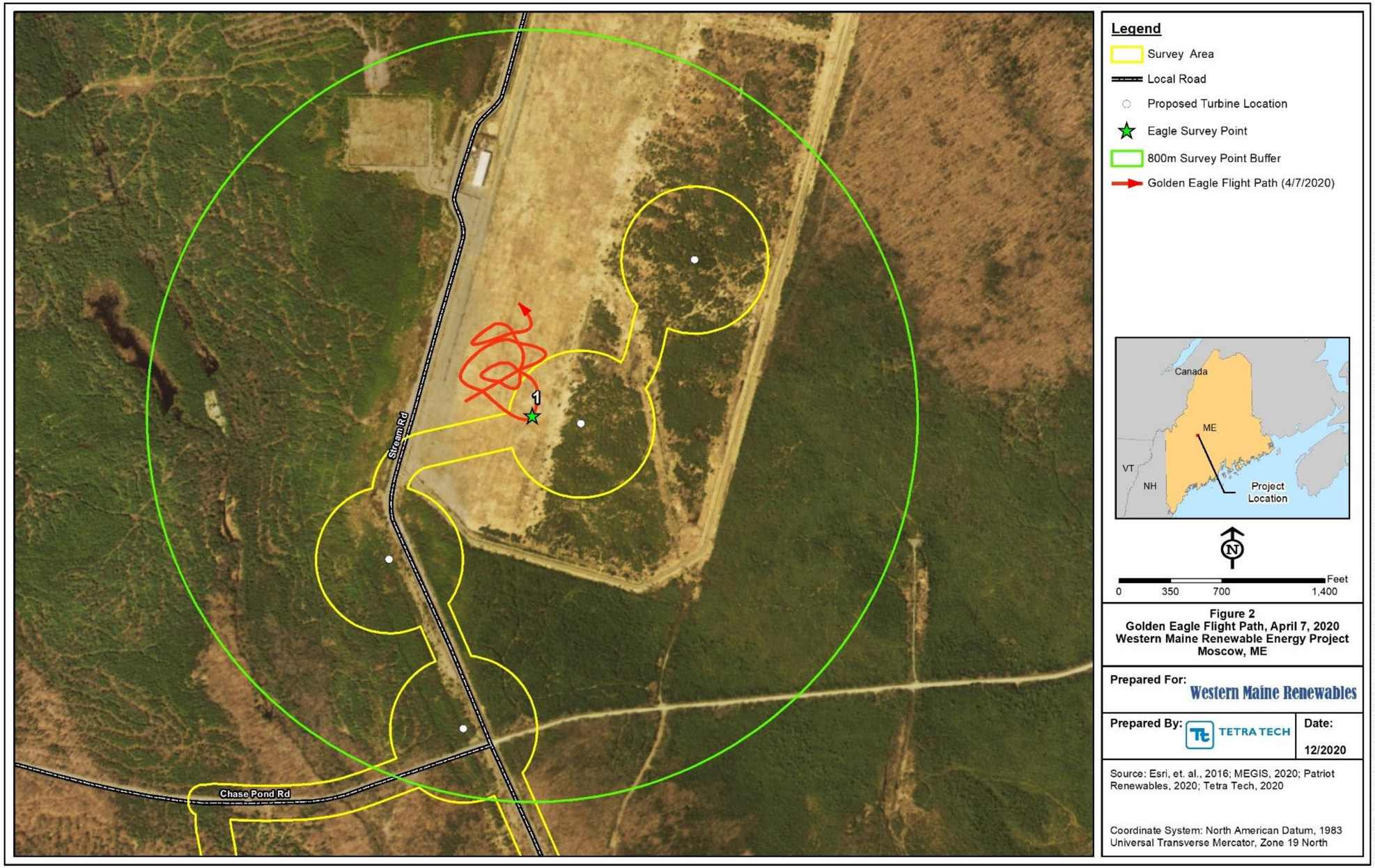


Figure 11. Golden Eagle Flight Path Observed at Eagle Survey Point 1 at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

10.3.2 Bald Eagles

Fifteen (15) bald eagles were observed intermittently throughout the survey period on 15 occasions or events (tandem birds were observed on two events; Table 8). Of the bald eagle observations, 12 were adults and three were juveniles. The first eagle observation was made on March 31, 2020 and the last on November 11, 2020 and most of the eagles (n=9) were observed in March and April. Observations were generally made during mid-day (average time of observation was made at 1:09 pm). Wind direction at time of observation varied with half of the observations made during northerly winds and the other half southerly winds. Average wind speed when eagles were observed was 4 miles per hour and no eagles were observed on calm days. Eagle flight paths were primarily in the valleys, which somewhat restricted views due to the lower elevation at survey points. Nearly half of the observed flight paths came within a horizonal distance of 800 meters of a survey point but the average distance at detection from a survey point was greater than 1 kilometer. Soaring without a strong flight direction was the primary behavior, but the last two observations of the year demonstrated more linear and less circuitous flight patterns. The average low flight height was 166 meters and all individuals detected within 800 meters were also below 200 meters, and therefore within the rotor sweep zone.

Two bald eagles were incidentally observed outside the designated survey times and locations. Both observations were made along the Kennebec River in Bingham. The first observation, an adult, was made on March 2 flying north of Bingham; and the second, a juvenile, was observed on May 13, 2020 from Route 201 in Bingham.

Table 8. Daily Summary of Migrating Eagles at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Date	Survey Point	Cloud Cover (%)	Wind Direction	Wind Speed (miles per hour)	Time	# of Individuals	High Flight Height (meters)	Low Flight Height (meters)	Age	Primary Behavior	Flight Path
3/31	1	20	N	6	12:29 pm	1	300	150	Juvenile	Soaring	Valley
4/1	2	90	N	7	1:58 pm	1	150	50	Adult	Powered	Valley
4/1	2	90	N	7	1:58 pm	1	150	60	Adult	Powered	Valley
4/15	2	55	SW	4	1:26 pm	1	500	200	Adult	Soaring	Valley
4/15	2	55	SW	4	3:20 pm	1	400	100	Adult	Soaring	Valley
4/29	1	5	NE	4	10:28 am	1	300	200	Adult	Soaring	Valley
5/5	2	95	SW	5	9:29 am	1	100	50	Juvenile	Powered	Valley
5/19	2	0	SW	2	3:35 pm	1	400	300	Adult	Soaring	Valley
5/19	2	0	SW	2	4:40 pm	2	500	400	Adult	Soaring	Valley
9/25	2	80	NE-SW	2	10:32 am	2	500	200	Adult	Soaring	Valley
10/22	2	75	NW	3	2:28 pm	1	300	200	Adult	Soaring	Valley
10/22	2	75	NW	3	2:30 pm	1	300	150	Juvenile	Soaring	Valley
11/11	1	90	S	4	12:15 pm	1	200	100	Adult	Powered	Valley

10.3.3 Other Raptors

A total of 347 raptors representing 12 species were recorded, which yielded an overall passage rate of 0.7 birds per hour (Table 9). Daily counts ranged from 0 to 31, with the highest count occurring on September 3, 2020. No raptors were observed during surveys in early spring and from late November through December. Within the season, there were several days with no raptor observations, which coincided with either calm or blustery days. Slightly more raptors were observed at Point 2 (n=161) than Point 1 (n=149), with the fewest at Point 3 (n=37), which also had a lower survey effort. Of the observations with a recorded prevailing wind, nearly half (48 percent) were northerly followed by southerly (41 percent) and west (13 percent). Most observations (57 percent) were recorded in the morning, with the greatest number of observations between 10:00 am and 11:00 am (Figure 12).

American kestrels (*Falco sparverius*) accounted for 29 percent of the total observations and were the most observed species during the raptor surveys. Kestrels dominated observations at Points 1 and 2 which are both located in fields. Individuals were often observed perched on light posts flanking fields and hunting within fields. Given how frequently the species was observed in the fields and that multiple individuals were common, it was likely breeding pairs were in the vicinity of the fields. To avoid double counting, American kestrels were only recorded once at the start of each survey date, otherwise totals would be greatly inflated for this species as individuals would come into and out of view regularly throughout surveys. Turkey vultures (*Cathartes aura*) were the second most recorded species (21 percent) and were detected primarily at Points 1 and 2 (50 and 45 percent, respectively)

With half of all raptor observations composed of American kestrel and turkey vultures, no other group of raptors stood out. More hawks (16 percent) were observed than accipiters (10 percent). Broad-winged hawks (*Buteo. platypterus*) were the majority of buteo observations (n=45) followed by red-tailed hawks (*Buteo jamaicensis*), which were observed in the spring and fall (n=10). Small groups of broad-winged hawks were observed kettling in September during peak migration, but no large groups were observed. Sharp-shinned hawks (*Accipiter striatus*) accounted for the majority of accipiter observations (n=25), most of which were detected at Point 3. Northern harriers (*Circus hudsonius*; n=29), a Maine Species of Special Concern, were observed throughout the spring and fall. Northern goshawks (*Accipiter gentilis*; n=6), another Maine Species of Special Concern, were observed on multiple occasions in late summer and early fall. Due to the expansive vantages in several directions at Points 1 and 2, raptors were detected at very long distances (greater than 2 miles) and identification to species or group was not always possible, thus 9 percent of the observations were classified as unknown raptors.

Survey duration allowed for a thorough picture of seasonal use of the Project Area by raptors. Beginning in late March with the first raptor observations of the year, raptor observations were fairly consistent (with the exception of July when no surveys were conducted) with spikes on April 30 and September 3, 2020 and then markedly dropping off after October 22, 2020 (Figure 13). Species not detected during June or August (note that no surveys were conducted in July) included: bald eagle, golden eagle, Cooper's hawk (*Accipiter. cooperii*), osprey (*Pandion haliaetus*), red-shouldered hawk (*Buteo lineatus*), and sharp-shinned hawk. Lack of detections during the summer months may suggest these are not summer resident species and may be common moving through the Project Area during migration in the spring and fall. Conversely, species detected in June and August suggest those species are summer residents.

Flight paths varied and did not align with the prevailing wind direction likely because of the topography of the site. The elevated plateau results to broader movements compared to ridges that raptors tend to follow. Of the raptors that did exhibit a clear direction of travel, nearly half were northerly (47 percent) followed by southerly (41 percent) and westerly (13 percent).

Of recorded flight heights, 56 percent of the low heights were 100 meters or less, heights that would be within the rotor sweep zone of a wind turbine (Vestas model V150-4.2; rotor diameter 150 meters above ground). Many of these observations were less than 10 meters (n=155) and dominated by American kestrel and northern harrier (80 percent). Common low flight behaviors included individuals kiting and flying low over the center field (Point 1) and south field (Point 2) hunting or individuals perching on utility poles. Kiting and hunting behaviors by red-tailed hawks and northern goshawks were also observed along the ridge west of Point 3.

Incidental observations of raptors and non-raptors were made during the surveys. The numbers of individuals were not recorded for each survey date and the observations serve as a record for species presence and offer insight in temporal use and migratory movements in the Project Area (Appendix G). Incidentally observed species with elevated conservation status included northern harrier, tree swallow (*Tachycineta bicolor*), white-throated sparrow (*Zonotrichia albicollis*), Canada warbler (*Cardellina canadensis*), chestnut-sided warbler (*Setophaga pensylvanica*), and yellow warbler (*Setophaga petechia*; MDIFW 2015; Appendix B). Although not listed, snow bunting (*Plectrophenax nivalis*) observations on October 29 and November 11 and 20 were noteworthy incidentals.

Table 9. Daily Summary of Migrating Raptors at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Date	American Kestrel	Bald Eagle	Broad-winged Hawk	Cooper's Hawk	Golden Eagle	Northern Goshawk	Northern Harrier	Osprey	Red-shouldered Hawk	Red-tailed Hawk	Sharp-shinned Hawk	Turkey Vulture	Unidentified Accipiter Hawk	Unidentified Hawk	Unidentified Raptor	Date Total	Survey Effort (hours)	Passage Rate
3/4																0	6.5	0.0
3/5																0	6.5	0.0
3/11																0	6.5	0.0
3/12																0	6.5	0.0
3/16																0	6.5	0.0
3/19																0	7.0	0.0
3/24																0	7.0	0.0
3/25																0	7.0	0.0
3/31		1								2					1	4	7.5	0.5
4/1		2													1	3	7.0	0.4
4/6	2										1					3	7.5	0.4
4/7	1		1		1					1						4	7.5	0.5
4/14	5						1					3		1	1	11	7.5	1.5
4/15	5	2	2									3			1	13	7.5	1.7
4/22								1				4				5	6.0	0.8
4/23	2															2	7.5	0.3
4/29	3	1	1									4			3	12	8.0	1.5
4/30	1		4				1	1				13			5	25	7.5	3.3
5/4	4						5									9	8.0	1.1
5/5	2	1					3	1								7	8.0	0.9
5/13	1		1				3					3				8	7.0	1.1
5/14	2						1									3	9.0	0.3
5/19	1	3	2									2				8	9.0	0.9
5/27	2						2									4	9.0	0.4
6/4			4									4				8	9.0	0.9
6/10	1											2				3	9.0	0.3
6/12	5		2									3				10	9.0	1.1
6/16												3				3	9.0	0.3
8/5	5											3				8	9.0	0.9
8/6	1															1	9.0	0.1
8/13										1						1	8.8	0.1
8/14	3															3	8.8	0.3
8/18			2			3						4			2	11	7.8	1.4
8/19	6		2									4			3	15	8.5	1.8
8/26	14						2					4				20	8.4	2.4
8/27			1													1	7.4	0.1
9/2			5	1												6	7.5	0.8
9/3	3		11			1			1		1	9	1		4	31	7.5	4.1
9/8	13										2	1				16	8.0	2.0

Date	American Kestrel	Bald Eagle	Broad-winged Hawk	Cooper's Hawk	Golden Eagle	Northern Goshawk	Northern Harrier	Osprey	Red-shouldered Hawk	Red-tailed Hawk	Sharp-shinned Hawk	Turkey Vulture	Unidentified Accipiter Hawk	Unidentified Hawk	Unidentified Raptor	Date Total	Survey Effort (hours)	Passage Rate
9/9											6					6	8.0	0.8
9/14	6		1				3				5	1				16	8.0	2.0
9/16							1				1					2	8.0	0.3
9/24																0	7.0	0.0
9/25		2		1		2	1			2	2	3	2		3	18	8.0	2.3
9/28	6						1									7	7.5	0.9
10/1																0	7.5	0.0
10/8											1					1	6.5	0.2
10/9			2							1	2	1			1	7	8.0	0.9
10/14							4			1	1					6	7.3	0.8
10/15							1			1						2	7.3	0.3
10/21											2					2	7.5	0.3
10/22	4	2	3												6	15	7.0	2.1
10/29											1					1	6.0	0.2
10/30																0	6.0	0.0
11/6								1								1	5.5	0.2
11/11		1														1	5.3	0.2
11/12																0	5.3	0.0
11/19										1						1	6.0	0.2
11/20																0	6.0	0.0
11/23																0	4.0	0.0
11/24																0	5.0	0.0
12/3																0	5.0	0.0
12/4																0	5.0	0.0
12/10																0	5.0	0.0
12/11																0	4.5	0.0
12/15																0	5.0	0.0
12/16																0	5.0	0.0
Overall	**100**	**15**	**45**	**2**	**1**	**6**	**29**	**4**	**1**	**10**	**25**	**74**	**3**	**1**	**31**	**347**	**479.6**	**0.7**

Table 10. Summary of Migrating Raptors by Survey Point at the Western Maine Renewable Energy Project; Somerset County, Maine, 2020.

Date	American Kestrel	Bald Eagle	Broad-winged Hawk	Cooper's Hawk	Golden Eagle	Northern Goshawk	Northern Harrier	Osprey	Red-shouldered Hawk	Red-tailed Hawk	Sharp-shinned Hawk	Turkey Vulture	Unidentified Accipiter Hawk	Unidentified Hawk	Unidentified Raptor	Grand Total
1	41	3	21	0	1	1	17	1	1	4	8	37	1	1	12	149
2	56	12	15	1	0	2	10	3	0	3	7	33	2	0	17	161
3	3	0	9	1	0	3	2	0	0	3	10	4	0	0	2	37
Grand Total	**100**	**15**	**45**	**2**	**1**	**6**	**29**	**4**	**1**	**10**	**25**	**74**	**3**	**1**	**31**	**347**

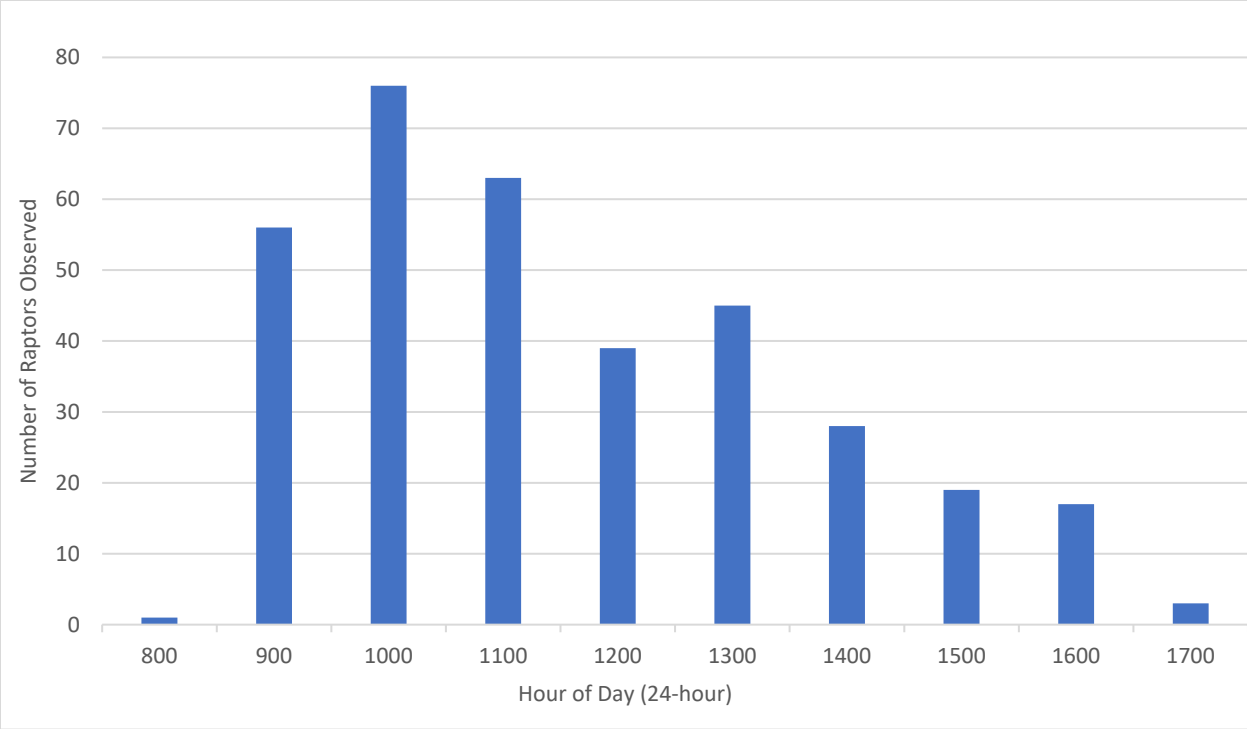


Figure 12. **Hourly Breakdown of Number of Raptors Observed, Western Maine Renewable Energy Project; Somerset County, Maine, 2020.**

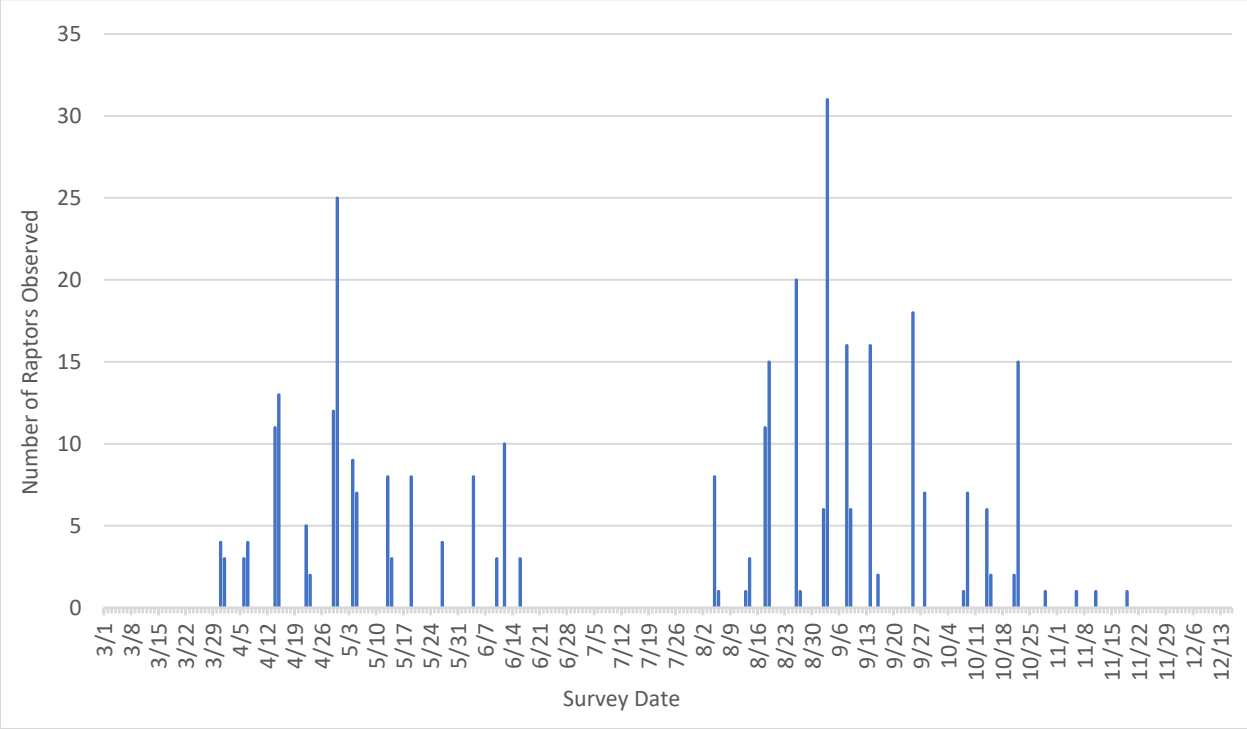


Figure 13. **Number of Raptors Observed by Survey date, Western Maine Renewable Energy Project; Somerset County, Maine, 2020.**

10.4 Discussion

10.4.1 Golden Eagles

Extensive survey effort targeting golden eagles throughout 2020 yielded a single golden eagle observation in April 2020 headed north. The two primary factors influencing low detections in the Project Area are 1) no breeding population of golden eagles currently exists in Maine and individuals that do pass through Maine do so during migration or forays, and 2) lack of features such as leading ridgelines to concentrate migratory raptor flight lines.

Historically, records of breeding golden eagles in the northeastern U.S. are rare with only 11 documented eyries in Maine (Todd 2000, Morneau et al. 2015). Since 1984, only two have been inhabited by golden eagles with the last active record occurring in Piscataquis County at a historic site (1736 eyrie) in 1997 (Todd 2000) and the species is now considered "extirpated as a breeder from the eastern U.S." (Morneau 2015). However, recent records indicate that golden eagles will move through Maine when migrating from breeding and summering areas in eastern Canada and wintering areas in the Great Lakes and the Appalachian high country (Katzner et al. 2012a). One telemetry study documented a golden eagle use in Maine over a 5-year period during migration and in the summer. This individual, dubbed "Virgil Caine," visited historic eyries in the state but did not establish a breeding territory (CCB 2020). Publicly available raptor migration data is limited and largely conducted by volunteers. In 2020, three sites affiliated with the Hawk Migration Association of North American submitted raptor data. Level of effort and seasonal timing of surveys varied but golden eagles were observed at the Moosehorn and Clarry Hill hawk watch stations, with 2 and 10 golden eagles reported for the year, respectively (Table 11; HMANA 2021). Similarly, few recent eBird records exist for the golden eagle near the Project Area. The most recent reports (2018 and 2019) in the vicinity of the Project Area are from southern Quebec, while the nearest viable report in Maine was in the vicinity of farmland north of Waterville in the winter and spring of 2013 (eBird 2021).

Golden eagles that occupy breeding ranges on the Gaspe Peninsula are most likely to travel through New England during migration to winter in New York and Pennsylvania, which is one of the seven predicted migratory routes for eastern golden eagles (Katzner et al. 2012b). This route does not coincide with established raptor migration watch sites (Katzner et al. 2012a) and may be why golden eagles are not well represented in Maine (Table 11). Watch sites are typically established on known migration flight paths, such as along the Appalachian Mountains in the eastern U.S. where long distant migrants follow leading lines (linear topographic features such as ridges along mountain chains) to capitalize on updrafts and conserve energy during migration. Well-defined topographic features creating leading lines for raptor migration are absent in the vicinity of the Project Area. The Appalachian chain and characteristic defined, continuous ridges become less well defined in northern New England. The Quebec/New England Boundary Mountains dominate the northern tier of the state and represent the highest elevations and potential for topographic leading lines. The Project Area flanks this ecoregion and the Central Foothills, a transitional area between lower elevations in the Acadian Plains and Northeastern Highlands (Griffith et al. 2009). Higher elevations and mountains such as Sugarloaf and the Bigelows to the west and northwest are prominent topographic features in the region and may concentrate raptor migration flights north of the Project Area. Unfortunately, hawk watch sites are absent in northern Maine and a direct comparison cannot be made. The Moosehorn hawk watch site located in Downeast Maine reported similar passage rates to this Project. Both sites are similar in that strong topographic and waterways are absent.

10.4.2 Bald Eagles

Bald eagles were observed in the Project Area and at a higher rate than golden eagles. However, passage rates observed for bald eagles were lower than at other hawk watch sites in Maine in 2020 (Table 11). The Moosehorn site is the most comparable to the Project Area given the lack of prominent topographic features and waterways, but passage rates were still higher at Moosehorn than in the Project Area.

Approximately 4 miles west of the Project Area, the Kennebec River has five active nests with breeding pairs from Caratunk south to Solon township (USFWS 2018). East of the Kenennbec River, including the Project Area, there is a 20-mile void with no documented bald eagle nests until reaching the Sebec lake area, which hosts a high density of nests on small lakes in the vicinity (USFWS 2018).

Summarizing eagle observations revealed that spring observations were most common and accounted for nearly half of the overall flight lengths observed (47 percent), while 20 percent occurred in the summer (May 15 – September 15, 2020), and only 33 percent in the fall. These findings were contrary to anticipated results, in that given the proximity of nesting eagles along the Kennebec River, more observations were expected during the summer. Seasonal energy budgets may have been a contributing factor to seasonal flight path behaviors. Watson et al. (1991) observed a significant reduction in nest building and maintenance in the winter and an increase in aggression between eagles with adjacent territories, which would allow more time for soaring and establishing territories. In addition, breeding activity begins in March, then transitions into care of chicks in May, which can last through September (Buehler 2000). Greater time and energy requirements for nest building, foraging, and caring for young may limit soaring activity and account for fewer observations in the summer.

Time of day was another factor that influenced eagle observations. Two-thirds of the eagle observations were made between 10:28 am and 2:30 pm, which is consistent with other research that eagles are mostly active and visible mid-day (USFWS 2013).

10.4.3 Other Raptors

Golden eagle surveys followed the raptor migration protocol so naturally, the survey yielded a rich dataset on raptor occurrence within the Project Area. While the number of raptor observations far surpassed eagle observations, passage rates within the Project Area were far lower compared to three of four hawk watch sites with 2020 data in Maine (Table 11). Passage rates were only slightly higher at the Moosehorn site than in the Project Area (1.7 birds per hour compared to 0.7 birds per hour, respectively). Most raptors observed were at flight heights less than 150 meters and potentially within a turbine rotor sweep zone, though not necessarily within 800 meters horizontal distance to proposed turbine locations or survey point. Low flight heights were dominated by American kestrel and northern harrier, species known to hunt by hovering and gliding close to the ground (Smallwood et al. 2020, Smith et al. 2020). However, due to pouncing foraging strategies by both species from low hunting heights, risk may be less as the species spend much of their time below rotor sweep zones. Risk of hazards such as wind turbines do not appear to be a risk to northern harrier due to their low flight habits (Garvin et al. 2011). In addition to the open habitats of the field near Points 1 and 2, American kestrel further benefited from light and utility poles bordering the fields, which served as convenient perches for hunting.

Table 11. Summary of Hawk Migration Association of North America Sites in Maine, 2020.

Site	Location	Season	# of Bald Eagles	# of Golden Eagles	Cumulative Raptor Counts	Survey Hours	Comments
Moosehorn	Cooper, Maine	Spring	11	2	60	101	all in April
		Fall	0	0	30	51	
Clarry Hill	Union, Maine	Spring	no data				
		Fall	590	10	12,846	303	9 of the golden eagles were in October
Cadillac Mountain	Bar Harbor, Maine	Spring	no data				
		Fall	99	0	2,973	257	
Bradbury Mountain State. Park	Pownal, Maine	Spring	89	0	5,057	407	
		Fall	no data				

10.4.4 Raptors and Wind

Publicly available information on turbine-caused avian mortalities in the northeastern U.S. has been limited (Piorkowski et al. 2012, AWWI 2020). Fortunately, Choi et al. (2020) recently published an evaluation of bird and bat mortalities that included data from 49 percent of northeastern U.S. turbines, the most comprehensive review to date. From data (2008–2017) included in this evaluation, *Accipitriformes* accounted for 3 percent of the total avian fatalities, only one of which was an eagle (bald eagle). This fatality estimate is similar to another review encompassing the eastern U.S. that reported 3 percent diurnal mortalities, but greater than the 1 percent diurnal mortalities reported for the Northern Forest (AWWI 2020). Conversely, far more eagle collisions have been reported in the western U.S., to the extent that facilities like the Altamont Pass Wind Farm have been identified as ecological sinks and may have broader implications for the western population of golden eagles (Katzner et al. 2017). Risk at the Altamont Pass Wind Farm, however, provides an example of worst-case scenario that is enhanced by turbine type, local eagle densities, and siting (Smallwood and Thelander 2008). Other studies in the western U.S. indicate that golden eagles modify behaviors to avoid turbines (Johnston et al. 2014).

The relatively low proportion of turbine-caused raptor fatalities in the eastern U.S. and the single reported eagle fatality, combined with collision avoidance behaviors demonstrated by eagles (Johnson et al. 2014, Choi et al. 2020) and the relatively low number of eagle observations in the 2020 surveys for the Project Area, supports the conclusion that collision risk to eagles within the Project Area will likely be low.

11.0 PEREGRINE FALCON

According to MDIFW, no peregrine falcon (*Falco peregrinus*) pairs have been documented in the vicinity of the Project Area and, therefore, no surveys for this species were requested (MDIFW 2020a). During previous surveys conducted at the Project Area, a single peregrine falcon was observed on April 5, 2013. No incidental observations of peregrine falcons were noted during any of the other natural resource surveys conducted in 2020.

12.0 GREAT BLUE HERON

12.1 Introduction

Great blue heron are a species of concern to MDIFW and has part of the permit process they recommended an evaluation of great blue herons rookeries within a 4 mile radius of the Project. An aerial survey during leaf off conditions is recommend as the best technique for this survey as can be conducted in conjunction with other aerial surveys.

12.2 Methods

Prior to fieldwork, Tetra Tech reviewed available information from the Maine Natural Areas Program (MNAP 2020) and the 2013 survey results. The 2020 field survey was conducted by helicopter (Bell 206B Jet Ranger; Maine Helicopters out of Whitefield, ME) with one biologist in a 1-day effort, on May 20, 2020 in conjunction with an eagle nest survey (Section 2.0). The flight path ensured all wetland areas and all areas that showed forested areas with trees large enough to support an eagle nest were checked out to 4 miles from the current Project Area (Figure 3). The 4-mile search area is twice the survey or buffer distance recommended by the USFWS updated eagle nest survey protocol for wind energy projects (USFWS 2020b). The aerial survey included Wyman Lake (Kennebec River) to the southwest of the Project Area which was considered the best habitat for heron nesting. The survey also included one stop in Greenville, Maine for refueling. Data collection parameters for the survey included GPS location, condition of the nest (i.e. active, inactive, not found), activity observed (i.e. incubating adult, number of

eggs/nestlings), and number of adults present. Data on nests was collected using an Apple iPad and flight path was recorded using a Garmin 60CSx GPS unit. If heron nests were observed, they were photographed using a Canon EOS-7D digital camera with a 100–400-millimeter telephoto lens.

12.3 Results

Information from the MNAP High Value Plant and Animal Habitat Map Tool webpage (MNAP 2020) indicated high value inland wading bird and waterfowl habitat at Chase and Little Chase Pond that may support breeding herons. The 2013 survey did not identify any great blue heron rookeries within 10 miles of the Project Area including Chase and Little Chase Pond. All wetlands of interest were checked during the 2020 helicopter survey. No great blue heron rookeries were found within the Project Area or within 4 miles of the Project Area. In addition, no great blue herons were observed flying or perched during the aerial survey. Weather on the day of the survey was sunny and clear with visibility of at least 50 miles.

12.4 Discussion

No great blue heron nests were observed during the 2020 aerial survey. The MNAP web map tool and the 2013 survey did not identify any great blue heron rookeries within 4 miles of the Project Area (Tetra Tech 2015, MNAP 2020). The results of the 2020 survey and the 2013 survey suggest that the Project Area is a low risk to nesting herons. One great blue heron was observed on September 3, 2020 in the South Field of the Moscow Radar Station during an upland sandpiper survey (Section 5.0).

13.0 WETLANDS

Wetlands were delineated within the Project Area in 2020 and 2021. Results of the wetland delineation are included in the Natural Resources Report included in the permit applications.

14.0 VERNAL POOLS

Vernal pool surveys and potential vernal pool surveys were conducted within the Project Area in 2020 and 2021. Results of the vernal pool surveys are included in the Natural Resources Report included in the permit applications.

15.0 OTHER RESOURCES

Information about intermittent and perennial streams and contiguous wetlands are included in the Natural Resources Report.

16.0 REFERENCES

AWWI (American Wind Wildlife Institute). 2020. AWWI Technical Report: 2nd Edition: Summary of Bird Fatality Monitoring Data Contained in AWWIC. Washington, DC. Available at www.awwi.org.

Atwood J., J. Collins, L. Kidd, M. Servison, J. Walsh. No date. Best Management Practices for Nesting Grassland Birds. Mass Audubon. Available at https://www.massaudubon.org/content/download/19413/274073/file/Best-Management-Practices_Grasslands.pdf. Accessed October 30, 2020.

Aversa, T. 2020. Checklist S69949285. Maine Bird Atlas. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available at https://ebird.org/atlasme/checklist/S69949285. Accessed October 30, 2020.

Avery, M. L. 2020. Rusty Blackbird (*Euphagus carolinus*), version 1.0. *In* Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at https://doi.org/10.2173/bow.rusbla.01. Accessed October 2020.

BirdCast. 2020. BirdCast: Bird migration forecasts in real-time. Cornell Lab of Ornithology, Ithaca, New York. Available at https://birdcast.info/.

Buehler, D. A. 2000. Bald Eagle (*Haliaeetus leucocephalus*), The Birds of North America (P. G. Rodewald, Ed.). Ithaca: Cornell Lab of Ornithology; Retrieved from the Birds of North America: https://birdsna.org/Species-Account/bna/species/baleag/introduction. Accessed February 2018.

CCB (Center for Conservation Biology, The). 2020. Tracking Golden Eagles in Eastern North America. Available online at: https://ccbbirds.org/what-we-do/research/tracking/tracking-projects/tracking-golden-eagles-eastern-north-america. Accessed January 2021.

Choi, D.Y., Wittig, T.W. and B.M. Kluever. 2020. An evaluation of bird and bat mortality at wind turbines in the Northeastern United States. *PloS one*, *15*(8), p.e0238034.

Davis, W. H., and H. B. Hitchcock. 1965. Biology and migration of the bat *Myotis lucifugus* in New England. Journal of Mammalogy, 46, 296–313.

Dechant, J.A., Dinkins, M.F., Johnson, D.H., Igl, L.D., Goldade, C.M., Parkin, B.D. and Euliss, B.R., 2002. Effects of management practices on grassland birds: Upland Sandpiper. USGS Northern Prairie Wildlife Research Center, p.118.

DeGraaf, R.M., Hestbeck, J.B. and M. Yamasaki. 1998. Associations between breeding bird abundance and stand structure in the White Mountains, New Hampshire and Maine, USA. *Forest Ecology and Management*, *103*(2), pp.217–233.

Divoll, T. J. 2013. Mist-netting, passive ultrasonic detection, and stable isotopes determine community structure and temporal variation in bats (*Chiroptera*) at Acadia National Park, Maine. MS thesis. University of Southern Maine, Portland, ME.

eBird. 2020. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available at http://www.ebird.org. Accessed October 30 ,2020.

_____. 2021. eBird: An online database of bird distribution and abundance [web application]. eBird, Cornell Lab of Ornithology, Ithaca, New York. Available: http://www.ebird.org. Accessed: January 4 ,2021.

Fink, D., T. Auer, A. Johnston, M. Strimas-Mackey, O. Robinson, S. Ligocki, B. Petersen, C. Wood, I. Davies, B. Sullivan, M. Iliff, S. Kelling. 2020. eBird Status and Trends, Data Version: 2018; Released: 2020. Cornell Lab of Ornithology, Ithaca, New York. https://doi.org/10.2173/ebirdst.2018

Foss, C. R. 1994. Upland Sandpiper. *In* Atlas of breeding birds in New Hampshire., edited by C. R. Foss, 86–87. Dover: Audubon Soc. of New Hampshire.

Garvin, J. C., C.S. Jennelle, D. Drake, and S.M. Grodsky. 2011. Response of raptors to a windfarm. Journal of Applied Ecology, 48(1), 199–209.

Griffith, G.E., Omernik, J.M., Bryce, S.A., Royte, J., Hoar, W.D., Homer, J.W., Keirstead, D., Metzler, K.J., and G. Hellyer. 2009. Ecoregions of New England (color poster with map, descriptive text, summary tables, and photographs): Reston, Virginia, U.S. Geological Survey (map scale 1:1,325,000).

HMANA (Hawk Migration Association of North America). 2021.Hawk Migration Association of North America's Raptor Migration Database. Hawk Count. Data available online at: http://hawkcount.org/sitesel.php?country=USA&stateprov=Maine. Accessed January 2021.

Hitchcock, H. B. 1955. A summer colony of the least bat, *Myotis subulatus leibii* (Audubon and Bachman). The Canadian Field-Naturalist, 69, 31.

Houston, C. S., C. Jackson, and D. E. Bowen Jr. 2020. Upland Sandpiper (*Bartramia longicauda*), version 1.0. *In* Birds of the World (A. F. Poole, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. https://doi.org/10.2173/bow.uplsan.01

Ingalls, M., Connery, B., and D. Yates. 2017. Identifying late summer activities and habitat preferences of remnant populations of *Myotis* bats in Acadia National Park, Maine. Biodiversity Research Institute. Portland, ME.

Johnston, N.N., Bradley, J.E. and K.A. Otter. 2014. Increased flight altitudes among migrating Golden Eagles suggest turbine avoidance at a Rocky Mountain wind installation. PloS one, 9(3), p.e93030.

Katzner, T., Smith, B.W., Miller, T.A., Brandes, D., Cooper, J., Lanzone, M., Brauning, D., Farmer, C., Harding, S., Kramar, D.E. and C. Koppie. 2012a. Status, biology, and conservation priorities for North America's eastern Golden Eagle (*Aquila chrysaetos*) population. The Auk, 129(1), pp.168–176.

Katzner, T.E., Brandes, D., Miller, T., Lanzone, M., Maisonneuve, C., Tremblay, J.A., Mulvihill, R. and G.T. Merovich Jr. 2012b. Topography drives migratory flight altitude of golden eagles: implications for on-shore wind energy development. Journal of Applied Ecology, 49(5), pp.1178–1186.

Katzner, T.E., Nelson, D.M., Braham, M.A., Doyle, J.M., Fernandez, N.B., Duerr, A.E., Bloom, P.H., Fitzpatrick, M.C., Miller, T.A., Culver, R.C. and L. Braswell. 2017. Golden Eagle fatalities and the continental-scale consequences of local wind-energy generation. Conservation Biology, 31(2), pp.406–415.

MDIFW (Maine Department of Inland Fisheries and Wildlife). 2015a. Maine's Wildlife Action Plan. Element 1: Species of Greatest Conservation Need. Available at https://www.maine.gov/ifw/docs/2015%20ME%20WAP%20Element%201_DRAFT.pdf. Accessed October 2020.

_____. 2015b. Maine's Endangered and Threatened Wildlife. Available at https://www.maine.gov/ifw/docs/Maine%20ET%20List_2015-10-15.pdf. Accessed October 2020.

_____. 2018. Maine Department of Inland Fisheries and Wildlife. Maine Wind Power Preconstruction Recommendations and Turbine Curtailment Recommendation to Avoid/Minimize Bat Mortality. Updated March 5, 2018.

_____. 2019. Northern Spring Salamander Survey Protocols – MDIFW. Updated September 25, 2019.

_____. 2020a. Moscow Renewable Energy Project Preliminary Resource Survey Recommendations. Consultation letter from Robert D. Stratton, Environmental Program Manager, Maine Department of Inland Fisheries and Wildlife; March 10, 2020.

_____. 2020b. Recommended Survey Protocol for the Roaring Brook Mayfly (*Epeorus frisoni*). Version April 17, 2020.

_____. No date. Representative Photographs of Suitable Bat Rock Roosting Sites.

MNAP (Maine Natural Areas Program). 2020. Beginning with Habitat - High Value Plant and Animal Habitats: Available at https://beginningwithhabitat.org. Accessed July 2020.

Miller, T.A., Brooks, R.P., Lanzone, M.J., Cooper, J., O'Malley, K., Brandes, D., Duerr, A. and T.E. Katzner. 2017. Summer and winter space use and home range characteristics of Golden Eagles (*Aquila chrysaetos*) in eastern North America. The Condor: Ornithological Applications, 119(4), pp.697–719

Moosman Jr, P. R., Warner, D. P., Hendren, R. H. and M. J. Hosler. 2015. Potential for monitoring eastern small-footed bats on talus slopes. Northeastern Naturalist, 22(1).

Moosman Jr, P. R., Marsh, D. M., Pody, E. K., Dannon, M. P., and R. J. Reynolds. 2020. Efficacy of visual surveys for monitoring populations of talus-roosting bats. Journal of Fish and Wildlife Management 11(2).

Morneau, F., Tremblay, J.A., Todd, C., Chubbs, T.E., Maisonneuve, C., Lemaître, J. and T. Katzner. 2015. Known breeding distribution and abundance of Golden Eagles in eastern North America. Northeastern Naturalist, 22(2), pp.236–247.

Nagorsen, D. W. and R. M. Brigham. 1993. Bats of British Columbia: Royal British Columbia museum handbook. University of British Columbia Press, Vancouver, Canada.

Piorkowski, M.D., A.J. Farnsworth, M. Fry, R.W. Rohrbaugh, J.W. Fitzpatrick, K.V. Rosenberg. 2012. Research priorities for wind energy and migratory wildlife. Journal of Wildlife Management 76:451–456.

Ralph, C. J., and J. R. Sauer. 1995. Managing and Monitoring Birds Using Point Counts. Pages 161–168. Gen. Tech. Rep, USDA Forest Service.

Robbins, C. S., D. Bystrak, and P. H. Geissler. 1986. The Breeding Bird Survey: Its First Fifteen Years, 1965–1979.

Royle, J. A., and J. D. Nichols. 2003. Estimating Abundance from Repeated Presence-Absence Data or Point Counts. Ecology 84:777–790.

Sauer, J.R. 2010. The North American Breeding Bird Survey 1966–2009. Summary Analysis and Species Accounts.

Simons, T.R., Alldredge, M.W., Pollock, K.H. and J. M. Wettroth. 2007. Experimental analysis of the auditory detection process on avian point counts. *The Auk*, *124*(3), pp.986–999.

Smallwood, K.S. and C. Thelander. 2008. Bird mortality in the Altamont Pass wind resource area, California. The Journal of Wildlife Management, 72(1), pp.215–223.

Smallwood, J. A. and D. M. Bird. 2020. American Kestrel (*Falco sparverius*), version 1.0. *In* Birds of the World (A. F. Poole and F. B. Gill, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at https://doi.org/10.2173/bow.amekes.01

Smith, K. G., S. R. Wittenberg, R. B. Macwhirter, and K. L. Bildstein. 2020. Northern Harrier (*Circus hudsonius*), version 1.0. In Birds of the World (P. G. Rodewald, Editor). Cornell Lab of Ornithology, Ithaca, NY, USA. Available at https://doi.org/10.2173/bow.norhar2.01

Todd, C.S. 2000. Golden Eagle Assessment. Maine Department of Inland Fisheries and Wildlife. Wildlife Resource Assessment Section. Endangered and Threatened Species Group.

Tetra Tech. 2015. Bird and Bat Survey Report 2012–2013. Moscow Wind Project. Moscow, Maine. April 2015. Prepared for Patriot Renewables.

_____. 2020. Moscow Renewable Energy Project Study Plan. Prepared for Patriot Renewables, LLC. June 2020.

USFWS (U.S. Fish and Wildlife Service). 2012. U.S. Fish and Wildlife Service Land-Based Wind Energy Guidelines. Available at https://www.fws.gov/ecological-services/es-library/pdfs/WEG_final.pdf. Accessed October 2020.

_____. 2013. Eagle Conservation Plan Guidance. Module 1- Land-based Wind Energy Version 2. U.S. Fish and Wildlife Service Division of Migratory Bird Management. April 2013.

_____. 2018. Maine Bald Eagle Nest Locations and Buffer Zones. Interactive Webmap. Available online at: https://www.arcgis.com/apps/webappviewer/index.html?id=796b7baa18de43b49f911fe82dc4a0f1. Accessed January 2021.

_____. 2020a. Maine Field Office. Bald Eagle Map Tool. Available at https://www.arcgis.com/apps/webappviewer/index.html?id=796b7baa18de43b49f911fe82dc4a0f1. Accessed July 2020.

_____. 2020b. Updated Eagle Nest Survey Protocol. Available at: https://www.fws.gov/migratorybirds/pdf/management/EagleNestSurveyGuidanceUpdated.pdf. Accessed July 2020.

_____. 2020c. Range-wide Indiana Bat Summer Survey Guidelines. March 2020. 65pp. Available online at: https://www.wildlife.state.nh.us/nongame/documents/endangered-threatened-wildlife-nh.pdf

Vickery, P.D., Blanco, D.E. and B. López-Lanús. 2010. Conservation plan for the Upland Sandpiper (*Bartramia longicauda*). Version 1.1. Manomet Center for Conservation Sciences, Manomet, Massachusetts.

Vickery, P.D., Hunter Jr., M.L., and S.M. Melvin. 1994. Effects of habitat area on the distribution of grassland birds in Maine. Conservation Biology, 8(4), pp.1087–1097.

Watson, J.W., M.G. Garrett, and R.G. Anthony. 1991. Foraging ecology of bald eagles in the Columbia River estuary. The Journal of wildlife management, 492–499.

Young, J.S., A. Cilimburg, K. Smucker, and R. L. Hutto. 2007. Northern Region Landbird Monitoring Program. Point Count Protocol 2007. Avian Science Center. Division of Biological Sciences, University of Montana Missoula, MT 59812 available at http://avianscience.dbs.umt.edu/research_landbird_methodsmanual.htm. Accessed October 2020.

APPENDIX A. BREEDING BIRD SURVEY POINT COUNT STATIONS

1: BBS-1 South, in ROW 5/21/20

2: BBS-1 North, in ROW, deciduous dominated 5/21/20

3: BBS-2 North, in ROW, deciduous dominated 5/21/20

4: BBS-2 North, in ROW, mixed forest 5/21/20

5: BBS-3 North, in ROW, 5/21/20

6: BBS-3 West, in ROW, mixed forest 5/21/20

7: BBS-4 North, open/wetland/pond, 5/21/20

8: BBS-4 East, open/wetland/pond, 5/21/20

9: BBS-5 North, open/wetland/pond, 5/21/20

10: BBS-5 South, access road, mixed forest, 5/21/20

11: BBS-6 North, open field, 5/21/20

12: BBS-6 South, open field, 5/21/20

13: BBS-7 North, deciduous dominated, 5/21/20

14: BBS-7 South, opening next to forest, 5/21/20

15: BBS-8 West, along road, 5/21/20

16: BBS-8 South, thick softwood dominated, 5/21/20

17: BBS-9 South, along roadway, 5/21/20

18: BBS-9 West, mid-successional mixed forest, 5/21/20

19: BBS-10 South, along roadway, 5/21/20

20: BBS-10 West, mid-successional mixed forest, 5/21/20

21: BBS-11 East, along roadway, 5/21/20

22: BBS-11 South, thick softwood dominated, 5/21/20

23: BBS-12 North, open filed, 5/21/20

24: BBS-12 West, open field, 5/21/20

25: BBS-13 North, open field, 5/21/20

26: BBS-13 East, adjacent to mixed forest, 5/21/20

27: BBS-14 East, open field, 5/21/20

28: BBS-14 West, mixed forest, 5/21/20

29: BBS-15 North, mixed tree species in field, 5/21/20

30: BBS-15 East, mixed tree species in field, 5/21/20

31: BBS-16 West, at crossroads, 5/29/20

32: BBS-16 South, dense mixed tree species, 5/29/20

33: BBS-18 North, early successional mixed forest, 5/29/20

34: BBS-18 South, early successional mixed forest, 5/29/20

35: BBS-19 North, mid successional softwood, 5/29/20

36: BBS-19 South, mid successional softwood, 5/29/20

37: BBS-20 West, along roadway, 5/29/20

38: BBS-20 North, mid-successional mixed forest, 5/29/20

39: BBS-21 North, mid-successional deciduous forest, 5/29/20

40: BBS-21 East, mid-successional deciduous forest, 5/29/20

41: BBS-22 North, mid-successional deciduous forest, 5/29/20

42: BBS-22 East, mid-successional deciduous forest, 5/29/20

43: BBS-23 North, mid-successional deciduous forest, 5/29/20

44: BBS-23 East, mid-successional deciduous forest, 5/29/20

45: BBS-24 North, mid-successional deciduous forest, 5/29/20

46: BBS-24 East, edge of red pine plantation, 5/29/20

47: BBS-25 North, mid-successional deciduous forest, 5/29/20

48: BBS-25 East, mid-successional deciduous forest, 5/29/20

APPENDIX B. CUMULATIVE AVIAN SPECIES LIST AND CONSERVATION STATUS

Species	Scientific Name	Maine SGCN Tier[1]	State[2]	BBS[3]	UPSA[4]	Eagle[5]
Alder Flycatcher	*Empidonax alnorum*			X		X
American Coot	*Fulica americana*					X
American Crow	*Corvus brachyrhynchos*			X	X	X
American Goldfinch	*Spinus tristis*			X	X	X
American Kestrel	*Falco sparverius*	3		X	X	X
American Robin	*Turdus migratorius*			X	X	X
American Tree Sparrow	*Spizella arborea*					X
American Woodcock	*Scolopax minor*			X		
Bald Eagle	*Haliaeetus leucocephalus*		SC			X
Barn Swallow	*Hirundo rustica*	2	SC			X
Belted Kingfisher	*Megaceryle alcyon*	3				X
Black-and-white Warbler	*Mniotilta varia*	2	SC	X		
Blackburnian Warbler	*Setophaga fusca*	3		X		
Black-capped Chickadee	*Poecile atricapillus*			X	X	X
Black-throated Blue Warbler	*Setophaga caerulescens*	3		X	X	X
Black-throated Green Warbler	*Setophaga virens*	3		X	X	X
Blue Jay	*Cyanocitta cristata*			X	X	X
Blue-headed Vireo	*Vireo solitarius*			X		X
Blue-winged Warbler	*Vermivora cyanoptera*	2	SC	X		
Broad-winged Hawk	*Buteo platypterus*	3		X	X	X
Brown Creeper	*Certhia americana*			X		
Brown Thrasher	*Toxostoma rufum*	2	SC	X		X
Canada Goose	*Branta canadensis*			X		X
Canada Warbler	*Cardellina canadensis*	2	SC	X	X	X
Cape May Warbler	*Dendroica tigrina*	3				X
Cedar Waxwing	*Bombycilla cedrorum*			X	X	X
Chestnut-sided Warbler	*Setophaga pensylvanica*	2	SC	X		X
Chipping Sparrow	*Spizella passerina*			X		X
Common Grackle	*Quiscalus quiscula*			X		X
Common Loon	*Gavia immer*			X		
Common Raven	*Corvus corax*			X	X	X
Common Redpoll	*Carduelis flammea*					X
Common Yellowthroat	*Geothlypis trichas*			X	X	X
Cooper's Hawk	*Accipiter cooperii*					X
Dark-eyed Junco	*Junco hyemalis*					X
Downy Woodpecker	*Picoides pubescens*			X		X
Eastern Bluebird	*Sialia sialis*					X
Eastern Wood-Pewee	*Contopus virens*	2	SC	X		
European Starling	*Sturnus vulgaris*					X

Species	Scientific Name	Maine SGCN Tier[1]	State[2]	BBS[3]	UPSA[4]	Eagle[5]
Field Sparrow	*Spizella pusilla*	3		X	X	X
Golden Eagle	*Aquila chrysaetos*	2	E			X
Golden-crowned Kinglet	*Regulus satrapa*			X	X	X
Gray Catbird	*Dumetella carolinensis*					X
Gray Jay	*Perisoreus canadensis*	3				X
Great Blue Heron	*Ardea herodias*	2	SC		X	
Hairy Woodpecker	*Picoides villosus*			X	X	X
Hermit Thrush	*Catharus guttatus*			X	X	X
Horned Lark	*Eremophila alpestris*	3	SC			X
Indigo Bunting	*Passerina cyanea*			X	X	
Least Flycatcher	*Empidonax minimus*	3	SC	X	X	
Lincoln's Sparrow	*Melospiza lincolnii*	3			X	
Magnolia Warbler	*Setophaga magnolia*			X	X	
Nashville Warbler	*Oreothlypis ruficapilla*			X	X	X
Northern Cardinal	*Cardinalis cardinalis*					X
Northern Flicker	*Colaptes auratus*	3		X	X	X
Northern Goshawk	*Accipiter gentilis*					X
Northern Harrier	*Circus hudsonius*	3	SC			X
Northern Parula	*Setophaga americana*	3		X	X	X
Osprey	*Pandion haliaetus*					X
Ovenbird	*Seiurus aurocapilla*			X	X	
Palm Warbler	*Setophaga palmarum*			X	X	X
Philadelphia Vireo	*Vireo philadelphicus*			X		
Pileated Woodpecker	*Dryocopus pileatus*			X		
Pine Siskin	*Carduelis pinus*					X
Pine Warbler	*Dendroica pinus*					X
Purple Finch	*Haemorhous purpureus*	3		X		X
Red-breasted Nuthatch	*Sitta canadensis*			X	X	X
Red-eyed Vireo	*Vireo olivaceus*			X	X	X
Red-shouldered Hawk	*Buteo lineatus*					X
Red-tailed Hawk	*Buteo jamaicensis*				X	X
Red-winged Blackbird	*Agelaius phoeniceus*			X		X
Rose-breasted Grosbeak	*Pheucticus ludovicianus*	3		X		
Ruby-crowned Kinglet	*Regulus calendula*	2		X		X
Ruby-throated Hummingbird	*Archilochus colubris*			X		X
Ruffed Grouse	*Bonasa umbellus*			X		X
Savannah Sparrow	*Passerculus sandwichensis*			X	X	X
Scarlet Tanager	*Piranga olivacea*	3		X	X	
Sharp-shinned Hawk	*Accipiter striatus*				X	X

Species	Scientific Name	Maine SGCN Tier[1]	State[2]	BBS[3]	UPSA[4]	Eagle[5]
Snow Bunting	*Plectrophenax nivalis*					X
Song Sparrow	*Melospiza melodia*			X	X	X
Spotted Sandpiper	*Actitis macularius*				X	
Swainson's Thrush	*Catharus ustulatus*	3		X	X	
Swamp Sparrow	*Melospiza georgiana*			X		
Tree Swallow	*Tachycineta bicolor*	2	SC	X		X
Turkey Vulture	*Cathartes aura*					X
Veery	*Catharus fuscescens*	2	SC	X		
White-breasted Nuthatch	*Sitta carolinensis*			X	X	X
White-crowned Sparrow	*Zonotrichia leucophrys*					X
White-throated Sparrow	*Zonotrichia albicollis*	3	SC	X	X	X
White-winged Crossbill	*Loxia leucoptera*	3		X		X
Wild Turkey	*Meleagris gallopavo*			X		X
Willow Flycatcher	*Empidonax traillii*			X		
Wilson's Snipe	*Gallinago delicata*			X	X	X
Winter Wren	*Troglodytes hiemalis*			X	X	X
Wood Duck	*Aix sponsa*			X		
Wood Thrush	*Hylocichla mustelina*	1	SC	X	X	
Yellow Warbler	*Setophaga petechia*	3	SC	X		
Yellow-bellied Sapsucker	*Sphyrapicus varius*			X	X	
Yellow-billed Cuckoo	*Coccyzus americanus*	2	SC		X	
Yellow-rumped Warbler	*Setophaga coronata*			X		X

[1]Maine Species of Greatest Conservation Concern Need (SCCN) Tier Ranking Codes: 1 Highest Priority; 2 High Priority; 3 Moderate Priority.

[2]State Codes: Endangered Species [E}; Threatened Species [T]; Candidate Species [C]; Special Concern Species [SC].

[3]Species observed during breeding bird surveys.

[4]Species observed during upland sandpiper surveys.

[5]Species observed during eagle surveys.

APPENDIX C. BREEDING BIRD SURVEY RESULTS BY SURVEY DATE

5/21/2020 Survey Event 1

Species	Point Count Station															Species Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
American Crow		1	2													3
American Goldfinch											1		3			4
American Robin	1	1		4	3	2					2				2	15
American Woodcock							1									1
Black-and-white Warbler					2											2
Blackburnian Warbler							1				1					2
Black-capped Chickadee	3				1	1										5
Black-throated Blue Warbler	1						1			1						3
Black-throated Green Warbler	1				2		2		1							6
Blue Jay	1		2		1	1	1						1			7
Blue-headed Vireo		2					1	1			1					5
Blue-winged Warbler		1			1											2
Brown Thrasher												1		1	1	3
Canada Goose									1							1
Chestnut-sided Warbler		1	2		1	1	2									7
Common Snipe			1													1
Common Yellowthroat	3	2	3	3	1	2			1	2	1	2	3		3	26
Golden-crowned Kinglet								1								1
Hairy Woodpecker	1															1
Hermit Thrush					1		1		2	1						5
Least Flycatcher			1		2					2						5
Magnolia Warbler								1								1
Nashville Warbler			2		1	1	2	3	2	3	1		1		2	18
Northern Flicker			1			1								1		3
Northern Parula	1	1	2				1				1			1		7
Ovenbird	3	2	2		2	2	4		4	1	1		1	1		23
Palm Warbler				1	1					2				1	1	6
Red-breasted Nuthatch		1				1	1									3
Red-eyed Vireo			1											1		2
Red-winged Blackbird				4												4
Rose-breasted Grosbeak	1	1														2
Ruby-crowned Kinglet								2								2
Ruby-throated Hummingbird			1													1
Ruffed Grouse				2												2
Savannah Sparrow						3						3	1		2	9
Scarlet Tanager		2														2
Song Sparrow	1	2		1		1				1		1	1	1	3	12
Swainson's Thrush		1		1												2
Swamp Sparrow													1			1
Veery	1															1
White-throated Sparrow		1	2	2	4	2	1	1	1	2	1	1	1	1	1	21
White-winged Crossbill									1							1
Wild Turkey	1		1													2
Wilson's Snipe				2	1	1							1	1	2	8
Winter Wren			1					1					1	1		4
Wood Duck														1		1
Yellow-bellied Sapsucker		6	2													8
Yellow-rumped Warbler				1	2	2	2	2			2					11
Total # of Individuals (Abundance)	**19**	**25**	**26**	**21**	**26**	**21**	**21**	**12**	**13**	**15**	**12**	**8**	**15**	**11**	**17**	**262**
Total # of Species (Richness)	**13**	**15**	**16**	**10**	**16**	**14**	**14**	**8**	**8**	**9**	**10**	**5**	**11**	**11**	**9**	**48**

5/29/2020 Survey Event 1

Species	Point Count Station										Species Total
	16	17	18	19	20	21	22	23	24	25	
American Crow	1										1
American Robin	2										2
Bachman's Warbler			1								1
Black-capped Chickadee			2								2
Black-throated Blue Warbler					1					1	2
Black-throated Green Warbler		2	1	2	1					1	7
Blue Jay				1				3			4
Blue-headed Vireo		1	1	1							3
Blue-winged Warbler			1								1
Chestnut-sided Warbler		1	1	1	2		1				6
Common Yellowthroat	3	2			1		1	1	2		10
Golden-crowned Kinglet	1	1									2
Hermit Thrush	1	2			1		1		1	1	7
Least Flycatcher					1						1
Magnolia Warbler		1					1		1		3
Nashville Warbler	2	1	2		1			1	2		9
Ovenbird	1	1	2		2	2		1		1	10
Philadelphia Vireo						1				1	2
Pileated Woodpecker									1		1
Red-eyed Vireo	1			1		1	1		1		5
Swainson's Thrush										1	1
White-breasted Nuthatch						1					1
White-throated Sparrow	2	2	2		4	1	1	3	2		17
Winter Wren					1						1
Yellow-rumped Warbler				2					1		3
Total # of Individuals (Abundance)	**14**	**14**	**13**	**8**	**15**	**6**	**6**	**9**	**11**	**6**	**102**
Total # of Species (Richness)	**9**	**10**	**9**	**6**	**10**	**5**	**6**	**5**	**8**	**6**	**25**

6/3/2020 Survey Event 2

Species	Point Count Station															Species Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Alder Flycatcher				2	1					1					2	6
American Crow	1		2	1	1			1						1		7
American Goldfinch	1														1	2
American Kestrel														1		1
American Robin		2	1	3	2	1	1				3	2	1		1	17
Black-and-white Warbler						1	1			1						3
Black-capped Chickadee							1			2		1				4
Black-throated Blue Warbler	2								1							3
Black-throated Green Warbler							1		2			1				4
Blue Jay	1	2							1		1				1	6
Blue-headed Vireo		1														1
Brown Thrasher											1		1	1	1	4
Chestnut-sided Warbler			1			1			1							3
Common Loon								1								1
Common Raven						2										2
Common Yellowthroat	2	2		2	2	2	1		1	3	2	1	1	1	1	21
Downy Woodpecker		1														1
Field Sparrow															2	2
Golden-crowned Kinglet									1							1
Hermit Thrush		1	1		1		1	1	2							7
Indigo Bunting	1															1
Least Flycatcher										1		1				2
Magnolia Warbler														1		1
Nashville Warbler			2	1	1		1	1		1			1	1		9
Northern Flicker		1				1	1						1		1	5
Northern Parula		2														2
Ovenbird	2	2	2		2	1	3	1	2		1		1	1		18
Palm Warbler				1						1		1	1	1	1	6
Philadelphia Vireo							1					1			1	3
Pileated Woodpecker		1														1
Red-eyed Vireo	1					1	2	2								6
Red-winged Blackbird				2												2
Ruby-crowned Kinglet								1								1
Savannah Sparrow						3					2		1		1	7
Song Sparrow	1			2		1	1			2	3		3	1	2	16
Swainson's Thrush					1					2		1		2		6
Tree Swallow														1		1
Unidentified Warbler	1								1							2
Veery		1														1
White-throated Sparrow		1	3	2	2	1	1	2	1	3	2	2		2	2	24
White-winged Crossbill			9													9
Wild Turkey											1					1
Willow Flycatcher							1			2	1		1	2		7
Wilson's Snipe				2							1	1	1	1	1	7
Winter Wren			1							1						2
Wood Thrush	1															1
Yellow Warbler					1							1				2
Yellow-bellied Sapsucker			2													2
Yellow-rumped Warbler				1				1		2	1	2				7
Total # of Individuals (Abundance)	**14**	**17**	**24**	**19**	**14**	**15**	**17**	**11**	**13**	**22**	**19**	**15**	**13**	**17**	**18**	**248**
Total # of Species (Richness)	**11**	**12**	**10**	**11**	**10**	**11**	**14**	**9**	**10**	**13**	**12**	**12**	**11**	**14**	**14**	**49**

6/4/2020 Survey Event 2

Species	Point Count Station										Species Total
	16	17	18	19	20	21	22	23	24	25	
American Robin				1							1
Black-and-white Warbler	1	2	1		1				1		6
Black-capped Chickadee	1	3		1							5
Black-throated Blue Warbler			1							1	2
Black-throated Green Warbler		1		1							2
Blue Jay							1				1
Blue-headed Vireo		1									1
Chestnut-sided Warbler		1	1		2						4
Common Loon		2									2
Common Yellowthroat	3	2	1		3						9
Golden-crowned Kinglet			1	1				1			3
Hermit Thrush				1					1		2
Magnolia Warbler	1			1	1		1		1		5
Nashville Warbler	3	1		1	2		1		1		9
Ovenbird	2	1	2	1	1	1	1	2	1	1	13
Purple Finch		2		1			1				4
Red-breasted Nuthatch		2				2					4
Red-eyed Vireo			1		1	2		1	1	2	8
Ruby-crowned Kinglet		1									1
Swainson's Thrush	2		1		2	1					6
White-throated Sparrow	2	1	1		3			1	1		9
White-winged Crossbill	1		4			1					6
Willow Flycatcher					1						1
Winter Wren		1			1						2
Yellow-rumped Warbler	1		1	1	1						4
Total # of Individuals (Abundance)	**17**	**21**	**15**	**10**	**19**	**7**	**5**	**5**	**7**	**4**	**110**
Total # of Species (Richness)	**10**	**14**	**11**	**10**	**12**	**5**	**5**	**4**	**7**	**3**	**25**

6/16/2020 Survey Event 3

Species	Point Count Station															Species Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Alder Flycatcher				1						1	2		1	3	1	9
American Crow											2		2			4
American Robin	1	1		2								1				5
Black-and-white Warbler												1				1
Black-capped Chickadee							1									1
Black-throated Blue Warbler			1													1
Black-throated Green Warbler							1		1				2			4
Blue Jay					1	1	2	1			1	1				7
Blue-headed Vireo												1				1
Broad-winged Hawk	1							1								2
Brown Creeper				1												1
Brown Thrasher											3		1	1		5
Canada Warbler				1												1
Cedar Waxwing		1														1
Chestnut-sided Warbler							1		2							3
Chipping Sparrow				1									1		1	3
Common Grackle				1												1
Common Loon											1					1
Common Raven														1	2	3
Common Yellowthroat	1	1	1	2	2	1	1		1	1	2	2	1	1	2	19
Eastern Wood-Pewee	1															1
Field Sparrow											1					1
Golden-crowned Kinglet								2					1			3
Hermit Thrush		1							2	1						4
Least Flycatcher				2	2								1			5
Magnolia Warbler								1						1		2
Nashville Warbler							1			1						2
Northern Flicker			1													1
Ovenbird	1		1			3	2		2				2	1		12
Palm Warbler				1	1					1				1	1	5
Purple Finch		1				1						1				3
Red-breasted Nuthatch			1									1				2
Red-eyed Vireo		2	2			2	2		1	1		1	1	1	1	14
Red-winged Blackbird				3												3
Ruby-crowned Kinglet								1					1			2
Savannah Sparrow						3					2		2	1		8
Scarlet Tanager	1															1
Song Sparrow				1		2				2	3		2	4	2	16
Swainson's Thrush								1								1
Tree Swallow				1							1					2
White-throated Sparrow			3		3	1	1	1	2	2	1	1	2	1	2	20
White-winged Crossbill				7	7		6									20
Wild Turkey										15						15
Willow Flycatcher							1				1				1	3
Wilson's Snipe				1						1					1	3
Winter Wren										1						1
Yellow-bellied Sapsucker	1					1										2
Yellow-rumped Warbler	1		1		1	1		1				1				6
Total # of Individuals (Abundance)	**8**	**7**	**11**	**25**	**17**	**16**	**19**	**9**	**11**	**27**	**20**	**11**	**20**	**16**	**14**	**231**
Total # of Species (Richness)	**8**	**6**	**8**	**14**	**7**	**10**	**11**	**8**	**7**	**11**	**12**	**10**	**14**	**11**	**10**	**48**

6/17/2020 Survey Event 3

Species	Point Count Station										Species Total
	16	17	18	19	20	21	22	23	24	25	
American Robin		1			1				1		3
Black-and-white Warbler			1								1
Black-throated Blue Warbler			1								1
Black-throated Green Warbler				1	1		1				3
Blue Jay							1				1
Blue-headed Vireo								1			1
Canada Warbler					1						1
Chestnut-sided Warbler		1	1		1						3
Common Yellowthroat		2	1		1		1		1		6
Eastern Wood-Pewee					1						1
Hermit Thrush		1		1							2
Magnolia Warbler		1		1					1		3
Nashville Warbler	1				2			1			4
Ovenbird		1	1	2		3	2	2		3	14
Palm Warbler								1			1
Philadelphia Vireo					1						1
Red-eyed Vireo		1	1			2	1			2	7
Ruby-crowned Kinglet		1									1
Song Sparrow					1						1
Swainson's Thrush	1		2	1	1			1		1	7
White-throated Sparrow	2	1	1	1	2	1	1		4		13
Willow Flycatcher					1						1
Yellow-rumped Warbler		1					1	1			3
Total # of Individuals (Abundance)	**4**	**11**	**9**	**7**	**14**	**6**	**8**	**7**	**7**	**6**	**79**
Total # of Species (Richness)	**3**	**10**	**8**	**6**	**12**	**3**	**7**	**6**	**4**	**3**	**23**

APPENDIX D. UPLAND SANDPIPER SURVEY SITES

1: UPSA-2 North, shorter veg, 6/17/20

2: UPSA-2 South, shorter veg on high/dry spot, 6/17/20

3: UPSA-3 North, shorter veg, 6/17/20

4: UPSA-3 South, shorter veg, 6/17/20

5: North ROW_0702 North, veg.ht 65cm, 7/2/20

6: North ROW_0702 South, veg.ht 65cm, 7/2/20

7: North ROW_0702 North, variable veg. ht., 7/2/20

8: North ROW_0702 South, variable veg. ht., 7/2/20

9: UPSA-4 North, T-line at bend, 7/2/20

10: UPSA-4 West, T-line at bend, 7/2/20

11: North ROW_0702 West, dry short veg., 7/2/20

12: UPSA-4 East, dry short veg., 7/2/20

13: Mid ROW_0716 Tall veg.: spirea, goldenrod, raspberry

14: Mid ROW_0716 Tall veg.: spirea, goldenrod, raspberry

15: South ROW_0731 juniper dominated

16: South ROW_0731 juniper gives way to forbs to east

17: South ROW_0731 veg thins on south slopes but still > 50cm

18: South ROW_0731 forb and juniper dominated

19: South ROW_0731 short veg. on knobs with thin soil

20: South ROW_0731 fern dominated

21: South ROW_0731 west, juniper dominated

22: South ROW_0731 mowed area near private property

23: South Field_0903 patch of suitable UPSA giving way to aspen and cedar.

24: South Field_0903 suitable structure but dominated by equisetum

25: South Field_0925 Shorter veg but wetland area.

APPENDIX E. INCIDENTAL AVIAN SPECIES OBSERVED DURING UPLAND SANDPIPER SURVEYS

Date	Point	Code	Common Name	Scientific Name
6/16/20	UPSA-01	YBCU	Yellow-billed Cuckoo	*Coccyzus americanus*
6/17/2020	UPSA-02	MAWA	Magnolia Warbler	*Setophaga magnolia*
		REVI	Red-eyed Vireo	*Vireo olivaceus*
		OVEN	Ovenbird	*Seiurus aurocapilla*
		WTSP	White-throated Sparrow	*Zonotrichia albicollis*
		NAWA	Nashville Warbler	*Oreothlypis ruficapilla*
	UPSA-03	REVI	Red-eyed Vireo	*Vireo olivaceus*
		HETH	Hermit Thrush	*Catharus guttatus*
		AMRO	American Robin	*Turdus migratorius*
		OVEN	Ovenbird	*Seiurus aurocapilla*
7/1/2020	North Field_0701	WISN	Wilson's Snipe	*Gallinago delicata*
7/2/2020	North ROW_0702	CAWA	Canada Warbler	*Cardellina canadensis*
		RTHA	Red-tailed Hawk	*Buteo jamaicensis*
		SSHA	Sharp-shinned Hawk	*Accipiter striatus*
		WISN	Wilson's Snipe	*Gallinago delicata*
7/15/2020	North ROW_0715	WTSP	White-throated Sparrow	*Zonotrichia albicollis*
		SWTH	Swainson's Thrush	*Catharus ustulatus*
		HETH	Hermit Thrush	*Catharus guttatus*
	UPSA-04	COYE	Common Yellowthroat	*Geothlypis trichas*
7/16/2020	UPSA-05	SAVS	Savannah Sparrow	*Passerculus sandwichensis*
		BLJA	Blue Jay	*Cyanocitta cristata*
		SWTH	Swainson's Thrush	*Catharus ustulatus*
		WTSP	White-throated Sparrow	*Zonotrichia albicollis*
		HETH	Hermit Thrush	*Catharus guttatus*
		FISP	Field Sparrow	*Spizella pusilla*
		WISN	Wilson's Snipe	*Gallinago delicata*
		COYE	Common Yellowthroat	*Geothlypis trichas*
		SOSP	Song Sparrow	*Melospiza melodia*
		AMRO	American Robin	*Turdus migratorius*
	Mid ROW_0716	OVEN	Ovenbird	*Seiurus aurocapilla*
		AMRO	American Robin	*Turdus migratorius*
		CORA	Common Raven	*Corvus corax*
		COYE	Common Yellowthroat	*Geothlypis trichas*
		CEDW	Cedar Waxwing	*Bombycilla cedrorum*
		NOPA	Northern Parula	*Setophaga americana*
		BCCH	Black-capped Chickadee	*Poecile atricapillus*
		WITU	Wild Turkey	*Meleagris gallopavo*
		LISP	Lincoln's Sparrow	*Melospiza lincolnii*
		SOSP	Song Sparrow	*Melospiza melodia*
		BTBW	Black-throated Blue Warbler	*Setophaga caerulescens*

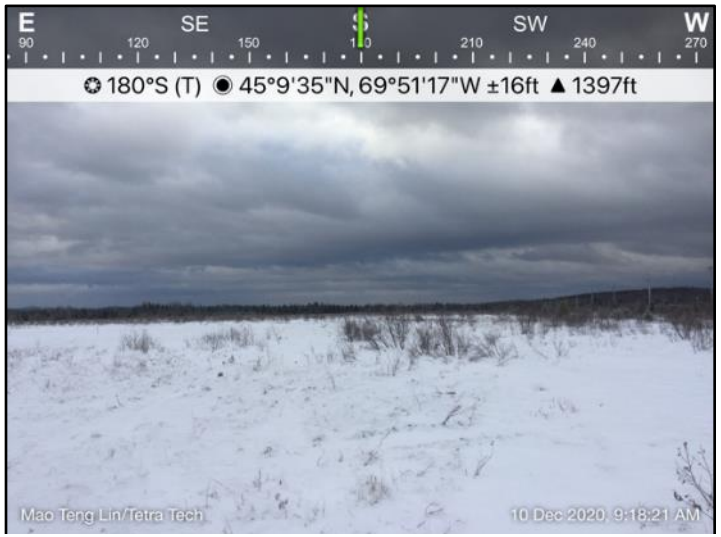
		SCTA	Scarlet Tanager	*Piranga olivacea*
		WIWR	Winter Wren	*Troglodytes hiemalis*
		RBNU	Red-breasted Nuthatch	*Sitta canadensis*
		WTSP	White-throated Sparrow	*Zonotrichia albicollis*
		WOTH	Wood Thrush	*Hylocichla mustelina*
		SWTH	Swainson's Thrush	*Catharus ustulatus*
		NOFL	Northern Flicker	*Colaptes auratus*
		BLJA	Blue Jay	*Cyanocitta cristata*
		WBNU	White-breasted Nuthatch	*Sitta carolinensis*
		YBSA	Yellow-bellied Sapsucker	*Sphyrapicus varius*
7/30/2020	UPSA-03	RTHA	Red-tailed Hawk	*Buteo jamaicensis*
		CAWA	Canada Warbler	*Cardellina canadensis*
		SWTH	Swainson's Thrush	*Catharus ustulatus*
		AMGO	American Goldfinch	*Spinus tristis*
		NOFL	Northern Flicker	*Colaptes auratus*
	UPSA-04	HETH	Hermit Thrush	*Catharus guttatus*
		COYE	Common Yellowthroat	*Geothlypis trichas*
		WTSP	White-throated Sparrow	*Zonotrichia albicollis*
7/31/2020	South ROW_0731	HETH	Hermit Thrush	*Catharus guttatus*
		WTSP	White-throated Sparrow	*Zonotrichia albicollis*
		AMRO	American Robin	*Turdus migratorius*
		INBU	Indigo Bunting	*Passerina cyanea*
		COYE	Common Yellowthroat	*Geothlypis trichas*
		AMKE	American Kestrel	*Falco sparverius*
		BLJA	Blue Jay	*Cyanocitta cristata*
		BCCH	Black-capped Chickadee	*Poecile atricapillus*
		AMCR	American Crow	*Corvus brachyrhynchos*
		SOSP	Song Sparrow	*Melospiza melodia*
		AMGO	American Goldfinch	*Spinus tristis*
8/19/2020	North Field_0819	WISN	Wilson's Snipe	*Gallinago delicata*
8/20/2020	North ROW_0820	COYE	Common Yellowthroat	*Geothlypis trichas*
9/3/2020	South Field_0903	AMCR	American Crow	*Corvus brachyrhynchos*
		AMKE	American Kestrel	*Falco sparverius*
		GBHE	Great Blue Heron	*Ardea herodias*
		BLJA	Blue Jay	*Cyanocitta cristata*
		BTNW	Black-throated Green Warbler	*Setophaga virens*
		BTBW	Black-throated Blue Warbler	*Setophaga caerulescens*
		PAWA	Palm Warbler	*Setophaga palmarum*
		SOSP	Song Sparrow	*Melospiza melodia*
		BCCH	Black-capped Chickadee	*Poecile atricapillus*
		LEFL	Least Flycatcher	*Empidonax minimus*

		NOFL	Northern Flicker	*Colaptes auratus*
		AMGO	American Goldfinch	*Spinus tristis*
		WTSP	White-throated Sparrow	*Zonotrichia albicollis*
		RBNU	Red-breasted Nuthatch	*Sitta canadensis*
		GCKI	Golden-crowned Kinglet	*Regulus satrapa*
		SSHA	Sharp-shinned Hawk	*Accipiter striatus*
		HAWO	Hairy Woodpecker	*Picoides villosus*
		SAVS	Savannah Sparrow	*Passerculus sandwichensis*
		AMRO	American Robin	*Turdus migratorius*
9/25/2020	South Field_0925	NOFL	Northern Flicker	*Colaptes auratus*
		BCCH	Black-capped Chickadee	*Poecile atricapillus*
		SPSA	Spotted Sandpiper	*Actitis macularius*
		RTHA	Red-tailed Hawk	*Buteo jamaicensis*
		BWHA	Broad-winged Hawk	*Buteo platypterus*

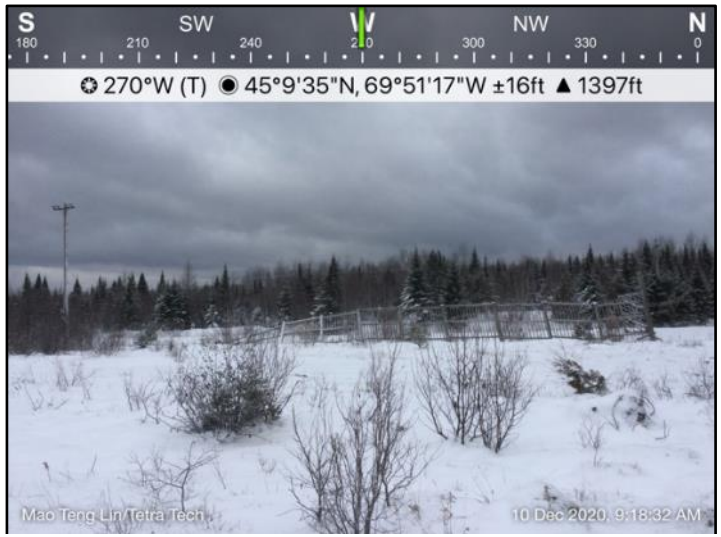
APPENDIX F. GOLDEN EAGLE SURVEY POINTS

1: Survey Point 1 North, 12/10/20

2: Survey Point 1 East, 12/10/20



3: Survey Point 1 South, 12/10/20



4: Survey Point 1 West, 12/10/20

5: Survey Point 2 North, 12/4/20

6: Survey Point 2 East, 12/4/20

7: Survey Point 2 South, 12/4/20

8: Survey Point 2 West, 12/4/20

9: Survey Point 3 North, 9/24/20

10: Survey Point 3 South, 11/4/20

APPENDIX G. INCIDENTAL AVIAN SPECIES OBSERVED DURING EAGLE SURVEYS

Date	Point	Name
1/23/2020	2	American Goldfinch
2/20/2020	1	Cooper's Hawk
3/2/2020	not in project	Bald Eagle
3/4/2020	not in project	Bald Eagle
	1	Common Raven
	1	American Crow
	1	Unidentified Bird
3/5/2020	2	Common Raven
	2	American Crow
3/11/2020	1	American Crow
	1	Common Raven
3/12/2020	2	American Crow
	Not in project	White-winged Crossbill
	2	Common Raven
	2	Black-capped Chickadee
3/16/2020	Not in project	American Goldfinch
	1	Common Raven
	1	Black-capped Chickadee
	1	American Crow
3/19/2020	2	American Crow
	2	Blue Jay
	2	Common Raven
3/24/2020	1	Common Raven
	1	American Crow
3/25/2020	2	American Crow
	2	Common Raven
	2	Blue Jay
	2	Black-capped Chickadee
	2	Downy Woodpecker
3/31/2020	1	American Crow
	1	Canada Goose
	1	Common Raven
4/1/2020	1	Common Raven
4/1/2020	1	American Crow
	1	American Goldfinch
	1	Blue Jay
4/6/2020	2	American Crow
	2	Common Raven
	2	Turkey Vulture
	2	Blue Jay

Date	Point	Name
	2	Dark-eyed Junco
4/7/2020	1	American Crow
	1	Common Grackle
	1	Common Raven
	1	Blue Jay
	1	Turkey Vulture
	1	Northern Harrier
4/14/2020	1	American Crow
	1	American Robin
	1	Common Raven
	1	Northern Flicker
	1	Wilson's Snipe
	1	Unidentified Sparrow
	1	American Goldfinch
	1	Wild Turkey
4/15/2020	2	Wild Turkey
	2	Blue Jay
	2	American Robin
	2	Dark-eyed Junco
	2	Red-winged Blackbird
4/22/2020	1	Blue Jay
	1	Canada Warbler
	1	Song Sparrow
	1	Yellow-shafted Flicker
4/23/2020	2	American Crow
	2	Wild Turkey
	2	Black-capped Chickadee
	2	Common Raven
4/29/2020	1	Savannah Sparrow
	1	Song Sparrow
	1	American Robin
	1	Turkey Vulture
	1	American Goldfinch
	1	Tree Swallow
	1	Common Raven
	1	American Coot
	1	White-throated Sparrow
	1	Ruby-crowned Kinglet
	1	Northern Flicker
4/30/2020	2	Northern Flicker

Date	Point	Name
	2	American Robin
	2	White-throated Sparrow
	2	Common Snipe
	2	Tree Swallow
	2	Common Raven
	2	American Crow
5/4/2020	1	American Goldfinch
	1	Yellow-shafted Flicker
	1	Savannah Sparrow
	1	Field Sparrow
	1	American Crow
	1	Ruffed Grouse
	1	Winter Wren
	1	Common Snipe
	1	American Robin
	1	Tree Swallow
5/5/2020	2	White-throated Sparrow
	2	Song Sparrow
	2	White-breasted Nuthatch
	2	American Crow
	2	Common Raven
	2	Yellow-shafted Flicker
5/12/2020	Not in eagle survey area	Northern Goshawk
5/13/2020	Not in project	Merlin
	1	Tree Swallow
	1	Savannah Sparrow
	1	Turkey Vulture
	1	American Crow
	1	Common Raven
	1	American Robin
	1	Brown Thrasher
	1	European Starling
	1	Song Sparrow
	Not in project	Bald Eagle
	Not in project	Osprey
	2	Merlin
5/14/2020	2	American Goldfinch
	2	Savannah Sparrow
	2	Red-eyed Vireo
	2	Blue Jay

Date	Point	Name
	2	American Robin
5/20/2020	2	American Robin
	2	Common Raven
	2	White-throated Sparrow
	2	Savannah Sparrow
	2	Hermit Thrush
	2	Yellow-rumped Warbler
	2	Blue Jay
	2	Common Snipe
	2	Barn Swallow
	2	Belted Kingfisher
	2	Wild Turkey
	2	White-throated Sparrow
	2	Song Sparrow
	2	American Crow
	2	Common Yellowthroat
	2	Yellow-shafted Flicker
	2	Tree Swallow
5/27/2020	2	White-throated Sparrow
	2	American Robin
	2	Song Sparrow
	2	Savannah Sparrow
	2	Yellow-rumped Warbler
	2	American Crow
	2	Common Yellowthroat
	2	Yellow-shafted Flicker
	2	Tree Swallow
6/4/2020	1	Brown Thrasher
	1	Canada Goose
	1	Song Sparrow
	1	Common Yellowthroat
	1	American Robin
	1	Savannah Sparrow
	1	Chestnut-sided Warbler
	1	American Crow
	1	Yellow-rumped Warbler
	1	White-throated Sparrow
	1	Alder Flycatcher
	1	Cedar Waxwing
	1	Yellow-shafted Flicker

Date	Point	Name
6/10/2020	1	Song Sparrow
	1	White-throated Sparrow
	1	Brown Thrasher
	1	Alder Flycatcher
	1	Common Yellowthroat
	1	Savannah Sparrow
	1	Blue Jay
	1	Common Raven
6/12/2020	2	American Crow
	2	White-throated Sparrow
	2	Song Sparrow
	2	Red-eyed Vireo
	2	Savannah Sparrow
	2	American Robin
	2	Yellow-shafted Flicker
	2	Common Raven
6/16/2020	2	American Robin
	2	American Crow
	2	White-throated Sparrow
	2	Savannah Sparrow
	2	Song Sparrow
	2	Wilson's Snipe
	2	Yellow-shafted Flicker
	2	Common Yellowthroat
	2	Brown Thrasher
	2	Blue Jay
	2	Common Raven
8/5/2020	1	Yellow-shafted Flicker
	1	American Crow
	1	American Goldfinch
8/6/2020	3	Yellow-shafted Flicker
	3	American Goldfinch
	3	Blue Jay
	3	White-throated Sparrow
	3	Ruby-throated Hummingbird
8/13/2020	3	Blue Jay
	3	Yellow-shafted Flicker
	3	American Robin
	3	American Goldfinch
	3	Song Sparrow

Date	Point	Name
	3	Ruby-throated Hummingbird
8/14/2020	2	Yellow-shafted Flicker
	2	American Goldfinch
	2	Black-capped Chickadee
	2	Blue Jay
	2	Savannah Sparrow
8/18/2020	3	Blue Jay
	3	Northern Flicker
	3	Purple Finch
	3	Ruby-throated Hummingbird
	3	Song Sparrow
	3	American Goldfinch
8/19/2020	3	Blue Jay
	3	Northern Flicker
	3	Purple Finch
	3	Ruby-throated Hummingbird
	3	Song Sparrow
	3	American Goldfinch
8/26/2020	2	Savannah Sparrow
	2	Yellow-shafted Flicker
	2	Blue Jay
	2	American Goldfinch
	2	Wild Turkey
8/27/2020	3	American Crow
	3	Wild Turkey
	3	Yellow-shafted Flicker
	3	American Goldfinch
	3	Black-capped Chickadee
	3	Blue Jay
	3	Ruby-throated Hummingbird
	3	Common Raven
9/2/2020	3	Blue Jay
	3	Black-throated Green Warbler
	3	Red-breasted Nuthatch
	3	American Goldfinch
	3	American Robin
	3	Song Sparrow
	3	Northern Flicker
	3	Common Raven
	3	White-winged Crossbill

Date	Point	Name
9/3/2020	1	Blue Jay
	1	American Goldfinch
	1	American Crow
	1	Northern Flicker
	1	American Robin
	1	Ruby-throated Hummingbird
9/8/2020	2	Blue Jay
	2	Yellow-shafted Flicker
	2	Common Yellowthroat
	2	American Robin
	2	Black-capped Chickadee
	2	Palm Warbler
9/9/2020	3	Blue Jay
	3	White-throated Sparrow
	3	Common Yellowthroat
	3	Northern Parula
	3	Cape May Warbler
	3	American Goldfinch
	3	Nashville Warbler
	3	Yellow-shafted Flicker
	3	Black-capped Chickadee
	3	Pine Warbler
	3	Common Raven
9/14/2020	1	Common Raven
	1	American Crow
	1	American Goldfinch
	1	Yellow-shafted Flicker
	1	American Robin
	1	Blue Jay
	1	Yellow-rumped Warbler
9/16/2020	3	Common Raven
	3	Common Yellowthroat
	3	Blue Jay
	3	White-throated Sparrow
	3	Turkey Vulture
	3	American Goldfinch
	3	Yellow-shafted Flicker
9/24/2020	3	Northern Flicker
	3	Golden-crowned Kinglet
	3	Blue Jay

Date	Point	Name
	3	Blue-headed Vireo
	3	Black-throated Blue Warbler
	3	Yellow-rumped Warbler
	3	Song Sparrow
	3	Cape May Warbler
	3	American Robin
	3	White-throated Sparrow
	3	Black-capped Chickadee
9/25/2020	2	Black-capped Chickadee
	2	American Goldfinch
	2	American Kestrel
	2	Blue Jay
	2	White-throated Sparrow
9/28/2020	1	Blue Jay
	1	Yellow-shafted Flicker
	1	Pine Warbler
	1	American Crow
10/1/2020	3	White-throated Sparrow
	3	Yellow-shafted Flicker
	3	Blue Jay
	3	Gray Catbird
	3	Common Raven
10/8/2020	3	Palm Warbler
	3	White-throated Sparrow
	3	Blue Jay
	3	Black-capped Chickadee
	3	Northern Flicker
	3	Song Sparrow
	3	Common Raven
10/9/2020	2	Common Raven
	2	Blue Jay
10/14/2020	1	White-crowned Sparrow
	1	American Goldfinch
	1	White-throated Sparrow
	1	Yellow-shafted Flicker
	1	American Goldfinch
10/15/2020	3	White-throated Sparrow
	3	Yellow-shafted Flicker
	3	Dark-eyed Junco
	3	Blue Jay

Date	Point	Name
	3	Black-capped Chickadee
	3	White-crowned Sparrow
10/21/2020	3	Dark-eyed Junco
	3	Downy Woodpecker
	3	Blue Jay
	3	Red-breasted Nuthatch
	3	Common Raven
	3	Black-capped Chickadee
	3	White-throated Sparrow
	3	American Robin
10/22/2020	2	American Goldfinch
	2	Black-capped Chickadee
	2	Pine Siskin
	2	Canada Goose
	2	Blue Jay
	2	Northern Flicker
	2	Hairy Woodpecker
	2	Dark-eyed Junco
	2	European Starling
	2	Gray Jay
	2	American Robin
	2	Downy Woodpecker
	2	Cedar Waxwing
	2	Eastern Bluebird
	2	Common Raven
	2	American Tree Sparrow
10/29/2020	1	American Crow
	1	Chipping Sparrow
	1	Dark-eyed Junco
	1	White-throated Sparrow
	1	Black-capped Chickadee
	1	Downy Woodpecker
	1	Blue Jay
	1	Snow Bunting
10/30/2020	3	Black-capped Chickadee
	3	Dark-eyed Junco
	3	Canada Goose
	3	American Crow
	3	Common Redpoll
	3	Gray Jay

Date	Point	Name
11/6/2020	2	Downy Woodpecker
	2	American Crow
	2	Gray Jay
	2	Black-capped Chickadee
	2	American Goldfinch
	2	Blue Jay
	2	Northern Cardinal
11/11/2020	1	Blue Jay
	1	Snow Bunting
	1	Horned Lark
	1	Downy Woodpecker
	1	American Crow
11/12/2020	3	Dark-eyed Junco
	3	American Tree Sparrow
	3	Blue Jay
	3	Downy Woodpecker
	3	American Robin
11/19/2020	3	Blue Jay
	3	Common Raven
	3	Black-capped Chickadee
	3	Dark-eyed Junco
11/20/2020	2	Blue Jay
	2	Black-capped Chickadee
	2	American Crow
	2	Common Raven
	2	White-winged Crossbill
	2	Snow Bunting
11/24/2020	1	American Crow
12/11/2020	2	Black-capped Chickadee
	2	American Crow
	2	Blue Jay
12/15/2020	2	Hairy Woodpecker
	2	Common Raven
	2	Black-capped Chickadee
12/16/2020	1	Common Raven
	1	Black-capped Chickadee