

4 DESCRIPTION OF EXISTING ENVIRONMENT

4.1 PHYSICAL ENVIRONMENT

Peatland No. 6 is located in the Kouchibouguac Ecodistrict of the Eastern Lowlands ecoregion, in the Atlantic Maritime ecozone. The Eastern Lowlands ecoregion contains the highest percentage of wetlands of all New Brunswick ecoregions, and has by far the largest area of peatlands. Peatlands occur both inland and along the coast and, in several locations, are being commercially used for horticultural peat production.

4.1.1 GEOLOGICAL AND GEOMORPHOLOGICAL SETTING

In terms of geology, Peatland No. 6 is located in the Maritimes Carboniferous Basin, which covers most of northeastern New Brunswick. This formation is composed of thick and complex sequences of sedimentary rocks from Carboniferous some 300 million years ago. In New Brunswick the basin is characterized by thick accumulations of dominantly sedimentary rocks deposited in alluvial, fluvial, lacustrine, and marine environments.

The Kouchibouguac Ecodistrict encompasses the eastern coastline of New Brunswick reaching from Miramichi Bay to Cape Tormentine, and is dominated by river estuaries, sand dunes, and peat bogs.

The bedrock is composed entirely of Pennsylvanian gray and red sandstone, mudstone, and conglomerate.

Quaternary deposits are found above bedrock in areas west and south of the peatland, where they outcrop. These deposits consist of moraine sediments composed mainly of till, silt, sand and gravel. The thickness of these sediments varies from 0.5 m to 3 m.

Organic deposits overlie moraine sediments in and around Peatland No. 6. The thickness of the organic deposits varies between 1 m and 5 m (Natural Resources Canada, 2021).

4.1.2 CLIMATE

Kouchibouguac Ecodistrict has one of the warmest and driest climates in New Brunswick, and a growing season that is exceeded only by that of the central Lowlands Ecoregion. It is located in the maritime climatic zone which is characterized by cool temperatures and frequent precipitations year-round. The proximity of the Atlantic Ocean creates a moderate, cool, and moist maritime climate. Most of the ecozone experiences long, mild winters (averaging about -4 °C in January) and cool summers (the mean daily July temperature is 18 °C). Coastal communities are generally several degrees warmer in winter and slightly cooler in summer⁵.

⁵ <http://landresources.ca/english/zone/AtlanticMaritime/land.html>.

The closest meteorological station is Miramichi A, operated by Environment Canada and located approximately 18 km from Peatland No. 6. Mean yearly temperature is 4.9 °C while mean, minimum and maximum temperatures for July are 19.1 °C, 13.0 °C and 25.2 °C, respectively (Environment Canada, 2021a). Mean, minimum and maximum temperatures for January are -10.8 °C, -16.6 °C and -5.0 °C, respectively. Mean yearly precipitation is 1,072 mm with 794 mm falling as rain and 291 mm as snow. November, July and May are the wettest months with around 100 mm of precipitation. The dominant wind direction for the peat harvesting season (May to September) is south, and there is less than one day per month with gusts exceeding 52 km/h.

Average monthly temperatures and precipitations are presented in Table 4-1.

Table 4-1 Average Monthly Temperatures and Precipitations at Miramichi A Station

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sep	Oct	Nov	Dec
Temperature												
Daily mean (°C)	-10.8	-8.9	-3.4	3.2	10.0	15.7	19.1	18.5	13.5	6.9	0.7	-6.2
Precipitation												
Rainfall (mm)	21.5	18.1	34.1	58.7	97.5	86.3	99.9	93.1	83.8	87.0	75.2	38.6
Snowfall (cm)	70.4	54.6	59.6	25.8	1.7	0.0	0.0	0.0	0.0	2.6	26.8	49.9
Total (mm water equivalent)	87.0	70.9	90.8	84.9	99.5	86.3	99.9	93.1	84.5	89.7	100.6	85.3

The Climate Atlas of Canada⁶ for Kouchibouguac region was consulted to provide an idea of how climatic conditions may potentially affect peat harvesting under anticipated global warming scenarios. The Climate Atlas displays projections for two possible climate paths. Each assumes a different level of future greenhouse gas emissions, which leads to more or less global warming. Appendix A provides mean numbers of the 4.5 (Low Carbon climate future, GHG emissions much reduced) and 8.5 (High Carbon climate future, GHG emissions continue to increase at current rates) Representative Concentration Pathways (RCP) for 1976-2005 (The Recent Past), 2021-2050 (The Immediate Future) and 2051-2080 (The Near Future) periods.

Considering a Low Carbon climate future (RCP 4.5), data show a 1.9 to 2.9 °C increase of the mean annual temperature and a 1.8 to 2.8°C increase of the mean summer temperature respectively for 2021-2050 and 2051-2080 periods (Table 4-2).

For a High Carbon climate future (RCP 8.5), mean annual temperature would increase by 2.1 to 4.3 °C and mean summer temperature by 2 to 4.2 °C for 2021-2050 and 2051-2080 periods respectively.

According to these scenarios, there should be an important increase in the number of days with very hot temperature (> 30 °C). This will affect peat harvesting activities since hot temperatures favor drying and airborne peat particle emissions. This may also increase the risk of fire in the bog. On the other hand, the harvesting season may begin earlier in the spring and extend later in the fall.

⁶ <https://climateatlas.ca/>

Table 4-2 Anticipated Change in Temperature and Precipitation for two Global Warming Scenarios for Kouchibouguac

	1976- 2005	2021-2050		2051-2080	
		RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Mean annual temperature	5.2	7.1	7.3	8.1	9.5
Mean summer temperature	17.8	19.6	19.8	20.6	22
Annual numbers of days > 30 °C	8	18	19	26	39
Total annual precipitation	1065	1137	1136	1161	1189
Total summer precipitation	247	260	262	265	268

The RCP 4.5 scenario anticipates an increase of 5.3 to 7.3% in precipitation during summer for the Immediate Future and the Near Future periods. As for RCP 8.5, changes are more important with an increase of 6.1 to 8.5% for summer total precipitation. This may not affect harvesting activities because the harvesting season will likely be longer under a warmer climate.

There is no data for anticipated wind conditions that is another meteorological parameter that influences peat harvesting.

4.1.3 HYDROGEOLOGY

Groundwater is present throughout the entire local stratigraphic sequence. It mostly flows in bedrock and, to a lesser extent, in the surficial deposits. The various geological formations, however, exhibit different hydrogeological behavior. In the peat deposits, the acrotelm’s permeability is several orders of magnitude higher than that of the catotelm. Hence, in saturated to nearly saturated conditions, water flow mainly occurs within the acrotelm. Conversely, the catotelm remains saturated, but its low permeability precludes significant water flow.

The major component of flow in the acrotelm is horizontal, while vertical exchanges with the underlying catotelm do occur, however, at a lower rate. Water fluxes between the acrotelm and catotelm may be oriented upward or downward, depending on point-specific hydraulic conditions. Horizontal water flow in the acrotelm and catotelm essentially occurs in a direction parallel to the local topographical gradient, hence, oriented from the center of the bog’s domes toward the periphery.

Being a low permeability unit, the catotelm acts as an aquitard, which precludes the occurrence of a significant water flow along the vertical axis, between the organic deposits and the underlying mineral deposits. Local topography and hydraulic conditions are also unfavorable to significant water exchange between organic and mineral deposits. The relatively flat profile of the peatland surface results in low hydraulic gradients.

Bedrock constitutes the main aquifer at both the regional and local scale. Sedimentary rocks forming bedrock are generally fractured.

Most groundwater movement in the bedrock aquifer occurs along the fractures that pervade the rock mass, although some flow may as well take place within the porous matrix (Stapinsky *et al.*, 2002).

Horizontal groundwater flow in the bedrock aquifer is generally oriented in accordance with the topographical gradient. As such, groundwater flow divides between watersheds generally coincide with surface water divides. Recharge of the aquifer essentially occurs through rainwater infiltration in areas where bedrock is overlain by a thin and more permeable mineral overburden cover.

Piezometric map shows that groundwater generally flows toward the ocean, but that watersheds of large rivers have a significant influence on groundwater flow (Rivard & al., 2008).

Peatland No. 6 is situated at the downgradient end of the local groundwater flow system within bedrock, as the Gulf of St. Lawrence forms its discharge limit. Areas located west of, and upgradient with respect to the peatland, act as recharge areas for the bedrock aquifer. Groundwater then flows predominantly eastward, toward the Gulf.

There are no known domestic or municipal wells within 5 km radius of Peatland No. 6⁷.

4.1.4 SURFACE WATER REGIME

Peatland No. 6 straddles the watersheds of two main rivers, respectively Black River and Bay du Vin River, but both are located within the Miramichi Bay Basin (Map 4). Total peatland areas located in Black River and Bay du Vin natural watersheds are respectively 124.5 ha and 52.0 ha. Natural water flow within the undrained bog predominantly occurs in the form of subsurface acrotelm flow, and surface runoff only occurs during episodes of significant precipitation or snowmelt.

4.1.5 PEAT AND STREAM WATER QUALITY

Surface water samples were collected in the two streams that will receive drainage water from Peatland No 6 to determine baseline conditions (Map 4). The first sampling location (PL6-1) is in Vandy Brook, a tributary of Black River located 2 km west of Peatland No. 6. The second sampling location (PL6-2) is in an unnamed tributary of Bay du Vin River positioned 500 m east of Peatland No. 6. Water sampling has been carried out three times, on July 6 and November 3, 2021, and on January 20, 2022, in order to document summer, fall and winter conditions respectively. Further measures will be taken in the spring to cover each season of the year (winter, spring, summer and fall) and data will be sent to the DELG.

Surface water was sampled in accordance with the *Guidelines for Peat Mining Operations in New Brunswick* (Thibault, 1998). Water samples were analyzed by RPC and certificates of analysis are provided at Appendix B. Analytical results from the collected water samples are provided in Table 4-3. Results are compared to CCME's recommended quality criteria for *Freshwater aquatic life protection* (CCME, 2007). Metal concentrations provided refer to the total extractable concentrations.

⁷ <https://www.elgegl.gnb.ca/0375-0001/>

Table 4-3 Water Samples Analysis Results

Parameters	Units	July 6, 2021		November 3, 2021		January 20, 2022		CCME Water Quality Guidelines for the Protection of Aquatic Life (freshwater)
		PL6-1	PL6-2	PL6-1	PL6-2	PL6-1	PL6-2	
Metals (total)								
Aluminum	µg/L	235	182	197	191	177	125	No data
Antimony	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	No data
Arsenic	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	5
Barium	µg/L	28	10	27	8	23	8	No data
Beryllium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	No data
Bismuth	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	No data
Boron	µg/L	2	1	2	1	2	< 0.1	1500
Cadmium	µg/L	0.02	0.02	0.02	0.01	0.03	0.02	0.04 ¹
Calcium	µg/L	2880	840	2160	640	2190	730	No data
Chromium	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	No data
Cobalt	µg/L	0.3	0.5	0.3	0.4	0.2	0.4	No data
Copper	µg/L	< 1	< 1	< 1	< 1	2	< 1	No data
Iron	µg/L	1040	1900	840	1760	690	1110	300
Lead	µg/L	0.4	0.3	0.5	0.5	0.5	0.3	No data
Lithium	µg/L	0.5	0.2	0.4	0.2	0.4	0.2	No data
Magnesium	µg/L	580	230	550	170	520	210	No data
Manganese	µg/L	84	103	95	96	83	116	Equation ²
Mercury	µg/L	2.74	0.05	< 0.025	< 0.025	< 0.025	< 0.025	0.026
Molybdenum	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	73
Nickel	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	25 ³
Potassium	µg/L	200	40	210	50	750	100	No data
Rubidium	µg/L	0.5	0.1	0.6	0.4	1.1	0.4	No data
Selenium	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	1
Silver	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0,25
Sodium	µg/L	1540	680	1560	930	2260	970	No data
Strontium	µg/L	12	3	11	3	10	3	No data
Tellurium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	No data
Thallium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	0,8
Tin	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	0.1	< 0.1	No data
Uranium	µg/L	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1	15
Vanadium	µg/L	< 1	< 1	< 1	< 1	< 1	< 1	No data
Zinc	µg/L	5	3	5	3	20	3	Equation ⁴
Other parameters								
Ammonia (as N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	0.09	< 0.05	48
pH	units	5.6	4.9	5.4	4.6	6.2	5.3	N/A
Nitrate + Nitrite (as N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0,05	No data
Nitrate (as N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	0,05	13
Nitrite (as N)	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	No data
Nitrogen - Total	mg/L	0.8	0.4	0.6	0.6	1.2	0.5	No data
Phosphorus - Total	mg/L	3.35	0.35	0.049	0.20	0.029	0.012	4 to 10
Solids - Total Suspended	mg/L	< 5	< 5	23	168	< 5	5	No data
Conductivity	µS/cm	24	21	24	26	28	21	No data
Hardness (as CaCO ₃)	mg/L	8.6	2.8	7.7	2.3	7.6	2.7	No data

¹ The Canadian Water Quality Guideline (CWQG) for cadmium depends on water hardness (as CaCO₃). If CaCO₃ concentration is > 0 to < 17 mg/L, the CWQG for cadmium is 0.04 µg/L.

² The CWQG for manganese depends on water hardness and is based on the following equation: $CWQG = e^{(0.878[\ln(\text{hardness})] + 4.76)}$.

³ The CWQG for nickel depends on water hardness. When the water hardness is 0 to ≤ 60 mg/L, the CWQG is 25 µg/L.

⁴ The CWQG for zinc depends on water hardness and dissolved organic carbon (DOC). $CWQG = e^{(0.947[\ln(\text{hardness mg L}^{-1})] - 0.815[\text{pH}] + 0.398[\ln(\text{DOC mg L}^{-1})] + 4.625)}$. Considering this equation and the average for water hardness and DOC measured, the CWQG is estimated to 26.8 mg/

From a global perspective, water quality results obtained for each sampling station reflect the biochemical nature of the environment through which they flow. Stream waters exhibit a decreasing trend in measured concentrations between July 2021 and November 2021, for most parameters. For example, calcium concentration in the first sampling location (PL6-1) has decreased by 25% between July and November 2021, dropping from 2880 to 2160 µg/L. The following metals and other parameters have also decreased by varying factors between summer and fall 2021: aluminum, barium, iron, magnesium, mercury, phosphorus, hardness (CaCO₃) and pH.

On the opposite, concentration of some other parameters increased between July and November 2021. For example, sodium increased by 250 µg/L at PL6-2 and the following metals showed a slight increase in concentration: lead, manganese (for PL6-1) and rubidium. The general decrease observed in metal concentrations does not correlate with a decrease of conductivity and suspended solids content as these two parameters increased.

Concentration of most metals and other parameters did not vary much between November 2021 and January 2022. Calcium concentration, one of the metals that varied the most between July and November 2021, remained stable. Important variations were observed for three metals: potassium (210 to 750 µg/L), sodium (1560 to 2260 µg/L) and zinc (5 to 20 µg/L). These variations were observed solely for PL6-1.

High concentrations were recorded for iron (840 to 1900 µg/L). These rates exceed CCME's corresponding guidelines for protection of freshwater aquatic life (300 µg/L, long-term exposure) for all sampling periods (July 2021, November 2021, and January 2022). High concentrations of mercury were also measured in July 2021. Indeed, concentrations of 2.74 µg/L and 0.05 µg/L were measured in PL6-1 and PL6-2 in July 2021, both concentrations exceeding CCME's guidelines (0.026 µg/L). Mercury concentrations decreased below the detection limit in November 2021 and January 2022. Mercury concentrations were also analyzed in soil samples collected in PL6-1 at different depths (10, 30 and 70 cm below the surface) with Cold Vapour AAS (SOP 4.M52 & SOP 4.M53). The concentrations measured varied from less than 0,01 mg/kg to 0,02 mg/kg.

Regarding pH, values between 5.4 and 6.2 were measured for PL6-1, and between 4.6 and 5.3 for PL6-2. In both cases, values were higher in winter and lower in fall. These values reflect the influence of acidic and nutrient poor bog water on both receiving watercourses that also drain adjacent uplands. Considering Peatland No. 6 is a bog and that PL6-1 and PL6-2 are located at least at 500 m from it, Peatland No. 6's pH is expected to be even lower.

4.1.6 PEAT CHARACTERISTICS

Peatland No. 6 covers 301 ha including 206 ha with a peat depth of over 1 m (Keys and Henderson, 1987). The volume of fibric peat in the area with more than 1 m of peat is estimated at 5.26 Mm³ out of a total volume of 7.14 Mm³ for the whole peatland. Theriault & Hachey intends to develop only 176 ha of the harvestable area (i.e. with peat depth over 1 m) mostly because of the presence of Rosaireville Lake and another large lake.

The peatland developed over sand and silty sand deposits except for the portion under Rosaireville Lake where the peat lies over 1 m of ooze overlying clay. The bottom of the peatland is sloping toward Rosaireville Lake. The peatland has two domes of peat separated by a shallow peat zone that corresponds to a ridge of the mineral deposit. The north dome is deeper with peat depth reaching 5 m locally while peat depth does not exceed 4 m in the south dome.

According to Keys and Henderson (1987), Sphagnum peat largely dominates as it composes the top 1-3 m of peat. It is underlain by a discontinuous layer of shrubby Sphagnum peat that lies over 1 m of well humified Sphagnum-Carex peat.

4.2 BIOLOGICAL ENVIRONMENT

4.2.1 WETLANDS AND VEGETATION

Peatlands are a dominant feature of the inland portion of the Kouchibouguac Ecodistrict that is part of the Eastern Lowland Ecoregion. They occupy large areas, and many are used for peat harvesting especially to the northeast in the Escuminac Peninsula. Peatland No. 6 belongs to region 2B of Keys and Henderson (1987) where peatlands are considered as mature domed raised bogs with ombrotrophic conditions. These peatlands are fed only by rain, and acidic and nutrient poor conditions developed over time. Two smaller peatlands (Nos. 1056 and 1057) lie west of Peatland No. 6 while large peatlands form large complexes to the west (Maps 2 and 5). Riparian wetlands are also widespread in the area as they border most watercourses.

The description of vegetation is based on a field survey performed solely for this project (Appendix C) and a general survey conducted as part of an inventory of wetland resources of New Brunswick (Air Photo Analysis Associates Consultants Limited, 1975). Peatland No. 6 is typical of ombrotrophic bogs of the Kouchibouguac area. It is dominated by two main habitats: domed bog primarily covered by a plant community dominated by Sphagnum moss (*Sphagnum* sp.) and Cottongrass species (*Eriophorum* sp.), and low-shrub bog habitat with moderate to dense ericaceous shrub cover dominated by Leatherleaf (*Chamaedaphne calyculata*), Sheep Laurel (*Kalmia angustifolia*), and Labrador Tea (*Rhododendron groenlandicum*). The peatland has minimal amounts of stunted Black Spruce (*Picea mariana*) and Tamarack (*Larix laricina*) along the peatland edge and in isolated patches within the peatland. Other species commonly encountered during the survey include Bog Rosemary (*Andromeda polifolia*), Black Huckleberry (*Gaylussacia baccata*), Three-leaved False Solomon's Seal (*Maianthemum trifolium*), and Northern Pitcher Plant (*Sarracenia purpurea*).

Several species are associated with the numerous pools along with the Sphagnum mat: Variegated Pond-Lily (*Nuphar variegatum*), White Beakrush (*Rhynchospora alba*), Spoon-leaved Sundew (*Drosera intermedia*), and Horned Bladderwort (*Utricularia cornuta*).

At the bog margin, the transitional area between the peatland and surrounding upland habitat includes lawns where the Sphagnum mat is dotted with herbaceous species, among them orchids such as Tuberous Grass Pink (*Calopogon tuberosus*), Pink Lady's-Slipper (*Cypripedium acaule*), White Fringed Orchid (*Platanthera blephariglottis*) and other *Platanthera* species (*Platanthera* sp.). The transitional area may also be dominated by a dense shrub cover with trees (Black Spruce and Tamarack).

A request was submitted to the Atlantic Canada Conservation Data Center (ACCDC) to identify potential presence of rare species and rare plant surveys were conducted in June and August 2021 to document the presence of these species. The ACCDC report is provided at Appendix D. Three Species of Conservation Concern (SOCC) were identified during the surveys: the Cloudberry (*Rubus chamaemorus*), Russet Cottongrass (*Eriophorum russeolum*), and White Fringed Orchid (Table 4-4). Cloudberry and Russet Cottongrass have provincial S-ranks of S3S4 and they were both ranked S3 in 2016 (WSP, 2016), meaning that they are more common as estimated 5 years ago. White Fringed Orchid is classified as S3 and its rank has not changed since 2016. None of the three species are listed under provincial or federal Species at Risk (SAR) legislation. The location of the three species is shown in Map 5. No Southern Twayblade was found during the specific survey in June.

Cloudberry was found in small patches of scarce individuals within the northern margin of the bog in a low-shrub transitional habitat dominated by stunted Black Spruce and Tamarack, as well as Leatherleaf, Sheep Laurel, and Labrador Tea.

Russet Cottongrass was observed on the western margin of the peatland in transitional habitat between open domed bog and low-shrub bog. It appears in small groups where there was greater shrub density (Leatherleaf, Sheep Laurel, Labrador Tea) and near some areas of ponded water where peat hummocks were alleviated.

Sparse and scattered colonies of White-Fringed Orchid were identified in areas near the middle of the bog, in an open area with minimal shrub cover and adjacent to a series of small ponds. Associated vegetation consisted of Sphagnum moss, Tawny Cottongrass (*Eriophorum virginicum*), and occasional patches of Leatherleaf and Black Huckleberry.

Table 4-4 Rare Plant Species Present in Peatland No. 6

COMMON NAME	LATIN NAME	PROVINCIAL RARITY RANK ¹	DESCRIPTION
Cloudberry	<i>Rubus chamaemorus</i>	S3/S4	Uncommon in province/ widespread, common and apparently secure in province
Russet Cottongrass	<i>Eriophorum russeolum</i>	S3/S4	Uncommon in province/ widespread, common and apparently secure in province
White Fringed Orchid	<i>Platanthera blephariglottis</i>	S3	Uncommon in province

¹ ACCDC. (2021). Data Report 6992: North of Rosaireville, NB.

4.2.2 TERRESTRIAL WILDLIFE

Peatlands are habitats for a variety of terrestrial wildlife and can contribute significantly to regional biodiversity, particularly at the limit between temperate and boreal regions (Calmé *et al.*, 2002; Spitzer and Danks, 2006). An individual peatland can be the home for more than 1000 arthropod species (Blades & Marshall, 1994). Several invertebrate species can be found exclusively in peatlands (Spitzer & Danks, 2006). On the opposite, many vertebrate species use peatland, but none is restricted to these ecosystems in terms of habitat (Rocheffort *et al.*, 2012). Wet ground conditions, low pH and nutrient status typically found in peatlands make it hard for wildlife to establish a foothold in these ecosystems. These conditions do not translate into a high biological productivity. Peatlands are mostly used by species looking for open areas.

MAMMALS

Overall, the presence of 35 mammal species has been established within a distance of 50 km to the study site. Friolet *et al.* (2008) report 24 mammal species present in the Tabusintac River watershed (Table 4-5), an area located approximately 50 km north of Peatland No. 6. Most of these species are also known to populate the Kouchibouguac National Park (Government of Canada, 2020), located approximately 20 km east of Peatland No. 6. Eleven additional terrestrial mammal species can be observed in Kouchibouguac National Park (Table 4-5).

Table 4-5 Mammals Present in the Kouchibouguac National Park and the Tabusintac River Watershed

ENGLISH NAME	LATIN NAME	AREA WHERE THE SPECIES WAS OBSERVED
Black bear	<i>Ursus americanus</i>	1, 2
Moose	<i>Alces alces</i>	1, 2
White-tailed deer	<i>Odocoileus virginianus</i>	1, 2
Coyote	<i>Canis latran</i>	1, 2
Red fox	<i>Vulpes vulpes</i>	1, 2
Bobcat	<i>Felis rufus</i>	1, 2
Raccoon	<i>Procyon lotor</i>	1, 2
Beaver	<i>Castor canadensis</i>	1, 2
Snowshoe hare	<i>Lepus americanus</i>	1, 2
Muskrat	<i>Ondatra zibethicus</i>	1, 2
River otter	<i>Lontra canadensis</i>	1, 2
Mink	<i>Mustela vison</i>	1, 2
Ermine	<i>Mustela ermine</i>	1, 2
Striped skunk	<i>Mephitis mephitis</i>	1, 2
Pecan	<i>Martes pennanti</i>	1, 2
Woodchuck	<i>Marmotta monax</i>	1, 2
Porcupine	<i>Erethizon dorsatum</i>	1, 2
Long-tailed weasel	<i>Mustela frenata</i>	2
Meadow vole	<i>Microtus pennsylvanicus</i>	2
Star-nose mole	<i>Condylura cristata</i>	2
American red squirrel	<i>Tamiasciurus hudsonicus</i>	2
Eastern chipmunk	<i>Tamias striatus</i>	1, 2
Northern flying squirrel	<i>Glaucomys sabrinus</i>	1, 2
Redback vole	<i>Clethrionomys gapperi</i>	2
Lynx	<i>Lynx lynx</i>	1
Lemming	<i>Synaptomys cooperi</i>	1
House mouse	<i>Mus musculus</i>	1
Deer mouse	<i>Peromyscus maniculatus</i>	1
Meadow jumping mouse	<i>Zapus hudsonius</i>	1
Woodland jumping mouse	<i>Napaeozapus insignis</i>	1
Norway rat	<i>Rattus norvegicus</i>	1
American water shrew	<i>Sorex palustris</i>	1
Arctic shrew	<i>Sorex arcticus</i>	1
Masked shrew	<i>Sorex cinereus</i>	1
Short-tailed shrew	<i>Mephitis mephitis</i>	1

1. Kouchibouguac National Park; 2. Tabusintac River watershed

Rat, mouse and shrew species are also reported in the Tabusintac River watershed area although species are not mentioned (Friolet *et al.*, 2008). The Arctic Shrew (*Sorex arcticus*) and the Maritime Shrew (*Sorex maritimensis*) are two species that use peatland, but the study site is more likely to be outside their range (Rocheffort *et al.*, 2012; Mazerolle *et al.*, 2001).

Although there is a lack of study about big mammals and their use of peatlands in New Brunswick, moose are known to use peatlands in New Brunswick (Gautreau-Daigle, 1990). Moose prefer forested peatlands rather than open peatlands, which they tend to stay at the limits. Their use of forested peatlands is more pronounced during winter (Nikla *et al.*, 2004).

BIRDS

Birds represent the most studied group among peatland vertebrates. Avian fauna is also the best represented vertebrate group in peatlands. Birds usually represent 80% of the vertebrate species found in a peatland (Payette & Rocheffort, 2001). Breeding birds and Nightjar surveys were conducted by WSP during the summer of 2021, and incidental bird observations were also noted during the two vegetation surveys. WSP also requested a data report from the Atlantic Canada Conservation Data Centre (ACCDC) in advance of the field surveys (Appendix D) and examined data from the *Second Atlas of Breeding Birds of the Maritime Provinces* (Bird Studies Canada, 2022).

Peatlands are home to a variety of more than 100 bird species (Desrochers & van Duinen, 2006), but none are exclusively found in peatlands. A bird survey comprising data collected in 120 eastern Canadian bogs from 1993 to 2002 yielded 10,575 bird observations (Desrochers & van Duinen, 2006). Most of these observations can be narrowed down to four species (in decreasing order): Common Yellowthroat (*Geothlypis trichas*), White-throated Sparrow (*Zonotrichia albicollis*), Lincoln's Sparrow (*Melospiza lincolnii*) and Savannah Sparrow (*Passerculus sandwichensis*). Though there are no occurrences of these four species by ACCDC and regionally according to the *Second Atlas of Breeding Birds of the Maritime Provinces*, these species have all been observed during the bird surveys completed by WSP. The Common Yellowthroat feeds mostly on insects and is considered fairly common in North America. This is validated by the bird survey completed by WSP, the Common Yellowthroat being the most observed bird species with a total of 10 observations. Its nesting area extends from southern Canada to central Mexico. On the other hand, the White-throated Sparrow, the Lincoln's Sparrow and the Savannah Sparrow are all part of the *Passerellidae* family, a group of birds mostly feeding on seeds and little insects. With a total of 6 observations, the Lincoln's Sparrow was the second most seen bird species, equaled by the Nashville Warbler (*Oreothlypis ruficapilla*) and the Palm Warbler (*Setophaga palmarum*).

According to the *Second Atlas of Breeding Birds of the Maritime Provinces* (Bird Studies Canada, 2022), 162 bird species were observed in the Kent region, which is comprised of 62 squared zones, each with a width of 6 km. Peatland No. 6 is located in Zone 20LS29. Among the species listed in the atlas, 35 were seen in more than 60% of the squared zones and can thus be considered common on the region. Furthermore, the presence of 26 species was confirmed in Zone 20LS29. These observations were completed over a period of 4 years (2006 to 2010) and comprise data collected from 28 listening points. The locations of the listening points in Zone 20LS29 are shown in Appendix E.

A total of 78 individual birds comprised of 26 species were recorded during the breeding bird surveys. An additional 62 birds were recorded incidentally (> 100 m from survey station), with 13 additional species not directly recorded within 100 m of the survey stations; these additional species are indicated as incidentals. The bird survey report is presented at Appendix G; the list of birds observed during the bird survey and those whose presence was confirmed by ACCDC and the Atlas is presented at Appendix F.

HERPETOFAUNA

Friole et al. (2008) report many reptile and amphibian species for the Acadian peninsula and several herpetofauna species can be observed in Kouchibouguac National Park (Table 4-6). Overall, the presence of 18 species has been established within a distance of 50 km with Peatland No. 6. Although peatlands represent a hostile habitat for amphibians because acidic conditions can affect them given the permeability of their skin, some species such as the Wood Frog, Green Frog and Leopard Frog as well as the American Toad, the Four-toed Salamander and the Eastern Redback Salamander can use peatlands (Desrochers and van Duinen, 2006; Mazerolle, 2003). Among reptiles, the Redbelly Snake (*Storeria occipitomaculata*) and the Smooth Green Snake (*Opheodrys vernalis*) are found in peatlands.

Table 4-6 Reptile and Amphibian Present in Kouchibouguac National Park and the Tabusintac River Watershed

ENGLISH NAME	LATIN NAME	AREA WHERE THE SPECIES WAS OBSERVED
Redbelly snake	<i>Storeria occipitomaculata</i>	2
Common garter snake	<i>Thamnophis sirtalis</i>	2
Smooth green snake	<i>Opheodrys vernalis</i>	1, 2
Yellow-spotted salamander	<i>Ambystoma maculatum</i>	1, 2
Eastern redback salamander	<i>Plethodon cinereus</i>	2
American toad	<i>Bufo americanus</i>	1, 2
Spring peeper	<i>Pseudocaris crucifer</i>	1, 2
Green frog	<i>Rana clamitans</i>	1, 2
Pickerel frog	<i>Rana palustris</i>	2
Leopard frog	<i>Rana pipiens</i>	2
Wood frog	<i>Rana sylvatica</i>	1, 2
Mink frog	<i>Rana septentrionalis</i>	1
Northern leopard frog	<i>Rana pipiens</i>	1
Eastern red spotted newt	<i>Notophthalmus viridescens</i>	1
Two-lined salamander	<i>Eurycea bislineata</i>	1
Common snapping turtle	<i>Chelydra serpentina</i>	1
Eastern painted turtle	<i>Chrysemys picta</i>	1
Wood turtle	<i>Glyptemys insculpta</i>	1

1. Kouchibouguac National Park; 2. Tabusintac River watershed

SPECIAL STATUS WILDLIFE SPECIES

A Species at Risk (SAR) is any species which is listed as Endangered, Threatened or of Special Concern under the federal SARA (Species at Risk Act, S.C. 2002, c. 29) and any species listed as Endangered, Threatened or Special Concern under the provincial New Brunswick Species at Risk Act (NB SARA; Species at Risk Act, S.N.B 2012, c.6). According to ACCDC, seven rare terrestrial wildlife species have been reported within a radius of 5 km around Peatland No. 6, all of which are birds. The seven species listed include the Barn Swallow (*Hirundo rustica*), the Canada Warbler (*Cardellina canadensis*), the Common Nighthawk (*Chordeiles minor*), and the Olive-sided Flycatcher (*Contopus cooperi*) the Eastern Kingbird (*Tyrannus tyrannus*), the Scarlet Tanager (*Piranga olivacea*) and the Wilson's Snipe (*Gallinago delicata*) (Table 4-7). Four of these species are listed as "Threatened" under the federal SARA and the three other have no legal status but have a provincial rarity rank S3B or S3S4B. None of these rare species have peatlands among their preferred habitat, but two species, the Olive-sided Flycatcher and the Canada Warbler, could potentially use this habitat.

WSP completed two rounds of breeding bird and nightjar surveys at Peatland No. 6 to evaluate general bird habitat usage and identify the potential presence of Species at Risk (SAR). One SAR, the Olive-sided Flycatcher, was observed incidentally during the first breeding bird survey but was not detected during the second survey round. The Olive-sided Flycatcher's known habitat is usually the edge of coniferous or mixed forest, burned forest with tall trees for perching which allows it to better track its food, mainly flying insects. The station where it was heard was located in a mid-aged coniferous forest with a dense understory, an unlikely habitat for that species which prefer semi-open habitat for nesting. The project may have some impacts on the Olive-sided Flycatcher. However, the habitat conditions should remain favorable to that species since the project impacts the peatlands and it is known to make use of the limits between disturbed and forested areas. Several mitigation measures will be taken to ensure that species is not impacted by the project (Section 5.1.4).

Though not observed during the bird survey, a second SAR species, the Common Nighthawk, was seen during the vegetation survey. Two Common Nighthawks were observed flying southeast, approximately 500 m east of the project boundary, and another Common Nighthawk was heard faintly calling along the southern boundary of the project area (Map 5).

Three provincially rare species, Bufflehead (*Bucephala albeola*), Sandhill Crane (*Antigone canadensis*), and Wilson's Snipe, were observed either directly or incidentally during the breeding bird surveys. Each of these species was observed only once. The Sandhill Crane and the Wilson's Snipe were observed within the proposed peat harvesting area, while a group of Buffleheads was observed in a pond that is located outside of the harvesting area (Map 5).

Table 4-7 SAR Species Potentially Present in the Study Site

COMMON NAME	LATIN NAME	HABITAT	PRESENCE POTENTIAL
Barn Swallow	<i>Hirundo rustica</i>	Prior to European colonisation of North America, Barn Swallows nested mainly in crevices on cliffs, on rock overhangs and in caves. Since then, it can be seen nesting on or in man-made structures, including barns, stables, houses, sheds and bridges. The Barn Swallow likes to forage in open areas, grassland, agricultural fields, shores, clearings, some wetlands and roads.	Peatland No. 6 and its surrounding area is mainly constituted of peatlands and dense coniferous forest. There are no farming grounds, houses or other humans structures in the area. Thus, the site is unlikely to host the Barn Swallow and its presence potential is considered low .
Canada Warbler	<i>Cardellina canadensis</i>	The Canada Warbler's preferred nesting areas are humid mixed forest (deciduous and coniferous) with a well-developed shrub layer. The species also makes uses of forests with dense understory during its migration.	Considering Peatland No. 6 is a bog, the presence potential for the Canada Warbler is considered low . However, coniferous forests with dense understory are present near Peatland No. 6. These areas could be used by the Canada Warbler during its migration.
Common Nighthawk	<i>Chordeiles minor</i>	The Common Nighthawk is known to breed in several open areas, including grasslands, peatlands and disturbed areas. The species can make uses of a far wider range of habitat. Populated areas, specifically, meet its habitat needs (open areas for feeding and bare or sparse surfaces for nesting).	Considering the study site is an undisturbed peatland (an open area), but that there is no populated areas nearby, the presence potential for the Common Nighthawk is considered moderate .
Olive-sided Flycatcher	<i>Contopus cooperi</i>	The Olive-sided Flycatcher can often be found at the edges of coniferous or mixed forests with trees that can be used for perching. It can be found near open or disturbed areas. This species can be seen at the limits between forested areas and wetlands, including peatlands.	Considering its habitat preferences for the edges of coniferous habitat, the study site fills all the requirements of the Olive-sided Flycatcher. Specifically, the species could be found at the limits of Peatland No. 6 and at the edge of forested areas. The presence potential for that species can be considered high .
Eastern Kingbird	<i>Tyrannus tyrannus</i>	Eastern Kingbirds are often found in open areas such as savannas, grasslands, forest or wetlands edges, near roads and city parks. This species likes to nest in trees, often near water.	Considering the Eastern Kingbird is not known for its use of peatlands and coniferous habitat, its presence potential on the study site is considered low .
Scarlet Tanager	<i>Piranga olivacea</i>	In eastern North America, Scarlet Tanagers live in deciduous and mixed forest. During their migration, they use a wider variety of forested and shrubbed areas.	Peatlands aren't usually used by the Scarlet Tanager, except as a possible staging area. The presence potential for that species is considered low .
Wilson's Snipe	<i>Gallinago delicata</i>	Lives in open and wet areas. The Wilson's Snipe is known to breed in bogs, swamp, fens and other wetlands.	Considering its habitat preference, the presence potential of the Wilson's Snipe is considered high .

4.2.3 AQUATIC WILDLIFE

Fish diversity in peatlands is usually low due to the acidity, low oxygen, and low nutrient levels in the water. Thus, fish habitat conditions are lacking in the shallow ponds typically found in bogs. However, small fish can be found occasionally in the open water areas of a peatland. Beaver modifications in peatland are known to improve conditions for the fish habitat (Ray *et al.*, 2004), but beavers are not likely to be present in Peatland No. 6 due to the lack of trees and important source of water.

Peatland No. 6 is located at the head of the Black River and Bay du Vin River watersheds. Both rivers flow toward the Miramichi Bay. The aquatic wildlife in the region is centered on the ecosystem of the Miramichi River and its tributaries. While close to the Miramichi River, Peatland No. 6 is not part of the Miramichi River watershed. According to the Atlantic Salmon Habitat Assessment for the Bay du Vin River Drainage Basin (Trajkovic & Collins, 2013), the Bay du Vin River does not represent a good habitat to host important stocks of Atlantic salmon (*Salmo salar*) due to two main limiting factors: the warm summer temperature regime and the riverbed geology. Consequently, chances to observe Atlantic salmon or other salmonid species (*Salmonidae* sp.) in the Bay du Vin River are very low due to poor habitat conditions.

4.2.4 SPECIAL STATUS AREAS

According to the ACCDC report (Appendix D), one managed area was identified in the vicinity of the study area, within a distance of 5 km of the central point of Peatland No. 6: the Goodfellow Brook Protected Natural Area (Map 5). Covering an area of 113 ha, Goodfellow Brook is a class 2 Protected Natural Area (PNA) that was created in 2008. In New Brunswick, PNAs represent areas of land or water permanently set aside and protected for the conservation of its biological diversity. A Protected Natural Area (PNA) is representative of a province natural's ecosystem. The Goodfellow Brook PNA is located 3.5 km northwest of Peatland No. 6. Therefore, it will not be impacted by the project.

A second PNA, the Black River conservation area, is located 14 km east of Peatland No. 6 and west of Kouchibouguac National Park. The Black River PNA covers an area of 3,997 ha and its conservation complements protection provided by Kouchibouguac National Park. The site is primarily covered by large domed peat bogs. The dominant tree species of the area are mainly Black Spruce and Tamarack. No other biologically significant sites were identified in the vicinity of the study area.

There are two Candidate Conservation Areas (CCA) located near Peatland No. 6. CCA No. 0683 is directly at the north border of the project area where it covers 199.5 ha composed of peatlands, forested areas and Rosaireville Lake. CCA No. 1782 covers an area of 329 ha east of Peatland No. 6 and it surrounds a watercourse that takes its source in Peatland No. 6 and flows toward Bay du Vin River.

4.3 HUMAN ENVIRONMENT

4.3.1 COMMUNITIES

Peatland No. 6 is located in Northumberland County and is part of the Local Service District (LSD) of Glenelg (Map 6). The closest populated area is the town of Rogersville, populated by 1,166 (Statistics Canada, 2021) and located 15 km to the south-east. The closest city, Miramichi, is located 20 km to the northwest with a population of 17,800.

4.3.2 FIRST NATIONS

The First Nations of New Brunswick are divided into two main groups: the Mi'kmaq and Maliseet. Peatland No. 6 lies in the traditional territory of the Mi'kmaq Nation. The closest First Nations communities are the Eel Ground and Red Bank communities (Map 1). The Eel Ground Mi'kmaq Nation is located near the city of Miramichi and 25 km to the northwest of Peatland No. 6, where it occupies an area of 1,226 ha. The community comprises a population of 1,036 (AANDC, 2016) and includes three reserves: Eel Ground 2, Big Hole Tract 8 (south half), and Renous 12. Eel Ground is positioned at the junction of the Northwest and Main Southwest branches of the Miramichi River. Thus, Eel Ground and its surrounding area have long served as a natural meeting point for the Mi'kmaq.

Red Bank 4, also known as Metepenagiag, is a Mi'kmaq Nation with a population of 702. The community is located 15 km west of Eel Ground and more than 38 km to the northwest of Peatland No. 6. Metepenagiag has been inhabited by Mi'kmaq for more than 3000 years, which makes it the oldest continuously habited settlement in New Brunswick.

Elsipogtog (Big Cove), L'nui Menikuk (Indian River) and Esgenoôpetitj (Burnt Church) are other Mi'kmaq communities located within a radius of 50 km from the project.

Theriault & Hachey has engaged with the Mi'kmaq First Nation and maintains contact with the Mi'gmawe'l Tplu'taqnn Incorporated (MTI), an organization that represents eight of the nine New Brunswick Mi'kmaq communities, and Elsipogtog First Nation (Kopit Lodge).

4.3.3 POPULATION

Northumberland County is home to a population of 44,952 inhabitants (Statistics Canada, 2017). Overall, the area surrounding Peatland No. 6 is sparsely populated. According to the Canada census completed in the last two decades, the population has been steadily decreasing since 1991 (Table 4-8).

The drivers of local economy are mostly based on primary and secondary activities using a resource base. As a result, there are many employment opportunities for workers without large amounts of education. In 2016, 30.8% of the aged 25 to 64 population had no certificate, diploma or degree, and only 46.7% had completed some form of post-secondary education (NBjobs.ca, 2018). The development of Peatland No. 6 will have a positive impact by providing additional jobs that do not require any special skills to the local population.

Table 4-8 Canadian Census Statistics for the Northumberland County

	2006	2011	2016
Population	48,868	48,355	44,952
Population density	4.0/km ²	3.7/km ²	3.5/km ²
Median age	42.5	46.4	49.1
Total private dwellings	21,115	22,078	21,792
Median household income	\$40,166	\$47,858	\$55,223

Source: Statistics Canada, 2017

4.3.4 SERVICES

Peatland No. 6 can be accessed from Weldfield-Collette Road, an unpaved road that connects Highway 126 to Highway 11. The peatland will be connected to Weldfield-Collette Road through a 4.07 km access road that will use an existing forest road that will be upgraded and new sections of roadway to be constructed.

The closest police service is located in Miramichi (1820 Water Street, tel.: 506-623-2124) while the closest fire department is the City of Miramichi Fire Department. Both are located approximately 20 km north of Peatland No. 6. There is also a Royal Canadian Mounted Police (RCMP) point of service located in Rogersville (10989 Rue Principale) approximately 15 km south of Peatland No. 6.

Horizon's Miramichi Regional Hospital is the closest place where health services can be provided in case of an emergency (> 22 km). Horizon's Rogersville Health Center, located in the village of Rogersville, can also provide basic health services.

Most services (groceries, restaurants, car repairs services, etc.) can be found in the City of Miramichi, which is the biggest city north-east of the province of New Brunswick.

4.3.5 LAND USE

Peatland No. 6 is located in the Kouchibouguac Ecodistrict of the Eastern Lowlands ecoregion, which contains the largest area of peatlands of all New Brunswick ecoregions. Thus, many peatlands of the ecoregion are used for peat harvesting.

Two protected natural areas are located in the Kouchibouguac Ecodistrict: Kouchibouguac National Park and the Cape Jourimain National Wildlife Area. Covering an area of 245 km², these protected areas are known for their diversity of unusual plants.

Forest covers 75% of Kouchibouguac Ecodistrict and of the 25% not covered by forest, 39% is covered by wetlands and 9% is used for agricultural activities (Government of New Brunswick, 2017). As of 2020, two peatlands are actively used for peat harvesting within a radius of 15 km of Peatland No. 6: Peatlands Nos. 4 and 5, both operated by Sun Gro Horticulture Canada Ltd. (Map 6).

4.3.6 ECONOMY

Peatland No. 6 is located in the northeast economic region, one of the five economic regions officially recognized by Statistics Canada (NBjobs.ca, 2018). The northeast economic region includes Gloucester, Restigouche and Northumberland counties. Peatland No. 6 is part of Northumberland County. The northeast economic region has a high unemployment rate (13.5%) that is higher than the provincial rate (8,1%), and active population is decreasing (NBjobs.ca, 2018). The northeast region is mostly rural and poorly diversified economically. Its main activities are agriculture, forestry, fishing and mining. The economy of the Miramichi area is centered around forestry, mining and fishing. For both the Miramichi area and the northeast economic region, the service sector is the largest employer. As of 2017, sales and services occupations represent 24% of the employment. The natural resources sector represents 6% of jobs in the Northeast region as of 2017.

In 2015, the average income for the Northumberland County's working-age population amounted to \$35,816, with a median of \$28,517. Considering the seasonal nature of several industries in the northeast region, 26% of the population received employment insurance (EI), which is higher than the EI recipients in the province (16.2%) or in the country (8.8%).

As previously mentioned, this project should have a positive impact on the local population by providing jobs that do not require special skills.

4.3.7 AREAS OF INTEREST

Kouchibouguac National Park, located to the southeast of the study area, is the main feature of the region. It covers an area of 239 km² including mainly peat bogs, forest and the coast. The city of Miramichi is the pole center of the region.

4.3.8 HISTORIC LAND USE

The first inhabitants of the region are the First Nations, most notably the Mi'kmaq. The traditional territory of the Mi'kmaq nation can be divided into 8 districts. These districts cover part of the Gaspésie region in Quebec (Gespegeoag), the eastern coast of New Brunswick (Sigenigteoag and Epegoitnag), Prince Edward Island (Pigtogeoag) and Nova Scotia (Onamag, Esgieoag, Epegoitnag, Segepenegatig and Gespogoitnag). Most of the region where Peatland No. 6 is located is part of Sigenigteoag, an area covering most of the east coast of New Brunswick to the Bay of Fundy. The region is highly influenced by its closeness to the sea and the river estuaries that dominate the landscape. The biggest river near Peatland No. 6 is the Miramichi River which encompasses most of the Northumberland County. The Miramichi River was a point of interest for the Mi'kmaq communities, which used the area mainly for fishing.

Historically, several Mi'kmaq villages or burial grounds were located near the Miramichi River and other rivers in the region such as the Scoudouc, Buctouche, Richibucto and Black (Government of New Brunswick, 2017). Among those rivers, the Black River is the closest to Peatland No. 6. The First Nations used the Northumberland coastline 3,000 years before Europeans arrived. The Mi'kmaq living in the region were mainly nomads, following the fish along the seashore most of the year and retreating inland during winter to hunt animals for food (Milson, 1988). The traditional lifestyle of the First Nations changed after the arrival of the first Europeans. The Northumberland coastline is considered as one of the first areas in New Brunswick to be inhabited by European settlers, who were likely French or Acadian. British immigrants arrived after the British conquest, during the 18th century.

4.3.9 ARCHEOLOGICAL CONSIDERATIONS

The results of a request sent to the Archaeological Services Branch of the Department of Tourism, Heritage and Culture indicate that there are three sites of interest within a distance of 5 km to the area targeted by the peat harvesting project that consist of two historic plane wrecks and one cemetery (Appendix H). The Archaeological Services Branch did not provide the coordinates of these sites. None are located on the study site and no other archaeological sites are present near the study site.