Brierly Brook Quarry Expansion

PID 10111946

Brierly Brook

NOVA SCOTIA

ENVIRONMENTAL BASELINE ASSESSMENT

PROPONENT

Conestoga Rovers and Associates
45 Akerley Blvd, Dartmouth
NS, B3B 1X9

Report Prepared by:

McCallum Environment Ltd.

May 8, 2014

Executive Summary

McCallum Environmental Ltd. was retained by Conestoga Rovers & Associates to complete an environmental baseline assessment on a property located in Brierly Brook, approximately 7 km west of Antigonish, Nova Scotia. The Project Area is defined by property identification number (PID) 10111946. The Project Area is currently an active aggregate quarry, with undeveloped lands in the north and east portion of the PID. Adjacent land use is a mixture of undeveloped hardwood forests typical of the Pictou Antigonish Highlands Ecodistrict, rural residential dwellings, and agricultural fields. It is our understanding that this Environmental Baseline Assessment is being completed in advance of quarry expansion, pending Provincial Environmental Assessment Approval.

The environmental baseline assessment is completed to describe baseline biophysical conditions on a site and to identify any concerns related to priority species prior to a proposed project. The scope of the assessment for this Project includes the selection and assessment of potential priority species identified through a series of desktop analyses. The identification of priority species is then used to advise field assessment methodologies. The field components of the biophysical environmental assessment were initiated in the Spring of 2013 and carried through the winter of 2014. These studies were aimed at describing baseline biophysical conditions across the Project Area, as well as with the habitats surrounding the Project Area. This work included:

1. Habitat Assessment (Summer 2013);
2. Vegetation surveys for priority species across the Project Area (Spring and Summer 2013);
3. Wetland and watercourse identification and surveys across the Project Area (Summer 2013);
4. Spring and Fall bird migration surveys 2013; Breeding bird surveys (Summer 2013); and,
5. Opportunistic surveys for all additional priority species across the Project Area (Summer 2013), as well as specific transects for Mainland Moose (June 2013, and Winter 2013/2014).

An assessment of vegetation and overall habitat was completed within the Project Area. Outside of the currently operating aggregate quarry, the Project Area consists of a patchwork of habitat types, such pure young hardwood stands, open mixed wood regrowth, and one section which is in early stages of regrowth following recent harvest for timber products. The vascular plant surveys focused on identifying general vegetative communities, with particular focus on identifying priority species. No priority vegetation species, rare or unique habitat types were identified within the Project Area.

A wetland and watercourse assessment was completed across the Project Area. Four wetlands were identified within the Project Area. Of the four wetlands identified, three are isolated, with

the fourth wetland in headwater position. The wetlands are largely intact and undisturbed, yet the overall functional significance of each wetland is low, due to factors such as wetland size, wetland type, landscape position, and absence of priority species. However, given that overall wetland cover throughout the tertiary watershed is low (3%), each individual wetland does provide floodwater detention to downstream areas. Four watercourses were also identified within the project area, none of which provide fish habitat.

Baseline assessment for birds was completed from June through October 2013 by a local bird expert, Dr. Ken McKenna. A total of 1,358 minutes (22.5 hours) of surveys were completed over 3 seasons, using a combination of point counts, transect surveys, and passage migration counts. These surveys resulted in the sightings of 988 individuals, representing 63 species within the Project Area.

Ten avian species of conservation interest (SOCI) or Species at Risk (SAR) were identified within the Project Area during the baseline avian use assessment from spring 2013 to fall 2013. Two of these species have legal protection under provincial or federal legislation: The Eastern Wood Pewee is listed as ‘vulnerable’ under NSESA, and is listed as a ‘species of concern’ by COSEWIC (three individuals observed); and the Olive-sided Flycatcher is listed by SARA and NSESA as 'Threatened' (two individuals observed). The occurrence of Eastern Wood Pewees and Olive-sided Flycatchers in the Project Area is not surprising, considering they are commonly found in commercially harvested forests throughout Nova Scotia and have been identified regularly by MEL during all bird work associated with development projects and environmental assessment baseline work. No breeding evidence was noted for any of the ten priority species identified.

Incidental observation of mammal species and herpetofauna was documented during all field survey activities during 2013 across the Project Area. No priority species were identified within the Project Area, and no rare or unique habitat types upon which priority species rely was observed (for instance, hibernacula or nesting sites for Snapping Turtles or Wood Turtles).

The Project Area is within a Mainland Moose Priority Area, so focused surveys were completed to identify usage of the Project Area by Moose. No pellet piles, tracks or browse were identified during either spring pellet group inventory surveys, or winter tracking surveys.

A desktop analysis was completed to identify any potential bat hibernacula within 25 km of the Project Area. One abandoned mine opening is located 600m southwest of the Project Area. The original depth of this shaft is 9.0 m, and it is not considered a potential location for bat hibernacula.

The desktop analyses, field assessments, and subsequent conclusions of this assessment indicate there are no concerns related to priority species, rare or unique habitat types, within the Project Area.

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ACCDC	Atlantic Canadian Conservation Data Centre
COSEWIC	Committee On the Status of Endangered Wildlife In Canada
CWS	Canadian Wildlife Service
GPS	Global Positioning System
MBBA	Maritime Breeding Bird Atlas
NSDNR	Nova Scotia Department of Natural Resources
NSE	Nova Scotia Environment
NSESA	Nova Scotia Endangered Species Act
PID	Property Identification Number
SAR	Species At Risk
SARA	Species At Risk Act
SOCI	Species of Conservation Interest
SSHD	Significant Species and Habitat Database
UTM	Universal Transform Mercator

1. Project Information

1.1 Environmental Baseline Project Team

The McCallum Environmental Ltd. (MEL) Project Team consisted of the following personnel:

- Meghan Milloy, Project Manager and Regulatory Specialist
- Robert McCallum, P.Biol., Lead Biologist
- Melanie MacDonald, MREM, Team Leader, Biologist, Wetland Evaluator, Species at Risk
- Derrick Mitchell, Biologist, Botanist, Species at Risk, Wetland Evaluator
- Dr. Ken McKenna, Avifaunal Specialist
- Jody Hamper, Wildlife Technician

1.2 Project Location

The proposed Brierly Brook Quarry Expansion ("Project") is located in Brierly Brook, Antigonish County, Nova Scotia. It is on the north side of Brierly Brook Road, approximately 7km west of the town of Antigonish. The Project Area is defined by property identification number (PID) 10111946, which is 26.7 hectares (66.0 acres) in size. The approximate centre of the Project Area is referenced as 571374 m E and 5050950 m N (UTM NAD 83, Zone 20 T). Please refer to Figure 1 for a map of the property location and PID boundaries.

The Project lands range in elevation from 120 to 210 m above sea level along the southern edge of the Pictou-Antigonish Highlands. The site is currently an active aggregate quarry, with undeveloped land in the northern and eastern portions of the PID. The Project consists of the expansion of the existing aggregate quarry. Agricultural fields and rural residential dwellings are found along Brierly Brook Road to the south of the Project Area. The remainder of the surrounding landscape is natural, mature hardwood dominated forest. There are no mapped wetlands or watercourses within the Project Area.

The proposed Project is located in the Nova Scotia Uplands Ecoregion and the Pictou-Antigonish Highlands Ecodistrict, as defined by the Nova Scotia Department of Natural Resources (Neily, Quigley, Benjamin and Stewart, 2003). The Nova Scotia Uplands Ecoregion stretches from Cape Chignecto in Cumberland County to Kellys Mountain in Cape Breton. On the hills, the parent materials are generally sandy loams. Where the topography is gently rolling, the soils are usually well to moderately well-drained. Extensive areas of smooth or level topography at the tops of these hills tend to have imperfectly to poorly drained soils, which support forests of coniferous species. The total area of the ecoregion is 9,862 km^2 or approximately 17.8% of the province (Neily et al., 2003).

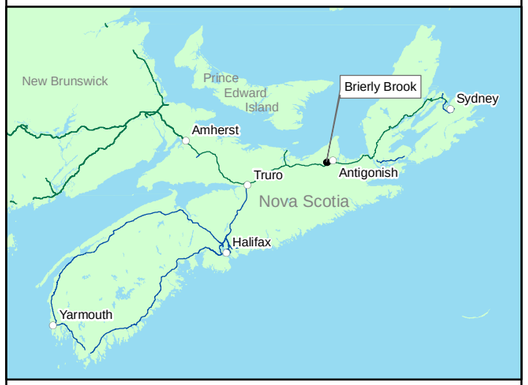
570000 572000 574000 576000 578000

5054000 5052000 5050000 5048000

Sylvan Valley
Brierly Brook Back Road
Antigonish
Lower West River
Brierly Brook
West River
Salt Springs
4
104
7

LEGEND:

- Property of Interest
- Existing Quarry
- Contours (5 m)



SOURCE:

Base Map: SNSMR
Photo: Bing Maps Apr 2013

0 0.5 1 2
Kilometres

N

PROJECTION:	DRAWN / CHECKED BY:	MAP ANGLE:
UTM z20 NAD83	JJP / MM	0° North
SCALE:	**DATE:**	**PROJECT NO:**
1:30,000	JANUARY 2, 2013	081464

081464 (01) GIS-DA005

figure 1
PROJECT LOCATION
BRIERLY BROOK QUARRY
NOVA CONSTRUCTION LTD
Brierly Brook, Nova Scotia

CONESTOGA-ROVERS & ASSOCIATES

The Nova Scotia Uplands Ecoregion is further subdivided into eight Ecodistricts. The Project Area is located at the southern edge of the Pictou Antigonish Highlands ecodistrict. This upland ecodistrict is crosscut by subsidiary faults trending north-south and northeast-southwest, creating many narrow valleys. Roland (1982) and Davis and Browne (1986) describe the geology of this ecodistrict as being extremely complex. The elevation is generally 210-245 m above sea level and rises to 300 m at Eigg Mountain. Overall, the highlands summit to a rolling plateau best exemplified by The Keppoch, an area once extensively settled. The dominant soils are mostly sandy loams which are well drained and fairly stony. Other dominant soils include those derived from shales. Typical of the upland ecodistricts, freshwater accounts for only 0.54% or 702 hectares (Neily et al., 2003).

The tolerant hardwood forests are especially notable on the crests and upper slopes of hills and larger hummocks. Otherwise, red spruce and hemlock are found on the lower slopes with black spruce occupying the imperfectly drained sites. Mixed wood, tolerant forests of beech, sugar maple, yellow birch and red spruce with scattered hemlock grow on the steep slopes adjacent to the streams and rivers which flow from the highlands. Many of the old field, white spruce stands occupy ecosections previously forested with upland hardwoods (Neily et al., 2003).

2. Project Scope

The environmental baseline assessment is completed to describe baseline biophysical conditions on a site, to identify any concerns related to priority species prior to a proposed project. The scope of the assessment for this Project includes the selection and assessment of potential priority species identified through a series of desktop analyses. The series of desktop analyses is completed to advise field assessment methodologies. The environmental baseline assessment was undertaken within the Project Area [PID 10111946] (Figure 1).

A priority list of species was compiled to identify potential species of conservation interest (SOCI) and Species at Risk (SAR) which may be using the Project are and surrounding lands. Assessment of wildlife, vegetation, and overall habitat was completed based on the requirements outlined in the Nova Scotia Environment (NSE) *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE September 2008). The development of a priority list of species for each taxonomic group was completed based on a compilation of listed species from the following sources:

1) Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the Federal Species-at Risk Act (SARA 2003). All species listed as Endangered, Threatened, or of Special Concern.
2) Nova Scotia Endangered Species Act (NSESA 1999). All species listed as Endangered, Threatened, or Vulnerable.
3) Nova Scotia General Status of Wild Species: All species designated as Species of Conservation Interest (Red or Yellow).

This priority list of species was narrowed by broad geographic area (for the Brierly Brook Quarry- the geographic area considered was northern mainland Nova Scotia). The priority list of species was then further narrowed by identifying specific habitat requirements for each species. For example, if a listed NSESA species required open water lake habitat, and no open water lake habitat is present inside the Project footprint, this species was not carried forward to the final list of priority species for field assessments within the Project Area. The final priority list of species used for field assessments is attached in Appendix I.

A review of Atlantic Canada Conservation Data Centre findings confirms the presence of several priority species in and around the Project Area (Appendix II). The ACCDC data report was cross-referenced with the priority species list to identify species that have been documented within 20 km of the Project Area. This list was used to help further identify appropriate methods and timing of field surveys to identify priority species.

A summary of federally and provincially protected species identified within 20km of the Project Area (as reported by the ACCDC) is listed below, along with a summary of habitat preferences. Breeding status as documented in the Maritime Breeding Bird Atlas square summary (square 20NR75) is also included for avian species. If the species was observed during atlas surveys, with no breeding evidence noted, this is indicated below as well.

- Northern Long-eared Bat – NS Endangered, COSEWIC Endangered – 61 km[1]
    - Hibernates in caves or abandoned mines. Summer activity is focused around watercourses and small ponds
- Little Brown Bat – NS Endangered, COSEWIC Endangered – 40 km[1]
    - Hibernates in caves or abandoned mines. Spends summers foraging near streams and lakes
- Eastern Pipistrelle (Tri-colored Bat) – NS Endangered, COSEWIC Endangered – Not reported within 100km by ACCDC[1]
    - Hibernates in caves or abandoned mines. Prefers partly open country with large trees and woodland edges
- Mainland Moose – NS Endangered, 5km
    - Habitat generalists, which use mixed wood forests, wetlands, mature forest for shelter and young forest stands
- Wood Turtle – NS Threatened, COSEWIC & SARA Threatened, 4 km
    - clear rivers, streams or creeks with a moderate current and sandy or gravelly bottom
- Snapping Turtle – NS Vulnerable, COSEWIC & SARA Special Concern, 6 km
    - occurs in almost any freshwater habitat, though it is most often found in slow-moving water with a soft mud or sand bottom and abundant vegetation
- Whip-poor-will - NS Threatened, COSEWIC & SARA Threatened, 5 km
    - Breeds in open, patchy forests
    - MBBA – observed, no breeding evidence noted

1 Three species of bats have recently been listed as Endangered in Nova Scotia. These have been carried forward to the short list provided below, despite the lack of reports within 20km of the Project Area by the ACCDC.

- Common Nighthawk – NS Threatened, COSEWIC & SARA Threatened, 5 km
    - Nests in gravelly substrates, and even on rooftops
    - MBBA – observed, no breeding evidence noted
- Canada Warbler – NS Endangered, COSEWIC & SARA Threatened, 5 km
    - Nests in cool, moist woodlands in a nest of dried leaves, often at the base of a stump
    - MBBA – observed, confirmed breeder
- Barn Swallow – NS Endangered, COSEWIC Threatened, 5 km
    - Agricultural lands, suburban areas, marshes & lakeshores, nests in buildings
    - MBBA – confirmed breeder
- Bank Swallow – COSEWIC Threatened, 5 km
    - Open stands, near flowing water
    - MBBA – Confirmed breeder
- Olive-sided Flycatcher – NS Threatened, COSEWIC & SARA Threatened, 5 km
    - Softwood forests, near openings such as burns, ponds, and bogs
    - MBBA – observed, possible breeder
- Eastern Wood-Pewee – NS Vulnerable, COSEWIC Special Concern, 5 km
    - Hardwood forests, orchards, parks, roadsides and suburban areas
    - MBBA – observed, possible breeder
- Black Ash – NS Threatened, 5 km
    - Bogs, along streams, seasonally flooded or poorly drained soil

The nearest Important Bird Area (IBA) is the Pomquet Beach Region (NS009), approximately 17km east of the Project Area. This site contains a series of sand dunes, and is a known nesting location for Piping Plovers. The habitat provided within this IBA is not consistent with habitat available within the Project Area. The Project Area is predominantly cleared of timber, surrounded by mixed forest, old field, and softwood forest. The Eigg Mountain-James River Wilderness area is located approximately 10 km northwest of the Project Area. This wilderness area consists of well-drained tolerant hardwood forests, mixed forest canyons, rich forested floodplains, and productive wetlands, which are typical features within the Pictou Antigonish Highlands ecodistrict. The Cape Breton Highlands National Park is approximately 180 km northeast of the Project lands. The Brierly Brook area site does not contain major islands, peninsulas, or ridgelines which may strongly channel migrant species.

The Project will not disrupt large contiguous wetland or forest habitat that may be of importance to wildlife. At this time, there is no knowledge of a large heron, gull or tern colony located near the site. Deadman Lake is located 1.2 km south of the Project Area, and it is the only lake within 2 km of the Project.

A review of the Significant Species and Habitat Database was conducted to identify any whether high priority polygons in the vicinity of the Project Area. A deer wintering area was identified on the western adjacent property. No other high priority polygons were identified within 5 km, and the site is not located within either a Lynx or Martin Management Area (SSHD, 2010).

The Project Area is located within a significant population concentration area for Mainland Moose, as defined in the Endangered Mainland Moose Special Management Practices report (NSDNR, 2012). Consultation with regional wildlife biologist Mark Pulsifer confirms that Wood Turtles have been reported in nearby watercourses such as Brierly Brook, James River, West River, Ohio River, Beaver River and Rights River. It is likely that Snapping Turtles inhabit the general area as well, where suitable habitat is available.

3. Environmental Baseline Assessment Methodologies

The environmental baseline assessment for the Brierly Brook Quarry will describe the biophysical considerations associated with the area proposed for quarry expansion. This chapter details the following key aspects of the environmental assessment methodologies for habitat, species at risk, wildlife, vegetation, watercourse identification, aquatic habitats, and wetland assessment and delineation.

The field components of the biophysical environmental assessment were initiated in the spring of 2013 and carried through the winter of 2014, in order to complete winter species at risk monitoring for Mainland Moose. These studies were aimed at highlighting the ecological linkages within the Project Area, as well as with the habitats surrounding the Project Area. This work included:

1. Vegetation surveys for priority species across the Project Area (summer 2013);
2. Wetland and watercourse identification and surveys across the Project Area (summer 2013);
3. Spring and fall bird migration surveys 2013; Breeding bird surveys (summer 2013); and,
4. Opportunistic herpetofauna and mammal survey for priority species across the Project Area (summer 2013), as well as specific transects for Mainland Moose (June 2013, and winter 2013/2014).

3.1 Vegetation and Overall Habitat

During the field season in 2013, an assessment of vegetation was completed within the Project Area. Stand Age classification (Over-mature, Mature, Immature and Regenerating) was determined through qualitative observations of multiple factors such as total basal area, level of canopy coverage, and species composition of the understory herb and shrub layers. The level of anthropogenic disturbances was described; particularly the presence of logging roads and harvested trees (clear cut or selective harvest, and approximate time since harvest). Vegetation Types were identified throughout the Project Area as described in the *Forest Ecosystem Classification for Nova Scotia* (Neily, Basquill, Quigley, Stewart & Keys, 2011).

As described in the *Guide to Addressing Wildlife Species and Habitat in an EA Registration Document* (NSE, Sept 2008), a full vascular plant survey was not completed. The vascular plant

surveys focused on identifying general vegetative communities, with particular focus on identifying priority species. The priority list of vegetation species prepared for this project is attached in Appendix I.

Field surveys were completed in summer 2013 to assess for all identified priority species across the Project Area. For this survey, a list of all rare species records found within 100 km of the Project Area was also assembled prior to the survey being undertaken (from Atlantic Canada Conservation Data Centre- ACCDC data results) to provide additional information regarding the potential presence of priority species within the Project Area. The ACCDC data report is provided in Appendix II. The ACCDC data report was used in cross-reference with the priority species list. The timing of field surveys was determined based on the identification of priority species that were documented within 20 km of the Project Area by the ACCDC.

3.2 Wetlands & Aquatic Surveys

A desktop review of available topographic maps, appropriate provincial databases and aerial photography was completed to aid in determination of wetland habitat and watercourses in the Project Area. Predicted wetland areas were identified from the NSDNR Wetland Inventory Database. Stereo pairs of air photos were also consulted as a predictor of where wetlands may exist within the landscape. Topography maps were reviewed (1:50,000, 1:30,000, and 1:10,000) to identify all mapped watercourses.

Field surveys were conducted on June 4 and August 21, 2013 across the Project Area for the presence of wetland habitat and compared against the predicted wetland areas from the desktop review. All watercourses observed across the Project Area were field assessed for general characteristics, fish habitat and navigability.

Wetland delineation was completed based on micro-topography, observed surface hydrology, vegetation and soils in accordance with Nova Scotia Environment wetland delineation methodology. Wetlands were delineated by approved wetland delineators. Wetland boundaries were documented using an SXBlue GPS unit and hand held field computer capable of sub 1m accuracy. Any inlet and outlet streams or features to each wetland were marked during the delineation processes and walked and mapped.

The project team completed an analysis of wetland functions for each wetland using Nova Scotia Environment (NSE) Nova WET 3.0 wetland evaluation technique. As part of the functional assessment, a watershed evaluation was completed to better understand the surface water systems across the property to support the detailed functions assessment process for wetlands identified in the Project Area. Watershed assessment can also identify wetland types that are rare or significant and identified headwater wetlands and first/second order streams that generally play an important role in water storage, water quality and flood control inside a watershed.

All identified watercourses within the Project Area were assessed. Watercourses were mapped using an SXBlue GPS unit and field computer capable of sub 1m accuracy. Watercourses were assessed for fish habitat as described in the *Standard Methods Guide for Freshwater Fish and Fish Habitat Surveys in Newfoundland and Labrador: Rivers & Streams* (Sooley, Luiker and Barnes, 1998). The fish habitat description includes morphological measurements of stream width, depth, substrate and flow, along with a description of in-stream and overhanging vegetative cover, presence of coarse woody debris, along with any barriers to fish passage.

3.3 Avian Monitoring

Bird surveys were completed from spring 2013 to Fall 2013 by a local bird expert, Dr. Ken McKenna. Avian surveys were completed in accordance with methods outlined by CWS in the *Migratory Birds Environmental Assessment Guidelines* (Milko, 1998).

All seasonal monitoring was conducted at one series of point counts, along a single, fixed-width transect, which has been established through all representative habitat types within the Project Area. This combination of point counts and transects is based on a modified standardized area search. Six point count locations were established along the transect, and a seventh point count location was established at the base of the active quarry. The same method and survey locations was used throughout all seasonal monitoring periods, with the exception of Point Count 1, which was relocated during Fall Migration due to site activities. All point count and transect locations are shown in Figure 2.

Point count surveys were 10 minutes long, and the observer recorded all species seen or heard, along with an estimate of the number of individuals of each species. General observations including the temperature, visibility, wind speed, date, start and end time and point count were also recorded. Transect surveys were completed while the observer walked from one point count location to the next, along an established transect. Species observed along the transect were recorded in a similar manner. All surveys were completed early in the morning (1/2 hour prior to sunrise to 4 hours after sunrise) during favorable weather conditions. Surveys were completed on very windy or rainy days.

Spring migration monitoring was completed in early June. Breeding season monitoring occurred in early and mid-June, during which time the observer attempted to confirm breeding status of any birds seen or heard, particularly those identified as priority species. Fall migration surveys were completed between early September and early October during peak migration. A passage migration watch count was completed during fall migration. Passage migration counts were completed between point counts 5 and 6, as this location provides a clear vantage point of the entire Project Area and much of the surrounding landscape. The surveys commenced at approximately 10 am, and bird activity was recorded continuously for 1-2 hours (depending on the level of bird activity). The species, height and flight direction was recorded for all passing birds.

The priority species list was cross-referenced with the ACCDC data report to determine which avian priority species were likely to be using the Project Area. The Common Nighthawk was identified within 5km of the Project Area by the MBBA. The Common Nighthawk prefers to nest in gravelly substrates, and is best detected while foraging for insects shortly after sunset. Given that suitable nesting habitat is not available in the expansion area, and that high levels of activity would act as a deterrent to nesting Common Nighthawks within the active quarry, it was determined that evening Common Nighthawk surveys would not be required. All other priority species are readily identifiable using point count, transect and passage migration surveys. It was determined that no specialized surveys would be required to identify priority species within the Project Area.

3.4 Herptofauna, Mammal, and Other Priority Species Surveys

3.4.1 Mammals

Incidental observations of mammals and various mammal signs across the Project Area were documented and photographed during field surveys. Signs included such features as dens and nests, scat, tracks, and forage evidence. Herptofaunal and mammal observations were collected throughout the field season in 2013. No targeted mammal surveys were undertaken, other than surveys associated with the Mainland Moose, described in the following section.

3.4.2 Mainland Moose

To determine the level of concern associated with Mainland Moose, the project team consulted with the Endangered Mainland Moose Special Management Practices report (NSDNR, 2012). In addition, the project team consulted with Regional Wildlife Biologist, Mark Pulsifer, to request a record of all moose sightings identified within a 5km radius of the Project Area.

Tracking surveys were completed for the purpose of determining if Moose are present within the Project Area. One transect, 575m in length, was established through representative habitat types. An observer capable of identifying moose and deer tracks, browse and scat completed the moose track survey. One moose pellet group inventory survey was completed along this transect in June 2013 by Ms. Melanie MacDonald. Winter tracking surveys were completed along this transect by Mr. Jody Hamper in December 2013, January and February 2014. Winter tracking results were completed within 3-7 days following a $\geq$ 10 cm snowfall. Surveys were not conducted during periods of rain, snowfall, or blowing snow. Locations of moose and deer tracks, browse and scat were recorded using a handheld GPS unit. The moose survey transect location is provided in Figure 2.

570600 570800 571000 571200 571400 571600 571800 572000

5051400 5051200 5051000 5050800 5050600 5050400 5050200

PC 2
PC 3
PC 4
PC 5
Passage Migration
PC 6
PC 7
Existing Quarry
PC 1a
PC 1b
BBC-1-001

LEGEND:

- Bird Survey Locations
- Abandoned Mine Opening
- Moose Transect
- Property of Interest
- Other Property

Forest Cover Type

- Softwood >75%
- Mixed Forest 25 -75%
- Hardwood >75%

Landuse

- Natural Stand (Unclassified)
- Treated
- Old Field
- Plantation
- Alders >75%
- Clear Cut
- Wetlands, Bogs
- Inland water
- Agriculture
- Miscellaneous (eg Mines, Mills etc)
- Power, Road or Rail Corridors

SOURCE:

Base Map: SNSMR
Photo: Bing Maps Apr 2013

0 50 100 200 300
Metres

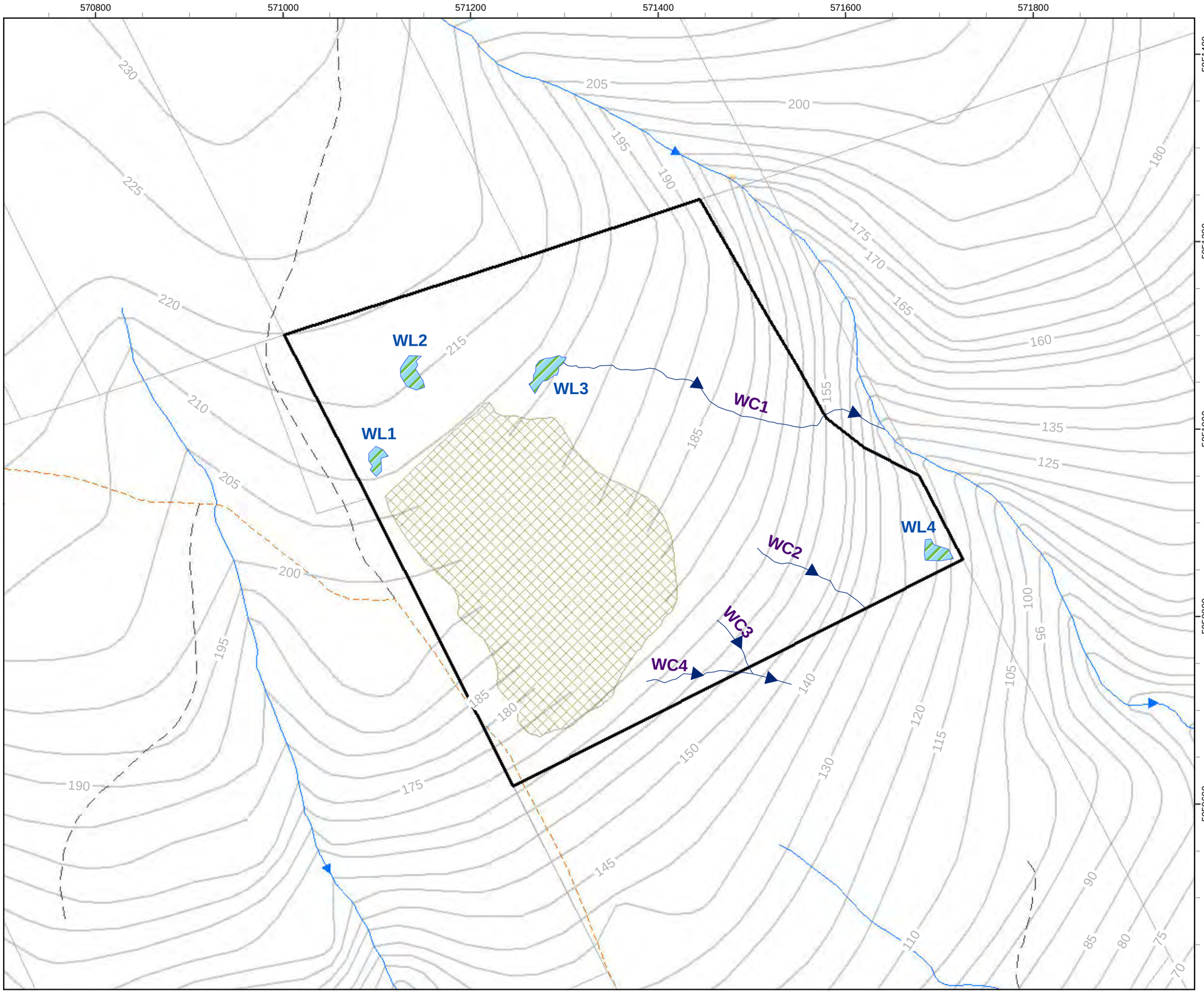
N

PROJECTION:	DRAWN / CHECKED BY:	MAP ANGLE:
UTM z20 NAD83	JJP / MM	0° North
SCALE:	**DATE:**	**PROJECT NO:**
1:5,000	JANUARY 2, 2013	081464

081464 (01) GIS-DA006

figure 2
WILDLIFE SURVEY LOCATIONS
BRIERLY BROOK QUARRY
NOVA CONSTRUCTION LTD
Brierly Brook, Nova Scotia

CONESTOGA-ROVERS & ASSOCIATES



LEGEND:

- Water Courses (Field Identified)
- Streams (Topo mapped)
- Wetlands (Field Identified)
- Property of Interest
- Other Property
- Existing Quarry
- Contours (5 m)

SOURCE:

Base Map: SNSMR
Photo: Bing Maps Apr 2013

0 50 100 200 300
Metres

PROJECTION:	DRAWN / CHECKED BY:	MAP ANGLE:
UTM z20 NAD83	JJP / MM	0° North
SCALE:	**DATE:**	**PROJECT NO:**
1:4,000	JANUARY 2, 2013	081464

081464 (01) GIS-DA007

figure 3
DELINEATED WETLANDS AND WATERCOURSES
BRIERLY BROOK QUARRY
NOVA CONSTRUCTION LTD
Brierly Brook, Nova Scotia

CONESTOGA-ROVERS & ASSOCIATES

3.4.3 Bats

A desktop analysis of bat habitat was conducted to determine level of concern associated with the project, and to determine whether field assessments were necessary. The desktop analysis commenced with a review of bat occurrences, as noted in the ACCDC report. The Significant Species and Habitat Database was searched for known potential bat hibernacula. In addition, Provincial government records for abandoned mine openings (AMO) were reviewed within a 25 km radius of site, as these AMO's potentially provide bat hibernacula. These records were reviewed for mine shaft type, access, original depth and presence of water in the shaft to determine likelihood that the AMO is potential bat hibernacula.

3.4.4 Herpetofauna

Herptofaunal searches of rock outcrops, deadfall, wetland, and stream habitats were conducted and incidental observations were recorded during completion of other field surveys. Both Wood Turtles and Snapping Turtles have been identified as priority species with potential to be present within the Project Area. The project team consulted with Regional Wildlife Biologist, Mark Pulsifer, to discuss the local distribution of Wood Turtles in the area. During field assessments conducted in the summer of 2013, all wetlands and watercourses were walked to identify any suitable nesting habitat or hibernacula sites for these species. The entire Project Area was surveyed, with special attention paid towards identifying any signs of turtle usage, such as tracks, scrapes in appropriate nesting habitat, or signs of depredated nests (MacGregor and Elderkin, 2003).

3.4.5 Other Priority Species

An initial habitat assessment was completed throughout the Project Area on June 4th, 2013. Based on this initial assessment, combined with a desktop analysis of priority species and ACCDC data, it was determined that no specialized surveys would be required to identify any other priority species within the Project Area. For example, Striped Bass (COSEWIC Special Concern) was identified within 13km of the Project Area by ACCDC. As the initial habitat assessment identified that no fish bearing watercourses were present within the Project Area, no specialized survey for Striped Bass was completed.

4. Environmental Baseline Assessment Results

4.1 Vegetation and Overall Habitat

Outside of the currently operating aggregate quarry, the Project Area consists of three predominant habitat types: pure young intolerant hardwood stands; open mixed wood regrowth; and early regrowth following recent harvest for timber products. In addition, four wetlands were identified within the Project Area. These are described in detail in section 4.2. All habitat types surveyed were consistent with expectations within the Pictou Antigonish Highlands Ecodistrict.

Open mixed stands are the most common habitat type within the Project Area. These are most similar to the MW4 vegetation type as referenced in the *Forest Ecosystem Classification for*

Nova Scotia (Part 1 Vegetation Types). This vegetation type is an early- to mid-successional mixed wood co-dominated by balsam fir and red maple. This vegetation type is broadly defined, and generally follows stand-replacing disturbance events such as wind throw or harvesting. In some areas, these mixed stands are more similar to open, old field vegetation types, similar to OF4. This vegetation type is another early- to mid-successional forest, dominated by balsam fir with a strong component of white spruce and red maple (Neily et al., 2011).

The intolerant hardwood stands on site are best defined as TH3 vegetation types, as described by Neily et al., 2011). This late successional vegetation type has an overstory dominated by sugar maple and white ash, with lesser amounts of yellow birch, American beech, and striped maple. Within the project area, these stands are immature.

The northeastern corner of the Project Area is in the early stages of regeneration following timber harvest. Species composition is typical of a recently disturbed site, with Balsam Fir, Red Maple, White Birch, Sugar Maple and White Ash. Raspberry, Soft Rush, with various grasses and sedges present as ground cover. Photographs of representative habitat types in the Project Area are provided below (Photo 1). A map of overall habitat types as identified by the provincial forestry database is available in Figure 2.

Photo 1: Representative habitat types within the Project Area.

The Project Area was assessed for rare, sensitive and at-risk vegetation during the field surveys on June 4th, July 1st, and August 21st 2013. Multiple transects across the Project Area were also

completed to assess for rare vegetation. Assessment was completed for all priority species identified during preliminary evaluations (desktop) as described in section 2. Care was also taken to assess for potential rare vegetation species that were identified from the ACCDC data search. The ACCDC report documenting the table and map of 6486 records of 451 taxa from 118 sources, a relatively moderate density of records, is provided in Appendix II.

A 100km buffer around the study area contains 1330 records of 254 vascular, 42 records of 20 nonvascular flora species. Particular attention was focused on identifying Black Ash within the Project Area. This species is currently listed as threatened in Nova Scotia, and it is commonly found in bogs, streams, and poorly drained soils. Black Ash is often found in association with White Ash, which is present in the Project Area. During field assessments throughout the Project Area, no flora species of conversation interest (SOCI) or species at risk (SAR) were identified.

A list of all species identified within the Project Area is provided in Table 1 below. None of these species identified are considered priority species.

Table 1. List of vascular plants identified within the Brierly Brook Quarry Project Area.

Common Name	Latin Name	S-rank
Balsam Fir	*Abies balsamea*	S5
Striped Maple	*Acer pensylvanicum*	S5
Red Maple	*Acer rubrum*	S5
Mountain Maple	*Acer spicatum*	S5
Yellow Birch	*Betula alleghaniensis*	S5
Paper Birch	*Betula papyrifera*	S5
Beaked Hazel	*Corylus cornuta*	S5
American Beech	*Fagus grandifolia*	S5
White Ash	*Fraxinus americana*	S5
White Spruce	*Picea glauca*	S5
Eastern White Pine	*Pinus strobus*	S5
Pussy Willow	*Salix discolor*	S5
Speckled Alder	*Alnus incana*	S5
Sheep Laurel	*Kalmia angustifolia*	S5
Mountain Holly	*Nemopanthus mucronatus*	S5
Pin Cherry	*Prunus pensylvanicum*	S5
Chokecherry	*Prunus viriginana*	S5
Blackberry	*Rubus alleganiensis*	S5
Red Raspberry	*Rubus ideaus*	S5
Bebb's Willow	*Salix bebbiana*	S5
Red Elderberry	*Sambucus racemosa*	S5
White Meadowsweet	*Spiraea alba*	S5

Common Name	Latin Name	S-rank
Meadowsweet	*Spiraea tomentosa*	S5
Alternate-leaved Dogwood	*Swida alternifolia*	S5
Red Osier Dogwood	*Swida sericea*	S5
Rough Bent Grass	*Agrostis scabra*	S5
Pearly Everlasting	*Anaphalis margaritacea*	S5
Sarsparilla	*Aralia nudicaulis*	S5
Lady Fern	*Athrium filix-femina*	S5
Bluejoint Reed Grass	*Calamagrostis canadensis*	S4S5
Drooping Woodland Sedge	*Carex arctata*	S5
Nodding Sedge	*Carex gynandra*	S5
Rough Sedge	*Carex scabrata*	S5
Broom Sedge	*Carex scoparia*	S5
Tussock's Sedge	*Carex stricta*	S5
Three-seeded Sedge	*Carex trisperma*	S4?
Fireweed	*Chamerion angustifolium*	S5
Drooping Wood Reed Grass	*Cinna latifolia*	S5
Small Enchanter's Nightshade	*Circaea alpina*	S5
Yellow Bluebead Lily	*Clintonia borealis*	S5
Goldthread	*Coptis trifolia*	S5
Bunchberry	*Cornus canadensis*	S5
Dewdrop	*Dalibarda repens*	S5
Flattened Oat Grass	*Danthonia compressa*	S5
Poverty Oat Grass	*Danthonia spicata*	S5
Hay-scented Fern	*Dennstaedtia punctilobula*	S5
Silvery Glade Fern	*Deparia acrostichoides*	S4
Flat-topped White Aster	*Doellingeria umbellata*	S5
Spinulose Wood Fern	*Dryopteris carthusiana*	S5
Crested Shield Fern	*Dryopteris cristata*	S5
Evergreen Wood Fern	*Dryopteris intermedia*	S5
Bog Willowherb	*Epilobium leptophyllum*	S5
Field Horsetail	*Equisetum arvense*	S5
Common Boneset	*Eupatorium perfoliatum*	S5
Grass-leaved Goldenrod	*Euthamia graminifolia*	S5
Fringed Black Bindweed	*Fallopia cilinodis*	S5
Wild Strawberry	*Fragaria virginiana*	S5
Common Hemp-nettle	*Galeopsis tetrahit*	SNA
Rough Bedstraw	*Galium asprellum*	S5
Common Marsh Bedstraw	*Galium palustris*	S5

Common Name	Latin Name	S-rank
Creeping Snowberry	*Gaultheria hispidula*	S5
Teaberry	*Gaultheria procumbens*	S5
Herb Robert	*Geranium robertianium*	S4
Water Avens	*Geum rivale*	S5
Slender Manna-grass	*Glyceria melicaria*	S4
Fowl Manna-grass	*Glyceria striata*	S5
Common St. John's Wort	*Hypericum perforatum*	SNA
Spotted Jewelweed	*Impatiens capensis*	S5
Elecampane	*Inula helenium*	SNA
Short-tailed Rush	*Juncus brevicaudatus*	S5
Soft Rush	*Juncus effusus*	S5
Northern Twinflower	*Linnaea borealis*	S5
Canada Fly Honeysuckle	*Lonicera canadensis*	S5
American Water Horehound	*Lycopus americana*	S5
False Lily-of-the-valley	*Maianthemum canadense*	S5
Three-leaved False Soloman's Seal	*Maianthemum trifolium*	S5
Partridgeberry	*Mitchella repens*	S5
Indian Pipe	*Monotropa uniflora*	S5
Whorled Aster	*Oclemena acuminata*	S5
Bog Aster	*Oclemena nemoralis*	S5
Sensitive Fern	*Onoclea sensibilis*	S5
Cinnamon Fern	*Osmunda cinnamomea*	S5
Interrupted Fern	*Osmunda claytoniana*	S5
Common Wood Sorrel	*Oxalis montana*	S5
Common Witch Grass	*Panicum capillare*	SNA
Arrow-leaved Smartweed	*Persicaria sagittata*	S5
Reed Canary Grass	*Phalaris arundinacea*	S5
Northern Long Beech Fern	*Phegopteris connectilis*	S5
Common Plantain	*Plantago major*	SNA
Ragged Fringed Orchid	*Platanthera lacera*	S4S5
Annual Blue Grass	*Poa annua*	SNA
Dotted Smartweed	*Polygonum punctatum*	S5
Arrow-leaved Tearthumb	*Polygonum sagittata*	S5
Christmas Fern	*Polystichum acrostichoides*	S5
Old Field Cinquefoil	*Potentilla simplex*	S5
Three-leaved Rattlesnakeroot	*Prenanthes trifoliolata*	S5
Common Self-heal	*Prunella vulgaris*	S5
Common Buttercup	*Ranunculus acris*	S5

Common Name	Latin Name	S-rank
Creeping Buttercup	*Ranunculus repens*	S5
Skunk Currant	*Ribes glandulosum*	S5
Bristly Dewberry	*Rubus hispidula*	S5
Dwarf Red Raspberry	*Rubus pubescens*	S5
Black-girdled Bulrush	*Scirpus atrocinctus*	S5
Common Woolly Bulrush	*Scirpus cyperinus*	S5
Marsh Skullcap	*Scutelleria galericulata*	S5
Canada Goldenrod	*Solidago canadensis*	S5
Zigzag Goldenrod	*Solidago flexicaulis*	S5
Rough-stemmed Goldenrod	*Solidago rugosa*	S5
Lance-leaved Aster	*Symphyotrichum lanceolatum*	S4S5
Purple-stemmed Aster	*Symphyotrichum puniceum*	S5
Common Dandelion	*Taraxacum officinale*	SNA
New York Fern	*Thelypteris noveboracensis*	S5
Northern Starflower	*Trientalis borealis*	S5
Coltsfoot	*Tussilago farfara*	SNA
Broad-leaved Cat-tail	*Typha latifolia*	S5
Common Speedwell	*Veronica officinalis*	S5
Small White Violet	*Viola macloskeyi*	S5
Kidney-leaved White Violet	*Viola renifolia*	S4

4.2 Wetlands and Watercourses

4.2.1 Wetlands

The NSDNR Significant Species and Habitats Database (SSHD, 2010) was consulted and, based on the information in this database, no wetlands are identified from that source within the Project Area.

Wetlands are defined as “a swamp, marsh, bog, fen or other land that is covered by water during at least three consecutive months of the year.” Wetland functions are the natural processes associated with wetlands and include water storage, pollutant removal, sediment retention and provision of nesting/breeding habitat. Functions may also include values and benefits associated with these natural processes and include aesthetics/recreation, cultural values, and subsistence production (Environment Canada, 2000). The discussions of wetlands presented herein primarily uses terminology associated with the Canadian Wetlands Classification System (Warner and Rubec 1997) or with the Nova Scotia methods for wetland delineation.

The Project Area is located within the South and West River Primary Watershed (1DR), in the West River Secondary Watershed, west of the Town of Antigonish, Nova Scotia. This

watershed drains in a northeasterly direction and exits into Antigonish Harbor [Atlantic Ocean] in Antigonish, Nova Scotia.

The Project Area is located in the Brierly Brook Tertiary Watershed. This watershed is relatively undeveloped, with urban lands and road corridors comprising 7% of the watershed area. Identified wetlands comprise only 3% of the tertiary basin. Given that the density of wetland area in the watershed is low, each wetland therefore provides greater floodwater detention to downstream areas, as compared to a watershed with greater wetland cover.

During field surveys across the Project Area, four wetlands were identified. The boundaries of all wetlands were delineated in the field to confirm wetland edges across the Project Area. These wetlands are shown on Figure 3, and all wetland data determination forms and functional assessment summary documents are provided in Appendix III.

4.2.1.1 Wetland 1

Wetland 1 is a mixed wood treed swamp, 364.0m^2 in size. The wetland is isolated, collecting passive drainage from adjacent uplands. Wetland 1 drains passively in a southeast direction, towards a berm associated with the existing quarry. Wetland 1 is an isolated wetland in a terrene landscape position. It is natural in origin.

Photo 2. Wetland 1.

Hydrological and Hydrogeological Character

Wetland 1 is topographically confined by uplands to the west, north and east. It drains passively to the southeast where the wetland boundary is unconfined by topography. Wetland 1 collects passive drainage from all surrounding upland. The wetland has a permanently saturated water regime, and standing water is present across approximately 10% of the wetland area, to an average depth of 5cm. The water table is present at surface, and the soil is saturated, confirming wetland hydrology.

Dominant Vegetation within the Wetland

Wetland 1 is a mixed wood treed swamp, with species such as Balsam Fir, Yellow Birch and Sugar Maple composing the canopy cover. These species are present in the shrub and sapling layer, along with Mountain Holly and Striped Maple. Ferns dominate the herbaceous vegetation; particularly Cinnamon Fern and Sensitive Fern. Table 2 lists species identified within Wetland 1.

Table 2. Vegetation species observed in Wetland 1.

Scientific Name	Common Name
Acer pensylvanicum	Striped Maple
Acer rubrum	Red Maple
Acer saccharum	Sugar Maple
Fagus grandifolia	American Beech
Betula alleghaniensis	Yellow Birch
Abies balsamea	Balsam Fir
Nemopanthus mucronatus	Mountain Holly
Kalmia angustifolia	Sheep Laurel
Osmunda cinnamomea	Cinnamon Fern
Phegopteris connectilis	Northern Long Beech Fern
Onoclea sensibilis	Sensitive Fern
Dryopteris intermedia	Evergreen Wood Fern
Galium palustre	Marsh Bedstraw
Ranunculus acris	Tall Buttercup
Coptis trifolia	Goldthread
Cornus canadensis	Bunchberry
Carex gynandra	Nodding Sedge
Carex trisperma	Three-seeded Sedge
Circaea alpina	Small Enchanter's Nightshade
Gaultheria hispidula	Creeping Snowberry
Rubus hispidus	Bristly Dewberry
Viola macloskeyi	Small White Violet

Scientific Name	Common Name
Scirpus cyperinus	Common Woolly Bulrush
Spiraea alba	White Meadowsweet
Spiraea tomentosa	Steeplebush

Soil Condition

A soil pit was sampled within Wetland 1 to assess for wetland soil indicators. A thin (3cm) layer of organic soil is underlain by a layer of silty soil (18cm thick) which is dark gray in color (10YR4/1). Hydric soil is present as indicated by a depleted matrix soil type.

Fish Habitat

Wetland 1 is an isolated wetland, with no watercourse inlets or outlets. As such, Wetland 1 does not provide fish habitat.

Condition and Integrity of Adjacent Land

Wetland 1 has undisturbed, vegetated buffers to the west, north and east. The southeastern edge (which is the down gradient boundary of the wetland) extends towards a berm associated with the existing quarry. The surrounding upland habitat consists of immature mixed forest, with Red Maple, White Ash, Balsam Fir and Sugar Maple. The ground cover is dominated by Hay-scented Fern, with traces of common upland herbaceous species such as False Lily-of-the-valley, Starflower, and Sasparilla. With the exception of the berm at the edge of the quarry, the landscape is gently sloping, and the wetland is completely accessible to wildlife. There are no concerns associated with erosion and sedimentation, stormwater, or excess nutrient inputs associated with upland adjacent to Wetland 1.

Identification of Exceptional Features

Wetland 1 is not classified as, or located within:

- A wetland of special significance
- A calcareous fen, cedar or black ash swamp
- A public water supply or protected water area
- A floodplain area that is upstream of, or within a populated area
- A federal/provincial/municipal area of interest (as per NOVAWET #SF12)

Wetland 1 does not provide important support for fish, shellfish or other species of commercial or recreational interest and is not associated with fish bearing streams or streams with potential fish habitat.

Hydrologic Condition and Integrity

Wetland 1 has natural hydrologic condition and integrity. Water storage capacity is low, however, due to the relatively small size of Wetland 1 and the lack of deep organic soil.

4.2.1.2 Wetland 2

Wetland 2 is an open softwood treed swamp. It is isolated, and is 601.5 m^2 in size. The wetland is isolated, collecting passive drainage from adjacent uplands. Wetland 2 drains passively in a northeast direction, generally towards Wetland 3. Wetland 2 is in a terrene landscape position, and it is natural in origin.

Photo 3. Wetland 2.

Hydrological and Hydrogeological Character

Wetland 2 is topographically confined by uplands in all directions. It drains passively to the northeast where the wetland boundary is not topographically defined. Wetland 2 collects passive drainage from all surrounding upland. The wetland has a permanently saturated water regime, and the soil is saturated at a depth of 5cm, with the water table present at a depth of 18 cm. No standing water is present in Wetland 2, and the wetland has no watercourse inlets or outlets. The presence of water stained leaves, along with a high water table and saturated soil confirms wetland hydrology.

Dominant Vegetation within the Wetland

Wetland 2 is a wet meadow, with sparse canopy cover, and essentially no shrub or sapling layer. Herbaceous vegetation contains a mixture of species such as Soft Rush, Nodding Sedge, Boneset, Arrow-leaved Tearthumb, and Flat-topped White Aster. See Table 3 for a list of species identified within Wetland 2.

Table 3. Vegetation species observed in Wetland 2.

Scientific Name	Common Name
Acer saccharum	Sugar Maple
Abies balsamea	Balsam Fir
Kalmia angustifolia	Sheep Laurel
Osmunda cinnamomea	Cinnamon Fern
Phegopteris connectilis	Northern Long Beech Fern
Onoclea sensibilis	Sensitive Fern
Dryopteris cristata	Crested Shield Fern
Osmunda calytoniana	Interrupted Fern
Juncus effusus	Soft Rush
Eupatorium perfoliatum	Common Boneset
Doellingeria umbellatus	Flat-topped White Aster
Euthamia graminifolia	Grass-leaved Goldenrod
Platanthera lacera	Ragged Fringed Orchid
Galium palustre	Marsh Bedstraw
Carex gynandra	Nodding Sedge
Carex trisperma	Three-seeded Sedge
Gaultheria hispidula	Creeping Snowberry
Rubus hispidus	Bristly Dewberry
Scirpus cyperinus	Common Woolly Bulrush
Spiraea alba	White Meadowsweet
Spiraea tomentosa	Steeplebush

Soil Condition

A soil pit was sampled within Wetland 2 to assess for wetland soil indicators. Very dark brown (10YR 2/2 in color) silty loam is present to a depth of 12 cm. This soil is underlain by a layer of very dark brown (7.5YR 2.5/3 in color) silty loam to a depth of 20cm, with distinct oxidized rhizospheres comprising 2% of the soil volume. Hydric soil is present as indicated by a depleted matrix soil type.

Fish Habitat

Wetland 2 is an isolated wetland, with no watercourse inlets or outlets. As such, Wetland 2 does not provide fish habitat.

Condition and Integrity of Adjacent Land

Wetland 2 has undisturbed vegetated buffers in all directions. The surrounding upland habitat consists of immature mixed forest, with Red Maple, Sugar Maple, and Balsam Fir dominating canopy cover. These species are present in the shrub layer, along with White Ash saplings. Herbaceous vegetation is relatively sparse, with species such as Christmas Fern, Evergreen

Wood Fern, New York Fern and Sasparilla. The landscape is gently sloping towards the wetland, with no barriers or restrictions to wildlife movement. There are no concerns associated with erosion and sedimentation, stormwater, or excess nutrient inputs associated with upland adjacent to Wetland 2.

Identification of Exceptional Features

Wetland 2 is not classified as, or located within:

- A wetland of special significance
- A calcareous fen, cedar or black ash swamp
- A public water supply or protected water area
- A floodplain area that is upstream of, or within a populated area
- A federal/provincial/municipal area of interest (as per NOVAWET #SF12)

Wetland 2 does not provide important support for fish, shellfish or other species of commercial or recreational interest and is not associated with fish bearing streams or streams with potential fish habitat.

Hydrologic Condition and Integrity

Wetland 2 has natural hydrologic condition and integrity. Water storage capacity is low, however, due to the relatively small size of Wetland 2 and the lack of deep organic soil.

4.2.1.3 Wetland 3

Wetland 3 is a deciduous treed swamp, 695.0 m^2 in size. The wetland is in a headwater position, located at the top of Watercourse 1. Wetland 3 collects drainage passively from adjacent upland, and drains via Watercourse 1 to the east. Wetland 3 is natural in origin.

Photo 4. Wetland 3.

Hydrological and Hydrogeological Character

Wetland 3 is topographically confined by uplands to the south, west and north, and it collects drainage passively from uplands in these directions. Wetland 3 is the headwater wetland for Watercourse 1, which flows east towards the Project Area boundary. The wetland has a permanently saturated water regime, and the soil is saturated at a depth of 10cm. No standing water is present in Wetland 3. The presence of water stained leaves, along with saturated soil confirms wetland hydrology.

Dominant Vegetation Within the Wetland

Wetland 3 is a deciduous treed swamp, with White Ash dominating the canopy coverage. Shrubs and saplings include White Ash along with Balsam Fir and Red Maple. Herbaceous vegetation is dominated by Sensitive Fern and Dwarf Red Raspberry. See Table 4 for a list of species identified within Wetland 3.

Table 4. Vegetation species observed in Wetland 3.

Scientific Name	Common Name
Acer rubrum	Red Maple
Acer saccharum	Sugar Maple
Abies balsamea	Balsam Fir
Fraxinus americana	White Ash
Betula alleghaniensis	Yellow Birch
Solidago flexicaulis	Zigzag Aster
Osmunda cinnamomea	Cinnamon Fern
Phegopteris connectilis	Northern Long Beech Fern
Onoclea sensibilis	Sensitive Fern
Athrium filix-femina	Lady Fern
Galium asprellum	Rough Bedstraw
Rubus pubescens	Dwarf Red Raspberry
Impatiens capensis	Spotted Jewelweed
Doellingeria umbellatus	Flat-topped White Aster
Solidago rugosa	Rough Goldenrod
Lycopus americana	American Water Horehound
Carex gynandra	Nodding Sedge
Carex scabrata	Rough Sedge
Carex trisperma	Three-seeded Sedge
Gaultheria hispidula	Creeping Snowberry
Rubus hispidus	Bristly Dewberry
Spiraea tomentosa	Steeplebush

Soil Condition

A soil pit was sampled within Wetland 3 to assess for wetland soil indicators. Very dark grayish brown (10YR 3/2 in color) silty loam is present to a depth of 15 cm. This soil is underlain by a layer of dark reddish brown (5Y 3/2 in color) silty loam, with distinct black (5Y 2.5/1) redox concentrations composing 2% of the soil volume. Hydric soil is present as indicated by a depleted matrix soil type.

Fish Habitat

Wetland 3 forms the headwaters of Watercourse 1. Watercourse 1 reaches a maximum width of approximately 1m, and a depth of approximately 15 cm as it approaches the eastern boundary of the Project Area. As Watercourse 1 flows out of Wetland 3, however, it is considerably smaller, with an average width of approximately 30cm, and a depth of approximately 8cm. Watercourse 1 does not offer fish habitat, primarily due to its small size, and steep slopes which serve as a barrier to fish passage. In addition, Wetland 3 has no standing water, and the watercourse is not present within Wetland 3. As such, Wetland 3 does not provide fish habitat.

Condition and Integrity of Adjacent Land

Wetland 3 has undisturbed vegetated buffers in all directions except southwest. The southwestern edge of the wetland is adjacent to an access road and berm along the north face of the existing quarry. The surrounding upland habitat consists of a mature deciduous stand, dominated by White Ash. Balsam Fir and White Ash dominate the shrub layer, and herbaceous vegetation is very sparse. The landscape is gently sloping towards the wetland, with no barriers or restrictions to wildlife movement, aside from the berm and access road associated with the existing quarry to the southwest. There is some evidence of minor erosion and sedimentation in the wetland associated with the access road and berm, but not at a level that alters the functionality of the wetland.

Identification of Exceptional Features

Wetland 3 is not classified as, or located within:

- A wetland of special significance
- A calcareous fen, cedar or black ash swamp
- A public water supply or protected water area
- A floodplain area that is upstream of, or within a populated area
- A federal/provincial/municipal area of interest (as per NOVAWET #SF12)

Wetland 3 does not provide important support for fish, shellfish or other species of commercial or recreational interest and is not associated with fish bearing streams or streams with potential fish habitat.

Hydrologic Condition and Integrity

Wetland 3 has natural hydrologic condition and integrity. Water storage capacity is low, however, due to the relatively small size of Wetland 3 and the lack of deep organic soil. Wetland 3 is important for maintaining base stream flow in Watercourse 1.

4.2.1.4 Wetland 4

Wetland 4 is a graminoid swamp, 458.6m^2 in size. The wetland is isolated, and passively collects drainage from adjacent uplands. Wetland 4 is in a terrene landscape position, and is natural in origin.

Photo 5. Wetland 4.

Hydrological and Hydrogeological Character

Wetland 4 is an isolated wetland, which is topographically confined by uplands in all directions. The wetland has a permanently saturated water regime, and the soil is saturated at a depth of 10cm. No standing water is present in Wetland 4. The presence of water stained leaves, along with saturated soil confirms wetland hydrology.

Dominant Vegetation Within the Wetland

Wetland 4 is a graminoid dominated swamp, with no tree cover, and very sparse shrub cover. The wetland is dominated by Tussock's Sedge, and species such as Soft Rush, Canada Goldenrod, and Flat-topped White Aster. See Table 5 for a list of species identified within Wetland 4.

Table 5. Vegetation species observed in Wetland 4.

Scientific Name	Common Name
Abies balsamea	Balsam Fir
Carex stricta	Tussock's Sedge
Doellingeria umbellatus	Flat-topped White Aster
Juncus effusus	Soft Rush
Persicaria sagittata	Arrow-leaved Smartweed
Euthamia graminifolia	Grass-leaved Goldenrod
Scirpus cyperinus	Common Woolly Bulrush
Carex gynandra	Nodding Sedge
Dryopteris cristata	Crested Shield Fern
Solidago canadensis	Canada Goldenrod
Phegopteris connectilis	Northern Long Beech Fern
Onoclea sensibilis	Sensitive Fern
Rubus pubescens	Dwarf Red Raspberry
Impatiens capensis	Spotted Jewelweed
Carex trisperma	Three-seeded Sedge
Spiraea tomentosa	Steeplebush

Soil Condition

A soil pit was sampled within Wetland 4 to assess for wetland soil indicators. Reddish brown (2.5YR 4/3 in color) silty soil is present to a depth of 25 cm. Within this red parent material, distinct redox concentrations (10YR 6/6) comprise approximately 8% of the soil volume. Hydric soil is present as indicated by a red parent material (F21) soil type, with distinct redox concentrations.

Fish Habitat

Wetland 4 is an isolated wetland, with no watercourse inlets or outlets. As such, Wetland 4 does not provide fish habitat.

Condition and Integrity of Adjacent Land

Wetland 4 has undisturbed vegetated buffers in all directions. The surrounding upland habitat consists of immature mixed forest, with White Birch, Balsam Fir, White Spruce, Red Maple and White Ash. The landscape is gently sloping towards the wetland, with no barriers or restrictions to wildlife movement. There are no concerns associated with erosion and sedimentation, stormwater, or excess nutrient inputs associated with upland adjacent to Wetland 4.

Identification of Exceptional Features

Wetland 4 is not classified as, or located within:

- A wetland of special significance

- A calcareous fen, cedar or black ash swamp
- A public water supply or protected water area
- A floodplain area that is upstream of, or within a populated area
- A federal/provincial/municipal area of interest (as per NOVAWET #SF12)

Wetland 4 does not provide important support for fish, shellfish or other species of commercial or recreational interest and is not associated with fish bearing streams or streams with potential fish habitat.

Hydrologic Condition and Integrity

Wetland 4 has natural hydrologic condition and integrity. Water storage capacity is low, however, due to the relatively small size of Wetland 4 and the lack of deep organic soil.

4.2.2 Watercourses

There are no mapped watercourses, lakes or areas of open water in the Project Area. Four un-named watercourses were identified within the Project Area during field assessments. Watercourse 1 originates from Wetland 3. It is 70 cm wide and up to 25 cm deep. The watercourse runs relatively slowly, with very little in-stream vegetation. Coarse woody debris is moderate, and the watercourse has overhanging vegetation, with the exception of a section approximately 75 m long which flows through a cleat cut.

Watercourse 2 originates from seepage, and is located running from northwest to the southeast through the Project Area. The watercourse is approximately 50 cm wide and 15 cm deep, with a gravel and silt substrate. Similar to Watercourse 1, this watercourse has no in stream vegetation and little coarse woody debris. The banks are intact and overhanging vegetative cover is present.

Watercourses 3 and 4 converge just prior to exiting the Project Area. These watercourses start along the southern edge of the access road through the existing quarry, and flow from the northwest to the southeast across the Project Area, flowing off the southern boundary. Both of these watercourses are approximately 30 cm wide and 10 cm deep with a cobble and gravel substrate. These watercourses lack coarse woody debris and in stream vegetative cover, but do have overhanging vegetative cover. None of the watercourses identified within the Project Area are identified as providing fish habitat.

Photo 6. (a) Watercourse 1. (b) Watercourse 2.

Figure 3 shows all watercourses identified within the Project Area, as well as mapped watercourses outside the Project Area.

4.3 Avian Use Assessment

Baseline assessment for birds was completed from June through October 2013 by a local bird expert, Dr. Ken McKenna. A total of 1,358 minutes (22.5 hours) of surveys were completed over 3 seasons. These surveys resulted in the sightings of 988 individuals, representing 63 species within the Project Area. Bird species were identified based on functional bird groups to understand how each group of birds is using the Project Area. These functional groups include gulls, passerines (songbirds), raptors, shorebirds and waterfowl. The most abundant group observed on site is passerines, which account for 90% of all species, and 95.5% of all individuals. Table 6 below identifies all species observed during baseline assessments, including seasonal and total abundance.

Table 6. Seasonal and total abundances of avian species identified during the 2013 baseline assessment

Code	Species	Spring	Breeding	Fall	Total
ALFL	Alder Flycatcher	11	15	0	26
AMCR	American Crow	2	2	3	7
AMGO	American Goldfinch	8	21	38	67
AMRE	American Redstart	1	5	0	6
AMRO	American Robin	10	25	22	57
AMWO	American Woodcock	1	1	6	8
BADO	Barred Owl	0	0	5	5
BAEA	Bald Eagle	0	0	19	19
BAWW	Black-and-white Warbler	6	8	2	16
BBWO	Black-backed Woodpecker	0	0	1	1
BCCH	Black-capped Chickadee	3	11	19	33
BEKI	Belted Kingfisher	0	1	1	2
BHVI	Blue-headed Vireo	3	9	5	17
BLBW	Blackburnian Warbler	1	2	0	3
BLJA	Blue Jay	4	4	39	47
BOCH	Boreal Chickadee	1	1	1	3
BRCR	Brown Creeper	0	0	1	1
BTNW	Black-throated Green Warbler	11	18	10	39
BWHA	Broad-winged Hawk	0	0	1	1
CEDW	Cedar Waxwing	3	9	58	70
COME	Common Merganser	0	1	0	1
CORA	Common Raven	2	10	25	37
COYE	Common Yellowthroat	4	9	8	21
CSWA	Chestnut-sided Warbler	0	2	1	3
DEJU	Dark-eyed Junco	2	5	5	12
DOWO	Downy Woodpecker	0	0	2	2
EAWP	Eastern Wood Pewee	1	2	0	3
EVGR	Evening Grosbeak	1	5	30	36
GCKI	Golden-crowned Kinglet	0	0	13	13
HAWO	Hairy Woodpecker	1	0	6	7
HETH	Hermit Thrush	2	13	2	17
KILL	Killdeer	1	0	0	1
LEFL	Least Flycatcher	5	14	1	20
LISP	Lincoln's Sparrow	0	2	1	3
MAWA	Magnolia Warbler	13	22	6	41
MODO	Mourning Dove	2	4	0	6

Code	Species	Spring	Breeding	Fall	Total
MOWA	Mourning Warbler	2	6	0	8
NOFL	Northern Flicker	3	3	4	10
NOPA	Northern Parula	5	11	1	17
OSFL	Olive-sided Flycatcher	1	1	0	2
OVEN	Ovenbird	18	29	3	50
PISI	Pine Siskin	1	3	20	24
PIWO	Pileated Woodpecker	2	2	4	8
PUFI	Purple Finch	4	10	21	35
RBGR	Rose-breasted Grosbeak	0	3	0	3
RCKI	Ruby-crowned Kinglet	4	9	6	19
REVI	Red-eyed Vireo	8	19	5	32
RTHA	Red-tailed Hawk	0	0	1	1
RTHU	Ruby-throated Hummingbird	0	1	1	2
RUGR	Ruffed Grouse	1	4	6	11
SAVS	Savannah Sparrow	0	2	0	2
SOSP	Song Sparrow	2	10	4	16
SSHA	Sharp-shinned Hawk	0	0	1	1
SWSP	Swamp Sparrow	0	0	2	2
SWTH	Swainson's Thrush	3	8	1	12
UNBI	Unidentified bird	0	2	12	14
UNRA	Unidentified Raptor	0	0	7	7
WBNU	White-breasted Nuthatch	0	0	2	2
WTSP	White-throated Sparrow	9	20	5	34
WWCR	White-winged Crossbill	0	1	0	1
YBFL	Yellow-bellied Flycatcher	1	2	0	3
YBSA	Yellow-bellied Sapsucker	1	5	1	7
YEWA	Yellow Warbler	0	0	1	1
YRWA	Yellow-rumped Warbler	1	2	10	13
Total:	**64 species**	**165**	**374**	**449**	**988**

4.3.1 Spring Migration

During spring migration, 165 individuals, representing 42 species, were observed. The most abundant species were Ovenbird, Magnolia Warbler, Alder Flycatcher and Black-throated Green Warbler. Based on the lack of diverse habitats available within, the Project Area does not offer many obvious attractants to passing migrants. No obvious migrants were observed during the spring migration monitoring. No obvious concentration of sea ducks or shorebirds were observed.

The majority of observations were of a single individual, and the largest group of birds observed contained 3 individuals. All bird species identified were passerines (songbirds) with the exception of two individuals: 1 American Woodcock and 1 Killdeer, which are both shorebirds. See Figure 4 for the abundance of species observed during spring migration.

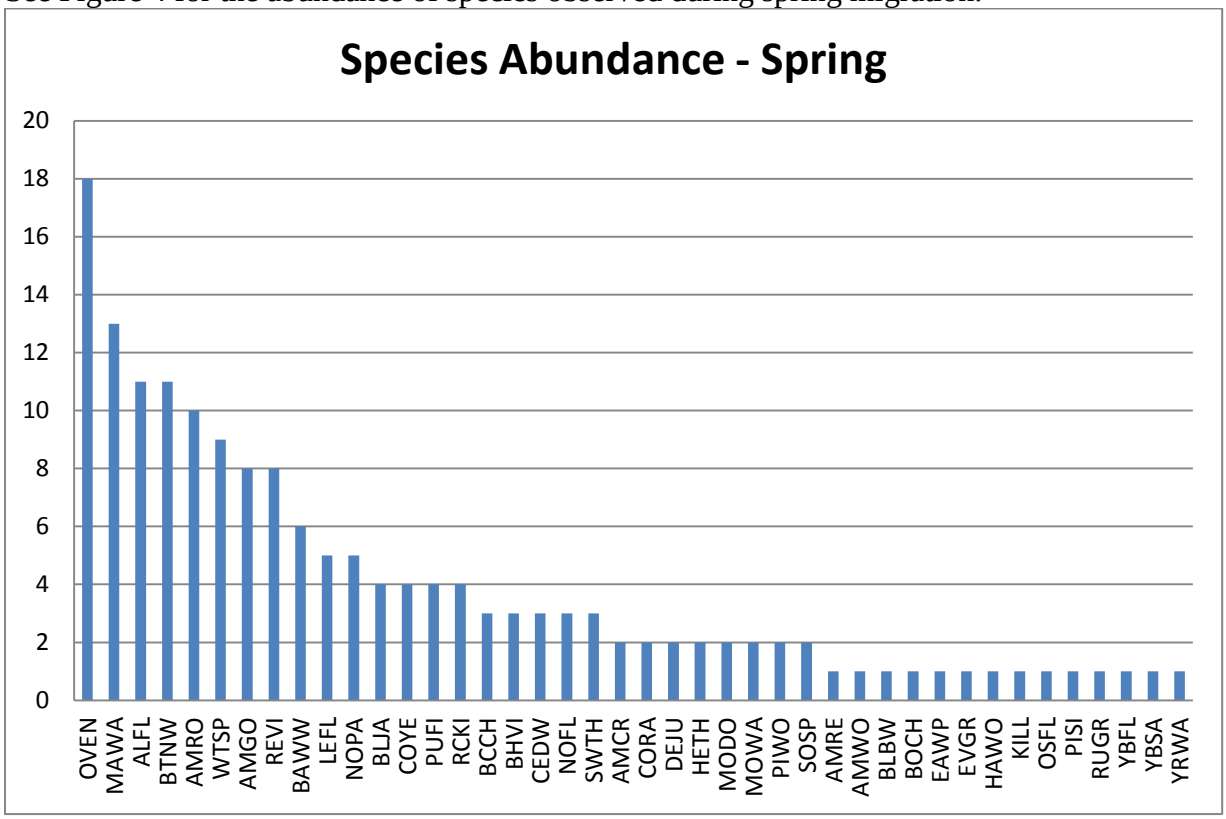


Figure 4. Species abundance of birds identified during spring migration monitoring.

4.3.2 Breeding Season

A total of 374 individuals representing 49 species were observed during the breeding season; the three most abundant of which were Ovenbird, American Robin and Magnolia Warbler. Since the site surveyed is a relatively small part of the surrounding area, however, it is not possible to confirm that all species listed were actually nesting within the boundaries of the site. For instance, for a bird that was observed carrying food (confirmed breeding evidence), it is possible that the bird was nesting on an adjacent parcel of land. All birds observed on site are presumed to be possible breeders, as no evidence of probable or confirmed breeding was observed during field assessments.

All of the species identified are native species expected to be found in this area of Nova Scotia and the province in general, and within the typical and common habitat associated with the Project and surrounding landscape. The majority of observations were of a single individual or a group of two or three individuals. The largest group of birds observed during breeding season

was a group of 6 American Goldfinches. The most abundant group observed on site during the breeding season was passerines, which account for all but 5 individuals observed during the breeding season. The other bird groups represented include 1 Common Merganser (waterbird) and 4 American Woodcocks (shorebird). See Figure 5 for the abundance of species observed during the breeding season.

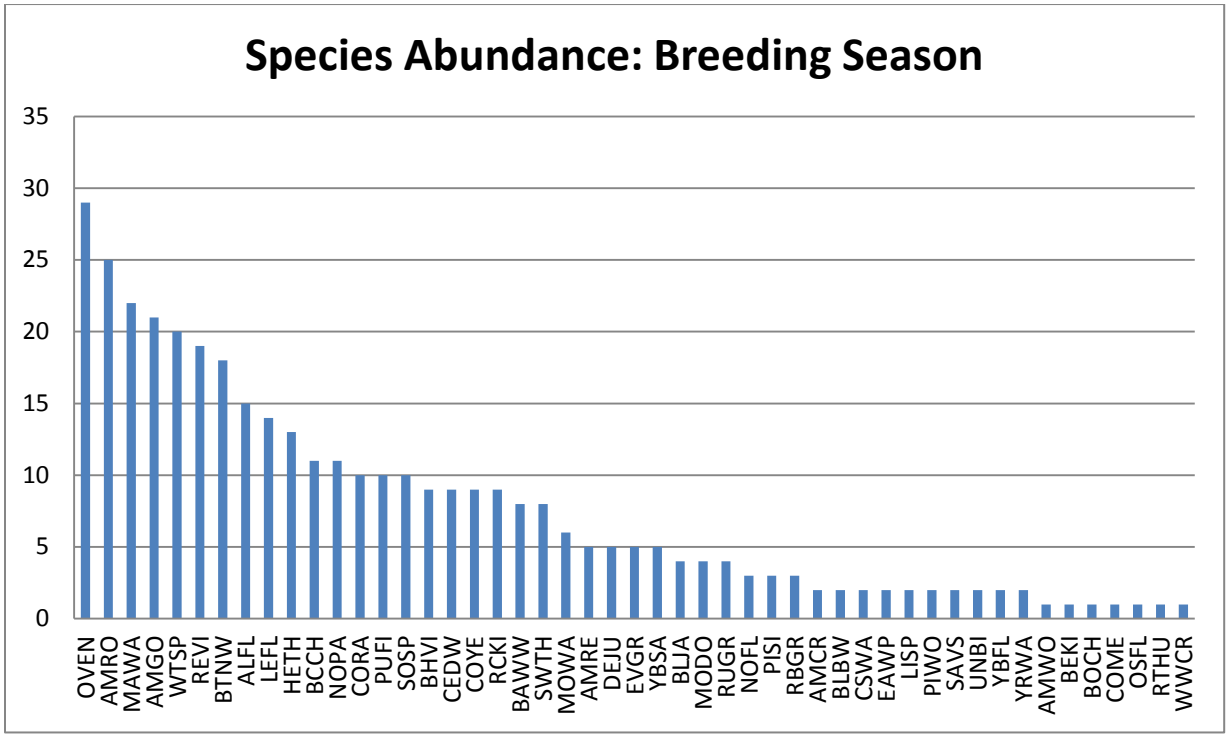


Figure 5. Species abundance of birds observed during breeding season monitoring.

4.3.3 Fall Migration

During fall migration, a total of 449 individuals were observed, representing 51 species. The most abundant species observed were the Cedar Waxwing, Blue Jay and American Goldfinch. Most observations documented groups of up to 5 individuals. However, on 5 September 2013, one flock of 20 Evening Grosbeaks was observed, along with two flocks of Cedar Waxwings, containing 15 and 30 individuals. These were the only obvious migrants noted, based on the size of their flocks.

The most abundant group observed on site during the fall migration period was passerines, which account for 91% of all individuals. Raptors accounted for 7% of individuals observed, while owls and shorebirds each accounted for 1% of all individuals observed (5 Barred Owls, and 6 American Woodcocks).

The fall migration monitoring period marks the first observations of raptors within the Project Area. This is likely due to the addition of a passage migration watch count, rather than an actual measured change in avian usage of the landscape. Passage migration counts allow the observer to spend a greater amount of time watching for soaring species, or those hunting at greater altitudes. In addition, passage migration counts are generally conducted later in the day than point count surveys, so they correspond with the time that raptor species are more active. Of the 29 raptors identified, 19 were Bald Eagles and 7 were unidentified. A single Broad-winged Hawk, Red-tailed Hawk and Sharp-shinned Hawk were also observed. See Figure 6 for the abundance of species observed during fall migration.

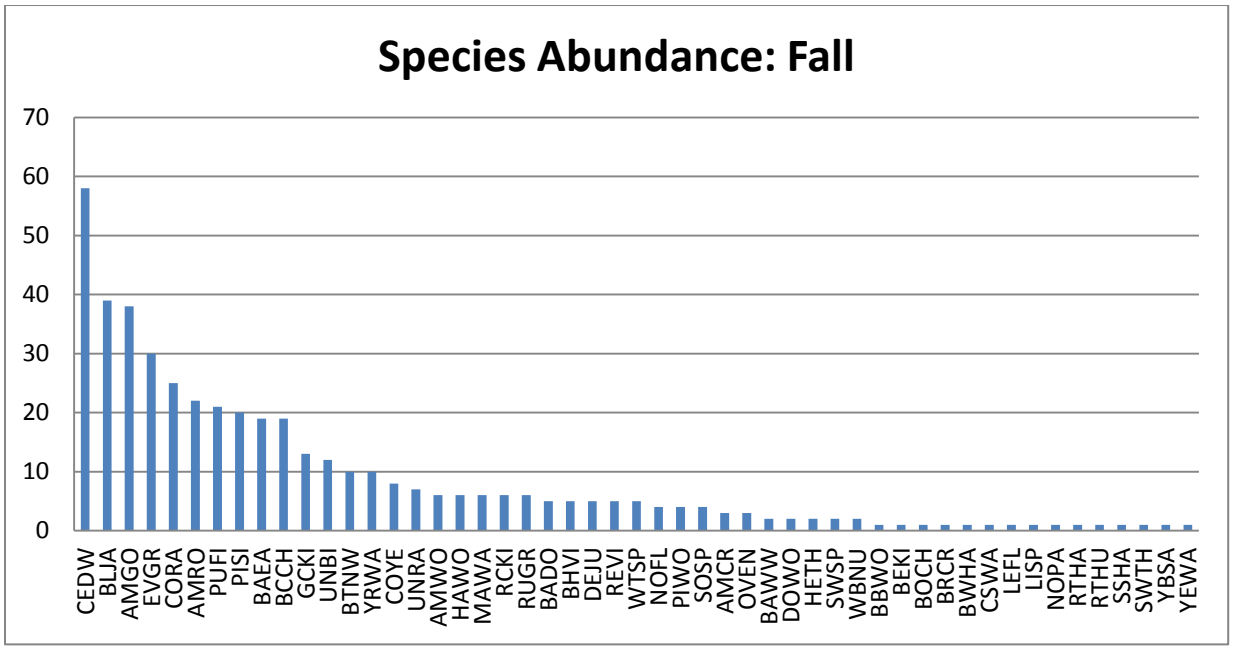


Figure 6. Species abundance of birds identified during fall migration monitoring.

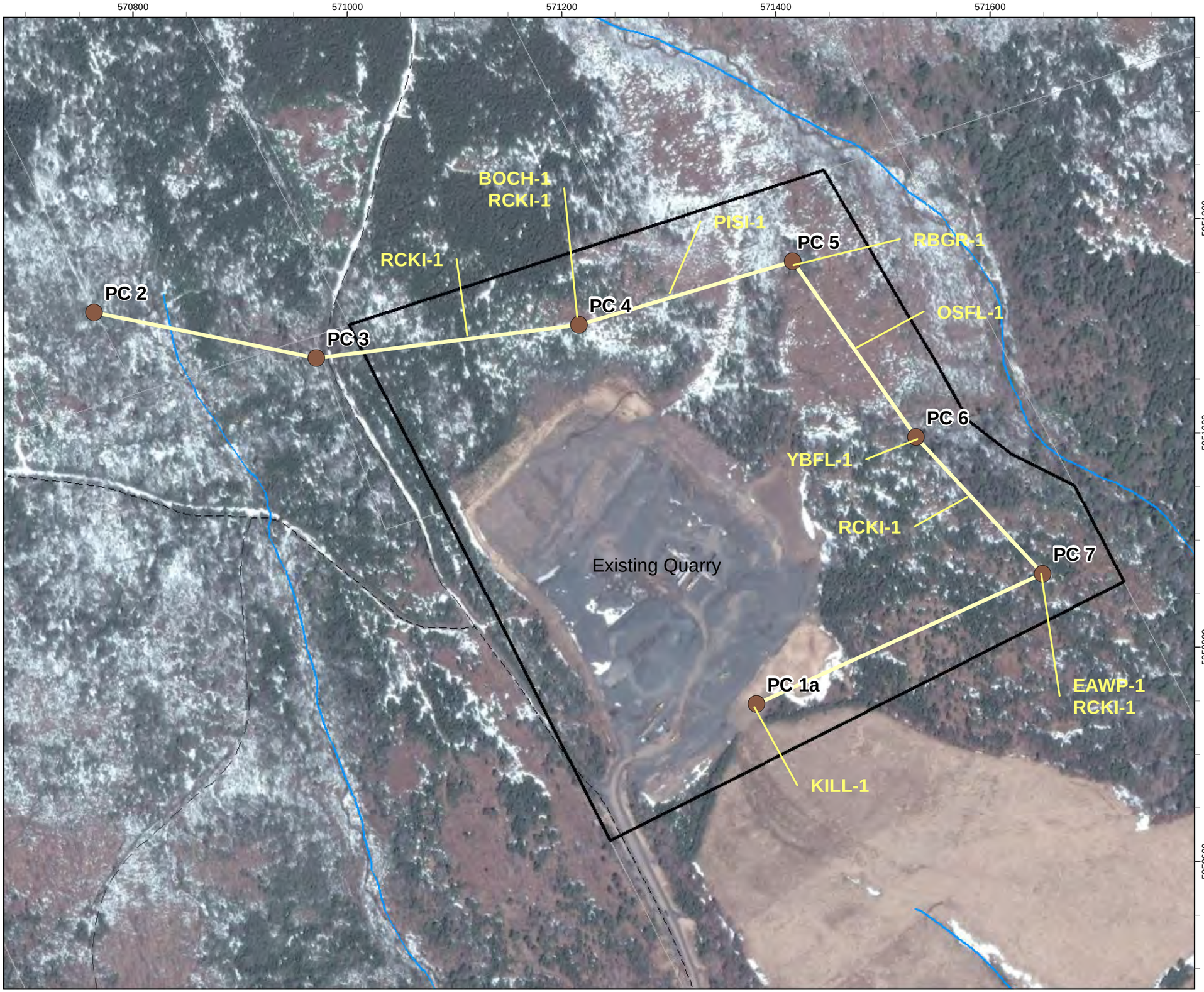
4.3.4 Avian Species of Conservation Interest and Species at Risk

Ten species of conservation interest (SOCI) or Species at Risk (SAR) were identified within the Project Area during the baseline avian use assessment from Spring 2013 to Fall 2013. Table 7 provides a detailed list of species observed, and these observations are also presented in Figure 7.

Table 7. Avian Species at Risk and Species of Conservation Interest observed within the Project Area

Code	Species	Conservation Status	Season	Number	Location
OSFL	Olive-sided Flycatcher	COSEWIC, SARA, and NSESA Threatened, NSDNR Red	Sp, Su	2	PC 5, 5-6
EAWP	Eastern Wood Pewee	COSEWIC Special Concern, NSESA Vulnerable, NSDNR Yellow	Sp, Su	3	7
YBFL	Yellow-bellied Flycatcher	NSDNR Yellow	Sp, Su	3	2-3, PC6, PC7
RBGR	Rose-breasted Grosbeak	NSDNR Yellow	Sp, Su	3	PC5, 5-6
BBWO	Black-backed Woodpecker	NSDNR Yellow	Fa	1	3-4
BOCH	Boreal Chickadee	NSDNR Yellow	Sp, Su, Fa	3	PC3, PC4
RCKI	Ruby-crowned Kinglet	NSDNR Yellow	Sp, Su, Fa	17	PC1, PC3, 3-4, PC4, PC5, 5-6, PC6, 6-7, PC7
GCKI	Golden-crowned Kinglet	NSDNR Yellow	Fall	12	PC1, PC2, PC3, 3-4, 5-6, PC7
PISI	Pine Siskin	NSDNR Yellow	Sp, Su, Fa	21	PC1, 2-3, 3-4, 4-5, PC5, 6-7, PC7, PC8
KILL	Killdeer	NSDNR Yellow	Sp	1	PC1

The Yellow-bellied Flycatcher, Black-backed Woodpecker, Rose-breasted Grosbeak, Boreal Chickadee, Golden-crowned Kinglet, Ruby-crowned Kinglet, Pine Siskin and Killdeer are listed as ‘yellow’ under NSDNR’s general status ranks. These species have been flagged as 'early watch' species by the Province, but they are not currently protected by the NSESA (NSDNR, 2013). As some of these species are potentially in decline, they will remain priority species for all future monitoring within the Project Area. The most abundant of the ‘yellow’ listed species is the Pine Siskin, with a total of 21 individuals observed, followed by the Ruby-Crowned Kinglet, with 17 individuals observed. These species were observed during all seasonal monitoring, across the majority of the Project Area. These species are fairly common in coniferous and deciduous forests throughout Nova Scotia. The Project Area does not offer any rare or unique habitat types upon which these species rely.



LEGEND:

- Bird Survey Locations
- Bird Survey Transect
- Property of Interest

BOCH	Boreal Chickadee
EAWP	Eastern Wood Pewee
KILL	Killdeer
OSFL	Olive-sided Flycatcher
PISI	Pine Siskin
RBGR	Rose-breasted Grosbeak
RCKI	Ruby-crowned Kinglet
YBFL	Yellow-bellied Flycatcher
-1	Bird Count

SOURCE:

Base Map: SNSMR
Photo: Bing Maps Apr 2013

0 50 100 200
Metres

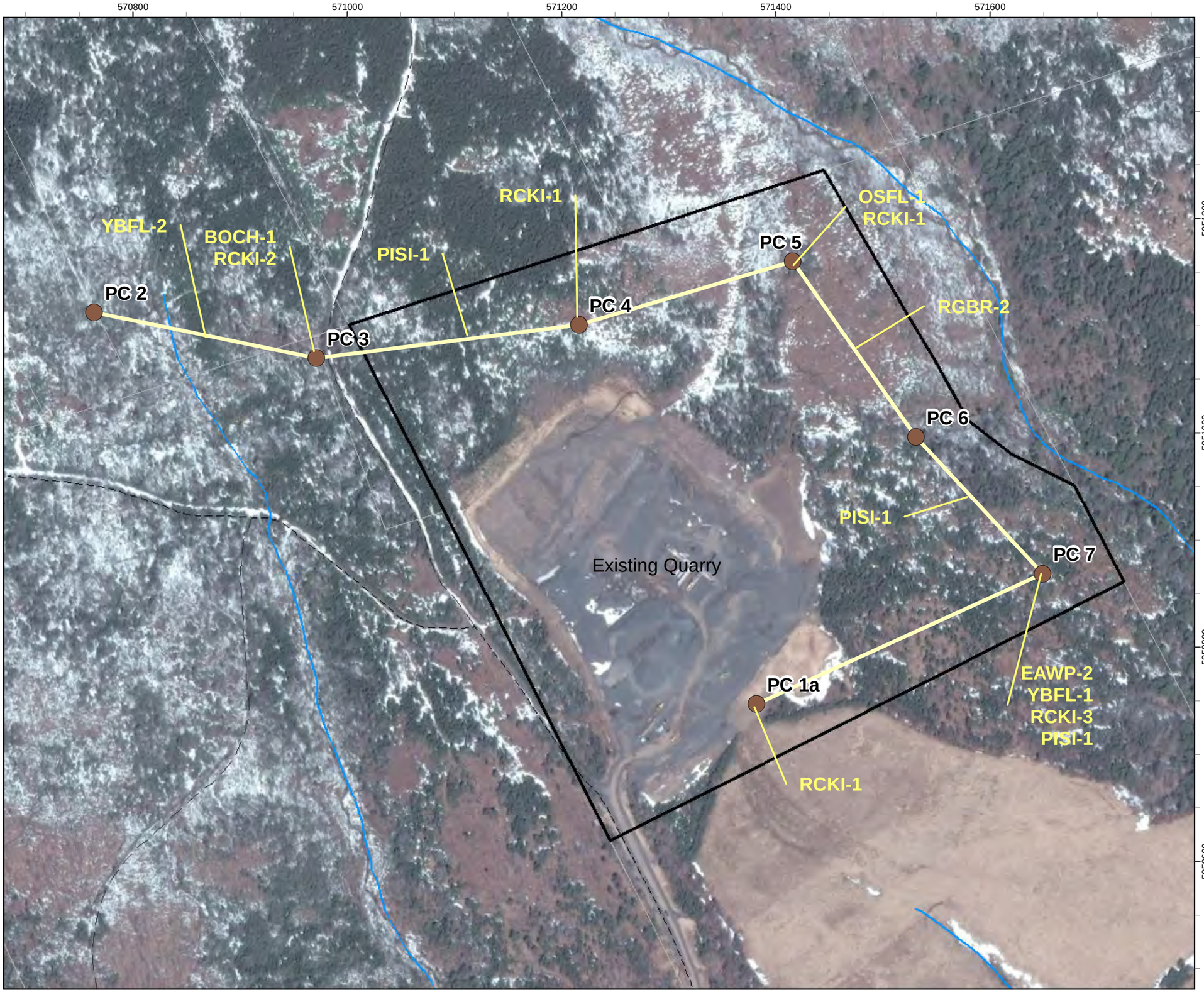
N

PROJECTION:	DRAWN / CHECKED BY:	MAP ANGLE:
UTM z20 NAD83	JJP / MM	0° North
SCALE:	**DATE:**	**PROJECT NO:**
1:3,500	JANUARY 2, 2013	081464

081464 (01) GIS-DA008

figure 7a: SPRING MIGRATION SURVEY
SPECIES AT RISK &
SPECIES OF CONSERVATION CONCERN
BRIERLY BROOK QUARRY
NOVA CONSTRUCTION LTD
Brierly Brook, Nova Scotia

CONESTOGA-ROVERS & ASSOCIATES



LEGEND:

- Bird Survey Locations
- Bird Survey Transect
- Property of Interest

BOCH	Boreal Chickadee
EAWP	Eastern Wood Pewee
OSFL	Olive-sided Flycatcher
PISI	Pine Siskin
RBGR	Rose-breasted Grosbeak
RCKI	Ruby-crowned Kinglet
YBFL	Yellow-bellied Flycatcher
-1	Bird Count

SOURCE:

Base Map: SNSMR
Photo: Bing Maps Apr 2013

0 50 100 200
Metres

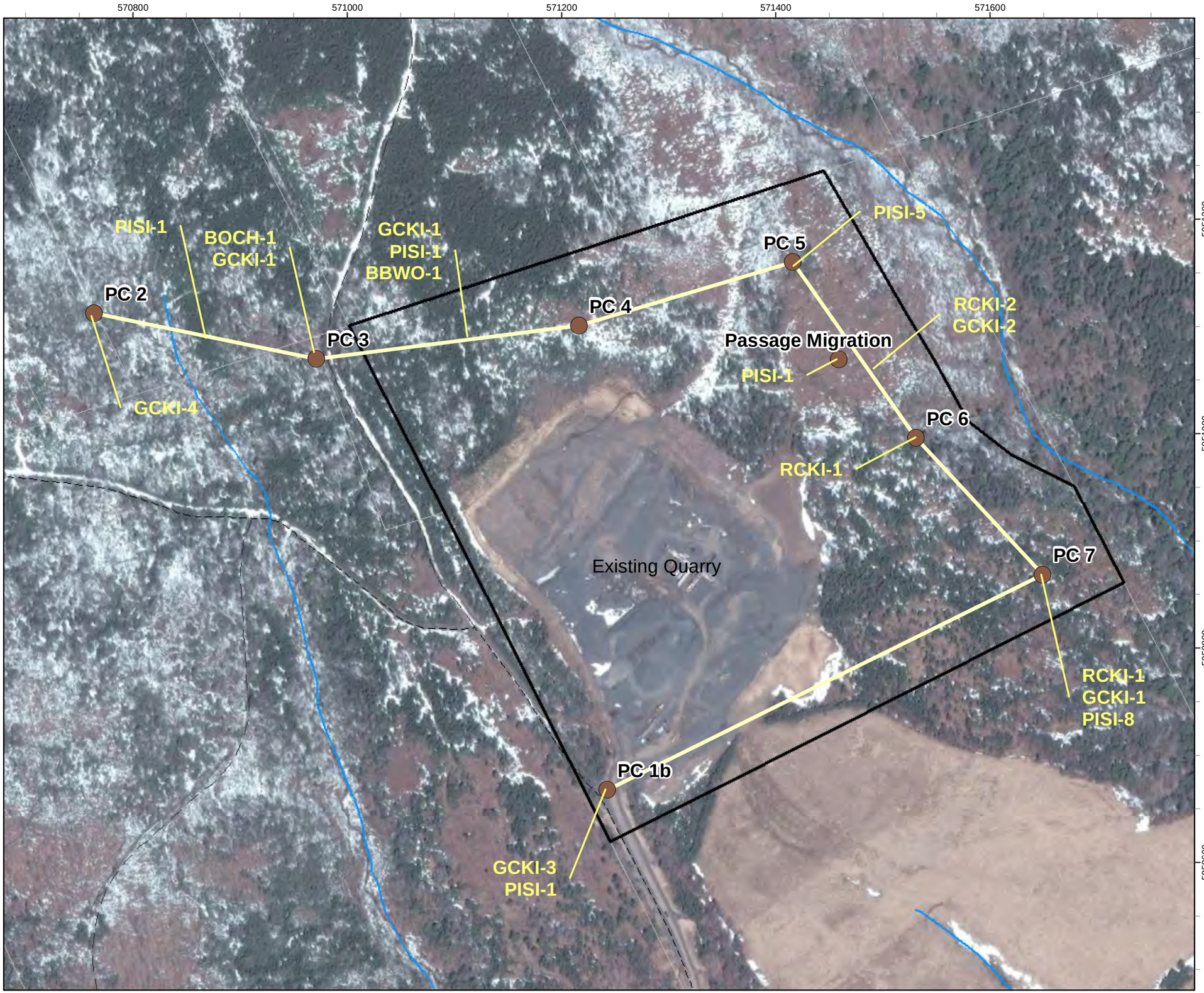
N

PROJECTION:	DRAWN / CHECKED BY:	MAP ANGLE:
UTM z20 NAD83	JJP / MM	0° North
SCALE:	**DATE:**	**PROJECT NO:**
1:3,500	JANUARY 2, 2013	081464

081464 (01) GIS-DA009

figure 7b: BREEDING SEASON SURVEY
SPECIES AT RISK &
SPECIES OF CONSERVATION CONCERN
BRIERLY BROOK QUARRY
NOVA CONSTRUCTION LTD
Brierly Brook, Nova Scotia

CONESTOGA-ROVERS & ASSOCIATES



LEGEND:

- Bird Survey Locations
- Bird Survey Transect
- Property of Interest

BBWO	Black-backed Woodpecker
BOCH	Boreal Chickadee
GCKI	Golden-crowned Kinglet
PISI	Pine Siskin
RCKI	Ruby-crowned Kinglet
-1	Bird Count

SOURCE:

Base Map: SNSMR
Photo: Bing Maps Apr 2013

0 50 100 200
Metres

N

PROJECTION:	DRAWN / CHECKED BY:	MAP ANGLE:
UTM z20 NAD83	JJP / MM	0° North
SCALE:	**DATE:**	**PROJECT NO:**
1:3,500	JANUARY 2, 2013	081464

081464 (01) GIS-DA010

figure 7c: FALL MIGRATION SURVEY
SPECIES AT RISK &
SPECIES OF CONSERVATION CONCERN
BRIERLY BROOK QUARRY
NOVA CONSTRUCTION LTD
Brierly Brook, Nova Scotia

CONESTOGA-ROVERS & ASSOCIATES

The Eastern Wood Pewee is listed as ‘vulnerable’ under NSESA, and is listed as a ‘species of concern’ by COSEWIC. This species is one of the most common and widespread songbirds associated with North America’s eastern forests. While the species is apparently resilient to many kinds of habitat changes, like most other long-distance migrants that specialize on a diet of flying insects, it has experienced persistent declines over the past 40 years both in Canada and the United States (Government of Canada, 2013a).

The Eastern Wood Pewee was observed on three occasions at point count 7, on June 5, June 7 and June 14, but no breeding evidence was observed. This species is identified as a possible breeder in the area by the MBBA. The Eastern Wood Pewee is found in many different habitat types, but particularly those with intermediate canopy and shrubby open forests for foraging. Suitable habitat for the Eastern Wood Pewee is present throughout the Project Area, particularly at point count 7 which is an open mixed forest.

The Olive-sided Flycatcher is listed by SARA and NSESA as 'Threatened'. Two individuals were observed in the Project area: one on June 5 between point counts 5 and 6; and one was heard calling approximately 200m east of point count 5. This species is identified as a possible breeder in the area by the MBBA. Olive-sided Flycatchers are listed as threatened in SARA and NSESA as a result of continuous and considerable declines in the population. Not much is known about the cause of this decline. Much of this decline is attributed to large scale changes in North American breeding habitat, as well as loss of habitat in their wintering grounds of Panama, Venezuela and Bolivia (Government of Canada, 2012b).

In the North American breeding grounds, Olive-sided Flycatchers are most often associated with openings or edges in coniferous forests, especially those with tall treed or snags for perching. As such, the Olive-sided Flycatcher is often observed around cut blocks and stands in early stages of re-growth following timber harvest. Bog margins, river valleys and slow-moving streams are all frequently used feeding habitats. These habitats are available at point count 5 (early re-growth) and along the transect between point count 5 and 6, which transitions from early re-growth through to an open coniferous forest.

The occurrence of Olive-sided Flycatchers in the Project Area is not surprising, considering they are commonly found in commercially harvested forests throughout Nova Scotia and have been identified on a regular basis during all bird work associated with development projects and environmental assessment baseline work.

Overall, avian activity within the Project Area is consistent with expectations based on available habitat types and local species abundance and distribution. Throughout all completed seasonal monitoring, the Project Area was used most extensively by a common assemblage of passerines (songbirds), and does not appear to provide any rare or unique habitats for nesting, foraging, or migration stop-over.

4.4 Herptofauna and Mammals

4.4.1 Mammals

Incidental observation of mammal species was documented during all field survey activities during 2013 across the Project Area. Specific focus was given to priority species identified as having appropriate habitat within the Project Area.

Table 8 lists those species that were confirmed on the Project Area either visually or by sign (scat, footprints, etc.). Potential presence of bats in the Project Area is described in subsequent sections.

Table 8. Confirmed mammalian species during 2013 field surveys.

Scientific Name	Common Name	ACCDC Prov. Rank	NSDNR Gen. Status
Canis latrans	Coyote	S5	Green
Erithizon dorsatum	American Porcupine	S5	Green
Odocoileus virginianus	White-tailed Deer	S5	Green
Procyon lotor	Raccoon	S5	Green
Tamiasciursus hudsonicus	American Red Squirrel	S5	Green
Ursus americanus	Black Bear	S5	Green

Raccoon and coyote sign were observed within the Project Area. Other common mammal species such as Red fox, Bobcat, American mink, Striped skunk, Short-tailed weasel may inhabit the Project Area or surrounding areas, at least periodically.

4.4.2 Mainland Moose

As the Project Area is located within a Mainland Moose Priority Area, the project team requested records of moose sightings from NSDNR. A total of 25 moose sightings have been recorded within a 5km radius of the project area since 1995 (including both ground and aerial surveys). A summary of moose sightings recorded by NSDNR is shown in Figure 8.

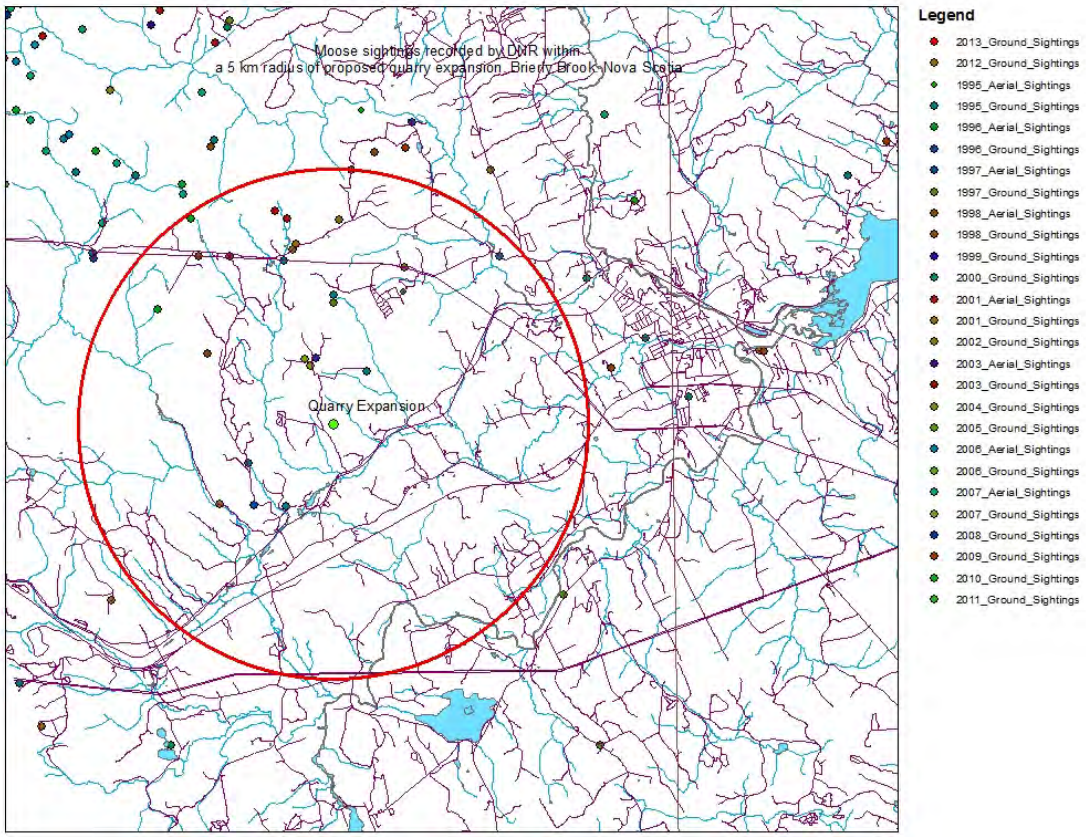


Figure 8. Moose sightings recorded by NSDNR within a 5km radius of the Project Area

Tracking surveys were completed for the purpose of identifying presence of Moose within the Project Area. One pellet group inventory was completed along the established transect (575m in length) in June 2013 by Ms. Melanie MacDonald. No pellet piles, tracks or browse were identified, and no incidental sightings of moose evidence were observed through remaining field assessments throughout the Project Area. Winter tracking surveys were completed along this transect by Mr. Jody Hamper in December 2013, January and February 2014. No Moose signs (scat, tracks, or browse) were identified.

4.4.3 Bats

Provincial government records or abandoned mine openings (AMO) were reviewed within a 25 km radius of site, as these AMO's potentially provide bat hibernacula. In total, 75 AMO's were identified within 25 km of the Project Area. Aside from three single AMO's, the remaining AMO's were located in 3 concentrated areas: Doctor's Brook, 16 km north of the Project Area; Big Marsh, 16 km northeast of the Project Area; and Copper Lake/College Grant, 24 km south of the Project Area.

All AMO records were reviewed to determine potential for bat hibernacula based on opening type, depth, protection (i.e. backfilling) and presence of flooding. Four of these sites (one in Doctor's Brook, and 3 in Copper Lake) are identified as having original depths of greater than 30m. To the knowledge of the project team, none have been surveyed for bats. One AMO, BBC-1-001 is located 600m southwest of the Project Area. The original depth of this shaft is 9.0 m, and it is not considered a potential location for bat hibernacula.

There are no identified bat hibernacula identified near the Project Area. The closest site mentioned by Moseley (2007) as a potential hibernaculum is Hirschfield Galena Prospect (an abandoned mine adit with a surveyed length of 215 m). This site is located in Guysborough County, approximately 40km south of the Project Area. Moseley described this location as a significant hibernaculum with 200-300+bats. The species composition was not confirmed, but probably was mostly *M. lucifugus*. A minor potential hibernaculum exists at the MacLellan's Brook Cave, approximately 41km west of the Project Area. Moseley describes this site as a dissolutional stream cave, approximately 85m deep, likely with fewer than 10 bats.

4.4.4 Herpetofauna

Herpetofaunal species were inventoried at the Project Area through both targeted searches of appropriate habitats and through incidental observations. Specific focus was given to priority species identified as having appropriate habitat within the Project area. Table 9 provides a list of herpetofaunal species identified during field assessments.

Table 9. Herpetofaunal species inventoried during 2013 field surveys.

Scientific Name	Common Name	ACCDC Rank	NSDNR Gen. Status
Rana sylvatica	Wood Frog	S5	Green
Rana palustris	Pickerel Frog	S5	Green
Thamnophis sirtalis	Maritime Garter Snake	S5	Green

The Project Area provides limited herpetofaunal habitat. The limitation for many turtle and amphibian species is the lack of open water habitats, particularly associated with wetlands. Although there are a number of wetlands across the Project Area, they do not exhibit vernal pool and open channel habitat. Species that may use intermittent stream channel habitats are more likely to find adequate habitat within the Project Area. Wood Frog (*Rana sylvatica)* and Pickerel Frogs *(Rana palustris),* which reproduce in running water and ephemeral bodies of water, were observed quite commonly and widespread over the Project area.

The Project Area is within range of two herpetofaunal species at risk. The Wood Turtle is listed as threatened by COSEWIC, NSESA and SARA. This species prefers clear rivers, streams or creeks with moderate current and sandy or gravelly substrate (MacGregor & Elderkin, 2003). Though specific observation records are not available from NSDNR, consultation with Regional Wildlife biologist Mark Pulsifer indicate that there are known Wood Turtle populations in adjacent Brierly Brook, James River, West River, Ohio River, Beaver River and Rights River.

While Wood Turtle populations may be present in the general vicinity of the project area, suitable nesting habitat or hibernacula is absent within the Project Area and immediate vicinity.

The Snapping Turtle is listed as vulnerable in NS, and is listed as a species of special concern by COSEWIC and SARA. This species occurs in almost any freshwater habitat, though it is most often found in slow-moving water with a soft mud or sand bottom and abundant vegetation (Government of Canada, 2013c). No specific information of snapping turtle distribution in the vicinity of the Project Area is available, and suitable nesting habitat or hibernacula is absent within the Project Area and immediate vicinity.

All wetlands, watercourses and suitable habitat were searched for incidental herpetofauna species during field assessments in 2013, and no signs of herpetofaunal Species at Risk were identified within the Project Area.

5. Conclusions

McCallum Environmental Ltd. was retained by Conestoga Rovers and Associates to complete an Environmental Baseline Assessment for a proposed expansion of an aggregate quarry, located in Brierly Brook, Antigonish, Nova Scotia. The baseline assessment was completed through the spring, summer and fall of 2013, within the boundaries of property identification number 10111946 (Project Area).

Outside of the existing aggregate quarry, three major habitat types exist: open mixed wood forest, young tolerant hardwood forest, and disturbed habitat in early stages of re-growth following disturbance such as timber harvesting. The entire Project Area was surveyed for priority species through field assessments in 2013. In total, 118 vegetation species were identified within the Project Area; none of which were priority species.

Four wetlands and four watercourses were identified in the Project Area. The wetlands are largely intact and undisturbed, yet the overall functional significance of each wetland is low, due to factors such as wetland size, wetland type, landscape position, and absence of priority species. However, given that overall wetland cover throughout the tertiary watershed is low (3%), each individual wetland provides floodwater detention to downstream areas. Four watercourses were also identified within the project area, none of which provide fish habitat.

Avian use assessments were completed through spring migration, summer breeding season, and fall migration in 2013. In total, ten priority bird species were identified; two of which are protected by provincial and federal legislation. Overall, avian activity within the Project Area is consistent with expectations based on available habitat types and local species abundance and distribution. Throughout all completed seasonal monitoring, the Project Area was used most extensively by a common assemblage of passerines (songbirds), and does not appear to provide any rare or unique habitats for nesting, foraging, or migration stop-over.

The Project Area is located within a Mainland Moose Priority Area, and Moose have been observed in the general vicinity of the project, as documented by NSDNR. A pellet group inventory survey and winter moose track surveys have not identified any sign of Mainland Moose, including tracks, scat or browse. It is not likely that moose use the project lands in any significant manner.

Suitable habitat for other priority species, specifically the Wood Turtle, Snapping Turtle, Little Brown Bat, Northern Long-eared Bat, and Eastern Pipisterelle was not identified within the Project Area. The desktop analyses, field assessments, and subsequent conclusions of this assessment indicate there are no concerns related to priority species, rare or unique habitat types, within the Project Area.

6. Limitations

Limitations incurred at the time of the assessment include:

- McCallum Environmental Ltd. has relied in good faith upon the evaluation and conclusions in all third party assessments. McCallum Environmental Ltd. relies upon these representations and information provided but can make no warranty as to accuracy of information provided;
- There are a potentially infinite number of methods in which human activity can influence wildlife behaviors and populations and merely demonstrating that one factor is not operative does not negate the influence of the remainder of possible factors;
- The environmental baseline assessment provides an inventory based on acceptable industry methodologies. A single assessment may not define the absolute status of site conditions;
- Effects of impacts separated in time and space that may affect the areas in question, have not been not been included in this assessment.

General Limitations incurred include:

- Classification and identification of soils, vegetation, wildlife, and general environmental characteristics (i.e. vegetation concentrations, and wildlife usage) have been based upon commonly accepted practices in environmental consulting. Classification and identification of these factors are judgmental and even comprehensive sampling and testing programs, implemented with the appropriate equipment by experienced personnel, may not identify all factors;
- All reasonable assessment programs will involve an inherent risk that some conditions will not be detected and all reports summarizing such investigations will be based on assumptions of what characteristics may exist between the sample points.

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8. Certification

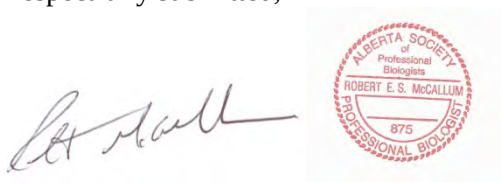
This Report has considered relevant factors and influences pertinent within the scope of the assessment and has completed and provided relevant information in accordance with the methodologies described.

The undersigned has considered relevant factors and influences pertinent within the scope of the assessment and written, and combined and referenced the report accordingly.

Meghan Milloy,
Vice President
McCallum Environmental Ltd.

I have reviewed the information as submitted and completed this report in conformity with the Code of Ethics and the Duties of Professional Biologists and good industry practice.

Respectfully submitted,



Robert McCallum, P.Biol
President
McCallum Environmental Ltd.

Appendix I. PRIORITY LIST OF SPECIES FOR FIELD ASSESSMENTS

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Accipiter gentilis	Northern Goshawk				YELLOW	Nests in a wide variety of forest types including deciduous, coniferous, and mixed forests. Has a complexity of habitat needs in the breeding season, which vary among forest types and region. Typically nests in mature or old-growth forests, and generally selects larger tracts of forest over smaller tracts.
Caprimulgus vociferus	Whip-Poor-Will	T	T	Threatened	RED	Arrives in the Maritimes in May and leaves for its wintering grounds in August-September. Breed in fairly open or patchy forests, often in relatively dry sites associated with sand plains or rock outcrops and having substantial cover of white and red pine and red oak and sometimes in sites that area regenerating following major disturbances. In the Maritimes, most records are from central and western NB. 0ther areas may support the occasional territorial bird
Sturnella magna	Eastern Meadowlark				YELLOW	Breeds from southeastern Canada through eastern U.S. west to Arizona; resident in the Bahamas and Mexico. Spends winters mostly within breeding range. Preferred habitats include pastures, meadows, grassy fields, prairies, open country and country roadsides. Often seen singing from fence posts or utility wires.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Cathartes aura	Turkey Vulture				YELLOW	Breeds from southern B.C., central Saskatchewan, the Great Lakes, and New Hampshire southward. Spends winters in the Southwest and eastern U.S. northward to southern New England. Preferred habitats include deciduous forests, woodlands and scrublands; often seen over adjacent farmlands.
Chordeiles minor	Common Nighthawk	T	T	Threatened	RED	Nest throughout Maritimes with the exception of PEI. Nest on the ground in a variety of habitats having little or no tree cover and a limited cover of taller shrubs and herbs, and then can also nest on flat gravel roofs in urban settings. Forest clearings created by forestry or fire are probably the most widely used habitats in the region, but sand dunes, river bars, open forests; commercial blueberry fields, mining and aggregate excavation sites, rocky outcrops and drier peat lands are all potential nesting habitats.
Asio otus	Long-eared Owl				RED	Occurs Throughout the northern hemisphere. Preferred habitats include dense vegetation close to grasslands or shrub lands, as well as open forests.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Myiarchus crinitus	Great Crested Flycatcher				RED	Uncommon with few confirmed breeding records broadly scattered over central and southern Nova Scotia.Breeds in deciduous forest (mainly), mixed, or pine woodland or somewhat open forest, parks, orchards, wooded residential areas, areas of scattered trees in cultivated regions, clearings and edges of wooded areas, and swamps. Preferred perches are tall trees, but may also be found on utility lines and short shrub-like growth in recent clear-cuts. Nests in natural cavity or old woodpecker hole in live or dead tree, average of 3-6 m above ground; also in bird box, pipe or similar cavity
Hirundo rustica	Barn Swallow	T		Endangered	YELLOW	Breeds from Alaska east across Canada to Newfoundland and south throughout most of the U.S.; spends winters in the tropics and Eurasia. Preferred habitats include agricultural lands, suburban areas, marshes and lakeshores.
Riparia riparia	Bank Swallow	T			RED	Habitat includes open and partly open situations, frequently near flowing water. Nests are in steep sand, dirt, or gravel banks, in burrows dug near the top of the bank, along the edge of inland water, or along the coast, or in gravel pits, road embankments, etc. Breeding Bird NS

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Contopus cooperi	Olive-sided Flycatcher	T	T	Threatened	RED	breeds throughout the maritime provinces. Is most associated with openings or edges in coniferous forest containing tall trees or snags for perching. Bog margins, river valleys, beaver ponds and meadows, slow moving streams with broad floodplains and cut over areas with some standing trees are frequently used habitats.
Contopus virens	Eastern Wood-Pewee	SC		Vulnerable	YELLOW	Breeds from eastern Great Plains to the Atlantic ocean, ranging from southern Canada to northern Florida, the gulf coast and central Texas. Winters in the tropics. Preferred habitats include northern hardwood, pine-oak, oak-hickory, bottomland hardwood, southern pine savannah, and Midwestern forests; also found in orchards, parks, roadsides and suburban areas.
Dendroica castanea	Bay-breasted Warbler				YELLOW	Breeds from northeastern B.C. east to Maritime provinces and south to the northern Great Lakes region and northern New England. Spends winters in the tropics. Preferred habitats include open spruce forests and deciduous woodlands.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Dendroica striata	Blackpoll Warbler				YELLOW	Breeds from Alaska and northern Canada to southern Canada and northern New England. Spends winters in the tropics. Preferred breeding habitat is coniferous forests; during migration found chiefly in tall trees.
Dendroica tigrina	Cape May Warbler				YELLOW	Breeds from southern Mackenzie, Manitoba, Ontario and Quebec south to North Dakota, Michigan, northern New York, Maine and Nova Scotia. Spends winters in southern Florida and the West Indies. Preferred habitats, but during migration also found in evergreen or deciduous woodlands, and often parks or suburban yards.
Empidonax flaviventris	Yellow-bellied Flycatcher				YELLOW	Breeds from central Canada and Newfoundland south to Great Lakes region, northern New York, northern New England, and maritime provinces. Spends winters from Mexico to Panama.
Empidonax traillii	Willow Flycatcher				YELLOW	Breeds from southern B.C., Ab., North Dakota, New York, and Maine south to central California, Nevada, the southwest, Arkansas, and Virginia. Preferred habitats include swampy thickets, upland pastures, and old abandoned orchards; also occurs along wooded lakeshores and streams.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Icterus galbula	Baltimore Oriole				RED	Arrive in the northern states and Canada in April-May; males precede females by a few days. Southward migration begins in late July or early August. Habitat includes open woodland, deciduous forest edge, riparian woodland, partly open situations with scattered trees, orchards, and groves of shade trees. In migration and winter this oriole also occurs in humid forest edge, second growth, and scrub; treetop level in coffee and cacao plantations, and savannah groves.
Molothrus ater	Brown-headed Cowbird				YELLOW	Habitat Comments: Breeding habitat includes woodland, forest (primarily deciduous), forest edge, city parks, suburban gardens, farms, and ranches. Cowbirds often are associated with forest-field edge habitat and clearings in forests. Feedlots, pastures, and fields with livestock also attract cowbirds, especially in predominately forested areas. Permanent resident in NS
Perisoreus canadensis	Gray Jay				YELLOW	Resident form Alaska east to Labrador and south across the northern U.S. Most commonly found in coniferous forests.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Pheucticus ludovicianus	Rose-breasted Grosbeak				YELLOW	Breeds from northeastern B.C. Manitoba, and Nova Scotia to southern Alberta, North Dakota, Oklahoma, and New Jersey, and as far south as Georgia; regular visitor on the west coast and winters from central into northern South America. Preferred habitats include moist woodlands, open fields and old, overgrown orchards.
Picoides arcticus	Black-backed Woodpecker				YELLOW	Resident in Alaska, Canada, and northern U.S. Preferred habitat includes coniferous forests in the boreal zone, especially where burned, logged, or swampy.
Pinicola enucleator	Pine Grosbeak				RED	Open coniferous (less commonly mixed coniferous-deciduous) forest and forest edge; in migration and winter also in deciduous forest, woodland, second growth and shrubbery. Nests in trees or shrubs in open coniferous woods, 2-9 m above ground Non breeding resident in NS

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Poecile hudsonica	Boreal Chickadee				YELLOW	Boreal coniferous and mixed forests, muskeg bogs, vicinity of white cedar and hemlock swamps, birches and streamside willows. Nests in natural cavities or abandoned woodpecker holes, or in cavity dug by pair in rotten tree stub, usually within 1 m of ground. Permanent resident. Breeds from northern Alaska east to Labrador and Newfoundland, south to northern edge of U.S. Occasionally wanders southward during winter. Usually found in coniferous forests.
Regulus calendula	Ruby-crowned Kinglet				YELLOW	Breeds from Alaska east across Canada to Newfoundland, south California and New Mexico, and to the Great Lakes region and southern New England in the east. Spends winters south from southern B.C. and California across the southern tier of the states to southern New England. Preferred habitats include coniferous and deciduous forests.
Regulus satrapa	Golden-crowned Kinglet				YELLOW	Common from southern Alaska to central Canada and southeast to the Carolinas; spends winters south to Florida and the Gulf Coast. Preferred habitat include dense conifer forests; also found in deciduous and mixed forests.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Sialia sialis	Eastern Bluebird	NAR			YELLOW	Habitat includes forest edge, open woodland, and partly open situations with scattered trees, from coniferous or deciduous forest to riparian woodland, also pine woodland or savannah in the tropics. Breeding Bird- NS- northern portions only - towards Amherst and Pictou-Antigonish counties. Breeds east of the Rockies from southeast Canada to the Gulf of Mexico; winters in southern portion of breeding range. Inhabits open woodlands, clearings, farmlands, parks, orchards, gardens, fields, often seen along roadsides on utility wires and fences.
Spinus pinus	Pine Siskin				YELLOW	Breeds from southern Alaska, Mackenzie, Quebec, and Newfoundland south to California, Arizona, New Mexico, Texas, Great Lakes region, and northern New England; wanders southward throughout the U.S. during winter. Preferred habitats include coniferous and deciduous forests, woodlands, parks, alder thickets, and brushy pastures.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Tachycineta bicolor	Tree Swallow				YELLOW	Breeds from Alaska east through northern Manitoba to Newfoundland and south to California, Colorado, Nebraska, and Maryland. Spends winters north to southern California, the Gulf Coast, and the Carolinas. Preferred habitats include open areas near water, such as fields, marshes, meadows, shorelines, beaver ponds, and wooded swamps and standing dead trees.
Tyrannus tyrannus	Eastern Kingbird				YELLOW	Breeds from British Columbia across interior Canada to Maritime Provinces and south to Northern California, central Texas, the Gulf coast, and Florida. Spends winters in the tropics. Inhabits open woodlands, clearings, rural roadsides, farms, orchards, edges of fields, streams, and suburbs.
Vermivora peregrina	Tennessee Warbler				YELLOW	Breeds from Yukon, Manitoba, and Labrador south to B.C., Wisconsin, southern Ontario, and Maine. Spends winters in the tropics. Preferred habitats include open mixed woodlands in the breeding season; trees and bushes during migration.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Wilsonia canadensis	Canada Warbler	T	T	Endangered	RED	found throughout the Maritimes-breeds in a variety of forest types-always in areas with a well developed shrub layer and frequently in moist to wet sites. Forested swamps with some combination of white cedar, black spruce, red maple, and tamarack and dense mixed forests on steep river valley slopes are favoured habitat.
Wilsonia pusilla	Wilson's Warbler				YELLOW	Breeds from Alaska eastward to Newfoundland and south to southern California, New Mexico, central Ontario, and Nova Scotia. Spends winters in the tropics. Preferred habitats include moist thickets in woodlands and along streams as well as alder, willow thickets, and bogs.
Charadrius vociferus	Killdeer				YELLOW	Preferred habitat includes open areas such as plowed fields, golf courses, and short-grass prairies
Myotis lucifugus	Little Brown Bat	E		E	YELLOW	The little brown bat can be found in most of the United States and Canada except for the south central and south eastern United States and northern Alaska and Canada. The little brown bat lives along streams and lakes. It forms nursery colonies in buildings. In the winter it hibernates in caves and mines.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Myotis septentrionalis	Northern Long-eared Bat	E		E	YELLOW	The Northern Long-eared Bat (Myotis septentrionalis) is found in many regions of Canada. This particular type of bat has two habitats: a winter hibernation habitat as well as a summer roosting and foraging habitat. The Northern Long-eared Bat hibernates in caves or abandoned mines during the cold winter months. During the summer months the Bats commonly use crevices behind peeling bark or cavities in partially-decayed trees as summer day roosts. Within thick forests, summer activity may be focused along watercourses and small ponds
Perimyotis subflavus	Eastern Pipistrelle (Tri-colored Bat)	E		E	YELLOW	Prefers partly open country with large trees and woodland edges. Avoids deep woods and open fields. Probably roosts in the summer in tree foliage and occasionally in buildings; may use cave as night roost between foraging forays. Usually hibernates in caves and mines with high humidity. Generally, maternity colonies utilize manmade structures or tree cavities; often in open sites that would not be tolerated by most other bats

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Alces alces americana	Moose (Mainland Population)			E	RED	Use mixed wood forests with lakes and streams for summer aquatic feeding habitat high quality winter browse, mature forest shelter areas that allow access to food; isolated sites for calving; and young forest stands with deciduous shrubs are essential components of moose habitat. In winter, food close to shelter in a mature conifer forest is especially important because in deep snow moose may expend more energy then they gain if they have to work too hard to find food.
Chelydra serpentina	Snapping Turtle	SC	SC	V	GREEN	southern new brunswick and parts of mainland nova scotia in ponds, lakes, slow-moving streams and sometimes in brackish water if these water bodies have soft mud bottoms and abundant aquatic vegetation
Glyptemys insculpta	Wood Turtle	T	T	T	YELLOW	Lives along permanent streams during much of each year, but in summer may roam widely overland and can be found in a variety of terrestrial habitats adjacent to streams, from deciduous woods, cultivated fields, and woodland bogs, to marshy pastures.

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Conopholis americana	American Cancer-root				RED	hardwood forest
Cynoglossum virginianum	Wild Comfrey				RED	hardwood forest
Cypripedium parviflorum	Yellow Lady's-slipper				YELLOW	hardwood and mixed wood forest
Dirca palustris	Eastern Leatherwood				RED	hardwood, mixed wood
Goodyera oblongifolia	Menzies' Rattlesnake-plantain				YELLOW	hardwood, mixed wood and softwood forest
Goodyera pubescens	Downy Rattlesnake-plantain				RED	hardwood, mixed wood, and softwood forests
Solidago hispida	Hairy Goldenrod				RED	Woods and forest edges
Anemone americana	Round-lobed Hepatica				RED	rocky woods
Bistorta vivipara	Alpine Bistort				RED	Moist to wet spruce or mixed woods along shorelines, moist subalpine woods and meadows, alpine meadows, heaths, nutrient-rich sites
Ceratophyllum echinatum	Prickly Hornwort				RED	fresh water of lakes, ponds, marshes and swamps
Conioselinum chinense	Chinese Hemlock-parsley				YELLOW	coastal island, hardwood forest, headland, marsh, softwood forest, swamp
Eriophorum gracile	Slender Cottongrass				YELLOW	bog, field meadow, lakeshore wetland, swamp
Goodyera repens	Lesser Rattlesnake-plantain				YELLOW	coniferous swamps and bogs, cool, shady, moist coniferous forests with a mossy understory
Lactuca hirsuta	Hairy Lettuce				YELLOW	disturbed sites, lake or pond shore, mixedwood forest
Ophioglossum pusillum	Northern Adder's-tongue				YELLOW	field meadow, lake or pond shore, swamp
Triantha glutinosa	Sticky False Asphodel				RED	beach or coastal shore, bog, swamp
Fraxinus pennsylvanica	Red Ash				RED	bogs and seepages or bottomland forests or disturbed and weedy areas or mesic upland forests or mixed forest edges or suburban plantings
Persicaria arifolia	Halberd-leaved				YELLOW	swampy, calcareous or fen habitats

Scientific Name	Common Name Tearthumb	COSEWIC	SARA	NSESA	NSDNR	Habitat
Triosteum aurantiacum	Orange-fruited Tinker's Weed				YELLOW	intervale
Ageratina altissima	White Snakeroot				RED	mixed wood forest, river or stream
Alopecurus aequalis	Short-awned Foxtail				YELLOW	river or stream
Anemone canadensis	Canada Anemone				RED	alluvial floodplain, field meadow
Anemone multifida	Cut-leaved Anemone				RED	river or stream
Anemone quinquefolia	Wood Anemone				YELLOW	intervale, river or stream
Anemone virginiana	Virginia Anemone				YELLOW	cliff or talus slope, intervale, river or stream
Antennaria parlinii	Parlin's Pussytoes				RED	hard wood, mixed wood, river or stream
Asplenium trichomanes	Maidenhair Spleenwort				YELLOW	cliff or talus slope, river or stream
Bidens beckii	Water Beggarticks				YELLOW	aquatic, river or stream
Campanula aparinoides	Marsh Bellflower				YELLOW	field meadow, river or stream
Cardamine maxima	Large Toothwort				RED	hardwood forest, river or stream
Carex bebbii	Bebb's Sedge				RED	Wet meadows and streamsides
Carex garberi	Garber's Sedge				RED	fen, river or stream
Caulophyllum thalictroides	Blue Cohosh				RED	alluvial floodplain, hardwood forest, intervale
Cinna arundinacea	Sweet Wood Reed Grass				RED	alluvial floodplain
Clematis occidentalis	Purple Clematis				RED	mixed wood forest, river or stream
Desmodium canadense	Canada Tick-trefoil				RED	river or stream
Desmodium glutinosum	Large Tick-trefoil				RED	hardwood forest, intervale
Eleocharis ovata	Ovate Spikerush				YELLOW	sandy freshwater margins, including lakes, ponds and rivers
Elymus hystrix	Spreading Wild Rye				RED	river or stream
Elymus wiegandii	Wiegand's Wild Rye				RED	field meadow, river or stream
Epilobium hornemannii	Hornemann's Willowherb				YELLOW	river or stream
Equisetum pratense	Meadow Horsetail				YELLOW	river or stream
Floerkea proserpinacoides	False Mermaidweed				YELLOW	hardwood forest, intervale
Galium boreale	Northern Bedstraw				RED	woodlands, fields, edges of streams and

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat lakes
Gratiola neglecta	Clammy Hedge-hyssop				YELLOW	marsh, river or stream
Halenia deflexa	Spurred Gentian				YELLOW	edges of moist forest, and wet, forest road ditches
Hieracium robinsonii	Robinson's Hawkweed				YELLOW	cliff or talus slope, river or stream
Hypericum majus	Large St. John's-wort				RED	wet meadows, shores, ditches, fens
Impatiens pallida	Pale Jewelweed				YELLOW	alluvial floodplain, coastal island, intervale
Juncus alpinoarticulatus	Alpine Rush				RED	Wet meadows, sandy and gravelly, often calcareous shores, fens, and clayey pools over rock
Juncus marginatus	Grass-leaved Rush				YELLOW	disturbed sites, field meadows, river or stream
Laportea canadensis	Canada Wood Nettle				YELLOW	alluvial floodplain, hardwood forest, intervale, mixed wood forest
Lilium canadense	Canada Lily				YELLOW	field meadow, river or stream
Limosella australis	Southern Mudwort				YELLOW	beach or coastal shore, coastal island, lake or pond shore, river or stream
Montia fontana	Water Blinks				RED	beach or coastal shore, river or stream
Myriophyllum farwellii	Farwell's Water Milfoil				YELLOW	lake or pond shore, lakeshore wetland, river or stream
Phleum alpinum	Alpine Timothy				RED	river or stream
Pilea pumila	Dwarf Clearweed				RED	hardwood, mixed wood, river or stream
Pinguicula vulgaris	Common Butterwort				RED	coastal island, cliff or talus slope, river or stream
Podostemum ceratophyllum	Horn-leaved Riverweed				RED	river or stream
Rumex triangulivalvis	Triangular-valve Dock				YELLOW	beach or coastal shore, river or stream
Sanicula odorata	Clustered Sanicle				RED	alluvial flood plain only
Silene acaulis	Moss Campion				RED	long streams, river terraces, tundra, slopes, ridges, cliffs; on seepage slopes, or dry, or moderately well drained areas; calcareous; gravel, sand, silt, till; with low organic

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
						content
Silene antirrhina	Sleepy Catchfly				RED	roadsides, railways, pastures, fields, wastegrounds, alluvial woods
Spiranthes lucida	Shining Ladies'-tresses				RED	saturated, calcareous, usually gravelly or sandy soils. Typical habitats include stream and river banks or floodplain terraces, fens, and old quarries or gravel pits
Spiranthes ochroleuca	Yellow Ladies'-tresses				YELLOW	barrens, disturbed sites, field meadow, river or stream
Stellaria crassifolia	Fleshy Stitchwort				RED	Fens, fen meadows, meadows, springs, waterside meadow shores that are prone to flooding, seashore kelp banks
Stellaria longifolia	Long-leaved Starwort				YELLOW	coastal island, field meadow, river or stream
Tiarella cordifolia	Heart-leaved Foamflower				YELLOW	hardwood forest, intervale
Trisetum melicoides	Purple False Oats				RED	river or stream
Viburnum edule	Squashberry				YELLOW	hardwood forest, mixed wood forest, river or stream
Woodsia glabella	Smooth Cliff Fern				YELLOW	cliff or talus slope, river or stream
Zizia aurea	Golden Alexanders				RED	field meadow, lake or pond shore, river or stream
Betula michauxii	Newfoundland Dwarf Birch				YELLOW	Sphagnum bogs, around pools, and wet peaty meadows
Coeloglossum viride	Long-bracted Frog Orchid				RED	Alluvial floodplain, bog, coastal island, mixed and softwood forests
Empetrum eamesii	Pink Crowberry				YELLOW	barrens, beach or coastal shore, bog, exposed rock or sand, headland
Galium labradoricum	Labrador Bedstraw				YELLOW	Bogs, mossy thickets, woods. [Conifer forest (forest, upland)]
Listera australis	Southern Twayblade				RED	Bog, mixed wood forest
Lobelia kalmii	Brook Lobelia				RED	bog, cliff or talus slope, field meadow
Rhamnus alnifolia	Alder-leaved Buckthorn				YELLOW	bog, field meadow, swamp

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Botrychium lanceolatum	Triangle Moonwort				YELLOW	field meadow, hardwood forest, swamp
Carex gynocrates	Northern Bog Sedge				RED	bog, coastal island, swamp
Eleocharis fallax	Creeping Spikerush				RED	marsh, lakeshore wetlands
Eleocharis flavescens	Yellow Spikerush				YELLOW	lakeshore wetland, swamp
Fraxinus nigra	Black Ash			Threatened	YELLOW	swamp
Galium obtusum	Blunt-leaved Bedstraw				RED	swamps, swampy grounds, wet areas of prairies, wet woods and thickets, roadside ditches.
Adiantum pedatum	Northern Maidenhair Fern				RED	hardwood forest, intervale
Allium tricoccum	Wild Leek				RED	hardwood forest, intervale
Boehmeria cylindrica	Small-spike False-nettle				RED	Moist and shady ground, in deciduous woods, swamps, bogs, marshes, wet meadows and ditches
Botrychium simplex	Least Moonwort				YELLOW	beach or coastal shore, field meadow, lake or pond shore, river or stream, swamp
Caltha palustris	Yellow Marsh Marigold				YELLOW	field meadow, river or stream, swamp
Carex capillaris	Hairlike Sedge				YELLOW	calcium-rich, wet habitats, including ledges, talus slopes, ditches, cedar swamps, and bogs
Carex castanea	Chestnut Sedge				RED	cliff or talus slope, field meadow, swamp
Carex haydenii	Hayden's Sedge				RED	open habitats of bogs/poor fens, moist meadows, and seasonally wet soils
Carex hystericina	Porcupine Sedge				RED	wet prairies, swamps, grassy fens, sedge meadows, calcareous seeps, edges of marshes, and ditches
Carex pellita	Woolly Sedge				RED	moist to wet prairies and dolomite prairies, prairie swales, sedge meadows, seeps and calcareous seeps, swamps and openings in floodplain woodlands, poorly drained fields, and roadside ditches

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Carex prairea	Prairie Sedge				RED	disturbed sites, swamps
Carex rostrata	Narrow-leaved Beaked Sedge				RED	wet meadows, marshes, edges of lakes, ponds, and streams, and other riparian areas
Carex swanii	Swan's Sedge				YELLOW	Boggy pastures, dry peaty barrens, forests, clearings and the edges of woods.
Carex tenera	Tender Sedge				YELLOW	wet prairies, swamps, and floodplain woods
Carex tenuiflora	Sparse-flowered Sedge				RED	fen and mixed wood forest
Carex tincta	Tinged Sedge				RED	disturbed sites, hardwood forests
Carex tuckermanii	Tuckerman's Sedge				RED	field meadow, marsh, river or stream
Carex wiegandii	Wiegand's Sedge				RED	bogs and poor fens, disturbed sites, swamps
Cypripedium reginae	Showy Lady's-slipper				RED	bog, swamp
Decodon verticillatus	Swamp Loosestrife				YELLOW	lakeshore wetland, river or stream
Eleocharis quinqueflora	Few-flowered Spikerush				RED	sparsely vegetated wet habitats found in graminoid fens, shorelines of ponds and small lakes, and occasionally in wet prairie openings
Equisetum palustre	Marsh Horsetail				RED	cold streams, ponds, and lakeshores; in fens and marshes; wooded swamps. Not often actually growing in water.
Erigeron hyssopifolius	Hyssop-leaved Fleabane				YELLOW	cliff or talus slope, river or stream
Festuca subverticillata	Nodding Fescue				RED	alluvial floodplain, hardwood forest
Isoetes acadiensis	Acadian Quillwort				YELLOW	aquatic, lake or pond shore, rivers and streams
Juncus subcaudatus	Woodland Rush				YELLOW	Marshes, edges of streams, and peaty acidic and basic wetlands including fens
Najas gracillima	Thread-like Naiad				RED	riparian, swamp, marsh, lakeshore wetlands
Platanthera flava	Tubercled Orchid				YELLOW	bog, field meadow, lake or pond shore, lakeshore wetland, river or stream, swamp

Scientific Name	Common Name	COSEWIC	SARA	NSESA	NSDNR	Habitat
Proserpinaca intermedia	Intermediate Mermaidweed				RED	sandy bogs and savannas, and especially along the periphery of sandy, acid ponds, lakes, streams, ditches, and also in wet pine savannas and flat woods, cypress-black gum ponds, swamps, and damp clearings
Proserpinaca pectinata	Comb-leaved Mermaidweed				YELLOW	shallow waters of bogs, marshes, swamps, and along the muddy shores and banks of ponds and streams
Rudbeckia laciniata	Cut-leaved Coneflower				YELLOW	intervale, lake or pond shore
Salix sericea	Silky Willow				RED	lake or pond shore, river or stream
Saxifraga cernua	Nodding Saxifrage				RED	seepage areas, moist crevices, and along streambanks, creeks and lakeshores, on moist ledges and in exposed dry sites
Selaginella selaginoides	Low Spikemoss				RED	bog, river or stream
Utricularia resupinata	Inverted Bladderwort				RED	lake or pond shore, river or stream
Viola nephrophylla	Northern Bog Violet				YELLOW	barrens, bog, river or stream
Woodwardia areolata	Netted Chain Fern				YELLOW	bog, river or stream, swamp

Appendix II. ATLANTIC CANADA CONSERVATION DATA CENTER DOCUMENTED SPECIES OBSERVATIONS

Atlantic Canada Conservation Data Centre
Centre de données sur la conservation du Canada Atlantique

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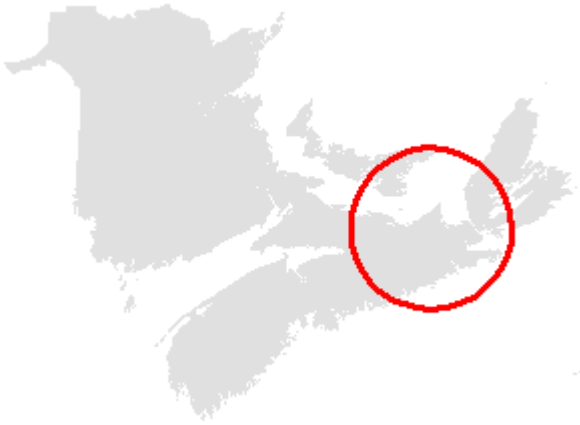

CONTENTS OF REPORT

1.0 PREFACE

The Atlantic Canada Conservation Data Centre (ACCDC) is part of a network of NatureServe data centres and heritage programs serving 50 states in the U.S.A, 10 provinces and 1 territory in Canada, plus several Central and South American countries. The NatureServe network is more than 30 years old and shares a common conservation data methodology. The ACCDC was founded in 1997, and maintains data for the jurisdictions of New Brunswick, Nova Scotia, Prince Edward Island, Newfoundland and Labrador. Although a non-governmental agency, the ACCDC is supported by 6 federal agencies, 4 provincial governments, as well as through outside grants and data processing fees. URL: www.ACCDC.com.

Upon request and for a fee, the ACCDC reports the rare and endangered flora and fauna known to occur in or near a specified study area. As a supplement to that data, the ACCDC includes locations of managed areas with some level of protection, and known sites of ecological interest. Data summarised in each report is attached as DBF files which may be opened using standard data software (ie Excel, Access) or mapped in a GIS applicatoin (ArcView, MapInfo, AutoCAD).

1.1 RESTRICTIONS

Included datasets:

1.2 RESTRICTIONS

The ACCDC makes a strong effort to verify the accuracy of all the data that it manages, but it shall not be held responsible for any inaccuracies in data that it provides. By accepting ACCDC data, recipients assent to the following limits of use:

a.) Data is restricted to use by trained personnel who are sensitive to landowner interests and to potential threats to rare and/or endangered flora and fauna posed by the information provided.
b.) Data is restricted to use by the specified Data User; any third party requiring data must make its own data request.
c.) The ACCDC requires Data Users to cease using and delete data 12 months after receipt, and to make a new request for updated data if necessary at that time.
d.) ACCDC data responses are restricted to the data in our Data System at the time of the data request.
e.) Locations given for rare species records may be deliberately imprecise. Each record has an estimate of locational uncertainty, which must be referenced in order to understand the record's relevance to a particular location. Please see attached Data Dictionary for details.
f.) ACCDC data responses are not to be construed as exhaustive inventories of taxa in an area.
g.) The absence of a taxon cannot be inferred by its absence in an ACCDC data response.

1.2 ADDITIONAL INFORMATION

Please direct biological questions about ACCDC data to the following individuals:

Plants, Lichens and Ranking Methods:	Sean Blaney	(506-364-2658), sblaney@mta.ca
Animals (Fauna):	John Klymko	(506-364-2660), jklymko@mta.ca
Plant Communities:	Sarah Robinson	(506-364-2664), srobinson@mta.ca
Data Management:	Michael Elliott	(506-364-2657), mielliott@mta.ca
Billing:	Cindy Spicer	(506-364-2665), cspicer@mta.ca

Questions on federal Species at Risk can be directed to ACCDC: (506) 364-2657, and technical data queries to: Samara Eaton, Canadian Wildlife Service (NB and PE): (506) 364-5060 or Julie McKnight, Canadian Wildlife Service (NS): (902) 426-4196.

For provincial information on rare taxa and protected areas, or information on game animals, deer yards, old growth forest, archeological sites, fish habitat etc, please contact Sherman Boates, NSDNR: (902) 679-6146.

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2.0 RARE AND ENDANGERED TAXA

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2.1 FLORA

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2.2 FAUNA

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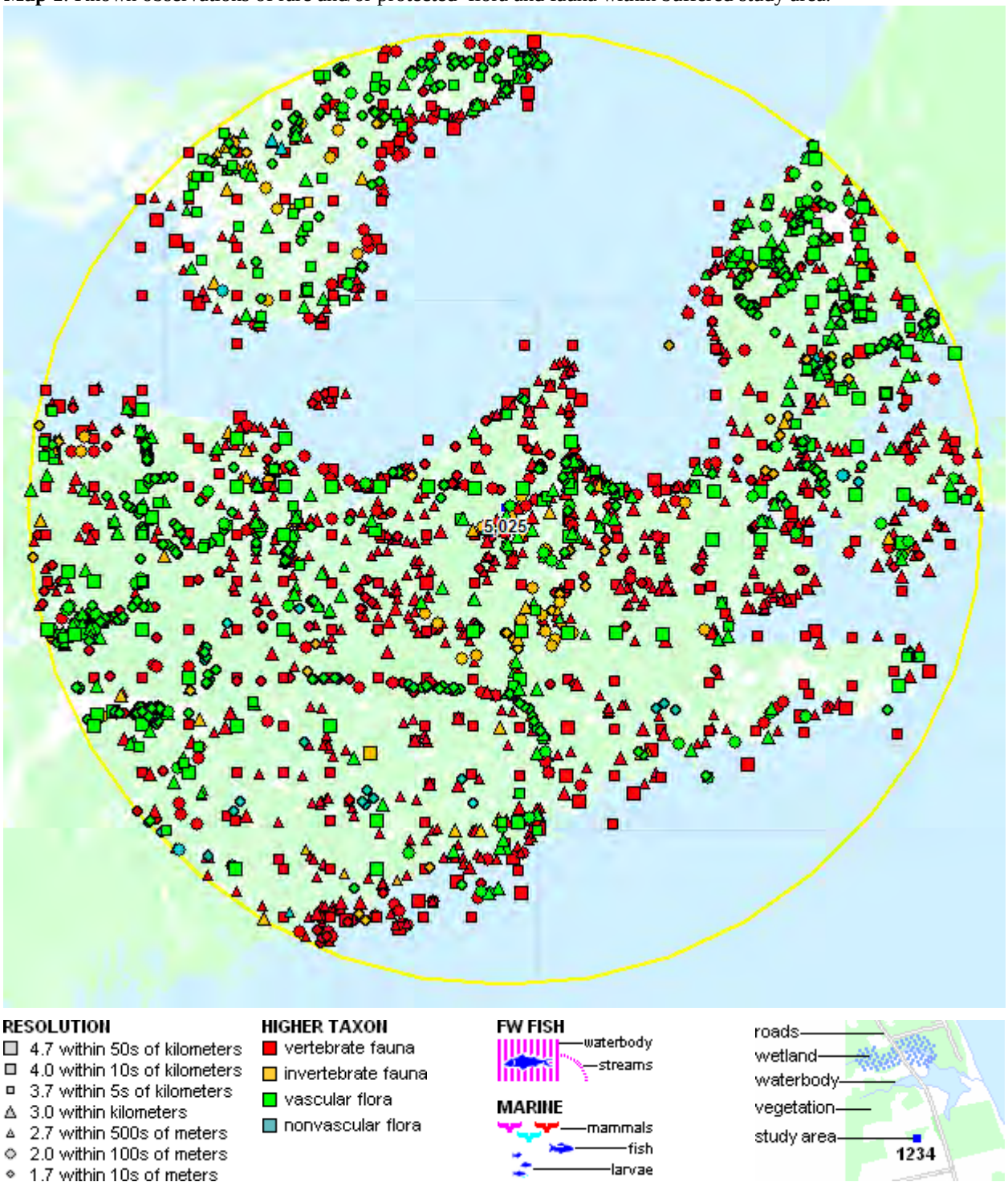
Map 1: Known observations of rare and/or protected flora and fauna within buffered study area.



3.0 SPECIAL AREAS

3.1 MANAGED AREAS
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3.2 SIGNIFICANT AREAS
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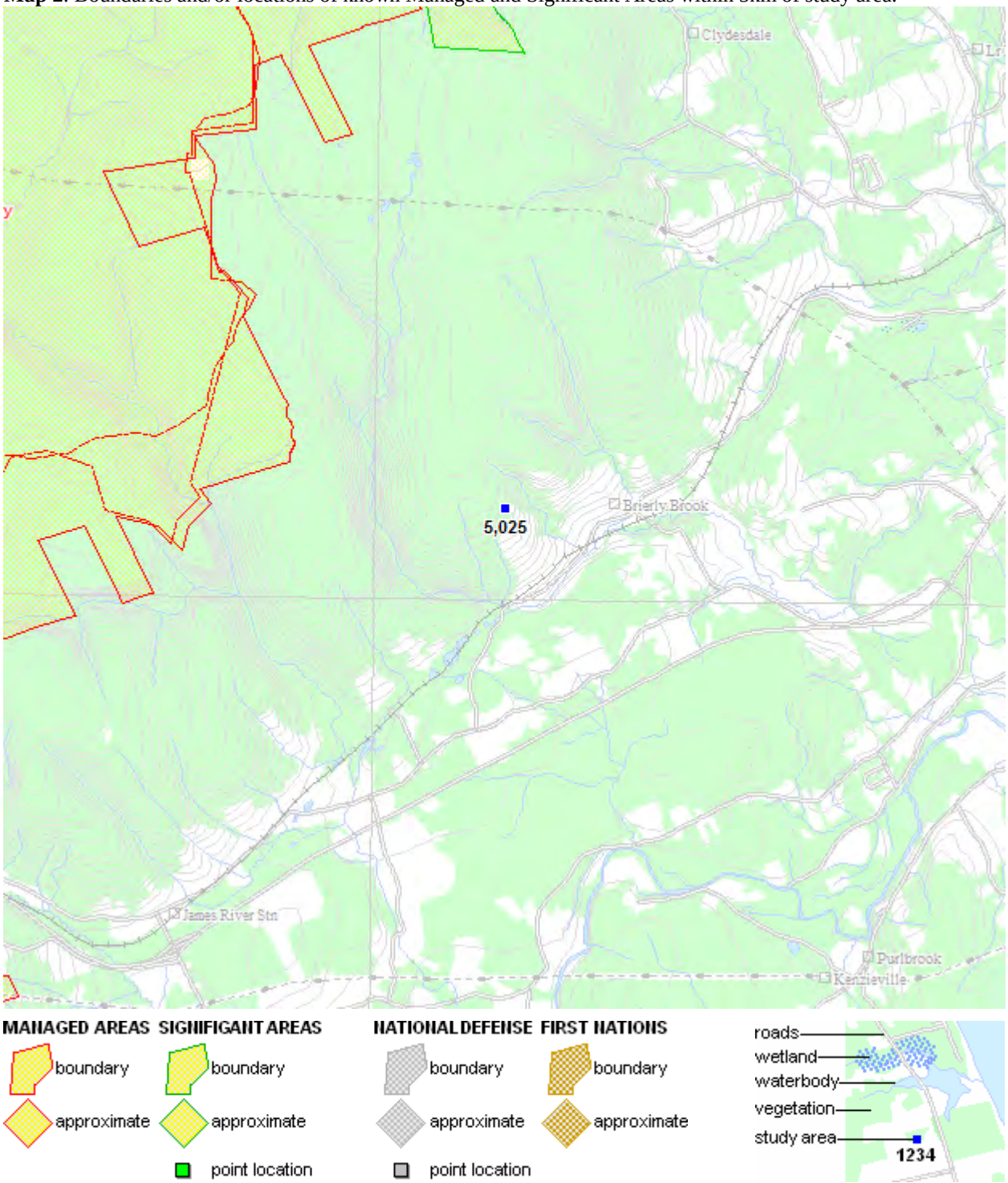
Map 2: Boundaries and/or locations of known Managed and Significant Areas within 5km of study area.



4.0 TAXON LISTS

Rare and/or endangered taxa within the buffered area listed in order of concern, beginning with legally listed taxa, with the number of observations per taxon and the distance in kilometers from study area centroid to the closest observation. [p] = vascular plant, [n] = nonvascular plant, [a] = vertebrate animal, [i] = invertebrate animal, [c] = community.

4.1 FLORA

scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km

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4.2 FAUNA

scientific name	common name	prov. rarity	prov. status	COSEWIC	obs	dist.km

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4.3 RANGE MAPS

The legally protected taxa listed below are linked to the study area by predictive range maps based upon expert estimates of distribution. Taxa listed here but not in the observation data above, are unknown within the study area but perhaps present. A potential for occurrence value of 1 indicates possible occurrence, with 2 and 3 increasly less probable.

scientific name	common name	prov. rarity	prov. status	COSEWIC	Potential for Occurrence

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5.0 SOURCE BIBLIOGRAPHY

The recipient of this data shall acknowledge the ACCDC and the data sources listed below in any documents, reports, publications or presentations, in which this dataset makes a significant contribution.

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Appendix III. WETLAND DATA DETERMINATION FORMS AND FUNCTIONAL ASSESSMENTS

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: Brierly Brook Municipality/County: Antigonish. Sampling Date: 4 June 13.

Applicant/Owner: Nova Construction. Sampling Point: Wet 1

Investigator(s): M. MacDonald Affiliation: McCallum Environmental

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 571102.3 mE Long: 5050974 m N Datum: NAD83

Soil Map Unit Name/Type: _____ Wetland Type: Mixed wood treed swamp

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	If yes, optional Wetland Site ID: Wetland I

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fagus grandifolia	10	✓	upl
2. Betula alleghaniensis	10	✓	fac
3. Abies balsamea	15	✓	fac
4. Acer saccharum	10	✓	facu
5.			
	45	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m.a)			
1. Acer saccharum	10	✓	facu
2. Abies balsamea	5		fac
3. Nemopanthus mucronatus	10	✓	fac
4. Acer pensylvanicum.	5		facu
5. Fagus grandifolia	3		upl
	30	= Total Cover	

Herb Stratum (Plot size: 1m)			
1. Phegopteris connectilis.	8		fac
2. Onoclea sensibilis.	10	✓	facw
3. Osmunda cinnamomea.	15	✓	fac
4. Ranunculus acris	10	✓	fac
5. Galium palustre	4		facw
6. Viola renifolia	3		fac
7.			
8.			
9.			
10.			
	50	= Total Cover	

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 10 (A)

Total Number of Dominant Species Across All Strata: 9 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Beverly Brook Sampling Point: Wetland 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0								Organic
0-18	10YR4/1	100					F	S/M loam.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 29 cm.

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ✓ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ✓ No ___ Depth (inches): Sum

Water Table Present? Yes ✓ No ___ Depth (inches): 0cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 0cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: Brierly Block Municipality/County: Antigonish Sampling Date: 4 June 13

Applicant/Owner: Nova Construction Sampling Point: Up 1

Investigator(s): M. MacDonald Affiliation: McCallum Env.

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none):

Slope (%): Lat: 5711 04m E Long: 5050 987mN Datum: NAD83

Soil Map Unit Name/Type: Wetland Type:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ✓	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	5		fac
2. Fraxinus americana	10	✓	fac
3. Acer saccharum	15	✓	facu
4. Abies balsamea	8	✓	fac
5.			
	28	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m)			
1. Acer rubrum	5		fac
2. Fraxinus americana	8		fac
3. Acer saccharum	15	✓	facu
4. Abies balsamea	10		fac
5. Betula papyrifera	15	✓	facu
	53	= Total Cover	

Herb Stratum (Plot size: 1m)			
1. Dennstaedtia punctilobula	20	✓	fac
2. Aralia nudicaulis	3		fac
3. Phegopteris connectilis	5		fac
4. Clintonia borealis	3		fac
5. Maianthanum trifoliatum	2		fac
6. Trientalis borealis	12		fac
7. Nemopanthus mucronatus	5		fac
8.			
9.			
10.			
	50	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ____ No ✓

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL ~~BP~~ Briarly Brook Sampling Point: Up 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches) cm	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
8-0								Organic.
0-23	5YR 4/4						F	Silty loam.

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 31 cm

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____

Water Table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: BrierlyBrook Municipality/County: Antigonish Sampling Date: 22 Aug 13

Applicant/Owner: Sampling Point: Wetland 2.

Investigator(s): M. MacDonald Affiliation: McCallum Env.

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none):

Slope (%): Lat: 571134mE Long: 5050071mN Datum: NAD83

Soil Map Unit Name/Type: Wetland Type:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____

Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No ____	**Is the Sampled Area within a Wetland?** Yes ✓ No ____
Hydric Soil Present?	Yes ✓ No ____	
Wetland Hydrology Present?	Yes ✓ No ____	If yes, optional Wetland Site ID: Wetland 2.

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Abies balsamea	3	✓	fac
2. Acer saccharum	4	✓	facu
3.			
4.			
5.			
	7 = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1.			
2.			
3.			
4.			
5.			
	0 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. Eupatorium perfoliatum	15	✓	facw
2. Juncus effusus	10		facw
3. Doellingeria umbellatus	5		fac
4. Polygonum sagittatum	5		obl
5. Scirpus cyperinus	5		facw
6. Carex gynandra	8		facw
7. Euthamia graminifolia	2		fac
8. Osmunda claytoniana	4		fac
9. Platanthera idcera	1		facw
10.			
	55 = Total Cover		
Woody Vine Stratum (Plot size: ____)			
1.			
2.			
	____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	5	x 1 =	5
FACW species	29	x 2 =	58
FAC species	14	x 3 =	42
FACU species	4	x 4 =	16
UPL species		x 5 =	
Column Totals:	52 (A)		121 (B)

Prevalence Index = B/A = 2.3

Hydrophytic Vegetation Indicators:

- ____ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ____ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ____ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Brierly Brook Sampling Point: Wet 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches) cm	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
5-0								Organic
0-15	10YR2/2						F	Silt loam
15-20	7.5YR2.5/3							

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 25cm

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ✓ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ✓ No ___ Depth (inches): 18cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 5cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: Brierly Brook Municipality/County: Antigonish Sampling Date: 22 Aug 13
Applicant/Owner: Nova Construction Sampling Point: Up2
Investigator(s): M. MacDonald Affiliation: McCallum Env.
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none):
Slope (%): Lat: 571127mE Long: 5051080mN Datum: NAD 83
Soil Map Unit Name/Type: Wetland Type:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ____ No ____ (If no, explain in Remarks.)
Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No ____
Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No ____	**Is the Sampled Area within a Wetland?** Yes ____ No ✓
Hydric Soil Present?	Yes ____	No ✓	
Wetland Hydrology Present?	Yes ____	No ✓	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Abies balsamea	25	✓	fac
2. Acer saccharum	20	✓	facu
3. Acer rubrum	5		fac
4.			
5.			
	50	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m)			
1. Fraxinus americana	5	✓	fac
2. Abies balsamea	10	✓	fac
3. Acer saccharum	10	✓	facu
4.			
5.			
	25	= Total Cover	

Herb Stratum (Plot size: 1m)			
1. Aralia nudicaulis	5	✓	fac
2. Dryopteris intermedia	3		fac
3. Maianthemum trifoliolatum	2		fac
4. Phegopteris connectilis	5	✓	fac
5. Polystichum arctostichoides	2		fac
6. Carex arctata	2		facu
7. Thelypteris noveboracensis	4		fac
8.			
9.			
10.			
	23	= Total Cover	

Woody Vine Stratum (Plot size: ____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)
Total Number of Dominant Species Across All Strata: 7 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 71% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species ____	x 1 = ____
FACW species ____	x 2 = ____
FAC species ____	x 3 = ____
FACU species ____	x 4 = ____
UPL species ____	x 5 = ____
Column Totals: ____ (A)	____ (B)

Prevalence Index = B/A = ____

Hydrophytic Vegetation Indicators:
___ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Briefly Bloody Sampling Point: Op 2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm / inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
5-0								Organic
0-20	5YR3/4						F	Silty loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 25 cm

Hydric Soil Present? Yes ____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ____ No ____ Depth (inches): ____

Water Table Present? Yes ____ No ____ Depth (inches): ____

Saturation Present? (includes capillary fringe) Yes ____ No ____ Depth (inches): ____

Wetland Hydrology Present? Yes ____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: Brierly Brook Municipality/County: Antigonish Sampling Date: 22 Aug 13
Applicant/Owner: Sampling Point: Wetland 3.
Investigator(s): M. MacDonald Affiliation: McCallum Environmental
Landform (hillslope, terrace, etc.): Local relief (concave, convex, none):
Slope (%): Lat: 571283mE Long: 5051057mN Datum: NAD83
Soil Map Unit Name/Type: Wetland Type:
Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)
Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No
Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ✓ No
Hydric Soil Present? Yes ✓ No
Wetland Hydrology Present? Yes No
Is the Sampled Area within a Wetland? Yes ✓ No
If yes, optional Wetland Site ID: Wetland 3

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus americana	40%	✓	fac
2. Betula alleghaniensis	5%		fac
3.			
4.			
5.			
	45% = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. Fraxinus americana	20%	✓	fac
2. Abies balsamea	5%		fac
3. Acer rubrum	5%		fac
4. Acer saccharum	2%		facu
5.			
	32 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. Onoclea sensibilis	70%	✓	facw
2. Solidago flexicaulis	5%		fac
3. Rubus pubescens	20%		fac
4. Impatiens capensis	1%		fac
5. Athyrium felix-femina	3%		fac
6. Galium asprellum	1%		obl
7. Doellingeria umbellatus	5%		fac
8. Lycopus americana	1%		obl
9. Solidago rugosa	2%		obl
10. Carex scabrata	2		obl
	168 = Total Cover		
Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:
Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)
Total Number of Dominant Species Across All Strata: 4 (B)
Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:
___ Rapid Test for Hydrophytic Vegetation
✓ Dominance Test is >50%
___ Prevalence Index is ≤3.0[1]
___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No

Remarks: (Include photo numbers here or on a separate sheet.)

Adapted from U.S. Army Corps of Engineers form for Northeast-North Central Supplement for use in Nova Scotia (2009)

SOIL Bierley Brook Sampling Point: Wet 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (cm) (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0								Organic
0-15	10YR 3/2	100						
15-30	10YR 3/3	98	5YR 2.5/1	2			F	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ✓ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 33cm

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): ___

Water Table Present? Yes ___ No ✓ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 10cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: Brierly Brook Municipality/County: Antigonish Sampling Date: 22 Aug 13

Applicant/Owner: Nova quarry Sampling Point: Wp 3

Investigator(s): M. MacDonald. Affiliation: McCallum Environmental

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 571288 mE Long: 5051050mN Datum: NAD 83

Soil Map Unit Name/Type: _____ Wetland Type: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes _____ No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes _____ No ✓
Hydric Soil Present?	Yes _____ No ✓	
Wetland Hydrology Present?	Yes _____ No ✓	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fraxinus americana	50	✓	fac
2. Acer saccharum	10		facu
3. Abies balsamea	5		fac
4.			
5.			
	65	= Total Cover	

Sapling/Shrub Stratum (Plot size: 5m)			
1. Abies balsamea	40	✓	fac
2. Fraxinus americana	20	✓	fac
3. Corylus cornuta	2		fac
4.			
5.			
	62	= Total Cover	

Herb Stratum (Plot size: 1m)			
1. Thelypteris noveboracensis	3	✓	fac
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
	3	= Total Cover	

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ✓ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

Adapted from U.S. Army Corps of Engineers form for Northeast-North Central Supplement for use in Nova Scotia (2009)

SOIL Brierly Block

Sampling Point: Up 3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
3-0								
3-25	5yr 3/2	100					F	Organic Silty

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Rock

Depth (inches): 28cm

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ___ Depth (inches): ___

Water Table Present? Yes ___ No ___ Depth (inches): ___

Saturation Present? (includes capillary fringe) Yes ___ No ___ Depth (inches): ___

Wetland Hydrology Present? Yes ___ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: Brierly Brook Municipality/County: Antigonish Sampling Date: 22 Aug 13

Applicant/Owner: Naval Construction Sampling Point: Wetland 4.

Investigator(s): M MacDonald Affiliation: McCallum

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____

Slope (%): _____ Lat: 571692 mE Long: 5058469 mN Datum: NAD83

Soil Map Unit Name/Type: _____ Wetland Type: Graminoid Swamp

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation X, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓ No _____	**Is the Sampled Area within a Wetland?** Yes ✓ No _____
Hydric Soil Present?	Yes ✓ No _____	
Wetland Hydrology Present?	Yes ✓ No _____	If yes, optional Wetland Site ID: Wetland 4.

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		
Sapling/Shrub Stratum (Plot size: 5m)			
1. Abies balsamea	5%	✓	fac
2.			
3.			
4.			
5.			
	5 = Total Cover		
Herb Stratum (Plot size: 1m)			
1. Juncus effusus	10		facw
2. Carex stricta	40	✓	obl
3. Boellingeria umbellatus	10		fac
4. Euthamia graminifolia	5		fac
5. Aster punctilobula	5		fac
6. Scirpus cyperinus	2		facw
7. Carex gynandra	2		facw
8. Solidago canadensis	10		fac
9. Dryopteris cristata	5		facw
10.			
	99 = Total Cover		
Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	_____ = Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	40	x 1 =	40
FACW species	19	x 2 =	38
FAC species	35	x 3 =	105
FACU species	_____	x 4 =	_____
UPL species	_____	x 5 =	_____
Column Totals:	94 (A)		183 (B)

Prevalence Index = B/A = 1.94

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ✓ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL Briefly Beside

Sampling Point: Wet 4.

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
5-0								
0-20	2.5YR 4/3	90	10YR 6/6	10	con		F	Organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ✓ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ___

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ✓ High Water Table (A2)
- ✓ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ✓ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes ___ No ✓ Depth (inches): _____

Water Table Present? Yes ✓ No ___ Depth (inches): 5cm

Saturation Present? (includes capillary fringe) Yes ✓ No ___ Depth (inches): 5 cm

Wetland Hydrology Present? Yes ✓ No ___

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

WETLAND DETERMINATION DATA FORM – NOVA SCOTIA

Project/Site: Bridley Brook Municipality/County: Antigonish Sampling Date: 22 Aug

Applicant/Owner: Sampling Point: Up 4

Investigator(s): M. MacDonald Affiliation: McCallum Env.

Landform (hillslope, terrace, etc.): Local relief (concave, convex, none):

Slope (%): Lat: 571679mE Long: 5050856mN Datum:

Soil Map Unit Name/Type: Wetland Type:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology Y significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No

Are Vegetation X, Soil X, or Hydrology Y naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No	**Is the Sampled Area within a Wetland?** Yes	No ✓
Hydric Soil Present?	Yes	No ✓	
Wetland Hydrology Present?	Yes	No ✓	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 10m)	Absolute % Cover	Dominant Species?	Indicator Status
1. Betula papyrifera	10	✓	facu
2. Abies balsamea	15	✓	fac
3. Picea glauca	5		fac
4. Acer rubrum	8		fac
5. Fraxinus americana	5		fac
	40 = Total Cover		

Sapling/Shrub Stratum (Plot size: 5m)			
1. Cornus sericea	5	✓	facw
2. Fraxinus americana	10	✓	fac
3. Abies balsamea	5		fac
4. Acer rubrum	2		fac
5.			
	22 = Total Cover		

Herb Stratum (Plot size: 1m)			
1. Fragaria virginiana	25	✓	fac
2. Epilobium angustifolia	30	✓	fac
3. Solidago rugosa	2		fac
4. Solidago canadensis	2		fac
5. Danthonia spicata	1		facu
6. Hieracium spp.	2		?
7.			
8.			
9.			
10.			
	62 = Total Cover		

Woody Vine Stratum (Plot size:)			
1.			
2.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 83% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:	
OBL species	x 1 =	
FACW species	x 2 =	
FAC species	x 3 =	
FACU species	x 4 =	
UPL species	x 5 =	
Column Totals: (A)		(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

- ___ Rapid Test for Hydrophytic Vegetation
- ✓ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ✓ No

Remarks: (Include photo numbers here or on a separate sheet.)

Adapted from U.S. Army Corps of Engineers form for Northeast-North Central Supplement for use in Nova Scotia (2009)

SOIL Brierly Block

Sampling Point: Up4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
10-0								
0-15	5YR 3/2						F	Organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Depleted Dark Surface (F7)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Polyvalue Below Surface (S8)
- ___ Thin Dark Surface (S9)
- ___ Loamy Mucky Mineral (F1)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Redox Depressions (F8)
- ___ Red Parent Material (TF2)

Indicators for Problematic Hydric Soils[3]:

- ___ Sandy Gleyed Matrix (S4)
- ___ Coast Prairie Redox (A16)
- ___ 5 cm Mucky Peat or Peat (S3)
- ___ Iron-Manganese Masses (F12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present? Yes _____ No _____ Depth (inches): _____

Water Table Present? Yes _____ No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes _____ No _____ Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

APPENDIX C:	Nova Scotia Wetland Evaluation Technique Field Data Sheet (September 2011)									
Wetland Number:	1									
Project Name: Brierly Brook		Evaluator: M. MacDonald		GPS Coordinates: 571102 m E, 5050974 m N						
PID: 10111946	Site Address: Lot 09-1, Brierly Brook Road, Antigonish, NS									
Sources and Dates of Mapping/Images:										
Evaluation Date: 22-Aug-13		Site Visit Date: 22-Aug-13								
Weather Conditions (past 48 hours): Seasonal, warm, dry										
Seasonal Weather Conditions: Warm, dry.										
SECTION ONE: WATERSHED CHARACTERISTICS										
1	Watershed Name (tertiary): Brierly Brook	Size: 3196.1 ha								
2	% Watershed Land Cover	For:71%	Nat:67%	Past/Hay:	Crop:14%	Urb/Com:5%	Road:2%	Other Dev:1%		
3	% Watershed WL Cover and by Class	Total: %	SM:	BO: 1%	FE:	FM:	FS: 2%	SS:	CP:	VP:
SF1	***Watershed condition***	***H***	***M √***	***L***						
SF2	***Proportion of WL area in watershed & opportunity for floodwater dete***	***H √***	***M***	***L***						
SECTION TWO: WETLAND CHARACTERISTICS										
Wetland Type: mixed wood treed swamp		WL size: 0.036 hectares		Landform: Basin				Landscape Position: Terrene		
Water flow path: Isolated		Wetland Origin: Natural								
1	Water Regime	PF	SF	TF	SS	PS √	RfT	IfT	AF	
2	# WL's within 30m project area	Total# 3	SM:	BO:	FE:	FM:	FS: 3	SS:	CP:	VP:
3	Is WL part of complex	Yes	No √							
4	% each wetland type in complex	SM:	BO:	FE:	FM:	FS:	SS:	CP:	VP:	
5	Is WL bordering or associated with a lake or pond?	bordering		within 100m		N/A √		specify		
6	Standing water?	Yes √	Avg Dep: 10 cm		% Inundated: 10		No			
7	Inlet or Outlet (circle all that apply)?	Inlet	Outlet							
8	Adjacent Upland Land Use within 100m (%)	For: 80	Nat:	PasHay:	Crop:	UrbCm:	Road:	Other Dev: Berm 20%		
9	Are there stressors in WL or WL buffer area? Circle primary stressor(s).	DD__, CW__, WcS__, O/C__,EB__,DP__,F__,M__, ES__,NE__,DwP__,								
		M__,GC__,ATV__,DG__,EA__, R__,Rr__,U/CD__,F__,FA__, other (specify): Berm								
10	Hydrology Altered (circle all that apply)?	Ditching	Dams	Tiles	Culvert	Well	Diversion	Other Specify:		
SF3	***Rate the general wetland condition/integrity***	**H √**	**M**	**L**						
SECTION THREE: ADJACENT LAND CONDITION AND INTEGRITY										
1	Average width of adjacent naturalized buffer	50 meters								
2	Widths for water quality	H >15 √	M 8-15	L <8						
3	Widths for wildlife habitat	H >100 √	M 15-100	L <15						
4	Adjacent area vegetation condition (list % in each category)	H 80%	M	L 20 %						
5	Adjacent area diversity and structure (list % in each category)	H 80%	M	L 20%						
6	Adjacent Upland Slope (list % in each category)	Steep	Mod	Gentle 100%						
7	Adjacent land supports water quality	*Yes √*	*No*	Specify:						
8	Adjacent land supports wildlife habitat	*Yes √*	*No*	Specify:						

SF4	***Rate the overall condition and integrity land adjacent to wetland***	***H***	***M √***	***L***	**is buffer required to maintain red flag functions of wetland? If yes if n**						
SECTION FOUR: DOCUMENTED IMPORTANT FEATURES											
SF5	***Is the WL a WSS?***	***Yes***	***No √***								
SF6	***Does the WL support commercial/recreational fish/shellfish?***	***Yes***	***No √***								
SF7	***Species of concern (Fed/Prov)? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A***	***√***
SF8	***Wetland has conservation/compensation agreements/activity?***	***Yes***	***No √***	specify:							
SF9	***Wetland is calcerous fen, black ash or cedar swamp?***	***Yes***	***No √***								
SF10	***Within Drinking Water Protected Area (designated watershed/wellfield***	***Yes***	***No √***	specify:							
SF11	***WL within a floodplain and upstream of or within of a populated area?***	***Yes***	***No √***								
SF12	***Fed/Prov/Municipal area of interest?***	***Yes***	***No √***	specify:							
SECTION FIVE: HYDROLOGIC CONDITION AND INTEGRITY											
1	Is WL source of stream or headwater(wc order 1 or 2)	***Yes***	No √	Specify:							
2	Is WL geographically isolated?	Yes √	No	Specify:							
3	WL ability to maintain characteristic hydrologic regime	High √		Med		Low					
4	Water Storage Depth (list % in each class)	>30cm	15-30cm	up to 15cm 10%		No ponding					
5	Signs of surface water retention observed?	SW_10_cm, WSL_√_, WCD__, WM__cm, SM__cm, SD__, AD__, ID__, PMT_√_, AI__, BT__, AR__, Other:									
6	Describe observable/historical anthropogenic sediment delivery	Low √		Med		High					
7	Disturbance of WL soils	Low √		Med		High					
8	Predominant soils adjacent to WL	Sand		Silt/loam √		Clay/bedrock					
9	Capacity of WL to alter/retard flows	High		Med		Low		N/A √			
10	Roughness coefficient for surface water flow path	High		Med		Low		N/A √			
11	Strormwater/Wastewater/Agricultural runoff detention	High		Med		Low √					
12	Water Source	Natural √		Mostly natural		Partly altered		Controlled			
13	Hydrology of tidal wetlands	Unrestricted		Reduced		Restricted		***N/A √***			
14	Coastal storm surge	***Yes***	No √								
SF13	***WL hydrologic condition***	***Natural √***	***Modified***		**Significantly Modified**						
SF14	***WL important for maintaining stream flow?***	***Yes***	***No √***								
SF15	***WL ability to detain surface water***	***High***	***Med √***	**Low**							
SECTION SIX: WATER QUALITY											
1	Strormwater/Wastewater/Agricultural runoff as water source?	High		Med		Low √					
2	Nutrients/sediments from surrounding land	High		Med		Low √					
3	Significant flood/stormwater attenuation	***Yes***	***No √***								
4	Vegetation capacity to settle suspended sediments	High		Med		Low √					
5	WL type /landscape position holds/filters runoff?	***Yes***	***No √***								
SF16	***Wetland improves water quality?***	***Yes √***	***No***								
SF17	***Evidence of excess nutrient loading/contamination?***	***Low √***	***Med***	***High***							
SF18	***WL contributes to water quality in downstream resources***	***High***	***Med***	***Low √***							
SECTION SEVEN: GROUNDWATER INTERACTIONS											

1	Describe soils in wetland	Recharge		Discharge √							
2	Land use / run off in subwatershed upstream	Recharge		Discharge √							
3	Conditions of upland soils within 200m of wetland	Recharge √		Discharge							
4	Hydroperiod of wetland	Recharge √		Discharge							
5	Describe inlet/outlet configuration	Recharge		Discharge √							
6	Characterize topographic relief surrounding wetland	Recharge		Discharge √							
SF19	***WL serves as a recharge site***	***Yes***	***No √***								
SF20	***WL serves as a discharge site***	***Yes √***	***No***								
SECTION EIGHT: SHORELINE STABILIZATION AND INTEGRITY											
1	Wetland fringing ocean/estuary/lake/pond/river/stream?	***Yes***	No √	streamwidth >4m		streamwidth<4m		WB Exposed	WB Sheltered		
2	% cover of rooted vegetation in shallow water zone	H >50%	M 10-50	L <10%							
3	Avg veg WL width b/w shoreline/streambank & 2 m depth contour	H >10m	M 3-10	L <3m							
4	Prevalence of strong-stemmed emerg. veg (shoreline marshes and fens o	High	Med	Low							
5	Describe shoreline erosion potential	High	Med	Low							
6	Shoreline/streambank veg condition upslope of water level	Low	Med	High	Artificial						
SF21	***WL ability to stabilize shoreline***	***H***	***M***	***L***	N/A						
SECTION NINE: PLANT COMMUNITY											
1	Vegetation diversity	High	Med √	Low							
1b	Dominant plant species and % cover in the WL	list: Abies balsamea 20%, Fagus grandifolia 13%, Osmunda cinnamomea 15%									
3	Dominant Non-native or Invasive species and % cover	Yes	No √	specify: %							
4	Vegetation Disturbance	H	M	L √	specify type(s) below						
5	Disturbance Types	H___,ATV___,G___,,M___,In__, D/D___, Im___, OAH___, Ii___, Sd___,E___,,other___,									
7	Vegetative Integrity of plant community	E	H √	M	L						
SF22	***Is the plant community unique or rare regionally or provincially?***	***Yes***	***no √***	***specify:***							
SF23	***Does the WL contain a diversity of plant communities***	***H***	***M***	***L √***							
SF24	***Rate the overall integrity/quality of plant community?***	***H √***	***M***	***L***							
SF25	***Are there any observed rare or endangered plant species? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***	
SECTION TEN: FISH AND WILDLIFE HABITAT AND INTEGRITY											
1	Interspersion of open water and vegetation (open water types only)	H	M	L	N/A √						
1b	% cover in vegetation verus open water	_____%									
2	Interspersion that best fits entire wetland	H	M	L	N/A √						
3	Wetland condition related to detritus	H	M	L	N/A √						
4	Interspersion of other wetlands in vicinity	H	M √	L							
6	Barriers/restriction between wetland and other habitat	L	M √	H	Berm and quarry to the south						
7	Noteworthy wildlife or evidence (birds, mammals, amphibians,etc)	Yes	No √	list:							
8	Connected to permanent water (accessible to fish)?	Exceptional	High	Med	Low	N/A √					
9	Fish species observed or evidence seen (list)	Yes	No √	list:							
10	Wetland part of contiguous upland or wetland:	>50ha √	25-50ha	10-25ha	<10ha						

11	WL provides habitat for:	**Amphibians**	**Reptiles**	Waterfowl	Waterbirds	**Mammals**	Fish	R/E species				
SF26	***Does wetland support fish/fish habitat?***	***Yes***	***No √***	***specify:***								
SF27	***Rare or endangered fish/wildlife species found in the wetland?***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***		
SF28	***Overall fish and wildlife habitat quality***	***H***	***M √***	**L**								
SECTION ELEVEN: COMMUNITY USE/VALUE												
1	Describe community use	VV__,CP__,CO__,PO__,PA__,,AV__,GB__,E__,HI__, WV__, BO__,HU__, PG__, BP__,F__, E__, R__, Other:										
SF29	***Rate the wetland's community use/value***	***H***	***M***	**L √**								

SF ratings highlighted in red indicate critical wetland functions or watershed conditions that are highly degraded. Whenever a wetland is found to have red-highlighted **SFs** the proponent is encouraged to contact NSE for advice about the approval because NSE is unlikely to approve alterations to wetlands that would affect these red-rated functions.

APPENDIX C:	Nova Scotia Wetland Evaluation Technique Field Data Sheet (September 2011)									
Wetland Number:	2									
Project Name: Brierly Brook		Evaluator: M. MacDonald			GPS Coordinates: 571134 m E, 5051071 m N					
PID: 10111946	Site Address: Lot 09-1, Brierly Brook Road, Antigonish, NS									
Sources and Dates of Mapping/Images:										
Evaluation Date: 22-Aug-13		Site Visit Date: 22-Aug-13								
Weather Conditions (past 48 hours): Seasonal, warm, dry										
Seasonal Weather Conditions: Warm, dry.										
SECTION ONE: WATERSHED CHARACTERISTICS										
1	Watershed Name (tertiary): Brierly Brook	Size: 3196.1 ha								
2	% Watershed Land Cover	For:71%	Nat:67%	Past/Hay:	Crop:14%	Urb/Com:5%	Road:2%	Other Dev:1%		
3	% Watershed WL Cover and by Class	Total: %	SM:	BO: 1%	FE:	FM:	FS: 2%	SS:	CP:	VP:
SF1	***Watershed condition***	***H***	***M √***	***L***						
SF2	***Proportion of WL area in watershed & opportunity for floodwater dete***	***H √***	***M***	***L***						
SECTION TWO: WETLAND CHARACTERISTICS										
Wetland Type: Coniferous treed swamp		WL size: 0.060 hectares			Landform: Basin			Landscape Position: Terrene		
Water flow path: Isolated		Wetland Origin: Natural								
1	Water Regime	PF	SF	TF	SS	PS √	RfT	IfT	AF	
2	# WL's within 30m project area	Total# 3	SM:	BO:	FE:	FM:	FS: 3	SS:	CP:	VP:
3	Is WL part of complex	Yes	No √							
4	% each wetland type in complex	SM:	BO:	FE:	FM:	FS:	SS:	CP:	VP:	
5	Is WL bordering or associated with a lake or pond?	bordering		within 100m		N/A √		specify		
6	Standing water?	Yes	Avg Dep:		% Inundated:		No √			
7	Inlet or Outlet (circle all that apply)?	Inlet	Outlet							
8	Adjacent Upland Land Use within 100m (%)	For: 100%	Nat:	PasHay:	Crop:	UrbCm:	Road:	Other Dev:		
9	Are there stressors in WL or WL buffer area? Circle primary stressor(s).	DD__, CW__, WcS__, O/C__,EB__,DP__,F__,M__, ES__,NE__,DwP__,								
		M__,GC__,ATV__,DG__,EA__, R__,Rr__,U/CD__,F__,FA__, other (specify):								
10	Hydrology Altered (circle all that apply)?	Ditching	Dams	Tiles	Culvert	Well	Diversion	Other Specify:		
SF3	***Rate the general wetland condition/integrity***	**H √**	**M**	**L**						
SECTION THREE: ADJACENT LAND CONDITION AND INTEGRITY										
1	Average width of adjacent naturalized buffer	50 meters								
2	Widths for water quality	H >15 √	M 8-15	L <8						
3	Widths for wildlife habitat	H >100 √	M 15-10(	L <15						
4	Adjacent area vegetation condition (list % in each category)	H 100%	M	L						
5	Adjacent area diversity and structure (list % in each category)	H 100%	M	L						
6	Adjacent Upland Slope (list % in each category)	Steep	Mod	Gentle 100%						
7	Adjacent land supports water quality	*Yes √*	*No*	Specify:						
8	Adjacent land supports wildlife habitat	*Yes √*	*No*	Specify:						

SF4	***Rate the overall condition and integrity land adjacent to wetland***	***H***	***M √***	***L***	**is buffer required to maintain red flag functions of wetland? If yes if no**						
SECTION FOUR: DOCUMENTED IMPORTANT FEATURES											
SF5	***Is the WL a WSS?***	***Yes***	***No √***								
SF6	***Does the WL support commercial/recreational fish/shellfish?***	***Yes***	***No √***								
SF7	***Species of concern (Fed/Prov)? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A***	***√***
SF8	***Wetland has conservation/compensation agreements/activity?***	***Yes***	***No √***	specify:							
SF9	***Wetland is calcerous fen, black ash or cedar swamp?***	***Yes***	***No √***								
SF10	***Within Drinking Water Protected Area (designated watershed/wellfield***	***Yes***	***No √***	specify:							
SF11	***WL within a floodplain and upstream of or within of a populated area?***	***Yes***	***No √***								
SF12	***Fed/Prov/Municipal area of interest?***	***Yes***	***No √***	specify:							
SECTION FIVE: HYDROLOGIC CONDITION AND INTEGRITY											
1	Is WL source of stream or headwater(wc order 1 or 2)	***Yes***	No √	Specify:							
2	Is WL geographically isolated?	Yes √	No	Specify:							
3	WL ability to maintain characteristic hydrologic regime	High √		Med		Low					
4	Water Storage Depth (list % in each class)	>30cm	15-30cm	up to 15cm		No ponding √					
5	Signs of surface water retention observed?	SW__cm, WSL_√_, WCD__, WM__cm, SM__cm, SD__, AD__, ID__, PMT_√_, AI__, BT__, AR__, Other:									
6	Describe observable/historical anthropogenic sediment delivery	Low √		Med		High					
7	Disturbance of WL soils	Low √		Med		High					
8	Predominant soils adjacent to WL	Sand		Silt/loam √		Clay/bedrock					
9	Capacity of WL to alter/retard flows	High		Med		Low		N/A √			
10	Roughness coefficient for surface water flow path	High		Med		Low		N/A √			
11	Strormwater/Wastewater/Agricultural runoff detention	High		Med		Low √					
12	Water Source	Natural √		Mostly natural		Partly altered		Controlled			
13	Hydrology of tidal wetlands	Unrestricted		Reduced		Restricted		***N/A √***			
14	Coastal storm surge	***Yes***	No √								
SF13	***WL hydrologic condition***	***Natural √***	***Modified***		**Significantly Modified**						
SF14	***WL important for maintaining stream flow?***	***Yes***	***No √***								
SF15	***WL ability to detain surface water***	***High***	***Med √***	**Low**							
SECTION SIX: WATER QUALITY											
1	Strormwater/Wastewater/Agricultural runoff as water source?	High		Med		Low √					
2	Nutrients/sediments from surrounding land	High		Med		Low √					
3	Significant flood/stormwater attenuation	***Yes***	***No √***								
4	Vegetation capacity to settle suspended sediments	High		Med		Low √					
5	WL type /landscape position holds/filters runoff?	***Yes √***	***No***								
SF16	***Wetland improves water quality?***	***Yes √***	***No***								
SF17	***Evidence of excess nutrient loading/contamination?***	***Low √***	***Med***	***High***							
SF18	***WL contributes to water quality in downstream resources***	***High***	***Med***	***Low √***							
SECTION SEVEN: GROUNDWATER INTERACTIONS											

1	Describe soils in wetland	Recharge		Discharge √					
2	Land use / run off in subwatershed upstream	Recharge		Discharge √					
3	Conditions of upland soils within 200m of wetland	Recharge √		Discharge					
4	Hydroperiod of wetland	Recharge √		Discharge					
5	Describe inlet/outlet configuration	Recharge		Discharge √					
6	Characterize topographic relief surrounding wetland	Recharge		Discharge √					
SF19	***WL serves as a recharge site***	***Yes***	***No √***						
SF20	***WL serves as a discharge site***	***Yes √***	***No***						
SECTION EIGHT: SHORELINE STABILIZATION AND INTEGRITY									
1	Wetland fringing ocean/estuary/lake/pond/river/stream?	***Yes***	No √	streamwidth >4m		streamwidth<4m		WB Exposed	WB Sheltered
2	% cover of rooted vegetation in shallow water zone	H >50%	M 10-50	L <10%					
3	Avg veg WL width b/w shoreline/streambank & 2 m depth contour	H >10m	M 3-10	L <3m					
4	Prevalence of strong-stemmed emerg. veg (shoreline marshes and fens o	High	Med	Low					
5	Describe shoreline erosion potential	High	Med	Low					
6	Shoreline/streambank veg condition upslope of water level	Low	Med	High	Artificial				
SF21	***WL ability to stabilize shoreline***	***H***	***M***	***L***	N/A				
SECTION NINE: PLANT COMMUNITY									
1	Vegetation diversity	High	Med √	Low					
1b	Dominant plant species and % cover in the WL	list: Eupatorium perfoliolatum 10%, Juncus effusus 10%, Carex gynandra 8%							
3	Dominant Non-native or Invasive species and % cover	Yes	No √	specify: %					
4	Vegetation Disturbance	H	M	L √	specify type(s) below				
5	Disturbance Types	H___,ATV___,G___,,M___,In__, D/D___, Im___, OAH___, Ii___, Sd___,E___,,other___,							
7	Vegetative Integrity of plant community	E	H √	M	L				
SF22	***Is the plant community unique or rare regionally or provincially?***	***Yes***	***no √***	***specify:***					
SF23	***Does the WL contain a diversity of plant communities***	***H***	***M***	***L √***					
SF24	***Rate the overall integrity/quality of plant community?***	***H √***	***M***	***L***					
SF25	***Are there any observed rare or endangered plant species? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3*** ***N/A √***
SECTION TEN: FISH AND WILDLIFE HABITAT AND INTEGRITY									
1	Interspersion of open water and vegetation (open water types only)	H	M	L	N/A √				
1b	% cover in vegetation verus open water	_____%							
2	Interspersion that best fits entire wetland	H	M	L	N/A √				
3	Wetland condition related to detritus	H	M	L	N/A √				
4	Interspersion of other wetlands in vicinity	H	M √	L					
6	Barriers/restriction between wetland and other habitat	L	M	H					
7	Noteworthy wildlife or evidence (birds, mammals, amphibians,etc)	Yes	No √	list:					
8	Connected to permanent water (accessible to fish)?	Exceptional	High	Med	Low	N/A √			
9	Fish species observed or evidence seen (list)	Yes	No √	list:					
10	Wetland part of contiguous upland or wetland:	>50ha √	25-50ha	10-25ha	<10ha				

11	WL provides habitat for:	**Amphibians**	**Reptiles**	Waterfowl	Waterbirds	**Mammals**	Fish	R/E species			
SF26	***Does wetland support fish/fish habitat?***	***Yes***	***No √***	***specify:***							
SF27	***Rare or endangered fish/wildlife species found in the wetland?***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***	
SF28	***Overall fish and wildlife habitat quality***	***H***	***M √***	**L**							
SECTION ELEVEN: COMMUNITY USE/VALUE											
1	Describe community use	VV__,CP__,CO__,PO__,PA__,,AV__,GB__,E__,HI__, WV__, BO__,HU__, PG__, BP__,F__, E__, R__, Other:									
SF29	***Rate the wetland's community use/value***	***H***	***M***	**L √**							

SF ratings highlighted in red indicate critical wetland functions or watershed conditions that are highly degraded. Whenever a wetland is found to have red-highlighted **SFs** the proponent is encouraged to contact NSE for advice about the approval because NSE is unlikely to approve alterations to wetlands that would affect these red-rated functions.

APPENDIX C:	Nova Scotia Wetland Evaluation Technique Field Data Sheet (September 2011)									
Wetland Number:	3									
Project Name: Brierly Brook		Evaluator: M. MacDonald			GPS Coordinates: 571283 m E, 5051057 m N					
PID: 10111946	Site Address: Lot 09-1, Brierly Brook Road, Antigonish, NS									
Sources and Dates of Mapping/Images:										
Evaluation Date: 22-Aug-13		Site Visit Date: 22-Aug-13								
Weather Conditions (past 48 hours): Seasonal, warm, dry										
Seasonal Weather Conditions: Warm, dry.										
SECTION ONE: WATERSHED CHARACTERISTICS										
1	Watershed Name (tertiary): Brierly Brook	Size: 3196.1 ha								
2	% Watershed Land Cover	For:71%	Nat:67%	Past/Hay:	Crop:14%	Urb/Com:5%	Road:2%	Other Dev:1%		
3	% Watershed WL Cover and by Class	Total: %	SM:	BO: 1%	FE:	FM:	FS: 2%	SS:	CP:	VP:
SF1	***Watershed condition***	***H***	***M √***	***L***						
SF2	***Proportion of WL area in watershed & opportunity for floodwater dete***	***H √***	***M***	***L***						
SECTION TWO: WETLAND CHARACTERISTICS										
Wetlland Type: Deciduous treed swamp		WL size: 0.069 hectares			Landform: Basin			Landscape Position: Headwater		
Water flow path: Outflow		Wetland Origin: Natural								
1	Water Regime	PF	SF	TF	SS	PS √	RfT	IfT	AF	
2	# WL's within 30m project area	Total# 3	SM:	BO:	FE:	FM:	FS: 3	SS:	CP:	VP:
3	Is WL part of complex	Yes	No √							
4	% each wetland type in complex	SM:	BO:	FE:	FM:	FS:	SS:	CP:	VP:	
5	Is WL bordering or associated with a lake or pond?	bordering		within 100m		N/A √		specify		
6	Standing water?	Yes	Avg Dep:		% Inundated:		No √			
7	Inlet or Outlet (circle all that apply)?	Inlet	Outlet √							
8	Adjacent Upland Land Use within 100m (%)	For: 90%	Nat:	PasHay:	Crop:	UrbCm:	Road:	Other Dev: 20% berm		
9	Are there stressors in WL or WL buffer area? Circle primary stressor(s).	DD_√_, CW__, WcS_√_, O/C__,EB__,DP__,F__,M__, ES__,NE__,DwP__,								
		M__,GC__,ATV__,DG__,EA__, R__,Rr__,U/CD__,F__,FA__, other (specify):								
10	Hydrology Altered (circle all that apply)?	Ditching	Dams	Tiles	Culvert	Well	Diversion	Other Specify:		
SF3	***Rate the general wetland condition/integrity***	**H √**	**M**	**L**						
SECTION THREE: ADJACENT LAND CONDITION AND INTEGRITY										
1	Average width of adjacent naturalized buffer	50 meters								
2	Widths for water quality	H >15 √	M 8-15	L <8						
3	Widths for wildlife habitat	H >100 √	M 15-10	L <15						
4	Adjacent area vegetation condition (list % in each category)	H 90%	M	L 10%						
5	Adjacent area diversity and structure (list % in each category)	H 90%	M	L 10%						
6	Adjacent Upland Slope (list % in each category)	Steep	Mod	Gentle 100%						
7	Adjacent land supports water quality	*Yes √*	*No*	Specify:						
8	Adjacent land supports wildlife habitat	*Yes √*	*No*	Specify:						

SF4	***Rate the overall condition and integrity land adjacent to wetland***	***H***	***M √***	***L***	**is buffer required to maintain red flag functions of wetland? If yes if r**						
SECTION FOUR: DOCUMENTED IMPORTANT FEATURES											
SF5	***Is the WL a WSS?***	***Yes***	***No √***								
SF6	***Does the WL support commercial/recreational fish/shellfish?***	***Yes***	***No √***								
SF7	***Species of concern (Fed/Prov)? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A***	***√***
SF8	***Wetland has conservation/compensation agreements/activity?***	***Yes***	***No √***	specify:							
SF9	***Wetland is calcerous fen, black ash or cedar swamp?***	***Yes***	***No √***								
SF10	***Within Drinking Water Protected Area (designated watershed/wellfield***	***Yes***	***No √***	specify:							
SF11	***WL within a floodplain and upstream of or within of a populated area?***	***Yes***	***No √***								
SF12	***Fed/Prov/Municipal area of interest?***	***Yes***	***No √***	specify:							
SECTION FIVE: HYDROLOGIC CONDITION AND INTEGRITY											
1	Is WL source of stream or headwater(wc order 1 or 2)	***Yes √***	No	Specify:							
2	Is WL geographically isolated?	Yes	No √	Specify: Outlet watercourse							
3	WL ability to maintain characteristic hydrologic regime	High √		Med		Low					
4	Water Storage Depth (list % in each class)	>30cm	15-30cm	up to 15cm		No ponding √					
5	Signs of surface water retention observed?	SW__cm, WSL_√_, WCD__, WM__cm, SM__cm, SD__, AD__, ID__, PMT_√_, AI__, BT__, AR__, Other:									
6	Describe observable/historical anthropogenic sediment delivery	Low		Med √		High					
7	Disturbance of WL soils	Low √		Med		High					
8	Predominant soils adjacent to WL	Sand		Silt/loam √		Clay/bedrock					
9	Capacity of WL to alter/retard flows	High		Med		Low		N/A √			
10	Roughness coefficient for surface water flow path	High		Med		Low		N/A √			
11	Strormwater/Wastewater/Agricultural runoff detention	High		Med		Low √					
12	Water Source	Natural √		Mostly natural		Partly altered		Controlled			
13	Hydrology of tidal wetlands	Unrestricted		Reduced		Restricted		***N/A √***			
14	Coastal storm surge	***Yes***	No √								
SF13	***WL hydrologic condition***	***Natural √***	***Modified***		**Significantly Modified**						
SF14	***WL important for maintaining stream flow?***	***Yes √***	***No***								
SF15	***WL ability to detain surface water***	***High***	***Med √***	**Low**							
SECTION SIX: WATER QUALITY											
1	Strormwater/Wastewater/Agricultural runoff as water source?	High		Med		Low √					
2	Nutrients/sediments from surrounding land	High		Med		Low √					
3	Significant flood/stormwater attenuation	***Yes***	***No √***								
4	Vegetation capacity to settle suspended sediments	High		Med		Low √					
5	WL type /landscape position holds/filters runoff?	***Yes***	***No √***								
SF16	***Wetland improves water quality?***	***Yes √***	***No***								
SF17	***Evidence of excess nutrient loading/contamination?***	***Low √***	***Med***	***High***							
SF18	***WL contributes to water quality in downstream resources***	***High***	***Med***	***Low √***							
SECTION SEVEN: GROUNDWATER INTERACTIONS											

1	Describe soils in wetland	Recharge		Discharge √						
2	Land use / run off in subwatershed upstream	Recharge		Discharge √						
3	Conditions of upland soils within 200m of wetland	Recharge √		Discharge						
4	Hydroperiod of wetland	Recharge √		Discharge						
5	Describe inlet/outlet configuration	Recharge		Discharge √						
6	Characterize topographic relief surrounding wetland	Recharge		Discharge √						
SF19	***WL serves as a recharge site***	***Yes***	***No √***							
SF20	***WL serves as a discharge site***	***Yes √***	***No***							
SECTION EIGHT: SHORELINE STABILIZATION AND INTEGRITY										
1	Wetland fringing ocean/estuary/lake/pond/river/stream?	***Yes***	No √	streamwidth >4m		streamwidth<4m		WB Exposed	WB Sheltered	
2	% cover of rooted vegetation in shallow water zone	H >50%	M 10-50	L <10%						
3	Avg veg WL width b/w shoreline/streambank & 2 m depth contour	H >10m	M 3-10	L <3m						
4	Prevalence of strong-stemmed emerg. veg (shoreline marshes and fens o	High	Med	Low						
5	Describe shoreline erosion potential	High	Med	Low						
6	Shoreline/streambank veg condition upslope of water level	Low	Med	High	Artificial					
SF21	***WL ability to stabilize shoreline***	***H***	***M***	***L***	N/A					
SECTION NINE: PLANT COMMUNITY										
1	Vegetation diversity	High	Med √	Low						
1b	Dominant plant species and % cover in the WL	list: Fraxinus americanus 60%, Onoclea sensibilis 70%, Rubus pubescens 20%								
3	Dominant Non-native or Invasive species and % cover	Yes	No √	specify: %						
4	Vegetation Disturbance	H	M	L √	specify type(s) below					
5	Disturbance Types	H___,ATV___,G___,,M___,In__, D/D___, Im___, OAH___, Ii___, Sd___,E___,,other___,								
7	Vegetative Integrity of plant community	E	H √	M	L					
SF22	***Is the plant community unique or rare regionally or provincially?***	***Yes***	***no √***	***specify:***						
SF23	***Does the WL contain a diversity of plant communities***	***H***	***M***	***L √***						
SF24	***Rate the overall integrity/quality of plant community?***	***H √***	***M***	***L***						
SF25	***Are there any observed rare or endangered plant species? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***
SECTION TEN: FISH AND WILDLIFE HABITAT AND INTEGRITY										
1	Interspersion of open water and vegetation (open water types only)	H	M	L	N/A √					
1b	% cover in vegetation verus open water	_____%								
2	Interspersion that best fits entire wetland	H	M	L	N/A √					
3	Wetland condition related to detritus	H	M	L	N/A √					
4	Interspersion of other wetlands in vicinity	H	M √	L						
6	Barriers/restriction between wetland and other habitat	L	M	H						
7	Noteworthy wildlife or evidence (birds, mammals, amphibians,etc)	Yes	No √	list:						
8	Connected to permanent water (accessible to fish)?	Exceptional	High	Med	Low √	N/A				
9	Fish species observed or evidence seen (list)	Yes	No √	list:						
10	Wetland part of contiguous upland or wetland:	>50ha √	25-50ha	10-25ha	<10ha					

11	WL provides habitat for:	**Amphibians**	**Reptiles**	Waterfowl	Waterbirds	**Mammals**	Fish	R/E species			
SF26	***Does wetland support fish/fish habitat?***	***Yes***	***No √***	***specify:***							
SF27	***Rare or endangered fish/wildlife species found in the wetland?***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***	
SF28	***Overall fish and wildlife habitat quality***	***H***	***M √***	**L**							
SECTION ELEVEN: COMMUNITY USE/VALUE											
1	Describe community use	VV__,CP__,CO__,PO__,PA__,,AV__,GB__,E__,HI__, WV__, BO__,HU__, PG__, BP__,F__, E__, R__, Other:									
SF29	***Rate the wetland's community use/value***	***H***	***M***	**L √**							

SF ratings highlighted in red indicate critical wetland functions or watershed conditions that are highly degraded. Whenever a wetland is found to have red-highlighted **SFs** the proponent is encouraged to contact NSE for advice about the approval because NSE is unlikely to approve alterations to wetlands that would affect these red-rated functions.

APPENDIX C:	Nova Scotia Wetland Evaluation Technique Field Data Sheet (September 2011)									
Wetland Number:	4									
Project Name: Brierly Brook		Evaluator: M. MacDonald			GPS Coordinates: 571692 m E, 5050869 m N					
PID: 10111946	Site Address: Lot 09-1, Brierly Brook Road, Antigonish, NS									
Sources and Dates of Mapping/Images:										
Evaluation Date: 22-Aug-13		Site Visit Date: 22-Aug-13								
Weather Conditions (past 48 hours): Seasonal, warm, dry										
Seasonal Weather Conditions: Warm, dry.										
SECTION ONE: WATERSHED CHARACTERISTICS										
1	Watershed Name (tertiary): Brierly Brook	Size: 3196.1 ha								
2	% Watershed Land Cover	For:71%	Nat:67%	Past/Hay:	Crop:14%	Urb/Com:5%	Road:2%	Other Dev:1%		
3	% Watershed WL Cover and by Class	Total: %	SM:	BO: 1%	FE:	FM:	FS: 2%	SS:	CP:	VP:
SF1	***Watershed condition***	***H***	***M √***	***L***						
SF2	***Proportion of WL area in watershed & opportunity for floodwater dete***	***H √***	***M***	***L***						
SECTION TWO: WETLAND CHARACTERISTICS										
Wetland Type: Graminoid swamp		WL size: 0.049 hectares			Landform: Basin			Landscape Position: Terrene		
Water flow path: Isolated		Wetland Origin: Natural								
1	Water Regime	PF	SF	TF	SS	PS √	RfT	IfT	AF	
2	# WL's within 30m project area	Total# 3	SM:	BO:	FE:	FM:	FS: 3	SS:	CP:	VP:
3	Is WL part of complex	Yes	No √							
4	% each wetland type in complex	SM:	BO:	FE:	FM:	FS:	SS:	CP:	VP:	
5	Is WL bordering or associated with a lake or pond?	bordering		within 100m		N/A √		specify		
6	Standing water?	Yes	Avg Dep:		% Inundated:		No √			
7	Inlet or Outlet (circle all that apply)?	Inlet	Outlet							
8	Adjacent Upland Land Use within 100m (%)	For: 100%	Nat:	PasHay:	Crop:	UrbCm:	Road:	Other Dev:		
9	Are there stressors in WL or WL buffer area? Circle primary stressor(s).	DD__, CW__, WcS__, O/C__,EB__,DP__,F__,M__, ES__,NE__,DwP__,								
		M__,GC__,ATV__,DG__,EA__, R__,Rr__,U/CD__,F__,FA__, other (specify):								
10	Hydrology Altered (circle all that apply)?	Ditching	Dams	Tiles	Culvert	Well	Diversion	Other Specify:		
SF3	***Rate the general wetland condition/integrity***	**H √**	**M**	**L**						
SECTION THREE: ADJACENT LAND CONDITION AND INTEGRITY										
1	Average width of adjacent naturalized buffer	50 meters								
2	Widths for water quality	H >15 √	M 8-15	L <8						
3	Widths for wildlife habitat	H >100 √	M 15-10	L <15						
4	Adjacent area vegetation condition (list % in each category)	H 100%	M	L						
5	Adjacent area diversity and structure (list % in each category)	H 100%	M	L						
6	Adjacent Upland Slope (list % in each category)	Steep	Mod	Gentle 100%						
7	Adjacent land supports water quality	*Yes √*	*No*	Specify:						
8	Adjacent land supports wildlife habitat	*Yes √*	*No*	Specify:						

SF4	***Rate the overall condition and integrity land adjacent to wetland***	***H √***	***M***	***L***	**is buffer required to maintain red flag functions of wetland? If yes if n**					
SECTION FOUR: DOCUMENTED IMPORTANT FEATURES										
SF5	***Is the WL a WSS?***	***Yes***	***No √***							
SF6	***Does the WL support commercial/recreational fish/shellfish?***	***Yes***	***No √***							
SF7	***Species of concern (Fed/Prov)? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***
SF8	***Wetland has conservation/compensation agreements/activity?***	***Yes***	***No √***	specify:						
SF9	***Wetland is calcerous fen, black ash or cedar swamp?***	***Yes***	***No √***							
SF10	***Within Drinking Water Protected Area (designated watershed/wellfiel***	***Yes***	***No √***	specify:						
SF11	***WL within a floodplain and upstream of or within of a populated area?***	***Yes***	***No √***							
SF12	***Fed/Prov/Municipal area of interest?***	***Yes***	***No √***	specify:						
SECTION FIVE: HYDROLOGIC CONDITION AND INTEGRITY										
1	Is WL source of stream or headwater(wc order 1 or 2)	***Yes***	No √	Specify:						
2	Is WL geographically isolated?	Yes √	No	Specify:						
3	WL ability to maintain characteristic hydrologic regime	High √		Med		Low				
4	Water Storage Depth (list % in each class)	>30cm	15-30cm	up to 15cm		No ponding √				
5	Signs of surface water retention observed?	SW__cm, WSL_√_, WCD__, WM__cm, SM__cm, SD__, AD__, ID__, PMT_√_, AI__, BT__, AR__, Other:								
6	Describe observable/historical anthropogenic sediment delivery	Low √		Med		High				
7	Disturbance of WL soils	Low √		Med		High				
8	Predominant soils adjacent to WL	Sand		Silt/loam √		Clay/bedrock				
9	Capacity of WL to alter/retard flows	High		Med		Low		N/A √		
10	Roughness coefficient for surface water flow path	High		Med		Low		N/A √		
11	Strormwater/Wastewater/Agricultural runoff detention	High		Med		Low √				
12	Water Source	Natural √		Mostly natural		Partly altered		Controlled		
13	Hydrology of tidal wetlands	Unrestricted		Reduced		Restricted		***N/A √***		
14	Coastal storm surge	***Yes***	No √							
SF13	***WL hydrologic condition***	***Natural √***	***Modified***		**Significantly Modified**					
SF14	***WL important for maintaining stream flow?***	***Yes***	***No √***							
SF15	***WL ability to detain surface water***	***High***	***Med √***	**Low**						
SECTION SIX: WATER QUALITY										
1	Strormwater/Wastewater/Agricultural runoff as water source?	High		Med		Low √				
2	Nutrients/sediments from surrounding land	High		Med		Low √				
3	Significant flood/stormwater attenuation	***Yes***	***No √***							
4	Vegetation capacity to settle suspended sediments	High		Med		Low √				
5	WL type /landscape position holds/filters runoff?	***Yes √***	***No***							
SF16	***Wetland improves water quality?***	***Yes √***	***No***							
SF17	***Evidence of excess nutrient loading/contamination?***	***Low √***	***Med***	***High***						
SF18	***WL contributes to water quality in downstream resources***	***High***	***Med***	***Low √***						
SECTION SEVEN: GROUNDWATER INTERACTIONS										

1	Describe soils in wetland	Recharge		Discharge √						
2	Land use / run off in subwatershed upstream	Recharge		Discharge √						
3	Conditions of upland soils within 200m of wetland	Recharge √		Discharge						
4	Hydroperiod of wetland	Recharge √		Discharge						
5	Describe inlet/outlet configuration	Recharge		Discharge √						
6	Characterize topographic relief surrounding wetland	Recharge		Discharge √						
SF19	***WL serves as a recharge site***	***Yes***	***No √***							
SF20	***WL serves as a discharge site***	***Yes √***	***No***							
SECTION EIGHT: SHORELINE STABILIZATION AND INTEGRITY										
1	Wetland fringing ocean/estuary/lake/pond/river/stream?	***Yes***	No √	streamwidth >4m		streamwidth<4m		WB Exposed	WB Sheltered	
2	% cover of rooted vegetation in shallow water zone	H >50%	M 10-50	L <10%						
3	Avg veg WL width b/w shoreline/streambank & 2 m depth contour	H >10m	M 3-10	L <3m						
4	Prevalence of strong-stemmed emerg. veg (shoreline marshes and fens o	High	Med	Low						
5	Describe shoreline erosion potential	High	Med	Low						
6	Shoreline/streambank veg condition upslope of water level	Low	Med	High	Artificial					
SF21	***WL ability to stabilize shoreline***	***H***	***M***	***L***	N/A					
SECTION NINE: PLANT COMMUNITY										
1	Vegetation diversity	High	Med √	Low						
1b	Dominant plant species and % cover in the WL	list: Carex stricta, 40%, Juncus effusus 10%, Doellingeria umbellatus 10%								
3	Dominant Non-native or Invasive species and % cover	Yes	No √	specify: %						
4	Vegetation Disturbance	H	M	L √	specify type(s) below					
5	Disturbance Types	H___,ATV___,G___,,M___,In__, D/D___, Im___, OAH___, Ii___, Sd___,E___,,other___,								
7	Vegetative Integrity of plant community	E	H √	M	L					
SF22	***Is the plant community unique or rare regionally or provincially?***	***Yes***	***no √***	***specify:***						
SF23	***Does the WL contain a diversity of plant communities***	***H***	***M***	***L √***						
SF24	***Rate the overall integrity/quality of plant community?***	***H √***	***M***	***L***						
SF25	***Are there any observed rare or endangered plant species? Specify.***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***
SECTION TEN: FISH AND WILDLIFE HABITAT AND INTEGRITY										
1	Interspersion of open water and vegetation (open water types only)	H	M	L	N/A √					
1b	% cover in vegetation verus open water	_____%								
2	Interspersion that best fits entire wetland	H	M	L	N/A √					
3	Wetland condition related to detritus	H	M	L	N/A √					
4	Interspersion of other wetlands in vicinity	H	M √	L						
6	Barriers/restriction between wetland and other habitat	L	M	H						
7	Noteworthy wildlife or evidence (birds, mammals, amphibians,etc)	Yes	No √	list:						
8	Connected to permanent water (accessible to fish)?	Exceptional	High	Med	Low	N/A √				
9	Fish species observed or evidence seen (list)	Yes	No √	list:						
10	Wetland part of contiguous upland or wetland:	>50ha √	25-50ha	10-25ha	<10ha					

11	WL provides habitat for:	**Amphibians**	**Reptiles**	Waterfowl	Waterbirds	**Mammals**	Fish	R/E species			
SF26	***Does wetland support fish/fish habitat?***	***Yes***	***No √***	***specify:***							
SF27	***Rare or endangered fish/wildlife species found in the wetland?***	***End***	***Thr***	***SpC***	***Red***	***Yellow***	***S1***	***S2***	***S3***	***N/A √***	
SF28	***Overall fish and wildlife habitat quality***	***H***	***M √***	**L**							
SECTION ELEVEN: COMMUNITY USE/VALUE											
1	Describe community use	VV__,CP__,CO__,PO__,PA__,,AV__,GB__,E__,HI__, WV__, BO__,HU__, PG__, BP__,F__, E__, R__, Other:									
SF29	***Rate the wetland's community use/value***	***H***	***M***	**L √**							

SF ratings highlighted in red indicate critical wetland functions or watershed conditions that are highly degraded. Whenever a wetland is found to have red-highlighted **SFs** the proponent is encouraged to contact NSE for advice about the approval because NSE is unlikely to approve alterations to wetlands that would affect these red-rated functions.

Appendix IV. PROJECT TEAM MEMBERS' CVs

McCallum Environmental Ltd.

Meghan Milloy, BSc. (Bio), MES
meghan@mccallumenvironmental.com
Vice President

Years in Practice
13

Certifications
Nova Scotia Advanced Wetlands Delineator and Evaluator

Memberships
Nova Scotia Wetlands Delineation, Maritime College of Forest Technology

Education
- Master in Environmental Studies (MES), York University, Toronto, Ontario, 1997-1999
- BSc. (Biology), Dalhousie University, 1992-1997
- BA (Political Science), Honours, Dalhousie University, 1992-1997

Training
- Urban Wetland Restoration: A Watershed Approach, 2012
- Nova Scotia Advanced Wetlands Delineation and Evaluation Course, 2009;
- Water Management and Wetland Restoration Training Course, 2009;
- Identifying and Delineating Wetlands for Nova Scotia, 2008
- Saint John Ambulance Standard First Aid, AED, CPR(C). 2013

Summary

Ms. Milloy oversees, manages, and executes environmental projects. She completes wetland delineations and characterizations, and guides clients through the environmental and permitting stages of development projects. Ms. Milloy also guides clients through provincial and federal environmental assessment requirements. Ms. Milloy has submitted multiple applications for Transport Canada, under the Navigable Waters Protection Program, has submitted numerous Department of Fisheries and Oceans HADD applications (freshwater and marine) and has developed HADD compensation programs. Ms. Milloy regularly completes applications for wetland alteration and development across Atlantic Canada, and has developed and implemented wetland compensation programs. Ms. Milloy is a trained wetland restoration professional. Ms. Milloy is also knowledgeable in preparing Environmental Management Plans and Emergency Preparedness Plans for development projects.

Ms. Milloy is also involved with programs including the remediation of contaminated commercial and residential sites, and the execution of Phased Site Assessments in accordance with the Nova Scotia Management of Contaminated Sites Guidelines and CSA. Ms. Milloy is knowledgeable in risk assessment processes, and completes both qualitative and quantitative risk assessments for commercial and residential properties. Ms. Milloy has extensive experience working with the Atlantic Risk Based Corrective Action (RBCA) risk assessment process for hydrocarbon-impacted sites, and is proficient in plume characterization and exposure assessment.

Selected Project Experience

- Completed watershed planning for the Sackville River Secondary watershed to evaluation wetland restoration potential and to aid in better land use planning, source water protection and management of water resources.
- Completion of 35-45 projects involving watershed evaluation, land use classification, wetland delineation and alteration and infill, and compensation planning for numerous residential and commercial large-scale developments across Nova Scotia and New Brunswick.
- Completion of a wetland alteration application and associated compensation for 24 individual wetlands associated with road development in support of a planned residential development in Sackville Nova Scotia.
- Completed the Provincial Environmental Assessment for the 80 MW Glen Dhu South Wind Power Project, Nova Scotia, for Shear Wind Inc. The Project received Ministerial approval on March 16, 2012.
- Project Management of regulatory permitting and environmental assessments for a 50 MW Wind Power Project in Nova Scotia for Sprott Power Corp.
- Completion of wetland delineation and watercourse identification for two large scale developments (200 ha and 400 ha) in 2012.
- Completion of provincial permitting requirements including wetland alteration and compensation planning, and watercourse alteration for a proposed marine terminal and associated 20 km rail and transmission line in Nova Scotia.
- Developed and implemented wetland restoration and creation projects as

Meghan Milloy, BSc. (Bio), MES
meghan@mccallumenvironmental.com
Vice President

compensation for wetland losses for numerous development clients.

- Completion of more than 50 phased site assessment and remediation projects - Phase I, II, III and risk assessment for commercial property transfers.

Experience

McCallum Environmental Ltd., Nova Scotia, 2010-Present

Vice President/Senior Project Manager - Provides project management expertise for site and/or route selection, constraints mapping, regulatory consultation, environmental assessments, wetland alteration and restoration planning, environmental protection plan development, regulatory applications, construction monitoring, and reclamation for small and large scale industrial projects. Other responsibilities include marketing, budget management, report preparation and client service.

Strum Environmental Services Ltd., Nova Scotia 2000-2010

Project Manager- From 2000- 2010, provided project management expertise for development clients across Atlantic Canada. Projects included environmental assessment, large scale commercial and residential developments, wetland alteration projects, wetland compensation planning and implementation, wetland restoration and creation projects, phased site assessments, and risk assessment and management.

Environmental Sciences Group, Kingston, ON 1998

Environmental Scientist- in 1998, provided contaminant and project management expertise to Department of National Defense in the Canadian Arctic in support of remediation of several remote military sites. Identified areas required for remediation and completed associated boundary soil and sediment confirmatory sampling and analysis.

McCallum Environmental Ltd.

Melanie MacDonald, BSc. (Bio), MREM
melanie@mccallumenvironmental.com

Years in Practice
8

Education

Masters of Resource and Environmental Management, Dalhousie University, 2009-2011

B.Sc. Advanced Major in Biology & Interdisciplinary Studies in Aquatic Resources, St. Francis Xavier University, 2001-2005

Training

- Wetland Delineation Certification, 2013
- Saint John Ambulance Standard First Aid, AED, CPR(C), 2013
- Health Safety and Environmental Leadership training and Advanced Safety Audit training, 2009
- Emergency Operations Centre crisis management training, 2006-2008
- Introduction to the Fisheries Act and Navigable Waters Protection Act course – ESAA
- Bear Awareness training and ATV training – Alberta Safety Council, 2006
- Site Supervisor Safety Training, Construction Safety Training System and W.H.M.I.S., 2005

Summary

Ms. MacDonald has been in the environmental consulting profession since 2005. She has worked on both project related and research related field assessments in Nova Scotia, Prince Edward Island, and Alberta.

Ms. MacDonald's academic credentials include a Bachelor's degree in Biology and Interdisciplinary Studies in Aquatic Resources, and a Masters' degree in Resource and Environmental Management. Melanie has been able to apply the lessons from these inter-disciplinary programs through a variety of projects throughout her professional career. Most recently, Ms. MacDonald has been responsible for completing biophysical assessments, including flora and fauna surveys, avian surveys, and species at risk evaluations, primarily for clients in the energy sector, mining sector, and commercial development sector. Ms. MacDonald coordinates all field staff required to complete all environmental baseline programs for Provincial Environmental Assessment registration. Ms. MacDonald has been responsible for the implementation of six environmental baseline programs for mining, quarry development and energy sector development projects in Nova Scotia in advance of environmental assessment registration.

Ms. MacDonald is specialized in wetland and watercourse delineations and functional assessments and fish habitat surveys, having delineated approximately 1200 wetlands and their associated watercourses within the past 2 years. Ms. MacDonald brings considerable experience in fisheries monitoring projects in both marine and freshwater environments. As a certified electrofishing crew leader, Melanie has logged hundreds of hours preforming electrofishing surveys for various DFO HADD monitoring programs and associated compensation projects. Specifically, Ms. MacDonald was pivotal in planning and completion of a watercourse alteration, fish salvage and diversion of 38km of the Tar River, and in the construction of a 77 hectare lake for fish habitat compensation. Ms. MacDonald is experienced in watercourse habitat assessments, various types of fisheries assessments, and has overseen multiple watercourse (both road and pipeline) crossings in Alberta and Nova Scotia. Throughout her career, Ms. MacDonald has gained experience in regulatory compliance and permitting, including DFO HADD and NWPA permits.

Selected Project Experience

- Completion of environmental baseline surveys for the provincial environmental assessment process for Goldworx for a proposed re-development of a gold mine in eastern Nova Scotia.
- Completion of environmental baseline surveys for Quebec based company for a proposed gold mine expansion in eastern Nova Scotia.
- Completion of environmental baseline surveys for three Nova Scotian quarry expansion projects in 2012-2013.

Melanie MacDonald, BSc. (Bio), MREM
melanie@mccallumenvironmental.com

- Completed watershed planning for the Sackville River Secondary watershed to evaluation wetland restoration potential and to aid in better land use planning, source water protection and management of water resources.

- Completion of field work associated with a wetland alteration application and associated compensation for 24 individual wetlands associated with road development in support of a planned residential development in Sackville Nova Scotia.
- Completed field programs and reporting associated with the Provincial Environmental Assessment for the 80 MW Glen Dhu South Wind Power Project, Nova Scotia, for Shear Wind Inc. The Project received Ministerial approval on March 16, 2012.
- Completion of wetland delineation and watercourse identification for four large scale developments (2 - 200 ha, 400 ha, and 450 ha) in 2012 and 2013.

Experience

McCallum Environmental Ltd., Halifax, Nova Scotia

Biologist and Environmental Specialist/Coordinator:
May-Aug 2011, Jan 2012-Present
Completing biophysical assessments, including flora and fauna surveys, with emphasis on species at risk. Completing wetland and watercourse delineations and assessments and coordinating migratory bird and bat monitoring. Communicating field survey results and methodologies for Environmental Assessments and other Provincial regulatory applications.

Amec Colt, Shell/Albian Sands Expansion 1 - Fort McMurray, Alberta.

Environmental Specialist and Area Environmental Lead
July 2008 – October 2009.
Proactively monitored construction activities via inspections, audits and Environmental Work Permits & Protection Plans to ensure compliance with regulatory approvals, the projects' Environmental Control Plan, and best management practices. Investigated and reported incidents, and liaised between contractors and project owners. Implemented Environmental Awareness and communicated issues via weekly newsletters. Developed a greater business sense, working as an independent contractor to Amec Colt.

Canadian Natural Resources Ltd. - Fort McMurray, Alberta

Regulatory and Environmental Specialist
October 2005 – July 2008
Conducted extensive field work in various fish and wildlife programs. Communicated issues with government agencies, contractors and external stakeholders. Performed on-call duties, spill response, and non-compliance reporting and response. Expanded upon site wide procedures for protection of water, wildlife and waterbirds. Played a pivotal role in planning & completion of a fish salvage of 38 km of the Tar River, and in construction of a 77 hectare fish habitat compensation lake (Horizon Lake). Horizon Lake earned CAPP Steward of Excellence Award for Environmental Performance. Hired, trained, and supervised teams of up to four summer interns. Chaired the regional 'Oil Sands Bird and Wildlife Protection Committee'.

McCallum Environmental Ltd.

Robert McCallum, P.Biol

robert@mccallumenvironmental.com
902-292-0514

Years in Practice
16

Memberships
Alberta Society of Professional Biologists (ASPB), 2001
AB# 875

Certifications
Watercourse Alteration Certification, Nova Scotia.
#10044385

Education
Bachelor of Science, Biology/ Environmental Studies, University of Victoria, BC

Recent Training

- Project Management Fundamentals, 2010
- ISO 14064-1 Essentials: Greenhouse Gas Inventories
- ISO 14064-2 Expert – Greenhouse Gas Projects (Carbon Emissions Reduction Expert Course)
- Standard First Aid w/ CPR Level C
- H2S Alive

Recent Clients

- Altagas Ltd.
- Sprott Power Corp.
- Goldworx
- BluEarth Renewables
- Joss Wind Inc.
- Alva Construction
- Shear Wind Inc.

Skills

Extensive project management experience in an owner and consulting environment.

Extensive experience in project planning, environmental assessments, regulatory compliance, construction planning and project execution.

Understand appropriate environmental assessment methodologies and project management to successfully permit both large and small scale projects.

Understand and can articulate environmental and regulatory requirements and constraints, technical, business and project management functions associated with project development and execution.

Understand construction practices, requirements and deliverables associated with project stages.

Understand typical owner company project sanctioning / funding cycles and business drivers.

Demonstrated dedication to safe project execution and a safe workplace in support of zero incident targets.

Selected Project Experience

MINING & CONSTRUCTION

- Completion of environmental baseline surveys for Nova Scotian provincial environmental assessment process for Goldworx for a proposed re-development of a gold mine in eastern Nova Scotia.
- Completion of environmental baseline surveys for Quebec based company for a proposed gold mine expansion in eastern Nova Scotia.
- Completion of environmental baseline surveys for three Nova Scotian quarry expansion projects in 2012-2013.

OIL & GAS

- Project manager for environmental approvals and compliance for 68 kilometres of pipeline development in Alberta. Project components included pipeline route selection, first nation/public consultation, regulatory consultation, environmental assessments, survey supervision, regulatory applications for licenses/permits, construction monitoring, and reclamation of the right-of-ways.
- Completion of environmental assessments for 53 oil and gas developments on the Hay Lake I.R. #209, Alberta, since 2001. Conducted construction compliance monitoring, reclamation, and completed regulatory compliance audits for ongoing activities.
- Working as part of the Nexen Abandonment and Reclamation team, completed the AENV facility amendment application, and the Decommissioning, Remediation and Land Reclamation Plan for the Balzac

McCallum Environmental Ltd.

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- Nexen Inc.
- Husky Energy
- Bonavista Energy
- Canadian Natural Resources
- Enhance Energy
- Nuvista Energy
- Advantage Energy
- Cenovus Energy
- Eiger Energy
- Devon Canada
- Penn West Petroleum
- Shell Canada
- Talisman Energy
- Taqa North
- Hatch Mott MacDonald
- AllNorth Consultants
- Armco Capital
- Ramar Development

References

(contact info available upon request)

- Greg Denham – A&R Coordinator, Nexen Inc.
- Louise Clarke – V.P. Sprott Power Corp.
- Don Bartlett, COO – Sprott Power Corp.
- Colin Fisher – Division Manager, Allnorth
- Tim Benko, Project Manager-Facilities, Enhance Energy

Gas Plant for Nexen Inc.

- Completed the Cumulative Effects Assessment and Environmental Protection Plan for a 107 shallow gas well program on federally regulated lands in Saskatchewan for submission to the Canadian Wildlife Service and Environment Canada.
- Environmental Coordinator for Baytex Energy Ltd. from 2004-2006. Responsible for regulatory approvals and compliance for all business operations in Alberta, Saskatchewan, and British Columbia.
- Completion of hundreds of regulatory compliance audits for oil and gas clients in Alberta.
- Completed hundreds of watercourse crossing applications for upstream oil and gas development in Alberta.
- Completion of site selection, CEAA screening documents, first nation consultation, regulatory consultation, and surface land applications for 10 wellsites, access road, and pipelines for Maverick Oil & Gas Ltd on the Louis Bull First Nation since 2006.

ALTERNATIVE ENERGY

- Construction monitoring for EPP compliance, and reclamation management, for Kettle Hills Wind Power Project, Alberta.
- Completed Environmental Protection Plan, Erosion & Sedimentation Control Plan, acting as Environmental Monitor and regulatory specialist, and completion of the Federal Cumulative Effects Assessment for the Glen Dhu Wind Power Project in Nova Scotia for Shear Wind Inc.
- Coordination and completion of the 10 year Alberta Environment renewal application for the 105 MW Balzac Thermal Power generating station for Nexen Inc. This application encompasses the same requirements as a new facility application.
- Completed winter wildlife and fall migration survey of the Glenridge Wind Power Project, Alberta for Altagas Ltd.
- Completed environmental assessment and Alberta Utility Commission (AUC) Application for the 79 MW HandHills Wind Power Project in Central Alberta, for Nexen Inc/Joss Wind Power Inc.
- Coordination of the environmental assessment and Alberta Utility Commission (AUC) Application for the 100 MW Willowridge Wind Power Project in Southern Alberta for Shear Wind Inc.
- Completed initial site assessment of turbine locations for constructability, access and environmental constraints for an 80 MW Wind Power Project in North East British Columbia, for Sprott Power Corp. This Project was recently cancelled.
- Completed the Provincial Environmental Assessment for the 80 MW Glen Dhu South Wind Power Project, Nova Scotia, for Shear Wind Inc. The Project received Ministerial approval on March 16, 2012.
- Completed the Provincial Environmental Assessment for the 25.2 MW Hampton Mountain Wind Power Project, Bridgetown, Nova Scotia. The

Project received Ministerial approval on January 10, 2011.

- Completed Environmental Assessment amendment application for a 32 MW Amherst Wind Power Project, Nova Scotia, for Sprott Power Corp. This Project was acquired from Acciona.
- Project Management of regulatory permitting and environmental assessments for the 50 MW Canaan Mountain Wind Power Project in Nova Scotia for Shear Wind Inc.
- Completed constraints and regulatory analysis for 2 different wind power projects in Saskatchewan for Joss Wind Power Inc. for the 2011/12 RFP.
- Completed constraints and regulatory analysis, and Fall and Winter wildlife surveys for the 80 MW Burstall Wind Power Project in Saskatchewan for Shear Wind Inc. for the 2011/12 RFP.
- Project Management of regulatory permitting and environmental assessments for a 65 – 100 MW Wind Power Project in New Brunswick for Shear Wind Inc.

OTHER PROJECTS

- Completing an Evaluation of Wetland Restoration Potential (EWRP) within the Sackville Watershed, Halifax, N.S. to identify priority wetland restoration sites. The goal is to reduce overland water flow within developed areas to reduce municipal liabilities.
- Completed fisheries assessments and applications for numerous bridge crossings in Nova Scotia.
- Assistance with project management and regulatory permitting for the 2010 Heritage Gas pipeline expansion within the Halifax Regional Municipality, Halifax, N.S.
- Completion of the CEAA screening document and NAV Canada application for the Deer Lake Regional Airport Authority (Newfoundland) Runway expansion, access road relocation, and transmission line relocation, including DFO and NAV Waters application.

Experience

McCallum Environmental Ltd.,

President - Since 2001, has provided project management expertise for site and/or route selection, constraints mapping, land acquisition, first nation/public consultation, regulatory consultation, environmental assessments, environmental protection plan development, survey supervision, regulatory applications, license and permit acquisitions, construction monitoring, and reclamation for small and large scale industrial projects. Other responsibilities include marketing, budget management, report preparation and client service.

Indian Oil & Gas Canada, Department of Indian & Northern Affairs, **AB**

Environmental & Surface Land Analyst (Responsible Authority under CEAA) - applied federal environmental legislation (CEAA, CEPA, Fisheries Act, and Indian Oil & Gas regulations (1995), which incorporate provincial legislation, on oil and gas producing Indian reserves in Canada. Analyzed

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environmental assessments for proposed projects and conducted site inspections where required (acting as the Responsible Authority under CEAA). Audited projects to ensure compliance with federal and provincial legislation. Negotiated and resolved environmental issues while maintaining an effective working relationship with First Nations, industry, IOGC and other federal and provincial regulators. Conducted reclamation inquiries to ensure compliance with reclamation criteria.

Stantec Consulting Ltd., AB

Project Manager - responsibilities included marketing, budget management, report preparation and client service. Project experience related to reclamation and environmental monitoring of construction projects. Completed federal and provincial environmental assessments, conservation and reclamation plans, designed and monitored environmental Protection Plans for developments in environmentally sensitive areas. Completed Phase I and Phase II Contamination Assessments and dig & dump supervision and closure sampling.

Pioneer Land Services Ltd., Calgary, AB

Assistant Environmental Manager -responsibilities included employee time management, billings, report preparation and quality control, marketing and client service. Consulting responsibilities included project management of reclamation programs, environmental monitoring of pipeline and wellsite construction projects. Completed environmental assessments as per provincial and federal requirements, designed and monitored environmental protection plans for developments in environmentally sensitive areas, Phase I and Phase II Contamination Assessments. Developed Emergency Response Plans for field personnel.

Pioneer Land Services Ltd., Grande Prairie, AB

Environmental Division Manager - responsibilities included employee time management, billings, report preparation and quality control, marketing and client service. Consulting responsibilities included project management of reclamation programs, environmental monitoring of pipeline and wellsite construction projects. Designed and monitored environmental Protection Plans for developments in environmentally sensitive areas. Completed Phase I and Phase II Contamination Assessments. Developed Emergency Response Plans for field personnel.

Great White North Environmental Services Ltd., AB

Senior Environmental Scientist - responsible for the preparation and implementation of Phase I and Phase II Contamination Assessments and Risk Assessments. Conducted Waste Auditing, Soil Vapor Surveys, and site remediation.

Derrick Mitchell, *B.Sc.F., R.P.F*
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Professional Affiliations

Association of Registered Professional Foresters of New Brunswick
New Brunswick Wetland Delineators Association
Recognized Wetland Delineator with the New Brunswick Department of Environment and Local Government

Formal Education

2003 Bachelor of Science in Forestry and Environmental Management - University of New Brunswick, Fredericton, NB

Continuing Education

2006 Wetland Delineation Certification Course, Humboldt Field Research Institute, Stueben, ME
2008 Sedge and Grass identification workshop UNB Department of Biology
2008 Watercourse Alteration Certification Course, Maritime College of Forest Technology, Fredericton, NB
2009 Willow and Aquatic plant identification workshop UNB Department of Biology
2010 Water Management and Wetland Restoration Training Course, University of Guelph, Kemptville, ON
2011 Electrofishing online training and field practicum, Fredericton, NB

Conferences

2009 NBEIA Wetlands Forum, Fredericton, NB
2010 NBEIA Wetlands Forum, Moncton, NB
2010 Atlantic Land Reclamation conference, Halifax, NS
2011 Advances in Ecological Restoration, CFB Gagetown, Oromocto, NB
2012 NS Wetland Forum, Halifax, NS
2013 Atlantic Land Reclamation conference, Sackville, NS

Volunteer Activities

Hammond River Angling Association (President)
New Brunswick Wetland Delineators Association (Vice chair)
Saint John Municipal Plan Citizens Advisory Committee
New Brunswick Protected Natural Areas Committee

Publications

Betts, M.G., **Mitchell, D.,** Diamond, A.W. and Bety, J. Uneven rates of landscape change as a source of bias in roadside wildlife surveys. Journal of Wildlife Management. 2007

Summary of Qualifications

Mr. Mitchell is a terrestrial ecologist, registered professional forester (R.P.F) and principal of Boreal Environmental. With over 15 years of experience working in the environmental industry, his expertise includes; environmental

permitting, environmental compliance, ecological restoration, habitat mapping, natural resource management and Geographic Information Systems (GIS).

Mr. Mitchell has 9 years of experience delineating wetlands throughout Atlantic Canada. He is a recognized wetland delineator and Vice Chair of the Wetland Delineators Association in New Brunswick and listed as a qualified wetland professional in Nova Scotia. He received formal wetland delineation training in 2006 at the Humboldt Field Research Institute in Stueben, Me. He has worked on many large highway and linear corridor projects in New Brunswick including; the Route 1 Gateway project, Route 11, and Brunswick Pipeline.

Beyond his focus on wetland related projects, Mr. Mitchell has a broad range of experience in conducting biophysical surveys and analysis including; watercourse assessments, avifauna surveys, Species at Risk assessments, and geospatial analysis for various commercial and residential developments throughout the Atlantic Provinces. His clients include Saint John Industrial Parks, Defense Construction Canada, Dexter Construction, Genivar, Roy Consultants, Integrated Informatics, Strum Environmental, McCallum Environmental, Stantec and several developers.

Project Work

Current Projects

Energy East Pipeline Project - Stantec - Rare plant and wetland delineation, functional assessments, Species at Risk assessment and wetland inventory geodatabase development.

Route 11 Wetland Monitoring Project - Roy Consultants - Wetland, rare plant monitoring. Comparative analysis of hydrological and vegetative conditions at periodic intervals (Tracadie, NB).

Past Projects

Gold Mining Project - McCallum Environmental - Wetland delineation/functional assessments, Species at Risk, breeding bird and bat hibernacula surveys (Goldenville, NS 2013).

Confidential Energy Project - Integrated Informatics - Ecological Land Classification (ELC) and remote sensing project. Creation of GIS database of interpreted habitat types (NL 2013).

Evaluation of Wetland Restoration Potential - Armco/Ramar - Developed LiDAR based wetland predictive model incorporating vegetation parameters. Predictive model used to prioritize potential wetland restoration opportunities for the Sackville River watershed. Partnership with McCallum Environmental (Bedford, NS 2013).

Hammond River Restoration Project (Scoodic Brook) - Hammond River Angling Association - Supervised the re-alignment and buffer re-vegetation of a 200 meter section of the Hammond River. Regulatory compliance monitoring included water quality monitoring (i.e., TSS sampling), maintaining and installing erosion and sedimentation control/prevention structures (Upham, NB 2012).

Hazen Brook Restoration Project - Hammond River Angling Association - Restoration plan, restoration supervision, and environmental compliance monitoring (Saint John, NB 2012).

Natural Resources Management Plan - Defense Construction Canada (DCC) - Species at Risk survey, wetland delineation, forest characterization, habitat assessment and associated reporting. (Canadian Forces Arms Depot Bedford, NS 2012).

Caribou habitat project - Sikumiut Environmental Management/Integrated Informatics - Ecological Land Classification and remote sensing using Landsat, SPOT 5, and high resolution aerial photography for the entire island of Newfoundland (2012).

Bat echolocation analysis - Strum Environmental - Identification of bat species through echolocation analysis. Analysis and reporting conducted in support of Environmental Impact Assessment registration for several proposed wind farm developments in Nova Scotia (February 2012).

Bat echolocation analysis - McCallum Environmental Ltd. - Identification of bat species through echolocation analysis. Analysis and report conducted in support of Environmental Impact Assessment registration for a proposed wind farm in central Nova Scotia (February 2012).

New Canaan Breeding Bird Monitoring - McCallum Environmental Ltd. - Breeding bird survey proposed wind farm in New Canaan, NS (May to July 2012).

Iron ore mining project - Integrated Informatics – Ecological Land Classification (ELC) and remote sensing project (Labrador City, NL 2012).

CFB Gagetown Land Reclamation Project - Defense Construction Canada - Surface water hydrology mapping and erosion control/prevention planning (Oromocto, NB 2012).

Damage Control Division Fire training School Wind Energy Project - Defense Construction Canada - Passage migration and over-wintering bird surveys and associated reporting (Halifax, NS 2012).

14 Wing Greenwood Wetland Study - Defense Construction Canada - Wetland delineation, functional analysis, Species at Risk surveys, and breeding bird survey (Greenwood, NS 2011).

Route 1 Gateway Project - Dexter Construction - Migratory bird nesting surveys and associated reporting (Saint John, NB 2011).

Conservation Design Project - Saint John Industrial Parks - Environmental constraints mapping, wetland delineation, watercourse mapping, forest inventory, site selection (Saint John, NB 2011).

Wetland Compensation Projects - Canaport^{TM} LNG$_{LP}$ - Project manager and technical lead for wetland compensation projects responsible for all aspects of the restoration process. Design criteria, remediation sewage sludge, environmental compliance monitoring, soil and water quality monitoring, erosion sedimentation control/prevention, re-vegetation species selection, environmental compliance reporting, and post restoration monitoring. (Saint John, NB 2009 - 2011).

Summerside Wind Farm Project - City of Summerside - Migratory bird surveys, bird/bat carcass monitoring, searcher bias trails and associated reporting (2010).

Water treatment facility site selection project - City of Saint John - Wetland delineation, functional analysis, watercourse mapping and habitat assessment (2010).

Route 1 Gateway Project - Dexter Construction - Breeding bird and Species at Risk surveys (Saint John, NB 2010**)**.

Eider Rock Project - Irving Oil Ltd. - Technical lead for wetland field assessments, watershed level wetland functional analysis, watercourse mapping, Species at Risk assessments, habitat assessments and author of the terrestrial habitat chapter of the Project Eider Rock EIA (Saint John, NB 2007 – 2009).

Uranium Mine Project- Aurora Energy Resources - Ecological Land Classification (ELC) for a proposed uranium mine (Postville, NL 2008).

Lameque transmission line and wind farm - Acciona - Technical lead for wetland assessments, watershed level

wetland, Species at Risk assessments, watershed level wetland functional analysis and associated reporting. (Lameque, NB 2008).

Route 11 Wetland Monitoring Project - New Brunswick Department of Transportation - Designed and implemented wetland monitoring plan (Tracadie, NB 2008).

Lower Churchill Falls Hydro-electric Dam Project - Nalcor - Technical lead for ELC assessment (Goose Bay, NL 2007).

Brunswick Pipeline Project - Emera - Technical lead for wetland assessments, watershed level wetland functional analysis and author of terrestrial habitat chapter for the Brunswick Pipeline EIA (Saint John, NB 2007).

Route 7 Bypass Project - New Brunswick Department of Transportation - Technical lead for wetland assessments, watershed level wetland functional analysis and author of the wetland VEC for the EIA (Welsford, NB 2007).

Route 1 Gateway Project - New Brunswick Department of Transportation - Technical lead for wetland assessments and co-author of the wetland VEC for the EIA (New Brunswick, 2006).

Kent Hills Transmission Line and Wind Farm - TransAlta - Technical lead for wetland delineation, watershed level wetland functional analysis and migratory bird surveys (Kent Hills, NB 2006).

References

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Ken McKenna Resume

Education:

BSC Biology 1975 University Prince Edward Island
DDS 1979 Dalhousie University

Bird related activities:

Participant Christmas Bird Counts-1991- present

Compiler Pictou Harbour Christmas Bird Count- 1992- present

Past member of Eastern Mainland Field Naturalists and was representative for that club to the Federation of NS Naturalists

Co-founder of Pictou Co. Naturalists Club-1995

Program coordinator of Pictou Co. Naturalists Club 1995-present

Seasonal editor NS Bird Society quarterly magazine 2001- present

Compiler NS Spring Migration Count (Pictou Co.) 1992- present

Breeding Bird Survey routes (1-2 yearly) for CWS- Bird Studies Canada 1999-present James River, Tatamagouche and Trafalgar are routes that have been run- James River every year during that period

Atlantic Canada Nocturnal Owl Survey for Bird Studies Canada 2001- present 2-3 routes yearly

Regional Coordinator area 23 (Antigonish) for the Maritime Breeding Bird Atlas – 2006-2010

Compile Data for nearly a decade on the New Glasgow Temperence St school Chimney Swifts and participant in the Maritime Swiftwatch Program
Piping Plover Guardian off and on for 20+ years

Have volunteered with CWS on Marsh surveys for Willets and Nelson's Sparrows
Have Volunteered with CWS with Kate Bredin on uptake of chemicals in Tree Swallows near a local pulp mill (field work only)

Bird Related Work Projects:
Windmill Bird survies Forbes Lake , Pictou Co.- 2012
Bird Nest Survey for Heritage Gas -spring 2013

Jody R. Hamper

2796 Laggan Rd., Barney's River, NS, B0K 1A0 **902-759-3412**

Experience

E & R Langille Contracting, New Glasgow, NS, (2007-present)

Logging Crew Supervisor

- Cut block lay-out
- Supervising work crews
- Coordinating transportation, floating schedules
- Collecting and monitoring time cards for payroll
- Timber Cruising

M & R Ross, New Glasgow, NS, (2006-2007)

Harvest Block Layout

- Laying out the harvest blocks for harvesting crew
- Supervising work crews

Education

1999 **Maritime Forest Ranger School, Fredericton, NB**
Forest Technician, Certified (Graduated with Honours)

1996-1998 **Holland College, Charlottetown, PEI**
Diploma in Renewable Resource Management

Skills

Emergency First Aid, comfortable with Microsoft Office, experience using GPS and GIS, work well on my own or with a team, detailed oriented

Additional Information & Interests

Volunteer Fire Fighter with Barney's River Volunteer Fire Department
Member of Masonic Lodge, Pictou County Shrine Club
Interests include hiking, rafting, playing hockey and travelling.