



**Stantec Consulting Services Inc.**  
30 Park Drive, Topsham ME 04086-1737

November 4, 2016  
File: 195601220

**Attention: Lindsay Deane-Mayer**  
Palmer Capital Corporation  
Palmer Management Corporation  
13 Elm Street, Suite 200  
Cohasset, MA 02025

**Reference: Rare Species Survey Report, Horseshoe Valley Wind Project, Roxbury, Maine**

Dear Lindsay,

On September 8, 2016, Stantec Consulting Services Inc. (Stantec) completed a field survey of the proposed Horseshoe Valley Wind Project (project) area on North Twin Mountain in Roxbury, Maine (Figure 1). The purpose of the field survey was to characterize the existing terrestrial and aquatic habitats and evaluate their potential to support populations of three state-listed rare wildlife species: the state-threatened northern bog lemming (*Synaptomys borealis*), state-threatened Roaring Brook mayfly (*Epeorus frisoni*), and state-species of special concern northern spring salamander (*Gyrinophilus porphyriticus*). The field survey was initiated in response to an Information Request letter that Horseshoe Valley Wind received from the Maine Department of Inland Fisheries and Wildlife (MDIFW) on May 31, 2016. This letter indicated that these species may potentially be present within the project area and recommended that field surveys be conducted to determine their presence. Stantec subsequently completed targeted field surveys of potentially suitable habitat for these species. The report summarizes the results of the field surveys and habitat evaluations.

## **SURVEY METHODOLOGY AND SPECIES BACKGROUND**

### **PRE-FIELD DESKTOP REVIEW**

Prior to conducting the field surveys, Stantec reviewed existing natural resource information available for the project area. This included the results of a vernal pool survey and reconnaissance-level wetland survey completed by Kleinschmidt that identified locations of several "black spruce bogs" within the project area as well as intermittent streams (Appendix A). In addition, Stantec reviewed publicly available aerial photography, National Wetlands Inventory data, U.S. Geological Survey quadrangle maps, and National Hydrography Dataset to identify potential habitats to evaluate and survey.

In preparation for northern bog lemming field surveys, Stantec coordinated with Dr. Zachary Olson at the University of New England relative to accepted genetic sample collection procedures for determining northern bog lemming presence. Due to morphological and ecological similarities between northern bog lemming and southern bog lemming (*Synaptomys cooperi*), genetic testing is required to differentiate between these species in the absence of trapping efforts. Prior

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to the field surveys, Dr. Olson provided Stantec with a bog lemming pellet sample collection kit that included sterilized vials filled with silica, laboratory grade ethanol, nitrile gloves, and the standardized pellet collection method.

### **NORTHERN BOG LEMMING**

Limited references are available regarding the specific habitat requirements of northern bog lemming. The MDIFW reports that the species is known to occur in moist, wet meadows or boggy areas often in alpine settings or spruce-fir forests. It is reportedly found in association with springs or lush, mossy logs and rocks. In Maine, it is reported to occur in moist peat moss (*Sphagnum* spp.) boggy areas in both low and high elevation settings (MDIFW 2003). Additional northern bog lemming habitat characteristics cited by the MDIFW in their May 31, 2016 Information Request letter includes riparian areas at 1,000 feet in elevation or higher with an abundant herbaceous vegetation. In general, areas identified as potentially suitable northern bog lemming habitat within the project area included areas characterized as wetlands with scattered trees and shrubs of red spruce (*Picea rubens*), balsam fir (*Abies balsamea*), and northern white cedar (*Thuja occidentalis*). The understories of these habitats contained a thick layer of peat moss and three-seeded sedge (*Carex trisperma*) over deep, mucky organic soils.

A minimum of 1 survey hour was spent meandering throughout each wetland containing potentially suitable northern bog lemming habitat. During the meander survey, rodent runways were inspected for the presence of green fecal pellets and a predominance of evenly cut graminoid vegetation lining the runway. According to Kurta (1995), bright green fecal pellets and evenly clipped stems of graminoid vegetation along well-defined runways are indicative of bog lemming activity. Bog lemming fecal pellets identified during the field survey were collected in accordance with the bog lemming pellet collection protocol provided by Dr. Olson and sent to him for genetic analyses.

Each bog lemming fecal pellet collection location was located with a Garmin® GLO GPS receiver. Data were collected on the associated habitat characteristics including dominant vegetation, hydrology, and evidence of past disturbances. Representative photographs were taken of bog lemming activity and general habitat characteristics.

### **NORTHERN SPRING SALAMANDER**

Northern spring salamanders reach the northern limit of their distribution in the mountainous regions of western and northern Maine. Potentially suitable northern spring salamander habitat includes streams with perennial flow and a predominance of boulders, rock, and cobble substrate materials with limited to moderate embeddedness within finer substrate material. Typically, streams with potential northern spring salamander habitat have moderate to high gradients and are located in predominantly forested watersheds with hardwood and/or mixed forest communities within the immediate riparian areas.



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A maximum of 1 survey hour was spent within each stream identified as potentially suitable northern spring salamander habitat. Survey efforts were limited to within, and immediately adjacent to (i.e., within 250 feet), the project area limits. During the survey effort, rocks and logs within and immediately adjacent to the wetted edge of the stream were turned over to look for northern spring salamanders. General data on the associated habitat characteristics were collected within each surveyed stream, including substrate composition, flow characteristics, bank dimensions, and riparian characteristics. The survey within each stream was deemed complete upon the location of a northern spring salamander or the total survey time reached 1 hour, whichever came first.

### **ROARING BROOK MAYFLY**

Stantec evaluated streams within the project area for potential Roaring Brook mayfly habitat. Based on a literature review and Stantec's past experience with this species, habitat typically characterized as potential Roaring Brook mayfly habitat include coldwater high-gradient streams located above 1,000 feet in elevation that have good water clarity and that are well-oxygenated (Swartz et al. 2004, Burian et al. 2008). These streams also contain a predominance of coarse substrate materials including ledge, boulders, cobbles, and gravels. Mesohabitats (medium-scale habitats) within the streams are dominated by runs, riffles, and/or cascades or plunges. Because the Roaring Brook mayfly is most readily identifiable in late September when final instar (i.e., pre-emergent) larvae would be expected, no in-stream sampling was completed for this species at the time of the September 8, 2016 field surveys. In addition, a scientific collection permit from the MDIFW would be necessary to complete sampling for this species.

## **RESULTS**

### **PRE-FIELD DESKTOP REVIEW**

Kleinschmidt identified 5 "black spruce bogs" and 2 intermittent streams on their *Horseshoe Survey Area 05-16-2014* figure that was provided to Stantec (Appendix A). A further review of additional information indicated that the proposed electrical corridor crosses an unnamed perennial tributary to the Swift River at approximately 700 feet in elevation. Using this information, field surveys were targeted within the "black spruce bog" areas to evaluate northern bog lemming habitat and the perennial stream to evaluate northern spring salamander habitat. The additional wetland and stream resources were briefly inspected during the field survey to assess potential habitat conditions for the target species.

### **NORTHERN BOG LEMMING**

Meander surveys were completed along the North Twin Mountain ridgeline to evaluate and characterize the existing "black spruce bog" wetland as identified by Kleinschmidt. Based on the field surveys, two small wetlands were identified as potential northern bog lemming habitat: Wetland Area 1 and Wetland Area 2 (Figure 2). Stantec characterized these areas as woodland



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wetlands with red spruce and balsam fir trees with an understory of hoary sedge (*Carex canescens*), cinnamon fern (*Osmundastrum cinnamomea*), bunchberry (*Cornus canadensis*), three-seeded sedge, yellow birch (*Betula alleghaniensis*) saplings, and peat moss. The deep organic soil was saturated near the surface at the time of the field survey. These two potential northern bog lemming habitats are hydrologically connected along the ridgeline by areas of recently harvested forest that were unsuitable habitat for the northern bog lemming.

Within these potentially suitable wetland habitats, Stantec followed rodent runways through vegetation and under coarse woody debris to locate bog lemming activity (e.g., fecal pellets and clippings of vegetation). Bog lemming fecal pellets were located in Wetland Area 1. Stantec collected 8 pellets for genetic analyses. Based on Dr. Olson's genetic analyses, none of the bog lemming samples were northern bog lemming (Appendix B).

Bog lemming activity was not observed in Wetland Area 2. Rodent activity observed in this wetland consisted of brown fecal pellets in well-defined runways. The additional areas identified as "black spruce bogs" by Kleinschmidt as well as other wetlands were not suitable northern bog lemming habitat. Recent forest harvest operations had disturbed the vegetation, hydrology, and soil of these other wetlands through clearing of vegetation and rutting of substrates by forest harvest machinery. Representative photographs of bog lemming activity and associated habitats are included in Appendix C.

#### **NORTHERN SPRING SALAMANDER**

One stream containing potentially suitable northern spring salamander habitat was located within the project area. The stream is an unnamed perennial tributary to the Swift River near the eastern terminus of the proposed electrical corridor and is adjacent to Route 120 and an existing transmission line with an electrical substation (Figure 2). The stream flows southerly and contains a cobble-sand-gravel substrate with occasional boulders. The coarse substrate material is moderately embedded (e.g., 30–50% embedded) by fine substrate material. The bankfull width averages approximately 18 feet. At the time of the field survey, the wetted width averaged between 6–7 feet. No northern spring salamander specimens were observed during the one-hour survey period. The stream flows offsite under a culvert adjacent to the project area. The stream has been disturbed by adjacent development. Representative photographs of this stream are included in Appendix C.

Other streams observed within the project area were intermittent streams that were dry at the time of the field surveys with abundant detritus in the stream channel and no evidence of recent flow. These streams do not contain suitable northern spring salamander habitat.

#### **ROARING BROOK MAYFLY**

No streams with potentially suitable Roaring Brook mayfly habitat were identified within the project area. The perennial stream identified near the eastern terminus of the electrical corridor was

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located at only 700 feet in elevation and contained a predominance of moderately embedded substrate material. Therefore, this stream is not considered suitable habitat.

Please let me know if you have any questions concerning the information contained in this report.

Regards,

**STANTEC CONSULTING SERVICES INC.**

Matt Arsenault  
Botanist / Ecologist  
Phone: (207) 406-5488  
Fax: (207) 729-2715  
matt.arsenault@stantec.com

Attachment: Figure 1 – Site Location Map  
Figure 2 – Rare Species Survey Map  
Appendix A – Kleinschmidt Wetland Reconnaissance Figure  
Appendix B – Genetic Analysis Results  
Appendix C – Representative Photographs

c. Adam Gravel, Stantec



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Lindsay Deane-Mayer

**Reference: Rare Species Survey Report, Horseshoe Valley Wind Project, Roxbury, Maine**

## **LITERATURE CITED**

- Burian, S.K., B.I. Swartz, and P.C. Wick. 2008. Taxonomy of *Epeorus frisoni* (Burks) and a key to New England species of *Epeorus*. p. 277-294 in Hauer, F.R., J.A. Stanford, and R.L. Newell (eds.). International advances in the ecology, zoogeography, and systematics of mayflies and stoneflies. University of California Publications in Entomology. Vol. 128.
- Kurta, A. 1995. Mammals of the Great Lakes Region. The University of Michigan Press, Ann Arbor, MI.
- Maine Department of Inland Fisheries and Wildlife (MDIFW). 2003. Northern Bog Lemming (*Synaptomys borealis*), fact sheet. Maine Department of Inland Fisheries and Wildlife, Augusta, Maine.
- Swartz, B.I., P.C. Wick, S.K. Burian, and A.D. Huryn. 2004. Status of the Endangered "Roaring Brook Mayfly" (MOHF grant #021-03-09): A Final Report to the Maine Outdoor Heritage Fund Board and Baxter State Park. November 19, 2004.

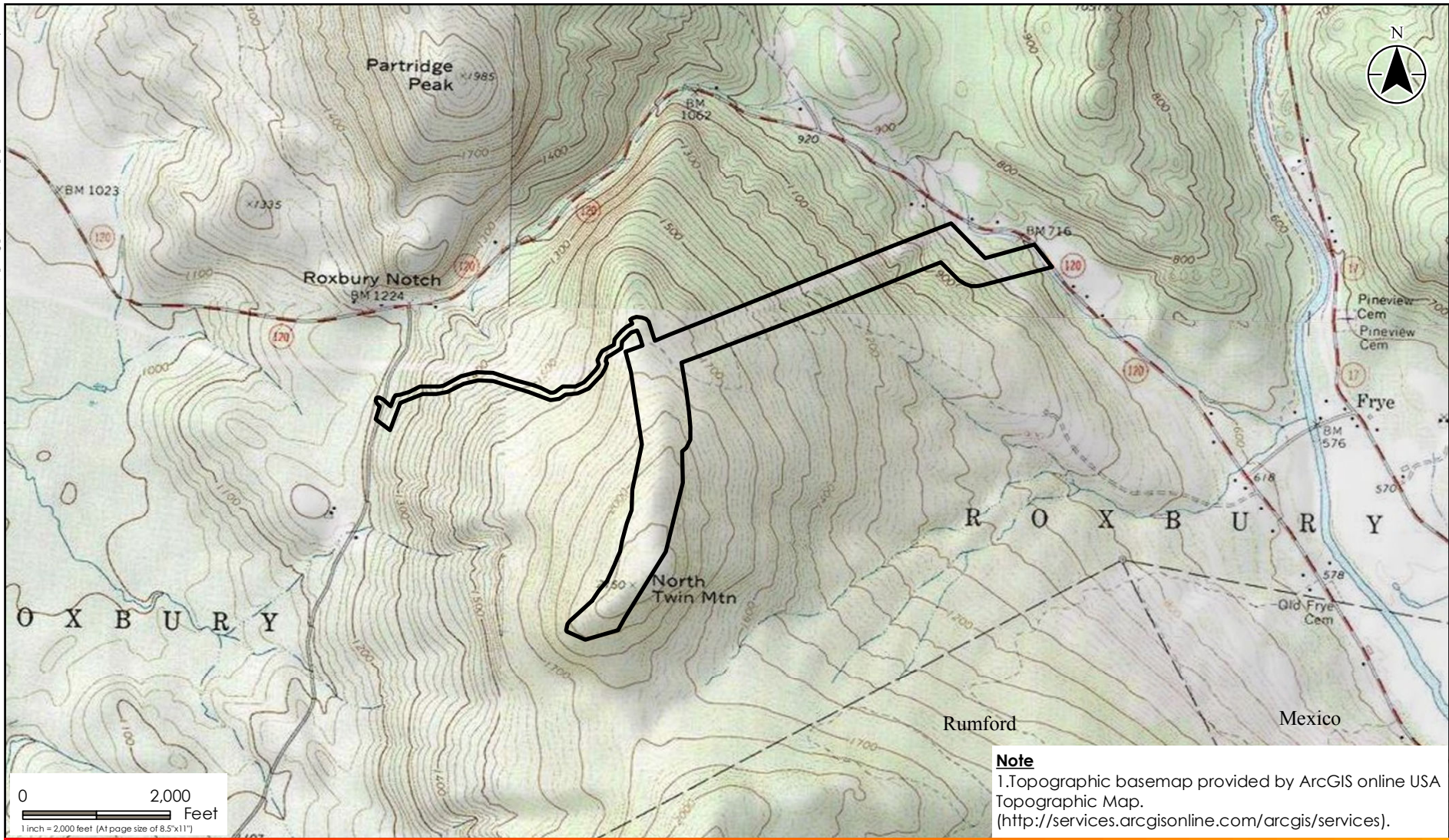


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## **FIGURES**

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Revised: 2016.10.26 by bblamer



**Note**  
 1. Topographic basemap provided by ArcGIS online USA Topographic Map. (<http://services.arcgisonline.com/arcgis/services>).

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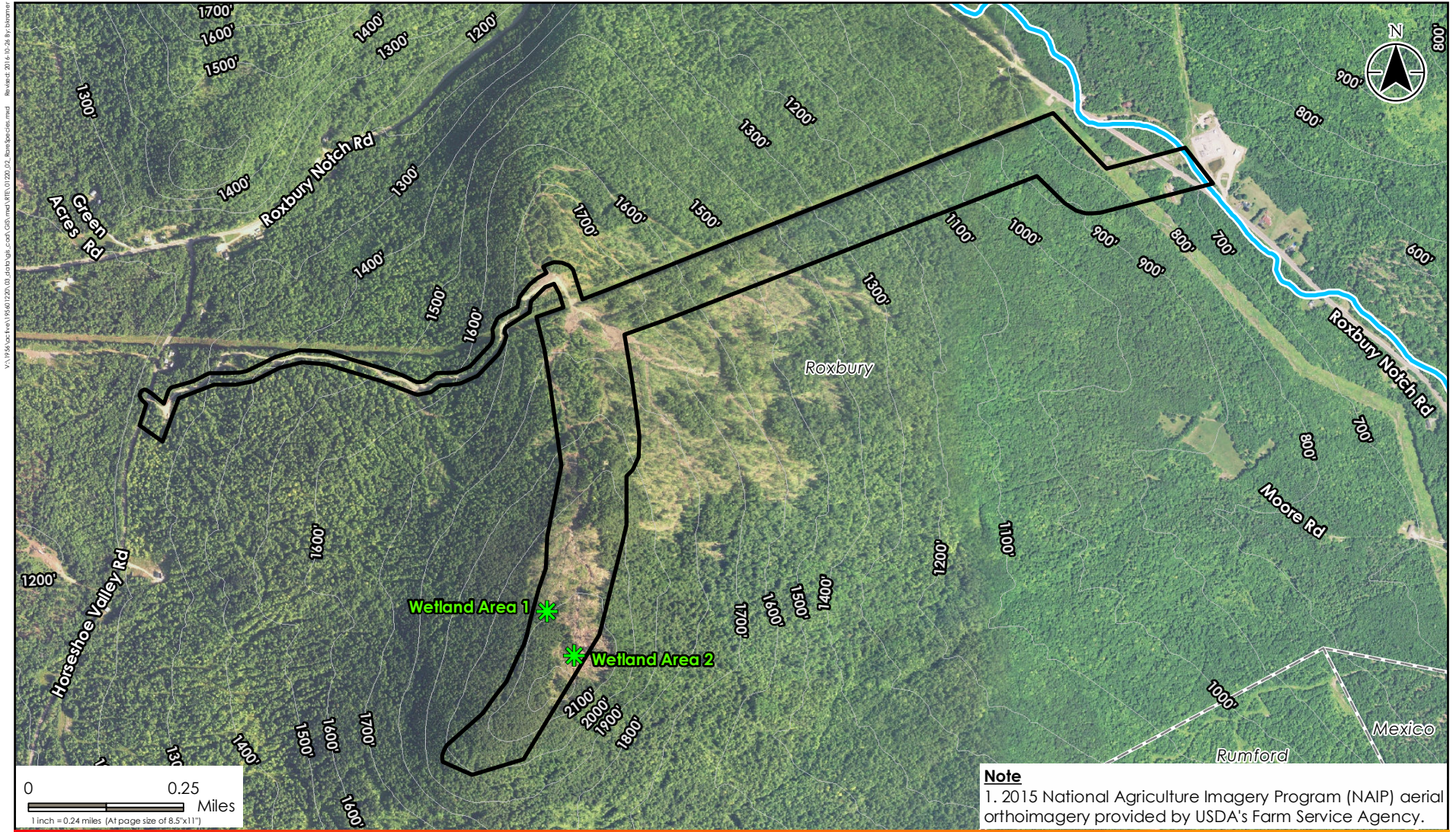
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 30 Park Drive  
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 Phone (207) 729-1199  
 Prepared by EMK on 2016-10-24  
 Quality Review by KWH on 2016-10-25  
 Independent Review by MPA on 2016-10-26  
 01220\_01\_Location.mxd



**Legend**  
 Approximate Project Area

195601220  
**Client/Project**  
 Palmer Management Corporation  
 Horseshoe Valley Wind Project  
 Roxbury, Maine  
**Figure No.**  
 1  
**Title**  
 Site Location Map  
 10/26/2016





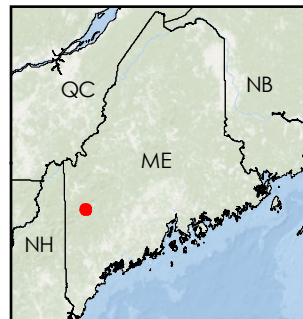
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Prepared by EMK on 2016-10-24  
Quality Review by KWH on 2016-10-25  
Independent Review by MPA on 2016-10-26

01220\_02\_RareSpecies.mxd



**Legend**

- Northern Bog Lemming Survey Wetland
- Northern Spring Salamander Survey Stream
- USGS Contour
- Approximate Project Area
- Town Boundary

**Client/Project**

Palmer Management Corporation  
Horseshoe Valley Wind Project  
Roxbury, Maine

**Figure No.**

2

**Title**

Rare Species Survey Map

10/26/2016

195601220

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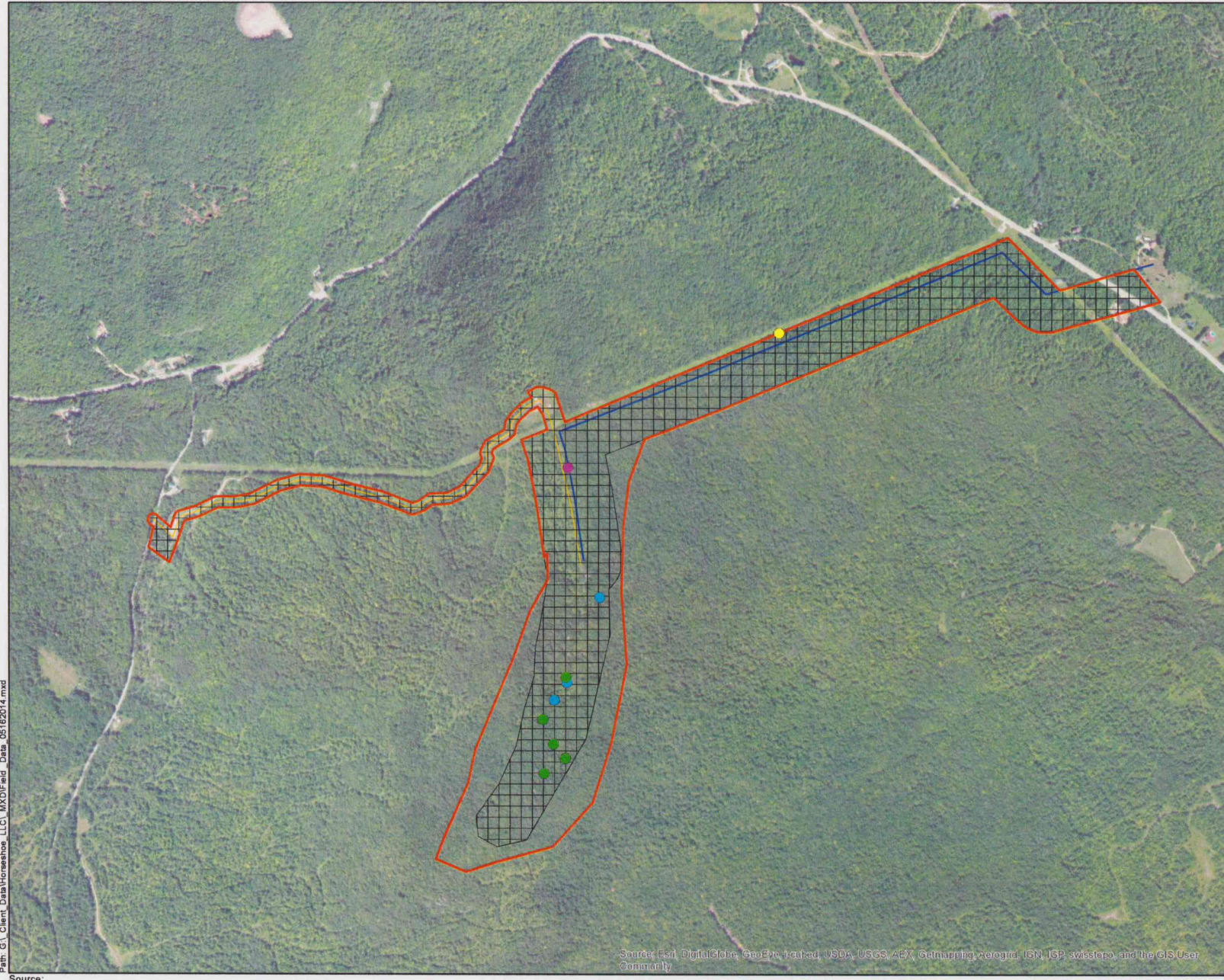




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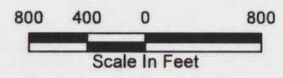
**Reference: Rare Species Survey Report, Horseshoe Valley Wind Project, Roxbury, Maine**

## **APPENDIX A – KLEINSCHMIDT WETLAND RECONNAISSANCE FIGURE**



### Legend

- Comment**
- Intermittent Stream
  - Black Spruce Bog
  - ABA
  - Disturbed Wetland
  - Vernal Pool Survey Area
  - Survey\_grid
  - Access Road
  - Gen-Lead



Kleinschmidt Project No. 0704059.01  
January, 2010

HORSESHOE VALLEY WIND, LLC

HORSESHOE  
SURVEY AREA 05-16-2014

MAP 1 OF 1

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Source: Esri, DigitalGlobe, GeoEye, iSat, USDA, USGS, Aero, GeoMapping, AeroGRID, IGN, IGP, swisstopo, and the GIS User Community

Path: G:\Client\_Data\Horseshoe\_LLC\_WXD\Field\_Data\_05162014.mxd





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## **APPENDIX B – GENETIC ANALYSIS RESULTS**

**From:** [Zach Olson](#)  
**To:** [Arsenault, Matt](#)  
**Cc:** [Zach Olson](#)  
**Subject:** sample results  
**Date:** Thursday, November 03, 2016 2:23:41 PM  
**Attachments:** [11-3-16 Stantec samples.pdf](#)

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Hi Matt,

I'm attaching a gel image for your records and for your client. I'm not sure how familiar you are with gel electrophoresis images, so here's a synopsis of what you're seeing:

The image contains 'lanes' that start with the wells at the top of the image and run down to the bottom of the image. We add our DNA product (white bands in the image) to the well at the top, apply an electrical charge, and the DNA moves towards the bottom. As it does that, the shorter fragments of DNA move farther/faster than larger fragments of DNA, so we're using the gel to sort DNA by size. Wherever we can see a white 'band' in a lane, there's a bunch of DNA fragments of that size that all migrated together.

The 8 samples you sent me are bracketed (lane 1 and 10) with a size standard that we can use to gauge the size of fragments in the unknown samples (lanes 2-9). Fragment size is measured in base-pairs (bp) and the size standard starts at the bottom with 25 bp, 50, 75, 100, 150, 200 bp etc. on up the lanes as indicated by the labels on the right.

Each of the samples you sent me has two bands <100bp, and then a gap until ~140bp or so. The presence of the 72 bp band and the absence of a band at 123 bp means that none of these samples are NBL.

I've spoken with my business office here at UNE, and it is a lot more complicated than I had thought to issue an invoice for this sort of thing. I'll be developing a contract for use in the future, but let's just call these samples a good test run for me and the method with no charge to you or your client. I'll keep you updated as we learn more about determining NBL presence/absence using field collections. We've collected pellets from most of the known NBL sites in the state, and my students and I are working to apply the lab method to see where NBL are and are not.

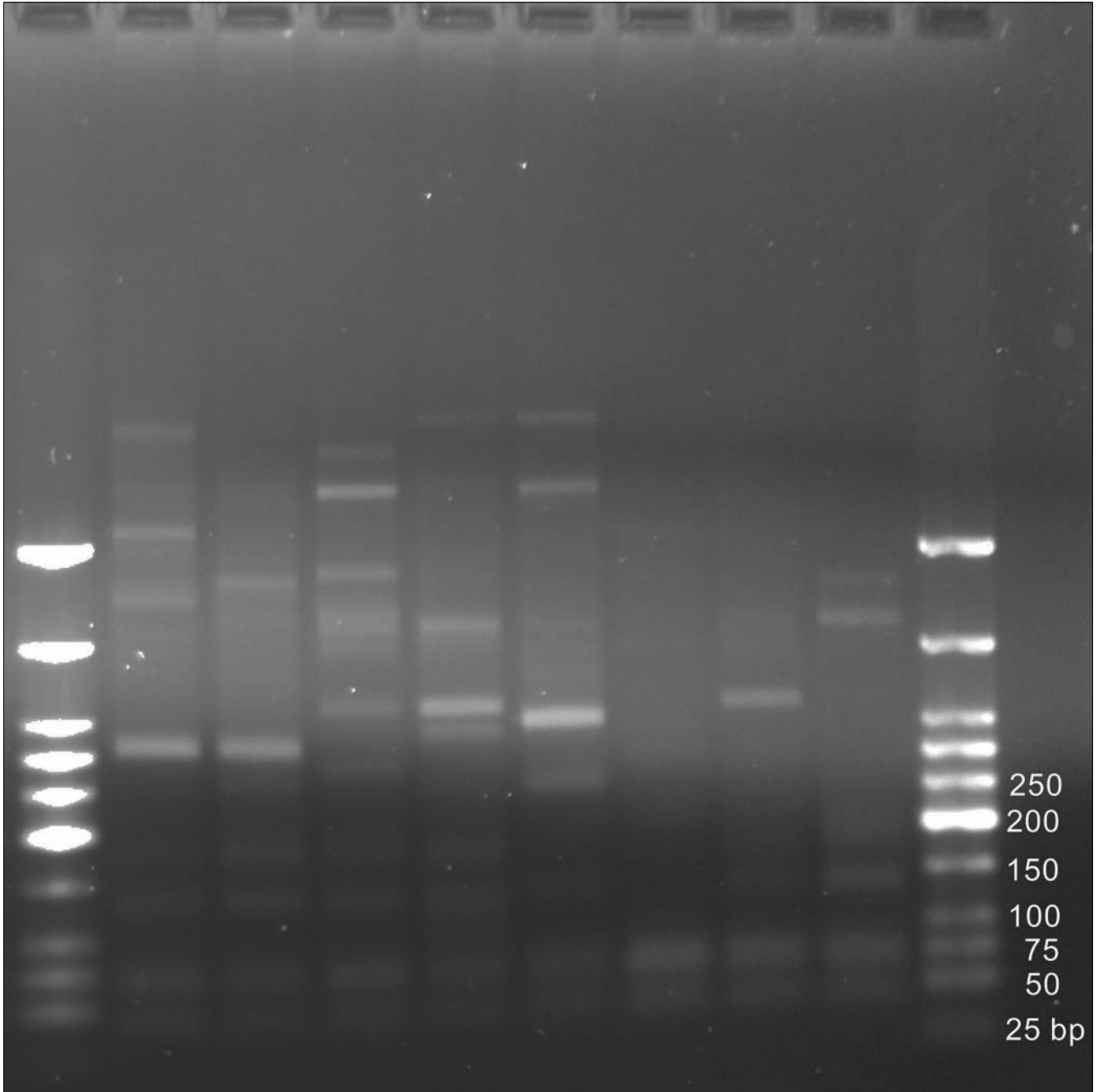
Hope all is well!

Zach

-----  
Zachary H. Olson, Ph.D.  
Assistant Professor of Animal Behavior  
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University of New England  
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11-3-16 Stantec samples





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**Reference: Rare Species Survey Report, Horseshoe Valley Wind Project, Roxbury, Maine**

## **APPENDIX C – REPRESENTATIVE PHOTOGRAPHS**



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**Reference: Rare Species Survey Report, Horseshoe Valley Wind Project, Roxbury, Maine**



Photo 1. Wetland Area 1 northern bog lemming survey area. Stantec. September 8, 2016.



Photo 2. Green fecal pellets (circled in red) collected for genetic analyses in Wetland Area 1. Stantec. September 8, 2016





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Photo 3. Wetland Area 2 northern bog lemming survey area. Stantec. September 8, 2016.



Photo 4. Non-bog lemming activity in Wetland 2. Stantec. September 8, 2016.





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Photo 5. Wetland with unsuitable northern bog lemming habitat. Stantec. September 8, 2016.



Photo 6. Unnamed perennial tributary of Swift River surveyed for northern spring salamander. Stantec. September 8, 2016.





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Photo 7. Intermittent stream with unsuitable habitat for northern spring salamander or Roaring Brook mayfly. Stantec. September 8, 2016.