Nalcor Energy Lower Churchill Project, Environmental Effects Monitoring Program – Newfoundland Marten

2015 Newfoundland Marten Hair Snag Trapping and Off Highway Vehicle Surveys

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Annual Report

December 2, 2015

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EXECUTIVE SUMMARY

As part of commitments made during the environmental assessment process for the Labrador-Island Transmission Link Project (the Project), Nalcor Energy (Nalcor) has retained Stassinu Stantec Limited Partnership (Stassinu Stantec) to implement an Environmental Effects Monitoring Program (EEMP) for the Newfoundland population of American marten (*Martes americana arata*), a species listed as threatened under both federal and provincial legislation. This report summarizes efforts from 2015 and represents the second year of a three year commitment to monitor the presence and distribution of American marten in the vicinity of the transmission line Right-of-way (ROW) near Main River, on the Northern Peninsula of Newfoundland.

The objectives of the 2015 field program were to assess the presence and distribution of marten in core habitat areas that overlap the proposed ROW, and to determine the density and access points for Off Highway Vehicle (OHV) use along the ROW. Between March 21, 2015 and April 16, 2015, seventeen hair snag traps were established to collect marten hair samples for genetic analysis and a series of ground and aerial surveys were completed to document marten tracks and OHV use of the ROW.

Hair snag trapping efforts were successful, with hairs obtained from 94% of traps on April 1, 88% of traps on April 9, and 100% of traps on April 16. Forty-eight hair samples were submitted for genetic analysis and screened to identify individuals and to determine sex. Complete genotypes were obtained from 33 samples, from which 21 individuals were identified and sex of 19 individuals confirmed (nine female and ten male). Six of the individuals had been previously identified in 2014, bringing the combined (2014 and 2015) total number of individual marten identified to 33. At least five different individual marten are using multiple (i.e., >1) trap sites in a given year, and are crossing the proposed ROW. The six individuals identified in both 2014 and 2015 used the same trap sites each year.

Ground-based winter track surveys were completed on April 10, 2015 to assess whether the ROW acts as a barrier to marten movements. Transects positioned roughly parallel and perpendicular to the ROW were surveyed near three hair snag trap locations. Marten tracks were observed in all three areas and indicate that marten are active in the Study Area and are crossing the ROW.

Aerial OHV surveys were completed April 10 and 16, 2015 and covered approximately 56.4 km and 48.5 km of linear transect, respectively. OHV activity was quantified by determining track densities along the proposed ROW in the core area, using snowmobile track density as an index of use. The density of OHV tracks within marten critical habitat ranged from 5.35 tracks / km^2 on April 10 to 12.14 tracks / km^2 on April 16, and were higher than densities in the area surveyed immediately south (2.91 to 8.54 tracks / km^2). Approximately 20 kilometers (linear distance) along the ROW had been cleared at the time of the aerial surveys, including approximately 8 km within marten critical habitat survey blocks.

The combined results of surveys in 2014 and 2015 provide preliminary information on the abundance, distribution, and habitat use by Newfoundland marten in the Main River watershed in the vicinity of the Project, as well as information on OHV use of the ROW. Results from 2014 and 2015 will be used in combination with results from future surveys (i.e., 2016) and other components of the EEMP to assess marten movement and distribution patterns in relation to Project activities.

1.0 INTRODUCTION

Furbearers were identified as a Valued Environmental Component (VEC) in the environmental assessment for the Labrador-Island Transmission Link Project (the Project) (Nalcor 2012). One furbearer species, the Newfoundland population of American marten (*Martes americana atrata*), is listed as *threatened* and is protected both federally under the *Species at Risk Act* (COSEWIC 2007) and provincially under the Newfoundland and Labrador *Endangered Species Act* (Government of Newfoundland and Labrador 2004). As part of commitments made during the environmental assessment process, Nalcor Energy (Nalcor) retained Stassinu Stantec Limited Partnership (Stassinu Stantec) to implement an Environmental Effects Monitoring Program (EEMP) for this and other species and VECs. This report summarizes efforts from the second year of a three year commitment to monitor American marten presence and distribution in the Project area (i.e., transmission line Right-of-way (ROW)) near Main River on the Northern Peninsula of Newfoundland.

1.1 Background

The Newfoundland population of American marten (marten) was recommended for special status a result of a substantial population decline (COSEWIC 2007). Following this designation a Recovery Plan was developed by the Newfoundland Marten Recovery Team (2010), which identified threats to this insular population including habitat loss and mortality from snaring and trapping. Critical habitat (delineated by 8 km^2 blocks based on female territory sizes) within core areas for this species in Newfoundland was identified from evidence of occurrence and habitat quality data (The Newfoundland Marten Recovery Team 2010).

Newfoundland marten are sensitive to habitat alteration and have a limited and discontinuous distribution in Newfoundland. As a result, it was included as a key indicator species for the EIS. Habitat alteration and loss during the construction phase was predicted as the greatest potential Project effect on furbearers. The Project overlaps critical Newfoundland marten habitat identified within the Main River core area. This core area has a protection rating (referred to as Group 2 Habitat) which requires development and forest harvesting to be managed through the *Environmental Protection Act* and resource planning process. All land-based traps, locking snares, and small game snares are legally prohibited under this level of protection (The Newfoundland Marten Recovery Team 2010).

2.0 STUDY OBJECTIVES

Based on monitoring requirements and commitments made during the environmental assessment, the Furbearer EEMP was designed to assess whether the cleared ROW acts as a barrier to Newfoundland marten distribution; to determine the efficacy of watercourse buffer zones, brush piles, windrows, and any applied modified vegetation management techniques as travel corridors; and to assess snowmobile access provided by the cleared ROW.

The primary objectives of the marten hair snag program were to collect and monitor potential environmental effects during Project construction. Specifically, the objectives of this field program were:

- to determine the presence and distribution of marten in the core habitat areas within the proposed ROW; and
- to determine the density and access points for Off Highway Vehicle (OHV) use along the ROW.

3.0 METHODS

3.1 Study Area

The Study Area for this program includes primary marten habitat throughout the Main River valley and the transmission line ROW. Stantec Geographic Information System (GIS) personnel worked with the Government of Newfoundland and Labrador Wildlife Division (NLWD) personnel to produce a map folio of the Main River valley and the Labrador-Island Transmission Link ROW indicating primary marten habitat (i.e., core marten habitat blocks) and transects to be surveyed for the OHV use during this late winter field program. Centroids from core marten block habitat were identified as locations for hair snag trap deployment (Figure 3-1).

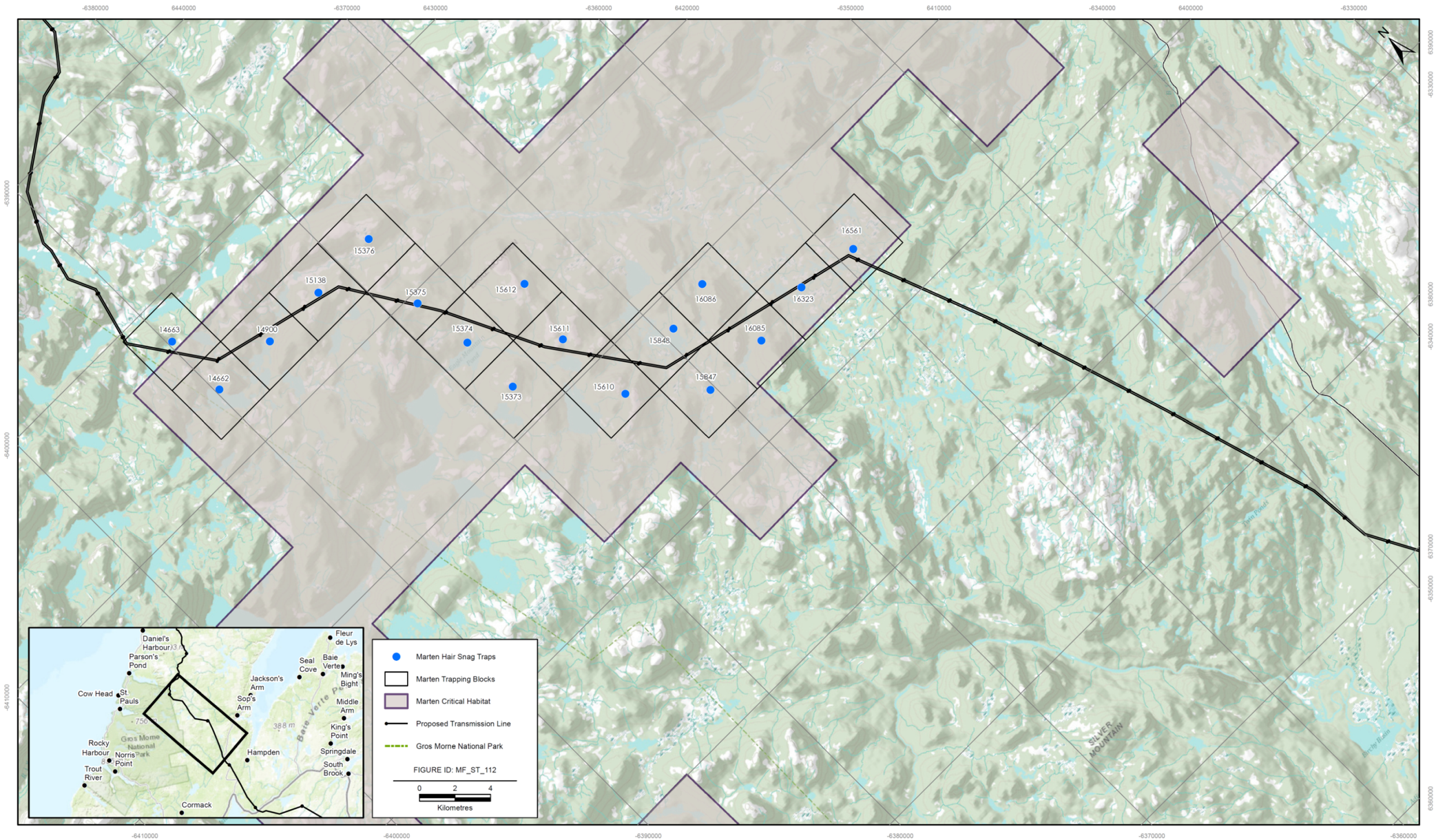

Figure 3-1 Marten Hair Snag Trap Locations, 2015

3.2 Study Team

The Study Team for the American marten hair snag program included Stassinu Stantec personnel and pilots from Universal Helicopters Newfoundland Limited Partnership (UHNL) (Table 3.1).

Table 3.1 Survey Team, Marten EEMP, March 21 – April 16, 2015

Name	Position/Role during each Visit					Organization
	March 21	April 1	April 9	April 10	April 16	
Chris Gosse	Pilot					UHNL
Matt Hoyles		Pilot	Pilot	Pilot	Pilot	UHNL
Tony Parr	Field Lead	Field Lead			Field Lead	Stantec
Tina Newbury		Field Biologist	Field Biologist	Field Biologist		Stantec
Stacey Camus	Field Biologist		Field Lead	Field Lead		Stantec
Karen Rashleigh					Field Biologist	Stantec

Notes:
UHNL – Universal Helicopters Newfoundland Limited Partnership

Prior to the start of the field component, all personnel reviewed the Health, Safety, Environment and Quality (HSEQ) and Project Execution Plan, and the Risk Management Strategy (RMS 1) (Stassinu Stantec Limited Partnership 2015). A daily hazard assessment (RMS 2) was completed each morning. The required scientific research permit (Permit #: IW2015-03, Appendix A) was granted by the Newfoundland and Labrador Wildlife Division prior to the surveys.

3.3 Hair Snag Trapping

Seventeen hair snag traps were constructed and deployed in the Main River area in 2014 (Figure 3-1), using guidelines provided by the NLWD. Additional traps were constructed in 2015 in the event that traps had to be replaced due to damage or if they could not be located (e.g., due to differences in snow depth between years) (Photo 1). Initial trap visits (and deployment of new traps, if necessary) occurred on March 21, 2015. Four sticky pads and bait were placed in each trap, as per the NLWD guidelines. Traps were checked (and re-baited) on three occasions (approximately once per week) during April 1 – 16, 2015. Snow depth (using a snow probe) and other weather conditions (e.g., temperature, wind) were also recorded at trap locations.

Photo 1 Marten Hair Snag Trap Deployed at Site 14663 in 2015

3.4 Laboratory DNA Analysis

Hair samples were delivered to the Genomics and Proteomics (GaP) Facility of the CREAIT Network at Memorial University of Newfoundland for genetic analyses. Detailed methods are provided in Appendix C and are summarized below:

- DNA was extracted from approximately 20 roots (one sticky pad per envelope submitted).
- DNA from hair samples were screened using standard operating protocols developed in the GaP Facility. Alleles were called independently by two readers.
- Sex determination of samples was carried out by amplifying an intron within the zinc-finger gene that is present on both sex chromosomes, using standard operating protocols developed in the GaP Facility. Agarose gels were read independently by two readers.

- Complete genotypes were run through GENECAP version 1.3, a Microsoft Excel macro that compares each individual multi-locus genotype with all other genotypes within the data set to locate matching genotypes (Wilberg and Dreher 2004) and thus identifies individuals within a set of samples.

DNA results were used to determine whether or not more than one marten visited a trap site, as well as assess use of multiple trap sites by an individual.

3.5 Ground-based Track Survey

Ground-based winter track surveys were completed to assess whether the ROW acts as a barrier to marten movements. A series of 1-km long transects (approximate distance) along the ROW were identified using GIS, in advance of survey efforts. The conceptual layout of transects was designed to target forested habitats parallel to the ROW in critical Newfoundland marten habitat, as well as perpendicular to the ROW, where active hair snags had been established (Figure 3-2). Transects were provided to field leads to guide navigation in the field, although terrain, snow conditions, and suitable helicopter landing areas influenced the final transect layout and length.

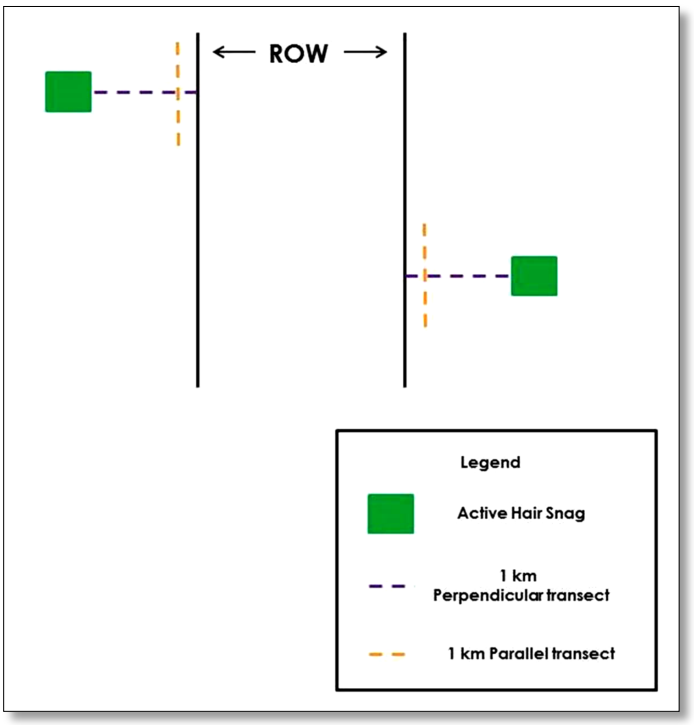

Figure 3-2 Conceptual Layout of Transects for Winter Track Surveys

3.6 OHV Survey

OHV activity was quantified by determining track densities along the proposed ROW in the core area, using snowmobile track density as an index of use. A transect identified along the ROW previously in 2014 was surveyed again in 2015 during aerial surveys on April 10 and April 16. All snowmobile tracks were recorded with locational data, and flight track files and digital photos stored for future reference.

Track density was calculated using the following formula:

$$\text{track density} = \frac{\text{\# tracks observed}}{\text{transect length x field of view (400 m)}}$$

4.0 RESULTS

4.1 Survey Effort, Trap Success and Conditions

Teams were deployed on five days during the period from March 21, 2015 – April 16, 2015 (Table 4.1). The first deployment on March 21 was to install the hair snag traps; subsequent visits (n=3) were to check and re-bait traps (Table 4.1). Aerial OHV surveys were completed on April 10 and April 16, concurrent with either winter track surveys or checking of traps (Table 4.1). Weather and snow conditions during surveys were suitable for observing marten tracks near the trap sites while checking traps and for documentation of OHV tracks from the helicopter (Table 4.1).

Table 4.1 2015 Survey Effort, Trap Success and Conditions

Date	Activities	Trap success	Conditions
March 21	Established sampling locations and set hair snag traps	17 traps activated	Winds <5 km/h, temperatures ranged between -11°C and 1°C during trap deployment; last snowfall on March 20
April 1	Checked and re-baited traps	16 traps positive for Marten	100% cloud cover, SW winds and approximately -2°C, fresh snowfall overnight
April 9	Checked and re-baited traps	15 traps positive for Marten	0% cloud cover, light W winds and approximately -8°C
April 10	Aerial OHV survey; Ground-based track surveys	n/a	0% cloud cover, approximately -11°C
April 16	Checked traps; Aerial OHV survey	17 traps positive for Marten	50% cloud cover, winds up to 30 km/h, approximately -4°C

Notes:
OHV – Off Highway Vehicle
n/a – not applicable
Trap locations are provided in Table B-1, Appendix B.

Hair snag trapping efforts were successful, with hairs obtained from 94% of traps on April 1, 88% of traps on April 9, and 100% of traps on April 16. All hair samples were labeled in the field, according to date and location, and stored in envelopes until sent for laboratory analysis.

4.2 Ground-based Track Surveys

Ground-based track surveys occurred on one day only (April 10, 2015) and included following marten tracks identified in the vicinity of a trap site, as well as general track surveys approximately parallel and perpendicular to the ROW. Surveys were completed near traps 14662 (Figure 4-1), 14900 (Figure 4-2) and 15374/15375 (Figure 4-3). As expected, marten tracks were observed at all three locations, in addition to evidence of moose (*Alces alces*), caribou (*Rangifer tarandus*), snowshoe hare (*Lepus americanus*), red squirrel (*Tamiasciurus hudsonicus*), and avifauna. Marten tracks were followed on three occasions, with tracks either eventually leading to a subnivean access point, or becoming undetectable (refer to Table B-3 in Appendix B).

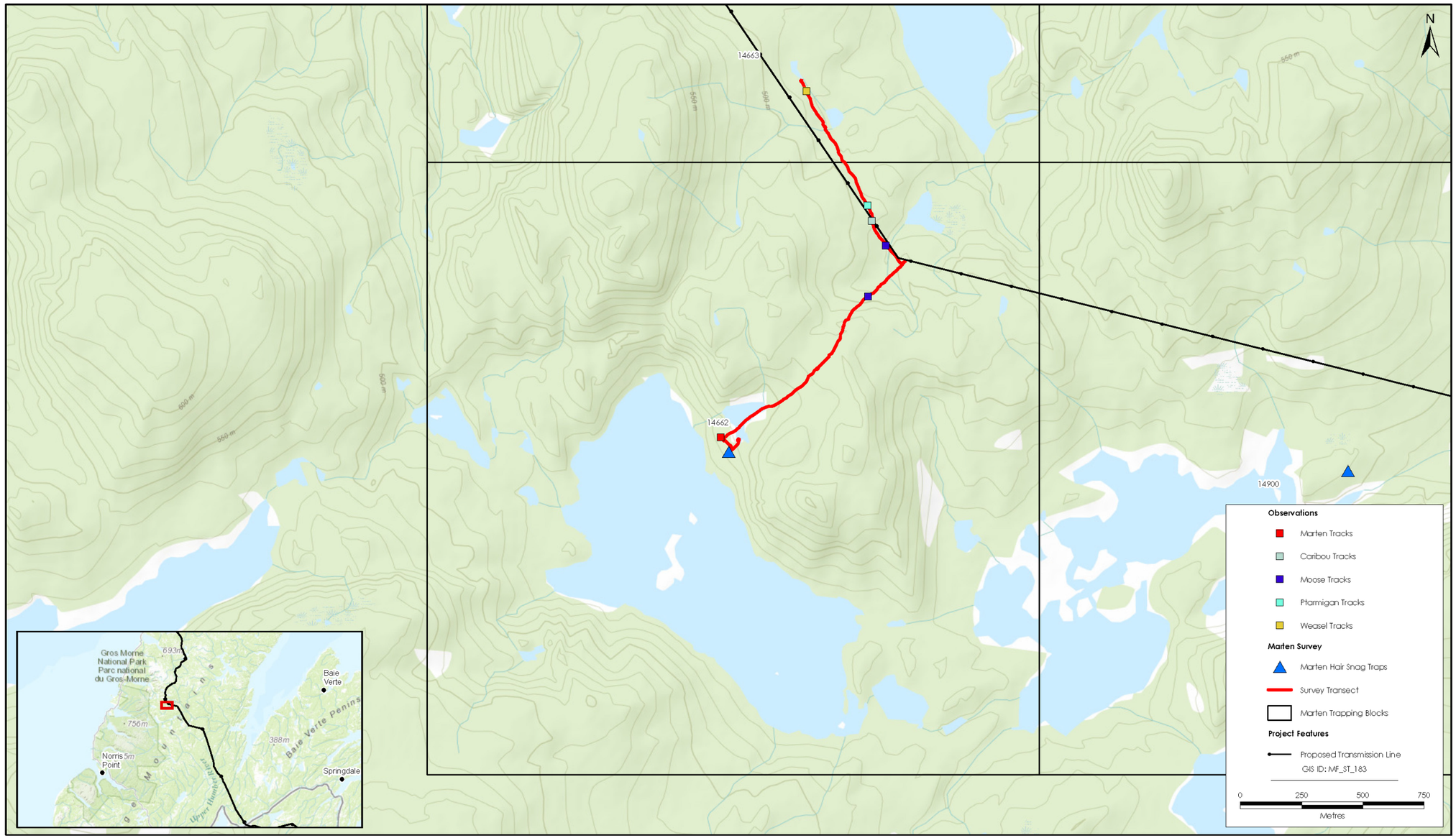

Figure 4-1 Ground-based Track Survey Results – Trap 14662

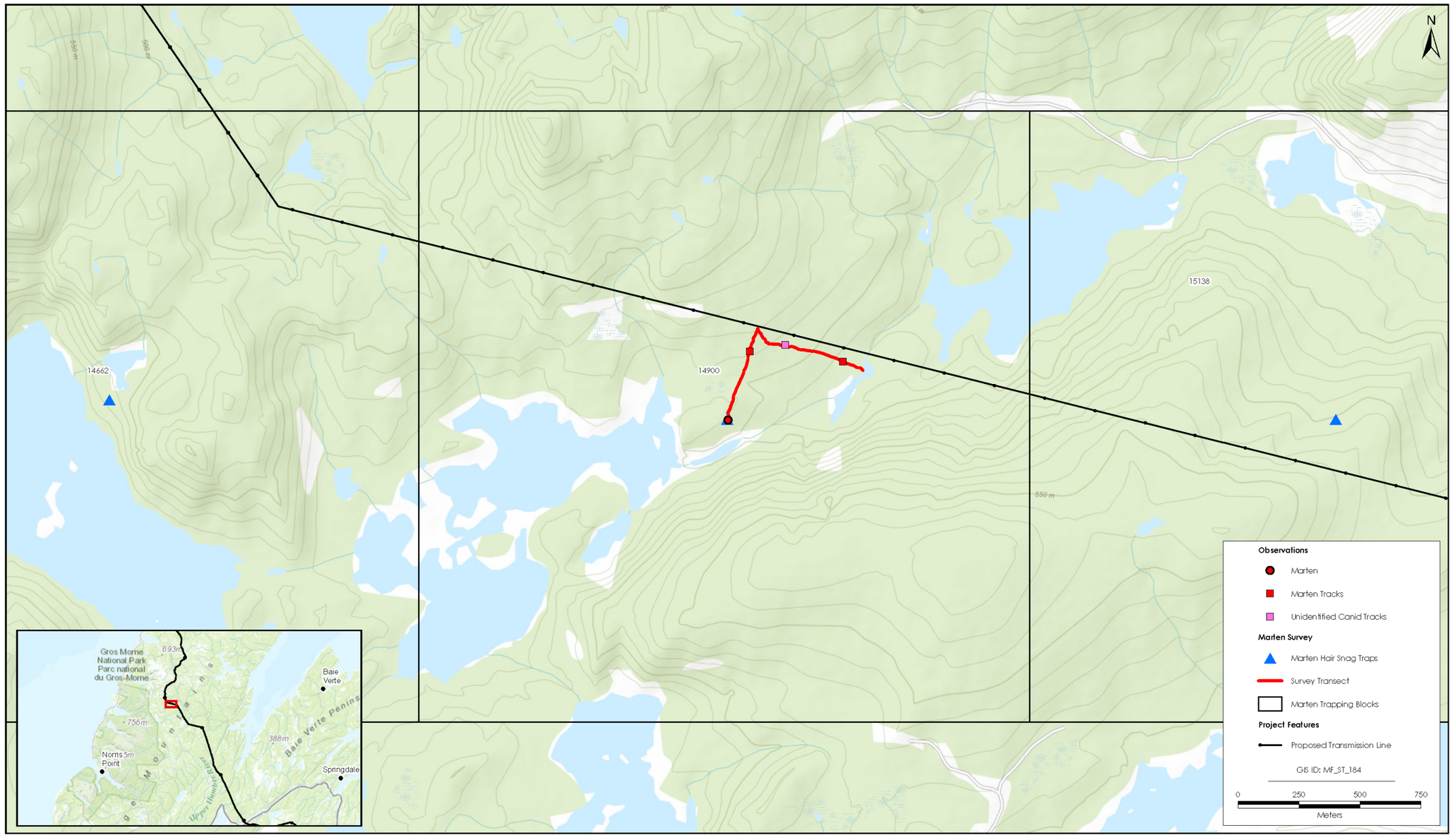

Figure 4-2 Ground-based Track Survey Results – Trap 14900

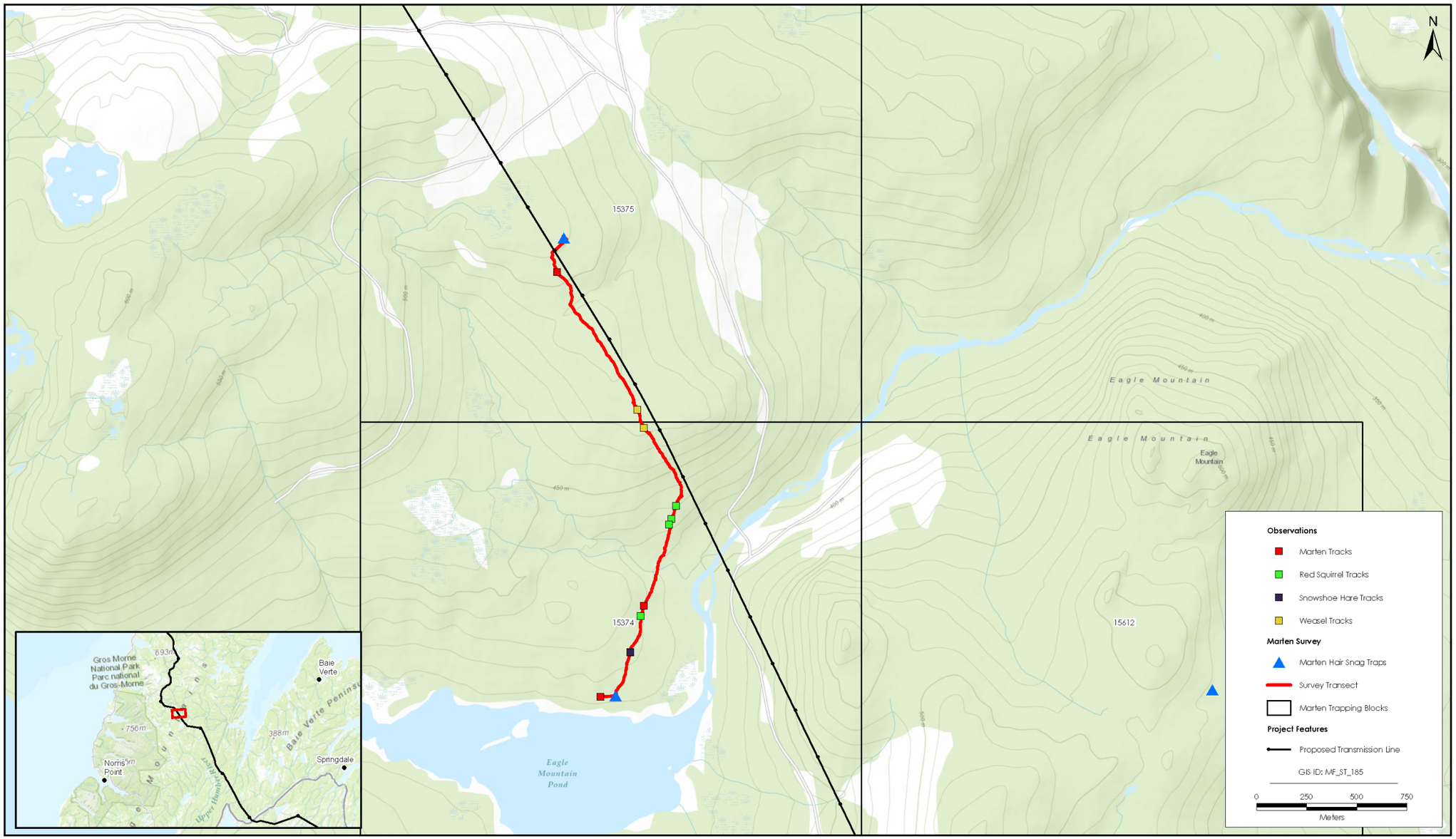

Figure 4-3 Ground-based Track Survey Results – Traps 15374 and 15375

4.3 Aerial OHV Track Surveys

Approximately 56.4 km of linear transect was surveyed via helicopter on April 10, 2015 and 48.5 km on April 16, 2015. OHV tracks were recorded at 18 locations along the ROW on April 10 and 28 locations on April 16 (Table 4.2). The density of OHV tracks within the survey area ranged from 2.91 to 5.35 tracks / km^2 on April 10 and from 8.54 to 12.14 tracks / km^2 on April 16 (Figures 4-4 and 4-5). On both days, the overall highest densities of tracks were within the marten critical habitat survey blocks compared to the area surveyed immediately south (Figures 4-4 and 4-5). Approximately 20 linear kilometers along the ROW was already cleared at the time of the aerial surveys, including approximately 8 km within marten critical habitat survey blocks.

Table 4.2 2015 OHV Survey Results

Survey Date	Approximate Linear Distance (km) Surveyed	# of Track Observations			Total Records	Total Number of Tracks (used for density calculation)[1]
		<5 tracks in an area	5-10 tracks in an area	>10 tracks in an area		
April 10	56.4	2	4	12	18	147
April 16	48.5	6	6	16	28	206
Total	**104.9**	**8**	**10**	**28**	**46**	**353**

Notes:

[1] –OHV tracks observed during aerial surveys were recorded as a range (i.e., 5-10) or as >10 when the number of tracks observed was >5 tracks. The number of tracks used to calculate density when the actual number was not available was based following: 5 for the 5-10 range and 10 for data recorded as >10 tracks.

Refer to Table B-4 of Appendix B for detailed results.

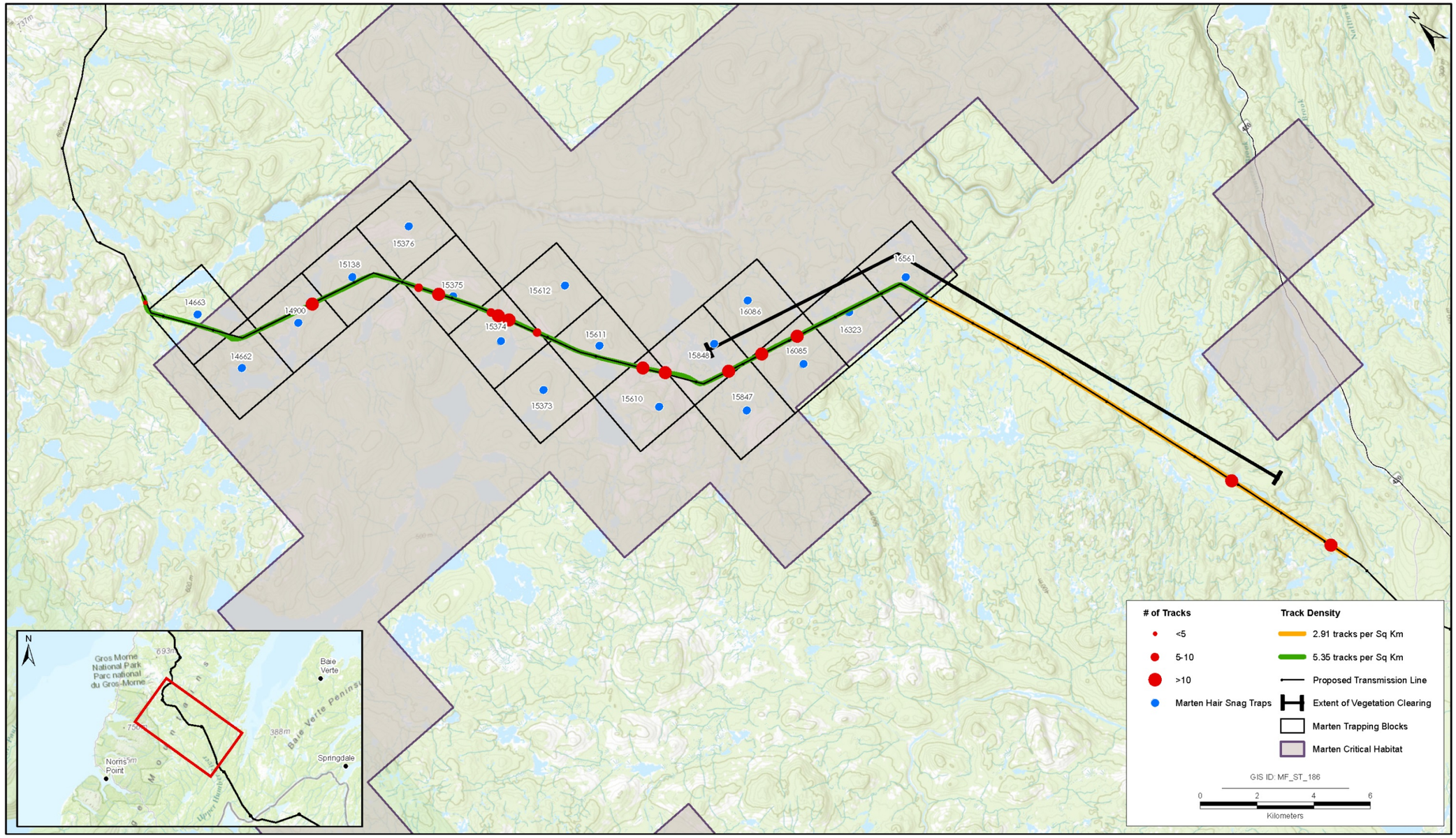

Figure 4-4 OHV Survey Results – April 10, 2015

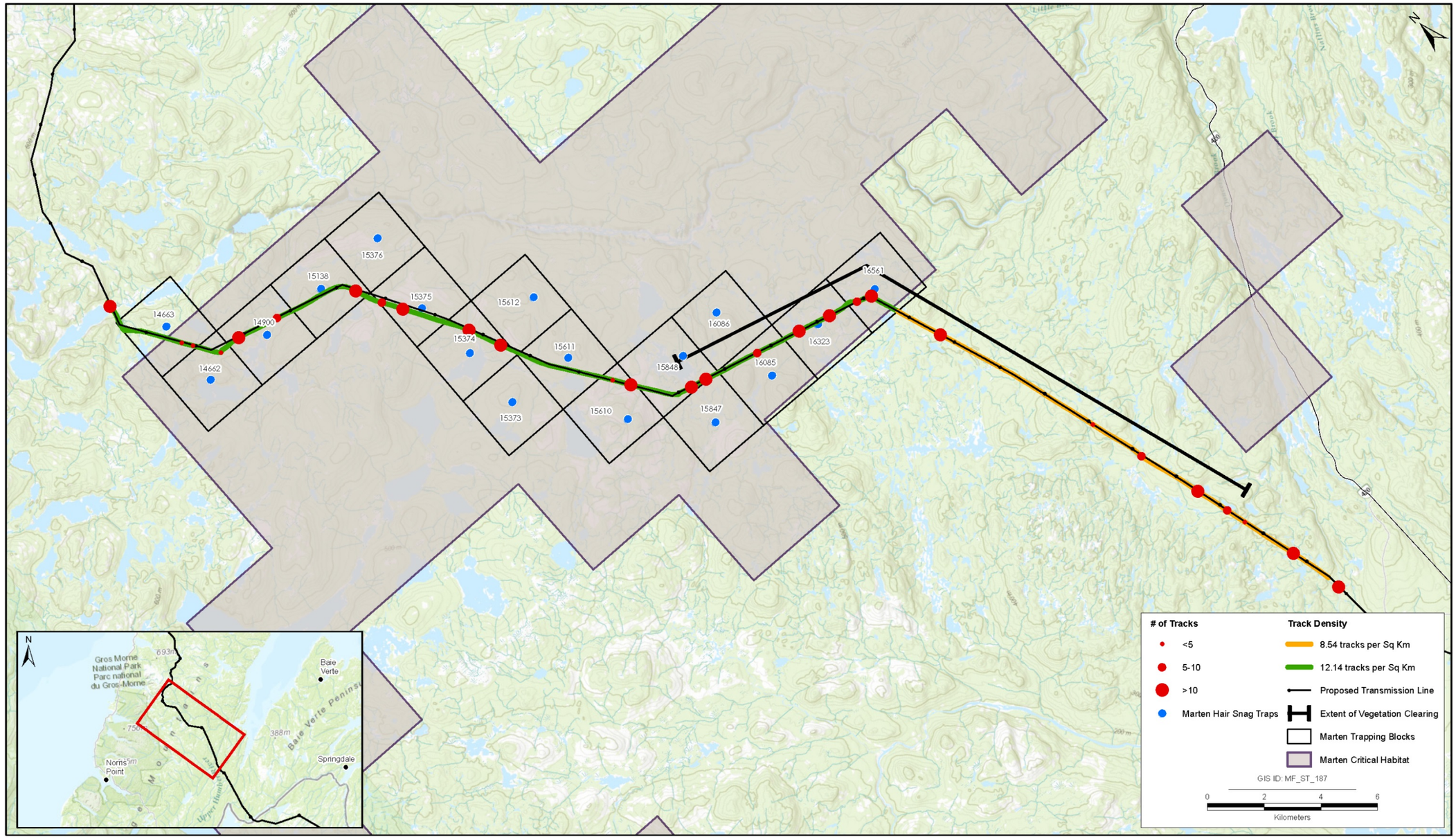

Figure 4-5 OHV Survey Results – April 16, 2015

4.4 Laboratory Results

Forty-eight envelopes containing hair samples were submitted for genetic analysis in 2015; one sticky pad per envelope processed. All 48 samples were screened to identify individuals and to determine sex, however only 33 had complete datasets (or genotypes). Of the 33 complete genotypes, 21 individuals were identified and the sex of 19 individuals confirmed (nine female and ten male; two were unconfirmed). Six of the individuals had been previously identified in 2014, bringing the combined (2014 and 2015) total number of individual marten identified to 33.

Table 4.3 Newfoundland Marten Identified from the 2015 Survey

Individual ID	Sex	Traps Visited			Total # Traps Visited	Previously identified in 2014 (traps visited)
		April 1, 2015	April 9, 2015	April 16, 2015		
A	Male	16561			1	No
B	Female	15847			1	No
C	Female	16086	16085		2	Yes (16085)
D	Female	15848			1	No
E	Female	14662 14663		14663 or 14662[1]	2	No
F	Male	14900			1	No
G	Female	15138	15138		1	No
H	Male	15375			1	Yes (15374 & 15375)
I	Female	15374			1	No
J	Female	15612		15612	1	Yes (15612)
K	Female	15610			1	No
L	Male	16085	15847	16085 15847 16086	3	Yes (16085 & 16086)
M	Female		16561	16561	1	Yes (16561)
N	Unknown		15848		1	No
O	Male		14900	15138	2	No
P	Male			14900	1	No
Q	Male			15373	1	No
R	Male			15848	1	Yes (15848)
S	Male			15375 15374	2	No
T	Unknown			15611	1	No

Individual ID	Sex	Traps Visited			Total # Traps Visited	Previously identified in 2014 (traps visited)
		April 1, 2015	April 9, 2015	April 16, 2015		
U	Male			16323	1	No

Notes:
[1] - Due to an error when recording the trap location on the envelope, the trap site cannot be confirmed. Trap locations are shown in Figure 3-1.

4.5 Marten Activity and Movements

Results indicate that at least five different individual marten are using multiple (i.e., >1) trap sites in a given year, and are crossing the proposed ROW (Figure 4-6). Two of these individuals used the same trap sites in 2015 and 2014 (individuals C and L in Table 4.3). Similarly, the remaining four individuals that were identified in both 2014 and 2015 also use the same trap site (individuals H, J, M and R in Table 4.3).

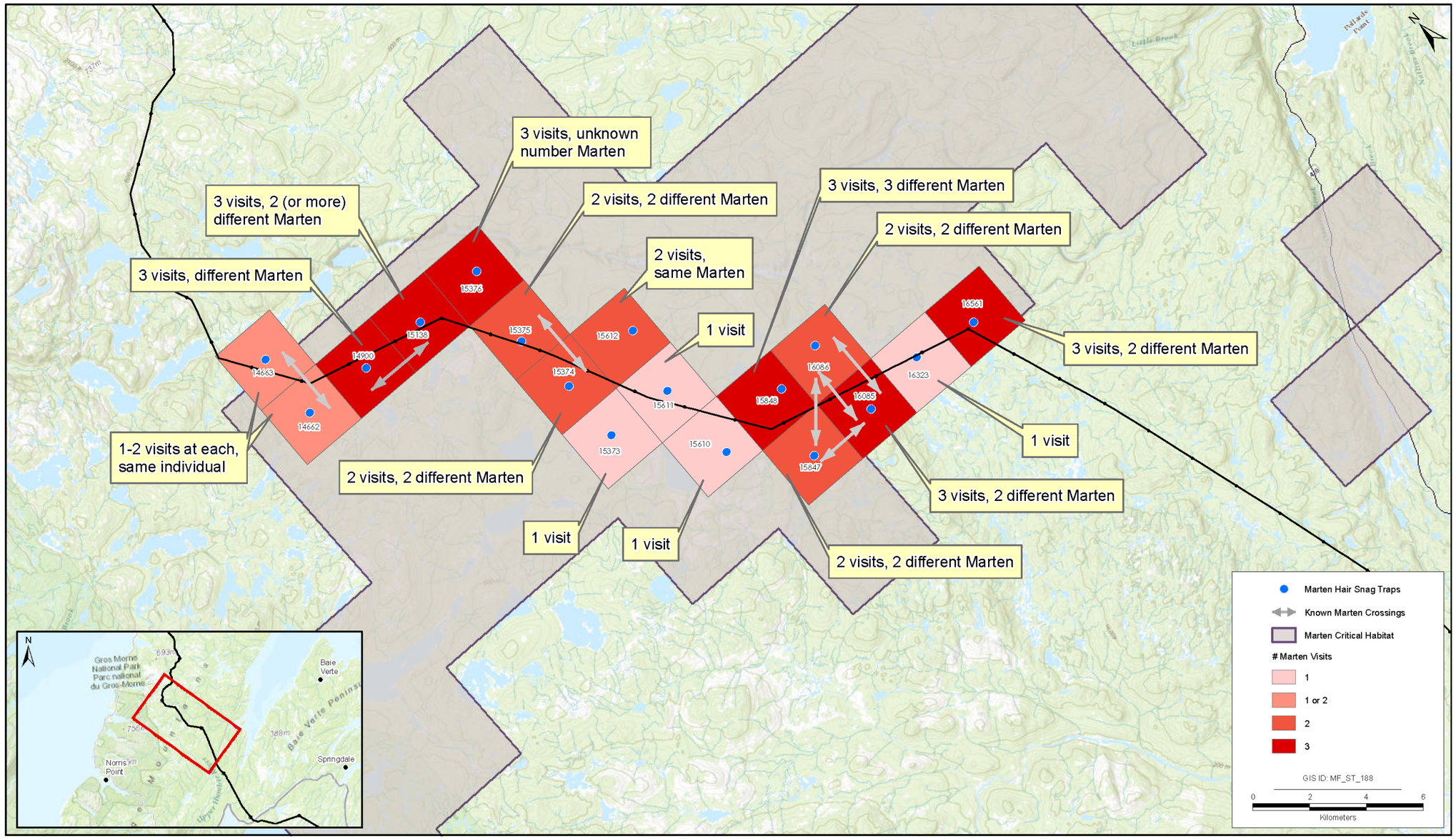

Figure 4-6 Marten Activity in the Study Area, April 1-16, 2015

5.0 SUMMARY

Newfoundland marten presence in the Study Area was confirmed through the observation of tracks and collected hair samples. This species was expected in the Main River area based on the results of previous studies (Gosse and Hearn 2005), available habitat, and proximity to core and critical habitat ranges identified by NLWD.

The combined results of surveys in 2014 and 2015 provide preliminary information on the abundance, distribution, and habitat use by Newfoundland marten in the Main River watershed in the vicinity of the Project. DNA results to date (i.e., 2014 and 2015 combined) have identified a total of 33 individual marten in the Study Area.

Results from the field surveys indicate that marten are active in the Study Area and are crossing the ROW. Two individuals [one male (individual ID "L") and one female (individual ID "C")] appear to have crossed the ROW in the area that had been cleared. These individuals were also documented in 2014 (i.e., prior to clearing), using the same area.

Results from 2014 and 2015 will be used in combination with results from future surveys (i.e., 2016) and other components of the EEMP to assess Newfoundland marten movement and distribution patterns in relation to Project activities.

6.0 PLANS FOR 2016

In 2016, the Study Team will re-sample the same 17 hair snags traps used in previous years, as well as complete six winter track surveys, following the 2014 and 2015 protocols. An OHV survey will also be completed to provide an index of activity along the ROW. As 2016 will be the final year of sampling, a final report will be issued compiling the results from all three years, and an assessment as per stated objectives (refer to Section 2.0).

7.0 REFERENCES

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APPENDIX A

Research Permit

Newfoundland Labrador

GOVERNMENT OF NEWFOUNDLAND AND LABRADOR

Department of Environment and Conservation

A PERMIT TO ENGAGE IN AN ECONOMIC ACTIVITY UNDER SECTION 19 OF THE *ENDANGERED SPECIES ACT, SNL 2001 C.E-10.1*

DATE: November 14, 2014

ECONOMIC ACTIVITY: Development of the Labrador Island Transmission Link

PERMIT NUMBER: 2014/4

ISSUED TO: Lower Churchill Management Corporation, on behalf of Labrador Transmission Corporation, 500 Columbus Drive, St. John's, NL A1A 1W5.

SPECIES AFFECTED:

Woodland Caribou (Red Wine) (*Rangifer tarandus*)
Woodland Caribou (Mealy Mountain) (*Rangifer tarandus)*
American Marten (*Martes americana atrata*)
Common Nighthawk (*Chardeiles minor)*
Rusty Blackbird (*Euphagus carolinus)*
Olive-sided Flycatcher (*Contopus cooperi)*
Harlequin Duck (*Histrionicus histrionicus),*
Red Knot (*Calidris canutus rufa)*
Gray-cheeked Thrush (*Catharus minimus minimus*)
Short-eared Owl (*Asio flammeus*)
Bobolink (*Dolichonyx oryzivorus*)
Red Crossbill (*Loxia curvirostra*)
Boreal Felt Lichen (*Erioderma pedicellatum*)
Graceful Felt Lichen (*Erioderma mollisimum*)
Fernald's Braya (*Braya fenaldii)*
Long's Braya (*Braya longii)*

PERMIT TO: Construct the Labrador Island Transmission Link described in the Labrador-Island Transmission Link Long's Braya and Fernald's Braya - Shoal Cove Impacts Mitigation and Monitoring Plan: Nalcor Doc. No. LK-PT-MD-0000-EV-PL-0011-01 Revision B1 and the Species at Risk Impacts Mitigation and Monitoring Plan Nalcor Doc. No. ILK-PT-MD-0000-EV-PL-0001-01.

EFFECTIVE DATE: November 14, 2014

EXPIRY DATE: December 31, 2017

This permit allows Lower Churchill Management Corporation, on behalf of Labrador Transmission Corporation to engage in activities as described in the Labrador-Island Transmission Link Species at Risk Impacts Mitigation and Monitoring Plan Nalcor Doc. No. ILK-PT-MD-0000-EV-PL-0001-01 and the Labrador-Island Transmission Link Long's Braya and Fernald's Braya - Shoal Cove Impacts Mitigation and Monitoring Plan: Nalcor Doc. No. LK-PT-MD-0000-EV-PL-0011-01 Revision B1, affecting the designated species listed above, the residence of a specimen of any of these designated species or their critical or recovery habitat related to the development of the Labrador Island Transmission Link under the authority of the *Endangered Species Act* SNL 2001 C.E-10.1.

This permit does not supersede any prohibitions under the federal *Migratory Birds Convention Act* or the federal *Species at Risk Act*, and covers requirements under the *Endangered Species Act,* SNL 2001 C.E-10.1 only.

CONDITIONS

1) The permit holder must adhere to all commitments outlined Labrador-Island Transmission Link Species at Risk Impacts Mitigation and Monitoring Plan Nalcor Doc. No. ILK-PT-MD-0000-EV-PL-0001-01 and the Labrador-Island Transmission Link Long's Braya and Fernald's Braya - Shoal Cove Impacts Mitigation and Monitoring Plan: Nalcor Doc. No. LK-PT-MD-0000-EV-PL-0011-01 Revision B1 including conducting monitoring and survey work and providing regular reporting.

2) The permit holder may designate other individuals to perform permitted actions on their behalf. The permit holder is responsible for ensuring that the designated individuals follow all conditions of this permit.

3) The permit holder must keep a list of all individuals having access to monitoring data for species at risk, including all caribou collar data, and the list must be provided to the Wildlife Division, Department of Environment and Conservation upon issuance of the permit. If new individuals are provided with access to the data, an updated list must be provided. The permit holder must advise all individuals that their information will be provided to the Wildlife Division and may be further disclosed as permitted or required by law. Data on species at risk shall not be shared outside the permit holder or its contractors.

4) Upon receipt of this permit the permit holder must provide the Wildlife Division with a timeline for the development of the project this time line should also be presented through georeferenced images, maps and data.

5) Upon receipt of this permit and throughout construction of the project the permit holder will maintain communications with the Wildlife Division to ensure the Division is fully informed of all upcoming activities. Pre-quarter plans must be provided at least 3 months before the initiation of activities.

6) Prior to beginning monitoring activities, the permit holder will meet and/or correspond with the Wildlife Division to develop a timeline for monitoring activities. .

7) Reporting Requirements:

a. Immediate reporting is required if individuals of a designated species listed above is harassed, damaged, injured or killed as a result of the project activities.

b. Weekly reports of where activities have occurred, species at risk observations and the upcoming week's activities are required every Monday morning. These reports need to be specific to species at risk but may include other Wildlife issues and observations.

c. Monthly reporting shall include a detailed synopsis including maps and photographs of activities such as access roads, trails, or forest clearing resulting in the removal, loss and or alteration of forests, wetlands or other natural features and an update to geo-referenced and spatial data.

d. Species Monitoring Conclusion Reports shall be submitted at the conclusion of each component of the work outlined in the SAR IMMP documents as listed in condition 1. Reports must provide a synopsis of the location of surveys, methods employed, number of samples/specimens taken, location of samples/specimens, additional relevant ecological information, and raw data and coordinates (submitted in digital format). If monitoring is conducted over multiple years then an interim report must be provided annually.

8) A copy of this permit must be in the possession of at least one person working in the field undertaking monitoring activities. The copy of the permit must be provided to a Fish and Wildlife Enforcement Officer, Wildlife Division official, or other authorized official upon request.

9) The permit holder must adhere to the caribou monitoring and mitigation requirements outlined in Schedule A.

10) Any changes to the site design or survey design and/or methodology outlined in the SAR IMMP documents as listed in condition 1 require approval from the Wildlife Division before implementation.

11) A digital copy of the shape files of all survey routes must be provided prior to the annual initiation of the field program for effects monitoring and baseline investigations.

12) The permit holder is responsible to obtain any and all permissions which may be required to release any information required under this permit to the Wildlife Division.

13) This permit does not absolve or relieve the permit holder from compliance with any other applicable laws, or orders or the obtaining of any other necessary permits or any requirement to obtain permission to access private property.

DAN CRUMMELL, MHA
District of St. John's West
Minister

SCHEDULE A: Caribou Monitoring and Mitigation Conditions

1. Aerial transect surveys shall be for the primary purpose of investigating for the presence of Woodland Caribou. Aircraft shall not descend lower than 100 feet on located caribou and observation time shall be limited to the minimum amount of time required to count and classify observed caribou, and shall not exceed 2 minutes.

2. Ground surveys shall be for the purpose of assessing caribou occurrence in relation to, and in proximity to project development activities such as roads, and hydro lines. Ground surveys may include use of motor vehicles, ATVs, and water craft. ATVs and snowmobiles may only be used on roads, forest roads and hydro line corridors.

3. The permit holder shall submit all raw data collected during the surveys (including GPS caribou locations, description of caribou observations, caribou tracks or observed caribou craters) within one week of the completion of any survey activities.

4. All capture, restraint, sampling, and collaring of caribou will be conducted only by Wildlife Division staff. No capture, restraint or any handling of caribou can occur under any circumstances except in the presence of Wildlife Division staff.

5. The permit holder will deploy up to 5 collars during the construction phase of the project. The permit holder is responsible for all costs associated with the deployment of and data fees related to the collars.

6. Wildlife Division will arrange with the collar manufacturer to have collar location data made available to both the Wildlife Division and the permit holder via an online data account as the data becomes available. The permit holder and the Wildlife Division shall mutually agree on the programming schedules for collars and Wildlife Division staff will be responsible for collar programing.

7. All caribou collar location data from all caribou collars, and all collars deployed by the permit holder under this permit, is strictly confidential. The data shall not be released to any individual or group except those individuals directly involved in caribou monitoring or mitigations. No raw or geographically representative data shall to be shared by the permit holder or any employees, contractors or subcontractors without the written permission of the Wildlife Division.

APPENDIX B

2015 Field Data

Table B.1 Trap Locations and Habitat Description

Site	UTM Location (Zone 21U)		Altitude	Habitat Description (Canopy Cover)
	Easting	Northing		
14663	471232	5524318	462	balsam fir dominant
14662	471260	5526750	496	balsam fir dominant
14990	473762	5524240	465	balsam fir dominant
15183	476253	5524239	509	balsam fir dominant
15376	478801	5516852	467	balsam fir and black spruce mixedwood
15375	478774	5519135	519	balsam fir and black spruce mixedwood
15374	478516	5521419	410	balsam fir and black spruce mixedwood
15373	478918	5524302	519	balsam fir and black spruce mixedwood
15612	481501	5513771	484	balsam fir and black spruce mixedwood
15611	481303	5516766	487	balsam fir dominant
15610	481750	5519165	509	balsam fir dominant
15848	483772	5511686	338	black spruce (75%) dominant with some balsam fir (25%)
16086	484411	5514204	407	balsam fir and black spruce mixedwood
15847	486348	5511636	361	balsam fir (75%) dominant with some black spruce (25%)
16085	486295	5514599	414	balsam fir and black spruce mixedwood
16323	488748	5511972	318	black spruce (75%) dominant with some balsam fir (25%)
16561	491064	5511617	318	balsam fir and black spruce mixedwood

Table B.2 2015 Hair Snag Results

Site	March 21	April 1		April 9		April 16	
	Snow Depth (cm)	Snow Depth (cm)	Hair Sample Obtained?	Snow Depth (cm)	Hair Sample Obtained?	Snow Depth (cm)	Hair Sample Obtained?
14663	220	213	Yes	>300	Yes	113	Yes
14662	205	210	Yes	240	Yes	173	Yes
14900	310	>230	Yes	207	Yes	198	Yes
15138	320	>230	Yes	-	Yes	241	Yes
15376	305	>230	Yes	227	Yes	>248	Yes
15375	310	>230	Yes	-	Yes	>238	Yes
15374	310	210	Yes	>240	Yes	212	Yes
15373	300	206	Yes	205	Yes	203	Yes
15612	300	>230	Yes	-	Yes	247	Yes
15611	220	218	Yes	-	Yes	208	Yes
15610	245	230	Yes	-	Yes	226	Yes
15848	185	184	Yes	-	Yes	198	Yes
16086	215	195	Yes	-	No	182	Yes
15847	200	197	Yes	-	Yes	168	Yes
16085	275	210	Yes	-	Yes	190	Yes
16323	250	176	No	-	No	170	Yes
16561	180	205	Yes	-	Yes	174	Yes
Total Hair Samples			**16**		**15**		**17**

Notes:
Snow depths were approximated using a snow probe
"-" indicates snow depth was not recorded

Table B.3 2015 Ground-based Track Survey Results

Transect #	Trap Location	Start Time	End Time	Distance (km)	Orientation to TL ROW	Observations	Comments
1	14662	1020	1050	1.3	Perpendicular	Marten track (followed); Moose tracks and scat; pair of Pine Grosbeak	
2	14622	1105	1127	0.9	Parallel	Old moose tracks and bed; caribou scat and bed; ptarmigan snow roost and tracks	Snow depth >240 cm
3	14900	1155	1206	3.9	Perpendicular	Marten observed at the hair snag trap	
4	14900	1207	1242		Parallel	Marten track; one unidentified track (canid?)	Snow depth 250 cm; portions through strip cut
5	15375	1308	1334	1.3	Parallel	Marten track; weasel tracks	
6	15374	1343	1411	1.6	Perpendicular	Squirrel tracks, marten tracks (eventually went to subnivean access point); Snowshoe hare track	Snow depth >250 cm
n/a	15374	1411	1421		n/a – following along marten track	Marten track (followed), that led to subnivean access point	

Notes:
n/a – not applicable
TL ROW – Transmission Line Right-of-way
Distance surveyed (km) and snow depth are approximate.

Table B. 4 2015 OHV Survey Results

Date	GPS Waypoint	UTM Location (Zone 21U)		# Tracks	Comments
		Easting	Northing		
10 April	472	432882	5474477	5-10	Moose tracks in area
10 April	474	432882	5474477	4	
10 April	475	432882	5474477	>10	6 snowmobiles in area
10 April	476	496350	5494755	>10	
10 April	477	495505	5497596	n/a	Start of TL ROW area cleared
10 April	478	495161	5498741	>10	Snowmobile traveling down TL ROW; Snowshoe hare tracks in area
10 April	479	486819	5512527	>10	Snowmobile route intersection (road crossing TL ROW)
10 April	480	485460	5512853	>10	Snowmobile route intersection (road crossing TL ROW)
10 April	481	484189	5513150	>10	TL ROW clearing ended; OHV tracks ended here
10 April	482	482460	5514551	>10	Tracks crossing TL ROW
10 April	483	481961	5515189	>10	Tracks crossing TL ROW
10 April	484	479944	5518540	5-10	Tracks crossing TL ROW
10 April	485	479482	5519513	>10	Tracks crossing TL ROW
10 April	486	479294	5519875	>10	Tracks crossing TL ROW
10 April	487	479162	5520131	5-10	Tracks crossing TL ROW
10 April	488	478184	5521808	>10	Tracks crossing TL ROW
10 April	489	477794	5522448	5-10	Tracks crossing TL ROW
10 April	490	476368	5523978	n/a	Moose tracks in area
10 April	491	474580	5524430	>10	Tracks crossing TL ROW
10 April	492	471968	5525100	n/a	Lots of moose tracks in area
10 April	493	471111	5526329	n/a	Six (6) caribou
10 April	494	470134	5528264	3	
10 April	495	470325	5528748	n/a	End of transect
16 April	418	470215	5528573	>10	
16 April	419	471300	5525973	1	
16 April	420	471532	5525643	3	
16 April	421	472127	5524810	3	

Date	GPS Waypoint	UTM Location (Zone 21U)		# Tracks	Comments
		Easting	Northing		
16 April	422	472939	5524809	>10	Road in area
16 April	423	474417	5524453	5-10	
16 April	424	477146	5523397	>10	
16 April	425	477570	5522489	5-10	
16 April	426	477987	5521842	>10	
16 April	427	479283	5519752	>10	Road/cabin in area
16 April	428	479792	5518631	>10	
16 April	429	481988	5515160	3	
16 April	430	482363	5514615	>10	Major use area
16 April	431	483938	5513172	>10	Perpendicular to ROW; start of cleared area
16 April	432	484506	5513052	>10	Tracks going down TL ROW
16 April	433	486480	5512590	5-10	
16 April	434	488097	5512212	>10	Tracks crossing TL ROW
16 April	435	489265	5511933	>10	Tracks crossing TL ROW
16 April	436	490316	5511691	5-10	Tracks crossing TL ROW
16 April	437	490830	5511507	>10	Tracks going down TL ROW
16 April	438	491800	5508896	>10	
16 April	439	493825	5503033	3	
16 April	440	494410	5501073	5-10	
16 April	441	495115	5498848	>10	
16 April	442	495467	5497661	5-10	
16 April	443	495674	5496959	3	
16 April	444	496268	5495000	>10	Groomed trail
16 April	445	496717	5493077	>10	Tracks going down TL ROW; cleared area

Notes:
n/a – not applicable
TL ROW – Transmission Line Right-of-way

APPENDIX C

Results of Genetic Analyses (Memorial University CREAIT Network Report)

Revised

Species, Individual and Sex Determination of Potential Newfoundland Marten (*Martes americana atrata*)

Prepared for: Tony Parr & Karen Rashleigh
Environmental Technologist
Stantec Consulting

Prepared by: Genomics and Proteomics Facility
CREAIT Network
Memorial University of Newfoundland

August 14th, 2015

Summary

On May 26th, 2015, the Genomics and Proteomics Facility of the CREAIT Network at Memorial University of Newfoundland received a set of 48 envelopes containing hair samples. Several envelopes contained multiple sticky pads; one sticky pad per envelope was processed. Seven samples were initially screened to determine the species of the hair donor. Fourty-eight hair samples were screened with 11 microsatellite loci to identify individual Newfoundland marten, and the sex of each individual was determined.

Findings

- All seven hair donors which were initially screened to identify species were determined to be Newfoundland marten.
- A total of 48 samples were screened for individual identification, of which 33 have complete data sets (genotypes).
- Of the 33 complete genotypes, 21 individual Newfoundland marten (nine female, ten male and two unknown) were identified.
- Eight individuals were recaptures; the remaining 13 individuals were captured once.

The purpose of this work was twofold: i) identify donor species of hair samples that had fewer hairs present; ii) identify individual Newfoundland marten by screening DNA extracted from hair samples with a suite of microsatellite loci, and in addition determine sex of each individual.

On May 26th, 2015, the Genomics and Proteomics (GaP) Facility of the CREAIT Network at Memorial University of Newfoundland received a set of 48 envelopes containing hair samples delivered by Tony Parr, B.Sc., Environmental Technologist, Stantec Consulting (Table 1).

One sticky pad per envelope was processed (N = 48). DNA was extracted from one to 40 hairs using the Qiagen DNeasy Blood and Tissue Kit (Qiagen Inc., Toronto, Ontario, Canada) following the manufacturer's Tissue Protocol, except that DNA was re-suspended in two consecutive 75 µL elutions, for a total volume of 150 µL of DNA. Hair roots were digested overnight.

We identified species of hair donors for samples which had five or less hairs (N = 7; specific samples identified in Table 1) by sequencing a fragment of the cytochrome *b* gene, found in the mitochondrial DNA. DNA was analysed using standard operating protocols developed in the GaP Facility.

In order to identify individuals, DNA from hair samples were screened twice at the following 11 microsatellite loci using standard operating protocols developed in the GaP Facility: Ma1, Ma2, Ma7, Ma9, Ma10, Ma11, Ma14, Ma18, Ma19 (Davis and Strobeck 1998); MP0085, MP0114 (Jordan et al. 2007). Alleles were called independently by two readers.

Sex determination of samples was carried out by amplifying an intron within the zinc-finger gene that is present on both sex chromosomes using primers LGL331 and LGL335 (Shaw et al. 2003) with standard operating protocols developed in the GaP Facility. Samples with two bands (zinc finger X and Y) were identified as male, and those with one band (two copies of zinc finger X) as female. Agarose gels were read independently by two readers.

Complete genotypes were run through GENECAP version 1.3, a Microsoft Excel macro that compares each individual multi-locus genotype with all other genotypes within the data set to locate matching genotypes (Wilberg and Dreher 2004) and thus identify individuals within a set of samples.

All seven hair donors which were initially screened to identify species were determined to be Newfoundland marten.

We were able to generate complete genotypes for 33 samples (69%; Table 2).

From the 33 samples that had complete genotypes, we identified 21 individuals (Table 3).

The overall probability that two first order relatives will share the same genotype by chance (P_{SIB}) was $p = 0.009$, and therefore, we are confident in an analysis that screens 11 microsatellite loci.

Eight of the individuals were recaptures. The remaining 13 individuals were captured only once (Table 3).

We were able to identify sex for 19 individuals (90%). Ten individuals are male, and the remaining nine are female (Table 2 and 3).

Table 1. GaP Facility inventory for hair samples detailing (where available) sample ID, trap number, sample collection date, crew, and GaP comments about the sample during DNA extraction.

Sample ID	Trap No.	Sample Collection Date	Crew	GaP notes about extraction
1	16561	01-Apr-15	T. Newbury, T. Parr	Used ~30 hairs; roots were visible
2	15847	01-Apr-15	T. Newbury, T. Parr	Used ~30 hairs; roots were visible
3	16086	01-Apr-15	T. Newbury, T. Parr	Used ~40 hairs; roots were visible
4	15848	01-Apr-15	T. Newbury, T. Parr	Used ~30 hairs; roots were visible
5	15376	01-Apr-15	T. Newbury, T. Parr	Used ~20 hairs; roots were visible
6	14662	01-Apr-15	T. Newbury, T. Parr	Used ~40 hairs; roots were visible
7	14663	01-Apr-15	T. Newbury, T. Parr	Used ~30 hairs; roots were visible
8	14900	01-Apr-15	T. Newbury, T. Parr	Used ~40 hairs; roots were visible
9	15138	01-Apr-15	T. Newbury, T. Parr	Used ~40 hairs; roots were visible
10	15375	01-Apr-15	T. Newbury, T. Parr	Used ~30 hairs; roots were visible
11	15374	01-Apr-15	T. Newbury, T. Parr	Used ~30 hairs; roots were visible
12	15373	01-Apr-15	T. Newbury, T. Parr	Used ~3 hairs; roots were visible; species ID
13	15612	01-Apr-15	T. Newbury, T. Parr	Used ~40 hairs; roots were visible
14	15611	01-Apr-15	T. Newbury, T. Parr	Used ~20 hairs; roots were visible
15	15610	01-Apr-15	T. Newbury, T. Parr	Used ~20 hairs; roots were visible
16	16085	01-Apr-15	T. Newbury, T. Parr	Used ~20 hairs; roots were visible
17	16561	09-Apr-15	T. Newbury, S. Camus	Used ~30 hairs; roots were visible
18	16323	09-Apr-15	T. Newbury, S. Camus	Used ~20 hairs; roots were visible
19	16085	09-Apr-15	T. Newbury, S. Camus	Used ~20 hairs; roots were visible
20	15847	09-Apr-15	T. Newbury, S. Camus	Used ~20 hairs; roots were visible
21	15848	09-Apr-15	T. Newbury, S. Camus	Used ~20 hairs; roots were visible
22	15610	09-Apr-15	T. Newbury, S. Camus	Used ~10 hairs; roots not visible
23	15612	09-Apr-15	T. Newbury, S. Camus	Used ~2 hairs; roots were visible; species ID
24	15373	09-Apr-15	T. Newbury, S. Camus	Used 1 hair; root not visible; species ID
25	15374	09-Apr-15	T. Newbury, S. Camus	Used ~5 hairs; roots were visible

Table 1 continued.

Sample ID	Trap No.	Sample Collection Date	Crew	GaP notes about extraction
26	15375	09-Apr-15	T. Newbury, S. Camus	Used ~5 hairs; roots not visible; species ID
27	15376	09-Apr-15	T. Newbury, S. Camus	Used ~1 hairs; roots not visible; species ID
28	15138	09-Apr-15	T. Newbury, S. Camus	Used ~10 hairs; roots were visible
29	14900	09-Apr-15	T. Newbury, S. Camus	Used ~10 hairs; roots were visible
30	14662	09-Apr-15	T. Newbury, S. Camus	Used ~10 hairs; roots not visible
31	14663A	09-Apr-15	T. Newbury, S. Camus	Used ~30 hairs; roots were visible
32	14900	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~30 hairs; roots were visible
33	14663B	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~20 hairs; roots were visible
34	15373	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~20 hairs; roots were visible
35	14663	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~10 hairs; roots were visible
36	16085	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~40 hairs; roots were visible
37	15847	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~30 hairs; roots were visible
38	15138	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~20 hairs; roots were visible
39	15848	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~30 hairs; roots were visible
40	15375	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~10 hairs; roots not visible
41	15374	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~20 hairs; roots were visible
42	15376	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~1 hairs; roots were visible; species ID
43	15611	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~10 hairs; roots were visible
44	15610	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~5 hairs; roots not visible; species ID
45	15612	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~20 hairs; roots were visible
46	16086	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~30 hairs; roots were visible
47	16323	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~30 hairs; roots were visible
48	16561	16-Apr-15	Tony Parr, Karen Rashleigh	Used ~20 hairs; roots were visible

Table 2. Microsatellite genotypes and sex identification results for all hair samples (N = 48) detailed in Table 1. '-' indicates no data available.

Sample ID	Sex	Microsatellite genotypes (in basepairs)																					
		Ma1		Ma2		Ma7		Ma9		Ma10		Ma11		Ma14		Ma18		Ma19		MP0085		MP0114	
1	M	225	225	181	181	204	204	146	147	180	180	108	108	199	203	167	169	210	210	136	136	162	162
2	F	225	225	181	181	206	206	147	147	181	181	108	108	199	203	169	169	210	210	134	136	162	170
3	F	225	225	181	181	204	206	147	147	180	181	108	108	199	209	167	169	210	212	134	136	162	170
4	F	225	225	181	181	206	206	147	147	180	181	108	108	209	209	167	167	210	212	134	134	162	170
5	-	225	225	-	-	206	206	146	146	180	181	108	108	199	199	167	169	214	214	134	136	162	162
6	F	225	225	175	175	204	206	146	146	181	181	108	108	203	209	165	167	214	214	134	136	170	170
7	F	225	225	175	175	204	206	146	146	181	181	108	108	203	209	165	167	214	214	134	136	170	170
8	M	225	225	181	181	204	206	146	147	181	181	108	108	203	209	169	169	214	214	136	136	162	170
9	F	225	225	181	181	206	206	146	147	181	181	108	108	209	209	167	169	210	210	136	136	162	162
10	M	225	225	175	181	206	206	146	146	181	181	108	108	199	199	167	169	210	214	134	136	162	170
11	F	225	225	177	181	204	206	147	147	180	181	108	108	209	209	169	169	210	214	134	136	162	170
12	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
13	F	225	225	175	181	204	204	147	147	181	181	108	108	209	209	169	169	214	214	134	136	162	162
14	-	225	225	-	-	204	206	-	-	180	181	-	108	-	209	-	-	-	-	136	138	-	170
15	F	225	225	181	181	204	206	147	147	180	181	108	108	209	209	169	169	212	214	134	134	162	170
16	M	225	225	181	181	204	204	146	147	180	181	108	108	199	209	167	167	210	214	136	136	162	162
17	F	225	225	175	181	204	204	146	147	180	181	108	108	199	203	167	169	214	214	134	136	162	162
18	-	225	225	181	181	204	-	-	-	180	180	108	-	203	203	169	169	210	210	-	-	162	162
19	F	225	225	181	181	204	206	147	147	180	181	108	108	199	209	167	169	210	212	134	136	162	170
20	M	225	225	181	181	204	204	146	147	180	181	108	108	199	209	167	167	210	214	136	136	162	162
21	-	225	225	181	181	204	206	146	147	180	180	108	108	199	209	167	169	210	210	136	136	162	162
22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
23	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
24	-	225	225	-	-	-	-	-	-	180	180	-	-	-	-	169	169	-	-	-	-	-	-
25	-	225	225	-	-	206	206	146	146	181	181	108	-	199	199	167	169	214	214	134	136	162	170
26	-	225	225	177	-	206	206	-	-	180	181	108	-	-	-	169	169	210	210	-	-	162	170
27	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Table 2 continued.

Sample ID	Sex	Microsatellite genotypes (in basepairs)																					
		Ma1		Ma2		Ma7		Ma9		Ma10		Ma11		Ma14		Ma18		Ma19		MP0085		MP0114	
28	F	225	225	181	181	206	206	146	147	181	181	108	108	209	209	167	169	210	210	136	136	162	162
29	M	225	225	175	181	204	206	146	146	181	181	108	108	199	209	167	169	214	214	136	136	162	170
30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
31	-	225	225	-	-	204	206	146	146	181	181	-	110	203	209	165	167	214	214	134	136	170	170
32	M	225	225	177	181	204	204	147	147	181	181	108	108	199	203	169	169	212	214	134	136	162	162
33	-	225	225	175	175	204	206	146	146	181	181	108	108	203	209	165	167	214	214	134	136	170	170
34	M	225	225	175	181	204	206	146	147	181	181	108	108	203	209	167	169	210	214	134	134	162	162
35	-	225	225	175	175	204	204	146	-	181	181	108	108	-	-	165	167	214	214	134	-	162	162
36	-	225	225	181	181	204	204	146	147	180	181	108	108	199	209	167	167	210	214	136	136	162	162
37	-	225	225	181	181	204	204	146	147	180	181	108	108	199	209	167	167	210	214	136	136	162	162
38	M	225	225	175	181	204	206	146	146	181	181	108	108	199	209	167	169	214	214	136	136	162	170
39	M	225	225	181	181	204	206	146	147	180	181	108	108	199	209	167	169	210	210	136	136	162	162
40	M	225	225	177	181	206	206	146	147	180	181	108	108	199	209	169	169	210	210	134	136	162	170
41	M	225	225	177	181	206	206	146	147	180	181	108	108	199	209	169	169	210	210	134	136	162	170
42	-	225	225	-	-	206	206	-	-	-	-	-	-	-	-	169	169	-	-	-	-	162	-
43	-	225	225	175	181	204	206	147	147	180	181	108	108	199	209	169	169	214	214	134	136	162	170
44	-	225	225	181	181	204	206	147	147	180	181	108	108	-	-	169	169	214	214	134	134	-	-
45	F	225	225	175	181	204	204	147	147	181	181	108	108	209	209	169	169	214	214	134	136	162	162
46	-	225	225	181	181	204	204	146	147	180	181	108	108	199	209	167	167	210	214	136	136	162	162
47	M	225	225	181	181	204	204	146	147	180	180	108	108	199	203	169	169	210	214	136	136	162	162
48	F	225	225	175	181	204	204	146	147	180	181	108	108	199	203	167	169	214	214	134	136	162	162

Table 3. Individual Newfoundland marten identified in this molecular study (including sex results) with samples having identical genotypes identified. '-' indicates no data available.

Individual	Sex	Sample IDs with matching genotypes				
A	Male	1				
B	Female	2				
C	Female	3	19			
D	Female	4				
E	Female	6	7	33		
F	Male	8				
G	Female	9	28			
H	Male	10				
I	Female	11				
J	Female	13	45			
K	Female	15				
L	Male	16	20	36	37	46
M	Female	17	48			
N	-	21				
O	Male	29	38			
P	Male	32				
Q	Male	34				
R	Male	39				
S	Male	40	41			
T	-	43				
U	Male	47				

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