

RESTORATION STATUS ACCURACY ASSESSMENT

Project Number: BCIP-2016-23

Submitted to:

BC Oil and Gas Research and Innovation Society (BC OGRIS)

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1.0 INTRODUCTION

1.1 Background

The province's Integrated Transportation Network (ITN), together with the Terrain Resource Inventory Mapping (TRIM), and datasets from the Oil and Gas Commission (OGC), map the locations of the majority of linear and polygonal disturbance features in the province. The status of many of these disturbance features is continually transitioning between active and non-active resulting in a range of vegetation regrowth stages. As such, the level of effort associated with maintaining these datasets is high, and as a result, much of the information is not current. Accurately mapping disturbance feature restoration facilitates the generation of spatial layers for quantifying human related disturbance. Spatial products, such as linear feature density maps, can be used to examine the potential effects of human disturbance on the habitat of various species including the boreal caribou (Caslys, 2015).

In a previous project, Caslys developed a cost effective approach to updating the restoration status of these features to improve the temporal accuracy of human disturbance data. The objective of the initial disturbance classification pilot project was to assess the cost, practicality and accuracy of using SPOT imagery to attribute existing disturbance features with a restoration status. The results of the classification method also facilitated the addition of any unmapped features (i.e., recent disturbances) absent from the current datasets. A method was developed to classify the imagery to effectively model the amount of disturbance activity, allowing a use level to be assigned to each feature (figures 1 and 2). To calibrate the results, the data for roads, trails and polygonal features were edited to incorporate any missing features and resolve any spatial differences between the vector features and their location in the imagery. The amount of each feature captured by the classification model was then quantified and summarized. The premise was that active disturbance features would produce a higher signal and therefore a greater proportion of the feature would be identified by the model. Less active and inactive features would only be partially captured by the model. The results of this summary were then examined to determine if class breaks were present in the data that would facilitate the assignment of an activity level to the features to indicate whether the feature was being used frequently, infrequently or was not being utilized (i.e., the feature was overgrown). The preliminary results indicated that a restoration status could successfully be assigned to the features (Caslys, 2015).

1.2 Objectives

The objective of the current project is to further quantify the accuracy of the disturbance datasets using a series of field samples to determine the usefulness of expanding the approach to a larger area. Accuracy was assessed through a comparison of the model-based restoration status attributes and field data collected by the OGC for a portion of the mapped area.

Figure 1. Assigning Use Status Attribute to Polygonal Features

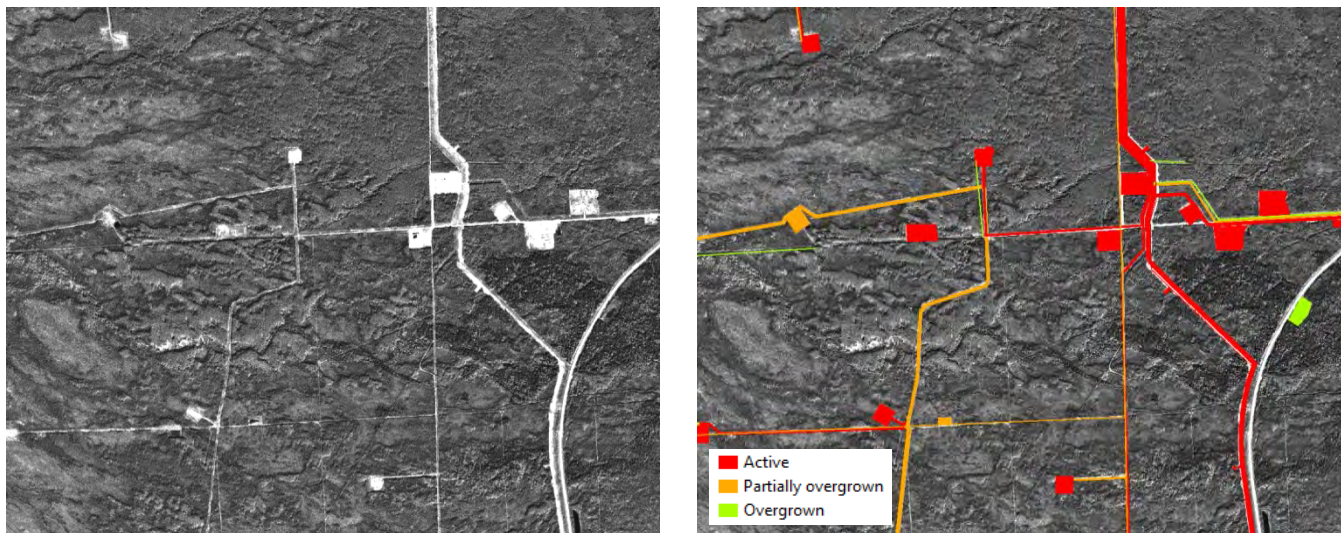
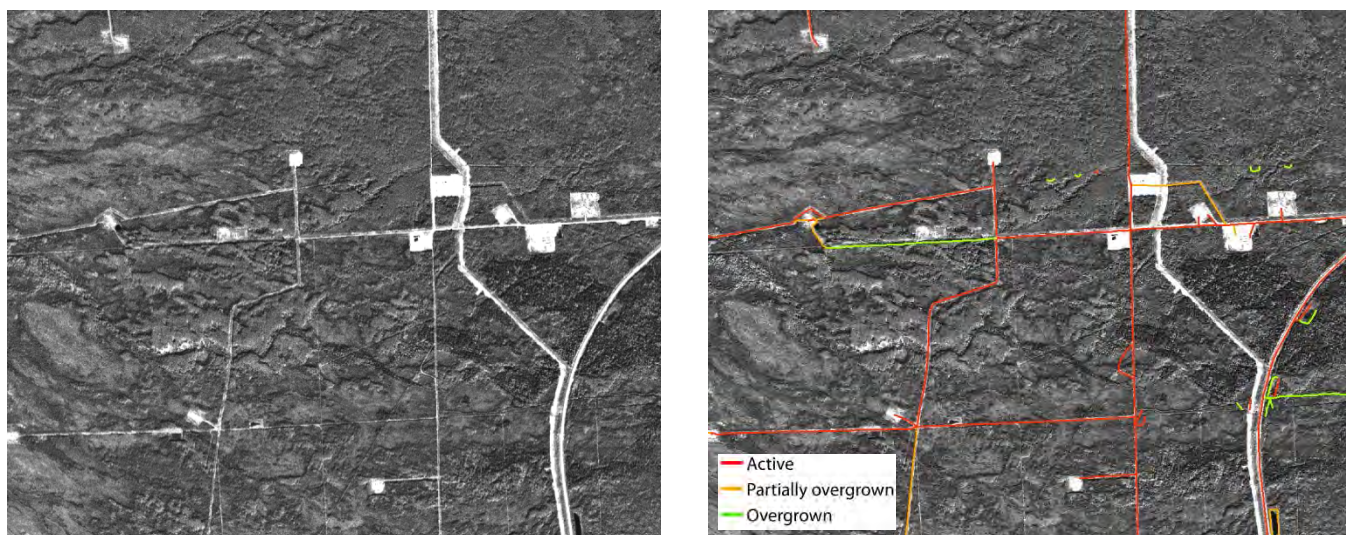


Figure 2. Assigning Use Status Attribute to Roads and Trails



2.0 METHODS

2.1 Study Area

The study area for this project consisted of one of the three SPOT scenes used in the original disturbance classification project completed by Caslys in 2015 (Figure 3). All three SPOT scenes are located in the northeastern corner of British Columbia and were originally selected because they provided a representative sample of different intensities of human disturbance together with varying levels of boreal caribou density. Scene B was selected as the site for field data collection, as it was the closest to Fort St. John where the field crew was based.

2.2 Source Data

The following data were used to assess the accuracy of the restoration status attributes generated by the image classification-based model.

2.2.1 Field Data

In the summer of 2015, OGC representatives conducted a survey where they visited a series of different disturbance types (e.g., wellpads, cutlines and roads). Information related to disturbance type and vegetation regrowth (e.g., type and height) was recorded for each site and a series of photographs were taken to facilitate a review of the model results. The survey results for each location are provided in Appendix A.

2.2.2 Disturbance Features

Model accuracy was assessed for two types of disturbance features: linear and polygonal. The linear features captured by the model included roads, cut lines, and trails; while, the majority of polygonal features were wellpads and wide roads. The disturbance feature layers were attributed using the image classification-based approach to estimate vegetation regrowth at disturbed locations. Both linear and polygonal disturbance features were assigned one of three activity levels: active, partially overgrown, or overgrown. From our preliminary results, a threshold of 30% (i.e., 30% of the feature was captured by the model) could be used to specify features as being potentially overgrown.

2.3 Accuracy Assessment of Modeled Habitat Restoration Attributes

The accuracy of the restoration status attributes was evaluated using the field data collected by OGC. The field data were associated with the corresponding feature in the linear and polygonal disturbance datasets based on a GPS location recorded by the field crew. For each field site, the site characteristics and photos were compared to the restoration attribute to assess model accuracy. Each site was subsequently assigned an agreement attribute of either 'yes' or 'no' on the similarity between the field data and restoration attribute. Figures 4 and 5 illustrate examples of each model agreement category.

During the initial disturbance classification project, it was observed that the model assigned the incorrect restoration status when an existing disturbance feature was not spatially aligned with the corresponding feature visible in the SPOT imagery. To correct for this known limitation, the alignment of all disturbance features associated with field sites were verified, and any misaligned features were excluded from the accuracy assessment.

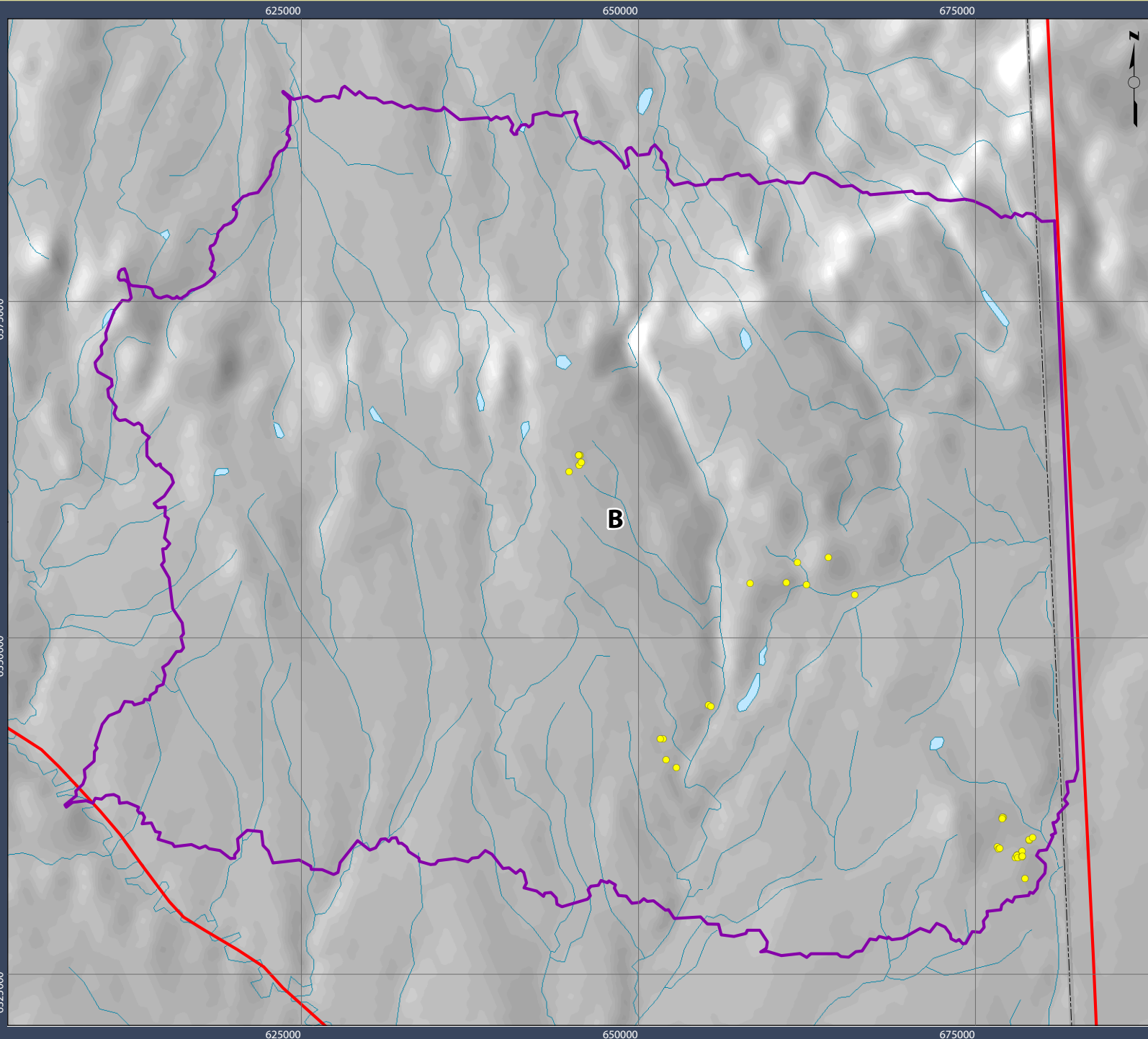
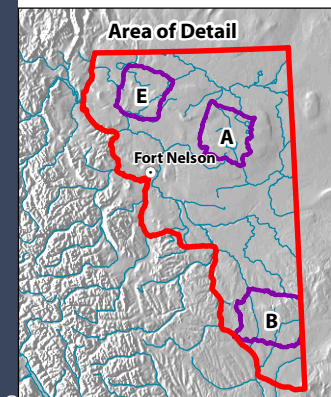


Figure 3
Study Area

Legend

- Community
- River
- Lake
- Field Site
- ▭ SPOT Scene
- ▭ Extent of Boreal Caribou Range



0 5 10
Kilometres

Projection:
NAD 1983 UTM Zone 10N

Data Sources:
BC OGRIS
Natural Resources Canada, GeoBase
National Topographic Database
Ministry of Forests, Lands and
Natural Resource Operations

Prepared for: By:



September 2016

Figure 4. An Example of an Incorrect Restoration Status Attribute Assignment - Wellpad

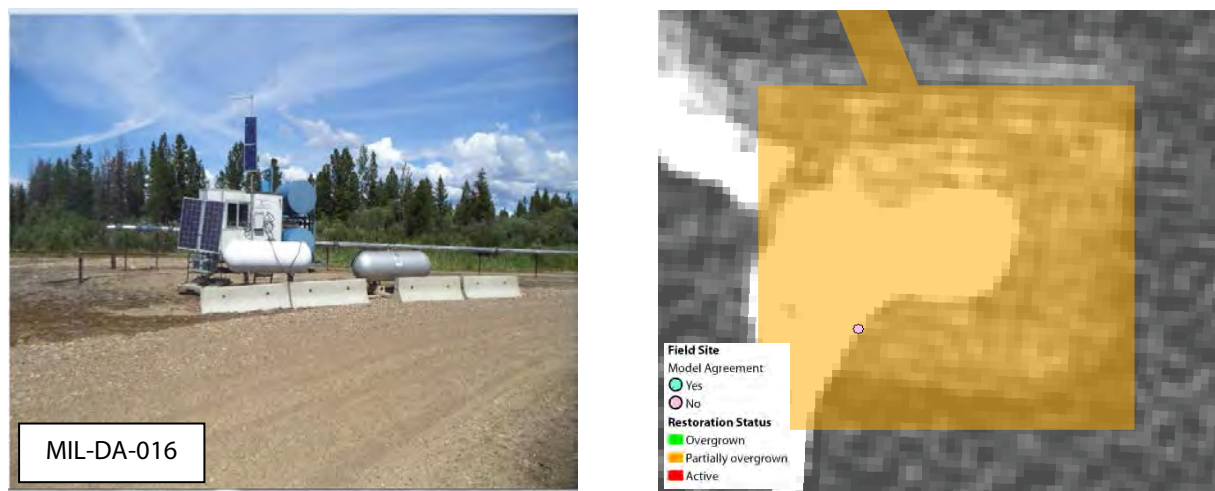


Figure 5. An Example of a Correct Restoration Status Attribute Assignment - Active Road



Model performance was quantified for the overall accuracy of the restoration status attributes and for the accuracy of the attributes assigned to the linear and polygonal features, respectively. Figure 4 illustrates a wellpad, which based on the field survey results is clearly in active use. A review of the SPOT image (on the right) indicates that while a portion of the polygon is disturbed (in white), over half of the feature is partially vegetated. As a result, the polygon was assigned a restoration status of partially active, which does not reflect real world conditions. Figure 5 illustrates an example of where the restoration status was assigned correctly to an active road.

3.0 RESULTS

3.1 Relating Field Data to Disturbance Features

Of the 36 field sites visited by OGC crews in 2015, 13 fell on linear disturbance features (Figure 6) and 19 within polygonal features (Figure 7). Three field site feature types were designated as 'uncertain'; however, their field GPS locations placed them in within polygonal disturbances. As such, their restoration attributes were evaluated as polygons (Table 1). The alignment of the disturbance features and SPOT imagery matched, so no features were excluded due to misalignment. However, field site MIL-CC-006 was excluded from the analysis because the GPS coordinates collected in the field were incorrect.

Table 1. Number of Field Sites by Feature Type

Feature Type	Field Sites
Polygon	19
Linear	13
Uncertain	3

Overall there was a slight bias in the field data against features designated as 'overgrown'. Within the study area, 23% of existing disturbances are classified as 'overgrown' by the model; however, only 11% of field sites sampled from the 'overgrown' class (Table 2). In contrast, linear features were slightly overrepresented in the sample: they made up 37% of the field samples in relation to 27% of existing disturbances. Polygonal features made up 51% of the field samples in relation to 49% of existing disturbances.

Table 2. Restoration Status by Feature Type

Feature Type	Restoration Status					
	Overgrown		Partially Overgrown		Active	
	Number	Percent	Number	Percent	Number	Percent
Linear	2	5.5%	5	14%	6	17%
Polygon	2	5.5%	8	23%	12	34%
Total	4	11%	13	37%	18	51%

3.2 Accuracy Assessment

The results of the accuracy assessment indicate that restoration status attributes can be well derived from the SPOT imagery with 94.2% of the field sites being in agreement with the model-based attributes (Table 3). Evaluating the attribute accuracy according to feature type (i.e., linear or polygonal) revealed similar accuracy results, with 100% agreement between the field data and model attributes for linear features (Table 4), and 90.9% agreement for polygonal features (Table 5). However, since features assigned 'overgrown' were under-represented in the field data, ideally additional samples should be reviewed for overgrown sites to increase the level of confidence that can be placed in the results. When interpreting the statistics it is important to consider the percent error in the context of the number of samples – classes with only a few samples can have large variation in percentage values.

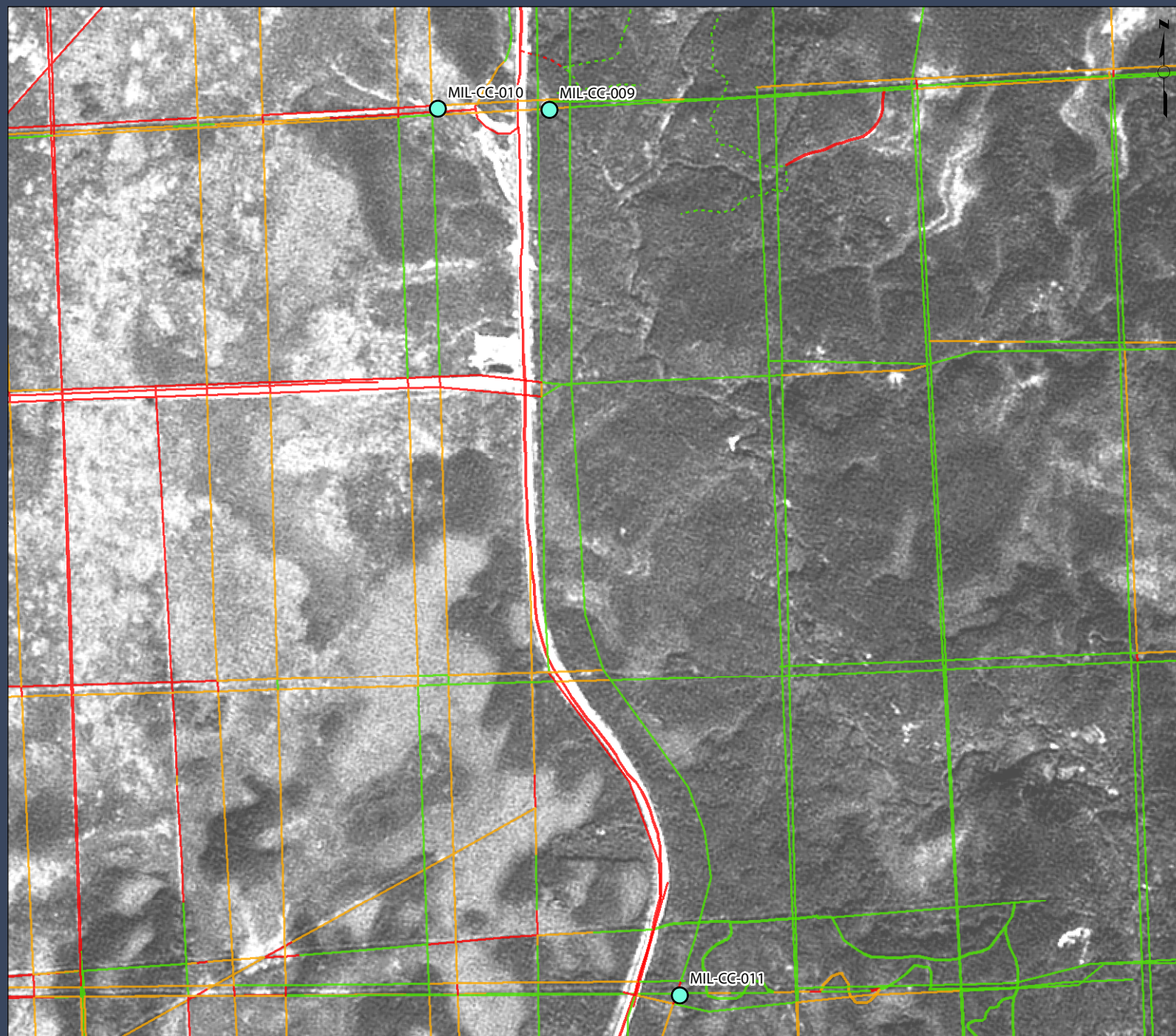


Figure 6
Example of Field Sites
in Relation to Model-attributed
Linear Disturbance Features

Legend

Field Site

Model Agreement

Yes

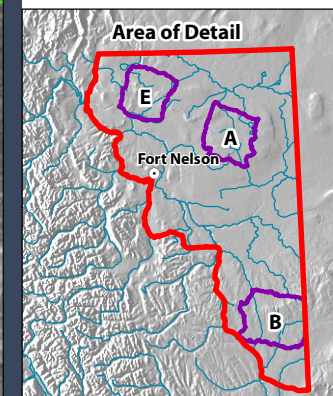
No

Restoration Status

Active

Partially overgrown

Overgrown



0 150 300
Metres

Projection:

NAD 1983 UTM Zone 10N

Data Sources:

BC OGRIS

Natural Resources Canada, GeoBase

National Topographic Database

Ministry of Forests, Lands and

Natural Resource Operations

Prepared for:

By:

BC OGRIS
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Figure 7

Example of Field Sites
in Relation to Model-attributed
Polygonal Disturbance Features

Legend

Field Site

Model Agreement

Yes

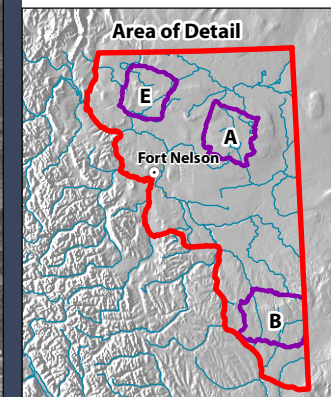
No

Restoration Status

Overgrown

Partially overgrown

Active



0 250 500

Metres

Projection:

NAD 1983 UTM Zone 10N

Data Sources:

BC OGRIS

Natural Resources Canada, GeoBase

National Topographic Database

Ministry of Forests, Lands and

Natural Resource Operations

Prepared for:

By:

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Table 3. Accuracy Assessment Confusion Matrix of Restoration Attributes - All Features

	Field Data - All Features				
Model-based attributes	Overgrown	Partially Overgrown	Active	Row Total	User Accuracy
Overgrown	3	0	1	4	75.0%
Partially Overgrown	0	13	0	13	100.0%
Active	1	0	17	18	94.4%
Column Total	4	13	18	35	
Producer Accuracy	75.0%	100.0%	94.4%		94.2%

Table 4. Accuracy Assessment Confusion Matrix of Restoration Attributes - Linear Features

	Field Data - Linear Features				
Model-based attributes	Overgrown	Partially Overgrown	Active	Row Total	User Accuracy
Overgrown	2	0	0	2	100.0%
Partially Overgrown	0	5	0	5	100.0%
Active	0	0	6	6	100.0%
Column Total	2	5	6	13	
Producer Accuracy	100.0%	100.0%	100.0%		100.0%

Table 5. Accuracy Assessment Confusion Matrix of Restoration Attributes - Polygonal Features

	Field Data - Polygonal Features				
Model-based attributes	Overgrown	Partially Overgrown	Active	Row Total	User Accuracy
Overgrown	1	0	1	2	50.0%
Partially Overgrown	0	8	0	8	100.0%
Active	1	0	11	12	91.6%
Column Total	2	8	12	22	
Producer Accuracy	50.0%	100.0%	91.6%		90.9%

Two field sites differed from the restoration status assigned by the model: MIL-DA-016 and MIL-DA-018. In the case of MIL-DA-018, the inconsistency may be due to the time elapsed between the SPOT imagery capture date and field data collection. The model attributed the polygonal disturbance as active; however, in the field photos the site appears to be inactive with vegetation heights of approximately one metre. The vegetation regrowth may have occurred during the four year time period between the SPOT imagery capture date and field data collection. As mentioned previously, the difference between the restoration attribute and field site data for MIL-DA-016 is most likely due to a discrepancy between the existing polygon boundary and disturbance boundary visible in the imagery.

4.0 KEY FINDINGS AND RECOMMENDATIONS

4.1 Key Findings

Completion of the project resulted in the following findings:

- The results of the accuracy assessment support the use of the 30% capture threshold used in the original project for attributing linear disturbance features; however, they also highlight the need for model adjustment when existing feature boundaries do not match the disturbance footprints visible in the SPOT imagery. Figure 4 is an excellent example of a disturbance feature that has a mix of 'active' and 'overgrown' characteristics when evaluated using existing polygons boundaries. To accurately assign attributes to these types of features, including a patch size analysis component to the model attribution workflow may facilitate the identification of features with mismatching boundaries. Features that have large contiguous patches of disturbed pixels rather than a mix of disturbed and undisturbed pixels could be flagged and be assigned restoration attributes manually.
- The accuracy assessment indicates that restoration status attributes can be successfully derived from the SPOT imagery with 94.2% of the field sites being in agreement with the model-based attributes. In the case of linear features there was 100% agreement between the field data and the assigned restoration status attributes, and 90.9% agreement for polygonal features.

4.2 Recommendations

The following recommendations should be considered:

- The model-based approach to the assignment of restoration status provides an accurate and cost effective approach to the assignment of restoration status attributes. As a result, expanding the project to cover other areas of the province, particularly those overlapping boreal caribou habitat would be worthwhile.
- The model allows the accessibility of given areas to be better quantified through the identification of active trails, rough roads and seismic lines that facilitate human access.
- The results of the model could potentially be used to monitor the success of reclamation efforts because areas of vegetation regrowth can be quantified easily.
- The model results could be used to identify and map wildlife movement corridors for different species. In effect the model allows 'low cost' movement pathways to be identified. These pathways could be used to evaluate prey/predator relationships which are of particular relevance to boreal caribou in this area.
- It would be worthwhile to conduct a pilot project to examine how the model could be used to more effectively identify linked pathways in the data (i.e., improve the connections between linear features to yield a seamless, connected transportation/disturbance network).
- Scenarios for different time periods could be developed through the acquisition and classification of imagery for given years. This would result in a multi-temporal dataset that would be of relevance in cumulative effects assessment.

5.0 DATA LIMITATIONS

The following are limitations associated with the field dataset and accuracy assessment:

- The field data sites were concentrated in the southern portion of SPOT scene B which falls within the southern part of the larger study area. As vegetation regrowth rates and human disturbance densities area are spatially variable, ideally additional field data sites should be collected throughout SPOT scenes A, B and E to ensure that the accuracy assessment results are consistent over a larger area.
- Features identified as 'overgrown' by the model were under sampled in the field data. Additional field data should be collected for 'overgrown' features to reasonably assess restoration status attribute accuracy for this class.
- A four year time period elapsed between the SPOT imagery capture date and field data collection. During this time the vegetation heights may have changed leading to discrepancies between the field data and restoration status attributes.

6.0 REFERENCES

Caslys Consulting Ltd. 2015. Image Age Classification System for Anthropogenic Features. Science and Community Environment Knowledge Fund.

Appendix A - Field Data Sheets

Site

MIL-CC-004

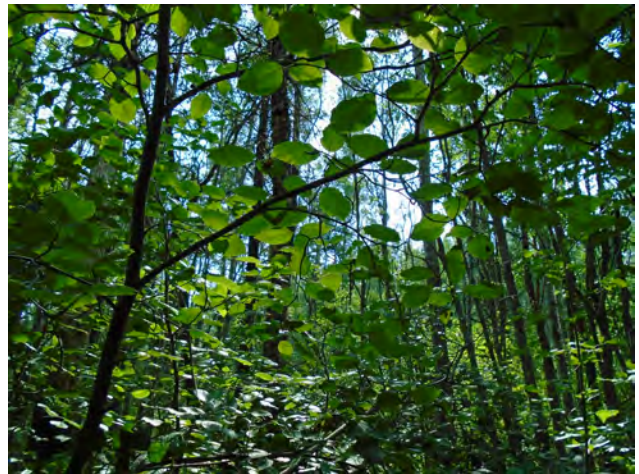
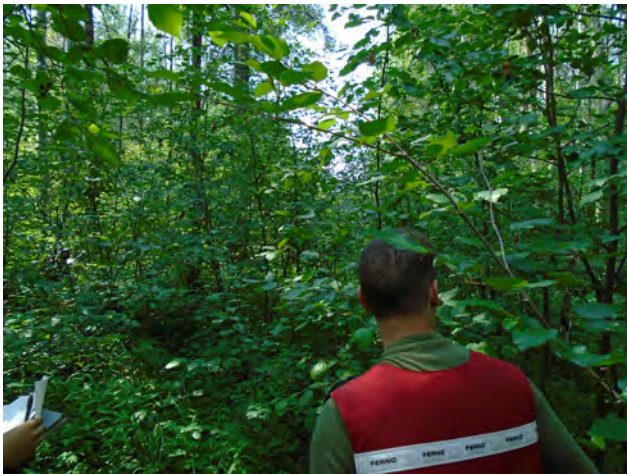
Date	08/07/2015	Feature Type	Road	Active / Inactive	Active
Easting	678128	Feature Width (m)	9	Use Type	Light Use
Northing	6333837			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)	Y	Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Winter access road				



Site

MIL-CC-005

Date	08/07/2015	Feature Type	Trail	Active / Inactive	Inactive
Easting	677956	Feature Width (m)	8	Use Type	Overgrown
Northing	6333641			Vegetation Height (m)	3
Unvegetated (Y/N)		Vegetated (Y/N)	Y	Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments	Overgrown trail				



Site

MIL-CC-006

Date	09/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	674120	Feature Width (m)		Use Type	
Northing	6181461			Vegetation Height (m)	
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Well pad				



Site

MIL-CC-007

Date	09/07/2015	Feature Type	Road	Active / Inactive	Inactive
Easting	655191	Feature Width (m)	7	Use Type	
Northing	6345033			Vegetation Height (m)	2
Unvegetated (Y/N)		Vegetated (Y/N)	Y	Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Winter access road				



Site

MIL-CC-008

Date	09/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	655380	Feature Width (m)		Use Type	
Northing	6344880			Vegetation Height (m)	1.5
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Winter use well site				



Site

MIL-CC-009

Date	09/07/2015	Feature Type	Cutline	Active / Inactive	
Easting	651823	Feature Width (m)	12	Use Type	Overgrown
Northing	6342514			Vegetation Height (m)	2.5
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	Y				
Comments	Restored well site				



Site

MIL-CC-010

Date	09/07/2015	Feature Type	Cutline	Active / Inactive	Active
Easting	651624	Feature Width (m)	9	Use Type	
Northing	6342516			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)	Y	Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Grassy				



Site

MIL-CC-011

Date	09/07/2015	Feature Type	Cutline	Active / Inactive	
Easting	652055	Feature Width (m)	8	Use Type	Overgrown
Northing	6340934			Vegetation Height (m)	3
Unvegetated (Y/N)		Vegetated (Y/N)	Y	Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	Y				
Comments	Overgrown				



Site

MIL-CC-012

Date	09/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	652825	Feature Width (m)		Use Type	
Northing	6340331			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)	Y	Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Well pad				



Site

MIL-CC-013

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	679004	Feature Width (m)	700	Use Type	
Northing	6334916			Vegetation Height (m)	
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Well pad				



Site

MIL-CC-014

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	678988	Feature Width (m)		Use Type	
Northing	6334973			Vegetation Height (m)	
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Flare site				



Site

MIL-CC-015

Date	13/07/2015	Feature Type	Road	Active / Inactive	Inactive
Easting	679252	Feature Width (m)	10.5	Use Type	Overgrown
Northing	6335151			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments					



Site

MIL-CC-016

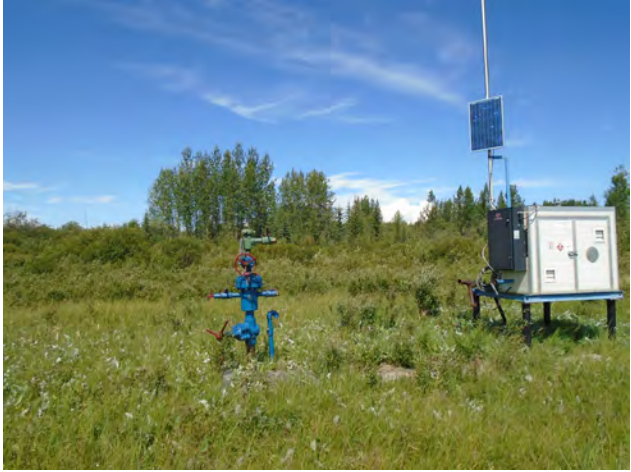
Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	677068	Feature Width (m)	100	Use Type	
Northing	6336654			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments					



Site

MIL-CC-017

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	676997	Feature Width (m)	100	Use Type	
Northing	6336665			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					



Site

MIL-CC-018

Date	13/07/2015	Feature Type	Road	Active / Inactive	Inactive
Easting	676984	Feature Width (m)	10	Use Type	Light Use
Northing	6336548			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Winter road				



Site

MIL-CC-019

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	676629	Feature Width (m)	500	Use Type	
Northing	6334441			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Well site				



Site

MIL-CC-020

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	676720	Feature Width (m)	300	Use Type	
Northing	6334293			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Gravel site				



Site

MIL-CC-021

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	676804	Feature Width (m)	120	Use Type	
Northing	6334373			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					



Site

MIL-CC-022

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	678677	Feature Width (m)		Use Type	
Northing	6332106			Vegetation Height (m)	
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Gravel site				



Site

MIL-DA-004

Date	08/07/2015	Feature Type	Road	Active / Inactive	Active
Easting	678469	Feature Width (m)	22	Use Type	Light Use
Northing	6334137			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)	Y	Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Winter road				



Site

MIL-DA-005

Date	08/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	678081	Feature Width (m)	150	Use Type	Light Use
Northing	6333790			Vegetation Height (m)	4
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)					
Comments	Well site				



Site

MIL-DA-006

Date		Feature Type	Trail	Active / Inactive	Inactive
Easting	678148	Feature Width (m)	19	Use Type	Overgrown
Northing	6333653			Vegetation Height (m)	5
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-007

Date		Feature Type	Uncertain	Active / Inactive	Inactive
Easting	678460	Feature Width (m)	19	Use Type	Overgrown
Northing	6333711			Vegetation Height (m)	3
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-008

Date	09/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	678491	Feature Width (m)	300	Use Type	
Northing	6333745			Vegetation Height (m)	
Unvegetated (Y/N)	Y	Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	Y
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-009

Date	09/07/2015	Feature Type	Polygon	Active / Inactive	
Easting	645676	Feature Width (m)	60	Use Type	Overgrown
Northing	6363582			Vegetation Height (m)	
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	Y
Gravel (Y/N)		Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	
Reclamation (Y/N)					
Comments					



Site

MIL-DA-010

Date	09/07/2015	Feature Type	Cutline	Active / Inactive	
Easting	645578	Feature Width (m)	10	Use Type	
Northing	6363587			Vegetation Height (m)	2
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-011

Date	09/07/2015	Feature Type	Cutline	Active / Inactive	Inactive
Easting	645566	Feature Width (m)	6	Use Type	
Northing	6363607			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-012

Date	09/07/2015	Feature Type	Uncertain	Active / Inactive	Active
Easting	644851	Feature Width (m)	150	Use Type	
Northing	6362342			Vegetation Height (m)	
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments	Muskeg				



Site

MIL-DA-013

Date	09/07/2015	Feature Type	Cutline	Active / Inactive	
Easting	645595	Feature Width (m)	16	Use Type	
Northing	6362854			Vegetation Height (m)	2
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-014

Date		Feature Type	Uncertain	Active / Inactive	
Easting	645754	Feature Width (m)	9	Use Type	Light Use
Northing	6363054			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-015

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	666059	Feature Width (m)	30	Use Type	Overgrown
Northing	6353200			Vegetation Height (m)	0.5
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					



Site

MIL-DA-016

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	662464	Feature Width (m)	100	Use Type	Overgrown
Northing	6353960			Vegetation Height (m)	1
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Well site				



Site

MIL-DA-017

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	661790	Feature Width (m)	200	Use Type	
Northing	6355592			Vegetation Height (m)	2
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)				Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Gravel pit				



Site

MIL-DA-018

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	664084	Feature Width (m)	30	Use Type	
Northing	6355983			Vegetation Height (m)	2
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)	Y	Deciduous Trees (Y/N)	Y
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	Y
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments	Well site				



Site

MIL-DA-019

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Active
Easting	660974	Feature Width (m)	30	Use Type	
Northing	6354136			Vegetation Height (m)	
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	
Paved (Y/N)		Grass (Y/N)		Mature Trees (Y/N)	
Gravel (Y/N)	Y	Shrub (Y/N)		Deciduous Trees (Y/N)	
Dirt (Y/N)	Y			Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	
Reclamation (Y/N)	N				
Comments	Well site				



Site

MIL-DA-020

Date	13/07/2015	Feature Type	Polygon	Active / Inactive	Inactive
Easting	658269	Feature Width (m)	100	Use Type	
Northing	6354073			Vegetation Height (m)	2
Unvegetated (Y/N)		Vegetated (Y/N)		Young Trees (Y/N)	Y
Paved (Y/N)		Grass (Y/N)	Y	Mature Trees (Y/N)	
Gravel (Y/N)		Shrub (Y/N)	Y	Deciduous Trees (Y/N)	
Dirt (Y/N)				Coniferous Trees (Y/N)	
				Overhanging Trees (Y/N)	N
Reclamation (Y/N)	N				
Comments					

