Project Profile

Project Name:	Estimating the Vegetation Regrowth on Anthropogenic Features in NEBC
Project Number:	BCIP-2018-05
Proponent:	Forsite Consultants with Rezatec Limited and Shifting Mosaics
Funding Envelope:	Boreal Caribou
Timeframe:	March 15 to October 15, 2018

Project Objectives

The objective of this project is to develop a cost-effective innovative method to map vegetation regrowth on anthropogenic features in Northeast BC using remotely sensed data. The result will be information to serve caribou recovery efforts:

- where treatment is not necessary because there is sufficient regeneration to diminish impacts of predators; and
- where treatment is necessary to ensure timely recovery of features.

Project Description

Caribou ranges in northeast BC are extensively intersected by a mosaic of legacy anthropogenic features of varying age, usage and regeneration status. Many of these features are linear following old tracks, access roads, pipelines and seismic lines with widths in many cases of less than 2 meters. These features also cross multiple underlying ground conditions with variations in geology, soils, wetness, slope and elevation. As these features have become disused they are now recovering at varying rates depending upon the original type of disturbance and these variations in local environment.

Mapping the status of these features from lower resolution earth observation data is a lower cost option than high-resolution satellite or aerial imagery but more significant technical challenges. The project will use a range of available earth observation data combined with existing environmental information and ground control data in a proprietary machine learning algorithm to generate vegetation heights. Key points include:

- Use of both multi-resolution multi-spectral imagery and radar datasets.
- Use of SPOT data and remote sensing feature extraction techniques to update the disturbance feature dataset, which can then be used to assess vegetation height variations for individual features against the height class raster.
- Use of existing and new LiDAR data in sample areas to capture highly detailed tree height and stocking (density) information over a wide range of disturbance types and forest regrowth

conditions. This data will be used as training and validation data for the remote sensing product covering the full AOI.

- Use of EO data and terrain/soil data to assist in modelled of vegetation height classes (5 height classes proposed).

Project Background

Habitat restoration is a key focus of boreal caribou recovery efforts in BC. The proposed revised *Boreal Caribou Recovery Implementation Plan* includes objectives for habitat restoration and it is a key activity that will be implemented to signal alignment with federal Critical Habitat requirements.

There are currently more anthropogenic features identified in northeast BC than are technically or economically feasible to treat. But not all features will require treatment and what we lack currently is an inventory of features that are known to require treatment to ensure timely recovery of vegetation to a standard sufficient to benefit caribou recovery. Knowledge of the state of vegetation regrowth on seismic lines, abandoned pipeline corridors, trails and roads, is required to complete strategic and tactical restoration plans.

To date we have used available research to apply simple rules-of-thumb to estimate where vegetation is likely to recover naturally (upland sites) and where it is not (lowland sites); however, we have limited evidence to support these coarse estimates and anecdotal information suggests that we may be under-estimating natural regeneration.

Developing an accurate inventory of vegetation regrowth on anthropogenic features is challenging because of the size of the land base in northeast BC. Ground or aerial reconnaissance, as well as acquisition and analysis of LiDAR data are all cost-prohibitive. This project aims to provide an innovative solutions to estimate the state of vegetation regrowth as accurately and precisely as possible using available remote-sensed data or other information.

Project Approach

The following steps outline the proposed approach for the Project:

1. Pre-process Data – gather and prepare input datasets
2. Feature Validation – extract features of interest and updated feature mapping
3. LiDAR collection and Sampling – gather existing datasets and acquire new data sample area. Extract sample areas of known heights for use in training the height prediction model.
4. Preliminary Model – Predict heights on the full landbase using a proprietary machine learning algorithm.

5. Accuracy Assessment – use additional validation areas extracted from the lidar datasets to evaluate the accuracy of the predictions.
6. Final Model – refine model as needed and finalize the height predictions. Assign heights to features extracted in step 2.
7. Final Report – summarize approach and key findings.

Project Deliverables

The deliverables from this project include the following:

1. Maps of caribou ranges in Northeast BC estimating vegetation height/density and feature regeneration status.
2. Report on the project findings and implications.
3. Presentation on the project findings, implications and future recommendations.