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## **PF16-W30 Northern Caribou Post-Fire Lichen Habitat Restoration Work Summary Report**

### **A Report Prepared By:**

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### **Project Background**

On February 20, 2015, the Fish and Wildlife Compensation Program (FWCP) board provided Seed funding for the proponent (Luke Gleeson of Tsay Keh Dene Nation) to further develop the PF16-W30 Northern Caribou Post-Fire Lichen Habitat Restoration project design. The seed funding totalled \$5,000.00.

Following the response from the FWCP, the partnership between the Tsay Keh Dene Nation and Duncan McColl at the BC Ministry of Forests, Lands and Natural Resource Operations (FLNRO) was expanded to include Chu Cho Environmental. The collaboration with Chu Cho Environmental proved to be a critical partnership in the development of this program.

### **Project Partners**

Chu Cho Environmental is a First Nations culturally based environmental consulting company that is owned by the Tsay Keh Dene Nation and operates within the framework of TKD's Economic Development Corporation. Conducting environmental monitoring and ecological restoration work provides employment and capacity building opportunities for TKD and Kwadacha membership. Chu Cho Environmental undertook the project lead, with Sean Rapai undertaking the role as project coordinator.

Sean Rapai is a field manager with Chu Cho Environmental, where his responsibilities include designing and implementing restoration and terrestrial monitoring programs. Sean received his MSc. from the University of Guelph School of Environmental Sciences with a focus on ecological restoration. Sean is currently employed in project development and monitoring a long term field trial that examines techniques for establishing terrestrial lichen in post mine substrates in northeastern Ontario. This is one of a series of restoration field trials that Sean monitors in Ontario and British Columbia. In addition to this restoration experience, Sean is experienced in lichen taxonomy and ecology, which is evident in his publication history.

## Team Members

- Sean Rapai (Manager – Chu Cho Environmental),
- Duncan McColl (Environmental Biologist – Ministry of Forests, Lands and Natural Resource Operations),
- Luke Gleason (Director – Tsay Keh Dene Nation Lands, Resources and Treaty Operations).

Our project team also consulted with prominent lichenologists Dr. Troy McMullin of the Canadian Museum of Nature and Dr. Darwyn Coxson of the University of Northern British Columbia regarding the ecological requirements for growth of terrestrial lichen and to aid in the development of a rigorous experimental design. Chu Cho Environmental, Tsay Keh Dene and FLNRO then embarked on an in kind, small scale program to evaluate methods of establishing terrestrial lichen in the proposed burned area.

### *Additional In Kind Field Staff*

- Mike Tilson (General Manager - Chu Cho Environmental),
- Kirk Miller (Field Technician – Chu Cho Environmental).

## Phase 1 2015

This was the first phase in a collaborative restoration program aimed at establishing terrestrial lichen communities within the Tenakihi/Mesilinka fire boundaries. A field trial was established within the 2014 Mesilinka Forest Fire, in a Northern Caribou Ungulate Winter Range (UWR) Polygon (U7-007 Unit 7b-002) designated under the *Forests and Range Practice Act*. This first phase was a one-year pilot project in which our team evaluated varying techniques for the establishment of terrestrial lichen communities under post fire conditions.

After reviewing the literature it was determined that several techniques have been used to establish terrestrial lichen communities in environments ranging from early successional forest (Roturier and Bergsten, 2009; Duncan, 2011) and clearcuts (Roturier et al., 2007), to post mine conditions (Campeau, 2013; Hugron et al., 2013). In order to increase the experience of the parties involved, provide clear cost estimates for a larger restoration program, and to alleviate concerns raised by the Technical Review Committee and First Nations Working Group of the Fish and Wildlife Compensation Program, our team carried out a field trial in summer 2015. While the Seed funding helped to support phase 1 of this program, the field work was largely made possible through in kind support from Tsay Keh Dene Lands Resources and Treaty Operations, Duncan McColl of FLNRO and Chu Cho Environmental.

## Experimental Design

Phase 1 of this program employed an experimental field design to evaluate the ecological requirements for the establishment of terrestrial lichen in the burned area. Candidate areas were selected based on burn characteristics and uniform micro topography. Three block transects were established. These transects were orientated (east/west) to maximize homogenous area in 3 fairly typical combinations of post fire conditions and micro topography: intense burn and hillcrest (Figure 1), intense burn and flat, less intense burn and flat (Figure 1).



**Figure 1:** Experimental block at intense burn hillcrest and less intense burn and flat.

In all, 180 1m<sup>2</sup> experimental units were established in July 2015, through which the use of lichen fragments (100g) (Figure 2) mats (100g) (Figure 2) and forest floor litter (100g) to enhance lichen fragment retention and growth under these site conditions was evaluated.

**Table 1:** Experimental treatment evaluated in this field trial.

**Treatment (n = 10 replicates each)**

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Entire mat (0.25m x 0.25m)

Entire mat (100g) + Forest Floor Litter

Fragments (100g)

Fragments + Forest Floor Litter (100g)

Control (plot empty)

Control (forest floor litter only)



**Figure 2:** Lichen fragment and mat treatments.

**Lichen Collection**

The efficiency by which lichen mats can be collected was also evaluated. Locations for collecting terrestrial lichens, targeting *Cladonia mitis* and *Cladonia rangiferina*, were identified using biogeoclimactic zone mapping and associated terrestrial ecosystem mapping to identify nutrient poor sub xeric stands with a high potential for lichen. Collection sites were established outside of current caribou ranges. The stand selected for collection was north of the Village of Bear Lake and adjacent to highway 97, north of Prince George (54.500139, -122.684555).

All Lichen biomass was collected by hand, and technicians ensured that <20% of the total lichen community was collected to ensure a sustainable harvest (Kauppi, 1979). Larger mats were targeted, but conditions and available lichen were limiting, and the lichen collected generally were pieces approximately 400cm<sup>2</sup> or less. A crew of two individuals collected seven 158L heavy plastic garbage bags of lichen over 4 hours. This is approximately 1100 litres of lichen in 4 hours of work.

In addition to the trial, 6 lichen installations were established. These area treatments were 100m<sup>2</sup>, measured using a 5.64m radius forestry plot cord. The center was marked at a minimum of 50m from adjacent area treatments or forest edge. Approximately 80L of lichen was spread over each area, reaching an average percent cover of 50% lichen. Once the area was chosen, each of these lichen installations took approximately 15 minutes to establish.

### **Statistical Analysis**

Data collection was conducted on September 17th 2015, and statistical analysis was conducted using a multiway ANOVA test to determine treatment effects. Student's T test was used for comparisons between treatment pairs of interest. The results of this analysis indicate that treatment had a significant effect on lichen cover ( $P < 0.01$ ), while block did not. Fragment and mat treatments had significantly greater percent cover ( $P < 0.001$ ), but there was not a significant difference between the fragment and mat treatment. Applying forest floor material had no effect on lichen percent cover.

### **2016 Successful Proposal Preparation**

The establishment and monitoring of this restoration pilot trial provided invaluable experience for the project team. In fall 2016, the project coordinator submitted a proposal for funding through FWCP entitled Northern Mountain Caribou Post Fire Habitat Restoration (PEA-F17-W-1223). The proposal included a thorough literature review and accurate assessments of costs and the field techniques required to carry out phase 2 of this program. The proposal also addressed each of the comments provided by Technical Review Committee and First Nations Work Group in response to the 2015 proposal. The proposal was accepted and the restoration work will be implemented in summer 2016. The ability for our team to provide detailed responses to the committee comments was enhanced by our experiences establishing the field trial and through conversations with lichenologists.



## Literature Cited

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