



**Title:** Final Report, ʔaqam Ecosystem Enhancement Project, COL-F20-W-3026

**Prepared for:** Fish and Wildlife Compensation Program

**Prepared by:** Sonja Seher, Lands & Resources Project Coordinator, ʔaqam

*Prepared with financial support of the Fish and Wildlife Compensation Program on behalf of its program partners BC Hydro, The Province of BC, Fisheries and Oceans Canada, First Nations and Public Stakeholders*

**Date:** June 30, 2020

## Executive Summary

ʔaqam's 5-year Ecosystem Enhancement project will apply forest thinning and prescribed fire to enhance ecosystem function and restore natural processes to over 1,300 hectares of habitat on lands forming Kootenay Indian Reserve No. 1 (Kootenay IR 1). Classified as a Natural Disturbance Type 4 ecosystem, these lands historically saw frequent, stand-maintaining fires consume fine fuels and revitalize plant communities for the benefit of wildlife forage, nesting and travel corridors. A century of fire suppression has seen these fires (both cultural and natural) removed from the landscape resulting in overstocking, grassland encroachment and an overall loss in ecosystem function for wildlife Species at Risk.

2019-2020 marked the first year of this multi-year project. Activities in this year focused on pre-treatment data collection, analysis and treatment planning, including: Archaeological Overview Assessment, Species at Risk Inventory, Effectiveness Monitoring Plot Installation, Wildlife Tree Assessment, Invasive Plant Inventory, Block Boundary and Road Layout, and Prescription Development.

Goals and objectives for ʔaqam's Ecosystem Enhancement works are consistent with the Columbia Region Upland & Dryland Action Plan (FWCP 2019), including ecosystem and species-level (American badger, Lewis's Woodpecker) objectives. Treatment prescriptions completed in 2020 for 522 hectares by mechanical and hand thinning will be applied in 2020-2021, benefitting elk, deer and wildlife species at risk populations by increasing suitable winter range, nesting/foraging habitat and improving/creating corridors for travel. Baseline data from long-term effectiveness monitoring plots will be used to monitor the success of treatments. American badgers and active badger sign were not observed in the project area during 2019 surveys, but badgers are believed to traverse the project area to access other, higher value habitats adjacent to ʔaqam Lands: Year Two treatments will help unimpeded movement of badgers through the project area. The site is not currently consistent with ideal habitat for Lewis's Woodpecker, and limited observations of the species were found in 2019. As the species is known to utilize other adjacent sites and areas on ʔaqam Lands, it is anticipated that woodpeckers will readily move into newly available habitat following treatment.

In conclusion, Year One activities supported through the Fish and Wildlife Compensation Program, including baseline inventory, stratification, layout and prescription development were critical first steps to planning the treatment and evaluating success of ecosystem enhancement project activities to take place in Years Two through Five of this project to restore ecosystem function and natural processes on this unique landscape.

## Table of Contents

Executive Summary.....	ii
List of Figures .....	iv
List of Tables .....	iv
Introduction .....	1
Goals and Objectives.....	2
Upland and Dryland Action Plan .....	2
Ecosystems – Habitat-based Actions .....	2
Species of Interest – Species-based Actions .....	2
Study Area.....	3
Methods.....	4
Archaeological Overview Assessment (Choquette 2019) .....	4
Species at Risk Inventory (Adams and Harris 2019) .....	4
Effectiveness Monitoring Plot Installation (Harris 2019) .....	4
Wildlife Tree Assessment (Harris 2019).....	4
Invasive Plant Inventory (EKISC 2019) .....	4
Block Boundary and Road Layout, Project Mapping/GIS Support & Prescription Development .....	4
Results and Outcomes .....	5
Discussion.....	7
Restoration of Upland Habitats .....	7
Badger Conservation.....	8
Lewis’s Woodpecker Conservation .....	8
Recommendations .....	8
Acknowledgements.....	9
References .....	10
Appendix A – Treatment Prescriptions Map.....	11

## List of Figures

Figure 1 – Orthophoto illustrating increased forest cover from imagery circa 1950 on left; B: 2018 on right (Adams and Harris 2019) .....	1
Figure 2 - Map of ʔaqam Reserve lands forming Kootenay IR 1, previous ER treatments and current Ecosystem Enhancement Project Areas TU1 & TU2. FWCP Columbia East Kootenay Subregion. ....	3
Figure 3 - Badger burrow on ʔaqam's Long Prairie, 2019. Credit: Ian Adams. ....	8

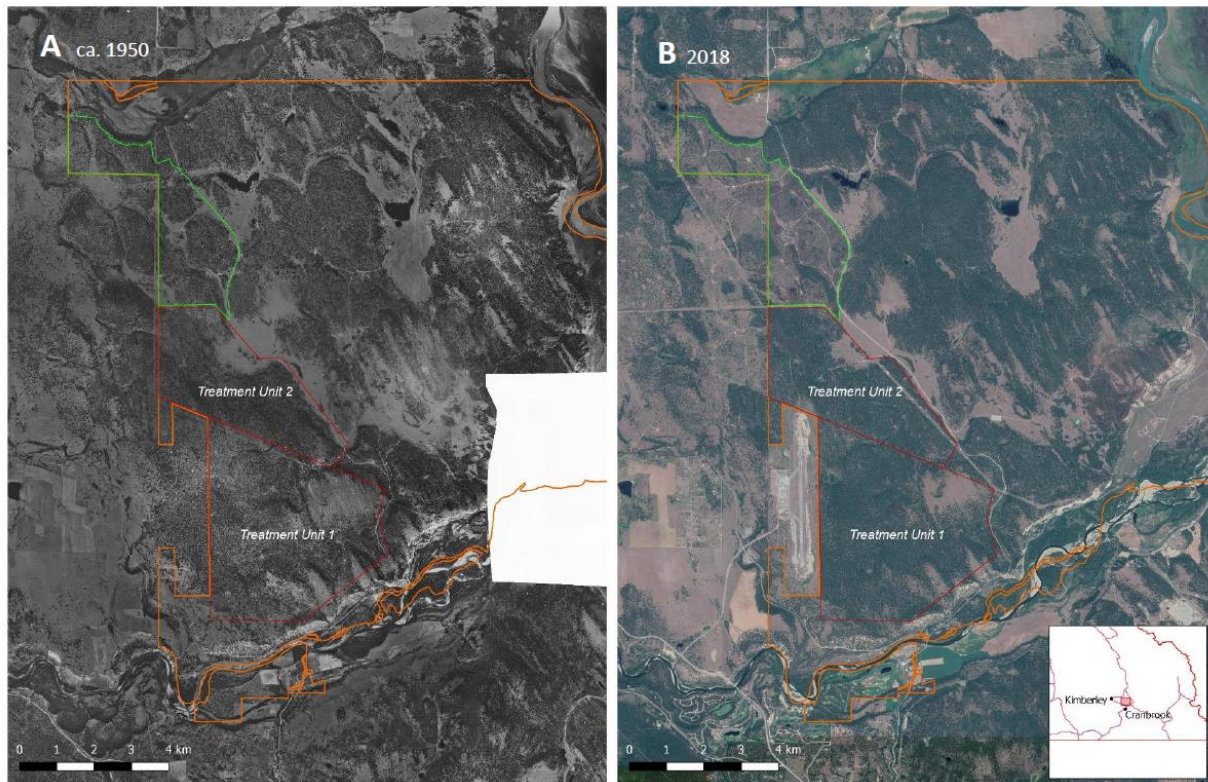
## List of Tables

Table 1 - Results and Outcomes of 2019-2020 Survey & Inventory Activities.....	6
--	---

## Introduction

ʔaqam Reserve Lands forming Kootenay IR 1, St. Mary’s 1/1A, Isidore’s Ranch IR 4, Cassimayooks IR 5 and Bummer’s Flats IR 6 comprise approximately 8,000 hectares of relatively undeveloped lands in the Rocky Mountain Trench. These act as a significant source of forage and travel corridors for ungulates, particularly elk and deer, and are utilized by several wildlife Species at Risk (SAR).

The ecosystems of these lands are classified as Natural Disturbance Type 4 (NDT4), or fire-maintained ecosystems. These sites frequently saw low intensity fires which consumed fine fuels, reduced competition from young trees and revitalized grass and shrub communities. In the last century, fire suppression has greatly altered the processes on this landscape, contributing to overstocking, low productivity, grassland encroachment and low ecological function, particularly for wildlife species native to open forests and grasslands. These species include but are not limited to: Long-billed Curlew, Lewis’s Woodpecker, Flammulated Owl, Common Nighthawk, American Badger and Little Brown Myotis Bat.



*Figure 1 – Orthophoto illustrating increased forest cover from imagery circa 1950 on left; B: 2018 on right (Adams and Harris 2019)*

This project will use thinning treatments and prescribed fire to enhance 1,300 hectares of habitat on ʔaqam Lands forming Kootenay IR 1. This compliments previous enhancement work conducted on Reserve by ʔaqam in 2018, as well as adjacent crown lands having received ecosystem restoration treatments over the last 20 years.

## Goals and Objectives

### Linkage of FWCP Action Plans and specific Action(s)

Through the use of mechanical treatments to thin 1,300 hectares of PPdh2 NTD4 ecosystem and the application of prescribed fire, the Project Goal is to enhance ecosystem resiliency and function at the stand and landscape level. Project goals and objectives are consistent with those within the Columbia Region Upland & Dryland Action Plan (FWCP 2019).

### Upland and Dryland Action Plan

#### Ecosystems – Habitat-based Actions

*#12 – Restoration of Upland Habitats – Contribute to restoration planning and treatments in grasslands, deciduous forests and open forest ecosystems on conservation lands, First Nation lands and crown lands through Ecosystem Restoration Committees. – P1*

The ʔaqam Ecosystem Enhancement project will ultimately restore a mosaic of mature forest, open forest and open grassland site types to 1,300 hectares of ʔaqam Lands. These lands are currently of low productivity and low ecological function to wildlife SAR and species of interest to the ʔaqam Community. Relevant actions in year one (2019-2020) of this five-year project include layout and prescription development for mechanical and hand forest thinning treatments to take place in year two. The installation of long-term vegetation monitoring plots and collection of baseline data in 2019 will support ʔaqam in monitoring the effectiveness of treatments at establishing species richness and diversity in the understory. Invasive Plant Inventory and Archaeological Overview Assessment were also completed to support the development of treatment prescriptions.

#### Species of Interest – Species-based Actions

*#21 – Badger Conservation – Support strategies and initiatives outlined in the SARA and BC Recovery Strategy for American Badger that relate to compensation for dam impacts. Where possible, link project work to the connectivity of this species across ecosystems and collaborate with recovery team specialists. – P1*

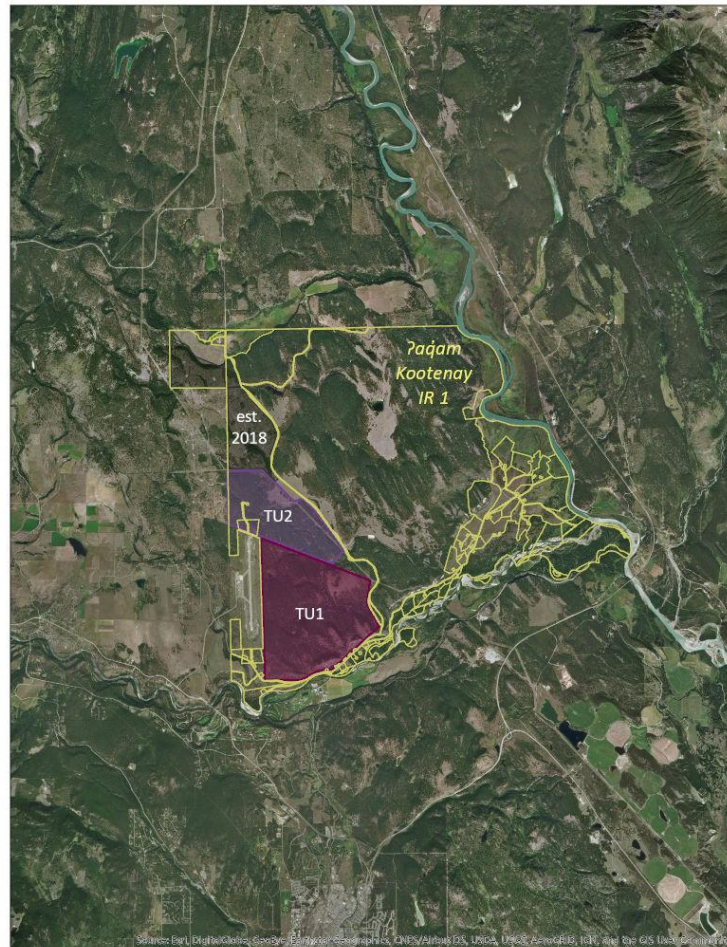
The reduction of forest ingrowth and encroachment will increase the availability of suitable habitat for the American Badger and its preferred prey, the Columbian Ground Squirrel, as well as increase corridors for travel of this species to other suitable habitat areas in the Rocky Mountain Trench. Relevant 2019-2020 project activities include the inventory of badgers and badger activity in the project area in preparation for Species at Risk permitting and design of ecosystem enhancement works.

*#22 – Lewis’s Woodpecker Conservation – Support strategies and initiatives outlined in the SARA Recovery Strategy for Lewis’s Woodpecker that relate to compensation for dam impacts. Where possible, link project work to the connectivity of this species across ecosystems and collaborate with recovery team specialists. – P1*

As above, the reduction of forest ingrowth and grassland encroachment will increase the availability of suitable habitat and the recruitment of nesting trees for Lewis’s Woodpecker. Relevant 2019-2020

project activities include the inventory of Lewis's Woodpecker in the project area for Species at Risk permitting and design of ecosystem enhancement works. Additionally, an inventory of Wildlife Trees and Wildlife Tree Reserve Areas was completed as part of this project.

## Study Area



*Figure 2 - Map of ʔaqám Reserve lands forming Kootenay IR 1, previous ER treatments and current Ecosystem Enhancement Project Areas TU1 & TU2. FWCP Columbia East Kootenay Subregion.*

## Methods

FWCP funds contributed to the following project activities and deliverables in 2019-2020:

### Archaeological Overview Assessment (Choquette 2019)

Archaeological Overview Assessment was carried out in three phases: review and assembly of relevant background information; field reconnaissance; and analysis, mapping and report preparation.

### Species at Risk Inventory (Adams and Harris 2019)

Call playback surveys were utilized to survey for Common Nighthawk, Flammulated Owl and Olive-sided Flycatcher at 500m intervals (during appropriate activity periods). Acoustical surveys were conducted for bats at eight stations throughout the treatment units. Visual, walking surveys were completed for American badger (and badger sign) as well as Lewis' Woodpecker. For rare plants Spalding's campion and alkaline wing-nerved moss, visual surveys of suitable habitats were conducted.

### Effectiveness Monitoring Plot Installation (Harris 2019)

Plots were installed across the project area to capture the full complement treatment types: mechanical harvest/brushing, had brushing and leave areas. Plot baselines were evaluated based on site characteristics, forest metrics, understory vegetation/composition and soils. Understory species diversity and composition, as well as regeneration of tree species, will be re-evaluated at one, three, five and ten years following treatment to evaluate success.

### Wildlife Tree Assessment (Harris 2019)

Wildlife trees were identified and evaluated by a Registered Professional Forester. Potential trees were located by traversing a systematic grid and GPS coordinates taken. Trees were evaluated using an FS 715 form provided by the BC Ministry of Forests, Lands and Natural Resource operations and classified as: low, moderate, high or very high in value for wildlife.

### Invasive Plant Inventory (EKISC 2019)

Walking surveys traversing the project area were conducted to identify point, line and area locations of invasive plant infestations. Species, density and distribution were evaluated for all infestations.

### Block Boundary and Road Layout, Project Mapping/GIS Support & Prescription Development

Following the initial stratification of treatment areas by ʔaqam Lands Department staff, contract crews completed boundary confirmation, road layout, mapping and prescription development in preparation for the 2020 bidding process for mechanical harvest/brushing and hand thinning treatments.



## Results and Outcomes

Activity	Completed	Results	Description
Archaeological Overview Assessment	September 2019	161 ha of (archaeological) No Work Zone delineated	Most of the area within proposed TU1 & TU2 was assessed as having low archaeological potential, and no archaeological constraints were identified on future management activities outside three areas identified as having potential for the presence of significant intact pre-contact archaeological deposits and/or features. These areas have been designated “No Work Zones” with regards to treatments.
Species at Risk Inventory	November 2019	12 species surveyed/observed: 6 present, 2 inconclusive, 4 absent	<p><i>Present:</i> Lewis’s Woodpecker, Common Nighthawk, Flammulated Owl, Long-billed Curlew, Little Brown Myotis Bat</p> <p><i>Inconclusive:</i> American Badger, Williamson’s Sapsucker</p> <p><i>Absent:</i> Olive-sided Flycatcher, Western Toad, Spalding’s Campion, Alkaline Wing-nerved Moss</p> <p>Ecosystem Enhancement works are anticipated to benefit most species, both present and absent, to varying degrees. Planning by ʔaqam Lands staff is will account for habitat requirements for species present and prioritize the maintenance of habitat features. ʔaqam has completed an SAR permit application to conduct work, based in these findings.</p>
Effectiveness Monitoring Plot Installation	September 2019	32 plots installed 32 plots evaluated for baseline conditions	24 plots in TU1 and 8 plots in TU2 were established in varying ecotypes and proposed treatment types, capturing various tree species, aspects and stand ages. Plots established in open range and reserve areas will be used as controls, representing the role of climate, etc. Baseline conditions were evaluated for all plots in 2019-2020, and vegetation plots will be repeated at one, three, five and ten year intervals to monitor plant community composition and structure following treatment.
Wildlife Tree Assessment	September 2019	1,354 total wildlife trees identified	Low and moderate value wildlife trees are anticipated to be replaced by prescribed burn activities, whereas high to very high value trees will be protected from harvest and burn

Activity	Completed	Results	Description
		725 high & very high value wildlife trees identified 13 wildlife tree patches delineated	activities. Wildlife Tree Patches have been used to stratify proposed treatments, which was further refined through boundary layout and prescription development.
Invasive Plant Inventory	November 2019	11 invasive plant species identified 153 invasive plant point locations identified 41 km of road transects; 3 km of roadway identified for possible herbicide treatment 15 ha of infestation area identified; 2 ha identified for possible herbicide treatment	Large, dense patches of Spotted Knapweed, Yellow Hawkweed and Sulphur Cinquefoil were identified in the project area, as well as seven other invasive species in low density. Herbicide application was recommended to treat Spotted Knapweed on roadways and mechanical harvest areas. Other priority species and small infestations will be considered for mechanical (hand-pulling) treatments. Spread of Yellow Hawkweed and Sulphur Cinquefoil will be mitigated using best management practices for contractors.
Boundary, Road Layout	May 2020	35 treatment boundaries confirmed 0.47 km new road proposed, 3.8 km upgraded 24 landings proposed	Completed block boundary and road layout will support the completion of prescriptions by mechanical harvest, mechanical brushing and hand treatment discussed below.
Project Mapping	May 2020	-	Overview map attached as appendix.
Prescription Development	May 2020	522 ha prescribed for treatment, including: 177 ha brushing by hand, 69 ha brushing by machine, 276 harvest by machine	To create a matrix of habitat types on site, four treatment types will be applied: no treatment, brushing by hand, brushing by machine, and harvest by machine. No treatment will be applied in areas such as wildlife corridors/tree patches and archaeological sites. Brushing will apply either mechanical mulching or chainsaws/brush saws. Mechanical harvest will apply conventional logging methods and equipment. Both methods will target coniferous trees (Fd, Py) <17.5 cm dbh and >30cm tall, and a 200 sph leave target. Prescribed burning will be applied in later years of the project to target germinants and other ground fuels. Overview map attached as appendix.

Table 1 - Results and Outcomes of 2019-2020 Survey & Inventory Activities

## Discussion

Survey and inventory works conducted in Year One of this five-year project, including Archaeological Overview Assessment, Species at Risk Inventory, Invasive Plant Inventory, Wildlife Tree Surveys and Effectiveness Monitoring Plot Establishment, collected valuable baseline data for project design. Findings informed the desktop stratification of treatment and no work zones, Species at Risk permitting, invasive plant treatment planning and, finally, the block boundary/road layout and treatment prescriptions (Nupqu 2020) for mechanical and hand thinning activities to take place in Year Two.

### Restoration of Upland Habitats

In areas planned for thinning, hand brushing, mechanical brushing or mechanical harvest treatments will be applied where appropriate to achieve approximately 200 stems per hectare (sph) and 30-35% crown closure. This prescription standard was chosen to increase light/moisture availability, understory health and habitat value while also retaining cover for wildlife and reducing disturbance/exposure for invasive plant encroachment. Prescriptions were developed for 522 hectares of forest, with an additional 809 total hectares of forest, riparian, prairie and other site types determined as No Work Zones. As discussed in ʔaḳam's original proposal, treated and untreated areas will complement one another, benefitting elk, deer and other wildlife populations by increasing suitable winter range and improving/creating corridors for travel. Mechanical and hand thinning treatments will reduce fuels for later treatment by prescribed burn, restoring natural processes on a fire-maintained NDT4 landscape. Treatment type will vary according to composition of residual trees, accessibility and topography, merchantability of timber and other values.

Effectiveness monitoring plots, including baseline data collected in 2019, will be evaluated at one, three, five and 10 years following treatment to determine if treatments have successfully restored the diversity and abundance of understory plants: an important metric for evaluating habitat and ecosystem function.

## Badger Conservation



Figure 3 - Badger burrow on ʔaqam's Long Prairie, 2019. Credit: Ian Adams.

Sign for American badgers was searched for during visual surveys conducted for Lewis's Woodpecker in the project area. No active badger sign was observed during survey efforts (Adams and Harris 2019). Incidental observations of three badger burrows (one within the project area, two adjacent) were reported, but these burrows were inactive at the time of study. No sign of Columbian ground squirrels, the badgers primary prey, were observed.

With provincially-designated Wildlife Habitat Areas for badger surrounding ʔaqam lands forming Kootenay IR 1, it is believed following this study that badgers occasionally traverse the project area to move between sites of greater habitat and prey availability. Thinning and prescribed burning activities are believed to benefit badgers in the long term by removing overstory and reducing ground cover that may impede movement (Adams and Harris 2019).

## Lewis's Woodpecker Conservation

Visual surveys were conducted in approximately 12km of suitable grassland and open forest habitat for Lewis's Woodpecker. No observations were recorded during dedicated surveys, but one active nest was located in the project area in a transmission pole (Adams and Harris 2019).

Most of the project areas ecotype is not currently consistent with habitat for Lewis's Woodpecker: open forest, with large diameter trees for nesting (Adams and Harris 2019). Proposed mechanical and thinning treatments are anticipated to benefit the species through the protection of high value wildlife trees, the thinning of immature trees and understory vegetation, creation of low-intensity burned areas and additional recruitment of wildlife trees. Lewis's Woodpecker are known to utilize the project site, other areas on ʔaqam Lands forming Kootenay IR 1 and adjacent suitable habitat types, and it is anticipated Woodpeckers will readily move into newly available habitat following treatment.

## Recommendations

Activities completed in Year One of ʔaqam's 5-year Ecosystem Enhancement Project and supported under this Contribution Agreement will support the completion of restoration works to take place in Years Two-Five of the project, including: pre-development activities, mechanical harvest, hand brushing, interim treatment activities (ex. invasive plant treatments) and prescribed burning.

## Acknowledgements

ʔaqam wishes to acknowledge the support of the Fish and Wildlife Compensation program on behalf of its program partners BC Hydro, The Province of BC, Fisheries and Oceans Canada, First Nations and Public Stakeholders. Additionally, this project would not be possible without the financial support of The Columbia Basin Trust and Government of Canada.

## References

Adams, Ian and Harris, B.J. Randall (2019). *ʔaqam Airport Pasture Ecosystem Restoration: Species at Risk*. Prepared for ʔaqam Lands & Resources.

Choquette, Wayne T. (2019). *Archaeological Overview Assessment of Two Ecosystem Restoration Treatment Units on St. Mary's Reservation No. 1*. Prepared for ʔaqam Lands & Resources.

East Kootenay Invasive Species Council (EKISC, 2019). *Inventory for ʔaqam Community Airport Pasture, Kootenay IR 1*. Prepared for ʔaqam Lands & Resources.

Fish and Wildlife Compensation Program (FWCP, 2019). *Columbia Region Upland & Dryland Action Plan*. Retrieved from: <http://fwcp.ca/action-plans-columbia-region/>

Harris, B.J. Randall (2019). *Pre Treatment Wildlife Tree Survey Report Unit 1 St. Mary's Reserve*. Prepared for ʔaqam Lands & Resources.

Harris, B.J. Randall (2019). *Pre Treatment Wildlife Tree Survey Report Unit 2 St. Mary's Reserve*. Prepared for ʔaqam Lands & Resources.

Harris, B.J. Randall (2019). *Routine Monitoring Plot Establishment Report, Unit 1, St Mary's Reserve*. Prepared for ʔaqam Lands & Resources.

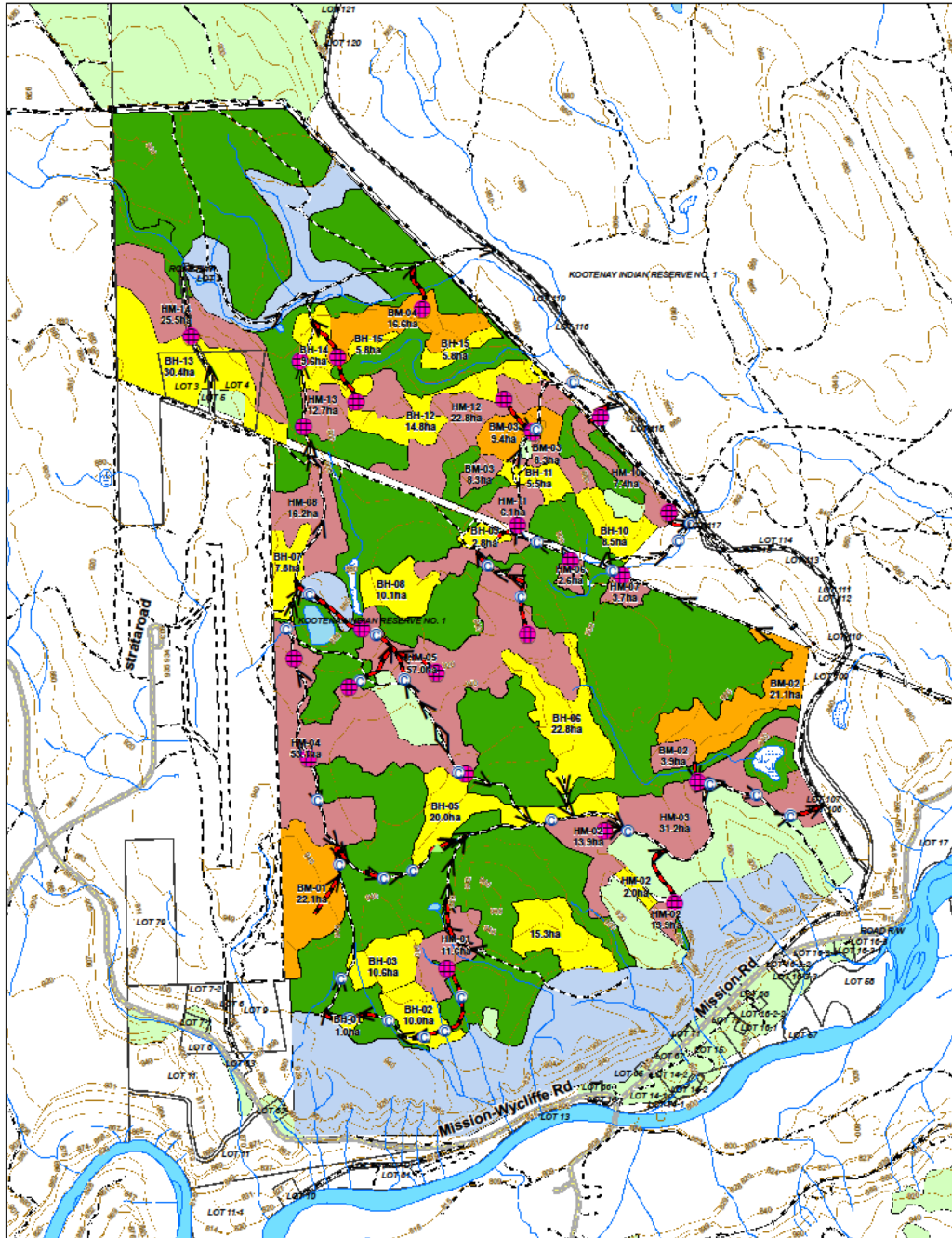
Harris, B.J. Randall (2019). *Routine Monitoring Plot Establishment Report, Unit 2, St Mary's Reserve*. Prepared for ʔaqam Lands & Resources.

Nupqu Development Corporation (2020). *Airport Pasture Ecosystem Restoration Prescription*. Prepared for ʔaqam Lands & Resources.

## Appendix A – Treatment Prescriptions Map



### Airport Pasture Ecosystem Enhancement Treatment Units Overview



- |                    |                   |                  |                       |
|--------------------|-------------------|------------------|-----------------------|
| Aspen              | 20m Contour       | Lake             | Brushing, Mechanical  |
| Culvert            | Gravel Road       | River            | Corridor/Riparian/WTP |
| Proposed Landing   | Paved Road        | Land Parcel      | Harvest, Mechanical   |
| Existing Haul Road | Railway           | <b>Treatment</b> | No Work Zone          |
| Proposed Road      | Transmission Line | Archaeological   | Previously Treated    |
| Stream             | Wetland           | Brushing, Hand   |                       |

1:20,000

0 100 200 400 600 m

Nupqu Limited Partnership	
Date: May/12/2020	Drawn By: Yvan Kathriner, RPF
Sheet No: 82G	Contact: ykathriner@nupqu.com
Map Grid: WGS	250-489-5762
Coordinate System: NAD 1983 UTM Zone 11N	