
Tuchodi Prescribed Burns for Wildlife Habitat

Supplemental Information 2020

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EXECUTIVE SUMMARY

Northeastern British Columbia (BC) has a long history of the use of prescribed fire for wildlife habitat improvement and enhancement, which has primarily been conducted by the Province of BC and, historically, First Nations. The Tuchodi River valley, located in the Northern Rocky Mountains Provincial Park, is renowned for the diversity and abundance of wildlife within it, which has been shaped and maintained through the implementation of prescribed burns for the past 50 years. Persistence of these wildlife values is important for traditional use by First Nations, biodiversity, and recreational opportunities. The purpose of the multi-year Tuchodi prescribed burn program is to restore early seral ecosystems to support healthy wildlife populations dependent upon these habitats. Early and mid-seral habitats, including natural grasslands and grassland-shrub complexes, will be treated with prescribed fire to increase the quantity and quality of forage, increase the traverse-ability of sites by removing blow down, and decrease vertical structure to meet the seasonal foraging requirements of each species. Effectiveness of the prescribed burns will be assessed by measuring and comparing vegetative response and changes in wildlife use before and after the prescribed fire treatment.

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TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
ACKNOWLEDGEMENTS	II
TABLE OF CONTENTS.....	III
LIST OF FIGURES.....	IV
LIST OF TABLES	IV
LIST OF PHOTOS.....	IV
INTRODUCTION	1
ISSUE	1
STUDY AREA	2
OBJECTIVES.....	2
WILDLIFE HABITAT OBJECTIVES	2
<i>Elk</i>	4
<i>Stone's Sheep and Mountain Goat</i>	5
<i>Grizzly Bear</i>	6
<i>Moose</i>	6
<i>Mule and White-tailed Deer</i>	7
FUEL MANAGEMENT OBJECTIVES.....	7
LANDSCAPE-LEVEL OBJECTIVES	8
<i>Fort Nelson Land and Resource Management Plan</i>	8
<i>Northern Rocky Mountains Park and Protected Area Draft Management Plan</i>	9
<i>BC Parks Conservation Policy</i>	13
<i>Muskwa-Kechika Wildlife Management Plan</i>	14
EFFECTIVENESS MONITORING OBJECTIVES.....	15
OTHER OBJECTIVES	16
PROPOSED BURN SITES.....	16
VALUES ASSESSMENT	27
MITIGATION MEASURES	27
<i>Values in Treatment Area</i>	27
<i>Values Outside Treatment Area</i>	33
EFFECTIVENESS MONITORING	35
METHODS.....	35
<i>Biophysical Characteristics</i>	35
<i>Vegetation Characteristics</i>	36
<i>Wildlife Use</i>	37
RESULTS	38
<i>Vegetation</i>	38
<i>Wildlife Use</i>	39
SUMMARY	42

LITERATURE CITED	43
APPENDIX A. LETTER OF SUPPORT	46
UNIVERSITY OF NORTHERN BRITISH COLUMBIA	46

LIST OF FIGURES

FIGURE 1. STUDY AREA OF THE TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21....	3
FIGURE 2. PROPOSED BURN SITES FOR TREATMENT IN MAY 2021, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.	17
FIGURE 3. EFFECTIVENESS MONITORING SAMPLING DESIGN AND LAYOUT FOR A PROPOSED BURN AND UNTREATED (CONTROL) AREA, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, 2020-21.	36

LIST OF TABLES

TABLE 1. SUMMARY OF THE EXISTING CONDITIONS, DESIRED CONDITIONS, WILDLIFE HABITAT OBJECTIVES, AND EFFECTIVENESS MONITORING HISTORY OF 13 SITES PROPOSED FOR TREATMENT IN MAY 2021, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.....	18
TABLE 2. SUMMARY OF VALUES WITHIN THE BOUNDARIES OF 13 PROPOSED BURN SITES, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEAST BC, 2020-21.	28
TABLE 3. SUMMARY OF VALUES OUTSIDE THE BOUNDARIES OF THE 13 PROPOSED TREATMENT AREAS, WITHIN A RADIUS OF 2-KM FROM TREATMENT AREA BOUNDARIES, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEAST BC, 2020-21. NUMBERS PRECEDING CHECK MARKS INDICATE THE NUMBER OF DIFFERENT OVERLAPS.....	34
TABLE 4. SUMMARY OF WILDLIFE USE OBSERVATIONS ALONG 688 M ² TRANSECTS ON LOWER DEAD DOG 2, SASKATCHEWAN MTN. AND TUCHODI 5 PROPOSED BURN SITES, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEAST BC, 2020-21.	41

LIST OF PHOTOS

PHOTO 1. ENCROACHMENT OF TREMBLING ASPEN (<i>POPULUS TREMULOIDES</i> , SHOWN IN THE CIRCLED AREA) UPWARDS INTO THE GRASSLAND SLOPE, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.....	5
PHOTO 2. FALK 1 PROPOSED BURN SITE FOR ELK, MOOSE AND DEER HABITAT: A) PROPOSED BURN AREA IN JULY 2020, B) HERB/GRASS COMMUNITY 2-MONTH POST-BURN (13 YEARS AGO IN JULY 2007), AND C) CURRENT VEGETATION STATE AND ASPEN ENCROACHMENT IN JULY 2020, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.	22
PHOTO 3. LARMAN 5 PROPOSED BURN SITE FOR ELK HABITAT, JULY 2020, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.....	23
PHOTO 4. LOWER DEAD DOG 1 PROPOSED BURN SITE FOR ELK HABITAT, JULY 2020, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.....	23
PHOTO 5. LOWER DEAD DOG 2 A) PROPOSED BURN SITE FOR ELK HABITAT AND B) CURRENT VEGETATION CONDITION, JULY 2020, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.....	24
PHOTO 6. SASKATCHEWAN MTN. A) PROPOSED BURN AREA FOR STONE'S SHEEP AND MOUNTAIN GOAT, B) PROPOSED BURN AREA FOR ELK AND MOOSE, AND C) GLAUCOUS BLUEGRASS-NORTHERN WORMWOOD PLANT COMMUNITY, JULY 2020, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.	25

PHOTO 7. TUCHODI RIVER 5 A) PROPOSED BURN AREA FOR ELK, MOOSE AND DEER AND B) CURRENT VEGETATION CONDITION ON THE PROPOSED BURN SITE, JULY 2020, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.	26
PHOTO 8. UPPER DEAD DOG 1 PROPOSED BURN AREA FOR STONE’S SHEEP HABITAT, MAY 2017, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21. THIS PHOTO REPRESENTS THE CONDITIONS THAT WOULD BE PRESENT AT TIME OF TREATMENT. NOTE SNOW AT THE TOP OF THE BURN AREA, IN THE DRAWS AND IN THE TIMBER BELOW; ALL OF WHICH PROVIDE NATURAL FIRE BREAKS.	27
PHOTO 9. STONE’S SHEEP EWE AND LAMB FORAGING ON NEW VEGETATION DAYS AFTER A PRESCRIBED BURN IN THE BESA RIVER AREA, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21. PHOTO CREDIT: KRISTA SITTLER	30
PHOTO 10. VEGETATION COMMUNITY AND HORIZONTAL COVER ON PROPOSED SASKATCHEWAN MTN. BURN SITE, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.	38
PHOTO 11. VEGETATION COMMUNITY AND HORIZONTAL COVER ON PROPOSED TUCHODI 5 BURN SITE, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.	39
PHOTO 12. A) LOWER DEAD DOG 2 PROPOSED BURN SITE AND B) GRASSLAND PLANT COMMUNITY ON THE BURN SITE, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21. NOTE THE PASTURE SAGE (<i>ARTEMESIA FRIGIDA</i>) IN THE BOTTOM PHOTO.	40
PHOTO 13. GRIZZLY BEAR (<i>URSUS ARCTOS HORRIBILIS</i>) DIG ON THE LOWER DEAD DOG 2 PROPOSED BURN SITE, TUCHODI PRESCRIBED BURNS FOR WILDLIFE HABITAT, NORTHEASTERN BRITISH COLUMBIA, 2020-21.	41

INTRODUCTION

In the Peace River region of northeastern BC, prescribed fire has been the primary management mechanism for the creation, enhancement and maintenance of wildlife habitat since the late 1970s (Clark 1979, Elliot 1983, Peck and Currie 1992). In the past, government-led burn programs for wildlife habitat enhancement concentrated on creating new early seral habitats across the region, with the intent of increasing large mammal populations, including elk, Stone's sheep and moose (Harper 1988). To meet these objectives, conifer-conversion burns (burning conifer stands to convert to early seral grassland habitats) were a common practice and instrumental in the elk enhancement programs of the 1980s (Elliot 1983, Peck and Currie 1992). However, in the early 2000s, the objectives of the Province-led burn program shifted from large-scale conversion and enhancement of habitats to the maintenance of existing habitats and ecosystem diversity, and targeted burning to meet specific wildlife objectives (Lousier et al. 2009, Goddard 2012). Because of the long-standing prescribed burn programs in the northeast, the area has become renowned for the diversity and abundance of wildlife inhabiting it, specifically large mammals such as moose (*Alces alces*), elk (*Cervus canadensis*), grizzly bear (*Ursus arctos*), Stone's sheep (*Ovis dalli stonei*), bison (*Bison bison*), mountain goat (*Oreamnos americanus*), mule deer (*Odocoileus hemionus*) and white-tailed deer (*Odocoileus virginianus*).

With the recent attention to ecosystem restoration initiatives and fuel management across the province, prescribed burns are becoming recognized not only for their utility in the management of wildlife habitat and populations, but also as a method of restoring early- and mid-seral ecosystems, maintaining biodiversity, and reducing fuel loading across the land base. Due to a long history of fire suppression across Canada, much of our historic ecosystem diversity has been homogenized into late-succession environments, and, thus, the wildlife communities associated with fire-maintained early seral habitats have declined or disappeared with them. This has been most notably recognized and documented in some of Canada's western National Parks (e.g., Jasper National Park, Banff National Park, Kootenay National Park). Historical records show that these Parks used to contain a variety of fire-maintained ecosystems, including natural grasslands and open forest ecosystems, which supported healthy and abundant populations of grizzly bears, wolves, and many species of ungulates (Rhemtulla 1999). Parks Canada is now re-introducing fire to the landscape through numerous prescribed burn programs, with the objectives of restoring early seral ecosystems, decreasing forest encroachment, and reducing fuel loading.

Government-led prescribed burning in northern BC's Provincial Parks has resulted in the diversity and abundance of wildlife and the variety of habitats that are the primary values being recognized and protected by a Park designation. Persistence of these early seral ecosystems is important for traditional use by First Nations, biodiversity, and recreational opportunities. The continued use of prescribed fire is an effective and natural mechanism to maintain Park values, ecosystem diversity and restore habitats that have been lost due to years of fire suppression.

Issue

The Tuchodi River area has a history of prescribed burns to maintain and enhance wildlife habitat for elk, moose, mule deer and Stone's sheep. However, prescribed burns have not been conducted for upwards of 30 years on some sites, and other sites have had treatment at intervals inappropriate

for maintaining sites in the desired vegetative condition to ensure suitable wildlife habitat. Past prescribed burns and wildfires in the Tuchodi River valley have created open grasslands on south facing slopes and mid-seral shrub and deciduous tree communities, which has created valuable winter range for elk, moose, mule deer, Stone's sheep and mountain goats. Prescribed burns also create grizzly bear forage and habitat. Since these early fires, however, a lack of fire and natural succession has resulted in a loss of early seral ecosystems. This in turn has caused the retraction of winter range and decreased forage quality for ungulates. Dense regeneration and encroachment of aspen (*Populus tremuloides*) and balsam poplar (*Populus balsamifera*) in winter range has decreased light penetration (impeding new forage growth) and reduced line of sight for predation detection. To restore and sustain wildlife populations in the Tuchodi, these winter ranges need to be exposed to a natural disturbance mechanism, such as fire, to restore the required early seral grass-shrub communities for wildlife habitat, and to sustain ecosystem and species diversity.

STUDY AREA

The Tuchodi prescribed burn project area, approximately 570 km² ha in size, is located approximately 100 km southwest of Fort Nelson in northeastern British Columbia (Figure 1). The study area is situated in the Muskwa Foothills and Muskwa Upland Ecosections, within the Northern Canadian Rocky Mountains and Muskwa Plateau Ecoregions. The study area is bound by Chlotapecta Creek to the north, the Muskwa River to the east, Gatho Creek to the south and the Tuchodi Lakes to the west. It is located within the Muskwa-Kechika Management Area (MKMA) and also in the Northern Rocky Mountains Park. Approximately 75% of the project area falls within the Spruce-Willow-Birch (SWB) Biogeoclimatic zone (BGZ), with the remainder of the area located in the Boreal White and Black Spruce zone (BWBS), which is prevalent along the Tuchodi valley floor and the flatter terrain to the east (Meidinger and Pojar 1991; Figure 1).

OBJECTIVES

The goal of the Tuchodi burn program is to ensure high-quality habitat for wildlife in the Tuchodi River watershed is maintained to support sustainable wildlife populations. The prescribed burn program addresses four main objectives: (1) wildlife habitat restoration, maintenance and enhancement, (2) fuel management, (3) landscape-level objectives identified in higher-level plans, and (4) effectiveness monitoring of prescribed burns.

Wildlife Habitat Objectives

The following outlines project objectives specific to wildlife and wildlife habitat:

Objective: Restore and maintain ungulate winter range and early seral ecosystems in the Tuchodi River watershed.

- 1) Reduce canopy cover, standing woody vegetation, and aspen and willow (*Salix* sp.) encroachment,
- 2) Promote regrowth of warm and cool season plants that provide optimal forage for ungulates,

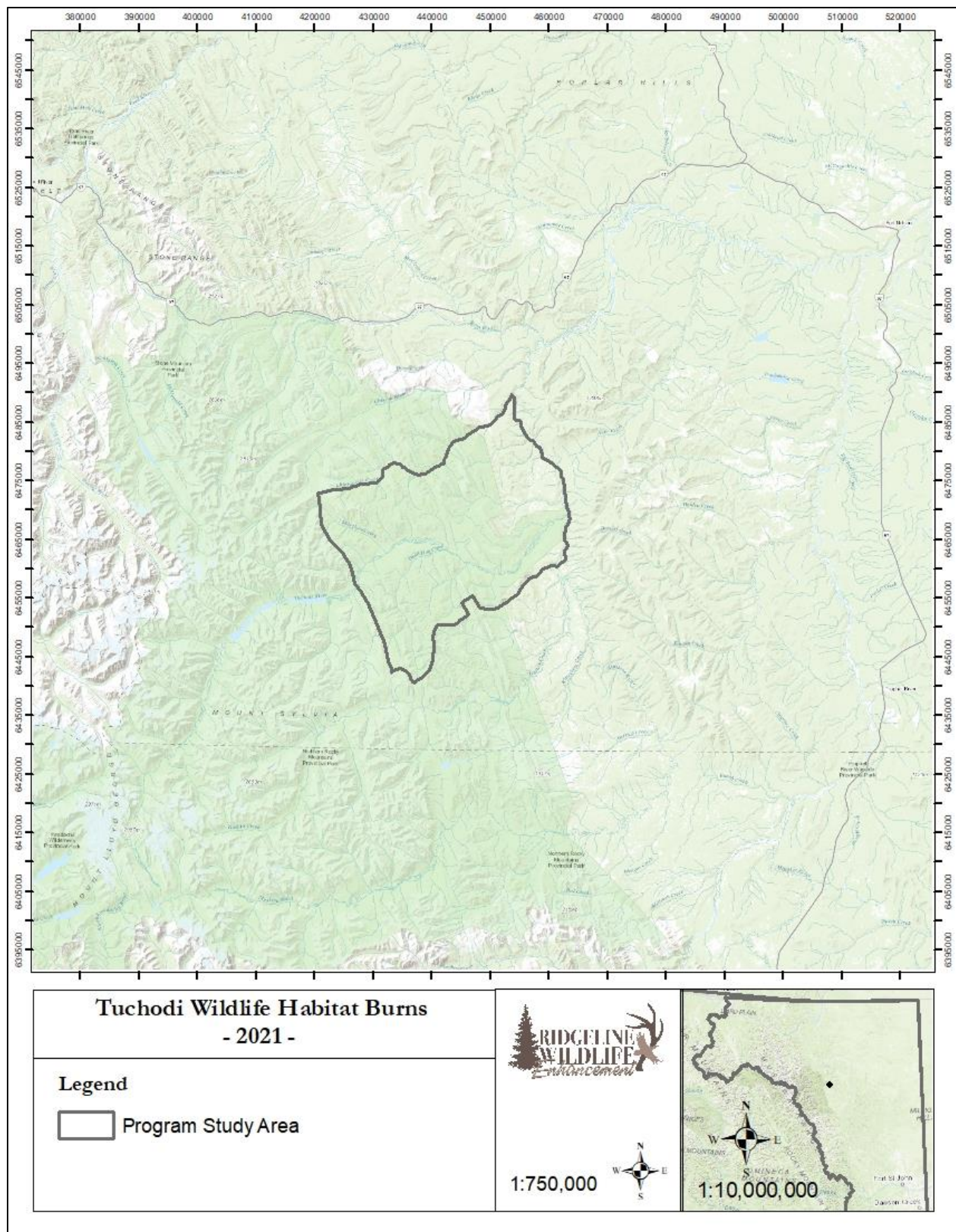


Figure 1. Study area of the Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.

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- 3) Improve nutritional quality of forage by creating a post-fire nutrient flush,
 - 4) Increase line of sight for predator detection,
 - 5) Increase forage abundance in winter range areas,
 - 6) Improve spatial separation between large ungulates (moose, elk) and Stone's sheep and caribou (Sittler et al. 2015), and
 - 7) Promote early seral and mid-seral habitats to maintain ecosystem diversity at a landscape-scale.

In addition to the above wildlife objectives, the Tuchodi burn project aims to achieve several species-specific objectives. The following objectives for each species have been identified below.

Elk

In the Tuchodi River area, elk winter range habitat is generally located along the south- and west-aspect slopes of the main Tuchodi River valley, which provide lower snow loads and provide quicker access to forage during the critical late-winter and spring periods. Due to fire suppression and a lack of prescribed fire over the past 30 years, elk winter habitat in the Tuchodi has become overgrown, reducing forage quality and availability (Photo 1). As a result, elk populations are believed to be declining¹ and competition with caribou at high-elevation areas is occurring, as elk search for more accessible forage in the windswept alpine². Maintaining and improving elk winter range will encourage elk to move out of caribou areas to more suitable forage and winter range in lower elevations. If these low elevation winter habitats are not maintained to ensure suitable forage, there is a risk of elk continuing to move up in elevation to find more easily accessible forage in the windswept alpine. This poses a direct risk to the quality of caribou alpine habitat and may increase risk of predation.

Specific objectives for elk include:

- 1) re-establish herbaceous forage on low elevation south- and west-aspect slopes in the Tuchodi River valley,
- 2) reduce aspen encroachment on lower slopes to increase light penetration and increase herbaceous forage,
- 3) reduce vertical structure of aspen and willow to <2 m in height to increase line of sight for predator detection,
- 4) reduce large down woody debris to improve mobility of elk and increase predator avoidance, and
- 5) create spatial separation from high-elevation species (e.g., caribou) to reduce competition for forage in alpine areas and risk of increased predation.

At the time of report preparation, there were no current Provincial population or habitat objectives identified for elk to guide development of objectives of the Tuchodi burn program.

¹ Monty Warren, Tuchodi River Outfitters, Fort St. John, BC.

² Alicia Woods, Wildlife Biologist, personal observations.



Photo 1. Encroachment of trembling aspen (*Populus tremuloides*, shown in the circled area) upwards into the grassland slope, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.

Stone's Sheep and Mountain Goat

Nearly the entire global population of Stone's sheep reside in British Columbia and greater than 50% of that are in northeastern BC (Sim et al. 2019). To uphold the responsibility of managing a species whose range is globally small, maintaining and enhancing habitat will be a key component of long-term species preservation. While elk require greater amounts of forage and are less selective of high-quality forage, Stone's sheep depend more on high nutritional quality forage in relation to key habitat features, such as escape terrain and mineral licks (Walker 2005, Sittler et al. 2019).

Stone's sheep and mountain goats both require habitats that maintain an open line of site for predator detection, which can be compromised when aspen, willow and sub-alpine scrub birch (*Betula glandulosa* spp. *glandulosa*) communities exceed 2 m in height. Specific objectives for Stone's sheep and mountain goat include:

- 1) improve nutritional quality of forage in winter, lambing and summer range habitats,
- 2) increase line of sight for predator detection,
- 3) improve forage in juxtaposition to important features (e.g., escape terrain and mineral licks) and within known winter, lambing and summer range areas,
- 4) increase lamb recruitment (Seip and Bunnell 1985),
- 5) decrease frequency of lungworm occurrence (Seip and Bunnell 1985), and
- 6) increase forage abundance in high-elevation winter range.

Population and habitat management objectives are not currently available for Stone's sheep. A draft Provincial Thinhorn Sheep Management Plan is currently being developed, which will hopefully

provide habitat management and population targets. As this plan is released, we will incorporate the habitat and population management objectives within the Tuchodi burn program.

By maintaining suitable mountain goat habitat in the Tuchodi River watershed, the Tuchodi burn program will meet the Provincial management goal for mountain goats, “maintain viable, healthy and productive populations of mountain goats throughout their native range” (Mountain Goat Management Team 2010). Prescribed burning is identified in the Provincial Management Plan as a direct habitat management method to improve and increase forage for mountain goats.

Grizzly Bear

During pre-treatment vegetation monitoring, many of the proposed burn sites in the Tuchodi area revealed the presence of important grizzly bear forage species including *Hedysarum* sp., *Shepherdia canadensis*, and *Vaccinium* sp. (Nielsen et al. 2004). The specific prescribed burn objective for grizzly bears is to re-establish high-elevation summer and fall habitat by maintaining important plant communities (e.g., *Hedysarum* spp., *Astragalus* spp.) and improving berry crops (e.g., *Shepherdia canadensis*; Munro et al. 2006, Milakovic 2008).

The following Provincial management guidelines have been identified for grizzly bear habitat in an independent review of grizzly bear management in BC (Peek et al. 2003) and *The Conservation of Grizzly Bears in British Columbia: background report* (MOE 1995):

- a) “use of prescribed burning of some portions of logged areas to enhance habitat for grizzly bears” (Peek et al. 2003),
- b) identifying and managing for the importance of natural disturbance patterns to maintain early successional habitat (MOE 1995).

The objectives of the Tuchodi burn program align with these Provincial management guidelines.

Moose

A recent moose survey conducted in adjacent Wildlife Management Unit 7-42 (Lirette 2015) showed low calf recruitment and a declining population trend. It is likely that moose populations in the Tuchodi program area are similarly declining, which is also supported by anecdotal evidence³. The primary burn objective for moose is to restore early seral and mid-seral habitats to promote increased nutritional quality and quantity of forage at low elevations for moose populations. Several of the proposed burn areas are known to be important moose winter range because of the shrub communities that resulted from past prescribed fire. However, over the past 30 years, these areas have become overgrown and forage is either out of reach of moose or of poor nutritional value. Re-burning these areas will refresh the existing shrub communities, increasing the nutritional value of shrubs, and decrease the height of the shrubs, making them more accessible as forage for moose. Prescribed burning in the spring has also been shown to reduce tick abundance (Drew et al. 1985, Gleim et al. 2019). Lower winter tick abundance and improved forage would have direct positive effects on moose populations by decreasing winter mortality of moose.

In the Provincial Framework for Moose Management in BC, the Provincial goal for moose management is “to ensure moose are maintained as integral components of natural ecosystems

³ Monty Warren, Tuchodi River Outfitters, Fort St. John, BC.

throughout their range, and maintain sustainable moose populations that meet the needs of First Nations, licensed hunters and the guiding industry in BC” (FLNRO 2015). The use of prescribed fire to maintain early seral ecosystems in the Tuchodi area will meet this Provincial goal, and will follow habitat management recommendations in the Goreley Report (“Recommendation 12: Undertake targeted habitat enhancement opportunities where it supports achievement of moose population objectives”; Gorely 2016).

Mule and White-tailed Deer

The Tuchodi River valley supports small populations of mule deer and white-tailed deer. Mule deer and white-tailed deer rely upon much of the same winter range areas occupied by elk in the Tuchodi area. Objectives to maintain mule deer and white-tailed deer habitat include:

- 1) maintain herbaceous forage on low elevation south- and west-aspect slopes in the Tuchodi River valley,
- 2) reduce aspen encroachment to increase light penetration and increase herbaceous and shrub forage,
- 3) reduce vertical structure of aspen and willow to <2 m in height to increase line of sight for predator detection, and
- 4) reduce large down woody debris to improve predator avoidance.

At the time of report preparation, there were no current Provincial population or habitat objectives identified for mule deer or white-tailed deer to inform objectives of the Tuchodi burn program.

Fuel Management Objectives

A secondary objective of the Tuchodi burn program is to support fuel management in the Northeast Region, in a controlled, planned and cost-efficient manner. Although much of the northern parts of the region have a “let-it-burn” policy as directed under the Parks Management Plans, the *Muskeena-Kechika Management Act*, and Land and Resource Management Plans (LRMPs), significant areas in the northeast have experienced mountain pine beetle (*Dendroctonus ponderosae*) and spruce bark beetle (*Dendroctonus rufipennis*) kill, which has created an unacceptably large fuel load in parts of the region. Prescribed burns proposed in the Tuchodi burn program will not reduce fuel loading (i.e., areas that have high fuel loading, such as beetle kill stands) as proposed burn areas are in existing early- to mid-seral stands. Although not reducing fuel loading, the burn program will result in the maintenance of early and mid-seral ecosystems, creating a heterogenous landscape that reduces large-scale fire events and creates natural fuel breaks.

Objective: Support fuel management to minimize large-scale wildfire risk:

- 1) Maintain a mosaic of early seral ecosystems,
- 2) Maintain a diversity of seral stages,
- 3) Maintain a heterogenous landscape, and
- 4) Maintain ecosystem diversity.

Landscape-level Objectives

A number of higher-level, land use plans and policies apply to the Tuchodi burn program area: (1) Fort Nelson Land and Resource Management Plan (FN LRMP), (2) Northern Rocky Mountains Park and Protected Area Draft Management Plan, (3) BC Parks Conservation Policy, and (4) Muskwa-Kechika Wildlife Management Plan. Objectives within these plans are described below.

Fort Nelson Land and Resource Management Plan

The objectives of the Tuchodi burn program align with many landscape-level objectives identified in the Fort Nelson Land and Resource Management Plan (FN LRMP)⁴:

- “Maintain the diversity and abundance of wildlife.”⁵
- “Maintain the integrity and diversity of existing habitats and ecosystems (including functional large predator-prey systems).”⁶
- “Conserving ecosystem diversity means maintaining all of the habitats naturally occurring in an area in sufficient quantities that allow the survival of all species associated with those habitats.”⁷
- “In order to maintain biodiversity, different seral stages must be maintained in the landscape in proportions which allow the maintenance of wildlife populations dependent on each stage and in proportions which mimic the natural disturbance interval of the forest type”⁸.
- Northern Rocky Mountains Park and Protected Area (cited in the FN LRMP):
 - “This area [Northern Rocky Mountains Park and Protected Area] provides key winter ranges for wildlife populations. Prescribed fires have been historically used for wildlife habitat enhancement.”⁹

The following objectives of the Tuchodi burn program align with the FN LRMP objectives. The proposed burns will:

- overlap with ungulate winter ranges and create winter forage,
- sustain biodiversity and heterogeneity across the landscape through the maintenance of early seral habitats, such as low-elevation grasslands and the Glaucous bluegrass-Northern wormwood vegetation community in the SWB zone (GCC 2017),
- target multiple species ranging from ungulates to grizzly bears to avian species (e.g., ptarmigan, short-eared owl) that rely on early seral and open sub-alpine habitats, and

⁴ Fort Nelson LRMP Working Group. 1997. Fort Nelson Land and Resource Management Plan. Fort Nelson, BC. http://ilmbwww.gov.bc.ca/slrp/lrmp/fortstjohn/fort_nelson/index.html

⁵ Page 28: Fort Nelson LRMP Working Group. 1997. Fort Nelson Land and Resource Management Plan. Fort Nelson, BC. http://ilmbwww.gov.bc.ca/slrp/lrmp/fortstjohn/fort_nelson/index.html

⁶ Page 28: Fort Nelson LRMP Working Group. 1997. Fort Nelson Land and Resource Management Plan. Fort Nelson, BC. http://ilmbwww.gov.bc.ca/slrp/lrmp/fortstjohn/fort_nelson/index.html

⁷ Page 18: Fort Nelson LRMP Working Group. 1997. Fort Nelson Land and Resource Management Plan. Fort Nelson, BC. http://ilmbwww.gov.bc.ca/slrp/lrmp/fortstjohn/fort_nelson/index.html

⁸ Page 23-24: Fort Nelson LRMP Working Group. 1997. Fort Nelson Land and Resource Management Plan. Fort Nelson, BC. http://ilmbwww.gov.bc.ca/slrp/lrmp/fortstjohn/fort_nelson/index.html

⁹ Page 128: Fort Nelson LRMP Working Group. 1997. Fort Nelson Land and Resource Management Plan. Fort Nelson, BC. http://ilmbwww.gov.bc.ca/slrp/lrmp/fortstjohn/fort_nelson/index.html

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- ensure the persistence of early and mid-seral habitats and ecosystems that would otherwise be lost to succession.

Northern Rocky Mountains Park and Protected Area Draft Management Plan

The following objectives outlined in the draft Northern Rocky Mountains Park and Protected Area Management Plan (NRMP Plan)¹⁰ will be either achieved, or not negatively impacted, by the prescribed burning of the proposed areas in the Tuchodi burn program.

- 1) Ecosystem Management and Climate Change Objectives:
 - “To increase knowledge of ecological components and processes and an understanding of their response to climate change”
 - “Mitigate or lessen the effects of climate change on the Park and its values”

Climate change is resulting in a warming trend. Subsequently, high elevation habitats such as sub-alpine and alpine habitats are being lost to the encroachment of forested ecosystems into higher elevations (Arno and Gruell 1986, Coop and Givnish 2007). Prescribed fire conducted as part of the Tuchodi burn program will reduce this forest encroachment, maintain the existing habitats and ecosystems, and slow the effects of climate change. Conducting prescribed burns in and adjacent to identified wildlife habitat will also maintain connectivity of habitats for ungulates and other species, which is identified as a Management Strategy in the NRMP Plan. Connectivity will help in maintaining self-sustaining populations through climate change and the resulting impacts of climate change. Maintaining existing early seral ecosystems will also maintain heterogeneity across the landscape, reducing the risk of large-scale wildfires that may occur more frequently because of climate change. Carbon emissions from the fire event will be low due to the small size of the prescribed fire and low fuel loading on the sites.

- 2) Geology, Landforms and Water Objectives:

Geology, landforms and water values will not be threatened by prescribed burn activities. Special geological features, such as hoodoos, are not located within the proposed burn areas and will not be impacted by the prescribed fire. Proposed burn sites are located at minimum 50 m from the nearest watercourse. Forests and shrub vegetation occurs between the burn site and watercourses, which will absorb and filter sedimentation, that may result from the prescribed fire, and prevent this from entering waterways.

- 3) Vegetation Objectives:
 - “Maintain vegetation and ecosystems for ecological integrity and visual aesthetics”
 - “Increase knowledge of ecosystems and protect at-risk plant communities and species”

¹⁰ BC Parks. 2019. Northern Rocky Mountains Park and Northern Rocky Mountains Protected Area Draft Management Plan: draft for final review. BC Parks.

Open grassland slopes that support a variety of wildlife species can be viewed throughout the Park and are an important component of park values. These grassland slopes will be maintained through the use of prescribed fire.

The Tuchodi burn program aligns with the Management Strategy identified in the NRMP Plan: “support inventories and studies aimed at better understanding the distribution of plant species and ecosystems and their ecology; including how they will respond to environmental changes such as climate change” (page 30). As part of the Tuchodi burn effectiveness monitoring program, vegetation monitoring plots will be measured in proposed burn areas and “control” (non-treated areas) prior to and after prescribed fire. Vegetation data collected will characterize the plant communities and identify rare or species at risk plants, which has been identified as an information gap in the draft NRMP Plan. Long-term vegetation monitoring plots could be used to measure long-term change in the vegetation community, potentially resulting from climate change. Vegetation monitoring plots will increase knowledge of the ecosystems and plant communities in the Northern Rocky Mountains Park. Rare or at-risk plant species and communities will be identified if present and reported to the Province. All information collected during the project will be submitted to appropriate Government Data Repositories.

- “Prevent the establishment or spread of non-native plant species”:

As occurrence of invasive plants in the park is currently low¹¹, prescribed fire will not increase the occurrence or spread of invasive species. Unlike other habitat management treatment options (mechanical clearing, brushing) that require heavy machinery, prescribed burning does not introduce any invasive seed sources, which would be brought in on machinery. Pre-treatment monitoring completed in July 2020 also confirmed the absence of invasive plants on proposed burn areas. During vegetation monitoring activities conducted pre- and post-fire, if invasive species are detected, occurrence and abundance will be monitored and reported to BC Parks.

4) Wildlife Objectives:

- “To gain a better understanding of wildlife populations, distributions and habitats”:

Currently, there are large information gaps around wildlife habitat and population status of many species in the Park and Ungulate Winter Ranges (UWR) have not been designated in the Tuchodi River area. Following the Management Strategies identified in the plan (pages 32-33), the Tuchodi burn program will result in the collection of pre-treatment and post-treatment data on wildlife and wildlife habitat. Using vegetation monitoring plots (detailed further in the Effectiveness Monitoring section below) and wildlife use monitoring methods (e.g., pellet transects, trail and timelapse cameras, and aerial recruitment surveys), information will be collected on

¹¹ BC Parks. 2019. Northern Rocky Mountains Park and Northern Rocky Mountains Protected Area Draft Management Plan: draft for final review. BC Parks.

wildlife habitat use, population trend estimates, wildlife distribution and vegetation communities. We have partnered with the University of Northern British Columbia (UNBC) to conduct research on the role of fire on ungulate physiology, recruitment and health, which will contribute significant scientific knowledge that currently does not exist.

- “Prevent impacts of non-native species to native wildlife populations and their habitats”:

There are no known non-native species in the Tuchodi area that may pose a threat to native wildlife populations.

- “Maintain current trapping opportunities subject to conservation objectives”:

Due to the location of the proposed burn sites on steep slopes and with minimal mature forest cover, trapping values and furbearer habitat will not be impacted. Reconnaissance and pre-burn vegetation monitoring on the sites have shown very little coarse woody debris or dead, standing snags that would be important furbearer habitat.

5) Fish:

The Tuchodi burn program does not address management objectives for fish outlined in the NRMP Plan. Fish values, however, will not be impacted as burn sites do not overlap with watercourses and a minimum 50 m buffer is left between the burn polygon and watercourses, resulting in a low probability of increased sedimentation to fish bearing streams.

6) Cultural Values:

- “Gain a better understanding of and protect cultural features, archaeological sites and tradition use locations”:

Following the Management Strategies in the NRMP Plan, we have engaged with Halfway River First Nation and Prophet River First Nation to identify traditional use sites in the Tuchodi valley. In addition, we also sought information from Ross Peck (former guide outfitter) to determine if other, non-documented traditional sites may be impacted by the burn program. Locations of a burial site and tee pee site were identified and have no conflict with the proposed burn sites. An additional reconnaissance flight with a representative of Prophet River First Nation is scheduled for mid-October to investigate additional traditional use sites. Fort Nelson First Nation has provided verbal confirmation of support for the Tuchodi burns and we have also been in contact with Kaska Dene and are awaiting a meeting with the community. A letter of support from Halfway River First Nation is included in the burn application package.

7) Access Management:

- “To ensure means of access is consistent with traditional uses and conserves wilderness characteristics”

-
- “To provide opportunities for aircraft access to the park while preserving a quality backcountry experience and minimizing wildlife conflicts”:

All activities associated with the prescribed burn program will be conducted using helicopter or on-foot access. Helicopter access will be limited to 5 visits during the burn treatment year: (1) pre-burn reconnaissance, (2) burn ignition, (3) post-burn fire monitoring, (4) post-burn effectiveness monitoring, and (5) winter recruitment surveys. After the treatment year, helicopter visits will be limited to effectiveness monitoring activities only (2 visits/year). The proposed burn site does not overlap with designated access routes. Wildlife inventories will be conducted under a Wildlife Act permit. No heli pads will be constructed. Proposed burn activities will not result in increased access into the Park.

8) Recreation Management:

The Tuchodi burn program will not have negative impacts on recreation management objectives.

9) Fire Management:

- “Use fire as appropriate to manage wildlife habitat and forage production, considering the impacts and benefits to all wildlife species and ecosystems”:

Management Strategies identified in the NRMP Plan for the use of prescribed fire to manage wildlife habitat include:

- a) “work with other agencies, First Nations, academia, relevant stakeholders and local community groups to continue to research the history and future objectives of prescribed burning in the park”,

We have addressed these strategies by engaging with government agencies, First Nations and the tenure holders to discuss the proposed burn areas. We have been working with the Ministry of FLNRORD and BC Parks since 2018, revising past prescribed burn plans to meet BC Parks and FLNRORD’s objectives.

- b) “considering prescribed fire for maintenance of early seral habitat and forage production where previously used, subject to the BC Parks impact assessment process and associated policy”,

This year, we have partnered with UNBC to research the role of prescribed fire on wildlife health, physiology, hormones, disease, and soil and vegetation nutritional properties pre- and post-fire.

- c) “do not use prescribed fire to create early seral habitat for ungulates where there has not been previous prescribed burning for this reason”.

Proposed burn sites in the Tuchodi burn program area are in early to mid-seral state and additional early-seral habitat will not be created by conducting prescribed burns.

- “Work collaboratively with the Range Program to manage *Range Act* tenures”:

We have engaged with the range and guide outfitter tenure holder regarding the project, proposed sites and wildlife habitat objectives. The prescribed burn will not have impacts on the range values and will not change AUMs. We will continue to work with tenure holders and the Range branch of FLNRORD to ensure wildlife and range values are maintained.

- “Information on the results of management activities is collected”:

Effectiveness of the prescribed burns will be monitored pre- and post-treatment and on control sites by measuring vegetation response, wildlife use and wildlife populations, and vegetation and soil nutritional content (refer to Effectiveness Monitoring Methods below for details).

BC Parks Conservation Policy

The BC Parks Conservation Policy¹² supports fire management activities within BC Parks and Protected Areas. The Tuchodi prescribed burn program for wildlife habitat maintenance will contribute knowledge and information relating to fire management, including the effects of fire on vegetation, wildlife, ecosystems and soil. The project also aligns with the BC Parks Conservation Policy objective of conducting prescribed fire in a controlled fashion and during appropriate times to reduce risk of wildfire, to maintain early seral habitats, and promote wildlife and plant diversity. Conducting prescribed burns will meet the following objectives outlined in the BC Parks Conservation Policy:

- 1) “To manage a species or ecosystem of conservation concern that is experiencing degradation due to natural process or other pressures”:

Stone’s sheep, specifically, are blue-listed and of a conservation concern in Northeast BC. Loss of early seral ecosystems due to reduced fire on the land base has and will continue to result in degradation of their habitat, which will, over time, result in population declines. Prescribed burning will prevent the degradation of this species of concern by maintaining key habitats.

- 2) “To support ecological restoration”:

Burn sites have been specifically selected to restore winter ranges that have been lost to aspen succession and encroachment into grassland slopes and sub-alpine grasslands.

¹² BC Parks Conservation Policy: <http://bcparks.ca/conservation-policy2014.pdf?v=1590099303327>

Prescribed fire will result in the restoration of early seral grass- and shrub-land ecosystems, thereby meeting the Policy objective.

- 3) “To effectively treat insect or disease conditions when other forest health controls are ineffective”:

Prescribed burns will not target insect-killed forests as burn sites are in early seral ecosystems. However, the use of prescribed fire in early seral areas will maintain a heterogeneous landbase to minimize forest insect epidemics.

- 4) “To enable First Nations cultural use”:

As described above, First Nations traditional, sustenance and cultural use will be maintained by providing key habitats for ungulates and grizzly bear to ensure long-term population sustainability, health, and persistence of the species.

- 5) “Habitat manipulation in protected areas will not be undertaken to encourage large wildlife populations for consumptive purposes unless specifically stated in an approved management plan”:

The objective of the prescribed burn program is not to increase wildlife for consumptive purposes. The objective of the Tuchodi burn program is to restore and maintain healthy, self-sustaining wildlife populations. Recent population surveys in management units adjacent to the Tuchodi have shown declines in moose populations (Lirette 2015) and, in the absence of elk inventory data, anecdotal information suggests that elk populations have also declined in the Tuchodi area. Prescribed burns are being proposed to restore existing habitats to supply the quality and quantity of habitat to maintain healthy wildlife populations (Sittler 2019, Sittler et al. 2019). The burn program will result in the restoration of previously used wildlife habitat.

- 6) “Management actions within cultural zones may include limiting successional advancement of vegetation or fire suppression to maintain historic vegetation cover or culturally modified vegetation”:

Proposed burn areas in the Tuchodi burn program area have been previously burned by First Nations, Guide Outfitters and the Province of BC for the purpose of maintaining wildlife habitat. One of the objectives of the Tuchodi burn program is to limit forest encroachment (i.e., successional advancement of vegetation) to maintain the habitat created through past cultural use and habitat management actions, achieving the Policy objective.

Muskwa-Kechika Wildlife Management Plan

The Tuchodi prescribed burn program falls within the Muskwa Strategic Unit identified in the Muskwa-Kechika Management Area (MKMA) Wildlife Management Plan: Technical Manual¹³.

¹³ Muskwa-Kechika Wildlife Management Plan: Technical Manual Appendices: http://www.muskwa-kechika.com/uploads/PDF/MKWMP-TechMan-Dec09_final.pdf

Stone's sheep, mountain goat and grizzly bear are identified as priority wildlife species and ungulate winter ranges are identified as priority wildlife habitat in the MKMA Wildlife Management Strategic Plan. The objectives of the Tuchodi burn program target habitat for these species, the maintenance of ungulate winter range, as well as benefiting other species such as mule deer, elk and unique vegetation communities. The Tuchodi burn program will address needs of priority species and ecosystems by achieving the following: a) maintaining line of sight for predator detection, b) ensuring availability of forage on south- and west-facing slopes for winter habitat use, c) creating and maintaining forage near to important escape terrain, and d) ensuring adequate quantity of forage to support sustainable populations. Specifically, the MKMA Wildlife Management Strategic Plan identifies the use of prescribed burning to ensure large openings for elk winter habitat and predator detection. The Glaucous bluegrass plant community, which is predominantly found on early seral south-facing slopes (GCC 2017), is also identified as a community of concern in the MKMA Wildlife Management Strategic Plan. Maintaining these early seral grassland communities through fire will ensure the persistence of this plant community in the MKMA.

Effectiveness Monitoring Objectives

Monitoring the effectiveness of prescribed burning is important to determine if habitat, vegetation, and wildlife objectives have been met through treatment with prescribed fire. Prescribed burn objectives will be assessed based on changes in indicators between pre-treatment, post-treatment and control sites. The objectives of the effectiveness monitoring component of the program include:

- 1) Measure indicators of wildlife use including:
 - wildlife pellet transects (site-specific wildlife use),
 - wide-range, time lapse cameras (polygon-level wildlife use), and
 - trail cameras (polygon-level wildlife use).
- 2) Measure population-level response of wildlife using late-winter recruitment surveys at yearly intervals post-treatment¹⁴,
- 3) Measure vegetative indicators of habitat quantity and quality:
 - shrub and tree height, and canopy cover (indicators of line of sight for predator detection, woody vegetation biomass and light penetration), and
 - forb cover and biomass (indicator of forage quantity)
 - crude protein, digestibility, and nutrient evaluation (indicators of forage quality).
- 4) Conduct soil nutrient evaluation, and
- 5) Report and recommend adaptive management options for future burns using effectiveness monitoring results.

Further details on the effectiveness monitoring methods are described in the Effectiveness Monitoring section below.

¹⁴ Activity recommended by Bill Jex, Provincial Mountain Sheep and Mountain Goat Specialist. We recognize that the timing (e.g., 1-year, 2-year, 3-year post-burn) of the response of young-of-year recruitment cannot be predicted and may be influenced by other factors including wolf removal. We are proposing this method as a trial method, a way to gather important population information that is not currently available, and to contribute to UNBC's research objectives.

Other Objectives

The following objectives will also be met during the implementation of the Tuchodi burn program:

- 1) Achieve an intense surface fire to remove dead, matted residual vegetation, increase herb and grass cover and nutritional quality, remove vertical vegetation structure >1 m in height, and kill suckering aspen and willow,
- 2) Restore and maintain grassland ecosystems in the Muskwa Foothills and Eastern Muskwa Ranges Ecosections (GCC 2017),
- 3) Protect soils and reduce risk of fire escape by conducting spring burns (between May 1st to May 31st) when frost remains in the ground and soil moisture is high, and
- 4) Support Aboriginal and licensed harvest of ungulates.

PROPOSED BURN SITES

The Tuchodi burn program is a 5-year prescribed burn program that will restore and maintain wildlife habitat and populations at a watershed-scale in a multi-year, phased approach. A total of 74 burn polygons, for a total of approximately 9,000 ha have been identified across the program area, ranging in size from 1 ha to 500 ha. Approximately 2,000 ha of prescribed fire is proposed to occur annually, with sites distributed across the watershed. In the first program year, 13 polygons, totaling approximately 2,400 ha, are proposed for treatment with prescribed fire in May 2021 (Figure 2, Table 1).

Sites identified for treatment in 2021 are located in five drainages: Falk Creek, Tuchodi River, Childers Creek, Dead Dog Creek and Larman Creek. One site along the Tuchodi River is in the BWBS zone, four sites overlap both the BWBS and SWB zones and eight sites are solely in the SWB zone. The sites range in elevation from 800 m to 1,600 m. The 2021 proposed sites target a variety of species including elk, moose, Stone's sheep, mountain goat, grizzly bear, mule deer and white-tailed deer.

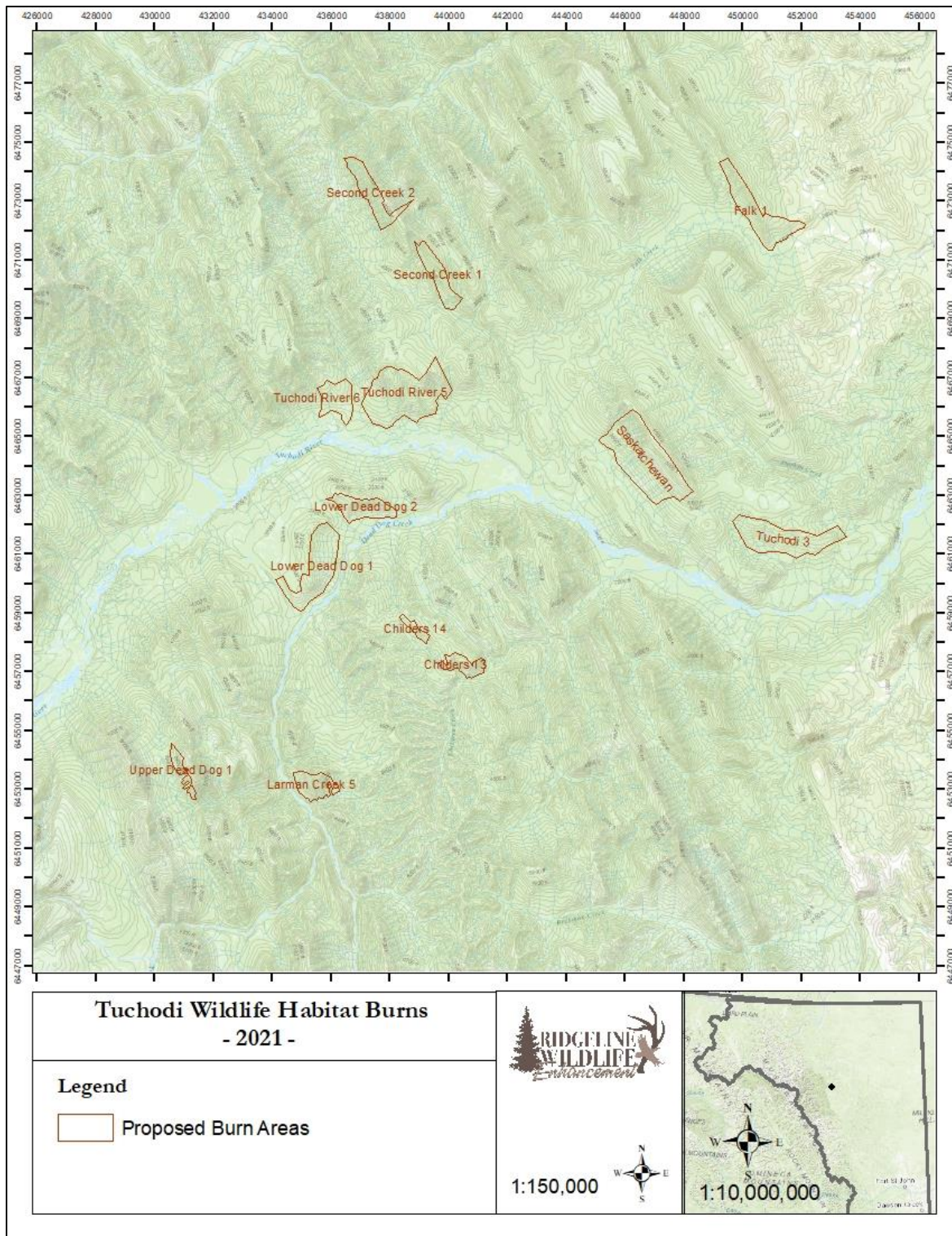


Figure 2. Proposed burn sites for treatment in May 2021, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.

Table 1. Summary of the exiting conditions, desired conditions, wildlife habitat objectives, and effectiveness monitoring history of 13 sites proposed for treatment in May 2021, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.

Burn Name	Proposed Burn Area (ha)	Burn History	Current Vegetation State	Desired Vegetation State	Wildlife Habitat Objective	Monitoring History	Target Species	Comments
Childers 13	72	1980 1985	- 3-8 m tall aspen & poplar - >50% deciduous tree cover	- <50% tree cover - >50% herb/grass cover	- restore winter range - increase herbaceous forage - increase line of sight - encourage spatial separation of elk, moose and caribou	-	Elk, moose, deer	
Childers 14	27	1980 1985	- 3-8 m tall aspen & poplar - >50% deciduous tree cover	- <50% tree cover - >50% herb/grass cover	- restore winter range - increase herbaceous forage - increase line of sight - encourage spatial separation of elk, moose and caribou	-	Elk, moose, deer	
Falk 1	230	1980s 2007	- 3-8 m tall aspen & poplar - >75% deciduous tree cover - high forest encroachment	- <50% tree cover - >50% herb/grass cover	- restore winter range - increase herbaceous forage - increase line of sight - encourage spatial separation of elk, moose and caribou - remove deciduous forest encroachment	2007	Elk, moose, deer	Photo 2
Larman Creek 5	100	1986 1990 2007	- ~25% deciduous tree cover - ~75% herb/grass cover - aspen encroachment	- >90% herb/grass cover - <20% tree cover - reduce aspen encroachment along burn peripheries	- improve winter range - improve forage quality - increase forage quantity - halt aspen encroachment - encourage spatial separation of elk, moose and caribou	-	Elk, moose	Photo 3
Lower Dead Dog 1	268	1982	- ~25% tree cover	- >90% herb/grass cover - <20% tree cover	- improve winter range - improve forage quality - halt aspen encroachment	-	Elk, moose, deer	Photo 4

Burn Name	Proposed Burn Area (ha)	Burn History	Current Vegetation State	Desired Vegetation State	Wildlife Habitat Objective	Monitoring History	Target Species	Comments
			- ~75% herb/grass cover - aspen and poplar encroachment	- reduce aspen encroachment along burn peripheries	- encourage spatial separation of elk, moose and caribou - restore grasslands in Eastern Muskwa Ranges			
Lower Dead Dog 2	125	1982	- ~25% tree cover - ~75% herb/grass cover - aspen and poplar encroachment	- >90% herb/grass cover - <20% tree cover - reduce aspen encroachment along burn peripheries	- improve winter range - improve forage quality - halt aspen encroachment - encourage spatial separation of elk, moose and caribou - restore grasslands in Eastern Muskwa Ranges	2020	Elk, moose, deer	Photo 5
Saskatchewan Mtn.	461	1986	- 3-8 m tall aspen & poplar - ~30% tree cover - aspen and poplar encroachment	- >75% herb/grass cover - <20% tree cover - reduce aspen encroachment along burn peripheries	- improve winter range - improve forage quality adjacent to escape terrain - improve forage quality at low elevations - halt aspen encroachment - encourage spatial separation of elk, moose and caribou - maintain glaucous bluegrass-northern wormwood plant community	2020	Stone's sheep, mountain goat, elk, moose, deer	Photo 6 The polygon includes both high-elevation, steep slopes for Stone's sheep and mountain goat, and lower elevation areas for elk, moose and deer.
Second Creek 1	120	1984 1987	- 30-50% tree cover - <50% herb/grass cover	- <50% tree cover - >50% herb/grass cover - remove aspen encroachment	- improve forage quality adjacent to escape terrain - improve forage quality at low elevations - increase line-of-sight for predator detection - encourage spatial separation of elk, moose and caribou	-	Stone's sheep, mountain goat, elk	The polygon includes both high-elevation, steep slopes for Stone's sheep and lower elevation areas for elk.

Burn Name	Proposed Burn Area (ha)	Burn History	Current Vegetation State	Desired Vegetation State	Wildlife Habitat Objective	Monitoring History	Target Species	Comments
					- maintain glaucous bluegrass-northern wormwood plant community			
Second Creek 2	140	1984 1987	- ~20% tree cover - ~20% shrub cover - ~60% herb/grass cover	- <10% tree cover - <10% shrub cover - >80% herb/grass cover	- improve forage quality adjacent to escape terrain - increase line of sight for predator detection - halt aspen encroachment - maintain glaucous bluegrass-northern wormwood plant community	-	Stone's sheep, mountain goat	
Tuchodi River 3	290	1986	- 3-8 m tall aspen & poplar - >50% deciduous tree cover	- <50% tree cover - >50% herb/grass cover	- restore winter range - increase herbaceous forage - increase line of sight - encourage spatial separation of elk, moose and caribou - restore grasslands in Eastern Muskwa Ranges	-	Elk, moose, deer	
Tuchodi River 5	410	1985 1987	- 3-8 m tall aspen & poplar - ~30% deciduous tree cover - high aspen and poplar encroachment	- >70% herb/grass cover - <20% tree cover - reduce aspen encroachment along burn peripheries	- improve winter range - improve forage quality - halt aspen encroachment - encourage spatial separation of elk, moose and caribou - restore grasslands in Eastern Muskwa Ranges	2020	Elk, moose, deer	Photo 7
Tuchodi River 6	120	1985 1987	- 3-8 m tall aspen & poplar - ~30% deciduous tree cover	- >70% herb/grass cover - <20% tree cover - reduce aspen encroachment along burn peripheries	- improve winter range - improve forage quality - halt aspen encroachment - encourage spatial separation of elk, moose and caribou	-	Elk, moose, deer	

Burn Name	Proposed Burn Area (ha)	Burn History	Current Vegetation State	Desired Vegetation State	Wildlife Habitat Objective	Monitoring History	Target Species	Comments
			- high aspen and poplar encroachment		- restore grasslands in Eastern Muskwa Ranges			
Upper Dead Dog 1	47	1987	- ~80% herb/grass cover - <10% tree cover	- >80% herb/grass cover	- improve winter range - improve forage quality and biomass - halt aspen encroachment - maintain glaucous bluegrass-northern wormwood plant community	-	Stone's sheep, mountain goat	Photo 8



a)



b)



c)

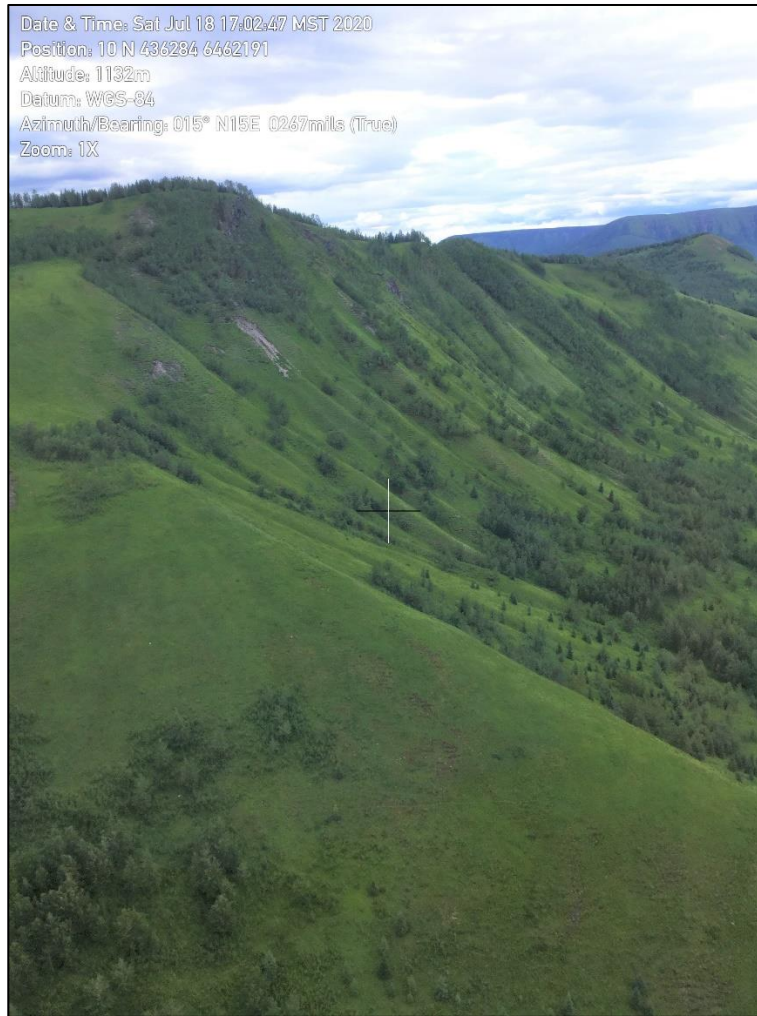
Photo 2. Falk 1 proposed burn site for elk, moose and deer habitat: a) proposed burn area in July 2020, b) herb/grass community 2-month post-burn (13 years ago in July 2007), and c) current vegetation state and aspen encroachment in July 2020, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.



Photo 3. Larman 5 proposed burn site for elk habitat, July 2020, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.



Photo 4. Lower Dead Dog 1 proposed burn site for elk habitat, July 2020, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.



a)



b)

Photo 5. Lower Dead Dog 2 a) proposed burn site for elk habitat and b) current vegetation condition, July 2020, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.



Photo 6. Saskatchewan Mtn. a) proposed burn area for Stone's sheep and mountain goat, b) proposed burn area for elk and moose, and c) Glaucous bluegrass-northern wormwood plant community, July 2020, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.



a)



b)

Photo 7. Tuchodi River 5 a) proposed burn area for elk, moose and deer and b) current vegetation condition on the proposed burn site, July 2020, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.



Photo 8. Upper Dead Dog 1 proposed burn area for Stone's sheep habitat, May 2017, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21. This photo represents the conditions that would be present at time of treatment. Note snow at the top of the burn area, in the draws and in the timber below; all of which provide natural fire breaks.

VALUES ASSESSMENT

A value overlay analysis was conducted using spatial layers available from DataBC and iMap. I identified values present within the proposed burn areas (Table 2) and values outside the burn area within a 2-km radius of the proposed treatment boundaries (Table 3). Results of the values analysis are summarized in Table 2 and Table 3. Mitigative measures have been identified below for values that may be impacted.

Mitigation Measures

Values in Treatment Area

- 1) Guide Outfitter Tenures
 - All of the burn areas are located in a Guide Outfitter tenure. Tuchodi River Outfitters is the tenure holder and is a partner in the project.
 - Mitigation: Notify tenure holder prior to ignition.

Table 2. Summary of values within the boundaries of 13 proposed burn sites, Tuchodi Prescribed Burns for Wildlife Habitat, Northeast BC, 2020-21.

Burn Name	Guide Outfitter Tenure	Range Tenure	Trapping Tenure	Parks & Protected Areas	MKMA	Species at Risk	Critical Timing Window for Birds	Soils	First Nations Consultative Areas	Private Land	Reserves, Notations, Licence of Occupation	UWR/WHA	THLB	Visual Quality Objectives	Fish & Water Quality	FSW	OGMA	Bats	Industrial Tenures *	Infrastructure **	Traditional Use Sites
Childers 13	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Childers 14	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Falk 1	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Larman 5	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Lower Dead Dog 1	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Lower Dead Dog 2	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Saskatchewan	✓	2✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Second Creek 1	✓	2✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Second Creek 2	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Tuchodi River 3	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Tuchodi River 5	✓	2✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Tuchodi River 6	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Upper Dead Dog 1	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-

* Includes oil and gas, forestry, mining, wind farm development, reclamation and remediation sites, pipeline, power lines, etc.

** Includes weather stations, cabins, towers, water wells, remediation sites, well sites, etc.

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- 2) Range Tenures
 - All of the burn areas are located in a Range tenure. Some burn sites overlap with multiple tenures: Tuchodi River Outfitters and Steamboat Mountain Outfitters. The tenure holders are aware of and support the project. Tuchodi River Outfitters is a partner in the project.
 - Mitigation: Notify tenure holders prior to ignition.
 - 3) Trapping Tenures
 - All of the burn areas are located in Trapping tenures. Tuchodi River Outfitters is the tenure holder and is a partner in the project.
 - Mitigation: Notify tenure holder prior to ignition.
 - 4) Parks and Protected Areas
 - All burn sites are located in the Northern Rocky Mountains Park. The proposed prescribed burns align with the NRMP Draft Management Plan and BC Parks Conservation Policy.
 - Mitigation: Notify North Area Parks Section Head and Area Supervisor prior to treatment. No other mitigative actions required.
 - 5) Muskwa-Kechika Management Area (MKMA)
 - All burn sites are located in the MKMA. The proposed prescribed burns align with the MKMA Strategic and Technical Plans as well as the Fort Nelson LRMP.
 - Mitigation: No mitigative actions required.
 - 6) Species at Risk
 - All burn sites overlap with the blue-listed (BC status) and Special Concern (COSEWIC status) Muskwa Northern Mountain caribou (*Rangifer tarandus* pop.15) range. Burn areas are not located in the alpine; therefore, caribou habitat will not be impacted. Proposed burn sites are in existing early seral ecosystems and thus the amount of early seral at the landscape-scale will not increase. Access to critical caribou habitats by predators or vehicles will not be affected by prescribed burning.
 - Mitigation: Ensure appropriate fire guards are in place to prevent fire spread into alpine habitats. Sites above 1,400 masl will be restricted to small patches of burn areas on steep slopes associated with escape terrain, not-overlapping caribou habitat and outside of alpine areas. Proposed burn sites have been identified in low elevation areas away from caribou habitat to encourage elk and moose use outside of caribou range.
 - 7) Least-Risk Timing Windows¹⁵ for:
 - Ungulates: The burn treatment window (May 15th to May 31st) overlaps with the Least-Risk Timing Window for ungulate parturition.

¹⁵ Peace Region Least-Risk Timing Windows: Biological Rationale - https://www2.gov.bc.ca/assets/gov/environment/plants-animals-and-ecosystems/wildlife-wildlife-habitat/regional-wildlife/northeast-region/best-mgmt-practices/moe_timing_windows_rationale_final.pdf

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- Mitigation: The burn area will be checked prior to ignition to ensure ungulates are not on the burn site. If ungulates are on site, where practicable, ignition will be delayed until they are no longer on the burn area. The burn event is relatively short (3-4 hours) and thus will not pose a long-term impact to ungulates. Ungulates generally move into the burn area within a few days of treatment to forage on new grass shoots (Photo 9)¹⁶.



Photo 9. Stone's sheep ewe and lamb foraging on new vegetation days after a prescribed burn in the Besa River area, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.
Photo Credit: Krista Sittler

- Breeding Birds: The burn treatment window (May 15th to May 31st) overlaps with the Least-Risk Timing Window for the breeding season of songbirds, trumpeter swans, sandhill cranes (not present in the area) and raptors. Breeding birds that rely on forested habitats will not be impacted by prescribed burns, which have been previously burned and are not forested, and therefore do not provide suitable habitat for raptors or owls. Ground-nesting birds will incur a short-term negative impact as nests may be lost during the fire event.
 - Mitigation: nest losses due to fire are mitigated through several mechanisms:
 - a) Most birds will renest after a first nest is lost (Reinking 2005),
 - b) Prescribed fires are patchy and nests in unburned areas are not lost (i.e., not all annual breeding effort is lost; Southern Fire Exchange 2011),
 - c) Birds that occupy areas that have a previous burn history are adapted to the disturbance and depend on the disturbance for long-term persistence (Southern Fire Exchange 2011),

¹⁶ Rob Woods, Retired Regional Wildlife Biologist, Prescribed Burn Specialist.

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- d) “Indirect benefits of habitat alteration [prescribed burns] are usually far more important and likely compensate or more than compensate for losses” (Knapp et al. 2009), and
 - e) If active raptor nests are identified by a Professional Biologist within the burn area, where practicable, a hand-built fire guard will be placed around the nest.
 - 8) Soils
 - Soils in the Tuchodi River watershed are generally colluvial, and brunisols and humo-ferric podzols. At the time of spring burns, soils are cool and damp at the surface (<5 cm deep) and frozen at depths >5 cm. Spring fires are quick events that consume surface vegetation only, duff layers are not consumed, and soil scorching does not occur (Certini 2005). Erosion of soils is greatly reduced during spring fires because of the greater soil moisture, as compared to fall fires (Knapp et al. 2009). Where soils are loose or exposed, fires can generally not be sustained due to a lack of sufficient fuel (i.e., vegetation).
 - Mitigation: Soils will be monitored by installing burn severity pins on the burn area and control plots to determine the effects of the fire on soil. The potential for soil erosion and sedimentation is mitigated by the patchiness of prescribed fires and soil moisture present during the spring. We are working with researchers at UNBC to develop a sampling protocol to measure soil nutrition before and after the fire event. Adaptive management actions will be taken on future burns if negative effects are observed.
 - 9) First Nations Consultative Areas
 - The burn areas are located in five consultative areas as identified by the Consultative Areas Database: Fort Nelson First Nation (FNFN), Doig River First Nation, Prophet River First Nation (PRFN), Liard First Nation and Kaska Dena Nation (KDN). We have received a letter of support from Halfway River First Nation (community located in Treaty 8; Appendix A) and have discussed the project with Katherine Wolfenden (Fort Nelson First Nation) who provided a verbal confirmation that FNFN supports prescribed burns for wildlife habitat. In mid-October we will be conducting a reconnaissance flight with a representative of Prophet River First Nation to confirm no overlap with traditional and cultural use areas. We have reached out to KDN but have not received a response at time of report preparation.
 - Mitigation: Known traditional and cultural use sites have been identified in the Tuchodi burn program area and no overlaps exist with proposed burn areas. We will continue to contact affected First Nations.
 - 10) Private Lands – none present
 - 11) Reserves, Notations and Licence of Occupations – none present
 - 12) Ungulate Winter Range (UWR) and Wildlife Habitat Areas (WHA) – none present
 - 13) Timber Harvesting Landbase (THLB) – none present
-

14) Visual Quality Objectives

- The Falk 1 burn site falls within an area that has visual quality objectives established. These are identified with the code EVQO – M (Environmental Visual Quality Objectives – Modification). The Modification code is defined as “activities are visually dominant but have characteristics that appear natural”¹⁷. Prescribed burning in these areas will meet the EVQO as fire is a natural process and creates a natural landscape mosaic. Three polygons along the Tuchodi River (Tuchodi River 3, 5, and 6) have been identified as EVQO – PR (Partial Retention). Partial retention is defined in the Guidebook as “activities are visible but remain subordinate”. The four polygons that overlap with EVQO include a total of 1,000 ha over a 32-km long section of the Tuchodi River. Further, these areas had been burned before EVQOs was identified and, as such, a burned state should represent the conditions that were present when EVQOs were established.
 - Mitigation: None required as burn objectives meet EVQO objectives.

15) Fish and Water Quality Objectives

- No water quality objectives have been identified for the Tuchodi River watershed.
- Fish species present in the Tuchodi River watershed and tributaries may include longnose sucker, slimy sculpin, Arctic grayling, mountain whitefish and bull trout.
 - Mitigation: All proposed burn areas are >50 m away from fish bearing streams and do not overlap with watercourses. Treed and riparian areas around the burn sites will naturally filter minimal amounts of sedimentation that may occur as a result of the burn.

16) Fisheries Sensitive Watersheds (FSW) – none present

17) Old Growth Management Areas (OGMA) – none present

18) Bats

- Eight species of bats occur in the Peace Region: hoary bat, eastern red bat, silver-haired bat, big brown bat, northern myotis, long-legged myotis, little brown myotis, and the long-eared myotis; however, the presence of these species is unknown within the Tuchodi River area and we were unable to find any information on confirmed observations of bats to confirm presence/absence. These bat species rely on cliffs, rock bluffs and mature, large diameter trees that have cracks, crevices, peeling bark and/or fire scars for roosting. In the proposed burn areas, the natural grasslands, shrubs and small patches of mid-seral aspen do not supply the required habitat for the regional bat species and, therefore, prescribed burning will not have a significant negative impact on bat habitat¹⁸. Low intensity ground fires may actually increase suitable bat habitat through the creation of crevices and fire scars in larger trees.
 - Mitigation: If suitable bat habitat features are present within the burn area, fire guards will be placed to protect mature stands of timber that have habitat

¹⁷ Visual Impact Assessment Guidebook: https://www2.gov.bc.ca/assets/gov/farming-natural-resources-and-industry/forestry/visual-resource-mgmt/visual_impact_assessment_guidebook.pdf

¹⁸ <https://ibis.geog.ubc.ca/biodiversity/efauna/BatsofBritishColumbia.html>

features suitable to bats. These areas will be identified by a Registered Professional Biologist during pre-treatment monitoring and reconnaissance flights.

19) Industrial Tenures (mining, oil and gas, forestry) – none present

20) Other Infrastructure – none present

Values Outside Treatment Area

The following values, and associated mitigative measures, are present within a 2-km radius of the burn polygon boundaries (Table 3). The values and mitigative measures described below are those that are in addition to values and mitigative measures inside the treatment area.

- 1) Private Lands
 - Private land is located within 2 km of the Tuchodi 6 and Tuchodi 7 burn sites. The landowner is a partner in the Tuchodi burn program (L. Warren) and the land will be used as the fire operations base.
 - Mitigation: On site will be pumps and hoses in the event the private land is threatened.
- 2) Reserves, Notations and Licence of Occupations – none present
- 3) Ungulate Winter Range (UWR) and Wildlife Habitat Areas (WHA) – none present
- 4) Timber Harvesting Landbase (THLB) – none present
- 5) Fisheries Sensitive Watersheds (FSW) – none present
- 6) Old Growth Management Areas (OGMA) – none present
- 7) Industrial Tenures (mining, oil and gas, forestry) – none present
- 8) Other Infrastructure – none present
- 9) Traditional Use Sites – traditional use sites have been identified in the Tuchodi watershed and none of the sites occur within 2 km of the proposed burn sites.

Table 3. Summary of values outside the boundaries of the 13 proposed treatment areas, within a radius of 2-km from treatment area boundaries, Tuchodi Prescribed Burns for Wildlife Habitat, Northeast BC, 2020-21. Numbers preceding check marks indicate the number of different overlaps.

Burn Name	Guide Outfitter Tenure	Range Tenure	Trapping Tenure	Parks & Protected Areas	MKMA	Species at Risk	Critical Timing Window for Birds	Soils	First Nations Consultative Areas	Private Land	Reserves, Notations, Licence of Occupation	UWR/WHA	THLB	Visual Quality Objectives	Fish & Water Quality	FSW	OGMA	Bats	Industrial Tenures *	Infrastructure **	Traditional Use Sites
Childers 13	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Childers 14	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Falk 1	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Larman 5	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Lower Dead Dog 1	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Lower Dead Dog 2	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Saskatchewan	✓	2✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Second Creek 1	✓	2✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Second Creek 2	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	-	✓	-	-	✓	-	-	-
Tuchodi River 3	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Tuchodi River 5	✓	2✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-
Tuchodi River 6	✓	✓	✓	✓	✓	✓	✓	✓	5✓	✓	-	-	-	✓	✓	-	-	✓	-	-	-
Upper Dead Dog 1	✓	✓	✓	✓	✓	✓	✓	✓	5✓	-	-	-	-	✓	✓	-	-	✓	-	-	-

EFFECTIVENESS MONITORING

Methods

Monitoring activities will be conducted to quantify the effectiveness of the prescribed burns at meeting burn, vegetation and wildlife objectives. Effectiveness monitoring methods will follow selected methods described in Woods and McNay (2017), Sittler (2013), and the *Procedures for Environmental Monitoring in Range and Wildlife Habitat Management* (Habitat Monitoring Committee 1996). Several indicators were chosen to determine how effective a prescribed burn is at achieving project objectives. The indicators selected focus specifically on the project objectives of maintaining early- to mid-seral successional stages and improving habitats for identified wildlife species. Eight indicators are measured: (1) biophysical characteristics (elevation, slope, aspect, and Biogeoclimatic zone (BGC)), (2) vegetation characteristics (plant species diversity, percent cover of each species, percent cover by height class (>10 m, 2-10 m, <2 m), and spatial distribution of each species), (3) horizontal cover (vertical obstruction), (4) vegetation biomass, (5) forage quality (e.g., crude protein, digestibility), (6) wildlife use (number of observations of wildlife use, wildlife species, age of wildlife sign, forage species browsed/grazed), (7) burn severity, and (8) soil properties.

A minimum of one sample site is selected on a burn area and one site on a control location that will not be treated with fire. Four circular, 11-m radius plots (i.e., macroplots), spaced 50 m apart, and an overlapping wildlife use transect (refer to methods below) are established on the burn and control locations (Figure 3). Each sample site is selected to be a location indicative of the target areas within the burn block and in areas typical of the habitat used by the ungulate species of interest. The macroplot line is located perpendicular to the elevational gradient to capture the change in site characteristics moving up the slope. Burn severity pins are located at the centre of each macroplot to measure burn severity.

Biophysical Characteristics

Biophysical characteristics (aspect, elevation, slope and BGC zone) of each burn block are identified using ArcMap (ESRI Corp., Redlands, CA) and spatial data collected from DataBC¹⁹. At each macroplot, several other indicators of biophysical characteristics are measured, including surface substrate (percent cover of decaying wood, bedrock, cobbles and stones, mineral soil, organic matter and water), site moisture regime, and coarse woody debris (CWD). These indicators are assigned a categorical classification or a visual estimate of percent cover (Habitat Monitoring Committee 1996). Coarse woody debris is defined as any woody vegetation that has fallen and is on the ground or suspended above the ground, and each macroplot is assigned a CWD class (high, moderate, low) based on the impediment posed to the usability by wildlife. For example, macroplots with a large number of fallen trees, which make walking difficult, are classified as “high” CWD. A nutrient evaluation of soils is proposed to be included in the effectiveness monitoring program. Soil monitoring will likely be conducted by a graduate student from UNBC as it is outside the scope of the Tuchodi burn program.

¹⁹ See <https://data.gov.bc.ca/>

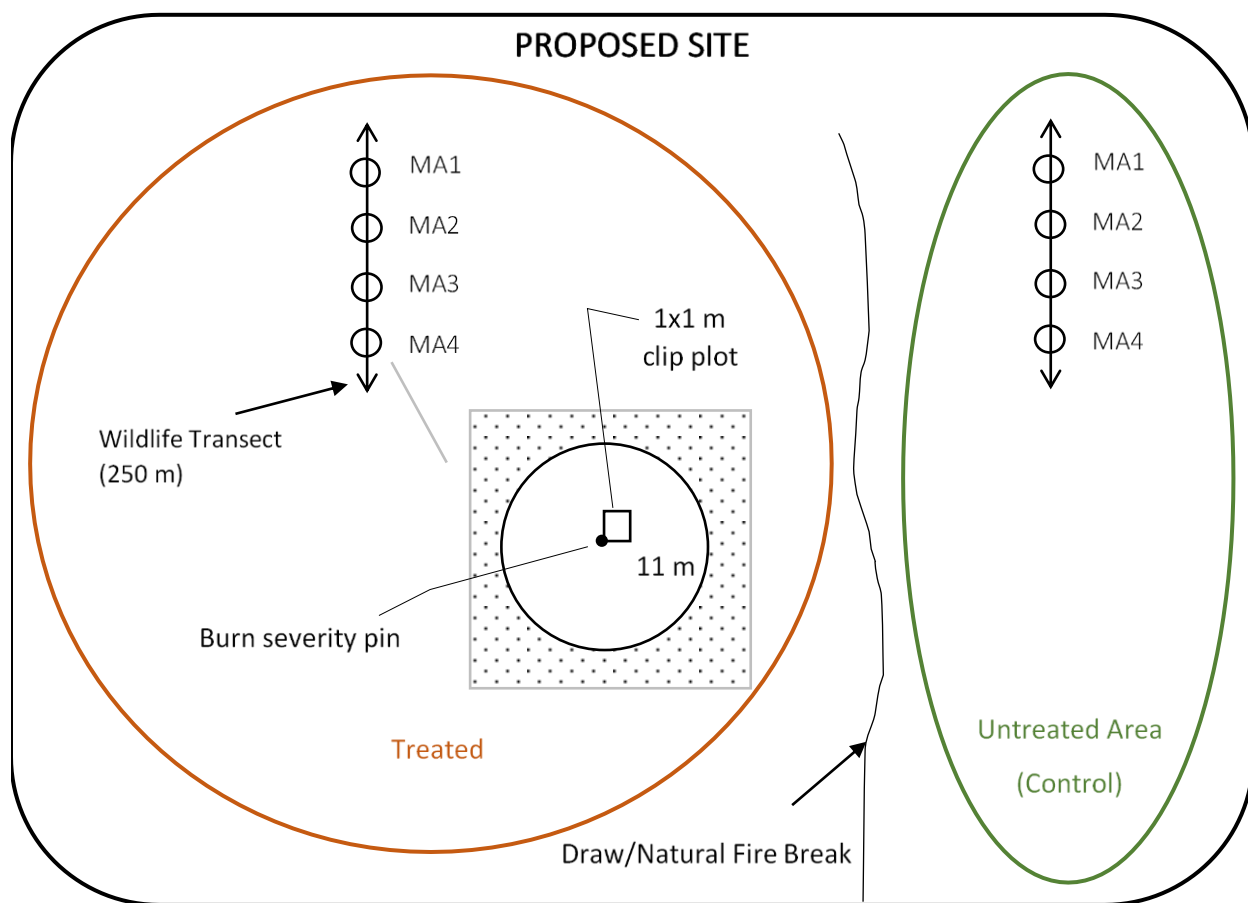


Figure 3. Effectiveness monitoring sampling design and layout for a proposed burn and untreated (control) area, Tuchodi Prescribed Burns for Wildlife Habitat, 2020-21.

Vegetation Characteristics

Methods identified for measuring vegetation characteristics primarily follow those described in the *Procedures for Environmental Monitoring in Range and Wildlife Habitat Management* (Habitat Monitoring Committee 1996) and Sittler (2013). In the macroplot (MA), each vegetation species is recorded, and the percent cover of each species is visually estimated. Tree cover is divided into three height classes (<2 m, 2-10 m, or >10 m) and shrub cover is split into two height classes (<2 m or 2-10 m), as a significant change in the height of woody vegetation post-burn would be expected. Additionally, the height of shrub and tree species is an indicator of the change in forage quantity and availability from pre- to post-burn. The number of plant species identified in each macroplot is summarized to determine a coarse indicator of species richness and diversity, which is a useful measure to assess change in vegetation and forage availability. All herbs are identified to species, but grasses are not identified beyond *Poaceae* sp. The spatial distribution of each vegetation species within the macroplot is classified into nine classes, ranging from a single occurrence of the plant, to a continuous and dense distribution (Habitat Monitoring Committee 1996).

A 1-m x 1-m “clip” plot is established on each macroplot. Within the clip plot, the percent cover of herbs/grasses and each shrub species is estimated using the Daubenmire cover classification (Daubenmire 1959) and a minimum of 10-random height measurements of each species is also

collected (Sittler 2013). Using these measurements, vegetation volume is calculated as the product of the average height and percent cover of each species (Sittler 2013). After these measurements are complete, all herb, grass and woody vegetation is clipped within the plot, dried and weighed to determine a measure of pre-burn and post-burn vegetation biomass. Woody and herb/grass vegetation are weighed separately. After drying, vegetation samples will be sent to UNBC for nutritional analyses.

Wildlife Use

To quantify wildlife use at each sample site, a 4-m x 200-m transect is established over the macroplot sample line (Figure 3). Wildlife use and sign is recorded along the transect for each observation, the species, if discernible, and the type of sign (pellets, tracks, hair, scrape, rub, browse, graze, game trail, and wallow) are recorded. If browsing or foraging is observed, the browsed species is also recorded.

In addition to wildlife use transects, camera traps are installed in two locations per sample site: one along a primary game trail in the proposed treatment area and one that captures a wide-angle of the burn area using timelapse settings. Timelapse cameras can be scheduled to take photos at different intervals and can be set-up at a distance that will allow for a large portion of the burn site to be captured by the camera. Using this two-trap system, we hope to (1) obtain a measure of the detection rate of wildlife use within the burn area and (2) quantify use of the burn area by wildlife, at the meso-scale. Improvements in remote camera technology have shown that this technology is cost effective and superior to other non-invasive methods for quantifying wildlife use and abundance (Silveira et al. 2003, Greenberg and Godin 2015, Moeller 2017, Keim et al. 2018, Greenberg et al. 2019). Camera traps on wildlife trails will allow us to enumerate detection rate of wildlife using the burn, and wide-angle cameras can be used to determine a crude estimate of wildlife use and seasonal timing of use of the burn. This camera-trap method of estimating wildlife use will be trialed during the first two-years of the project to determine its efficacy. Both treatment and control sample sites will have camera traps installed.

At the suggestion of Bill Jex (Provincial Mountain Sheep and Mountain Goat Specialist), we will conduct pre-treatment and post-treatment aerial late-winter recruitment surveys in the project area to provide an indicator of population response to treatment over time. The recruitment survey will also allow for collection of freshly deposited fecal and urine samples, which will be used to determine stress hormone levels, pregnancy rates and other physiological metrics. A thorough sampling design will be developed in collaboration with a graduate student from UNBC, under the supervision of Dr. Heather Bryan²⁰. Appropriate Wildlife Use permits will be obtained prior to the recruitment survey.

Due to the remoteness of the Tuchodi burn program area, treatment areas are only accessible by helicopter or river boat, making effectiveness monitoring on all burn sites cost prohibitive. Therefore, sites representative of multiple burn areas, BGC zones and target species will be selected for monitoring activities.

²⁰ Associate Professor, University of Northern British Columbia and Ian McTaggart Cowan Muskwa-Kechika Research Chair.

Results

Vegetation

Three proposed burn sites had pre-treatment vegetation and wildlife use monitoring completed between July 14-18, 2020: Saskatchewan Mtn., Tuchodi 5, and Lower Dead Dog 2. Areas to be burned and control sites were measured using the macroplot sampling design described above. The three sites were chosen to be representative of other proposed burn sites in the program area: high-elevation SWB for Stone's sheep and mountain goat, and low elevation BWBS and SWB sites for elk, moose and deer.

Pre-treatment vegetation plots on Saskatchewan Mtn., located in the spruce-willow-birch (SWBmks) BGC zone, were predominantly comprised of sub-alpine herbs; the most common being *Hedysarum* sp., tall bluebell (*Mertensia paniculata*), field locoweed (*Oxytropis campestris*), fireweed (*Epilobium angustifolium*) and grass. Shrubby cinquefoil (*Potentilla fruticosa*) was the most dominant shrub species at approximately 20% cover across the plots. Horizontal cover (vertical obstruction) averaged 50 cm in height (Photo 10). On average, bedrock cover was approximately 10%, and exposed mineral soil and decaying wood were both <1% of the plot area.



Photo 10. Vegetation community and horizontal cover on proposed Saskatchewan Mtn. burn site, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.

The Tuchodi River 5 site is in the BWBSmk and the SWBmks zone. Plots on average contained 8-10% cover of aspen and balsam poplar between 2 to 10-m in height. Aspen and poplar cover less than 2-m tall was approximately 25% cover (Photo 11). The most dominant herbs on the Tuchodi 5 site were creamy peavine (*Lathyrus ochroleucus*), American vetch (*Vicia americana*), strawberry (*Fragaria vesca*), and grass. Notably, pasture sage was found on the Tuchodi 5 plots. The average horizontal

cover on the Tuchodi 5 site was 63 cm. Approximately 2% decaying wood and 4% mineral soil were measured in the plots.

Lower Dead Dog 2 burn site is also in the BWBSmk with higher elevations in the SWBmks. Balsam poplar was the most dominant tree species and averaged 9% cover and 7% cover at the 10-m and 2-10 m tall height classes, respectively. American vetch, an important winter forage species for ungulates, averaged 40% cover on the plot. Grass had 70% cover and horizontal cover averaged 40 cm (Photo 12). The Lower Dead Dog 2 site is representative of some of the 3,255 ha of grasslands in the BWBS mw2 (Fort Nelson Dry Cool Boreal White and Black Spruce variant; GCC 2017; Photo 12). No decaying wood was present and 2% mineral soil was exposed.



Photo 11. Vegetation community and horizontal cover on proposed Tuchodi 5 burn site, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.

Wildlife Use

Camera traps were deployed between July 14-18, 2020 and have been collecting data since deployment. Photo data will be collected October 2020, prior to winter, and again in March 2021. Wildlife transects completed on Saskatchewan Mtn., Tuchodi 5 and Lower Dead Dog 2 revealed varying levels of wildlife use. Among the three sites, game trails bisecting the transect, elk pellets and browse, and grizzly bear digs (Photo 13) were the most common wildlife use observations. The Tuchodi 5 control site had the most wildlife use observations along the 688 m² transect (Table 4). Wildlife transects and vegetation plots (treatment and control) will be re-measured post-burn at 2-months, 1-year and 3-years post-burn.



a)



b)

Photo 12. a) Lower Dead Dog 2 proposed burn site and b) grassland plant community on the burn site, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21. Note the pasture sage (*Artemisia frigida*) in the bottom photo.



Photo 13. Grizzly bear (*Ursus arctos horribilis*) dig on the Lower Dead Dog 2 proposed burn site, Tuchodi Prescribed Burns for Wildlife Habitat, Northeastern British Columbia, 2020-21.

Table 4. Summary of wildlife use observations along 688 m² transects on Lower Dead Dog 2, Saskatchewan Mtn. and Tuchodi 5 proposed burn sites, Tuchodi Prescribed Burns for Wildlife Habitat, Northeast BC, 2020-21.

Burn Name	Treatment Type	Game Trails	Elk Pellets & Tracks	Bear Scat, Excavations &	
				Hair	Browse
Lower Dead Dog 2	Burn	>5	25*	2	6
	Control**	-	-	-	-
Saskatchewan	Burn	4	19	1	0
	Control	2	3	0	2
Tuchodi River 5	Burn	4	2	1	1
	Control	19	4	8	8

*Includes 1 observation of mule deer pellets

**Not completed in July 2020

SUMMARY

In summary, the Tuchodi burn program is a multi-year project with the primary objective of restoring and maintaining ungulate winter range in the Tuchodi River watershed. Habitat management is the foundation of ensuring long-term, self-sustaining wildlife populations, which is an important component of meeting Aboriginal Treaty rights, maintaining ecological integrity and Park values, and providing recreational opportunities to the general public. We believe the Tuchodi burn program will achieve these needs through annual prescribed burning over a 5-year period.

To ensure a scientifically based approach is taken towards the Tuchodi burn program, we have developed an intensive effectiveness monitoring protocol and began pre-treatment monitoring in July 2020. In addition, we have created a partnership with Dr. Heather Bryan (Associate Professor, UNBC and the Ian McTaggart Cowan Muskwa-Kechika Research Chair) to incorporate a graduate student(s) to further investigate the effects of habitat treatment on the physiology of wildlife and how that has the potential for population-level effects, and soil nutrients.

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APPENDIX A. LETTER OF SUPPORT

University of Northern British Columbia



Sept 24, 2020

Re: Support for prescribed burns to enhance ungulate winter range in Tuchodi River Watershed

To Whom It May Concern:

Please accept this letter of support for Alicia Woods' project on prescribed burns to enhance ungulate winter range in the Tuchodi River Watershed, Northeastern BC. It is my understanding that the project will enhance summer and winter habitats for ungulates, including stone sheep, elk, moose, deer, and mountain goats. In addition, one of the primary goals of the project is to measure the effectiveness of the prescribed burns at improving habitat quality. The study comes at an important time given concerns around the cessation of prescribed burning in northern BC and potential effects on wildlife and their habitat. Accordingly, this work is supported by the Halfway River First Nation, the Fort Nelson First Nation, the Habitat Conservation Trust Foundation, the Wild Sheep Society of BC, and the North Peace Rod and Gun Club.

As an Assistant Professor and the Muskwa-Kechika Research Chair at UNBC, I would like to voice additional support for this project. I plan to partner with Ms. Woods and her research team to enable expanded sampling, data collection, and analyses. Specifically, this partnership will enable insights into the effects of burning on ungulate health, physiology, and recruitment. Key benefits of this partnership will include access to additional funding, academic support including the recruitment of a graduate student, field equipment, and laboratory facilities to analyze samples. We anticipate that the opportunity to leverage the current project through a partnership with UNBC will provide management agencies, industry, and conservation partners with new insights essential to improving our understanding of prescribed burns on wildlife and habitat.

Notably, UNBC has a history of successful partnerships that have generated applied management outcomes. For example, in 2008, the partnership between UNBC, the Muskwa-Kechika Advisory Board, and the Integrated Land Management Bureau of the BC government received a BC Premier's Award for Innovation and Excellence. We anticipate that the proposed collaboration with Ms. Woods and her research team will be similarly effective and will improve the credibility of the applied habitat management strategies being addressed in the project. The partnership on prescribed burns will further benefit from UNBC's past experience with prescribed burn research, ties with the Muskwa-Kechika Advisory Board, and recent partnership with FLNRORD and the Together for Wildlife Strategy.

Please do not hesitate to contact me should you have any further questions.

Sincerely,

A handwritten signature in blue ink, appearing to read 'Heather Bryan', is written over the printed name.

Heather Bryan

Assistant Professor, Ecosystem Science and Management, UNBC

Ian McTaggart Cowan Muskwa-Kechika Research Chair

Phone: (250) 960-5861; Email: heather.bryan@unbc.ca

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