Marion Creek Benchlands Forest Restoration Project

FWCP Project No. COL-F20-W-3058

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Fish and Wildlife Compensation Program
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Prepared with the 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.

Executive Summary

The purpose of the Marion Creek Benchlands Forest Restoration project (FWCP Project No. COL-F20-W-3058) is to provide resources to enable the Nature Conservancy of Canada (NCC) to continue restoring habitat on conservation properties in the East Kootenay region of the Columbia Basin. Specifically, the goal of this project was to restore approximately 16 hectares of Rocky Mountain Douglas-fir forest to dry open forest structure on the Marion Creek Benchlands (MCB) property, and to remove non-native pine trees. This project addresses two Fish and Wildlife Compensation Program Action Plans: the "Upland and Dryland Action Plan" (FWCP 2019) and the "Species of Interest Action Plan" (FWCP 2014). The specific actions addressed are:

1. Contribute to NDT4 restoration planning and treatments on crown land, conservation lands and within Parks and Protected areas (understory slashing, and/or burning), through the NDT4 Ecosystem Restoration Committees – P1; and

2. Increase nesting opportunities for Lewis's Woodpecker using a variety of methods on a site-specific and experimental basis. Work with EK Restoration committees to incorporate targets for Lewis's Woodpecker nest trees – P1.

The Marion Creek Benchlands Forest Restoration Project took place between 19 June, 2019 and 31 March, 2020. Funding in the amount of $22,000 was designated to conduct ecosystem restoration activities, specifically restoration of degraded open forest and grassland communities on NCC's MCB property, which is located within NCC's Canadian Rocky Mountain Program Area.

Funding provided by FWCP has allowed NCC to undertake grassland/open forest restoration activities that seek to address the urgent need to improve critical habitat for species-at-risk, improve the resiliency of these ecosystems in the face of a changing climate, and reduce the risk of catastrophic wildfire.

Nature Conservancy of Canada

NCC is a leading national, non-profit, private land conservation organization. We protect and care for ecologically significant lands and waters and the species that they sustain. Our science-based conservation planning process drives our work. We partner with individuals, governments, Indigenous communities, foundations, corporations and others to achieve durable conservation solutions. We secure properties through donation, purchase, conservation agreements and the relinquishment of other legal interests, and manage them for the long term. Since 1962, NCC and our partners have helped conserve more than 14 million hectares (35 million acres) from coast to coast to coast.

Within the Columbia Basin, NCC provides protection for over 190,000 acres of land, including landscapes such as: at-risk grasslands, unusual geological formations, montane regions and precious valley bottom habitat. NCC's properties in the Basin conserve vital habitat for several species at risk (e.g. American Badger, Grizzly Gear, Mountain Caribou, Bull Trout and Rocky Mountain Bighorn Sheep).

Table of Contents

Executive Summary 1
Marion Creek Benchlands Forest Restoration Project 3
Introduction 3
Goals & Objectives 3
Study Area 4
Methods 4
Results 8
Discussion 10
Recommendations 10
References 11
Acknowledgements 11
Appendix A – Marion Creek Benchlands Stand Management Prescription 12

List of Figures

Figure 1. Location of the Marion Creek Benchlands property (highlighted in red). 4
Figure 2. Ecological units on the Marion Creek Benchlands property that were investigated for restoration prescriptions in fall 2019, outlined in red. 6
Figure 3. Delineation of 2019/20 restoration treatment units on the Marion Creek Benchlands property, outlined in purple. 7
Figure 4. Pre- and post-restoration images from units E5a-3 and E5b-1&2. 9

Marion Creek Benchlands Forest Restoration Project

Introduction

In the East Kootenay region of British Columbia, approximately 250,000 hectares of dry forest historically experienced frequent, low-intensity fires (Gayton 2013). Modern suppression of fire has favoured the development of forests with dense growth of conifers in the understory, causing dramatic declines in grassland and open forest ecosystems. Forest in-growth in areas that were historically open forests and grasslands not only increases the risk of catastrophic wildfire to local communities, but it also decreases the amount of habitat that is available for wildlife. By strategically thinning in-grown forests and restoring open forest conditions, the Nature Conservancy of Canada (NCC) works to not only improve critical species-at-risk habitat and reduce the risk of catastrophic wildfire, but also to improve the resiliency of these ecosystems in the face of a changing climate.

The long-term restoration strategy for the Marion Creek Benchlands (MCB) conservation property is guided by the Marion Creek Benchlands Vegetation Management Plan (2013-2043), which was developed by a Registered Professional Forester (Allen 2013). This project addresses the following Fish and Wildlife Compensation Program (FWCP) Action Plans: the "Upland and Dryland Action Plan" (FWCP 2019) and the "Species of Interest Action Plan" (FWCP 2014). The specific actions addressed are:

1. Contribute to NDT4 restoration planning and treatments on crown land, conservation lands and within Parks and Protected areas (understory slashing, and/or burning), through the NDT4 Ecosystem Restoration Committees – P1; and

2. Increase nesting opportunities for Lewis's Woodpecker (LEWO) using a variety of methods on a site-specific and experimental basis. Work with EK Restoration committees to incorporate targets for Lewis's Woodpecker nest trees – P1.

Goals & Objectives

The goal of this project was to restore approximately 16 hectares (ha) of Rocky Mountain Douglas-fir forest to dry open forest structure on the MCB conservation property, and to remove non-native pine trees that had been planted by a previous landowner. Restoration of open forest structure and core grassland communities in areas where forest in-growth and encroachment have occurred improves critical habitat for species such as Mule Deer (*Odocoileus hemionus*), Elk (*Cervus elaphus*), American Badger (*Taxidea taxus jeffersonii*), and Lewis's Woodpecker (*Melanerpes lewis*), reduces the risk of catastrophic wildfire to nearby communities, and enhances the resiliency of imperiled Rocky Mountain Douglas-fir systems in the face of a changing climate. This project complements restoration work done in previous years elsewhere on the property.

Restoration treatments were planned for three units within mapped Ungulate Winter Range as described by the Ungulate Winter Range Order U-4-008 (Allen 2019), with treatments designated for Open Range and Open Forest management purposes. Objectives for the treatment areas involve using hand slashing methods to create a mosaic of open forest structure with some residual coniferous stocking, for a post-treatment stocking rate of 76-400 stems per hectare (sph) variably dispersed on the landscape.

Some coniferous thickets were reserved as designated wildlife tree patches, which will provide thicket habitat adjacent to thinned open forest for species such as Flammulated Owl (*Psiloscops flammeolus*). These wildlife tree patches also promote the retention of high quality wildlife trees (e.g. standing snags) as well as patches of deciduous trees that contribute to high quality cavity nesting structure, such as Quaking Aspen (*Populus tremuloides*).

Study Area

All activities took place on the MCB property, which is owned and managed by NCC (Figure 1). The MCB property is 204.4 ha in size and is located in the Rocky Mountain Trench. It lies within the Kootenay Dry-Mild Interior Douglas-fir biogeoclimatic subzone (IDFdm2) between the village of Canal Flats to the south and the community of Fairmont Hot Springs to the north.

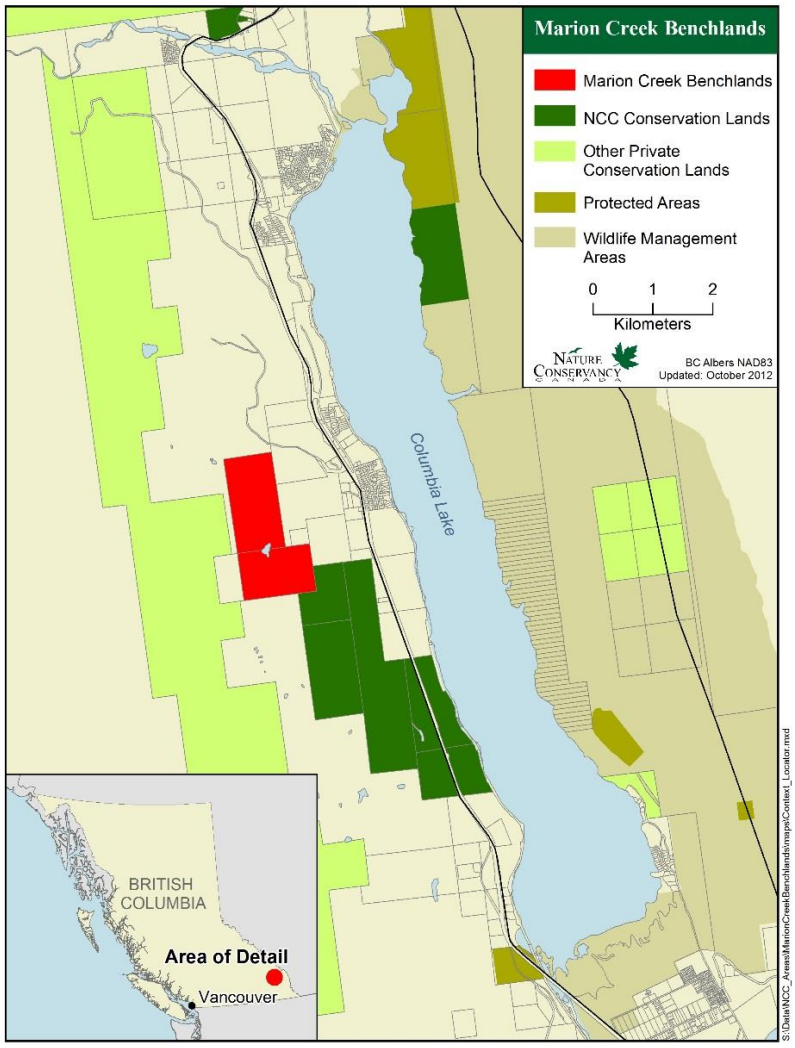


Figure 1. Location of the Marion Creek Benchlands property (highlighted in red).

Methods

A Registered Professional Forester was hired in fall of 2019 to complete reconnaissance on the remaining ecological units on the MCB property that have not yet received forest restoration

treatments. Two broad areas were targeted for the investigations at the north and south ends of the property (Figure 2). A thorough walk-through was completed for each area to determine treatment priorities for this project, and from that a prescription was prepared for three units (E4a-3, E5b-1&2, E2). No invasive plant species were known by NCC or detected during this initial field work within the proposed treatment units. Permanent monitoring plots were established in each unit in order to monitor pre- and post-restoration tree stocking densities and to track understory growth in future monitoring sessions.

Following a bid process, a local forestry contractor was hired to carry out hand slashing treatments on the three selected units in December 2019 and January 2020. Chainsaws were used on units E4a-3 and E5b-1&2 (Figure 3a, 3b) to selectively remove trees that were greater than 0.2 m tall and less than 15 cm in diameter at breast height (dbh), with target species including Rocky Mountain Douglas-fir (*Pseudotsuga menziesii var. glauca*), Lodgepole Pine (*Pinus contorta*), and Rocky Mountain Juniper (*Juniperus scopulorum*). Additionally, the lower branches on some of the larger retained trees were prunedto improve sight lines for ungulates, and some conifers were girdled to create clusters of future standing snags and coarse woody debris recruitment. Resultant slash was scattered on site where volumes were low and piled and burned in areas where slash densities exceeded 1 tonne/ha. The overall goal in these units was to reduce the coniferous crown closure from 75% to less than 20%.

In unit E2 (Figure 3c), chainsaws were used to remove all the exotic red pine trees. Resultant slash material was piled for burning, which will be completed by NCC staff in the fall of 2020.

Refer to the full restoration prescription in Appendix A for more details.

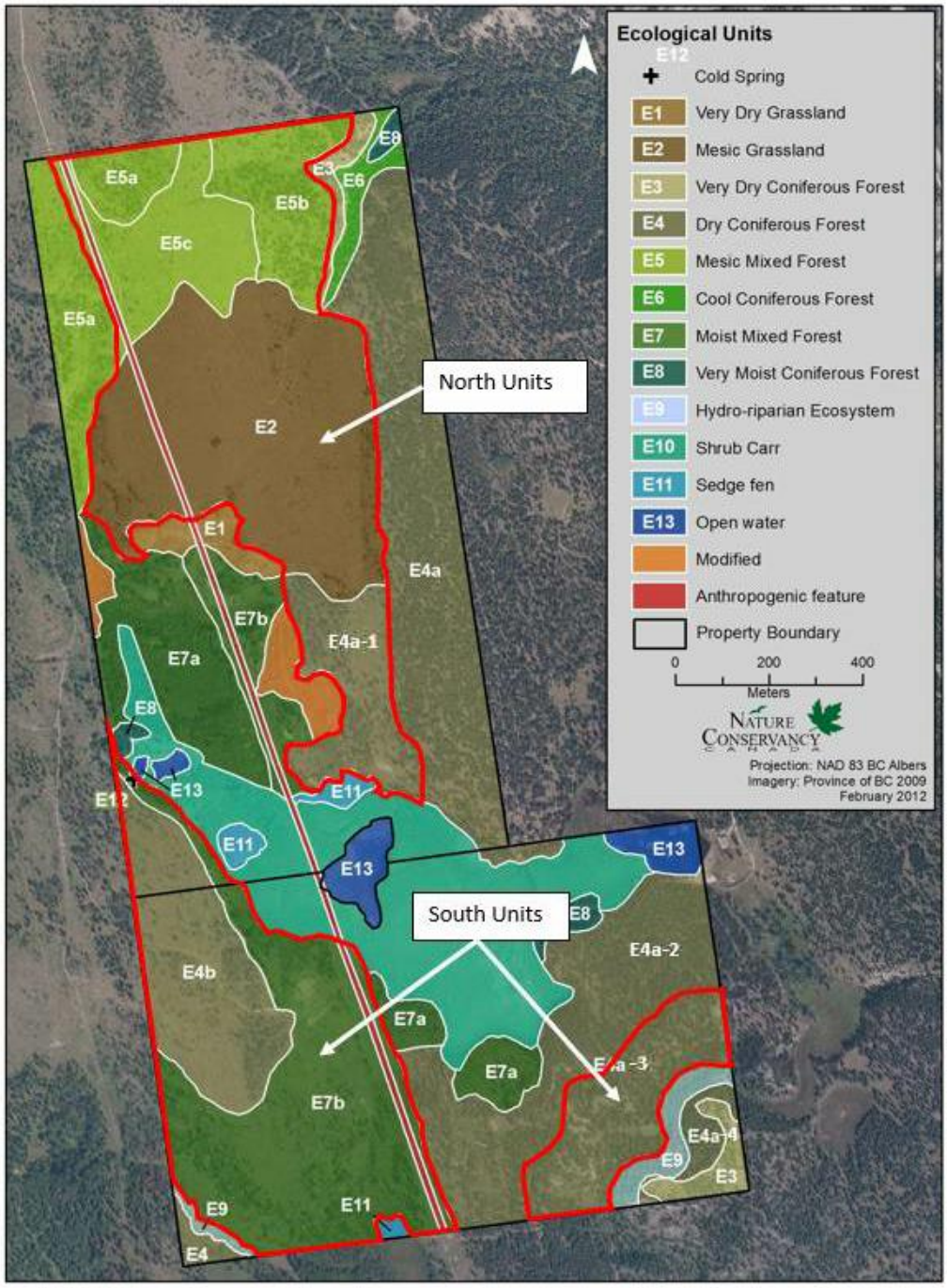
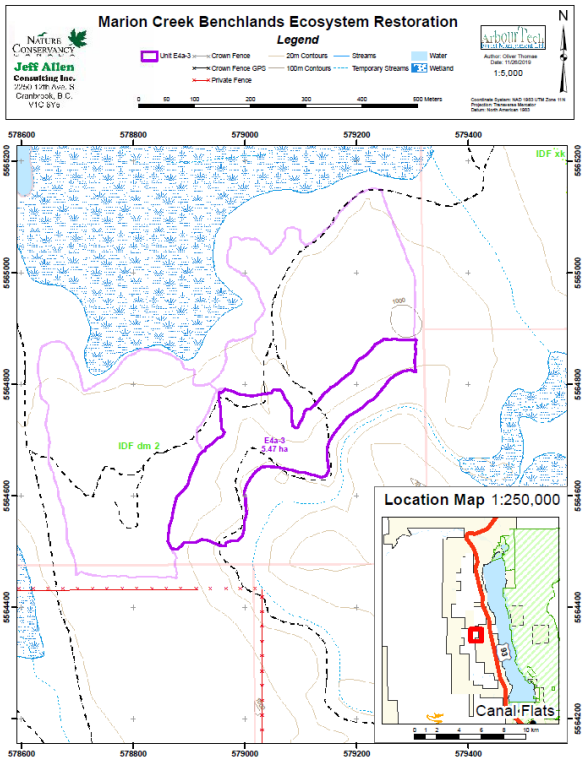
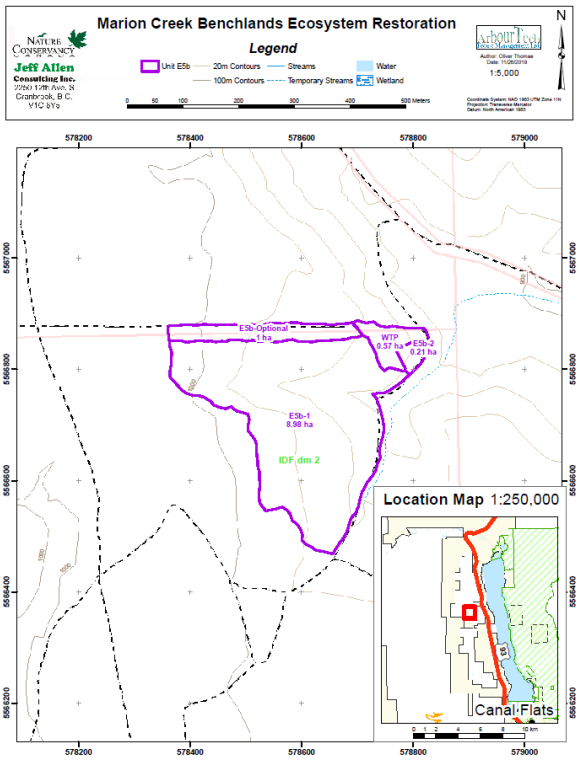


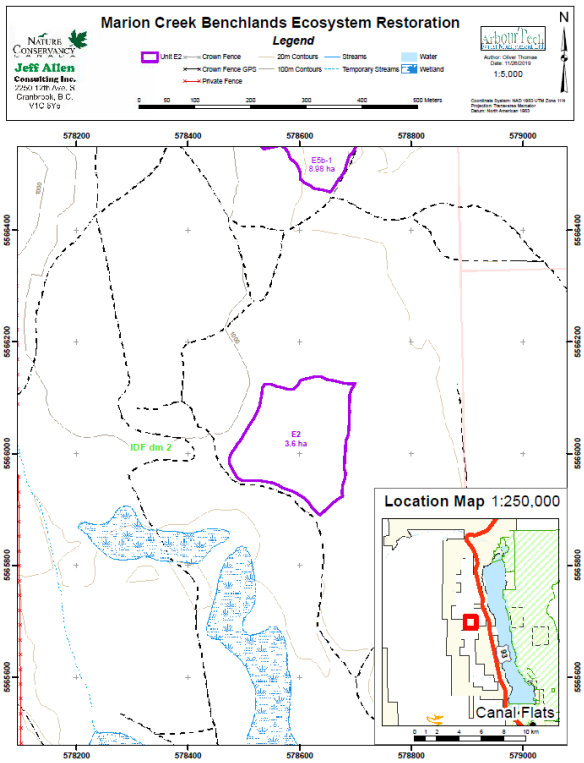
Figure 2. Ecological units on the Marion Creek Benchlands property that were investigated for restoration prescriptions in fall 2019, outlined in red.



a. Treatment Unit E4a-3.



b. Treatment Units E5b-1 and E5b-2.



c. Treatment Unit E2.

Figure 3. Delineation of 2019/20 restoration treatment units on the Marion Creek Benchlands property, outlined in purple.

Results

At project completion, a total of 18.3 ha of grassland and open forest vegetation communities were successfully treated according to the restoration prescription. Additionally, field reconnaissance also identified two treatment units (E4b and E7b, 38 ha total) that will be the subject of hand slashing with volunteers either in the fall of 2020 or spring 2021. See Figure 4 for examples of before and after photos of restoration treatments.

Treatment Unit E2

Non-native red pine trees were completely removed from unit E2 (3.6 ha) as prescribed, lowering the stocking rate of non-native red pine trees to 0 sph in the unit. It is highly likely that this species has now been completely eradicated from the MCB property.

Treatment Unit E4a-3

With the removal of coniferous stems, the stocking rate on unit E4a-3 (5.5 ha) was reduced from 3,080 sph to 147 sph. Trees removed were primarily layer 1 Rocky Mountain Douglas-fir.

Treatment Units E5b-1&2

The stocking rate on units E5b-1&2 (9.2 ha) was reduced from 3,180 sph to 90 sph, with a final crown closure of 15%. Slash densities in these units exceeded 1 tonne/ha, and so several slash piles were burned on-site.

a. Pre-restoration photo of unit E4a-3 showing in-growth of coniferous trees.

b. Post-restoration photo of the same view in unit E4a-3.

c. Pre-restoration photo of unit E5b showing in-growth of coniferous trees.

d. Post-restoration photo of the same view in unit E5b showing reduction of conifers in the understory and trimming of low branches on larger trees.

e. Pre-restoration photo of unit E5b showing in-growth of young coniferous trees.

f. Post-restoration photo of same view in unit E5b.

g. Photo of standard stump height (<10 cm) following the removal of coniferous trees.

h. Photo of several trees that were girdled and left to become wildlife trees as per the prescription.

Figure 4. Pre- and post-restoration images from units E5a-3 and E5b-1&2.

Discussion

This project focused on vegetation management units with high levels of forest in-growth that were susceptible to an increased risk of catastrophic wildfire. These units also had a limited amount of viable habitat for wildlife. During the 2019-20 winter season, NCC successfully completed a restoration prescription and hand slashing treatments on three units totalling 18.3 ha, and further identified a large unit that will be treated by volunteers in either the fall of 2020 or spring of 2021. Treatment of that final unit will signal the completion of slashing treatments required on the property, and NCC will be able to shift focus towards eventual plans to maintain these and past restoration efforts using prescribed fire.

This project addresses the urgent need to enhance critical habitat for species at risk such as American Badger and Lewis's Woodpecker, to improve grazing and overwintering grounds for ungulates such as Elk and Mule Deer, and to reduce the risk of catastrophic wildfire to local communities. By strategically thinning forests to restore open forest conditions NCC can not only improve critical species-at-risk habitat but can also improve the resiliency of these ecosystems in a world with a changing climate.

Recommendations

Several recommendations can be derived from work completed in 2019-20:

1. The scope of the challenge to restore a fire maintained ecosystem from which fire has been excluded requires consideration of larger landscape-scale projects that may utilize prescribed burning as a restoration technique. NCC should continue to investigate options to initiate a prescribed burning program on the MCB property.

2. Now that most ecological units on the MCB property has been restored, prescribed fire can be applied to the landscape more safely and effectively. NCC should work with adjacent conservation land management partners (i.e. Ministry of Forests, Lands and Natural Resource Operations and Rural Development, The Nature Trust of B.C.) to create a landscape-level burn plan and to seek out sources of funding.

3. NCC staff should visit monitoring plots annually in the treated areas to determine effectiveness of restoration efforts and complete the burning of several piles of leftover slash material in the fall of 2020.

4. NCC staff should work with local wildlife clubs (e.g. Lake Windermere Rod & Gun Club) to organize a volunteer event to hand slash conifer seedlings throughout the final units that require treatments on the property.

5. Explore opportunities to work with BC Hydro when upgrading existing powerline infrastructure along west Columbia Lake transmission corridor to move decommissioned legacy poles with existing cavities (some known to be used by LEWO) onto adjacent NGO conservation-owned properties and transfer ownership to NCC and/or NTBC through an Asset Transfer Agreement.

References

Allen, J. (2019). *Stand Management Prescription: Marion Creek Benchlands*. Prepared for the Nature Conservancy of Canada on November 25, 2019.

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Acknowledgements

The Nature Conservancy of Canada would like to acknowledge the 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.

Appendix A – Marion Creek Benchlands Stand Management Prescription

STAND MANAGEMENT PRESCRIPTION: Marion Creek Benchlands Date: November 25, 2019

A. LOCATION AND GENERAL DESCRIPTION OF AREA

SU	TREATMENT AREA (TA) IDENTIFIER (OPENING NO.; CUTBLOCK; TIMBER MARK; OTHER)	TREATMENT AREA (Net) (to the nearest 0.1 ha)
1	E4a-3	5.47
1	E5b – 1&2	9.19
	Sub-Total SU1	14.66
2	E2	3.6
ALL	TOTAL	18.26

B. MANAGEMENT OBJECTIVES

B-1. HIGHER LEVEL PLANS

ARE ANY OF THE TREATMENT AREAS SUBJECT TO A HIGHER LEVEL PLAN? ( ) YES (X) NO

	PLAN NAME	Date Y	M	D
Note	Kootenay Boundary Land Use Plan-Implementation Strategy. (KBLUP-IS) Though legally the Marion Creek Benchlands is not subject to KBLUP-IS this document is the guiding document for treatment of the ecosystem components within Natural Disturbance Type 4 (NDT4).	1997	06	

IF NO: CONSULT WITH OTHER RESOURCE AGENCIES TO ASSIST IN DEVELOPING MANAGEMENT OBJECTIVES FOR THE PRESCRIPTION.

SUMMARY OF HIGHER-LEVEL OBJECTIVES FOR THESE TREATMENT AREAS (Please rank specific objectives *[1 = highest priority, 10 = lowest]*):
(10) Timber (N/A) Range (N/A) Recreation (N/A) VQO (1) Wildlife habitat (1) Biodiversity (1) Wildlife trees (N/A) Fisheries (N/A) Water quality (N/A)
USE SECTION B2. STAND-LEVEL OBJECTIVES TO CLARIFY, CONFIRM AND SPECIFY MANAGEMENT OBJECTIVES FROM HIGHER LEVEL PLANS.

B-2. STAND-LEVEL OBJECTIVES

ARE CURRENT STAND-LEVEL OBJECTIVES AVAILABLE FROM SILVICULTURE PRESCRIPTIONS? ( ) Yes (x) No IF 'YES,' SEE ATTACHED FS 711A.

ARE CURRENT STAND-LEVEL OBJECTIVES STILL APPROPRIATE FOR THESE STANDS? ( ) Yes ( ) No (x) N/A

USE THIS SECTION TO SUMMARIZE OBJECTIVES FROM HIGHER LEVEL PLANS OR FOR DEVELOPING OR CLARIFYING STAND-LEVEL OBJECTIVES.

TIMBER MANAGEMENT OBJECTIVES

THESE OBJECTIVES APPLY TO: SU: 1

There are no direct timber management objectives associated with this prescription. Timber harvesting may be carried out in the future to enhance/maintain the wildlife management objectives outlined below.

STAND MANAGEMENT PRESCRIPTION: Marion Creek Benchlands Date: November 25, 2019

WILDLIFE MANAGEMENT OBJECTIVES – HABITAT/BIODIVERSITY/WILDLIFE TREES

THESE OBJECTIVES APPLY TO: SU1

The treatment area is located within mapped Ungulate Winter Range as per Ungulate Winter Range Order U-4-008. The treatment area is designated for Open Range and Open Forest management. This document does not specifically apply to private lands but will is used as a guiding document for prescription development.

Treatment objectives are to create a mosaic of Open Forest structures with residual coniferous stocking meeting KBLUP-IS guidelines for these ecosystem components. Specifically post treatment stocking of 76-400 sph for open forest areas, variably dispersed over the landscape. This stand structure will enhance the landscape for red and blue listed species which inhabit open forest/open range stand structures.

Specifically the following species identified in the Conservation Data Centre (CDC) are known to inhabit or may inhabit these habitats:

Species	BC List
American Badger (*Taxidea taxus*)	Red
Flammulated Owl (*Otus flammeolus*)	Blue
Lewis' Woodpecker (*Melanerpes lewis*)	Blue

All the above species are considered to benefit from lower coniferous crown closure. (ie they prefer grassland or open forest habitats. Coniferous thickets maintained within wildlife tree patches, both within and adjacent to treatment units, will supply thicket habitat for flammulated owls.

Wildlife tree management will promote retention and creation of high quality existing wildlife trees on site. Where snags (including stubs) are found they will be retained on site. As well aspen (Populus tremuloides) patches adjacent to the treatment area will contribute high quality cavity nesting structure.

STAND MANAGEMENT PRESCRIPTION: **Marion Creek Benchlands** **Date: November 25, 2019**

WATERSHED MANAGEMENT OBJECTIVES

THESE OBJECTIVES APPLY TO: SU 1

There are no domestic or community watersheds within the treatment area.

FISHERIES/STREAMS–WETLANDS MANAGEMENT OBJECTIVES

THESE OBJECTIVES APPLY TO: SU 1

There are no streams or wetlands within, or adjacent to, the treatment area.

RANGE MANAGEMENT OBJECTIVES

CATTLE USE? (x) Yes ( ) No	IF 'YES' RANGE UNIT PASTURE: N/A	
CATTLE PRIMARY ACCESS TRAILS? (x) Yes ( ) No	IF 'YES' LOCATE ON ATTACHED MAP	SEEDED? ( ) Yes (Year) (x) No

THESE OBJECTIVES APPLY TO: SU 1

The Nature Conservancy of Canada has a grazing agreement within the treatment area. Proposed treatments will enhance grazing potential within the treatment area.

VISUAL LANDSCAPE MANAGEMENT OBJECTIVES (VQO)

LANDSCAPE SENSITIVITY Low.	VISUAL QUALITY OBJECTIVE No objectives have been set for this private land.

THESE OBJECTIVES APPLY TO: SU 1

To create a landscape with historic stand structures with a parkland appearance. There is no prominent public viewpoint for this property.

RECREATION MANAGEMENT OBJECTIVES

FEATURE SIGNIFICANCE N/A	
KEY FEATURE N/A	MANAGEMENT CLASS N/A

THESE OBJECTIVES APPLY TO: SU 1

There are no public recreation objectives as this unit is located on private land. The area is used by the public for hunting and other outdoor recreational activities.

OTHER RESOURCE VALUES/INTERESTS MANAGEMENT OBJECTIVES Noxious Weed Management

THESE OBJECTIVES APPLY TO: SU: 1

A variety of identified noxious weeds have been identified throughout the planning area, including but not limited to:

Spotted Knapweed (*Centaurea maculosa*)
Diffuse Knapweed (*Centaurea diffusa*)

These species were found throughout the road systems within the plan area. Care is to be taken to ensure machinery is not walked through or parked in infestation areas.

STAND MANAGEMENT PRESCRIPTION: Marion Creek Benchlands **Date:** November 25, 2019

SU: 1 &2 **Ecosystem Component:** OF/OR **TA:** E5b-1&2/E4a-3/E2 **Area** 14.66ha

C-1. AREA DESCRIPTION

ZONE, SUBZONE, VARIANT	SITE SERIES (RANGE)	MOIST/NUTR. GRID
IDFdm2	01 (03-01)	3-4/C-D

ELEVATION (m)			ASPECT	SLOPE DATA			SLOPE		
Min:	Max:	Avg.:		Min. %:	Max. %:	Avg. %:	POSITION	LENGTH (m)	UNIFORMITY
960	1000	980	Variable	0	35	15	Lower	200	Undulating

HUMUS FORM	ROOTING DEPTH (cm)	SOIL DEPTH TO RESTRICTING LAYER (cm)	SOIL TEXTURE	SOIL COARSE FRAGMENT (%)	DRAINAGE
Mor	>35	>100	SiL	30	Well

WATER COURSES	MECHANIZED STAND TENDING
Water 0 Gullies 3	(x) Yes ( ) No

C-2. CURRENT STAND DESCRIPTION

TA or Strata	Layer	Species Composition										Age (bh yrs)	Height (0.1) m	Ref. year	Site Index	Density (stems/ha)	Well-spaced (stems/ha)	Crown Closure (%) All Layers
		Spp	%	Spp	%	Spp	%	Spp	%	Spp	%							
E5b-1&2	1	Fdl	82	Pll	18	Ju Sc	0					37	14.6	2019		340	N/A	
	2	Fdl	90	Pll	5		5					28	11.3	2019		780	N/A	
	3	Fdl	90	Pll	1	9						35	4	2019		1720	N/A	
	4	Fdl	65	Pll	0	35								2019		340	N/A	
	All															3180		

C-2. CURRENT STAND DESCRIPTION

TA or Strata	Layer	Species Composition										Age (bh yrs)	Height (0.1) m	Ref. year	Site Index	Density (stems/ha)	Well-spaced (stems/ha)	Crown Closure (%) All Layers
		Spp	%	Spp	%	Spp	%	Spp	%	Spp	%							
E4a-3	1	Fdl	100									61	11.7	2019		200	N/A	
	2	Fdl	100									49	6.8	2019		280	N/A	
	3	Fdl	100									12	2.5	2019		840	N/A	
	4	Fdl	100									18	0.7	2019		1760	N/A	
	All															3080		

C-2. CURRENT STAND DESCRIPTION

TA or Strata	Layer	Species Composition										Age (bh yrs)	Height (0.1) m	Ref. year	Site Index	Density (stems/ha)	Well-spaced (stems/ha)	Crown Closure (%) All Layers
		Spp		%		Spp	%	Spp	%	Spp	%							
E2	1	Red Pine		100									8-10	2019		42	N/A	
	2																N/A	
	3																N/A	
	4																N/A	
	All															3180		

STAND MANAGEMENT PRESCRIPTION: Marion Creek Benchlands **Date:** November 25, 2019

C-3. FOREST HEALTH AND PROTECTION

FOREST HEALTH — **AGENT OCCURRENCE**

SU	AGENT CODE	AGENT NAME	HOST SPECIES	TOTAL TREES AFFECTED (%)	TOTAL CONIFERS AFFECTED (%)	HOST TREES AFFECTED (%)	AREA (ha)
1	DRA	Armillaria Root Disease	Fdl,Pli,Py,Lw	<1	<1	Fdl	20.67

FOREST HEALTH STRATEGIES:

DRA is present within the stand. Primary objective of for this area is wildlife habitat. As such small pockets of DRA are seen as a benefit for creation of wildlife trees through the life of the stand.

PROTECTION

FIRE HAZARD ASSESSMENT & PROTECTION STRATEGIES:

Slash loadings >1 tonne/ha will be piled and burned at a later date. Low volume/tonnage areas will be lop and scattered

SOIL CONSERVATION

Soil Disturbance Hazard	Hazard Rating	Allowable Soil Disturbance (%Treatment Area)*	Allowable Forest Floor Displacement (% Treatment Area)
Compaction and Puddling	**H**	**10**	**30**
Displacement Hazard	**L**	**N/A**	**N/A**
Forest Floor Displacement	**M**	**10**	**30**
Surface Erosion	**L**	**10**	**30**
Mass Wasting	**L**	**10**	**30**

*' From Soil Conservation Surveys Guidebook

D. TARGET STAND CONDITIONS AND OBJECTIVES TU E5b-1&2, E4a-3

STAND TREATMENT REGIME — The stand treatment objectives for all treatment areas in this standards unit must be the same. Clearly describe the average target stand condition for all treatment areas under this standards unit. Clearly identify how you propose to achieve the forest management objectives in Part B of this prescription. Clearly explain how the proposed treatments will achieve the stated objectives and/or mitigate impacts on non-timber forest resources listed in Part B. Where quantification is *NOT* possible, use qualitative descriptions.

This area is identified as Open Forest under Ungulate Winter Range Order U-4-008. With a current crown closure of approximately 75% these areas require a reduction in coniferous stocking in order to meet the desired condition of less than 40% (target CC for open forest area treatment re-entry). Current crown closure is the result of historic ingress, which due to the edaphic quality of these sites has been progressive over the past century.

Treatment Objectives:

- To reduce coniferous crown closure < 20% to increase health and vigour of understory species;
- Target post treatment stand structure is:
  - Coniferous stocking 76-400 sph variably distributed.
  - Expect numerous small patches of open range structure distributed over the unit.
  - Expect approximately 15-20% of the area to have stocking greater than 400 sph. These areas consist of current high layer 1 patches on steeper slopes that will not be masticated to protect soils. These areas will contribute to structural diversity
- To increase the fire resilience of the stand by reducing the probability of crown fire.

Overstory Manipulation

- Target trees: remove: Douglas-fir, lodgepole pine and, Rocky Mountain Juniper (see below) stems greater than 0.2m tall and less than 15cm dbh.
- Remove all Rocky Mountain Juniper with <3 distinct stems. Larger wolfy specimens may be left at an approx. density of 30per ha.
- Maintain all deciduous species.
- Where target coniferous stems are located within the danger zone of a danger trees a no treatment zone shall be established. NCC administrator to be consulted.
- Maximum stump height 0.1m. Maximum stump cut angle <10degrees.
- Ensure all live limbs are removed from stumps.
- Prune residual stems to a height of 2m. Either pile or scatter pruned branches away from base of tree. Piling required where an effective tonnage per ha exceeds 1 tonne/ha. See slash abatement requirements below for guidance on piling requirement. Piles must be placed so that the burning of piles does not put the adjacent residual stems at risk of burning. As well do not place burn piles on or adjacent to old stumps or logs.
- If required a small opening in the stand may be created as required in consultation with NCC administrator.
- Slash abatement Requirements: (see attached schematic. NOTE: plot size in schematic is 3.99m radius)
  - Layer 3 and 4 stems:
    - Low density (centre and lower right scenario on attached schematic) areas can be lop and scattered. Cut trees are to be de-limbed so that the stem lays directly on ground surface and no limbs extend > 0.5m above the ground surface.
    - Where slash densities exceed 1tonne/ha slash is to be piled (upper left scenario on schematic). Piles density to be approximately spaced at 30m minimum inter-pile distance.
  - Layer 1 and 2 stems:
    - Low density areas (lower left scenario on schematic) can be lop and scattered. Cut trees are to be de-limbed so that the stem lays directly on ground surface and no limbs extend > 0.5m above the ground surface.
    - Higher density area (upper right in schematic) trees are to have trees de-limbed with branches and tops (down to a 10cm dia.) either scattered, or piled (where volumes dictate considering the branches of layer 1 and 2 stems to equate to layer 3 and 4 stems). Pile density at a 30m minimum inter-pile distance. Boles of layer 1 and 2 trees are to be stacked to create coarse woody debris structures.
  - Only slash created by the contractor required to be abated. Existing slash on site is not required to be abated.
  - Piles must be placed so that the burning of piles does not put the residual stems at risk of burning. As well do not place burn piles on or adjacent to old stumps or logs.
  - Piles to be conical in nature to support proper burning. Piles to be a mixture of boles and fine branch material (with significant amount of fine material distributed throughout the pile) to ensure proper combustion.
- Where layer 1 non-target stems (ie >15cm dbh) dominate a clump and removal of the understory stems would not result in an increase in light to the forest floor (as per the attached "No Treatment Clumps" schematic)no treatment in the clump is required.
- Where available approx. 20 residual stems >17cm < 25cm dbh are to be killed, and left standing, by double ringing the stem. Ensure rings penetrates through the cambium into the xylem approx. 1cm. Ringing must be completed carefully so as not to destabilize the stem. These stems are to create feeder and perching stems for avian species. Preferably, where available, these should be left in small groups of 5-10 per group. Do not create these snags within 1.5 tree lengths of a road or fenceline.
- If a nesting box, or other obvious manmade habitat structure, is found on a target tree NCC is to be informed. As well, if a natural habitat feature is observed in/on a target tree (ie nest, cavity, sapwells, bark stripping etc.) inform NCC.

D. TARGET STAND CONDITIONS AND OBJECTIVES TU E2

STAND TREATMENT REGIME — The stand treatment objectives for all treatment areas in this standards unit must be the same. Clearly describe the average target stand condition for all treatment areas under this standards unit. Clearly identify how you propose to achieve the forest management objectives in Part B of this prescription. Clearly explain how the proposed treatments will achieve the stated objectives and/or mitigate impacts on non-timber forest resources listed in Part B. Where quantification is *NOT* possible, use qualitative descriptions.

This area is identified as Open Forest under Ungulate Winter Range Order U-4-008. With a current crown closure of approximately 75% these areas require a reduction in coniferous stocking in order to meet the desired condition of less than 40% (target CC for open forest area treatment re-entry). Current crown closure is the result of historic ingress, which due to the edaphic quality of these sites has been progressive over the past century.

Treatment Objectives:

- To eradicate the previously planted exotic Red Pine;
- Target post treatment stand structure is:
  - Removal of Red Pine will result in ZERO stems/ha remaining in the treatment unit.
  - Open range.

Overstory Manipulation

- Target tree: Cut all pine species within the layout boundary
- Minimum cutting height 20cm (ie cut all pine stems >20cm tall). Maximum stump height: 10cm
- No live limbs on stumps
- Pile ALL "Red Pine" slashing debris, including boles and branches. Care needs to be taken to ensure all branches with cone is in burn pile. Piles to be distributed at approx. 30m spacing (ie. slashing debris is expected to be moved a minimum 15m). Piles to be conical in nature to support proper burning (ie don't just stack the logs). Piles to be a mixture of boles and fine branch material (with significant amount of fine material distributed throughout the pile) to ensure proper combustion.
- If a nesting box, or other obvious manmade habitat structure, is found on a target tree the NCC administrator is to be informed. As well, if a natural habitat feature is observed in/on a target tree (ie nest, cavity, sapwells, bark stripping etc.) inform NCC.