

FUEL MANAGEMENT PRESCRIPTION

Champion Lakes Provincial Park

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Champion Lakes Provincial Park Fuel Management Prescription

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BC Parks



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Prescription Overview

Established in 1955 by Order in Council No. 581, Champion Lakes Provincial Park encompasses 1,408 hectares and is located under 20km from the community of Fruitvale, BC. Situated in the Bonington mountain range, the park consists of 3 primary lakes equipped with boat launches, a beach, and an extensive trail network. 95 vehicle-accessible campsites and well-developed facilities make this park a popular destination attended by over 13,000 campers and 50,000 day users annually¹.

Unfortunately, emergency vehicular egress from the park is possible only by means of a single road framed by highly flammable dense coniferous forests. In light of severe wildfire events in preceding years, BC Parks has identified Champion Lakes Park as a candidate for fuel management treatments designed to mitigate the threat of wildfire to the safety of park visitors.

At the direction of BC Parks staff following the conclusions of a BC Wildfire Service assessment¹⁰, a two-tiered fuel management solution was devised by Cabin Forestry Services in the late fall of 2017 to mitigate the fire hazard. A high-priority intensive treatment unit was established surrounding the most popular park features, including the playground, beach, and parking lot, as well as critical infrastructure. Over two separate entries, the first treatment unit will undergo a staged conversion to a mixed-species shaded fuel break in order to prevent the spread and reduce the intensity of active crown fires, creating safe evacuation corridors from popular sites for egress via vehicle or airborne routes.

A second, lower intensity treatment unit was designated around the forests surrounding the campsites and extending west to the parking and boat launch areas of the second lake. This treatment unit will serve to mitigate risk by reducing surface fire behavior, intensity, and rate of spread through the reduction of the understory and surface fuel layers.

The combination of these two treatment units will serve to reduce the hazard to park visitors during the wildfire season, establishing safe muster zones and evacuation corridors. This prescription is designed to ensure fuel modifications are carried out effectively while minimizing deleterious impacts to ecosystems, soils, and vegetation. Suggestions are made regarding the operational aspects of treatments, as well as the disposal of resultant debris, the timing of treatments, and the reduction of inherent windthrow risks created by intensive crown fuel modification.

Treatment Unit Overview

Treatment Unit	Treatment Summary	Net Treatment Area
TU 1	High intensity overstory removal to mitigate the risk of active crown fires and establishing safe muster zones	16.9 hectares
TU 2	Understory, ladder fuel, and surface fuel removal for the prevention of ground fires and maintaining egress	29.6 hectares

Project Objectives

Safe Muster Zone

Safe muster zones will be established in the 0.7 ha paved parking lot located 100 meters south of the Third Lake and the playground for marshalling during wildfire events and evacuation by air or ground. The muster zones will be buffered at least 30 meters on all sides by Treatment Unit 1, modifying surface and aerial fuels to an extent sufficient to reduce the hazard of active crown fires.

Safe Egress Routes

High priority egress routes will be created to link popular day-use areas, including the beach, playground, and campsites to the safe muster zone and the paved exit road. Treatment Unit 1 will encompass these routes to mitigate the hazard of surface or crown fires inhibiting safe egress. Treatment Unit 2 will create a buffer around the road extending west to the parking lot at the Second Lake, mitigating the hazard of ground fires and enabling an egress route from that section of the park.

Campsite Protection

95 campsites are located in close proximity between the Second and Third Lakes. Fuels conducive to ground and surface fires will be reduced to mitigate the hazard of fires spreading between campsites, and ladder fuels will be removed to reduce the probability of crown fire initiation.

Critical Infrastructure

BC Parks staff, equipment, and a power generator reside at the service yard. The power lines extending from the generator and a well site located nearby have been designated critical infrastructure and will be protected from crown and ground fire by fuel modification in Treatment Unit 1. Other assets and outbuildings protected by TU 1 include the warming hut and the playground.

Windthrow Risk

Modification of the stand structure in Treatment Unit 1 will significantly change the windthrow dynamics of the stand. Post-treatment windthrow risk is moderate to high across TU-1 and low in TU-2. Windthrow risk shall be mitigated through the selection of windfirm species, the windfirming of treatment boundaries, and the removal of hazard trees to such an extent that windthrow hazard does not exceed moderate levels.

Water and Riparian Ecosystems

The treatment is to be conducted in close proximity to two L1 classified lakes, Landis Creek, and several smaller drainages. Discussion should take place regarding the impacts of treatment on riparian systems. Tree hazard management and windfirming treatments can take place within riparian areas. Soil disturbance and coarse woody debris removal is to be limited to prescribed levels.

Wildlife

Wildlife trees, coarse woody debris loading, canopy structure complexity and critical habitat must be maintained to prescribed levels throughout the treatment area. Particular care should be taken in the vicinity of the northern shores of the Third Lake, where Western painted turtle habitat exists.

Links to Higher Level Plans and Legislation

Management Direction Statement for Champion Lakes Park (2004)²

Much of the area covered by Treatment Unit 1 (overstory removal) is within the designated Intensive Recreation zone. The riparian zone of the Second Lake abuts Treatment Unit 2 and is designated a Special Features zone for the protection of its riparian ecosystem.

Kootenay-Boundary Higher Level Plan Order, Arrow RMZ

This prescription is compliant with the KBHLPO and its mandates. The treatment areas are within the N503 and N507 Landscape Units within the Arrow Resource Management Zone and have a Low biodiversity emphasis (BEO). The treatment areas are within Natural Disturbance Type 3.

Provincial Legislation and Regulations

This prescription must comply with all relevant provincial legislation, regulations, and internal BC Parks and Ministry of Environment protocols, including the *Park Act* [RSBC 1996], the *Environment and Land Use Act*, the *Environmental Assessment Act*, the *Wildlife Act*, the *Forest and Range Practices Act*, and the *Environmental Management Act*.

This includes subordinate regulations pursuant to the aforementioned legislation, including in particular the *Forest Planning and Practices Regulation* pursuant to the *Forest and Range Practices Act* and the *Open Burning Smoke Control Regulation* pursuant to the *Environmental Management Act*.

All recommendations herein are subject to the BC Parks Impact Assessment Process.

Site Assessments

Fire Hazard

A grid survey of 30 plots throughout the treatment area revealed a high density coniferous understory conducive to the spread of wildfire. Several BC Wildfire Threat Plots were conducted with moderate outputs. Large numbers of visitors and a single egress road elevate the threat hazard.

Streams, Lakes, and Riparian Areas

The Second and Third Lakes are L1-B class features with a Riparian Reserve Zone (RRZ) of 10 meters assigned by the *Forest Planning and Practices Regulation* (FPPR). This prescription must comply with the regulation and activities within the RRZ must comply with s. 51(1).

Biodiversity and Natural Disturbance Patterns

The treatment area encompasses some stands with high vertical structure complexity, high species diversity, and biologically beneficial coarse woody debris loading. While some danger trees and excess surface fuels may require removal, it is important to retain structural and species diversity.

Forest Health

Endemic levels of bark beetles were observed, including Douglas fir beetle (*Dendroctonus pseudotsugae*) and balsam bark beetle (*Dryocoetes confuses*). Moderate levels of *Arceuthobium laricis*, dwarf mistletoe, were observed on larch. Endemic root diseases were observed affecting Douglas fir. Some white pine show signs of blister rust. Laminated root rot (*Phellinus weirii*) was noted in Fd and Sx.

Plant Communities & Species at Risk

Two Species Occurrence Reports from the Conservation Data Centre fall within the treatment area: 12061 identifies the painted turtle population found within the lakes, and 105765 identifies a red-listed pygmy slug detected in 2014 just north of the Second Lake. Riparian management strategies must protect turtle nesting areas on the east end of the Third Lake. Riparian management, the protection of streams, and working during the winter can mitigate negative impacts of treatment.⁶

Cultural & Archaeological Features

A request to the Archaeology Branch of the Ministry revealed no known archaeological sites recorded in the treatment area. A 2018 Archaeological Overview Assessment¹¹ of the treatment area noted high archaeological potential throughout a significant portion and recommended a post-impact study and PFR to confirm minimal soil disturbance, and to conduct an assessment if disturbed areas are found.

Visual Impact

The treatment areas are not within a visually sensitive polygon as classified by the Visual Landscape Inventory. However, as Treatment Unit 1 is intended to convert the forests surrounding the Third Lake to an open forest type, aesthetic impact and public perception merits discussion. Considering the heightened public awareness of wildfire, signage and education would positively influence perception.

Terrain Stability

No terrain stability concerns were identified in the course of field assessments. While a majority of the treatment area is on gentle slopes, small portions of TU 1 north of the Third Lake have slopes exceeding 30%. These slopes are bedrock controlled and separated from the lake by a paved road.

First Nations

Consultations

The Management Direction Statement for Champion Lakes Park identifies the Ktunaxa Nation and the Okanagan Nation Alliance as having included the park within their asserted traditional territory.

The rights of First Nations must be honored and protected with regards to conservation, safety, cultural, and health concerns. BC Parks will conduct a comprehensive consultation in accordance with its internal best management practices.

Stakeholders

Adjacent Forest Tenures and Land Use

- The Park is surrounded by the Arrow Timber Supply Area
- Forest License A20193 (Atco Lumber Ltd) is active near the Park
- Two traplines exist within the vicinity of the treatment area:
 - Trapline TR0408T001 to the west
 - Trapline TR0408T003 to the east
- No range tenures exist in the vicinity of the park at this time

Other Government Agencies

- The Regional District of Kootenay Boundary takes part in the Eurasian milfoil eradication program
- The Ministry of Forests, Lands, Natural Resource Operations and Rural Development operates closely with BC Parks to address potential adverse impacts caused by adjacent logging operations
- BC Wildfire Services (Arrow Fire Zone; Southeast Fire Centre), headquartered in Castlegar

Community Interests

- The Beaver Valley Cross-Country Ski Club maintains a cabin between the Third Lake and the parking lot falling within TU1, and conducts cross country skiing and track maintenance. Operations are likely to overlap with some of the Ski Club's activities, and collaboration is recommended
- Scouts Canada and Girl Guides of Canada hold special events at the park
- The annual Family Fishing Weekend is held in mid-June in collaboration with BC Parks staff
- Clubs such as Kiwanis from Castlegar and Trail operate senior citizen field trips at the Park

Site Description

Ecological

BEC Zone	Treatment Area	Site Series	NDT	SMR/SNR
ICHdw1	1	101(104)	NDT 3	3-4 / D
ICHdw1	2	101	NDT 3	4/C- D

Terrain

TU	Slope %	Uniformity	Aspect	Slope Position	Gullied	Drainage	Elevation
1	15 (0-45)	Broken	South/Varied	Mid-Low	Yes (20%)	Moderate	1060-1080
2	10 (0-25)	Broken	Varied	Low	No	Moderate	1060-1070

Note: Gullied terrain present in TU1 along the northern edge of the Third Lake, where slopes are greatest.

Riparian Zone Management

TU	Waterbody Name	Waterbody Classification	Riparian Reserve Zone	Riparian Mgmt Zone	Riparian Mgmt Area
1	Champion Lake 3	L1-B	10m	0m	10m
1	Landis Creek	S3	20m	20m	40m
1	Unnamed Creek	S4	0m	30m	30m
2	Champion Lake 2	L1-B	10m	0m	10m

Riparian Area Management Strategy

The Riparian Reserve Zone (RRZ) will be restricted to the following treatments: surface fuel removal, pruning, and hazard tree removal only.

The Riparian Management Zone (RMZ) will be treated the same as the Treatment Unit within which it resides, with the addition of the following best management practices:

- Focus retention of clumps in both the RMZ and RRZ of all classifiable riparian features
- Retain and minimize impacts to all deciduous shrubs and trees
- Trees should be hand felled, away from the creek
- Use a vegetable-based chain oil
- Minimize the number and size of burn piles, or locate them outside the RMA if practicable

Note: See map for non-classified drainages.

Treatment Unit 1 Summary

Description

Pre-Treatment

Treatment Area	Treatment Type	Access
16.9 ha	Thin from below; Hazard tree removal; Surface fuel removal; Understory brushing; Pruning for windfirmness	Accessible on the north side of the lake from paved road, from the parking lot on the south, and from playground parking lot to the east. Foot access by trail on southwest side between playground and beach.

Treatment Unit 1 is marked in the field with Pink/Black striped ribbon. Stations are marked with yellow.

Stand Description

TU1 envelops much of the Third Lake, the main parking lot, and the critical infrastructure extending towards the park entrance. The overstory is cedar and spruce leading, with a low crown base and 6—9m fuel strata gap*. Less than 5 stems/ha snags of an average 65cm DBH provide wildlife habitat.

The understory is dense cedar and subalpine fir leading, with scattered to patchy ladder fuel coverage. *Vaccinium membranaceum* and *Paxistima myrsinites* cover much of the understory.

Stand Table

Layer	Layer Description	Species % *	Stems / hectare	Mean DBH (cm)	Mean Total Height (m)	Basal Area (m ² /ha)	Net Merch Volume (m ³ /ha)	Crown Closure (%)
L1 merch	>17.5cm DBH*	Cw ₂₉ Sx ₂₂ Ac ₁₂ Hw ₁₀ Fd ₉ Lw ₇ Pw ₅ Bl ₃ Pl ₂	719	30.5	27.3	43.6	374	60
L1 submerch	12.5—17.5cm DBH	Cw ₄₂ Sx ₂₆ Bl ₁₁ Fd ₁₁ Ep ₅ Hw ₅	238	16	9.8			
L2	7.5—12.5cm DBH	Cw ₄₈ Bl ₁₇ Fd ₁₄ Bg ₁₀ Sx ₇ Pw ₃	363	9.9	8.5			
L3	<7.5cm DBH >1.3m ht	Cw ₄₃ Bl ₃₉ Sx ₇ Pw ₃ Fd ₂ Hw ₂ Lw ₂ Bg ₁	1875	3.5	3.6			

Stand Hazard Ratings

Wildfire Threat Assessment Rating	Moderate (avg 60 points)
Windthrow Rating FS712	Moderate

Note: DBH = Diameter at 1.3m above ground. Species comp in order of basal area (L1 merch) or stems/ha.

Lodgepole pine (Pl) merch limit at 12.5cm DBH. Values are derived from 15 fixed & prism plots and are estimates only, not to be used for cost estimates by bidding contractors.

*Fuel Strata Gap refers to the vertical distance between the beginning of the ladder fuels and the live crown base height of the overstory.

Treatment Unit 1 Summary

Post-Treatment—Entry 1

Description

Treatment Area	Treatment Type	Access
16.9 ha	Thin from below; Hazard tree removal; Surface fuel removal; Understory brushing; Pruning for windfirmness	Accessible on the north side of the lake from paved road, from the parking lot on the south, and from playground parking lot to the east. Foot access by trail on southwest side between playground and beach.

Treatment Unit 1 is marked in the field with Pink/Black striped ribbon. Stations are marked with yellow.

Post-Treatment Stand Description

TU1 is designed to prevent the spread of high intensity crown fire. The first entry thins the stand from below to allow retention to develop expanded root systems and allow the residual stand to increase in windfirmness. Care is taken to retain the most windfirm trees in clumps, centered around one or more dominant, windfirm stems.

Surface fuels over 7cm in diameter are reduced to levels below 2 kg/m² and fuels under 7cm reduced to below 0.5 kg/m². Resultant organic debris is properly disposed of to contract specifications.

Stand Table

Layer	Layer Description	Species %	Stems / hectare	Mean DBH (cm)	Mean Total Height (m)	Basal Area (m ² /ha)	Net Merch Volume (m ³ /ha)	Crown Closure (%)
L1 merch	>17.5cm DBH*	FdCw LwSxActPwBl	400	30+	30	30	275	45
L1 submerch	12.5—17.5cm DBH	CwSxBIFdEpHw	100	16	10			
L2	7.5—12.5cm DBH	CwBIFdBgSxPw	100					
L3	<7.5cm DBH >1.3m ht	CwBISxPwFdHw LwBg	100					

Stand Hazard Ratings

Wildfire Threat Assessment Rating	Low (below 50 points)	Treatment Windthrow Rating FS712	High ⁶
Windthrow Rating FS712	Moderate—High		

Note: DBH = Diameter at 1.3m above ground. Species comp in order of basal area (L1 merch) or stems/ha.

Lodgepole pine (PI) merch limit at 12.5cm DBH. Values are derived from 15 fixed & prism plots and are estimates only, not to be used for cost estimates by bidding contractors.

Treatment Unit 1 Summary

Post-Treatment—Entry 2

Description

Treatment Area	Treatment Type	Access
16.9 ha	Thin from below; Hazard tree removal; Surface fuel removal; Understory brushing; Pruning for windfirmness	Accessible on the north side of the lake from paved road, from the parking lot on the south, and from playground parking lot to the east. Foot access by trail on southwest side between playground and beach.

Treatment Unit 1 is marked in the field with Pink/Black striped ribbon. Stations are marked with yellow.

Post-Treatment Stand Description

Plan the second entry over 3 growing seasons following the first entry to allow root systems to expand and allow the residual stand to adapt to increased wind loads. Stand is modified to become open forest at 300 SPH, thinning from below to 30cm DBH. Care is taken to retain the most windfirm trees. Remove excessive blowdown following Entry 1 but retain CWD for wildlife. L2, L3, and L4 retention is to be located in clumps comprising no more than 10% of the treatment area. Each clump should be no greater than 150m². Maintain fuel strata gap of 6-9m to minimize risk of crown fire initiation.

Surface fuels over 7cm in diameter are reduced to levels below 2 kg/m² and fuels under 7cm reduced to below 0.5 kg/m². Resultant organic debris is properly disposed of to contract specifications.

Stand Table

Layer	Layer Description	Species %	Stems / hectare	Mean DBH (cm)	Mean Total Height (m)	Basal Area (m²/ha)	Net Merch Volume (m³/ha)	Crown Closure (%)
L1 merch	>17.5cm DBH*	FdCw LwSxActPwBl	250	30+	30	20.2	184.4	35
L1 submerch	12.5—17.5cm DBH	CwSxBIFdEpHw	50	16	10			
L2	7.5—12.5cm DBH	CwBIFdBgSxPw	100					
L3	<7.5cm DBH >1.3m ht	CwBISxPwFdHw LwBg	100					

Stand Hazard Ratings

Wildfire Threat Assessment Rating	Low (below 50 points)	Treatment Windthrow Rating FS712	High ⁶
Windthrow Rating FS712	Moderate		

Note: DBH = Diameter at 1.3m above ground. Species comp in order of basal area (L1 merch) or stems/ha.

Lodgepole pine (PI) merch limit at 12.5cm DBH. Values are derived from 15 fixed & prism plots and are estimates only, not to be used for cost estimates by bidding contractors.

Treatment Unit 2 Summary

Description

Pre-Treatment

Treatment Area	Treatment Type	Access
29.6 ha	Hazard tree removal; Surface fuel removal; Understory brushing	Generally ready access from paved roads, good access in campground area and on western road buffer extension. Access by foot trail to the south of playground.

Treatment Unit 2 is marked in the field with solid Pink ribbon. Stations are marked with yellow.

Stand Description

TU2 surrounds the northern edge of the Third Lake, the campsites, partially buffers TU1, and buffers the egress road from the secondary parking lot. The overstory is Fd leading, with a low crown base and 6—9m fuel strata gap. Over 31 stems/ha snags of an average 65cm DBH provide wildlife habitat.

The understory is dense cedar and subalpine fir leading, with scattered to patchy ladder fuel coverage. Campground area has less dense forests and sparse understory.

Stand Table

Layer	Layer Description	Species % *	Stems / hectare	Mean DBH (cm)	Mean Total Height (m)	Basal Area (m ² /ha)	Net Merch Volume (m ³ /ha)	Crown Closure (%)
L1 merch	>17.5cm DBH*	Fd ₃₂ Cw ₂₀ Sx ₁₆ Lw ₁₂ Bl ₆ Pw ₆ Hw ₂ Pl ₂ At ₂	725	30.3	28.3	42.0	442	60
L1 submerch	12.5—17.5cm DBH	Cw ₅₂ Fd ₁₅ Pw ₉ Sx ₉ Bl ₆ Lw ₆ Act ₃	440	16.7	10			
L2	7.5—12.5cm DBH	Cw ₇₂ Bl ₁₂ Fd ₈ Lw ₄ Ep ₄	333	9.4	7.6			
L3	<7.5cm DBH >1.3m ht	Cw ₇₂ Bl ₁₂ Bg ₄ Hw ₄ Act ₂ Fd ₂ Sx ₂ Lw ₁	1133	3.8	3.3			

Stand Hazard Ratings

Wildfire Threat Assessment Rating	Moderate (avg 65 points)
Windthrow Rating FS712	Moderate

Note: DBH = Diameter at 1.3m above ground. Species comp in order of basal area (L1 merch) or stems/ha.

Lodgepole pine (Pl) merch limit at 12.5cm DBH. Values are derived from 15 fixed & prism plots and are estimates only, not to be used for cost estimates by bidding contractors.

Treatment Unit 2 Summary

Description

Post-Treatment

Treatment Area	Treatment Type	Access
29.6 ha	Hazard tree removal; Surface fuel (CWD) removal; Understory brushing	Generally ready access from paved roads, good access in campground area and on western road buffer extension. Access by foot trail to the south of playground.

Treatment Unit 2 is marked in the field with solid Pink ribbon. Stations are marked with yellow.

Post-Treatment Stand Description

TU2 treatment is designed to reduce the spread of low-intensity surface fires and crown fire initiation. Overstory remains similar to pre-treatment conditions, with hazard trees removed.

Understory removal retains only sparse patches of L2 and L3 regen, focused around riparian features. Surface fuels over 7cm in diameter are reduced to levels below 2 kg/m² and fuels under 7cm reduced to below 0.5 kg/m². Resultant debris is properly disposed of to contract specifications.

Stand Table

Layer	Layer Description	Species % *	Stems / hectare	Mean DBH (cm)	Mean Total Height (m)	Basal Area (m ² /ha)	Net Merch Volume (m ³ /ha)	Crown Closure (%)
L1 merch	>17.5cm DBH*	FdCwSxLwBI PwHwPIAt	700	30	28	42.0	442	60
L1 submerch	12.5—17.5cm DBH	CwFdPSxBILwAct	400	16.7	10			
L2	7.5—12.5cm DBH	CwBIFdLwEp	100	10				
L3	<7.5cm DBH >1.3m ht	CwBIBgHwAct FdSxLw	100	3.5				

Stand Hazard Ratings

Wildfire Threat Assessment Rating	Low (below 52 points)	Treatment Windthrow Rating FS712	Low
Windthrow Rating FS712	Moderate		

Note: DBH = Diameter at 1.3m above ground. Species comp in order of basal area (L1 merch) or stems/ha.

Lodgepole pine (PI) merch limit at 12.5cm DBH. Values are derived from 15 fixed & prism plots and are estimates only, not to be used for cost estimates by bidding contractors.

TU 1 Treatment Specifications—Entry 1

Treatment	Target	Description
<u>Overstory Thin</u>	400 SPH	Overstory removal of merchantable trees up to 30cm in diameter with a preference for the retention of windfirm and disease-free trees in clumps around several dominant stems. Retain important wildlife trees and retain all healthy Pw and cottonwood trees where practicable, not counting deciduous trees toward target density. Treat in the following order of preference for removal: Bl, Sx, Hw, Cw, Fd, and Lw. Target canopy closure below 50%. ⁷
Thin from Below	30% basal area reduction	
17.5-30cm DBH	≤20cm stump ht	Mark to leave. Minimize damage or scarring to retained trees.
	≤20° stump angle	
<u>Sub-Merch Thin</u>	100 SPH	Thin from below, removing smallest and diseased trees first until target density of 100SPH is reached. Prioritize Bl and diseased trees over other species in for removal and retain all deciduous where practicable.
Thin from Below	60% SPH reduction	
12.5-17.5cm DBH	≤15cm stump ht	Retain clumps of Cw in and around riparian areas as Cw in moist environments is relatively fire resistant and provides good habitat value. Focus clumps around several windfirm dominant stems.
	≤20° stump angle	
<u>Brushing</u>	<200 SPH	Remove coniferous understory regeneration, beginning with spruce and Douglas fir and diseased trees until a maximum density of 200 SPH remains. Minimize stump height and angle, and remove debris from the ground. Remove all L4.
L2, L3 L4 layer	≤10cm stump ht	
>12.5cm DBH	≤20° stump angle	Retain healthy Pw and retain sparse clumps in and around riparian features including non-classified drainages, given these clumps are not major ladder fuels.
<u>Pruning</u>	3m crown base ht	Prune remaining L1 trees for windfirmness and fire resistance. Prune to maximum 3m and retain at least 40% live crown ratio. Cut branches flush to edge of branch collar and minimize damage to cambium.
L1 Layer Retention	>30% live crown	
>12.5cm DBH		Remove all residual slash.
<u>Fuel Removal</u>	<7cm: <0.5 kg/m ²	Remove woody debris and surface fuels following thinning, brushing and pruning treatments to the target maximum levels.
Fine fuels <12cm	>7cm: <2.0 kg/m ²	
CWD retention	1 CWD / 10m	Retain coarse woody debris (CWD) over 12cm diameter, scattered at 1 piece per 10-15m, (about 50-100/ha). ⁵ Retain all CWD in riparian areas.
<u>Debris Disposal</u>	To fuel removal specifications	Remove treatment debris from treatment area. Ensure fine fuel removal specification is met. Chip and haul or chip and burn debris as required by contract.
<u>Wildlife Trees</u>	LOD: 3	Conduct danger tree assessments to regulated standards and establish no-work zones as necessary around retained wildlife trees, particularly in riparian zones.
WDTA		As felling of trees is prescribed in TU1, a Level of Disturbance (LOD) 3 is required. Ensure no more than 10% of TU1 area is no-work zone.

TU 1 Treatment Specifications—Entry 2

Treatment	Target	Description
<u>Overstory Thin</u>	250 SPH	Overstory removal of merchantable trees up to 30cm in diameter with a preference for the retention of windfirm and disease-free trees in clumps around several dominant stems. Retain important wildlife trees and retain all healthy Pw and cottonwood trees where practicable, not counting deciduous trees toward target density. Treat in the following order of preference for removal: Bl, Sx, Hw, Cw, Fd, and Lw. Target canopy closure below 35-40%. ⁷
Thin from Below	55% basal area reduction	
17.5-30cm DBH	≤20cm stump ht	Minimize damage or scarring to retained trees.
	≤20° stump angle	
<u>Sub-Merch Thin</u>	50 SPH	Thin from below, removing smallest and diseased trees first until target density of 50SPH is reached. Prioritize Bl and diseased trees over other species in for removal and retain all deciduous where practicable.
Thin from Below	80% SPH reduction	
12.5-17.5cm DBH	≤15cm stump ht	Retain clumps of Cw in and around riparian areas as Cw in moist environments is relatively fire resistant and provides good habitat value. Focus clumps around several windfirm dominant stems.
	≤20° stump angle	
<u>Brushing</u>	<200 SPH	Remove coniferous understory regeneration, beginning with spruce and Douglas fir and diseased trees until a maximum density of 200 SPH remains. Minimize stump height and angle, and remove debris from the ground. Remove all L4.
L2, L3 L4 layer	≤10cm stump ht	
>12.5cm DBH	≤20° stump angle	Retain healthy Pw and retain sparse clumps in and around riparian features including non-classified drainages, given these clumps are not major ladder fuels.
<u>Pruning</u>	3m crown base ht	Prune remaining L1 trees for windfirmness and fire resistance. Prune to maximum 3m and retain at least 40% live crown ratio. Cut branches flush to edge of branch collar and minimize damage to cambium.
L1 Layer Retention	>30% live crown	
>12.5cm DBH		Remove all residual slash.
<u>Fuel Removal</u>	<7cm: <0.5 kg/m ²	Remove woody debris and surface fuels following thinning, brushing and pruning treatments to the target maximum levels.
Fine fuels <12cm	>7cm: <2.0 kg/m ²	
CWD retention	1 CWD / 10m	Retain coarse woody debris (CWD) over 12cm diameter, scattered at 1 piece per 10-15m, (about 50-100/ha). ⁵ Retain all CWD in riparian areas.
<u>Debris Disposal</u>	To fuel removal specifications	Remove treatment debris from treatment area. Ensure fine fuel removal specification is met. Chip and haul or chip and burn debris as required by contract.
<u>Wildlife Trees</u>	LOD: 3	Conduct danger tree assessments to regulated standards and establish no-work zones as necessary around retained wildlife trees, particularly in riparian zones.
WDTA		As felling of trees is prescribed in TU1, a Level of Disturbance (LOD) 3 is required. Ensure no more than 10% of TU1 area is no-work zone.
<u>Planting</u>	Act at 200 sph	In openings outside of retention clumps, plant Act at 200 sph. Cottonwood is relatively fire resistant and would serve to shade the surface fuels, reduce conifer ingress, and drop leaves in the fall to modify surface fuels.
Cottonwood		

TU 2 Treatment Specifications

Treatment	Target	Description
<u>Brushing</u>	<200 SPH	Remove coniferous understory regeneration, beginning with spruce and Douglas fir and diseased trees until a maximum density of 200 SPH remains. Minimize stump height and angle, and remove debris from the ground.
L2 & L3 layer	≤10cm stump ht	
>12.5cm DBH	≤20° stump angle	Retain healthy Pw and retain sparse clumps in and around riparian features including non-classified drainages, given these clumps are not major ladder fuels.
<u>Fuel Removal</u>	<7cm: <0.5 kg/m ²	Remove woody debris and surface fuels following thinning, brushing and pruning treatments to the target maximum levels.
Fine fuels <12cm	>7cm: <2.0 kg/m ²	
CWD retention	1 CWD / 10m	Retain coarse woody debris (CWD) over 12cm diameter, scattered at 1 piece per 10-15m, (about 50-100/ha). ⁵ Retain all CWD in riparian areas. ⁶
<u>Debris Disposal</u>	To fuel removal specifications	Remove treatment debris from treatment area. Ensure fine fuel removal specification is met. Chip and haul or chip and burn debris as required by contract.
<u>Wildlife Trees</u>	LOD: As Req'd	Conduct danger tree assessments to regulated standards and establish no-work zones as necessary around retained wildlife trees, particularly in riparian zones.
DTA		Modify treatment activities around wildlife trees as required in order to remain within acceptable LOD. Target no more than 10% of TU2 area as no-work zone.

Operational Recommendations

The following are recommendations for ideal equipment configurations and not inherent requirements or limits

Treatment	Equipment	Description
<u>Tree Removal</u>	Line skidder	A line skidder would optimize tree removal in sensitive riparian zones.
TU 1	Skidding arch	A skidding arch can aid in the removal of sub-merch stems and minimize basal scarring where larger vehicles would require wider trails.
	Spider excavator	Use ghost trails, using a trail route only once to prevent soil compaction.
	Horse logging	Slopes in the northern portion of TU1 can be reached by conventional equipment but would benefit from the use of a spider hoe and/or line skidder.
	Hand falling	Portions of the overstory removal treatment will require hand falling and bucking.
<u>Debris Disposal</u>	Tracked chipper	A portion of the treatment unit behind the playground is difficult to access with heavy equipment. A tracked or mobile chipper is recommended for convenience.
TU1 & TU2	Pile burning	Consider forwarding material to a central staging area and using an industrial drum chipper.
	Air curtain burner	While both mulching and pile burning are good options, a hot-fed burn is recommended to reduce pile size and limit smoke. The well site, supply yard, and even some campsites provide good burning locations. Consider soil impacts.
	Mulching	Consider the use of an air curtain burner or a burning sloop to minimize smoke and impacts on soils. Ensure compliance with open burning regulations.
	Bucking	
<u>Soil Disturbance</u>	High floatation	The area immediately south of the main parking lot is believed to be a water-receiving site and should be considered as such when accessing TU1 to the south using heavy equipment.
TU 1	Horse logging	The use of alternatives to traditional skidders is recommended. Use of a harvester/forwarder combo or line skidder would be effective. Consider horse logging.
	Forwarder	High floatation equipment should be utilized regardless of the prime mover, and the choice of equipment consideration should incorporate park values.

Operational Specifications

Consideration	Target	Description
Fire Prevention	Written procedure	The treatments undertaken in both TU1 and TU2 are considered high risk pursuant to the <i>Wildfire Act</i> (section 6). Crews must have the corresponding fire suppression equipment and level of training required by regulation.
	Hydrant access	
	Suppression equipment	Hydrant access is possible on site and hydrants are located at several points within the treatment area.
Safety	Personnel safety	Access to the park is controlled by one primary entrance road with a gate.
	Public safety	<p>Ensure the safety of all personnel and members of the public during operations. Compliance with WorkSafe BC regulations and appropriate precautions are necessitated throughout the operational process.</p> <p>TU1 includes seasonally active power lines. Follow WorkSafe BC protocols and applicable regulations and employ a certified utility arborist for felling near lines.</p>
Soil Disturbance	Max 5% in TU1	As no overstory removal is to take place in TU2, expected soil disturbance levels are lower. Low risks of soil erosion and displacement exist throughout the treatment area. Should unacceptable soil disturbance occur, a rehabilitation plan must be developed to mitigate deleterious impacts.
	Max 5% in TU2	
Site Rehabilitation	100% of trails	All temporary access trails created in the process of overstory removal in TU1 must be fully rehabilitated by the contractor to pre-treatment condition. Any seeding mix requires BC Parks approval. All such corridors for removal, chipping, or other operations must be documented both pre- and post-treatment by the contractor. Replanting following the second entry in TU 1 must cover bare ground with cottonwood at approximately 200 stems per hectare.
Invasive Plants	Minimize contact	Intensive use of the area around the Third Lake contributes to a heightened risk of invasive species including spotted knapweed and orange hawkweed. Spotted knapweed and common mullein were identified in the field near the playground. Avoid repeated contact with infested areas and clean equipment prior to entering treatment area. Equipment must be inspected and approved by project manager. Cover mineral soil that is exposed as a result of treatment with forest litter.
	Cover mineral soil	
Migratory Birds		The park is habitat to 49 bird species and several species protected under the <i>Migratory Birds Convention Act</i> and the <i>Wildlife Act</i> . If required, conduct a pre-treatment bird survey. Disturbance is to take place outside of breeding season.
Species at Risk		Ensure adherence to <i>Species at Risk Act</i> and best management practices regarding red and blue listed species. Identified blue-listed species include Western painted turtle, pigmy slug, great blue heron, and Regal's rush.
Special Feature Zone	TU2 Riparian	A 20m unmarked buffer around the Second Lake designated for riparian habitat management. No overstory removal is to take place in this zone.
Archaeological Impact	Post-Treatment Survey & PFR	Contractors are required to follow best practices and notify BC Parks and the Archaeology Branch upon a discovery, ceasing work in the area. A post-treatment survey and PFR are recommended to identify disturbed soils.

Treatment Considerations

Public Presence

The park is used by the public almost year-round, with the presence of the cross-country ski club providing access during winter months. A narrow treatment window exists in the late fall / early winter during which access is at its lowest. As such, it is recommended that these treatments, in particular those treatments with the greatest impact, be undertaken during this window.

Implementation Supervision Requirements

The following should be completed prior to commencement of treatments:

- Mark-to-leave for tree retention
- Ribbon small group retention leave patches
- Identify additional skid/forwarding trails off of main roads and proposed trails.

Windthrow Management

Post-treatment Windthrow Risk* is assessed and outlined in the table below

Treatment Unit	Area	Risk	Comments
1	Playground and parking lot.	M	The majority of the surrounding area is mesic, well-drained soils. 10–20 m not-treed buffer around playground. Mature, multilayered stand of CwHwSxPwBl.
1	Main Parking	H	South and east of the parking lot is a moisture receiving site associated with NCD-2. The result is an increased soil hazard and windthrow risk. Mature with vets, multilayered stand of SxFdActCwBIHwLw.
1	Warming Hut and Main Beach	M-H	Well-drained soils and windfirm spp surround the hut— LwActSx
1	Southern Lakeshore	H	Moderate levels of localized existing windthrow. High soil hazard and variable timber types
1	Well and Services Yard	M	Low soil hazard. CwLwSx
2	All	M	Thin-from-below with minor overstory removal in the intermediate crown class.

**Post-treatment Windthrow Risk* is assessed for endemic winds.*

Windthrow Strategies

- Species Selection in order of priority: Fd, Lw, Cw, Act, At, Bg, Bl, Pw, Pl, Sx, Ep
- Retain trees with Live Crown Ratios >60% and Height to Diameter Ratios <70%
- Within 1.5 tree lengths of any target, retain most windfirm species only. Where none are present, consider clear cutting
- Consider clear cutting 1.0 -1.5 tree lengths from major values i.e. beach and warming hut.
- Consider clear cutting on moisture receiving sites (SMR>5) not associated with classifiable riparian features
- Feather timbered edges along all riparian management zones
- Minimize site disturbance to roots in and around all retained trees with the use brush mats or conduct treatments when ground is frozen or dry.
- Retain veteran, dominant and codominant crown classes
- Retained trees should be free from heart rots and root rots
- Grey attack Fd or Pl should be slated for removal in areas around park infrastructure

Post-Treatment Actions

Windthrow Assessment

The intensive treatments involved in TU1 will significantly modify the wind loading on individual trees. A predicted increase of 40% drag force acting on individual trees can be expected in the safe muster zone due to increased inter-tree spacing.⁴ While treatment specifications require increased precautions for windfirmness, a post-treatment windthrow assessment is required.

Archaeological & Post-Treatment Disturbance Survey

Pursuant to the recommendations of the Archaeological Overview Assessment, a post-treatment survey should be conducted to identify areas where increased levels of soil disturbance may have created a requirement for further assessments of archaeological sites.

Post-Treatment Rehabilitation

TU1 treatments are intended to result in the creation of an open forest type. Retention of deciduous species throughout the treatment specifications should increase the deciduous component of the stand. If rehabilitation of disturbed soils or ecosystems is required, the planting of deciduous species is recommended for both fuel reduction and ecological reasons.

Long-Term Monitoring & Maintenance

It is recommended that fuel loadings, particularly the ingress of conifer regeneration in treated areas, be monitored over 5-year intervals following treatment in order to design an effective treatment maintenance regime. Consider the use of unmanned aerial vehicles (UAVs) to conduct aerial surveys of TU 1.

Maintaining the reduction in L3-layer regeneration is expected to maintain the efficacy of the treatments in the long term.

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Professional Reliance

Registered Professional Forester		Signature & Seal
Name:	Kyle A. Broome	
RPF Number:	4672	
Date Signed:	August 3rd, 2018	
<p>I certify that the work described herein fulfills the standards expected of a member of the Association of British Columbia Forest Professionals and that I did personally supervise the work.</p>		

Prescription Approval

Ministry of Environment & Climate Change Strategy Project Lead

 Name: Date Signed:

Ministry of Environment & Climate Change Regional Director

 Name: Date Signed:

Primary Contractor

 Name: Date Signed: