

FRST 282 – Integrated Resource Management

Area 2 (Witchcraft Lake) Management Plan

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1.0 Project Scope

This management plan offers a description of management objectives and strategies for a planned area within the VIU woodlot 020 containing a range of integrated resource values. The intent of this report is to outline the practices that will address the various needs, limitations, and goals of the management area while respecting and/or enhancing strategies previously established in the WL Plan #W0020. The scope and extent of the

following document are of a broader planning level—it is expected that stand level conditions warrant alternative approaches in some cases. Moreover, it should be acknowledged that the management unit is only a small portion of WL 020 and therefore priorities and practices may evolve over time. However, for the interim, the recommendations made in this document deliver a sound basis for planning timber development activities in “Area 2.” Practices and strategies emphasise the conservation, productivity, and enhancement of biological diversity throughout the management area.

Information for this plan stems from the Vancouver Island Land Use Plan, WL020 Management Plan (2006 Revision), WL020 Licence Plan, pre-existing databases, and biophysical inventories gathered. The woodlot licensee will act in accordance to the *Forest and Range Practices Act* (FRPA) while this plan contains the required information outlined in the *Forest Act*.

2.0 Defined Forest Area

Area 2 lies within the southernmost portion of WL020 (Fig. 1). It is geographically situated between the lower slopes of Mt. Benson’s northern face and Witchcraft Lake. The management unit occupies a **76.6 ha** area of the woodlot’s Crown lands (Schedule B). The eastern portion of the unit is bordered by a recently harvested cutblock managed by Island Timberlands and to the west by McGarrigle Creek. A proponent of future parkland forms the northern boundary as well as Witchcraft Lake. To the south we are constrained by inhospitable slopes and sensitive colluvial fan terrain. Area 2 falls in the RDN area D and features in the “Mountain land District.”

The approximate geographic centre of Area 2 is: E 424228 N 5445869. General access to the northern boundary is attainable by 2WD along Benson View Drive, a public road, and to the higher sections via private Island Timberlands resource roads. 4WD is recommended for the private roads.

Management Area 2’s physiography is characterized by steep slopes, coarse soils, good drainage, and a significant land base of inoperable rocks and cliffs.

Area 2 General Map

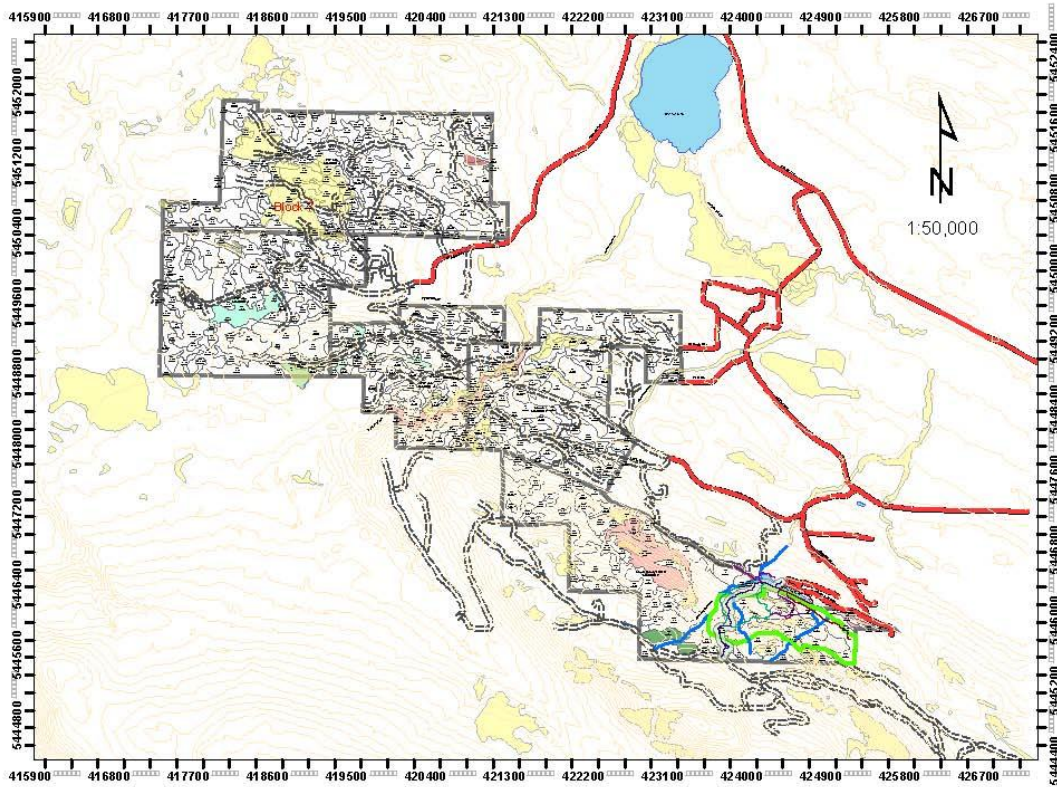


Figure 1: Area 2 location map

3.0 Management Goals

In general, it is the licensee’s goal to holistically manage these lands consistent with the WL020 Management Plan, the WL020 Licence Plan, and FRPA. This relatively new portion of land boasts a range of the 11 values described in FRPA, including a significant component of recreation, visual quality, and sensitive terrain type values.

A healthy and resilient forest is reinforced by biodiversity. Area 2 will be managed in a way that places conservation, structural heterogeneity, and connectivity at the forefront of decisions and strategies. Therefore, the licensee will demonstrate good forest stewardship by adopting strategies concurrent with integrated resource management in the goal of enhancing all values present. Long-term sustainable harvests are an important source of finances for the licensee; academic programs are greatly assisted from the funds generated by timber. Without unduly reducing timber supply, annual harvests will be maximised within a 5 year cut control period while fostering the need for a secure and biologically diverse stand.

Given the academic nature of the licence holder, it is crucial to manage not only for legislated values, but also to benefit the educational experience for visitors and VIU students alike. Providing infrastructure and opportunities for education and community involvement will benefit the estate as a whole. Given the unique diversity of values present, Area 2 is a candidate for more unconventional harvesting and silvicultural systems/activities where feasible. Such activities may include selective harvesting, the use of modified cable systems, group retention, and variable density thinning (VDT).

Area 2 is captured by the newly recognised “Benson Special Management Zone.” This ensures that biodiversity must be enhanced throughout the entire management area, regardless of particular use (i.e., WTP vs. THLB). Additional to the abovementioned goals are the following points of focus:

- Balance biodiversity with timber, recreation, and visuals;
- Enhance/progress late seral attributes;
- Maintain connectivity and diversify habitat types;
- Overlap reserves to meet multiple goals;
- Protect fragile sites, soils, species, and communities;
- Mitigate forest health hazards and;
- Utilise natural landscape constraints and barriers

4.0 Inventory Summary

4.1 Forest Cover & Volumes

Due to a lack of pre-existing stand data, Area 2 is left with limited accuracy and viability of polygon volumes because they were derived from a light cruise of the stands (15 plots over 76.6ha). In other words, a full cruise is recommended in order to verify the volumes and subsequent AAC calculations found in this management plan.

Area 2 is characterised by second growth Douglas-fir domination. There are distributed patches of merchantable Cw, Hw, and Pl, but Fd is largely the commercial tree for initial harvests. Grades are fairly uniform, composed mostly of sawlog H and I grades. A sizable pocket of high value timber, predominately Douglas-fir and western red cedar, is found along the northern boundary between Witchcraft Lake and the rock bluffs. This section coincides with high site indices and 01 site series. Other areas of high value timber exist, however, they are not accessible by road.

Total stand volume is **538m³/ha** (Cw 53.8m³/ha; Plc 53.8m³/ha; Fd 432m³/ha) (Appendix A) with an average density of 625 sph. This is bound to vary from polygon to polygon, and site index to site index. For the purposes of an overview management plan, the above noted volume/hectare is used for the forthcoming timber development plan.

4.2 Roads

The primary harvesting opportunities in Area 2 are located in the eastern section, south of Witchcraft Lake and adjacent to Island Timberlands (IT) forested lands. Existing IT roads that lead to the shared

property line provide excellent access to this timber. This area could only otherwise be accessed from Benson View Road, which is not a recommended access point due to the volume of residential and recreational traffic on this City of Nanaimo owned road.

The IT owned road in the southeast (steeper section) would require minimal resurfacing (class 1), some clearing (class 2) and potentially widening for sections of 100 to 200 metres. Most of the existing 5km road (which exits at Nanaimo Lakes Road) is currently activated and was being used for active hauling at the time of this recce. A natural bench runs across this southeastern section of Area 2, making road construction and block layout feasible with little to no end haul.

The second existing road, also owned by IT, runs through their recently harvested cutblock forming the eastern boundary. The proposed extension of this road runs through the lower portion of the THLB. One of the recreation trails was likely an old logging road, and is conveniently located where the proposed road should go. Therefore, minimal road clearing will be necessary and costs will be kept low by capitalising on this partially constructed passageway. Existing and proposed road locations visible on the development map (Appendix B)

A Road Use Permit must be erected to take over responsibilities for these privately owned roads in accordance with Island Timberlands.

4.3 Site Series & Soils

Area 2 (CWHxm1) has a variety of site series and soil types (Appendix C). This is due to the range of topography and slopes on the northeast face of Mt. Benson. Five distinct site series were identified in Area 2. In general, Area 2 is characterised by steep slopes, coarse well-drained soils, very dry to fresh moisture, and poor to rich nutrient regimes. The drainage pattern is marked by a significant presence of rock outcrops and cliffs—resulting in rapid response to precipitation events. Table 1 summarises the plots:

Table 1: Site series plot summary

Plot #	SS	SMR/SNR	Type	Humus	Texture	CFC %	Timber	Rooting	Structural Stage	Site Factors
1	01	3C	Podzol	Moder	SL	45	Fd75Cw20Hw5	No restrictions	6	DRL
2	02	1B	Brunisol	Mor	LS	70	Fd95Ar5	Bedrock (40cm)	5	Sensitive plants
3	03	2C	Brunisol	Mor	SL	65	Fd90Cw5PI5	No restrictions	5	None
4	05	3/4D	Podzol	Moder	FSL	40	Cw45Fd30Hw20Dr5	No restrictions	6	Windfall hazard
5	01/05	3C/D	Podzol	Moder	SL	55	Fd40Cw35Hw25	No restrictions	6	DRL, chimneys

Refer to the Inventory Report for a more detailed description of the above table, including vegetation cover.

4.4 Riparian

Within Area 2 there are a series of unmapped, unnamed, and unclassified streams. We have identified Stream 1 and Stream 2 as streams worthy of consideration in our planned harvest area. All other streams drain into McGarrigle Creek and are within the area we have defined as valuable retention for recreational and biodiversity attributes. Above the south-east boundary of Area 2 is a large fan. A second fan was noted close to where Stream 3 meets McGarrigle Creek. One of the official trails passes this fan placing it out of the potential harvest area.

Witchcraft Lake is classified as an L2 lake based on its size and surrounding BEC unit. The planned harvest area for Area 2 exceeds the required 10m reserve zone and 20m management zone width. Through consultation of John Morgan from VIU's RMOT department, we confirmed that Witchcraft Lake contains stickleback, but no other fish. Table 2 summarises stream inventory:

Table 2: Stream summary

Feature	Stream, Lake, Wetland	Class	Average Width (cm)	Average Depth (cm)	Bank Gradient	Flow Gradient	Substrate	Comments
Stream 1	S	S6	134	12	10%	15%	B 20% ; C 20%; G 60%.	Seasonal. High CWD.
Stream 2	S	S6	104	8	10%	18%	B 5%; C 20%; G 60%; F 15%.	Seasonal. Ripple complex.
Stream 3	S	S6	210	15	10%	35%	O 20%; F 10%; G 10%; C 30%; B 10%; R 20%.	Perennial. Several waterfalls present. Fan present at low end of stream.
McGarrigle Creek	S	S5	368	13	80%	10%	O 15%; F 50%; G 10%; C 15%; B 10%.	Perennial. Severe erosion and stability issues along banks. Labelled S6 but has S5 widths.
Witchcraft Lake	L	L2	N/A	N/A	N/A	N/A	N/A	Located outside of Area 2. Contains stickleback. Heavy recreational use in area.

4.5 Sensitive Sites & At-risk Plant Species

The sensitive sites in Area 2 include each rock outcrop visible in Appendix B. Not only do the outcrops bear relatively shallow and coarse soils prone to erosion, but they also support a diverse community of bryophytes. These include: Oregon beaked moss, step moss, lanky moss, electrified cat's tail moss, and traces of red-stem feather moss. Hazards associated with improper management of these sites include windthrow, erosion, and destruction of habitat. There is also an abundance of lichens, both arboreal and ground. Riparian areas may bolster a range of sensitive plant communities, however, none were observed during field recce.

Consequently, a vegetation assessment should be carried out along streams and rock outcrops for a full inventory of noted species as well as potential Blue and Red-listed plants. The following species may occur on the outcrops or riparian areas (Ministry of Environment, 2014):

- Rough-leaved aster
- Deltoid balsamroot
- Purple sanicle
- Streambank lupine

4.6 Forest Health

There are *Phellinus weirii* concentrations in multiple sections of our management area, mostly along the lower slopes and nearby McGarrigle Creek. Concentrated patches are denoted on the Forest Health map (Appendix D). Albeit the documented patches, laminated root rot is dispersed in low severity throughout most of the 01, 01/05, and 05 site series polygons. The tree species present and those to be replanted after harvesting are also susceptible to other root rots including *Armillaria ostoyae*, *Phaeollus schweinitzii*, and *Heterobasidion annosum*.

Hemlock dwarf mistletoe was not observed but is likely present given the component of Hw in some sections. If the parasite is not currently established it may develop in the future. Potential hazard areas are denoted in Appendix D.

Deer browsing is a guaranteed hazard throughout the entire THLB. Throughout the field recce numerous signs of ungulate activity were observed. Deer browsing has proven to be a serious issue in the rest of the woodlot and will also have to be managed in Area 2.

Due to the lack of western white pine in Area 2, the fungus *Cronartium ribicola* is not a likely problem.

4.7 Wildlife

Area 2 contains a broad range of habitat types that would support a number of different animals. The rocky outcrops bore the greatest amount of ungulate activity and the lichens are probable winter food sources for deer. Riparian areas have the potential to foster amphibious life as well as a variety of bird species due to favourable habitat created by diverse morphological features. The WL020 Management Plan outlines the following animal species seen in the woodlot:

- Black-tailed deer
- Black bear
- Beaver
- Red squirrel
- Cougars
- American robins
- Red-tailed hawks
- Ravens
- Turkey vultures
- Chestnut-backed chickadees
- Woodpeckers
- Barred owls
- Bald eagles

Though this list is not completely exhaustive, these are the most common species occurring in the woodlot. It is improbable that bears or cougars frequently inhabit Area 2 due to the proximity of residences, nearby forestry activity, and recreational usage of the area. Only deer, squirrels, robins, chickadees, woodpeckers, and barred owl were observed during recce. Red-legged frogs may occupy the slower moving parts of the various streams in Area 2 (SARA, 2014).

Fire history, root rot, and wind events have left a strong component of legacy wildlife trees throughout the management area. Particular concentrations of wildlife trees are present throughout the WTP on the Timber Development map (Appendix B). A total of 21 snags were documented for their location, species, diameter, height, limbs, and likely animal usage. Refer to the Inventory Report for further detail on snags.

4.8 Recreation

Area 2 contains a series of official and non-official hiking and cycling trails. The GIS database for the Woodlot 020 contained trail data from 2009 and 2012 provided by the RDN and the Nanaimo Mountain Bike Club. The majority of trails are too steep for mountain bike use, but there are trails in the mid-lower slopes of Area 2 that are suitable for mountain biking. Some trails have fallen into disrepair due to limited use. The official trails within Area 2 receive heavy foot traffic due to its connection from Witchcraft Lake Park and Mount Benson Regional Park.

Three Geocaches have been identified to be in or adjacent to Area 2. None of these are within the planned harvest area and since Geocachers generally follow existing trails they are included as trail-users.

The location of our planned harvest area is only likely to affect two non-official trails. One was categorized as low priority, but the other is heavily used and is high priority (as it connects to Westwood Lake's trails). There is no viable alternative but to harvest around this trail.

Some of the steeper rock bluffs are ideal locations for rock climbing. Equipment and climbing anchors were observed during field recce.

With the confirmation that there are only stickleback in Witchcraft Lake, there is no concern over recreational fishing at the lake.

4.9 First Nations

No evidence of previous First Nations use, such as bark stripping or culturally modified trees, was observed during the various walkthroughs of the block. Additionally, no monumental cedars were observed in the block. However, there are a few areas containing a moderate concentration of mature western red cedar, such as within the 05 site series polygon. The rock outcrops have extremely high concentrations of salal in vigorous form. These areas provide a wealth of berry foraging and flower salal picking. Edible mushrooms likely grow in the richer site series polygons contained within the WTP and recreation corridors.

5.0 Timber Development

5.1 Annual Allowable Cut

It should be restated that for Area 2, *forest cover polygon volumes* are absent from any accessible databases, GIS attribute tables, timber supply analysis, or other resources. As a result, volume was derived by a means of comparison to the woodlot's overall AAC. As previously mentioned, average volume per hectare was determined with a cruise lacking total statistical validity, and the licensee will therefore make an amendment to this plan once a thorough cruise has been performed and a viable inventory established. For the intent and purpose of this report, AAC is generalised and subject to a degree of inaccuracy and variability.

The concept behind the modified AAC calculation begins with determining the percentile difference in non-harvestable landbase between the woodlot and the management area. Thereafter, this difference is applied to the woodlot's AAC as an adjustment factor; in the case of Area 2, it is a subtraction since the inoperable/non-harvestable land base of the management area is relatively greater than that of the woodlot.

5.1.1 THLB

Table 3 summarises the various non-harvestable land bases, including NP, roads, reserves, and buffers.

Table 3: Non-harvest summary

Land Base	Area (ha)
No harvest (WTP, rocks/buffers, NP)	44.7
Roads	0.78
Partial harvest (20% stream buffers)	0.70
Total non-harvestable land base	46.2

The THLB is thus determined by subtracting non-harvestable land from the total land base: 76.6ha-46.2ha=**30.4 ha**. The percentile THLB is **40%**.

5.1.2 AAC Calculation

According to the WL020 Management Plan, out of the 1700ha area, only 1300ha is harvestable. As such, the woodlot's total THLB is 76% and 24% non-harvestable. The *adjustment factor* is the percent difference between the woodlot's percent non-harvestable and Area 2's percent non-harvestable.

Adjustment Factor=60%-24%=**36%**

Area 2 AAC=4800m³/yr-(4800 x 0.36)=**3072m³/yr**

5.2 Harvest Units

With an AAC of 3072m³/yr, Area 2 can support a cutblock size of 5.7ha when using our average 538m³/ha stand volume. This was determined by dividing the AAC by stand volume (i.e., 3072/538). Undoubtedly, assumptions are made as to the uniformity of volume distribution throughout the blocks. In other words, we are relying on the “Law of the Averages” until further stand volume data is generated.

Since this management area requires a significant degree of retention due to visual objectives and biodiversity, 30% was determined to be adequate in meeting these goals (Zielke *et al.*, 2008). The SEDA for variable retention encourages quantities of up to 40% for high value non-timber resources; however, with significant proponents of reserves and landscape barriers as is, 30% seems substantiated. In this light, multiplying 5.7ha by 130% gives a group retention opening size of **7.41ha**. This also means that the *clearcut equivalent* of retention trees is 914.6m³.

Cutblocks A, C, and D will be harvested under silvicultural strategies of aggregated retention at 30%. Cutblock B, will be harvested by using an unconventional multiple-entry system known as Variable-Density Thinning (VDT) (Appendix B). Silviculture systems will be expanded in greater detail in the proceeding sub-sections. Table 4 summarises the harvest plan in sequence:

Table 4: Harvest plan summary

Cutblock #	Volume (m ³)	Area (ha)	Silviculture System	Harvesting System
A	3174.2	7.6	Aggregated	Grapple Yarding
B	3722.7 (2 entries)	8.62	VDT	Hoe Forward
C	2905.2	7.1	Aggregated	Hoe Forward
D	3072	7.41	Aggregated	Grapple Yarding

5.2.1 Initial Harvest Unit

Cutblock A is the initial harvest unit and merchantable species composition is uniformly I-grade Fd. A rough gross value of this unit is approximately \$274,283.00. The management objective in CB-A is to generate profits by harvesting the AAC while maintaining visual quality and fortifying stand structure complexity with the aggregate retention system. Specific to harvesting, the licensee’s goal is to harvest trees in a way that preserves the integrity of the site’s productivity and ecology. Mitigating the use of ground-based machinery on these steep slopes ensures the soil will not be damaged. Furthermore, lower road densities associated with cable systems is ideal in preventing the hazard and extent of road erosion.

Selection of grapple yarding is, in large, due to the topographic constraints of this unit. Slopes range between 45-55% over yarding distances of up to 150m (uphill). Although a self-levelling hoe forwarder may be capable, the difficult colluvial terrain and necessity for tight squeezes in avoiding damage to residuals warrants favour to cable yarding due to safety concerns. Findings from the Clayoquot Sound Scientific Panel (1995) reveal that grapple yarding is feasible for

aggregated retention in linear strips. Grapple yarding is preferred over swing yarding or skyline systems due to short yarding distances and economic gain. Nevertheless, skyline yarding is unarguably the best system for VR in that it possesses superior lateral reach and log control (Clayoquot Sound Scientific Panel, 1995). It is recommended that CB-A be hand-felled.

5.2.2 Subsequent Harvest Units

Cutblocks B, C, and D are planned to be harvestable within the subsequent 4 years. CB-B is to be hand-felled and hoe forwarded in accordance to the principles of VDT. Given the nature of VDT (i.e., thinning a stand at different densities), a second (or multiple) entry will likely be needed after initial harvests since unthinned patches are let behind. Any remaining AAC volume may be reallocated and harvested in other portions of the woodlot.

CB-C is next, with the use of hoe-forwarding under the same silvicultural system as CB-A. Thereafter, another entry into CB-B is advised to allow some green-up of CB-A prior to entering CB-D, even though the WL020 Management Plan requires green-up adjacency rules only for harvest units >40ha. High visual sensitivity merits this staggered sequence.

5.3 Road Access

Refer to section 4.2 and Timber Development Map (Appendix B)

6.0 Silviculture

Variable retention and clearcutting are the preferred silvicultural systems outlined in the WL020 Management Plan and Licence Plan due to their flexibility and economic feasibility. System selections are dictated by stand structure, physiography, site factors, species silvics, and miscellaneous cut block necessities (e.g., visuals). The woodlot as a whole suffers from a wide margin between site indices as well as uneven age class distribution. In turn, commercial thinning and group selection are often constituted to bring order to the woodlot's dilemma. For the challenges present in Area 2 and a need to foster an approach focused on biodiversity, the two systems to use in the management unit are: a) *Group/Aggregated Retention* and b) *Variable Density Thinning* (Appendix B). In general, with the over-arching management goals of this IRMP in mind, the silviculture systems selected trade-off a component of harvestable timber for:

- Biocomplexity;
- Stand structure diversification;
- Maintenance of habitat carrying capacity;
- Creation of biological anchors and legacies;
- Recruitment potential;
- Connectivity and;
- Visual quality

6.1 Silviculture Systems

6.1.1 Aggregated Retention

The abovementioned management objectives are targeted with this system; groups of retained trees, especially when strategically placed, connect retention with reserves, capture age-class variation, mix up stand mosaics, support a variety of habitat types, conserve features, and break up the visual landscape. When the harvested 'strips' begin to regenerate, those cohorts will become part of a broader stand with patches of late seral groupings. Such stand dynamics ameliorate conditions for a scope of species to inhabit them and, in turn, encourage a more biologically diverse forest.

Using forest influence distribution, biological anchors, wildlife tree concentrations, and special ecosystems/microclimate as guides for retention placement will fortify connectivity and complexity. Forest influence should be targeted at 50% to remain ecologically unique from other silvicultural systems (Zielke *et al.*, 2008).

With any forestry activity, there are risks associated with a decision. For variable retention, major risks include windthrow, DMH, and long-term sustainability. Fortunately, concentrations of severe windthrow are located in the western portion of Area 2 within the WTP. As such, wind is not of particular concern since group retention provides relatively windfirm aggregates. This will also be a criterion for selecting retention patches if windthrow becomes a more apparent issue. Deep soils permit this silviculture system on even the steeper slopes. Hemlock dwarf mistletoe is acceptable in the interest of biodiversity so long severity is kept low. Hw is not a choice crop species either way.

6.1.2 Variable Density Thinning (VDT)

The area under prescription for VDT is characterised by homogenous second-growth stand structure and is bordered by creeks, sensitive ecosystems, Witchcraft Lake, recreation corridor, and the WTP reserve. The reason VDT is a viable system is because utilisation of various thinning matrixes allows supreme control over the interface between CB-B and its diverse and sensitive borders. VDT is technically a silvicultural activity but it can have such a profound effect on a stand that the licensee is assigning it as a system. VDT is an effective method in converting a homogenous stand into a stand of mixed age and species, however, its full effects require a long period of time to be completely realised (Mazza, 2009).

Since thinning at different densities—from unthinned to fully thinned (miniature patch cut)—emulates the dominant stand disturbance of Coastal BC (i.e., gap dynamics), we are able to address the management goals of recruiting and fostering late seral stand characteristics while harvesting timber. Although profits are considerably lower than clearcuts due to multiple entries, small harvests, and highly methodical layout, VDT enhances crucial components of biodiversity. Harvest priorities for cuts are recommended to target root rot concentrations first as urged in the WL020 Management Plan. Figure 2 portrays an example of VDT.

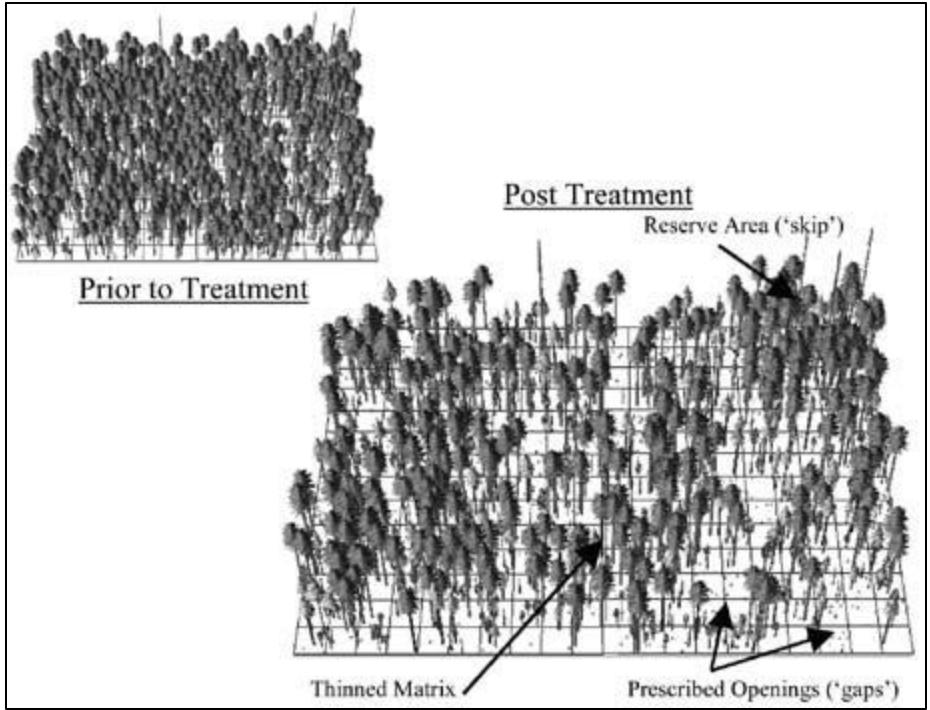


Figure 2: VDT with "skips" and "gaps" (Mazza, 2008)

6.2 Reforestation

The NAR occurs over two distinct site series: 01 and 03 (Appendix C). Therefore, two site units (SU) are defined for reforestation, each with specific species and stocking standards for artificial regeneration. The area that falls within CB-B is to be regenerated naturally with Hw and Cw given the north facing aspect unless stocking or health issues arise at time of post-harvest surveys. SU 1 will require a higher proportion of Cw in order to combat DRL outbreaks and will be entered as a preferred species. Table 5 summarises the modified stocking standards for each SU:

Table 5: SU stocking summary

SU	SS	Preferred	Accept.	TSS (sph)	MSSpa	MSSp	Spp/Ht
1	CWHxm/01	Fd, Cw	Hw, Pw	900	500	400	Fd/3, Cw/1.5
2	CWHxm/03	Fd, Pl	Cw	800	400	400	Fd/2, Pl/1.25

6.3 Stand Tending

Overall, the cutblocks under prescription are fairly productive and free of serious health issues. Careful monitoring and assessing should be maintained during regeneration in order to gauge hazard, risk, and consequent need for stand tending treatments.

Mechanical brushing is advised for reducing competition of seedlings against salal, sword fern, and possibly incurred invasive species. It is important to differentiate between *invasive* and *competitive*

species; although they may overlap, not all invasive species are competitive. Regardless, invasive species should be monitored throughout regeneration and dealt with accordingly via removal. The public should also be educated as to how to reduce their influence on the spread of invasive species, especially those that may prove highly competitive in the cutblocks, particularly Himalayan blackberry, English holly, and scotch broom.

Some site preparation may take place in order to deal with slash accumulations or severe root rot patches. Area 2 has productive enough sites to render fertilisation ineffective, especially throughout the site series 01.

6.4 Forest Health

The management goals for forest health evolve around keeping pests and pathogens at endemic levels and to prevent outbreaks with potential to cause serious damage to timber resources. Forest disease and insects play integral roles in biodiversity as well as provide a wealth of ecosystem benefits, such as decaying of CWD. They act as detritivores, decomposers, pollinators, and even as biological control agents in some cases. Therefore, it is crucial to allow acceptable levels of pathogen and insect activity in the pursuit of stand heterogeneity.

Strategies should mitigate unreasonable losses due to the pests and pathogens commonly seen on the woodlot, such as those noted in section 4.6.

6.4.1 DRL

While all prescribed conifer species are somewhat susceptible to laminated root rot, Fd is at high risk. Although root rot contributes to gap dynamics, it has a history of outbreak in WL020 and should therefore be managed intensively, both directly via stumping where site conditions permit and through planting components of alternate species resistant to the rot.

6.4.2 DMH

Hemlock dwarf mistletoe is almost ubiquitously present in Area 2 but is of low concern since it fosters wildlife habitat and Hw is not a preferred species. Management for Hw may involve eradication of infected trees in areas of severe outbreak. Moreover, doughnut buffers around cutblock edges may be spaced or planted with alternate species to ensure healthy development of naturally regeneration Hw seedlings.

6.4.3 Deer Browse

Both Douglas-fir and western red cedar seedlings have suffered serious casualties and has resulted in an expensive toll on the licensee. Deer browsing must be mitigated in regenerating cut blocks, especially since sizable reserves have been set aside for ungulates in Area 2.

Strategies for lessening the impact of deer browse may include the installation of sino-cast cones on planted seedlings, use of Vexar, and if available, the planting of enhanced stock (e.g., turpentine, repellent). Sino-casting is a costly endeavour as they must be monitored throughout life of seedlings until they are outgrown. Conversely, the cost of stunted and malformed growth from browsing is much greater.

7.0 Other Resource Values

Area 2 is an important resource for the public at large and management is heavily focused on balancing social, environmental, and economic needs while providing a multi-use land base for all to enjoy. The dynamic physiography and location at the base of one of Nanaimo’s most popular hiking destinations offers unique opportunities for management. It should be acknowledged that a large portion of the non-harvestable land base contained in Appendix B is dedicated to the enhancement, conservation, and progression of a range of non-timber resources and users.

7.1 Biodiversity

As previously mentioned, the focus of this IRMP is on biodiversity. Upon initial field recce it became apparent that the management area would be nearly divided in half; the west dedicated entirely as a large reserve and the east mostly to THLB. Even the harvesting systems were selected to address the enhancement of biodiversity by varying the stand structures and connecting harvest areas to reserves and sensitive ecosystems. The management goals attributed to biodiversity have been stated numerous times throughout this document yet its importance cannot be overstated.

The scale of biodiversity management is being addressed at both stand level and on a broader level. Table 6 outlines the management objectives and how they have been accounted for:

Table 6: Biodiversity mgmt summary

Management Goal	Strategies
Enhance late seral attributes	VDT, 30% retention harvest, sizable WTP
Overlap reserves	Recreation with WTP, salal foraging with sensitive outcrops and ungulate winter range
Maintain connectivity	Retention harvests connect to rock bluffs and WTP
Protect fragile sites & species	Firm 10m no harvest buffer around rocks, 20m 20% basal retention buffer along streams
Diversify habitat	Combination of variably thinned densities, stand age/type mosaics, reserves, corridors, plantations, etc.
Balance with other resources	Retention meets both biodiversity and visual needs. Reserves overlap multiple resources.

7.2 First Nations

The management objectives for FNs include full inclusion into planned activities at various phases of development and conservation of resource values, whether they be spiritual, material, or cultural. Consultation at planning phases and harvest phases will be carried out in hopes of conducting a collaborative field assessment of any features to be excluded from harvests. First Nations bands will be given opportunities to extract resources for an agreed period of time prior to harvests if no permanent reserves are formally established.

Currently, the most significant component of cedar trees is already excluded from harvests and is located within the 05 site series in the WTP reserve. Furthermore, berry foraging grounds are placed in permanent reserves for the sensitive rocky outcrop ecosystems.

The licensee would seize an opportunity to foster an integrated relationship with local bands to acquire traditional ecosystem management techniques and provide educational workshops/field trips for VIU students.

7.3 Recreation

Of the many trails delineated in Appendix B and discussed in the inventory report, only the RDN recognised trail has been assigned a 50m no harvest buffer. However, other high-use trails are safely preserved within the confines of the WTP. The trail running along Witchcraft Lake through cutblocks B and C is being converted to a forest harvesting road. Upon the completion of harvests and regeneration, the public may decide whether to retain the road or have the licensee deactivate and rehabilitate.

The management objectives for recreation are to encourage continued use of the Mt. Benson regional park and provide visitors with an opportunity to learn about integrated resource management with a real life example. Ideally, such a scenario would spark interest in the public to become responsible and involved stakeholders in resource management and conservation. Other activities that take place include mountain biking and rock climbing. Infrastructure for both activities will remain intact as the licensee is willing to relocate trails when feasible. Rock climbing areas are contained in the sensitive rocky outcrop reserves.

7.4 Wildlife

Management goals for wildlife evolve around supporting a variety of habitat types, maintaining connectivity between these habitats, and ameliorating biodiversity through the selected reserves and silvicultural systems. The animals described in the inventory will benefit from the diversity of stand types, ages, and densities throughout Area 2.

The large WTP acts as a “laissez-faire” area where natural ecological processes will not undergo any form of management. In turn, CWD, wildlife trees, and natural disturbances will continue to develop over time into its progression towards a late seral forest.

The sensitive ecosystem buffers surrounding the rocky outcrops and cliffs provide an important winter food source for deer and elk, meanwhile harvesting activities create spring forage opportunities for the ungulates.

Riparian fauna is encouraged since amphibious life is often associated with a biologically diverse ecosystem. The 20m RMAs should maintain adequate shading and not adversely affect drainage patterns of streams.

7.5 Visual Quality

Visual quality is an important factor in the management of Area 2 as it lies in the “sensitive” VQO. Once again, the licensee has planned to capitalise on the flexible nature of variable retention and satisfy both

visual quality objectives and biologically-focused timber extraction. Since the Witchcraft Lake slopes of Mt. Benson are a cherished viewpoint for a major portion of the City of Nanaimo, natural landscape barriers such as the Westwood Ridge are utilised to obscure long-distance views of harvests while placement of roads on flat benches blends the unnatural linear features with the mountainous topography.

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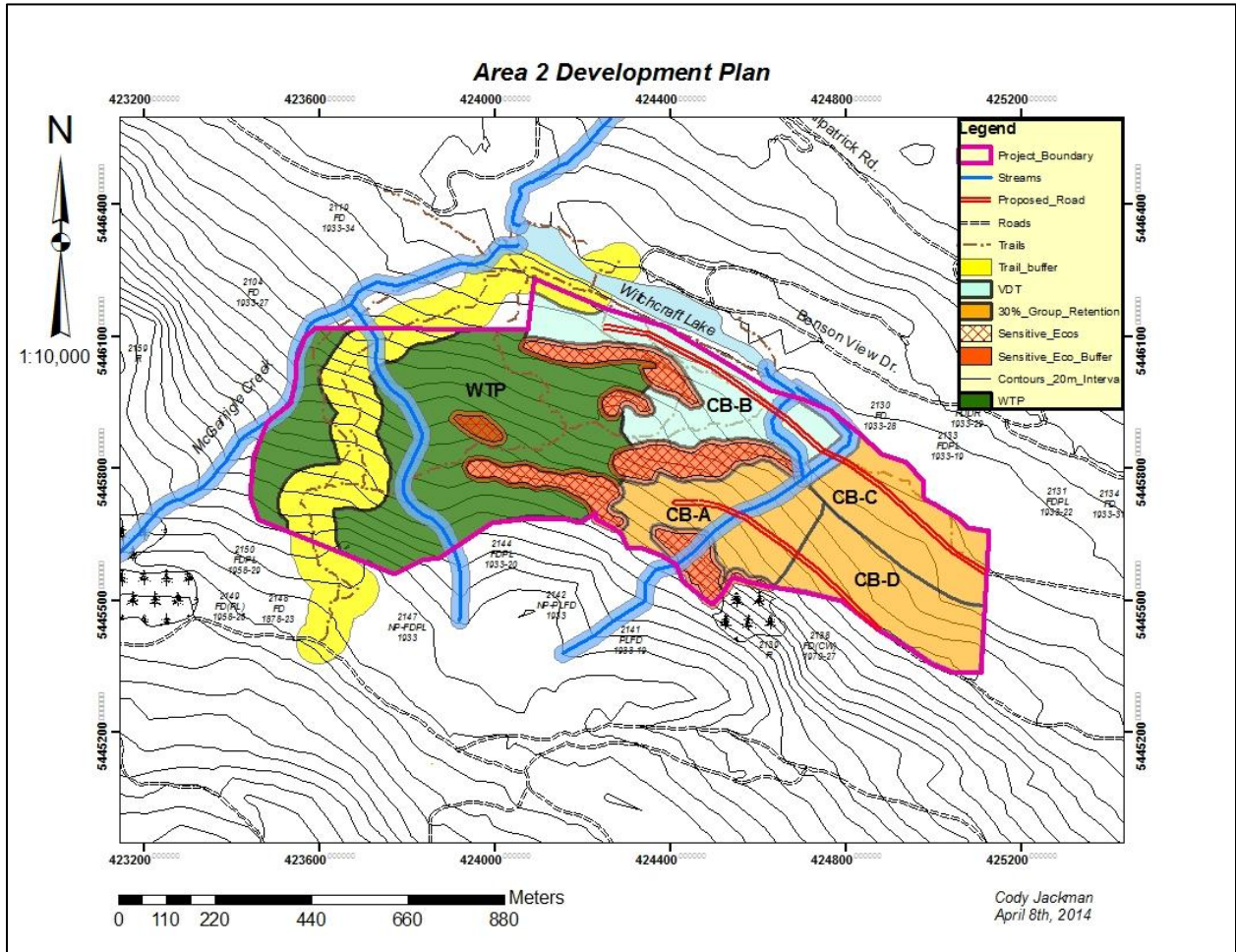
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Appendices

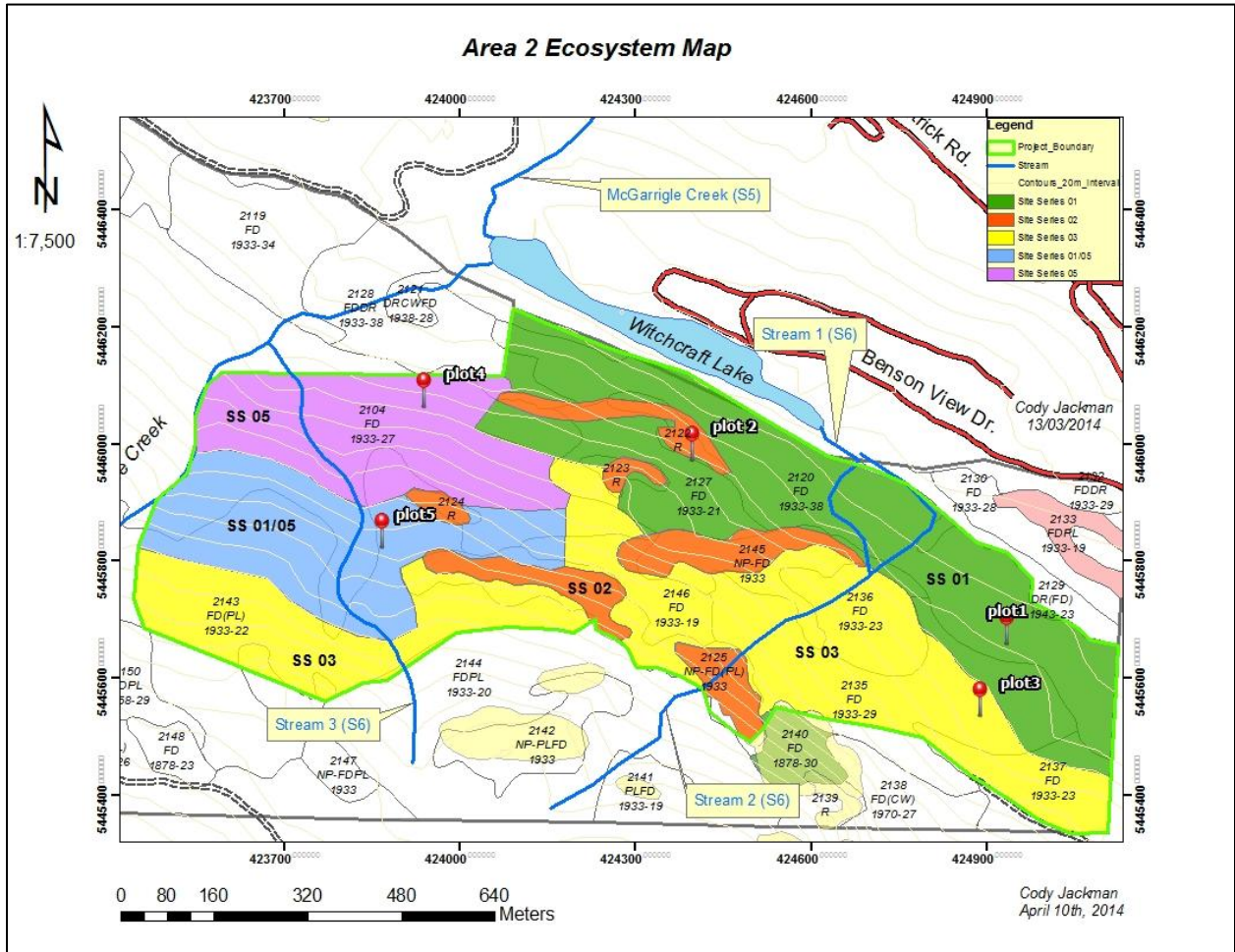
Appendix A -Volume Summary Table

Plot #	Total Trees	Merchantable Volume (m ³)
1	5	177
2	4	802
3	3	268
4	6	556
5	2	465
6	6	589
7	4	223
8	3	256
9	4	450
10	3	332
11	5	803
12	4	439
13	2	180
14	6	774
15	3	206
Mean Volume per Hectare		538.65m³/ha

Appendix B – Timber Development Map



Appendix C – Site Series Map



Appendix D – Forest Health Map

