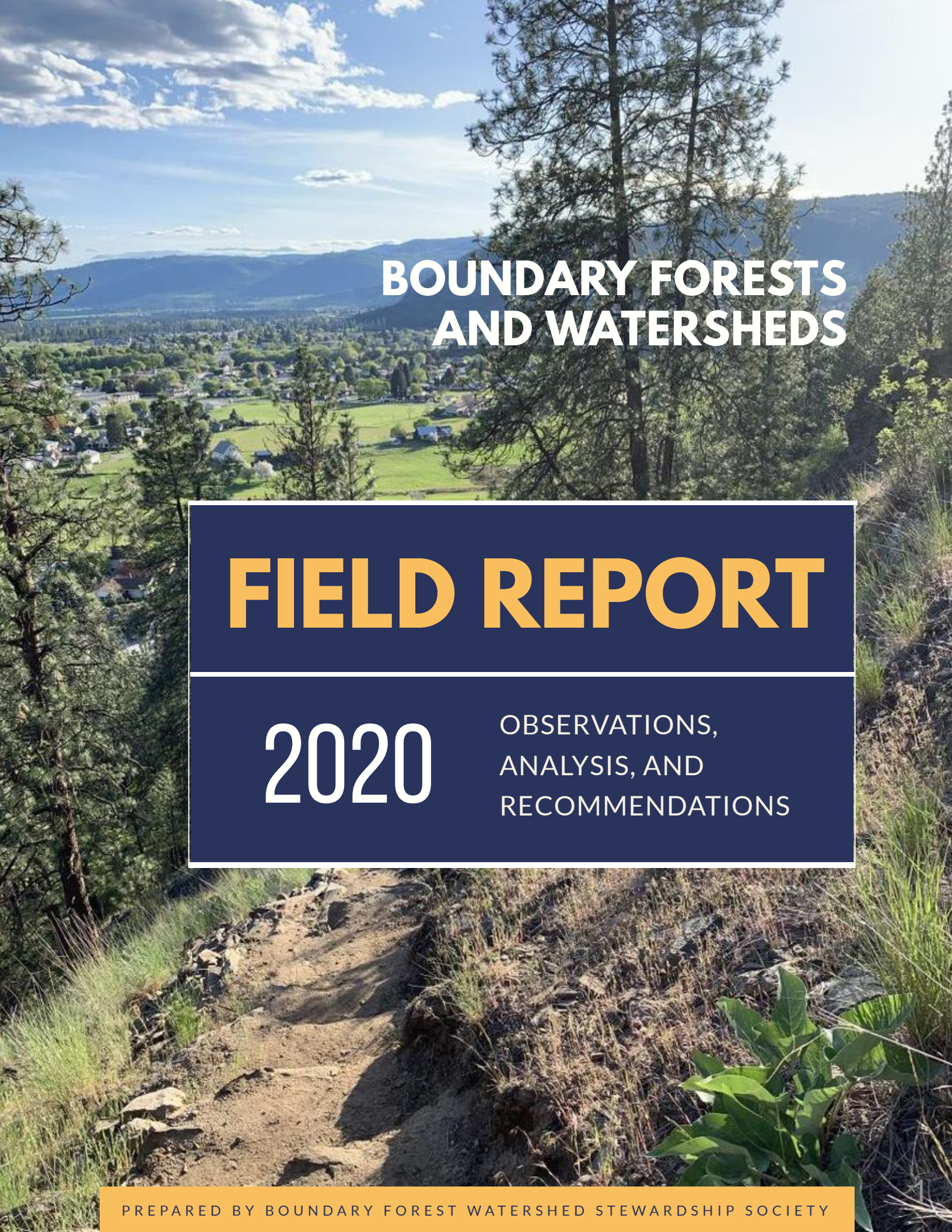

BOUNDARY FORESTS AND WATERSHEDS

FIELD REPORT

2020

OBSERVATIONS, ANALYSIS, AND RECOMMENDATIONS

PREPARED BY BOUNDARY FOREST WATERSHED STEWARDSHIP SOCIETY

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This report would not have been possible

without the countless hours that Stan Swinarchuk and Wayne Tblus spent reconnoitering throughout the Boundary watershed. It is, in a big way, thanks to their dedication and love for the forests that this information is being shared.

Thanks to Al Grant and Noel Giffin for the time they have spent documenting the watershed.

We are grateful to Patagonia for the financial support that partially funded this field report.

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INTRODUCTION

From July 21 to 24, 2020

members of BFWSS, Stan Swinarchuk, Wayne Tblus, Roy Schiesser, and Jennifer Houghton, along with Forester-in-Training, Erik Piikkila, visited a number of sites in the Boundary watershed to record conditions and concerns. Most of the information and photos in this report were recorded that week. Some of the photos and observations were recorded in June and are marked accordingly. Video of these sites is available.

Both Stan Swinarchuk and Wayne Tblus have decades of previous logging experience in the Boundary. As a result of the extensive amounts of time they still spend travelling throughout the watershed, they are experts on local forest conditions. Stan has been fishing, hunting, and logging in the Boundary for over 60 years and has in depth knowledge of the ecosystems, wildlife, and forestry activities. Wayne Tblus is a retired logging equipment operator and also did logging layout for winter mule deer range in the region.

Roy Schiesser, has a BSC in Biology and Ecology, and has worked with the Granby Wilderness Society, professional biologists, and citizen scientists on the preservation of habitat for the South Central Kettle-Granby Grizzly population. He lives north of Grand Forks in the North Fork/Granby River valley and sees logging happening in his back yard.

The observations in this report were contributed by the entire team.

The Boundary region is home to many varied forests

including the dry Ponderosa Pine Zone, the drier Interior Douglas-fir Zone, the wet interior Cedar Hemlock forests, dense Lodgepole Pine, Montane Spruce, Engelmann Spruce, and the sparse subalpine Fir forests.

There are challenging mountain terrains, high precipitation zones, and high elevation sites in the snow zone. Throughout these diverse areas there is an abundance of regenerating tree plantations, stands of old growth, too many clearcut cutblocks, and over 16,000 kilometers of logging roads.

The forests of the Boundary, with their diversity of species and magnificent hillsides and mountain ranges, are a wonder to behold. Created by glaciers thousands of years ago, this landscape was formed by water. Now, the damage caused by unsustainable forestry is causing erratic water flows and flooding, habitat destruction, the loss of biodiversity, and undoing the balance struck over millennia.

1. Cedar-Hemlock Old Growth Forest Adjacent to Pine Plantation

General information:
This stand of old growth hadn't experienced a disturbance, such as fire or logging, in many years- perhaps hundreds or a thousand.

Compared to the clearcut and regenerating conifer forests beside it, this old growth stand is brimming with variety. It is a mix of various tree species, ages, amounts of decay, dead trees or snags, and downed logs or coarse woody debris on the ground.

A classic example of Boundary old growth, there were multiple layers of tree canopies consisting of different tree species. There was a variety of shrubs in the understory. The amount of coarse woody debris in the form of standing snags and logs on the ground that has accumulated over the centuries was striking. A wide variety of habitats is available here .

The cool air and shade in the forest was noticeable compared to the temperature in the adjacent regenerating plantation that was planted after clear cut logging.

Date of Visit: July 21, 2020
GPS: N 49°23.354' W118°32.667'
Elevation: 3792ft, 1155m

Watershed or sub-watershed:
Almond Creek watershed feeding the Granby River

Original ecosystem or forest type:
Cedar-Hemlock, Old growth

Tree species observed:
Old growth forest consisted of cedar, hemlock, larch, fir, spruce, yew. Plantation consisted mainly of lodgepole pine.

Cedar-Hemlock Old Growth Forest Adjacent to Pine Plantation

Condition of trees/ current growth status:
Undisturbed old growth forest next to pine plantation. It is a thriving example of old growth with sp,e hemlock and cedar trees at least 250 years old. See photos below for more of the features of the old growth forest. Adjacent plantation zone: originally old growth, was clearcut approximately 25-30 years ago. The plantation consists of 80-90% lodgepole pine growing thickly. There are also a few larch and fir interspersed – possibly planted or possibly seeded by the nearby old growth.

Soils, hydrology:
Old growth zone –The top layer of duff (needles, dead vegetation, decaying medium to fine matter on forest floor) is acting as insulator for moisture. A few inches below the duff is dark mineral soil with a high moisture level. Rotting materials from downed logs and caverns underneath are providing habitat for microorganisms and fungi. The forest floor smells of rich humus.

Wildlife (type of habitat, evidence observed):
Scat and tree bark rubbing showed evidence of bears. Stan has previously observed woodpeckers, squirrels, northern flickers, and grouse along with their habitats. There were moose tracks and deer tracks. Kinnikinnick berries provide food for wildlife.

Problems, concerns, issues:
A cutblock was laid out with flags nearby. We are concerned that this patch of old growth might be logged as part of this cutting permit.
Pine plantation: In the first 10 years of growth the pine will grow quickly because there is enough sunlight coming through. The stand is currently very thick that the trees are now competing with each other for sunlight and for nutrient uptake via the roots. Because of the crowding it will take a long time for the trees to grow to merchantable size. The rotation age for pine is 75 years. This block is so thick it may not grow to a large enough diameter for cutting in that time period. Climate change may also slow the growth. That makes this a good candidate for a spacing project, i.e. cutting trees out so there is spacing between them of 6-10 feet. Without spacing, this block would likely only be useable for chips or pellets. The cutting for spacing would be done with chainsaws. The cut trees would be left on the ground to rot and create more nutrients in the ground and hold moisture.

Other comments:
It was a hot day. Inside the old growth forest the conditions were much cooler than inside the pine plantation.

Analysis/Recommendation
We recommend that this unique and special patch of old growth be protected and never logged.

Cedar-Hemlock Old Growth Forest Adjacent to Pine Plantation

Wayne Tblus and Stan Swinarchuk beside a 250 year old hemlock tree. Cedar, spruce, fir, larch were also present.

Wildlife tree. Holes in dead cedar provide homes for woodpeckers and other wildlife. On the ground is coarse woody debris in the form of a large larch log holds moisture. As it rots it adds nutrients back into the ground.

Variety of trees (cedar, fir) at different levels providing species diversity and varied canopy levels, providing homes for a variety of species. Ferns and other plants on the forest floor. Some of the understory plants provide berries and forage for animals. Larger trees cast seed onto the nutrient-rich forest floor and seedlings sprout in the dappled light.

Cedar-Hemlock Old Growth Forest Adjacent to Pine Plantation

An old growth forest with a mix of cedar, hemlock, fir, spruce at different stages of growth with canopies at different levels.

Roy Schiesser stands inside the old growth forest. Combination of large standing trees and large downed trees provide both shade and woody debris to maintain the moisture level of the forest floor. Multiple species include fir, cedar, hemlock, downed larch. Dappled sunlight allows seedlings to grow. This is an untouched natural forest. Temperature inside this partially shady old growth stand was a few degrees lower than outside in the plantation on a hot July day.

Light green clear cut regeneration (front) next to dark green undisturbed old growth cedar-hemlock forest (rear).

Adjacent to the old growth forest (front of picture to left and right) is a plantation zone (shorter trees). Note the difference in height of the plantation and the old growth.

Stan Swinarchuk and Erik Piikkila within the old growth forest. Large fallen logs include larch, cedar, and hemlock. Downed trees absorb carbon. Different tree species rot at different rates, thus providing a constant supply of nutrients to the soils. Fir rots more quickly than cedar which rots very slowly. Rotting logs provide homes for insects, microorganisms, and fungi. Many of the downed trees were large like this example.

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2. Whitebark Pine and Old Growth Subalpine Fir

General information:

Whitebark Pine (Pinus albicaulis) is growing at a high elevation .

Whitebark Pine is rare and under threat. This is a microhabitat (of Whitebark Pine)as defined by the BC BioGeoClimatic Site Series.

There are Whitebark Pine conservation efforts underway in northwest BC. We recommend that the BC government collect information on Whitebark pine in the Boundary as well to contribute to conservation efforts.

Date of Visit: July 21, 2020
Location: N 49°25.716' W118°42.884'
East Patarageous Road, top end of Boundary Creek summit
Elevation: 6593 ft, 2009 m

Watershed or sub-watershed: From this summit some water flows down into the Granby side/ Gable Creek and some flows into the Kettle River side

Original ecosystem or forest type: Old growth Subalpine fir with Whitebark Pine patches

Tree species observed: Subalpine fir, Whitebark Pine

Whitebark Pine and Old Growth Subalpine Fir

Significance of Whitebark Pine

“Whitebark Pine is a keystone species, essential to ecosystem function on many alpine and subalpine sites. Whitebark Pine performs a number of ecosystem services (particularly where it is the dominant tree species), including: moderating snowmelt and run-off, initiating tree islands and facilitating recruitment of more shade tolerant species, pioneering harsh sites, and providing food for wildlife" (Tomback, 2001).

The seeds in the purple cones are an important food source for Clark's Nutcrackers, Red Squirrels, Grizzly Bears, and other high elevation, mountain-dwelling wildlife (Felicetti, 2003).

Whitebark Pine co-evolved with, and formed a mutualistic relationship with the Clark's Nutcracker. The nutcracker disperses pine seeds by burying them in small caches for retrieval during times of low food availability. Unretrieved caches may germinate new trees. The distribution of Whitebark Pine across the landscape is almost exclusively due to the caching behaviour of the Clark's Nutcracker (Hutchins, 1982)

Whitebark Pine tends to produce mast cone crops at irregular intervals of 3-5 years (Morgan, 1992) (Crone, 2011), thus large cone crops are often followed by several years of little to no cone production (Sala et al. 2012). Once established, it takes between 30-50 years for trees to begin producing cones, and 60-80 years to produce cones in a sizeable quantity (COSEWIC, 2010).” (Government of Canada, 2017)

Whitebark Pine seedlings are hard to see. They grow intertwined with other trees. There were very few seedlings growing around the mother trees. The seedlings we observed were growing in sunny patches and varied in height from 2 to 6 feet. The needles on some seedlings looked pale and yellowish.

Whitebark Pine Forest and Old Growth Subalpine Fir

Condition of trees/ current growth status:
There are two sets of clear cuts of Subalpine fir ecosystems. One is currently regenerating and the other is very recent. Surrounding the clear cuts are old growth subalpine fir ecosystems with patches of Whitebark Pine. The older trees are displaying some rot.

Soils, hydrology:
Dark, very moist soils, and some very wet soils. Soils are also rocky and shallow. Throughout this high elevation, high-snowpack ecosystem there are streams of water pouring out through the rocks and shallow soil. Even in the month of July there is still a great deal of runoff as snow melts. The areas that have been clearcut display a lot of exposed light-colored rock.

Wildlife (type of habitat, evidence observed):
Mule deer, grizzly bear, elk, owls, pilated woodpeckers –fewer and fewer each year. Mule deer used to be in abundance but now are rarely spotted here.

Problems, concerns, issues:
The Whitebark Pine patches are in a cutblock that is flagged for logging. There are flags marking a road to go through the subalpine fir old growth.

Clearcutting is already negatively impacting the hydrological function of the ecosystem by reducing the trees and vegetation that mitigate the flow of water in these shallow rocky soils.

The presence of tree canopies slows snow melt. Needles and branches from live trees help create organic material that build soils which hold water. Roots slow the movement of water and absorb water.

In the surrounding clear cut areas where there are no longer forests to mitigate the movement of water, the flow is carrying sediment down the slopes and across and down roads. The downstream effects of the movement of all this water include sediment build up in streams and river and increased seasonal flooding. Clearcuts in this wet highland result in soils drying faster and less moisture available to sustain the vegetation. This high elevation is already a harsh environment which is challenging for trees to grow in. In the era of climate change, the clearcutting of trees at this high elevation creates the risk that the subalpine trees will not grow back.

Analysis/recommendation

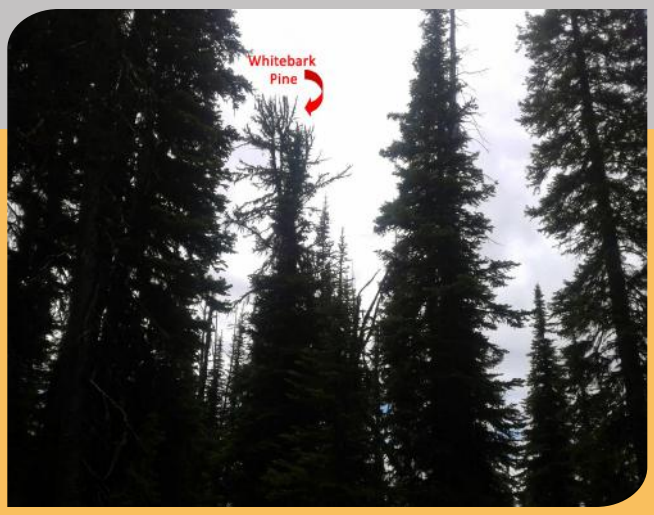
This area must not be logged at all due to the presence of Whitebark pine

Whitebark Pine Forest and Old Growth Subalpine Fir

Upper canopies of Whitebark Pine

Dead standing old growth Whitebark Pine trees

The forest around the whitebark pine was very moist. There were extensive above-ground streams and small water pools. There were still mounds of snow scattered throughout the shaded areas.



Upper canopies of Whitebark Pine

Whitebark Pine trunks

3. High Elevation Steep Slope Clear Cuts and Crushed Culverts

Condition of trees/ current growth status:
Newly clearcut zones and steep slope clearcuts surrounded by some old growth subalpine fir forests and some older clearcuts. This site is BCTS tenure and was logged by Lime Creek Contracting.

Soils, hydrology:
Very moist but shallow top soils and also very rocky. Snow melts from May to August with water pouring down the slopes.

Wildlife (type of habitat, evidence observed):
Black bear, grizzly bear, elk, mule deer – populations are in decline. The clearcut leaves no habitat, food, or shelter.

Date of Visit: June 24 and July 21, 2020
GPS: N 49° 29.012 W 118° 39.133
Elevation: 5329ft, 1624m

Watershed or sub-watershed:
Boulder Creek watershed flowing into the Granby River

Original ecosystem or forest type:
Old growth high elevation subalpine fir, very moist soils, 6-15 feet of snow in winter (there used to commonly be 15 feet of snowpack, it has been declining in recent years).
Tree species observed: Spruce, balsam, perhaps some larch

High Elevation Steep Slope Clear Cuts, Crushed Culverts

Problems, concerns, issues:

• Subalpine high elevation logging disrupts water holding capacity of forests and increases flows.

• Two 4-5 foot culverts were crushed from boulders being rolled onto them. One of them was crushed to half its diameter. This will interfere with water flow and will probably become blocked over time.

• Clearcutting high elevation subalpine old growth forests: these forests are very rare and take centuries to mature. Natural soils are moist because the trees hold in the moisture. Without the trees, snow will melt faster in the spring which has the possibility to contribute to higher peak flows in valley bottoms. Then in the summer, lack of shade will cause the soils to dry out making it less likely for seedlings to grow in the warmer, hotter conditions of climate change. Very little top soil is available for seedlings to take. The growing season is extremely short and seedlings will struggle to grow.

• Clearcutting steep slopes at high elevations: without trees to hold the shallow soils on top of the rocky terrain, erosion is going to occur more quickly. Seedlings will struggle to grow on these slopes.

• Oil was spilled onto soil and never cleaned up. This will flow into the water courses and cause damage to aquatic life.

• Many large trees were cut down and left behind as well as sections of the trees that were rotten. Trees are being cut above the rotted section of the butt then the rotted section is left behind. We estimate that only 1/2 to 1/3 of each tree cut is actually being used due to the remainder being rotten and left behind.

Analysis/recommendation

•Immediately stop clearcutting these high elevation subalpine forests in the Boundary. The potential negative impact on flooding is extremely high. These rare ecosystems should also be preserved for their contributions to biodiversity. They are not likely to regrow due to climate change and extreme weather conditions at that elevation.

•Immediately stop clearcutting steep slopes (at this and any elevation).

•The operators responsible must be required to immediately clean up (at their own expense) the oil spill and replace the crushed culverts.

High Elevation Steep Slope Clear Cuts and Crushed Culverts

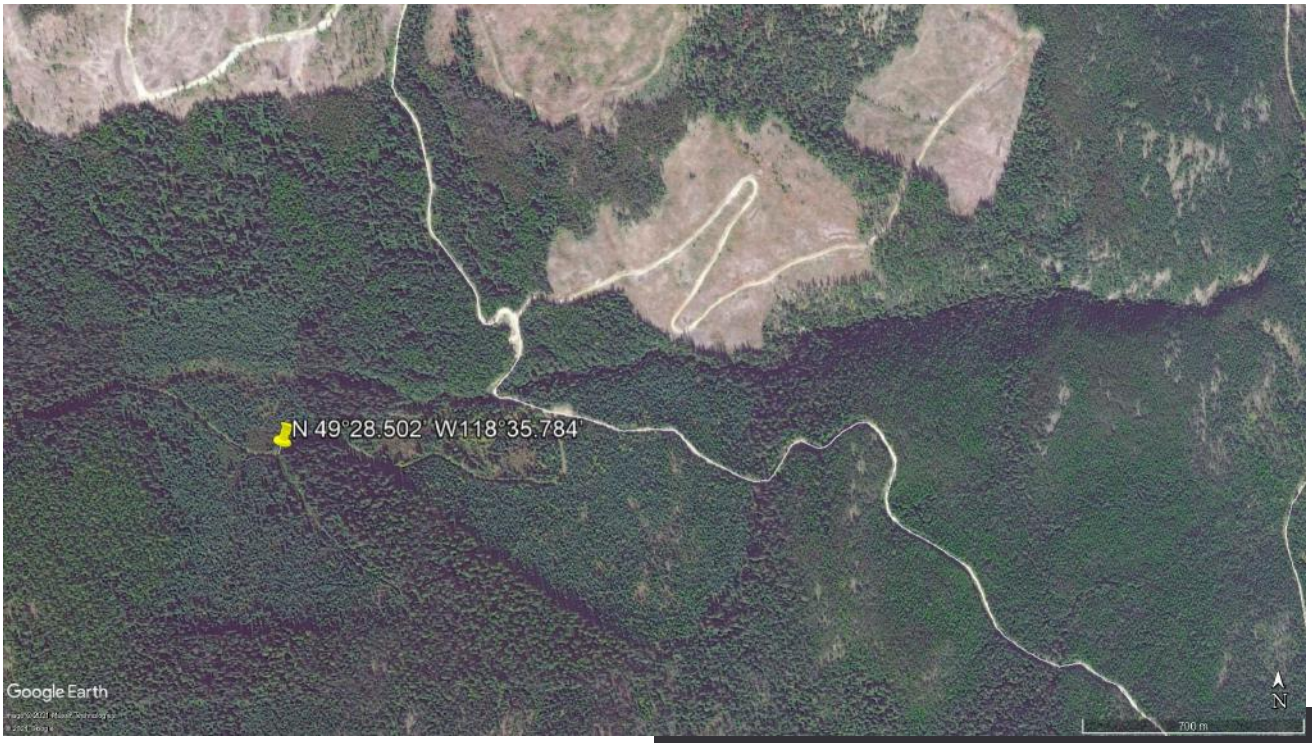
Yellow arrow indicates large culvert that was crushed when boulders (in the pictures) were pushed on top of them.

Logging was done down to the creek on both sides. Large extensive clearcuts (lighter green) can be seen across the valley.

This pool is filled with oil that leaked from equipment.

Steep slopes were clearcut.

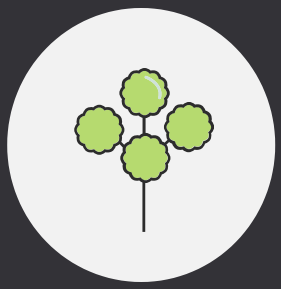
Large trees were cut down and sections of them were left behind.



4. 'Shopping Center' Site Road Washout in Inland Temperate Rainforest zone

Original ecosystem or forest type:
There is a highly biodiverse, very highly productive ecosystem in this Inland Temperate Rrainforest. It is a high elevation, Interior Cedar- Hemlock Zone where the high amounts of precipitation create cool and moist conditions. Wet, dark, rich soils host a mix of plant species, including understory plants like ferns, Devil's Club, and thimbleberry.

Concerns about clearcutting rare Inland Temperate Rainforest:
This type of forest is rare, not only in BC, but also across the planet. It provides food and habitat for specialized species and has high levels of biodiversity. Tree plantations that are created after clearcutting cannot reproduce the same level of biodiversity nor will they provide the same food and habitat for species that currently thrive there. Clearcutting causes the naturally moist soils to dry out.



Date of Visit: July 21, 2020

GPS: N 49°28.502' W118°35.784'
Elevation: 4570 ft, 1398m

Watershed or sub-watershed:
Flows into Boulder Creek which flows into the Granby River

Tree species observed:
Fir, cedar, hemlock, spruce
Plant species – a wide variety of ground vegetation and shrubs.

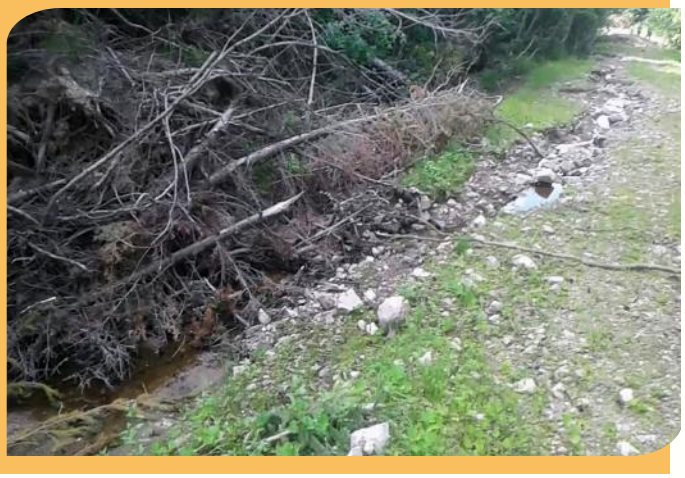
‘Shopping Center’ Site Road and Drainage “Repair”
Inland Temperate Rainforest zone

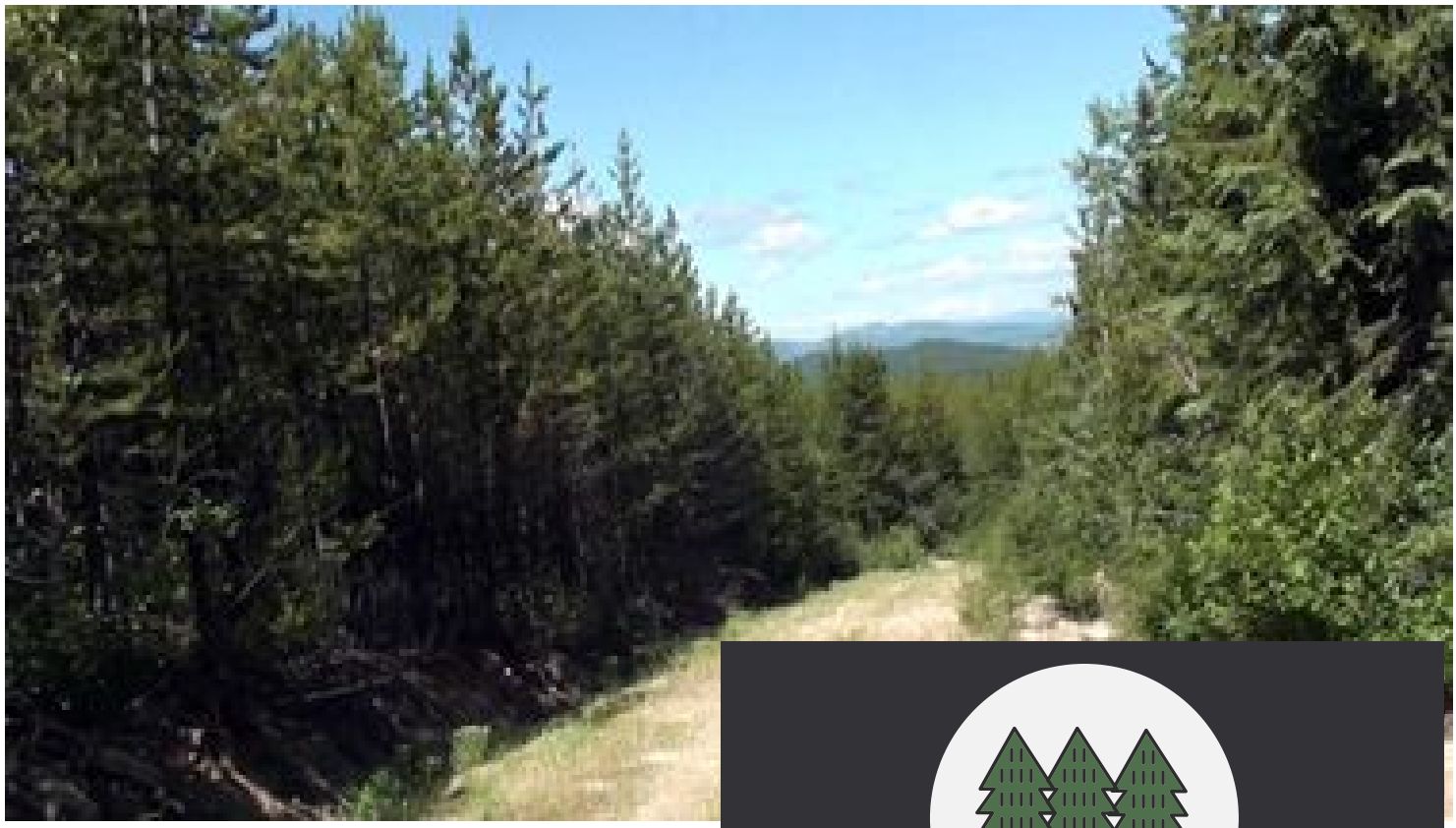
There are old and mature forests in this area with a high level of biodiversity. Pictures above and below shows piles of dirt created in an attempt (done in July 2020) at mitigating the washout.

The soils in this location are very moist. There is a high variety of groundcover species in the disturbed areas along the road and in the natural forest.

Water running over the road in one of the spots where the ditch had filled with debris and overflowed.

Photo below shows where the operator piled loose dirt onto bushes on the side of the road instead of removing it or using it to further mitigate the washout.





5. Dense Pine Stands

General information:
Healthy young, dense monoculture (single species) pine stands with very little light reaching forest floor and very little to no vegetation in ground and shrub layers.

General comments on younger forests:
Younger forests have higher evapo-transpiration rates than older forests and cannot slow down precipitation and retain as much moisture as older forests. Also younger forests lack moss in the canopies and moss mats on the forest floor. The forest floor also suffers from a lack of large downed decaying logs which act as moisture sponges. Downed logs that have been burned during a forest fire absorb even more moisture.

Date of Visit: July 22, 2020

GPS: No reading available
Elevation: No reading available

Original ecosystem or forest type:
Unknown

Tree species observed:
Lodgepole pine

Soils, hydrology:
Soils not examined.

Dense Pine Stands

Condition of trees/ current growth status:
Possibly clear cut or possibly a fire from many decades ago. Healthy young, dense forest stands, monoculture pine stands (single species), very little light reaching forest floor, very little to no vegetation in ground and shrub layers.

Wildlife (type of habitat, evidence observed):
No signs of wildlife. Very few signs noticed on any of the field trip days.
General comments: Wildlife may use dense pine stands, in particular older dense pine stands as thermal cover especially during hot summers (which have been increasing over the past 30 years due to climate change). However, some dense plantation pine stands may be too dense for wildlife species as thermal cover. Also, due to the lack of light from the closed canopy, an abundant herb layer is not present as food browse for ungulates. Wildlife will then have to travel to more open areas such as new clearcuts or post-fire zones to find browse to eat. They are not able to shelter and eat in one location in these dense pine stands like they can at July Creek, for example (see below).

Travelling for browsing opportunities could cause wildlife, such as deer, to cross the paths of predators.
Also mother deer may leave their young in protected places while travelling to distant browsing locations which in turn could facilitate predators killing the young while mothers are absent.

Problems, concerns, issues:
When tree plantations are created using dense single tree species the problems can include:
- lack of biodiversity causes issues if a single tree species is attacked
- other organisms may rely on a mix of tree species, shrubs, and herbs which collectively provide a food web to sustain multiple species
- the natural seed sources for herb and shrub species are likely far removed from these dense pine stands if they originated from clearcuts. It will take time for seed that is spreading naturally via wind and animals to reach the plantation forests if they are far from the seed sources.
- small diameter trees with canopies that reach from the forest floor to the top of each tree (as opposed to canopies starting at mid-tree height or higher) can act as ladder fuels and wick up a ground fire and carry it up into the canopy to become a crown fire.
- small diameter trees with full canopies and lots of green needles will burn hotter and faster than older trees with less canopy and larger diameters (which will take more time to burn especially if they are more decayed, spongy, and wet)
- un-thinned dense stands result in smaller diameter trunks
- these dense stands will eventually self thin but it will take decades and possibly centuries

Other comments:
Dense single species pine stands are susceptible to the Mountain Pine Beetle which will attack and kill a large percentage of the trees. Large stands of dead trees will create a forest fire fuel source especially for lightening-caused fires. At the same time, if the stand is attacked by beetles, there are ecological benefits to having dead standing or downed logs to act as biological legacies.

Dense Pine Stands

Analysis/Recommendation

Dense plantation forests benefit from juvenile spacing (of young trees 10 – 20 yrs old) or thinning (of older trees 30 – 100+ years old) in the following ways:

- reducing tight, connected tree densities will reduce fire hazards, especially for crown fires
- remove trees with canopies that reach the forest floor that are ladder fuels
- create gaps in canopy which allows more light to reach forest floor creating opportunities for herbs and shrubs to become established and create more browse for ungulates
- concentrate growth from each forest site into fewer stems and create large tree diameters through a release or growth increase after tree competition is reduced
- larger diameter trees have more volume and value than smaller diameter trees
- spacing and thinning will provide employment which calls for tree knowledge and logging skills
- create forest stand structural elements as biological legacies: larger live trees, creating or retaining dead standing trees, and downed logs

Spacing and thinning operations can have multiple objectives:

o Fire Smarting
o Forest Restoration
o Move a forest stand along the Old Growth Development Curve
o Create Habitat: increased light allows herbs & shrubs to develop, creating ungulate browse

6. Juvenile Spacing & Tree Release

General information:

In 1996, Pope and Talbot used juvenile spacing at this location to change the forest stand.

Juvenile spacing is a silvicultural process that reduces the number of standing trees by cutting some (with a chainsaw). The downed trees are left on the forest floor to rot and fertilize the soil. The trees which were uncut and left standing had 'released'.

'Release' involves diameter increases and growth on each individual tree after juvenile spacing. The trees that are currently standing were at least two to three times larger in diameter than the size they were when spacing was done in the 1990s.

This release after silvicultural activity is in contrast to the common forestry understanding of tree physiology and ecosystems, which suggests that when competitor trees are removed, the remaining trees do not release or grow in height, diameter, or tree ring width growth after a treatment.

Spacing aids growth of species that rely on sunlight (like pine) – more sun allowed in helps the trees grow faster and stops shade species from growing in.

Date of Visit: July 22, 2020

GPS: N49°20.674' W118°43.976' and N49°20.693' W118°43.976
Elevation: 5123ft and 5142ft

Watershed or sub-watershed:
West Fork of Boundary Creek (Sebastian starts there)

Original ecosystem or forest type:
Unknown

Tree species observed:
Mostly pine

Juvenile Spacing & Tree Release (Diameter Increase & Growth After Spacing)

Condition of trees/ current growth status:
Two possibilities: a fire decades earlier and this pine stand grew after the fire or (based on Google Earth views) there is also the possibility that it is a cutblock that was clearcut and then planted. These sites are excellent examples of 25 year old juvenile spacing that show the results of juvenile spacing treatment. The spacing increases the amount of vegetation on the ground for food foraging.

Soils, hydrology:
Both areas that were juvenile spaced in 1995 & 1996 are on relatively flat ground with soils that are medium in productivity with somewhat poor drainage. These sites are also mid elevation, slightly cooler sites.

Wildlife (type of habitat, evidence observed):
No evidence of wildlife.

Problems, concerns, issues:
There are no issues with these sites. Just let then grow and monitor them to see if they are reaching their maximum growth potential and creating higher value wood than if not spaced. Let them grow longer and older than current management regimes which are using shorter and shorter rotation durations.

These kinds of juvenile thinning projects have rarely occurred in the Boundary since the early 2000s. They produced employment, helped educate foresters on the ground, helped to increase the value of the forest (less knots on the trees – especially if limbing is done after the spacing is done), and the diameter of the tree increases faster.

Other comments:
Locate all forest stands that have been juvenile spaced.

Analysis/Recommendations

We recommend more juvenile spacing in thick pine stands to create employment and increase the value of these stands. It will lower the likelihood of them being clearcut for pellets or chips and increase the likelihood of the trees becoming merchantable timber earlier.

Schedule future thinning treatments to manage these stands for additional multiple objectives such as forest restoration, old growth development, habitat, fire smarting, and carbon sequestration (and also to create more jobs).

Juvenile Spacing & Tree Release (Diameter Increase & Growth After Spacing)

Spacing let more sunlight enter to create conditions for groundcover to grow.

Lodgepole Pine Crowns & Canopies about 25 years after juvenile spacing.

Treatment sign, interior forest showing tree densities & inter tree distances. Vegetation on the ground produces fertilizer, food foraging, and natural composting. The felled trees left on the ground also provide fertilizer and hold moisture.

Juvenile Spacing & Tree Release (Diameter Increase & Growth After Spacing)

The size of the stump when the tree was cut for juvenile spacing in 1995 or 1996.

The diameter of one of the trees about 25 years later demonstrates that 'release occured'.

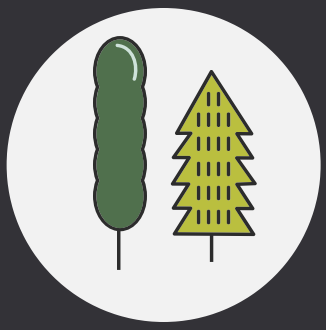
The diameter of many of the trees was between 22.5cm to 25cm demonstrating that 'release happened'.

7. Woodlot Selection Logging and Tree Release

In the woodlot (possibly Davidson's) there were several large spruce trees, three to four feet in diameter, which had been cut. Judging by their growth rings, they had experienced two releases after other overstory trees had been removed in the past, very likely as a result of a previous selection logging system.

Selection logging intentionally retains trees, patches of trees, forest cover, the forest canopy, and leaf area. The long term effects of selection logging, the harvesting and silviculture system predominantly used in the BC Interior (prior to the advent of Feller Bunchers and Clearcutting in the 1970s), needs to be fully investigated.

We found examples where trees had released after juvenile spacing and selection logging in two different areas of the same watershed. It would be useful to know how many other sites in the Boundary exhibit these types of releases. This would demonstrate if these are just two isolated incidents or if many of the forest sites in the Boundary also have the ability to release tree growth once competing trees are removed through juvenile spacing and selection logging.



Date of Visit: July 22, 2020

GPS: N49°17.307' W118°52.220'
Elevation: 2569ft

Watershed or sub-watershed:
Williamson Creek flows through the woodlot then flows into the Kettle River

Original ecosystem or forest type:
Probably the same as currently observed

Tree species observed:
Lodgepole Pine, Spruce, Douglas-fir, Yellow Pine, Cedar

Woodlot Selective Logging and Tree Release

Condition of trees/ current growth status:
This selectively logged forest is fully functioning. It contains a variety of trees species and ages, multi-layerd canopies, undergrowth, and natural regeneration. Large trees are providing ecosystems services - habitat, shade, moisture retention, seed trees, carbon storage above and below ground. Growth continues at the levels that existed before selection logging. In a clearcut zone, ecological processes and species need time to recover, in some cases decades and most likely centuries. But in this selectively logged forest, ecological processes continue to occur because trees of varying ages are left behind after each logging season. Old and mature trees are present.

Soils, hydrology:
Moist soils, even in summer with raised drier mounds. Douglas-fir and Lodgepole Pine were established on the drier mounds while spruce and cedar lived in and along the wetter riparian areas.

Wildlife (type of habitat, evidence observed):
A variety of habitat is available - from downed trees, to standing dead trees, and standing old growth.

Problems, concerns, issues:
We did not have any concerns with this selection logging system which used hand falling of trees and a small skidder with low ground pressure. The skidder stayed on the higher and drier mounds and did not drive into or through the wet riparian areas, thus decreasing damage and impacts to the ecosystem and ecological processes.

Analysis/Recommendation

In many forest types in the Boundary forests, this type of selection logging with tree patch and log retention would be one of the appropriate methods of harvesting within a Nature Based Forestry system.

Intact riparian zones left undisturbed by logging. Large cedars were growing on the edge of the creek.

Woodlot Selective Logging and Tree Release

Seedling growing on decaying nurse log. Leaving downed trees on the ground provides habitat and nutrients for seedlings.

Low impact skid trails with narrow widths. Use of small equipment to skid – may have been logged during later winter on the snow – less impact on the soil- less soil compacted, less vegetation damaged.

Forest history is recorded in the tree's growth rings. Growth rings are tight in the early years of this tree's growth possibley due to less availability of light and moisture. The release point occurred when an overstory tree or trees were removed (perhaps due to logging or tree death) and the then sapling began to grow quickly. The quick growth is demonstrated by tree rings that are increasing in width.

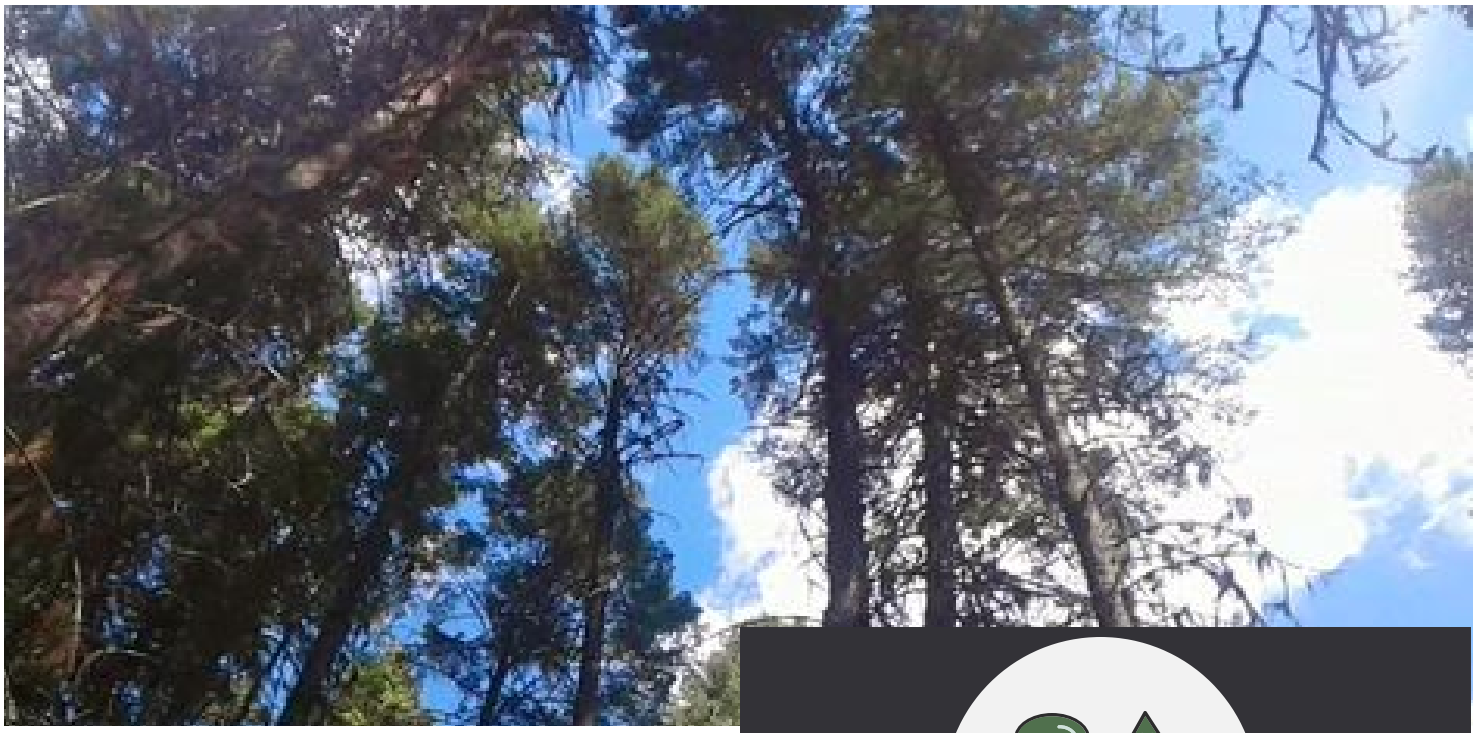
Woodlot Selective Logging and Tree Release

Canopy & Ground Views of the Selection Logging Site on southern western slope areas. Very diverse forest in terms of species. Generally speaking, peeler quality trees like these command a high price (a peeler is a tree that is used for plywood). This is incentive for woodlot owners to target fir. Woodlot owners can make a decent living, using small cats, small skidders, and hand falling, rather than large mechanical feller-bunchers. Woodlot owners cut the bigger trees and leave room for the remaining trees to grow (release) and become more valuable. They are not cutting down the future value of the forest like in a clearcut.

Selection logging is good from an environmental point of view because it leaves habitat, maintains shade, maintains riparian zones.

This woodlot is an example of uneven age class stand of timber – allows continuous harvesting over decades and possibly centuries. True sustainable logging.

This style of logging keeps more moisture in the ground.
The seedlings in this woodlot were planted. There were small clear cuts opened up to create a different kind of habitat – allows grazing for some animals.



8. Small Scale Selection Logging with Small Machinery & Retained Forest

General information:
West of Rock Creek, near Ed James Lake between Johnson Creek West Road and James Lake Road is a logged area that had been laid out by Stan and Wayne in the 1990s. The logging was done using feller-bunchers with small track widths, low ground pressure, and narrow counterweights on the back of each machine, which reduced the swing-around area for each machine. This allowed for a smaller harvesting system to be used. Yarding (line skidding) had been done by a small line skidder.

There was still paint on some of the trees that were marked by Stan and Wayne in the 90s.
This small, low impact harvesting system is bordered by a regular 100% clearcut harvesting cutblock that left no trees and removed all logs from the ground. This clearcut area is now in long term recovery mode.

In contrast to the clearcut cutblock, the low-impact harvested forest is fully functioning, not in recovery mode

Date of Visit: July 23, 2020

Location: Johnson Creek Road towards Conkle Lake
Elevation: Reading not available

Watershed or sub-watershed:
Rock Creek /Johnson Creek, Kettle River

Original ecosystem or forest type:
Unknown

Tree species observed:
Mostly Douglas fir, larch, some yellow pine, some lodgepole pine

Small Scale Selection Logging with Small Machinery & Retained Forest

General Information cont.
There are large trees connected by underground fungal networks. The adjacent clearcut will take decades if not centuries to get even somewhat close to the fully functioning older forest next to it.
This area is an excellent example of the sustainable differences more ecological low impact harvesting systems provide.

Condition of trees/ current growth status:
This is a relatively intact forest that is functioning despite one harvest entry into the stand in the 1990s. This site has a wide range of tree species, sizes, and ages that are all connected to the ecosystem. There is some large old decaying coarse woody debris (downed logs) that are providing nutrients to the site, acting as moisture sponges, and providing microsite habitat for seedlings.

Soils, hydrology:
Soils are fairly well drained and drier as evidenced by the presence of Douglas-fir and Lodgepole Pine. This site has a slight slope. With wide spread canopy and forest cover, the hydrology of this site has not changed much even with the harvesting. This is in direct contrast to the adjacent whole hillside of clearcutting that extends south from the small-scale harvesting and intact forest site.

Wildlife (type of habitat, evidence observed):
Important mule deer habitat. Also terrain for cougars, bears, rattle snakes, and elk although no signs were observed that day except scratching on trees and shrubs perhaps by ungulates or bear.

Problems, concerns, issues:
The small scale harvesting and intact forest site has no concerns on its own but the impacts of the large clearcut directly adjacent is of great concern. Clearcut temperatures in summer are hotter. The heat picked up by even slight winds may extend 200 – 600 meters into the adjacent intact forest site. These hyper-warm winds travelling from the clearcut into the intact forest are called Edge Effects. When a small patch of forest is surrounded by clearcuts, the hot dry winds entering off the clearcuts cause the loss of interior forest conditions (coolness and moisture) as these winds will drive right through a forest and out the other side. If a remaining forest patch is large enough and the distance on all sides is more than 600 meters, then there might be a small area in the center that the warm dry clearcut winds will not be able to reach. Clearcuts will also allow snow pack to build up which could then be susceptible to rain on snow events causing flash melts and flooding. However, the adjacent intact forest with high levels of forest cover will not allow snow drift to accumulate nor allow rain to quickly melt snow. Thus, forest cover will prevent quick melts and flash flooding from rain on snow events.

Analysis/Recommendations
Instead of clearcutting, implement Nature-Based Forestry using small-scale equipment and selection logging that maintains forest cover, prevents edge effects, provides habitat, maintains coarse woody debris, maintains large old trees, enables carbon sequestration, and slows down water on the landscape.

Small Scale Selection Logging with Small Machinery & Retained Forest

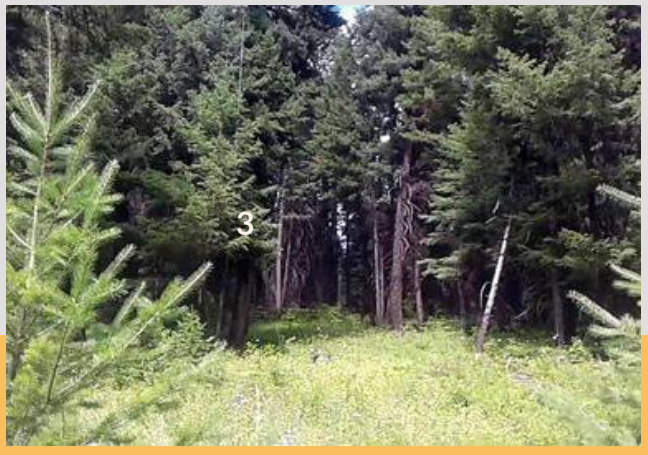
Above and top right: Old Man's Beard hanging off the trees provides food for mule deer. When it was logged using selection logging methods in the 1990s, trees were left to form uneven-aged clumps of trees to provide winter habitat for mule deer.

Beside the area that had been selection-logged in the 1990s was a clearcut.

The phenomenon of 'Wind Shook' trees on the edge of a clearcut. The trees on the edge of the clearcut are pushed around by winds which results in trunks becoming brittle and weak then snapping off. They produce a lot of sap due to the constant stress of movement from the winds.

Small Scale Selection Logging with Small Machinery & Retained Forest

Left: Clear cut area adjacent to selectively harvested Area/Yarding Corridor. The temperature in the clear cut was hotter than inside the selectively forested area. There were no tree seedlings growing in the clear cut.



Selective harvesting preserved clumps of trees to provide winter shelter for mule deer.

9. High Elevation Clear Cuts to the Edges of Big White Ski Hill

General information:
On the eastern side of the Christian Valley the ridgeline moves north and eventually heads into Granby Provincial Park. This entire ridgeline that used to be old growth forest is now covered by thousands of hectares of clearcuts at low, medium, and high elevations.

Big White ski hill itself is also surrounded by clearcuts. This seems to be the way in so-called 'Super Natural BC': log right to the edge of park or recreation areas.

Date of Visit: July 23, 2020

GPS: N 49°41.658' W 118°56.055'
Elevation: 4963ft

Watershed or sub-watershed:
Trapping Creek or into the Kettle River depending on the side

Original ecosystem or forest type:
Based on observations of surrounding un-logged areas, Engelmann Spruce and Subalpine Fir Zone

Tree species observed:
Engelmann Spruce and Subalpine Fir

High Elevation Clear Cuts to the Edges of Big White Ski Hill

Condition of trees/ current growth status:
This area had been clearcut and planted with seedlings. Height of seedlings ranged from 2'-4'. There were a variety of seedling species including pine, larch, and spruce.

Soils, hydrology:
This is a flat site with deeper soils with some wet areas and soil moisture that required ditching. This is in the snow zone and snow accumulations in winter will be substantial. Snow pack will increase because the clearcutting has removed all of the forest cover. This will result in the accumulation of snow drifts. The snow drifts will be susceptible to rain on snow events causing quick melts and flash flooding.

Wildlife (type of habitat, evidence observed):
Some evidence of seedling browsing by ungulates.

Problems, concerns, issues:
Seedlings are suffering from substantial snow press that is contorting their stems so that they are bent in several locations. As a result, they will not grow tall and straight to provide much needed forest cover that would prevent these snow accumulations. The economic value of any future harvesting will be greatly reduced due to the curving of the trunks.

Planted pine seedlings suffering from snow press which is causing deformed trees. Also, some tips were snapped off – possibly due to snow press and also possibly due to skidoos running over the top of the snow and compacting. Selection logging would have left bigger trees around the seedlings to provide protection from heavy snow load.

High Elevation Clear Cuts to the Edges of Big White Ski Hill

ANALYSIS/RECOMMENDATIONS

Stop clearcutting at these high elevations. Instead, either leave the forests intact or use selection logging methods appropriate for snow zones. Intact canopies from mature trees are required to protect seedlings from snow press. The protective canopies that ensure the straight growth of young trees is eliminated with clearcutting.

In these higher elevation snow zones, a strategy of super dense planting or fill planting is required to create near maximum forest cover from the seedling stage going forward.

Instead of standard seedling spacing, the plantings should have been fill-planted with the largest seedlings possible and in a very tight pattern so that a dense stand is created as it grows. This would have begun to create the closed forest canopy and forest cover right from the start. The trees would help one another to grow straight but also create a closed forest that would not allow the amount of snow accumulation that is happening due to the clear cut.

This planting technique could be called the Porcupine Quill Method. Re-establishing dense stands and forest cover as soon as possible in high elevation snow zones may mitigate problems with hydrology, snow drifts, and rain on snow events.

Clear cutting at cold, high elevations is a problem due to the slow recovery rate of seedlings. It will take a very long time for this piece of land to produce timber equal in economic value to the timber that was clearcut. With the unpredictability resulting from climate change it is also likely that this forest will struggle to recover and grow. It may never return to its previous state of ecological function.

Clear cuts at various elevations on the way up to Big White Ski Hill

High Elevation Clear Cuts to the Edges of Big White Ski Hill

Wide Plateau of clearcut logging within sight of the Big White Ski Hill.

10. Hydrologic Changes - Bridge blowout at Arthur's Creek, Increase in size of Rendell Creek

General information:
There have been significant hydrological changes in the Rendell and Arthurs watersheds as a result of high elevation logging in the area. The flow rates in both creeks have increased substantially. Stan has observed that the time span of the flow rate increae may be as short as 5 years.
Rendell Creek flow rates now equal or exceed historic flow rates in the Kettle River. The Arthurs Creek bridge crossing, previously at least 10 meters above the creek bed, was blown out due to the water volume and velocity. The bridge was lifted and thrown 100 meters downstream.
The flooding also eroded the road fill and surface to a distance of 30 meters on each side of the former bridge . These increased water flows are becoming the norm in the entire Boundary watershed.

Date of Visit: July 23, 2020

GPS: N 49°41.219' W 118°42.207'
Elevation: 2795ft, 851m

Watershed or sub-watershed:
Trapping Creek or into the Kettle River depending on the side

Original ecosystem or forest type:
Based on observations of surrounding un-logged areas, Engelmann Spruce and Subalpine Fir Zone

Tree species observed:
Engelmann Spruce and Subalpine Fir

Hydrologic Changes - Bridge blowout at Arthur's Creek, Increase in size of Rendell Creek

General Information cont.

Rendell Creek is developing new gravel islands in the stream bed that never used to exist. These islands are a direct result of high elevation logging using clearcutting, which brings runaway water able to move and pick up massive amounts of sediment. The sediment laden water flows into the Arthur and Rendell Creek watershed systems, which in turn deposits the raw material in the previously non-existent islands in the Rendell Creek bed.

The road had been blocked off where the bridge had been washed out. The picture to the right is where the bridge had been.

Location photos of the Arthurs Creek Bridge Washout. Right: The edge of the road where the bridge used to be.

11. 'Wildfire Risk Reduction and Pine Beetle Management Project' Greenwood

General information:
Beside the old Greenwood highway tunnel is a recent clearcut with a sign stating "Wildfire Risk Reduction and Pine Beetle Management Project'. Despite the sign, what was produced could be called a standard clearcut with very little fire mitigation results. Very few trees had been left standing and slash piles and fine dry debris littered the site. There was little forest cover to provide shade and moisture retention.

Immediately adjacent to the clearcut zone is a block of unthinned forest which is highly susceptible to fire due to the density of the trees.

Date of Visit: July 24, 2020

GPS: 49° 6'42.89"N, 118°40'35.64"W, located on Highway 3, near "Tunnel of Flags"
NOTE: Google image above was taken prior to logging

Watershed or sub-watershed:
Trapping Creek or into the Kettle River depending on the side

Original ecosystem or forest type:
Douglas-fir, Aspen, Cedar, Poplar

Tree species observed:
Douglas-fir, Aspen, Cedar, Poplar

‘Wildfire Risk Reduction and Pine Beetle Management Project’ Greenwood

General Information cont.
The clear cut area’s lower boundary is right along Hwy 3 within the 'cigarette flick zone', making it highly susceptible to ignition. This area also has a slight uphill slope which would facilitate a fire starting near the highway and running uphill.

Condition of trees/ current growth status:
The clearcutting of this land created contiguous dry litter and debris piles. There is fine textured dried and drying brush scattered throughout. The only things retained during harvesting were scattered individual trees and a few small forest patches. The area is now wide open with little or any forest cover. Adjacent to the clear cut is a zone of thick dry forest and next to that is another clearcut (on the border of the city of Greenwood) also with a series of connected and contiguous dry slash accumulations and piles

Soils, hydrology:
This is a drier hillside with a moderate uphill slope. There are a few watercourses that go through the site but most of the site is drier.

Wildlife (type of habitat, evidence observed):
Did not see any wildlife signs.

Problems, concerns, issues:
It is our opinion that the hazards of potential forest fires at this location have not been mitigated in any way with this logging activity. Instead, this logging has created dangerous conditions for a forest fire that may burn very quickly. If these areas catch fire, it will spread quickly towards the city of Greenwood less than 1km away.

Highway 3 uphill showing piles of and the spread of fine brush which has a high potential for indenciary materials. Rather than acting as a fire break, the unthinned forest at the top of the photo has the potential to ignite and spread fire rapidly. Whereas, if it had been thinned, it might be less of a risk.

Below: Pull-out zone on the side of the highway – the cigarette ‘flick zone’. Beside the rest stop is a combination of deciduous trees and young conifers that have not been thinned.

ANALYSIS/RECOMMENDATIONS

This area now potentially has a higher fire hazard than it did as an intact and standing forest when it had higher levels of canopy closure and forest cover to create cool, shady, and moist conditions to act as a fire deterrent. A selection harvesting system would have removed fire fuels such as brush, branches, and the kinds of trees that act as ladder fuels. Selection harvesting would have maintained tree crowns, canopies, and forest cover, maintaining cool, shady, and moist interior forest conditions to reduce fire risks. A selection harvesting system would not have created large amounts of connected slash.

At this point, the slash on this site from clearcutting must be removed to reduce the fire hazard. Also, some sort of site cleaning and fuel reduction will be required beside the road pull-out and on the strip of remaining trees along Highway 3. The adjacent thick forest should be thinned.

Planting large and over-sized seedlings is recommended so that they can become saplings more quickly and produce forest canopy in a shorter period of time.

BFWSS is concerned that this forestry project may have created a higher fire risk for the City of Greenwood than if the forest had been left intact.

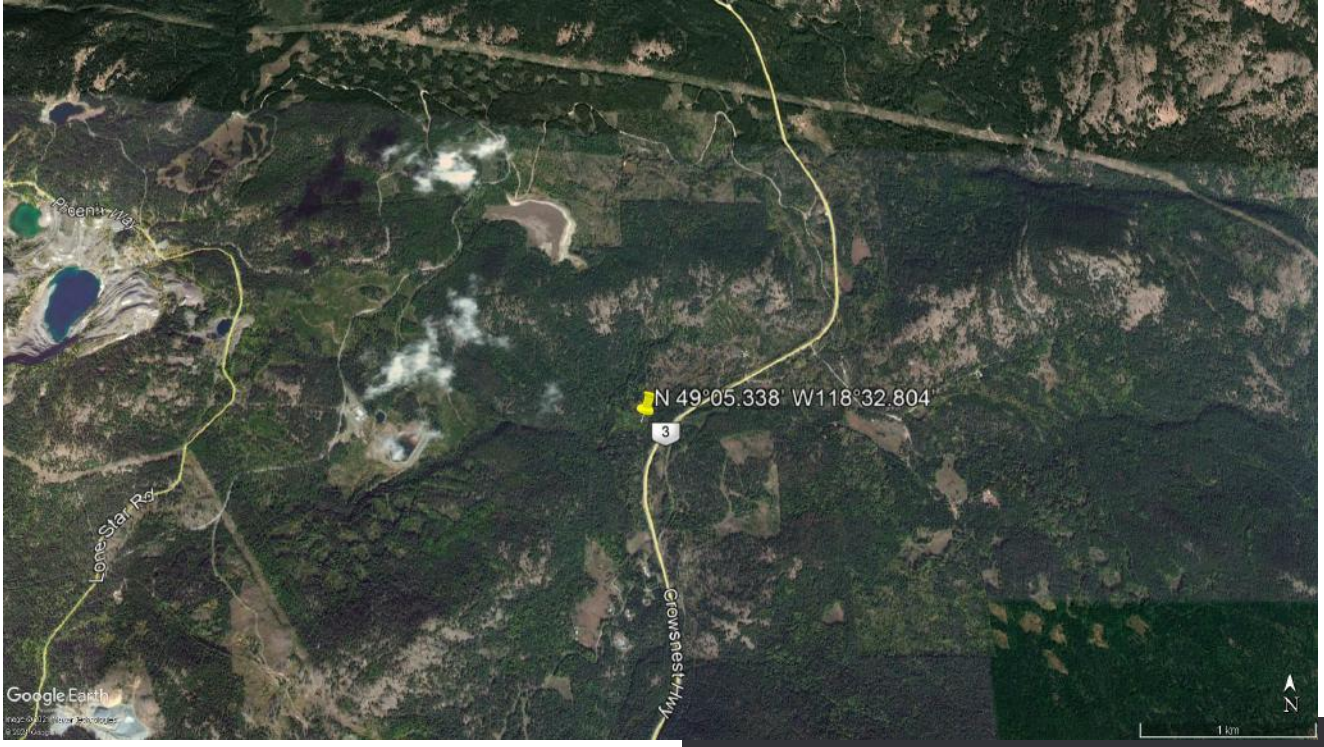
Beside Greenwood tunnel - Google maps image showing condition of forest in October 2018 prior to clearcutting

‘Wildfire Risk Reduction and Pine Beetle Management Project’ Greenwood

East of the Greenwood tunnel - Google maps image showing condition of forest in October 2018 prior to clearcutting

Post-logging in 2020. View from Highway 3 of clearcut zone uphill towards the zone that has dense, unthinned forest. A few deciduous trees had been left uncut beside the rest stop: deciduous trees can have fire mitigating effects, however, there are conifers growing connected to the poplars. These conifers have branches almost reaching ground level which makes them more susceptible to fire.

Sign says ‘Wildfire Risk Reduction and Pine Beetle Management Project’.



12. July Creek Old Growth Riparian Zone - proposed cutblocks

General information:
This site contains forest that is very wet and reminiscent of a coastal BC forest. There is an abundance of lush, tall ground vegetation with patches of tall ferns. There is a high water-table. Even in mid-summer it is very damp and moist. The flat low-lying areas have standing water in many places.
All this water and lush vegetation is a result of rich soils, including silts and clays, built up over millennia, These soils are very good at moisture retention but are no match for the ground-based equipment, which will compact and damage the natural drainage and water retention of the site.

The many game trails indicate this is a healthy and productive ecosystem. From a wildlife perspective this area is an important corridor that provides a sheltered low elevation intact forest route, including a major game corridor providing connectivity for moose and mule deer that are moving across the Canada - US border.

Date of Visit: July 24, 2020

GPS: N 49°05.338' W118°32.804' , located on Highway 3, east of Greenwood
Elevation: 3258ft, 993 m

Watershed or sub-watershed:
July Creek, Kettle River

Original ecosystem or forest type:
Interior Cedar Hemlock Forest, Pine, Spruce, Poplar

Tree species observed:
Cedar, hemlock, fir, poplar, pine, spruce

July Creek Old Growth Riparian Zone - proposed cutblocks

General Information cont.
West Boundary Community Forest has this area flagged for road building and harvesting.

Condition of trees/ current growth status:
This is a mature forest that has not been harvested previously or historically. No stumps from previous harvesting were observed. The age and size of some of the trees indicate that it has been decades or even centuries since a major disturbance such as a fire went through this area. The year-round wetness of the site would preclude any major fire events.

Soils, hydrology:
Soils will likely be clay and silt. There are wetlands and creeks extending throughout the site. The site is at the bottom of a slope and receives moisture from above along with moisture from the creeks. Even in the height of summer, this site was still very wet. Locals calls this north-south valley 'the snow belt' because it gets very high levels of snow in the winter relative to Grand Forks or the other drier valley bottoms.

Wildlife (type of habitat, evidence observed):
Ungulate beds and many trails that crisscross the site were observed. This area is a major game corridor for moose and deer that use this area to transit from the forests north of Highway 3 and south towards the Canada-US Border.

This intact forest provides winter habitat for wildlife. The closed forest canopy and forest cover lower snow accumulations during the winter. Less snow means browse on the ground for moose and mule deer will not be buried in or frozen under the snow. Any lichens that have fallen during the year are closer to the surface making it easier for ungulates to access this small but vital resource for survival in the winter.

Problems, concerns, issues:
This area has many concerns that focus on wildlife, and includes ever-present and standing and running water, large old trees, large dead trees, downed logs, incredible biodiversity (especially incredible tree and plant diversity), a natural water-based fire break , fragile wet soils that will not survive any forestry machines without being damaged. There is important low elevation older productive forest, which according to a 2020 independent report on old growth in BC, is becoming very rare in the province (Price, Holt, and Daoust)

The historic railroad grade that runs East and West along the northern edge of the site and Hwy 3 is a planned access route to the sites. The first proposed logging road extends southward from the railway grade into this rich moist environment and cuts across some of the wettest land in the proposed cutblock areas. Two other proposed roads extend south from the historic railway grade and cut through the middle and the upper area.

All three of these proposed roads that extend South from the historic railroad grade need to be removed from the plan, with access being instead achieved from the existing road grades. The drier and higher portions of the lower slopes in the proposed harvest area could be accessed these ways, instead of literally wading across the "wetlands" along Highway 3.

July Creek Old Growth Riparian Zone - proposed cutblocks

ANALYSIS/RECOMMENDATIONS

Leave this rare and valuable site alone and do not log it. Let the wildlife species have one place on the landscape where they can travel through, bed down in, and find food to eat and access water. If left intact, this forest serves critical functions that are becoming rare in the Boundary watershed. It is home to a wide diversity of plants and animals that might not exist anywhere else; it serves as a potential refuge from fires or harvested and planted landscapes that are nearing the limits of their capacity to provide a wide variety of ecological goods and services, or at worst are at or over an ecological tipping point of no return.

Site views of the rich and wet ecosystems with abundant and tall herb and shrub layers and tree diversity

A mix of conifer and deciduous species

Thick patches of thimble berries, tall old growth trees, multiple layers of canopy.

Layered canopies providing shade, habitat, interception of precipitation functions.

July Creek Old Growth Riparian Zone - proposed cutblocks

Thimble berries, wildlife nesting patches, bears, moose, deer, Site views of the rich and wet ecosystems with abundant and tall herb and shrub layers and tree diversity. Top two pictures: forest floor with an abundance of vegetation and food forage.

Bottom two pictures: varied species in the canopy, a mix of deciduous and conifer species. Pink flag indicates where a forest road was planned. There was flagging throughout the wet areas for a planned forest service road.

13. High Elevation Logging on Rocky Soil

Condition of trees/ current growth status (clear cut, regen, primary forest, selectively logged, etc:
Seedlings struggle and often do not regenerate. Clearcut approximately 6-7 years ago. A few scraggly seed trees (mother trees) were left behind at random locations – most are more than 30 to 100 meters apart and some have died.

Soils, hydrology:
Thin, rocky, dry soils.

Wildlife (type of habitat, evidence observed):
Used to be a mule deer habitat and feeding ground when there were lichen and moss in the original shadier forests. There have been no mule deer observed there for 25 years by Stan (he previously observed them in this area in abundance).

Problems, concerns, issues:
Lack of moisture on the very thin, rocky soil is resulting in seedlings struggling to grow. This is a common observation at similar rocky locations across the Boundary. The forest is clearcut, the land is left bald, and there is not enough soil for seedlings to grow.

Date of Visit: Tuesday July 21, 2020

GPS: N49.23.352 W118.32.699
Location: Almond Mountain Road, 7km on the Gable FSR

Watershed or sub-watershed: Flows into Gable Creek which flows into the Granby River

Original ecosystem or forest type:
Mixed fir, larch, pine, hemlock, cedar. Old and mature growth.
Tree species observed: Fir seed trees. A few thin cedars were also left after the clearcut. Pine seedlings, larch seedlings.

High Elevation Logging on Rocky Soil

ANALYSIS/RECOMMENDATION

High elevation areas with these soil conditions should either not be logged at all or logged using selection logging methods. The alternative to clearcutting is to use small equipment to just remove the particular species that are desired, such as pine, and leave all the other species. Large patches of trees should be left for mule deer feed and habitat.

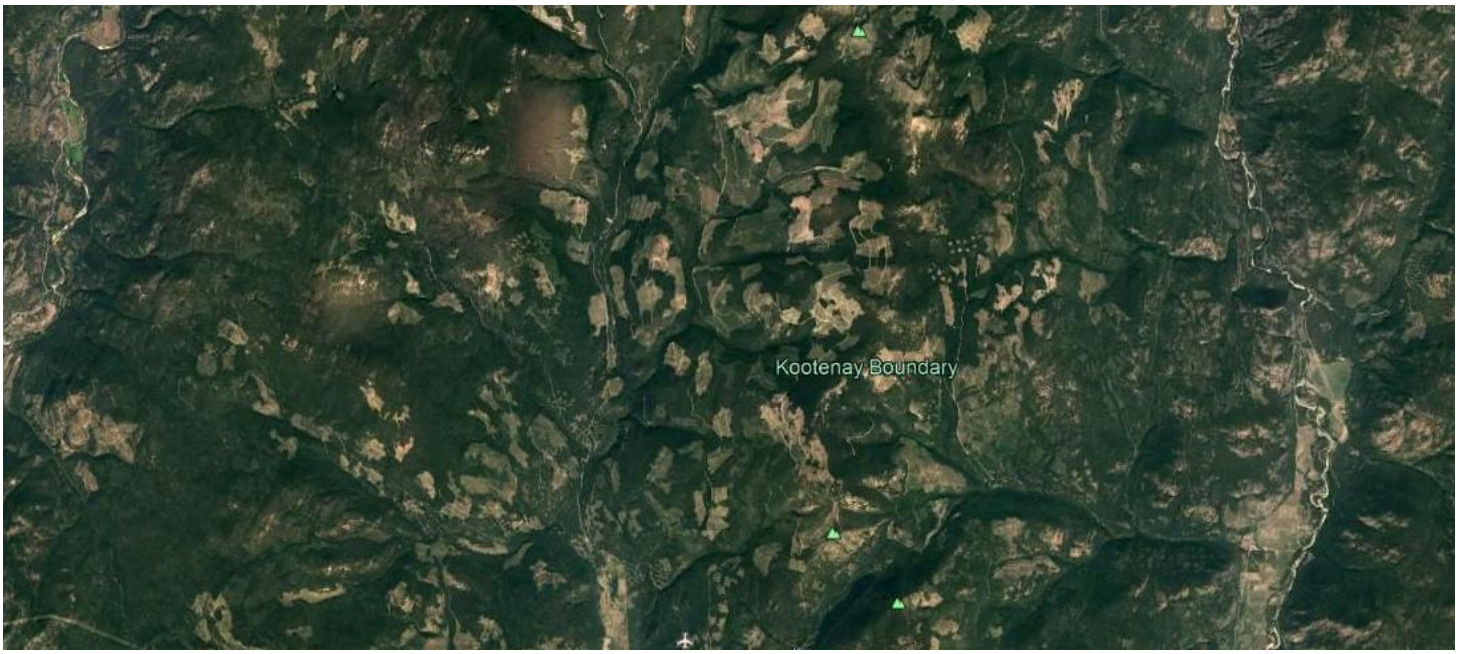
Rocky thin soil in the high elevation clearcut. Mother trees are 30 to 100 meters apart. Simard et al (2020b) found that most natural regeneration happens within 15m of mother trees – this makes it essential to leave other trees near the mother to provide growing conditions.

Post-clear cut. Very thin rocky soils. There is no longer any food or shelter on these sites for mule deer or other mammals.

Large expanses of clearcuts at high elevations – this is a common sight across the Boundary region.

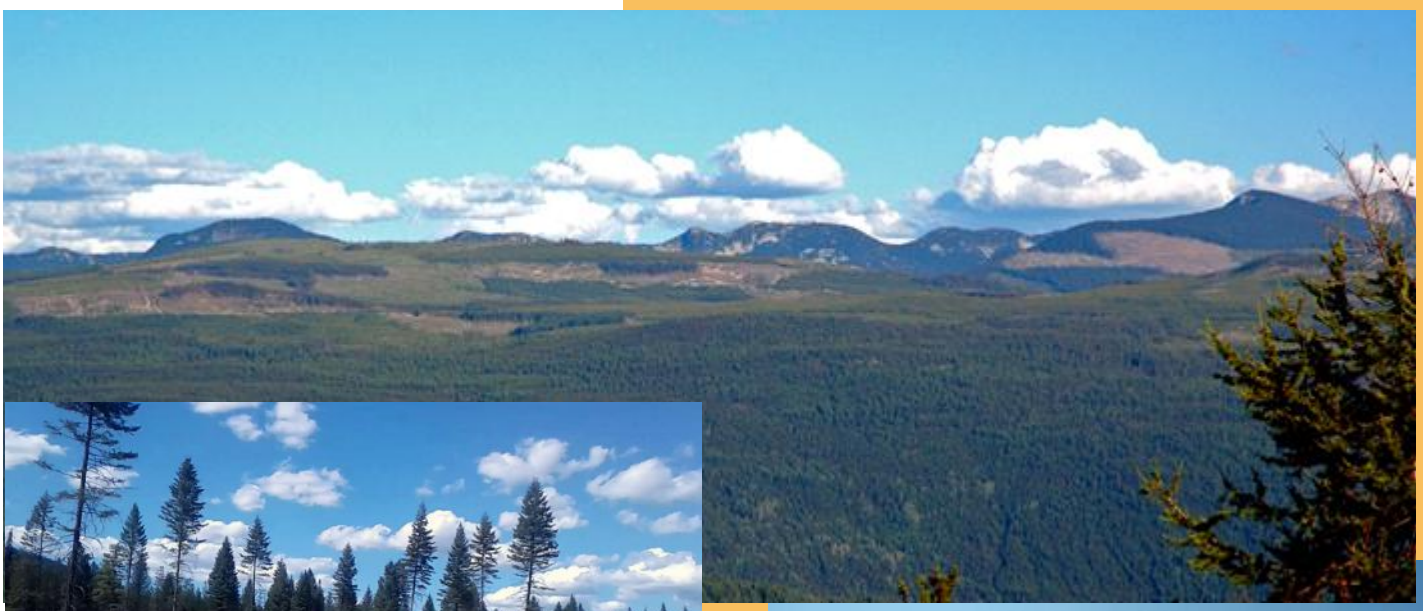
Tree plantation in the foreground (lighter green), darker green in the mid-ground is old growth, Across the valley are more clearcut cutblocks much larger than 40 hectares. Small areas of forest were left in between the cutblocks but because they are so small, the entire mountainside is essentially one big clearcut.

Clear Cuts Across the Boundary Watershed



There are extensive clearcuts across the Boundary watershed. Very few sub-watersheds on public land have been left intact. In some valleys, the clearcuts extend for miles. Blocks that were clearcut recently are directly adjacent to blocks clearcut in the early 2000s which are beside blocks clearcut in the 1990s. The clearcutting is being done in the valley bottoms, mid-elevations, and high elevations. In winter of 2020-2021, licensees continued to clearcut and decimate remaining intact primary and old growth forests at rapid rates. Below are examples of clearcuts from numerous locations in the watershed.

Clearcuts Across the Boundary



It is time for citizens of the Boundary to seriously face these issues and work together to create a brighter future for the Boundary region.

CONCLUSION

This report has shared examples of both good forestry and extremely destructive forestry. BFWSS members continue to travel the Boundary and observe conditions in the watershed that arise as a result of forestry activities.

It is our aim to shift all forestry away from destructive industrial clearcutting and towards Nature-Based Planning that prioritizes ecosystem integrity and resilience.

We have pointed out problems and ways to make things better in a few locations. But these sites are representative of problems across the watershed. What is needed to protect the people, the wildlife, and the ecosystems of the Boundary watershed, is a major intervention and change of direction by the government of BC. Nothing less than a complete transformation of human actions in watershed will create the desired outcome of ecosystem integrity.

Climate change is upon us in the Boundary. In the face of an uncertain future, we need intact forests more than ever. We need to take effective action (not untested action) to achieve these desired outcomes. Vision, courageous leadership, and immediate implementation of the solutions laid out in this report are required to avoid irreversible damage.

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