Field visit to Deception Lake FS Road – Fuel management treatment

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Context

The Bulkley Valley Wildfire Risk Reduction (WRR) Tactical Plan identified areas that have "sufficiently high fuel hazard to warrant treatment" and high perceived wildfire risk to communities in the Wildlife-Urban Interface (WUI)[1]. The Tactical Plan aims to streamline and prescribe site-specific treatment plans to reduce fuel loading in proposed Fuel Management Treatment Units (FTUs). Treatment objectives recommended for the relatively large polygon at Deception Lake FTU (CC-FTU-02) were understory thinning, pruning ladder fuels, cleaning surface fuels, and post-harvest broad-cast burn[1].

On the ground, fuel management included creating a 50-m wide (4.88 ha) fuel-free corridor break as well as partial cutting by the Small-scale Salvage Program. The salvage operator harvested dead and recently-fallen trees (> 10% incidental live trees), thinned the understory and cleaned surface fuels to < 15 tons per ha. The purpose of the field visit was to assess whether the structure and function of the old forest was maintained after the fuel reduction treatments.

Old forest structure in the SBSmc2

- Large, old trees where 'old' is defined as older than median disturbance return interval (>140 years[2], > 184 years[3] in the SBSmc2). Ancient forests are > 250 years[2].
- Frequent standing dead trees/snags (many large): 22 large (>1 m^3) snags per ha was recommended[3]. Large-diameter snags are important for cavity nesters.
- Large downed wood in various stages of decomposition is a reliable indicator of old forests: at least 50 large logs (>1 m^3) per ha[3,4]
- Multi-layered canopies
- Complex spatial patterning of horizontal and vertical structure. Wide, uneven spacing of canopy trees and dense regeneration in openings.
- Understory is well-developed compared to younger or mature forests.
- Species sensitive to disturbances are known to be more abundant in old forests (e.g. ferns, late successional herbs such as orchids, as well as devil's club and canopy lichens)
- Gap dynamics occur in SBSmc forests[5]
    - 57% of area in total gaps, 36% of which are developmental (tree mortality), and 19% edaphic shrubs (mainly alder)[5]
    - Frequency of gaps 0.56/m in SBSmc2 (similar to ICHmc2 and ESSFmc)[5]
    - Most gaps < 300 m^2 (19-830 m^2)[5]
    - Gaps were formed by gap makers of varying decay classes (mostly standing dead, snapped) signifying several gap-making events over time.

    - Light level – average of 18% full sunlight, 3.6 to 53% range, 90% of the forest has < 30% full sunlight[5]
- SBS mc2 old forests are dominated by subalpine fir, interior spruce and lodgepole pine[6]
- Reverse J-shaped age structure in old SBSmc2[3] - lots of younger trees and fewer large old trees
- At least 57m^2 per ha and 531 m^3 per ha live tree basal area and volume respectively[3]

Pre-treatment forest characteristics of Deception Lake Road FTU

- Technical Advisory Panel identified this polygon as Priority Big-treed Old Forest. Spruce stumps were ~180-200 year old.
- Classified as SBSdk to SBSmc2 – BEC subzone boundary crosses the FTU[6]. SBSmc2 seems better fit.
- Pre-harvest forest stand composition (forest cover polygon) was described as an equal mix of lodgepole pine, interior spruce and subalpine fir (minor amount trembling aspen and black cottonwood). However, few pine were observed during the site visit: subalpine fir and spruce (some large) seemed dominant (as residual live trees and stumps).
- The multi-layered old forest had abundant regeneration of subalpine fir and spruce in all sub-canopy and understory layers prior to treatment. The cohort ratio may have approached 1:1 prior to treatment.
- The forest license application reported that 37% of the trees were standing dead or damaged prior to harvest; the WRR Tactical plan reported 19% standing dead.
- WRR Tactical plan classified the site as a "wetter forest type with a relatively narrow window of availability". Spruce – horsetail and Spruce - oak fern sites were common (SBSmc2/10 and /06)
- BC Wildfire classified this as C-3 fuel type[1] (lodgepole pine) but very few pine were observed during the field visit.
- Riparian areas and wetlands were not identified during the pre-harvest assessment but at least one wet, willow area was observed at the site
- LRMP legal landscape corridor overlaps eastern part of the FTU (some of it may have been logged)
- Historic partial cutting had taken place

Post-treatment stand

The treated forest was very open with large expanses of harvested, non-forested area and uniformly-thinned stands with fully-cleared understories. Light level distributions have likely shifted outside of the range found in unmanaged old forests. The post-treatment stand no longer had large, standing dead trees, large downed wood, large live trees, or abundant regeneration of various sizes. Large, live subalpine fir and spruce were rarely encountered after the treatment, but mature stems and canopy cover were maintained on the site, providing some shelter and habitat.

The treated forest has lost old forest structure and function. None of the ecological benchmarks that characterize SBSmc2 old forests (e.g. 22 large snags and > 50 large logs[3]) are now achieved at the site. With the removal of the shrubs, regeneration and multi-layered structure, horizontal and vertical spatial complexity was dramatically reduced. Canopy recruitment (and functioning gap dynamics) will no longer occur if the regeneration layers are continuously removed.

The post-treatment forest would no longer meet Old Forest Deferral criteria, using the field verification methods developed by the Ministry of Forests[2].

Spruce – horsetail forests after fuel treatment.

Level sites and low-lying depressions supported Spruce – horsetail forests before the fuel treatment. Large landings, clearings and roads now occupy these areas.

Level, receiving areas would have supported large spruce, horsetails and lady fern (SBSmc2/10). The blue-listed SBSmc2/10b (ws07) likely occurred at the site in level areas and poorly-drained depressions[6]. Roads, logged openings, and large landings now occupy these sites.

The forest floor was very disturbed, with exposed mineral and organic soils, and o shrub and moss layers were virtually absent from the understory. Water ponding at the surface and altered hydrology was observed at the site. The extensive soil disturbance will create favourable seedbeds for natural conifer regeneration in many areas. With open canopies and disturbed soils, and greater availability of resources (light, soil nutrients), conifer regeneration will grow rapidly.

Windthrow is a concern in these wetter forests since high water table restricts rooting and can make trees vulnerable to uprooting. The thinned forests are vulnerable to winds owing to long wind fetch to the south and west (the direction of prevailing winds) because of extensive cleared, private lands in this area.

Post-treatment forests with cleared understories and thinned overstories.

Lush, mountain alder – fern openings are a natural component of SBSmc 2 forests and pose low risk.

Old forest resiliency

- The thinning treatment will likely make the site vulnerable to fire because of increased drying, stronger winds through the understory and canopy, and lower relative humidity than before[8, 9]
- Intact old forests on wetter sites have inherent resilience to fire (sometimes acting as fire refugia for long time periods)[10, 11]
- Old forests store carbon, thereby reducing climate change impacts such as extended summer droughts, warmer temperatures, and high-intensity storms with greater numbers of ignition events that cause more frequent, higher severity fires.[12.]

Recommendations

- Verify that WRR assessment of the site is accurate. E.g., there were several errors: the treated part of the forest was not pine-leading, did not have grassy, brushy fire-prone openings, was better characterized as SBSmc2 vs SBSdk, etc.
- Stratify the polygon and ensure that only areas deemed to have risk are treated and that this treatment is appropriate. The lower west side (CC-FTU-01) had larger amounts of high-risk variables but was untreated (e.g. it had longer edge effect, more slash from recent harvest, heavy concentrations of debris at timberline, grassy openings). Wet microsites were logged completely but they have higher resilience to wildfire.
- Stratify the Priority Old Forest Deferral Area into sections based on old forest stand conditions. E.g. delineate exceptional examples of old forest (low-lying Spruce – horsetail sites with large-diameter trees) and preserve them.
- Create fire breaks around high-value old forests, especially if they are regionally rare or provincially listed
- Verify that the old forests meet the criteria for Old Forest Deferral; where criteria are not met, then consider treating fuel in these parts but with special attention to preserving old forest attributes and buffering high-value areas.
- If fuel treatment must occur, aim to maintain threshold densities of structural features critical to old growth structure and function (e.g. old, large trees, downed wood and standing dead). Old, large downed wood is not a fire risk.

Summary

- The fuel management treatment at this site did not maintain old forest values, though lower levels of mature canopy and herb cover were retained.
- The resulting stand structure would not occur naturally in SBSmc2 forests in our region.
- If the intention is to retain the current stand structure and fire break, then long-term intervention (likely costly) will be required to keep the understory clear.
- It is highly recommended to ground truth both the WRR polygons and the Old Forest Deferral Areas, and to further stratify them based on old forest values and level of wildfire risk.
- Stratification would allow for preserving high-value areas, maintaining old forest attributes at threshold densities while reducing fire risk in areas that warrant it.
- Old, humid forests, especially those in northern aspects, cold air drainages, sheltered topography and near bodies of water, are best left undisturbed. They have resilience to fire and can act as refugia on the landscape.

References

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