Vegetation Resources Inventory (VRI) Wildfire Fire Updates 2017

The 2017 Vegetation Resources Inventory (VRI) includes adjustments to reflect the impacts of wildfires that occurred in 2016 and 2017. These adjustments are based on fire severity mapping performed using satellite imagery and ground sampling of a network of already existing ground plots.

The fire severity mapping classified burned areas into 5 distinct severity classes. For the 2017 Cariboo fires, ground samples were then used to quantify the impact within each of the mapped fire severity classes. The resulting adjustments factors were then applied to key VRI attributes. It should be noted that ground sampling data was **not available** for the **2016 fires and 2017 fires outside of the Cariboo**. Provincial generalized adjustment factors were applied to VRI attributes in these areas.

Fire Severity Methodology

Target population:
- 2016 and 2017 wildfire perimeters with an area greater than 100 ha

Classification procedure:
- Wildfire perimeters were intersected with VRI polygons using Arc Map.
- The remote sensing software eCognition was used to classify the VRI intersected fire perimeters polygons into the following severity classes
    - very high (~95% trees burnt,
    - high (~70% to 94% trees burnt),
    - medium (~31 to 70% trees burnt),
    - low (~ <30% trees burnt) and
    - not burnt
- For the 2016 Wildfires, the software classified fires using pre-fire Landsat8 satellite imagery from 2015 and post-fire Landsat8 satellite imagery from 2017.
- For the 2017 fires, pre and post-fire imagery came from Landsat8 2017 imagery where smoke was not an issue and 2017 Sentinel satellite imagery to fill in the remaining areas.
- The VRI delineation was used as hard boundaries and subdivided into severity classes which were not merged across VRI borders. Any shapes less than 5ha were merged into similar forest cover to reduce the fragmentation of the forest inventory information..

Cariboo Fire 2017 Mortality Impact Analysis

Overview

A network of ground samples established between 2013-2016 across the three Cariboo TSAs (Quesnel, Williams Lake, 100 Mile House) and subsequently revisited in fall 2017, were used to quantify the impact of the recent 2017 Cariboo fires within each of the mapped fire severity classes. The intent was to apply these ground-based mortality averages as adjustments to the VRI phase 1 inventory classification attributes used for VDYP 7 volume projections.

Ground Sample Data Sources

Ground samples were originally established between 2013 – 2016 under three different sampling protocols : 1) Change monitoring inventory (CMI) permanent samples established on the 20km*20km National Forest Inventory (NFI) monitoring grid across all three TSAs, 2) Young stand monitoring (YSM) permanent samples established on a 5km * 10km intensification of the NFI grid in mapped young stands across all three TSAs, and 3) mature audit temporary sample clusters (VRI) established on a 5km * 10km intensification of the NFI grid in mapped mature stands within the 100 Mile House TSA. All fire-impacted ground samples located within the 2017 fire perimeters were identified using ground sample based GPS coordinates. Of the total 68 samples within the fire perimeters, a subset of 36 ground samples were identified via air recce as being partially burned, and were subsequently ground-visited in October 2017 by FAIB staff, and individual tree status (live/dead) were recorded for each ground sample. This permitted both pre-burn and post-burn stand attributes (stems / ha, basal area, volume), and mortality to be compiled for each ground sample. Mortality impact for each sample was calculated as a percentage loss:

$$\% \text{ mortality} = 100 * (\text{preburn} - \text{postburn}) / \text{preburn}$$

Intersection of ground/photo samples with Fire Severity Class Mapping

Fire severity mapping of the Cariboo 2017 fire perimeters (map version 2017-nov-03 created by A. Morrison) was used to classify all ground samples into five fire severity classes (NOT BURNED, LOW, MEDIUM, HIGH, VERY HIGH). Of the 68 samples within the fire perimeter, nine samples were dropped from analysis (ie., 6 samples were outside the forested landbase, and 3 were in adjacent TSAs).

Mortality Impact by Fire Severity Class

The combination of ground samples included CMI samples on the 20km grid and YSM samples on the 5*10km grid across all three TSAs, and mature audit samples on the 5*10km grid from 100MH TSA only. Therefore, mortality impacts by severity class were area-weighted by the following TSA and VRI Phase 1 age combinations: a) Quesnel & Williams Lake TSA Young (<=50yrs); b) Quesnel & Williams Lake TSA Mature (>50yrs); and c) 100 Mile House TSA all ages.

Application of mortality impacts to VRI

Adjustments factors were applied to the **basal area/ha @ 7.5cm utilization**, **stems/ha @ 7.5cm utilization**, **& crown closure** VRI attributes projected to 2017.

2017 Cariboo Fires
Once the VRI was projected to 2017, the attributes basal area and stems/ha were adjusted by the ground sample based percent mortality averages by fire severity class (Table 1a). Crown closure was adjusted by the same percentages as basal area. Revised VDYP volumes were subsequently computed from these adjusted input attributes.

2016 Fires and 2017 Fires Outside of the Cariboo
The projected basal area, crown closure and stems per ha attributes were adjusted by the generalized percent mortality averages in Table 1b. Revised VDYP volumes were subsequently computed from these adjusted input attributes.

Table 1. Percent mortality by Severity Class for a) 2017 Cariboo Fires based on ground data, and b) 2016 fires and 2017 fires outside of the Cariboo based on generalized estimates.

Attribute	Severity Class	% Mortality	
		(a) 2017 Cariboo Fires	(b) All other Fires
Basal Area @ 7.5cm (m2/ha)	very high	98%	80%
	high	92%	80%
	medium	33%	50%
	low	18%	20%
	not	6%	0%
Stems / ha @7.5cm (#/ha)	nuked	99%	80%
	high	89%	80%
	medium	38%	50%
	low	14%	20%
	not	3%	0%
Crown Closure	nuked	98%	80%
	high	92%	80%
	medium	33%	50%
	low	18%	20%
	not	6%	0%