Provincial Forest Cover Wildfire Update for 2018

The 2018 Provincial Forest Cover includes adjustments to reflect the impacts of wildfires that occurred in 2018. These adjustments are based on fire severity mapping performed using satellite imagery which classified burned areas into four distinct severity classes. The resulting adjustments factors were then applied to key VRI attributes.

Burn Severity Methodology

Target population:

- All 2018 wildfire with an impacted area greater than 100 ha

Classification procedure:

Pre & Post Fire Image Selection:

- Where possible, all pre-and post-fire scenes are acquired from June 1st to September 30th of the specified years.
- 2018 fires use either Landsat 8 or Sentinel-2, depending on availability/cloud-cover:
    - Pre-fire imagery can be from June 1st to September 30th up to 3 fire seasons prior to the fire ignition date and from June 1st to one day prior to the ignition date for the year of the fire. Every attempt is made to use imagery as close to the ignition date as possible in order to best reflect ground conditions at the time of ignition.
    - Post-fire imagery can be from June 1st to September 30th one or two years post-fire (occasionally imagery is pulled from late May/early-to-mid October, depending on weather & ground conditions). For "same year" classifications, imagery is pulled from as soon as possible after the smoke clears and the fire has actively stopped moving. In some cases, this means pulling post-fire imagery from late October, and potentially into May/June of the following year to meet operational needs for a product as soon as possible.
    - Example: For a "same year" classification, a fire with an ignition date of July 7, 2018 could have pre-fire Landsat scenes from June-Sept 2015-2017 or June 1st to July 6th 2018. Post-fire scenes will be pulled from August-October 2018 where possible, with some gaps being filled in with post-fire imagery from the year following the fire.

Burn Severity Dataset Creation:

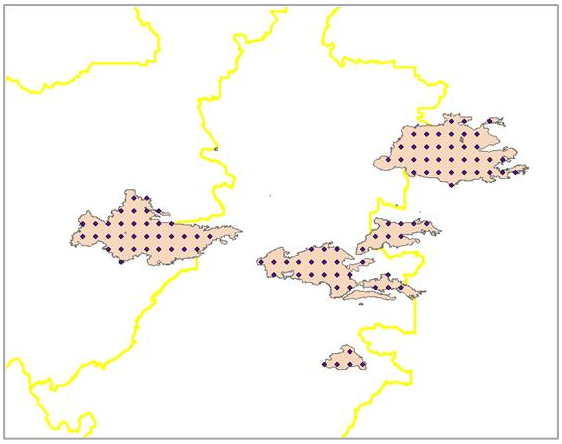
- Pre- and post-fire scenes are used to create a differenced Normalized Burn Ratio (dNBR) raster image. The dNBR uses Landsat 8 or Sentinel-2 imagery in the near infrared and short wave infrared bands.
- $dNBR = \frac{NIR_{prefire} - SWIR_{prefire}}{NIR_{prefire} + SWIR_{prefire}} - \frac{NIR_{postfire} - SWIR_{postfire}}{NIR_{postfire} + SWIR_{postfire}}$

- The dNBR raster image is then classified according to USFS BARC4 categories, with default breakpoints of 76/110/187. A vector dataset is produced and Euclidian distance smoothing is applied.
- No field calibration is done on this data.
- Burn severity ratings are influenced by the effects to the canopy. The severity rating is based upon a composite of the severity to the understory (grass, shrub layers), midstory trees and overstory trees. Because there is often a strong correlation between canopy consumption and soil effects, this algorithm works in many cases for teams whose objective is a soil burn severity assessment. **It is not, however, appropriate in all ecosystems or fires**.

2018 Mortality Impact Analysis

Background:

The distribution of 2018 fires in the Province tended to be more widespread covering the Lakes TSA, Morice TSA, Vanderhoof Forest District, Quesnel TSA, plus Tweedsmuir Park, compared to the 2017 fires. In addition, relatively few grid-based ground samples had previously been established over the majority of burned areas, thereby limiting the value of revisiting previous ground samples (as was done in 2017 to quantify burned impacts). Rather, an aerial reconnaissance sampling of the 2018 burn areas was carried out instead.



Sampling Methods:

Sample points were identified using a 5km * 5km grid established across five major fires primarily within the Morice and Lakes TSAs: (Cheslaslie Arm, Island Lake, Nadina Lake, Shovel Lake, and Verdun Mountain Fires). Helicopter surveys were completed in October 2018 over each GPS sample point location, and included ocular estimates of the total percent burned (by stems) within a 0.04ha plot area. A total of 106 sample points were surveyed.

Analysis Methods:

All sample point locations were intersected against the fire severity segmentation coverage (completed October 2018), and post-stratified into four fire severity classes (high, medium, low, unburned). The average percent burn was then computed from all sample points located in each severity class.

Application:

The different estimates of percent burned were compared (1. previous year's estimates, 2. calculation of ground monitoring samples following 2017 Cariboo fires, 3. calculation from grid-based aerial surveys following 2018 Nadina fires), recognizing that each was based on different methods, and applied to different geographic regions. Final implementation of percent burn estimates for the 2018 fires in BC was based on a generalization of, and knowledge gained from these previous results (Table 1).

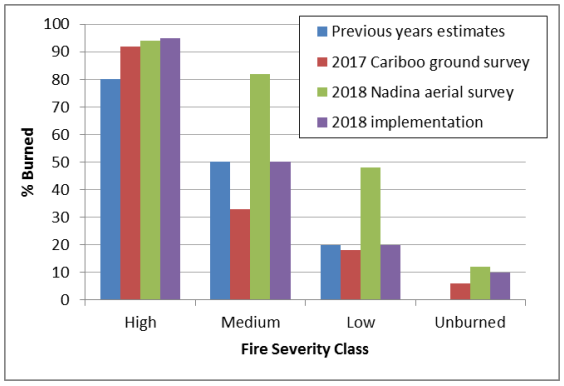


Table 1. Percent burned by fire severity class for 2018 fires applied to the current VRI Phase 1:

Fire severity class	High	Medium	Low	Unburned
% burned	95	50	20	10

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** with VRI attributes projected to 2018.

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

Table 1. Percent mortality by Severity Class for 2018 fires based on generalized estimates.

Attribute	Severity Class	% Mortality
Basal Area @ 7.5cm (m2/ha)	High	95%
	Medium	50%
	Low	20%
	Unburned	10%
Stems / ha @7.5cm (#/ha)	High	95%
	Medium	50%
	Low	20%
	Unburned	10%
Crown Closure	High	95%
	Medium	50%
	Low	20%
	Unburned	10%