How Well do Forest Inventories Identify Wildfire Patterns?

This is an unfair, but timely, question. Forest inventories are designed to identify polygons based on a large number of structural, compositional, and site factors using recent aerial photos. Identifying historic disturbance patterns is not a priority for forest inventories. Nevertheless, a comparison is informative.

Let’s start with an ideal scenario. The images below show burnt (in red) and unburnt (in green) portions of two 3 X 5km sections of a 1956 wildfire that burnt through a mature, pine-dominated forest according to the most recent forest inventory (on the left), and a wildfire pattern map generated from historic photos (on the right). Note that “burnt” for the inventory corresponds to an origin date of 1956, plus or minus five years.

Fifty years after the wildfire event, the inventory in this case was able to roughly identify the location of many of the more significant residual patterns (yellow circle in example A). The inventory did an even better job of identifying the perimeter of the original wildfire (yellow circle in example B).

Many of the differences found are not unexpected. The blue circle in Example A shows a ~80 ha partially disturbed island remnant that the inventory identifies as burnt in 1956 (with no over-story). One can imagine that a partially disturbed residual would be difficult to identify 50 years later - although several other partially disturbed islands were identified by the inventory. It is also not entirely unreasonable to expect that the inventory would mistake a patch of forest from 1930 (in blue in Example B) as one originating from the 1956 burn. The greatest age differences were associated with black spruce, hardwoods, and low density stands.

Keep in mind that the wildfire example given here is deliberately a perfect world scenario. The conditions for identifying age differences could not be better in terms of age and stand composition. Now, imagine extrapolating these issues to average conditions across a boreal landscape. It is hard not to conclude that the ability of inventory data to identify natural disturbance patterns is severely limited. Recall from Quicknote #5 that the forest inventory agreed with a stand origin map only 32% of the time, plus or minus five years. In the end, there was no significant bias, and no consistent relationship between the aging differences and associated site or stand characteristics. Nor was it possible to significantly improve the ability of forest inventories to represent wildfire patterns through supplemental field sampling and spatial modelling.

What does this mean in terms of identifying historic wildfire patterns? Don’t push (inventory) data beyond its originally intended use. It is an unfair expectation, impossible to defend, and cannot be corrected or improved through sampling and modelling. Wildfire patterns can only be gleaned from spatial data specifically collected to study wildfire patterns.

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