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Healthy Landscapes Program Quicknote #52

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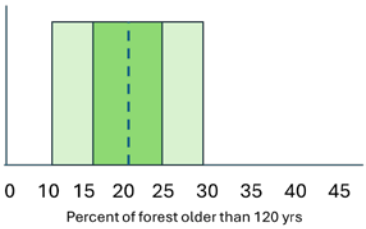
Scale Matters

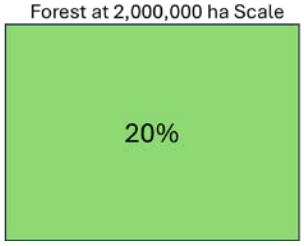
When applying a coarse filter strategy to a landscape, one of the first questions is "*What is its Natural Range of Variation (NRV)?* It is a good question, but incomplete. A better question is "*What is its NRV and at what scale(s)?*

Consider a 2 million ha landscape for which the NRV of old forest levels has been determined (Figure 1). In this case, recreating pre-industrial conditions using a landscape simulation model determined that the median of NRV of old forest was 20% (the vertical dashed line), the middle two quartiles 15–25% (the two dark green boxes), and the range 10–30% (all green boxes). In other words, any old forest levels below 10% or above 30% would be outside of NRV and raise red flags *based on Figure 1*. As it turns out, the current condition of our 2 million ha landscape is at the 20% NRV median (Map 1).

Figure 1. NRV of old forest at 2,000,000 ha.



Map 1. Current Condition of Old Forest at 2,000,000 ha Scale



However, imagine that our landscape is divided up into 20 equal management units (MUs) of 50,000 ha. The current levels of old forest in the MUs (Map 2) varies from 6–37%. Moreover, only 11 of the MUs are in the middle two quartiles, five are in the outer two quartiles, and four are either above or below NRV – *based on Figure 1*.

Map 2. Current Condition of Old Forest at 50,000 ha Scale

31%	24%	20%	23%	11%
25%	10%	8%	28%	16%
28%	23%	12%	14%	37%
12%	24%	22%	6%	26%

It might be tempting to respond to this discrepancy by using the data from Figure 1 to "red flag" the four MUs (shown on Map 2 in red) and/or to use Figure 1 to set old forest targets for strategic planning. However, the problem in this case is that *scale matters*.

Figure 2. NRV of Old Forest at 50,000 ha.

If NRV were to be recreated via modelling based on a 50,000-ha MU scale, it would look something like Figure 2. The median (of 20%) would not change, but the width of each of the quartiles would expand significantly. Consider the following by way of an explanation: in any given year, any single hectare of boreal forest will either not burn, or almost entirely burn, which translates into an NRV of zero to 100%. But over ten million hectares, in any given year the highest possible percentage of forest that will burn will be much less than 100%, and much higher than zero. In other words, *as spatial scales become finer, the range of NRV becomes wider.*

(Why) Is this important? As the example here demonstrates, it is too easy – and highly misleading – to apply estimates of NRV calculated at one scale to another. This is an important nuance that has significant ecological implications. For example, the pattern of spatial variation in old forest levels shown in Map 2 is a part of the natural dynamics of boreal ecosystems required to maintain healthy, diverse, and resilient ecosystems that will help mitigate the impacts of climate change, not to mention provide opportunities for the provision of sustainable habitat solutions levels for critical species like woodland caribou.

In the end, for those committed to EBM via an NRV strategy we need to replace the question "*What is the NRV?*" with "*What is the NRV, and at What Scale(s)?*" to make it more robust, sustainable, and defendable.

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