foothills MODEL FOREST
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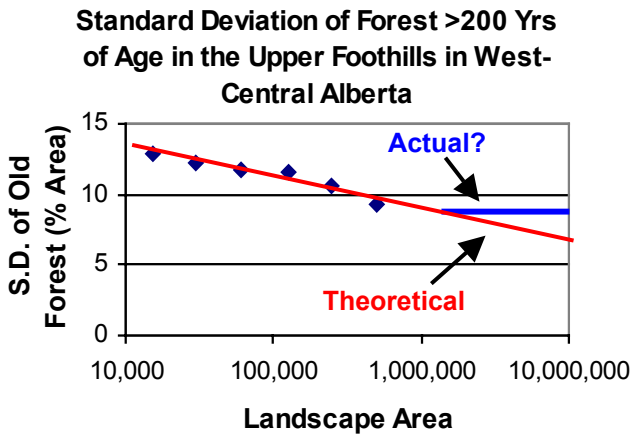
Natural Disturbance Program Quicknote #40

April 2007 *By: David W. Andison*

Do Large Landscapes Have Stable Old Forest Levels Over Time?

In the Alberta foothills at least, the answer is *probably not.*

One hundred landscape snapshots from a spatial modelling exercise were captured at six different spatial scales for the Upper Foothills natural subregion in west-central Alberta. The standard deviations (SD) of the percent area in old forest for each set of runs were calculated (shown as blue dots in the figure below). When the relationship is extrapolated to larger landscapes (red line in the figure below), the theoretical "stable" landscape size for old forest over time (at which point the standard deviation is zero) exceeds the total area of the boreal forest in Canada.



The extrapolation of a relationship so far beyond raw data is admittedly highly dubious. The red line shown here is unlikely to be the actual relationship. Still, the exercise demonstrates two important points;

1) The variation of old forest levels changes (decreases in this case) as landscape size increases (see Quicknote #17 for more details), and

2) *Under constant conditions*, there is no evidence that old forest levels become stable at some threshold landscape size.

However, in reality, we know that the assumption of *constant conditions* is unrealistic. Finding a landscape even 2-3 million ha in size (let alone 10 million ha) with stable climate, vegetation, and topographic conditions is unlikely in the Canadian boreal forest. We know that even minor changes in climatic, vegetation, and topographic conditions are associated with changes in the natural disturbance regime, which will ultimately influence old forest levels (see Quicknotes #1 and #2). We also know that climatic variation plays a significant role in wildfire activity across huge areas of the boreal. So as landscape size increases, the number of fire regimes multiplies, climate remains variable, and the chances of old forest levels becoming *more* stable (or less variable) declines. In fact, at some point, the variability of old forest levels may level off at some threshold landscape size (see the blue line above for one possibility), or even begin to increase again. *In other words, it is possible that the red line in the figure above represents a theoretical minimum value of old forest level variability.*

Details aside, there are considerable practical implications associated with the trends noted here. First and foremost, this exercise suggests that the cycling of old forest areas from low to high levels occurred historically at regional, and even biome scales. Presumably, this cycling functions as a form of landscape resilience, ultimately linked to long-term forest health. For example, the severity of the current mountain pine beetle (MPB) outbreak is arguably in part a result of our successful efforts to "stabilize" the area of older forest at moderate to high levels through forest management and fire control efforts. And the situation was not caused by traditional forest management and fire control efforts *per se*, but rather by adopting similar criteria and applying the same strategies and rules everywhere at the same time.

This suggests that the active management of old forest levels should include regional and provincial scales. At the very least, this creates an appropriate vehicle for managing trans-boundary threats (i.e., MPB) and issues (i.e., habitat) as the need arises. For example, adequately sized habitat for some old forest dependent species are far more likely to be achieved through provincial old forest strategies than relying on the cumulative impacts of landscape specific targets. It also creates a biological framework for considering variable levels of old forest over time at regional or provincial scales, perhaps in response to critical economic, social, or ecological concerns.

For more information on this or other ND Quicknotes, please contact: Dr. David Andison, Bandaloop Landscape Ecosystem Services, Tel.: (604) 939 – 0830, Email: andison@bandaloop.ca, or visit www.fmf.ab.ca