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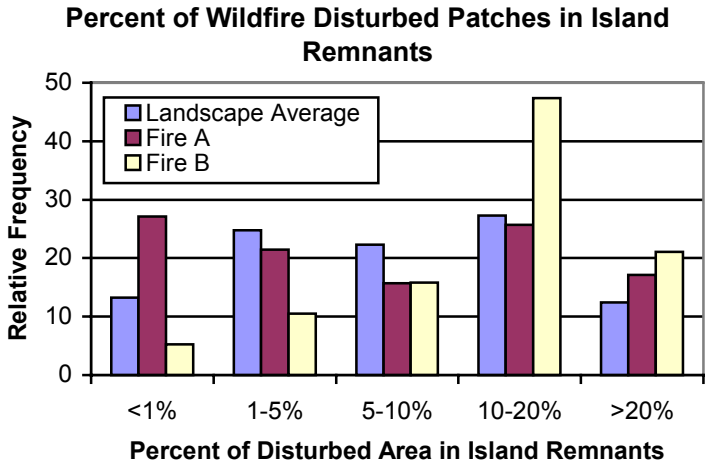
Natural Disturbance Program Quicknote #35

January 2006 ***By: David Andison***

Which is More Important: Variability Between Fires or Within Fires?

Both. The blue columns in the Figure below depict the average frequency distribution of island remnant area for all disturbed patches within 25 wildfires across west-central Alberta – in other words, a landscape average of island remnant levels. Recall that a disturbance event can have many disturbed patches (Quicknotes #4, #7, #13).



If each wildfire represents unique burning conditions, then one might expect the island remnant levels within fires to be similar. Thus, the distribution of the blue bars in the adjacent Figure would be largely due to differences ***between*** fires.

In reality, there is almost as much variation ***within*** fires. For example, the largest fire in our sample shows variability in island remnant levels similar to the landscape average (Fire A in the adjacent Figure). Island remnant levels within disturbed patches of the second largest fire (in yellow) cluster moderately between 10-20%, but the full landscape range is still well represented. In fact, island and matrix remnant levels from all fires in the database show little tendency to cluster based on either event membership, or event size.

Consider what this means. We have established that residual patterns within fires are highly variable. We already know that fuel-type is only marginally related to the probability of burning within a wildfire (Quicknotes #24, #31), which suggests that some combination of fuel and fire weather conditions is responsible for most of the observed variability in residual levels. But it is also well documented that extreme fire weather and fuel conditions are associated with larger fires. So why is there not a relationship between fire size and/or burning conditions and residual patterns? *Why do we not find clustered residual levels for individual fires in west-central Alberta?*

There are several possible explanations. Fire weather may function on different spatial scales. So although there may be a narrow set of (temperature, relative humidity, wind, etc) parameters for a given fire at a given point in time, there is likely a much wider range of site–specific fire weather conditions. Fire weather is also variable over time. Many of the fires in our database burnt over several weeks, during which time weather conditions no doubt varied widely. Consider also that almost half of time, wildfires burn at night. In fact, the proportion of time during which forest fires grow significantly in size may be very short relatively to the duration of each fire. Another possibility is that burn preferences may shift between small and large fires, or during less and more severe fire weather conditions within a single fire. So although *what* burns may significantly change over the course of a fire, *how much* burns may not.

In all likelihood, all of these explanations apply, plus a few others. But in the end it is more important to appreciate that the variability of residual survival patterns within individual fires can be almost as great as that for entire landscapes.

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