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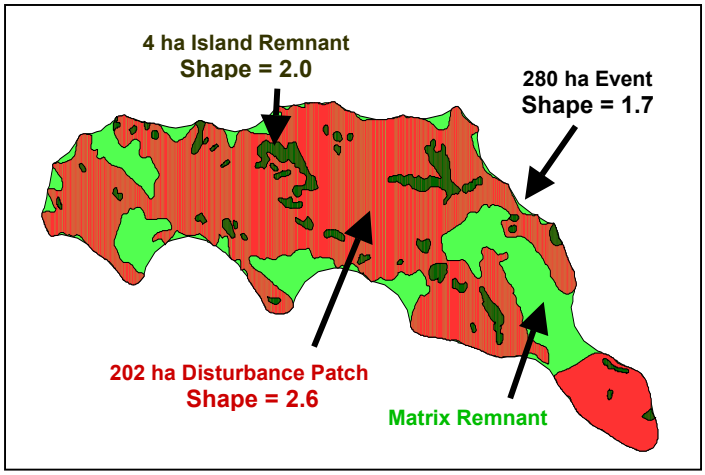
Natural Disturbance Program Quicknote #27

July 2004 *By: David W. Andison*

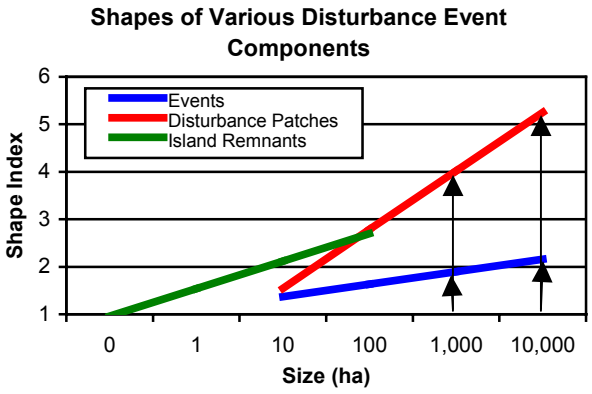
The Shapes of Things to Come

Different parts of forest fires in west-central Alberta have different shapes. Disturbed patches tend to be highly convoluted, while fire events (Quicknote #7) have very simple shapes. For example, the figure below depicts a typical fire event from west-central Alberta, with disturbance patches shown in red, and matrix remnants (Quicknote #22) in light green. In this case, the "shape index" (Quicknote #9) of the largest disturbance patch is 2.6, but the 280 ha event polygon (including all matrix remnants and disturbance patches) has a shape index of just 1.7. In other words, the perimeter of the disturbance event is 1.7 times longer than it would be for a 280 ha circle.

Surprisingly, given their size, island remnants are the most convoluted polygons within forest fires. For example, a 10 ha island remnant has the same shape index as a 30 ha disturbance patch, or a 6,000 ha event.



Common to all polygons is the fact that shape becomes more complex as size increases, although to different degrees. For example, a 1,000 ha disturbance patch has about twice as much perimeter as a 1,000 ha event (shape index of 1.9 and 4.0 respectively – see figure below). However, a 10,000 ha disturbance patch has 2 ½ times as much edge as a 10,000 ha event (5.3 versus 2.1 respectively).



These observations raise some interesting questions. For example, why are island remnant shapes so different than those of disturbance patches, given that they are both direct spatial products of forest fires? The higher complexity of island shapes may be a result of an elevated response to fine-scale shifts in fuel-type, fire weather or topography. If this is true, it suggests that islands are created by a slightly different combination of factors than are fire edges.

Similarly, why do disturbance patches become significantly more convoluted as they increase in size? Since there is no parallel increase in either island remnant or matrix remnant areas (Quicknotes #18, #22), this phenomenon may be related to an increase in the range of fire intensity associated with larger fires. If this is true, it means that large fires are influenced by a slightly different combination of factors than are small fires.

In any case, the value of studying shapes is well demonstrated. From a practical perspective, these are all valuable benchmarks for natural pattern emulation strategies. More importantly, the examination of shapes also generates some relevant questions that may lead to an even greater understanding of the relationship between pattern and process.

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