

FMF Natural Disturbance Program Research

Quicknote No. 9 – July 2001

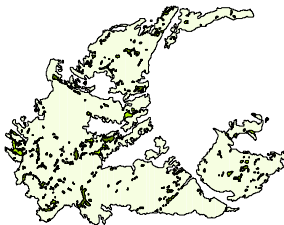
The Mystery of Patch Shape

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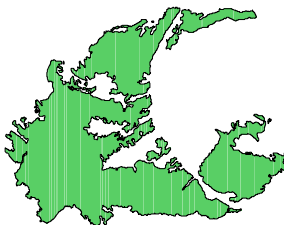
“Shape” is the relationship of the length of the perimeter of a patch relative to its area. Circles are the simplest shapes and thus have a “shape index” of one. As patches become more convoluted, the amount of perimeter per area increases, and the shape index climbs. In the figure below, the shape index of 5.8 refers to a perimeter length 5.8 times longer than that required for a circle (of the same number of hectares).

Many landscape pattern studies suggest that patch shape increases as patch size increases – often dramatically. While this is generally true of Alberta, interpreting this assertion is not as simple as it would seem. For example, pattern software may not differentiate between *perimeter* and *edge*. “Edges” include the exterior perimeter of a patch, plus all of the boundaries of internal features such as islands. So in the fire example below, a shape index of 10.2 is computed using all (internal and external) edges. Yet,

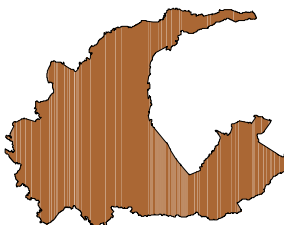
Patches with Islands
Shape = 10.2



Patches Alone
Shape = 5.8



Event Area
Shape = 2.2



of 10.2 is computed using all (internal and external) edges. Yet, when the edges of island remnants are eliminated from the calculation, the shape index is reduced to 5.8. In other words, islands account for almost half of the edges in this particular fire.

When all internal complexity (in the form of peninsulas and corridors) is dissolved, the shape of the gross fire event area (see Quicknote #7) is 2.2. In fact, the shape of fire events (as opposed to patches) is actually quite consistent. For 22 sample fires in the foothills of Alberta ranging in size from 28 to 18,000 ha, shape index averages 2.4 and is not related to disturbance size. The sample fire used here is about 8,900 ha.

From an ecological point of view, this further supports the notion that there are different types of edges on a “natural” landscape (see Quicknote #8). It is quite possible that island and corridor edges function differently than do perimeter edges.

From a practical point of view, this finding suggests that forest management and monitoring should be planning for, and differentiating between different types of edges, and nested levels of complexity. Fortunately, the relationship between event shapes and patch shapes facilitates a logical progression. Event area shapes are consistently simple, meaning both large and small disturbance events can be designed strategically. At operational scales, the perimeter of individual patch shapes within an event become more complex as patch size increases. At even finer scales, the amount of internal edge increases with patch size as the number and amount of residual islands in each patch increases. The trick is to understand, and distinguish between the different expressions of “shape”, and make sure comparisons to baseline data are equitable.