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DISCLAIMER

The views, statements and conclusions expressed and the recommendations made in this report are entirely those of the author(s) and should not be construed as statements or conclusions of, or as expressing the opinions of the Canadian Forest Service, the Foothills Model Forest or the sponsors of the Foothills Model Forest.

The Foothills Model Forest is one of eleven Model Forests that make up the Canadian Model Forest Network. As such, Foothills Model Forest is a non-profit organisation representing a wide array of industrial, academic, government and non-government partners, and is located in Hinton, Alberta. The three principal partners representing the agencies with vested management authority for the lands that comprise the Foothills Model Forest, include Weldwood of Canada (Hinton Division), the Alberta Department of Environmental Protection and Jasper National Park. These lands encompass a combined area of more than 2.75 million hectares under active resource management.

The Canadian Forest Service of Natural Resources Canada is also a principal partner in each of the eleven Model Forest organisations and provides the primary funding and administrative support to Canada=s Model Forest Program.

The Foothills Model Forest mission: We are a unique community of partners dedicated to providing practical solutions for stewardship and sustainability of our forest lands.
BACKGROUND

The Natural Disturbance Research Program of the Foothills Model Forest has been established to describe and summarise the patterns caused by historical disturbances at a range of scales. Reporting of small-scale patterns has been, or is now being, completed but several questions remain at larger scales. Evidence from similar landscapes (in Saskatchewan) suggests that disturbances such as fire may act selectively along riparian corridors. Such selectivity may be in the form of increased edge-forming capabilities along such corridors, or perhaps changes in fire intensity or even fire type as fire moves through such areas. There is also evidence from other similar landscapes (in B.C.) suggesting that such corridors have no unique role in terms of disturbance pattern design. The impact of riparian corridors in disturbance patch design has not been tested on the Foothills Model Forest.

The project described here will complement an ongoing study of meso-scale patterns studying differences in ages, composition, or structure in riparian corridors. This project will focus on potential detailed changes that take place through a given individual riparian corridor in terms of age and stand structure.

OBJECTIVES

The primary objective of this study is to determine whether fire severity, flooding, and/or other impacts of disturbance within these areas is significantly different than that of the surrounding forest matrix. This first year of the study was to be a pilot year, to test methods, and provide preliminary information on disturbance activity in riparian areas. This report is the final phase of the pilot project.

METHODS

Office

Ultimately, all five natural subregions present on the Model Forest should be used as strata, but this year only the Lower Foothills and Upper Foothills Natural Subregions of the foothills east were selected and sampled. The sample frame for this study consisted of continuous strip transects. Each transect was oriented at a right angle to the water course it crossed, and extended at least 50m into the forest matrix (upland) on either side. Identification of what the “matrix” consisted of was somewhat subjective, but as a minimum, was beyond the geological impact of the original water action that created the riparian zone. Weldwood’s riparian zone maps did a good job of distinguishing riparian from upland (matrix) forest areas. A total of fifteen transects were sampled during the summer of 1998.

The small sample size resulting from the short field season meant that randomisation of the transect locations was not possible. Ideally, we had hoped to stratify transect positions according to subregion, stream order, and degree of topographic change. Ultimately in 1998, we merely tried to cover as many combinations as possible. We also tried to cover a range of stand ages and types, and transect directions, and avoid known cultural activity.
Selecting transect candidates for 1998 involved using the Weldwood orthophotos, the stream-order and riparian type map, and topographic maps to find a range of natural riparian conditions (as outlined above), within reasonable travel distance from roads or trails. Candidate transects were marked on copies of the photos, and located in the field.

Field

Once in the field, reconnaissance was carried out to make sure there was no evidence of cultural activity or other complications at the site not evident from the photos or maps. Rejection of candidates at this stage was a common occurrence – close to half of the transects identified in the office were rejected in the field for one reason or another.

When a transect location was approved, the exact beginning of the transect was located on the ground and tied into a known geographic location (so that each may be found again). Each transect was to be four metres wide (the width of outstretched arms with 100 centimetre calipers in each hand), but this was soon found too onerous and time consuming and was reduced to two metre width early on in the sampling.

Originally, every live and dead tree within the strip was noted for distance, and sampled for species, dbh, height, and either a core or wedge sample taken from each. Again, this proved to be too time consuming, and the age sampling was reduced to every tenth tree after the first two transects. For stems with fire scars within 10m of either side of the strip (beyond the intensively sampled area), wedges or cookies were taken. Changes in topography and site classification (using the field guide) were noted along the transect, as well as significant changes in duff depth, amounts of downed woody debris, evidence of charcoal, fire scars, or evidence of other disturbance. A soil pit was dug and described every time the ecophase classification changed. At every ecophase change, a slide photograph was taken.

Core and cookie samples were taken as close to the germination point on each tree as possible. All tree core samples were marked with the associated tree and transect numbers and were stored in straws. Cookies and cores were bundled and sent to a lab for processing and ageing.

Data Manipulation

All core and wedge samples were sent to a second consultant for preparation and counting. All field data were entered into a spreadsheet.

RESULTS

Analysis

The tally sheets were not available until late March, so only a very cursory examination of the data has taken place so far. Even so, the examination was revealing. Of the 15 transects sampled, only six showed even marginal evidence of surviving older trees or “veterans”. The remaining nine transects showed no evidence at all of any trees having survived the last stand-replacing disturbance. Figure 1 demonstrates one of the nine transects that showed no evidence of veterans. Of the six that showed at least one older tree along the transect, only three or four
are convincing. Difficulties arose in being able to identify the significance of older stems appearing within the riparian “zone” versus the upland matrix. In other words, it was not always clear that the upland forest did not have veterans as well. Although the riparian zone clearly had an influence on the survival of veterans in transect 12 (Figure 2), the relationship is not so clear in transect 14 (Figure 3).

However, three of the transects showed fairly clear signs of ingress, or younger trees closest to the water course (Figure 4). This is an aspect of disturbance impacts on riparian zones that was not considered at the outset of this project, but is a potentially important pattern worthy of study.

Ultimately, analysis will involved the entire field dataset and also include changes in structure, composition, and density (as well as age) along the transect using simple regressions to start, and then moving to percent similarity, distance blocking, and semi-variograms if necessary.

Figure 1. Tree ages along transect 5, Disturbance Dynamics in Riparian Corridors Project, 1998.
Figure 2. Tree ages along transect 12, Disturbance Dynamics in Riparian Corridors Project, 1998.

Figure 3. Tree ages along transect 14, Disturbance Dynamics in Riparian Corridors Project, 1998.
Method Review

The greatest weakness of the current method is that it does not provide adequate sampling in the upland matrix(s) on either end of the transects. It is now evident that 50 metres into the matrix is not far enough. Field methods in 1999 should extend this to 100 metres on either side.

Another problem with the sampling method is that it is still too slow. With only 15 samples so far, several different, and competing conclusions could be drawn. The need for a far higher sample size outweighs the need for high levels of detailed mensurational and site data. Therefore, the following changes are recommended for 1999:

1. Eliminate soil pits. The ecosite classification data will act as a surrogate for changes in soil texture, drainage, or moisture regime.

2. Estimate tree heights within classes. The procedure for measuring exact heights with a clinometer is labour intensive, and prone to human-error under less than ideal conditions.

The greatest concern in this project is that while transect data may indicate where and when fires may have left residual material behind, these instances must be associated with a particular set(s) of circumstances. Careful control over stratification is therefore necessary. Subregion stratification proved difficult to control in other projects (such as in the island remnants project), and is probably not the best way to stratify. Stream type and/or riparian zone width and steepness are likely better classifications to use, representing the relative degree of
difficulty of fires being able to cross. Fuel-type (perhaps using the Fire Behaviour Prediction classification) and age should be tracked as independent variables, but not used to stratify. It may also be worthwhile to sample the same disturbances in different locations, across different riparian types.

Finally, sampling methods which allow for mensurational data only within a two metre strip, yet at the same time allow for a subjective “search” for trees that have obviously survived past fires, is not as rigorous as it could be. This could be considered a loose application of a two-stage sampling regime, but may introduce a bias since it relies on visual evidence. However, this is an unavoidable tradeoff if the speed of sampling is to be maintained. The alternative of more intensive destructive sampling is out of the question.

Analyses from this study would no doubt benefit from a parallel analysis done one scale up from this. In other words, there is the possibility that this project is not addressing the riparian/disturbance interaction at the appropriate scale. Efforts to maintain a connection between the results of analysis at each scale must be continued.

**RECOMMENDATIONS**

Despite the methodological issues, the results indicate that, at least so far, the majority of riparian zones are not treated differentially by forest fires. Fires appear to simply burn through riparian areas as they do in the upland. It should be noted that the data is far too weak as it stands to support strong conclusions. Considering the importance of this issue in forest management, it is recommended that sampling in 1999 proceed with the changes noted above, with the goal of at least tripling the sample size.

The final analysis and report would benefit from incorporating the spatial work done in the Meso-Scale Landscape Disturbance Patterns and Processes project in 1999/2000. This will provide a more comprehensive overview of the riparian disturbance question.