THE EFFECT OF PATCHCUT SIZE ON THE COMPOSITION OF NATURAL REGENERATION IN THE NEOTROPICAL FOREST OF BELIZE

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Abstract

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Four sizes of patchcut (500m^2 l000m^2. 2500m^2 and 5000m^2) were cleared in the neotropical forest of northwestern Belize in July of 1996. One year later, natural regeneration that had become established on a l00m^2 central study plot in each patchcut was identified and measured as a first step towards evaluating the optimum patchcut size for regenerating valuable shade-intolerant species. Two parameters affecting the composition of the regenerating trees were also quantified: the light environment (PAR) as measured simultaneously on all patchcuts by Li-cor light bars over 7 days; and the available seed source from the surrounding trees.

The 500m^2 patchcut had a significantly lower number of species regenerating (8/l00m^2 than did the larger patchcuts (ll-13/100m^2). There were also significantly fewer individuals >1 tall regenerating in the 500m^2 patchcut (31/l00m^2 than in the larger patchcuts (61-80/loom The average number of individuals of commercial species was also lower in the 500m^2 patchcut (21/ than in the larger patchcuts (32-45/100m^2 but this difference was not statistically significant at the 95% level. The quantity of light (PAR) received at the center of the 500m^2 patchcut averaged 73% of that received at the center of the 5000m^2 patchcut in the summer and 55% in the autumn. Measurements of the range in light (PAR) from the center to the edge of the 500m^2 and 5000m^2 patchcuts confirmed that the proportion of each patchcut that is favorable to shade-intolerant species is larger in the larger patchcut sizes.

The composition of seed trees surrounding each patchcut did not explain the composition of the regenerating trees. Nonetheless, only 15% of the regenerating species in the 500m^2 patchcut were also found in the tree canopy surrounding the patchcut as compared to 19- 21% in the larger patchcuts.

Conclusion

The objective of this study was to evaluate the effect of patchcut size on the composition of naturally regenerating species. I concluded that there are significant differences in the composition of species naturally regenerating in the 500m^2 patch relative to the larger patch sizes. After 1 year, natural regeneration from seed in the center study plot of the 500m^2 patch was consistently lower in the number of species, the number of commercial species, and the number of seedlings >lm tall. This trend may be explained by what was revealed in the seed availability and light study.

The seed availability study does not sufficiently explain the composition of regeneration. Nonetheless, there was a lower average % of compositionally similar species in 500m^2 patch than in the larger patches. This may be a result of fewer trees on the perimeter of the smaller patch. It may also be a consequence of the effect of patch size on light available to the regenerating species.

The results from the *Interpatch study* indicate that light may be a causal factor in the differences in natural regeneration inside the different patch sizes. With decreasing patch size, there was a steady decrease in the daily sum of light reaching the patch centers. The consequences of this lower availability of light may become more apparent as the existing trees compete for resources over time, Dale et *al*. (1995) found that 30 years after silvicultural treatments, the proportion of shade-intolerant species increased as opening size increased up to 1 acre (~4050m^2).

The *Intrapatch study* revealed the effect of edge on light available to the regenerating species. The larger patch sizes have a smaller edge per area ratio than the smaller patch size, and these edge effects are likely to be further exaggerated on each side of the summer solstice, based on the seasonal differences in light revealed in the *Interpatch study*. This means that the proportion of patch clearcuts favorable to shade intolerant species will be higher in the larger patchcut sizes.

In the temperate forest of North America, studies have shown that 30 years after clearing, the distance from the edge affects stand characteristics for at least 30m into the opening (Dale et *al*. 1995). Although the species composition in the center study plot of the 1000m^2 and 2500m^2 patches (both 25m to the patch center) was not significantly different from the 5000m2 patch, differences may emerge overtime. Future trends in species composition must be monitored. Even at one year since clearing, the 500m^2 patchcut seems to be below a threshold that limits both the number of different species and the number of individuals of commercially valuable species.