

Landscape fragmentation and forest fuel accumulation in Puerto Rico

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Landscape fragmentation creates an increasingly complex environment in which to manage forests in the United States. Few studies have related the combined effects of fragmentation, fragment size, forest type, and climate on biomass, species composition, downed woody debris, and decomposition. Fragmentation can affect fuel accumulation, increase the spatial variability of fuel loads, and affect the susceptibility of forests to fire. Developing a landscape-scale picture of spatial variability in fuel loads requires an understanding of fragmentation and edge effects. We are investigating the effect of forest fragmentation on fuel loads along gradients of climate, stand age and structure, and fragment size. We are using a combination of remote sensing, field sampling and experimentation, GIS, multivariate analyses, and empirical modeling in order to quantify and compare fuel loads in fragments of different sizes (e.g. ha to km²), ages (e.g. open young secondary to older closed forests), and in different climates (e.g. tropical, temperate, and boreal). We measured coarse and fine woody debris, species composition, tree heights, diameters, crown dimensions, and understory characteristics along transects crossing 720 fragment edges and interiors in Puerto Rico, Washington, Idaho, Alaska, and Minnesota. Initial findings on downed woody debris accumulation indicate similar patterns in boreal and tropic climates, with mean plot values of 17.7 and 14.7 Mg/ha downed woody debris in boreal and tropical plots respectively. Edge effects and differences related to fragment structure, age, and size vary with climate. Analyses of Puerto Rican lowland moist and dry forests indicate 1. Greater amounts of coarse woody debris on older, moist forests and in larger fragments, 2. Significant edge effect in older forest patches, with a trend of reduced coarse woody debris along edges, and 3. Significant differences in fragment size effect with less coarse woody debris in smaller, moist forest patches.