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The Role of Fire in Population Dynamics of Woody Plants

William A. Hoffmann and Adriana G. Moreira

UNDERSTANDING THE FACTORS RESPONSIBLE FOR THE GREAT VARIATION in woody plant density has been a challenge for ecologists in the cerrado and other tropical savannas. It is becoming evident that no single factor determines tree density in the cerrado; rather, nutrient availability, water stress, and fire interact to determine woody plant cover. Of these three factors, the role of fire is perhaps most important to understand, since it alone is largely under human control and is probably the factor most variable at the interannual to interdecadal scale. Therefore it is likely responsible for most temporal changes in woody plant density within the time frame of human observation (see chapter 4).

Evidence of fires in the cerrado has been recorded for before 27,000 years before present (Vicentini 1993) and was probably present long before then. Thus, woody plants have been exposed to its selective pressure for a considerable part of their evolutionary history. Although the flora appears very well adapted to normal levels of fire, human activity has almost certainly increased fire frequency above the natural rate (chapter 5). So while the cerrado plants are in general tolerant of fire, in many cases they are now subjected to frequencies in excess of the environment in which they evolved.

The dynamics of plant populations is determined by a suite of vital rates, including survival, growth, sexual reproduction, vegetative reproduction, and seedling establishment (chapter 8). The impact of fire is sufficiently severe to affect all of these vital rates, having implications for population dynamics and thus community dynamics. In this chapter, we review the known effects of fire on each of these vital rates. Then we