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Preface

Large-scale experimentation and oak regeneration

Oak (*Quercus*) species are among the most ecologically and economically important tree species in temperate regions of North America (Abrams, 1992; Tyler et al., 2006). However, because promoting oak regeneration has been problematic in many North American oak ecosystems, it is a topic of interest to land managers, silviculturists, and ecologists. In addition to numerous articles in the ecological and forestry literature, oak regeneration has been the focus of past symposia, special issues, and proceedings (e.g., Loftis and McGee, 1993; Spetich, 2004; Weigel et al., 2005). In this Special Issue, we explore oak regeneration from a large-scale perspective. The origin of this Special Issue is a symposium at the October 2006 Society of American Foresters National Convention, in Pittsburgh, PA, USA, co-sponsored by the C-1 Ecology and D-2 Silviculture Working Groups.

For a number of years, researchers have noted the importance of large-scale manipulations for understanding the ecology and management of ecosystems (Carpenter, 1990; Walters and Holling, 1990). For example, there have been recent calls for large-scale manipulations to help resolve processes critical to forest management, such as hydrology (Ormerod and Watkinson, 2000), fire (Freckleton, 2004), and forest harvesting (Bennett and Adams, 2004). Oak regeneration is also driven by a variety of processes operating at large spatial scales (Johnson et al., 2002). Important oak regeneration drivers, such as fire, canopy gap formation, and silvicultural harvesting techniques, operate at scales ranging from hundreds of square meters to hundreds of hectares. Although important to our current understanding of oak regeneration, past studies of these processes based on observation, extrapolation from smaller-scale experiments, or unreplicated large-scale manipulations carry varying levels of uncertainty (Carpenter, 1990). Through direct manipulation of large-scale processes, large-scale experiments can provide unmatched insight into drivers of oak regeneration (Carpenter, 1990). Several large-scale experiments have recently been established to understand oak ecology and produce management recommendations for regenerating oaks. This Special Issue brings together five papers that address oak regeneration in large-scale experimental settings, encompassing a variety of North American oak ecosystems.

The papers in this Special Issue address determinants of oak regeneration in a number of ways. All manipulate large-scale ecological processes that may be important for oak regeneration including fire, canopy gap formation, and mammal browsing. Some experimentally employ management techniques, such as overstory harvesting and restoration, as large-scale manipulations. Others investigate how underlying factors such as soil characteristics, ecological land types, and year-to-year variability interact with large-scale experimental manipulations to govern oak regeneration. Specifically, Brudvig and Asbjornsen (2008) use restoration thinning in Iowa oak savannas to understand the interplay of woody encroachment/encroachment removal and canopy gap dynamics for oak regeneration. Collins and Battaglia (2008) summarize results from a long-term experiment investigating oak regeneration after experimental canopy gap formation in South Carolina bottomland hardwood forests. Iverson et al. (2008) manipulate landscapes with prescribed fire and canopy thinning to investigate how these management options interact with underlying soil moisture regimes to impact oak regeneration in southern Ohio. Kabrick et al. (2008) study the importance of underlying ecological land types for determining oak regeneration during landscape-scale silvicultural manipulations in Missouri. Tyler et al. (2008) investigate underlying site-level conditions, manipulate browsing by a variety of mammals, and repeat their experiment in four different years to understand recruitment limitations of two savanna forming oak species in California.

These papers demonstrate both the important contributions that large-scale experiments can make to our understanding of forested ecosystems and, at the same time, the types of difficulties associated with working at these scales. By experimenting at appropriately large scales, important insights can be drawn that would be simply missed if working at smaller scales or with observational studies (Carpenter, 1990). However, there is an inherent trade-off between experimental scale and experimental replication. The papers in this Special

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Issue employ a variety of analytical techniques to empower modestly replicated experiments. Through these and more standard approaches to experimental design, these papers succeed in working at large scales to inform land management and direct the regeneration of oaks.

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