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Biological Diversity in Forest Ecosystems

A Position Statement of the Society of American Foresters

This position statement is based on a task force report published by the Society of American Foresters in July 1991 (SAF 91-03, ISBN O-939970-45-7). Originally adopted by the SAF Council on November 12, 1991, and renewed December 5, 1994, December 11, 1995, June 1, 1996, January 13, 2003, and November 14, 2008. This position will expire on November 14, 2013 unless, after subsequent review, the SAF Council decides otherwise.

Position

The Society of American Foresters (SAF) values biological diversity and supports forest management practices that consider biological diversity together with other factors, such as the characteristics of the ecosystem, landowner objectives, natural disturbances, and the best available science.

SAF believes that active silvicultural practices can play an important role in restoring and sustaining native species and their habitats, and in maintaining natural patterns of biological diversity across landscapes by approximating ecological processes and maintaining the compositional, functional, and structural diversity of forests at varied spatial and temporal scales.

Managing for biodiversity reflects important policy choices and value judgments. Among these choices are the levels of acceptable biodiversity, how to measure biodiversity (e.g., native versus non-native species), and the roles of different landownerships and land uses in providing for biodiversity.

Issue

Most forest management practices influence biological diversity (also referred to as "biodiversity") to varying degrees, with attendant economic, social, and ecological implications. Knowledge of the interaction among biological, social, and silvicultural systems is necessary to plan and implement actions that will have the desired effect on biodiversity. Historically, human demands on natural systems have resulted in modification, often manifest as a simplification, of many biological systems (Schulte et al. 2007), together with a loss of open space, which in recent years has increasingly raised concern about the need to balance human-centered land uses with biodiversity conservation objectives, such as providing adequate habitats for species dependent on forest ecosystems.

Forest management practices can restore, maintain, or reduce biodiversity depending on how they are conducted. Professional foresters can contribute to the management of landscapes for biological diversity by virtue of their knowledge, training, and experience. A primary challenge is determining how to manage forestlands for human needs while meeting biodiversity objectives. Another challenge is to agree to clear biodiversity objectives that are achievable

within context of the changes that have already taken place, or will take place, while also meeting the objectives set for other human needs.

Background

Biodiversity refers to the variation of life forms within a given ecosystem, biome or the entire earth. It includes the variety and abundance of species, their genetic composition, and the communities, ecosystems, and regions in which they occur (Hunter 1990, Gaston and Spicer 1998, Burley 2002). It also refers to ecological structures, functions, and processes in communities, ecosystems, and landscapes and includes variation within a species and among species, and comparative variation or diversity among ecosystems. Biodiversity has evolved over time through the influence of genetic and ecological processes. Genetic processes such as natural selection are interconnected with ecological processes, including climate change and disturbance from fire, flood, wind events, and insect and disease infestation. Biodiversity is also believed to have dramatically changed due to large scale catastrophic events such as volcanism or meteor events. Human activities that affect biological diversity are many and vary greatly worldwide, but may include modification of ecological processes (e.g., fire regimes), conversion of forest to alternate land uses, hunting and fishing, introduction of non-native species (both in terrestrial and aquatic ecosystems), fuelwood gathering, subsistence agriculture, and forest management practices that change habitat characteristics of forests (FAO 2001). Public policies that address the major factors causing changes in biodiversity, such as providing incentives to retain land in forest cover, can help maintain some components of biological diversity (e.g., Greenberg et al. 1995, Provencher et al. 2002, Best 2002), particularly when disturbance regimes have been modified.

The history of forest use, changing natural disturbance regimes, and current and anticipated levels of demand for forest resources (FAO 2001) mean that protection in an unmanaged state is not a viable option for much of the world's forests. Since the beginning of the profession, foresters have attempted to meet human demands by managing for a sustained yield of commodities while protecting soil and water resources and maintaining the productive capacity of the site. Recently, however, as the importance of biological diversity and its relationship to other forest uses and values has become better understood, a more comprehensive view of sustainability has emerged in which sustained yield of wood and fiber is one among several goals of forest management (Floyd et al. 2001). This view of sustainability includes concerns about relationships among human uses of forests, biological diversity, ecosystem processes and services, and economic and social well-being (e.g., Johnson et al. 1999, Heissenbuttel et al. 2001, Wilkinson 2001). Many questions about sustainability reflect the need to learn how long-term, large-scale interactions between the environment and human activities can be better managed to improve both human well-being and the condition of natural systems in ways that are both ecologically and economically sustainable.

Considerations

Foresters should recognize the context and effects of their operations and their implications for biological diversity (Hunter 1990, Dale et al. 2000). Managed forests exist in many different contexts, including those where other land uses such as agriculture and development may be

common. In such situations, foresters need to work with landowners and communities to help identify desired biodiversity objectives and consider how to address such factors as urban expansion, forest uses, and management for fire, disease, and insect outbreaks to meet those objectives. Within landscapes dominated by forest, contextual considerations may include maintaining or restoring a mosaic of forest structural classes, the diversity of native tree species, and the distribution of features (e.g., abiotic features, retention areas, corridors, edges) within and among stands (Dale et al. 2000). In both landscape contexts, consideration of societal interests will be essential to address non-native species and uses such as hunting and fishing.

Foresters also need to consider actions at the stand scale that sustain or restore ecological processes (e.g., prescribed fire) and structures (e.g., large dead wood, both standing as snags and fallen trees) important for maintaining species and functional diversity. Consideration should be given to how structural and functional diversity varies but is still important at all stages of stand development.

Coordination and planning across ownerships can enhance conservation of biological diversity at the regional and local levels. Numerous strategies for conserving biological diversity exist and vary by landowner. For example, public landowners may emphasize late-successional forests or undertake ecological restoration projects, whereas, private landowners may emphasize early-successional habitats or make other contributions, such as protection of riparian zones. Efforts to date indicate that a mix of strategies, involving both public and private forest owners, offers the greatest promise of success. In developing ownership-level goals for biological diversity, foresters should become familiar with the conservation priorities of habitat and recovery plans for endangered, threatened, and sensitive species and initiatives that exist at the regional or national levels (e.g., Recovery Plans for specific endangered and threatened species, North American Bird Conservation Initiative, Partners in Flight, the North American Waterfowl Plan, and Partners in Amphibian and Reptile Conservation). Landowner incentives and forest certification programs are valuable tools to influence private landowner's capacity and desire to manage forests for biodiversity (Hagen et al. 2005). As such, existing incentives (e.g., conservation easements) should be enhanced and new incentives developed to achieve that goal.

Research provides significant information to assist forest managers in providing for biological diversity while meeting the economic and social objectives of their forest management strategies. However, there is a need for continued long-term research and monitoring to enhance our understanding of ecological interactions in forests and between forests and other land uses (Schulte et al. 2006). When feasible during forest inventories, foresters should gather data on forest structural features that are useful when considering biological diversity at relevant spatial scales (Pregitzer et al. 1999). Additionally, foresters should seek to integrate standard forest data and biological inventory data (Pregitzer et al. 1999). As knowledge accumulates through research and monitoring, management actions will have to be taken using the best available information. Thus, forest management activities should be considered "adaptive" in terms of their relationship with biological diversity, and foresters should be willing to "learn by doing" (Walters and Hollings 1990).

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