

EMERGING NEEDS FOR OAK MANAGEMENT AND RESEARCH

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A facilitated audience discussion on emerging needs for oak management and research at the Oak Symposium revealed several interrelated themes. The audience identified needs that fell into three primary categories:

- Applying research;
- Adoption of existing knowledge and technology; and
- Infrastructure/available markets.

Research needs are broad, due to large species' ranges, and specific, due to lack of studies on particular research questions. Extrapolation of research results across multiple geographical ranges is difficult. A single management prescription to regenerate and recruit oak is desired by managers, but is probably unrealistic; however, single prescriptions have been adopted across a wide geographic range. For example, a shelterwood-burn technique (Brose 2010) tested in the Piedmont is currently being applied on many public and some private lands throughout the Eastern United States without concurrent support from research in other areas. Conversely, other research needs (e.g., use of fire, planting, thinning) in the Piedmont is largely lacking. Artificial regeneration research developed in the Ozarks/Boston Mountains (Johnson and others 1986, Spetich and others 2002) has been largely adopted throughout the Eastern United States even though site quality and competition will drastically differ in forests to the east and south. The long-term nature of forestry research further exacerbates difficulties in transferring research results into real-world prescriptions. Rarely do silvicultural studies have results past the stem exclusion stage of forest development.

Specific research gaps exist on relationships between site quality and management. While it is well understood that lower site quality yield better oak regeneration and recruitment (see Chapter 4 Johnson and others 2002), there is a specific lack of research on efficacy of specific management practices across a range of productivity levels (e.g., site index). Oak silviculture should be 'finer-tuned' to identify stands where oaks can dominate, timber returns can be realized, and management inputs to promote oak (e.g., fire, herbicide, planting) do not exceed revenue. In other words, where will managers get the best return on their investment?

A major research need currently exists for growth and yield models in oak stands. Comparisons among existing growth and yield models have not been adequately conducted, and models of ingrowth are virtually non-existent (see Chapter 10 in Johnson and others 2002). The most commonly used growth and yield tables in oak stands are limited to even-aged stands that are normally stocked (i.e., near 100 percent stocking) (Gingrich 1971, Schnur 1937). Model use and validation rely largely on expert knowledge of forest conditions.

Large knowledge gaps exist on prescribed burning in oak stands. Impacts to timber quality and economics from prescribed fire is not well understood. The inherent variability in fire use and behavior restricts research results from specific studies being applied broadly. Studies that capture the full gamut of stand management, species characterization, and fire ecology are largely lacking (but see Iverson and others 2008). Managers need to be able to incorporate knowledge of past stand disturbances, including fire, into silvicultural

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prescriptions and better understand when and how to apply prescribed burning to meet management and restoration goals.

Perhaps the most difficult aspect of oak research is the transfer and adoption of research results to the field. The most widespread problem is the continual use of high grading or diameter-limit harvesting on private forest lands. Forestry was founded on sound principles to improve tree growth, and thereby tree health, but degradation of forests through high-grading is probably the most widespread 'management' technique historically and currently used in eastern hardwood forests (Nyland 1992). A specific question arose as to how to persuade landowners to conduct silvicultural practices that do not include high-grading. The transfer of information on prescribed fire could be used as a model, as this is being conducted somewhat successfully to both public and private landowners using a variety of public-private partnerships, consortia, and State vendor programs.

Lack of available markets for poor quality (i.e., non-commercial) wood products inhibits sound forest management (Nyland 1992). The biofuel market offers one alternative, but this is largely driven by policy (both nationally and internationally) that is not well understood, studied, and is ever changing (Abt and others 2012). Infrastructure for biofuels is currently largely restricted to predominately softwood regions in the South (Abt and others 2014). Current efforts to subsidize alternative wood markets to private industries are underway (USDA 2018). The lag time between policy changes that fund these initiatives and impacts on the ground is a problem for landowners wishing to invest in alternative markets. Pulpwood markets are also not consistently available across the region, and are not subsidized similarly to biofuels.

On public lands, lack of management is negatively affecting habitat conditions for certain wildlife (e.g., golden-winged warbler), forest health, and timber revenue streams. This in turn, leads to loss of infrastructure that further degrade future management operations. For example, reduction in logging operations will lead to loss of available loggers and sawmills, making future timber sales difficult to implement. There is currently more timber lost on national forests from natural mortality than from timber extraction (Hartsell and Connor 2013). Forest certification and Collaborative Forest Landscape Restoration (CFLR) programs may help increase management by engaging participation from private citizens' groups with the hopes of decreasing litigation (Urgenson and others, 2017).

An additional concern was raised that does not fit into one of the three aforementioned categories. The creation of savannas or woodlands through harvesting

or thinning and repeated fire has been an emerging focus for conservationists in recent decades. Multi-purpose management is a goal, but savanna/woodland management itself has been largely framed in a silviculture context (i.e., to promote oak regeneration). Specific habitat creation (e.g., stand structure, vegetation composition of both woody plants and grasses) can also be achieved using standard silviculture practices such as even-aged management and thinning while improving forest health (Clark and Schweitzer 2016). Repeated prescribed burning has been used to promote oak regeneration, but it can also be used to create a specific habitat to meet goals of restoration or improvement of wildlife habitat.

The facilitated discussion with the audience at the Oak Symposium probably served to raise more questions than answers, but specific recommendations did emerge:

- Research should be more refined to specific site productivity levels. A 'one size fits all' approach is probably not feasible to regenerate and sustain the oak resource we currently have.
- The lack of subsidies for management and/or diverse and available markets for forest products on private lands is a problem in achieving forest management goals. In particular, the removal of lower quality wood products is a consistent need.
- New markets are emerging for biofuels, but these may not be sustainable as they are dependent on policies that are not necessarily stable.
- Growth and yield models need to be better developed and tested, specifically for ingrowth.
- The lack of management expectations on public lands, particularly Federal lands, could be improved with use of third-party review/forest certification and CFLR programs.
- Forest management to create savannas or woodlands should be focused not just on the regeneration process, but on creation of specific habitat conditions for wildlife or restoration of historical conditions.

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