J. For. 115(1):51–53
http://dx.doi.org/10.5849/jof.16-057

Ecological Forestry: Much More Than Retention Harvesting

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We read with interest the recent *Journal of Forestry* article on "Conceptual Ambiguities and Practical Challenges of Ecological Forestry: A Critical Review" (Batavia and Nelson 2016). In it, Batavia and Nelson do a good job of bringing attention to the concept of ecological forestry, and we agree that a clear understanding of what it is and what it can be is a useful undertaking; one that would likely open the door to even greater adoption by stakeholders. Moreover, a discussion of the need for an "appropriate ethic" for ecological forestry may be beneficial, and Batavia and Nelson's suggestion of workshops and conferences on the topic would seem a step in the right direction, as does their call for increased attention given to ethics training in natural resource programs and forest management planning.

Our intent here is not to debate their points about the state of an ethical foundation for ecological forestry. Perhaps there is such a need. . . . However, as we discuss below, ecological forestry is more a framework for management than a philosophy; it is not clear to us that ethics can be applied to such a framework. Regarding a normative statement, which Batavia and Nelson suggest is lacking, our view is that the goal of ecological forestry is to sustain healthy productive forests (including timber production), replete with native species diversity and a full array of ecosystem services (so far, this is not a departure from a large segment of traditional forestry) and that this goal is best met by managing forests in ways that bring them closer (compared with traditional management approaches) in structure, function, and composition to healthy, natural forests at all stages of successional development. This latter statement points out where ecological forestry and traditional forestry often diverge. Our sense is that most stakeholders understand this as the goal of ecological forestry and that there is a potential for divergence from traditional forestry, thus providing, to paraphrase Batavia and Nelson, a compass bearing that prevents ecological forestry from meaning "virtually anything."

Maintaining an appropriate compass bearing for ecological forestry also requires a more complete understanding of the approach than is provided by Batavia and Nelson. In their review, Batavia and Nelson use retention harvesting and emulation of natural disturbance to illustrate their points about the ethical state of ecological forestry. Although acknowledging that these terms (ecological forestry, retention harvesting, and emulation of natural disturbance) are not "entirely synonymous," their discussion nevertheless probably leads most readers to think that ecological forestry is, in fact, simply retention harvesting or emulation of natural disturbance. Consider that after discussion of these terms in some detail, they provide a broader assessment of ecological forestry, yet still come back to say that ". . . ecological forestry attempts to mimic the effects of natural processes of disturbance and succession by strategically retaining certain elements of the preharvest stand." This statement describes retention and emulation of natural disturbance, not ecological forestry; in fact, retention and emulation are but two closely related parts of a much broader framework of ecological forestry.

The broader framework of ecological forestry is based on four foundational principles, as discussed in various way by different authors over the last several decades (e.g., Seymour and Hunter 1999, Franklin et al. 2007, Long 2009, Franklin and Johnson 2012). These principles generally include the following: (1) *continuity*—the provision for continuity in forest structure, function, and biota between pre- and postharvest ecosystems during regeneration harvests; (2) *complexity*—the need to create and maintain structural and compositional complexity and biological diversity, including spatial heterogeneity at multiple spatial scales through all silvicultural interventions; (3) *timing*—referring to the importance of applying silvicultural interventions at ecologically appropriate time intervals; and (4) *context*–underscoring the importance of planning and implementing silvicultural interventions in the context of objectives developed at larger (landscape) spatial scales.

Again, retention harvesting and emulation of natural disturbance are but two parts of the broader concept of ecological forestry; in fact, they are intimately related to each other and associated only with Principle 1. We think it is important to fully appreciate the broader framework of ecological forestry, including all the principles, because doing so probably makes clearer to stakeholders what the guiding goals and objectives of ecological forestry actually are and that, in fact, ecological forestry cannot be "virtually anything."

Batavia and Nelson seem to suggest, perhaps unintentionally, that there is a lack of *critical evaluation* of ecological forestry as a management approach. Referring to the

Received August 29, 2016; accepted September 16, 2016; published online November 24, 2016.

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four principles, we point out that the critically reviewed body of literature on each is enormous. For example, continuity has been studied for 25 years (and much earlier with Clement's (1916) consideration of organic residuals.), through research on biological legacies in natural (e.g., Franklin et al. 2000) and managed (e.g., Lindenmayer et al. 2004) forests. The importance of structural and compositional complexity in forests is extremely well studied, beginning with work on bird habitat (e.g., MacArthur and MacArthur 1961) and continuing with a focus on more taxa and in managed forests (e.g., Lindenmayer et al. 2000, Jung et al. 2012). Consideration of the *appropriate timing* of silvicultural interventions has its roots in understanding developmental process in natural forests, such as deadwood dynamics (Spies et al. 1988), which in turn have helped inform ecological approaches for silviculture aimed to maintain structural complex forests (e.g., Franklin et al. 2002). Finally, context is rooted in understanding landscape-scale phenomena (e.g., Forman 1995) and in how consideration of larger scales is important for sustaining biodiversity in managed settings (e.g., Hunter 1990, Hansen et al. 1991). Although most foresters will not have the time to delve into this foundational literature, we think it important to point it out, as it provides a sampling of numerous thoroughly reviewed and critically evaluated references that support the principles of ecological forestry. Perhaps more importantly, as Batavia and Nelson point out themselves in their article, many of the principles and approaches forming the basis of ecological forestry draw heavily on the large body of research associated with the general practice of silviculture (D'Amato et al. 2016), a discipline that has been scientifically (and critically) evaluated for well over a century.

Batavia and Nelson also express concern about a lack of clear objectives for ecological forestry, leading to the danger that almost anything can pass for the approach. For example, they find ambiguity with this statement in Franklin et al. (2007, p. 34): ". . . managers should determine how similar to the reference condition a stand needs to be to achieve ecological forestry goals. The answer is driven by objectives." They go on to say that "The literature never suggests where within this range [from a reference condition to an industrial plantation] practitioners should aim." Unfortunately, they omit the important context surrounding this statement, which is essentially this: not every organization can subscribe to a full program of ecological forestry (as defined above), but almost all can address some aspect of the elements of ecological forestry, e.g., continuity through retention. For example, a forester could choose to do nothing more "ecologically" than retain some large legacy trees during harvest of a plantation, so as to provide continuity of structure between the old and new stand. Is this comprehensive ecological forestry? No. Is it retention? Yes. Is this retention like The Nature Conservancy might practice retention? No. Is this ok? It might be, as the level of retention for a particular forest will be the product of negotiation among the stakeholders. Is this sufficient (enough retention)? In the context of industrial plantation management, what the forester is doing in the example is better than what they might do otherwise, i.e., no retention.

Our sense is that foresters generally understand that between the bookend of a reference ecosystem and the other bookend defined here as an industrial plantation, are a range of conditions that may meet to greater or lesser degrees the objectives of ecological forestry. Rather than finding fault with this variation, as Batavia and Nelson clearly do, we recognize that operational forestry must have a range of options available to it, if there is a chance that any aspect of ecological forestry will be implemented broadly. The thread of continuity in this variation is that actions are taken to address the foundational principles, with a goal of improving on approaches for sustaining native biodiversity and ecosystem services in managed forests.

We do recognize that the primary purpose of Batavia and Nelson's review is to point out that ecological forestry may lack fully developed normative and ethical foundations and that greater attention should be given to ethics training for students and professionals. These may be reasonable arguments, although again we are unsure about the ability to develop an ethical statement for a framework of management. However, we do question their implication that without a fully developed ethical foundation, ecological forestry "seems liable to become another ephemeral idea in forest management," saying that it [ecological forestry] "has been applied on the ground in only a handful of locations (Corace et al. 2009, Johnson and Franklin 2012), although variable retention harvest (e.g., Seymour et al. 2006, Wilson and Puettmann 2007) and disturbance-based management (e.g., Long 2009, Kuuluvainen and Grenfell 2012) have been implemented somewhat more extensively." We point out that all of these citations are for researchers writing about experiments, pilot projects, theory, or perspective; we would expect such work and discussion of ideas to be limited in geography. These do not give much insight into how widespread the actual practice of ecological forestry has become over the last 20+ years.

Granted, it is difficult to round up information on who, where, and how foresters are actually using ecological forestry concepts. However, as one measure of the pervasiveness of the practice consider the following Forest Stewardship Council (FSC) certification indicators (FSC 2010), which pertain to Principle 6 (Environmental Impact) and Criterion 6.3 (Ecological Functions), and their relationship to the four principles:

Indicator 6.3.a.1: . . . maintains, enhances, and/or restores underrepresented successional stages . . . that would naturally occur on the types of sites found . . . . Where old-growth of different community types that would naturally occur . . . are underrepresented in the landscape relative to natural conditions, a portion of the forest is managed to enhance and/or restore old-growth characteristics. (*Principle 4: Context*)

Indicator 6.3.d: Management practices maintain or enhance plant species composition, distribution and frequency of occurrence similar to those that would naturally occur on the site. (*Principle 1: Continuity; Principle 3: Timing*)

Indicator 6.3.f: Management maintains, enhances, or restores habitat components and associated stand structures, in abundance and distribution that could be expected from naturally occurring processes. These components include:

(a) large live trees, live trees with decay or declining health, snags, and well-distributed coarse down and dead woody material. Legacy trees where present are not harvested. (*Principle 1: Continuity; Principle 3: Timing*)

(b) vertical and horizontal complexity. (*Principle 2: Complexity*)

Indicator 6.3.g.1: . . . when even-aged silvicultural systems are employed, and during salvage harvests, live trees and other native vegetation are retained within the harvest unit in a proportion and

> configuration that is consistent with the characteristic natural disturbance regime. . . . (*Principle 1: Continuity*)

If organizations are FSC certified, then they are meeting these indicators and by so doing are putting ecological forestry principles into practice. And, in fact, there are a lot of organizations doing just this; as of July 2016, FSC reports 167,714,255 acres certified in the United States and Canada, with 5,043 companies having chain-of-custody certification (FSC 2016), suggesting that ecological forestry has already proven a fairly durable concept and a widely implemented approach as well, despite an apparent lack of an ethical foundation.

In the end, we come back to our point that ecological forestry is less a philosophy of management and more of a framework, a toolbox if you will, for management of forests where the goal is to reduce the divergence between managed and natural ecosystems; as such, it may be less critical than Batavia and Nelson suggest that it have a fully developed ethical foundation. Our concern is that Batavia and Nelson's criticism of ecological forestry for lacking this ethical foundation could actually hinder the growth and adoption of the management framework if, without a close reading, those getting on the ecological forestry ship come away thinking that it is about to sink, when in fact we and many others suggest their ship is sound and pointed in the right direction.

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