



## Overview of Vol.2, No.6 – Forests

### Restoration of Forest Ecosystems

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The restoration of forest ecosystems offers the restoration and management community a chance to address challenging questions of scale, system complexity, and social dynamics that, to some degree, exist in all restorations, yet can seem most vexing in forests. Grassland and wetland restoration have recently gained momentum and support as these ecosystems become more identified with our culture's conception of naturalness, and their role in landscape-level processes has become clear. However, to deal with forest ecosystems is to touch on a much more "loaded" subject, with a history of cultural significance as old as humanity. As Glacken illustrates in his excellent review of human conceptions of nature, *Traces on the Rhodian Shore*, the forest has always served as symbolic shorthand for the totality of wild nature, that is, everything beyond human control. The science of managing and restoring forests must therefore be approached as much as a cultural project as a scientific one, if the social context of restoration is as important as many researchers would have us believe. The profound economic importance of forests is a part of this phenomenon, and Cornett's paper in the section below makes clear both the importance of silvicultural data and the specificity of that data to an economic approach toward forests.

Forests also challenge us across the four dimensions in ways that most ecosystems do not. The complex vertical structure of forests, which can extend hundreds of meters in the air and below the ground, presents us with an almost infinite number of microecologies to consider in a restoration. The papers below address different aspects of this problem. Johnson's paper discusses the special problems of protecting trees from various stressors, and the impact of various methods on the vertical structure of the restoration. The height of tree tubes turns out to be a critical factor, as well as the fact that such tubes may constrain lateral growth; trees that survive a planting in a tube may begin life as a taller, narrower tree with less well-developed root systems than a naturally-growing seedling. Pone focuses on the need for appropriate canopy conditions to be in place before tropical forest restoration can occur. The establishment of vertical structure with a planting of young trees can break the continuity of the "old-field" ecosystem both by changing the shade regime and the nature of the root zone. Maloney describes the difficulty in using prairie restoration techniques to restore savanna, an environment which is superficially similar but whose verticality precludes the use of the large equipment so useful in many prairie plantings.

The lateral spatial extent of forests is as important as the vertical, and in this respect the potentially high cost of restoration materials again differentiates forest restoration from other ecosystems. Were saplings as easy to come by as plugs of prairie grass, no doubt the elaborate protection mechanisms discussed by Johnson would never have been dreamed of. The economical planting patterns of strips or clumps suggested by Pone are seen also to serve an ecological function in drawing dispersal agents across barren patches, helping to knit the restoration into the larger fabric of the landscape.

Forests are also variable over time in unique ways. Cornett's paper cautions restorationists against ignoring the temporal dimension, showing that jack pine ecosystems may be quite different in the timing of fire regimes necessary for successful regeneration. Equally important as the variance between forest types is the difference between the restoration of forests and the restoration of more "rapid" ecosystems. While long-term monitoring is important in any restoration, many types of restorations can reasonably be expected to have reached a stability threshold within a decade or two. Forests, on the other hand, require many decades of growth and canopy formation before a true forest ecosystem can be said to have been restored; the implications for monitoring strategies, personnel and budget are obvious. Impatient restorationists may be naturally drawn to prairies because of the frequent disturbance regimen, but forests, as illustrated by Cornett's paper, have much longer cycles of disturbance and thus will require longer-term data in the estimation of appropriate disturbance regimes. This data will be difficult to obtain.

The clearest message from the papers presented below is that, methodologically, we have a lot to learn about forests. Entrenched methods of management and restoration must change to reflect ecological reality. The well-established technique of passive restoration is clearly useless in the situation that Pone describes, where only careful and considered intervention will result in the return of forests to farmed lands. Both Maloney and Cornett write about the difficulties and dangers of transporting restoration techniques learned in one ecosystem into a different ecosystem. Cornett offers fresh ways of measuring the impact of various fire regimes on forests, abandoning the loosely-worded generalizations about technique efficacy that are so prevalent in the restoration profession, but help no one. Saplings are far from indestructible, and Johnson makes it clear that many of the simple solutions of the past do not offer adequate protection. The elements of forest restoration should be treated with at least as much care (particularly given their cost) as other types of plantings, and the promises of protection-product manufacturers rigorously tested in the field.

The papers in this section see the forest for the trees: in each the focus is on the relationship between the treatment of individual trees and the ecosystem response. Because trees are the dominant life form in forests and savannas, it is easy and tempting to consider tree ecology to be forest ecology, and tree restoration to be forest restoration. But behind Johnson's tube heights is a consideration of root-zone ecology and invertebrate habitat, and Pone's foster trees not only provide shade conditions for other trees, but reduce the habitat for predatory ants and rodents. Cornett reiterates the importance of considering the fire-adaptiveness and response of understory plants in prescribing a fire regime for a jack pine ecosystem. The point is well taken that jack pine forests and savannas differ not in the trees present, obviously, but in a great many other features of understory, soil, and fire regime.

The evidence considered above points to forests being a more difficult subject of restoration than less vertically complex and more short-cycled ecosystems. Their importance to us ecologically, economically, and culturally is part and parcel of these characteristics, and compels us to address these difficulties and emerge with more comprehensive and efficient methodologies. They will stretch our conception of restorations to encompass greater dimensional variability, and this is undoubtedly a good thing.