

## Is Forest Restoration an End unto Itself or a Means to an End?

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**F**orest restoration, the act of returning a forest ecosystem to a prior condition, is an increasingly popular management goal and is even mandated on some lands. The decision to initiate a forest restoration project implies that the management unit has been degraded, that the degradation was probably caused by anthropogenic forces, and that some other ecosystem state is more desirable than the current condition. The benefits of restoration may include an increase in native forest biodiversity, the maintenance or perhaps reinitiation of important ecosystem functions, and the promotion of resilience and other ecosystem services. The justification for forest restoration seems to be centered on the assumption that prior ecosystem states were biologically diverse, structurally complex, and resilient. We suggest that the true value of this management approach is the ecosystem properties that may result from the restoration process, not the actual recreation of prior forest conditions.

Thus, we ask, is forest restoration an end unto itself or a means to an end? If the chief goal of forest restoration is not the recreation of past conditions per se, but rather the enhancement and maintenance of biodiversity, ecosystem resilience, key ecosystem functions, and/or other important processes that are hypothesized to develop through restoration, it begs the question, why justify management objectives under the banner of restoration? With forecasted climate change, increased forest fragmentation, urban encroachment around natural areas, the spread of alien species, and other ongoing changes, we would be better to look to the future and focus on managing for characteristics such as resiliency and complexity in our forests rather than creating conditions that may have occurred in the past. Management plans should be informed by historical ecology, but the end goal need not be the recreation of prior ecosystem conditions (Jackson and Hobbs 2009).

We are not advocating that forest restoration efforts be abandoned, and we emphatically endorse the need to advance our understanding of site-specific historical ecology, including how forest composition, structure, and function have changed through time in response to a vari-

ety of forces. Unequivocally, forest restoration projects have been successfully completed in recent decades, and we know of ongoing projects with high likelihoods of success. However, for most landscapes, we must accept the fact that some ecosystems cannot be truly restored because we have lost foundation species, new species have been introduced in the form of alien organisms that may withstand eradication efforts, forests are increasingly fragmented, and climate is changing in perhaps novel ways (Hobbs et al. 2006). In addition, operational and financial constraints often make restoration unfeasible. The primary issue with a strict adherence to forest restoration is the assumption that ecosystems that existed historically would be resistant and resilient to contemporary and future perturbations, which include forces that did not occur in the past. Forest ecosystems are experiencing and will continue to experience novel stresses and managers are increasingly forced to deal with issues that were not factors in historical ecosystems (such as alien plant invasions). Therefore, we suggest that in many situations restoration should not be the primary management goal. Managers should instead focus on desired outcomes that address the ability of the ecosystem to resist and adapt to the modern and projected environment.

A change in management objectives would not necessarily mean a fundamental shift in management strategies. Treatments designed to increase native forest biodiversity, structural complexity, and ecosystem resiliency may resemble treatments commonly prescribed in plans aimed to restore prior forest conditions. However, the criteria used to determine success or failure should be different. If restoration is the goal, then the recreation of some prior ecosystem state must be met for the project to be considered a success. Restoration efforts that increase biodiversity, structural complexity, and ecosystem resilience would still be considered failures if restoration targets based on prior conditions were not achieved. The same results would be considered successful if the stated goal was to implement treatments that would yield these forest ecosystem characteristics without concern for recreating the past. We suggest that managers act within the existing and projected environmental conditions to meet the end goals of resilience, diversity, complexity, and other desired ecosystem characteristics while still using historical ecology to better understand how ecosystems respond to environmental perturbations. By managing for resiliency as opposed to restoration, managers can create forest conditions that will be able to respond to future disturbances and avoid the

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possible pitfalls associated with recreating ecosystem conditions that developed and existed in environments that are not analogous to the present.

Perhaps one reason forest restoration has become such a popular management objective is the romance we have for the past. Will our fascination and infatuation with recreating the past prevent us from being able to adapt to the future? By recreating prior ecosystem states, it is possible we are in fact managing for forests that are less likely to withstand future perturbations, and we may limit the ability of forests to offer a variety of goods and services. Management strategies with the aim of resiliency must be

adaptive and flexible to ensure the long-term maintenance of the ecosystem in an ever-changing environment (DeRose and Long 2014). Therefore, managers should reconsider their current interpretations of management plans and policies and be willing to take necessary risks and implement new strategies to ensure that restoration practices are not an end, but a means to an end (Millar et al. 2007). We appreciate the constraints and difficulties in forest management decisionmaking and the need for public support, but ultimately we should be forward thinking and managing forests to provide a wide range of goods and services now and well into the future.

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