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Response

# Has Forest Restoration Been Freed from the Bonds of History?

**Justin L. Hart, Megan L. Buchanan, and Lauren E. Cox**

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The focus of ecological restoration has evolved, and the scope has broadened considerably over the last several decades. Early restoration efforts were largely regulatory in nature and focused on reestablishing plant cover on surface mines and other reclaimed lands (Wagner et al. 2000). Forest restoration as a management goal arose in the 1990s after the realization of the negative ecological consequences of anthropogenically altered disturbance regimes, fire suppression in specific. Nascent forest restoration projects were focused on mimicking the outcomes of historical periodic wildfires to mitigate the effects of fire suppression (Covington et al. 1997). Thus, the historical range of variation (HRV) concept was critical in defining forest restoration goals. Forest restoration projects have since expanded beyond addressing the effects of fire suppression to include creation of compositional and structural forest characteristics and disturbance regimes hypothesized to be representative of historical conditions. The HRV has provided the basis for identifying the desired future conditions in forest restoration plans, and the common theme in forest restoration has been to return forest ecosystems to predegraded conditions. As the scope of forest restoration has expanded, the definition has become increasingly nebulous. What, then, is contemporary forest restoration?

Hanberry et al. (2015) did not provide a comprehensive definition of their version of forest restoration but did include more than 15 descriptions of restoration. Many descriptions did not include mention of recreating past patterns or processes and several explicitly stated that restoring was not a goal of restoration. The authors suggested that restoration has moved beyond efforts to recreate conditions within a site's HRV and is now focused on managing for uncertain futures through the principles of resiliency and climate change adaptation. Although we agree with these management concepts (see Hart et al. 2015), we contend that if forest restoration is no longer primarily concerned with the recovery of ecosystem conditions within the HRV, the term "restoration" is a misnomer. Incorporating resiliency in management goals is wise forest stewardship, but labeling this objective as restoration can lead to a disconnect between restoration scientists and forest managers (i.e., those directly involved with forest restoration). In our experiences, many managers are working from a paradigm and the associated regulatory guidelines that define forest restoration as the recovery of historical patterns and processes that existed before degradation, a definition that does not explicitly include enhancing forest resiliency, biodiversity, or complexity. Given this disconnect between restoration scientists and forest managers, a discussion on what is and what is not forest restoration is warranted and may lead to clearer and more widely accepted definitions that can be translated into guidelines specified in forest management plans (Stanturf et al. 2014).

The descriptions provided by Hanberry et al. (2015) suggest that restoration is no longer about the recovery of predegraded forest patterns and processes. Instead, the goal of restoration is now to recover the "resiliency" hypothesized to be characteristic of prede-

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**Affiliations:** *Justin L. Hart (hart013@ua.edu), University of Alabama, Tuscaloosa, AL. Megan L. Buchanan, University of Minnesota. Lauren E. Cox, University of Alabama.*

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graded forest conditions. The assumption is that predegraded forests were, in fact, resilient. Attempting to increase resiliency through restoration efforts may be a risky approach as it is based on the assumption that historical ecosystems would be resilient to the perturbations of today and those that will occur in the future, including perhaps novel stresses (Hobbs et al. 2006). With forecasted climate change, increased forest fragmentation, urban encroachment around natural areas, the spread of alien species, and other ongoing changes, it may not be possible to ensure resiliency by mimicking historical conditions (Jackson and Hobbs 2009).

Forest managers require desired future conditions (DFCs) for planning. Resiliency, however, is a characteristic of forest conditions, not a condition itself. Thus, managing for resiliency requires compositional, structural, and functional targets (i.e., DFCs). Although the body of literature on ecological resilience theory is relatively large, few studies have tested the efficacy of silvicultural treatments designed to promote resiliency (Puettmann 2011, O'Hara and Ramage 2013, DeRose and Long 2014, Keyes et al. 2014). Thus, it is largely unknown which forest conditions are resilient, how the resiliency of each different condition compares with that of another condition, or how conditions would respond to a range of perturbations. The success of management efforts designed to promote resiliency is dependent on knowledge of the forest conditions proven to be resilient to disturbances and other stresses projected to occur in those stands. Once this knowledge base is developed, silviculturists may then prescribe treatments to create stand conditions known to be resilient to the forces hypothesized to be most problematic in the future.

New visions of restoration (e.g., Higgs et al. 2014, Hanberry et al. 2015) must be translated into language that is operational for forest managers. Some managers may be constrained by regulatory guidelines that are based on a paradigm of restoration that some restoration scientists now consider outdated. We hope these restoration scientists will work to ensure that management policies across all ownerships are modified to accommodate their new visions of restoration. Because of the literal definition of restoration (to return to a prior state), and the necessity of tangible conditions for forest planning guidelines, we speculate that the expanded definition of restoration will cause confusion among managers. We suggest that rather than continuing to broaden the definition of restoration, restoration scientists should use or develop terms that accurately depict the goals of enhancing forest resiliency in the face of an uncertain future, allow for target conditions outside the HRV, are universally recognized, and may be operationalized by forest managers. The latest iteration of forest restoration may liberate managers from the bonds of history, but renders the term *restoration* inaccurate or perhaps even meaningless.

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RESPONSE

# Forest Restoration Is Forward Thinking


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**R. Kasten Dumroese, Brian J. Palik, and John A. Stanturf**


It is not surprising to us that the topic of forest restoration is being discussed in the *Journal of Forestry*. It is a topic frequently bantered about in the literature; a quick search in Google Scholar for "forest restoration" generates more than 1 million hits. A significant portion of the debate centers on the search for succinct, holistic, universally accepted terminology, and we confess that we have recently contributed to that effort (Stanturf et al. 2014a, 2014b). Given the lack of consensus on definitions for each word, forest and


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**Affiliations:** *R. Kasten Dumroese (kdumroese@fs.fed.us), USDA Forest Service, Grassland, Shrubland, and Desert Ecosystems Program, Rocky Mountain Research Station, Moscow, ID. Brian J. Palik (bpalik@fs.fed.us), USDA Forest Service, Center for Research on Ecosystem Change, Northern Research Station. John A. Stanturf (jstanturf@fs.fed.us), USDA Forest Service, Center for Forest Disturbance Science, Southern Research Station.*



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