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OPINION ARTICLE

Forward-Looking Forest Restoration Under Climate Change—Are U.S. Nurseries Ready?

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Abstract

The pace of climate change suggests that restoration efforts once focused on past conditions should become more forward-looking. Suggestions for such restoration emphasize the use of a suite of species adapted to a range of possible future climates. In forest restoration, opportunities for forward-looking restoration may be limited by the availability of suitable stock from state and commercial nurseries. Presently, most state nurseries have stock potentially suited to warmer climates than currently exist in their states. However, these nurseries are generally not actively incorporating information about climate change into their stocking choices and some see clear obstacles to providing such stock, particularly uncertainty about the future climate, and the existence of seed zones and other policies designed to protect locally adapted species genetics. As restoration ecologists adapt their methods to incorporate climate change, state nurseries should be involved in those discussions and may be important partners in outreach.

Key words: forest restoration, planning, restoration planting, state nurseries.

Introduction

The notion of restoration as a return to past conditions is implicit in the common use of the word, and that sense is enshrined in laws and policies that direct land managers to use past conditions as a guide for ecosystem restoration (e.g. the National Wildlife Refuge System Improvement Act of 1997). Despite this foundation for backward-looking restoration, researchers studying climate change impacts on species and ecosystems increasingly conclude that managers will need to look to the future, rather than to the past, to set goals for successful restoration (Harris et al. 2006; Choi 2007; Seastedt et al. 2008).

A growing list of publications predicts changing ranges for tree species across the United States (Iverson & Prasad 1998, 2002). To support species adaptation under changing climatic regimes, managers are being advised to acknowledge climate change predictions when planning restoration plantings by increasing the proportion of plant species that will be favored under climate change and decreasing the proportion of plant species that will not readily tolerate predicted climatic conditions (Harris et al. 2006; Millar et al. 2007; Hebda 2008). In practice, given the uncertainties associated with site-specific climate predictions, this will mean choosing a variety of species adapted to warmer conditions as well as to predict future moisture conditions. Although all the temperate regions are expected to undergo an increase in temperature, predicted changes in moisture conditions range from significant increases to significant decreases. Even in areas predicted to have little change in precipitation, changes in seasonality may lead to changes in soil moisture (e.g. to longer and deeper summer droughts in the Midwest; Kling et al. 2003).

Forest restoration that includes tree planting often occurs following conservation purchase of farm and pastureland, but also follows forest harvest or disturbances such as forest fire or damage from ice storms or tornadoes. Reforestation of open land or early successional stages provides an opportunity to shift species composition of the resulting forest in a direction that may accommodate climate change (Millar et al. 2007). However, such forward-looking restoration requires a ready source of trees that may not presently be native to the restoration site or to the state.

We were interested to know whether state nurseries currently offer species that would support forward-looking restoration. State nurseries are often the source for restoration activities undertaken not only by state natural resources agencies, but also by land trusts and others undertaking restoration that needs hundreds or thousands of saplings of one or more species. Here, we report on the capacity of such nurseries, as well as a sample of large-scale commercial nurseries, to support forward-looking restoration.

Methods

We collected information about state and commercial nurseries in the 48 contiguous states from November 2008 to May 2009,

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