From Forest Nursery Notes Winter 2013

115. © Placing forestry in the assisted migration debate. Pedlar, J. H., McKenney, D. W., Aubin, I., and Beardmore, T. BioScience 62(9):835-842. 2012.

Placing Forestry in the Assisted Migration Debate

JOHN H. PEDLAR, DANIEL W. McKENNEY, ISABELLE AUBIN, TANNIS BEARDMORE, JEAN BEAULIEU, LOUIS IVERSON, GREGORY A. O'NEILL, RICHARD S. WINDER, AND CATHERINE STE-MARIE

Assisted migration (AM) is often presented as a strategy to save species that are imminently threatened by rapid climate change. This conception of AM, which has generated considerable controversy, typically proposes the movement of narrowly distributed, threatened species to suitable sites beyond their current range limits. However, existing North American forestry operations present an opportunity to practice AM on a larger scale, across millions of hectares, with a focus on moving populations of widely distributed, nonthreatened tree species within their current range limits. Despite these differences (and many others detailed herein), these two conceptions of AM have not been clearly distinguished in the literature, which has added confusion to recent dialogue and debate. Here, we aim to facilitate clearer communication on this topic by detailing this distinction and encouraging a more nuanced view of AM.

Keywords: assisted migration, climate change, forestry, conservation, trees

Assisted migration (AM) has been proposed as an approach to mitigate climate change impacts on biodiversity by intentionally moving species to climatically suitable locations outside their natural range (McLachlan et al. 2007, Hoegh-Guldberg et al. 2008, Richardson DM et al. 2009). Controversy has arisen around this concept, which breaks with traditional conservation paradigms (Minteer and Collins 2010, Aubin et al. 2011). Proponents of AM have suggested the need to undertake bold efforts to conserve species in the face of unprecedented global change (Minteer and Collins 2010, Vitt et al. 2010), whereas opponents cite a myriad of environmental calamities that have resulted from human-mediated species movements (Ricciardi and Simberloff 2009).

In the context of commercial forestry operations, AM has been proposed as a means to maintain forest productivity, health, and ecosystem services under rapid climate change (Gray et al. 2011, Kreyling et al. 2011). This is an important issue for North America, where there are both globally significant amounts of forest cover and large-scale forestry operations; across the United States and Canada combined, an area of nearly 500 million hectares (ha) has been classified as *managed timberland*, and roughly 5 million ha are harvested annually (Smith et al. 2009, Natural Resources Canada 2010). Given that the suitable habitats of many North American tree species are projected to shift hundreds of kilometers northward by century's end (Iverson et al. 2008, McKenney et al. 2011), AM represents a potential tool for adapting future forests to climate change.

Here, we distinguish forestry-related AM (henceforth, *forestry AM*) from the more standard conception of AM as a means to rescue species threatened by climate change (henceforth, *species rescue AM*). We examine how these different types of AM vary with respect to intended outcomes, target species, movement logistics, potential risks, science-based feasibility, scope, cost, and practice (table 1). Although a wide variety of AM forms may be distinguished along the spectrum of movement distances, target species, and intended outcomes (Aubin et al. 2011), the forms examined here represent two separate conceptions that have not been clearly teased apart in the literature. We believe that by making this distinction and, more generally, by encouraging a more nuanced view of AM, the debate around this topic may be advanced.

Intended outcomes and target species

As the name implies, *species rescue AM* is aimed at conserving species in the face of rapid climate change. Several life-history characteristics have been proposed as indicators of suitability for this type of AM, including the degree of rarity, the species' niche width, the degree of habitat specialization, and migration or colonization potential (Keel 2007, Vitt et al. 2010). These characteristics could be used in combination with results from species distribution models (e.g., McKenney et al. 2011) to further prioritize species with respect to potential climate change impacts (Vitt et al. 2010). Furthermore, several studies have presented frameworks to assist in deciding whether AM is a suitable approach for a given species and location (e.g., Hoegh-Guldberg et al. 2008, Richardson DM et al. 2009).

In contrast, forestry AM aims to ensure that plantations of widespread (often commercially valuable) tree species

BioScience 62: 835–842. ISSN 0006-3568, electronic ISSN 1525-3244. doi:10.1525/bio.2012.62.9.10