

Biodiversity Case Study: Assisted Migration¹

Along a short, slim stretch of the Apalachicola River between the northern Florida panhandle and southern Georgia, lies a cool, shady ravine, home to the last native stand of *Torreya taxifolia*. This evergreen conifer tree is an endemic and endangered species of Florida, said to be threatened by a combination of fungal disease and shifting environmental conditions due to climate change (Smith and Trulock 2010; Barlow and Martin 2004; Barlow 2009; The Economist 2015; Torreya Guardians 2016a). Though the trees used to grow to heights around 60 feet, they currently exist only in a juvenile and diminishing state (Smith and Trulock 2010; Barlow and Martin 2004).

The Florida *Torreya* first suffered a decline in the 1950s, when it is thought a fungal pathogen felled all the large adult specimens (reviewed in Smith and Trulock 2010). Today, only stump sprouts and seedlings remain, and they are in such decline that the USFWS declared the *Torreya* a federally endangered species in 1986 (USFWS 1986). Still in 2010, in the last updated endangered species plan, the USFWS declared that “given the lack of seed production in the wild and potentially a decline due to a disease, all population viability models predict extinction” (Schwartz et al. 2000; USFWS 2010, 11).

With fewer than 1000 plants left in the endemic stand, Connie Barlow, a writer, naturalist, and concerned citizen, decided she must act (Greenfieldboyce 2011). She claims that climate change, particularly rising temperatures, threatens to kill off the stand entirely (Barlow 2009; The Economist 2015; Torreya Guardians 2016b). So, in 2004, she founded the Torreya Guardians, “a self-organized group of naturalists, botanists, ecologists, and others with a deep concern for biodiversity protection, who have chosen to use the internet as a tool for discussing ideas, posting plans, and taking a variety of actions in behalf of our most endangered conifer tree: *Torreya taxifolia*” (Torreya Guardians 2016c).

The Torreya Guardians claim that the tree species could have naturally migrated North with the retreating glaciers 15,000 years ago, but poor surrounding soils, the extinction of large herbivores (i.e., seed distributors), and the presence of increasing numbers of wildfires due to human activity are all possible reasons that the species remains stuck in place (Barlow and Martin 2004; Barlow 2009). To save the tree, the Torreya Guardians first proposed assisted migration in 2004 (Barlow and Martin). In 2005, Barlow joined forces with a botanist and *Torreya taxifolia* expert, Lee Barnes, to initiate a seed distribution scheme that has become the center of an ‘assisted migration’ project. The group has now distributed trees to sites outside the endemic range, including in North Carolina, Tennessee, Ohio, Michigan, Wisconsin, New Hampshire, and Oregon (Torreya Guardians 2016a).

According to group leader and founder, Barlow, she felt the assisted migration method was (and is) an “easy, legal, and cheap” way to protect the endangered tree species from extinction. First, anyone with access to the web (and some private land) can apply to take part in a test planting via the group’s website (Torreya Guardians 2016d). And although they’ve been called “ecological vigilantes” (The Economist 2015), it’s also legal. Distribution of endangered plants and seeds is lax, particularly within states, and then once privately owned, individuals can go across state lines with their plant property as they please (Shirey and Lamberti 2011). Finally, this scheme is cheap, requiring only small out of pocket expenses from volunteers to initiate and maintain plantings.

The group also advocates a ‘deep time’ perspective that can change perceptions of what constitutes a “native” species (Barlow 2009). For example, the Torreya Guardians claim the tree species lived in what is now the northern parts of the Appalachian region in previous periods of warmth over the last 2.5 million years. Thus, when the Torreya Guardians move a tree to Ohio, they are returning the tree to its prehistoric range (Greenfieldboyce 2011).

Discussion Questions:

1. Do humans have a duty to protect *Torreya taxifolia* from extinction? Why or why not? If so, can assisted migration fulfill our duty to this species in peril? Why or why not?

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2. Is inaction worse than acting, even if the consequences are risky? Explain.
3. Does assisted migration comport with traditional preservation strategies? Why or why not? How could assisted migration be utilized in conjunction with other measures to prevent extinction?
4. Assisted migration efforts by the Torreya Guardians are considered legal under federal law. Does that justify their actions? Are there other moral considerations outside of the law that should factor in a decision to move a plant species? If so, what are they?
5. What constitutes a native vs. non-native species? What scientific, geographical, temporal, legal, and other terms should be considered in the distinction? Why those terms?

Content Commentary

In the last decade, assisted migration, “the intentional introduction by humans of an organism beyond its natural range” (Keel et al. 2011, 44; Keel 2005), has gained attention as a radical tool to save species threatened by climate change and habitat destruction (e.g., McLachlan et al. 2007, Hoegh-Guldberg, et al. 2008; Richardson et al. 2009). These environmental changes are in some cases occurring faster than species can adapt or migrate, and the connectivity of landscapes has largely been altered by human developments, blocking would-be migrations as environmental conditions shift (Kolbert 2014).

In this case, the Torreya Guardians have decided that assisted migration is necessary and justified for the *Torreya taxifolia*, a rare and endangered tree species that is native to Florida. Their first and foremost goal is to save the species from extinction that the group claims is driven by climate change combined with the tree’s inability to migrate (Torreya Guardians 2016e; Barlow 2009; The Economist 2015; Torreya Guardians 2016b). The group’s goal, then, is to move the tree north, where they claim it could and would migrate if there weren’t so many barriers.

The Torreya Guardians hope to serve as a model for similar cases, or in their words, “for the kinds of geographic interventions that will be necessary for plants in a warming world” (Torreya Guardians 2016e). In many cases, extinction cannot be prevented without assisted migration (McLachlan et al. 2007). Options are slim and shrinking for species that are threatened by climate change; the high stakes demand “radical strategies” and a “significantly more activist and hands-on approach to species conservation than we have taken in the past” (Minteer and Collins 2010, 1804, 1802).

The Torreya Guardians approach their program systematically, such that they could even claim to have scientific justification. For example, they have developed a set of “Ecological Standards” that help them to decide whether an endangered species should undergo assisted migration (Beardmore and Winder 2011). They examine species history, risk of extinctions, characteristics of the plant that could portend invasive potential, and overall feasibility of the project (Beardmore and Winder 2011). Their volunteer cultivators keep thorough records of all plants (Torreya Guardians 2016f), and the group uses that data to fulfil their third goal, to “test the efficacy of assisted migration for this and other threatened plants that were ‘left behind’ in their peak-glacial reserve” (Torreya Guardians 2016e). The Torreya Guardians have also been careful to justify their actions in legal terms, arguing that it’s lawful to transport privately owned plants between states and replant in new locations on private property (Torreya Guardians 2016c; Shirey et al. 2011).

Finally, if humans are (at least in part) responsible for the rate and nature of climate and environmental change, humans may have a duty to act to save species from extinction due to climate change. Despite risks of bad or unintended outcomes, they may feel it is worse to do nothing while species go extinct because of anthropogenic climate change (Marris 2011). The Torreya Guardians certainly feel a duty to save *Torreya taxifolia*: “We’re just helping the tree get around habitat obstacles that we humans have put in its way” (Barlow 2009).

There are, however, also strong arguments against assisted migration. For example, questions are being raised about the role assisted migration can play within the system of traditional conservation practices which have historically focused on preserving species in their native habitats by setting aside tracts of land as protected areas, as well as lobbying for legislation like the Endangered Species Act of 1973 (Minteer and Collins 2010). Conservation biologists who are proponents of this conventional approach will argue that time, money, and resources should be spent on (1) facilitating natural range shifts by maintaining or restoring habitat connectivity, and (2) working to achieve carbon-management solutions (Hunter 2007). They remain committed to saving endangered species by minimizing human influence, as opposed to intervening further, and they argue that there is no scientific support for assisted migration (e.g., the “Nativist Technocrat” in Neff and Larson 2014). But that doesn’t mean a balance can’t

be struck. Both traditional and newer, more controversial techniques could be used in complimentary ways, with assisted migration being an option, even if just for a small number of species (Appell 2009; Minter and Collins 2010).

Despite the potential for integrated management strategies, there are still those who resist assisted migration, citing human arrogance; humans could never know enough about an ecosystem to be certain whether a relocated species will become invasive or not (Greenfieldboyce 2011; Minter and Collins 2010). Indeed, there is incredible potential for relocated species to become invasive in new habitats (Greenfieldboyce 2011; Davidson and Simkanin 2008; Ricciardi and Simberloff 2009; Seddon et al. 2009). Related, contested definitions of native vs. non-native species (which are more likely to become invasive) have come into play. To justify their actions, for example, the Torreya Guardians question the ways in which native species are defined. Does history matter and to what depth of time? If the *Torreya taxifolia* lived in mid-east to northeast North America between 2.5 and 65 million years ago, migration to that location today, with the assistance of the Torreya Guardians, could be interpreted as a movement into an older species range (Greenfieldboyce 2011; Barlow 2009). Torreya Guardians founder, Connie Barlow, calls this a “deep-time” perspective:

“A deep-time perspective... opens up a new line of questioning: where would the native range for species X have been during a peak interglacial—or during even more ancient times (species of genus *Torreya* coexisted with Cretaceous dinosaurs) when global climate was even warmer than it is today?” (Barlow 2009, 168-169).

Still, contesting a definition does not erase the potential for negative impacts on other species when transplanting *Torreya taxifolia* outside its current range. The Torreya Guardians may not be properly assessing the situation, including the status of *Torreya taxifolia*, as well as the invasive or disease-transmission potentials of the species (Greenfieldboyce 2011).

For instance, the group claims that climate change is the driving force of extinction, but researchers from the University of Florida have found that the main reason for the decline of the species continues to be a fungal species of *Fusarium* and not climate change (Smith and Trulock 2010; Smith et al. 2011). Currently, there are no options for managing the disease. This call into question the legitimacy of the scientific standards used by the Torreya Guardians. Also, it raises the issue of under which scenarios assisted migration is defensible: should the species be threatened by climate change and other anthropogenic factors to justify assisted migration? If *Torreya taxifolia* are threatened by a pathogen, as opposed to climate change, should they be relocated? And what if the species’ demise is caused by a combination of natural and anthropogenic factors in unknown proportions? How much fault demands action?

Further complicating decision making around this issue are questions of the terms of debate and who decides. First, though it may be tempting to couch these discussions into technical terms, there are clearly political, legal, and ethical elements as well. In an analysis of the arguments used in assisted migration literature, most rhetoric was found to have “implicit or explicit evaluative terms” (e.g., what is the appropriate level of risk? which species should we move? etc.) (Klenk and Larson 2013). Similarly, in a classification of four varying perspectives on assisted migration among conservation practitioners, Neff and Larson (2014) discovered that “disagreements... were defined by value-based and policy-strategic considerations as least as much as they were by varied understandings of technical issues” (1). The central non-technical ‘considerations’ include regulating the practice of assisted migration, as well as assigning the distribution of limited resources for conservation projects (Klenk and Larson 2013). Given that these are not solely scientific considerations, this raises questions about who should be involved in the debate:

“The debate over [assisted migration] has been concentrated in the scientific community, but at its core is a political and societal debate about the role of science and the public in shaping the future of our ecosystems...” (Klenk and Larson 2013, 17).

When it comes to assisted migration for endangered species, who should make the decisions? To what degree should decisions and practice be public, professional, and/or scientific? (Minter and Collins 2010, 1803). This corresponds to the final listed goal of the Torreya Guardians: “To nurture citizen-professional collaborations and a high degree of volunteerism in the service of biodiversity” (Torreya Guardians 2016e). The group believes that as concerned citizens and advocates, they have a duty and a *right* to decide and act. And the experts with the US Fish and Wildlife Service have taken note, recommending that the USFWS biologists “foster a working relationship” with the advocacy group (USFWS 2010, 18). But there are conservation professionals who feel that such a risky method, if carried out, should be in the hands of experts (Neff and Larson 2014; Shirey and Lamberti 2011). As demonstrated

in this case, advocacy groups can be influential stakeholders, but how much influence should advocacy groups like the Torreya Guardians have in shaping public policy?

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Link

The Torrey Guardians

<http://www.torreyguardians.org/>