

Conservationists Should Not Move *Torreya taxifolia*

by Mark Schwartz

In 1988, I began a long-term study of the Florida torreya (*Torreya taxifolia*). I have followed natural populations across their distribution for more than 15 years and have, from the start, been focused on conservation efforts for this critically endangered coniferous tree. Rob Nicholson and I collected the material from approximately 150 trees that now constitute our *ex situ* plant material. My research has been focused on determining whether there is genetic differentiation across the distribution, understanding the magnitude of the population decline, understanding disease factors, and predicting the likelihood that the species will recover.

During this period, there have been occasional efforts to transplant the species northward on behalf of conservation. One justification for northward introduction may be that the population has suffered from disease within its current distribution and thus a northward movement may allow it to escape its pathogens. This justification is somewhat weak, as current individuals do not appear to be overly susceptible to any particular disease, although the population is not recovering from a previous decline. Further, since the disease agent responsible for the original decline is a matter of conjecture, it is not clear what Florida torreya would be escaping from, nor where it should go. In short, I am skeptical of the disease escape arguments, as we are at pre-sent unclear of the culprit and thus the tree is not assured of any relief to the north.

Another rationale for northward introduction is that the species likely existed further north at some time in the past, although not during the current 10,000 year interglacial, and that it is more suited to a cooler climate. Range expansion efforts have begun with the assumption that the reason that the species declined to near extinction

is at least partially because the species is trapped in a current distribution that is too far south and too warm, and that the species is now unable to disperse further north where it is more climatically suited. Thus, the reasoning goes, if we assist migration northward, the species is likely to thrive, thereby assuring the persistence of one of this continent's most distinctive conifers. Based on my reading, research, and personal experience, I find some merit in this argument; *Torreya taxifolia* is a glacial relict, quite likely on the edge of its climatic tolerance, and might do well in a cooler climate.

Recent research on global warming provides predictions of rates of tree species range shifts—driven by future climate change—and estimates the ability of tree species to migrate to new distributions (Iverson 2003). One of the findings is that many species with narrow distributions, such as the Florida torrey, are projected to have future distributions that are wholly disjunct from their current distributions. In other words, global warming can put species in jeopardy as a consequence of disassociating the current distribution of a species from what we currently understand to be its envelope of appropriate climate (Schwartz 1992). If these climate-limited species fail to migrate, they can go extinct (Hannah 2002, Midgley 2003).

In North America Florida torrey, a trapped glacial relict, seems a plausible case for such a fate. In addition, this line of thinking goes, we are likely to witness more potential cases in the future as the climate warms, habitats are fragmented, and existing corridors fail to allow species to move northward at a sufficiently rapid rate (Thomas 2004).

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So why, then, am I opposed to assisted migration for Florida torrey and other similar cases? One reason, unfortunately, is that the arguments about range and climate rely on very important assumptions that are not well justified. We usually do not have empirical data from which to judge whether narrowly distributed species are, as assumed, limited by climate and not by other environ-

mental factors, such as soils and disturbance regimes. As a consequence, I believe that we should exercise caution.

There is another, more important, reason why assisted migration must be a management option of last resort. My logic is simple and based not on the biology of the target species, in this case Florida *torreya*, but on conservation concerns of the recipient ecosystem. Humanity has a long record of tinkering with natural ecosystems. Largely these have been successful from the perspective of the human endeavor—think agriculture. This tinkering, however, creates a series of ancillary non-target biological winners and losers. It has been argued that the majority of species introduced have had little effect on ecosystem structure, and most introductions do not cause undue ecological damage (Mack 2000). Nevertheless, those few cases where introduced populations rapidly expand and threaten to endanger other species or damage ecosystems and ecosystem functions cost the U.S. billions of dollars each year (U.S. Congress 1993, Pimentel 2000). As a consequence, I believe that conservationists should be very reticent about introducing species to novel environments as a conservation measure. Societal recognition of an appropriate reticence toward species introductions has been slow, but is emerging (Mack 2000). If we are to now advocate species introductions on behalf of conservation, conservationists must have clear guidance as to when this action is warranted and when it is not. It is not an action to be taken lightly.

Assisted migration implies that we do not recognize the target species as native to the newly introduced locale. Local conservationists must then reconcile themselves as recipients of this novel species in their midst. In most cases we use historical records to establish a baseline forest community toward which we manage our current forests. Certainly, we do not want to return to a static view of forests and manage our natural lands as museum pieces, but then again we would like to retain an historical basis for the range of variability in composition of plant communities that are representative of the habitats we are trying to conserve (Landres 1999). Without a baseline we have no target. Without a target, every kind of management, including those that result in lost native species, is arguably a success. I fear such

success. Intentional introduction of species outside their current distributions in an effort to conserve them detracts from and trivializes this baseline and threatens to discount standards for conservation. From a visceral level, it seems likely that a range of people would say: Florida *torreya* has no place in southern Appalachian cove forests. As a consequence, assisted migration should, and will, result in rancor among conservationists. This rancor does not serve conservation.

Novel species becoming out of control is an issue of concern with assisted migration. An example of conservation tinkering gone awry comes from Newfoundland. Pine martens were not doing well, and it was thought that by augmenting their diet by introducing red squirrels, the population may do better. Red squirrels were introduced in 1963 (Benkman 1993). The squirrels competed with crossbills for black spruce cones as a primary food source. A by-product of the squirrel introduction was the dramatic decline and now presumed extinction of the Newfoundland sub-species of the red crossbill (Parchman and Benkman 2002). Well-conceived, conservation-minded introductions have unintended negative ecological consequences. Thus, we must be cautious in our enthusiasm to assist species that are in trouble.

The likelihood of *Torreya taxifolia* expanding out of control is low. Florida *torreya* is a slow growing, shade-tolerant, dioecious tree that requires relatively large canopy gaps for successful recruitment. The species does not spread clonally and the relatively few seeds that trees produce are a favorite food of squirrels. The tree carries all of the attributes of a species that will not spread and become a noxious weed. Nevertheless, assisted migration sets a risky precedent. Will control assurances and monitoring of problems be followed for future species that are deemed to be in need of assisted migration? I fear not. Thus, it is critical that we take a hard look at what criteria are to be used to justify assisted migration and develop guidelines for appropriate assisted migration in order to preserve biological diversity.

I share with others the dedication to favoring the preservation of biodiversity over the preservation of historical examples of what we perceive as natural communities. But conservationists must also be reluctant to

advocate ecological tinkering. I would advocate assisted migration for plants only when there is a clearly imminent extinction risk. Some believe the Florida torreyia is such a case. There are probably fewer than 1000 individuals extant in the current distribution and the numbers are dwindling (Schwartz 2000a). At last count, there is a single known individual that is producing seeds in the wild (personal observation). Aside from this one individual and the approximately 8 seeds it has produced, there has been no observed seedling recruitment for at least 20, and probably 40 years. The situation, indeed, seems critical. Nevertheless, our population modeling suggests the species retains a very high probability of remaining extant for the next 50 years (Schwartz 2000b). Further, there are no current disease symptoms that suggest that an augmentation of the population within its native distribution would not succeed. The germplasm currently housed in botanical gardens of the southeast could be used to augment natural populations. Local population augmentation of Florida torreyia has not been adequately explored. All local options for conservation must be exhausted prior to assisted migration. Florida torreyia fails this simple criterion.

The reality of the situation, however, bears mentioning: anyone who wants to plant Florida torreyia, can do so — wherever they want. The ownership and movement of plants are very loosely regulated. The species is commercially available in South Carolina. Anyone is free to venture to a dealer, buy the plant, and introduce it to their property. This is perfectly legal. Thus, if assisted migration is going to be used sparingly, and only in conditions where the need is dire, then the conservation community should begin now to specify and advertise a consensus view on when this may be appropriate.

In fact, Florida torreyia has already been moved northward in a test planting in northern Georgia. Florida torreyia is a native plant of Georgia, but of the approximately 30 trees within the native Georgia distribution, all are within 200 meters of the Florida state line. Planting the tree in northern Georgia as a species native to the state is somewhat of a stretch; this is a northward expansion of more than 10 times the distribution

breadth of the species in its native range. Some current assisted migration efforts would like to move the species northward further still, across state lines. This is the sort of effort that should begin with a dialogue with conservation organizations and leaders from the recipient location. In some cases, the result will be no assisted migration and extinction of species in the wild. For *Torreyia taxifolia*, with an *ex situ* population in several botanic gardens, and some years before we lose the native population, now is the time to fully explore local solutions—that is, local population enhancement—before taking rash action.

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