Extreme Climate Variability Should Be Considered in Forestry-assisted Migration

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Recently, Pedlar et al. (2012) stated that assisted migration in forestry (forestry AM) differs from species-rescue-assisted migration (species rescue AM) because the risks of invasiveness, hybridization with local species, and spread of diseases are minimized in managed forests. The rationale behind this assertion for forestry AM is that it involves the translocation of populations within the existing geographic range of the species, whereas species rescue AM involves the introduction of exotic species.

However, while we agree that forestry AM is less risky than species rescue AM for the recipient ecosystem, forestry AM can not only fail but can also incur enormous financial costs. The failure of efforts that involved planting maritime pine (*Pinus pinaster* Aït) trees in Southwest France (Aquitaine) with seeds from more southerly populations from Portugal for production purposes is a textbook case.

The climate variability in Aquitaine includes periods of intense frost that are sufficiently rare (every 10 to 20 years) to be overlooked when establishing tree populations. The frost of the winter of 1985, the most intense frost event since records began with temperatures dropping as low as –22 °C (Boisseaux, 1986), affecting about 350 km² of tree plantations in the region (Doré & Varoquaux, 2006). The highest mortality related to frost was observed in populations harvested from Leiria in Portugal, for which nearby records show that the absolute minimum temperature was only –7.8 °C in the last 60 years. Climate *averages* over the last 30 years differ only slightly between Leiria and Aquitaine, which would erroneously suggest that samples from Portugal would have survived in the Aquitaine region.

Newly emerging climates (Williams et al. 2007) and the uncertainty related to climate change extreme events (Easterling, 2000) will make the search for southern locations with climatic conditions similar to those of northern populations of trees extremely difficult. Policies of forest adaptation to climate change should account for extreme cold events in the target populations even if climate change will likely decrease the number of extreme cold events

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(Easterling, 2000), that remain in our opinion, the hidden element behind the maladaptation of southern populations to northern locations.

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