Genetic Conservation Planning for Forest Tree Species in Western North America Under Future Climate Change: Employing a Novel Approach to Identify Conservation Gaps[1]

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Among the 17 provinces, territories, and states that comprise western North America, approximately 18 percent of the 8.4 million km^2 of forested land base is designated as protected areas to ensure the *in situ* conservation of forest biodiversity. Jurisdictions vary substantially however, in their responsibilities, protected area coverage, and conservation policies. Here we demonstrate a novel approach to identify current and potential future conservation gaps for genetic populations across a tree species' range based on (1) statistical species distribution maps generated from 250 m remote sensing data and species frequency estimates from over 50,000 forest inventory plots, and (2) a multivariate velocity of climate change metric. We ask which tree species will be most vulnerable due to insufficient population protection in the future. Our goal is to determine sensible global conservation priorities that can be implemented in individual jurisdictions. The analysis of the putative genetic populations within major ecological zones revealed that forests are generally well represented with only four jurisdictions (Oregon, Saskatchewan, as well as the Yukon and Northwest Territories) protecting less than 10 percent of their forested land base. Within the 54 tree species analyzed, populations of western white pine (*Pinus monticola*), whitebark pine (*P. albicaulis*), and limber pine (*P. flexilis*) were found to be the least protected *in situ*. Under projected climate change, interior and boreal tree species are expected to be the most vulnerable, although they are currently among the most frequent and best protected species. To facilitate policy development, we present an example of how conservation efforts can be prioritized across multiple jurisdictions. We also provide data for resource managers that pinpoint the least protected tree populations as well as their relative vulnerability to climate change.

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