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Species, Climates, Climate Change, and Forest Health: A Conversion of Science to Practice for Inland Northwest (USA) Forests

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推送时间	20210125
研究领域	森林经理
年份	2021
类型	期刊
语种	英语
标题	Species, Climatypes, Climate Change, and Forest Health: A Conversion of Science to Practice for Inland Northwest (USA) Forests
来源期刊	FORESTS
期	第275期
发表时间	20201124
关键词	climate-change impacts ; ecosystem responses to climate ; species distributions ; climatype distributions ; adaptive management ;

摘要

Research Highlights: This paper integrates disparate research results pertaining to climate change impacts to 12 co-occurring forest tree species and their climatypes such that management options for the ecosystem as a whole become discernible. Background and Objectives: The ecosystem under analysis is the Thuja-Tsuga forest ecosystem, occupying ca. 121,500 km² in a largely mountainous setting in the interior northwest, USA. Our goal is to present land management options tied directly to climate-change in a straightforward framework for both the current and future generations. Materials and Methods: By merging synecological and genecological concepts in a climatic framework, we simplify complex interactions in a manner that relates directly to climate change impacts. Species and climatype distributions are redefined in terms of mean annual temperature and elevation of forested landscapes. Results: For each 2 degrees C increase in temperature, plant associations should shift upwards ca. 400 m, provided precipitation remains at or near contemporary levels, which, for this ecosystem, vary between 300 mm and 1450 mm. Management guidelines are developed for (a) selecting climatypes of the species suited to the climate at the leading edge of the migration front, (b) anticipating decline at the trailing edge, and (c) converting climatypes in areas where species should persist. Conclusions: Our results can provide robust strategies for adapting forest management to the effects of climate change, but their effectiveness is dependent on the implementation of global warming mitigation actions.

服务人员 付贺龙

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