NEW FRONTIERS IN FORESTRY: COMBINING PHENOMICS, COMMON GARDENS, AND LANDSCAPE GENOMICS TO ADDRESS DISEASE RESISTANCE AND CLIMATE CHANGE

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A collaborative team of researchers from the United States and Mexico have begun a project funded by The National Science Foundation's Macrosystems Biology program. The project is to study ecological and evolutionary processes affecting the distribution of southwestern white pine, an important tree species of mixed conifer forests in the Southwest United States and Mexico. Southwestern white pine (*Pinus strobiformis*) sustainability is threatened by changing climate, and an invasive non-native tree disease, white pine blister rust. White pine blister rust causes extensive tree decline and mortality where it occurs in North America, including where it overlaps with southwestern white pine, an ever-expanding area. Climate may advance too rapidly for southwestern white pine to move or adapt. The dual threats of climate change and an invasive species make forecasting future tree distributions across continental scales an urgent challenge. The goal of this project is to determine how gene movement among populations, adaptation to disease and drought, epigenetic changes, and a changing environment interact to govern the success of southwestern white pine. This project is developing tools to help forecast and manage the future of the species, including genomics, common gardens, disease resistance testing, phenomics, and computer modeling in landscape ecology and genomics. We show how the project is combining genomics and traditional common garden approaches and its potential management applications for southwestern white pine.

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