UNDERSTANDING AND FORECASTING FOREST CHANGES: 30 YEARS OF RESEARCH IN THE SIERRA NEVADA (1E)

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Western North American forests are facing unprecedented challenges, including rapid climatic changes, altered fire regimes, and upsurges of pests and pathogens. Our ability to respond to these challenges depends in part on three key pieces of information: accurate detection of forest changes, attribution of those changes (determination of their causes), and forecasting future changes. In the Sierra Nevada, our globally unique network of thirty permanent forest plots in Sequoia and Yosemite national park -- currently with 30 years of annual-resolution data -- has contributed substantially to detection, attribution, and forecasting. Some of our findings include: (1) Tree mortality rates in Sierra Nevada old growth forests have more than doubled in recent decades, an apparent consequence of warming temperatures, (2) Increasing stresses on forests -- such as those caused by warming temperatures -- can be expected to result in increased fire severity even without changes in fire prescriptions, and (3) Relatively simple models can accurately forecast the continuing (and sometimes dramatic) loss of Sierra Nevada sugar pines to white pine blister rust, an introduced pathogen. We expect that the value of our unique long-term data set for informing management will only increase through time.

Key words: forest, tree, mortality, forecast, climate change