Harnessing the ecological data revolution
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Cross-scale investigation of declining forest cover in southwestern Australia

Abstract

Background/Question/Methods

Many forest ecosystems are vulnerable to combinations of ultimate (e.g. drought, heat, fire) and proximate (e.g. opportunistic pathogens and insect pests) stressors. Tracking and understanding forest health changes in response to stressors is critical for predicting how forests will respond in the future and developing evidence-based, proactive management intervention techniques. Preliminary work indicated a decline in forest cover in particular regions of southwestern Australia over the last 15 years. Thus, in our current project, we asked: what are the spatial and temporal patterns and changes in forest cover, and what are the factors involved in forest cover decline? To answer this, we examined forest cover across landscape, stand and tree scales with a multidisciplinary team.

Results/Conclusions

Using estimates of vegetation cover derived from Landsat (i35 index), we identified declining and stable forest areas. Then, we investigated factors potentially contributing to forest decline and validated remote sensing data with ground-based, stand and site-level measurements. Landscape-level measurements suggested a decline in vegetation cover of particular ecosystem types, such as those located in isolated sandy basins, surrounding swamps and surrounding rocky outcrops. Various ultimate stressors, such as frost, drought, heatwaves, and fire, are thought to be associated with canopy die-off in these areas. At other sites, more proximate stressors, such as insect attack, are thought to be involved. Different forest ecosystem types may be more vulnerable to, and may recover at different rates, following stressors, and this could be influencing the overall trend of forest cover. These nuances in the range of forest responses are being investigated and incorporated into trend analysis. Such cross-disciplinary work with diverse ecological data will provide insights into developing management intervention techniques.

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