Optimal Strategies for the Surveillance and Control of Forest Pathogens

Abstract

In this essay, we develop a model of optimal surveillance and control of forest pathogens. Managers allocate limited budgets between surveillance and control activities and among locations within the forest landscape. Our model allows for a heterogeneous forest, where grid cells are differentiated by the number of trees and the number of infected trees. We develop a cost curve associated with the expected fraction of healthy trees saved from becoming infected. We find that the cost curve of saving healthy trees from infection is upward sloping, and that marginal cost increases along with the increase in the desired fraction of healthy trees. We also explore characteristics of sites selected for surveillance. In particular, we examine the characteristics of sites that make them high-priority sites for surveillance when the budget level is relatively low. We find that the best surveillance strategy is to prioritize sites with relatively low expected unit surveillance cost per tree saved from infection. The particular case we examine is oak wilt (caused by the fungus *Ceratocystis fagacearum*) in a region within Anoka County, Minnesota. Our results offer practical guidance to managers in charge of deciding how and where to spend limited public dollars when the goal is to reduce the number of trees newly infected by forest pathogens.

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