Detection and Eradication: An Important Component of Managing Forest Insects and Diseases

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Preventing invasions in the beginning (quarantine) is generally regarded as the most efficient way to manage the biological invasion problem. Unfortunately, with current trends of increasing trade, not all invasion pathways can be practically closed. Consequently, eradication will continue to play an important role in comprehensive programs to minimize the impacts of alien species. Here, eradication refers to management activities that result in the extirpation of a species from a given area. Eradication treatments are closely tied to surveys conducted to detect newly arrived populations of invading species; populations must be detected before they are eradicated. For any species, there is a balance between expenditures on detection and eradication. Heavy investment in detection means populations will be detected when they are small and relatively inexpensive to eradicate. Alternatively, less money can be spent on detection which means that populations will be relatively large and more expensive to eradicate. These expenditures can be optimized and the optimal allocation will vary over heterogeneous landscapes where costs and arrival frequencies vary.
Despite the vast costs of eradication programs and their importance to mitigation of undesirable effects of non-indigenous species, an exploration of the scientific basis for eradication founded on basic principles of population ecology has been lacking. The “Allee effect”, a phenomenon in which population growth declines with decreasing density, plays a critical role in most eradication strategies. Strong Allee effects create thresholds, below which populations decline toward extinction. Eradication treatments should thus be targeted to bring the population below these thresholds. Many eradication programs may utilize multiple tactics and understanding how tactics interactively affect Allee dynamics is critical to the design of efficient programs.

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