

# Exotic *Phytophthora* species Are Being Systematically Introduced in California Wildlands During Restoration Projects<sup>1</sup>

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## Abstract

This study describes the identification of several *Phytophthora* species previously found in San Francisco Bay Area nurseries (Sims and others 2018a) from multiple sites at the urban wildland interface within the greater San Francisco Bay Area. Isolation success was highest from the three plant species: *Diplacus aurantiacus* (sticky monkey-flower), *Ceanothus thyrsiflorus* (blueblossum), and *Frangula californica* (California coffeeberry), growing in restoration sites and in adjacent disturbed sites. Isolation success was zero in control undisturbed “natural” areas adjacent to infested sites. In order to confirm plant production facilities were the source of the *Phytophthora* strains isolated from restoration sites, genetic and phenotypic analyses were performed on *Phytophthora crassamura*, one of the most common species identified during the course of this and other studies. Results indicated that field isolates were genetically identical to those found in plant production nurseries. Resistance to fungicides such as phosphites and mefenoxam was identified in a select number of isolates found both in plant production facilities and wildland sites, which further corroborates a “nursery” origin for the wildland infestations (Sims and others 2018b). Spatial landscape-level analysis identified patterns of *Phytophthora* spread consistent with an outward expansion from sites that were planted and with topography, although the presence of some species was not associated with water accumulation patterns. *Phytophthora* species assemblages were site-specific and possibly related to site type, nursery where the plants were grown, and time since planting. To our knowledge, this is one of the first studies providing robust evidence that exotic *Phytophthora* species are being systematically introduced through the use of infected plants in restoration projects.

## Literature Cited

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