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Recovery of *Phytophthora* species from critical control points in horticultural nurseries

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We previously reported results of a systems approach study that elucidated critical control points (CCPs) for *Phytophthora* contamination in Oregon nursery production systems. A CCP is the best point at which significant hazards of contamination can be prevented. CCPs included contaminated gravel substrates, re-used containers, potting media, and irrigation ponds. We now report the identity of *Phytophthora* isolates associated with each of these CCPs. *Phytophthora* isolates were identified to species by direct sequencing of the internal transcribed spacer (ITS) rDNA and blast searches at www.phytophthora-id.org. Of 449 total *Phytophthora* isolates, 364 isolates (81%) belonged to 15 *Phytophthora* species, 13% matched *Phytophthora* taxa without species designations, and 6% did not match any sequence in the database. The most frequently isolated species from symptomatic plants were *P. citricola*, *P. cinnamomi*, and *P. syringae*. From gravel substrates, pots, and soil, the predominant species were *P. citricola*, *P. cinnamomi*, and *P. cryptogea*. From irrigation ponds, most isolates were *P. gonapodyides* or other *Phytophthora* taxa belonging to ITS Clade 6. *P. parsiana*, not previously reported from nurseries, was also detected. *P. cinnamomi*, the species most frequently isolated from plants, was never recovered from water. These results provide insights on *Phytophthora* pathology and ecology in nurseries.