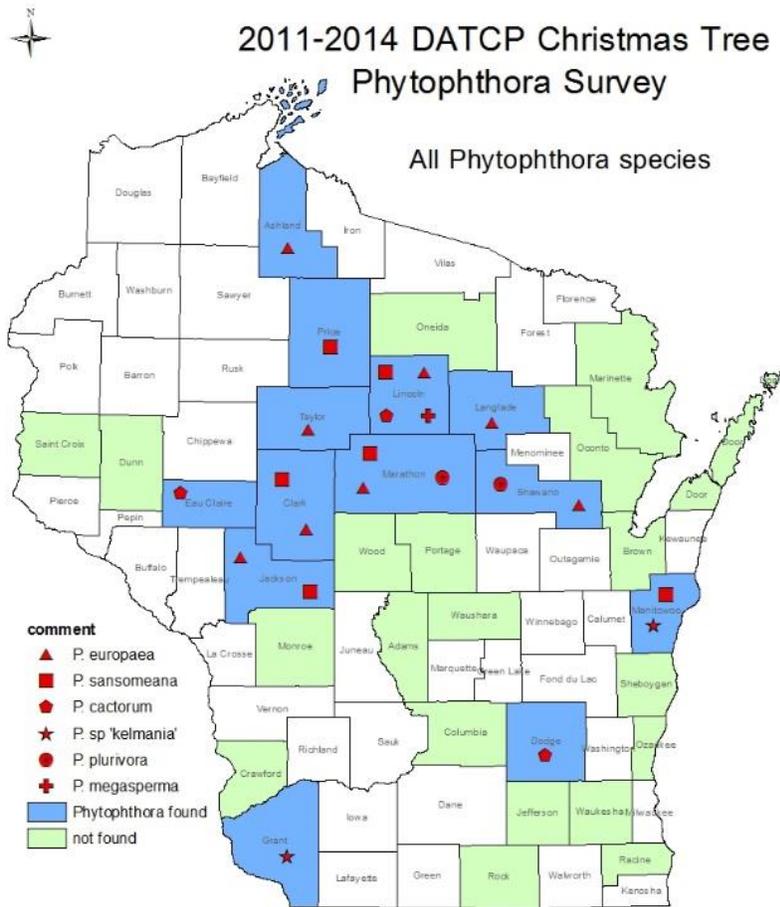


Plant Industry Laboratory Report 2014

Christmas tree survey for new root rot diseases

<http://pestsurvey.wi.gov/>

A survey of Wisconsin Christmas tree fields for new root rot diseases revealed six different species of *Phytophthora* on declining trees (*P. cactorum*, ***P. europaea***, *P. megasperma*, *P. plurivora*, ***P. sansomeana***, ***P. sp. 'kelmania'***). Three of these species (in bold print) are new to Wisconsin. *Phytophthora* are soil-living fungus-like organisms that can cause root rot under wet conditions. The discovery of *Phytophthora sp. 'kelmania'*, in 2010, initiated a 4 year project with the goal to identify *Phytophthora* species affecting tree production in the state. *Phytophthora* was found in 13 of 33 surveyed Wisconsin counties, causing total tree loss in some fields.



DATCP Christmas Tree Program and Plant Industry Bureau Laboratory, in cooperation with Wisconsin Christmas Tree Growers



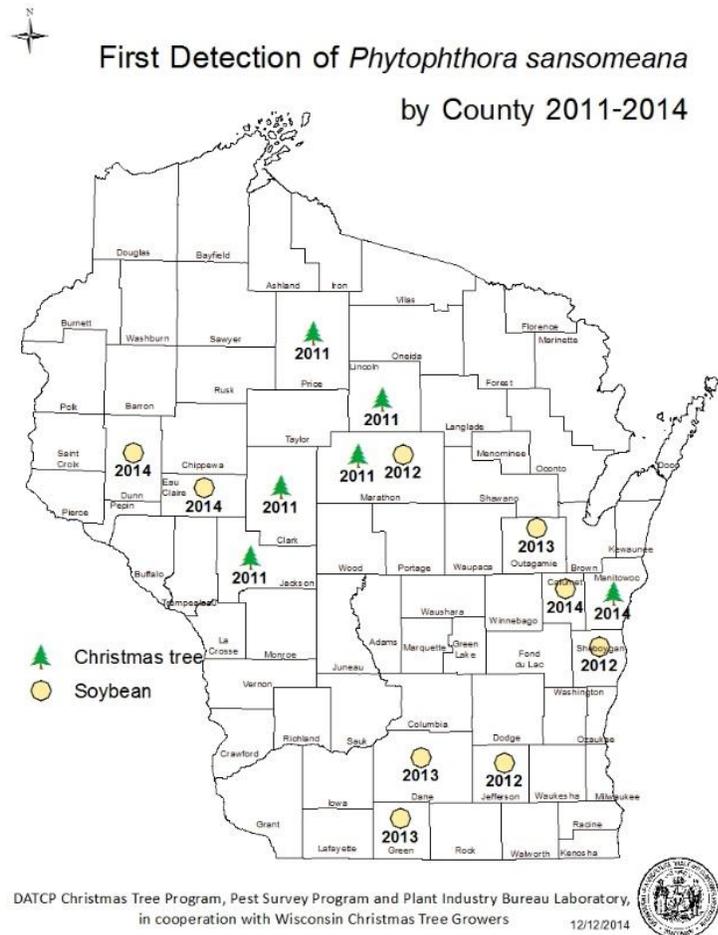
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Over the 4 year survey, 27 of 91 (29.7%) participating tree farms tested positive for *Phytophthora*, that is 47 of 187 (25%) collected tree samples.

Fraser fir (*Abies fraseri*) was the most susceptible to root rot of the 7 different Christmas tree species inspectors collected. Laboratory testing detected *Phytophthora* in 36 of 115 (31%) Fraser fir samples, followed by Balsam fir (*Abies balsamea*) with 8 of 44 (18%) positive samples. A few other tree species also tested positive for *Phytophthora* such as Nova Scotia Balsam fir, Canaan fir (*Abies balsamea* var. *phanerolepis*) and Douglas fir (*Pseudotsuga menziesii*). Spruce (*Picea spp.*) and pine (*Pinus spp.*) were checked as well but tested negative for *Phytophthora*.

The most frequently detected *Phytophthora* species was *P. europaea* with 27 of 47 (57%) positive testing samples, followed by *P. sansomeana* with 10 of 47 (21%). All other species were found between 1 and 4 times (2-9%). *P. cactorum* (on Balsam, Canaan and Fraser fir), *P. plurivora* syn. *P. citricola* and *P. megasperma* (on Nova Scotia Balsam fir) are known to occur in Wisconsin. *P. europaea* and *P. sansomeana* were identified in Wisconsin for the first time during this survey in 2011. *P. europaea* was first reported in the scientific literature in European forest soils around oak trees, and has since been collected from soil samples in oak forests in Minnesota, West Virginia, Wisconsin and Pennsylvania where it is considered a weak pathogen of oak.

This survey found 22 Fraser and 5 Balsam fir infected with *P. europaea*. Our observations indicate that it may be the primary cause of tree death, although more research is needed to prove pathogenicity on fir.



P. sansomeana is known to cause root rot on fir trees, especially Fraser fir. It was detected on 9 Fraser and 1 Balsam fir during our survey. *P. sansomeana* has been reported on Douglas fir in Oregon, on several weed species in New York. It is a new pathogen of corn (Ohio) and soybean (Indiana) in the Midwest. In Wisconsin we found *P. sansomeana* for the first time on soybean in 2012 and on corn in 2013. It is noteworthy that *P. cinnamomi*, the species most destructive on Fraser fir in its native Appalachian Mountain range, was not detected in Wisconsin and as far as we know does not occur in this state.

A common abiotic problem was root compaction as a result of planting methods. Shallow lateral, j-shaped,

fan-shaped root development and self-girdling roots were observed in 51.5% of collected samples, adding to tree stress. Several other diseases and pests diagnosed were: Armillaria root rot, Rhizosphaera needle cast, Sclerophoma shoot blight, Diaporthe/Phomopsis and Cytospora cankers, blue stain fungi, bark beetles, white pine weevils, Cerambycid beetles and root aphids.

Phytophthora root rot was present in most Christmas tree producing counties, except for the central sands where soils drain better, which prevents the build-up of these fungi. Loss estimates provided by Wisconsin Christmas tree growers whose fields tested positive for *P. europaea* or *P. sansomeana* ranged widely, but were significant and reached up to 100%. The longevity of this pathogen in soil is a major concern in fields with a history of Phytophthora.

Culture isolates of all species were placed in national collections and shared with University of Wisconsin and Washington State University researchers to learn more about pathogenicity and management of these new Phytophthora species. At this point disease management consists of root rot prevention. Starting by carefully planting disease-free seedlings in well-drained, Phytophthora-free sites to avoid root compaction and root injury.