DATCP's 2014 early soybean disease survey found the highest level of Phytophthora root rot since the beginning of this survey in 2008 and identified four different species of this water mold on Wisconsin soybean. Besides the well-known cause of seedling root rot *Phytophthora sojae*, DNA based testing also determined the presence of *Phytophthora sansomeana, Phytophthora pini* and *Phytophthora sp. "personii"*.

2014 Soybean Phytophthora Survey

57 fields sampled
VC-R3

Results
- P. sojae, P. sp. "personii" (1)
- P. sansomeana, P. pini (1)
- P. sansomeana, P. sojae (1)
- P. sansomeana (2)
- P. sojae (24)
- not found (28)

Wisconsin Department of Agriculture, Trade and Consumer Protection

11/26/2014
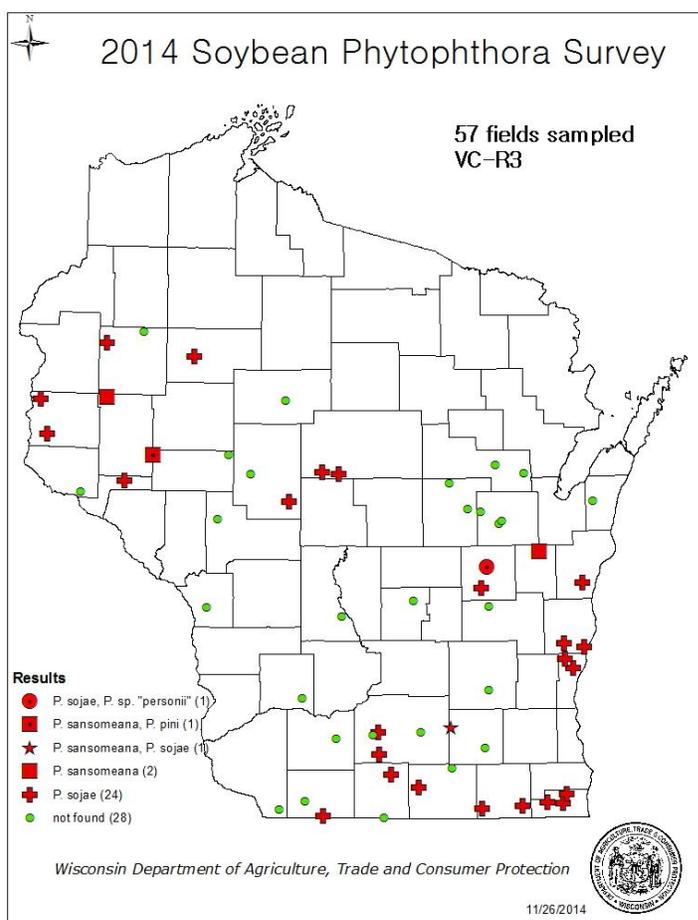
The map shows the prevalence of these Phytophthora species in Wisconsin in 2014.

P. sojae, a fungus-like organism, is the species that is well established in Wisconsin and known to cause damping-off and root rot disease in spring. Later in the season it causes characteristic brown lesions on the lower stem.

In 2014 *P. sojae* was found in nearly half (26 of 57) of all tested fields. *P. sansomeana* was detected in 4 fields. *P. pini* was isolated from one soybean sample from Eau Claire Co. that was also infected with *P. sansomeana*. *P. sp. "personii"* was cultured from Winnebago Co. soybean roots that also tested positive for *P. sojae*.

P. pini and *P. sp. "personii"* are first detections in Wisconsin soybeans. This survey found *P. sansomeana* on soybeans for the first time in 2012 in Wisconsin. Symptoms observed on seedling roots infected with *P. sansomeana* consisted of lesions on tap and lateral roots, and decaying fine roots. The brown stem lesions characteristic for *P. sojae* are not associated with *P. sansomeana*. Since the symptoms observed on soybean seedlings were not distinguishable from those caused by Pythium root rot, testing was expanded to screen for Pythium as well.

Detection Methods. Plant collections were made during vegetative and early reproductive growth stages; survey dates varied each year depending upon spring growing conditions. Fields were chosen at random but sampling within a field was biased toward areas prone for root rot such as low lying areas, field access areas and headlands. Twenty seedlings were carefully dug up and combined into one sample from each field. Soybean roots were washed thoroughly before root tissue was tested for the presence of Phytophthora and Pythium. Starting in 2010 we expanded pathogen testing from *P. sojae* species-specific testing to include other species of Phytophthora. Gene based methods, such as PCR (polymerase chain reaction) combined with gene sequence analysis, allowed us to identify these pathogens quickly and reliably to species level (1, 3, 5).

Table 1 shows the number of fields and percentage of fields infected with Phytophthora and Pythium. Pythium was present in the majority of fields surveyed. A break-down of all Pythium species identified can be found in a separate report on "Pythium Species Associated with Soybean Seedlings" on this website.

| Table 1. Phytophthora and Pythium Survey Summary 2008-2014									
			Total Number and Percent of Fields Testing Positive for						
Year	Survey Dates	Total Sampled Fields	*Phytophthora sojae*		*Phytophthora sansomeana*		*Phytophthora pini*	*Phytophthora sp. "personii"*	*Pythium spp.*	
2008	6-23 to 7-17	50	12	24%	NA	NA	NA	NA	NA	NA
2009	7-9 to 7-17	50	9	18%	NA	NA	NA	NA	NA	NA
2010	6-16 to 7-9	45	17	38%	0	0	0	0	NA	NA
2011	6-14 to 7-14	15	2	13%	0	0	0	0	13	87%
2012	5-29 to 7-2	49	8	16%	3	6%	0	0	49	100%
2013	6-17 to 7-18	52	7	13%	5	10%	0	0	46	94%
2014	6-6 to 7-16	57	26	46%	4	8%	1 (2%)	1 (2%)	52	98%

P. sojae was found in 46% of all tested fields in 2014, compared to 13% to 16% of fields in the three years prior. Relatively high incidence of infection was also noted in 2008 (24%) and 2010 (38%). While local conditions always vary, many growing areas in 2008, 2010 and 2014 experienced heavy rainfalls in spring causing prolonged saturation of soils and flooding, according to the Wisconsin Crop Progress Reports (6). One to two weeks of continuous moisture with temperatures of 60-65 °F create ideal conditions for *P. sojae.* For information on soybean disease management please see UW-Extension website https://fyi.uwex.edu/fieldcroppathology/.

P. sojae is found in all major soybean growing areas of Wisconsin as shown on the map below that combines all survey data from 2008 to 2014.

2008-2014 DATCP
Phytophthora sojae
Survey

314 fields sampled
V1-R3 growth stages
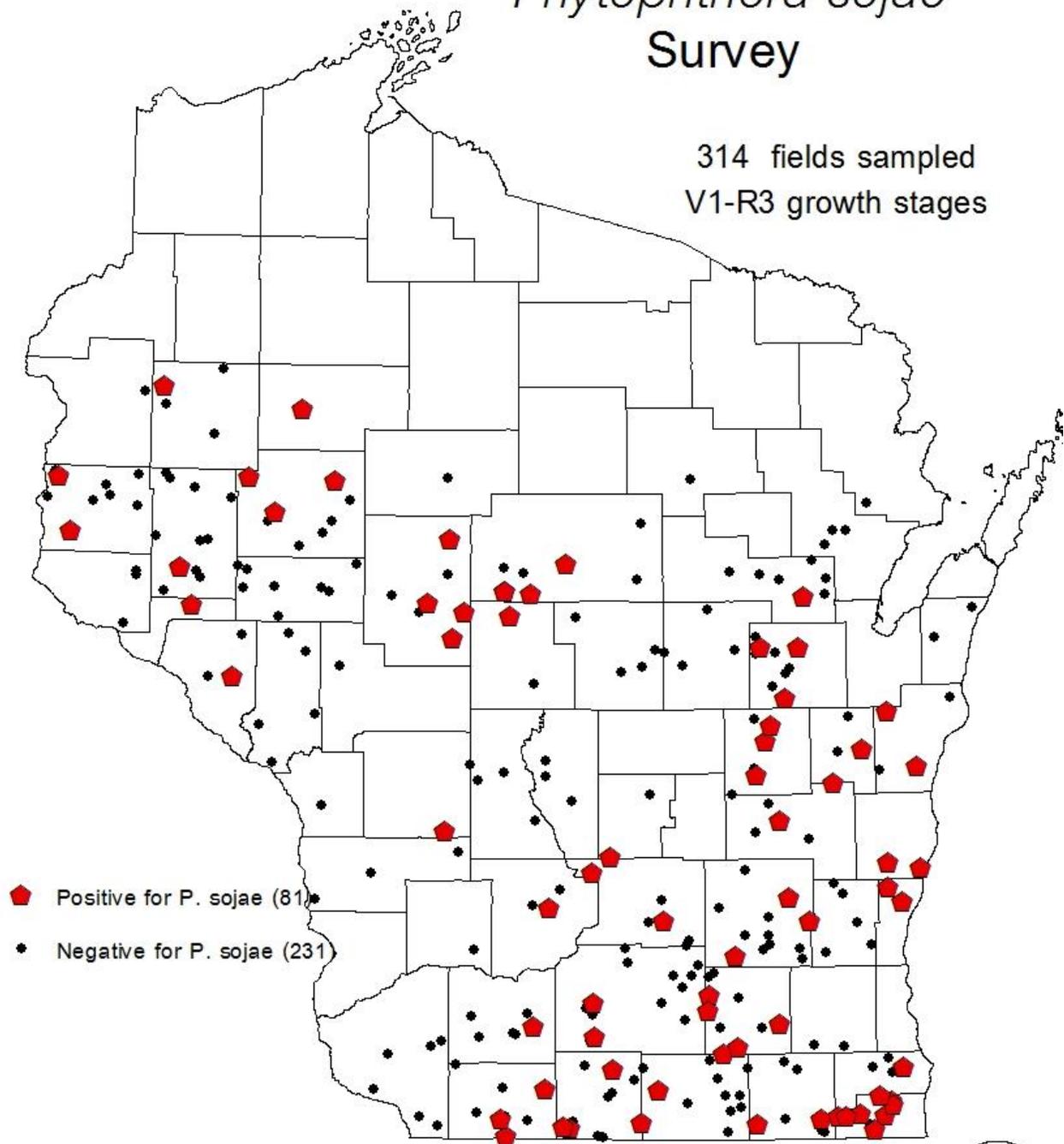
Positive for P. sojae (81)

Negative for P. sojae (231)

Wisconsin Dept of Agriculture, Trade and Consumer Protection
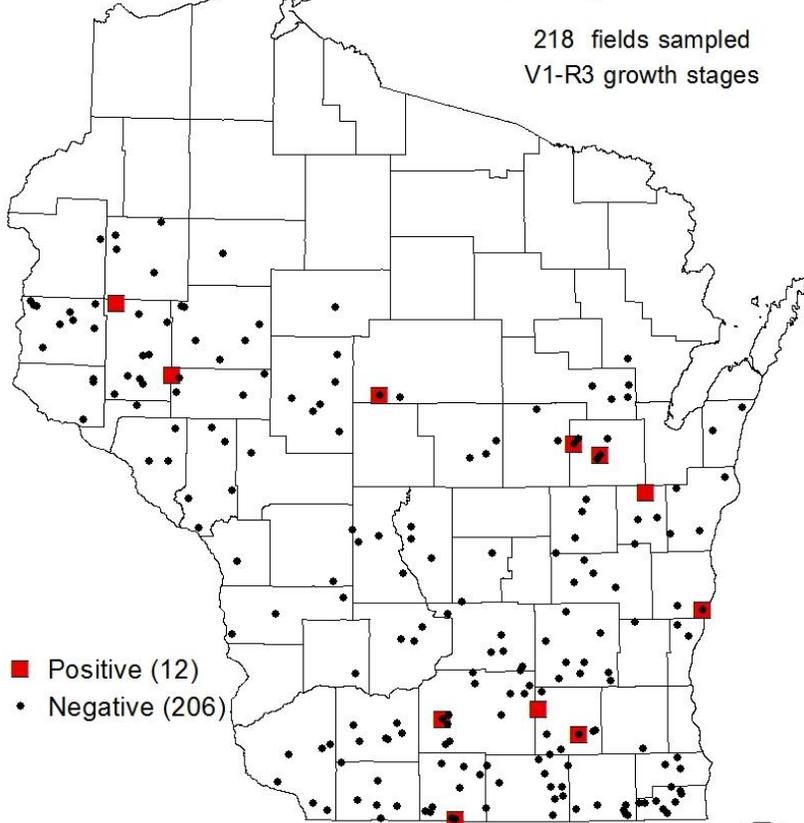Plant Industry Bureau Laboratory

AB 12/18/2014

2010-2014 DATCP
Phytophthora sansomeana
Survey

218 fields sampled
V1-R3 growth stages

■ Positive (12)
• Negative (206)

Wisconsin Dept of Agriculture, Trade and Consumer Protection
Plant Industry Bureau Laboratory
AB 2/10/2015

Phytophthora sansomeana was found in 4 soybean fields in 2014 in Calumet, Dunn, Eau Claire and Jefferson Counties. *P. sansomeana* has now been documented in soybean fields in 9 Wisconsin counties (Dane, Dunn, Calumet, Eau Claire, Green, Jefferson, Marathon, Outagamie and Sheboygan). The map on the left shows all sites surveyed from 2010 to 2014.

In 2013 this survey detected *P. sansomeana* in corn roots but there was no disease associated with the infected corn. Unlike *P. sojae* which is specific to soybeans, *P. sansomeana* can infect multiple hosts.

The corn field in which it was found had a history of *P. sansomeana*-infected soybeans. In a corn-soybean crop rotation this pathogen could build-up over time in the soil. We believe this was the first detection of this *P. sansomeana* in corn in Wisconsin.
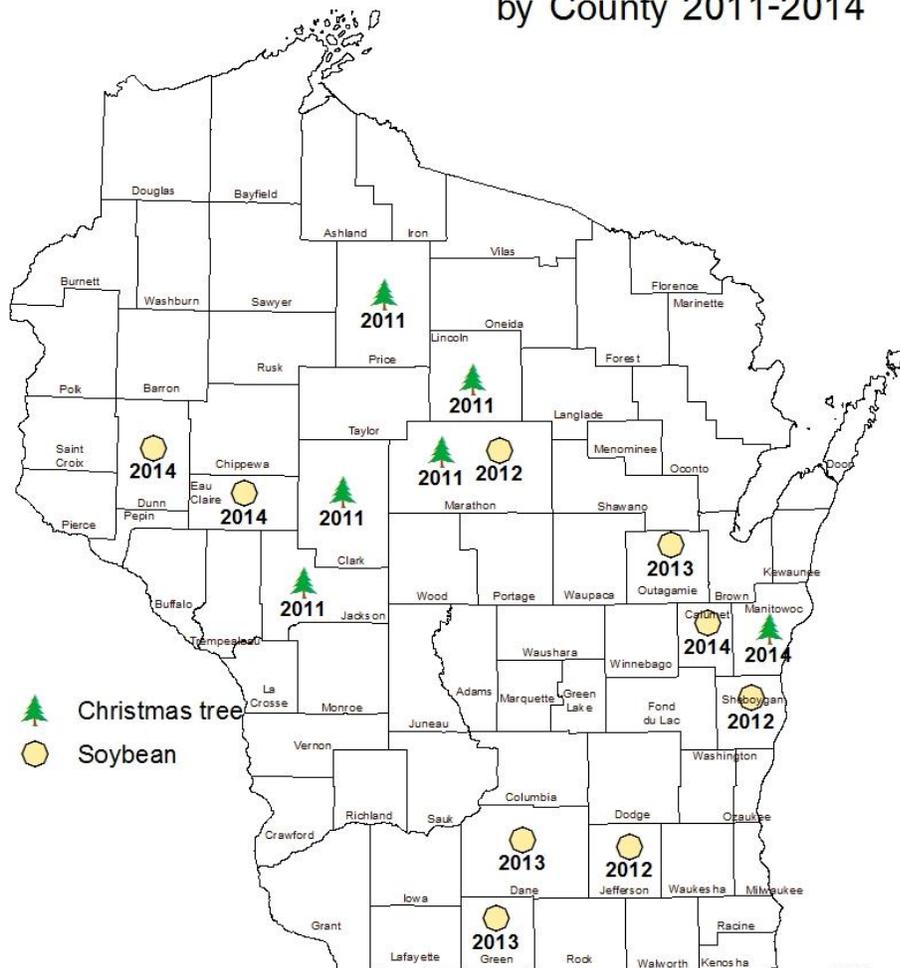
Researchers have reported *P. sansomeana* on corn in Ohio, soybeans in Indiana, Douglas fir seedlings in Oregon, and weeds in New York (2). *P. sansomeana* was also reported to have caused significant losses on soybean in China (4). Culture isolates from the Wisconsin soybean survey are being tested on both corn and soybeans at UW-Madison to evaluate pathogenicity under Wisconsin growing conditions.

In addition to affecting field crops, *P. sansomeana* has also been detected in Christmas tree plantations on Fraser and balsam fir in six Wisconsin counties (Clark, Jackson, Lincoln, Manitowoc, Marathon and Price). This brings the total number of Wisconsin counties where *P. sansomeana* has been identified since 2011 to 14, see the map below.

Two additional new species *P. pini* and *P. sp. "personii"* were isolated from soybean roots in 2014. *P. pini* (formerly included in *P. citricola*) is generally considered to be a pathogen of shrubs and trees. The organism survives well in surface waters and could

First Detection of *Phytophthora sansomeana*
by County 2011-2014

Christmas tree

Soybean

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

12/12/2014

be inadvertently introduced by flooding or irrigating with pond or river water. *P. pini* has been reported in Wisconsin under the name *P. citricola*.

P. sp. "*personii*" is new to science and has yet to be formally described. It was originally found in rivers and wetland soils in Australia, where it affects horticultural crops. To the best of our knowledge it has never been detected in Wisconsin before.

Neither species has previously been associated with soybeans and their significance for soybean production remains to be determined.

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