

2014 Late Blight Update
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Again this year our lab received potato and tomato samples from all over the USA. Most reports were from the eastern part of the USA, but we had a few samples from the Midwest and Northwest. The total number of samples from the USA investigated for the calendar year has risen to 171. Of these, 130 were US23 from: CT, FL, ID, MA, ME, MD, NC, NH, NY, OH, PA, VA. Additionally US8 was detected twice in WA; US24 was detected 6 times (NY, OR); and US11 was detected once (WA). There were three genotypes not seen previously. 2014A (A1 mating type) was detected once in LI, NY. 2014B (A2 mating type) was detected 6 times in two counties in NY. 2014C was detected once in NY. 2014A and 2014B are still being analyzed. 2014C was not successfully isolated into pure culture. The characteristics of the dominant strains of *Phytophthora infestans* are given in Table 1.

Table 1. Phenotypic characteristics of the most common clonal lineages detected in the USA 2009-2014.

<u>Lineage</u>	<u>A1/A2</u>	<u>Host Preference</u>	<u>Mefenoxam sensitivity</u>
US8	A2	Potato	moderately resistant
US11	A1	Potato and Tomato	resistant
US22	A2	Potato and Tomato	sensitive
US23	A1	Potato and Tomato	sensitive – moderately sensitive
US24	A1	Potato	moderately sensitive

Several collaborators have desired to learn more about the population structure of *P. infestans* in local fields. They have wanted more than one or two analyses in each sample. Steve Johnson (University of ME) suggested that we use FTA cards on which sporulating lesions can be “smashed”. The cards can then be sent via mail or courier for analysis – DNA extraction and microsatellite analysis (PCR and sequencing). Steve sent some FTA cards that had been “smashed” and we are investigating how best to analyze these. The system in our lab is not yet optimal, but we are working it. On the expectation that this process will become operative, we should be able to do more “single-field” population assessments. The disadvantage of the FTA cards is that there will not be biological material from which to obtain isolates. However, if something interesting appears, we hope that investigators will be willing to obtain good samples from which *P. infestans* can be isolated.

A summary of the dynamics of the strains of *P. infestans* over the past years is presented in Figure 1.

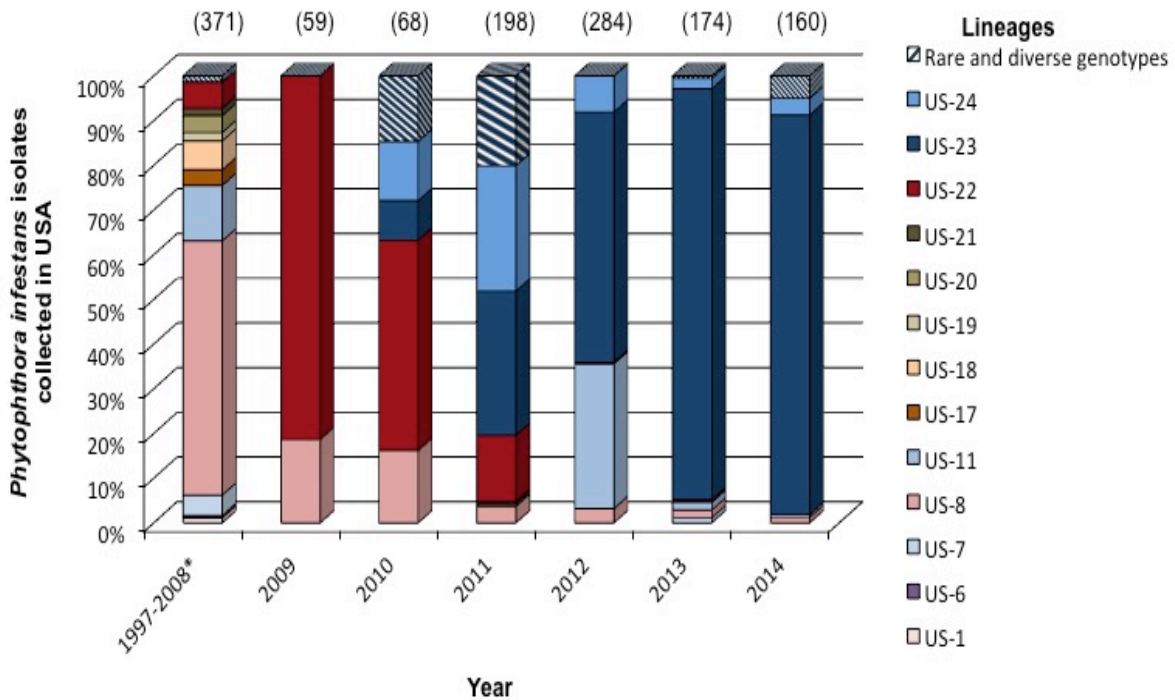
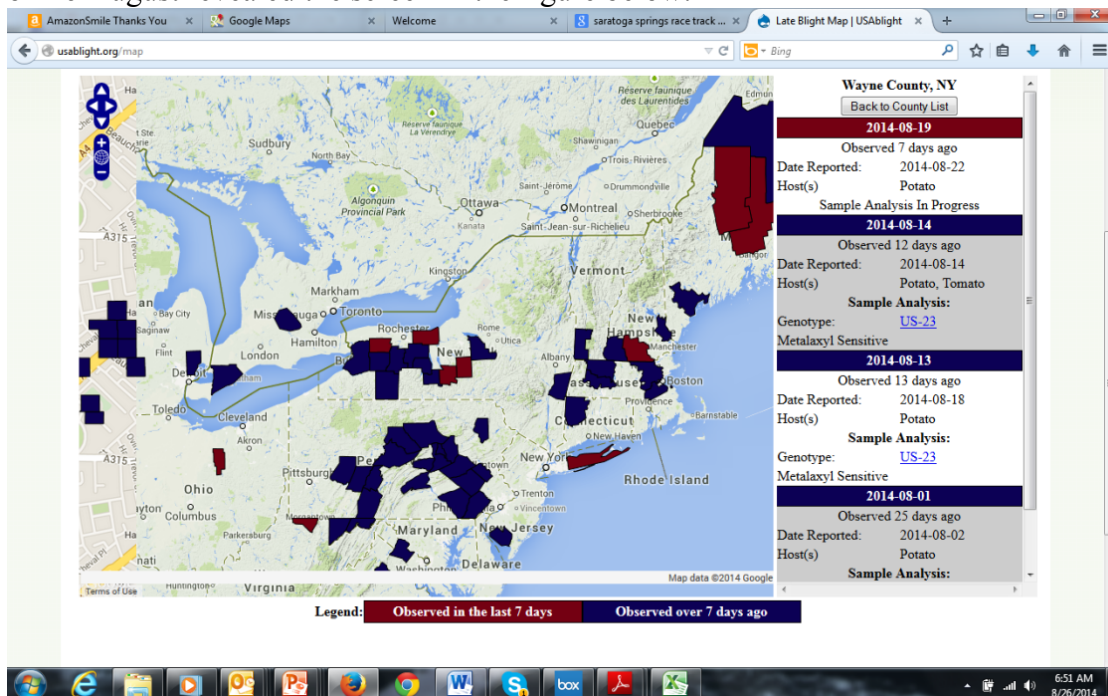


Figure 1: Dominant clonal lineages detected in the USA, 1997 - 2014. The sample size for each year is indicated at the top of each column. Lineages US-7, US-8, and US-11 have been in the USA since the 1990s. Lineages US-22, US-23, and US-24 were first detected in 2007-2009.

These samples and a few not sent to us were published on the USAblight.org site. One can click on a map at this site and learn what has been reported in one's area. A query on Wayne County on 26 August revealed the screen in the figure below:



In 2010 and 2011, there was a group of isolates from central/western NYS that seemed to be diverse (Figure 1). After considerable analysis it now seems that these isolates represent a recombinant population (from sexual reproduction – most likely in the USA). This is the second confirmed occurrence of a sexual recombination event in the USA. The first was in the Pacific Northwest in 1993. Sexual recombination in the USA is still very rare, but it has happened at least twice. However, we do not yet have any evidence that there is a “residential sexual population”. A residential sexual population would be unfortunate. Such a population has been established in the Nordic countries as result of migrations into Europe in the 1970s. The *P. infestans* population in the Nordic countries is now dramatically diverse. Since the early-mid 1990s oospores are a source of inoculum in soil and epidemics start earlier than previously (Figure 3.) As a result farmers are applying more fungicide to suppress late blight (Figure 4).

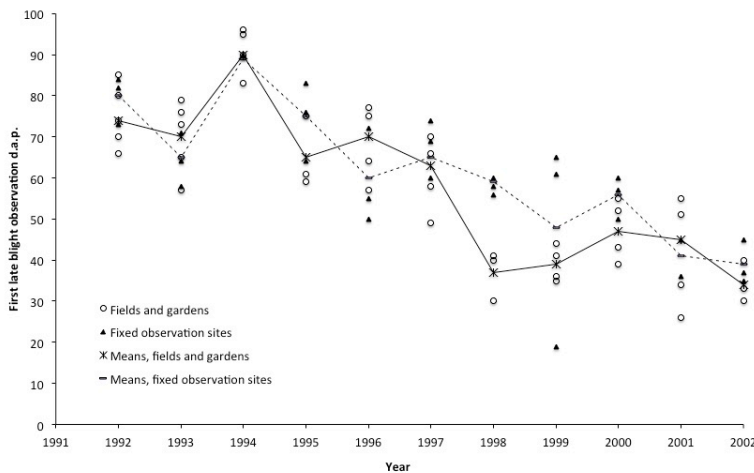


Figure 3. The date of the first late blight observation in Finnish potatoes from 1991 through 2002 (Hannukkala et al. 2007)

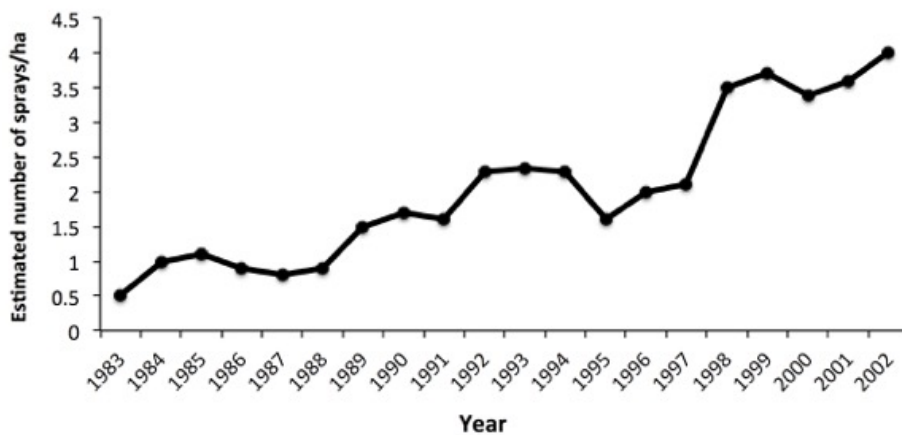


Figure 4. Estimated numbers of fungicide applications made by Finnish farmers 1983-2002. (Hannukkala et al. 2007)

It is very clear that we don't want to host a residential sexual population of *P. infestans*. The implications are not at all pleasant. The good news is that there is not yet any evidence that we have any residential sexual populations. We need to maintain our vigilance and suppress this pathogen very effectively.