LATE BLIGHT UPDATE 2015

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Overview. Late blight caused by *P infestans* occurred in many potato and tomato production states during 2015. However there were no regional outbreaks so severe that they made the national news, and several regional cooperators had no late blight to report. For example, there was no late blight reported on Long Island in 2015. Additionally, collaborators in Maryland, and Wisconsin had no late blight in their trials. Many (most?) outbreaks were reported on the USA Blight map https://www.usablight.org/map (Figure 1). Not on the map were occurrences of late blight in Colorado, Montana, and Minnesota. In New York, 22 counties reported late blight.

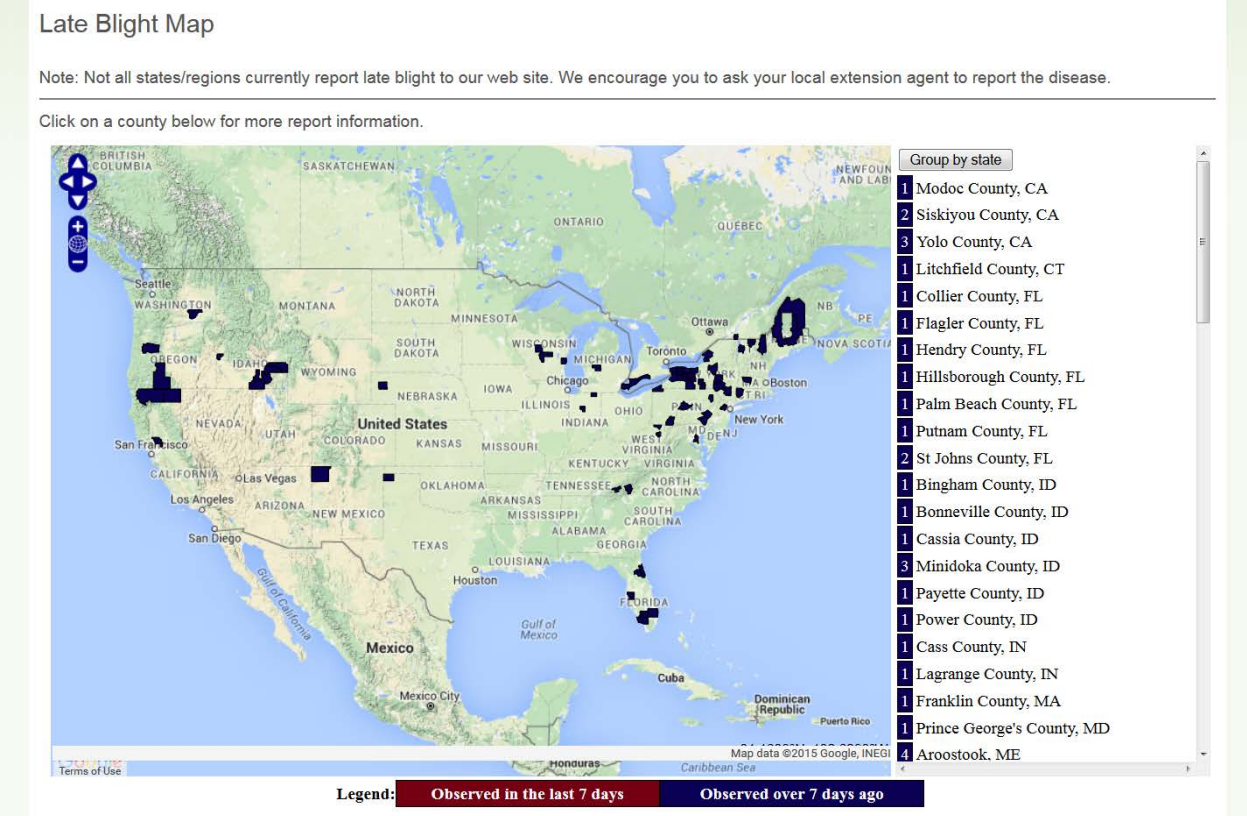

Figure 1. Map of late blight reports in 2015 from the USABlight website.

Lineages of *Phytophthora infestans* in 2015.
Our lab received 158 samples from 18 states during the year for lineage assessment. As in the previous several years (Figure 2), the most common lineage was US-23, and accounted for 101 of the 158 samples. This lineage is pathogenic to potato and tomato, but still appears largely sensitive to mefenoxam. It appears sensitive to all other late blight fungicides. In New York (52

submissions), only US-23 was detected in growers fields. US-8 (A2, mefenoxam insensitive, and mainly pathogenic to potatoes) was reported from California, Colorado, Nebraska and Washington. US-11 (A1, highly resistant to mefenoxam and pathogenic to both potatoes and tomatoes) was found in Oregon and California. Two new genotypes (not yet numbered) were recovered from Texas.

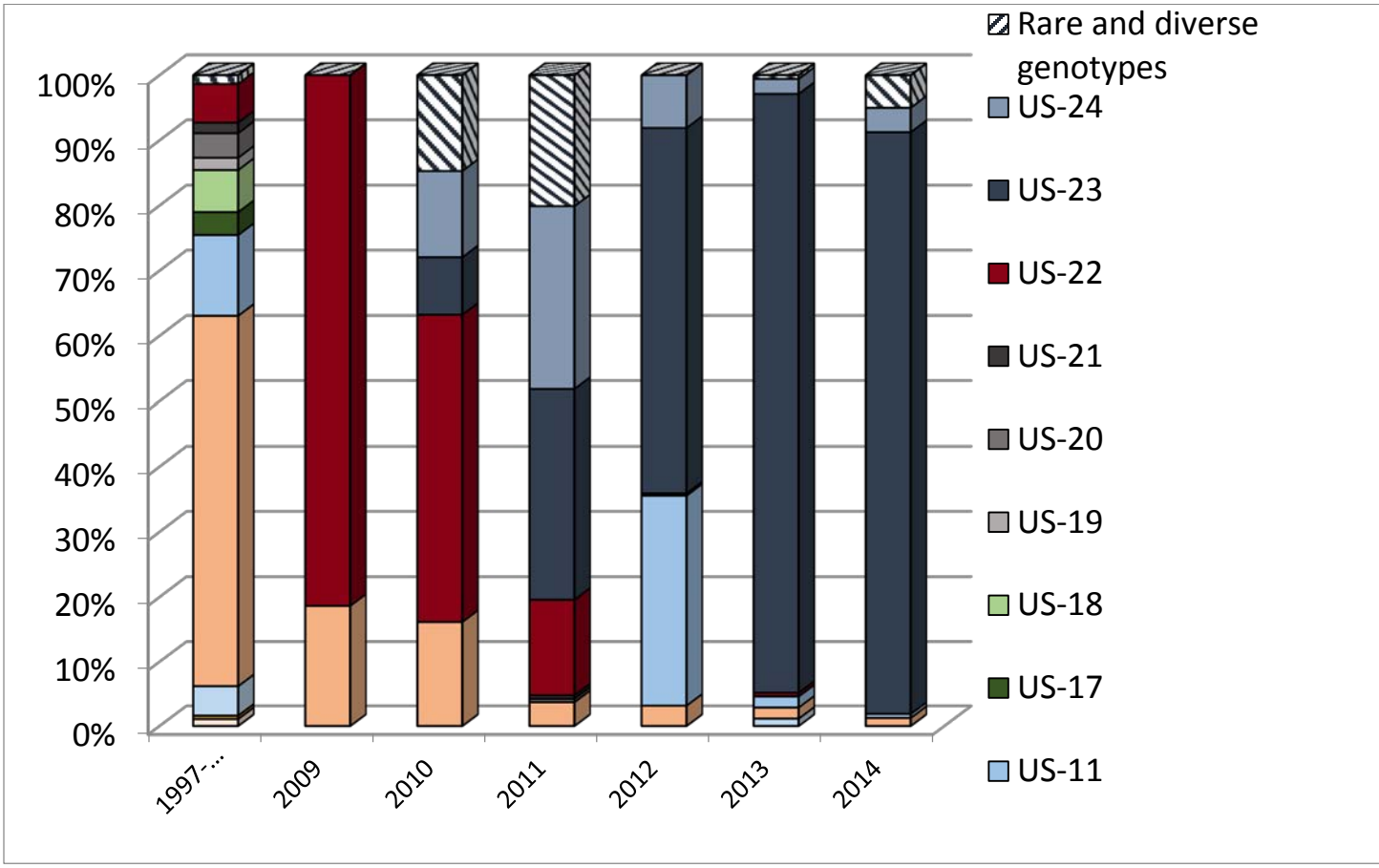

Figure 2. Lineages of *Phytophthora infestans* reported in the USA from the 1990s through 2014. Sample sizes were: 371 (1990s – 2008), 59 (2009), 68 (2010), 198 (2011), 284 (2012), 174 (2013), 160 (2014).

There remains no evidence of a "residential" sexual population of *P. infestans* in the USA.

Decision Support System (DSS): The DSS on which we've been working for many years was named this year: 'BlightPro'. It has been evaluated in small research plots near Ithaca, by early adopter producers in the northeastern USA, by scientists in several states in the southeast, the northeast, the Midwest, and the northwest. In these experiments, and in comparison to weekly sprays, 'BlightPro' responds to weather by: i) recommending more fungicide applications when weather is particularly favorable to late blight – more effectively suppressing disease; ii) by recommending fewer applications without jeopardizing disease suppression when the weather is

less favorable to disease; and iii) taking advantage of host resistance by recommending fewer applications to cultivars with some late blight resistance without losing any disease suppression. 'BlightPro' also responds to fungicide residue and efficacy. In thousands of simulation experiments, 'BlightPro' was observed to use fungicide more efficiently than a weekly application schedule and to reduce the variance in disease suppression. Reduction of variance is the same as reducing the risk of a disease control failure. A business model to continue the development and availability of 'BlightPro' is currently being investigated.

Resistance to late blight in Cornell potato breeding lines. We evaluated several lines in Walter de Jong's breeding program. Most were quite susceptible (Table 1), but a few were somewhat resistant to US-24. These included NY-150, and L9-6.

Table 1. Resistance to late blight of some Cornell breeding potato breeding lines. AUCPC is the area under the disease progress curve; a large number means severe disease, and a small number means less disease – due to resistance.

Cultivar/Line	**AUDPC[z]**	**Cultivar/Line**	**AUDPC**
NY150	572 f[y]	K27-3	1325 abcd
L9-6	623 f	K28-7	1346 abcd
L17-1	1021 e	Superior	1346 abcd
Pike	1113 de	L7-2	1356 abc
L1-7	1119 de	L17-3	1367 abc
L2-12	1171 cde	K27-1	1382 abc
K31-4	1187 bcde	K11-2	1383 abc
L12-2	1200 bcde	K28-18	1388 abc
Chieftain	1208 bcde	L8-12	1417 ab
Atlantic	1293 bcd	K28-14	1532 a
L33-1	1300 abcd		

Comments on late blight resistant varieties. Late blight resistance has been sought in potatoes for nearly a century. Some resistances (R gene) are dramatically effective against certain strains of *P. infestans.* However, these resistances are ineffective against other strains. Because populations of *P. infestans* can change rapidly R gene resistance has never had a long lasting effect. (For example, Atlantic has R1 and R3, but it is highly susceptible to current populations of *P. infestans* in the USA.) However, because the effect is so dramatic (total immunity) breeders continue to use R genes. R genes are involved in the resistance of Simplot's Innate 2 cultivars. The effect against current populations of *P. infestans* in the USA is dramatic. These cultivars remain green in an epidemic – even without any fungicide. Such R gene resistances might last longer in an integrated program in which they also receive some fungicide. Other resistant cultivars have been investigated. In our experiments, Adirondack Blue, Defender and Jacqueline Lee have been quite resistant. It seems likely that R genes might contribute to these resistances. R genes have also been found in tomato. Two tomato R genes (Ph2 and Ph3) are effective against US-23 and US-22, and are currently being bred into tomato cultivars.

Unfortunately, pathogen strains unaffected by these R genes have been detected in some locations worldwide. It is expected that they will “break down” at some point in the future in the USA.

Another type of resistance (partial) resistance has also been identified. This resistance is not complete and is thought to be under the control of many genes; cultivars with such resistances should also receive fungicide. Cultivars with partial resistance include Kennebec, Allegany and Elba. It is thought that these resistances are not due to R genes, but the genetics are not clear. However, these resistances have been stable against diverse populations of *P. infestans.* If the resistances in NY150 and L9-6 are also of this type, these resistances might be effective for a long time. ‘BlightPro’ lists the relative resistances of many potato cultivars.