

# First Finding of *Phytophthora alni* subspecies *uniformis* in North America

## Detection Monitoring Project



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### BACKGROUND

*Phytophthora alni* is a well documented pathogen causing a lethal root and collar disease of alder species in Europe. It is an emergent hybrid pathogen with three subspecies. Until 2007, none of the subspecies were known to occur in North America. The three subspecies exhibit a range of aggressiveness. *P. alni* ssp. *uniformis* (PAU) and *P. alni* ssp. *multiformis* are reported to be significantly less aggressive than *P. alni* ssp. *alni*, though still considered pathogenic.

During riparian *Phytophthora* surveys in Alaska conducted by Dr. Gerard Adams, MSU, three isolates of *P. alni* ssp. *uniformis* were recovered from soil beneath *Alnus incana* ssp. *tenuifolia* from two remote, unmanaged riverine systems hundreds of miles apart: in South-central Alaska on the Kenai Peninsula and in Interior Alaska 6 miles north of Healy. The pathogens were trapped from saturated rhizosphere soil using rhododendron leaves as bait during July 2007. Root rot symptoms were not evident among excavated alder roots in 30 plots. Species identification of the three isolates was based on DNA sequence homology of ITS and RAS-Ypt protein molecules, and subspecies identification by SCAR profiles and morphology.

This is the first finding of any of the *P. alni* variants in North America. PAU is the only variant found in Alaska to date. Independent molecular confirmation of the Alaska PAU finding was received from:

- 1) Dr. Susan Diehl, Mississippi State University and
- 2) Dr. Mary Palm, USDA/APHIS/PPQ/PHP/PSPI, PPQ Molecular Diagnostic Lab.

Morphological confirmation of the Alaskan PAU cultures was received from Dr. Paul Reeser and Dr. Everett Hansen, Oregon State University. However, slight differences in the morphological descriptions from that of the European PAU have been noted. Discussions are under way with European scientists to discern whether there are possible differences between the Alaskan PAU isolates and those from Europe. More samples are needed from Alaska, however, to fully determine differences.



Figure 2. Rhododendron leaf baits used in Alaska *Phytophthora* surveys

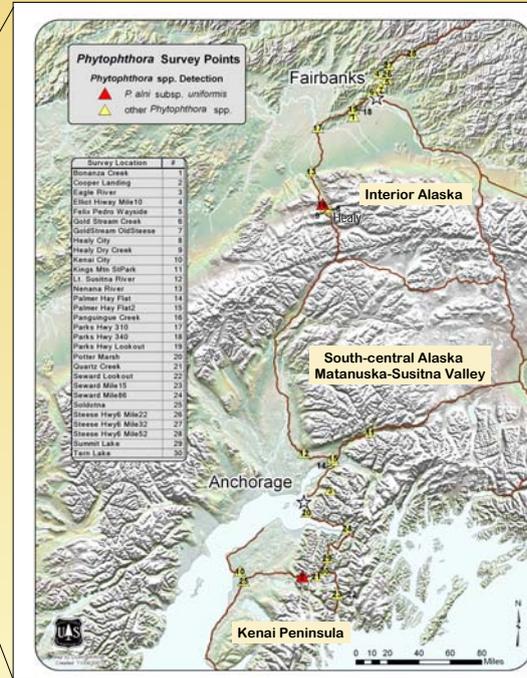


Figure 1. Panguingue Creek, near Healy Alaska, a PAU (+) site

### CURRENT SAMPLE PROCESSING

Reprocessing of 2007 isolates from the 30 Alaska sites is underway at Michigan State University under the direction of Dr. Gerard Adams and through the financial assistance of FHM Detection Monitoring. All samples are expected to be re-processed and re-evaluated in less than 6 months.

- Traditional isolation of *Phytophthora* spp. by culturing the bait samples and identifying cultures by sequencing yielded an overwhelming number of *Phytophthora gonapodyides* and rarely other species.
- To more effectively determine the presence of *P. alni* subspecies, and rare species and to more accurately determine their distribution, all the summer 2007 bait samples need to be re-processed.
- Reprocessing will permit targeted searches for the species of interest and avoid the interference of the predominant *P. gonapodyides*. This can be accomplished by extracting total DNA from leaf baits, selectively amplifying *Phytophthora* DNA, and screening for *P. alni* subspecies and other rare species.



- ### TECHNICAL TRANSFER
- The Region 10 Alaska FHP website: [www.fs.fed.us/r10/spf/fhp](http://www.fs.fed.us/r10/spf/fhp) contains an array of materials associated with this finding and is updated regularly.
  - Discussions among US Forest Service Region 10 – Alaska, APHIS, and Alaska Division of Agriculture are underway to assess the significance of this finding. A fact sheet was developed for the 52nd Alaska Nursery Conference in January.
  - The risk of introduction, establishment and natural dispersal of *P. alni* ssp. *alni* in the United States is currently being modeled in Alaska by the USDA Forest Service, Forest Health Technology Enterprise Team Invasive Species Steering Committee.

Figure 3. Thirty *Phytophthora* survey points across South-central and Interior Alaska in 2007. Locations of the two PAU positive sites are depicted by a red triangle.

### NEXT STEPS

There are many unanswered questions related to the PAU finding in Alaska including:

1. Is PAU native or invasive?
2. Is PAU causing disease on alders?
3. What are the host species in Alaska?

Further studies are underway to determine whether the pattern of PAU distribution may reflect recent introduction or an endemic population. While not completely understood, it is possible that PAU benignly co-exists with alder in Alaska and has not previously been noted due to the lack of surveys such as those conducted in 2007.

In summer 2008, disease detection surveys and stream baiting will be conducted within known PAU infected and presumed uninfected water courses.

Depending on funding, studies on the susceptibility of alder and other Alaskan tree species to this pathogen will hopefully be undertaken in 2008.

Table 1. Number of isolates of *Phytophthora* and *Pithium* species\* from 2007 Alaska surveys

<i>Phytophthora alni</i> ssp. <i>uniformis</i>	3
<i>Phytophthora megasperma</i>	15
<i>Phytophthora gonapodyides</i>	90
<i>Phytophthora cactorum</i>	1
<i>Phytophthora</i> sp. P426	2
<i>Phytophthora hungarica</i>	3
<i>Pythium sterilum</i>	17
<i>Pythium macrosporum</i>	5
<i>Pythium undulatum</i>	12
<i>Pythium</i> sp. 93-70P	27
<i>Pythium</i> sp. 824b	10
<i>Pythium</i> sp. UASWS0189	8
<i>Pythium boreale</i>	1
<i>Pythium</i> sp. B07	2
<i>Pythium pachycaule</i>	1

\* Species names are tentative until morphological studies are complete