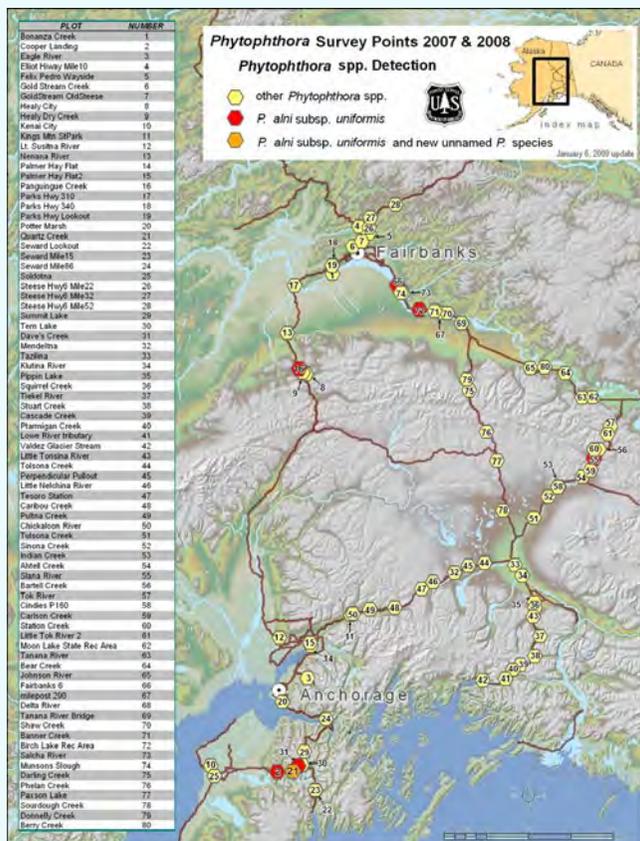


New Pathology Findings Associated with Alder in Alaska

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Phytophthora surveys in Alaska

For five years, surveys have been conducted for fungi and other organisms that may be responsible for the widespread dieback and mortality of thineleaf alder (*Alnus incana* subsp. *tenuifolia*) across south-central and interior Alaska. In summer 2007/08, eighty riparian sites were sampled for *Phytophthora* spp. along a south to north transect from the Kenai Peninsula to beyond Fairbanks and east to Tok and Valdez. We baited watercourses with floating bags of rhododendron leaves, alder twigs, and bearberry leaves (*Arctostaphylos uva-ursi*). We also baited soil from beneath dying alders with rhododendron leaves. The baiting yielded isolates of *Phytophthora alni* subsp. *uniformis* as well as other *Phytophthora* and *Pythium* species of interest.



Bait bag with floatation



Recovering bait bags



Rhododendron leaves with lesions after a two week incubation period.

Results and Discussion

Over 500 isolates of *Phytophthora* and *Pythium* species were recovered from baiting watercourses or saturated rhizosphere soil. The finding of *Phytophthora alni* subsp. *uniformis* (PAU) was the first time this lethal root and collar rot of alder was confirmed in North America.

Phytophthora alni subsp. *uniformis*

Species	2007	2008	Total
<i>Phytophthora alni</i> subsp. <i>uniformis</i>	3	19	22

To date, 22 isolates of PAU have been found from seven locations across over 1,000 road miles (see map). To test whether PAU was causing root disease in Alaska, we completely excavated the root systems of 100 alders exhibiting dieback in south-central and interior Alaska. We found that most root systems lacked rot. Of those few with dead roots, no genet had more than 20% of the roots compromised. This strongly suggests that PAU, though closely associated with alder roots, is not causing root disease in Alaska.

Other *Phytophthora* species of significance

Species	2007	2008	Total
<i>Phytophthora gonapodyides</i>	90	83	173
<i>Phytophthora megasperma</i>	15	48	63
<i>Phytophthora hungarica</i>	5	29	34
<i>Phytophthora cactorum</i>	1	3	4
<i>Phytophthora pseudosyringae</i>	0	6	6
<i>Phytophthora</i> sp. "Missaukee"	0	10	10
<i>Phytophthora</i> sp. "4, FFL-2008"	0	50	50
<i>Phytophthora</i> sp. "near-ramorum"	0	15	15
<i>Phytophthora gallica</i>	0	1	1
<i>Phytophthora inundata</i>	1	0	1
<i>Phytophthora</i> sp. in other unnamed groups	2	14	16

Many other *Phytophthora* species have been recovered from the 07/08 sampling. Not surprisingly, *P. gonapodyides* and *P. megasperma* were the most common species recovered. Also two species that are known as pathogens of alder have been found, *P. pseudosyringae*, and *P. gallica*. A new *Phytophthora* species, referred to as *Phytophthora* sp. "near-ramorum" has been found. It is referred to as "near-ramorum" because the DNA sequence is closely associated with Clade 8C *Phytophthoras*, including *P. ramorum*. The *P. "near-ramorum"* is previously unknown to science and was found on the Kenai Peninsula (see map).

Pythium species recovered

Species	2007	2008	Total
<i>Pythium sterilum</i>	17	8	25
<i>Pythium macrosporum</i>	5	41	46
<i>Pythium undulatum</i>	12	7	19
<i>Pythium pachycaule</i>	1	6	7
<i>Pythium anandrum</i>	0	5	5
<i>Pythium lutarium</i>	0	5	5
<i>Pythium boreale</i>	1	0	1
<i>Pythium</i> sp. in other unnamed groups	48	8	56

Next Steps

Alder mortality and dieback was common in most of the 80 surveyed sites and was often associated with extensive stem cankers caused by at least 12 native fungal species. The lack of evidence of root disease strongly suggests that this is not a below-ground root rot issue. Monitoring of alder in Alaska will continue.



Extensive alder dieback in riparian areas of south-central and interior Alaska.

The discovery of PAU in remote regions of Alaska without causing root disease does not match the scenario in Europe. We are currently working with European researchers to compare PAU isolates and to test whether the PAU subspecies found in Alaska may be native to Alaska.

The finding of a new *Phytophthora* in Clade 8C helps to illustrate the relevance of our surveys. Due to the similarities between the new *Phytophthora* and *P. ramorum* (both in Clade 8C), *P. ramorum* research labs in Canada, Germany, United Kingdom, France, Netherlands and USDA APHIS have all requested cultures of the new *Phytophthora* for continuing and improving their research on detection assays. It is agreed that the new *Phytophthora* isolate is unique and worth pursuing formal description and naming.

Pathogenicity testing on alder is underway with four species (PAU, *P. gallica*, *P. pseudosyringae*, and the new *Phytophthora* species, referred to as *Phytophthora* sp. "near-ramorum"). Dr. Everett Hansen (OSU) is conducting the greenhouse pathogenicity studies.

The findings from the 2007/08 Alaska sampling have been very exciting. Contributions have been made to the *Pythium* Barcoding project (Canadian, Netherlands, and USA-Gloria Abad) and *Phytophthora* barcoding project (Penn State). Michigan State University is continuing to process the remaining water and rhizosphere soil samples. More PAU or other interesting *Phytophthora* or *Pythium* isolates may yet be uncovered.

See our webpage for latest map and update, www.fs.fed.us/r10/spf/fhp, click on "Alder *P. alni*" quick link.



To test whether PAU was causing root disease in Alaska, we completely excavated 100 alder root systems in 2008. This revealed that symptoms of root and collar rot were typically absent from locations where PAU was recovered.

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