

# Monitoring for Invasive *Phytophthora* Species in Western Washington Streams

## 2011



## ***Manual for Volunteers***

Modified from “Fishing for *Phytophthora* in Western Australia’s Waterways” by Dr. Daniel Huberli and A. Prof. Giles Hardy and the Stream Baiting Protocol for the National *Phytophthora ramorum* Early Detection Survey of Forests, USDA-Forest Service 2008.

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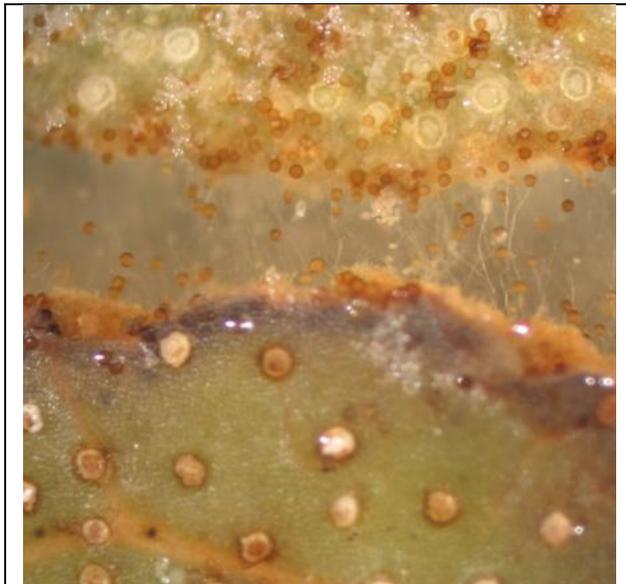
## What is *Phytophthora*, and why should we monitor it?

In any ecosystem, one way to confirm its good health is to check the waterways such as creeks, rivers and lakes. The first step in determining if an ecosystem is healthy is to find out what is normal. What should be present and what is introduced? These are questions that are not so easy to answer even if it may seem obvious at first glance. In addition to fish, amphibians, and plants, which we can see, waterways contain organisms which can only be seen with a microscope. Some of these naturally-occurring micro-organisms are beneficial to the survival of the body of water, while others can be the cause of disease in plants and animals. Micro-organisms are often introduced from somewhere else and have managed to adapt and survive under local conditions.

Some of the micro-organisms that attack plants (plant pathogens) can be very destructive. *Phytophthora* (pronounced fy-toff-thaw-ra, meaning ‘plant destroyer’ in Latin) is a “water mold” that produces several types of spores which germinate to form a network of filaments, called “mycelium”. Many species of *Phytophthora* are plant pathogens of considerable economic importance. *Phytophthora infestans* was the organism responsible for the potato blight that caused the Great Irish Famine (1845-1849), and still remains the most destructive pathogen of potato crops. Other species of *Phytophthora* attack forest vegetation, such as *P. cinnamomi* in Australia’s forests, and *P. ramorum*, the cause of Sudden Oak Death in California and Southern Oregon.

*Phytophthora* must have water to be able to survive and spread. In fact, one of its spore types can swim through water to reach its host plants. One of the easiest ways to detect it is by water monitoring. Monitoring of waterways has been used as an early detection tool for several *Phytophthora* species, but the best example is *Phytophthora ramorum*, which has caused significant damage to coastal forests in California. Streams and rivers are monitored by placing leaves into bags to “fish” for this and other *Phytophthora* species. It could be detected in new areas where previously the plant disease was not observed in the forest. While *Phytophthora ramorum* has spread and caused massive damage in the

oak/tanoak portions of forests in coastal California and southern Oregon, it has not yet become established in forests in the Pacific Northwest. The organism has been detected and eradicated in nurseries and landscape settings in Washington and British Columbia, and stream monitoring in Washington State has shown that four streams associated with positive nurseries have had positive detections of *P. ramorum*. In light of the recent



Spores and mycelium of *P. ramorum* growing on *Rhododendron* leaf.

discovery of *P. ramorum* causing resinous stem cankers on Western hemlock in the UK, forests in Western Washington are at risk of suffering ecological damage similar to the oak/tanoak die-off in California's coastal forests.

We have never determined which *Phytophthora* species are present in Western Washington's waterways, so a study to find out what is present would first of all provide knowledge of what is 'normal' and secondly, what may be 'unusual.' We may also be able to determine where these species are coming from prior to reaching the waterways, and by looking at other environmental data, get an idea of what conditions are favorable for spread of *Phytophthora*. It is unlikely that *P. ramorum* will be detected in many of the streams being monitored, but baseline information about *Phytophthoras* in these streams will be collected and areas can also be verified "free" of *P. ramorum*.



Newly-planted areas can be sources for introduced *Phytophthora* organisms if they are present on the plants or potting material.

Collecting all this important information would not be possible without you, our volunteer. We sincerely thank you for helping with our project and contributing to building our knowledge of what *Phytophthora* species are present in western Washington's waterways.

## INSTRUCTIONS: HOW TO FISH FOR *PHYTOPHTHORA*

We will be using the methods of the National *Phytophthora ramorum* Early Detection Survey of Forests and it is important to stay consistent with the protocol given here.

### Procedure:

- **Site Selection:** Locations of bait sites are chosen based on a number of factors, such as proximity to plant nurseries, new development and landscaping, or forested areas, and availability of other monitoring data. It is important to avoid sunny, exposed locations and choose shady, sheltered areas for best results. Bait sites should be easily accessible in all seasons. In addition, baits should be placed so that they will not be seen and disturbed by people or animals. **ALWAYS CONSIDER SAFETY IN SITING BAIT STATIONS. SAFE ACCESS IS ESSENTIAL, ESPECIALLY DURING HIGH STREAM FLOWS. DELAY BAIT DEPLOYMENT/RECOVERY IF CONDITIONS DICTATE.**
- **Baiting Assay Method:** 4 symptom-free rhododendron leaves in a mesh bag tethered in the stream current, plus one leaf from a different plant species.
- **Replication:** 2 bait bags per site, deployed close to, but in locations distinct from each other. The second bag is to provide sufficient leaf material for lab diagnostics and as a backup in case a bag is lost due to high stream flow, vandalism, etc. If a bag gets lost use one of the extra bags (provided).
- **Exposure Period:** 2 weeks. Record water temperature (see datasheet) at each baiting period at deployment and retrieval. Thermometers will be provided. Place the thermometer in the water near the bait location while changing leaves and record the result after 5 minutes.
- **Frequency:** 6 baiting periods during the optimal time for *P. ramorum* detection. In Washington this is February – June. NOTE: *P. ramorum* is more reliably detected in cooler parts of the growing season in west coast endemic areas. As a rule of thumb, begin baiting when water temperature reaches 8-10C (46 – 50 F) and suspend baiting when water temperature exceeds 22C (72 F). Water will be much colder in glacier-fed streams than in slow-moving urban waterways. See calendar for baiting times in this study. We will start in early March and continue through May.
- **Record your hours:** It is important for us to keep track of how much volunteer time is spent, so record your starting and ending times on the datasheet.

## Equipment list

Bait bags (2 per location) NOTE: one pouch of the bag is left purposely empty. This is where you can get creative and put in your choice of leaves of one plant species.

- Choose intact, healthy leaves that are not too young or too old. Record the plant species on the datasheet. Two extra bags are provided in case one gets lost.

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- Fresh, symptom-free rhododendron leaf baits (8 per location per baiting period). These will be mailed to you from WSU Puyallup.

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- Plastic sample bags (gallon size)

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- Paper towels

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- Digital camera

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- Cooler and ice for samples

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- GPS (for first bait deployment)

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- Extra rope

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- Flagging tape

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- Waterproof “Sharpie” pen

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- Thermometer

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- Data sheet

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- Pen or pencil for recording data
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## Bait Deployment

Upon arrival of bait leaves in the overnight mail, deploy the bait on that day, or 1 day later. **Store leaves in the fridge at 4°C (39 F) to keep them fresh.**

There will be two bait bags deployed at each site. Insert the leaves into four of the pouches in each bait bag. The remaining pouch can contain leaves from a plant of your choosing. Source plants should be healthy and mostly free of dieback and leaf symptoms. Use 1 year-old leaves as free as possible from leaf symptoms (spots, blight, chlorosis), insect and mechanical damage. Do not use newly formed, succulent leaves. Leaves formed in the present year may be used after full leaf expansion and a period of hardening in summer. If leaves are small use more than one. Be sure to pick healthy, undamaged leaves and record on the data sheet which plant species you choose.

Record the location name, deployment date, additional plant species, and water temperature (if possible). Also record your starting and ending times, including travel. Keep track of your hours spent on this project.

If this is the first deployment at a given site, record GPS coordinates (preferably in **decimal degrees**) on the datasheet. Verify GPS coordinates on a mapping website such as Google maps. Logistics (continuous access, probability of detection and disturbance by passers-by) are important in site selection.

Consider microclimate in deploying your baits. Avoid sunny, exposed locations where water temperature can exceed desired limits. Pick shady, sheltered sites. Also the bait bags will be less likely to be disturbed by the curious.

Fasten the nylon rope of the bait bag to the waterway bank (tree, reeds or a secure object). A standard length is provided. If you need more rope please provide your own. If the bait floats to the bank, place a stick through the loop of the rope to secure it into place. Alternatively, tie a rope to the other end of the bait by making a small hole and secure it to another object, or anchor the rope with a rock so the bag floats in the current.

AVOID deploying the bait in the swiftest part of the current since large debris may accumulate in high flow periods. Avoid sites where baits are exposed to direct sunlight for extended periods of the day.

Take a digital photograph of the bait and the landscape of the waterway. This can be done at the first baiting. Send to Marianne (melliott2@wsu.edu) via email.



Examples of bait bags placed in streams.

### **Bait Retrieval**

After 14 days, remove the baits from the waterway. Carefully remove leaves from the pouches and rinse in stream water.

Label one zip-lock bag with a permanent waterproof Sharpie pen with the following information: the location name, bag # (1 or 2), date and your name.

Moisten paper towels in the stream water and place leaves on one side of the paper towels so they are not touching. Fold so that all the leaves are covered. Use a second paper towel if needed. Place into the labelled zip-lock bag.

Clean debris from bait bags and rinse in stream. Place new leaves in the bag and put it out in the same location in stream.

Record the date of retrieval on the datasheet. Also record stream temperature. Don't forget to record your hours!



Rhododendron leaf baits in bait bag after retrieval.

### **Sample transport, storage, and shipping**

All samples should be kept in a cooler on a sealed coolant bag or ice and protected from direct sunlight, or in a refrigerator until shipped. Place your bagged samples in a fridge at 4°C (39° F) until ready for mailing. We will provide return mailing envelopes when sending the bait leaves. Return samples to the lab as soon as possible.

***Do not permit the samples to freeze or dry out at any time.*** Freezing will cause watersoaking of leaf tissues that is indistinguishable from *Phytophthora* spp. infection. Samples may be stored refrigerated for up to 3 days before shipping via overnight mail. The samples should be sent to the address below as soon as possible after retrieval for best results. Send data sheet after bait retrieval by email to Annie (debauw@wsu.edu). And/or include a copy along with the samples. Place the sheet in a separate zip-lock bag to keep it dry.

**Notify Annie via email before shipping samples so the arrival will be expected.**

### **Mailing address:**

Annie DeBauw  
WSU Puyallup  
2606 West Pioneer  
Puyallup, WA, USA  
98371-4998

## **Websites**

Program website:

<http://www.puyallup.wsu.edu/ppo/sod/monitoring/stream%20monitoring.htm>

Fishing for *Phytophthora* in Western Australia

<http://www.fishingforPhytophthora.murdoch.edu.au/>

US Forest Service National *Phytophthora ramorum* Early Detection Survey

<http://fhm.fs.fed.us/sp/sod/sod.shtml>

## **Contact information**

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## **Appendices**

Map of baiting locations

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