Stream monitoring for *Phytophthora* in Washington State, USA:
A citizen science project

Marianne Elliott, Gary Chastagner, Katie Coats, Lucy Rollins;
Washington State University Puyallup Research and Extension Center,
Puyallup, WA 98371;
(253) 445-4596; melliott2@wsu.edu
Movement of plant diseases

Nursery

Sudden oak death caused by *Phytophthora ramorum*

Restoration site

Wildland
Movement of plant diseases

Sudden oak death caused by *Phytophthora ramorum*
Phytophthora ramorum surveys in WA

- *P. ramorum* detected in western WA nurseries (2003) and streams (2006)
- Stream surveys done by state agencies but limited in scope.
- Because sample collection techniques are easy, citizen volunteers can increase the number of sites surveyed.
Volunteers

Types of volunteers

Students
- High school
- Community college
- University

Master Gardeners

Stewardship groups

Community members

Many retired with years of experience

Recruiting
- Group emails

Planning and informational meeting for community

Print and web information

Surveys/sample collection should be easy.
Volunteer activities

Sample collection

Processing samples in lab

Student interns

Employment

Graduate student recruitment
Methods

Send rhododendron leaf baits to volunteers

BOB (bottle of bait) method

Oomycetes cultured and isolated from baits in WSU lab

Meet with volunteers at their site for training and first sampling

Bait bags in streams for 2 weeks

Identification
2010 – Pilot study

Stream monitoring for *Phytophthora*

6 sites
2011 – Stream survey

*Phytophthoras* in Western WA streams

*P. ramorum* distribution

<table>
<thead>
<tr>
<th>Clade</th>
<th>Species</th>
<th># Streams</th>
<th># Isolates</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td><em>P. gonapodyides</em></td>
<td>10</td>
<td>28</td>
</tr>
<tr>
<td>6</td>
<td><em>P. chlamydospora</em></td>
<td>6</td>
<td>23</td>
</tr>
<tr>
<td>6</td>
<td><em>P. lacustris</em></td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6</td>
<td><em>P. borealis</em></td>
<td>3</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td><em>P. bilorbang</em></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td><em>P. megasperma</em></td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td><em>P. inundata</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td><em>P. siskiyouensis</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td><em>P. inflata</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td><em>P. plurivora</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td><em>P. ramorum</em></td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>total</td>
<td></td>
<td></td>
<td>65</td>
</tr>
</tbody>
</table>
Halophytophthora

1104
P. gonapodyides
P. bilorbang
Pythium undulatum
Phytopythium new sp. 1
H. new sp. 1

1110
H. new sp. 1
H. new sp. 2
H. new sp. 3

Conservation area

Brackish water sites

Industrial site
Find the source of Pr in Dungeness River
Stormwater retention ponds as early detection for *Phytophthora* spp.

2013 *P. ramorum* detected in river with no obvious water connection to Pr+ nursery.

11 Sequim sites – local volunteers

No Pr found

2015

Objectives:
- Test bait materials
- Oomycete genera present
- Early detection
- Introduce students to research projects

7 Puyallup sites – high school and community college students
2017 – *Phytophthora* in habitat restoration sites

Does *Phytophthora* survive outplanting?

Seward Park – Forested

No *Phytophthora* in sword fern dieoff sites

Clark’s Creek - Riparian

Some *Phytophthora* in 2017 plantings

Same endemic *Phytophthora* spp. on 2009 plants as in stream

http://sewardparkswordferndieoff.blogspot.com
New technology

Smartphone apps – a useful tool in the toolbox. You also need print and web survey materials since some volunteers do not use the technology.

Sword fern dieoff sites mapped using ArcGIS collector app
Dieoff progression using photopoints (Before and After app)

http://sewardparkswordferndieoff.blogspot.com

Pacific madrone range and health survey
Webforms
Printable survey
Mobile app

https://ppo.puyallup.wsu.edu/pmr/
Summary

• Funding – small amount from grants, can be leveraged with volunteer hours matching
• Recruit/train volunteers from local schools, stewardship groups, other organizations
• Researchers maximize area covered and data collected, volunteers get experience and class credit
• Win/win!

https://ppo.puyallup.wsu.edu/sod/monitoring/streams/
Acknowledgements

Thanks to WSU staff and all our volunteers from these groups:

Pierce College
University of Washington Tacoma
University of Puget Sound
Evergreen State University
Puyallup High School
Bellarmin Preparatory School
Gig Harbor High School

Master Gardeners
Streamkeepers of Clallam County
Friends of Seward Park

and others.