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

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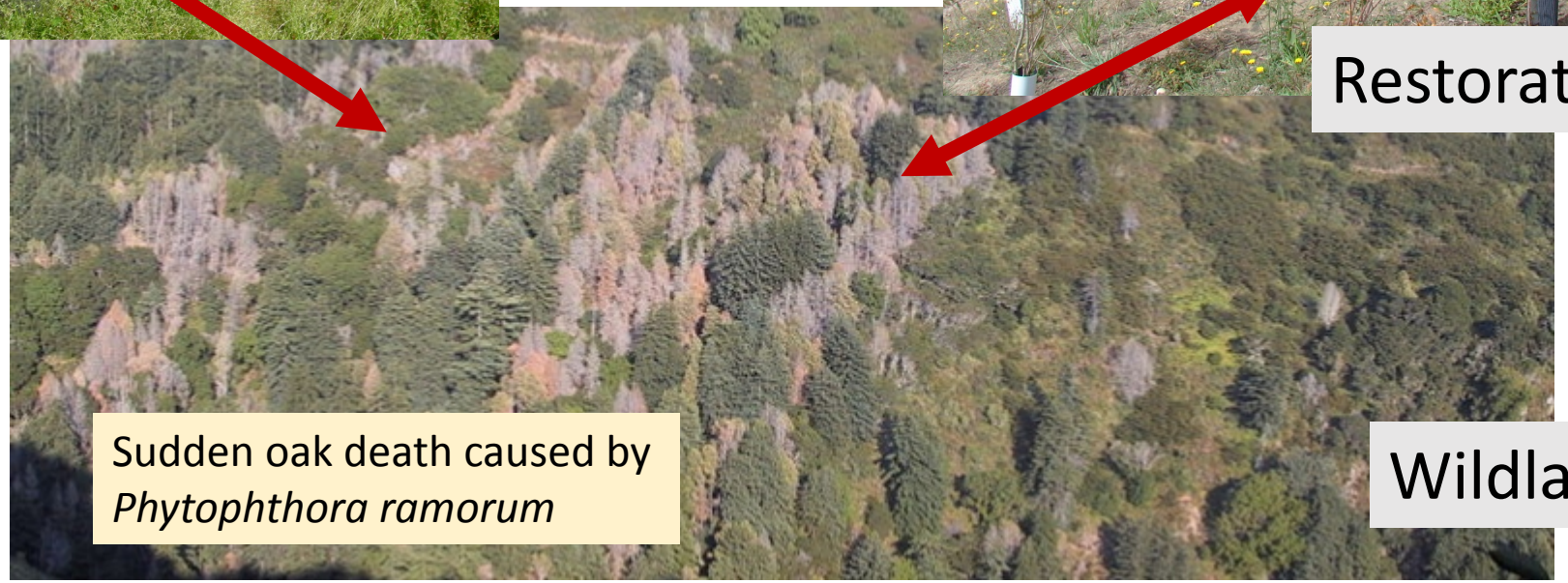
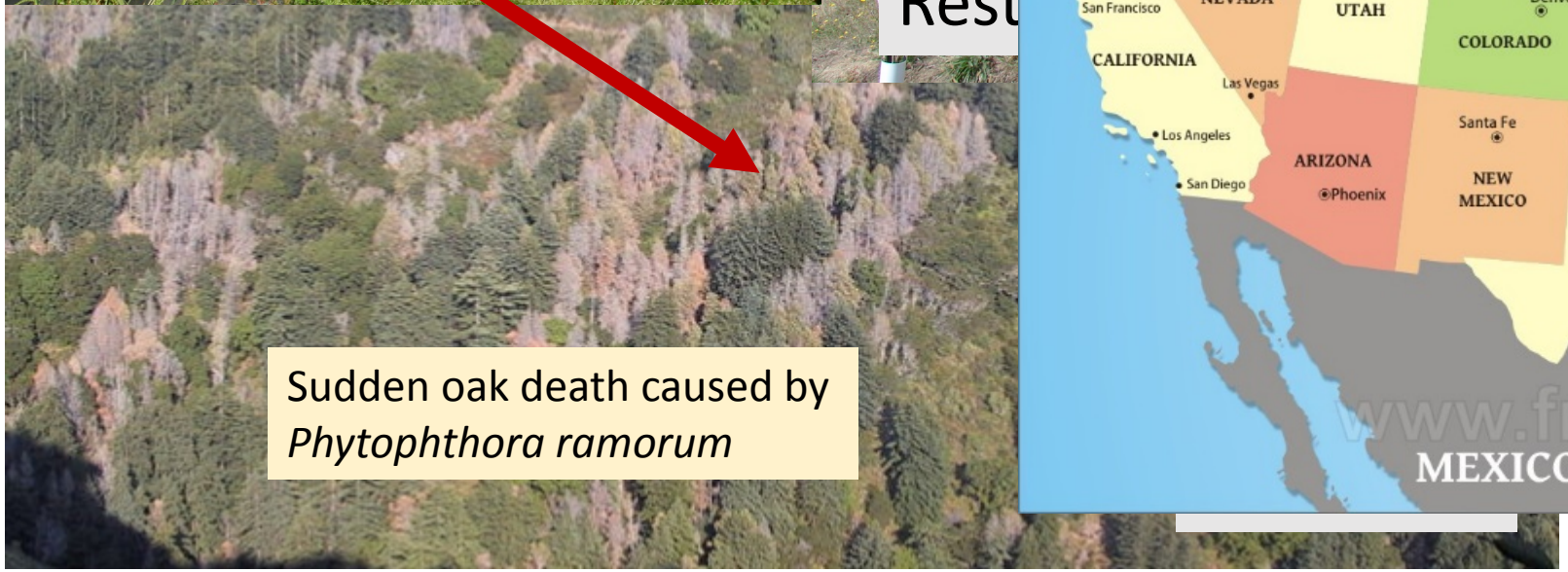
WASHINGTON STATE UNIVERSITY

Movement of plant diseases

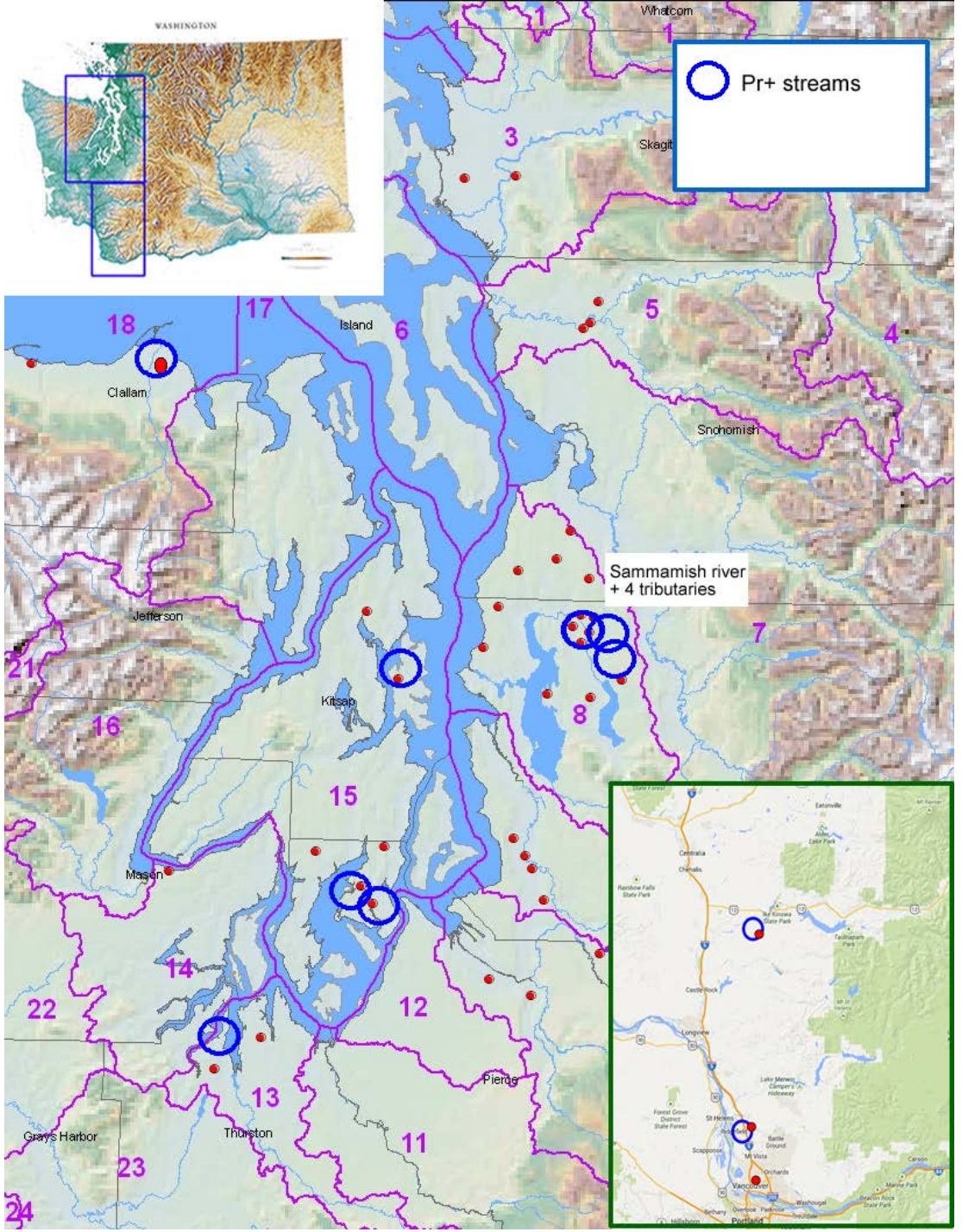


Movement of plant diseases



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

Recruiting
Group emails

Planning and informational meeting for community

Print and web information

Types of volunteers

Students
- High school
- Community college
- University

Master Gardeners
Stewardship groups
Community members

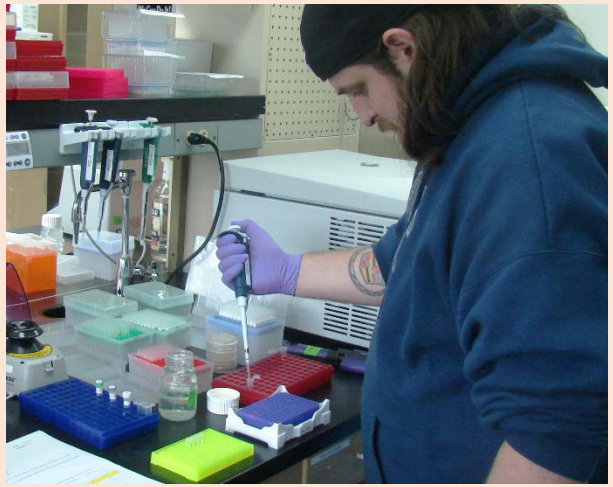
} Many retired with years of experience

Surveys/sample collection should be easy.

Volunteer activities

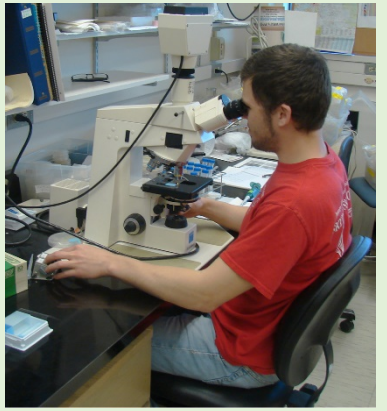
Sample collection

Processing samples in lab



Student interns

Employment

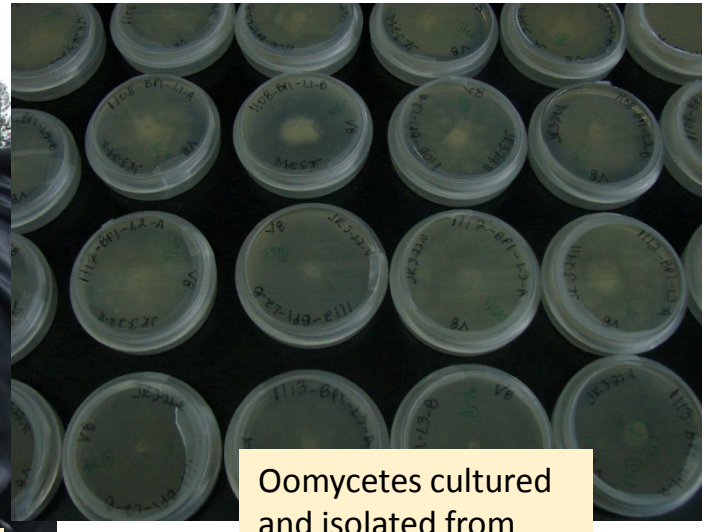


Graduate student recruitment

Methods

Send rhododendron leaf baits to volunteers

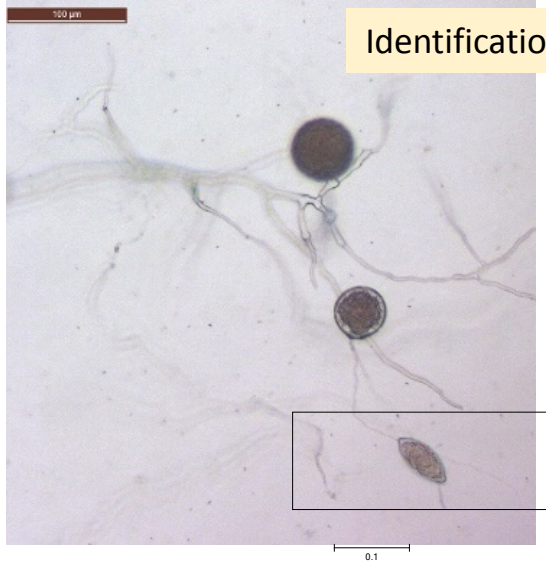
BOB (bottle of bait) method



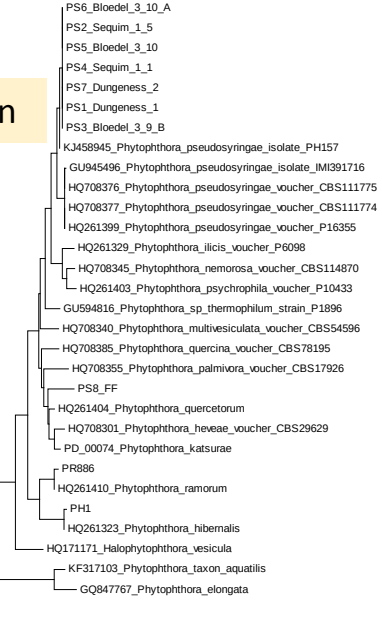
Oomycetes cultured and isolated from baits in WSU lab

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 *Phytophthoras*

6 sites

Individual volunteers and students

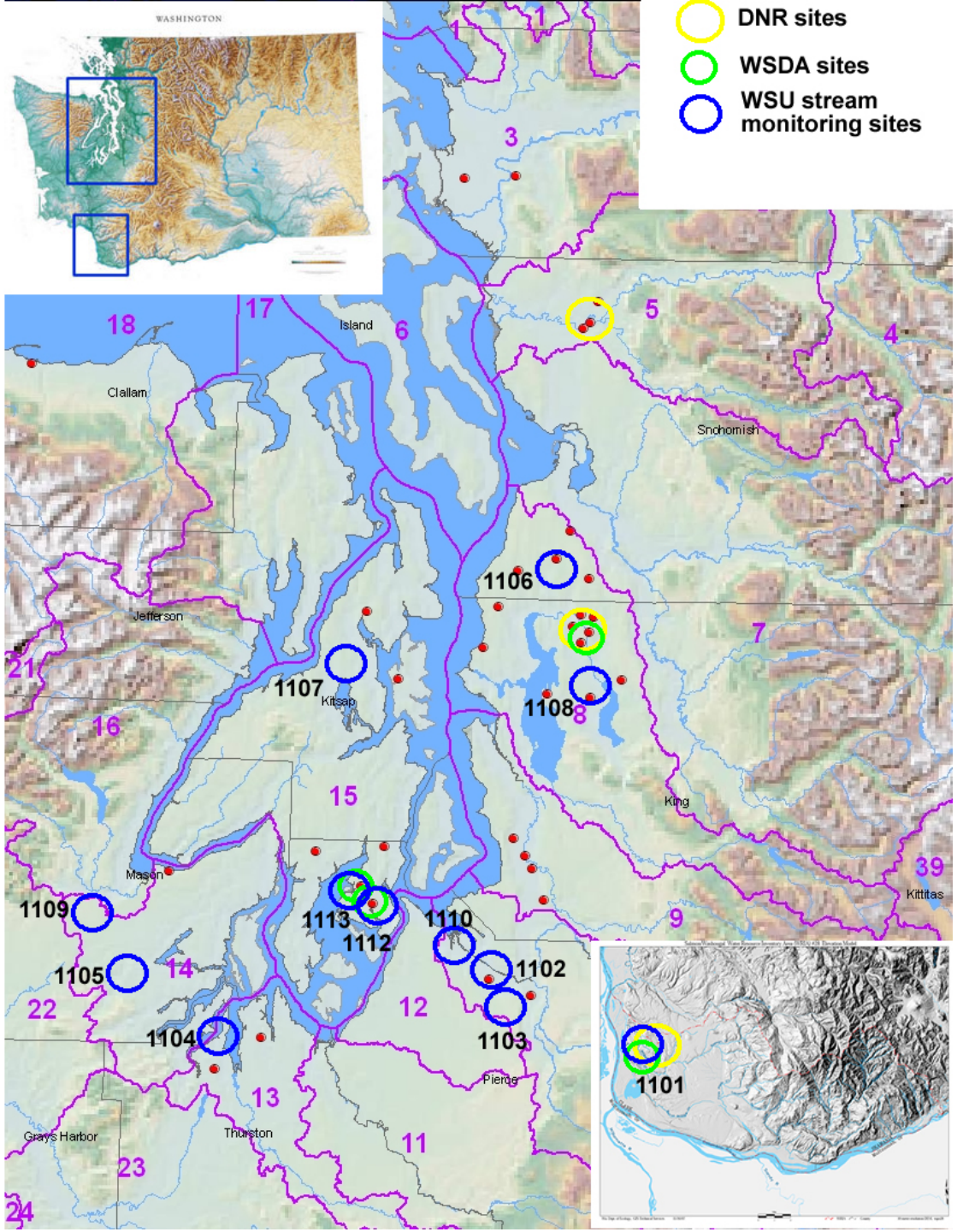
Class projects

2011 – Stream survey

Phytophthoras in Western WA streams

P. ramorum distribution

Clade	Species	# Streams	# Isolates
6	*P. gonapodyides*	10	28
6	*P. chlamydospora*	6	23
6	*P. lacustris*	4	5
6	*P. borealis*	3	3
6	*P. bilorbang*	2	2
6	*P. megasperma*	2	2
6	*P. inundata*	1	1
2	*P. siskiyouensis*	1	1
2	*P. inflata*	1	1
2	*P. plurivora*	1	1
8	*P. ramorum*	1	1
total			65

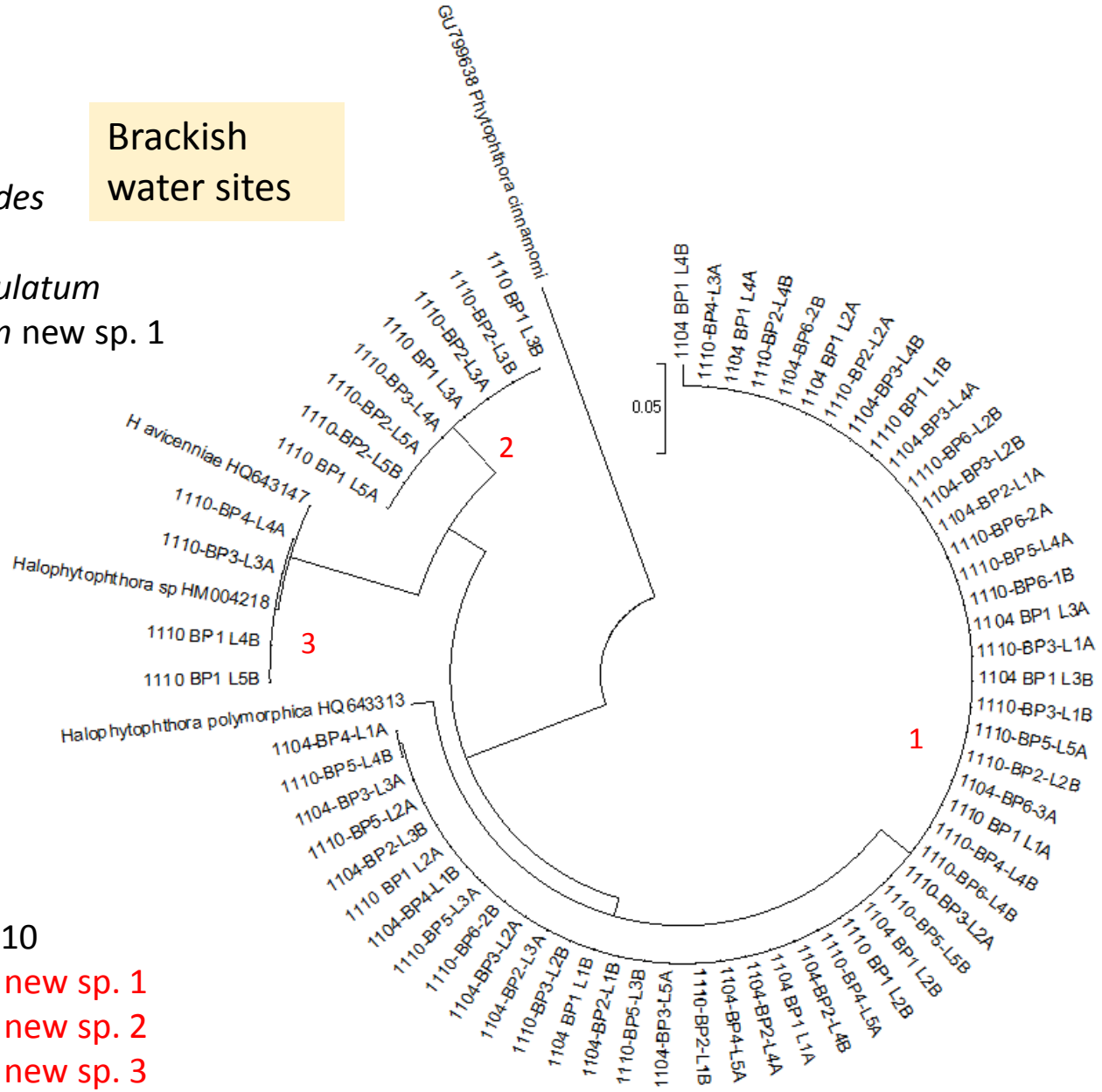


Halophytophthora

Conservation area

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

Brackish water sites



Industrial site

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

2015

Find the source of Pr in Dungeness River

Stormwater retention ponds as early detection for *Phytophthora* spp.

No Pr found

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

11 Sequim sites – local volunteers

7 Puyallup sites – high school and community college students

Objectives:

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

2017 – *Phytophthora* in habitat restoration sites

Does *Phytophthora* survive outplanting?

Seward Park – Forested

No *Phytophthora* in sword fern dieoff sites

Some *Phytophthora* in 2017 plantings

Clark's Creek - Riparian

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

http://sewardparkswordferndieoff.blogspot.com

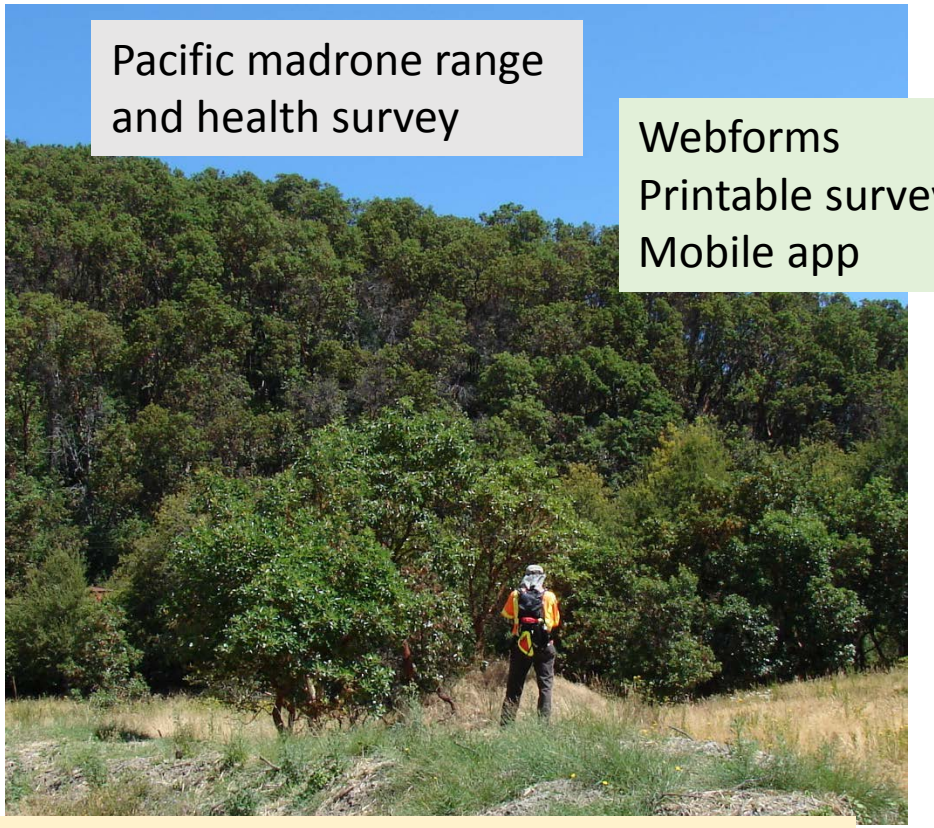
New technology

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



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
Bellarmine Preparatory School
Gig Harbor High School

Master Gardeners
Streamkeepers of Clallam County
Friends of Seward Park

and others.