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The Phytophthora Ramorum (Sudden Oak Death) Stream Monitoring Project

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Community Service Learning: The *Phytophthora ramorum* (Sudden Oak Death) Stream Monitoring Project

● ERICA CLINE, MARIANNE ELLIOTT

Key Words: *Phytophthora ramorum*, sudden oak death, service learning, stream monitoring.

Dr. Cline was looking for a way to revitalize the class project in her environmental microbiology course, an upper-division college class that introduces students to general microbiology in the first 5 weeks and then explores environmental applications of microbiology. Dr. Elliott was looking for volunteers to participate in a community stream monitoring project. Cline was intrigued by service learning as a way to engage students and widen their focus to the world outside the classroom, but hesitant to sacrifice the time they could otherwise devote to studying fundamental concepts. And furthermore, could students who had only studied microbes for weeks give back to their community in a meaningful way? The answer proved to be yes – as long as the project was carefully designed.

Phytophthora ramorum Werres, De Cock & Man in't Veld 2001 is an invasive pathogenic oomycete that attacks a wide range of plants (Figure 1; Cline et al., 2008). Since its introduction in the 1990s, it has become established in California and Oregon and has been detected in nurseries in Washington (Rizzo et al., 2002). Because its flagellated spores disperse by swimming, stream leaf baiting is an effective way to detect the pathogen within a watershed. Researchers from Washington State University Puyallup, including Dr. Elliott, have implemented a stream baiting project in which community members deploy *Rhododendron* leaves in mesh bags for 1 week and then culture *Phytophthora* spp. from leaf disks on selective media and screen for *P. ramorum*. This allows for early detection of *P. ramorum* and other invasive *Phytophthora* spp., as well as examination of the biodiversity of *Phytophthora* spp. in stream ecosystems.

For the class project, we completed the standard leaf baiting in First Creek, an urban stream, and Puget Creek, an urban park, both in Tacoma, Washington. Each group was responsible for one leaf from each creek. After the baiting, culturing, and identification

of *Phytophthora* spp. was completed by the students, with the assistance of Elliott, DNA sequencing was used to generate a phylogenetic tree of *Phytophthora*. A detailed student lab handout and instructor manual are available at <https://sites.google.com/a/uw.edu/erica-cline-uw-faculty-webpage/home>.

While we were relieved to not find *P. ramorum* in our local streams, we did find several other *Phytophthora* spp., including both saprophytes and pathogens. The students presented their results to a group of middle school students from First Creek who are leading a restoration effort for the creek.

Subsequently, students tested salt tolerance of *P. ramorum*, finding that a common lineage produces more chlamydospores when cultured on salt medium. This finding has important management implications, as the pathogen may be able to disperse in salt water, demanding increased vigilance in enforcing the quarantine (see detailed project description at http://www.puyallup.wsu.edu/ppo/sod/monitoring/student_projects/index.htm).

Tips for successful implementation of service learning projects:

- Service learning projects should be closely aligned with learning objectives.
- Don't underestimate the power of casting your students as experts. Struggling students blossomed when given the opportunity to share their learning with middle school students, and their pride and excitement revitalized the class. Because of their enhanced engagement, they were more motivated to study, more careful in their lab technique, and, ultimately, learned more from the experience.
- Long-term monitoring projects are ideal for class projects. Classes that are taught on a quarterly or yearly basis can build an extensive database and make a real difference over time. We look forward to our next opportunity to contribute to the community monitoring effort with a new class of students.

Cline was intrigued by service learning as a way to engage students and widen their focus to the world outside the classroom.

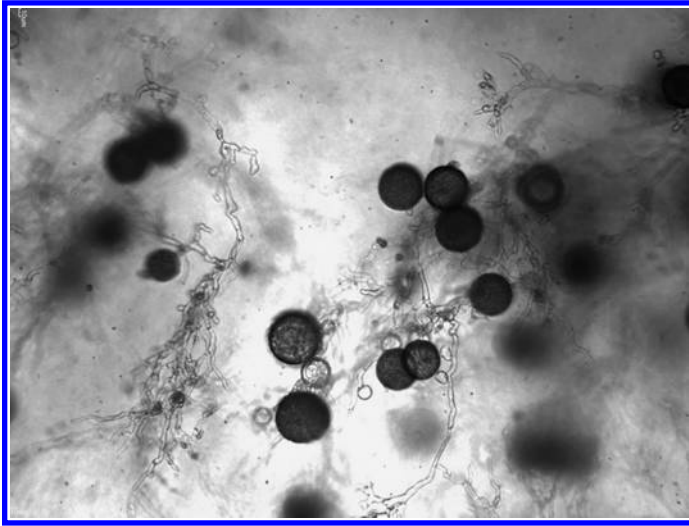


Figure 1. Hyphae and chlamydospores of *P. ramorum*.

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