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Partnering for Pathogen Free Plants: Joining Forces to Keep Plants Healthy in the City of Tacoma Plant Holding Facility

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Partnering for Pathogen Free Plants: Joining Forces to Keep Plants Healthy in the City of Tacoma Plant Holding Facility

Partnerships between cities and universities can help overcome the challenges of producing healthy plants free of pests and pathogens for urban planting and restoration. In Tacoma, a partnership with researchers from Washington State University (WSU) helped the City of Tacoma implement best management practices in its plant holding facility (PHF). The PHF is a critical resource for improving open spaces, managing stormwater, and fostering community environmental stewardship throughout Tacoma and Pierce County. It supports urban forestry and natural area restoration by cultivating 8000 native plants and 1000 street trees for planting into restoration sites and neighborhood streets respectively. While many cities would benefit from similar facilities of their own, management can be challenging. For example, in fall 2021 a Phytophthora outbreak at the PHF led to the loss of hundreds of plants. Phytophthora is a genus of plant-damaging oomycetes (water molds) that thrive in wet conditions. Plant pathogens in this group spread through water and soil to cause diseases that can kill plants, possibly causing serious problems for planting stock, forests and restoration projects. Partnering with researchers from WSU was essential for collaboratively developing improved best management practices and implementing lessons learned by other small-scale nurseries. The partnership improved the function of the facility by helping address disease pathways, reduce re-infections with pot steaming, improve overall equipment hygiene, and train conservation crews.

Keywords

urban forested natural areas, practitioner notes, urban forests, partnership, plant pathology, plant nursery

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CONTEXT

The Tacoma PHF was established to support the plant and tree stock needs of urban forestry programming and natural area restoration, addressing challenges including stormwater management, urban heat islands, and declining green spaces by cultivating and distributing native plants and street trees. Established on 2.6 acres at the capped Tacoma Recovery and Transfer Center (Landfill), the PHF developed in stages, expanding from a small in-ground facility to housing thousands of plants in shade houses, wet beds, and raised beds. The location and subsoil, composed of TAGRO (a blend of biosolids, sawdust, and sand), create unique conditions impacting drainage and disease pathways, and an elevated water table, due to the cap, increases the risk of pooling and standing water. In 2021, after staff noted plant die-off, pathogen testing was initiated, leading to the discovery of multiple *Phytophthora* species infecting PHF stock. A partnership was developed with plant pathology researchers at the nearby WSU Puyallup Research and Extension Center. Partnering with these researchers helped the City of Tacoma implement best management and hygiene practices that led to the reduction of impacts from plant pathogens. Other cities and organizations growing plants or holding plants for planting would benefit from similar partnerships with local universities.

GOAL

The partnership between the City of Tacoma and WSU led to the development of the following goals for the cultivation and distribution of native plants and street trees:

- (Primary) Improve onsite best management and hygiene practices to reduce pest and pathogen pathways at the nursery, ensuring increased plant success and reducing risk of introducing pests or pathogens into planting sites through outplanting of nursery stock.
- (Short-term) Improve onsite conditions to limit the spread of *Phytophthora* and protect plant stock.

- (Long-term) Develop and demonstrate best management strategies and lessons learned guidelines for other municipalities with limited resources interested in building small-scale plant holding facilities or nurseries.

APPROACH

Facility Improvements

After testing recovered multiple *Phytophthora* species from unhealthy planting stock at the PHF, WSU helped guide City staff through the implementation of Best Management Practices (BMPs) and facility improvements to reduce the impacts. Major improvements included:

- Stock was raised off the ground to prevent direct ground water transfer, root contact between plants, and contamination via soil carried on footwear. This was accomplished in indoor hoop houses by building tables for plant storage and propagation off the ground (Figure 1). Conditions were improved for outdoor plants by converting in-ground tree storage for larger street tree stock to above-ground storage to prevent direct soil contact and encourage drainage away from the stock and the site (Figure 2). Outdoor plants were also elevated off the ground using recycled pallets (Figure 3).
- Efficiency in irrigation methods was implemented from standard drip lines to emitter-based irrigation for larger street tree stock.
- Washington Conservation Corps crews and City staff were leveraged for building and implementing facility changes.

Figure 1. Hoop house before and after implementing best management practices.

Figure 2. Example of converted rows after cable and post-installation.

Figure 3. Re-use of pallets from Recovery & Transfer station for elevating small plant stock off the ground.

Onsite Staff and Partner Hygiene & Monitoring Protocols

- Implemented boot-washing stations, provided cleaning solution for boots on volunteer days, created a tool-cleaning station, and designated a specific area for disposal of diseased plants and contaminated soils.
- Elevated and designated storage of clean pots, isolated from used pots until they can be disinfected and re-used.
- Coordinated annual pot sterilization workshops with WSU's portable steamer (Figures 4–7).

- Hosted annual partner meetings: training new staff on facility history, *Phytophthora*, and the importance of BMPs.
- Implemented more rigorous screening of incoming plant stock, avoiding stock with signs or symptoms of pests or pathogens.
- Quarantined new stock, when possible, in separate areas of hoop houses or planting rows to monitor for pests and pathogens before integration with older stock.

Figures 4–7. Pot steaming activities at PHF.

Educational Opportunities

- Provided training and demonstrations for Washington Conservation Corps Crews and other stakeholders (Figure 8).
- Demonstrated effective implementation of BMPs and infrastructure for other cities and nursery stakeholders (Figure 9).

Figure 8. Tree pest and disease trainings with Washington Conservation Corps crew prior to implementation of BMPs.

Figure 9. Demonstration and sharing of best management practices with other city staff during American Forests and Washington Department of Natural Resources Tree Equity workshop.

RESOURCES

Support for PHF operations is funded through City of Tacoma Environmental Services, specifically stormwater rates, which are evaluated on a biennial budget cycle. WSU received funding from the United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service to develop techniques for steam sanitation to manage pathogens such as *Phytophthora*. This project was also possible because of support from the Washington State Department of Agriculture to provide education and Best Management Practices training. The PHF space is also used and partially supported by many partners, including Pierce County Parks, Pierce Conservation District, Washington State Department of Ecology, and non-profit organizations such as the Tacoma Tree Foundation.

KEY RESULTS

- Improved facility conditions have prevented any large-scale infection or die-off since implementation.
- Site improvements provided a demonstration site for staff and partner education activities.
- Facility improvements varied in terms of expense, but the majority of BMPs used at the City nursery were low-cost, with the exception of converting a portion of in-ground Urban Forestry rows to above ground (Figures 10–12).
- Strengthened partnership between WSU and collaborators relying on PHF.

Figures 10–12. Row conversion in progress and after initial earth moving and gravel filling. Example of in-ground row setup prior to conversion.

OPEN QUESTIONS

- How can the nursery expand its capacity to scale community greening initiatives to support citywide tree canopy and restoration goals?
- What additional funding sources can be tapped to enhance nursery operations and support the partnership?
- How can the lessons learned from the partnership and the demonstration space be better supported as an educational tool for reducing the impacts of pests and diseases in other plant holding facilities?
- What additional strategies can be employed to mitigate pest management challenges?
- Which pests or pathogens are on the horizon for future monitoring?
- What are ways to integrate nursery operations with broader city planning and greening efforts?

ADDITIONAL RESOURCES

City of Tacoma Environmental Services
Urban Forestry - City of Tacoma
TAGRO - City of Tacoma
Washington State University Ornamental Plant Pathology Program
Washington State University Ravenholt Urban Forest Health Lab
Preventing Phytophthora Infestations in Restoration Nurseries | OSU Extension Service (oregonstate.edu)
How to Prevent Phytophthoras in Restoration Plantings on Your Woodlands | OSU Extension Service (oregonstate.edu)