Accreditation to Improve Restoration

Dean Watson and Johanna Del Castillo
Staff Research Associate, AIR Program
UC Davis Plant Pathology Dept.
CalPhytos Meeting, Fall 2024

A service through the UC Davis Plant Pathology Dept,
Del Castillo Lab

UC DAVIS DEPARTMENT OF PLANT PATHOLOGY
California Native Plant Society
USDA Forest Service
USDA
San Francisco Public Utilities Commission
Valley Water

What is AIR?

https://airnursery.ucdavis.edu

- A voluntary, audit-based accreditation program with the goal of producing *Phytophthora*-free nursery stock by implementing Best Management Practices (BMPs) in California native restoration nurseries.
  - *"Start Clean, Stay Clean"*
- Producing *Phytophthora*-free nursery stock is crucial to prevent introduction to habitat restoration sites from restoration plantings.
- *Phytophthora* has not been detected in nurseries that have successfully implemented the AIR Program's BMPs.

AIR Participating Nurseries

Northern California	County	Accreditation Status
Casa Grande High School Nursery	Sonoma	*In Progress*
Central Coast Wilds	Santa Cruz	Accredited
EBRPD Botanic Garden Nursery	Alameda	*In Progress*
GGNPC Marin Headlands Nursery	Marin	Accredited
GGNPC Presidio Nursery	San Francisco	Accredited
Grassroots Ecology Nursery	Santa Clara	Accredited
Heritage Growers - Escondido Nursery	Yolo	*In Progress*
Laguna de Santa Rosa Fdn-CNPS Native Nursery	Sonoma	Accredited
Native Here Nursery	Alameda	*In Progress*
Point Blue / San Pablo Bay National Fish and Wildlife Service Nursery	Sonoma	*In Progress*
Save the Bay Nursery	Alameda	*In Progress*
SFPUC Sunol Native Plant Nursery	Alameda	Accredited
The Watershed Nursery	Contra Costa	Accredited

13 Nurseries in Northern California

- 7 Fully Accredited
- 6 In progress

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AIR Participating Nurseries

Southern California

California Botanic Garden (Rancho Santa Ana Restoration Nursery)	Los Angeles		*In Progress*
Mojave Desert Land Trust	San Bernardino		*In Progress*
PVPLC Palos Verdes Peninsula Land Conservancy	Los Angeles		*In Progress*
Riverside-Corona RCD	Riverside	Accredited	
SAMO Fund / Santa Monica Mountains NP	Ventura		*In Progress*
San Bernardino NF - Big Bear Nursery	San Bernardino	Accredited	
Tree People	Los Angeles	Accredited	

7 Nurseries in Southern California

- 3 Fully Accredited
- 4 In progress

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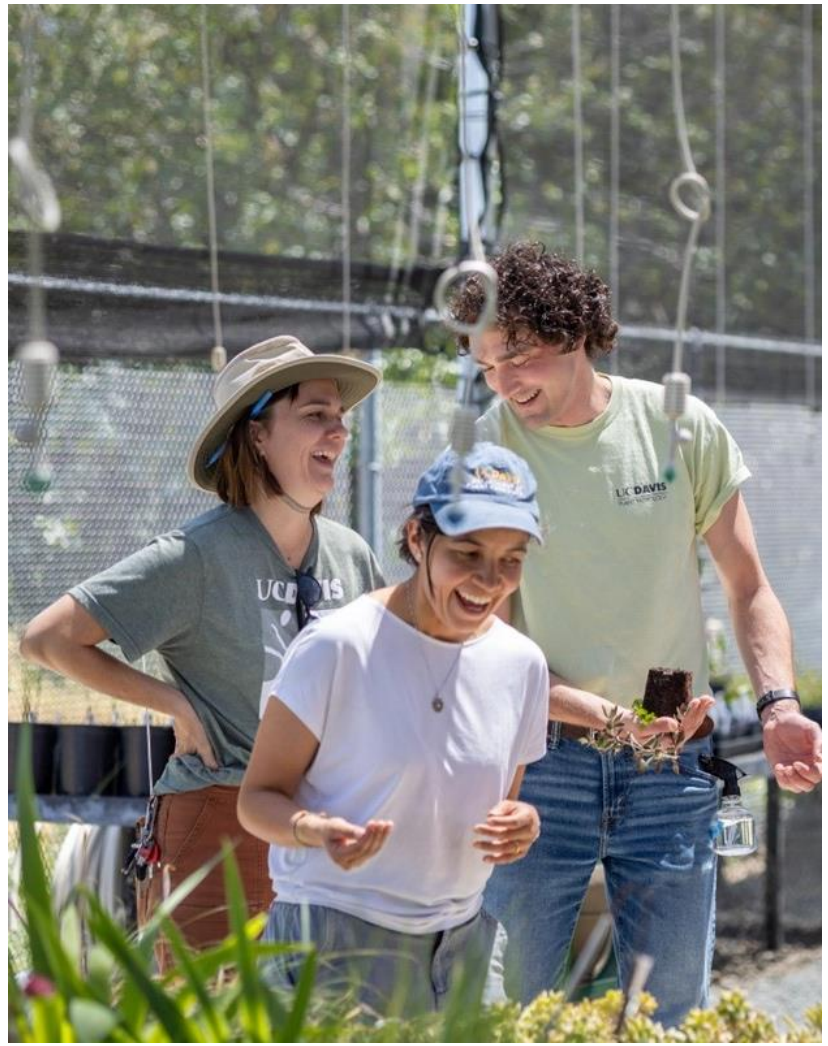
Current AIR Participation Status:



20 Total *Actively Participating* Nurseries:

- 10 Fully Accredited
- 10 In Progress
- 15 Prospective Nurseries
  - In contact, pre-accreditation
  - Have been sent a NEFs

2024 AIR Activity

- Visited 15 Nurseries
- Reaccredited 6 nurseries
- Accredited for the first time 1 nursery
- Contacted 9 new nurseries, currently at early stages in the program

https://airnursery.ucdavis.edu

Nursery Accreditation Process

1. Complete a Nursery Evaluation Form (NEF)

- Basic Nursery Information
- 12 aspects of nursery production including:
  - Layout
  - Sanitation
  - Propagule collection and treatment
  - Media
  - Propagation and Production
  - Testing and Recordkeeping

2. Onsite Accreditation Visit 2 Part

A. <u>Site Evaluation</u>

- AIR Evaluators Review NEF
- Walkthrough nursery to document layout, infrastructure, and practices and confirm information on NEF
- Clarify any questions from NEF
- Note areas for improvement before accreditation

B. <u>Plant Testing</u>

- Conduct Leachate Testing
- Provide hands-on demonstration of bench leachate testing for *Phytophthora*
  - Accredited nurseries expected to perform regular testing
- Results will be posted to NEF

3. Re-evaluation and Accreditation

A. Address issues with noncompliance or recommended improvements from visit

B. Confirm changes to achieve BMP compliance

C. Accreditation
  - Lasts 2 years from accreditation date

<u>Accreditation Takes Time!</u>

It will take the average nursery several months to become AIR Accreditable

2024 Bench Leachate Testing

Participating and Prospective Nurseries

AIR Testing from Nov 2023 – Oct 2024

- Nurseries AIR Tested: 10
  - 8 AIR Participants
  - 2 Prospective Nurseries
- Total Blocks Tested: 93
- Total Number of Plants Tested: 2612

- *Phytophthora* was not detected in any AIR Accredited Nurseries

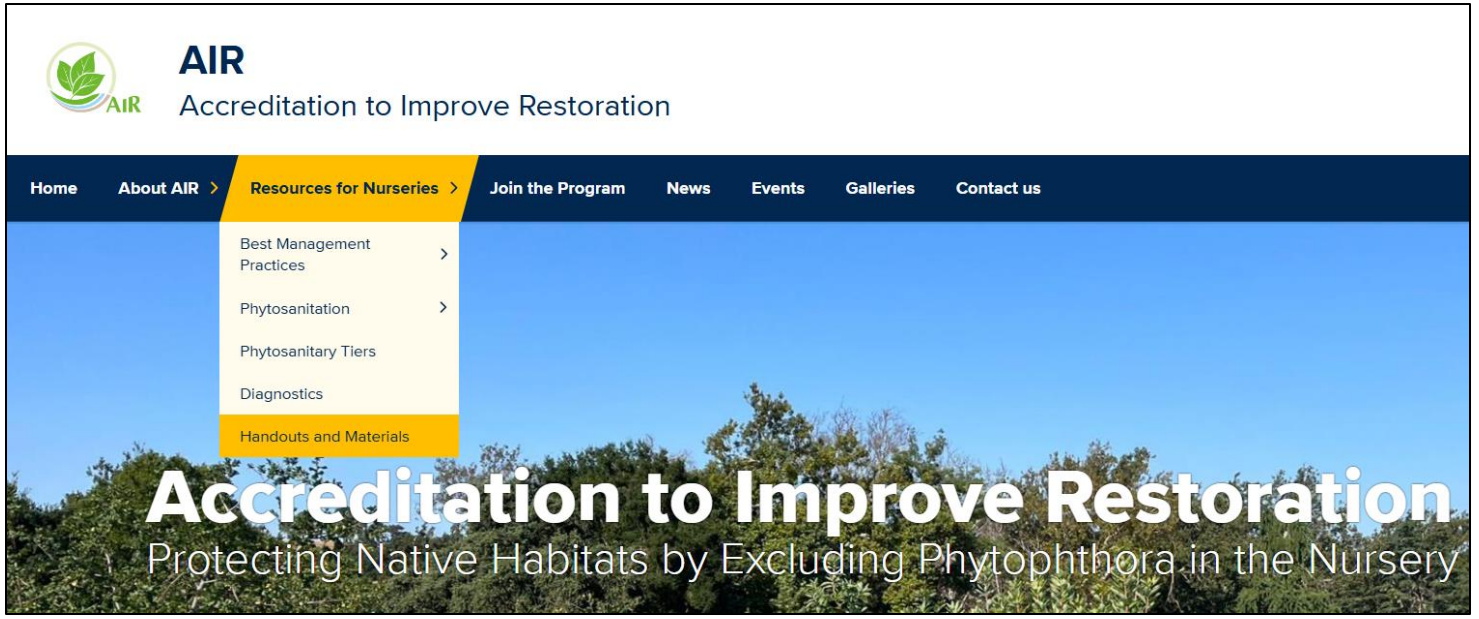
PC: Ted Swiecki, Phytosphere Research

Plant Testing Resources

A Note on Testing

- Plant testing is an integral component of the AIR Program
- AIR performs only limited testing during site evaluations
- Participating nurseries are expected to test regularly on their own
- AIR has produced several instructional handouts including:

Instructional Materials for Growers Available at https://airnursery.ucdavis.edu/



- Leachate baiting equipment construction
- Leachate testing instructions
- Single plant root baiting

Plant Testing resources

Leachate Test Equipment Construction

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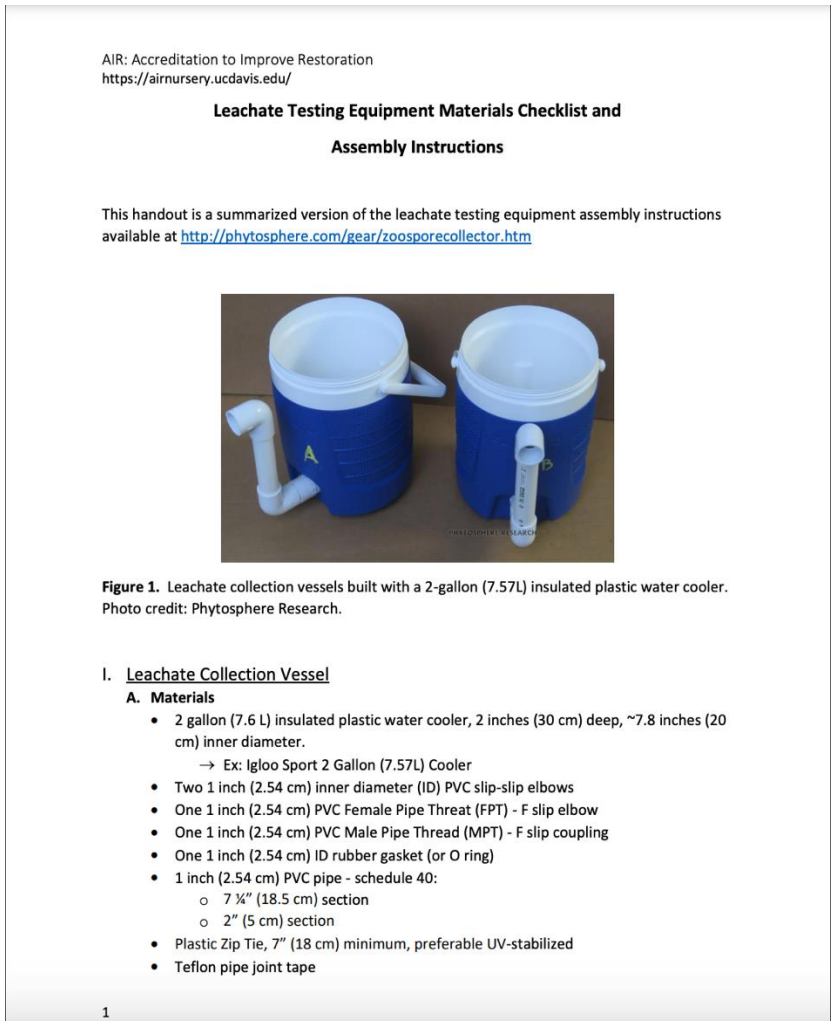

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Leachate Testing Equipment Materials Checklist and Assembly Instructions

This handout is a summarized version of the leachate testing equipment assembly instructions available at http://phytosphere.com/gear/zoosporecollector.htm

Figure 1. Leachate collection vessels built with a 2-gallon (7.57L) insulated plastic water cooler. Photo credit: Phytosphere Research.

I. Leachate Collection Vessel

A. Materials

- 2 gallon (7.6 L) insulated plastic water cooler, 2 inches (30 cm) deep, ~7.8 inches (20 cm) inner diameter.
  - → Ex: Igloo Sport 2 Gallon (7.57L) Cooler
- Two 1 inch (2.54 cm) inner diameter (ID) PVC slip-slip elbows
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Plant Testing resources

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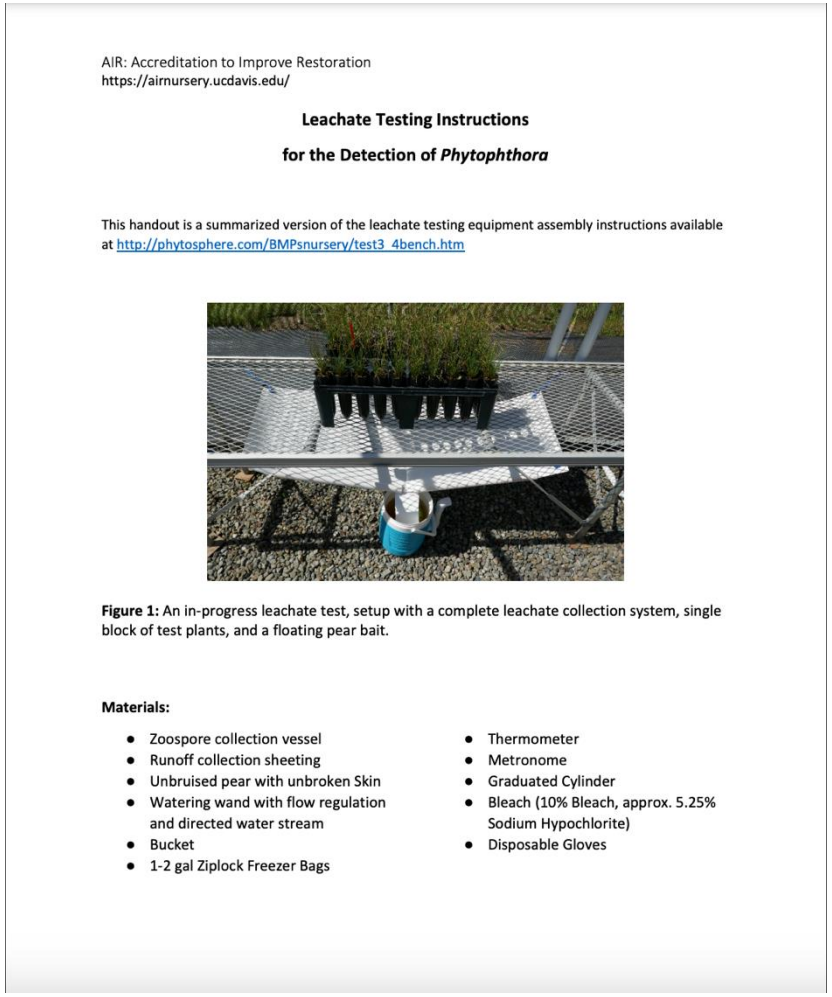

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Leachate Testing Instructions

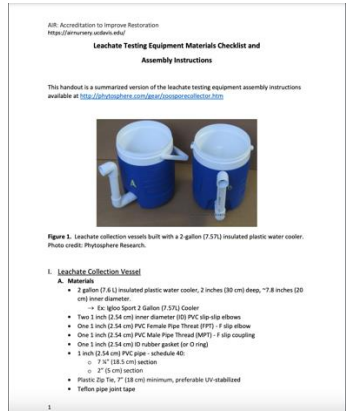
for the Detection of *Phytophthora*

This handout is a summarized version of the leachate testing equipment assembly instructions available at http://phytosphere.com/BMPsnursery/test3_4bench.htm

Figure 1: An in-progress leachate test, setup with a complete leachate collection system, single block of test plants, and a floating pear bait.

Materials:

- Zoospore collection vessel
- Runoff collection sheeting
- Unbruised pear with unbroken Skin
- Watering wand with flow regulation and directed water stream
- Bucket
- 1-2 gal Ziplock Freezer Bags
- Thermometer
- Metronome
- Graduated Cylinder
- Bleach (10% Bleach, approx. 5.25% Sodium Hypochlorite)
- Disposable Gloves



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Plant Testing resources

Root Baiting Instructions

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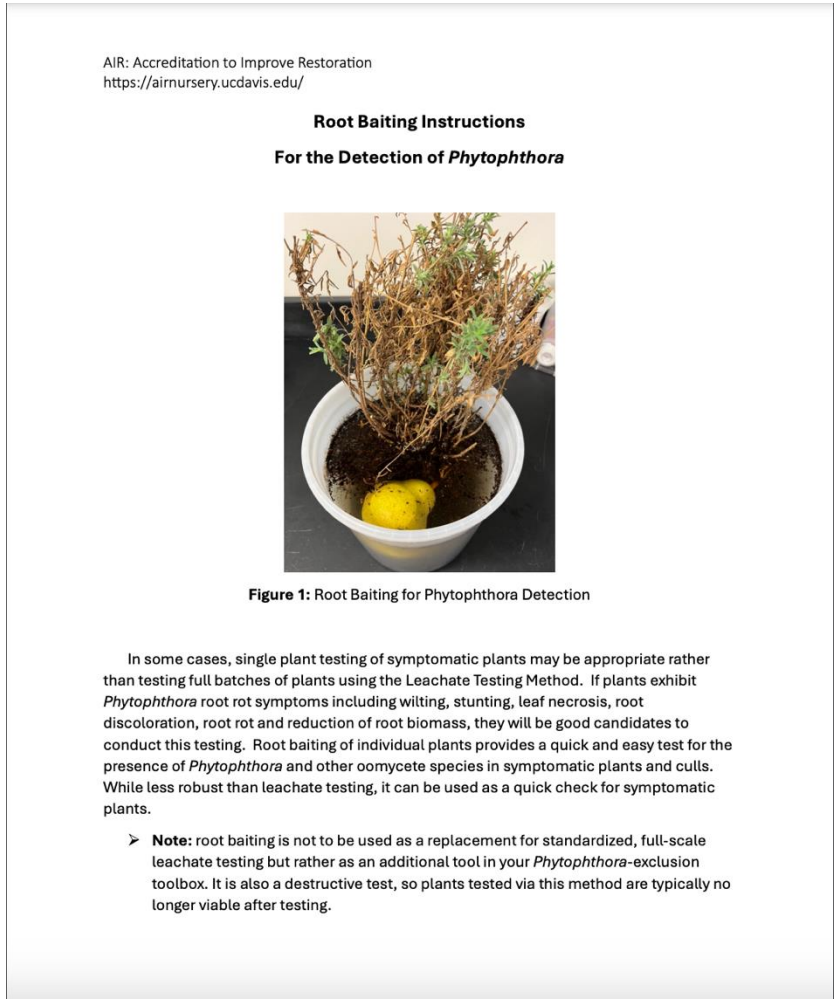

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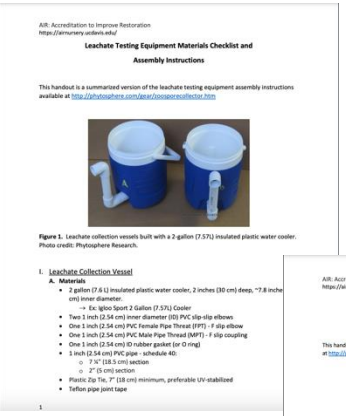
Root Baiting Instructions

For the Detection of *Phytophthora*

Figure 1: Root Baiting for Phytophthora Detection

In some cases, single plant testing of symptomatic plants may be appropriate rather than testing full batches of plants using the Leachate Testing Method. If plants exhibit *Phytophthora* root rot symptoms including wilting, stunting, leaf necrosis, root discoloration, root rot and reduction of root biomass, they will be good candidates to conduct this testing. Root baiting of individual plants provides a quick and easy test for the presence of *Phytophthora* and other oomycete species in symptomatic plants and culls. While less robust than leachate testing, it can be used as a quick check for symptomatic plants.

- **Note:** root baiting is not to be used as a replacement for standardized, full-scale leachate testing but rather as an additional tool in your *Phytophthora*-exclusion toolbox. It is also a destructive test, so plants tested via this method are typically no longer viable after testing.



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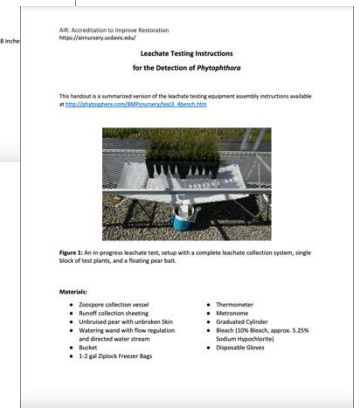

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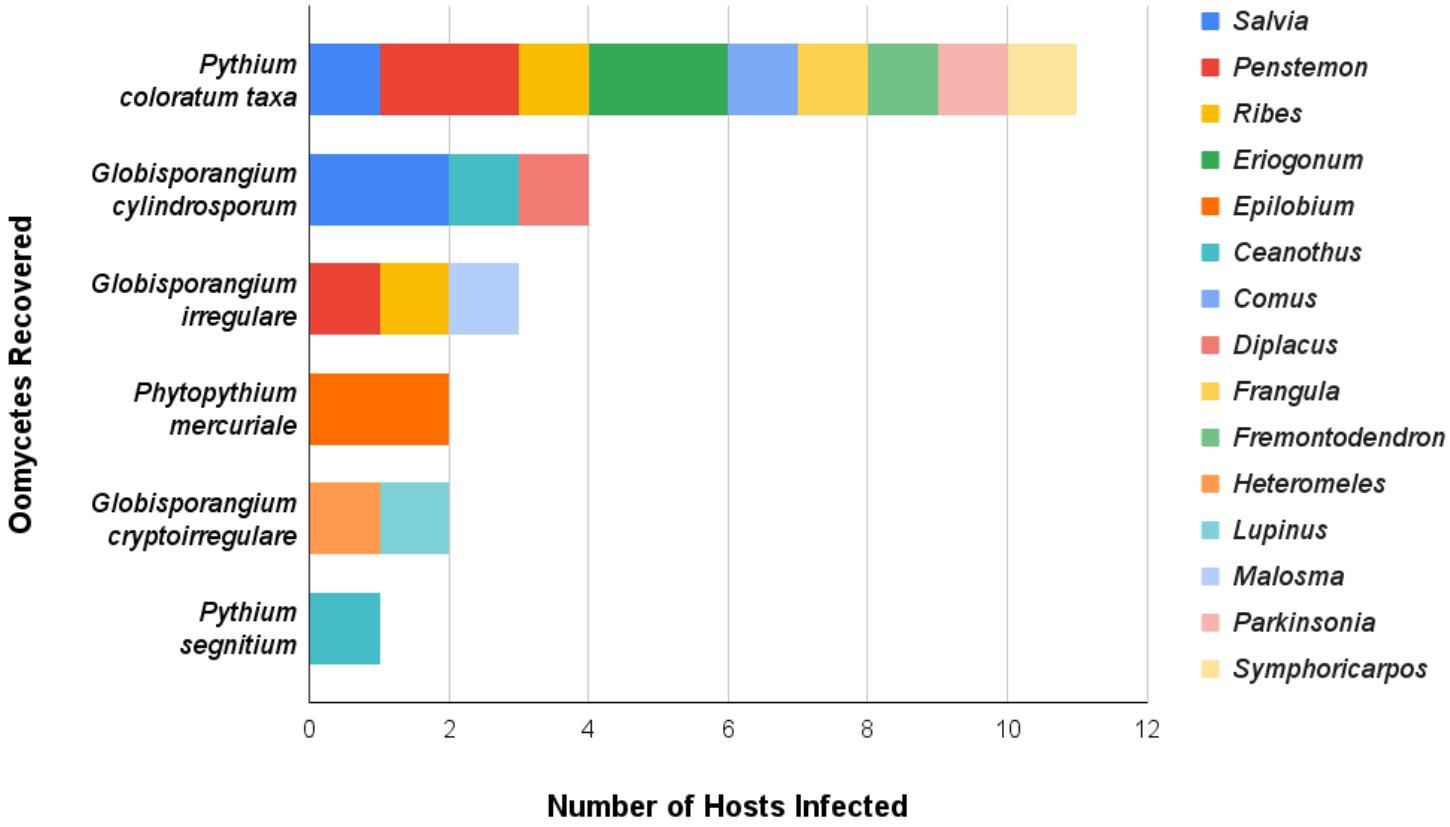
Plant Testing Results 2024: Oomycete Detections

Pythium sp. were regularly recovered

- *Pythium sp.*, *Globisporangium sp.*, and *Phytopythium sp.*
  - Most Prevalent:
    - *Pythium coloratum/dissotocum*
  - Common Hosts:
    - *Salvia sp.*
    - *Penstemon sp.*
    - *Eriogonum sp.*
    - *Diplacus sp.*
- Del Castillo Lab is currently evaluating pathogenicity of commonly recovered Oomycete species

Pythium Detections from 5 AIR Nurseries Spring 2024



Research: What role are playing *Pythium* species in native plants health?

- **Symptoms:**
  - Stunting
  - Loss of vigor
  - Chlorosis
  - Leaf curl/drop

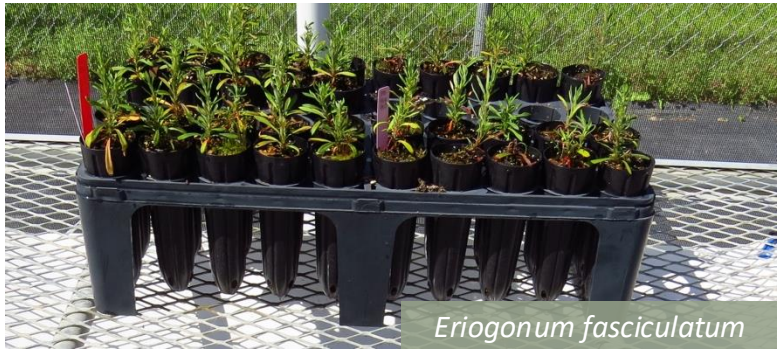


Photo Credit: Ted Swiecki

Newsletter update on current resources

https://airnursery.ucdavis.edu

AIR
Accreditation to Improve Restoration

Newsletter email with updates on website content and future activities

Resources for new nurseries joining AIR

Workshop: How to complete the Nursery Evaluation Form (NEF)?

Date: Dec 5th from 10 am to 11:30 am

Registration:
https://surveys.ucanr.edu/survey.cfm?surveynumber=43930

https://airnursery.ucdavis.edu/events/nursery-evaluation-form-workshop

Resources for new nurseries joining AIR

How much does it cost to become AIR compliant?

Survey to currently accredited nurseries on costs of implementing certain practices

Upon surveys completion analyze answers and perform cost analyses

Develop materials to share cost analyses with all AIR participating and new nurseries

https://www.giancarloserra.org/coping-with-money-worries/

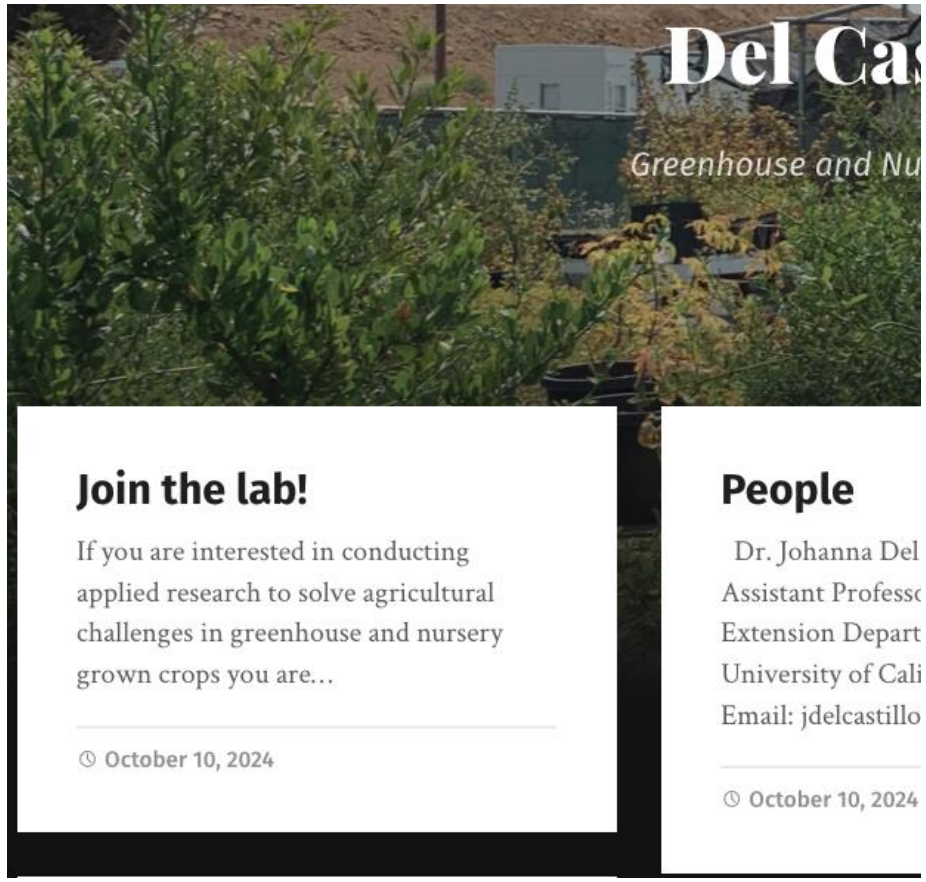
AIR certificate

- Accredited nurseries will receive a certificate recognizing them as producers of AIR accredited nursery stock
- Certificates will be sent in November

Workshops winter 2025

- BMPs for restoration in the field
- *Pythium* biology, ecology and diagnostics
- Diagnostics tools for nurseries: How to process pear baits (in the nursery)
- Horticulture practices: Irrigation management and plant nutrition

Disease Diagnostics



DISEASE DIAGNOSTICS OF ORNAMENTAL PLANTS

We provide disease diagnostics of ornamental plants in all California through farm advisors, or directly from growers. To submit a sample please fill out the plant disease form:PLANT DISEASE FORM 4.10.23

How to submit a sample guideline: How to submit samples

To mail samples: Package samples in paper or plastic, well padded. Include a specimen information form or email the form to Johanna at jdelcastillo@ucdavis.edu

Mail to:
Johanna Del Castillo
One Shields Ave
Hutchison Hall room 205
University of California, Davis
Davis, CA, 95616

Closing Notes

- AIR program is growing! The number of AIR participating, accredited and recently enrolled nurseries have increased up to this year.
- Currently working on identifying nursery challenges and creating outreach resources to overcome them.
- Plant testing helps identify potential areas of research to focus on.
- Looking forward to keep working with nurseries and understand their needs.

Acknowledgements

The Air Team

Dr. Ted Swiecki
Principle Plant Pathologist
Phytosphere Research

Dr. Susan Frankel
Plant Pathologist
US Forest Service

Diana Benner
Principle Vegetation Ecologist and
Project Manager,
The Watershed Nursery

Our Partners

California Native Plant Society

Forest Service US Department of Agriculture

Valley Water

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San Francisco Public Utilities Commission

UC Davis Department of Plant Pathology

Any Questions?

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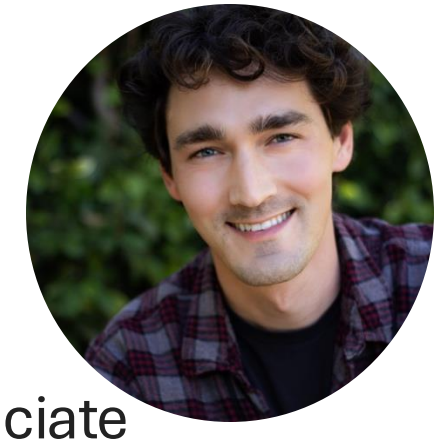

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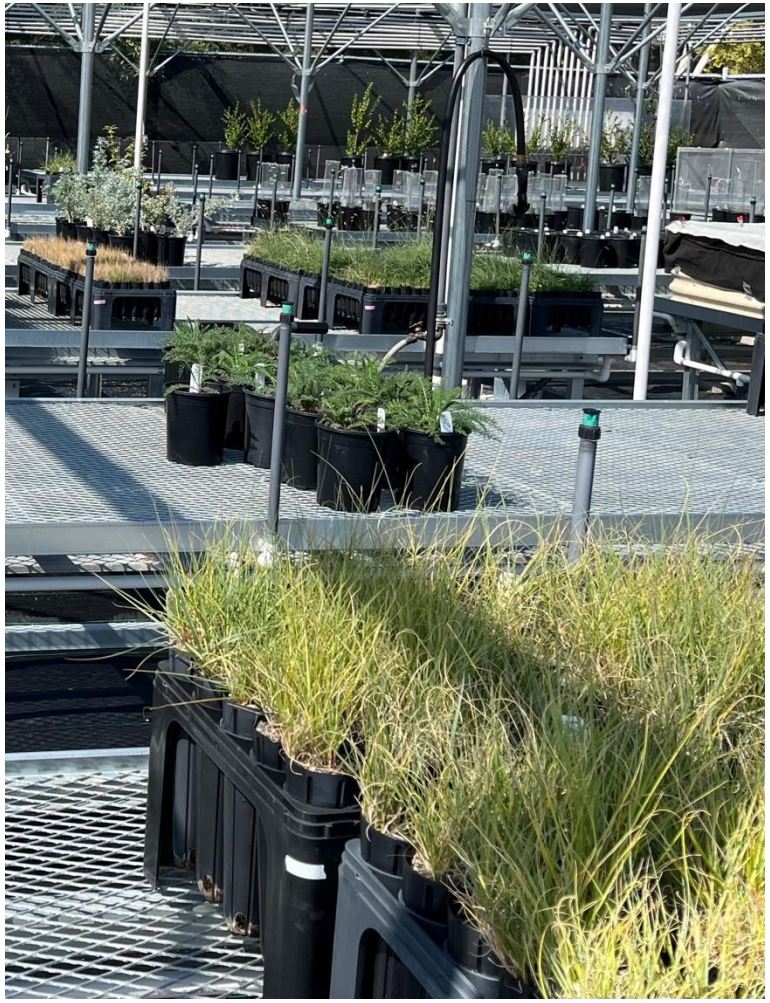
References



- Leachate Testing: Swiecki, T.J, Bernhardt, E.A., McClanahan, S.G. (2024). Validating and Optimizing a Method for Detecting Phytophthora Species by Baiting Leachate from Arrays of Container Nursery Plants. *PhytoFrontiers, 4:* 14-30.

- Air Program Outline: Swiecki, T.J., Bernhardt, E.A., Frankel, S.J., Benner, D., Hillman, J. (2021) An Accreditation Program to Produce Native Plant Nursery Stock Free of Phytophthora for use in Habitat Restoration. Plant Health Progress, vol. 22:348-354. https://doi.org/10.1094/PHP-02-21-0025-FI