Fall 2021 Progress Report

Intraspecific Hydraulic Responses of Commercial Tree Seedlings to Nursery Drought Conditioning

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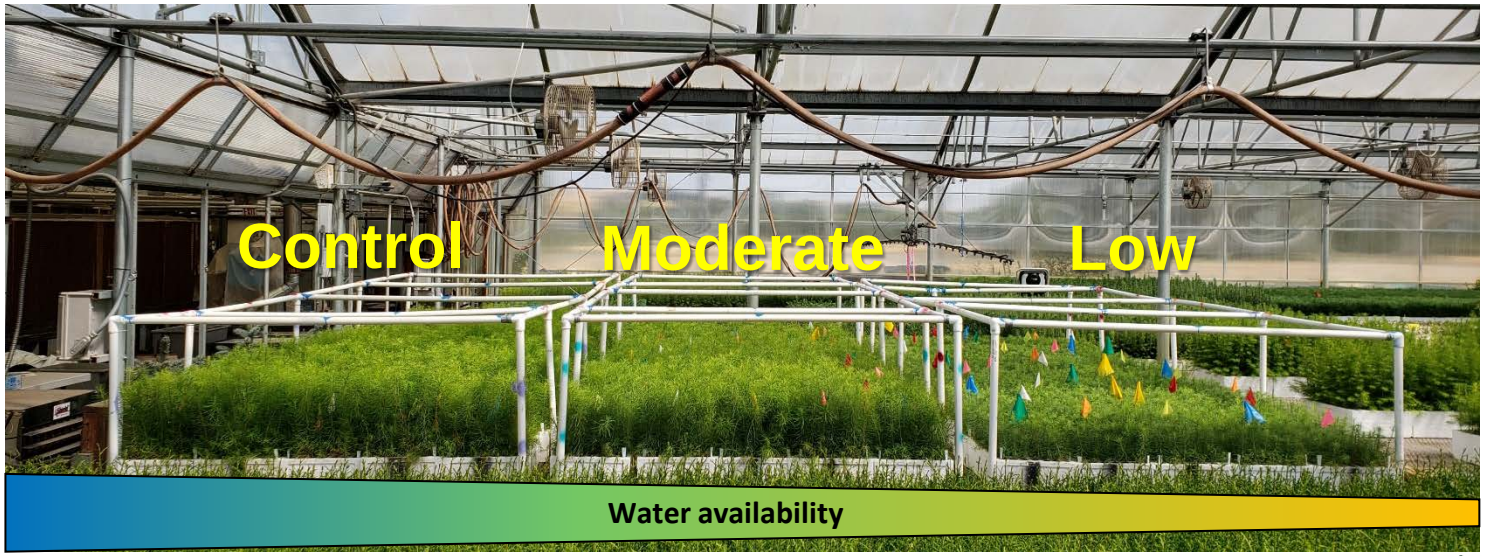
Project Overview

Our **objective** is to examine seedling physiology, root system architecture and field performance in response to nursery-induced drought conditioning of coastal Douglas-fir, western larch, and black walnut from seed sources across a range of maternal tree environments.



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- Nondestructive analysis of simulated post-planting root development and architecture using 3D imaging based on X-ray computed tomography (CT)

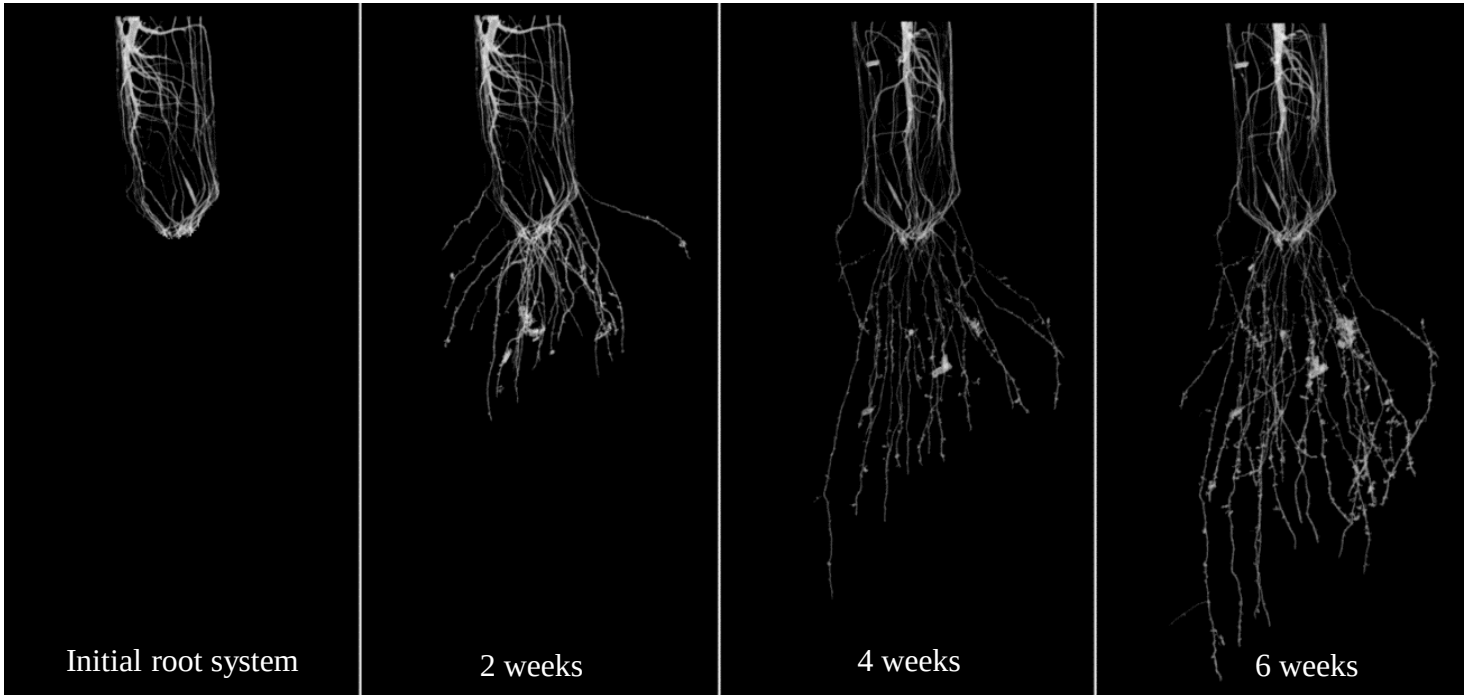


Figure: 3D root segmentation of one-year old Douglas-fir seedlings using an X-ray computed tomography root scanner.

Current Progress

Outplanting across multiple forest systems relevant to CAFS members

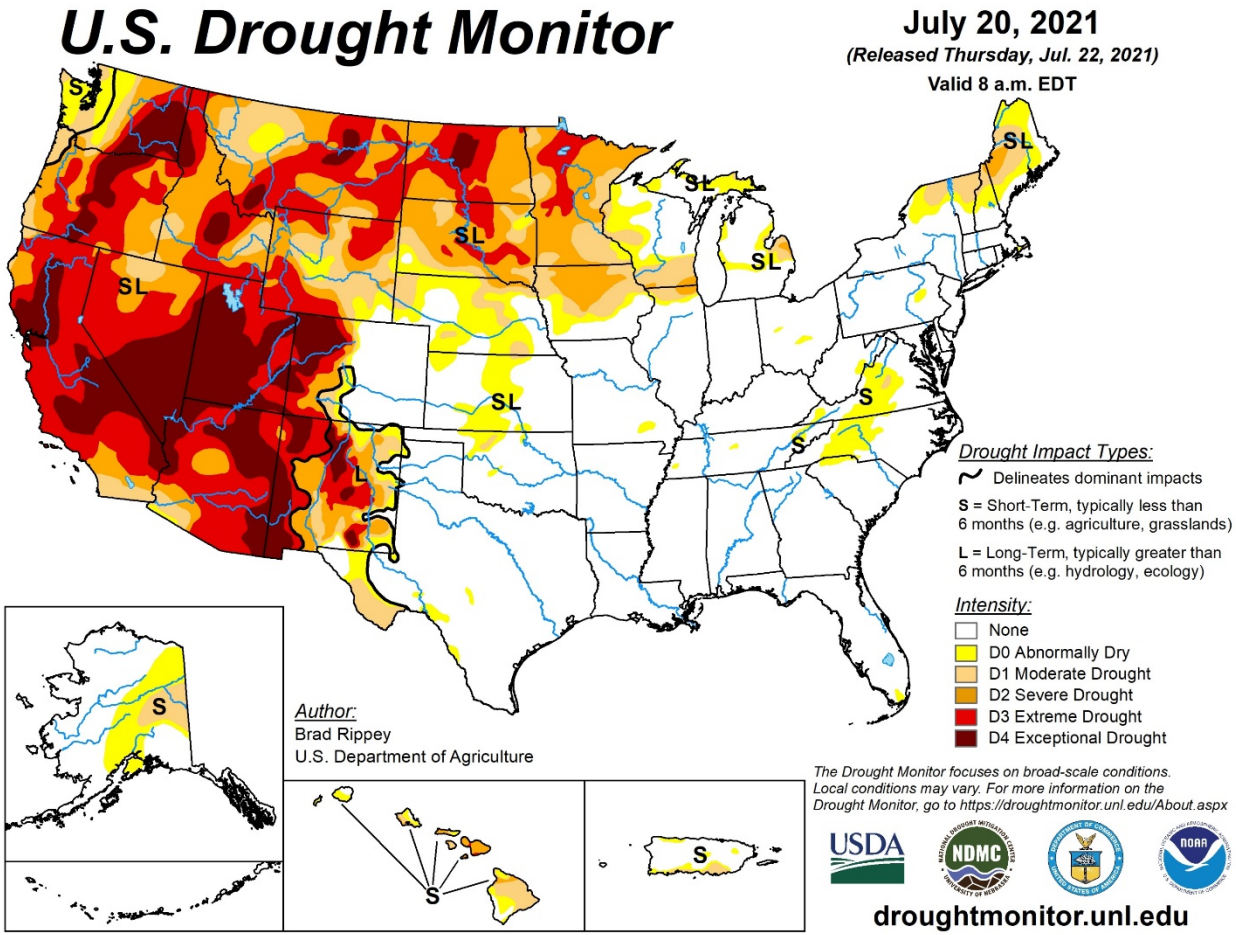
Black walnut, Indiana

Western larch, Idaho

Douglas fir, Oregon

Current Progress

Exceptional Summer Drought



Field performance measurements

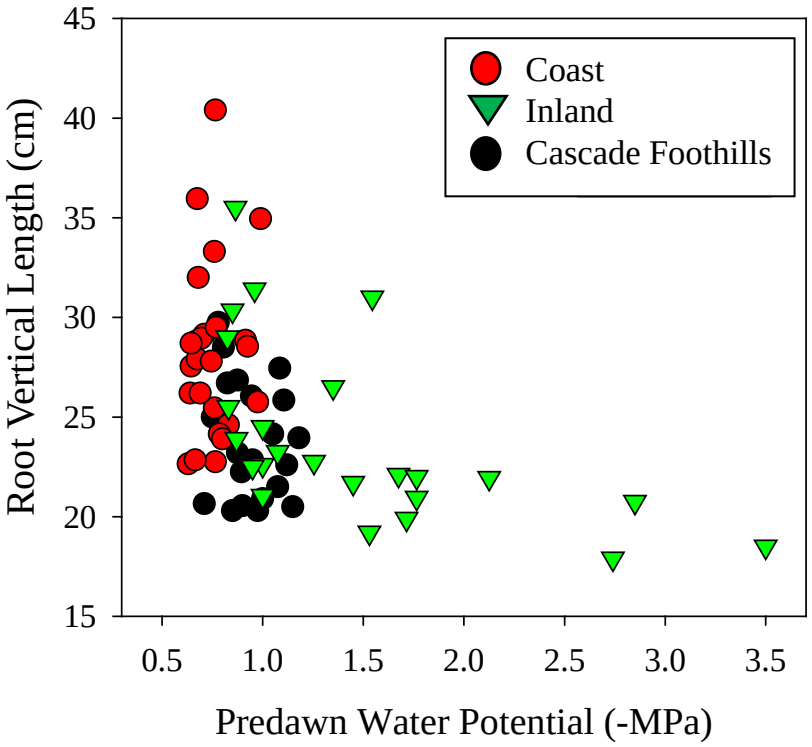
- Pre-dawn and Mid-day water potential
- Growth (height, diameter and biomass)
- Root development
- Nutrient analysis
- Vigor/Damage (browsing, drought, heat)
- Survival

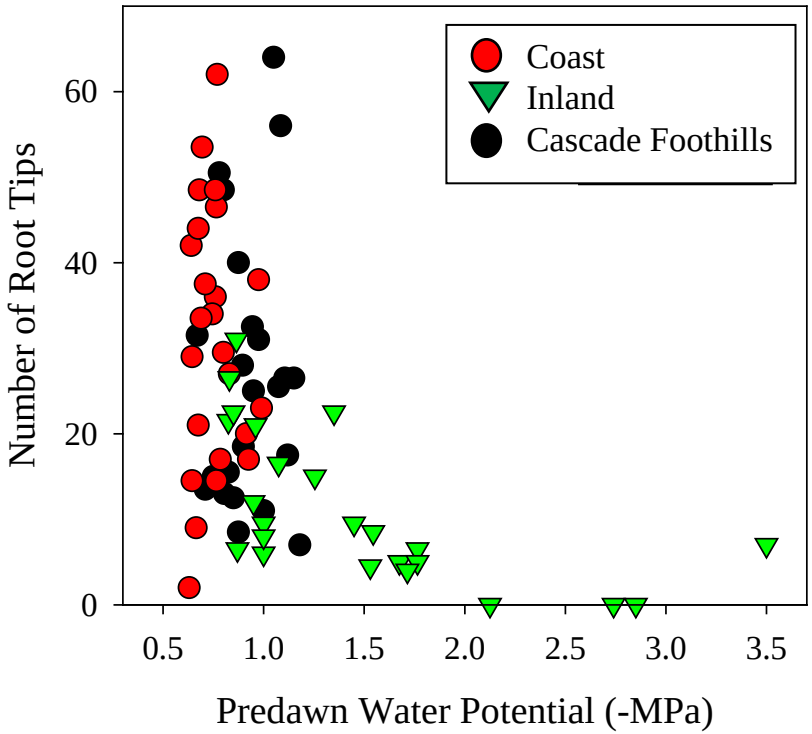
Western larch, Idaho

Current Progress

Preliminary results

Douglas-fir, Oregon





Future Plans

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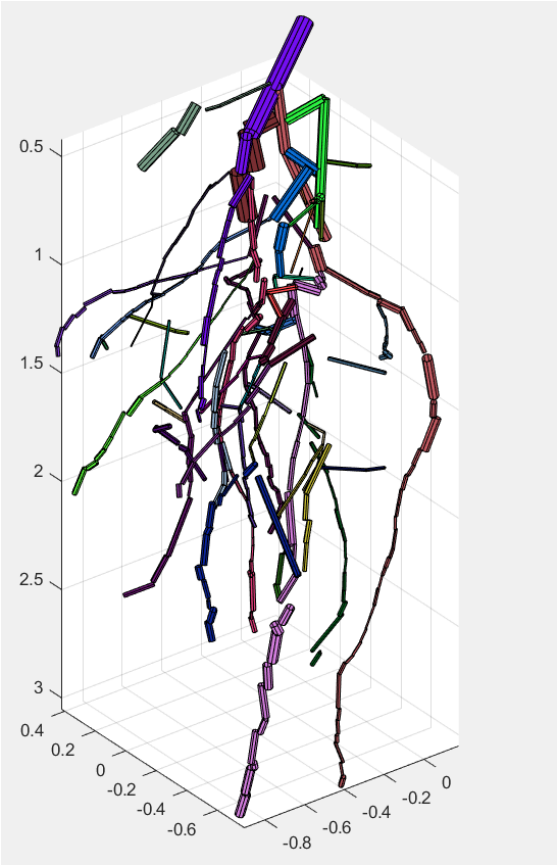

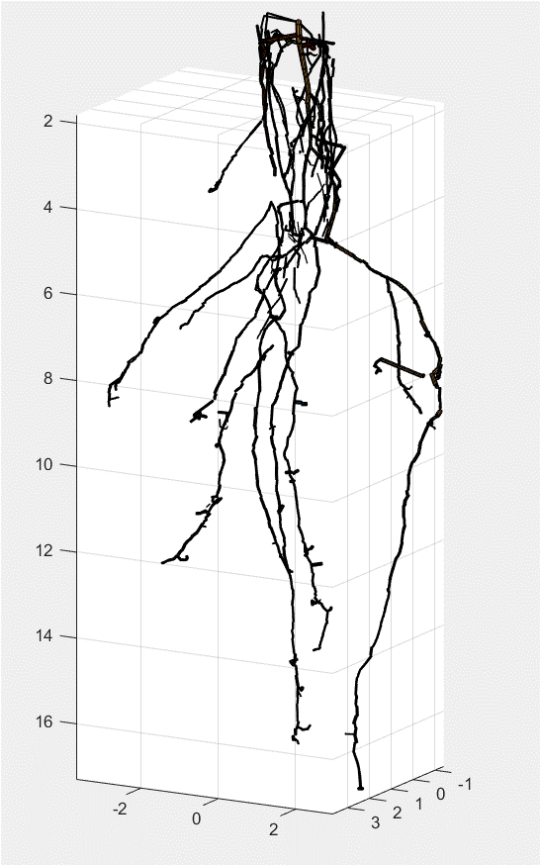

Figure: 3D cylinder root models for architectural traits analysis.

Digital analysis

- ❑Root growth dynamics
- ❑Root branching
- ❑Lateral root angle
- ❑Rooting depth

Laboratory analysis

- ❑Root scanning (Winrhizo)
- ❑Leaf area
- ❑Biomass

Outplanting

Field performance measurements

- ❑ Scanning of root systems excavated in the field
- ❑ Leaf nutrient analysis

Manuscript preparation

- Nursery
- Hydraulics
- Outplanting

Douglas-fir, Oregon

Western larch, Idaho

Black walnut, Indiana

Is Nursery Drought Conditioning a suitable treatment to promote root development and increase seedling field performance?

Thank you for your attention