United States Department of Agriculture

What's New in Nursery Technology?

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This is a big topic!

- A brief overview of some of the latest techniques, research questions, and issues in the nursery world
- (This will be a bit of a smorgasbord)
- Many of the topics are gleaned from the 2017 and 2018 Western and Northeast/Southern Nursery meetings (**_except Andrew's_**)
  - 2017 meeting proceedings are published in Fall 2018 issue of *Tree Planters' Notes*
  - 2018 meeting proceedings will be published in Fall 2019 issue of *TPN*

www.RNGR.net

- Extensive online collection of searchable and downloadable information on nurseries and outplanting
- Includes calendar, directory, links, etc.

Product Evaluations

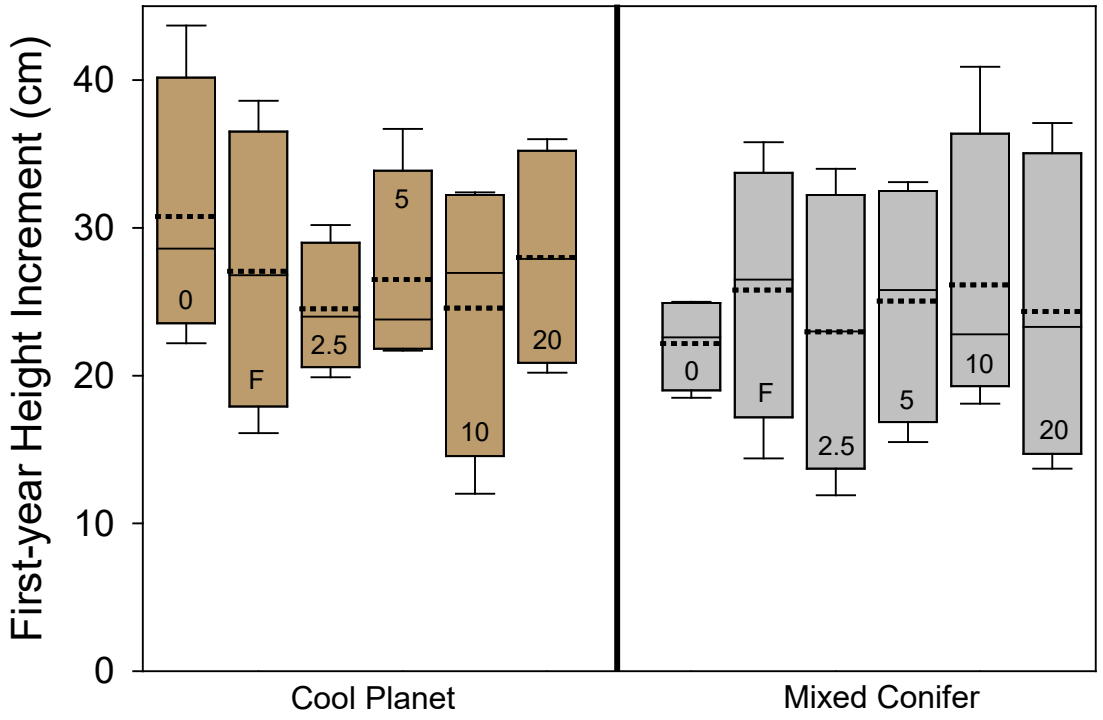
- Biochar
- Plant growth regulators
- Mycorrhizae
- Biofumigation
- Monitoring and control
- Mobile apps

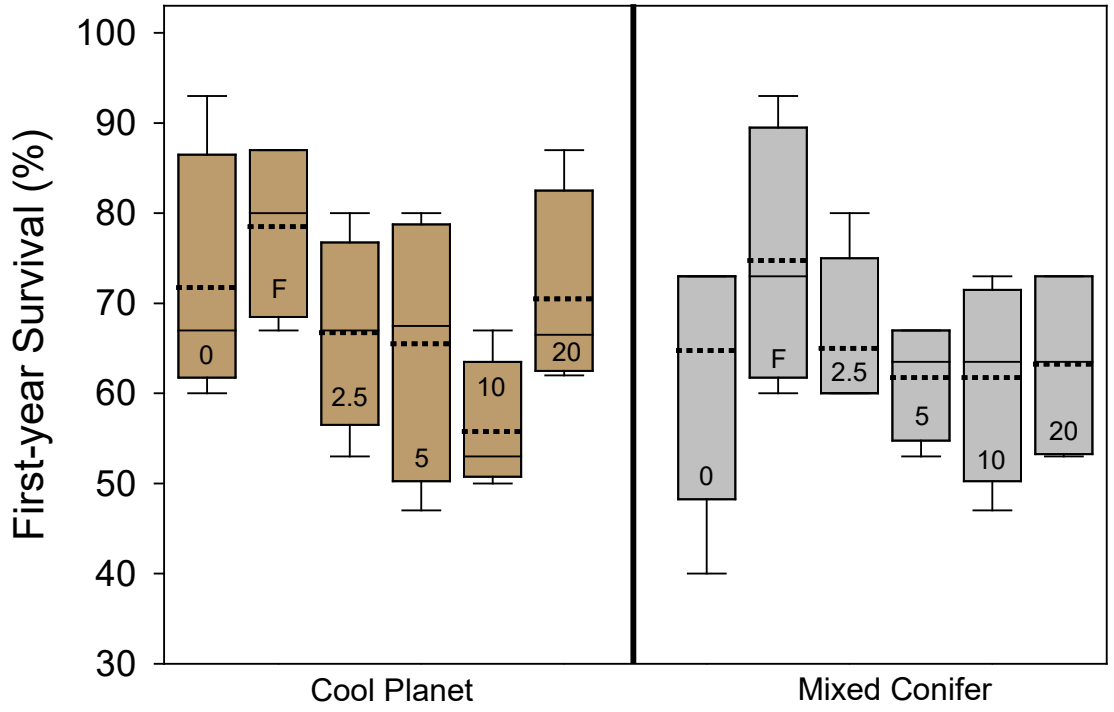
Biochar

- Can this waste product from the production of biofuel be used as a component in container growing medium or an amendment to bareroot nursery soil?
- Potential benefits:
  - Reduce irrigation frequency
  - Replace or reduce use of costlier inorganic materials
  - Increase cation exchange capacity
  - Reduce residues following harvest
  - Carbon sequestration

Presented at 2018 NE&SFCNA meeting by Kas Dumroese

Shortleaf Pine Outplanting Results





No differences between types of biochar or rates
Potential to make adjustments (e.g. more nitrogen)

Presented at 2018 NE&SFCNA meeting by Kas Dumroese

Plant Growth Regulators

Control

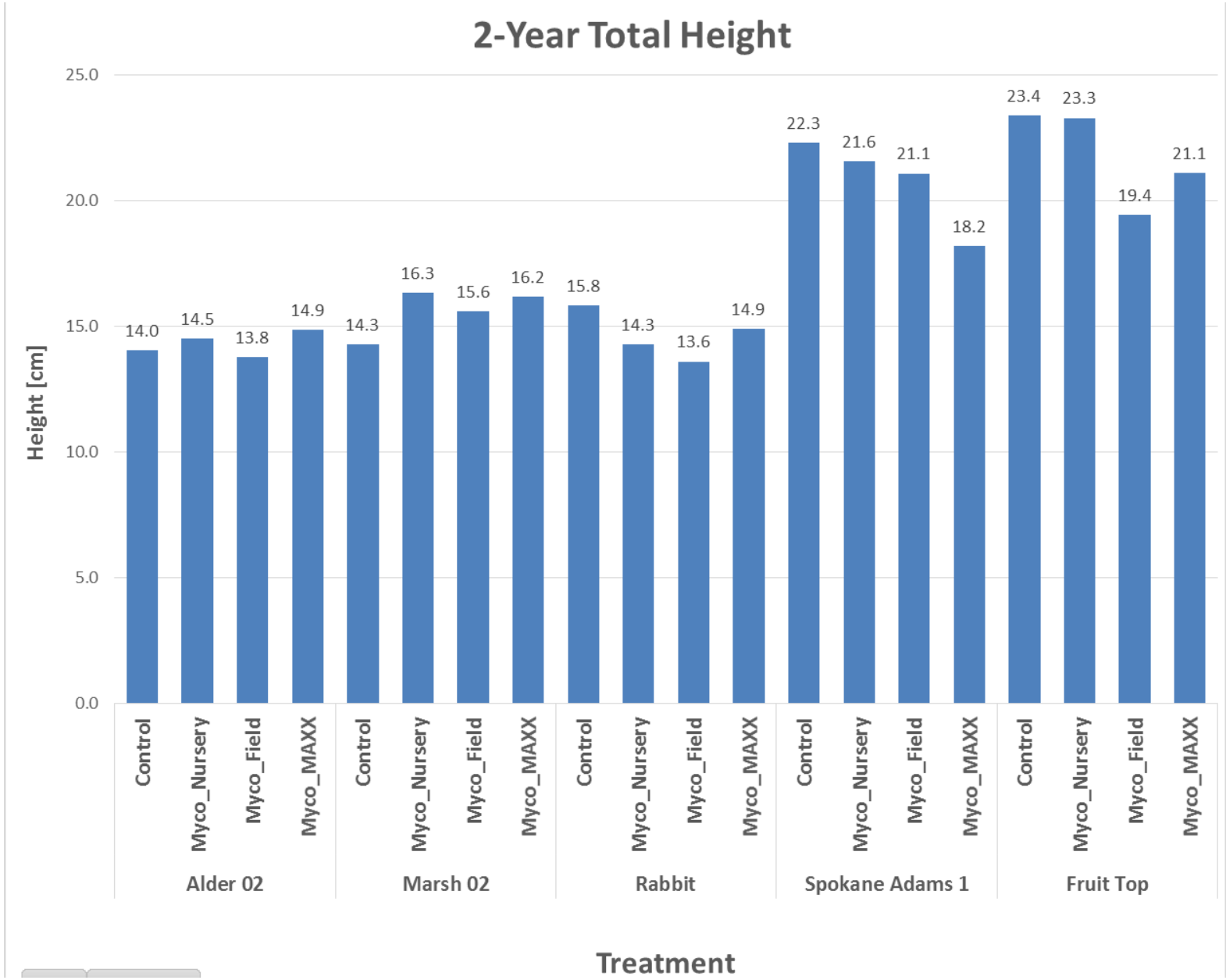
Bonzi PGR

- Improved alder seedling shoot:root
- Higher chlorophyll content
- Easier to handle
- No difference after outplant

Presented at 2018 WFCNA meeting by Nabil Khadduri

Mycorrhizae Revisited

- Does it make a difference in field performance?
  - Results in the literature are mixed
  - Successful trials generally occur on harsh sites (mine spoils, dry sites, etc.)
  - Existing field populations usually colonize seedling roots during first several months after planting

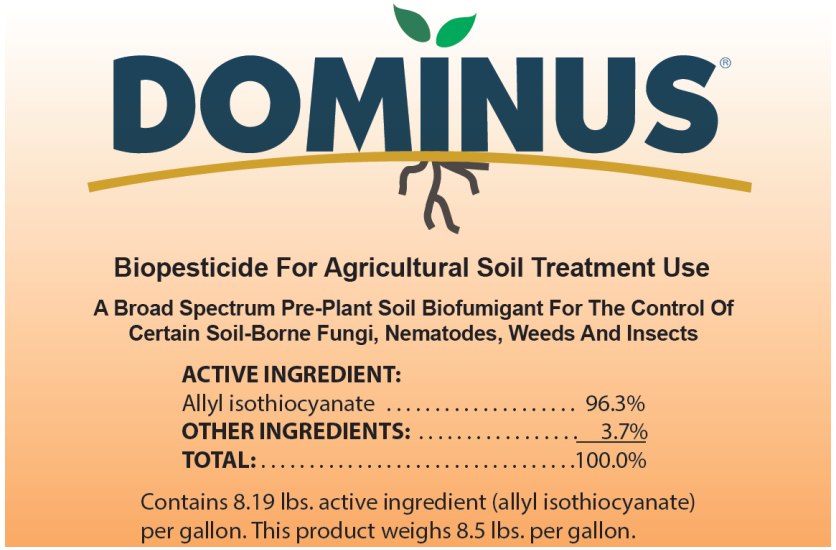


Visual inspection of excavated ponderosa pine roots found no obvious differences in development

Presented at 2017 WFCNA meeting by Florian Deisenhofer

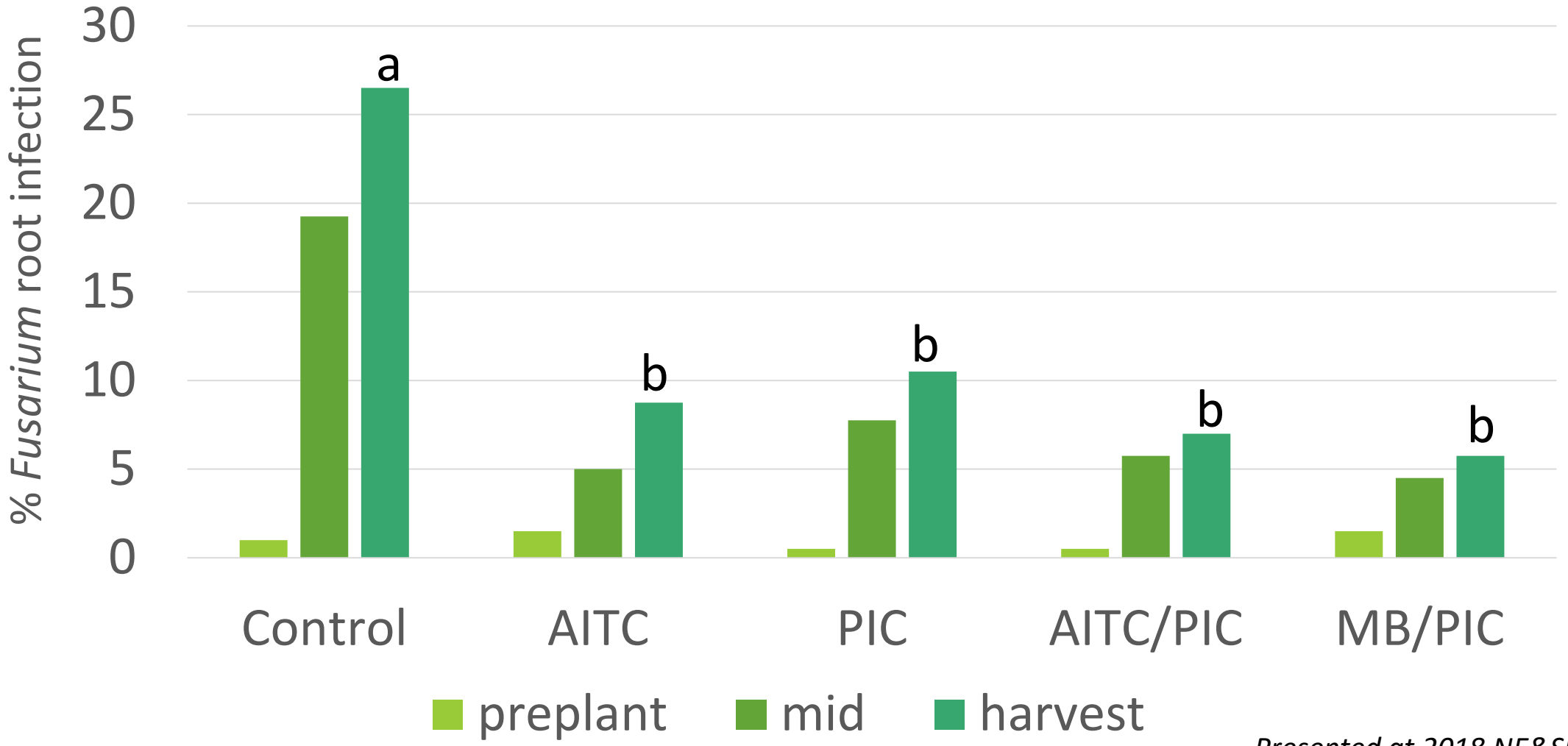
Biofumigation

- Methyl bromide to fumigate bareroot nursery soil for disease, weed, and insect control is slowly on its way out
- Buffer zone restrictions result in reduced area that can be fumigated
- Biofumigation with organic amendments that release volatile products toxic to pathogens
- Dominus was registered by the EPA and requires a 25-ft buffer zone



Presented at 2018 NE&SFCNA meeting by Nabil Khadduri, Anna Leon, and Gary Chastagner

2015-16 Dominus (AITC) trial results - DNR



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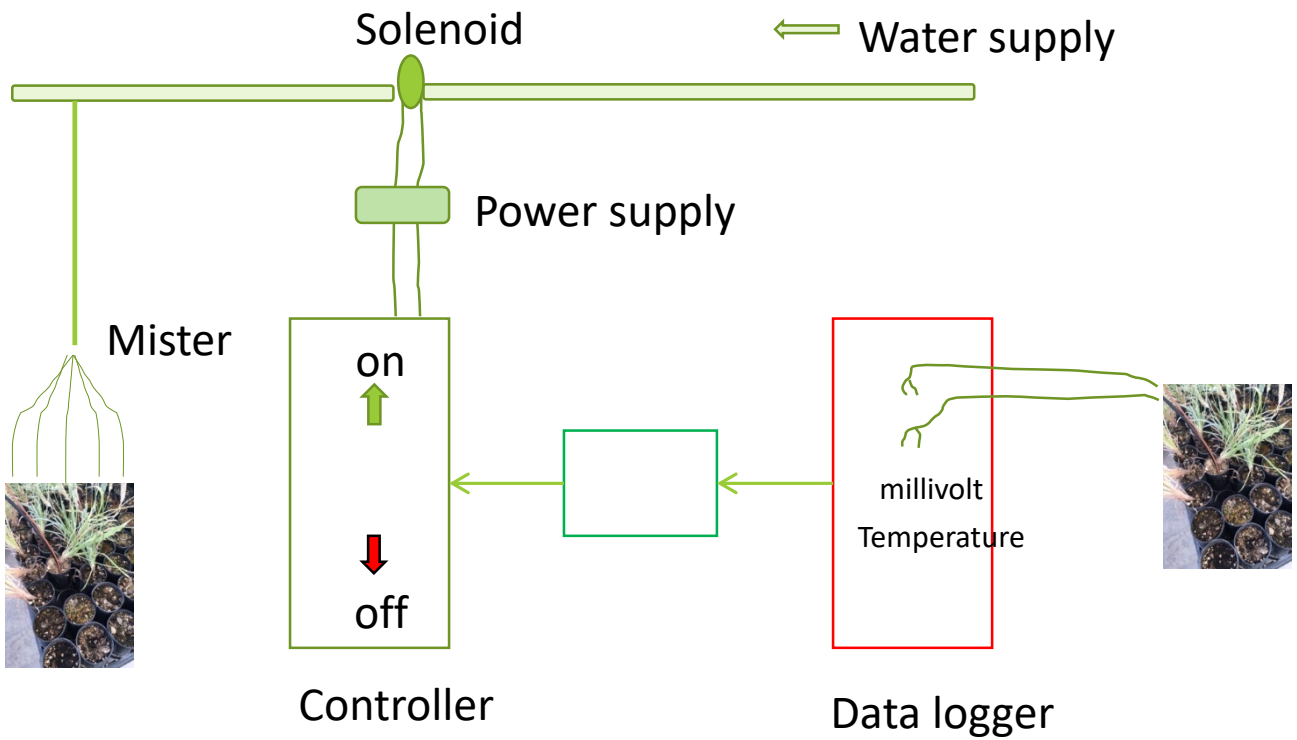
Monitoring Moisture for Irrigation Control

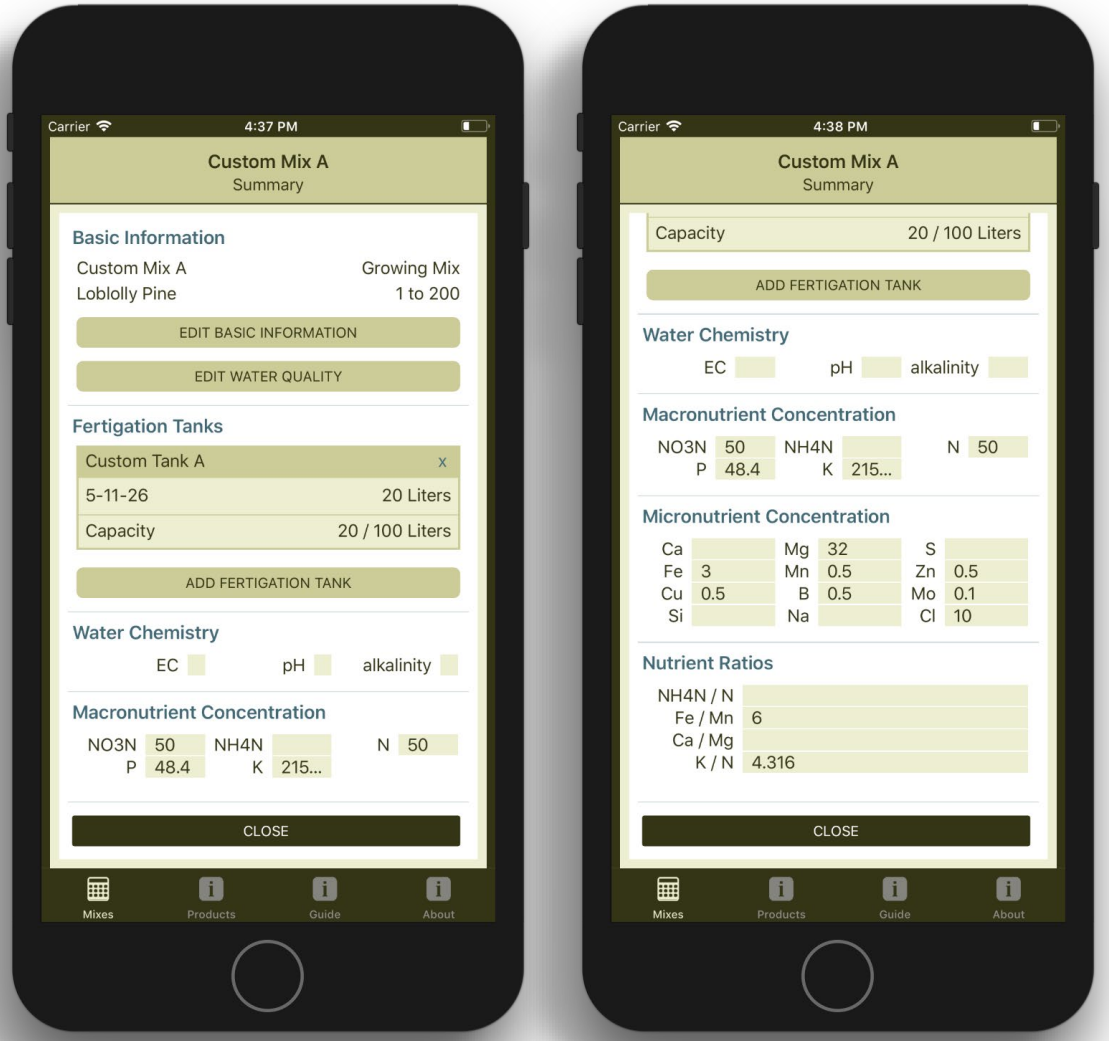


Presented at 2017 NE&SFCNA meeting by Steven LInk

Drummond D, Haase DL. 2016. **Useful Mobile Applications for Nursery and Field Personnel**. Tree Planters' Notes. 59(2): 86-90.

iFertigate

- Custom mixes
- Output:
  - Water Chemistry
  - Macronutrient Concentration
  - Micronutrient Concentration
  - Nutrient Ratios
  - Precipitate Warnings

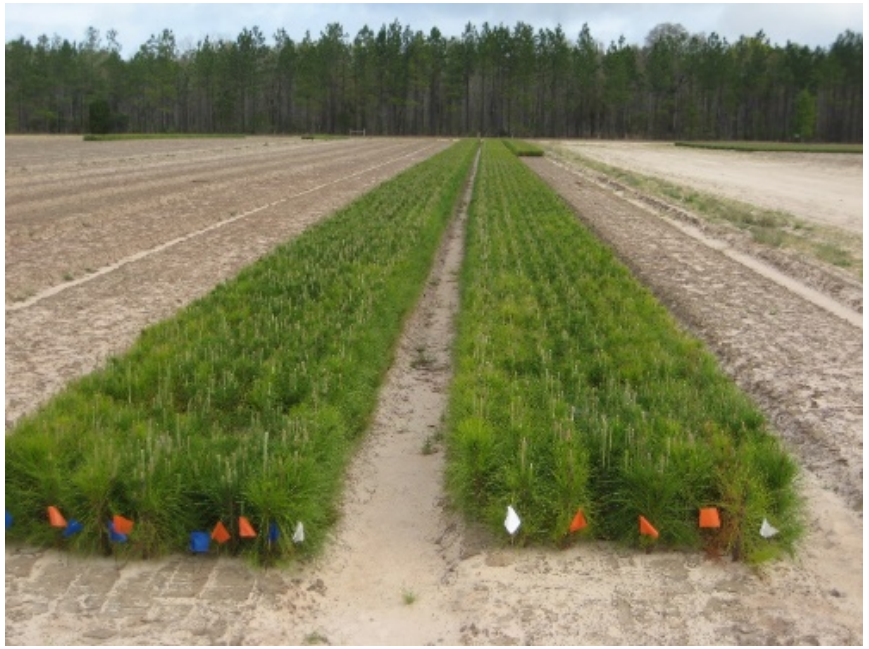


Presented at 2018 WFCNA meeting by Daniel Drummond

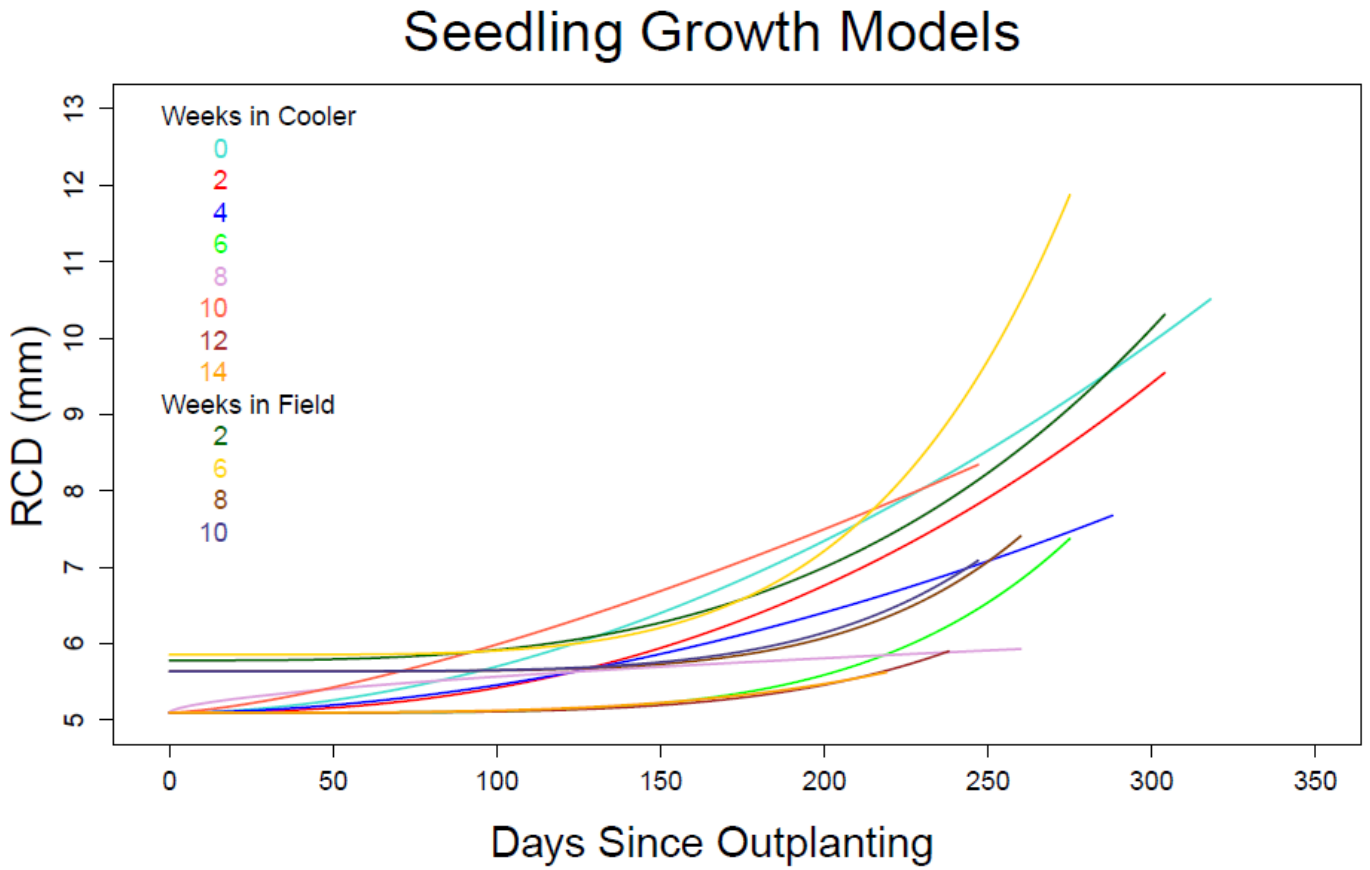
Seedling Quality

- Storage
- Drought tolerance
- Species
- Genetics

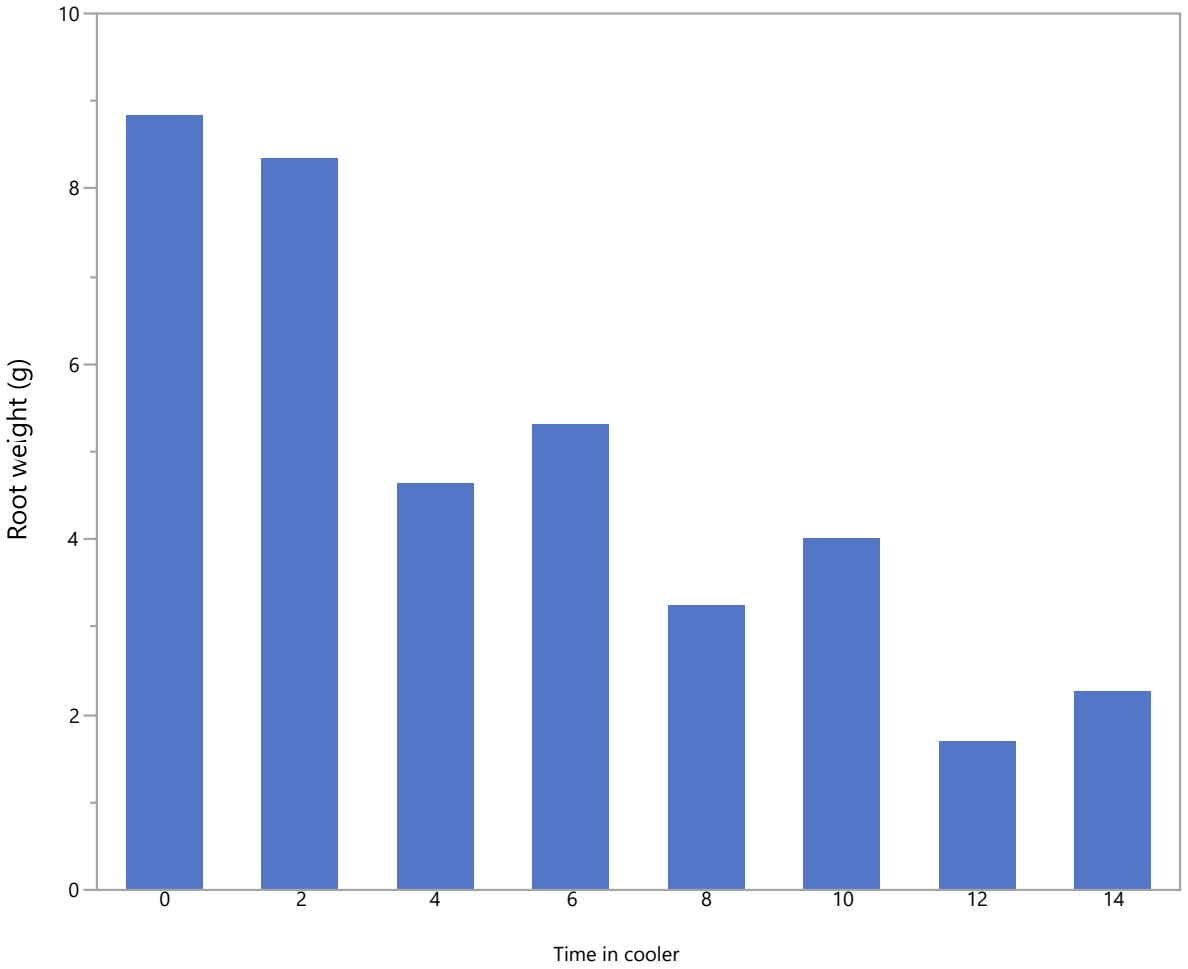
Storage Duration

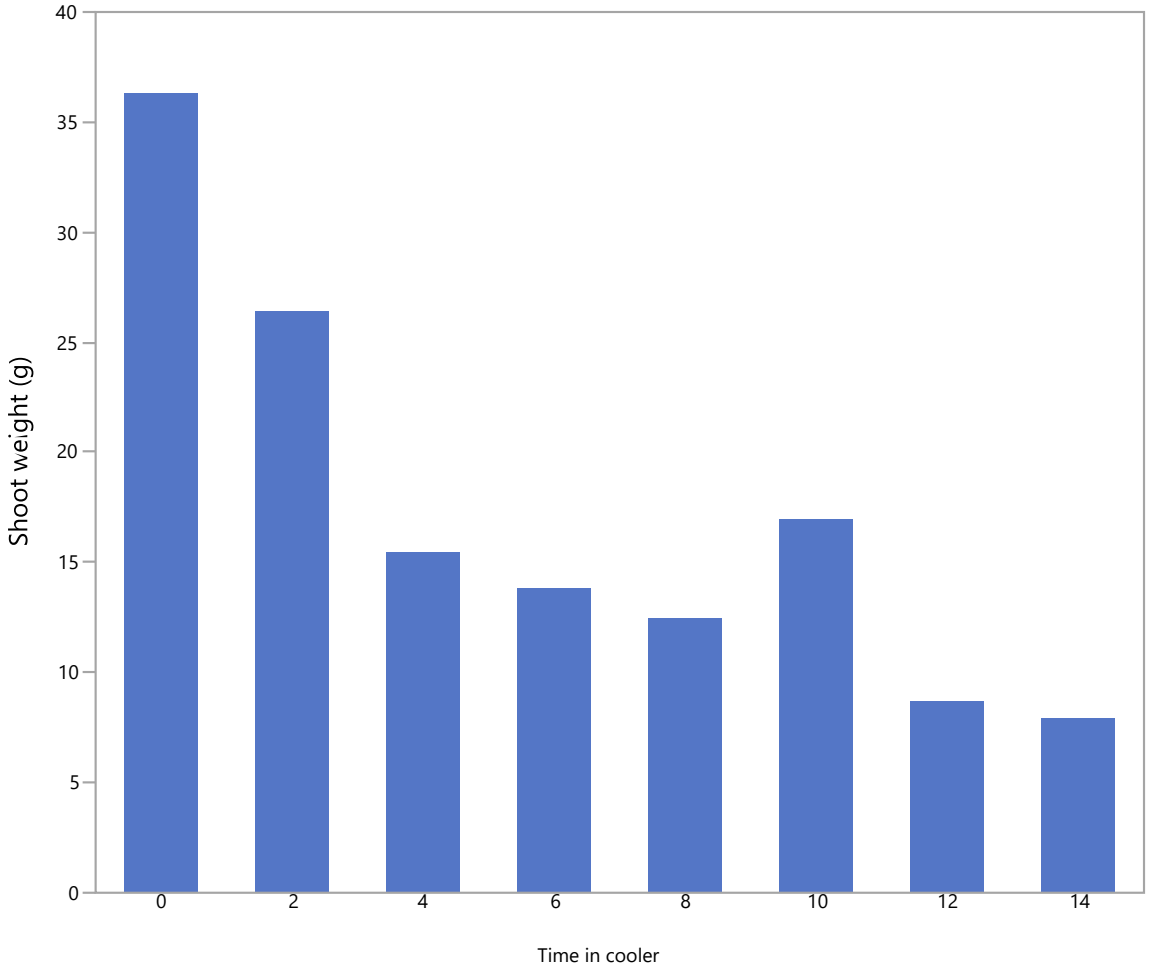


slash pine



Presented at 2018 NE&SFCNA meeting by Ryan Nadel





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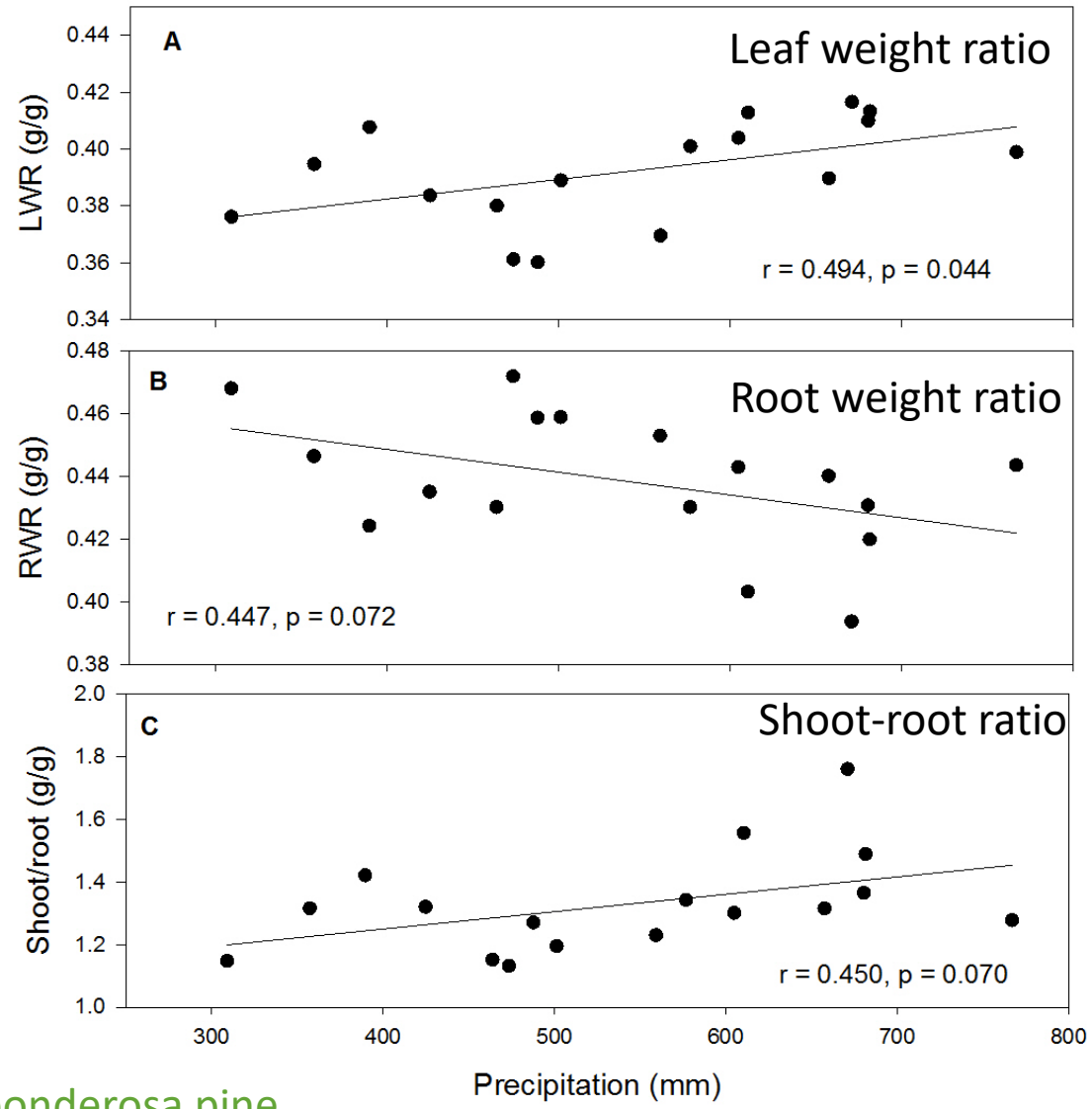
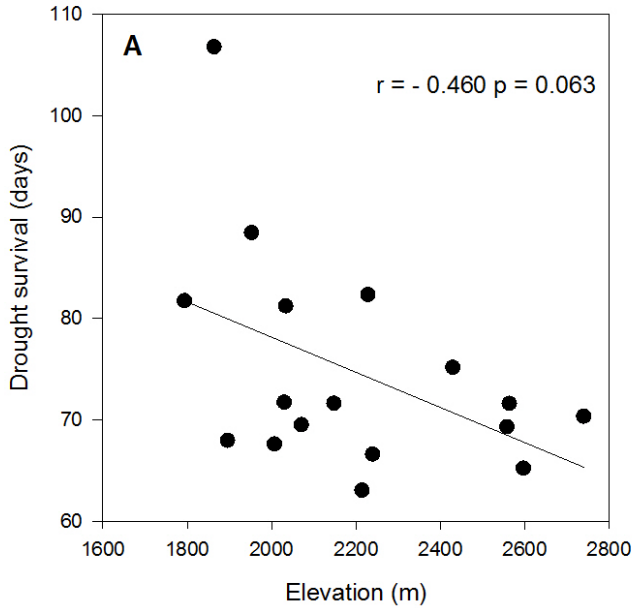
Arid-Adapted Seedlings

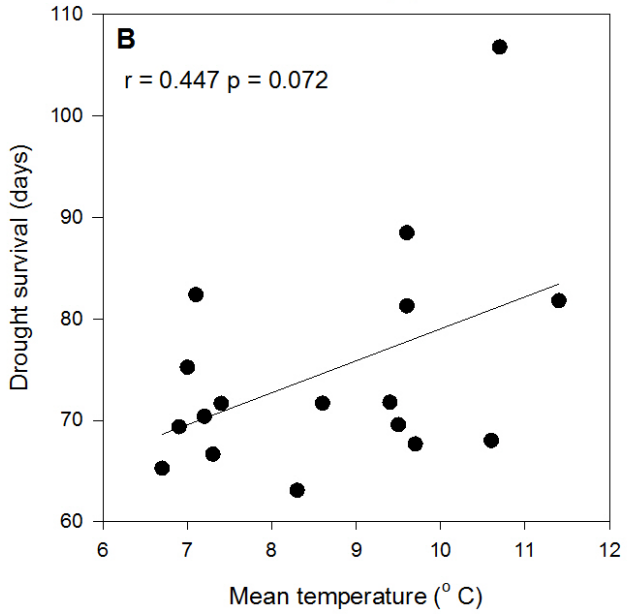


ponderosa pine

Seedlings from dry sites tend to have more roots



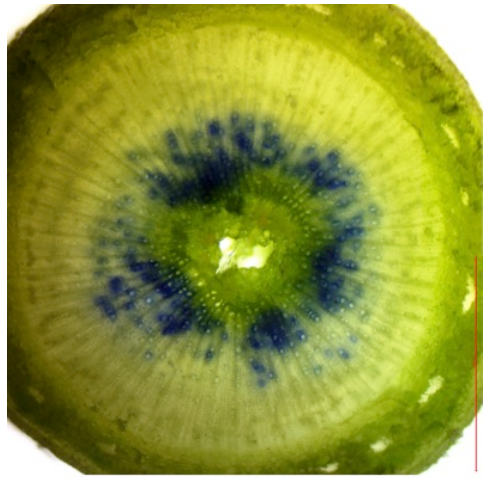
Warmer, low-elevation sites produce the most drought tolerant families

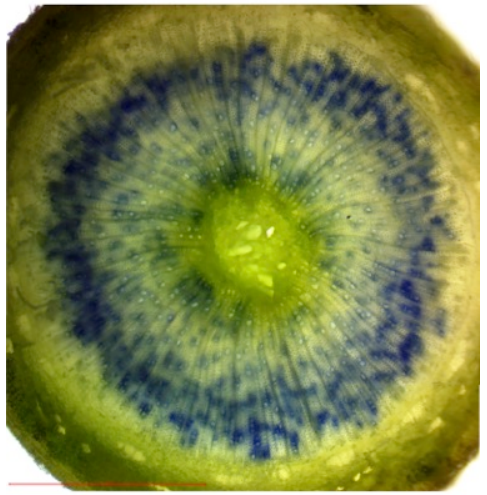


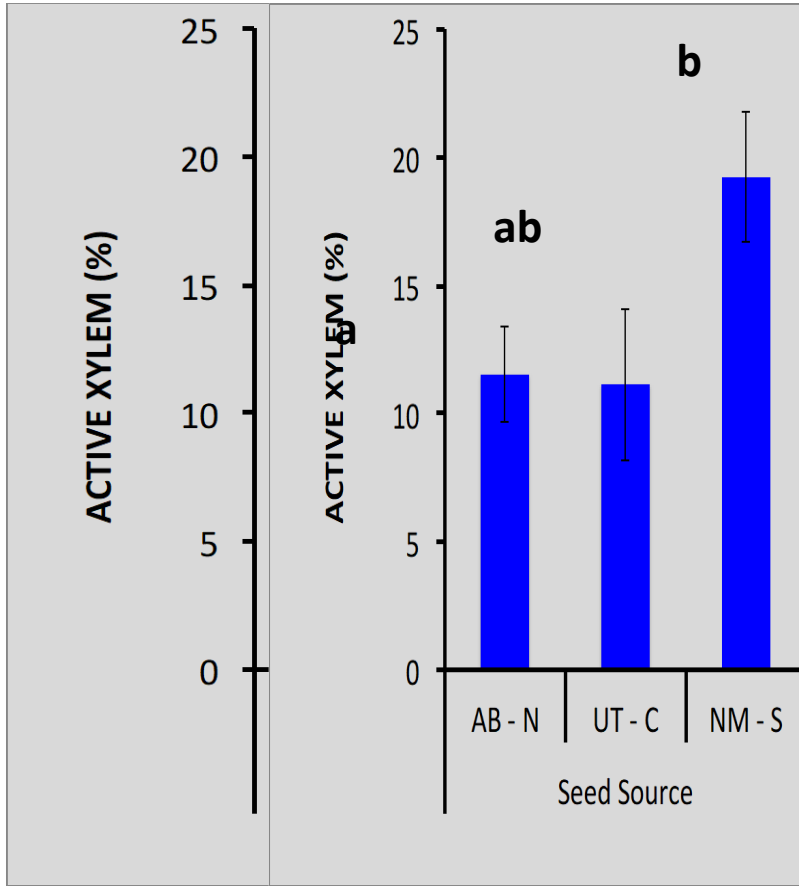
Presented at 2018 WFCNA meeting by Thomas Kolb

Drought Conditioning Study

- Does conditioning alter plant physiology, morphology, and hydraulics?
- Compared with high irrigation treatments, aspen seedlings grown in low irrigation treatments had increased percentage of active xylem and increased height and diameter
- Not influenced by genetics



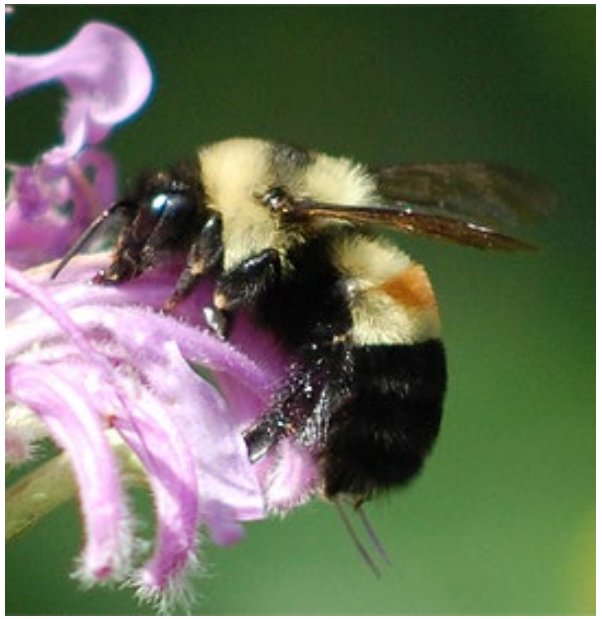




Presented at 2018 WFCNA meeting by Owen Burney

Diverse Species Production for Ecological Function, Cultural Needs, Education

- Plants for pollinators
- Native plant restoration
- To grow and outplant successfully, each species requires knowledge of:
  - Seed zones
  - Germination
  - Irrigation and nutrition
  - Hardening
  - Storage

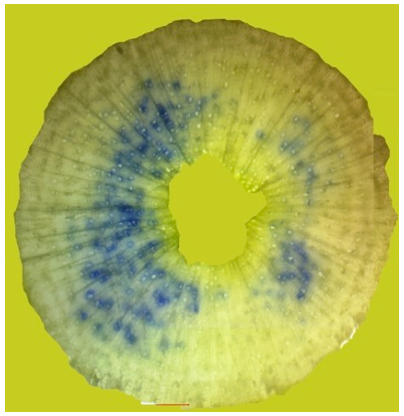


Photos from 2017 NE&SFCNA meeting by Kenneth Pete, Dan Cariveau

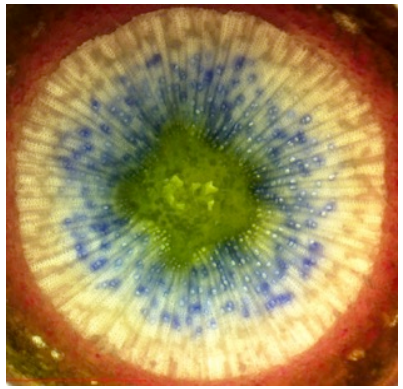
Genetics

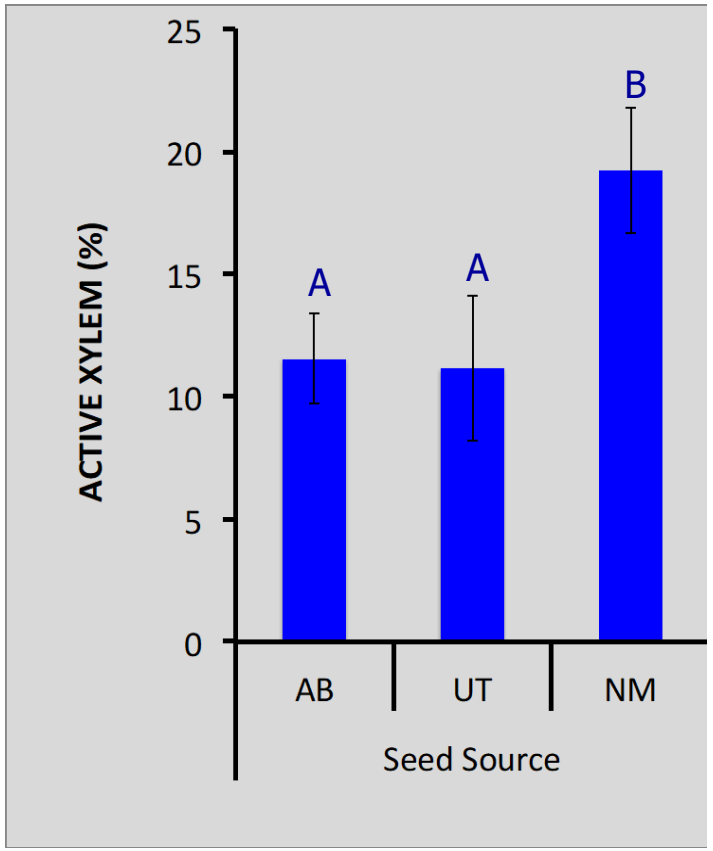
- Pest and disease resistance
- Genetic adaptation
- Assisted migration
  - When? How far?
- Seed orchards
  - Retention? Expansion?

Northern Source



Southern Source





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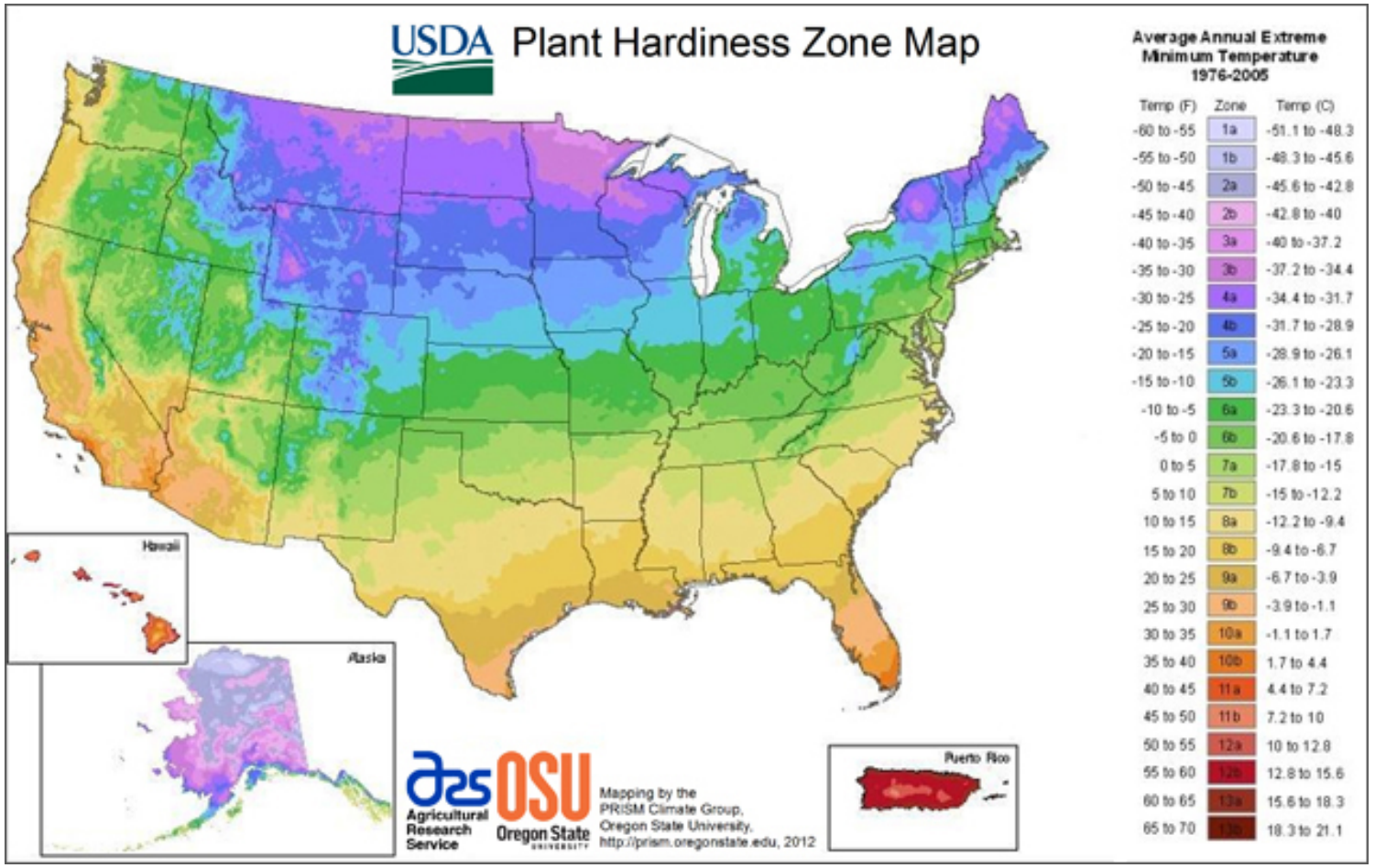
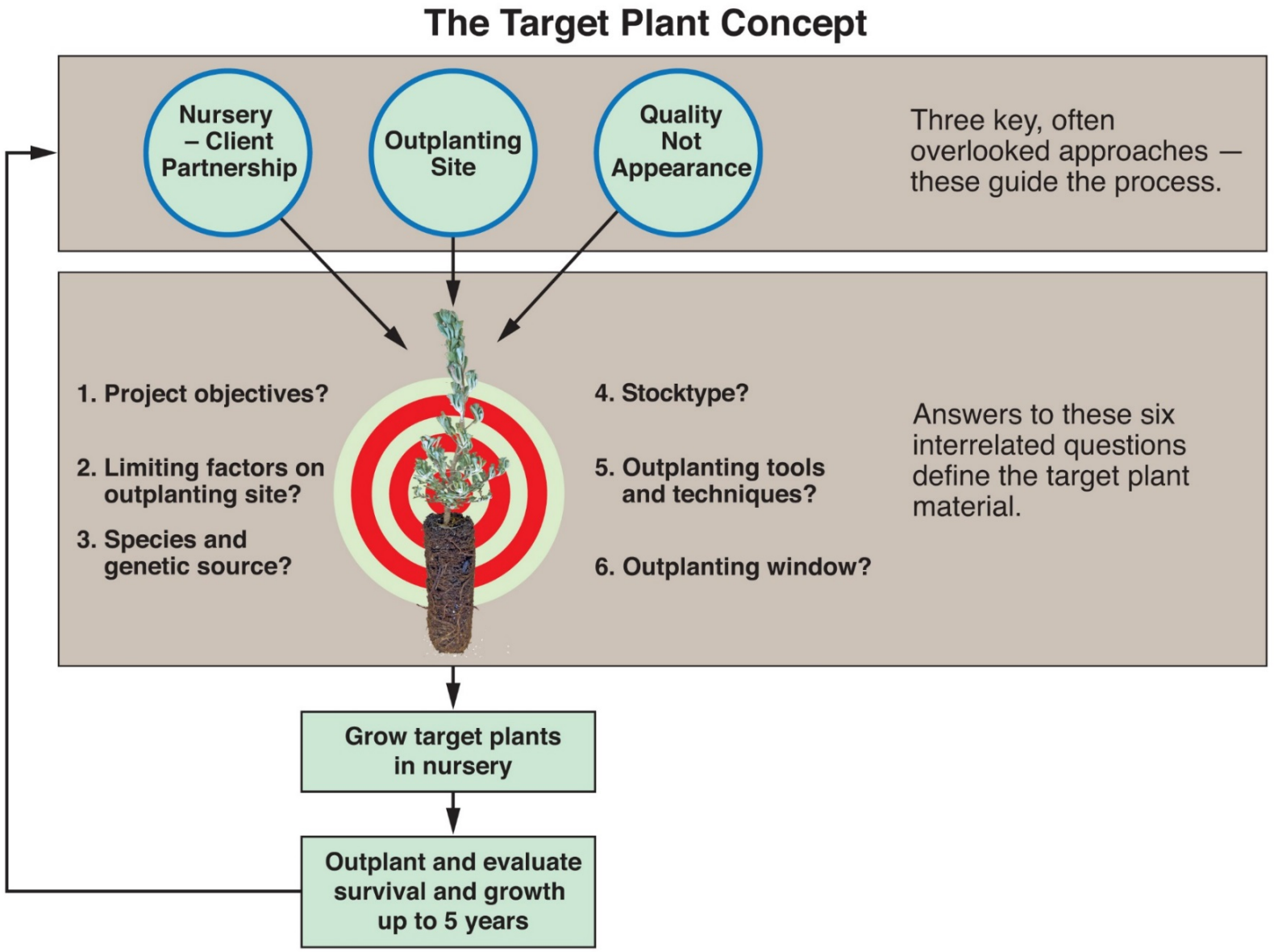
Seed Zones

- Existing zones modified based on climate models
- Expanded range of species being examined
- Development of species-specific seed transfer guidelines



What's Old is New Again !!

The <u>Target Plant Concept</u> is the foundation for quality seedlings, successful establishment, and long-term field performance



TPC = Match the Seedling to the Site!

Stocktype mismatched to shallow soil conditions

Questions?

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