



United States Department of Agriculture

What's New in Nursery Technology?

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Portland, OR



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*



REFORESTATION, NURSERIES, & GENETICS RESOURCES

RNGR

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home

RNGR MISSION:
To supply people who grow forest and conservation seedlings with the very latest technical information.

ABOUT RNGR.net
[Learn more](#) about the RNGR program, its personnel and mission.

POPULAR RNGR.net RESOURCES

- [National Nursery and Seed Directory](#)
- [Intertribal Nursery Council](#)
- [FNN/TPN Subscription Form](#)
- [Native Plant Network](#)
- [Links](#)

UPCOMING EVENTS

Setting Stands Up For Success: From Seed to PCT
Spokane, WA
December 13, 2018
For more information, [click here](#).

Cullowhee Native Plant Conference
Cullowhee, NC
July 17 - 20, 2019
For more information, [click here](#).

[View More Events...](#)

PUBLICATIONS

- **Tree Planters' Notes**
This publication is dedicated to technology transfer and publication of research information relating to nursery production and outplanting of trees, shrubs, and native plants for reforestation, conservation, and restoration.
- **The Container Tree Nursery Manual**
This seven volume set provides a comprehensive overview of topics concerning the production of tree and woody shrub seedlings in containers.
- **Tropical Nursery Manual**
A Guide to Starting and Operating a Nursery for Native and Traditional Plants
This comprehensive manual serves people who are starting or operating a nursery for native and traditional species in the tropics. Key concepts, principles, and processes are presented, based on proven practices and the best science available.
- **The Woody Plant Seed Manual**
General principles such as seed biology, harvesting, storage, testing as well as nursery practices.

RNGR.net includes a repository of approximately 12,000 searchable and downloadable articles relevant to nursery production, seedling quality, reforestation, tree improvement, germplasm conservation, and native plant restoration. [Click here](#) for more publications.

Admin Log in

RNGR.net is sponsored by the [USDA Forest Service](#) and [Southern Regional Extension Forestry](#) and is a collaborative effort between these two agencies.




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



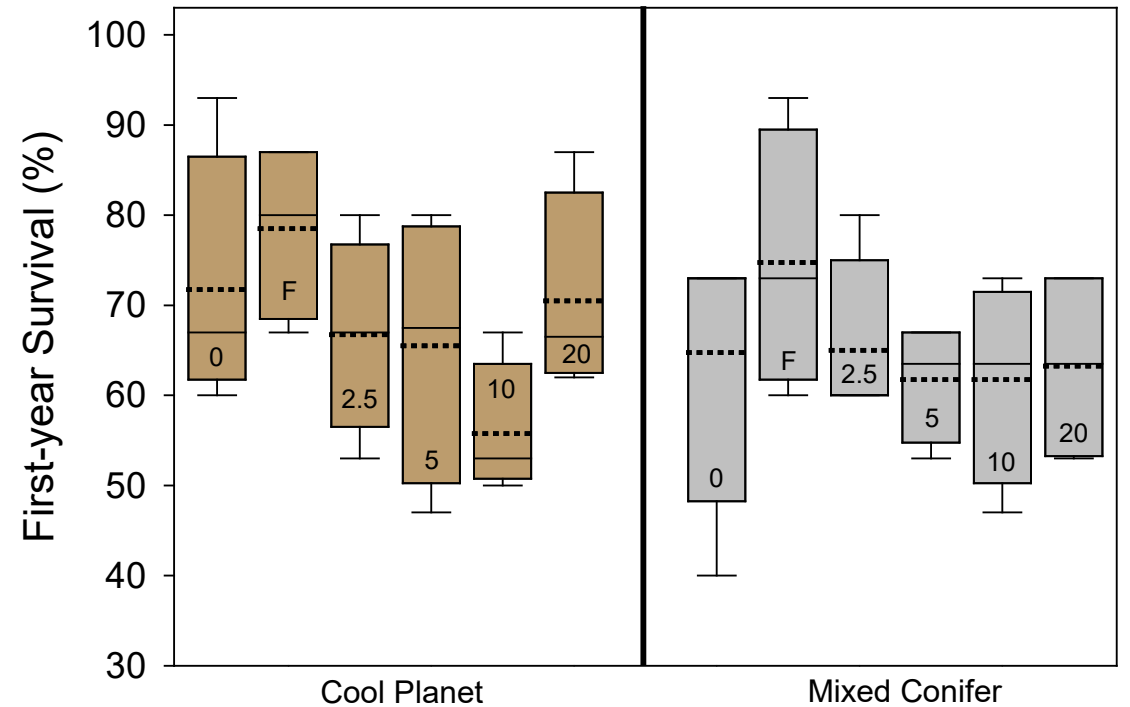
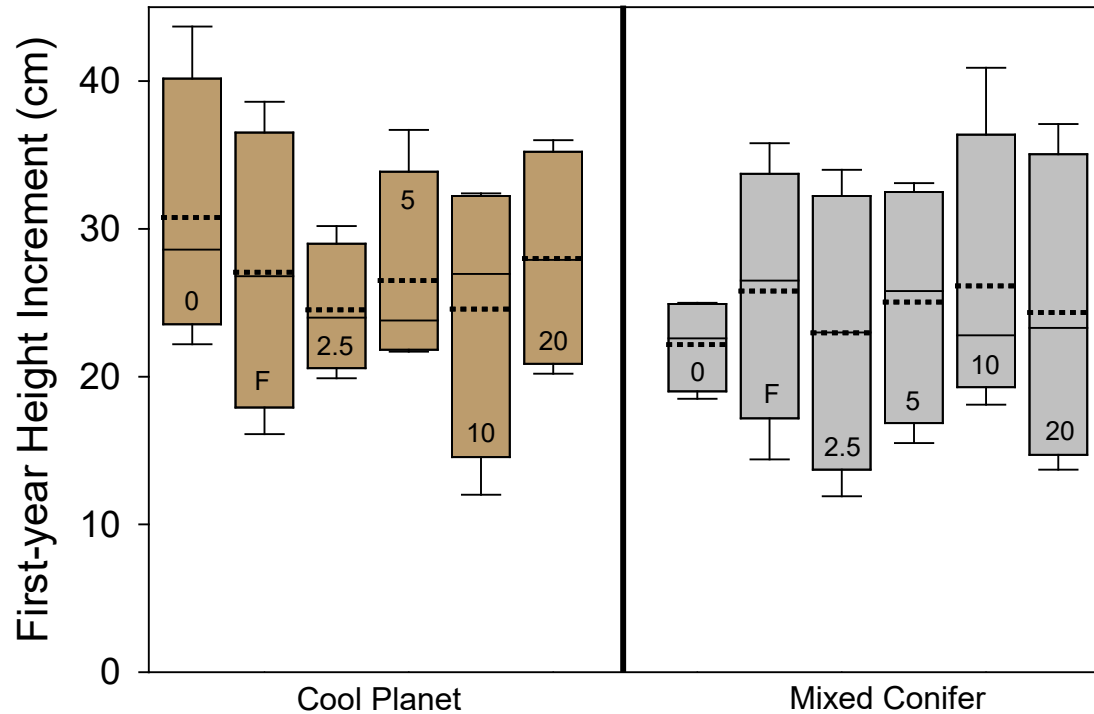
Biochar

- 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

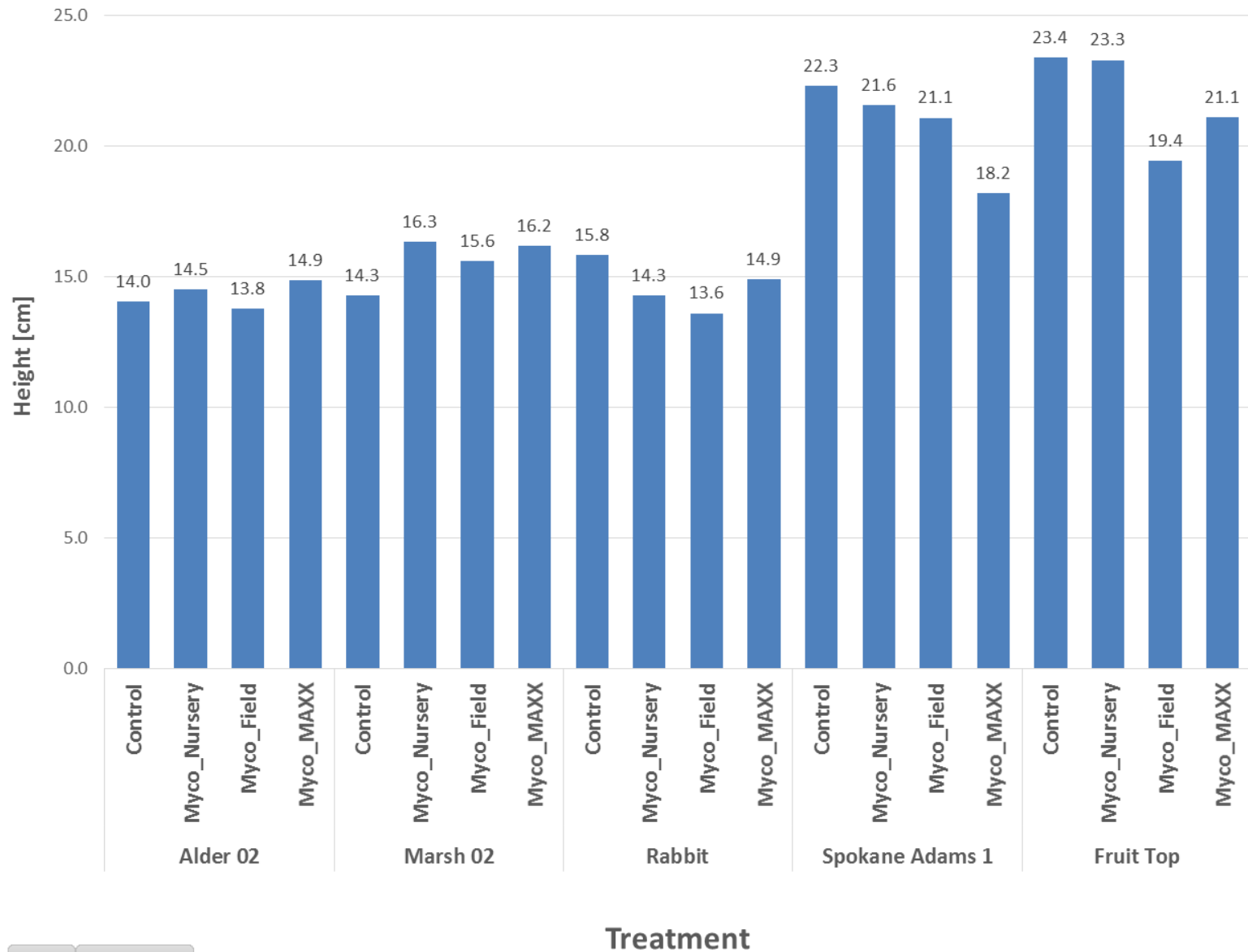
Presented at 2018 WFCNA meeting by Nabil Khadduri

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



2-Year Total Height




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



DOMINUS[®]

Biopesticide For Agricultural Soil Treatment Use

A Broad Spectrum Pre-Plant Soil Biofumigant For The Control Of Certain Soil-Borne Fungi, Nematodes, Weeds And Insects

ACTIVE INGREDIENT:
Allyl isothiocyanate 96.3%

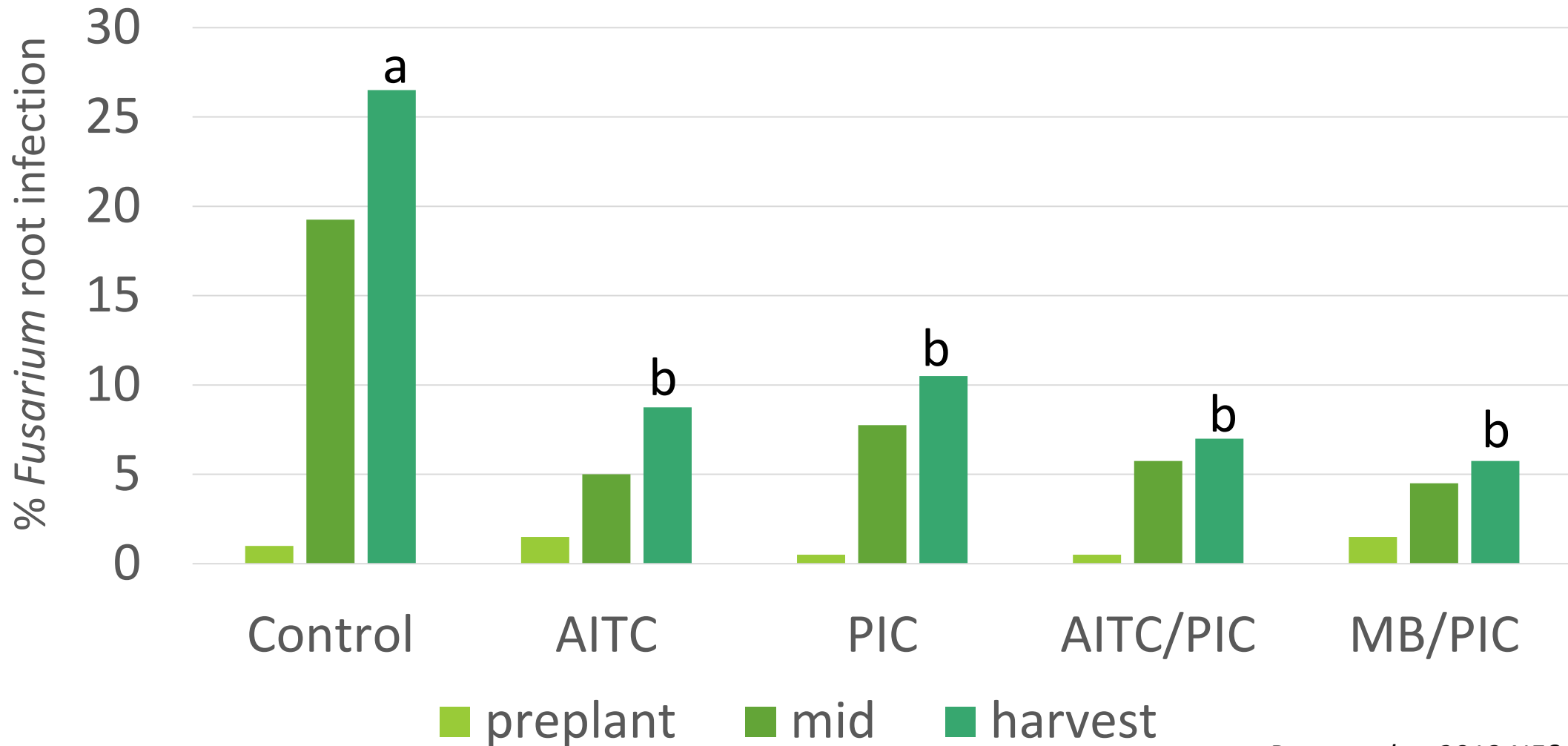
OTHER INGREDIENTS: 3.7%

TOTAL: 100.0%

Contains 8.19 lbs. active ingredient (allyl isothiocyanate) per gallon. This product weighs 8.5 lbs. per gallon.

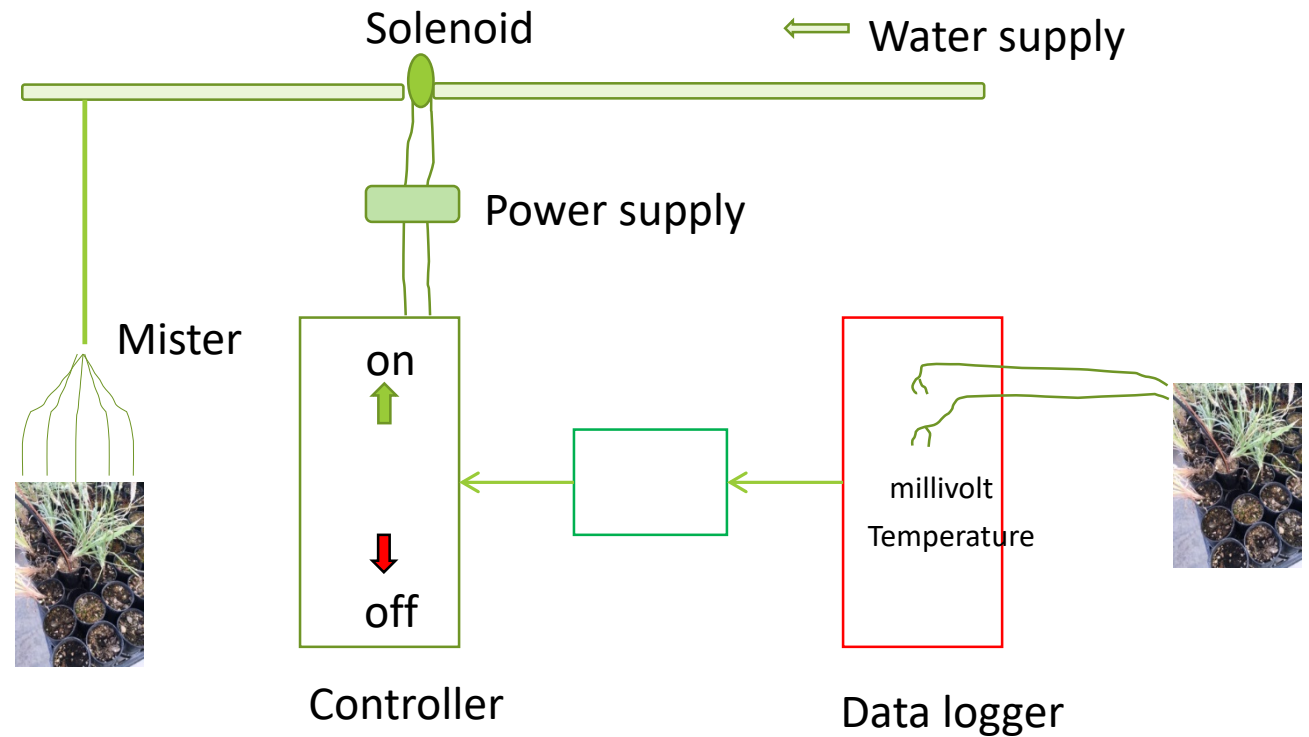
*Presented at 2018 NE&SFCNA meeting
by Nabil Khadduri, Anna Leon, and
Gary Chastagner*

2015-16 Dominus (AITC) trial results - DNR



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

Monitoring Moisture for Irrigation Control



*Presented at 2017 NE&SFCNA meeting
by Steven Link*

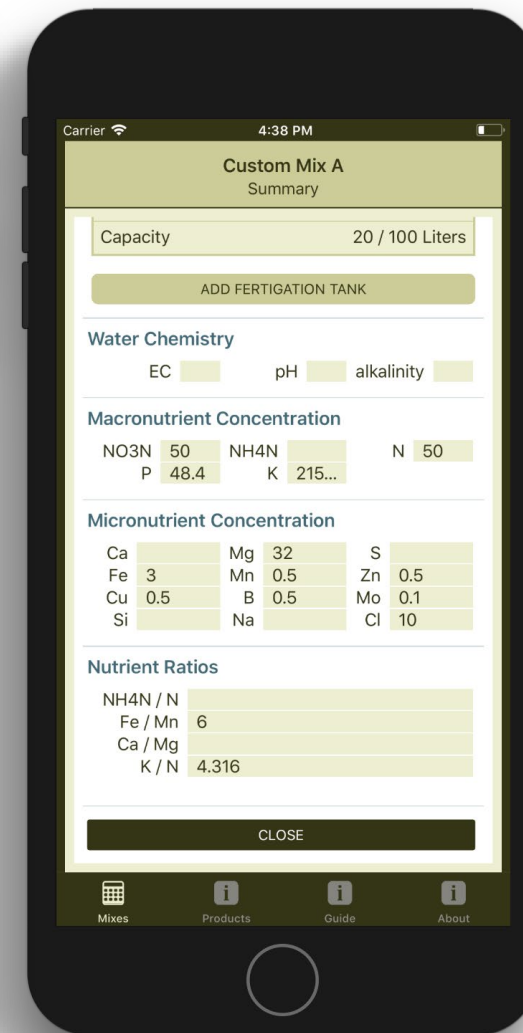
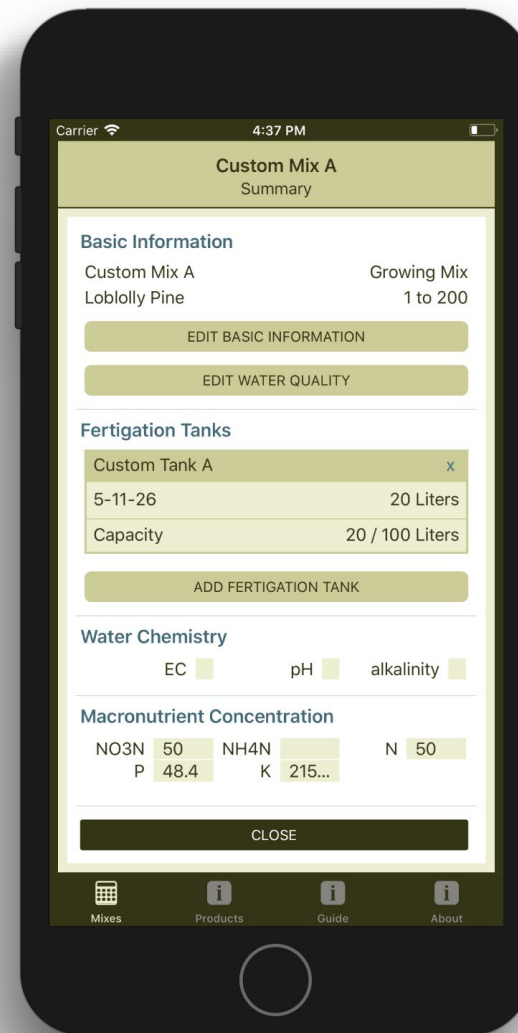


Drummond D, Haase DL. 2016. **Useful Mobile Applications for Nursery and Field Personnel.** Tree Planters' Notes. 59(2): 86-90.



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

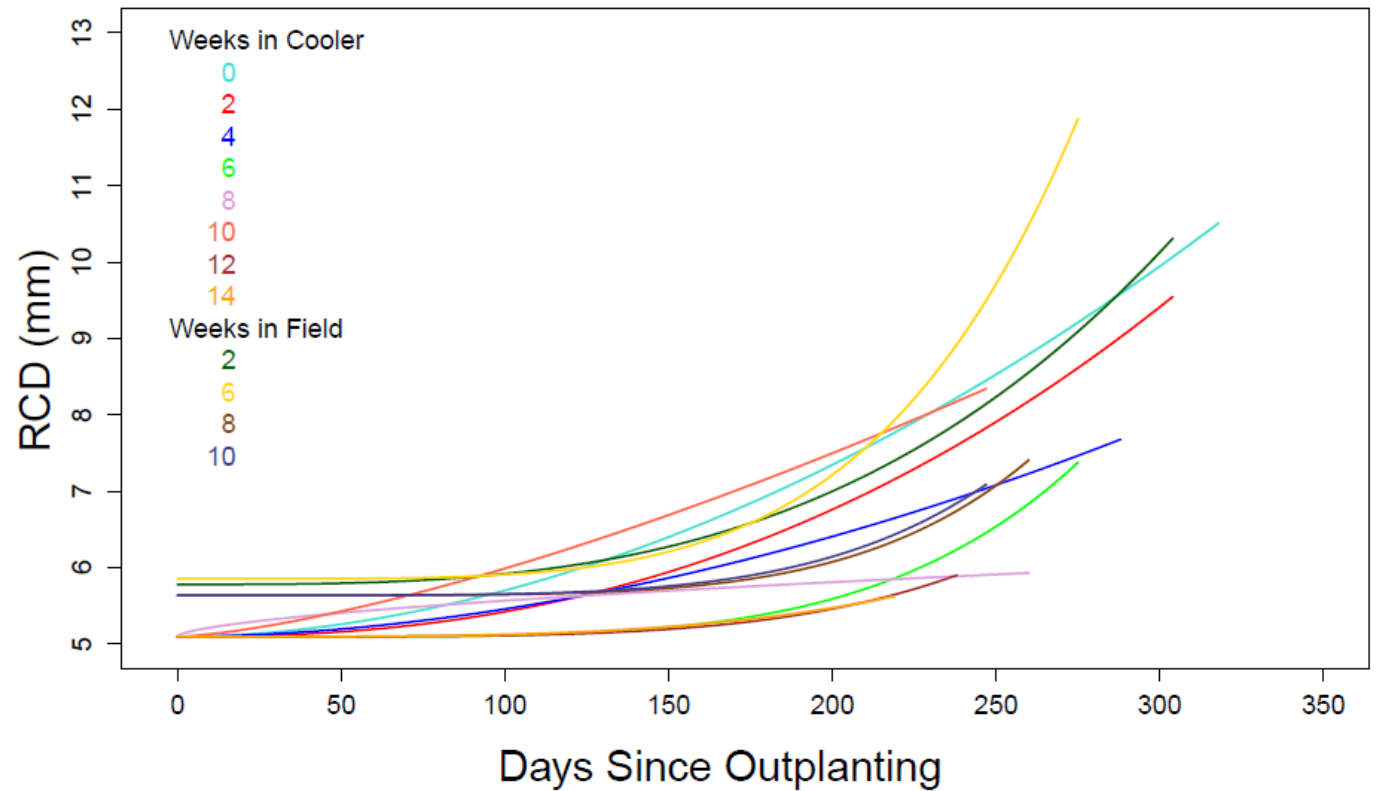


Storage Duration

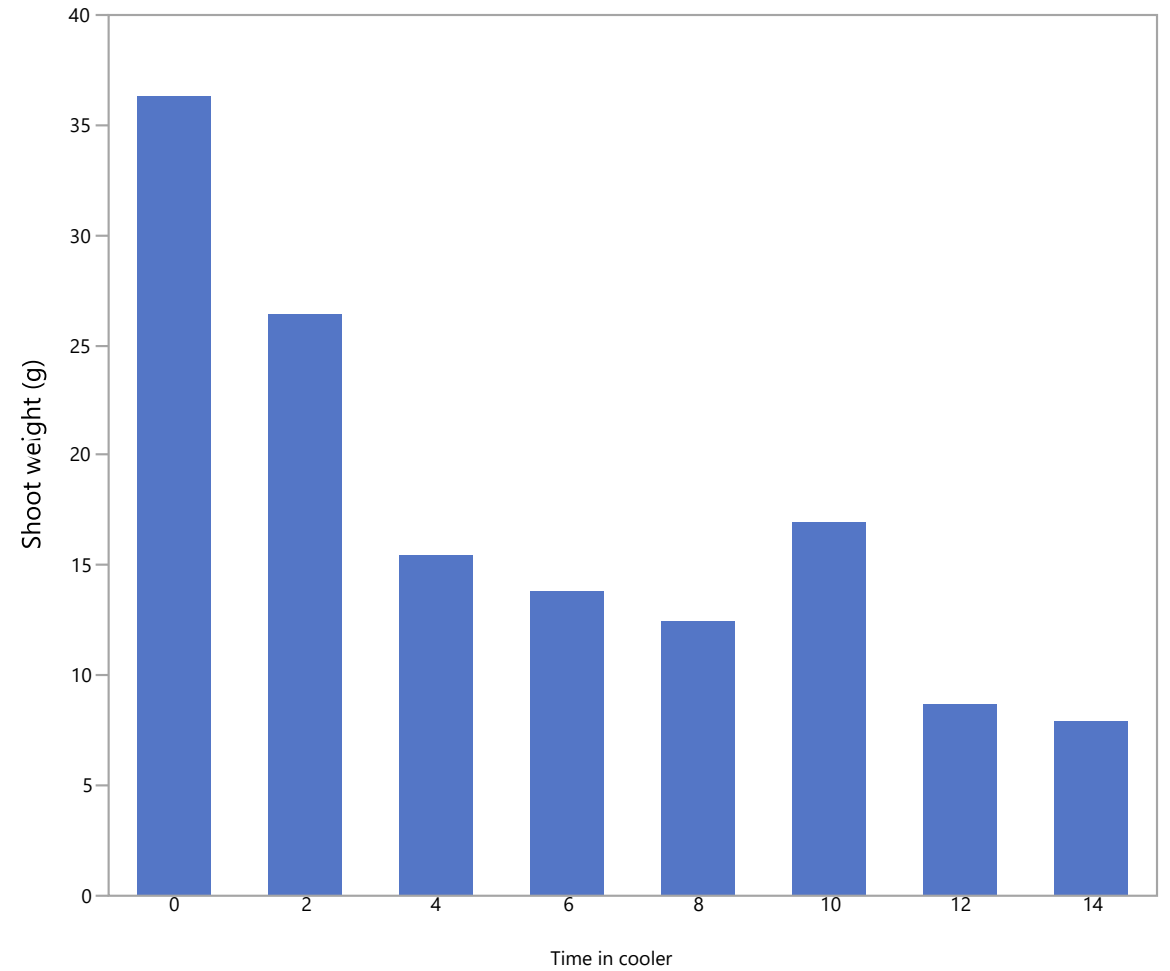
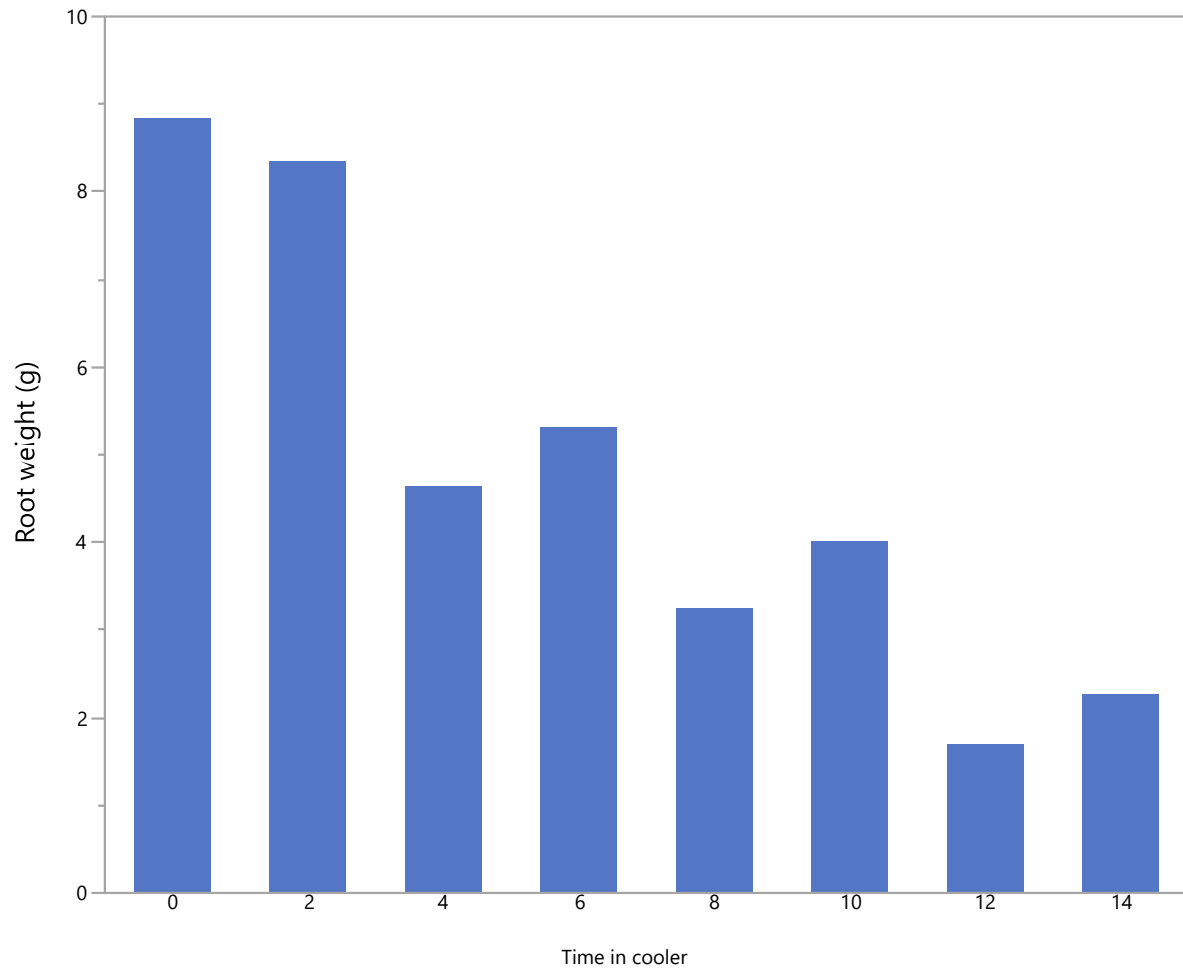


slash pine

Seedling Growth Models

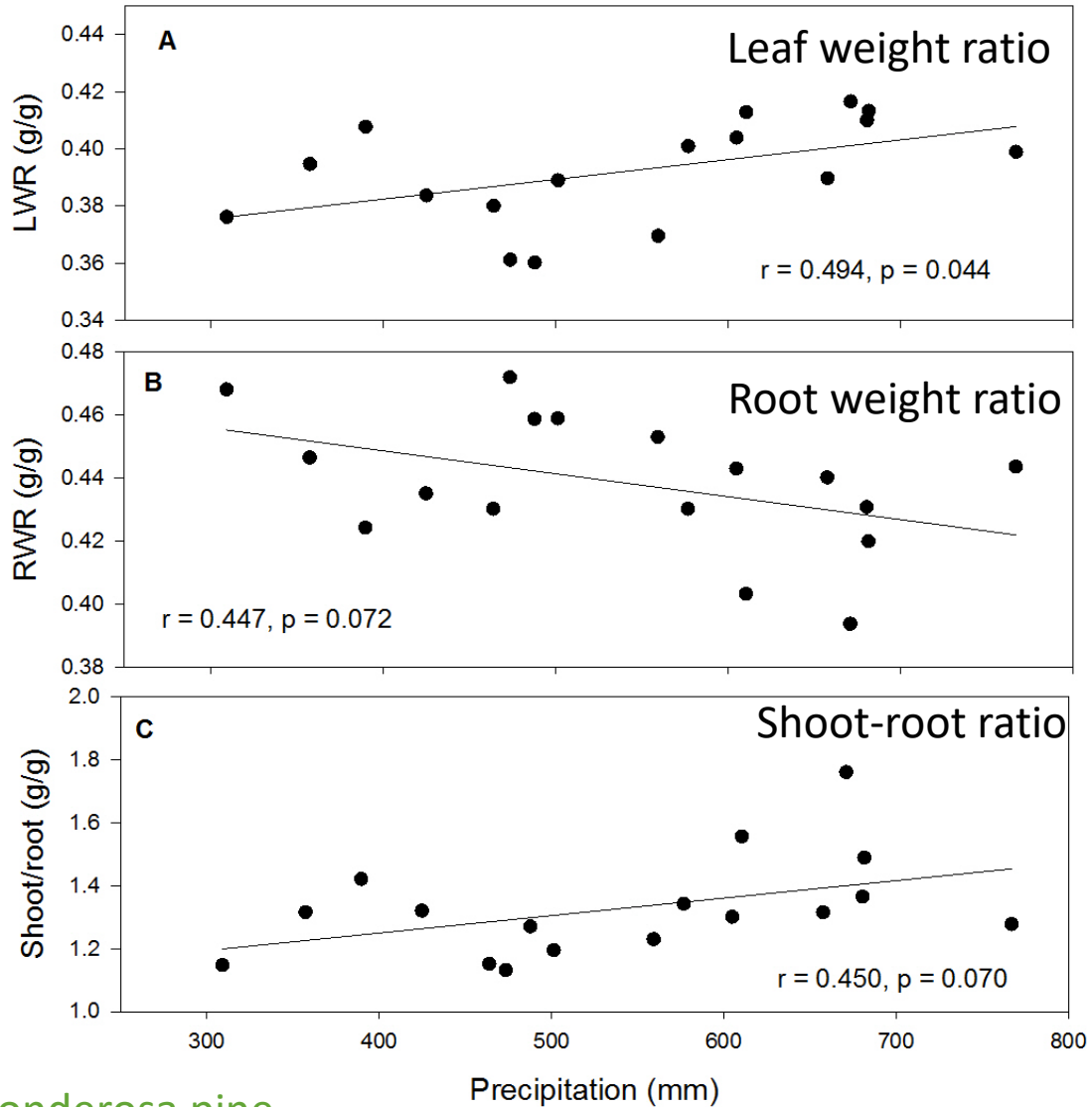


*Presented at 2018 NE&SFCNA
meeting by Ryan Nadel*



*Presented at 2018 NE&SFCNA
meeting by Ryan Nadel*

Arid-Adapted Seedlings

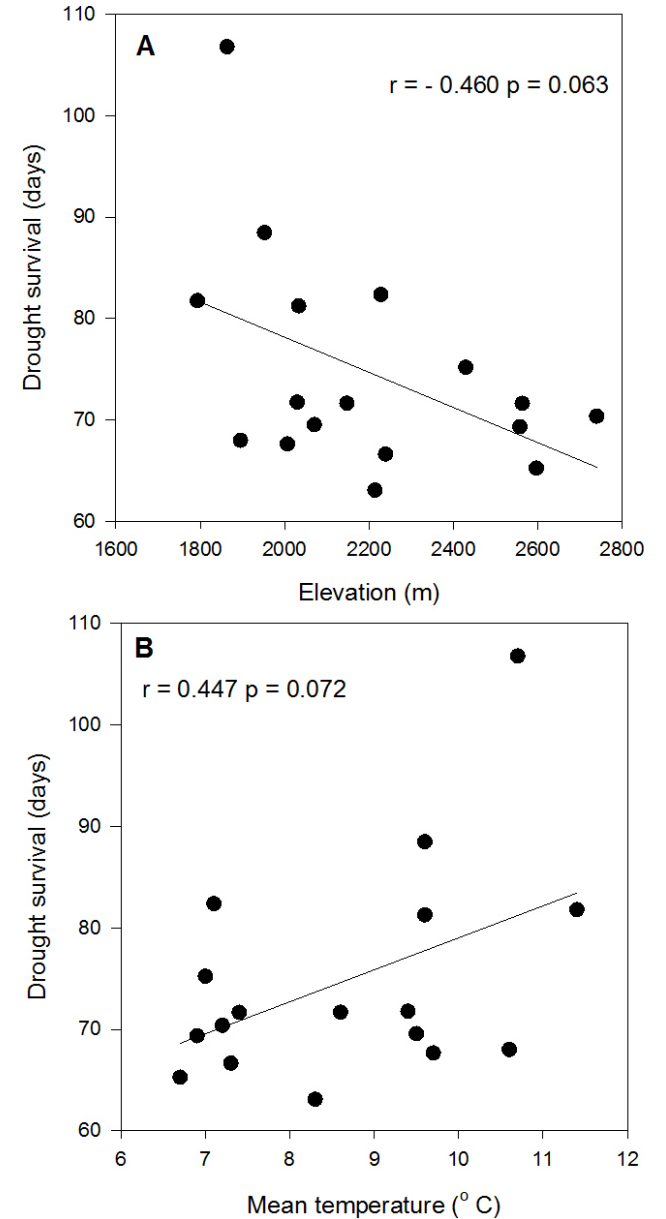


Seedlings from dry sites tend to have more roots



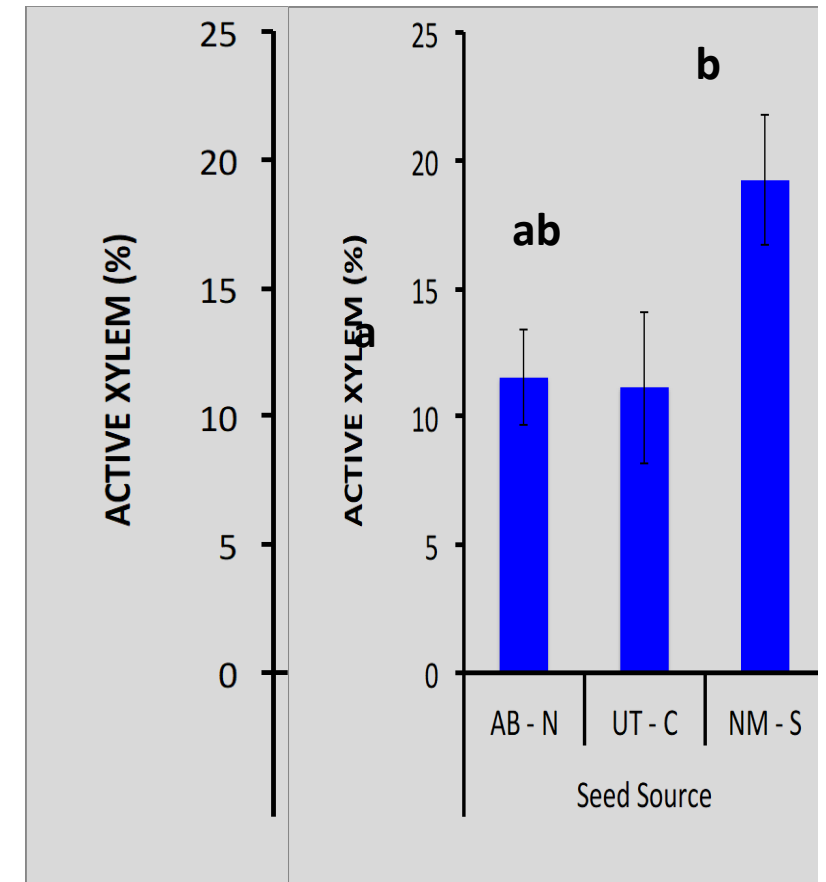
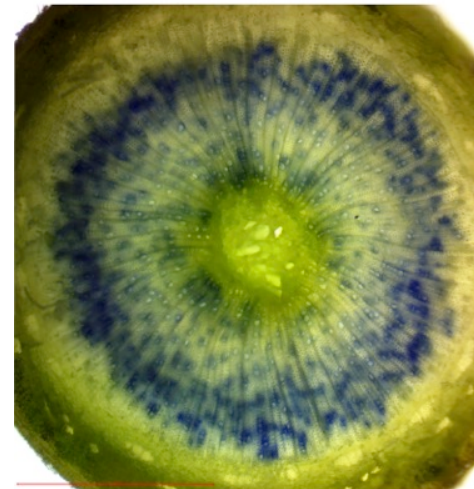
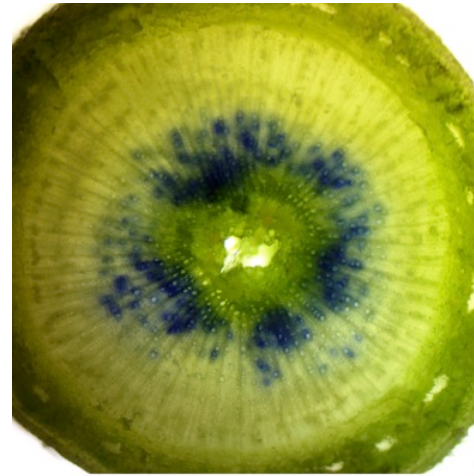
Warmer, low-elevation sites produce the most drought tolerant families

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



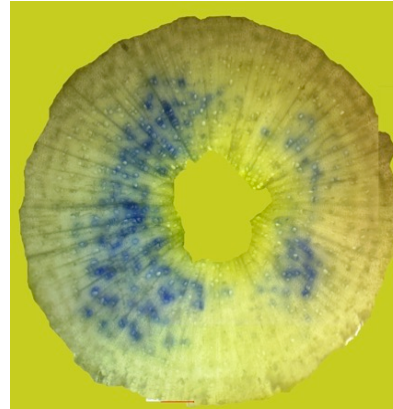
*Photos from 2017 NE&SFCNA meeting
by Kenneth Pete, Dan Cariveau*

Genetics

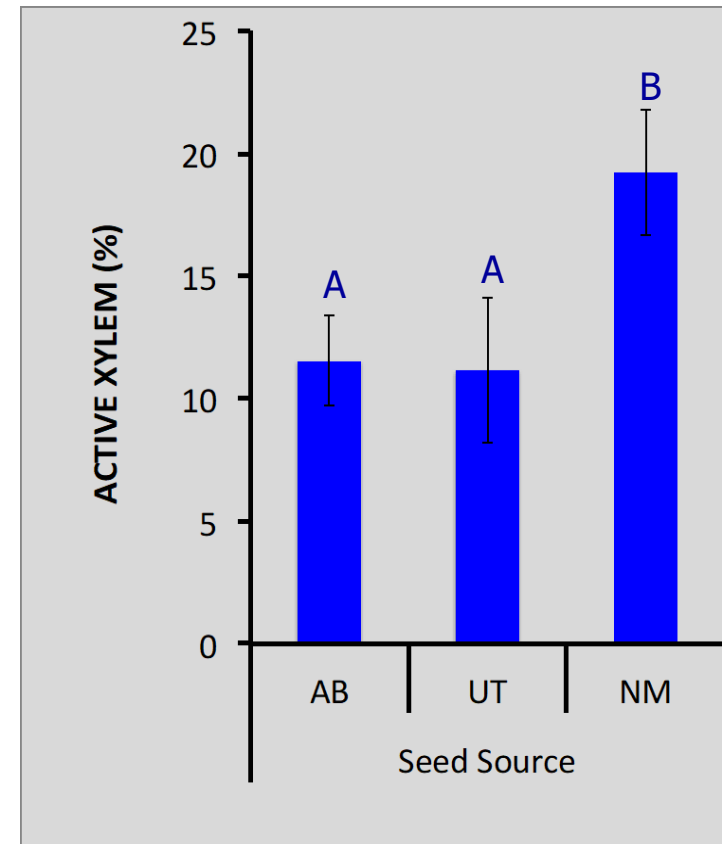
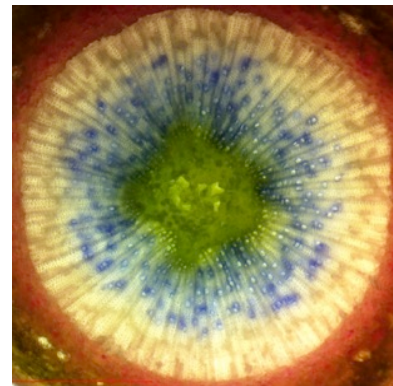


- Pest and disease resistance
- Genetic adaptation
- Assisted migration
 - When? How far?
- Seed orchards
 - Retention? Expansion?

Northern Source



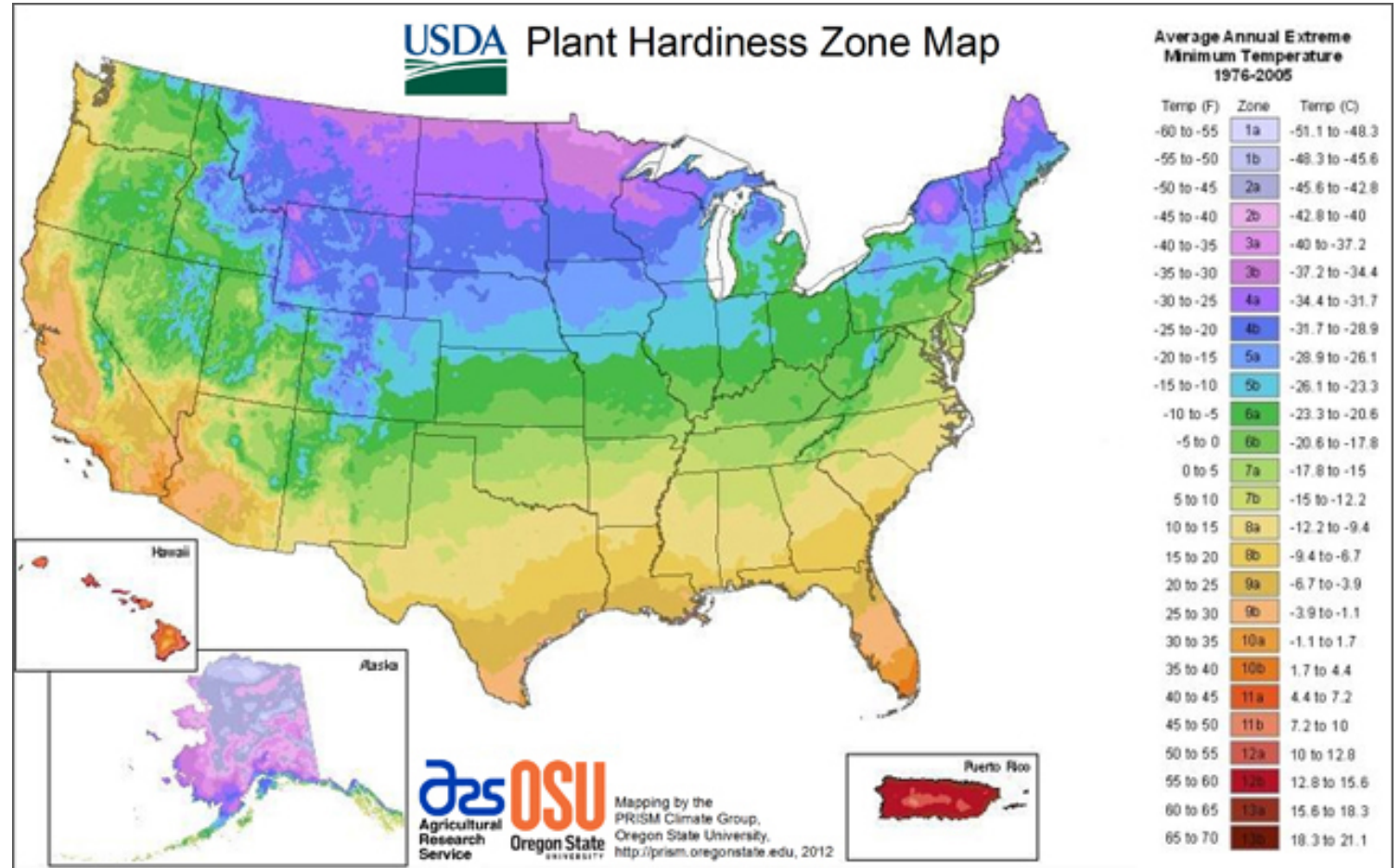
Southern Source



Presented at 2017 WFCNA meeting by Owen Burney

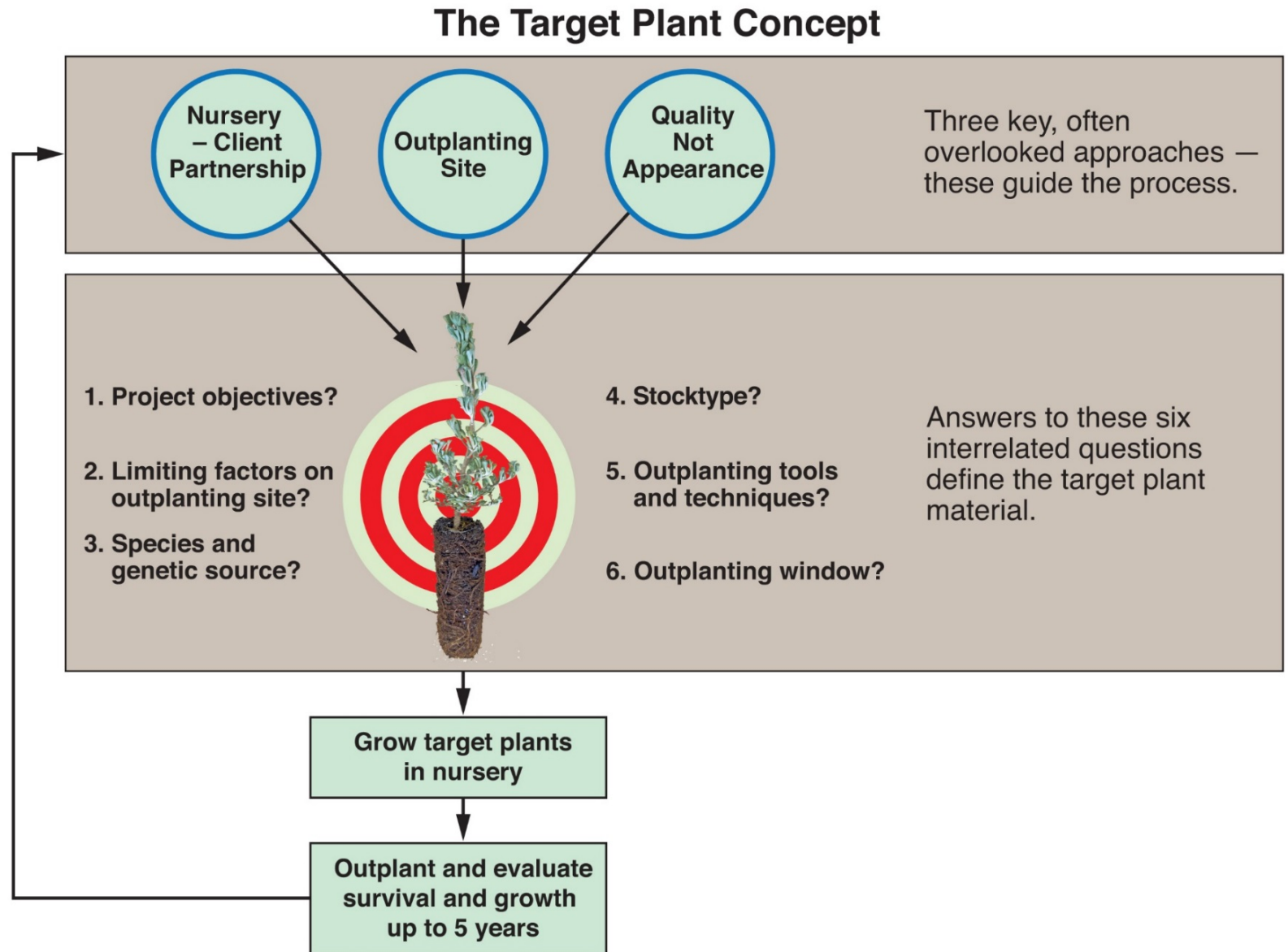
Seed Zones

- 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 Target Plant Concept is the foundation for quality seedlings, successful establishment, and long-term field performance



TPC = Match the Seedling to the Site!

One size
does **NOT**
fit all.



Stocktype mismatched to shallow soil conditions

Questions?



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