Root Growth Potential Testing and Seedling Container Types to Improve Reforestation Success

Intermountain Forestry Cooperative Annual Meeting 2018
March 27th, 2018

Florian Deisenhofer

Hancock Forest Management, Vancouver, WA

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

Content

- Background
- Root Growth Testing
  - Literature
  - Methodology
  - Results
- Container Testing
  - Methodology
  - Results
- Outlook – Future Research

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company


Why is it a problem?

- Ongoing annual issue
- Various nurseries
- Morphologically undetectable

Several companies actively conducting research/testing

Responses

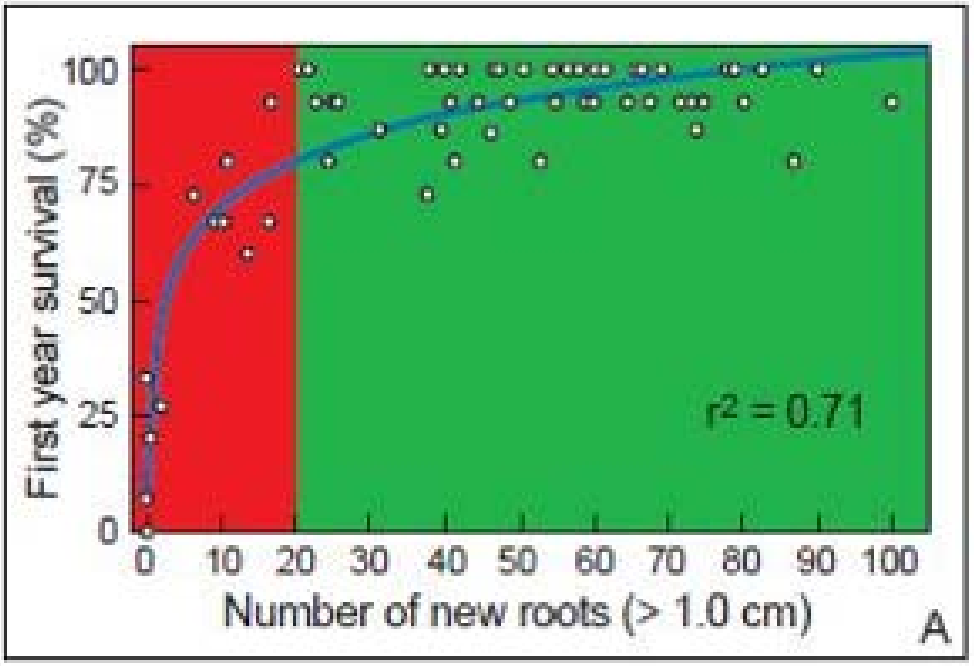
- With rise of P+1, bareroot nurseries became vertically integrated
- Root Growth Potential (RGP) testing
- Common garden – consistent implementation and data collection
- Focus on survival data collection
- Herbicide research
- Changes in stock types, nurseries
- Container testing
- More seedling digging

Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

Root Growth Potential (Capacity) Testing (RGP)

- Physiological performance test – “snapshot”; not “silver bullet”
  - Seedlings placed in favorable environment (greenhouse) – potted or aeroponic system
  - Held for a standard amount of time (21-28 days)
  - Root assessment: Count number of new roots > 1cm



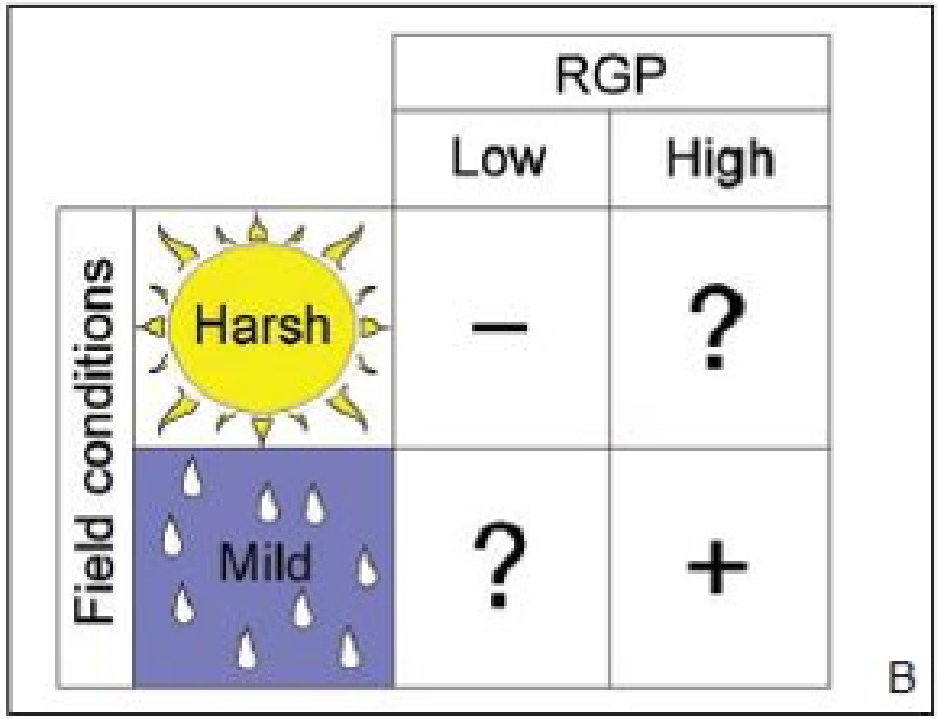
Container Tree Nursery Manual 7(2)

Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

Root Growth Potential (Capacity) Testing (RGP)

- "Red flag" test
- Intuitive, robust and simple
- Good relationship between RGP & Survival <u>sometimes</u> exist



Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

Container Tree Nursery Manual 7(2)

University of Idaho RGP

16-20 day test
15 seedlings per seedlot/nursery

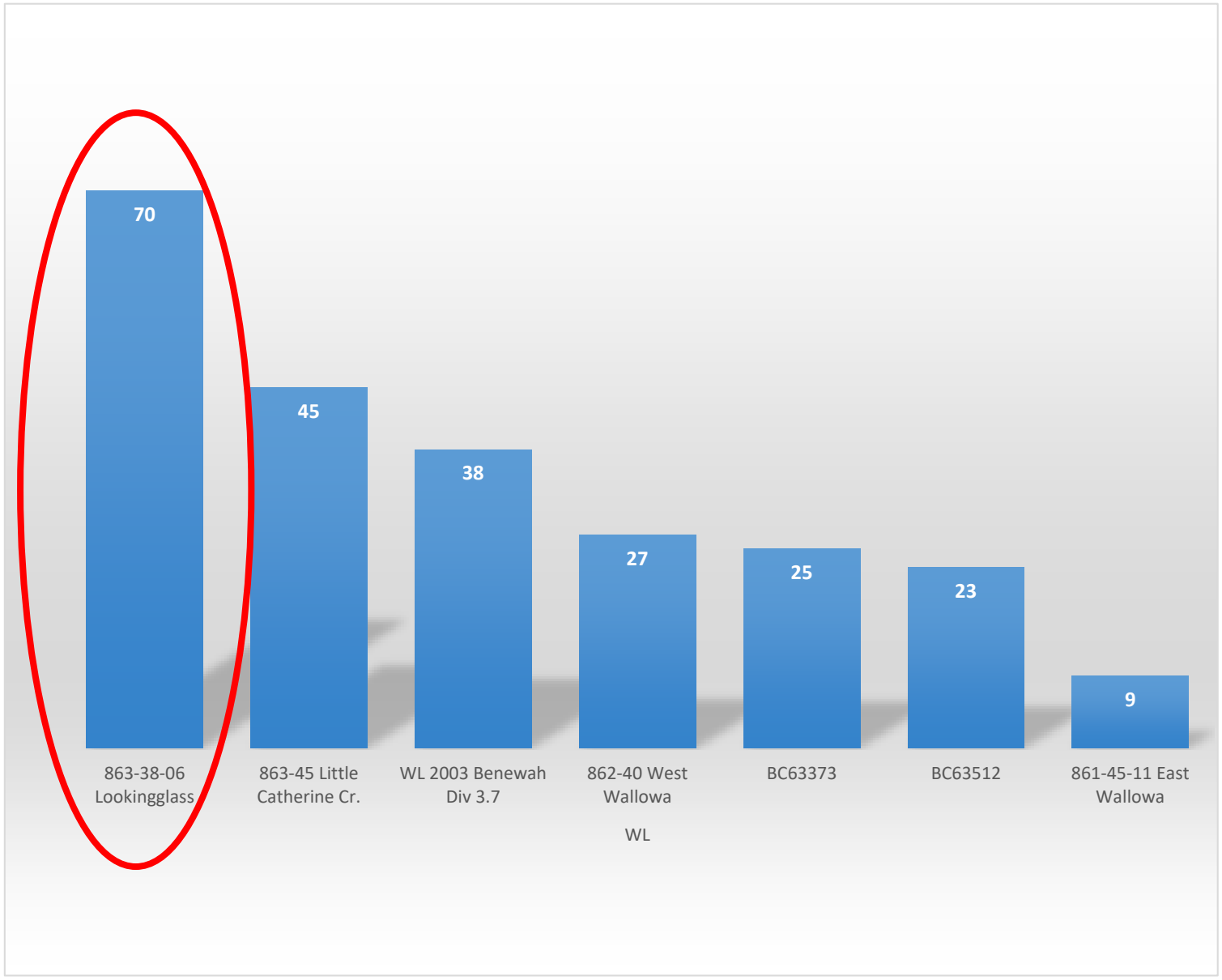
Hancock Forest Management®
A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company



2018 Western Larch Results by Seedlot



Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

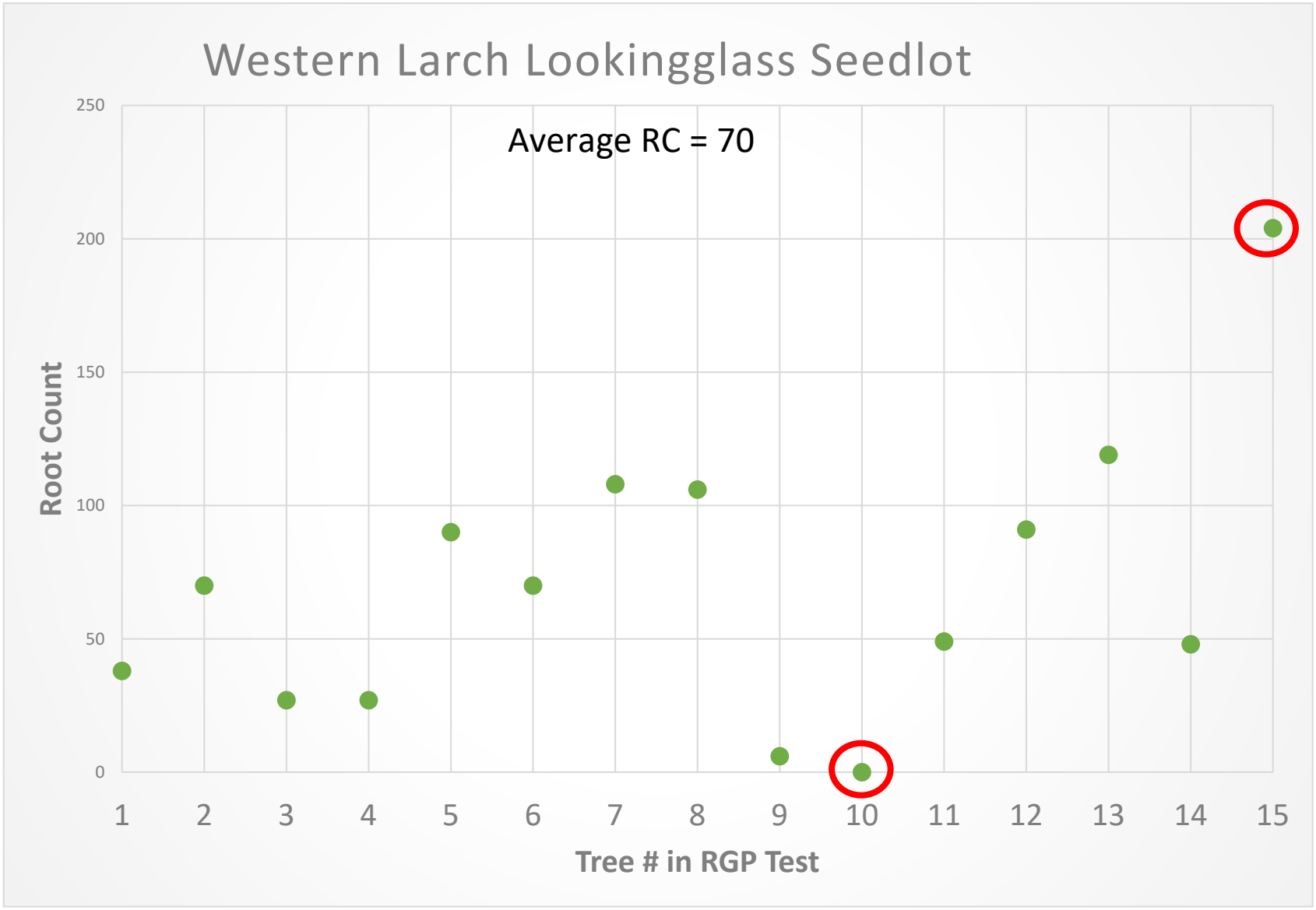
7 seedlots – 3 nurseries

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

Photo credit: Lori Mackey

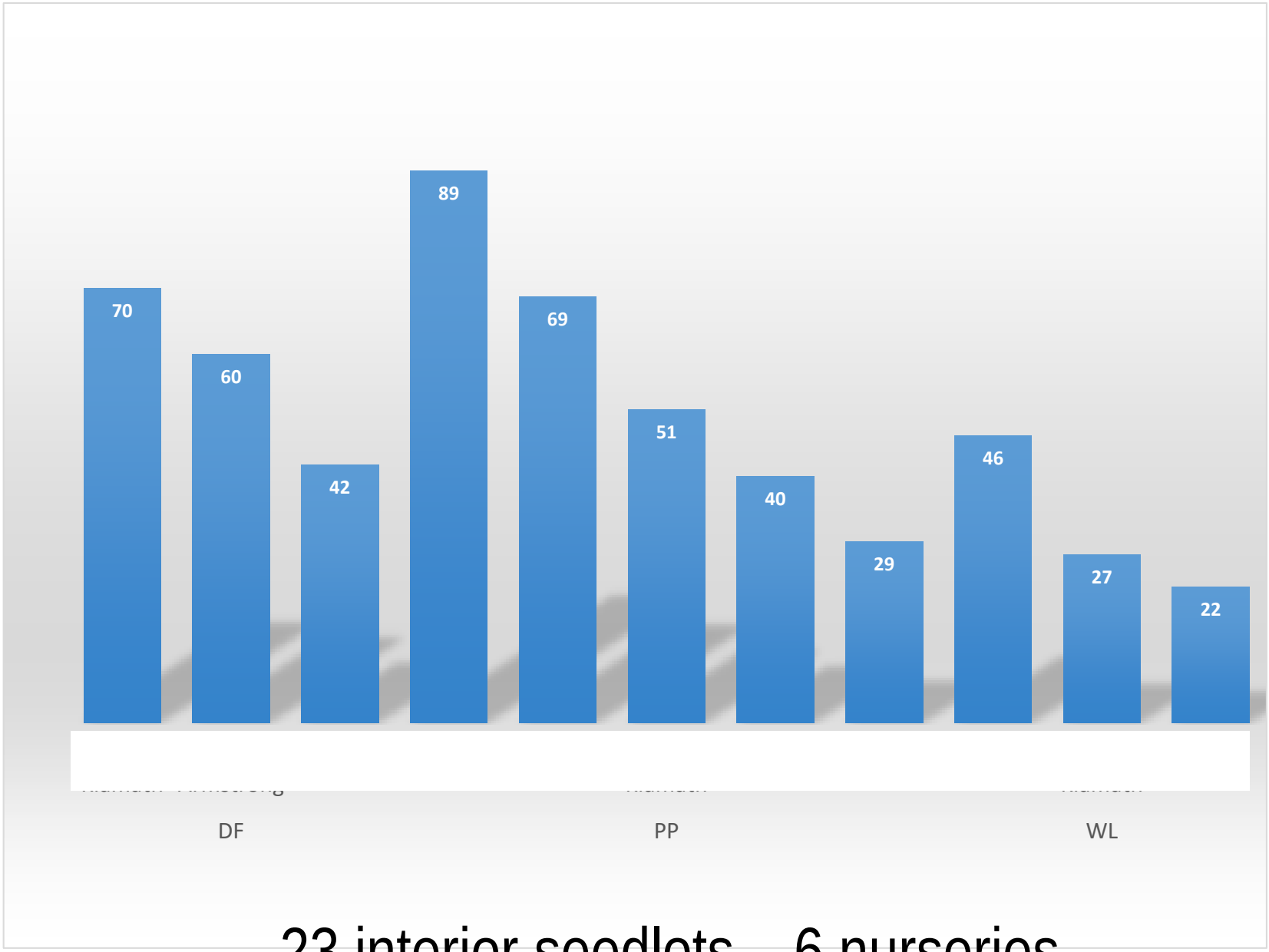
Root Count Variability within a Seedlot



Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

2018 Results by Species and Nursery



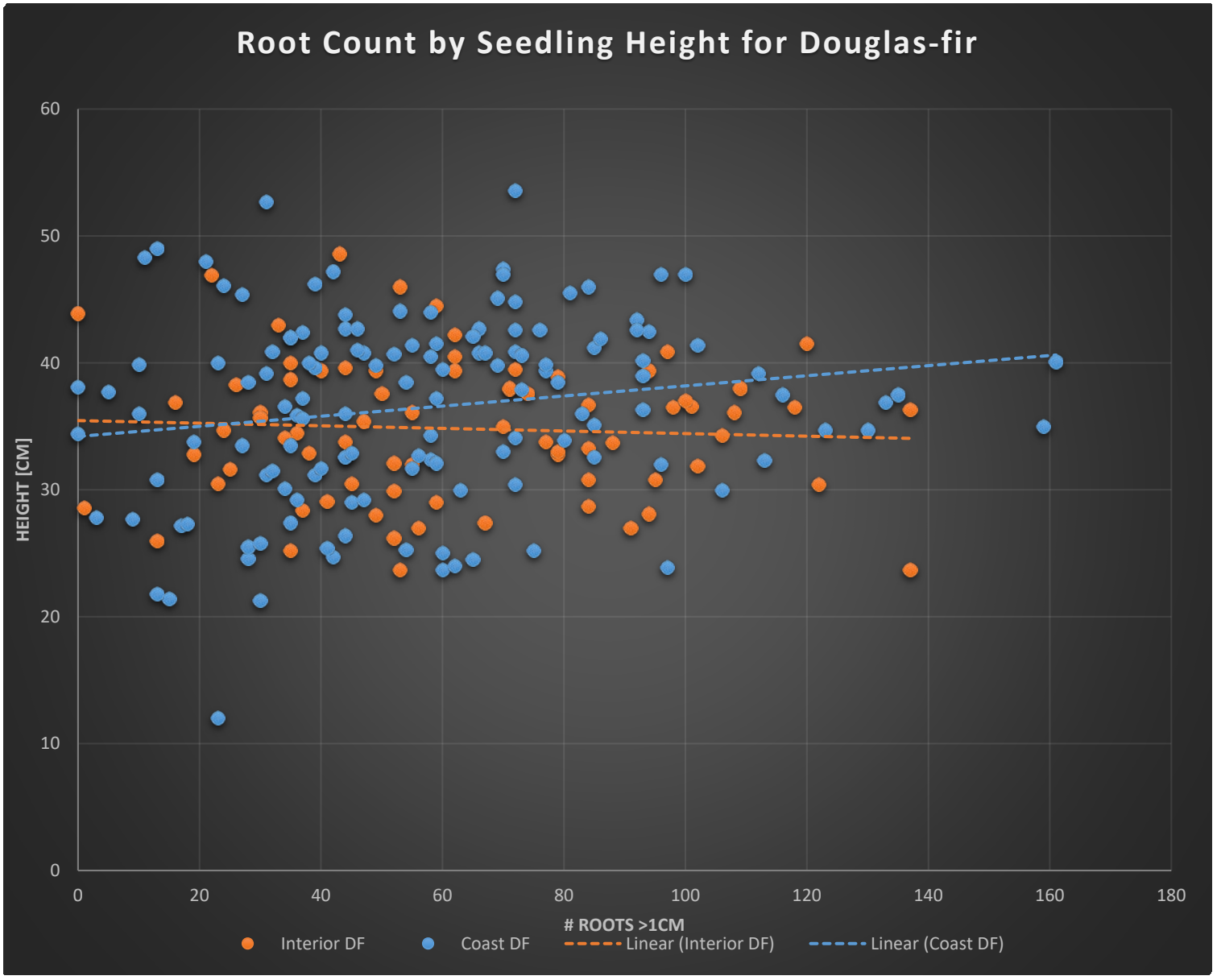
23 interior seedlots – 6 nurseries

Nursery performance varies by species

Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

2018 Root Count by Seedling Height

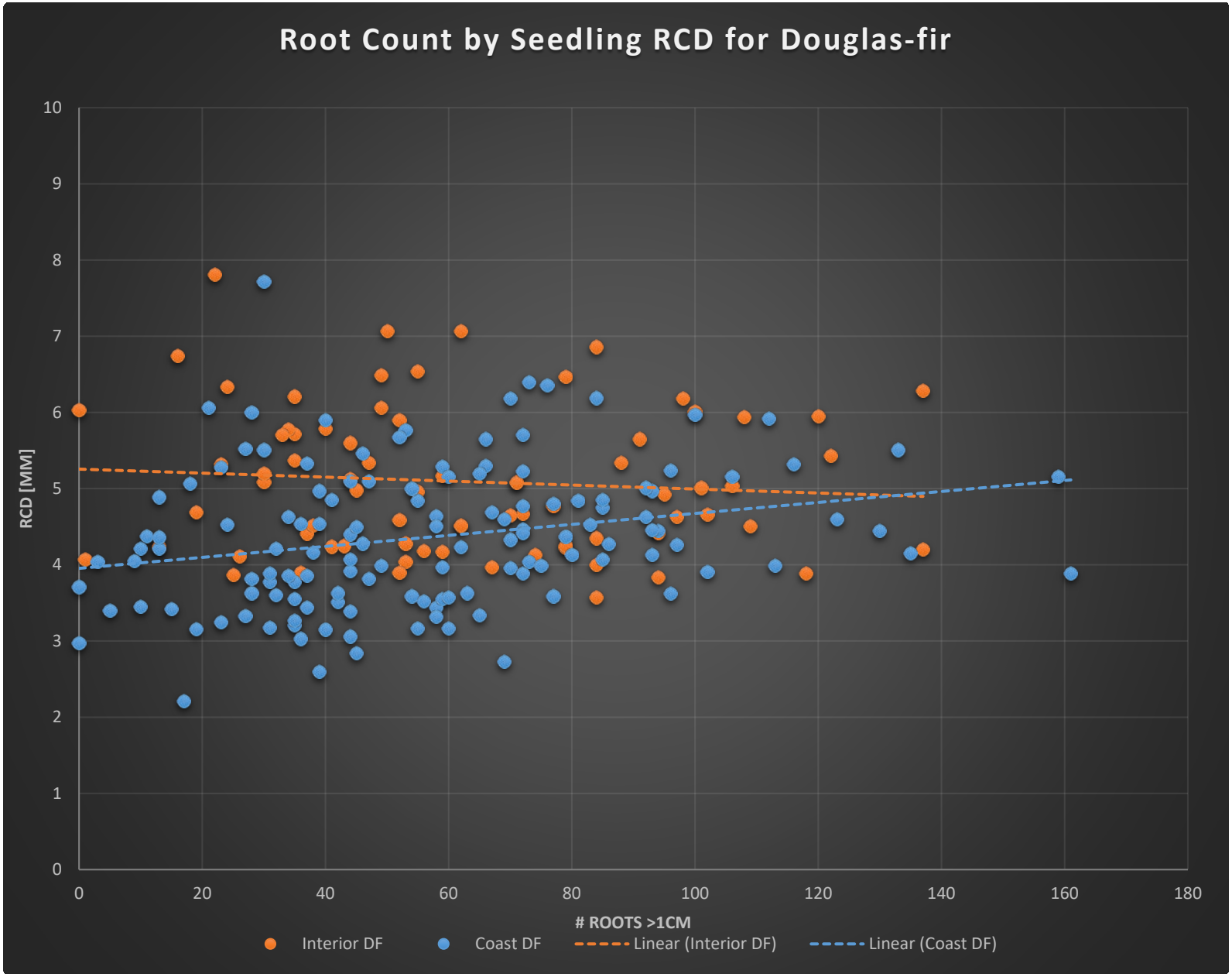


Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

No relationship with seedling height

2018 Root Count by Seedling RCD

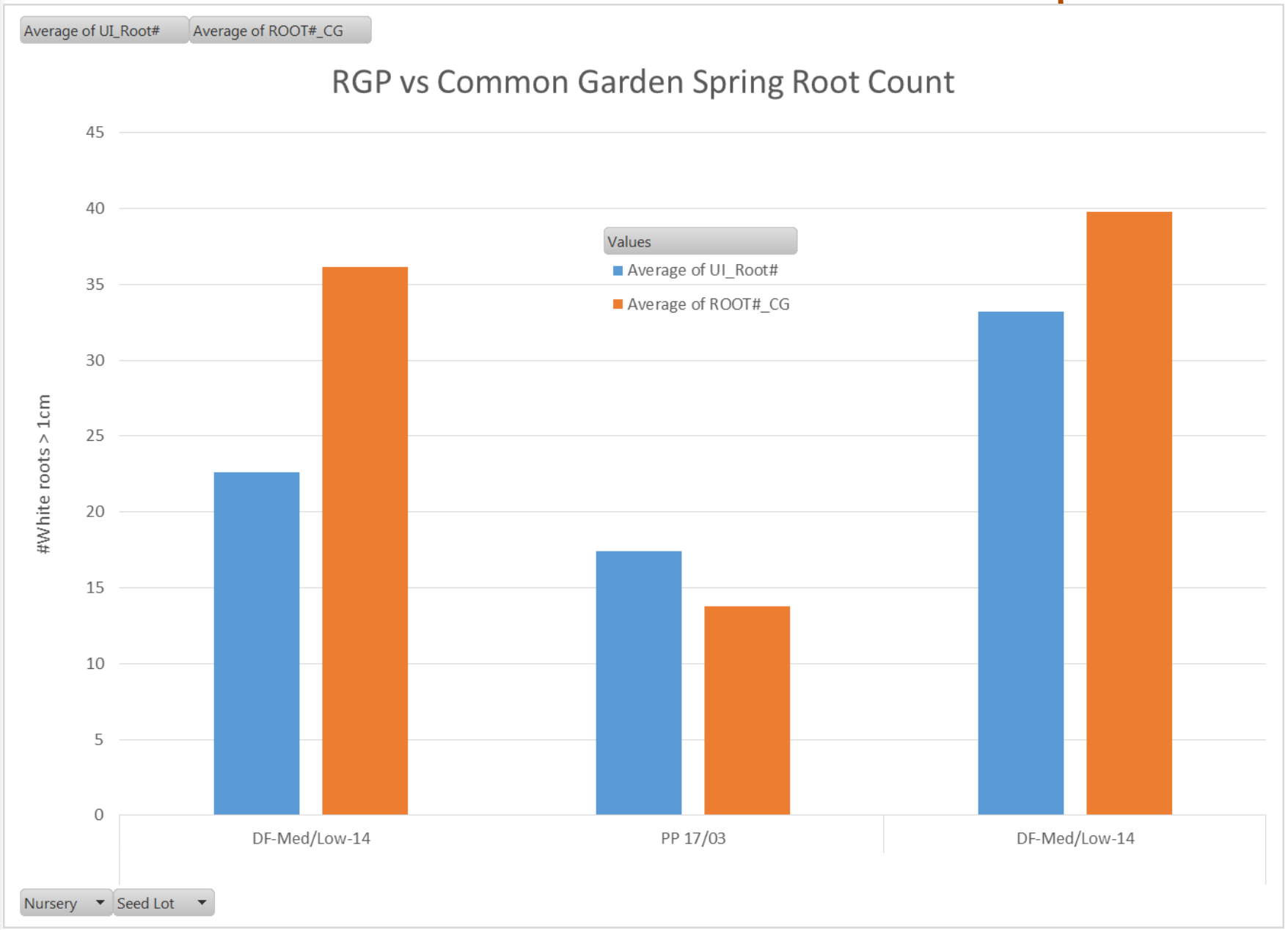


Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

No relationship with seedling RCD

RGP vs Common Garden Example



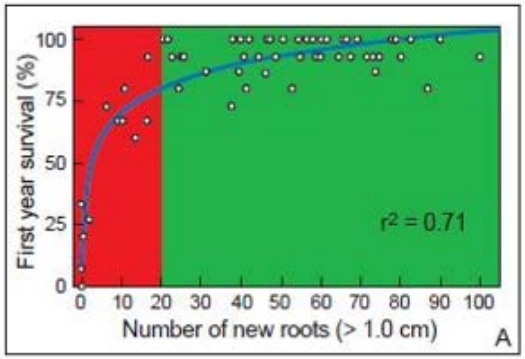
Hancock Forest Management®

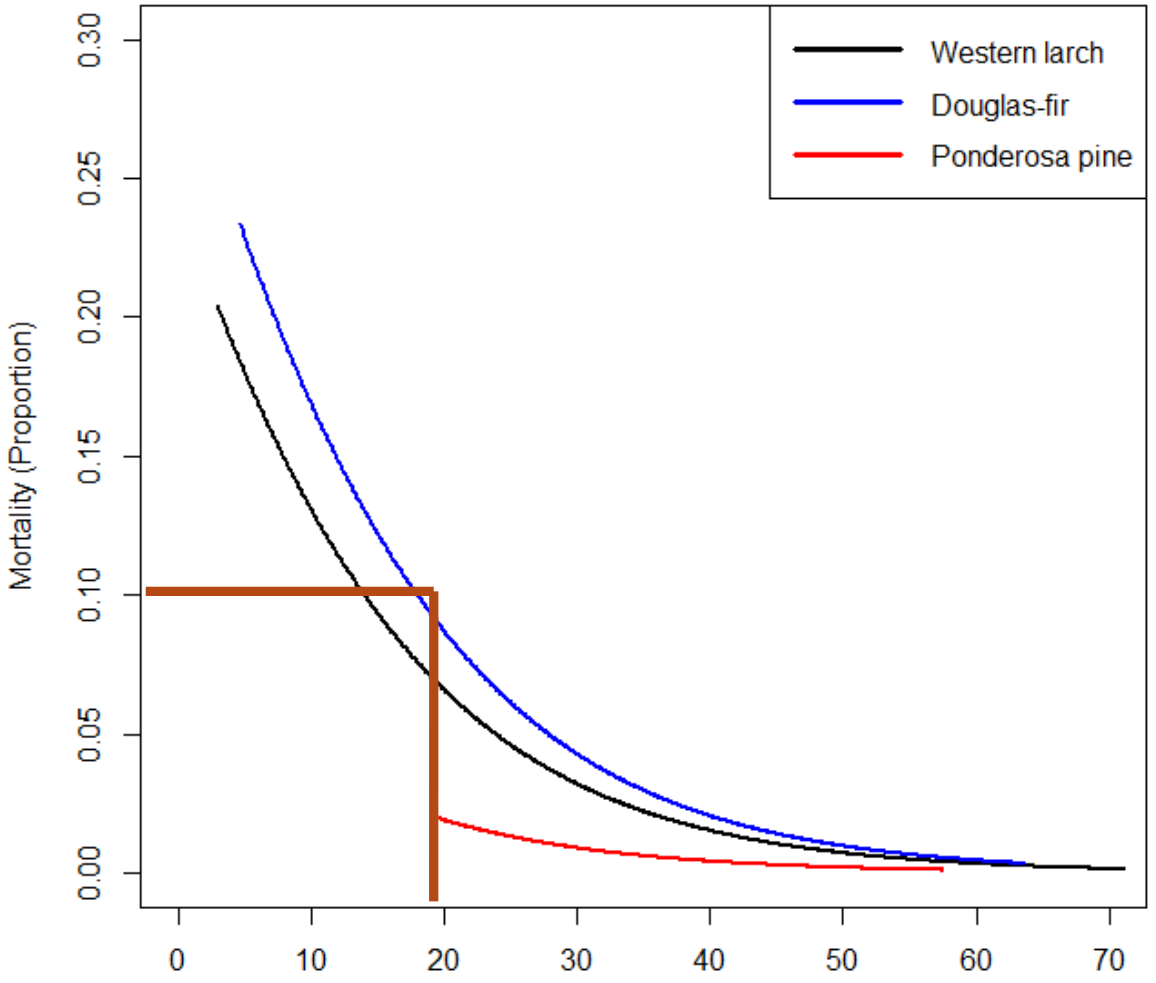
A Division of Hancock Timber Reso... Group,
A Manulife Asset Management Company

- Same stock type & seed lot, different nursery
- Seedlings (top):
  - Slightly better RGP score
  - Better in common garden
  - 10% better operational survival

RGP – Survival Relationship 2017

- 101 seedlots tested on one site
- 9 sample trees per seedlot





Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

From A. Nelson 2017

RGP Benefits

- RGP is a “red flag” test; verify performance
- RGP useful for identifying:
  - Top RGP performers – best survival %
  - Lowest RGP performers – worst survival %
  - Mid-range RGP – variable survival %
  - Nursery visit priorities
  - Preferred nurseries by species
  - Understanding relationship between morphological & physiological traits
  - Potential seedlot problems

Remaining Questions

- What is driving RGP differences?
- What is causing large within seedlot RGP performance variability? (genetics, nursery practices, testing environment)
- How does stock type (bareroot, different sizes) influence RGP?
- How comparable are potted & aeroponic results?



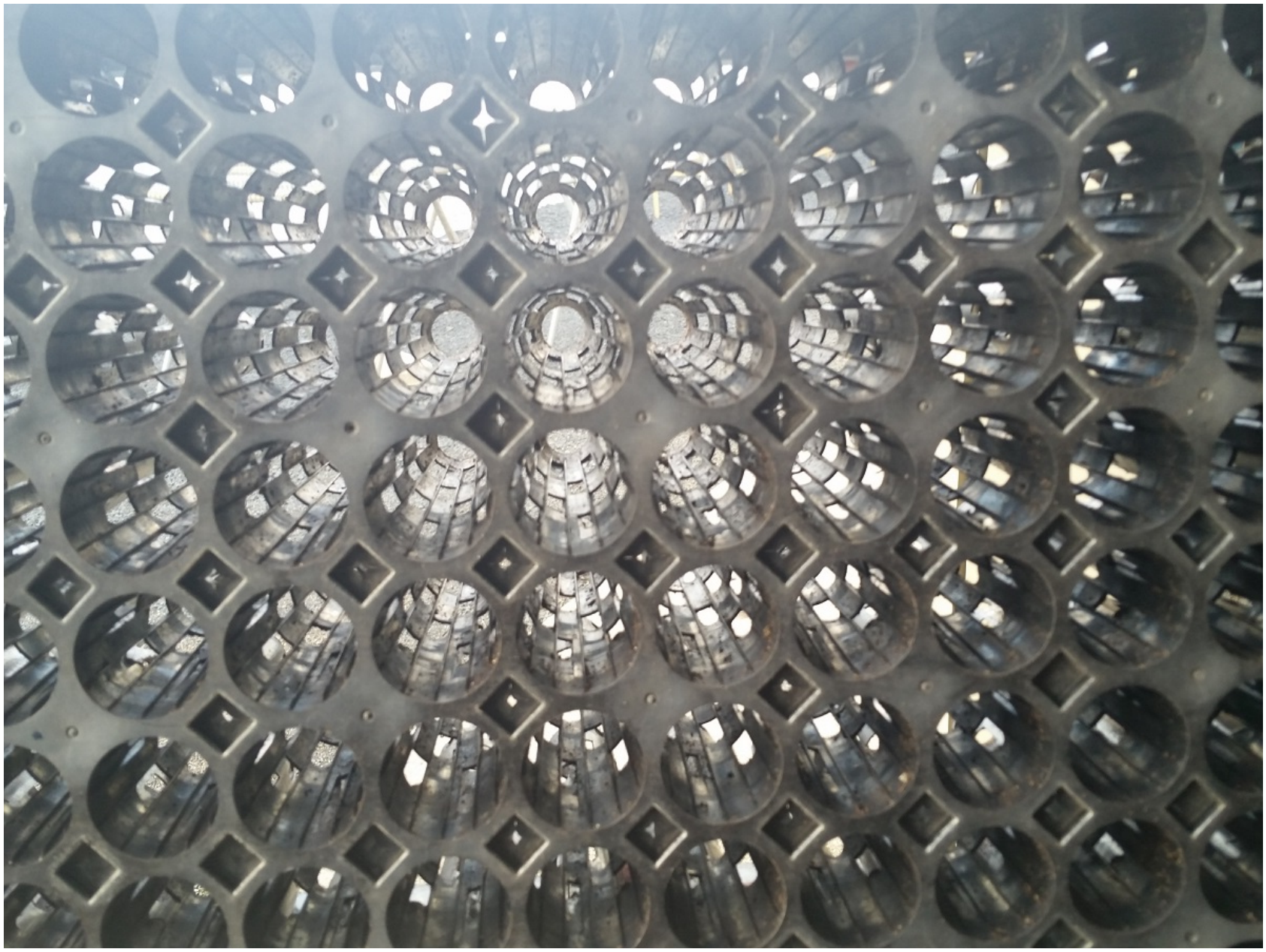
Container Testing

- Styroblock containers = PNW “nursery culture”
- Styrofoam issues – deterioration & sterilization; drain hole; root distribution; uneven drying; etc.
- 2 plastic tray types (~7” cubic) from International Forest Company (IFCO) in 2017
- Tested coast DF @ IFA; interior DF, WL & PP @ Pitkin Nursery
- 3 trays per species:
  - 415 B Styroblock™ containers (6” cubic)
  - IFCO “square” black plastic
  - IFCO “round” super-aerated black plastic

IFCO

Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company



Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

Container Comparison – Ponderosa pine

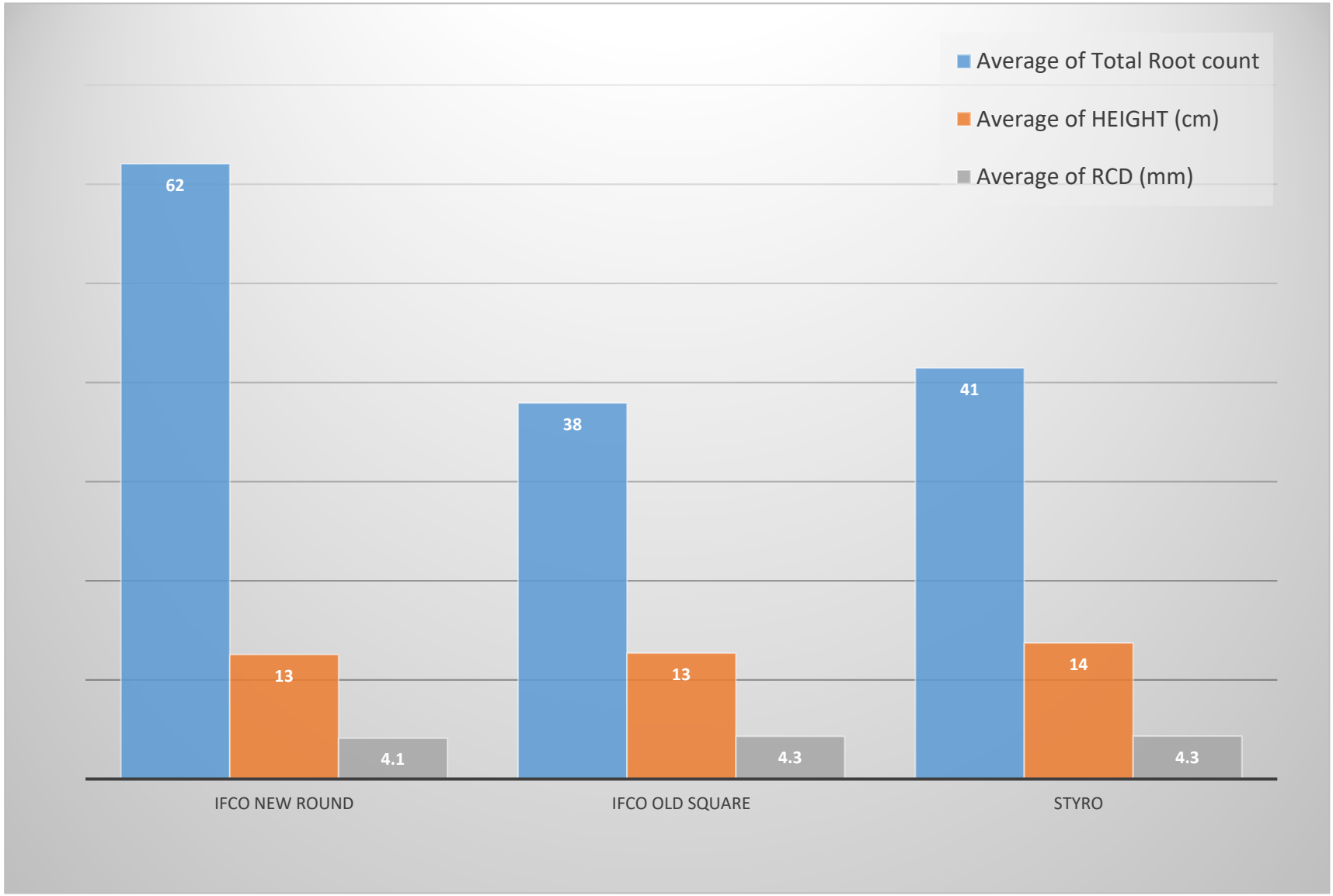
Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company



Container Comparison – Ponderosa pine

Root count > 1cm, height and diameter

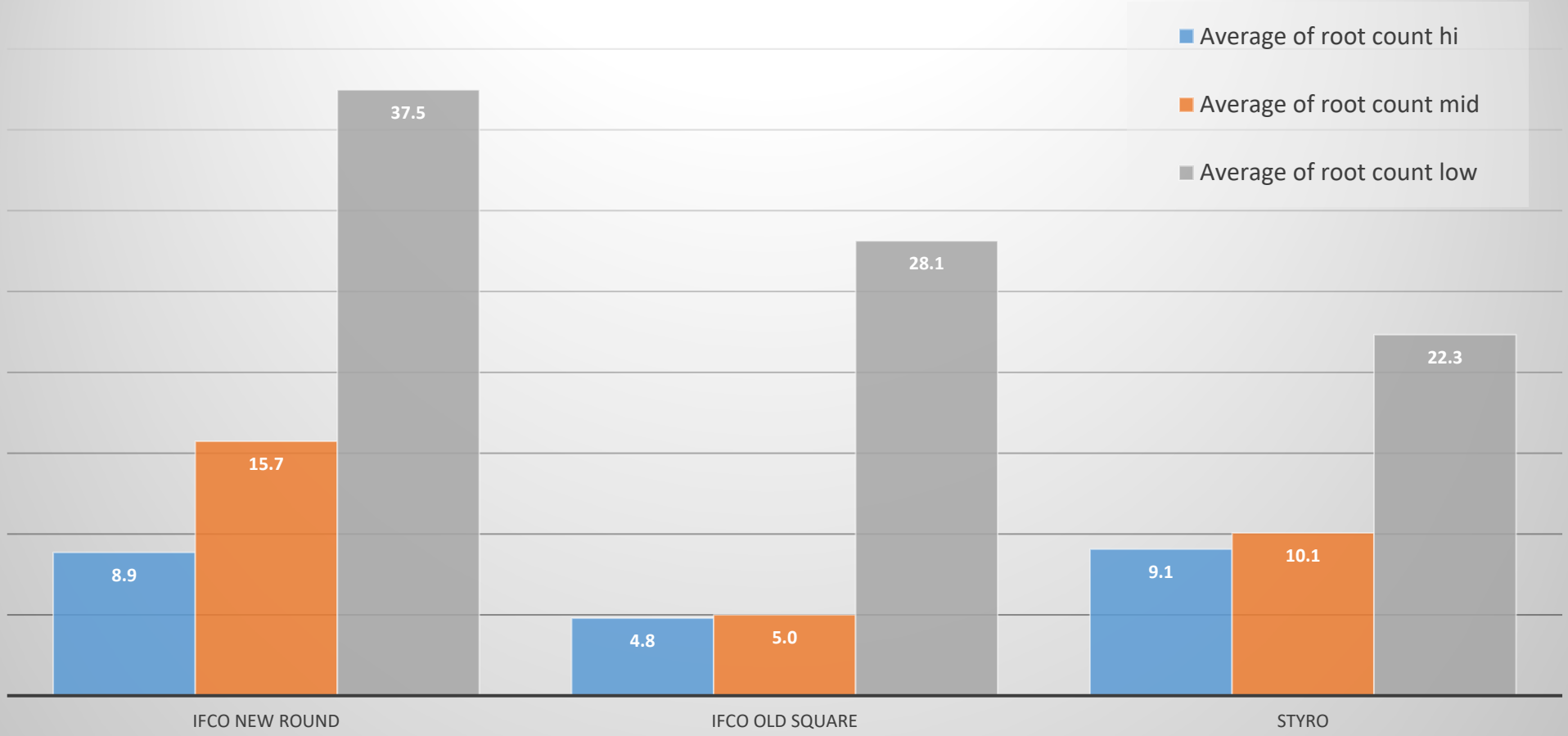


Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

Container Comparison – Ponderosa pine

Root count > 1cm by location (upper, middle, lower 1/3)



Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

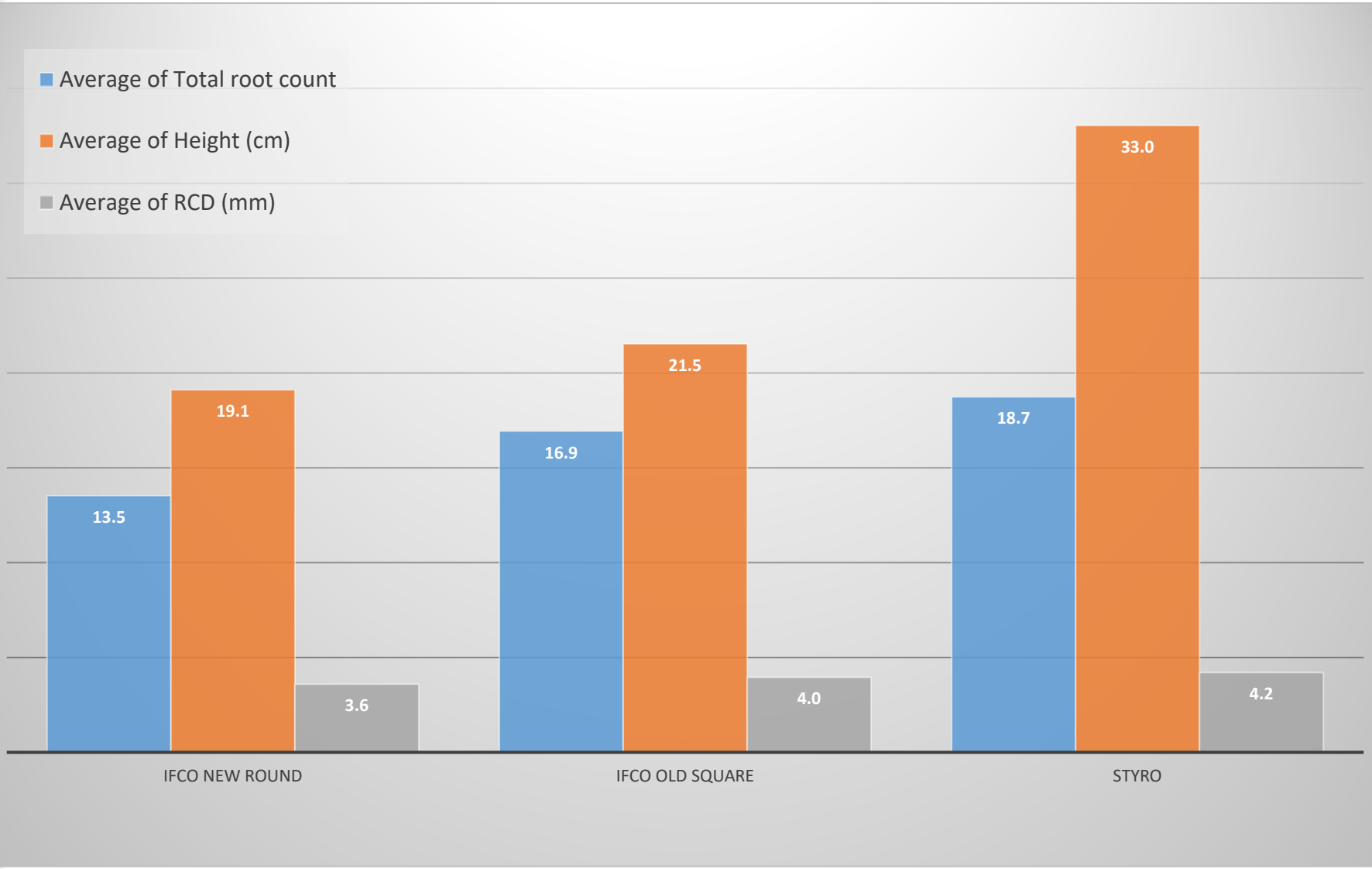
Container Comparison – Douglas-fir

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

Container Comparison – Douglas-fir

Root count > 1cm, height and diameter

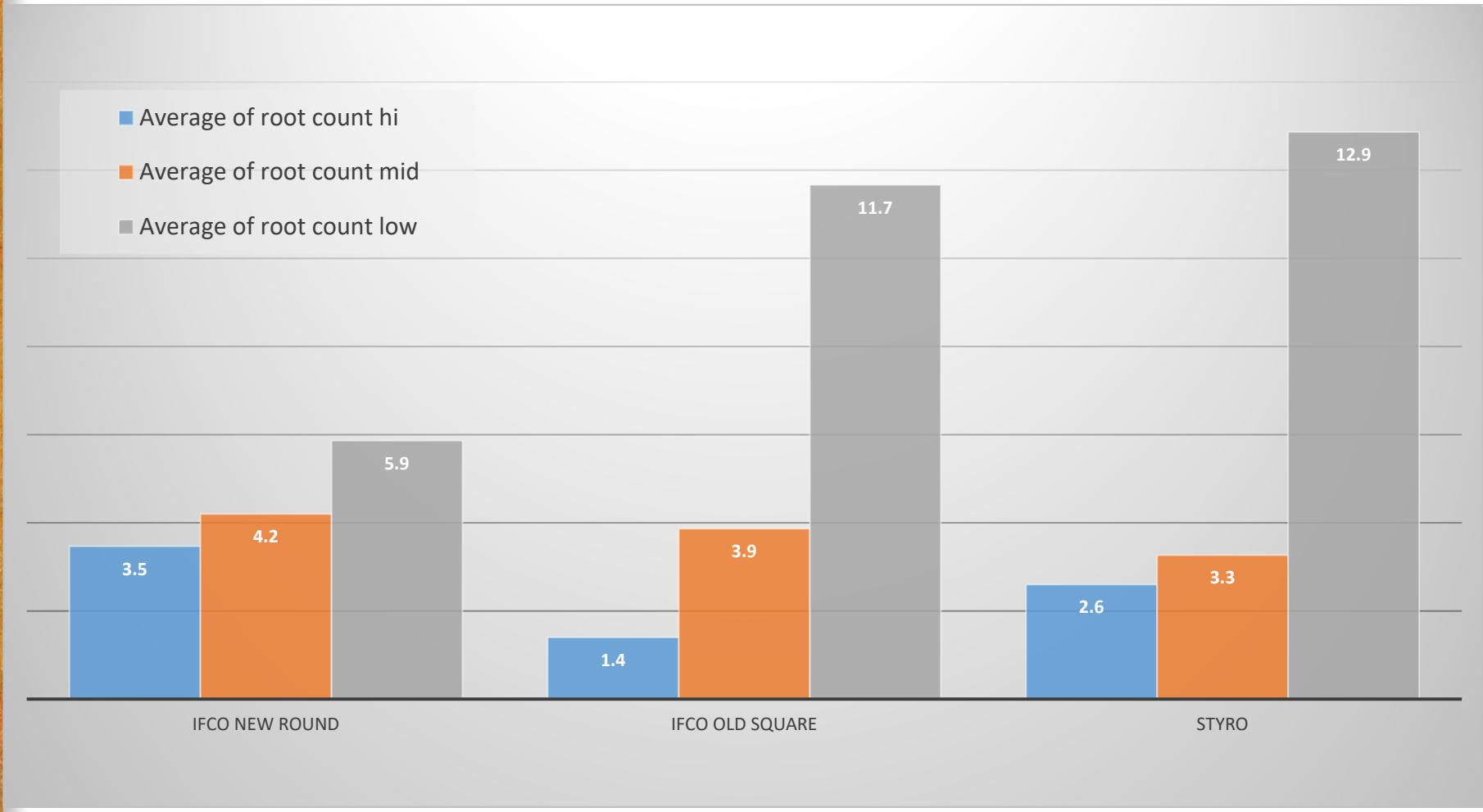


Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

Container Comparison – Douglas-fir

Root count > 1cm by location (upper, middle, lower 1/3)



Hancock Forest Management®

A Division of Hancock Timber Resource Group, A Manulife Asset Management Company

Container Testing Results

Relevance

1. Growing regime
2. Container configuration
3. Container material

- PP – promising results
- DF – need more experience
- WL – “do over”

Super-aerated IFCO: Trend = different root distribution

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

Container Outlook

- Continue super-aerated plastic tray testing (DF & WL)
- Evaluate 2017 PP and DF seedling field performance
- Expand testing to “earth pots” (Elle pots)
- Collaborate with university and industry partners in further research

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company

Thank You

- Andrew Nelson – University of Idaho
- Don Regan – University of Idaho
- Lori Mackey – University of Idaho
- Melanie Miller – OBC Northwest, Inc.
- Chris Johnston – IFCO
- Tom Starkey – IFCO
- Mike Taylor – IFA Nurseries
- Abbie Acuff – Potlatchdeltic
- Patrick Marolla – Hancock Forest Management

Questions?

Photo credit: Andrew Nelson

Hancock Forest Management®

A Division of Hancock Timber Resource Group,
A Manulife Asset Management Company