



# Nursery Crop Visits – What to Look for and What Questions to Ask Your Grower

Abbie Acuff



# Background

- Worked for the USFS White River Ranger District during college
- Graduated from WSU, BS Forest Management
- 1990: Started working at Potlatch Greenhouse as Assistant Seedling Production Supervisor
- 1993: Promoted to Seedling Production Supervisor
- 2009: Potlatch Greenhouse closed
- 2010: Promoted to Silviculturist. Current responsibilities include seed and seedling procurement for Idaho



# Fall 1982 Noble Fir Cone Collection USFS





# Outline:

- ▲ PotlatchDeltic North Idaho Planting Program
- ▲ Nursery Inspection Expectations and Checklist:
  - ▲ Location
  - ▲ Greenhouse vs Outdoor Compound
  - ▲ Primary vs Secondary Needles
  - ▲ Buds
  - ▲ Growing Container and Size
  - ▲ Contract
  - ▲ Genetics
  - ▲ Media
- ▲ Example Inspection and Questions to Ask
- ▲ How to Address Issues



# PotlatchDeltic North Idaho Planting Program:

## 🌲 1990 to 2009

- 🌲 1.9 to 6.5 million per year
- 🌲 Majority grown in-house
- 🌲 59 million seedlings

## 🌲 2010 to present

- 🌲 4.8 to 8.4 million per year
- 🌲 All seedlings contract grown
- 🌲 53 million seedlings





# Nursery Inspection Expectations and Checklist:

- 🌲 Location
- 🌲 Greenhouse vs Outdoor Compound
- 🌲 Primary vs Secondary Needles
- 🌲 Buds
- 🌲 Growing Container and Size
- 🌲 Contract
- 🌲 Genetics
- 🌲 Media





# Location:

## ▲ Miles from Lewiston to:

- ▲ Boise – 267
- ▲ Klamath Falls – 513
- ▲ Portland – 343
- ▲ Olympia – 356
- ▲ Vernon BC – 361

## ▲ Travel Time for Inspections

## ▲ West Side vs East Side



# Greenhouse vs Outdoor Compound

## Greenhouse:

- ▲ Extended growing season
- ▲ Complete control of growing environment
  - ▲ Heat
  - ▲ Humidity
- ▲ Protected from bad weather events
- ▲ Supplemental Lighting
- ▲ Higher cost

## Outdoor Compound:

- ▲ Shorter growing season
- ▲ No control of growing environment
- ▲ Exposed to birds and small mammals
- ▲ May or may not have supplemental lighting
- ▲ Lower cost





# Greenhouse





# Outdoor Compound with No Supplemental Lighting





# Outdoor Compound with Supplemental Lighting





# Primary vs Secondary Needles





# Primary vs Secondary Needles





# Bud Set



▲ In Pines, exposure to supplemental lighting, will produce different buds





# Growing Container and Size

## ▲ Various Containers Available (but not all used):

### ▲ Styroblocks

- ▲ Most common in PNW
- ▲ Made of dense Styrofoam
- ▲ 5-6 year life expectancy



### ▲ Jiffy Plugs

- ▲ Used world wide
- ▲ Soft walled, meshed container
- ▲ One time use



### ▲ HIKO Tray System

- ▲ Used worldwide
- ▲ High density polyethylene
- ▲ 10+ year life expectancy














# Growing Container and Size

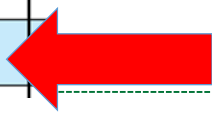
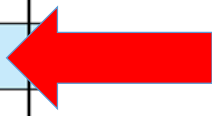
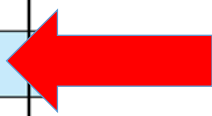
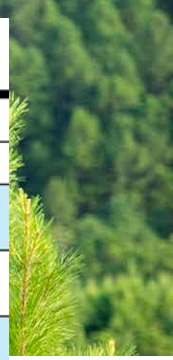
## Container Size

-  Measured by volume in a single cavity
-  Higher volume containers:
  -  Usually yield larger seedlings
  -  Have fewer seedlings per square foot
  -  Are more expensive
  -  May be too large to allow root to fill all available space in one growing season
  -  May be more susceptible to root issues early on



# Styroblock Containers

| ID CODE<br>cavities/ml | BLOCK<br>number | METRIC<br>number | BLOCKS<br>per bundle | CAVITY TOP DIA.<br>in. | CAVITY DEPTH<br>in. | VOLUME PER CAVITY |     | CAVITIES<br>per sq. ft. |
|------------------------|-----------------|------------------|----------------------|------------------------|---------------------|-------------------|-----|-------------------------|
|                        |                 |                  |                      |                        |                     | cu. in.           | ml  |                         |
| 448/17                 | 1*              | 207A             | 37                   | 0.7                    | 2.8                 | 1.0               | 17  | 197.4                   |
| 240/18                 | 2S              | 206A             | 41                   | 0.9                    | 2.5                 | 1.1               | 18  | 105.8                   |
| 240/40                 | 2A              | 211A             | 23                   | 0.9                    | 4.5                 | 2.4               | 39  | 105.8                   |
| 240/50                 | 3A              | 213A             | 20                   | 0.9                    | 5.1                 | 3.0               | 49  | 105.8                   |
| 198/60                 | 4A              | 313A             | 20                   | 1.1                    | 5.2                 | 3.7               | 60  | 87.3                    |
| 180/60                 | *               | 309A             | 27                   | 1.1                    | 3.7                 | 3.7               | 60  | 79.3                    |
| 160/60                 | 4S              | 310B             | 25                   | 1.2                    | 4.1                 | 3.3               | 54  | 70.5                    |
| 160/65                 | 4               | 313B             | 21                   | 1.2                    | 5.0                 | 3.9               | 65  | 70.5                    |
| 160/90                 | Super 4         | 315B             | 17                   | 1.2                    | 6.0                 | 5.5               | 90  | 70.5                    |
| 128/80                 |                 | 410C             | 25                   | 1.9 x 1.4              | 4.0                 | 4.9               | 80  | 56.4                    |
| 112/80                 | 6S              | 410A             | 25                   | 1.4                    | 4.1                 | 4.9               | 80  | 49.4                    |
| 112/95                 |                 | 412B             | 22                   | 1.4                    | 4.6                 | 5.8               | 95  | 49.4                    |
| 112/105                | 6               | 415B             | 17                   | 1.4                    | 5.8                 | 6.6               | 108 | 49.4                    |
| 91/130                 | 8L              | 415C             | 17                   | 1.5                    | 6.0                 | 7.9               | 130 | 40.1                    |
| 77/125                 | 10S             | 412A             | 22                   | 1.7                    | 4.6                 | 7.6               | 125 | 34.0                    |
| 77/170                 | 10              | 415D             | 17                   | 1.7                    | 6.0                 | 10.0              | 164 | 34.0                    |
| 60/220                 | 15S             | 512A             | 22                   | 2.0                    | 4.7                 | 13.4              | 220 | 26.5                    |





# Growing Cost of Seedlings

| Block Size      | # of Cavities | #/Sq Ft   | Seedlings per Greenhouse | \$/M        |
|-----------------|---------------|-----------|--------------------------|-------------|
| 4A              | 198/60        | 87.3      | 523,800                  | \$ 572.74   |
| Super 4         | 160/90        | 70.5      | 423,000                  | \$ 709.22   |
| 8L              | 91/130        | 40.1      | 240,600                  | \$ 1,246.88 |
| 15S             | 60/220        | 26.5      | 159,000                  | \$ 1,886.79 |
| Assumptions:    |               |           |                          |             |
| Greenhouse Cost | \$ 50.00      | per sq ft |                          |             |
| Greenhouse Size | 6,000         | sq ft     |                          |             |
| \$/Greenhouse   | \$ 300,000    |           |                          |             |



# Styro 15 vs Styro 8












# Contract

## Important Points to Remember:

-  Read your contract every year
-  As Customers, we ask Nursery to provide a certain seedling. Nursery has complete control over how the seedling is grown.
-  Target Specifications  $\neq$  Contract Minimum Specifications
-  Review Inventory Reports and Scatter Diagrams
-  Relationship with Nursery is a Partnership



# Genetics

- ▲ Genetically improved seedlings grow differently than woods run seed:
  - ▲ Higher germination
  - ▲ Even crop
  - ▲ Grow faster

Cherrylane Seed Orchard

1 inch = 288 feet









# Seed Cost Calculation of Douglas-fir

| Species        | Seed/lb | \$/lb       | \$/seed | Net Seedlings | Total Cost of Seed | Cost w/ 20% Oversow |
|----------------|---------|-------------|---------|---------------|--------------------|---------------------|
| DF-woods run   | 42,000  | \$ 250.00   | 0.006   | 100,000       | \$ 1,190.48        | \$ 1,428.57         |
| DF-Improved    | 43,000  | \$ 1,200.00 | 0.028   | 100,000       | \$ 5,581.40        | \$ 6,697.67         |
| Assumptions:   |         |             |         |               |                    |                     |
| 2 seeds/cavity |         |             |         |               |                    |                     |



# Media

▲ Each Nursery will use a different media mix.  
Components may include:

- ▲ Peat Moss
- ▲ Perlite
- ▲ Vermiculite
- ▲ Douglas-fir sawdust
- ▲ Coir
- ▲ Slow release fertilizer
- ▲ Lime







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- ▲ How to Address Issues



# Example Inspection and Questions to Ask

- ▲ June/July and October
- ▲ Make an appointment
- ▲ Have your paperwork
- ▲ Check in at Office
- ▲ Follow safety rules
- ▲ Have fun!





# Example Inspection and Questions to Ask

How many miles to next nursery?

What is average height?

If I am in K-Falls then today must be Tuesday.

I wish Abbie was here!

Any planned improvements to greenhouses?

Any problems so far?

What is that smell?

Are you using supplemental lighting?

When's lunch?

What should I be looking for??

How many greenhouse do they have?

What are the inventory numbers?

How do I pull a seedling out of block?

What is Grower's Name?

What was germination?

What is average caliper?



# Arrival At Nursery Look Around



- ▲ Older facility
- ▲ New Roof
- ▲ Walls and structure in good repair
- ▲ No weeds next to greenhouse



# Look Around

- ▲ Unused equipment neatly stored
- ▲ No weeds or garbage in open areas
- ▲ Propane tank barricaded





# Look Around

- ▲ Nursery investing in upgrading structures to grow higher quality seedlings.



# Inspection

- ▲ You will be accompanied by Nursery Personnel
- ▲ When you enter
  - ▲ Pause
  - ▲ Take a deep breath
  - ▲ Look around
  - ▲ Look down length of greenhouse at crop
- ▲ Remember, if you find any problems, the Nursery will already know about them











# First Inspection What I Look For:

- ▲ Feel of greenhouse environment
- ▲ Unpleasant odors
- ▲ Discrepancies in the crop
  - ▲ Fill rate of blocks
  - ▲ Color
  - ▲ Even crop height
  - ▲ Signs of disease or insects
  - ▲ Weeds
- ▲ Root development









# Topics to Cover During 1<sup>st</sup> Inspection

- ▲ In-house germination percentages
- ▲ Transplanting?
- ▲ Average height and caliper of the crop
- ▲ Any problems with the crop to this point
- ▲ What pesticides have been applied to the crop
- ▲ Fertilizer regime
- ▲ Supplemental lighting














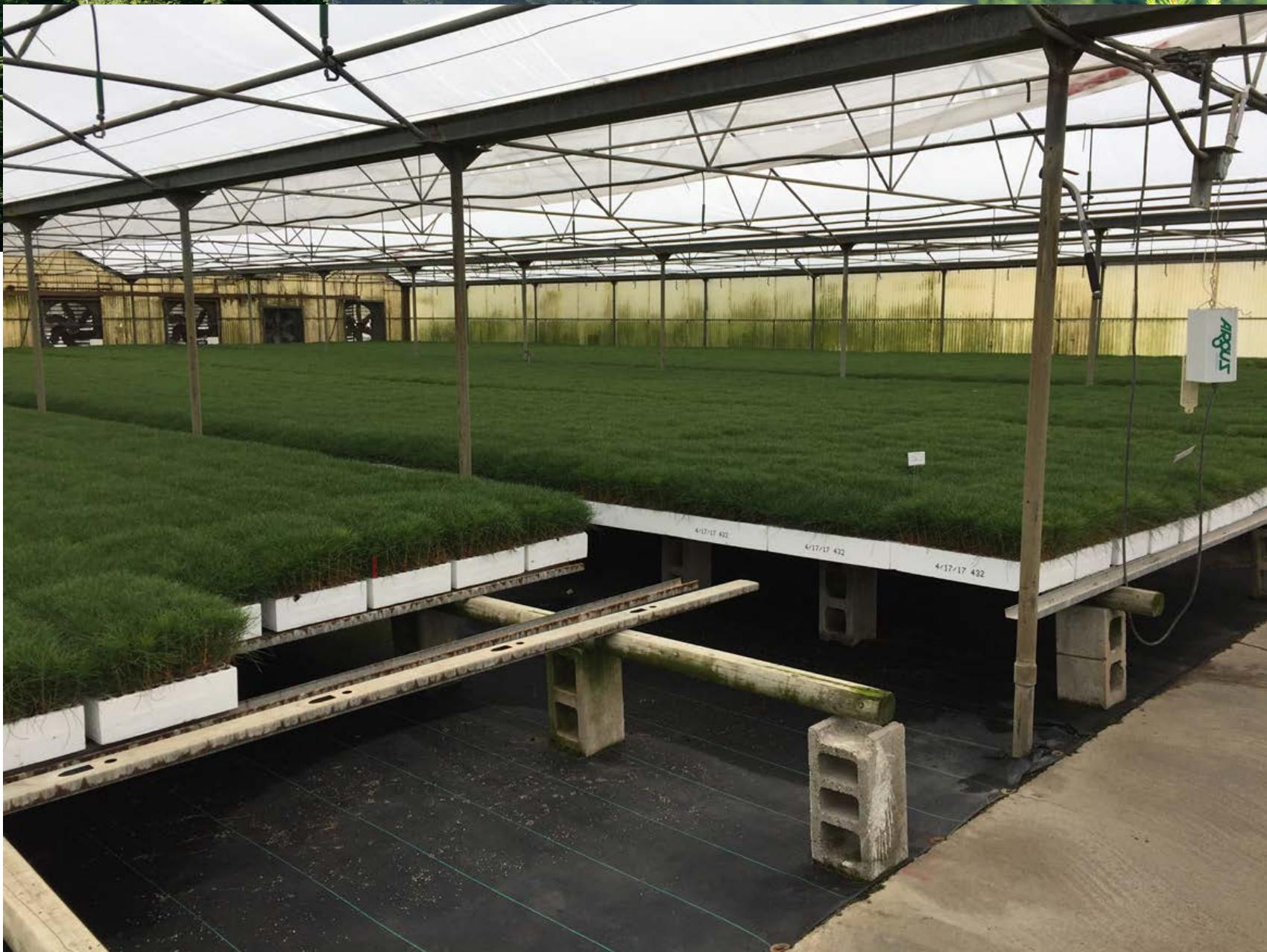




## Second Inspection – What I look For:

- ▲ Is this how you want the final product to look?
- ▲ Final height and caliper
- ▲ Bud set
- ▲ Root system
- ▲ Lignification
- ▲ Color
- ▲ Diseases?
- ▲ Weeds?
- ▲ Nursery cleanliness (even during production time)





















# Topics to Cover During 2<sup>nd</sup> Inspection:

- ▲ Average height and caliper. Meet contract specs?
- ▲ Inventory
- ▲ Adjustments to contract specifications?
- ▲ Packing start date
- ▲ Cull standards
- ▲ Pre-package fungicide treatments
- ▲ Chilling hours
- ▲ Copies of frost hardiness tests
- ▲ Box counts
- ▲ Freezer storage























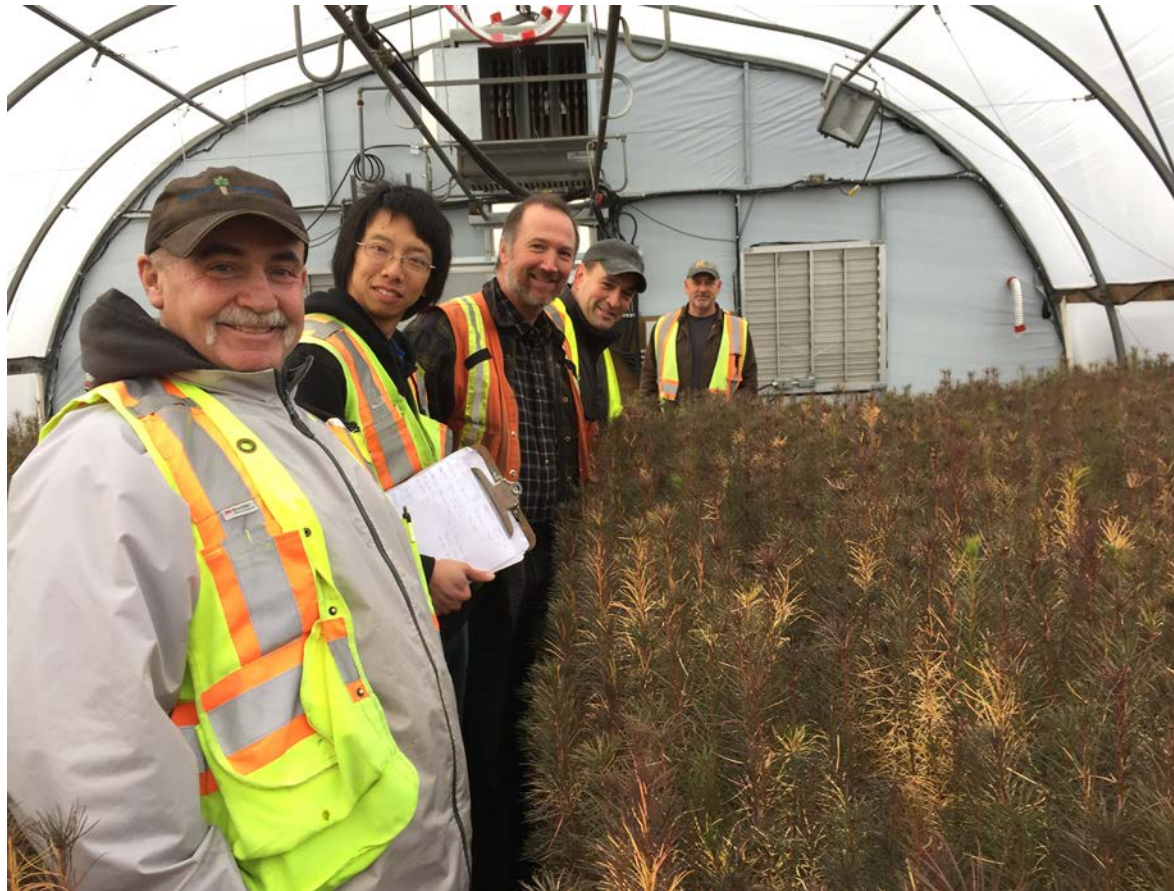








# All Smiles After A Good Inspection







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- ▲ **How to Address Issues**



# How to Address Issues



- ▲ What is problem?
- ▲ How much of crop is effected?
- ▲ Timing
- ▲ Nursery plan?



# How to Address Issues





# How to Address Issues





# How to Address Issues





# How to Address Issues





# How to Address Issues





# How to Address Issues





# How to Address Issues

## 1<sup>st</sup> Example

### A Tale of Two Nurseries...





# How to Address Issues

## 1<sup>st</sup> Example

### A Tale of Two Nurseries...





# How to Address Issues

## 1<sup>st</sup> Example

### A Tale of Two Nurseries...





# How to Address Issues

## 2<sup>nd</sup> Example

### Fall Inspection





# How to Address Issues

## 2<sup>nd</sup> Example

### Fall Inspection





# How to Address Issues

## 2<sup>nd</sup> Example

### Fall Inspection





# How to Address Issues

## 2<sup>nd</sup> Example

### Fall Inspection





# How to Address Issues

## 2<sup>nd</sup> Example

### Fall Inspection

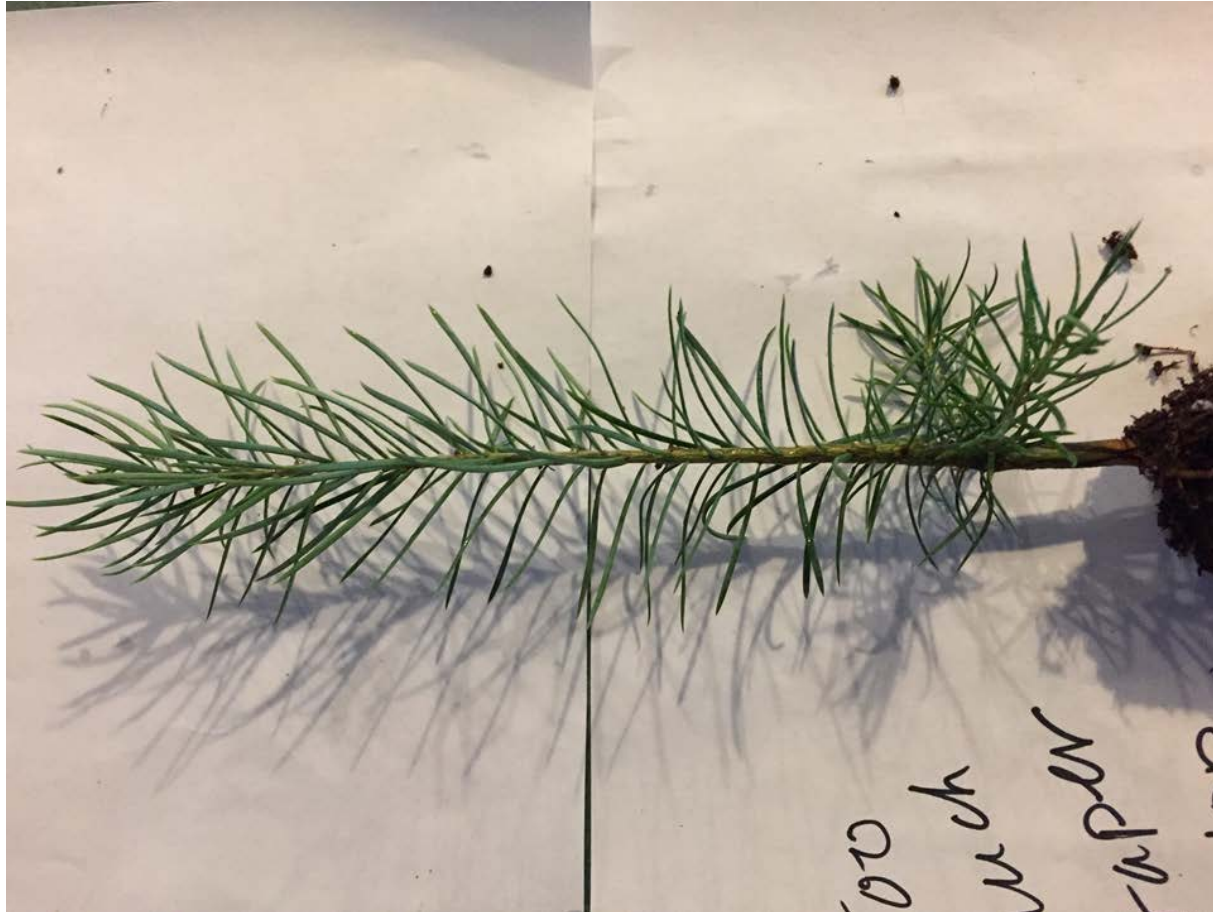




# How to Address Issues

## 2<sup>nd</sup> Example

### Fall Inspection







# How to Address Issues 2<sup>nd</sup> Example Follow Up

- ▲ 75 seedlings were randomly selected and sent to UI Pitkin Nursery for Root Growth Potential testing
- ▲ Seedlings were inspected a day after they arrived at Pitkin
- ▲ Questions:
  - ▲ When was crop pulled? Were the daily temperatures high enough to effect dormancy?
  - ▲ Was there active root growth?
  - ▲ Had the seedlings broken bud?
- ▲ DF finished packing on January 23<sup>rd</sup>
- ▲ Average daily temperature from January 1<sup>st</sup> to January 26<sup>th</sup> was 42 F
- ▲ And the results are.....



# How to Address Issues

## 2<sup>nd</sup> Example

### February – 1<sup>st</sup> Issue





# How to Address Issues

## 2<sup>nd</sup> Example

### February – 1<sup>st</sup> Issue





# How to Address Issues

## 2<sup>nd</sup> Example

### February – 2<sup>nd</sup> Issue





# How to Address Issues

## 2<sup>nd</sup> Example

### February – 2<sup>nd</sup> Issue







# How to Address Issues 2<sup>nd</sup> Example Follow Up

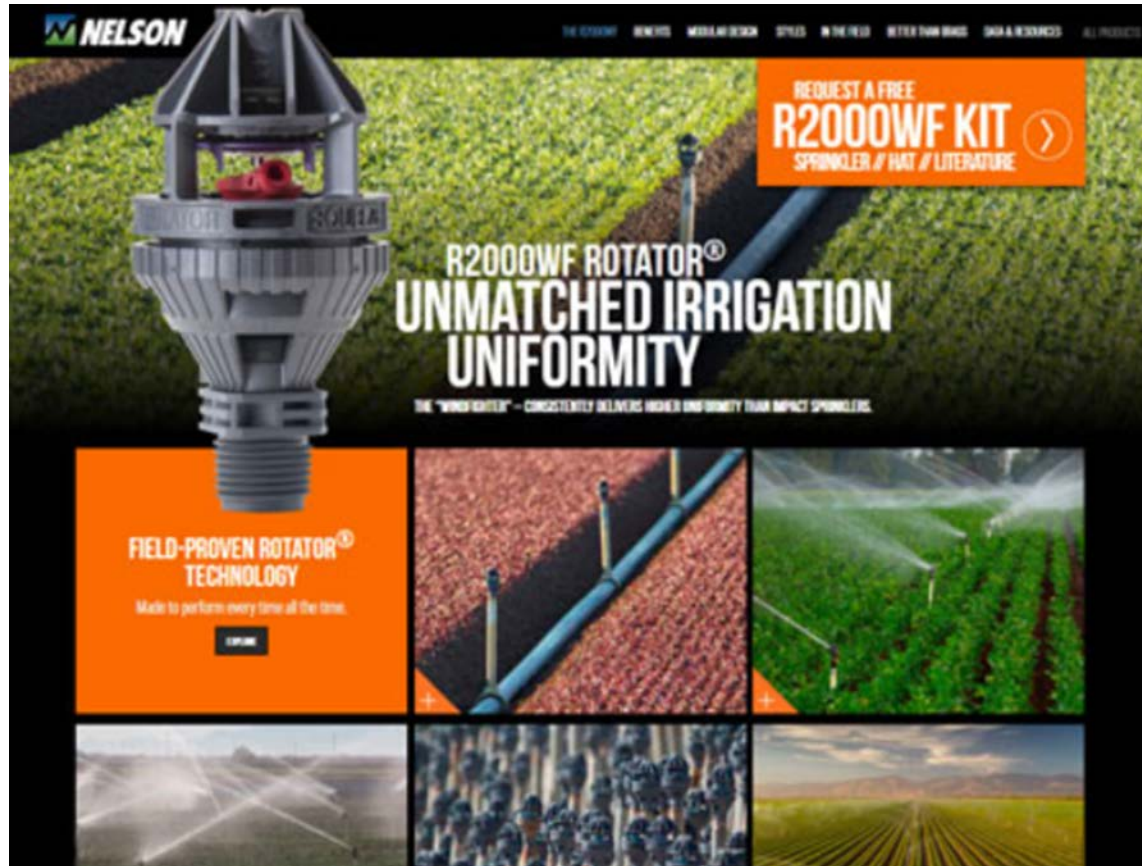
- ▲ Frost hardiness test results showed no significant decrease.
- ▲ Root Growth Potential (RGP) tests resulted in significantly fewer new roots than seedlot grown at another nursery.
- ▲ Potential loss is expected to be about 20%.
- ▲ Based on results of tests, seedlings were block planted on two sites for future monitoring.



# How to Address Issues

## 3<sup>rd</sup> Example

### Sprinklers



**NELSON** THE ROTATOR NEW KIT MEDIA DESIGN STYLES IN THE FIELD BETTER THAN BANG DATA & RESEARCH ALL PRODUCTS

REQUEST A FREE **R2000WF KIT**  
SPRINKLER / PART / LITERATURE

**R2000WF ROTATOR®**  
**UNMATCHED IRRIGATION**  
**UNIFORMITY**

THE "WIND-KATLER" - CONSISTENTLY DELIVERS HIGHER UNIFORMITY THAN IMPACT SPRINKLERS.

**FIELD-PROVEN ROTATOR®**  
**TECHNOLOGY**  
Made to perform every time all the time.

EXPLORE

The advertisement features a large image of the R2000WF Rotator sprinkler head on the left. The background shows a green field with a blue pipe and a sprinkler head. Below the main text are six smaller images: a close-up of the rotator, a close-up of the pipe, a close-up of the rotator, a close-up of the pipe, a close-up of the rotator, and a close-up of the pipe.





# How to Address Issues

## 3<sup>rd</sup> Example - Sprinklers From the Start

- ▲ Cherrylane Seed Orchard Douglas fir crop, mid-elevation.
- ▲ First inspection revealed seedling height had highs and lows, typically associated with sprinkler pattern.
- ▲ Shared my observation with Grower and explained that if the issue continued, there would be root problems at my 2<sup>nd</sup> inspection.
- ▲ Second inspection:
  - ▲ Chlorotic seedlings
  - ▲ High and low seedling height
  - ▲ Very small bud set
  - ▲ Dead roots in short seedlings
  - ▲ My estimation of loss, approximately 25-30%.



# How to Address Issues

## 3<sup>rd</sup> Example – Sprinklers

### Now What?

- ▲ Start asking questions:
  - ▲ How much water applied each irrigation?
  - ▲ Sprinklers checked at each irrigation?
  - ▲ Crop checked for a leach after each irrigation?
  - ▲ If no leach, then what was protocol?
- ▲ Show Grower what you will accept at packout.
- ▲ Schedule pathogen tests on sample seedlings.
- ▲ Conduct Root Growth Potential test on seedlings.

**Communication!!**





# How to Address Issues

## 3<sup>rd</sup> Example – Sprinklers Results

- ▲ Grower culled heavily at packout.
- ▲ 30% of seedlings culled.
- ▲ Pathogen testing showed presence of Fusarium in roots.
- ▲ Even with culling, RGP had low root counts.
- ▲ Out planted packed seedlings.
- ▲ Preliminary feedback from field indicates fairly good survival.
- ▲ Decision made not to grow at this facility in near future.



# Ultimate Goal





# Ultimate Goal







Any Questions?

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