

Optimizing Reforestation: Root Growth Potential of Fall Planted Douglas fir (*Pseudotsuga Menziesii*) under different cold-hardiness treatments

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INTRODUCTION

- Douglas-fir is a local conifer tree (čsey' in ɫəkʷəŋən)
- Douglas-fir accounts for **35%** of the entire Coast forest harvest
- Douglas-fir seedlings are usually planted in spring
- Spring plant is increasingly difficult with cold snaps and hot flashes, especially with climate change
- Fall plant** may be a good alternative, as **roots can establish in the soil** before drastic spring drought or heat stress occurs
- Roots stop growing in the winter once the soil freezes and trees become dormant
- Trees become dormant when they are cold-hardy which occurs after they set bud, which is initiated by a **decrease in daily light**
- To fall plant, nurseries artificially decrease light for the month of July for trees to **set bud earlier**, called a **black-out period**
- The best time to fall plant is when **trees can still grow roots but before the soil freezes** which stops their roots from growing

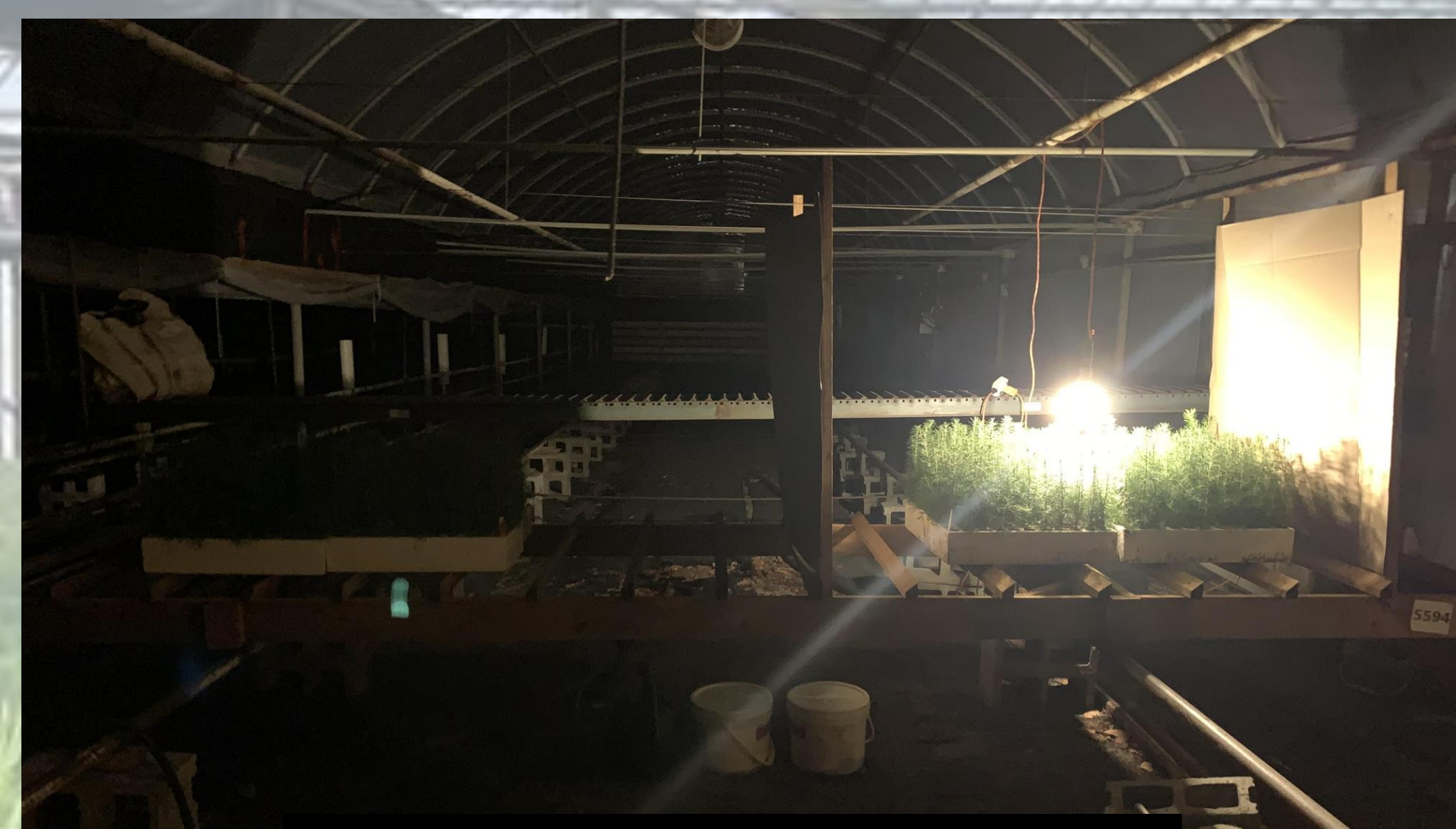
METHODS



trial set up during the day



2 weeks



trial set up at night: light treatment on the right



- Root growth potential: potential for a tree to grow roots under ideal conditions
- Trees were kept at the nursery under 13hr light or ambient light and include a Northern seedlot from Vancouver Island and a Southern seedlot from Southern Oregon
- Throughout the fall (08/26-12/02/25), 16 trees from each seedlot and treatment were taken to UVic and grown in ideal conditions for root growth for two weeks, after which white roots >1cm were counted per tree
- Statistical analyses were done in R, including graphs, normality tests, ANOVA, linear regression, and linear models
- Any non-normal data was subject to nonparametric tests

DISCUSSION

- There was **light pollution** on the trees subjected only to ambient light (Figure 1)
- Unexpectedly**, root growth potential **increased** throughout the fall (Figure 2)
 - Linear regression had **positive slopes** for total root count over all trials and for individual categories for all but Southern Seedlot with Extended Photoperiod (which was not significant).
- Seedlot and treatment had **no affect** on root growth potential, probably in some part due to the light pollution
- The best time to fall-plant Douglas-fir is **early November to early December** when looking at root growth potential as the only planting factor
- Overall, every trial, seedlot, and treatment produced a high root growth potential: ≥ 5 on the Burdett scale.
 - All trees were above the minimum standard to be planted and will most likely survive a fall planting at any time, under either treatment, and with either seedlot**

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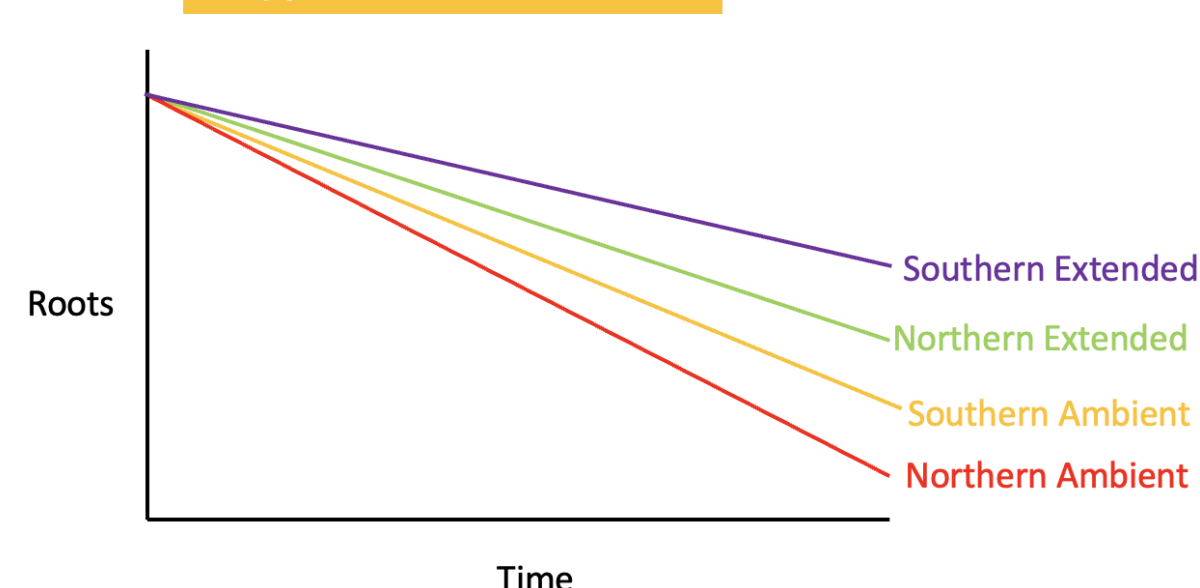
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QUESTIONS

- How long do roots maintain the ability to grow throughout the fall and to what degree?
- Will adding a consistent August-level light (13hr day) to trees post black-out affect their **root growth potential** ?
- Will **seedlot** origin affect **root growth potential** throughout the fall?
- Will adding a consistent August-level light (13hr day) to trees affect their **cold-hardiness** in December?
- Will light treatment or seedlot affect lammas growth (secondary flush in the fall)?

Application: What is the best time to plant in the fall, and is it different depending on the seedlot? Will a light treatment increase root growth potential?

hypothesized results



PRELIMINARY RESULTS

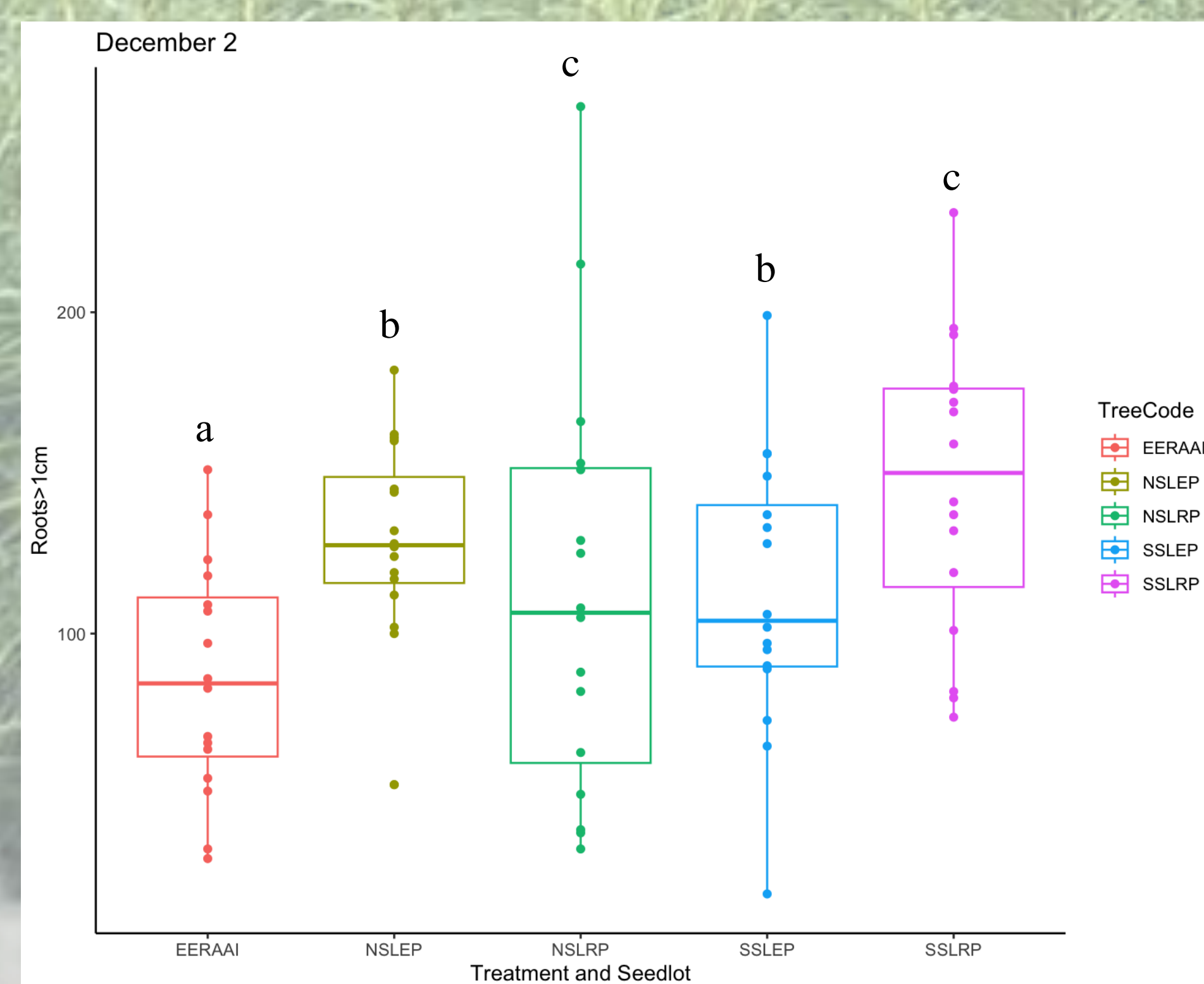


Figure 1. Final trial, December 2, comparing EERAAI (northern extra seedlot with ambient photoperiod) to the other seedlots and treatments (NSL=northern seedlot, SSL=southern seedlot, RP=regular (ambient) photoperiod, EP=extended photoperiod) in order to show if there was light pollution on the ambient photoperiod treatments. Letters indicate significant difference based on Welch's t-tests. Figures made with R.

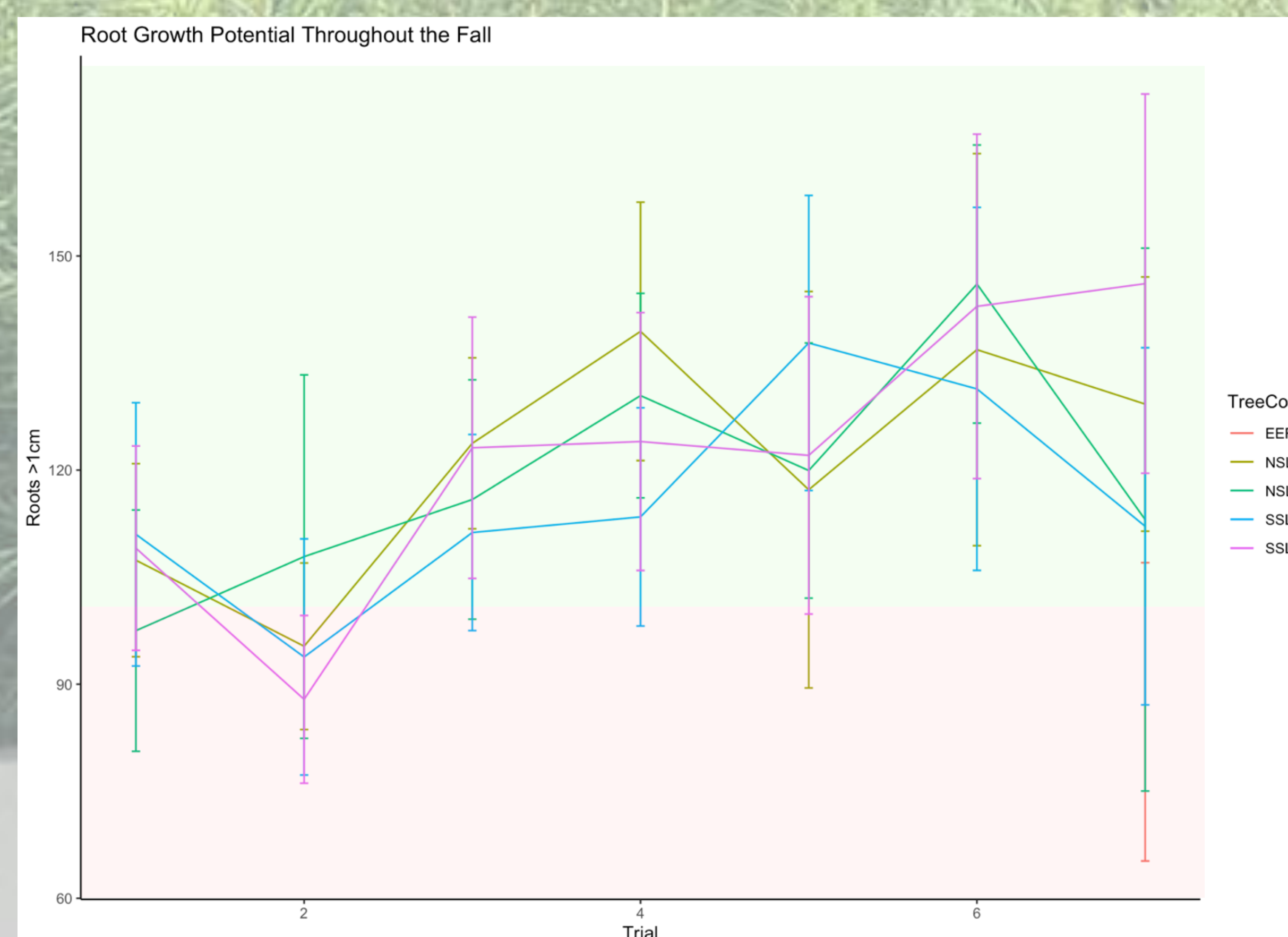


Figure 2. Root Growth Potential throughout the fall. Trials were every two weeks from August 26-December 2. NSL=northern seedlot, SSL=southern seedlot, RP=regular (ambient) photoperiod, EP=extended photoperiod, EERAAI= northern extra seedlot with an ambient photoperiod. Red background is a Burdett scale of 5 and green background is Burdett scale of 6. A healthy tree root growth potential is greater than 4 on a Burdett scale. Figures made with R.

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