

# If a Tree Falls in the Forest: An Analysis of Long-Term Survival of Trees Growing on Dead Logs

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## Research Questions:

- What effects do large organisms have when they die?
- How might growing on a fallen log effect *Tsuga Heterophylla* (TSHE) trees survival?

## Background:

- Tree mortality is increasing globally, there may be more nurse logs (NL) in the future.
- Large trees have more growth and lower mortality.
- TSHEs represent a large amount of carbon storage in western North American forests.

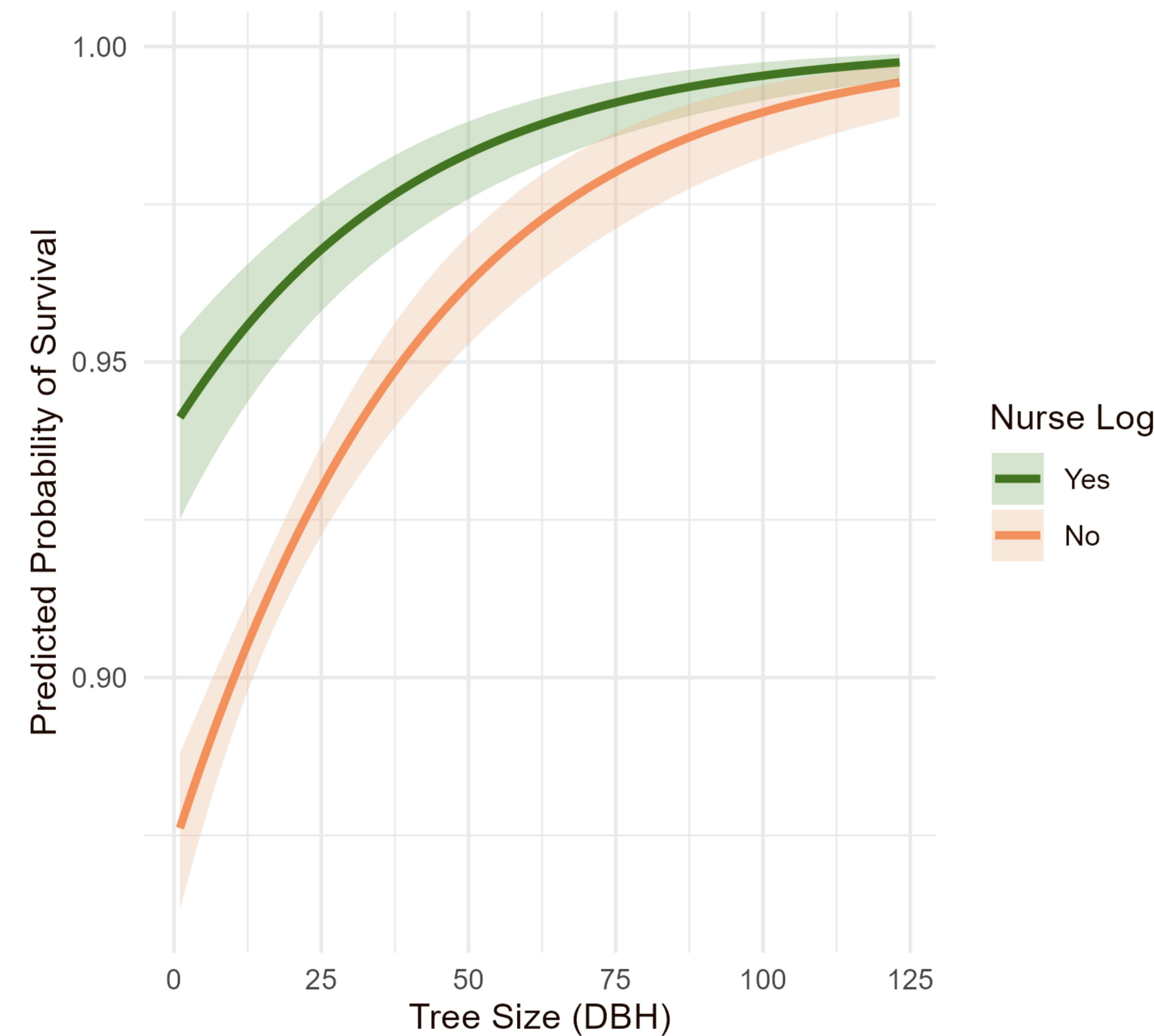
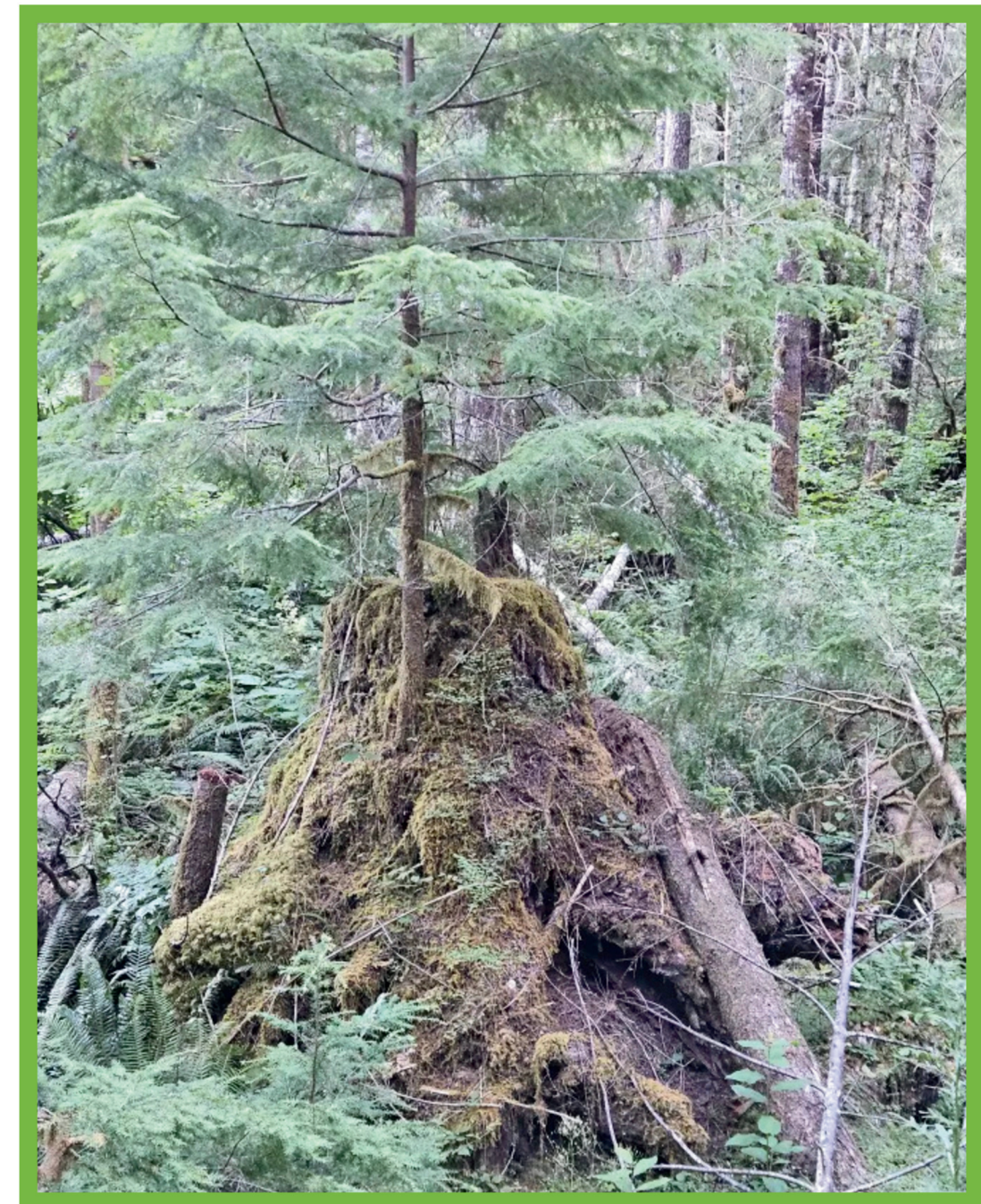
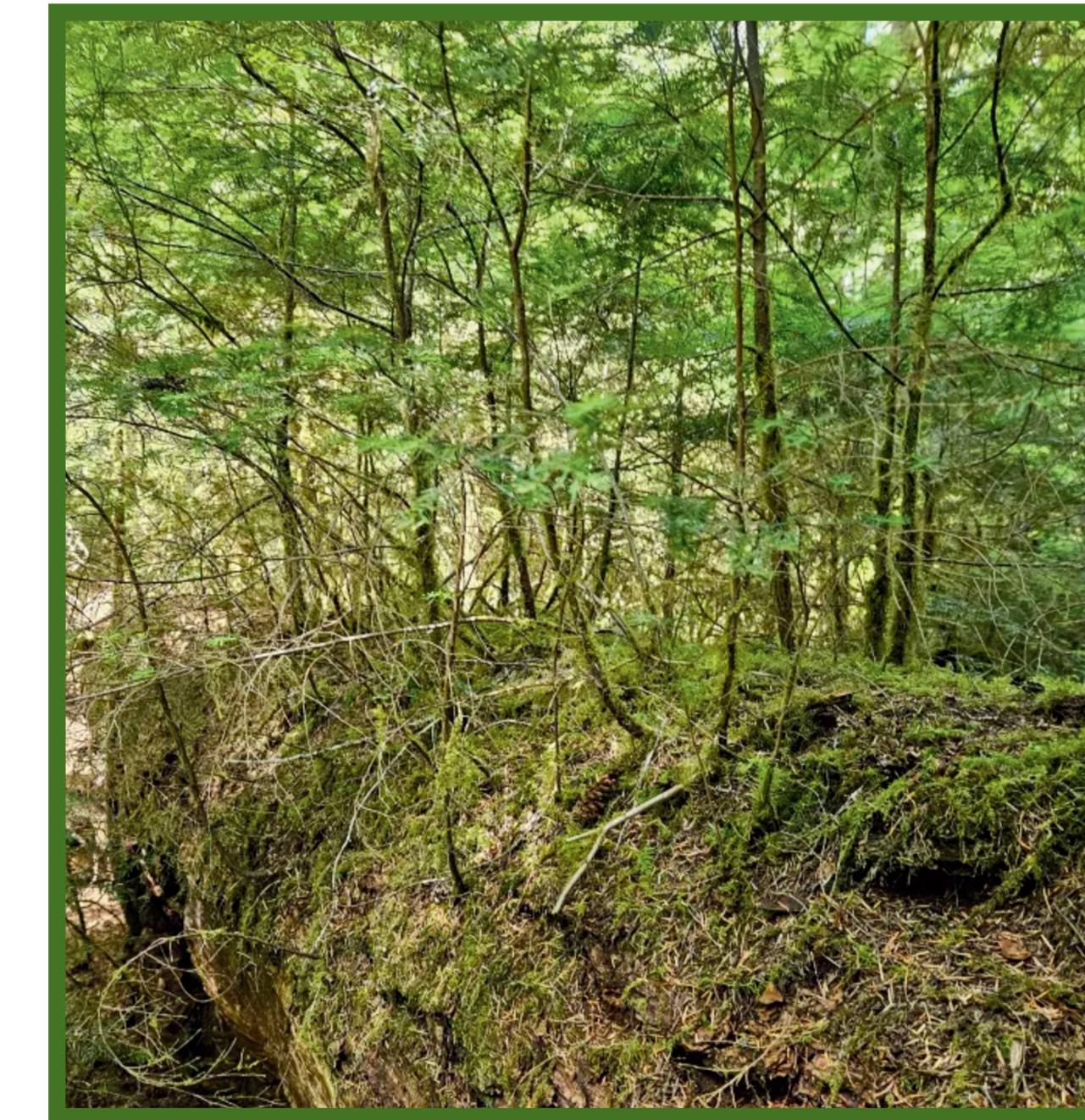


Fig 1. *Tsuga Heterophylla* survival curves  
The graph shows the difference in survival curves for trees based on the size of the tree and if it is growing on a NL vs growing in soil. There is a large difference in the survival rate on and off of NLs in small trees ( $p = < 2e-16$ ), however as any tree gets bigger its survival rate increases.



## Methods:

- Collected tree census data - including DBH (diameter of the tree at 1.37 m), mortality, and if it was on a NL.
- Compiled TSHE growth data as the change in DBH between census one and two with respect to how much time passed.

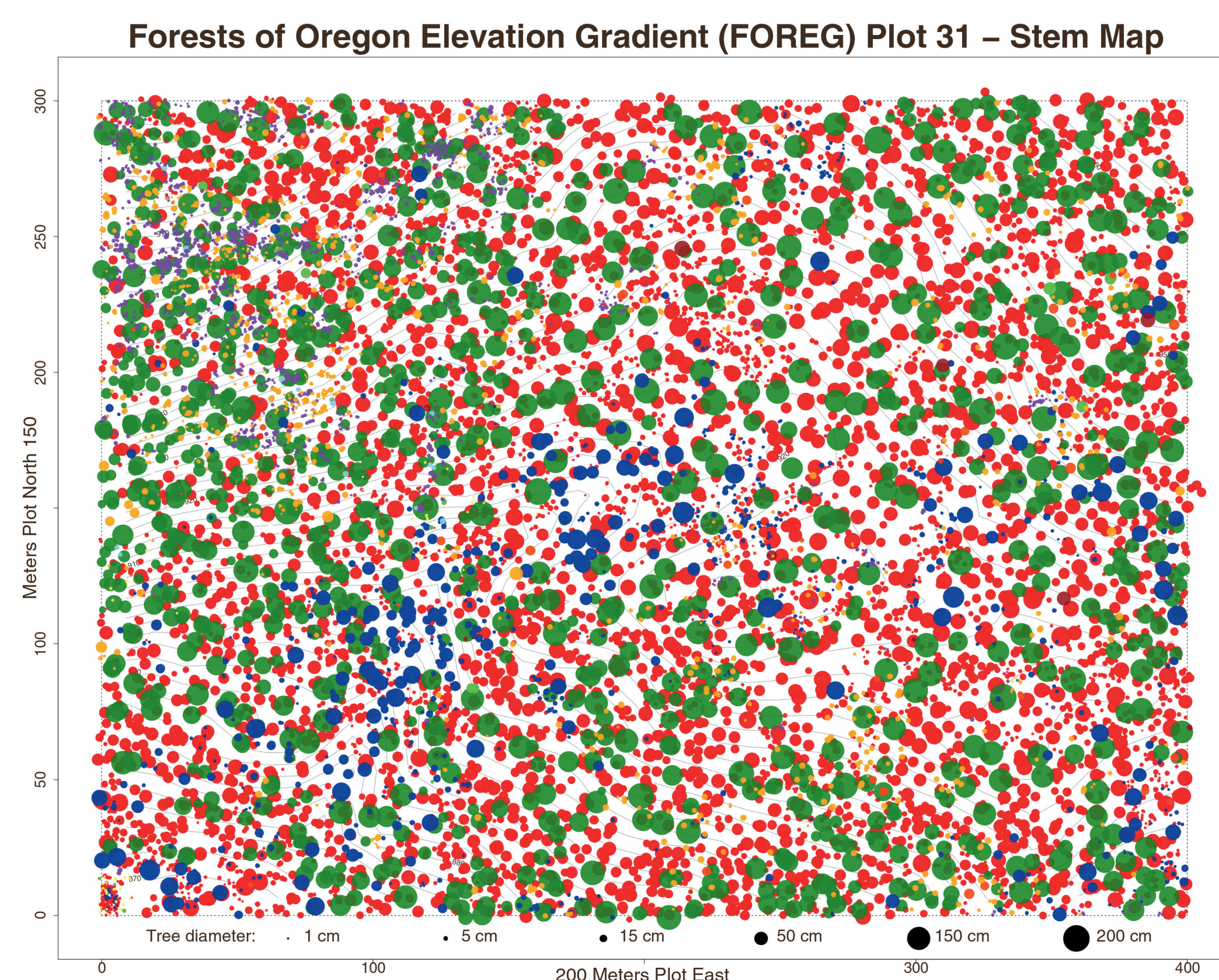
## Results:

1. Growing on a NL **decreases small tree mortality**, and has no effect on mature trees ( $p = < 2e-16$ ).
2. Large trees have higher growth rates while on a NL ( $p = 0.00145$ ,  $R = 0.1037$ ).

## Conclusion:

Nurse logs provide initial survival benefits during early life stages and growth benefits at later stages in life.

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## Hypotheses:

1. Growing on a NL will destabilize root anchorage and **increase pre-mature mortality**.
2. Any benefits to survival from germinating on a NL will fade away with time as the tree ages and grows larger.

## Predictions:

- Trees on NLs will have an initially larger survival rate as saplings, however they will have higher mortality rates in later life stages.

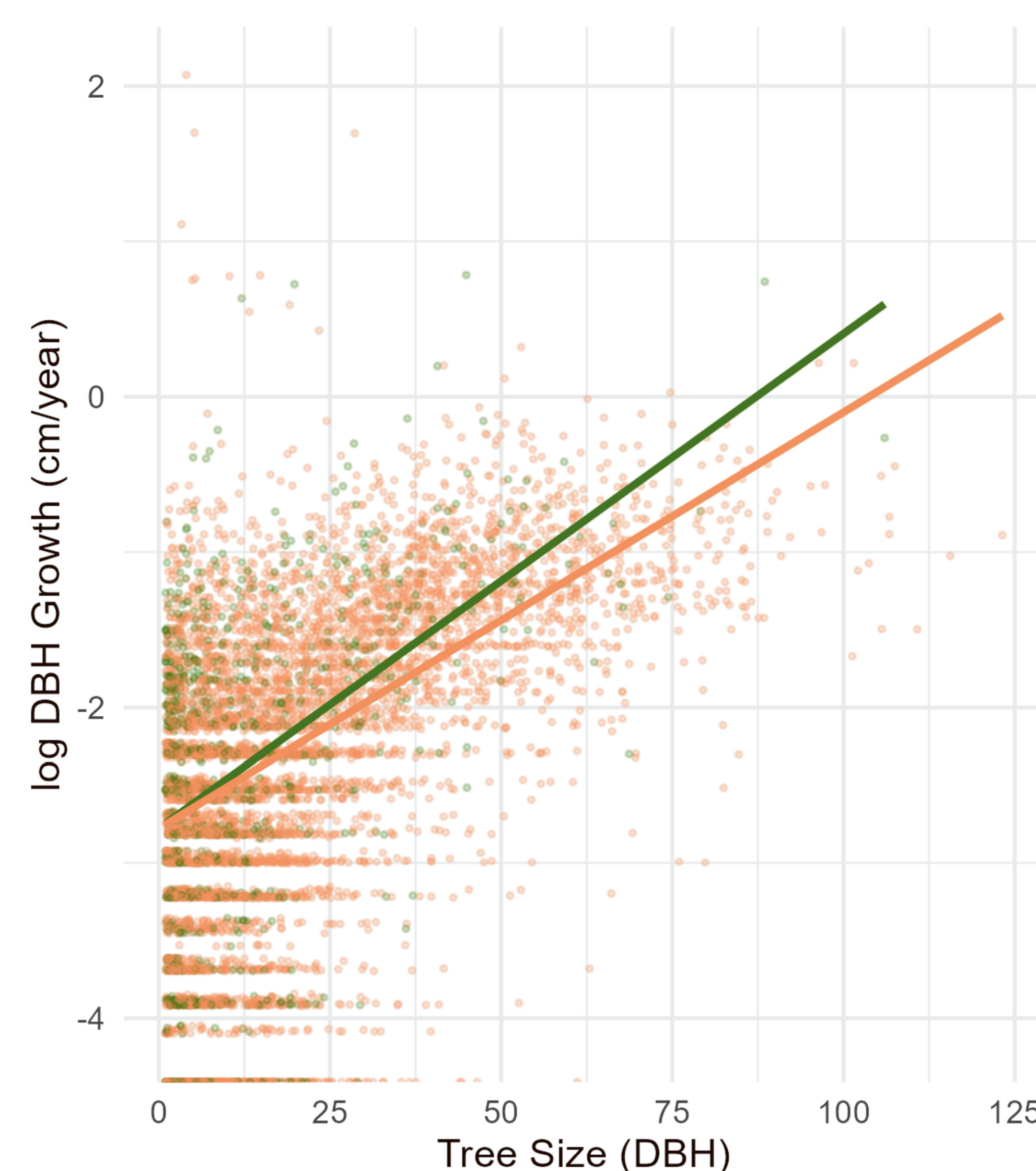


Fig 2. *Tsuga Heterophylla* growth rate  
The graph shows the change in growth rate from small to large trees and the difference in growth between trees on NLs vs growing in soil using a scatterplot and linear fit model. There is a difference in growth rates between NL and non-NL trees in large trees ( $p = 0.00145$ ,  $R = 0.1037$ ).