University of Idaho
College of Natural Resources

ENHANCING INTERIOR DOUGLAS-FIR AND WESTERN LARCH SEEDLING GROWTH WITH POST-PLANTING FORB CONTROL

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INC/WFCNA/ICSGA JOINT MEETING

29 SEPTEMBER 2022

DO WE NEED TO CONTROL COMPETITION?

MANY COMMON FORBS ON RECENTLY DISTURBED SITES ARE NON-NATIVE & INVASIVE

Canada thistle

Prickly lettuce

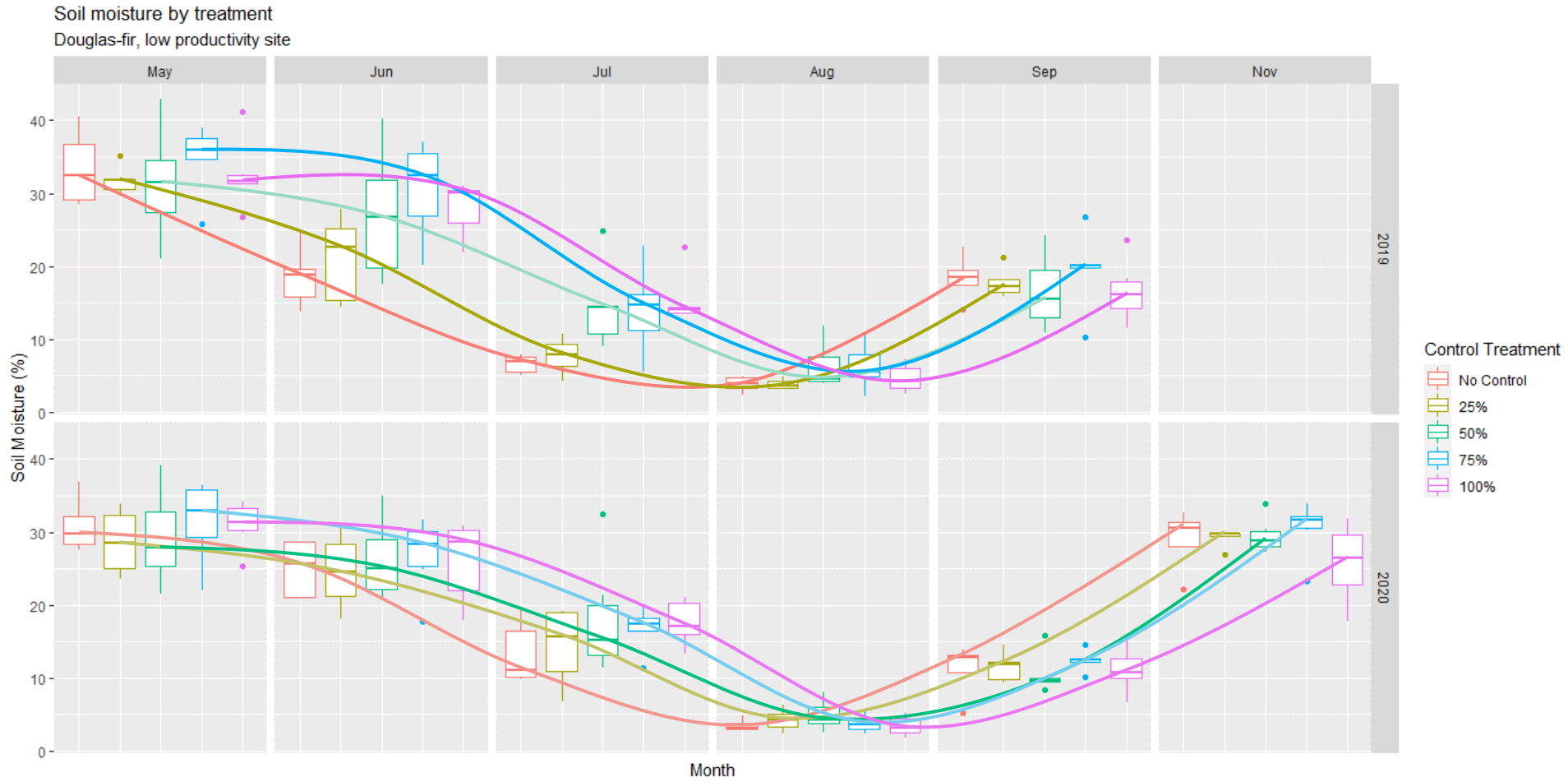
https://weedid.missouri.edu/weedinfo.cfm?weed_id=151

MANY COMMON FORBS ON RECENTLY DISTURBED SITES ARE NON-NATIVE & INVASIVE

Oxeye daisy

Mullein

EFFECTS OF FORB CONTROL ON SOIL MOISTURE ON A NORTH IDAHO CLEARCUT SITE



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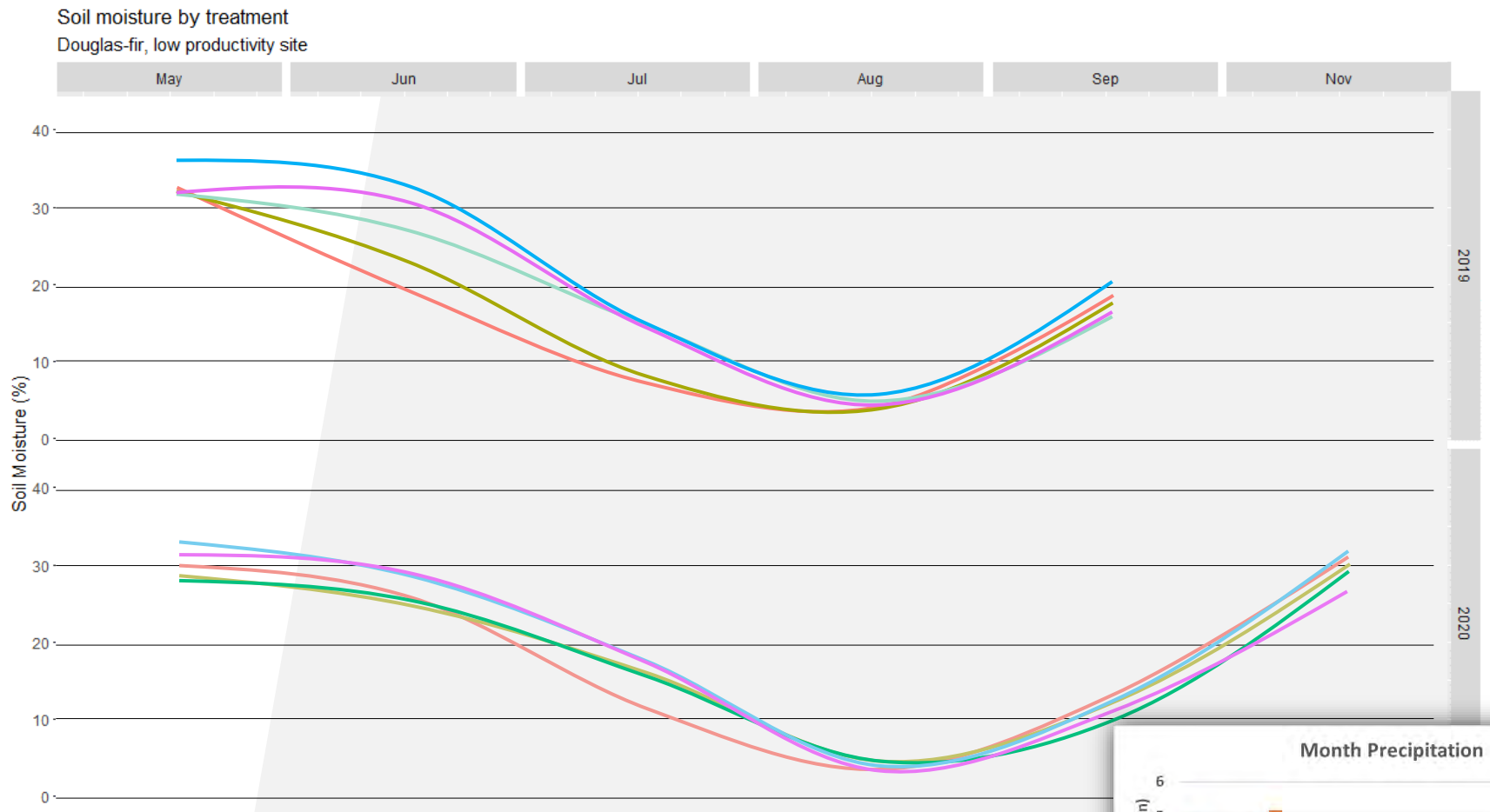
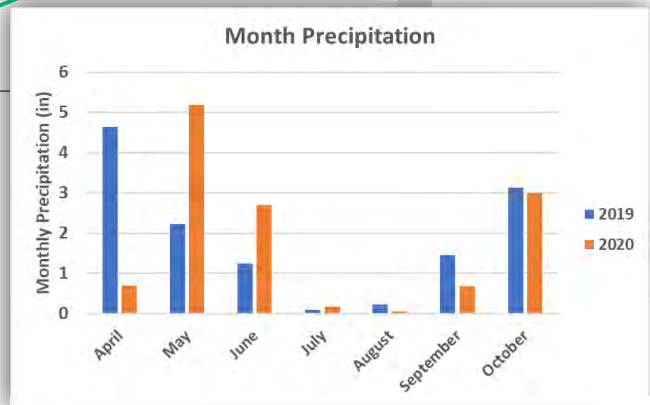
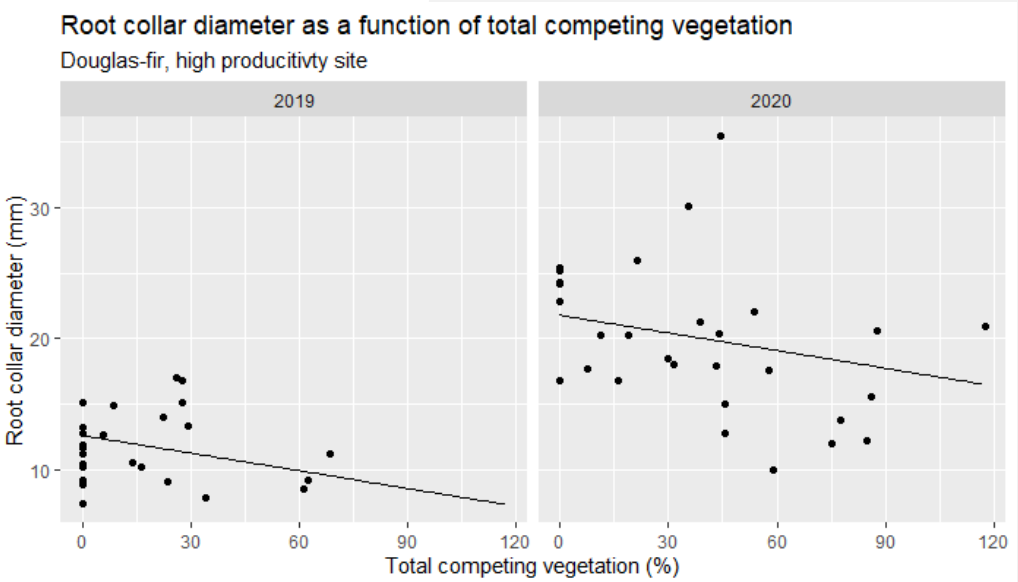




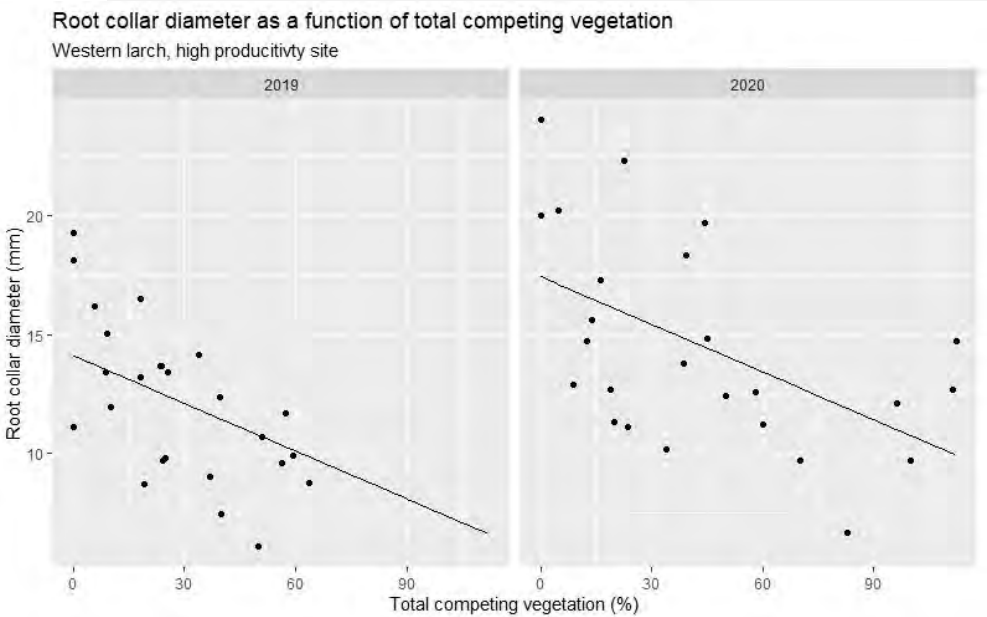
2019 had much lower precipitation in May and June compared to 2020, which is reflected in the lower moisture early and mid-summer when 0% and 25% competition was removed

COMPETITION EFFECTS ON ROOT COLLAR DIAMETER



Douglas-fir

Western larch



Both species showed negative correlation between competing vegetation cover and root collar diameter at the end of the 3rd growing season, but western larch was more sensitive to increases in competition

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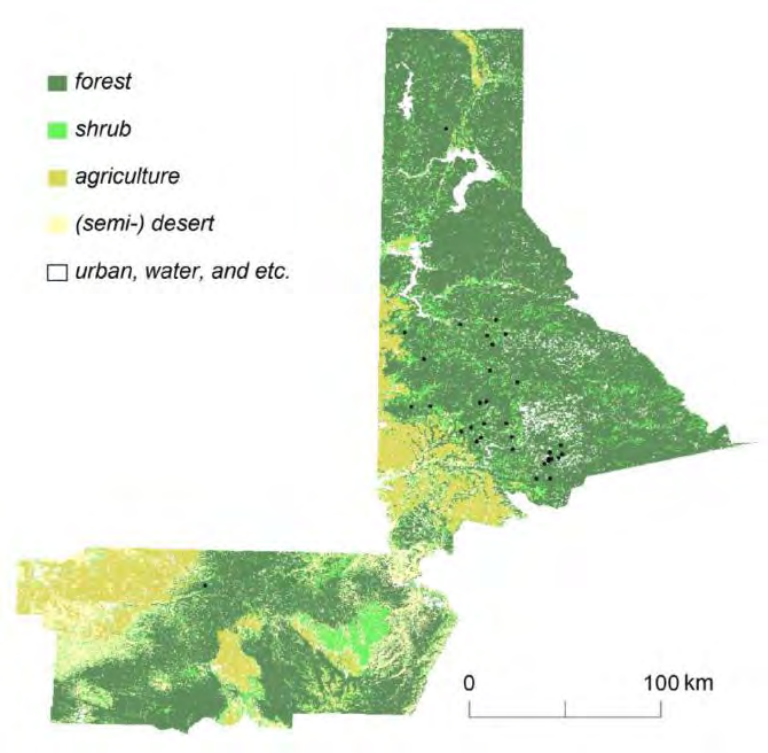
INLAND NORTHWEST SURVIVAL AND GROWTH COMPETITION THRESHOLDS

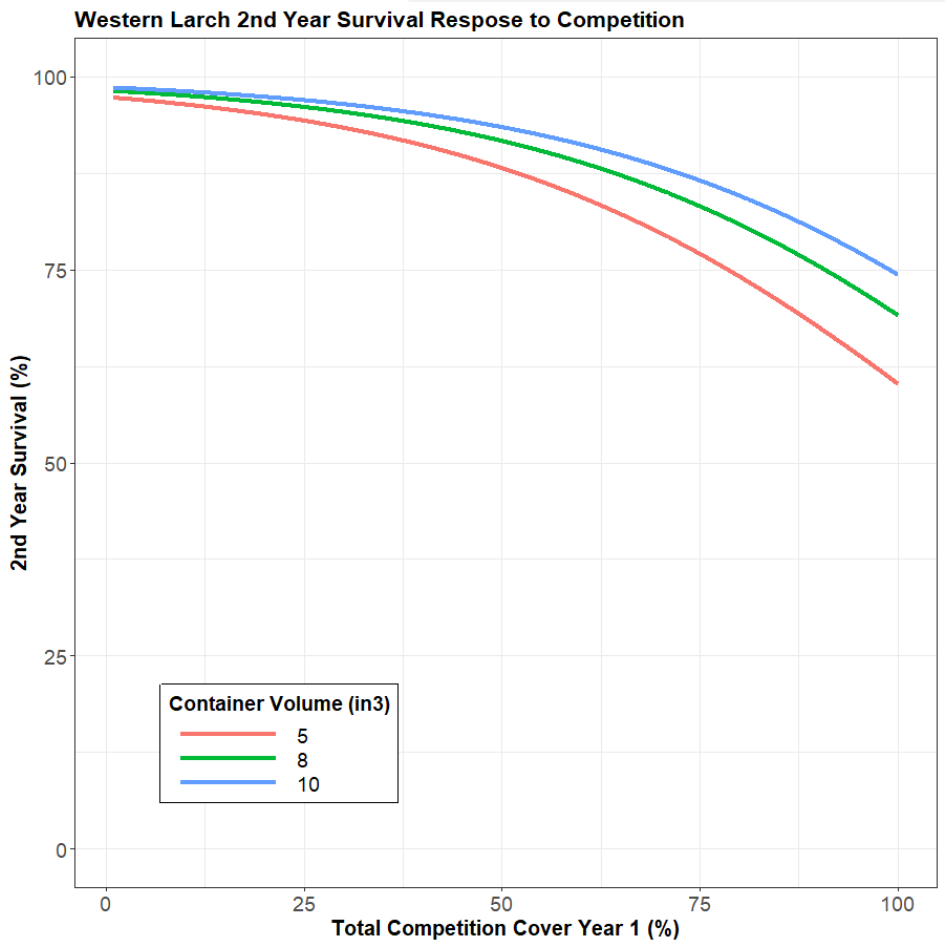
- Western Larch
  - 476 plots
  - 10,553 seedlings
- Interior Douglas-fir
  - 367 plots
  - 6,832 seedlings
- Plots across northern Idaho and northeastern Oregon, but primarily on the higher end of site productivity
- Various stocktypes and years of planting



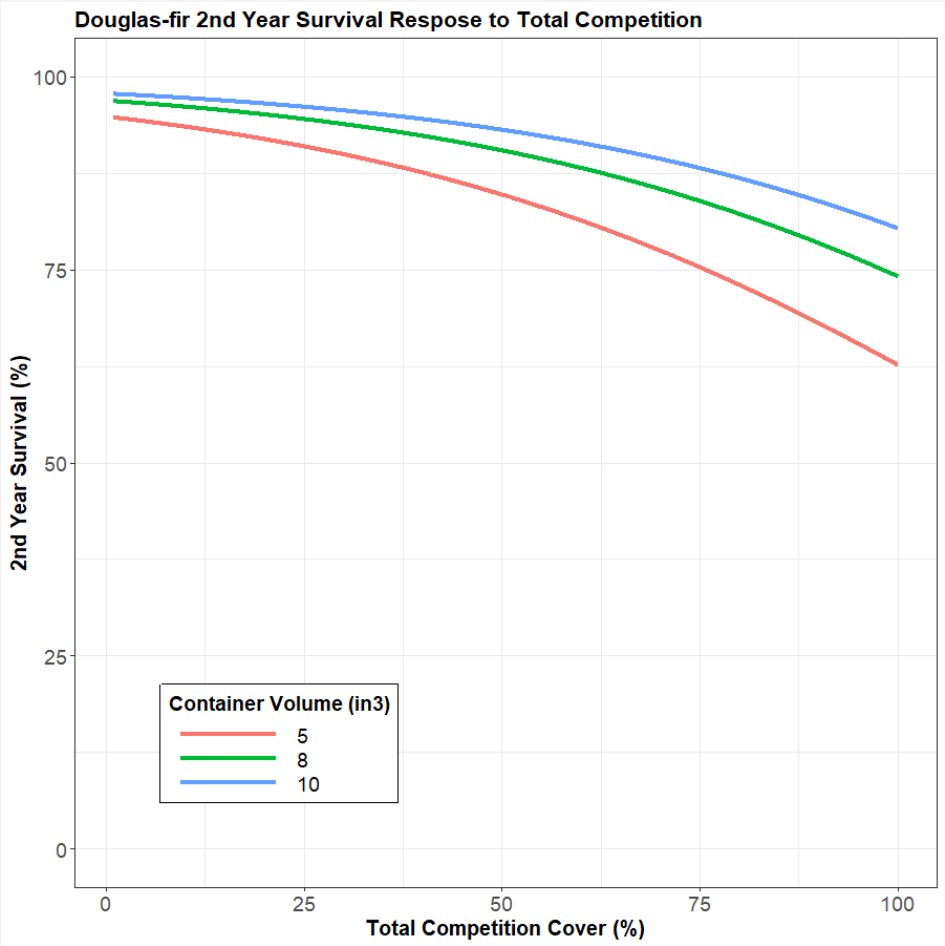
Chen and Nelson. 2020. For. Ecol. Manage. 474: Art. 118386

COMPETITION THRESHOLDS: SURVIVAL

Western Larch



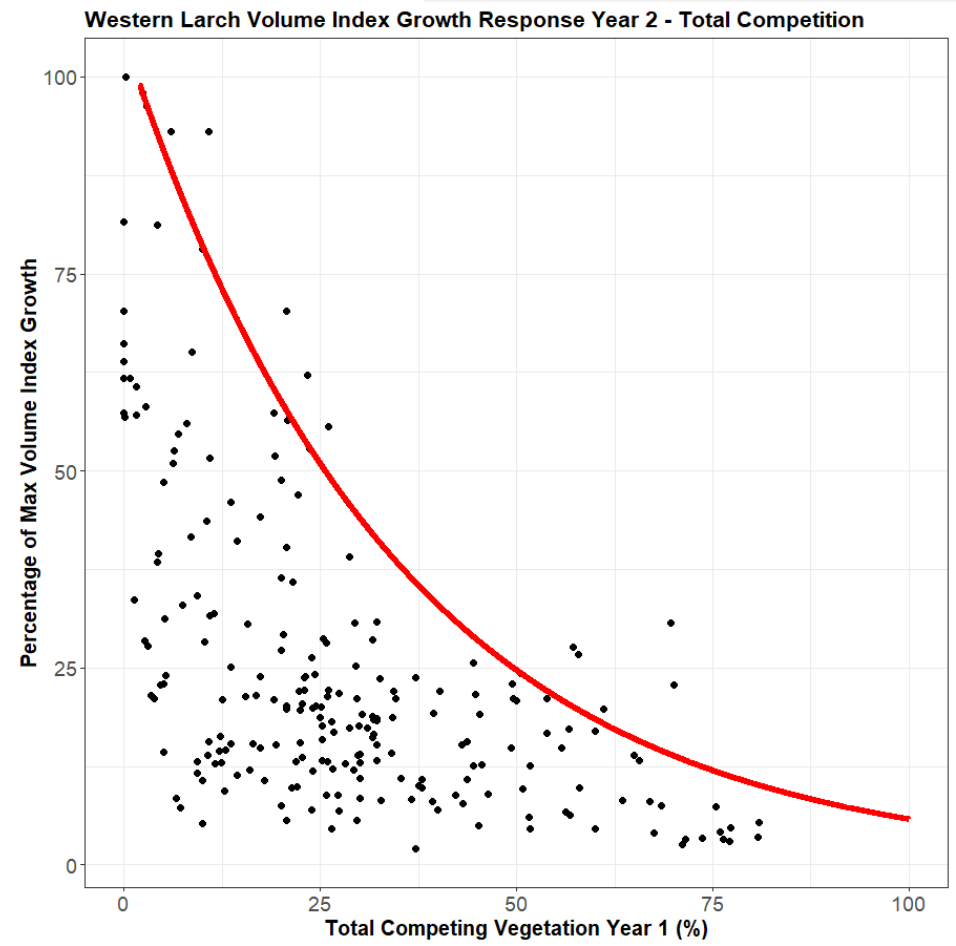
Interior Douglas-fir



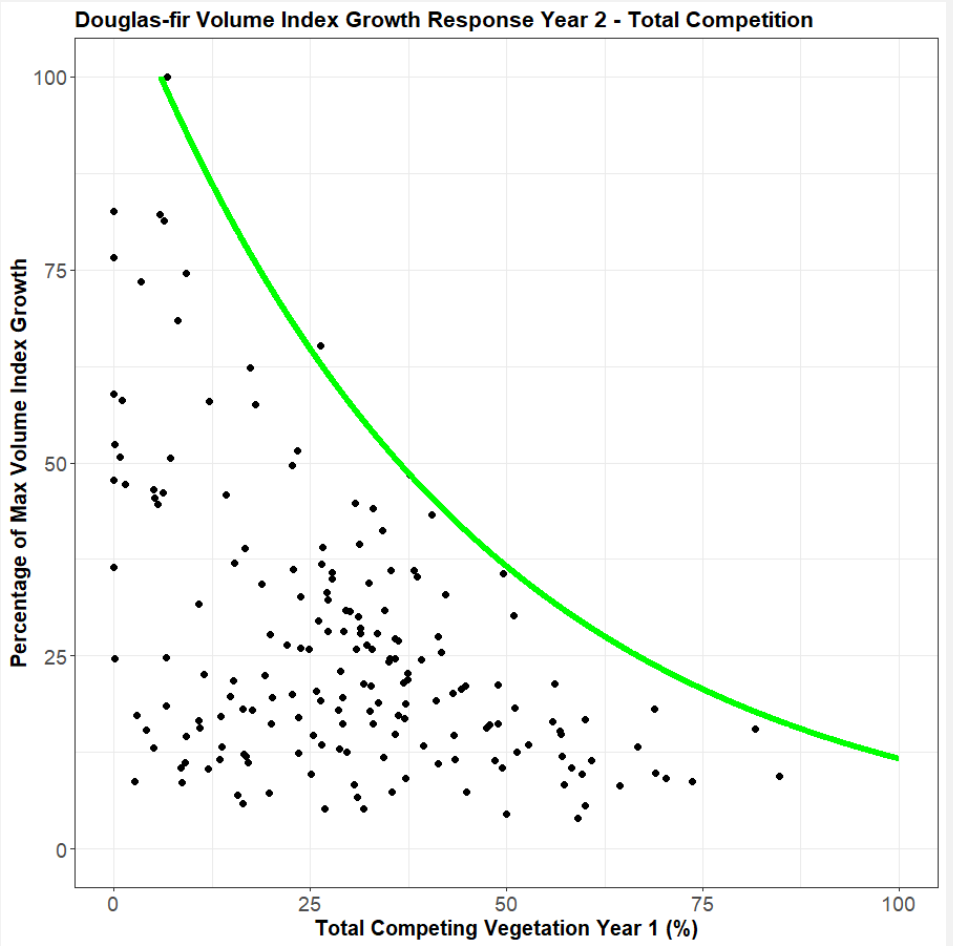
Nelson, A.S. *Unpublished data*.

COMPETITION THRESHOLD: GROWTH

Western Larch



Interior Douglas-fir



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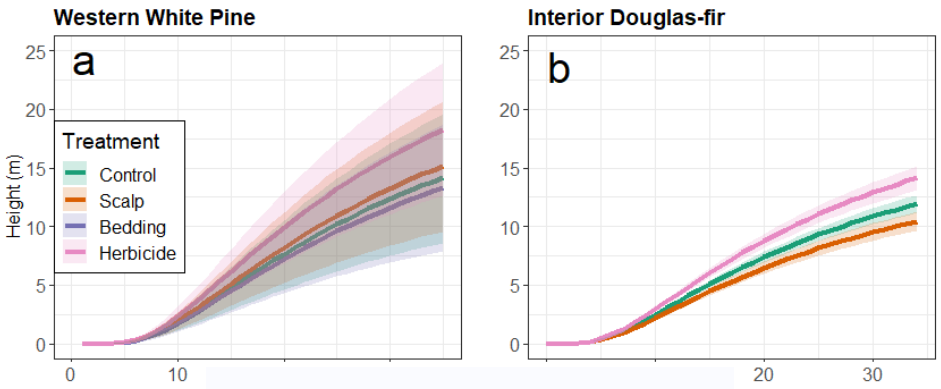
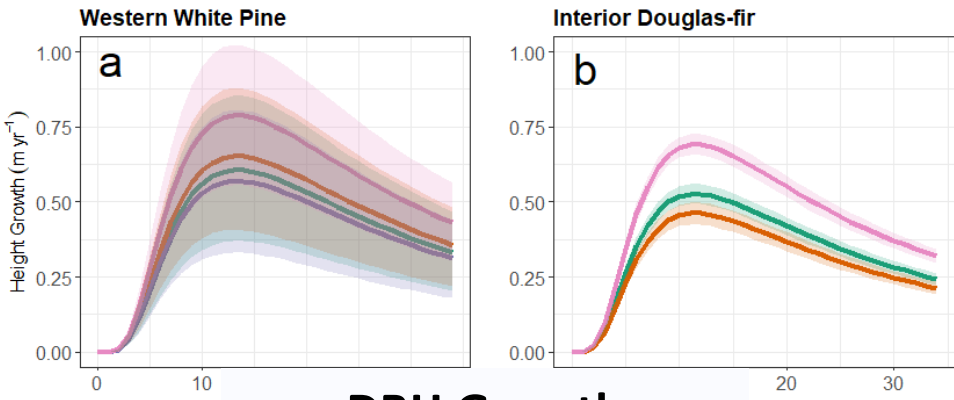
EARLY COMPETITION CONTROL CAN RESULT IN SUSTAINED GAINS IN TREE SIZE AND GROWTH

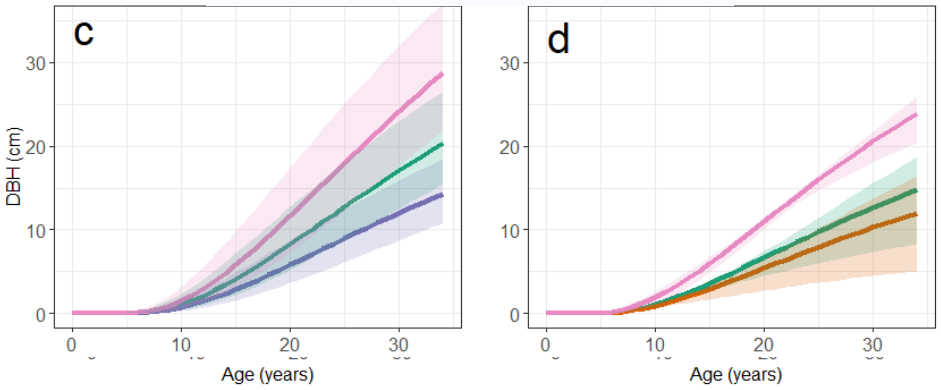
Height Over Time



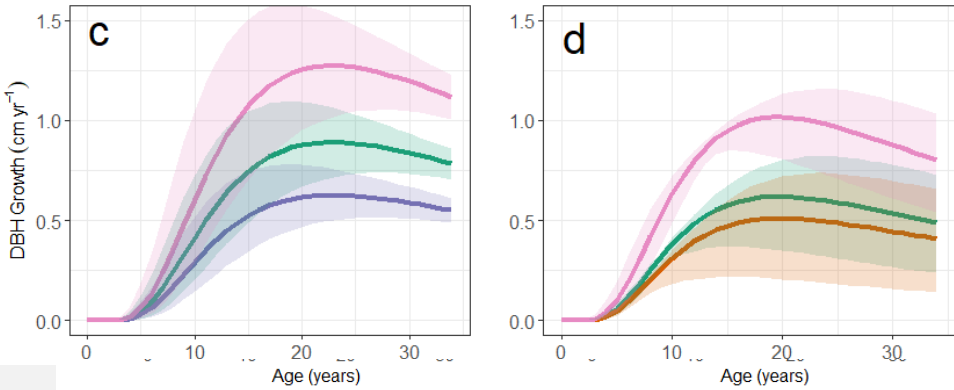
Height Growth



DBH Over Time



DBH Growth



Change in tree size

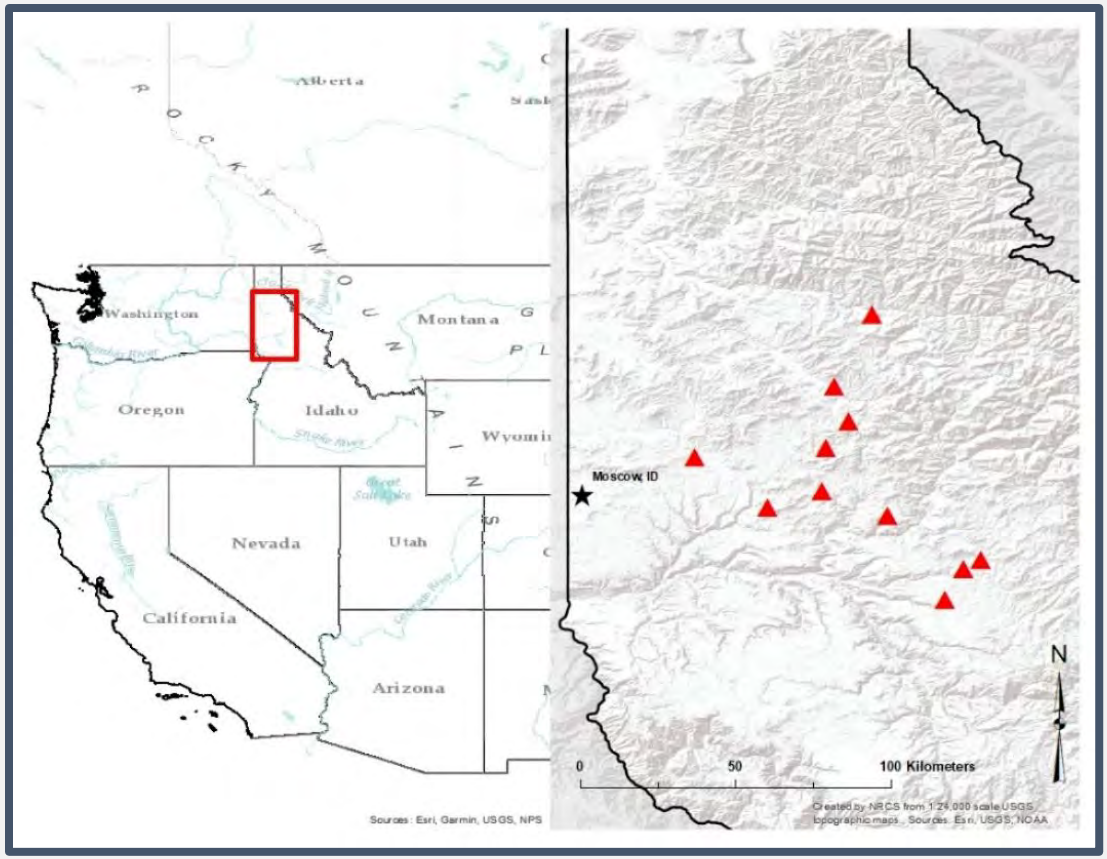
Change in tree growth

Cherico et al. 2020. Forests 11: 509

WHAT HAPPENS WHEN WE CONTROL FORBS POST-PLANTING?

STUDY SITES

- Eleven study sites in North-Central Idaho
  - Seven with both species
  - Two Douglas-fir only
  - Two western larch only
- All sites were treated with typical herbicide site preparation prescriptions the summer or fall before planting. Planted 2018.
- Seedlings were operationally planted on ~ 10 x 10 ft spacing



EXPERIMENTAL DESIGN

- Three productivity classes based on a Douglas-fir site index model
  - Low: Site index ≤ 74 ft
  - Moderate: Site index 75-88 ft
  - High: Site index ≥ 89 ft
- Three sites per species (western larch or Douglas-fir) per productivity class. Some sites were planted with both species
- Six plots per species
  - Three no post-planting release
  - Three with post-planting release

POST-PLANTING RELEASE TREATMENT

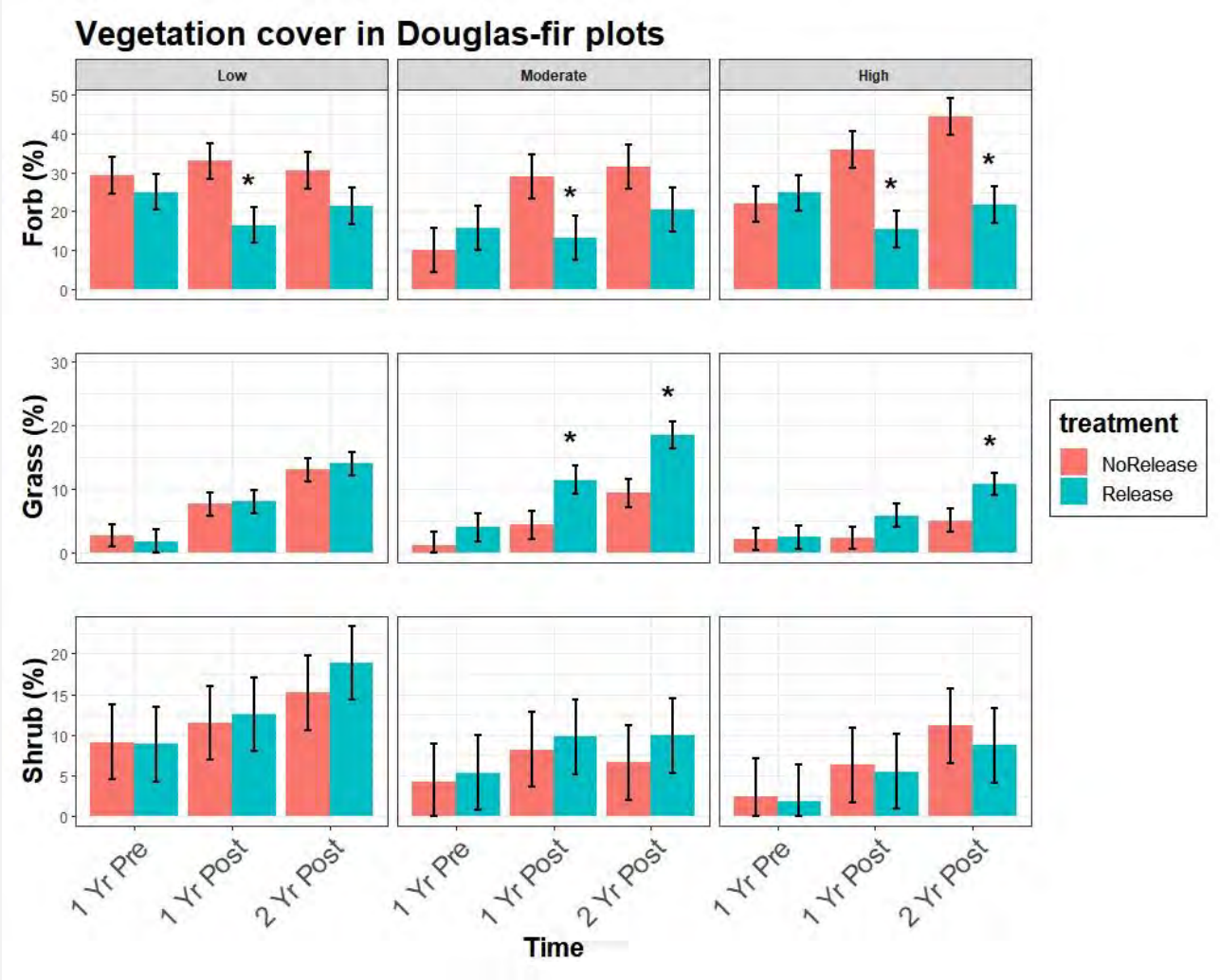
- Treated plots were broadcast sprayed with 15 oz per acre of Transline® herbicide (active ingredient clopyralid), a rate recommended for control of hawkweed and thistles, in spring 2019
  - Targets forbs, primarily in the Asteraceae family
  - Only chemical available for release of western larch
- Treatments applied with backpack sprayers using the waving-wand technique

TIMELINE OF ACTIVITIES

Activity	Summer/ Fall 2017	Spring 2018	Summer 2018	Fall 2018	Spring 2019	Summer 2019	Fall 2019	Summer 2020	Fall 2020
Site Prep	X								
Planting		X							
Competition cover			X			X		X	
Seedling growth & survival		X		X			X		X
Transline application					X				

CHANGE IN COMPETITION COVER

Post-planting treatment kept forb cover lower after treatment than no control, but at moderate and high productivity sites forb control resulted in greater grass cover



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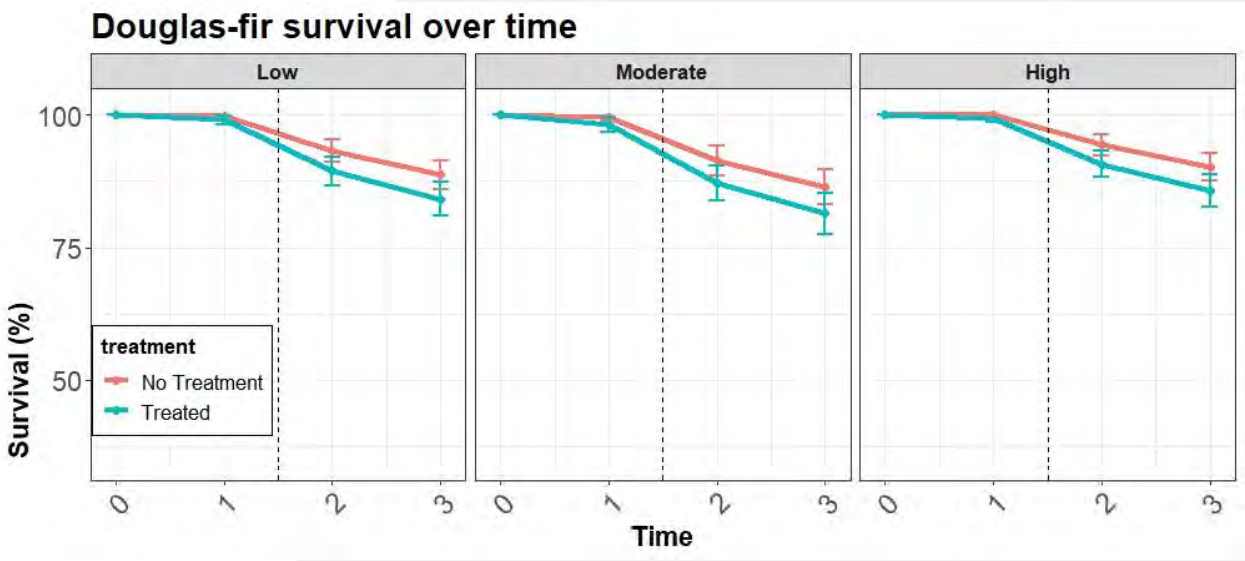
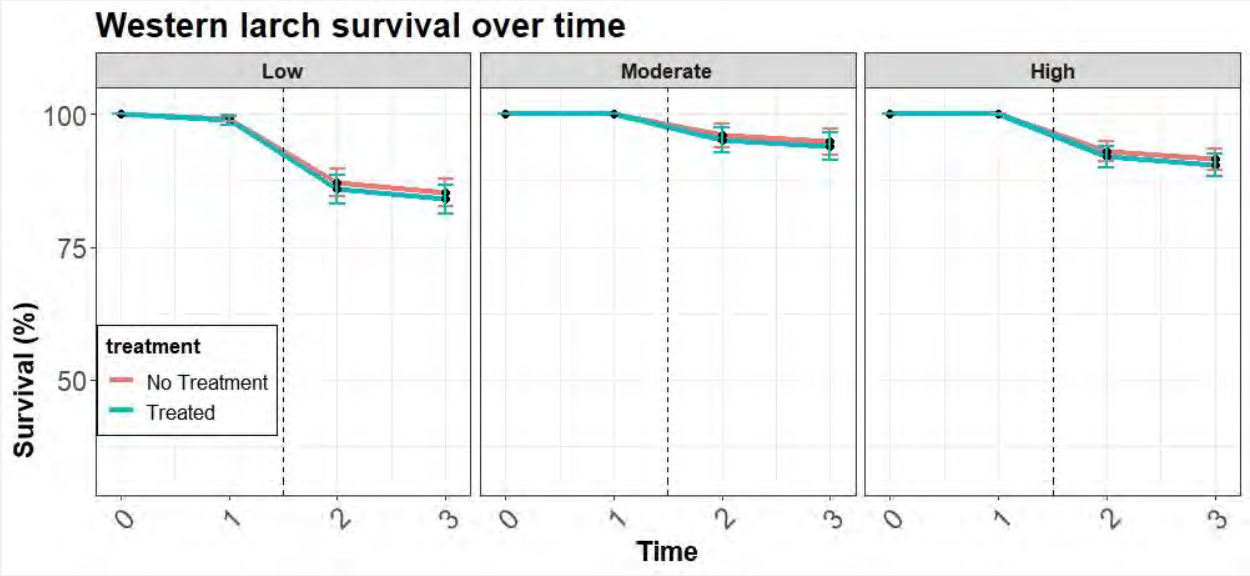
SEEDLING SURVIVAL RESPONSE



No effect of treatment on survival of Douglas-fir or western larch



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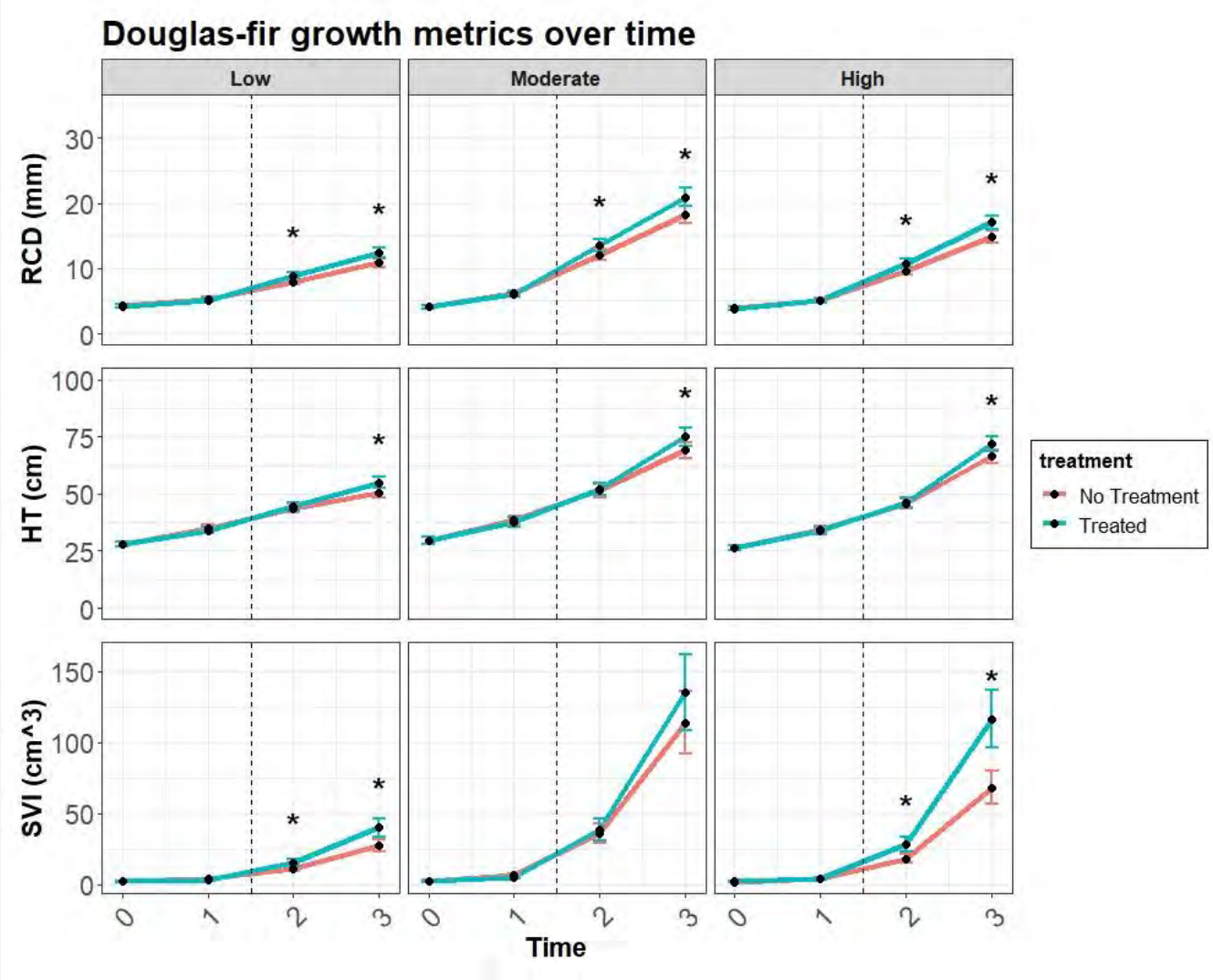
GROWTH EFFECTS

DOUGLAS-FIR

Stem diameter showed an immediate response to treatment, while height response was delayed a year



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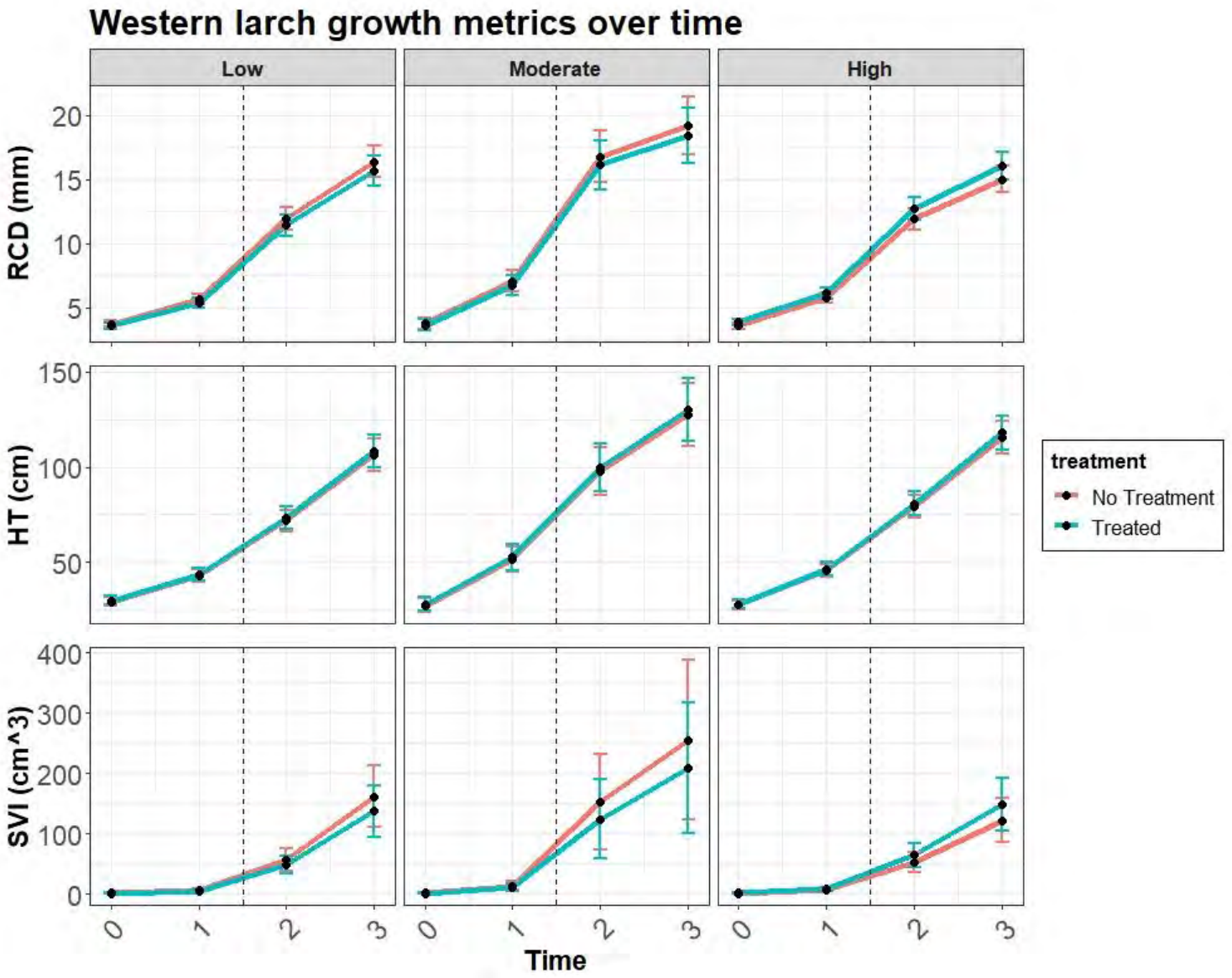
GROWTH EFFECTS

WESTERN

LARCH



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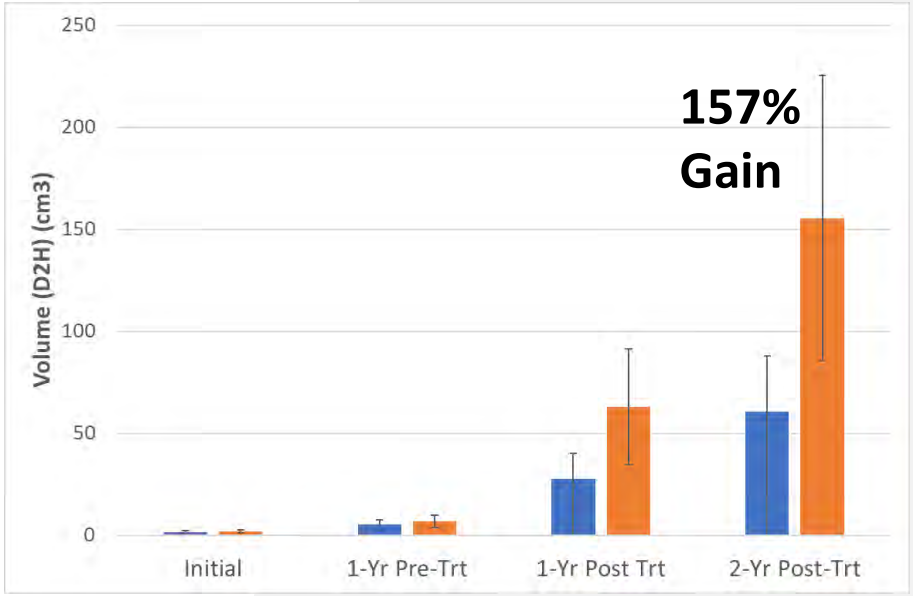
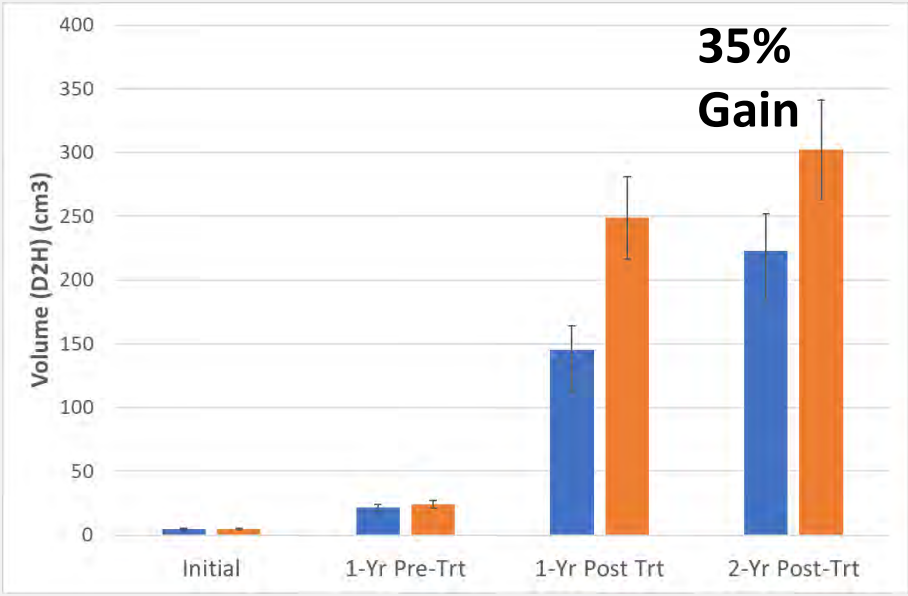
INDIVIDUAL SITE EXAMPLES

WESTERN LARCH

One Low Productivity Site



One High Productivity Site



SUMMARY OF FINDINGS

- Clopyralid application effectively reduced forb cover immediately after treatment that remained lower than untreated plots the second year after treatment. Removal of forbs increased grass cover at Moderate and High productivity sites, while shrub cover was unaffected.
- Across a range of site productivity, post-planting forb control did not influence survival of Douglas-fir or western larch. The lack of response could be because survival was generally high regardless of treatment
- Treatment immediately increased stem diameter growth of Douglas-fir, while height growth was delayed a year. Likely due to the determinate growth habit of interior Douglas-fir.
- Treatment had no effect on diameter or height of western larch across sites, likely due to high variability.
- Still the gains in western larch volume two years after treatment were large with the biggest gains observed at some low productivity sites.

NEXT STEPS

- Repeating the experiment, the following way:
  - Single seedlots of Douglas-fir and western larch, grown at same nursery (Pitkin Forest Nursery)
  - Site productivity defined using a site grid approach comprised of:
    - Soil quality (ash mantle depth, water holding capacity)
    - Mean annual precipitation
    - Heat loading (slope, aspect)
  - Two stocktypes (411B [Styro-5] and 415C [Styro-8])
- Timeline:
  - 2021: Located sites, measured pre-site prep vegetation & slash, performed same site prep treatments across all sites
  - 2022: Planted seedlings, measured seedlings, measured competing vegetation
  - *2023: Apply herbicide, measure seedlings and competition cover*
  - *2024: Measure seedlings and competition cover*

ACKNOWLEDGEMENTS

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- Seedlings and data provided by PotlatchDeltic Corp. and Manulife Investment Management were used to develop the survival and growth response curves to competition