

Managing debris and disturbance to benefit the regenerating stand

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Silvicultural reallocation of resources during plantation development

Logging debris

Vegetation control

Soil disturbance

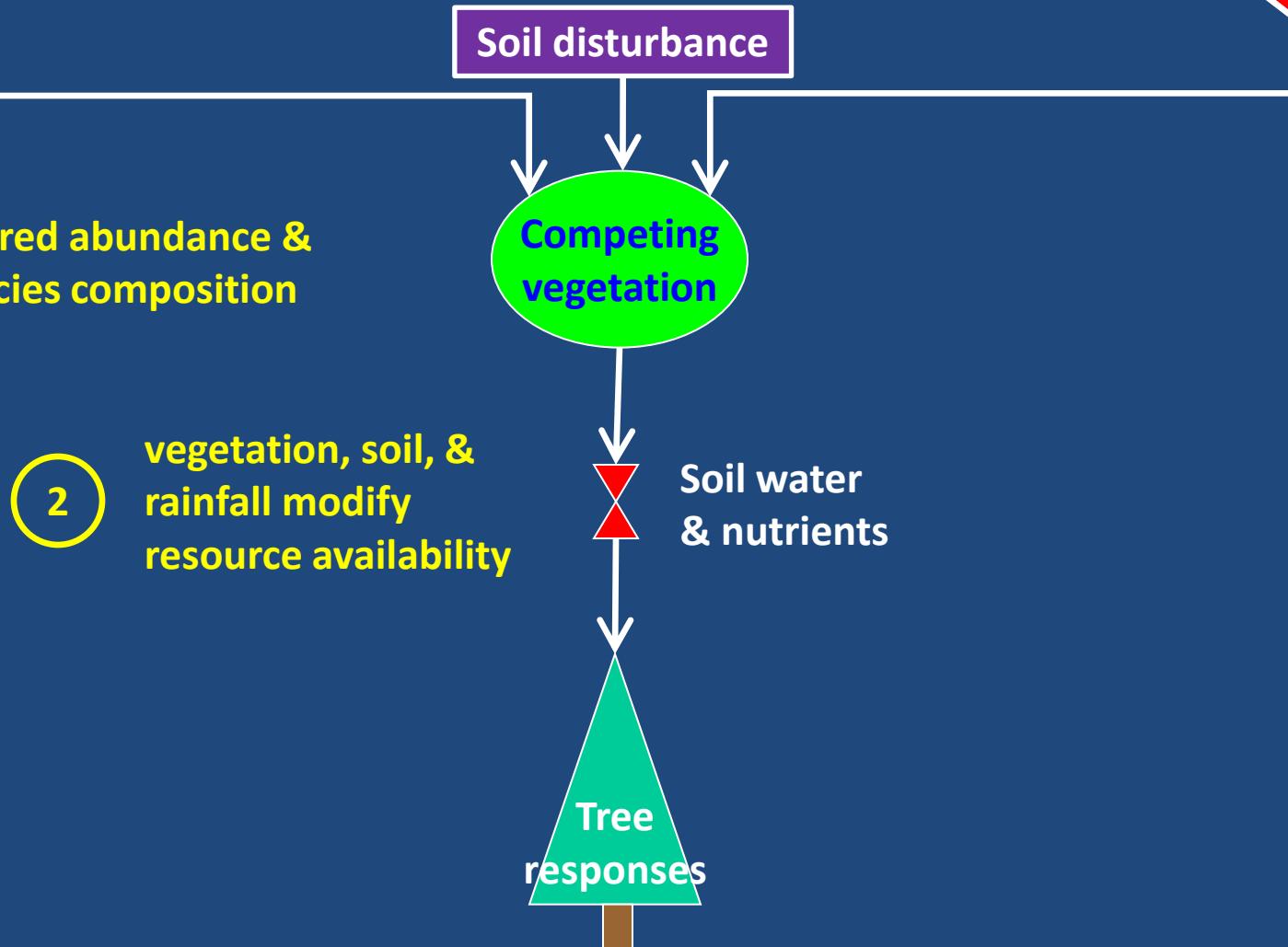
Competing vegetation

1 altered abundance & species composition

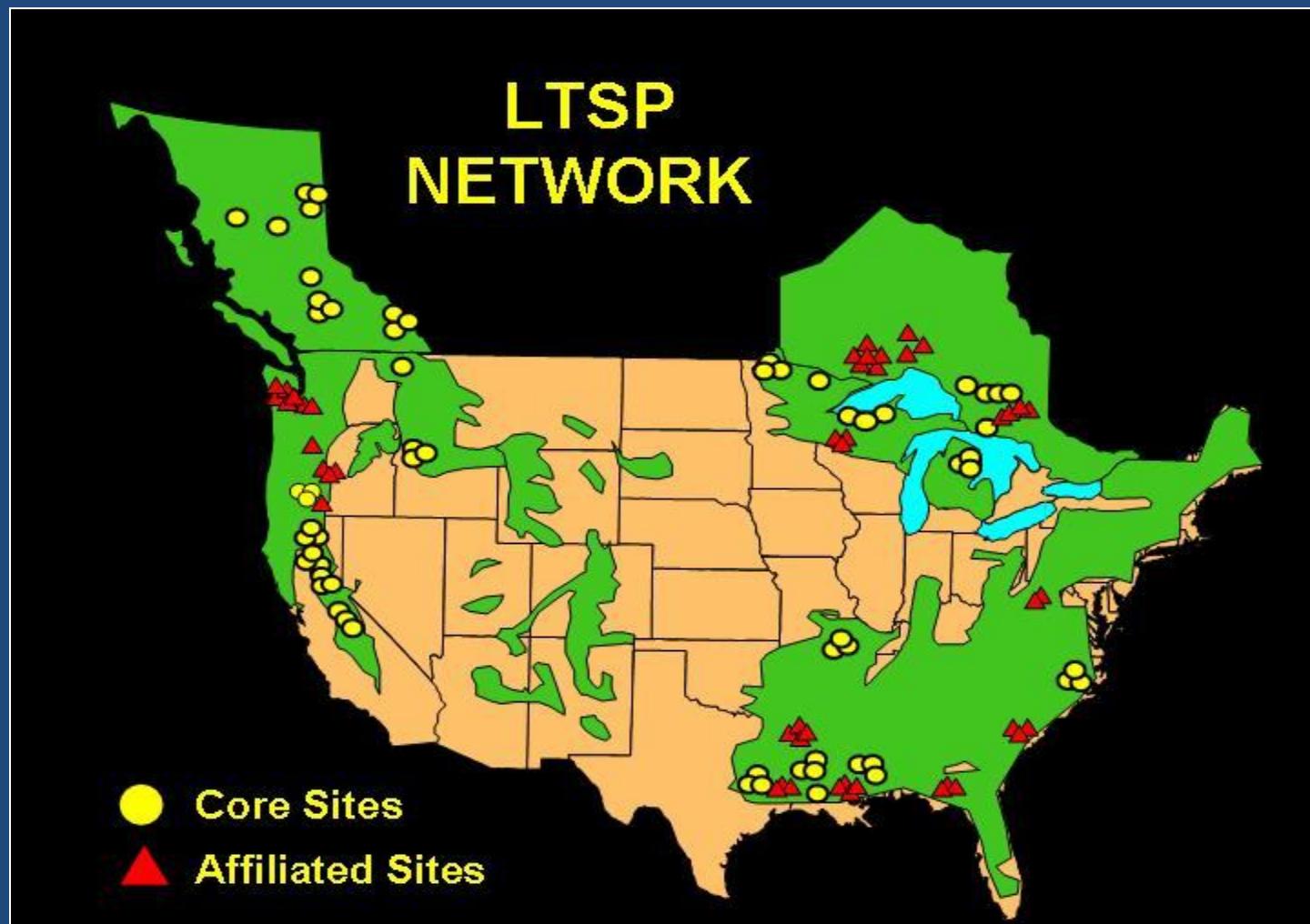
2 vegetation, soil, & rainfall modify resource availability

Soil water & nutrients

Tree responses



The North American Long-Term Soil Productivity (LTSP) Experiment



LTSP logging debris treatments

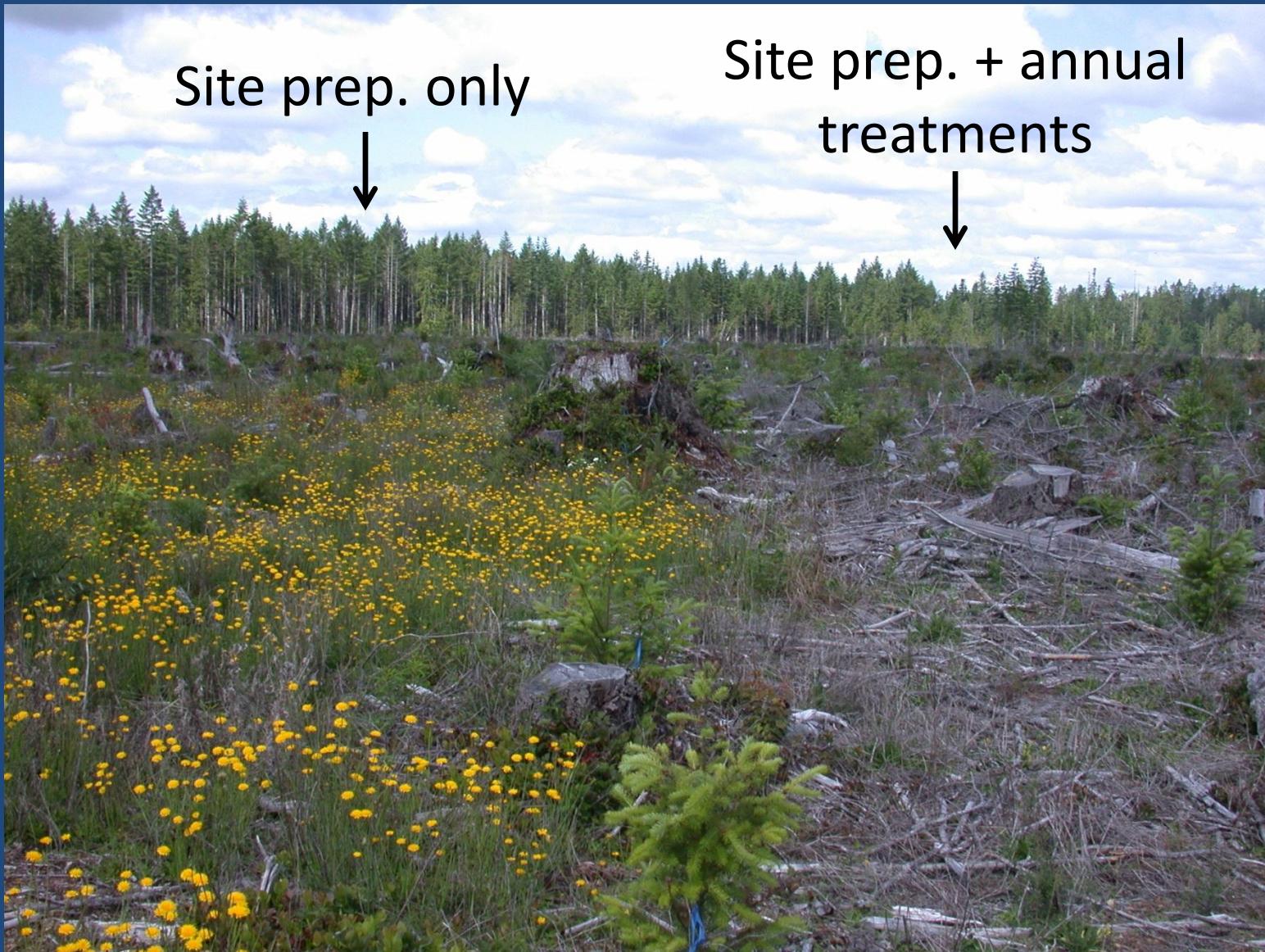


Heavy debris: remove logs but retain tops and branches; “bole-only” harvesting.



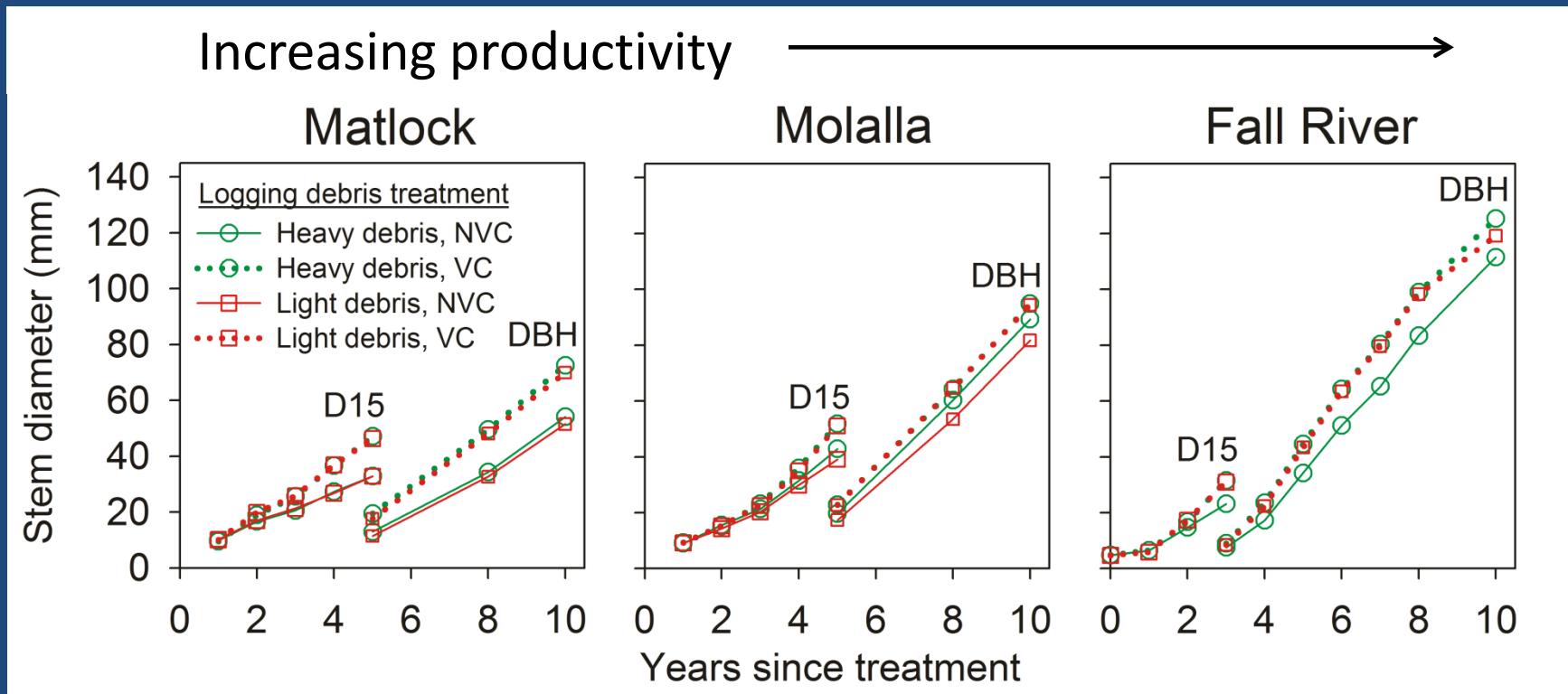
Light debris: remove logs, tops, and branches; “whole-tree” harvesting.

LTSP vegetation control treatments



Matlock WA, September 2006 (3rd year)

Douglas-fir stem growth responses



Where competing vegetation was controlled, tree growth has not differed between debris levels.

Matlock Long-Term Soil Productivity Study

Heavy debris



Light debris



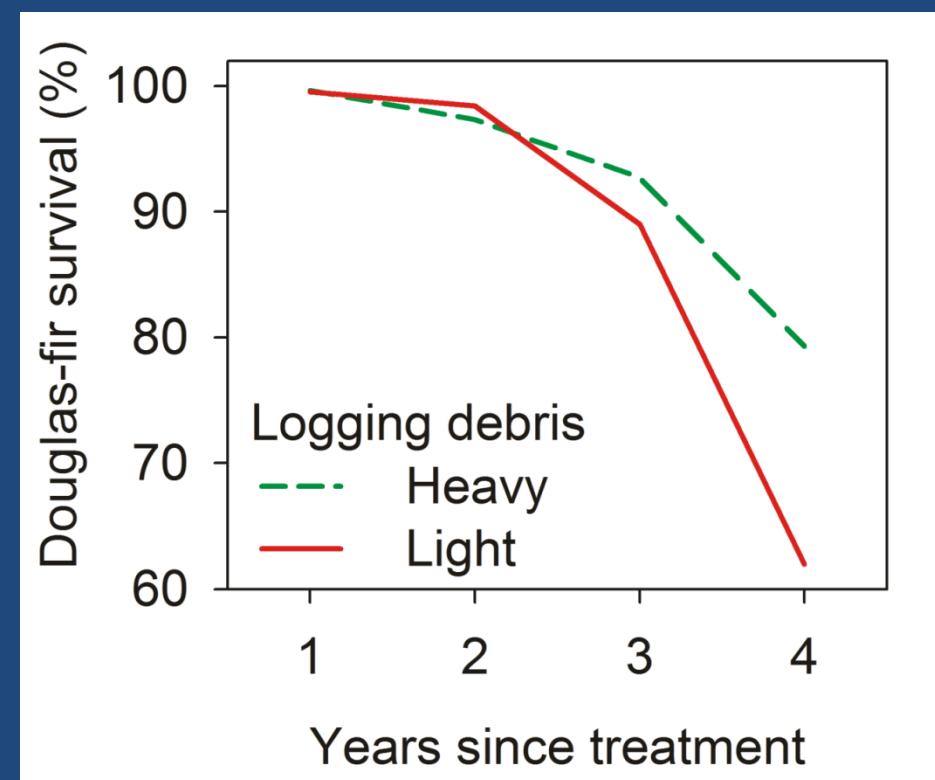
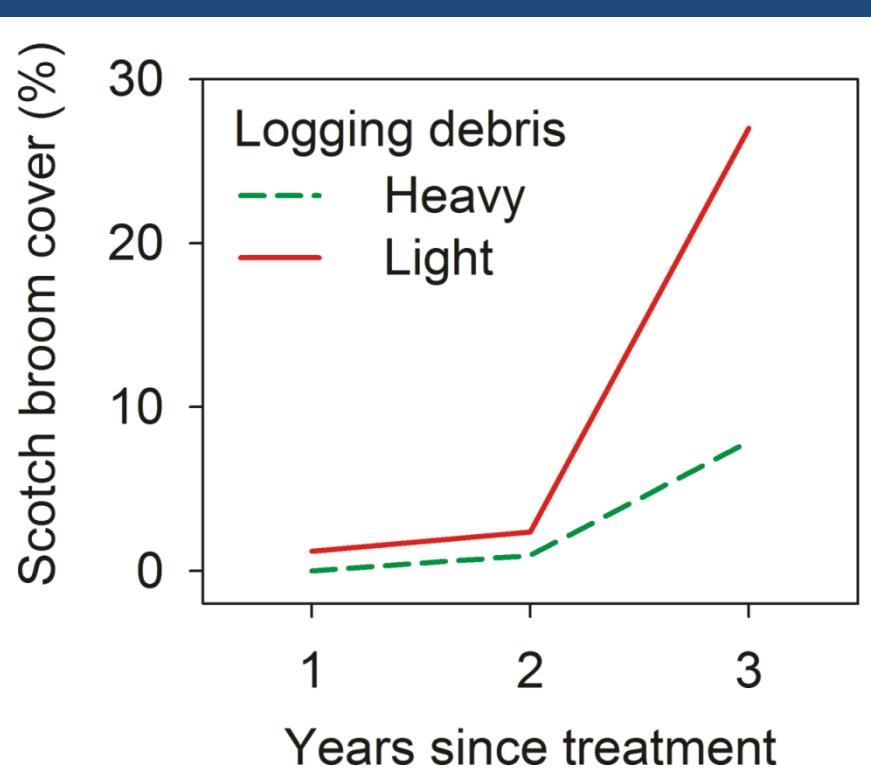
2 weeks after treatment



3 years after treatment

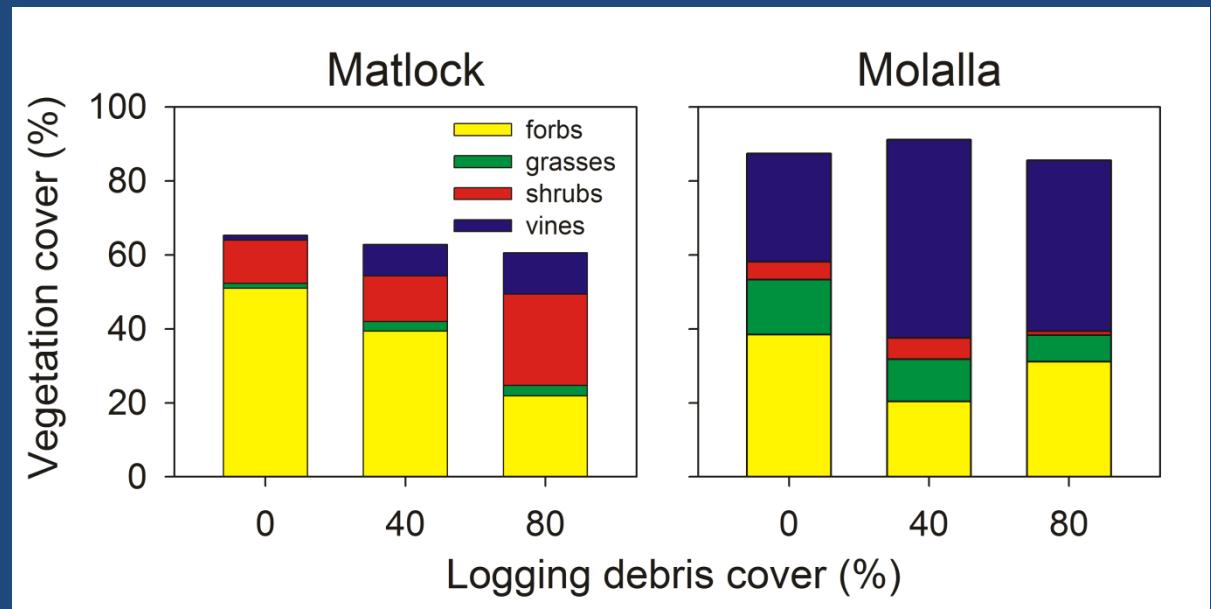


Logging debris limited broom cover, resulting in better Douglas-fir survival



Logging debris reduces forb and grass cover

- Proportionate decreases at Matlock.
- Interaction with *Rubus ursinus* at Molalla.



Dry Bed Creek Study



Heavy debris:
12" depth



Light debris:
6" depth

Machine
trails: 6"
debris depth



Silvicultural reallocation of resources during plantation development

Logging debris

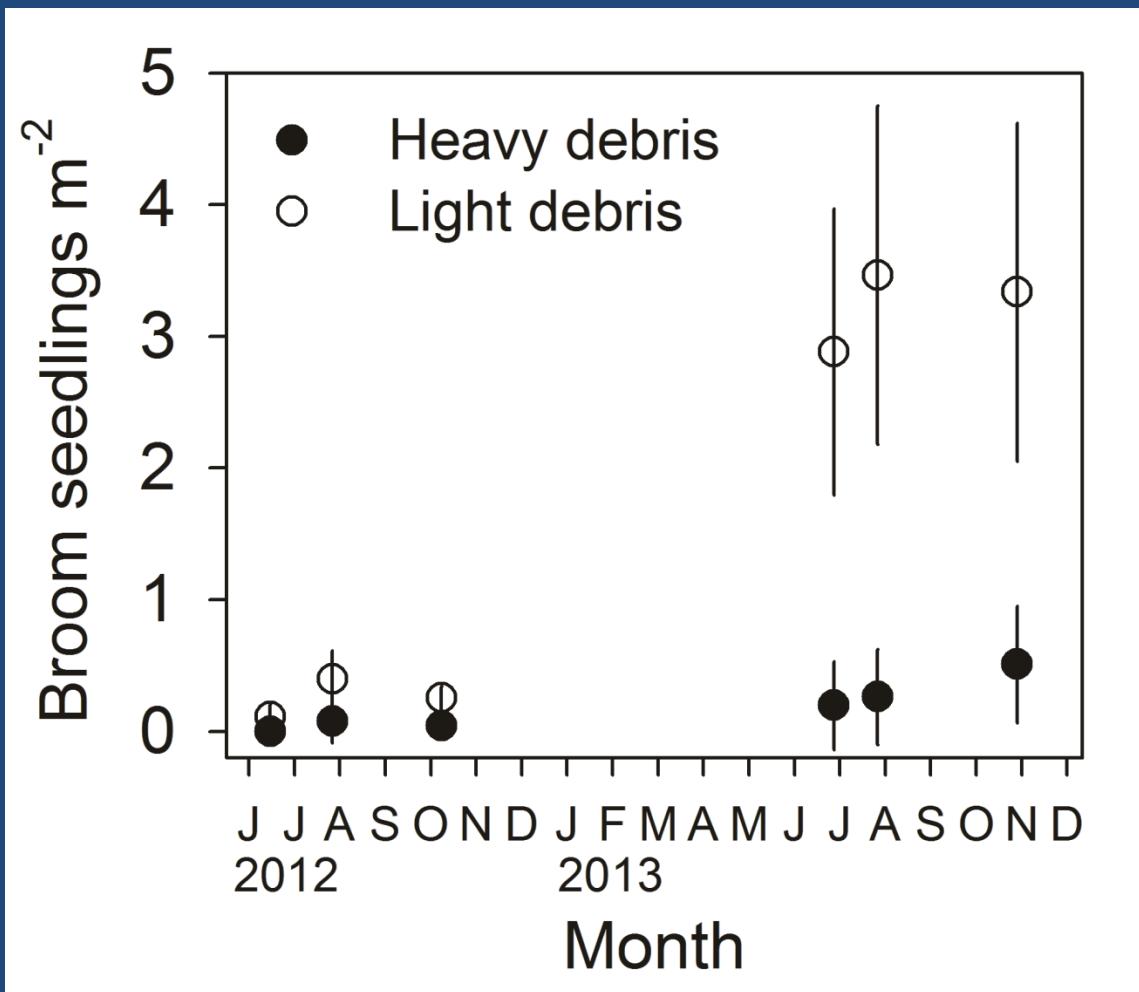
Vegetation control

Soil disturbance

Competing
vegetation



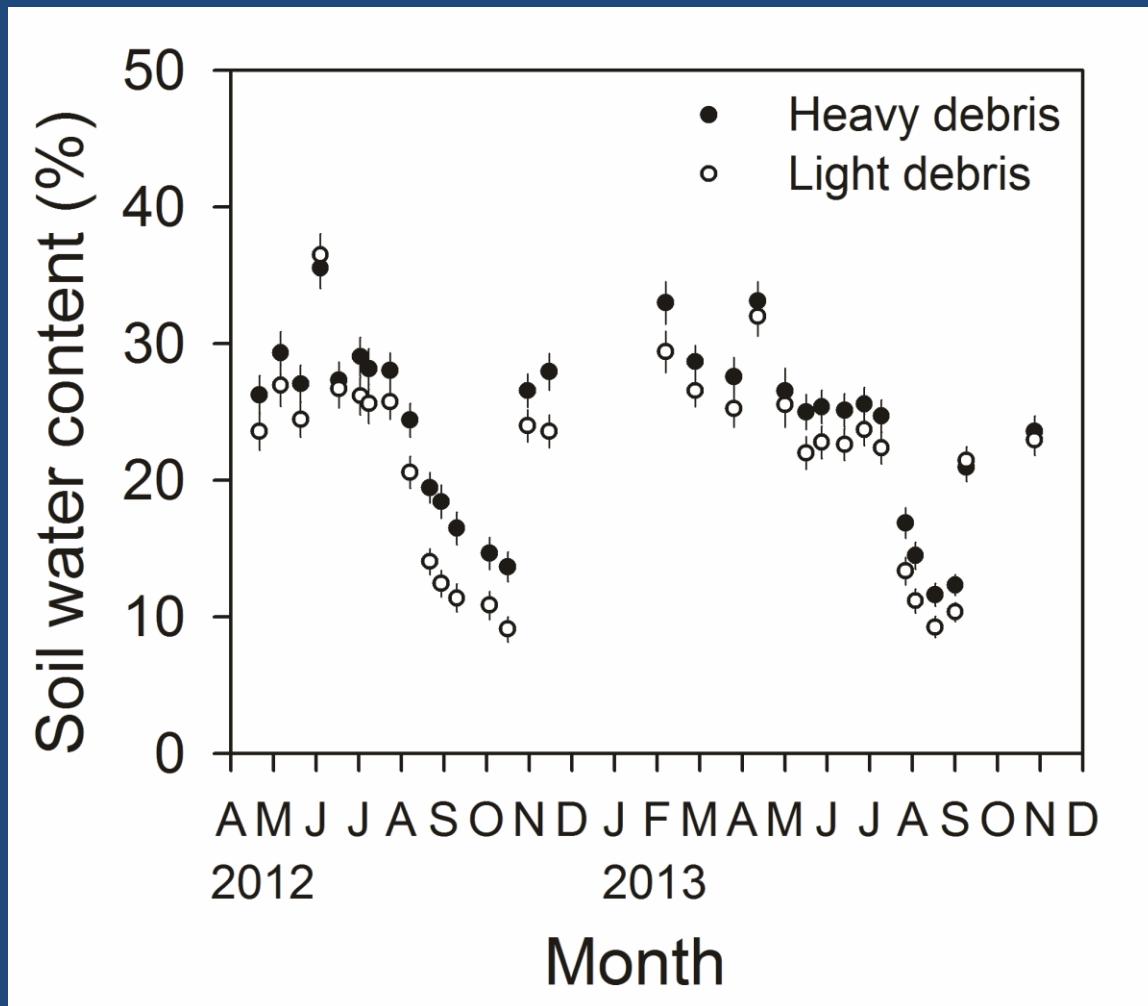
Logging debris reduces Scotch broom regeneration



Logging debris conserves soil water

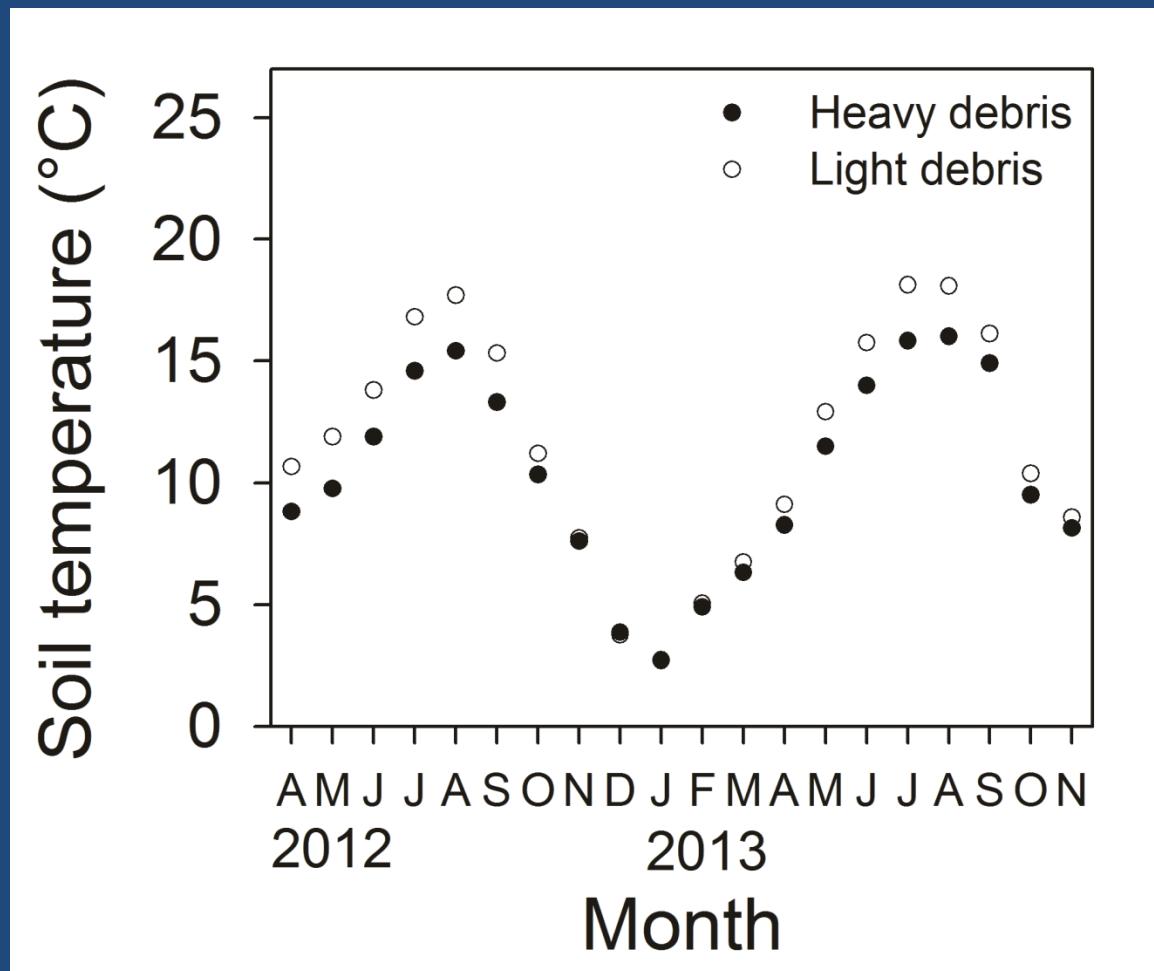
(5-25 cm depth)

Mulching effects of heavy debris reduce soil evaporation.



Logging debris reduces soil temperature

- (5 cm depth)
- Up to 2.5°C cooler under heavy debris.
- Reduced soil temperatures slow broom germination.



Seedling vigor improved by logging debris

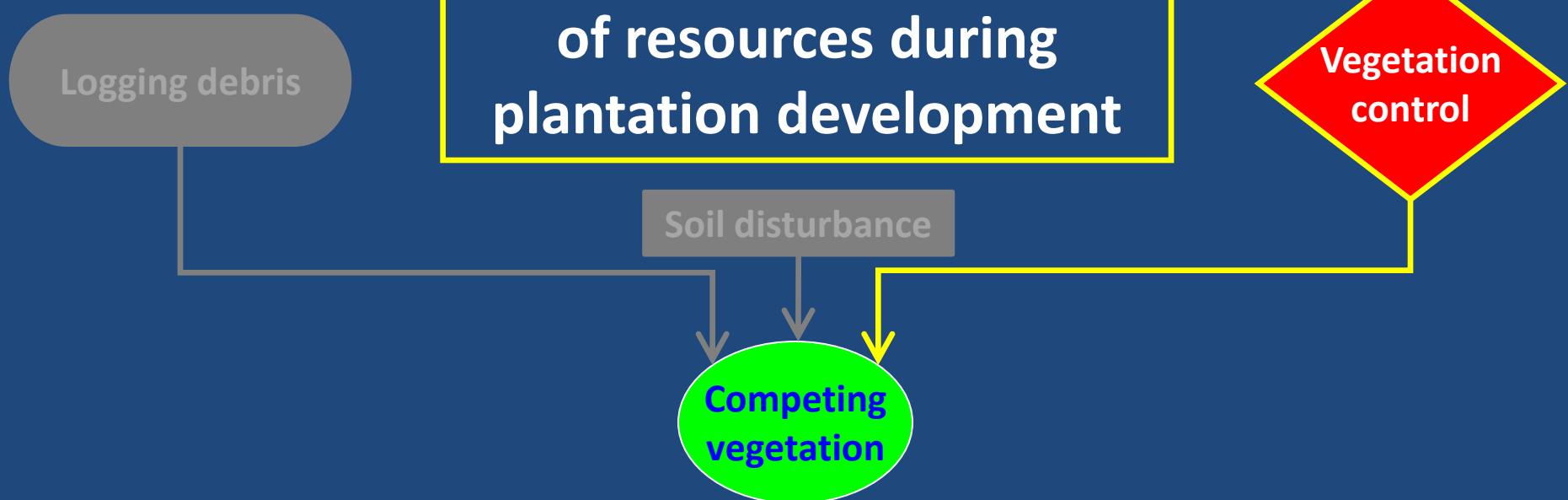
First-year vigor indicator	Heavy debris	Light debris
Chlorosis (% of seedlings)	6.7 b	15.6 a
Dieback (% of seedlings)	6.0 a	7.7 a

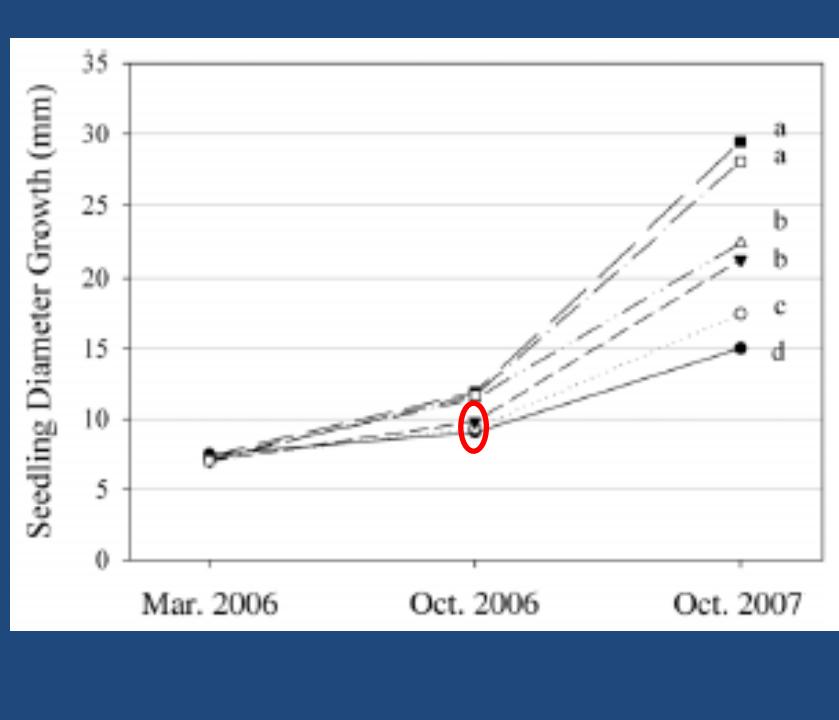
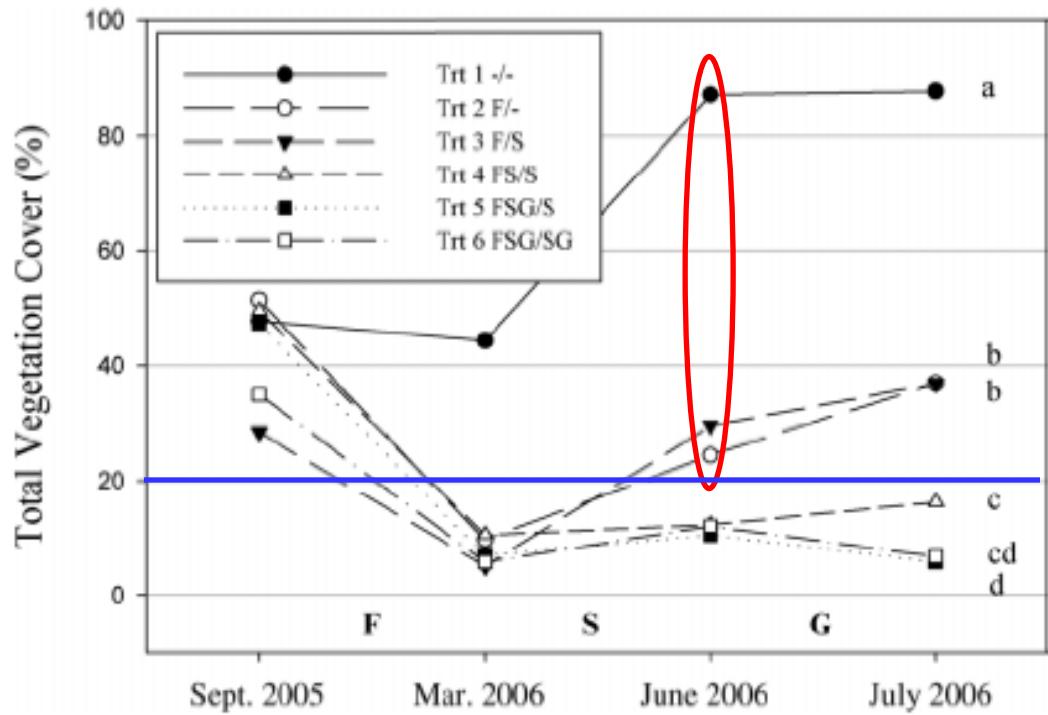
Managing debris and disturbance: Take-home messages

1. Logging debris provides multiple benefits to planted Douglas-fir.

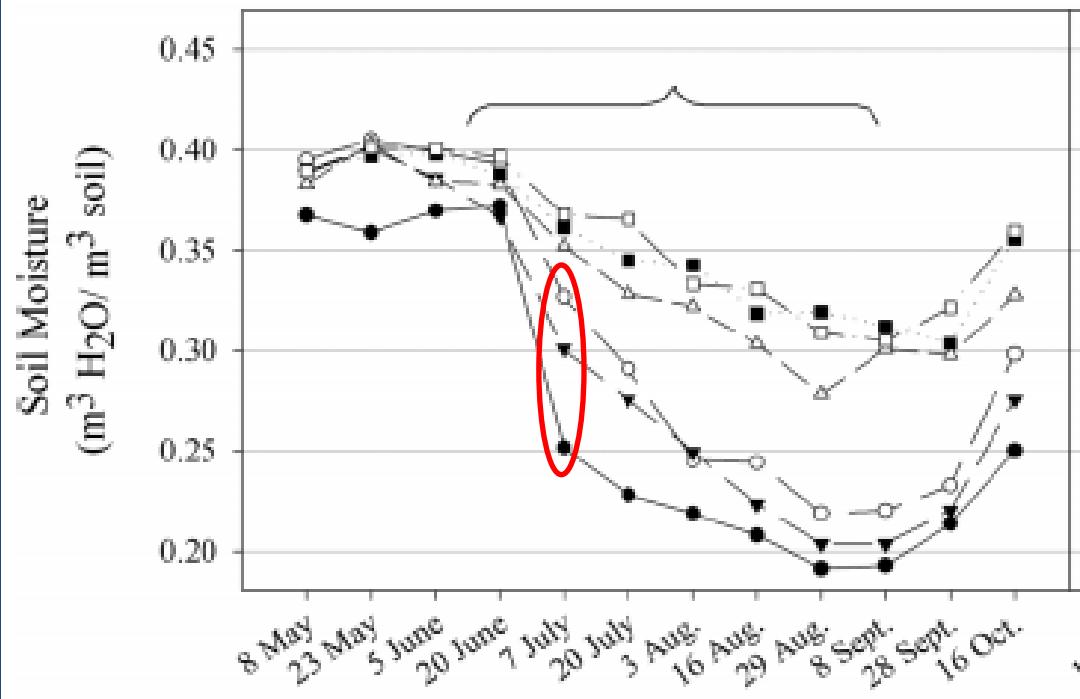


Silvicultural reallocation of resources during plantation development





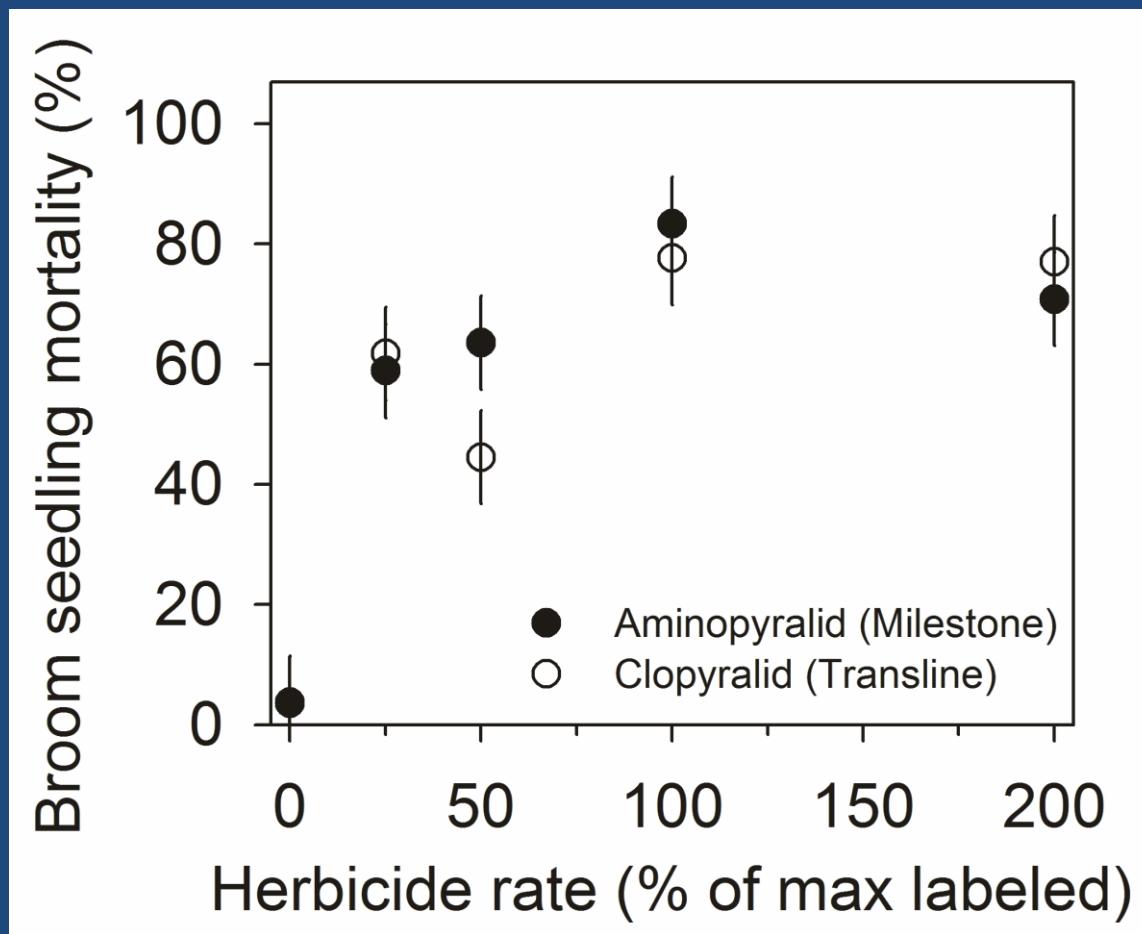
Herbaceous competition threshold \approx 20% cover



Herbaceous vegetation control strategies

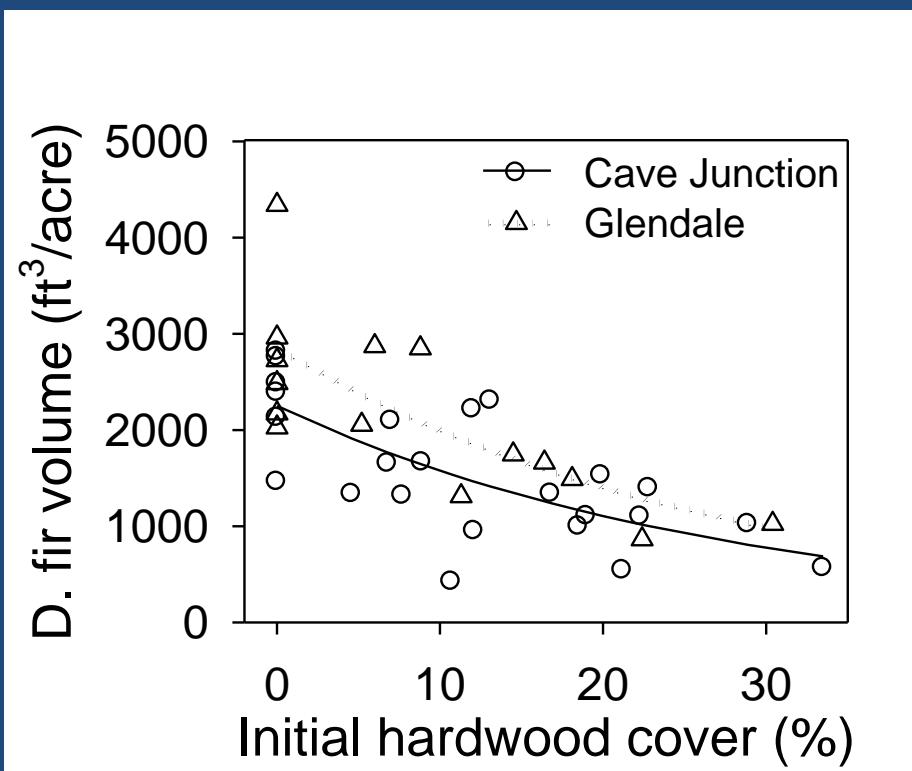
- Fall application of sulfometuron: over winters to provide full-season, pre-emergent herbaceous weed control.
- Atrazine + glyphosate or sulfometuron: controls grasses & forbs.
- Clopyralid: effective on legumes & thistles; safe to apply over conifers.
- Metsulfuron + aminopyralid: broad spectrum control at site preparation.

Pre-emergent control of Scotch broom

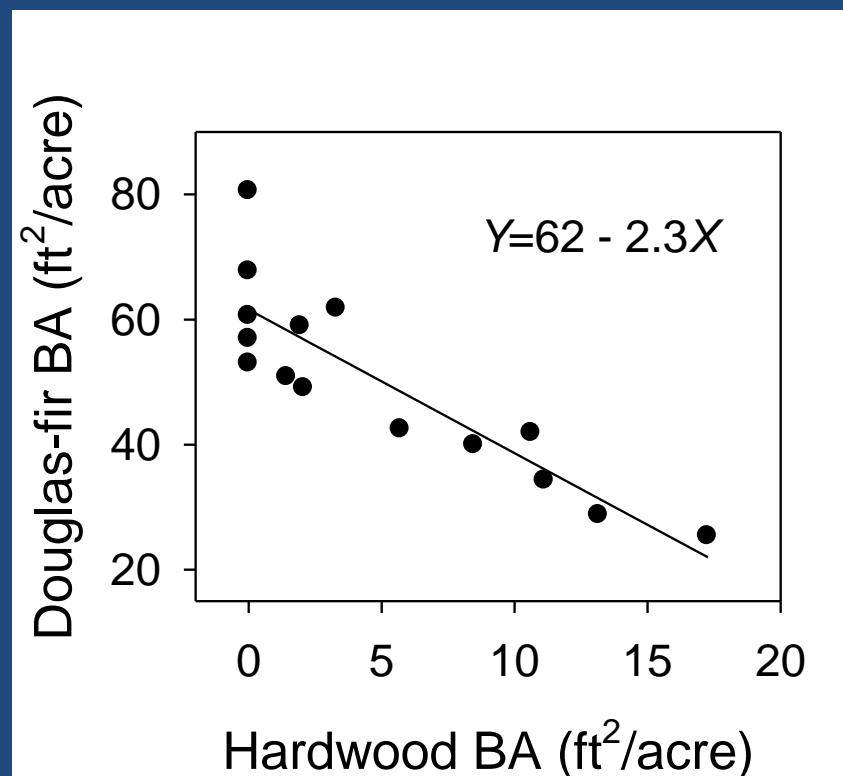


Long-term effects of hardwood control

Douglas-fir volume varies 3X among hardwood densities created 23 years previously.



Hardwoods excluded over twice the potential conifer basal area.

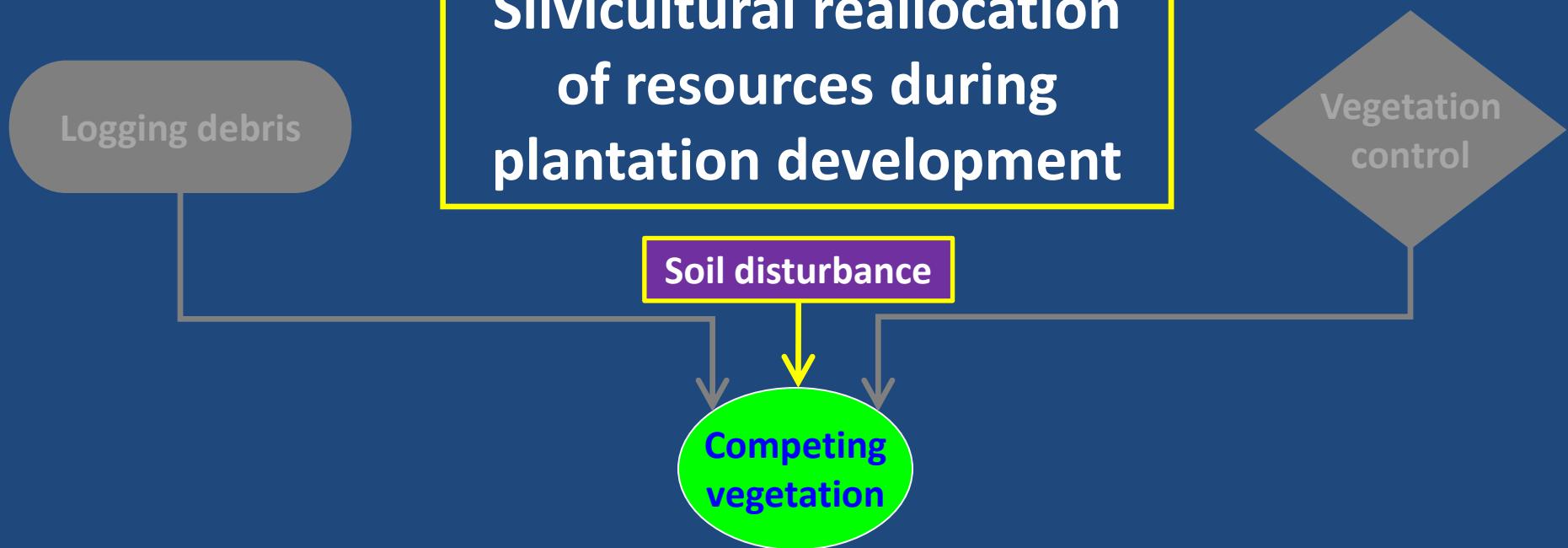


Managing debris and disturbance: Take-home messages

1. Logging debris provides multiple benefits to planted trees.
2. Timing and intensity of vegetation control are critical to treatment effectiveness.

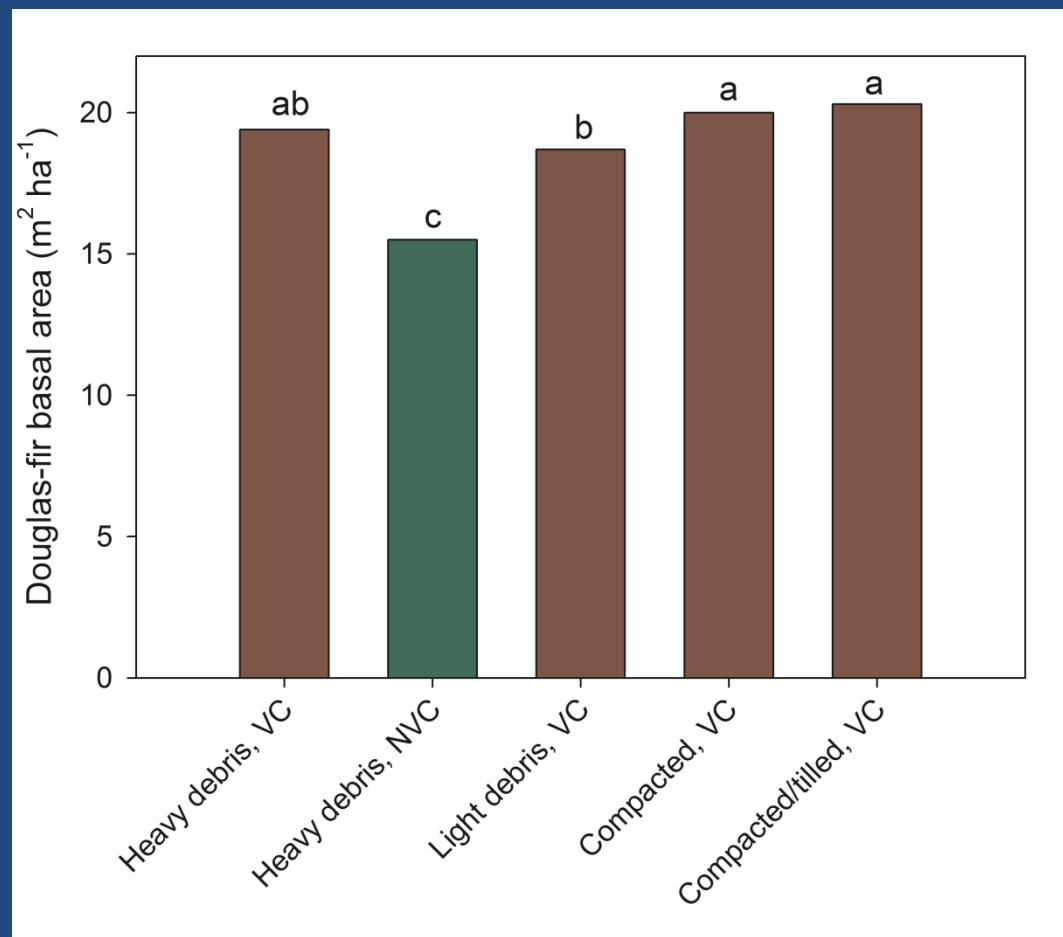


Silvicultural reallocation of resources during plantation development



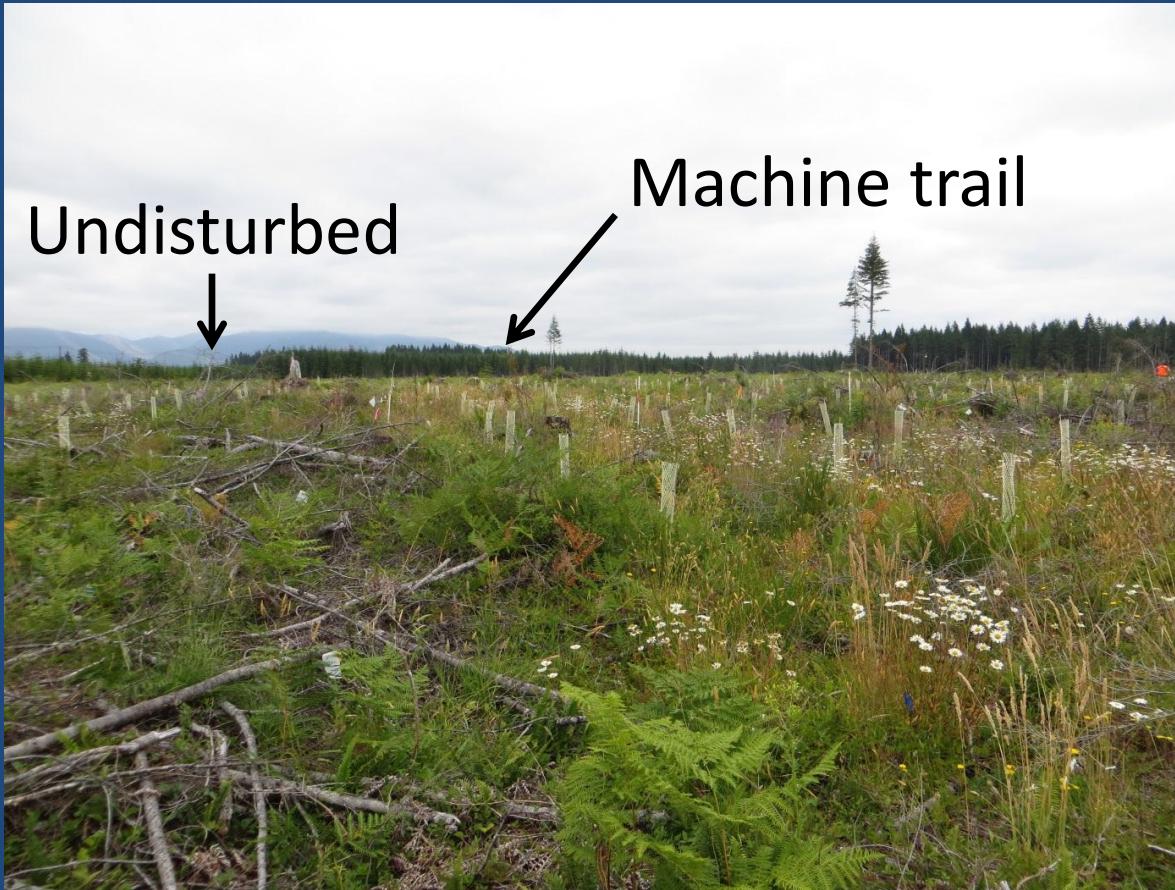
Soil compaction: no adverse effects on tree growth*

- 10th-year basal area at Fall River
- Similar responses observed at Matlock & Molalla



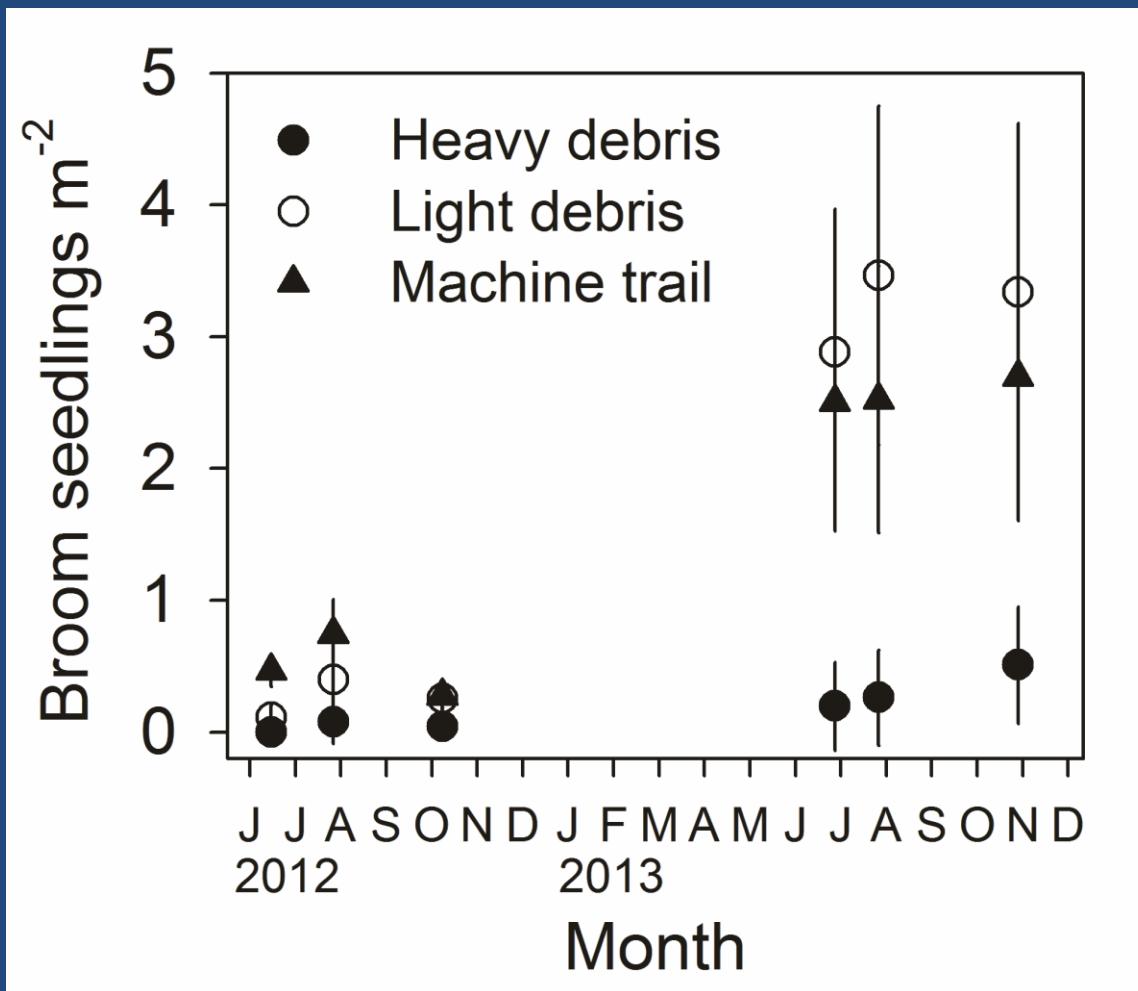
* If combined with vegetation control

Soil disturbance favors grasses and non-native forb



Dry Bed Creek Study, unpublished data

Soil disturbance increases Scotch broom regeneration



Douglas-fir vigor lower on machine trails

First-year vigor indicator	Heavy debris	Light debris	Machine trail
Chlorosis (% of seedlings)	6.7 b	15.6 a	15.0 a
Dieback (% of seedlings)	6.0 b	7.7 ab	10.8 a

Managing debris and disturbance: Take-home messages

1. Logging debris provides multiple benefits to planted trees.
2. Timing and intensity of vegetation control are critical to treatment effectiveness.
3. Soil disturbance often results in a highly competitive plant community.

