How forest treatments influence tree mortality and recovery in the Sierra Nevada

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Were treated forests more resistant to the recent bark beetle epidemic in the Sierra Nevada?

Actions to restore forests to more historical conditions (i.e. reduce stand density)

Untreated

Treated

Yosemite National Park, Photo: Marc Meyer

Sierra National Forest, Photo: Marc Meyer

2016 Rapid Assessment Plots

Variable radius plot

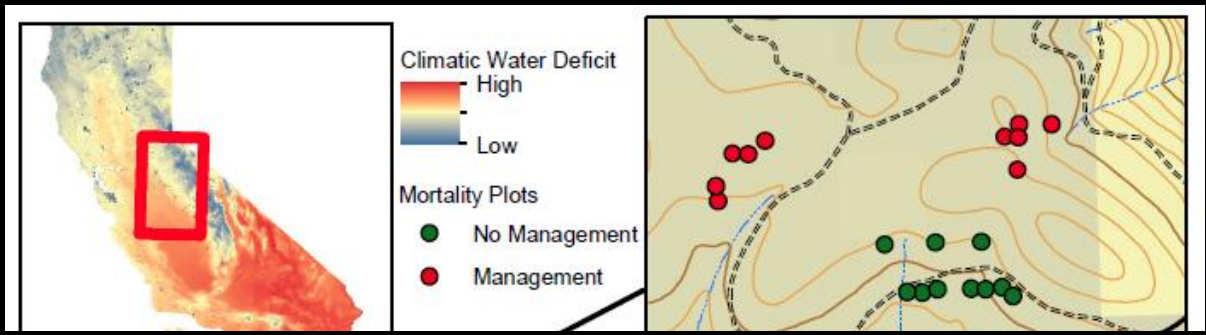
- Basal area gauge
- 5–7 trees per plot
- DBH
- Health code
- Level of insect attack
- % Live crown

Fixed radius plot

- Tree count on live and dead trees and saplings
- Seedling classes (1,2,3)
- Cover
- Heterogeneity classification

Miscellaneous

- Cored three trees per plot
- Canopy between plots



Eldorado NF – 46 plots

Stanislaus NF – 84 plots

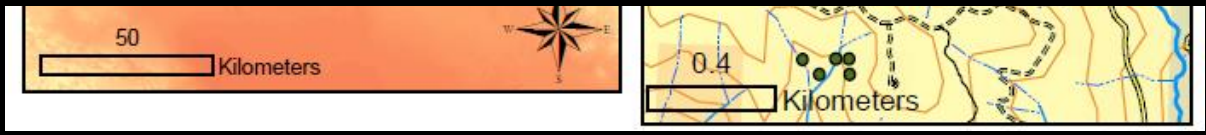
Yosemite NP – 67 plots

Sierra NF – 114 plots

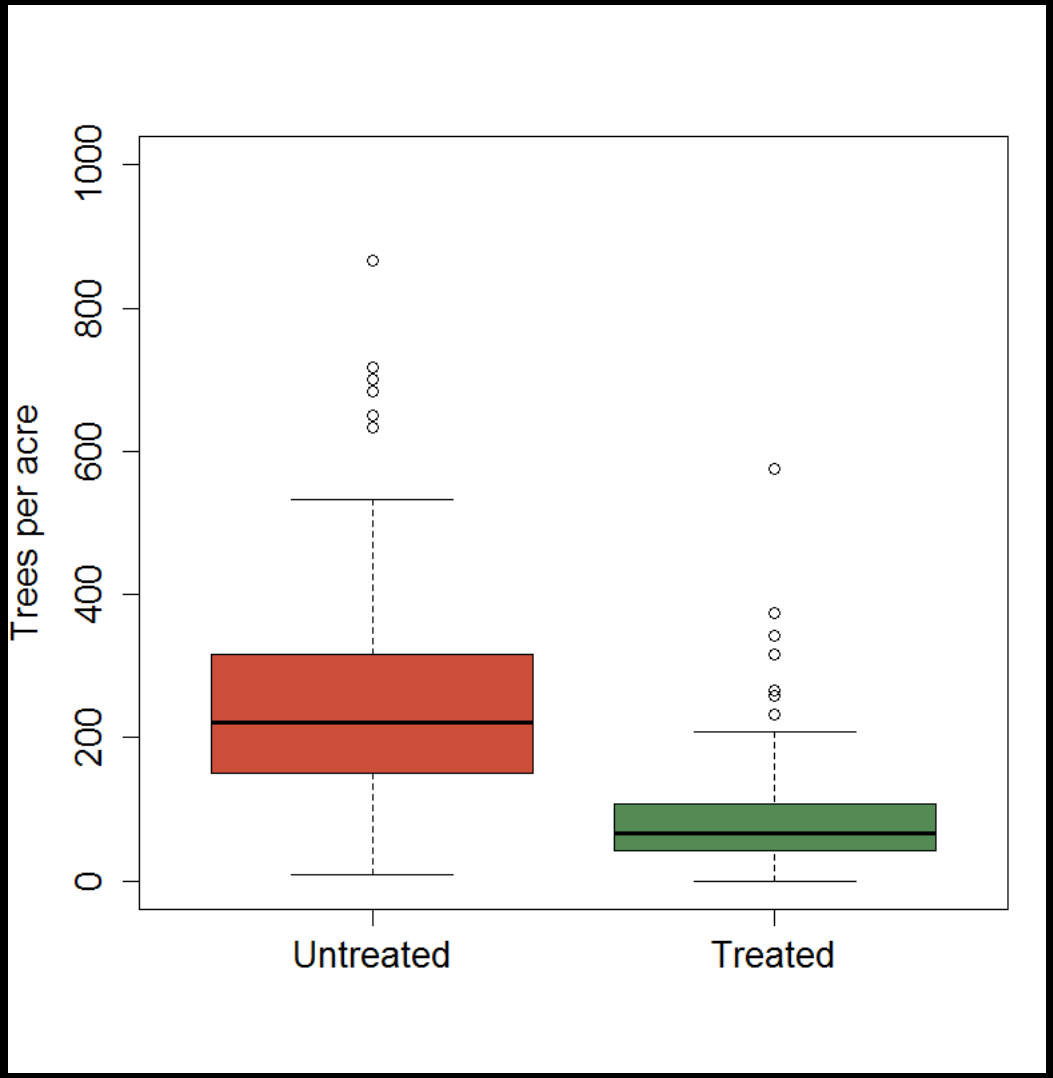
Total = 311 plots

Untreated = 158

Treated = 153

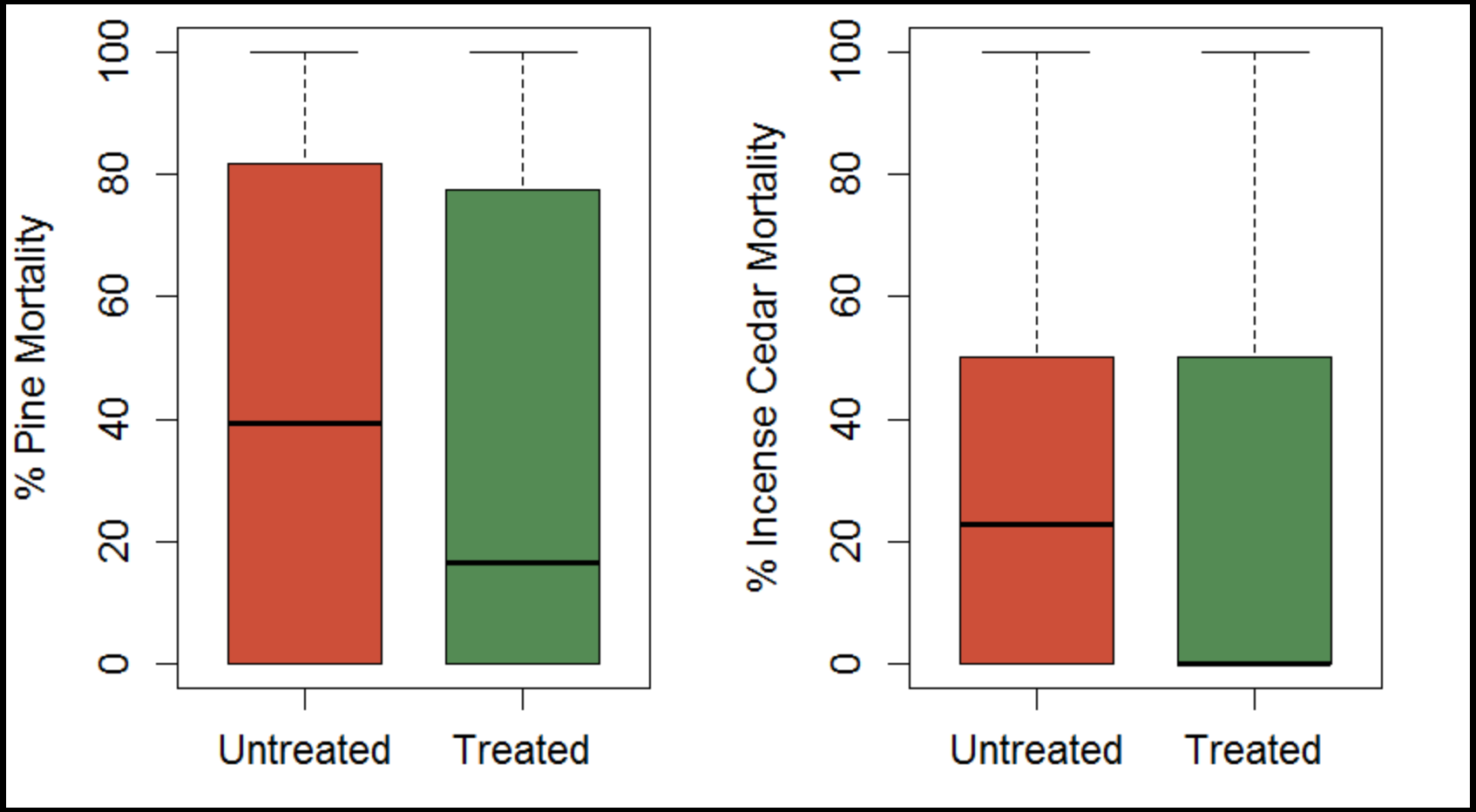


Higher density (TPA) in untreated stands



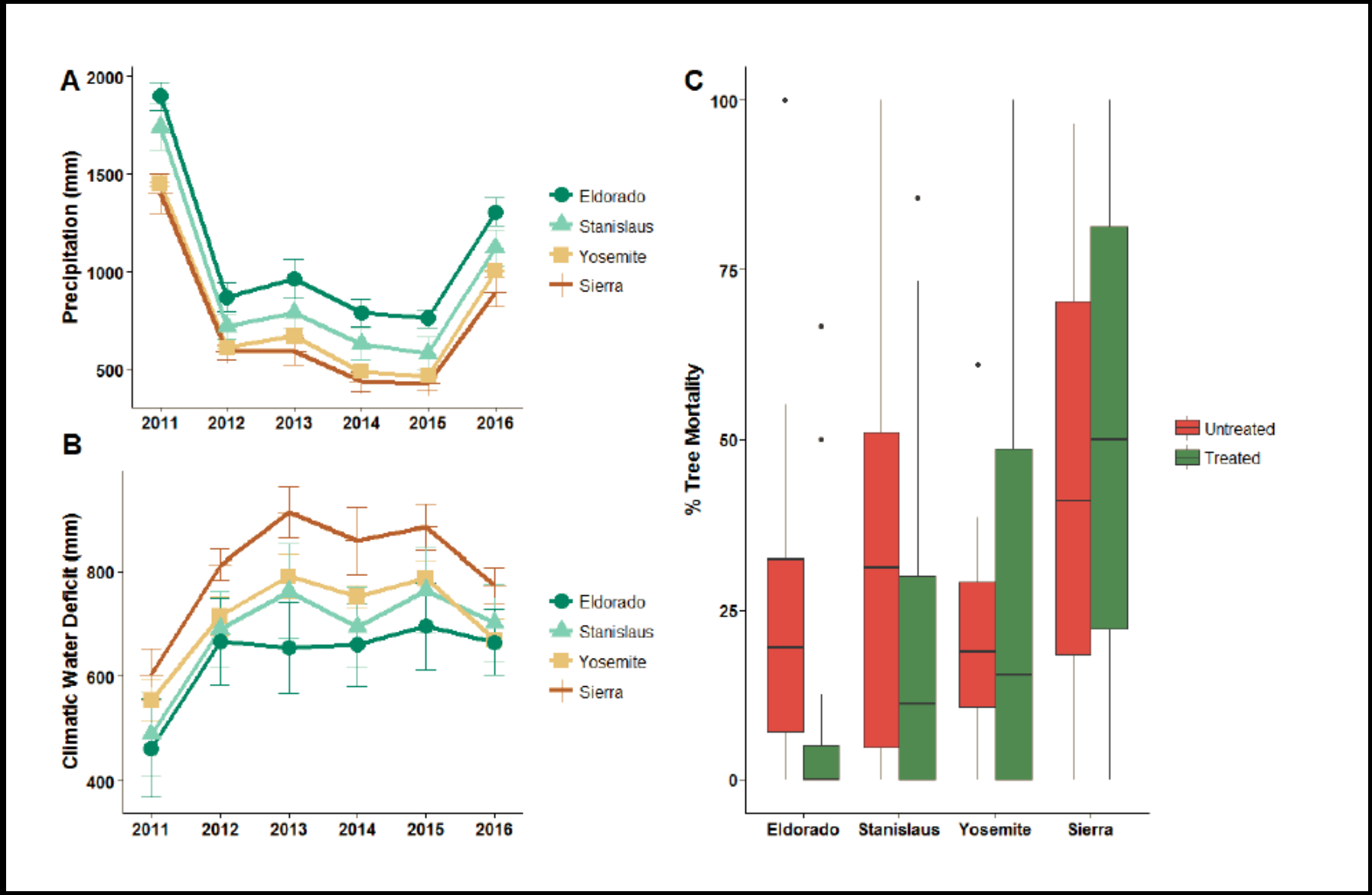
TPA = Trees per acre

Higher tree mortality in untreated units



Higher density → Higher tree mortality

Treatment effectiveness decreases with latitude



2017 Detailed Plots (157 plots)

Full Tree Data

- All trees in fixed radius plot (12.6 m)
- Diameters and health codes

Regeneration

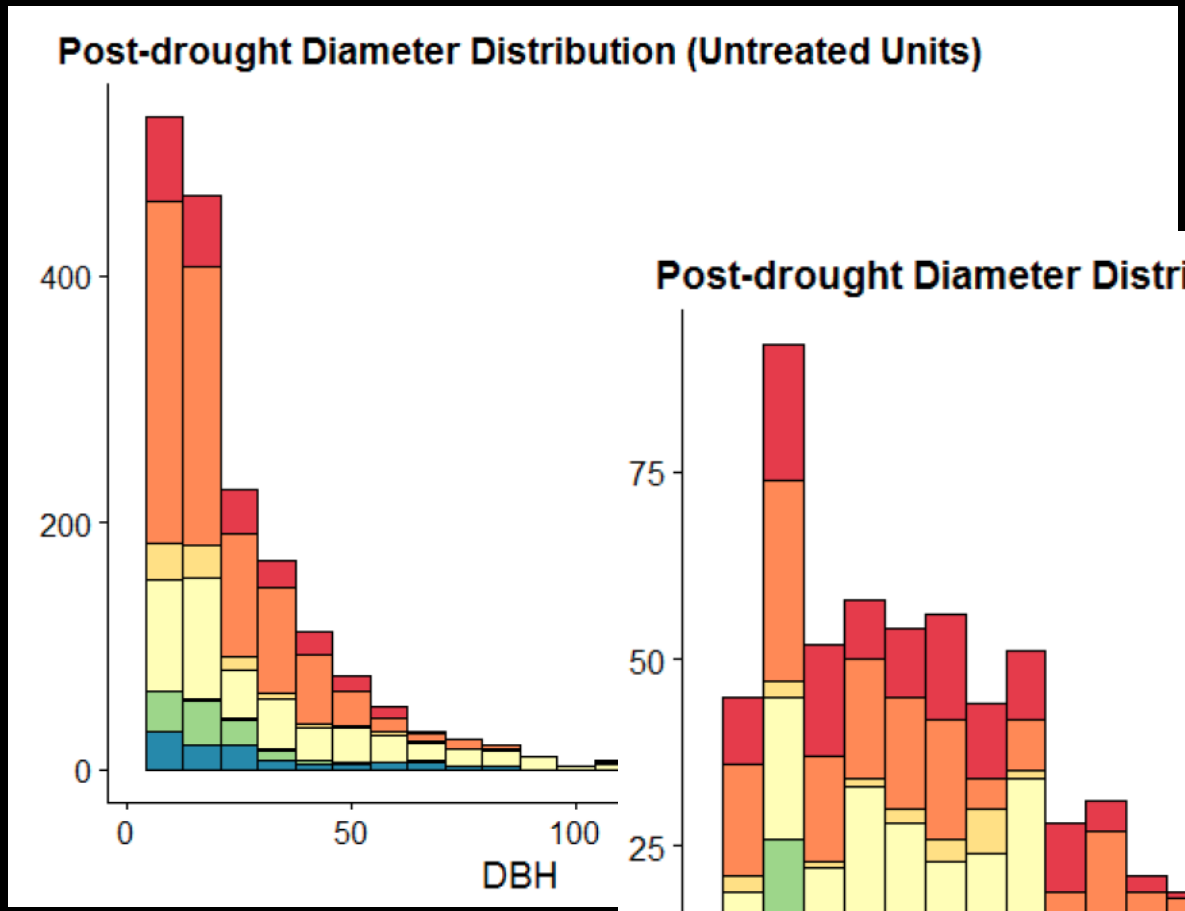
- Full counts by species in smaller regeneration plots (4.37 m)

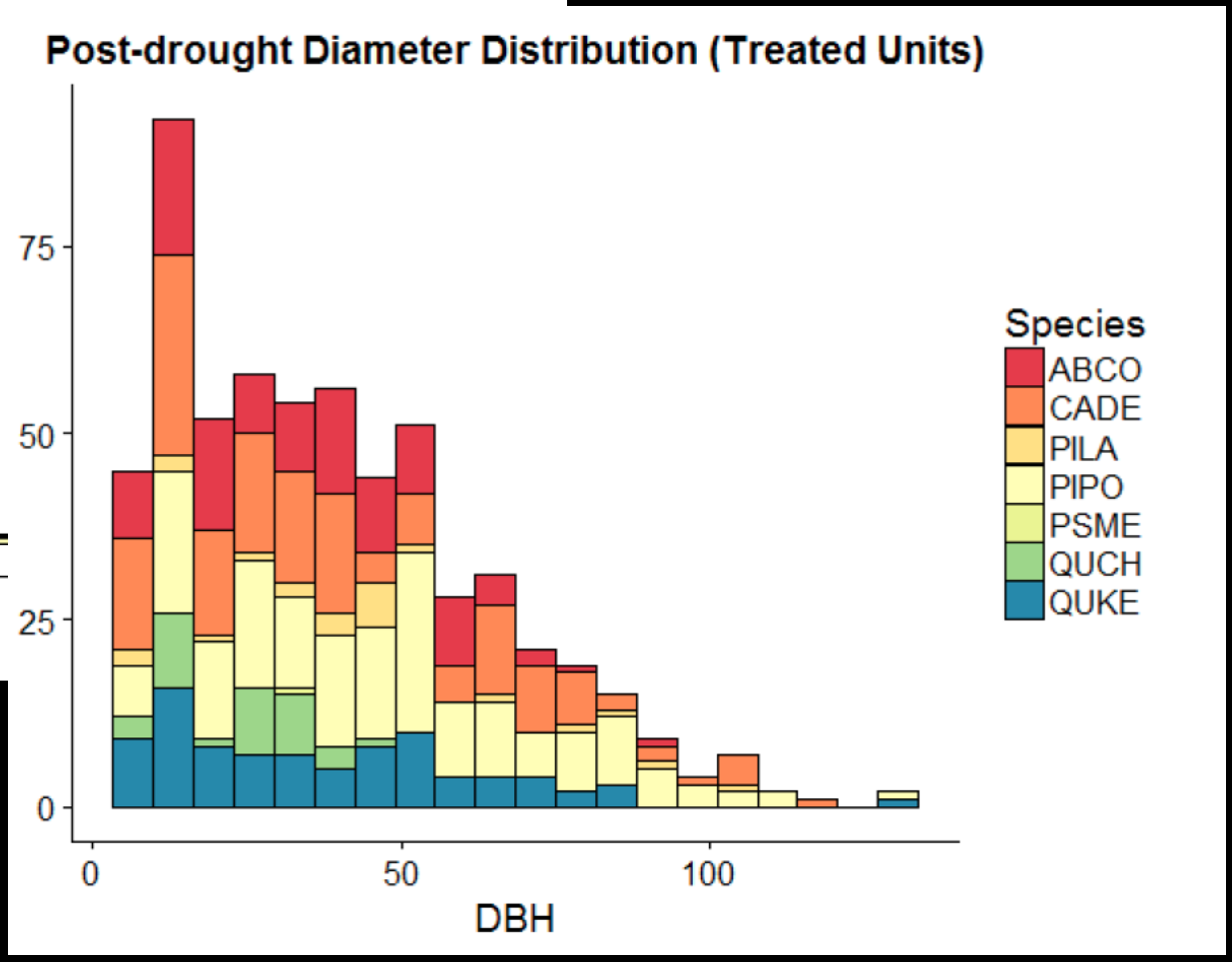
Fuels Data

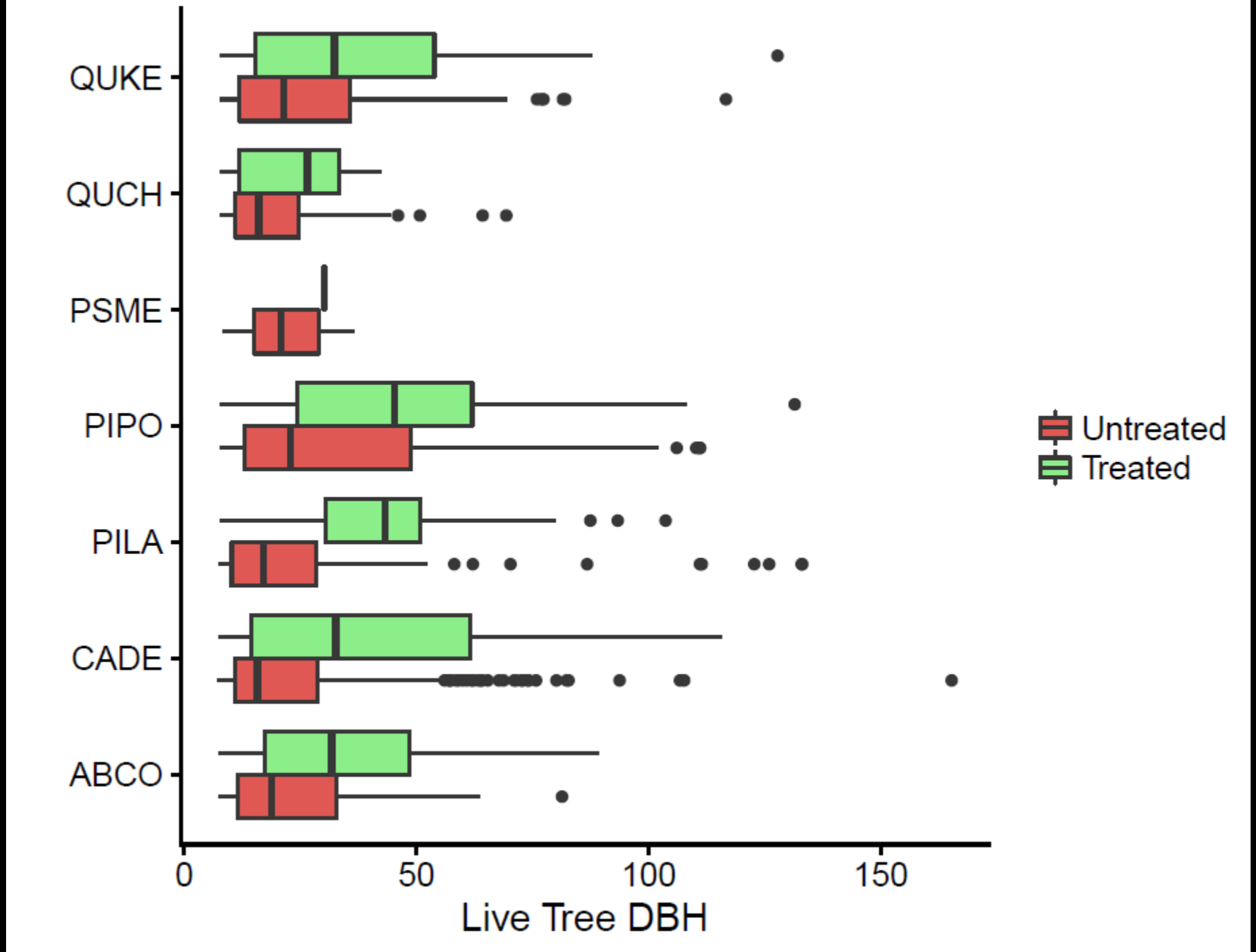
- Browns Transects

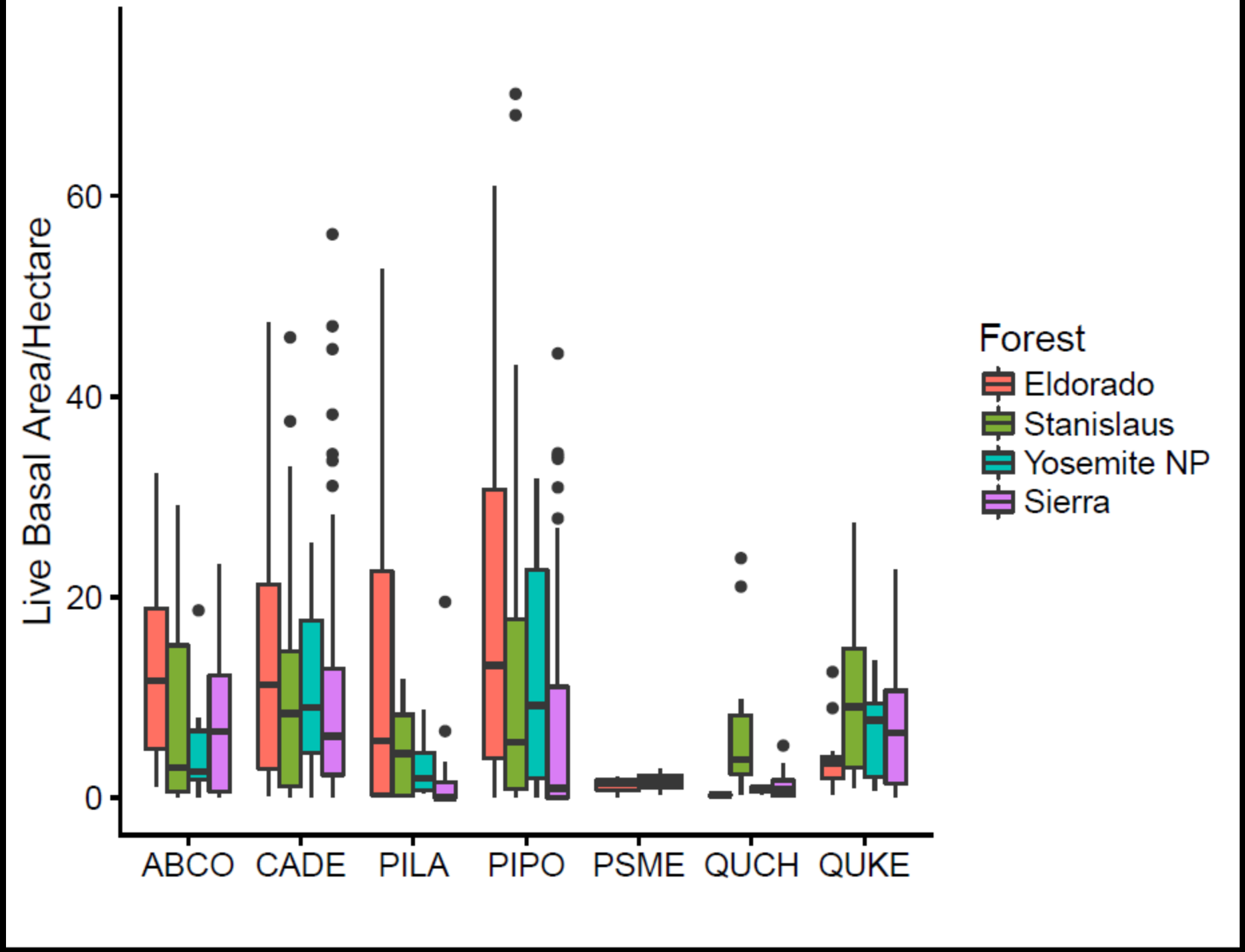
Spatial Heterogeneity Data

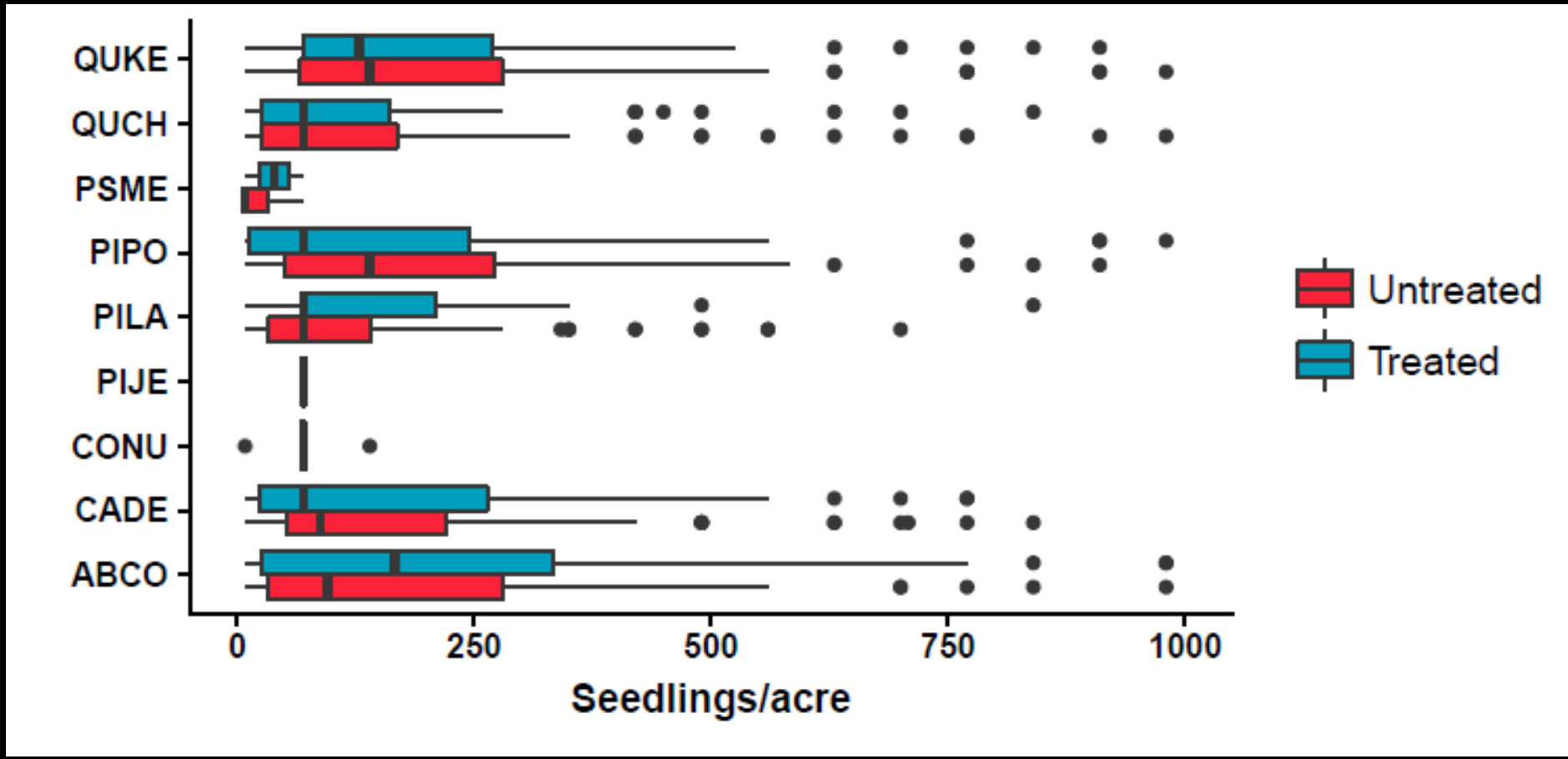
- Mapped Individuals, Clumps, and Openings (ICO) in all plots.

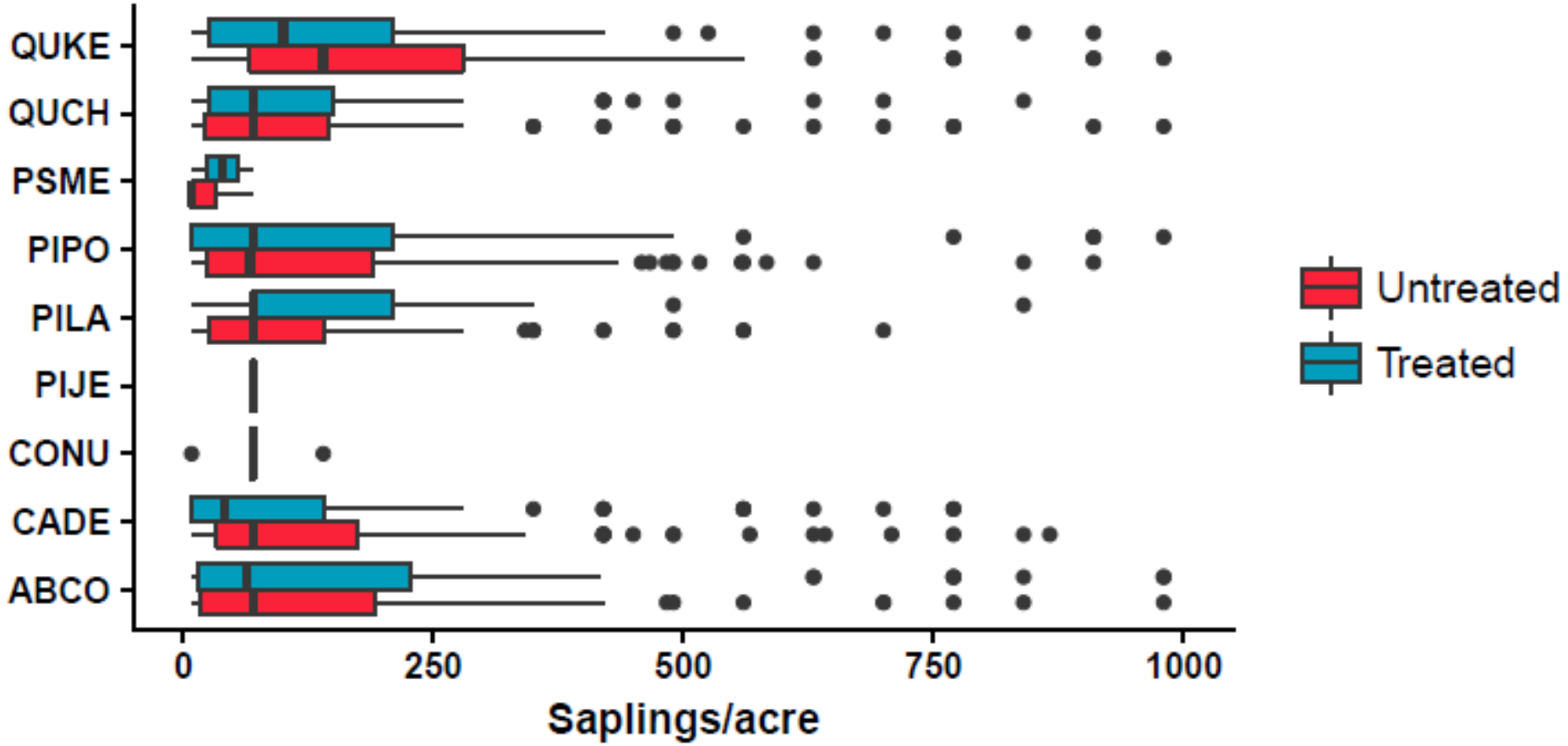

Post-drought Diameter Distribution (Untreated Units)
400
200
0
0
50
100
DBH


Post-drought Diameter Distribution (Treated Units)
75
50
25
0
0
50
100
DBH
Species
ABCO
CADE
PILA
PIPO
PSME
QUCH
QUKE


QUKE
QUCH
PSME
PIPO
PILA
CADE
ABCO
0
50
100
150
Live Tree DBH
Untreated
Treated


Live Basal Area/Hectare
0
20
40
60
ABCO
CADE
PILA
PIPO
PSME
QUCH
QUKE
Forest
Eldorado
Stanislaus
Yosemite NP
Sierra


QUKE
QUCH
PSME
PIPO
PILA
PIJE
CONU
CADE
ABCO
0
250
500
750
1000
Seedlings/acre
Untreated
Treated


QUKE
QUCH
PSME
PIPO
PILA
PIJE
CONU
CADE
ABCO
0
250
500
750
1000
Saplings/acre
Untreated
Treated

Summary

- High tree density → more mortality
- Low tree density → less mortality

- Gradient in treatment effectiveness from north to south

- More small trees remaining in untreated units

- Good levels of regeneration in both untreated and treated units

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