

Climate- & Disease-Induced Demographic Shifts in an Endemic Conifer

Dr. Sarah Bisbing, University of Nevada – Reno

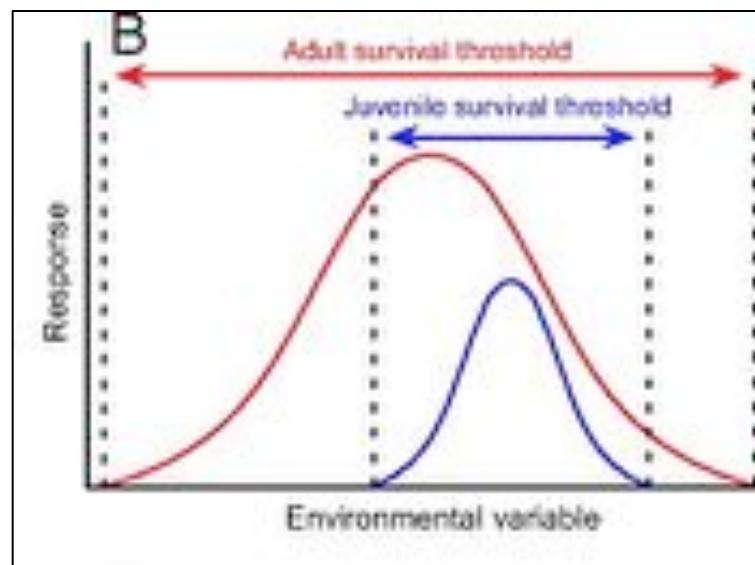
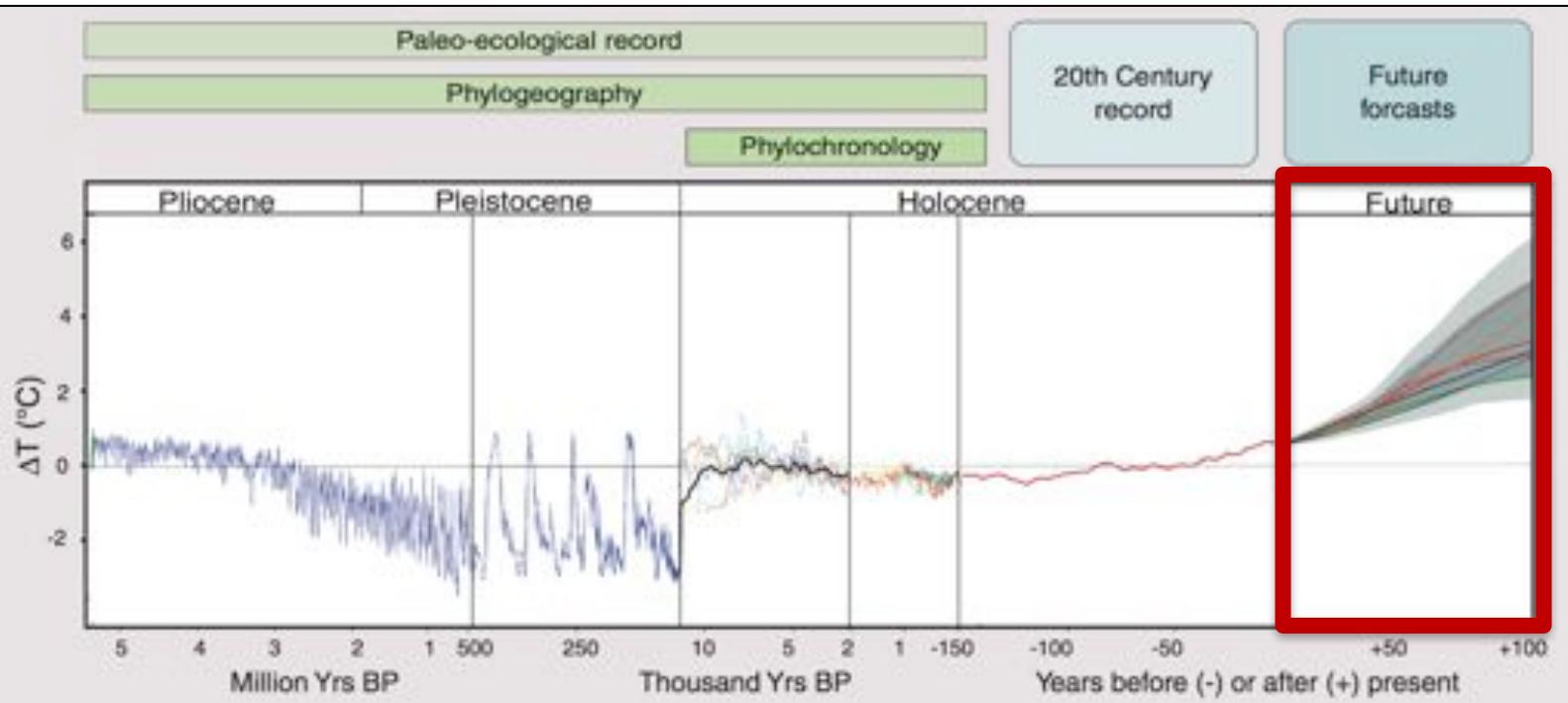
Matt Terzes, California Polytechnic State University

Dr. Brian Buma, University of Alaska – Southeast

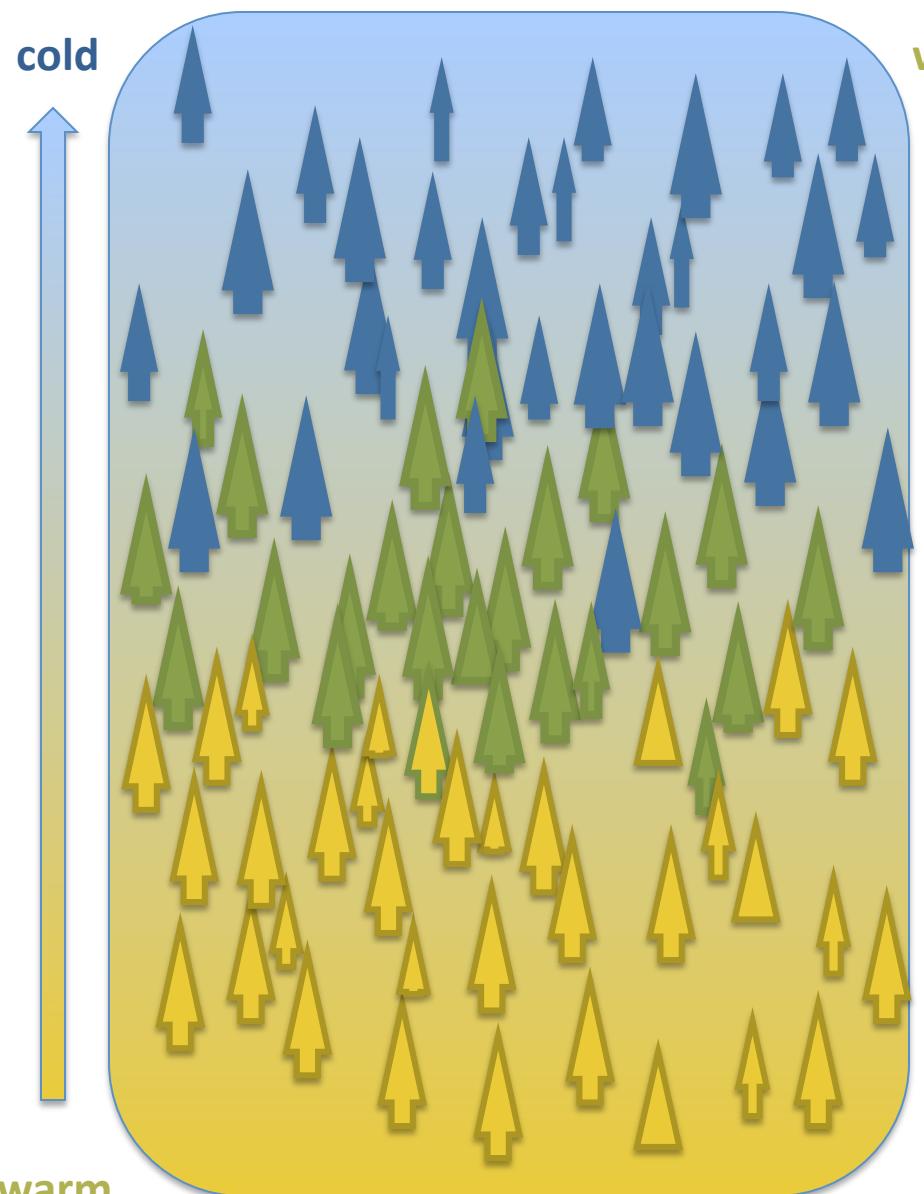
Dr. Seth Davis, Colorado State University

Don Canestro, University of California – Santa Barbara

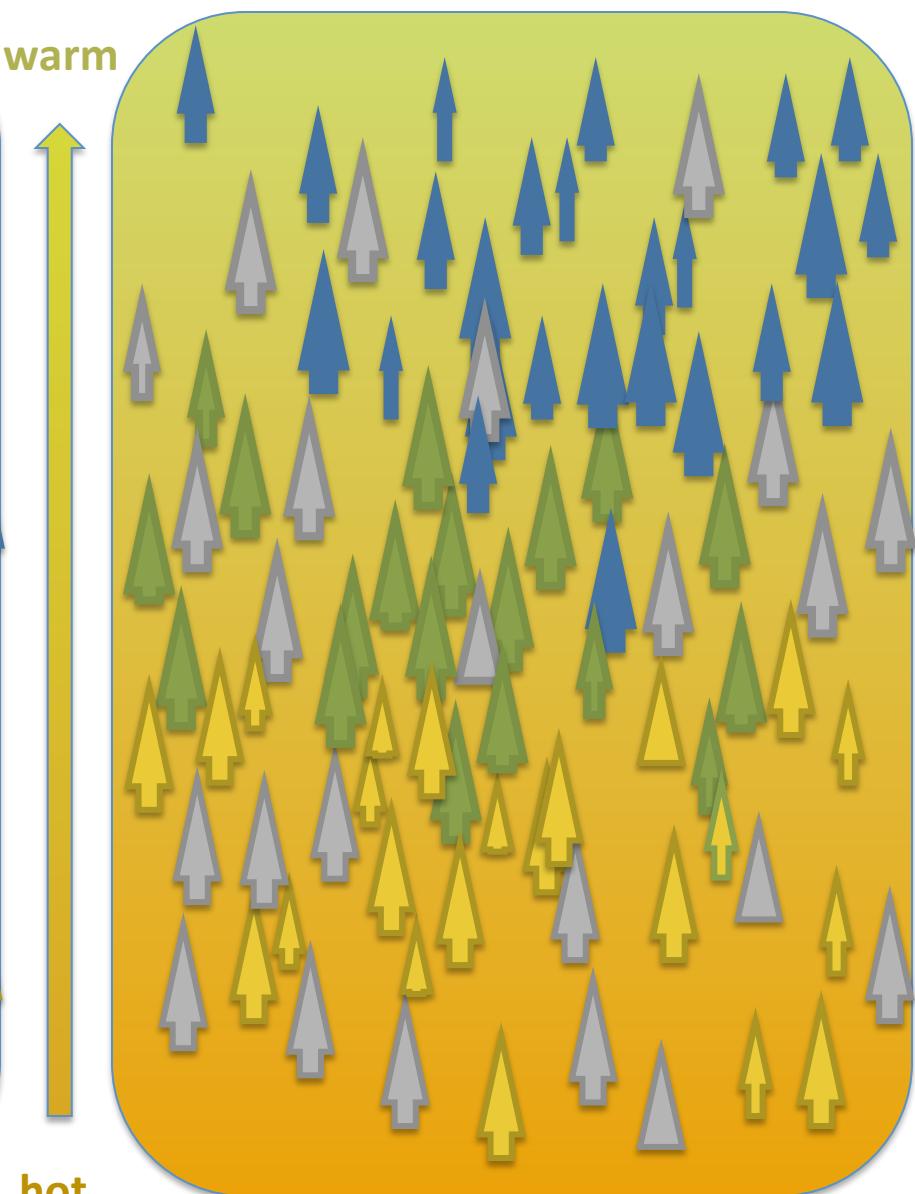




Populations are adapted to historical climate

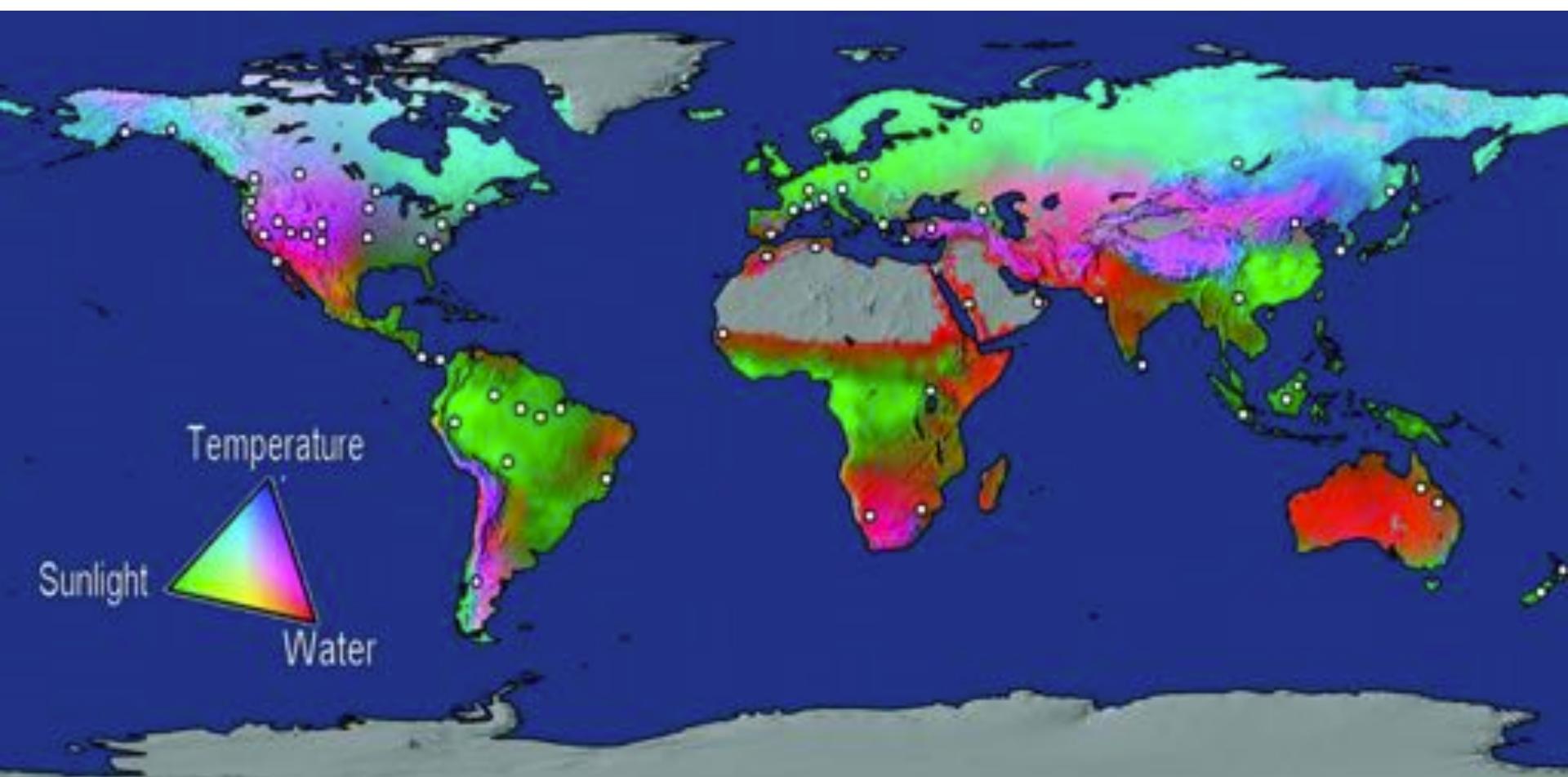


Populations are mismatched with future climate

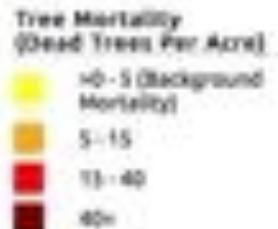


Borrowed from Sally Aitken, UBC

Consequence: Global Forest Mortality



Tree Mortality Viewer





The IUCN Red List of Threatened Species™
ISSN 2307-8235 (online)
IUCN 2008. T42408A2977955

Pinus radiata, Monterey Pine

Assessment by: Farjon, A.



Pinus radiata distribution

Pinus muricata distribution



Sources: Best, McAllister, McRoy, Barbiero & Margulies, Calflora, Chiarucci, Chiarucci, A., Farjon, A., Fitter, J., Gershenson, and Lee 2015. The IUCN Red List of Threatened Species.

Pinus radiata



Pinus radiata

Quercus agrifolia





Cambria 'Pines by the Sea'



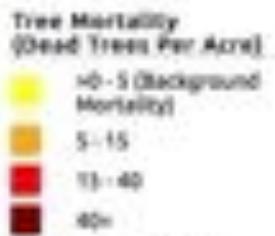
Los Angeles Times

Cambria's Pines Are Doomed, Experts Say

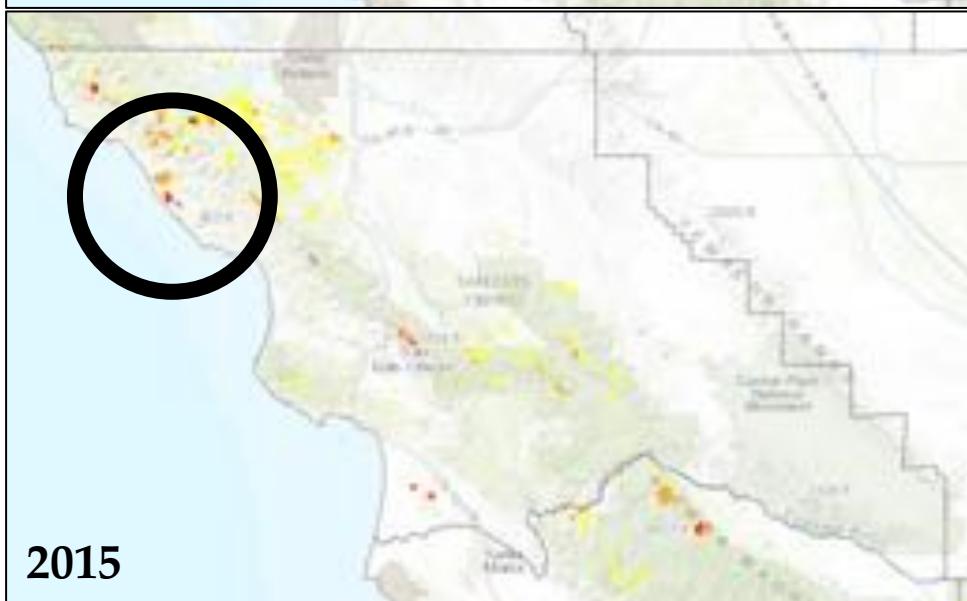
Nature: Fungus known as pine pitch canker could wipe out 80% of the native stand that helps draw visitors to scenic coastal village.

May 26, 1998 | MARCIA MEIER | SPECIAL TO THE TIMES

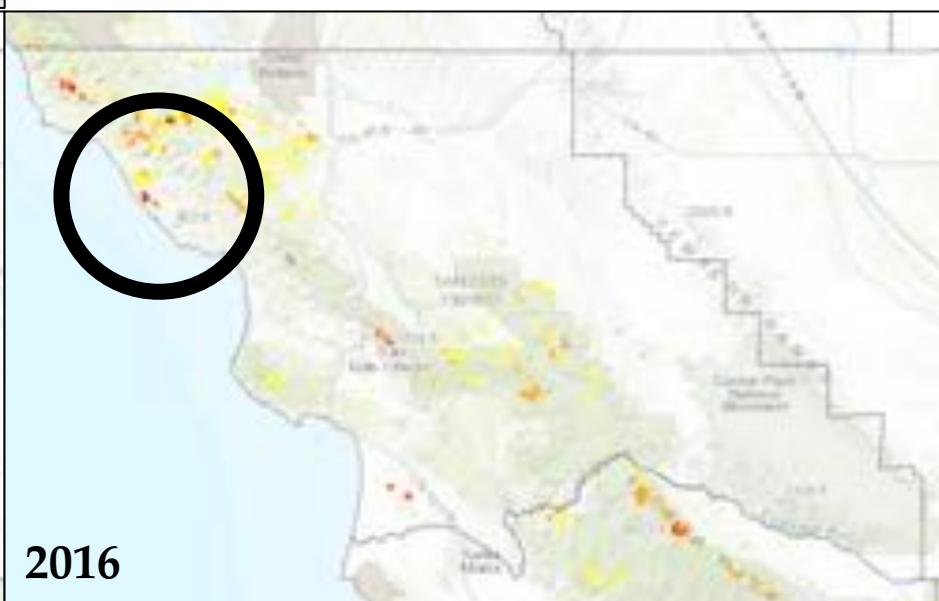
Tree Mortality Viewer



2014

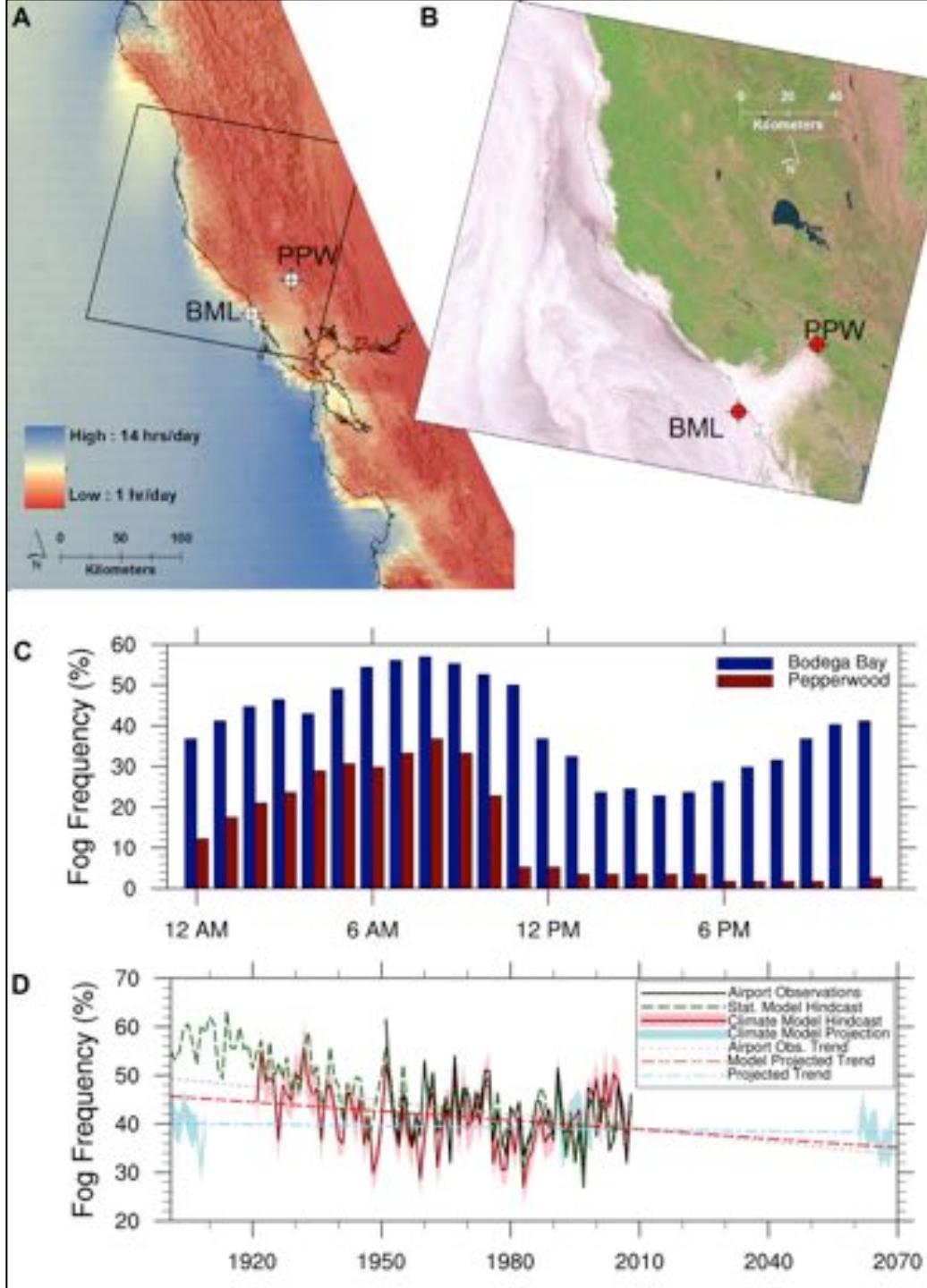


2015

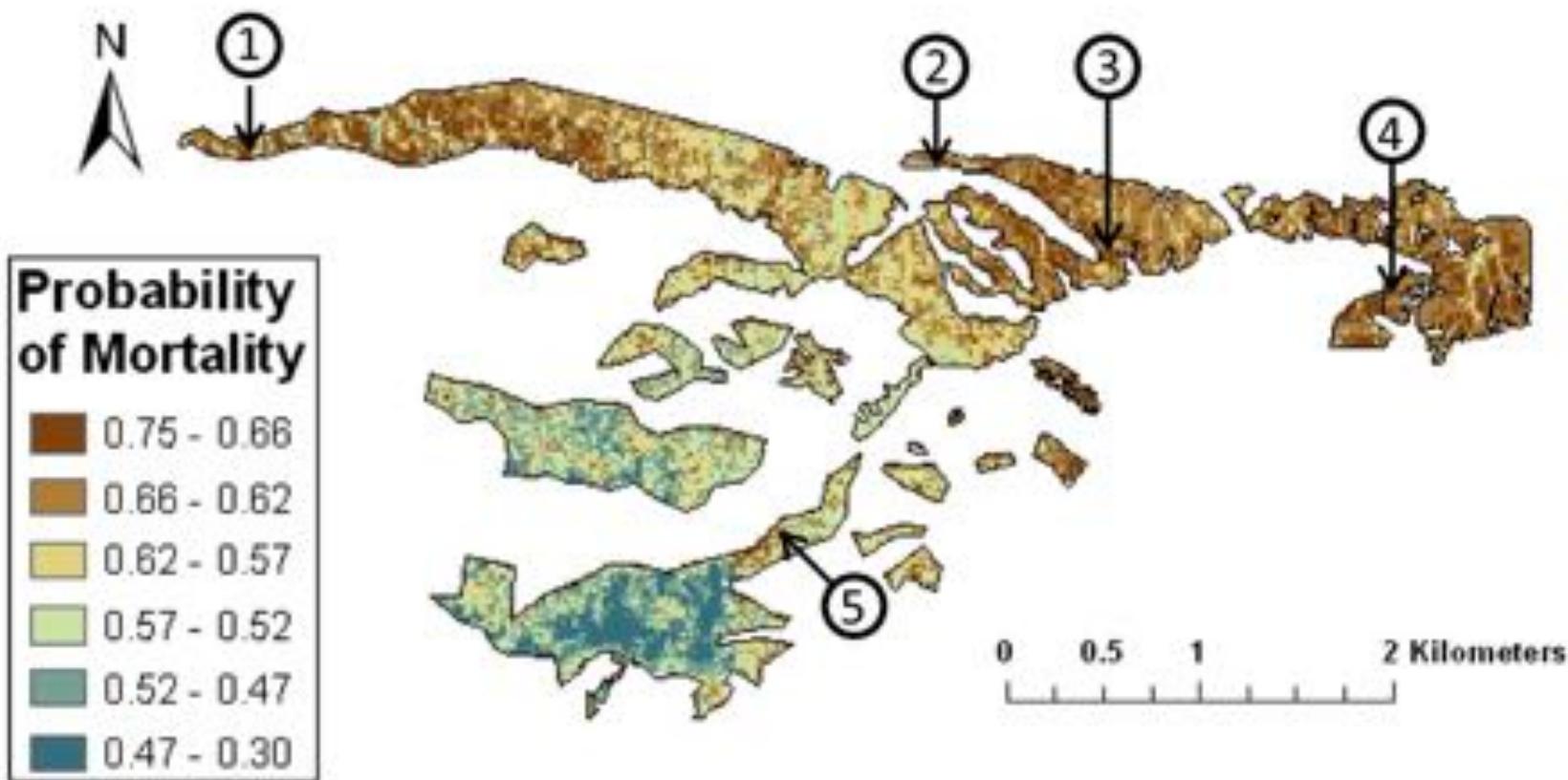


2016

Fog Dependency



Fog Dependency





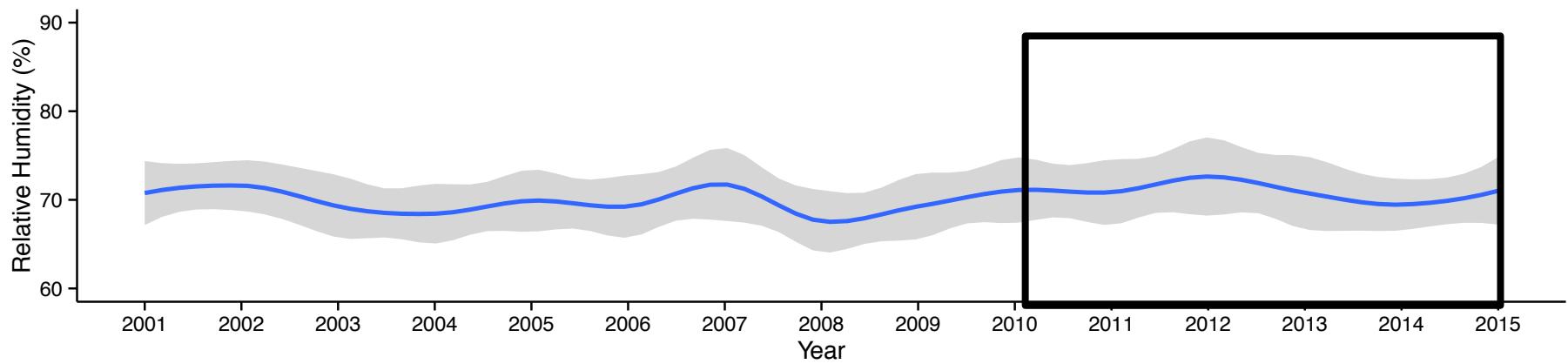
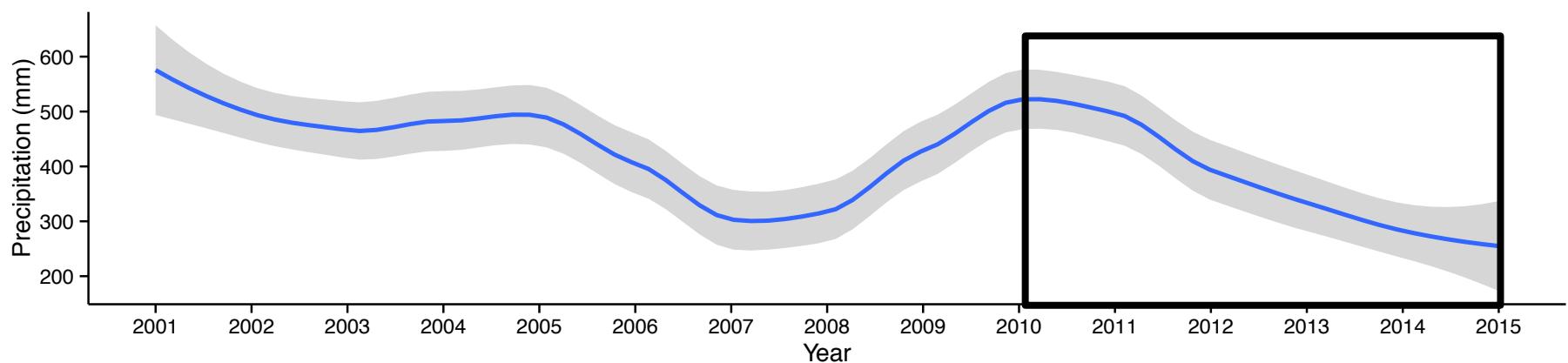
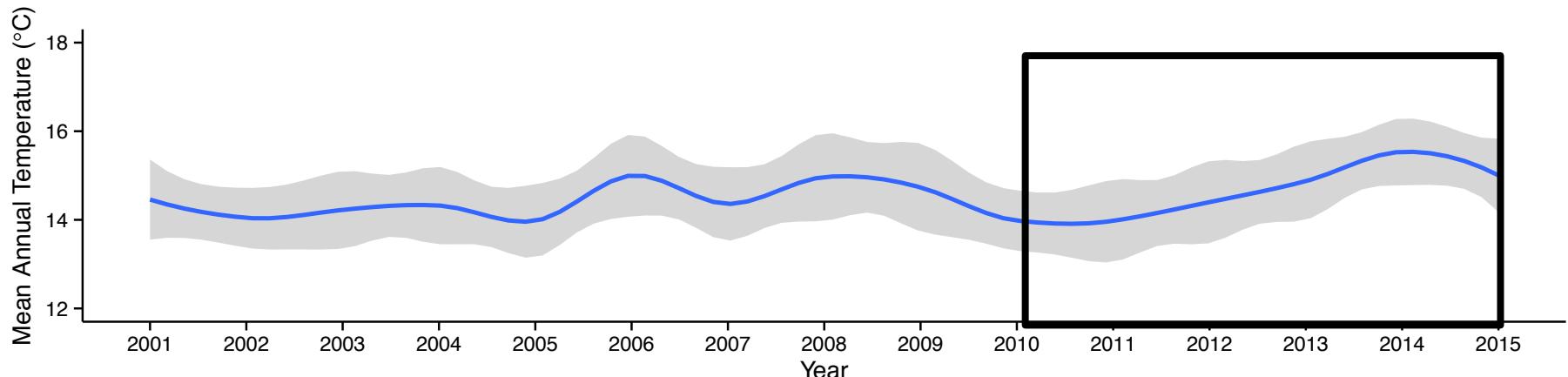
1) Are forest population dynamics driven more by exogenous or endogenous factors?

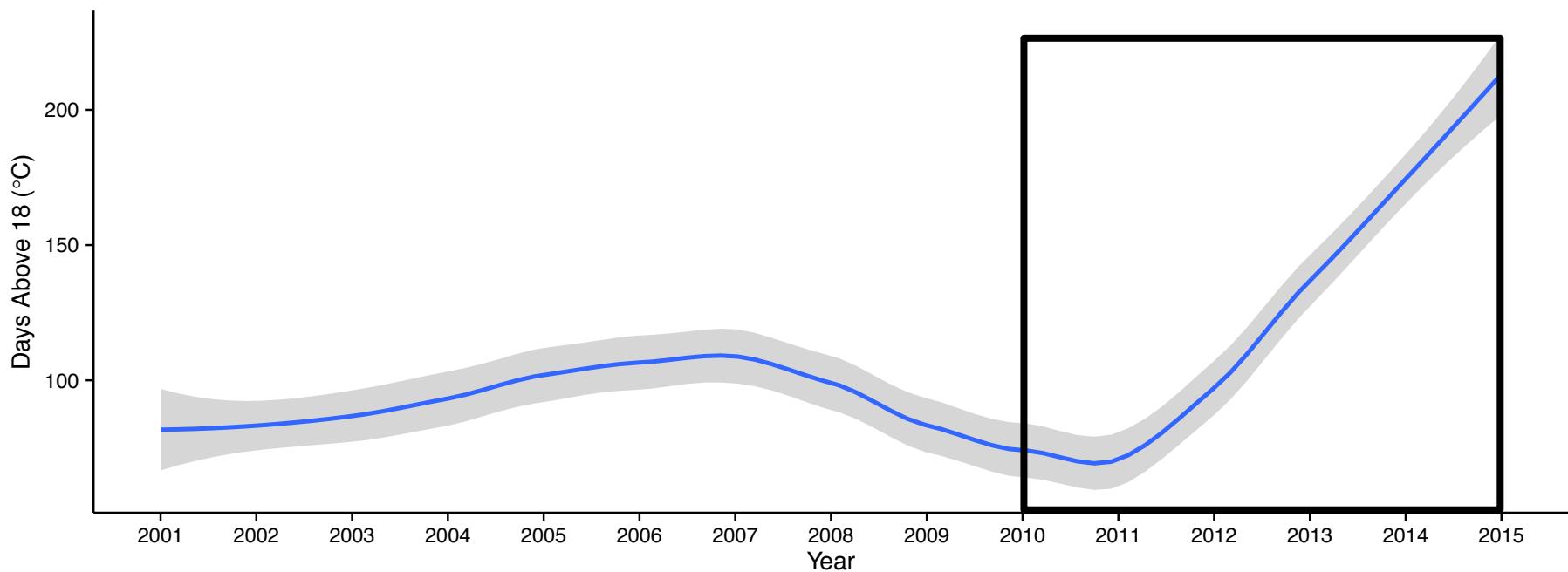
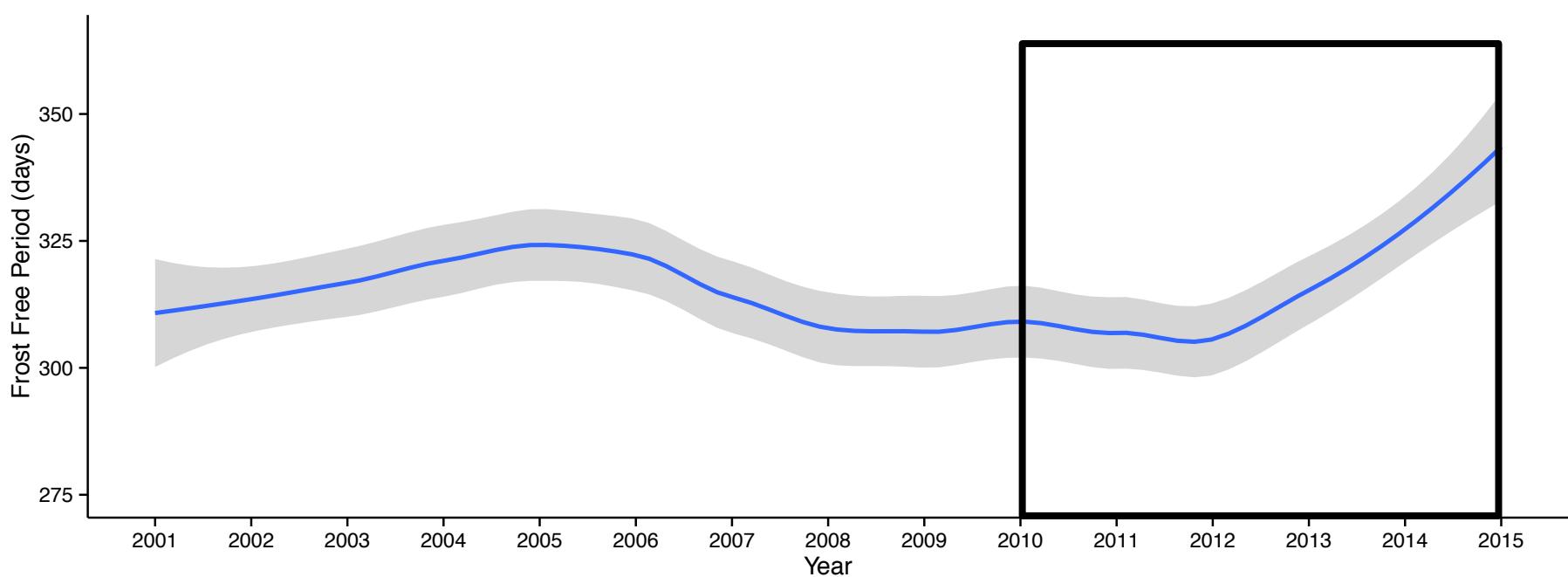


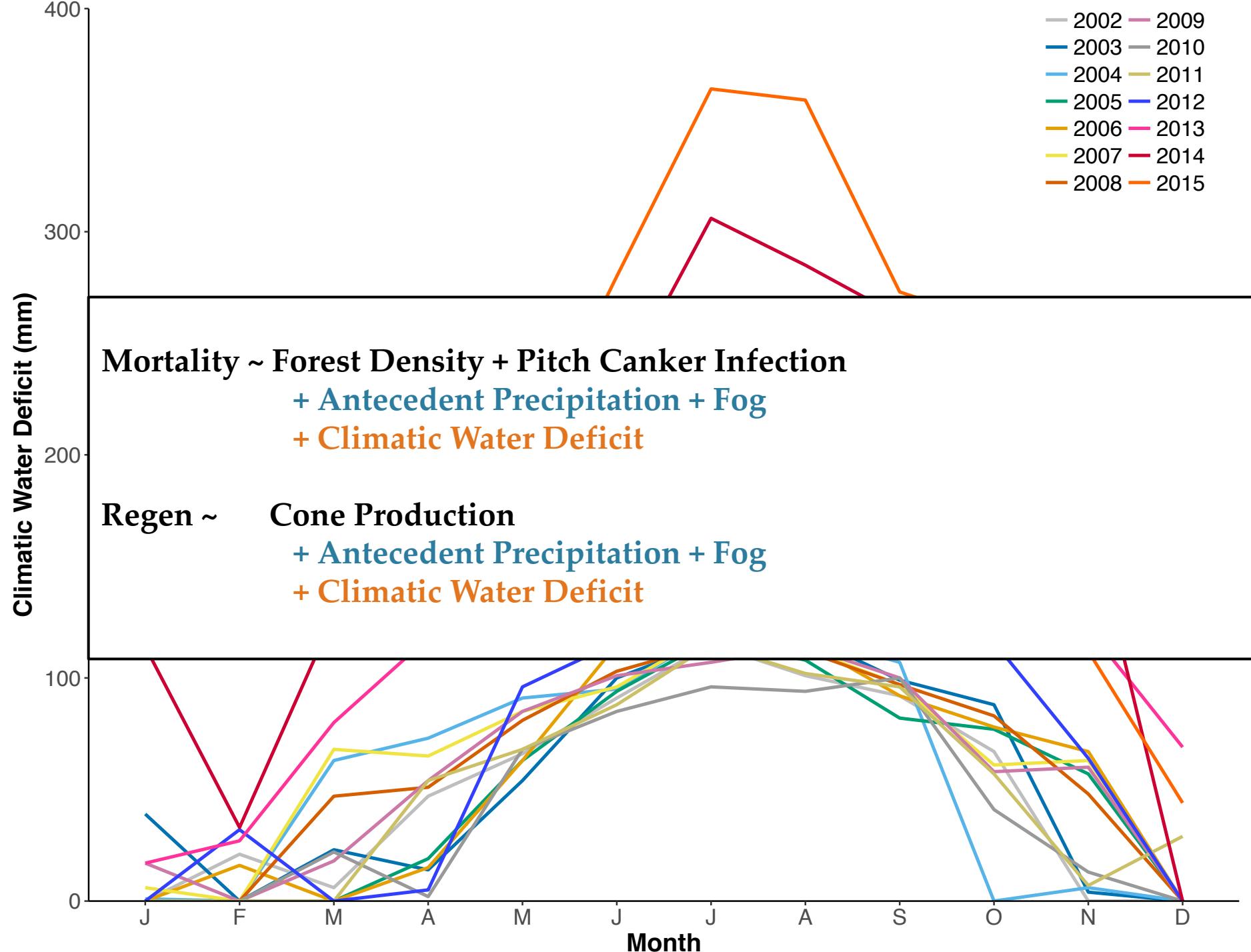
2) How does climate influence patterns of mortality and regeneration?



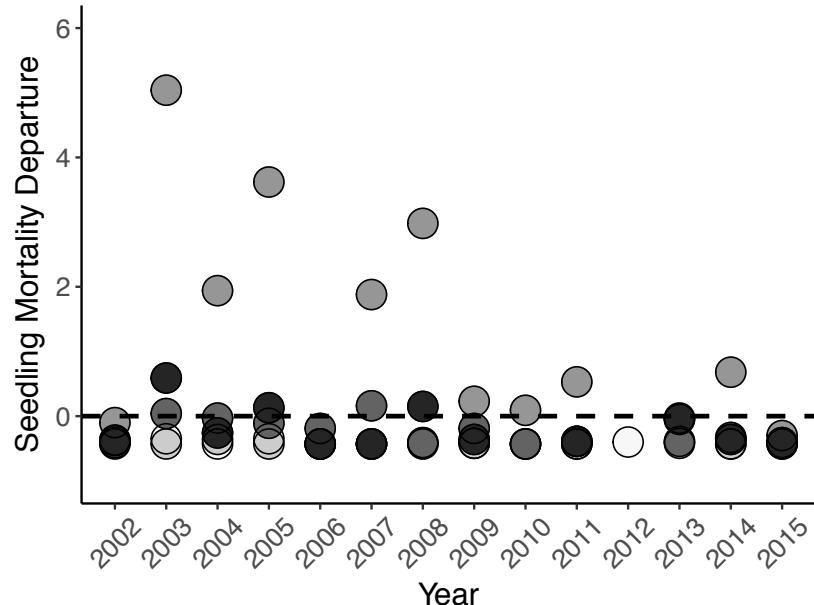
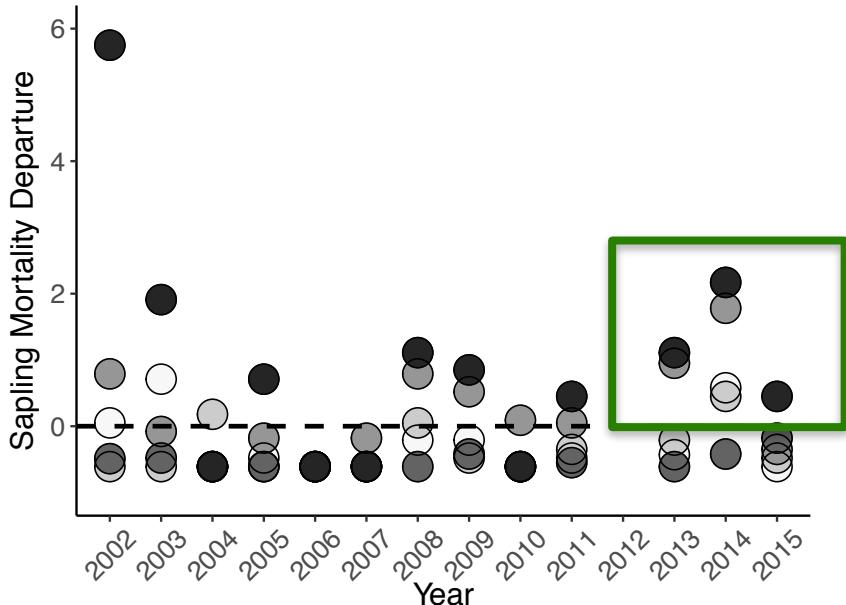
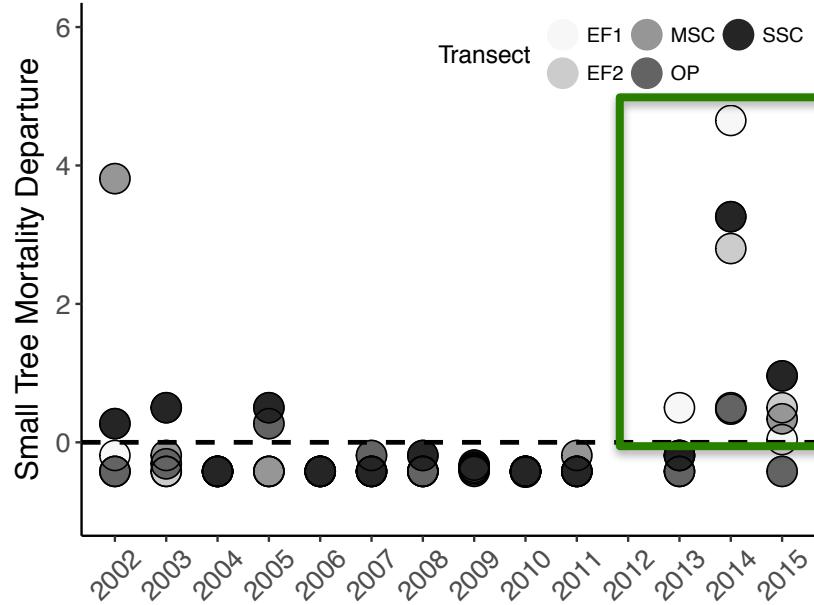
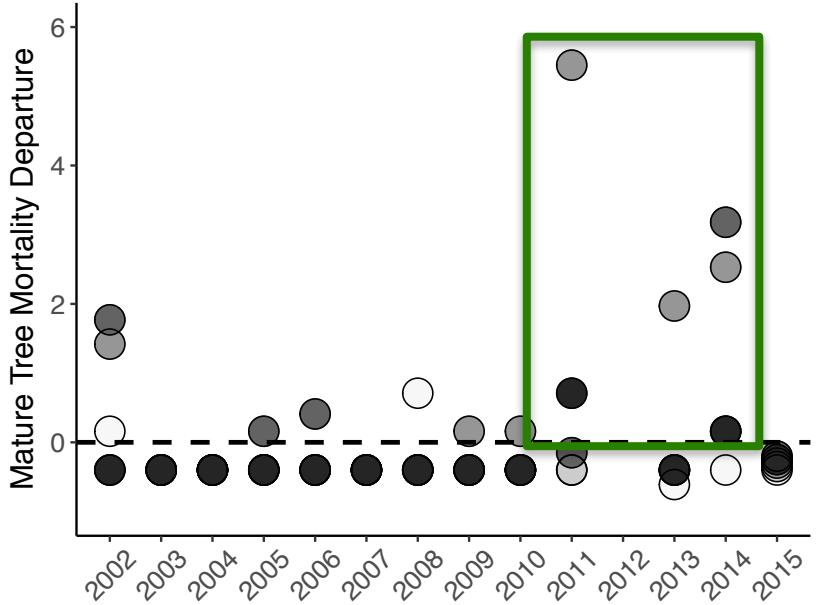
3) Given these drivers, what response can we anticipate under future climate conditions?



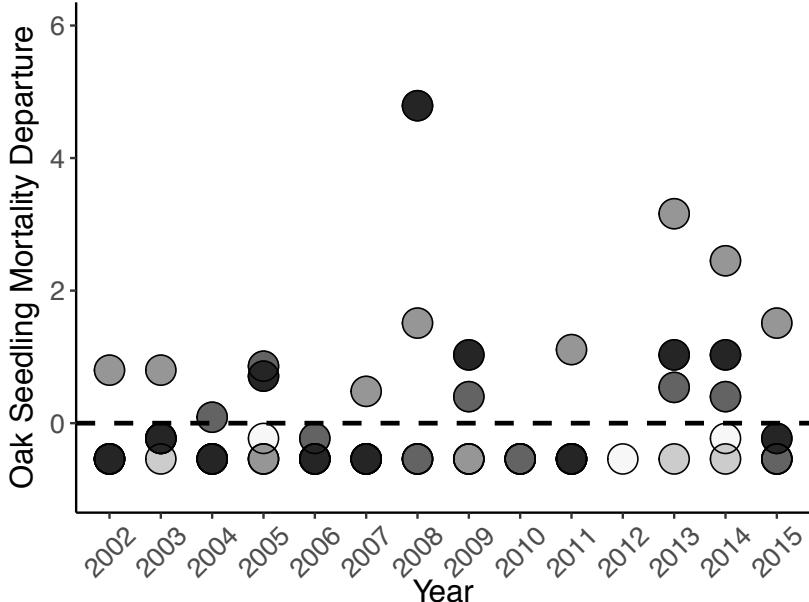
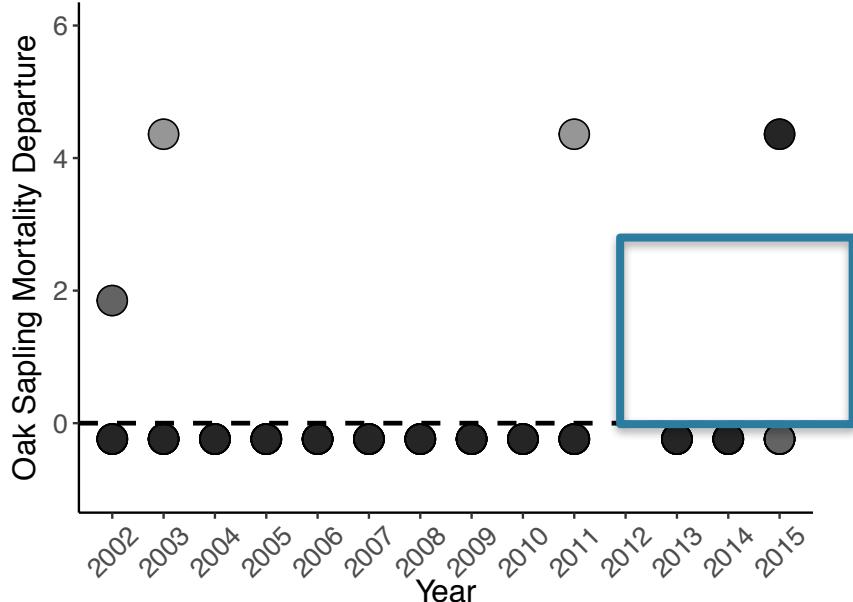
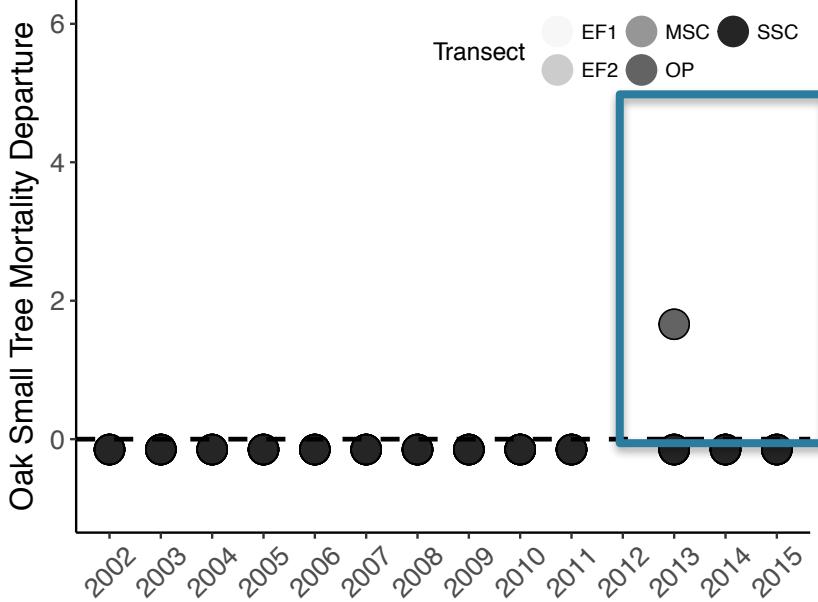
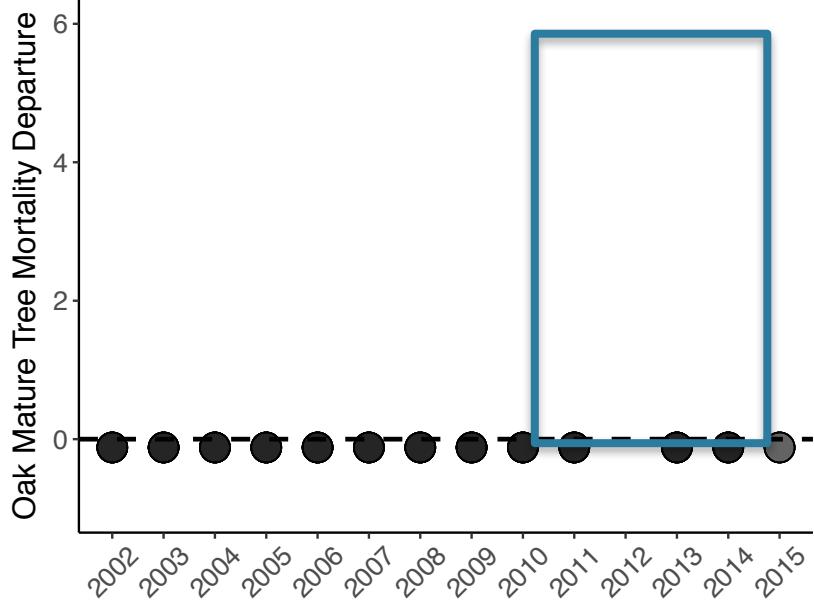


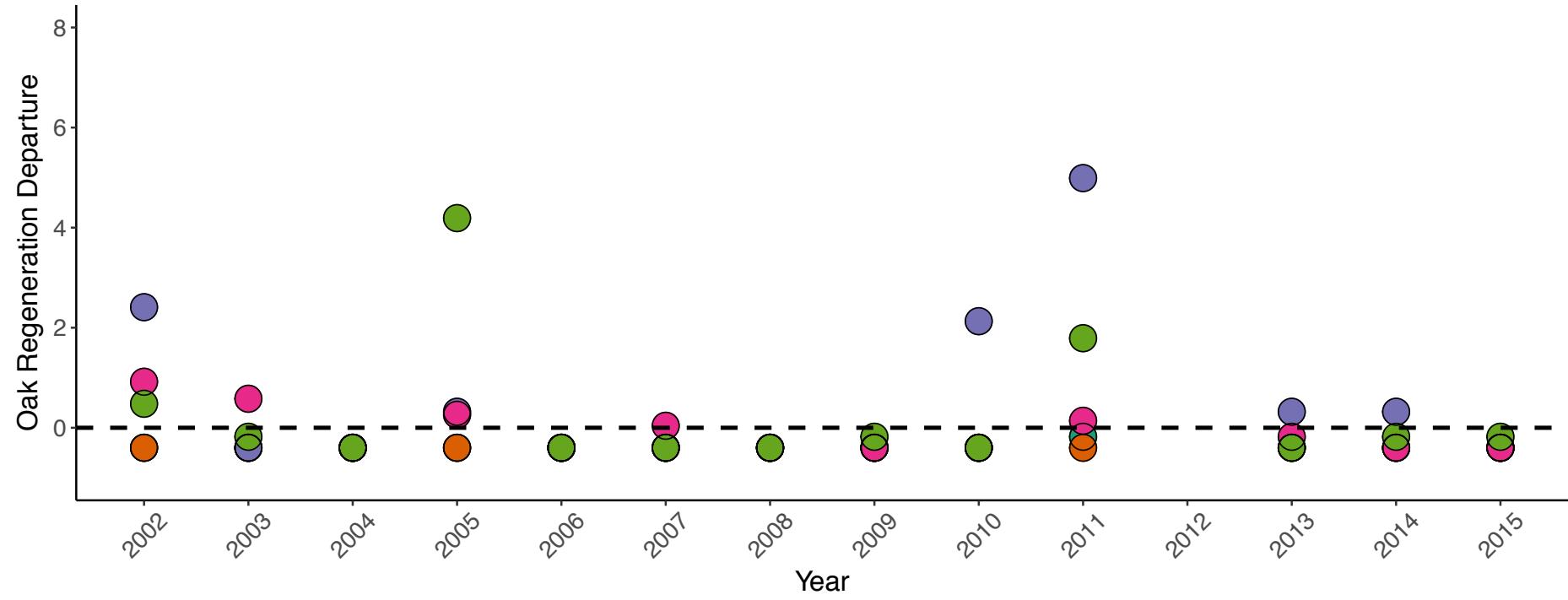
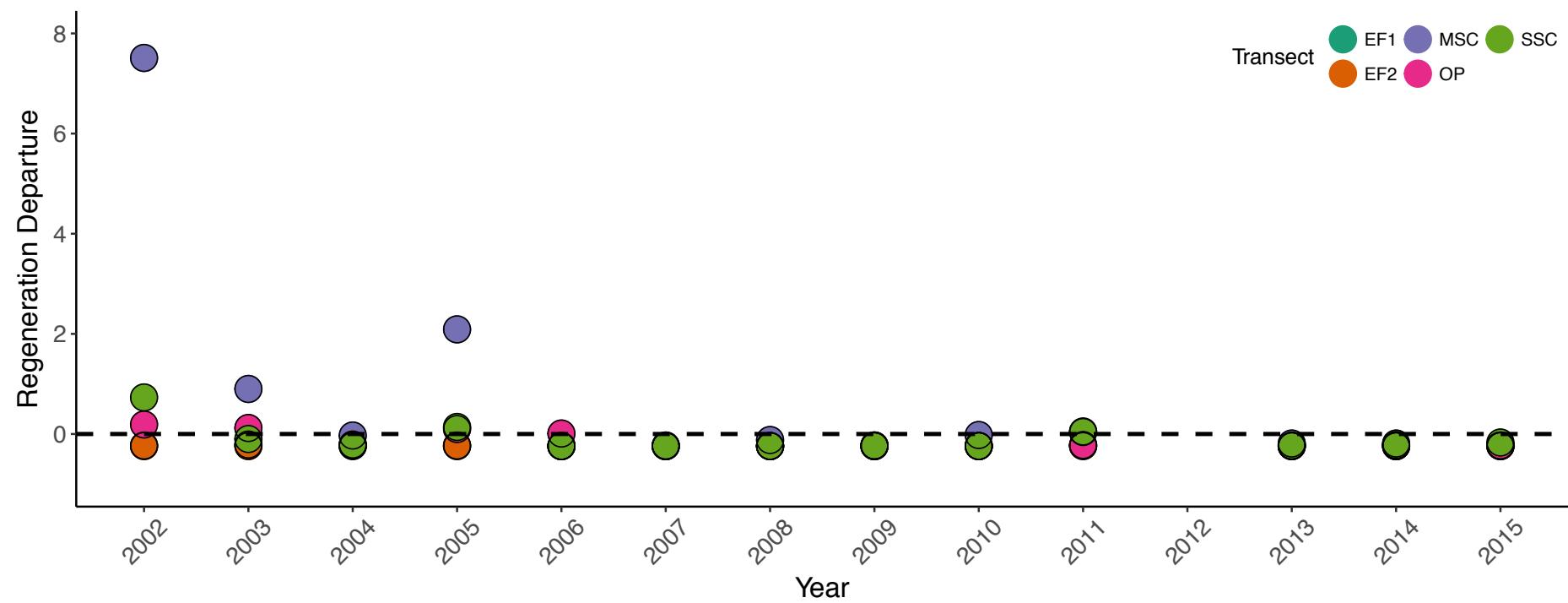


Pinus radiata

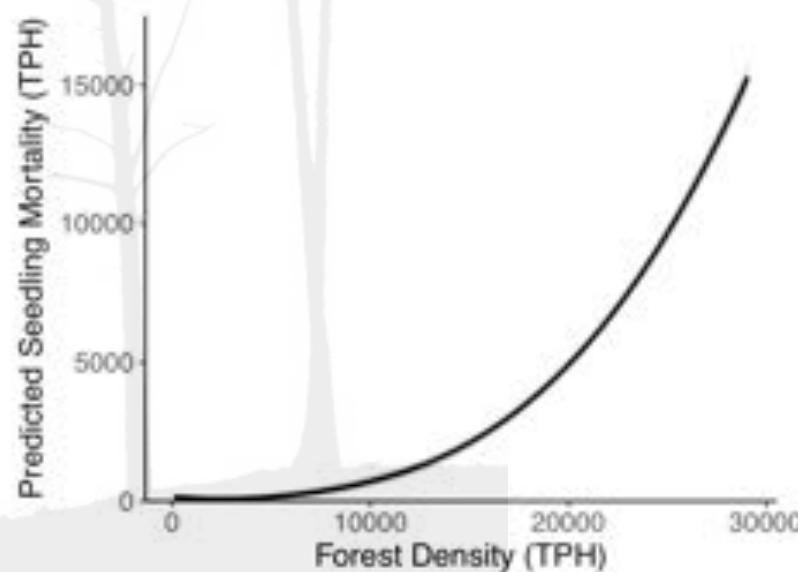
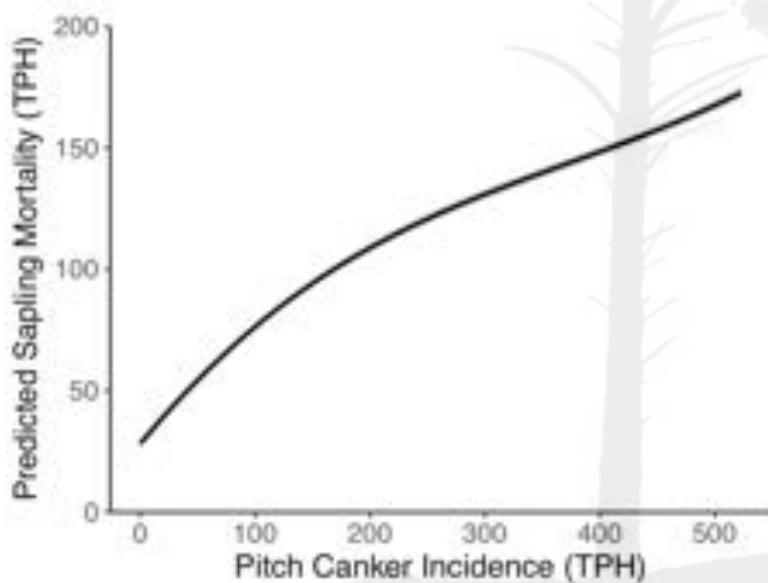
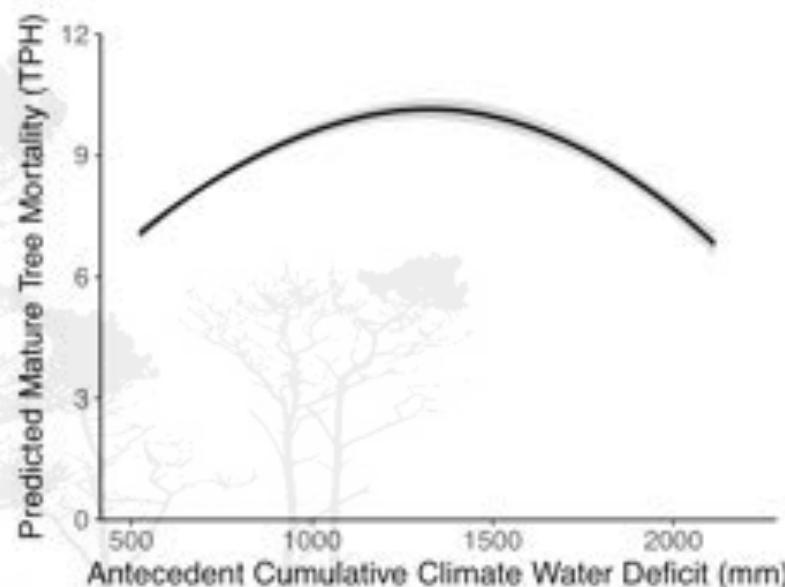
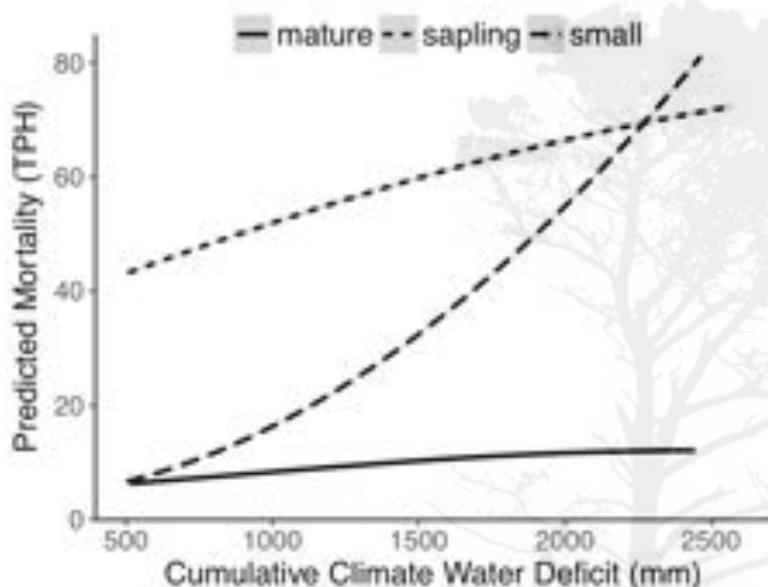


Quercus agrifolia



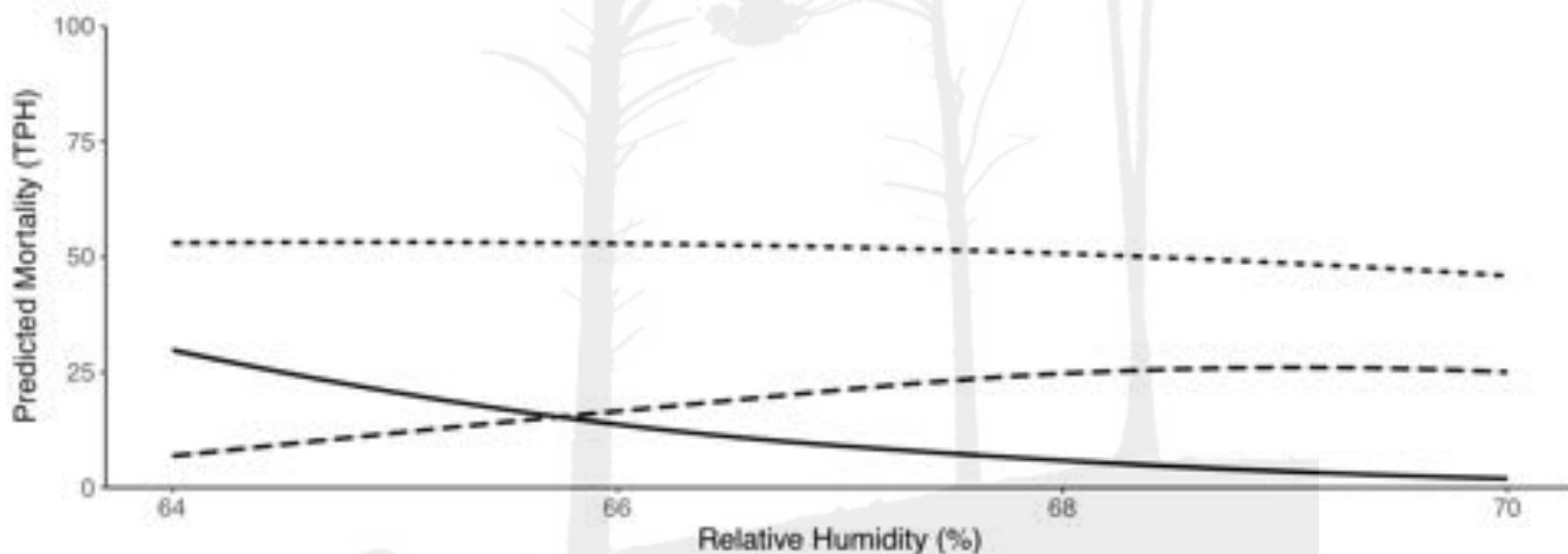
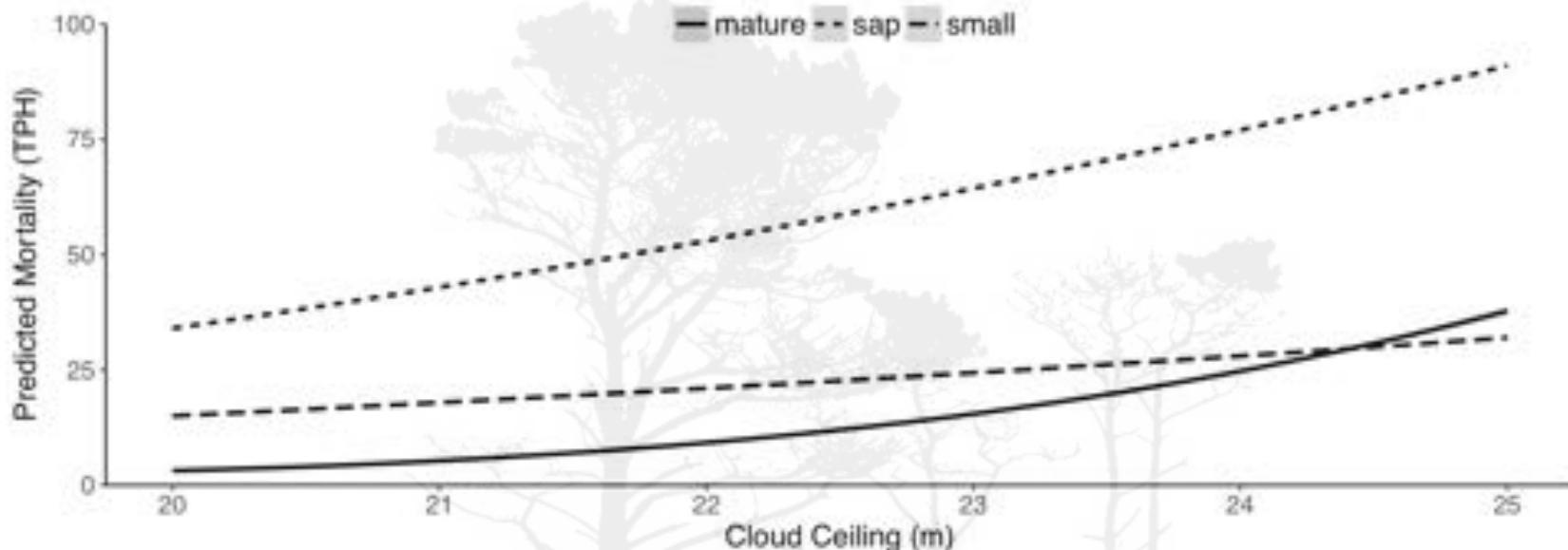


Pinus radiata



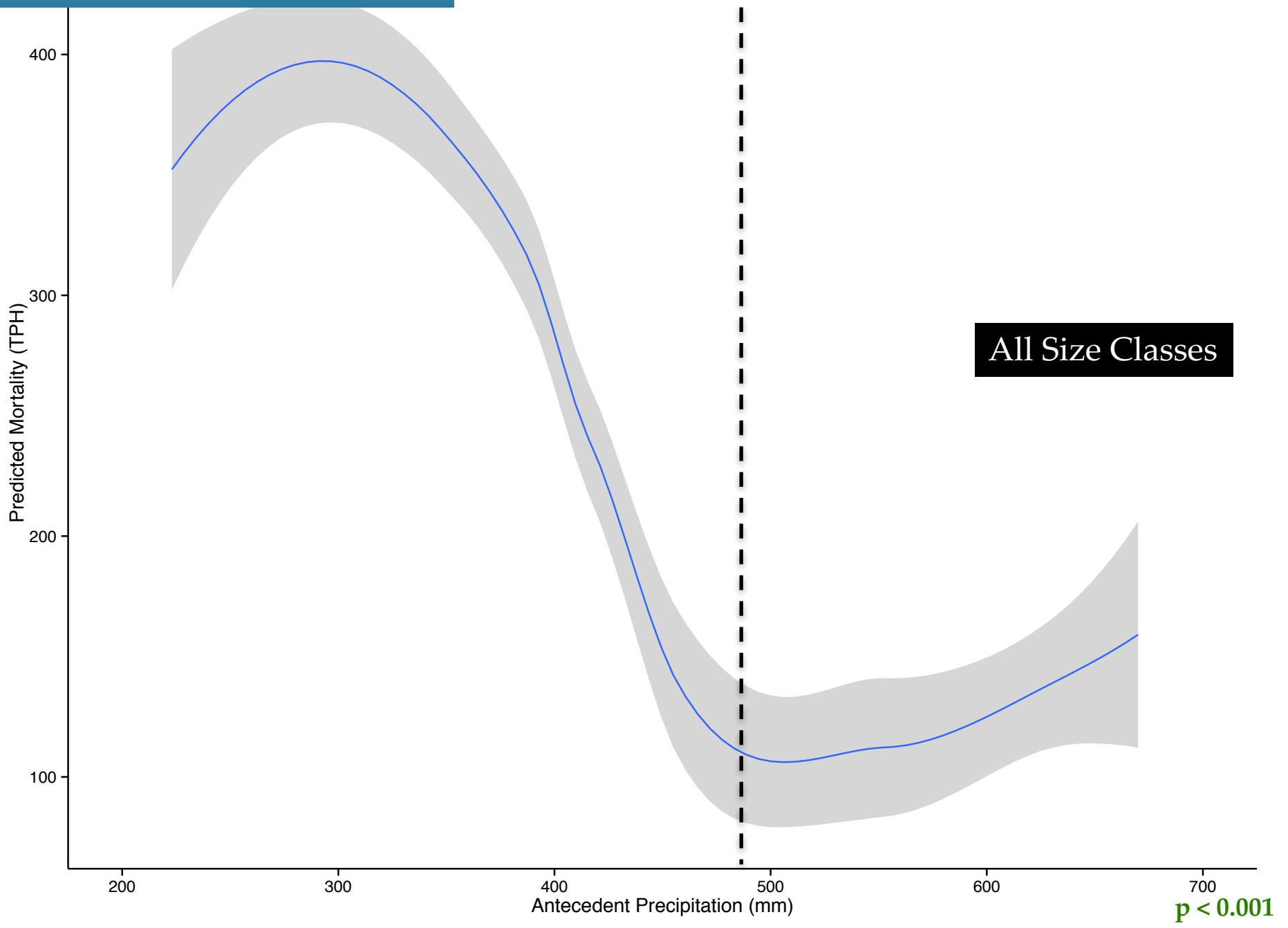
p < 0.01

Pinus radiata

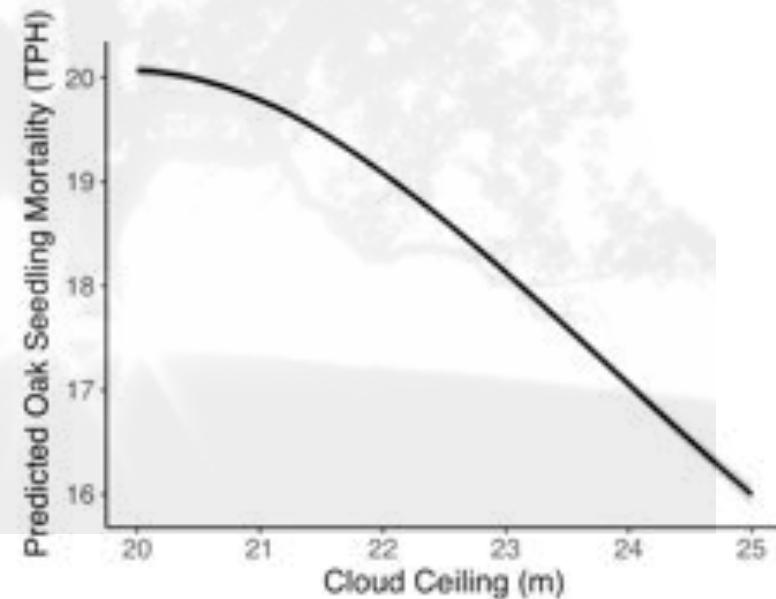
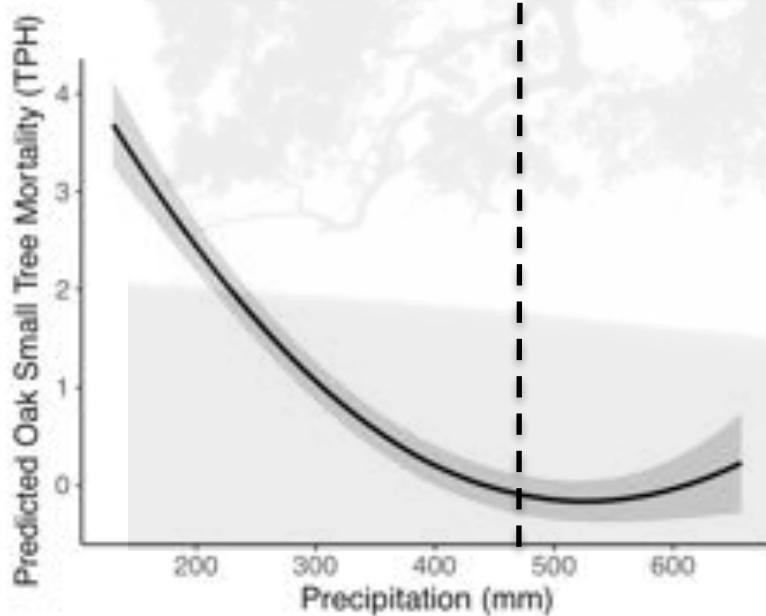
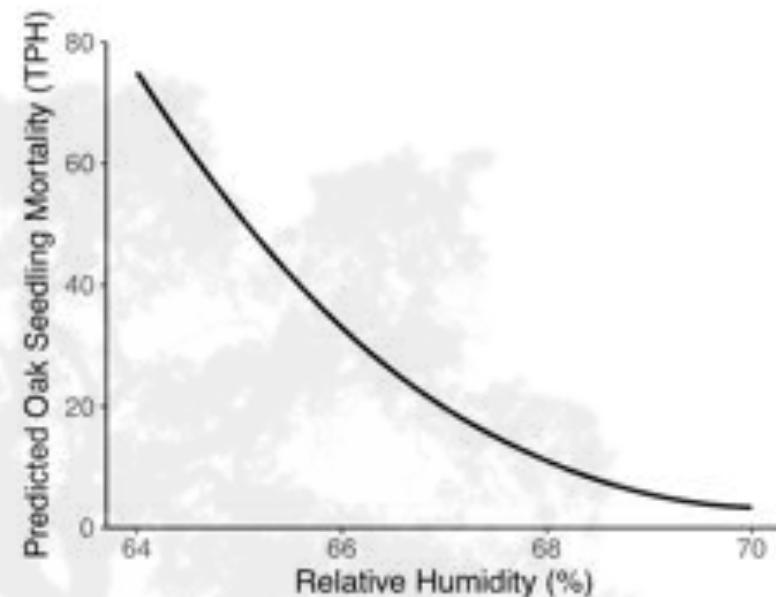
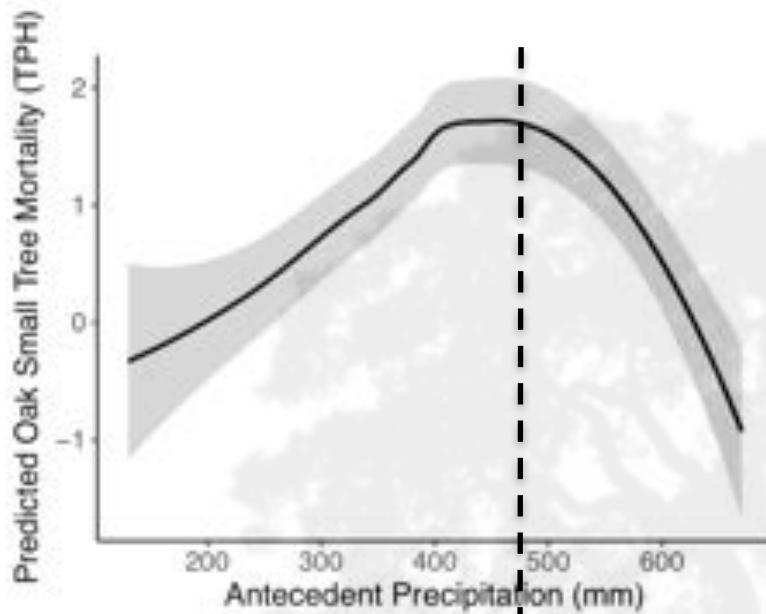


NOT SIGNIFICANT, $p > 0.10$

Pinus radiata

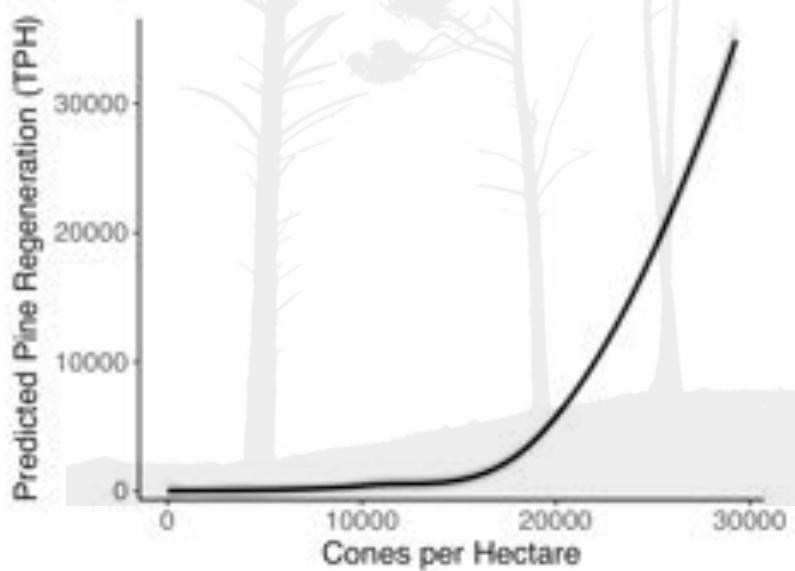
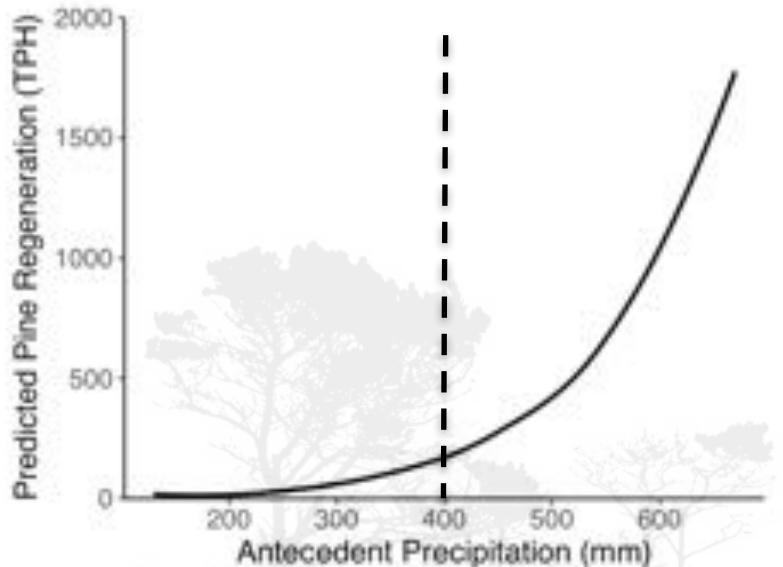


Quercus agrifolia

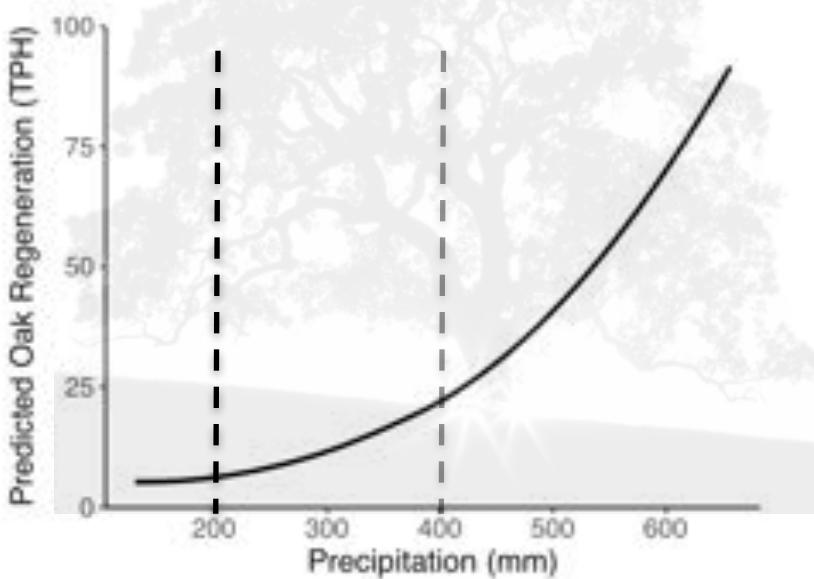
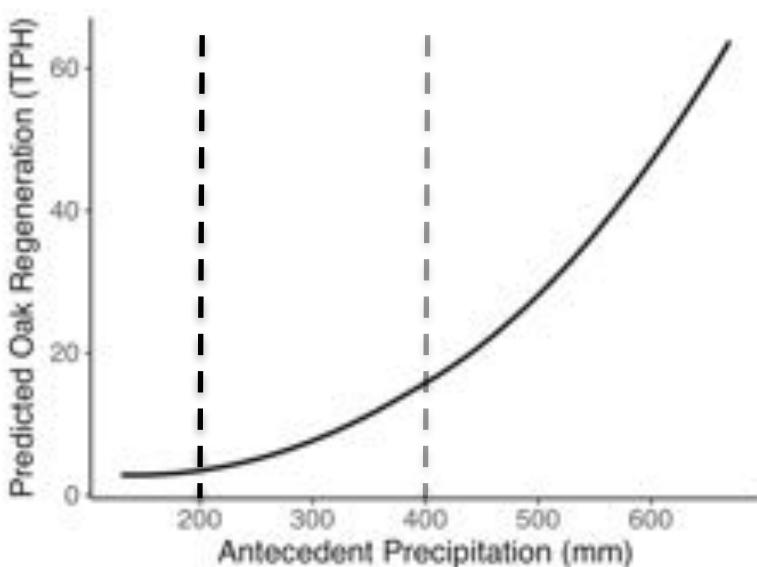


p < 0.05

Pinus radiata



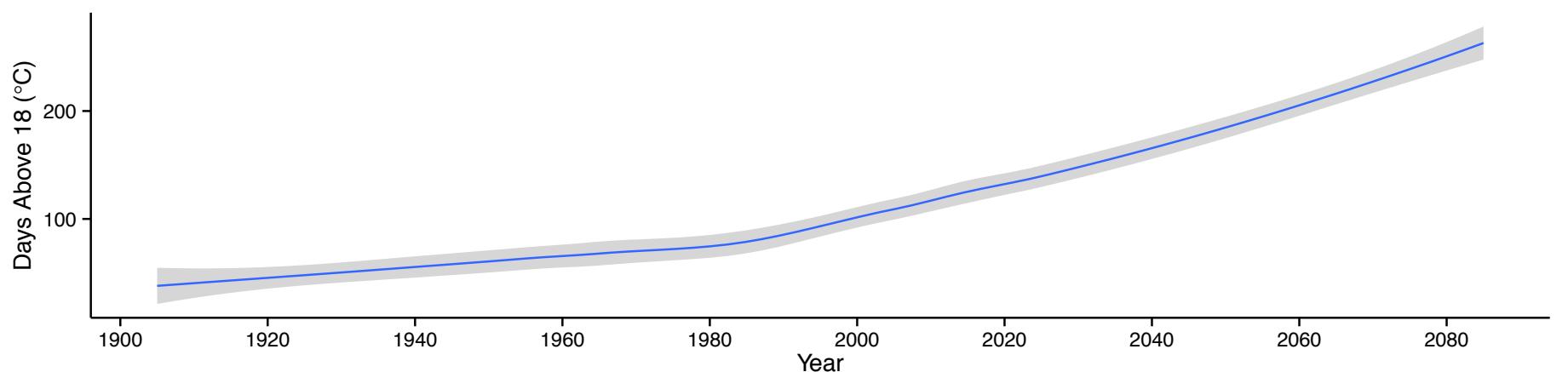
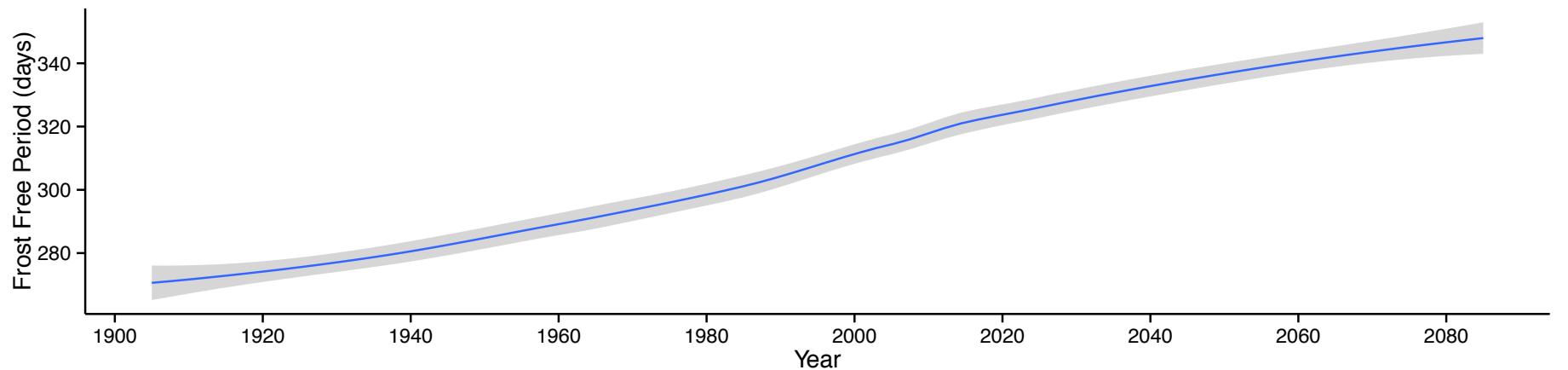
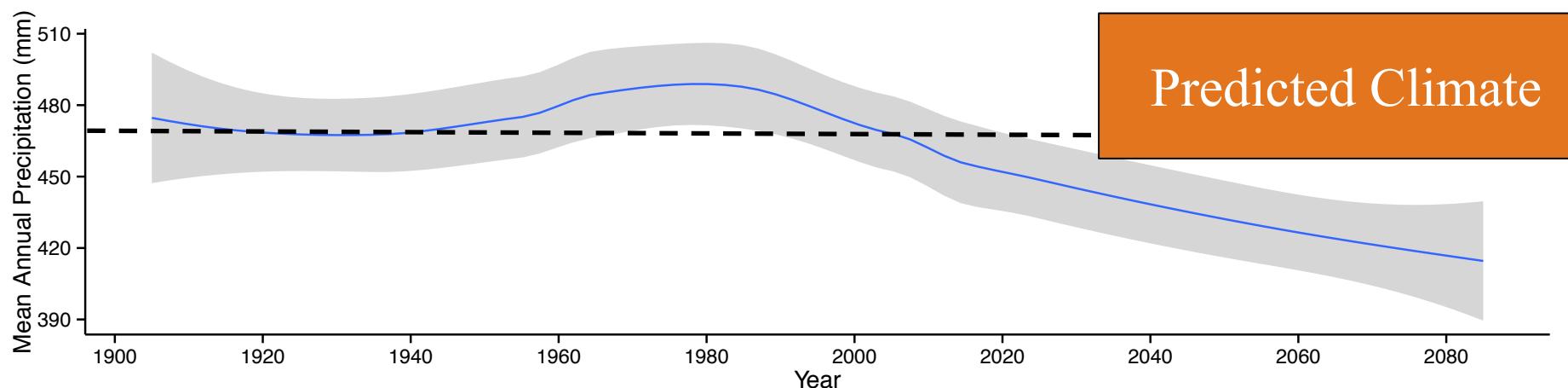
Quercus agrifolia

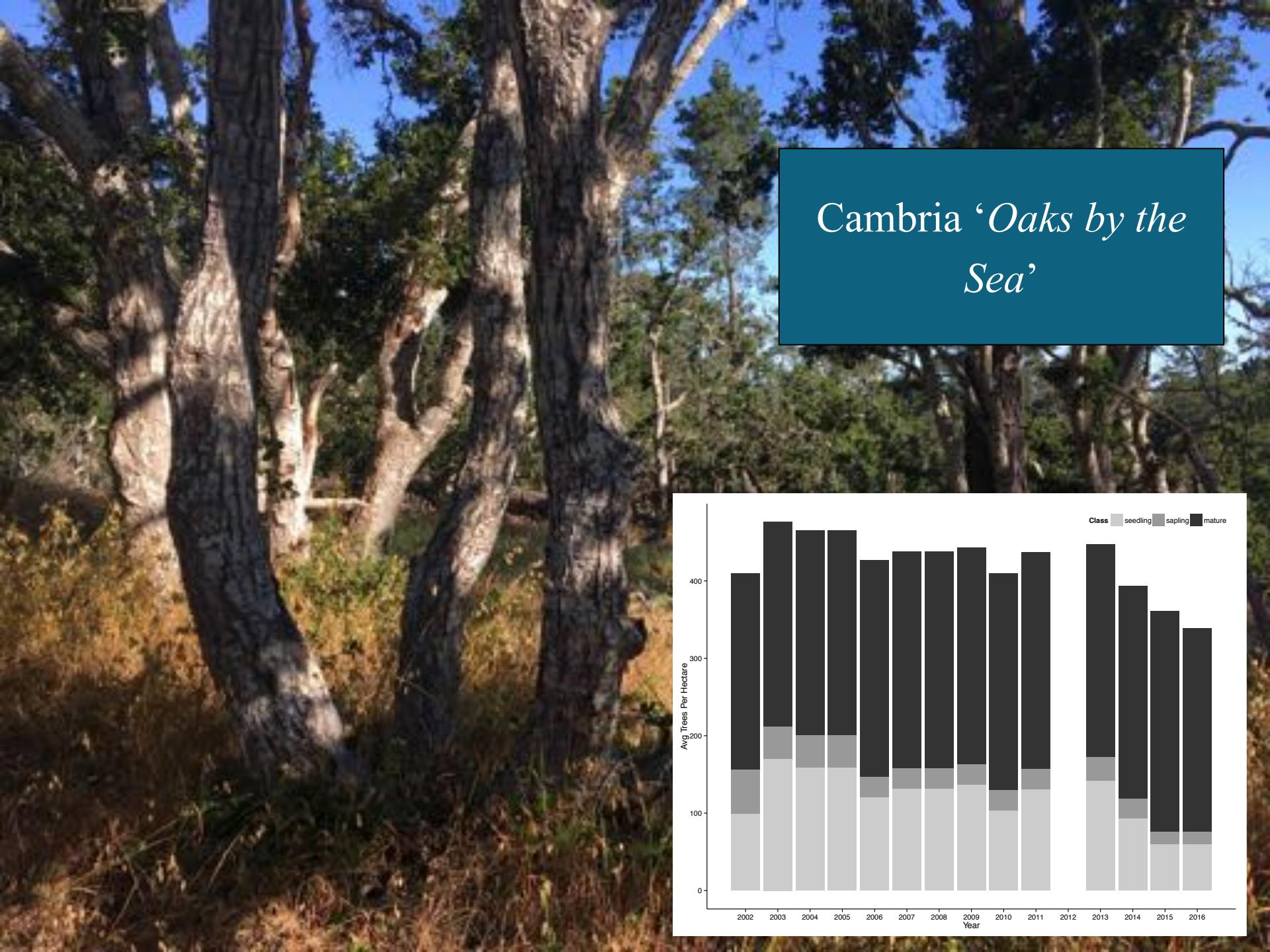


Pinus radiata

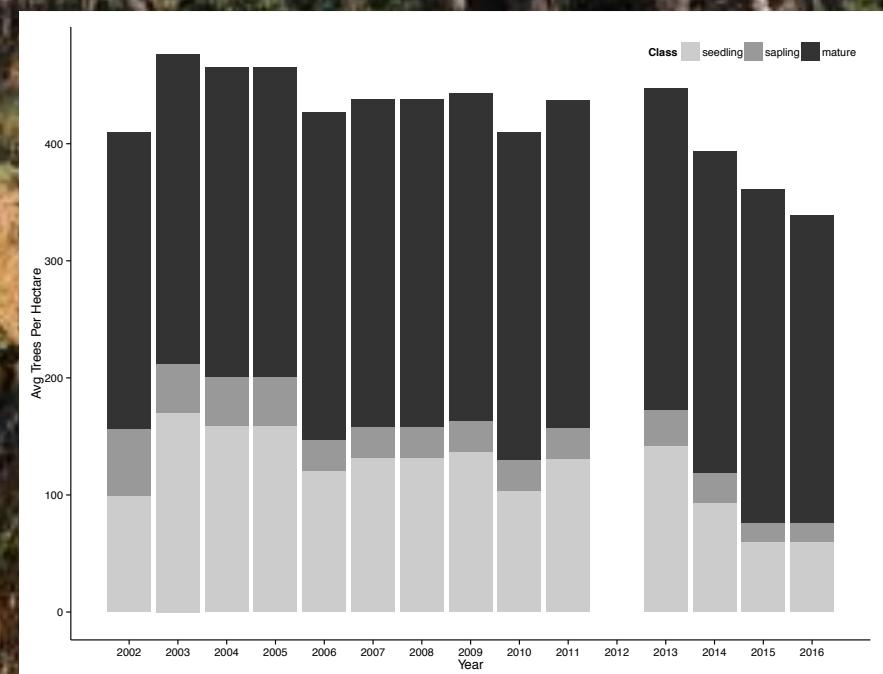
Quercus agrifolia





A photograph of a dense forest of tall, slender trees with light-colored, textured bark. The trees are growing on a hillside, with some leaning at angles. The background shows more of the forest under a clear blue sky.

Cambria ‘Oaks by the Sea’



Exogenous

1) Are forest population dynamics driven more by exogenous or endogenous factors?

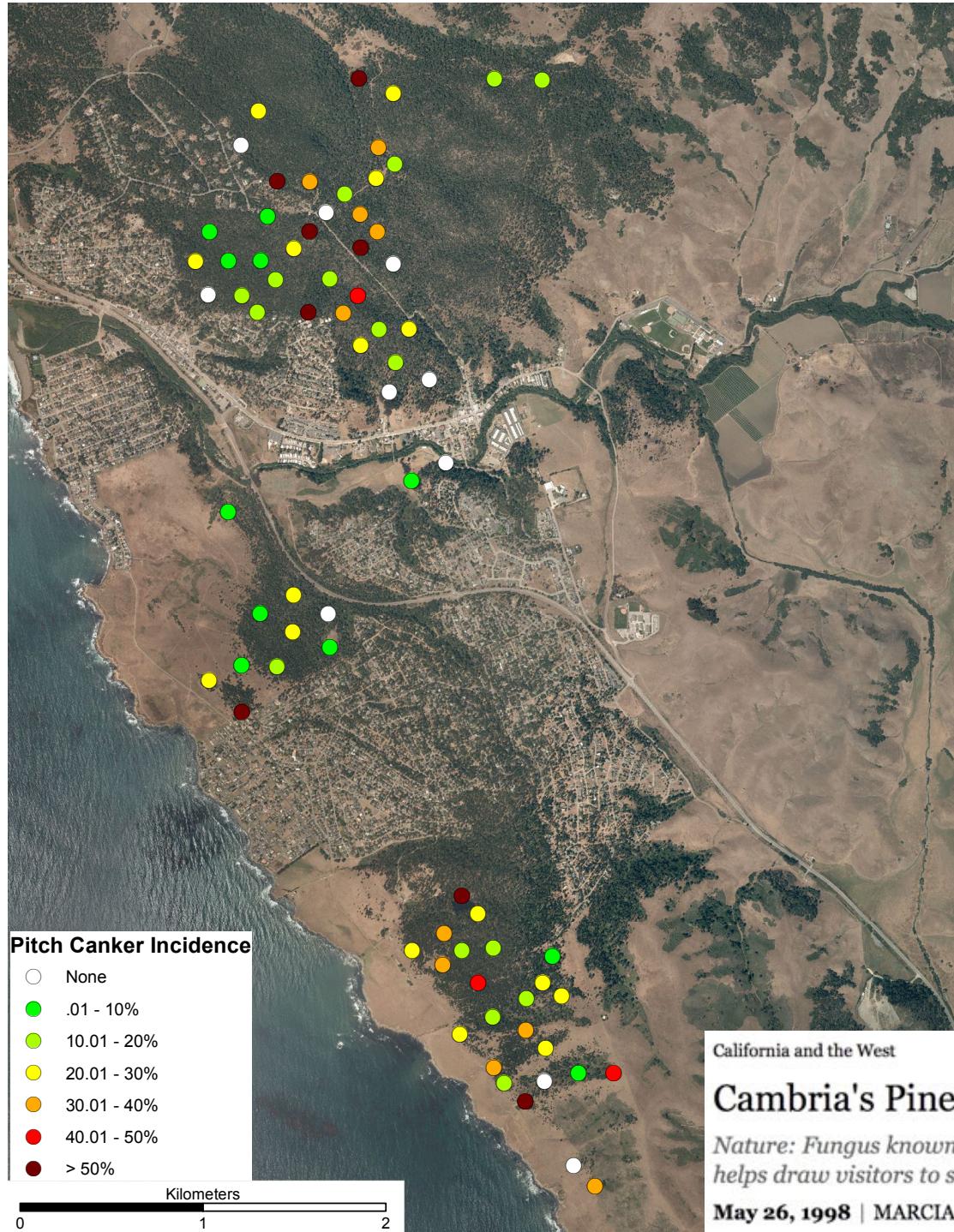
2) How does climate influence patterns of mortality and regeneration?

Species-specific thresholds

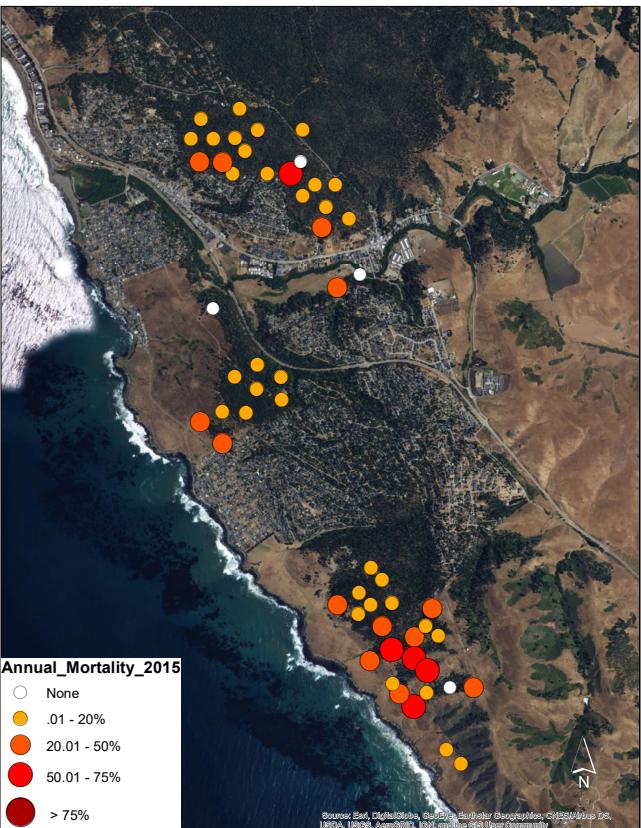
3) Given these drivers, what patterns can we anticipate under future climate conditions?

Population declines & compositional shifts

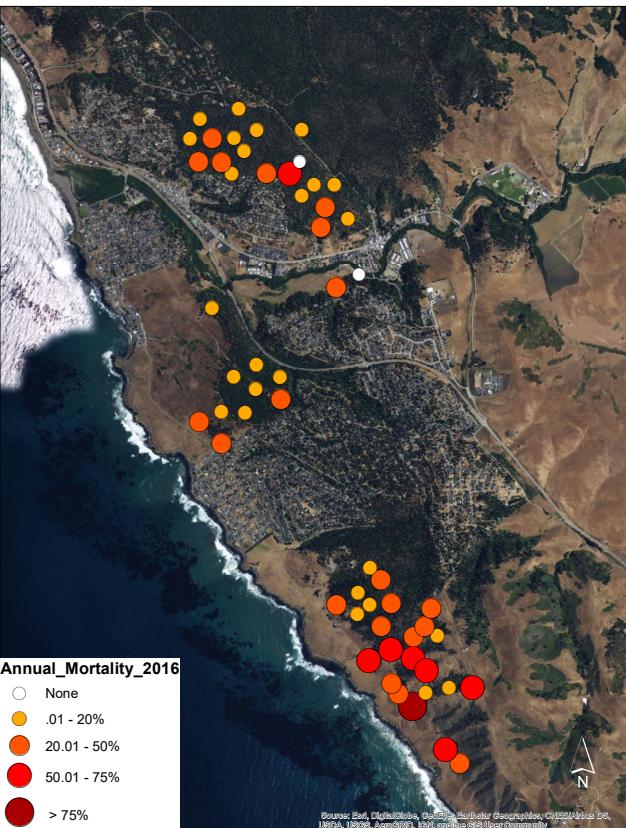
Long-term Permanent Plot Network



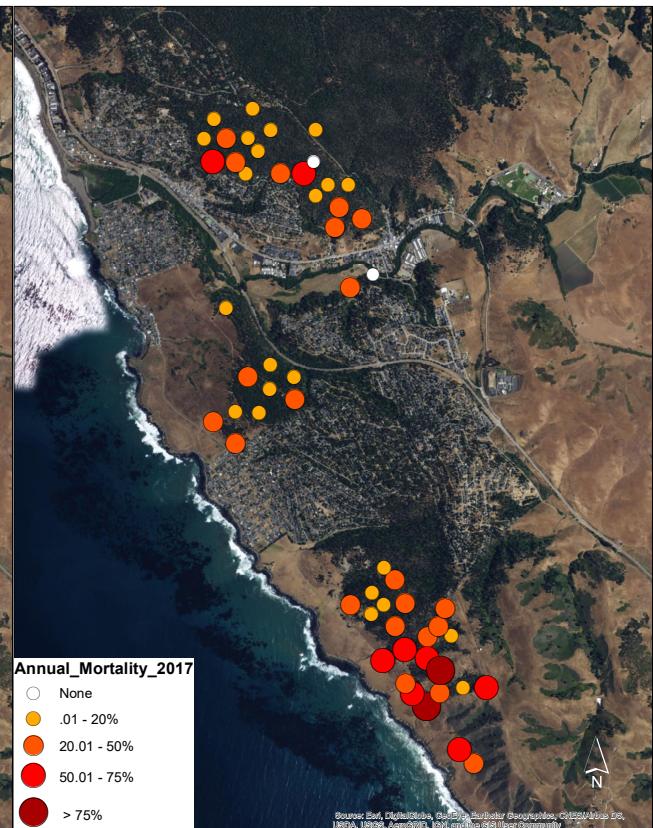
2015



2016

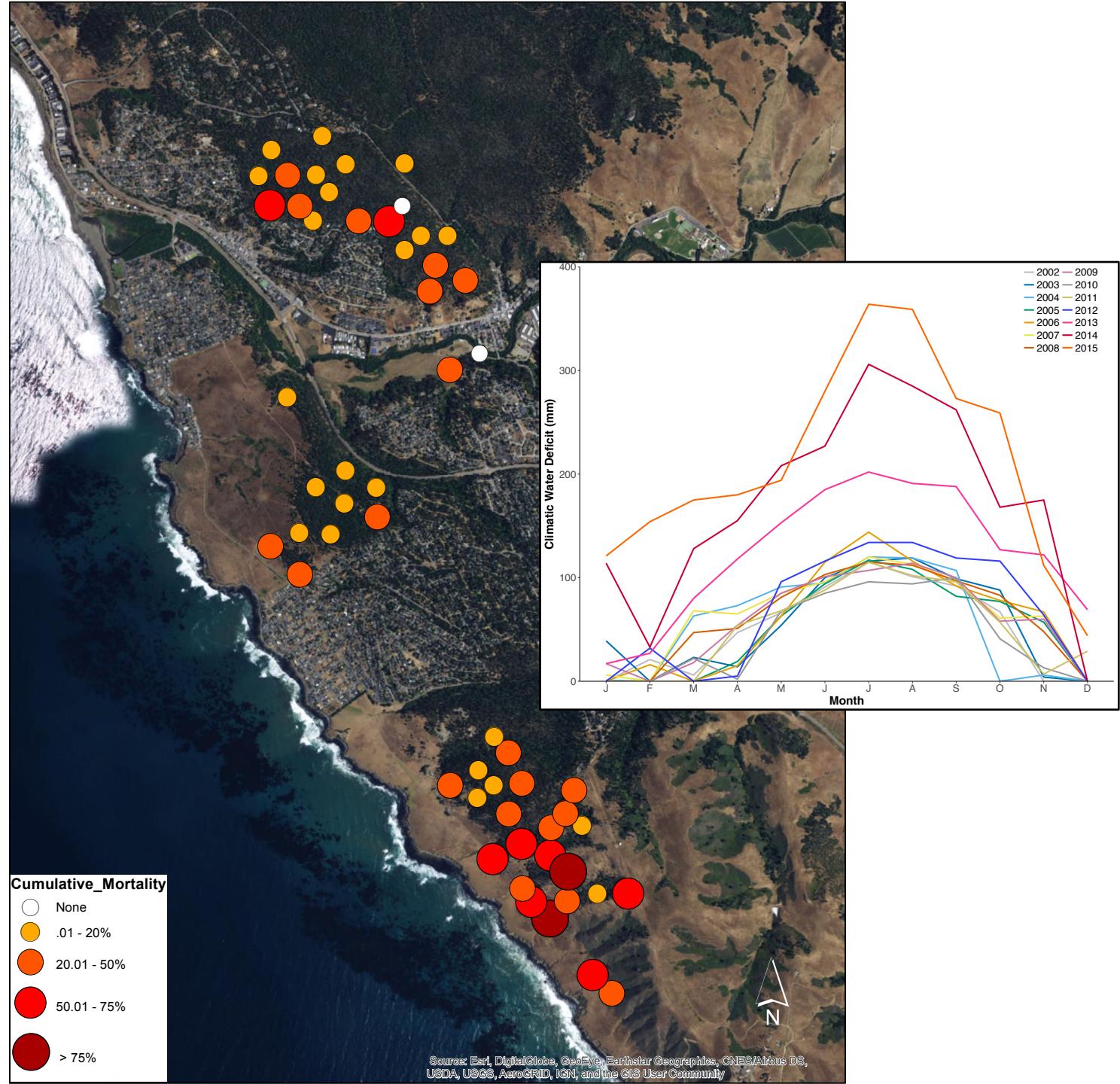


2017



Mortality

Cumulative 2015 - 2017





The Nature Conservancy



Support

Questions?



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