Developing potential land surface temperature as an indicator of forest regeneration potential in the western United States

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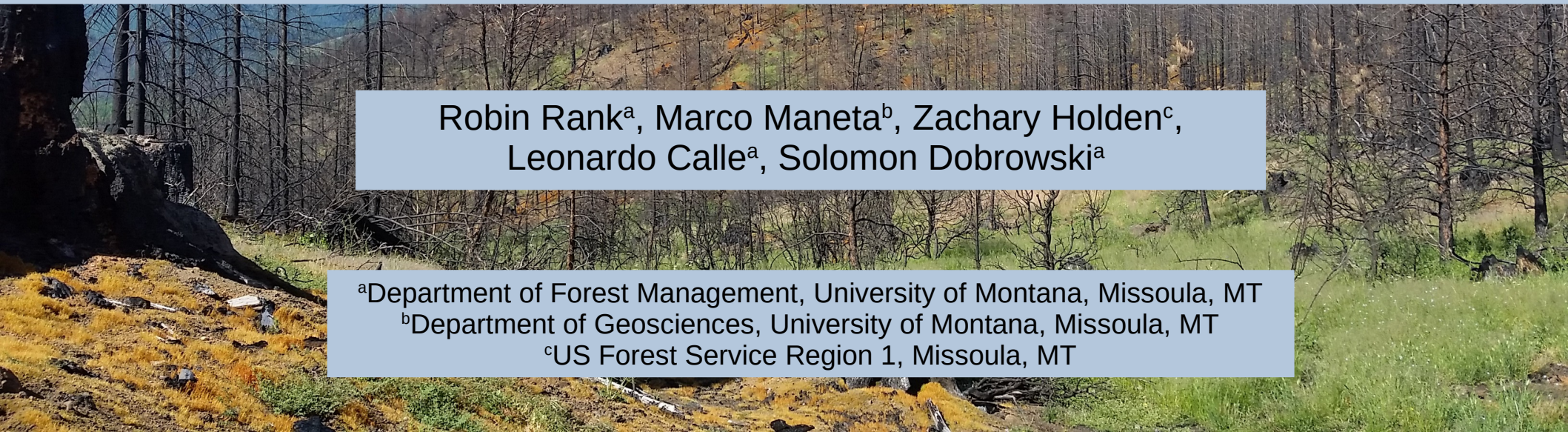

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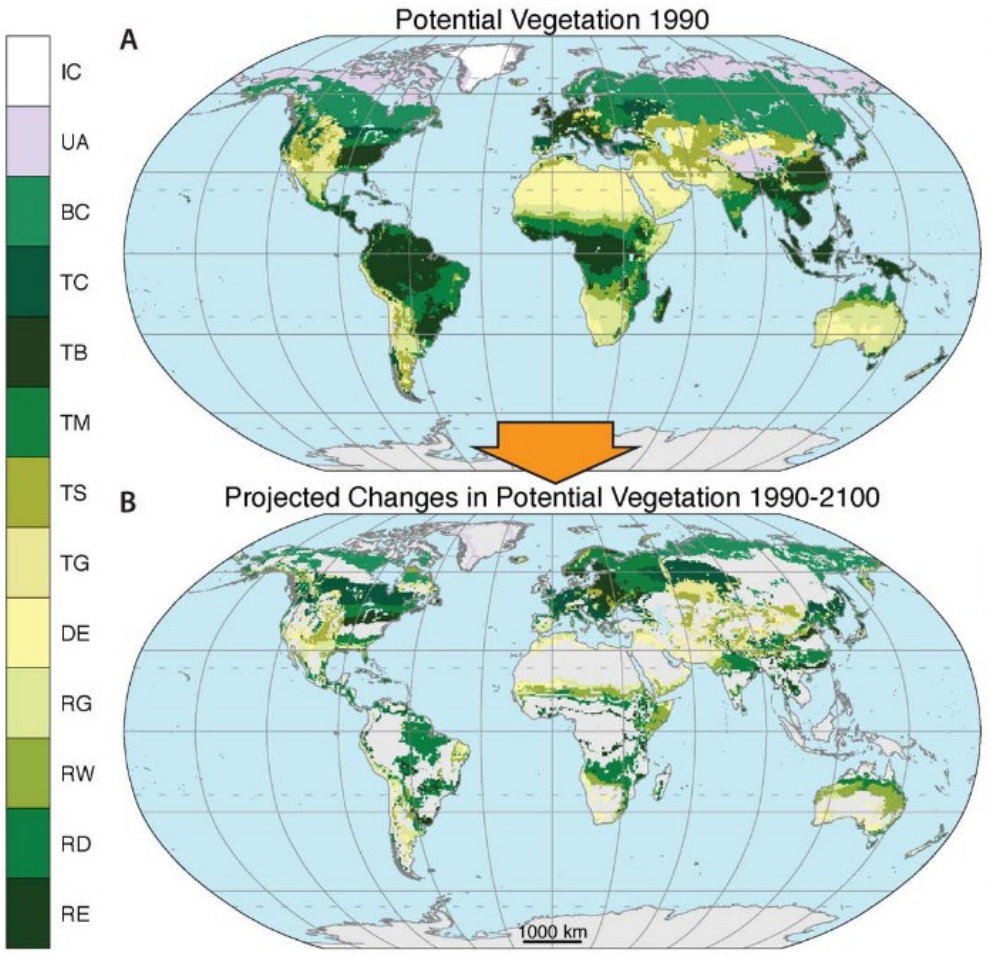
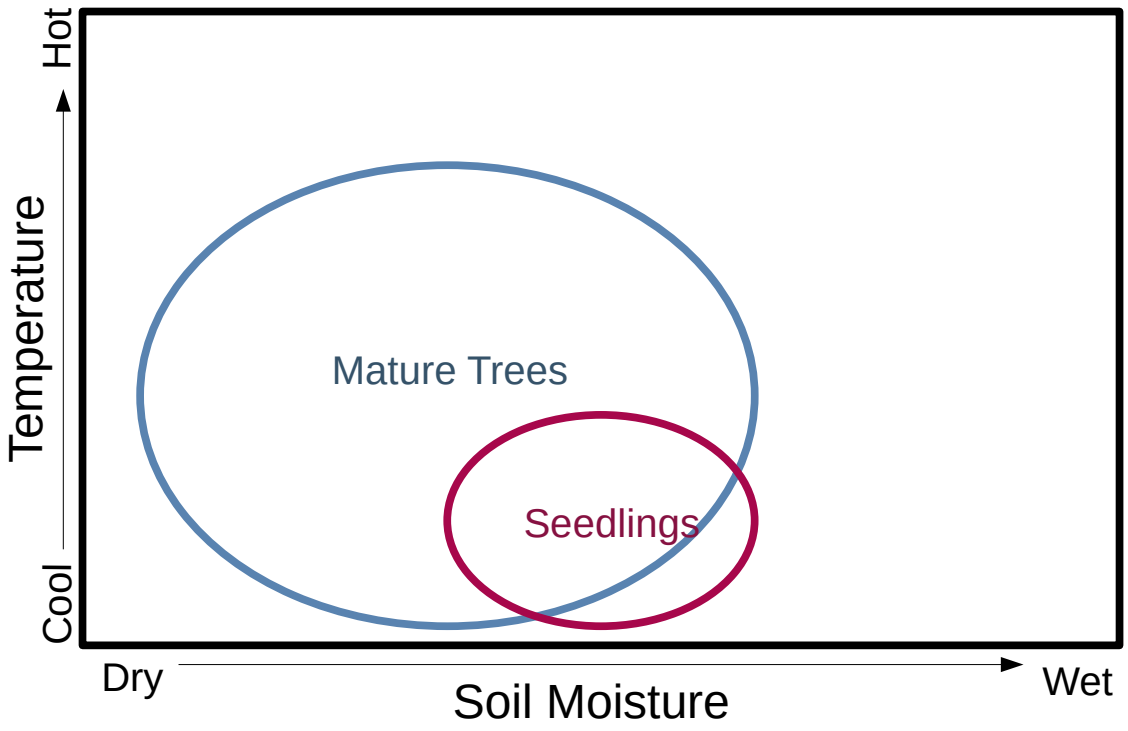
[b]Department of Geosciences, University of Montana, Missoula, MT
[c]US Forest Service Region 1, Missoula, MT

Projected shifts in forest extent with climate change

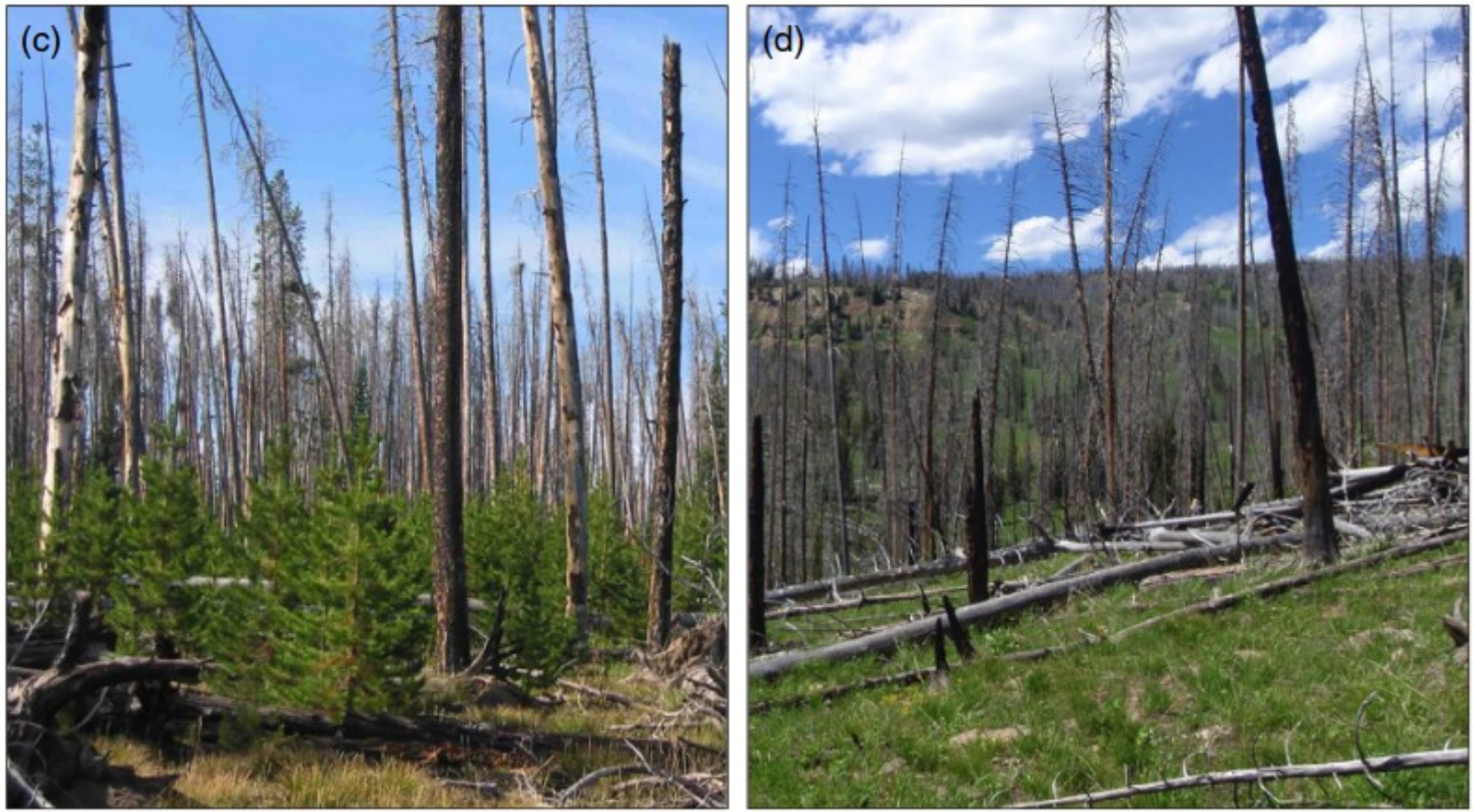


Gonzalez, P., Neilson, R.P., Lenihan, J.M. and Drapek, R.J. (2010), Global patterns in the vulnerability of ecosystems to vegetation shifts due to climate change. Global Ecology and Biogeography, 19: 755-768.

Forest disequilibrium with climate

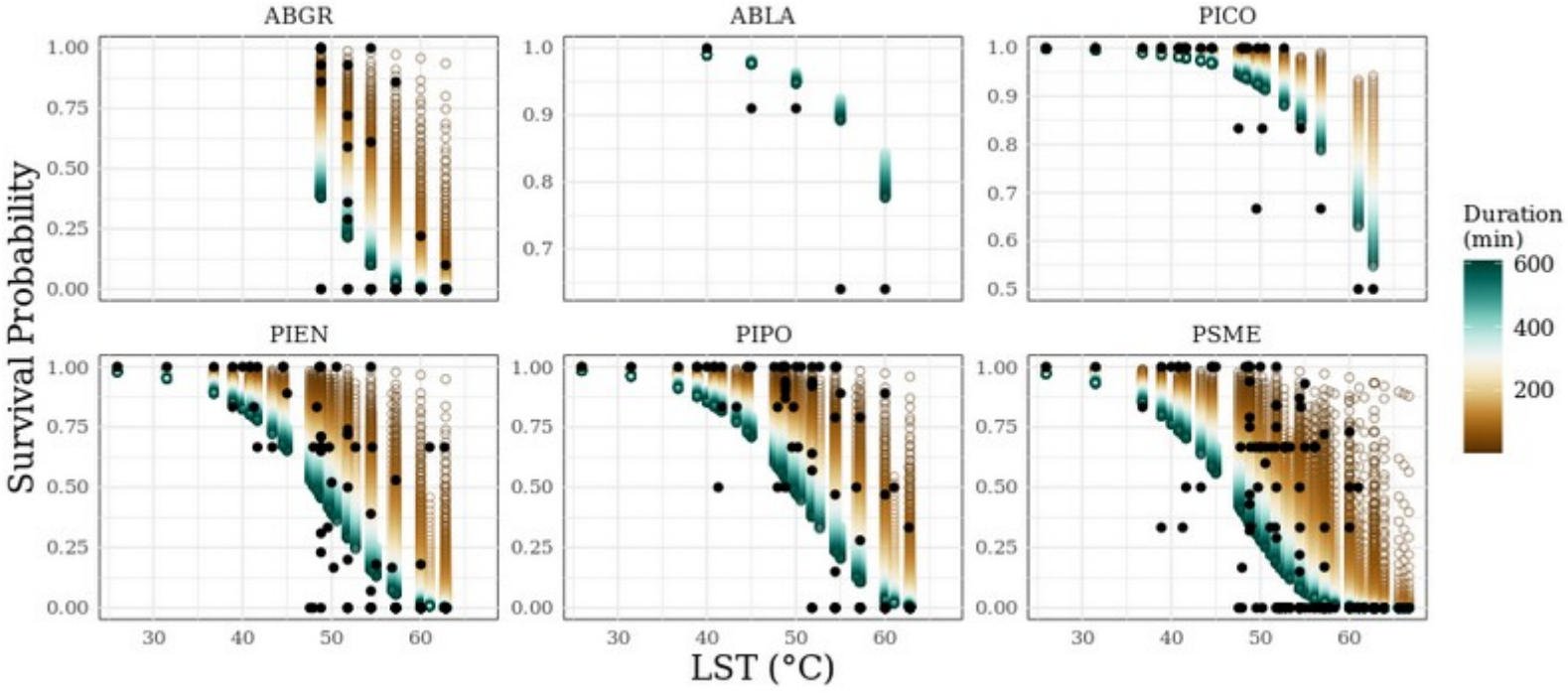


Forest regeneration is crucial to understanding changes in forested landscapes



Johnstone, Jill F., et al. "Changing disturbance regimes, ecological memory, and forest resilience." Frontiers in Ecology and the Environment 14.7 (2016): 369-378.

Why use LST as an indicator of forest regeneration suitability?



Potential LST (PLST) as a measure of forest regeneration suitability after disturbance

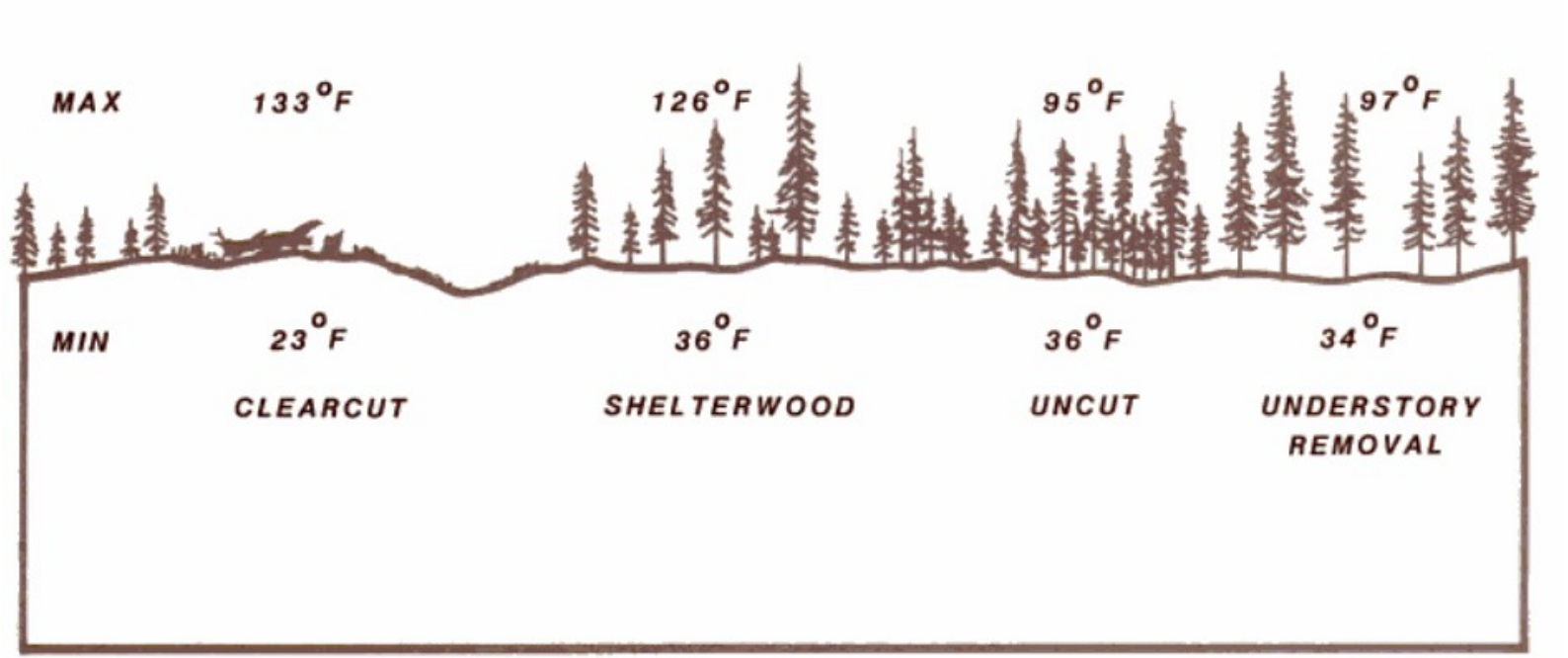


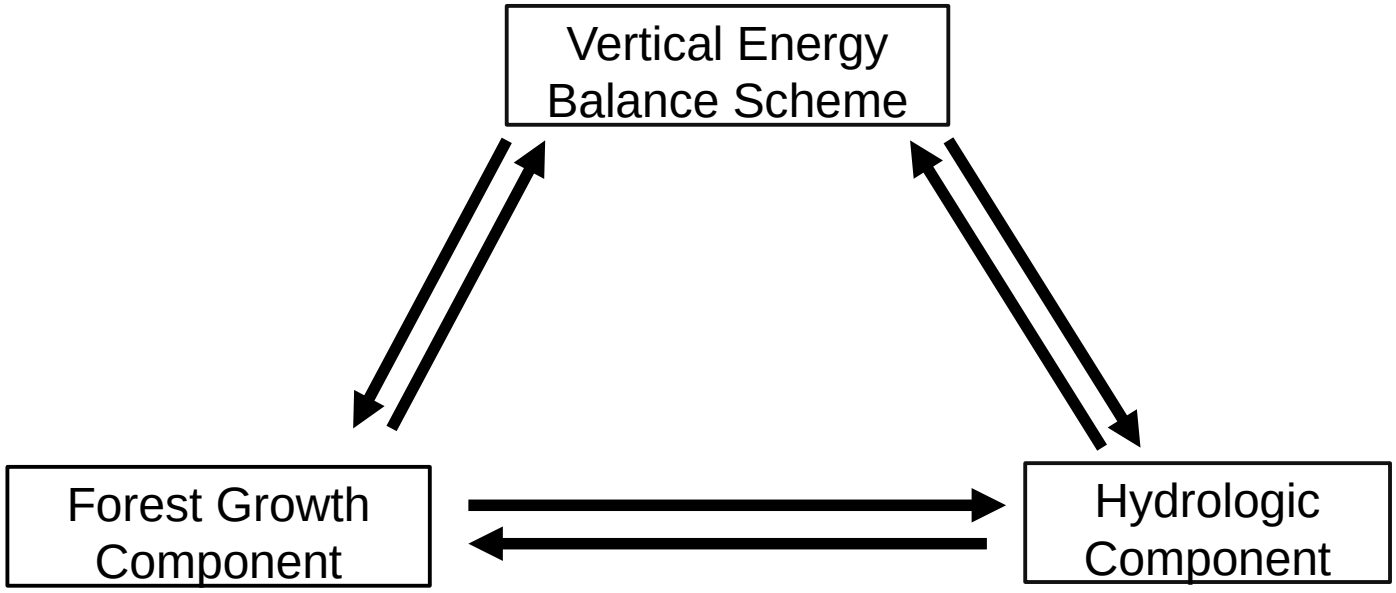
Figure 5—Daily maximum and minimum surface temperatures (°F) by overstory treatment at Lubrecht, August 29, 1978.

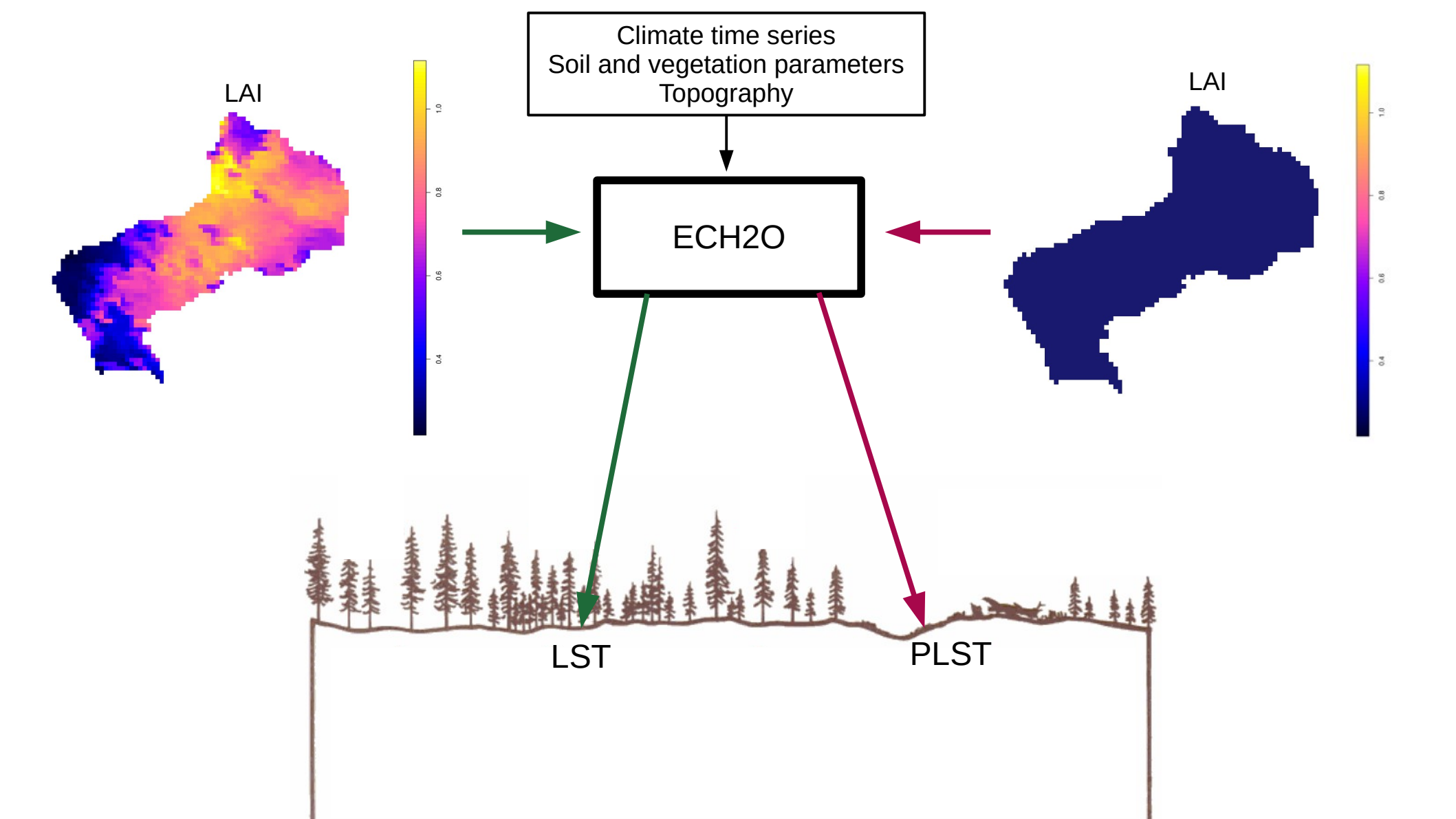
Hungerford, Roger D., and Ronald E. Babbitt. *Overstory removal and residue treatments affect soil surface, air, and soil temperature: implications for seedling survival*. Vol. 377. US Department of Agriculture, Forest Service, Intermountain Research Station, 1987.

Can we predict current forest cover on a landscape using estimates of PLST from a mechanistic, ecohydrologic model?

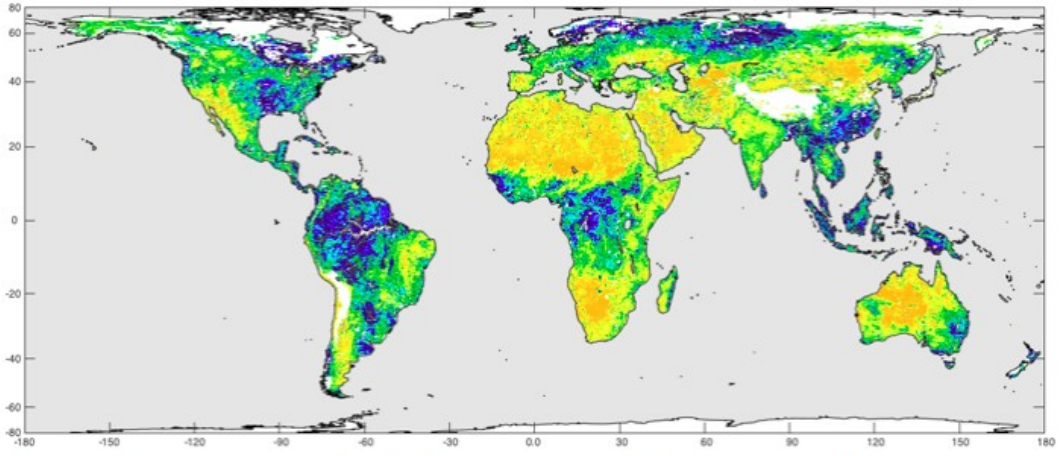
What do these predictions tell us about patterns of forest regeneration suitability at the landscape scale?

Methods: ECH2O, a Spatially Explicit, Physics-Based Ecohydrologic Model




Climate time series
Soil and vegetation parameters
Topography
ECH2O
LAI
LAI
1.0
0.8
0.6
0.4
LST
PLST

Methods: Study Sites and Model Calibration



Retrieved soil moisture based on the SMAP “active” and “passive” radiometer data. SMAP Active-Passive Soil Moisture Product (9 km). Three Days Composite May 21st to May 23rd, 2015.

https://smap.jpl.nasa.gov/data/

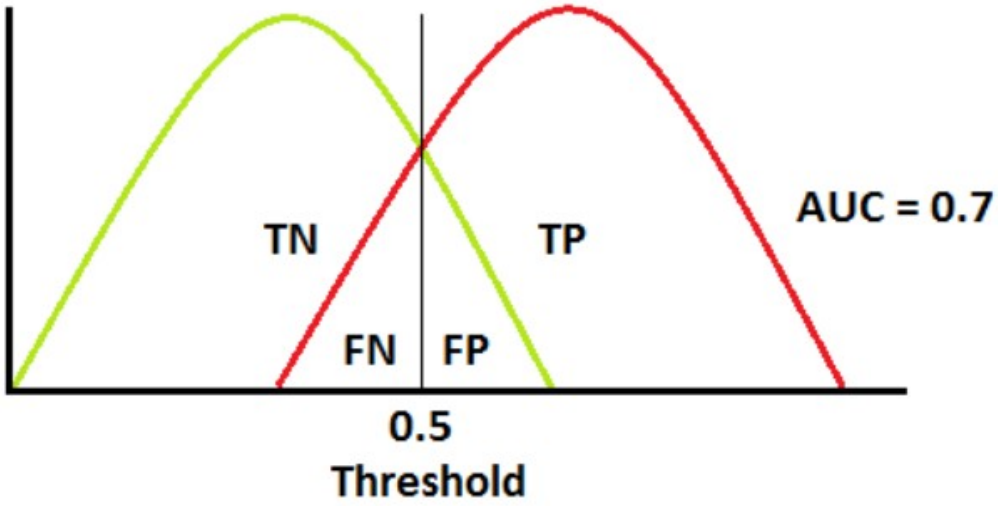
http://mediad.publicbroadcasting.net/p/kufm/files/styles/x_large/public/201807/Willow-creek-stream-gauge_USGS.JPG

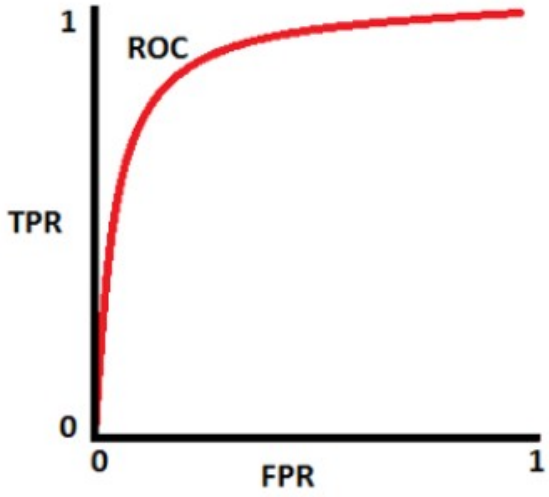
Methods: predicting forest cover from PLST using an AUC analysis

Actual Forest Cover (MODIS VCF)

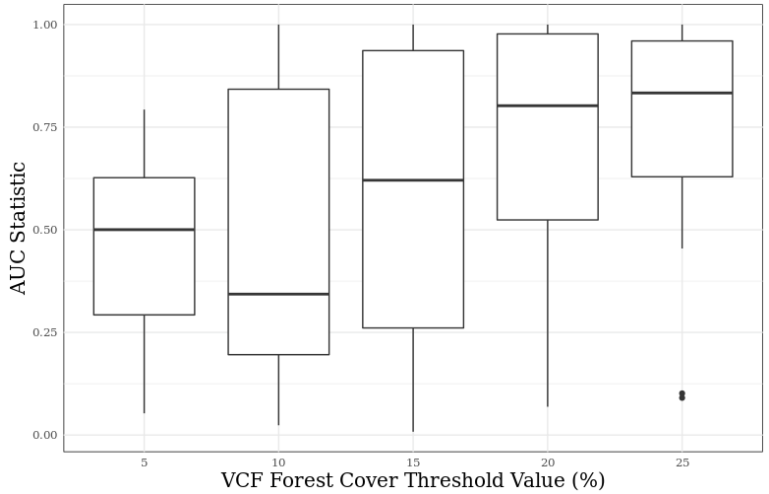
Predicted Forest Cover (PLST Threshold)	Cover	No Cover
Cover	True Positive TP	False Positive FP
No Cover	False Negative FN	True Negative TN

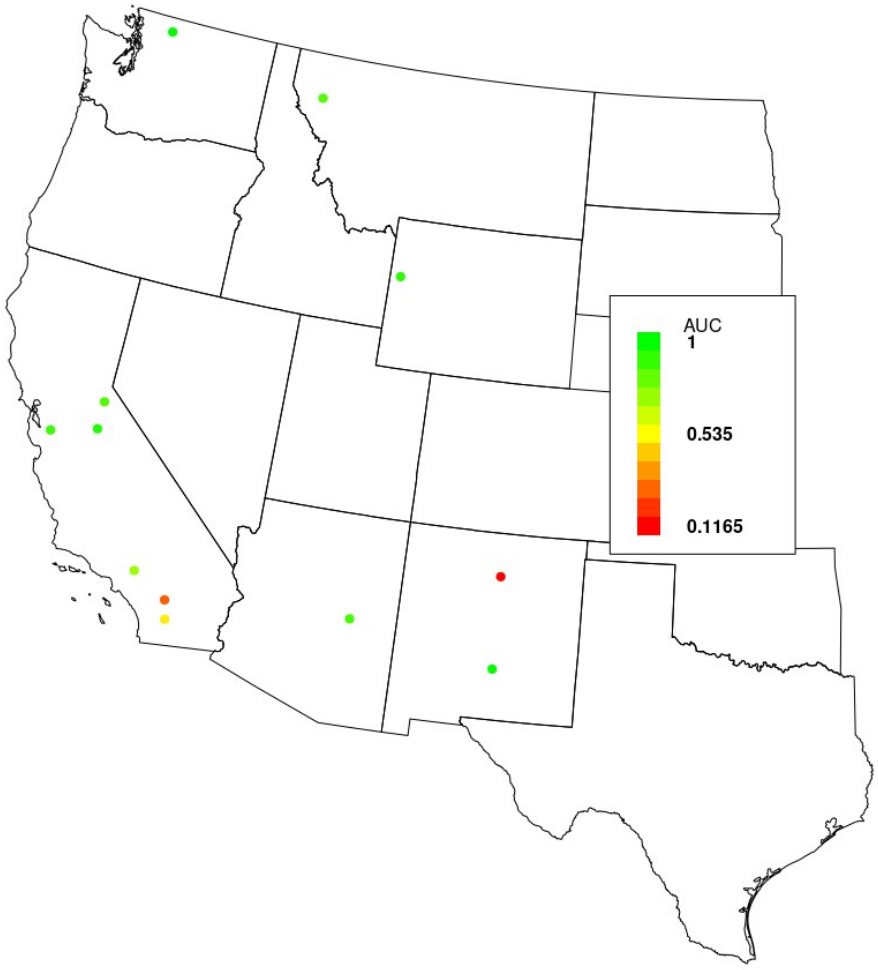
Methods: predicting forest cover from PLST using an AUC analysis





Can we predict current forest cover with PLST estimates?





Patterns of PLST and its implications for forest regeneration suitability