UAV-derived Estimates of Vertical and Horizontal Structure across Forest Density Gradients

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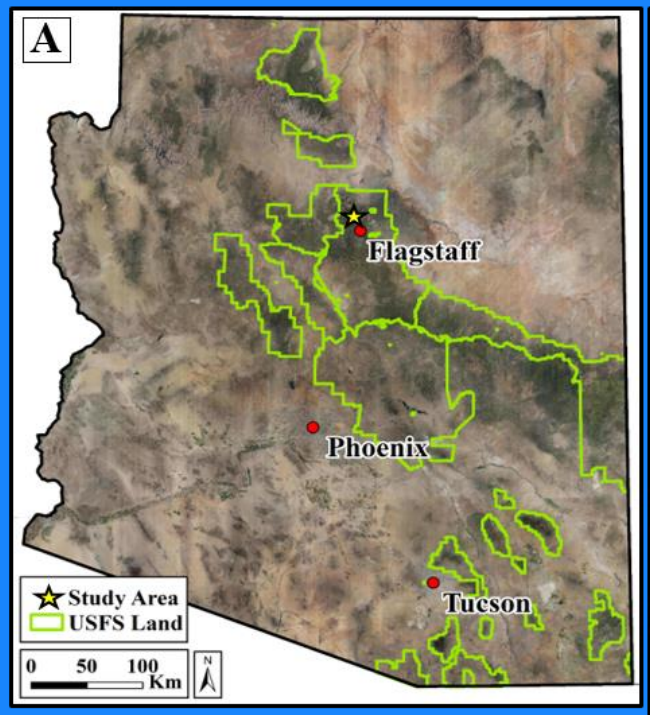
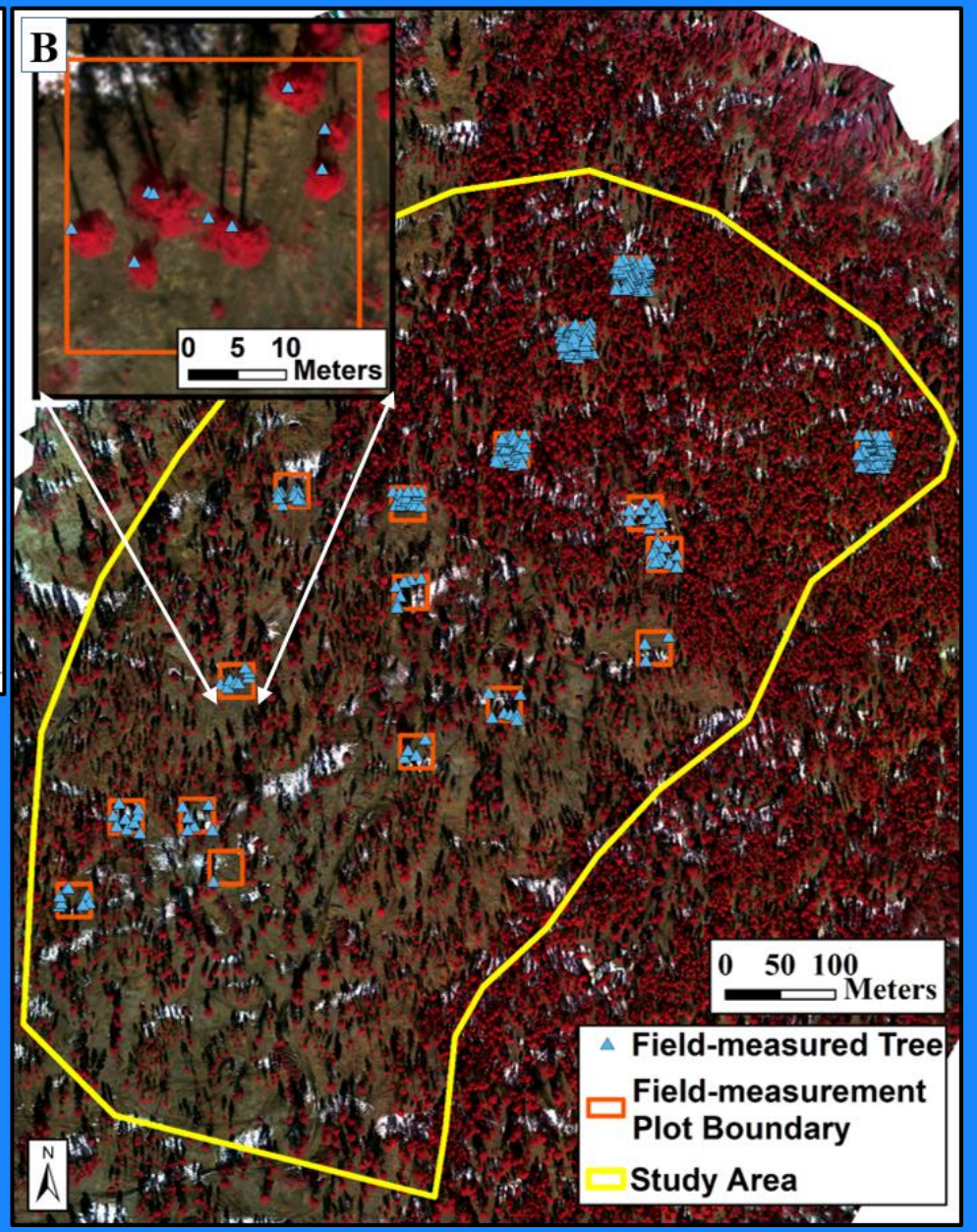
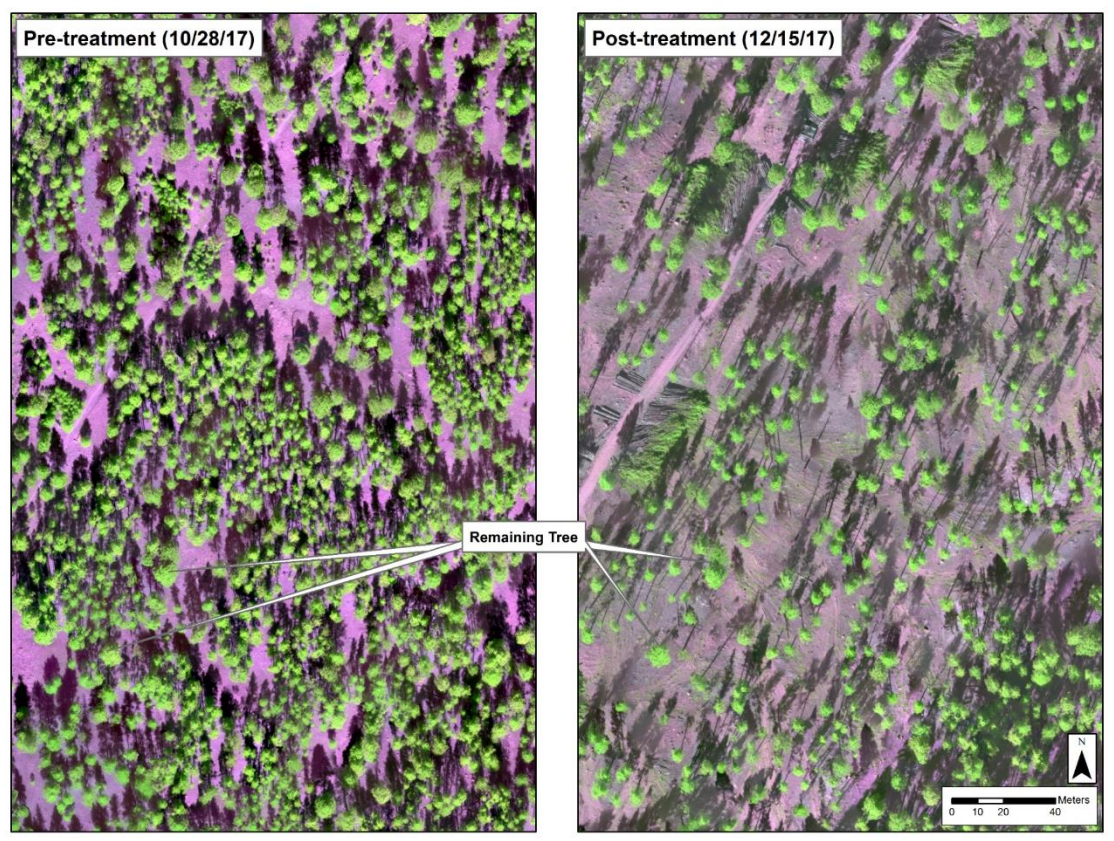
Research Objective and Methods

- Perform fixed-wing UAV flights over 80 ha forests
- Generate thermal and multispectral images
- Generate Structure-from-Motion data
- Evaluate accuracies in estimates of forest canopy cover, density, temperature, and height

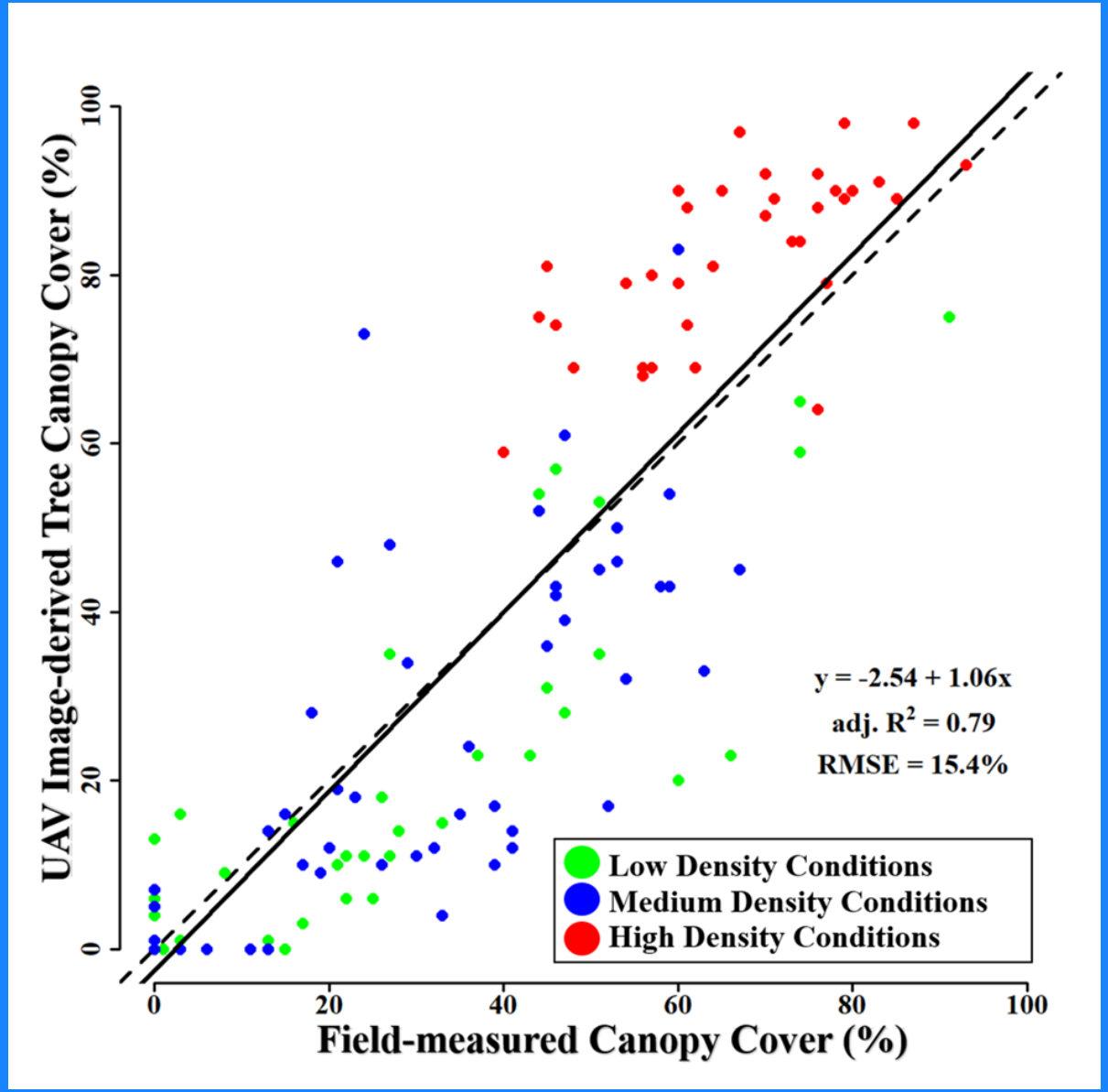




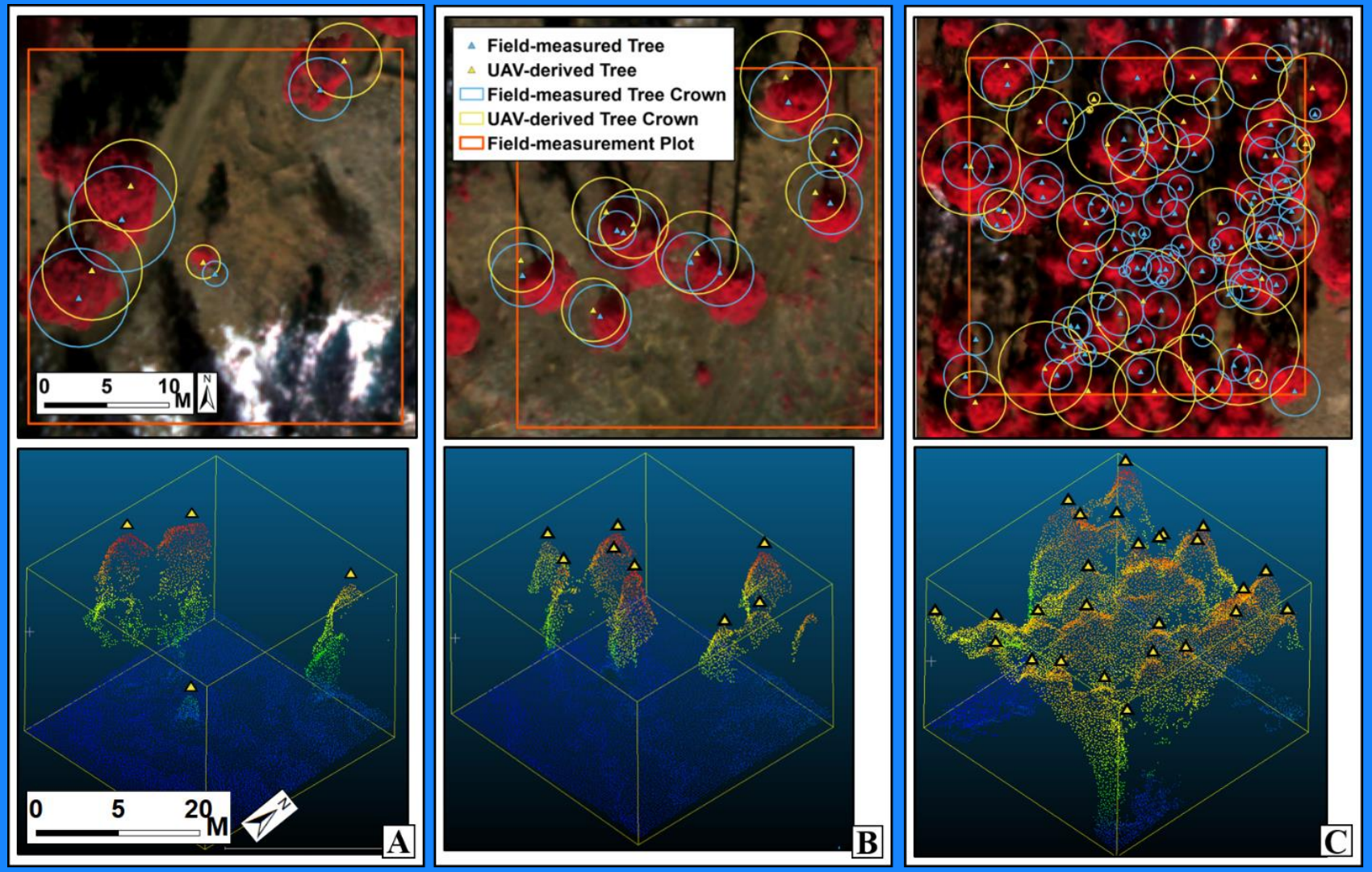
Results: Canopy Cover Estimates



Belmonte et al., 2019. Remote Sensing in Ecology and Conservation (https://doi.org/10.1002/rse2.137)



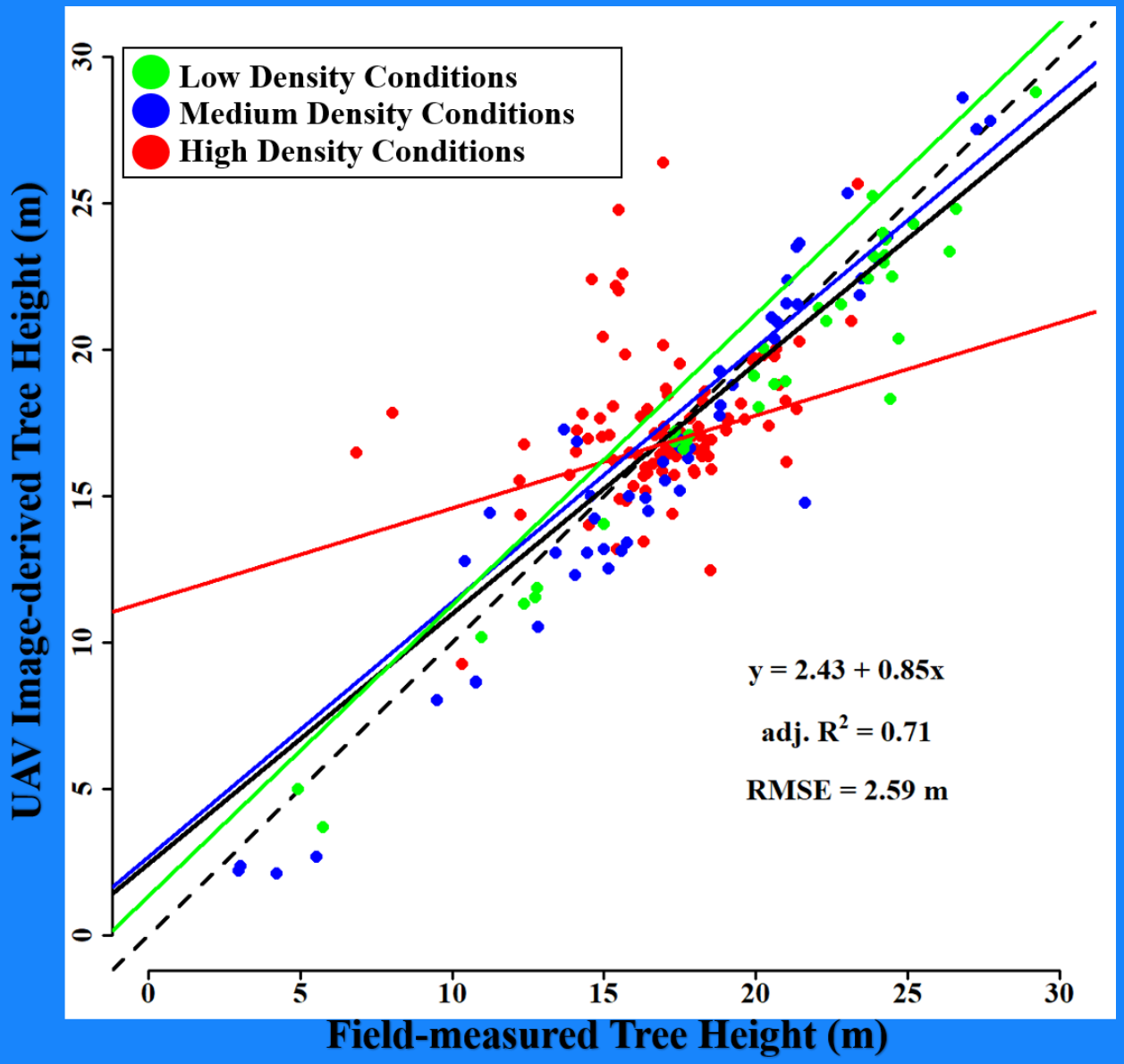
Results: Structure-from-Motion Data for Tree Height



Belmonte et al., 2019. Remote Sensing in Ecology and Conservation (https://doi.org/10.1002/rse2.137)

Results: Tree Height Estimates

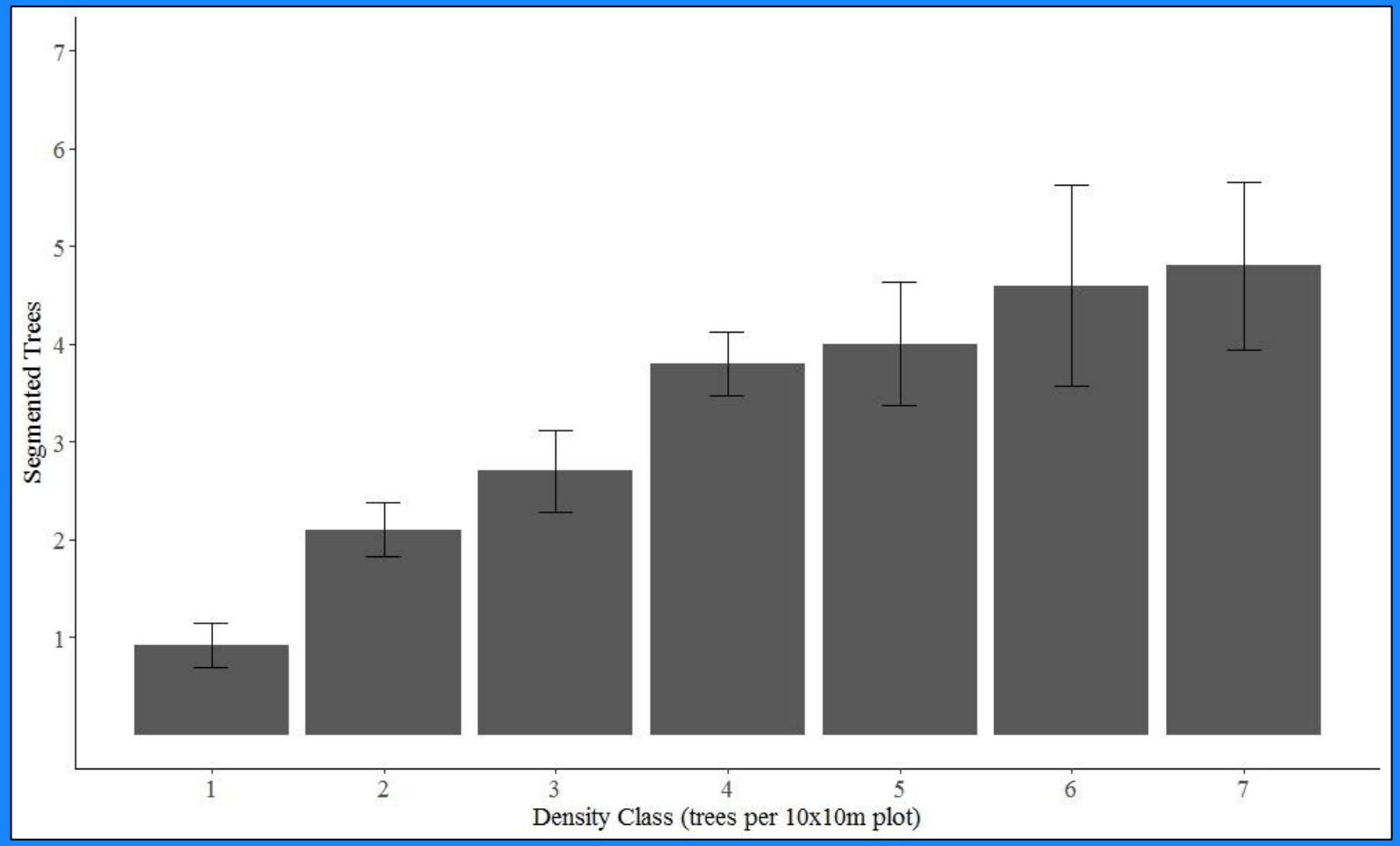
- Height estimate accuracies vary by forest density conditions
- Height estimates are much more accurate in low and medium density forests



Belmonte et al., 2019. Remote Sensing in Ecology and Conservation (https://doi.org/10.1002/rse2.137)

Results: Tree Density Estimates

- Accuracies in tree density estimates also vary with forest density conditions

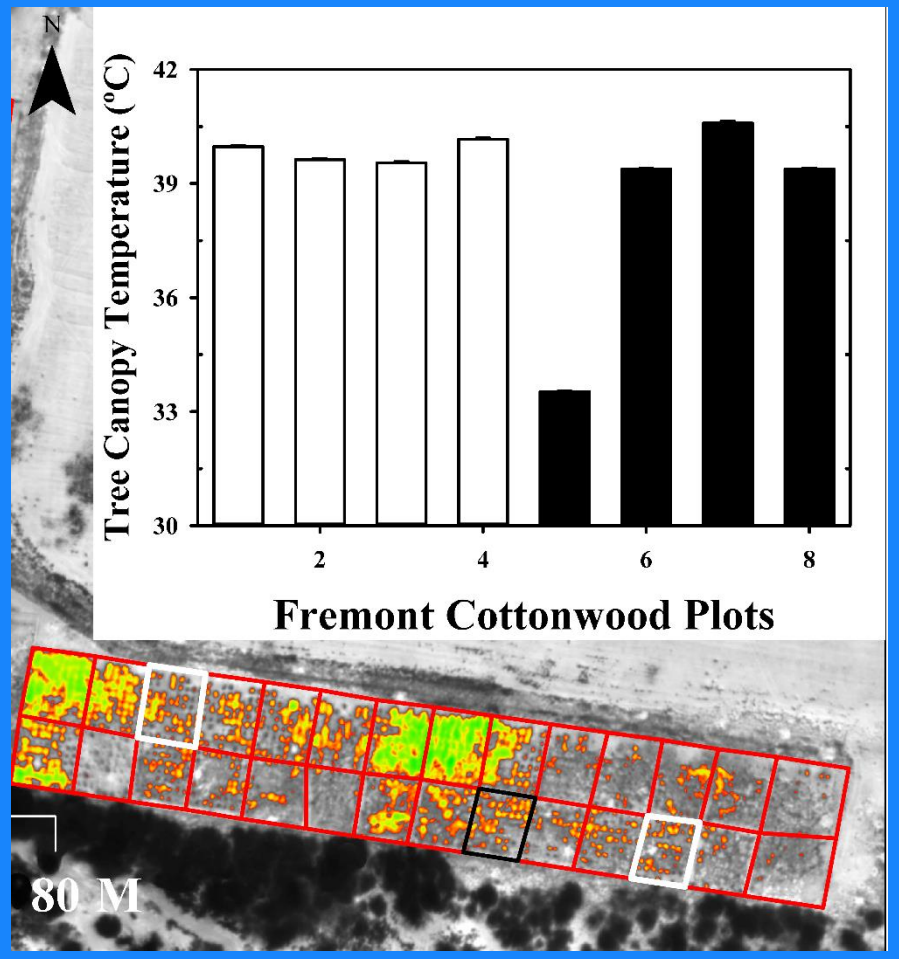


Shin et al., 2018. Remote Sensing (https://doi.org/10.3390/rs10081266)

Results: Tree Canopy Temperature Estimates

- UAV thermal data can be used to estimate mean canopy temperature across a density gradient.

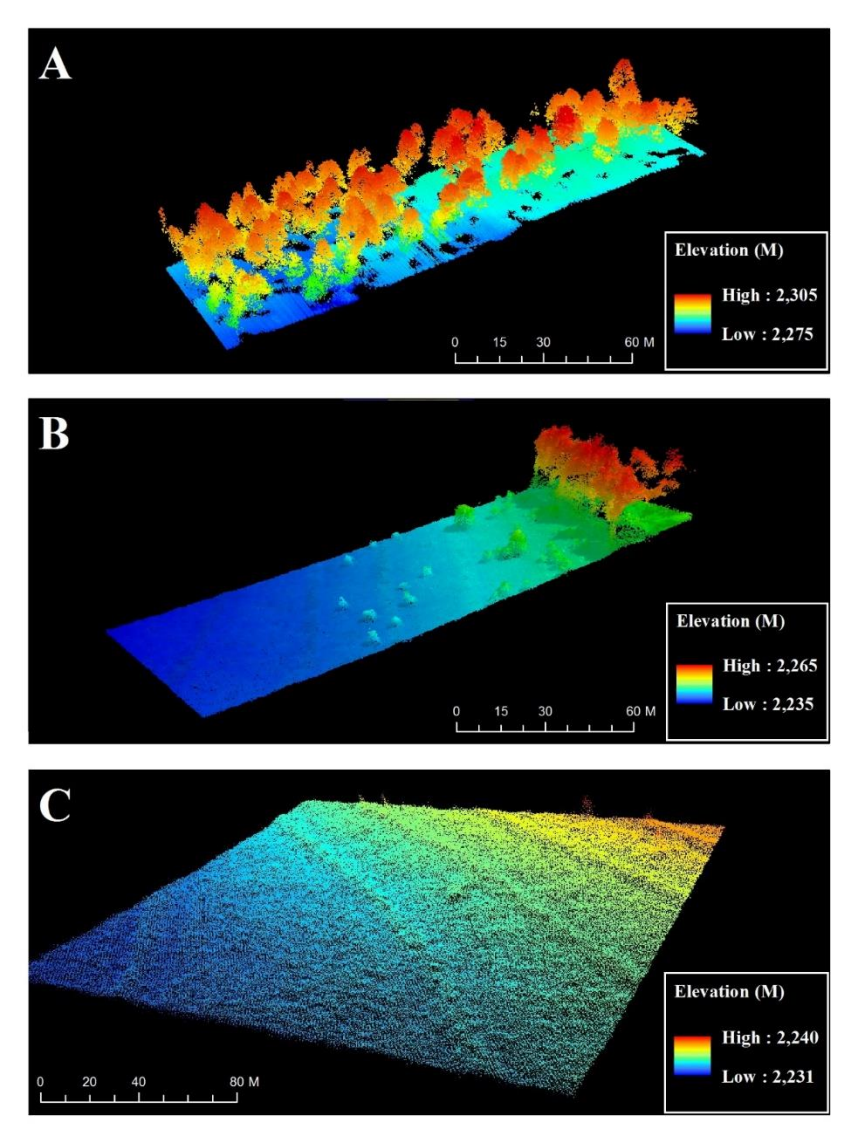
- UAV-derived mean canopy temperatures are significantly different among populations and genotypes.

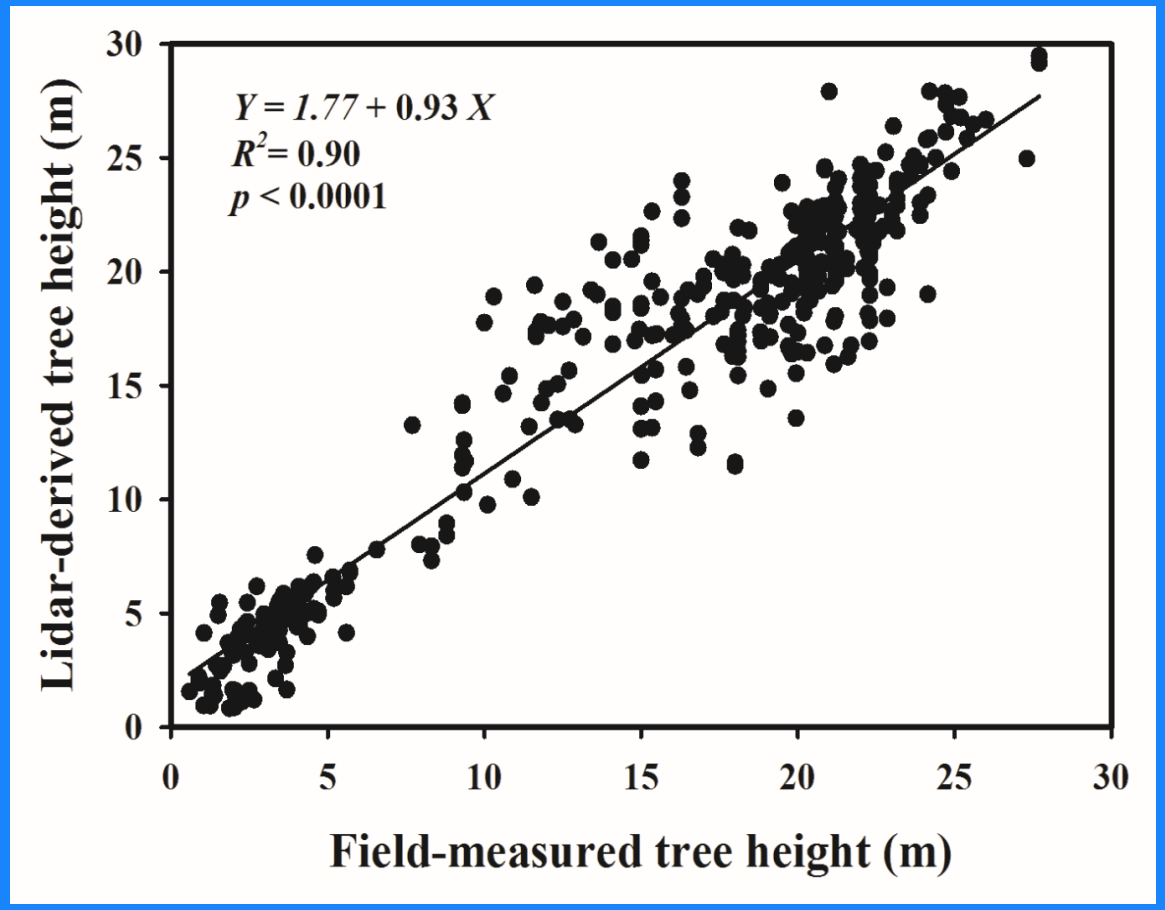


Sankey et al. (In Review) Remote Sensing in Ecology and Conservation

Results are consistent with our previous UAV studies

- UAV lidar data accurately estimates individual tree height

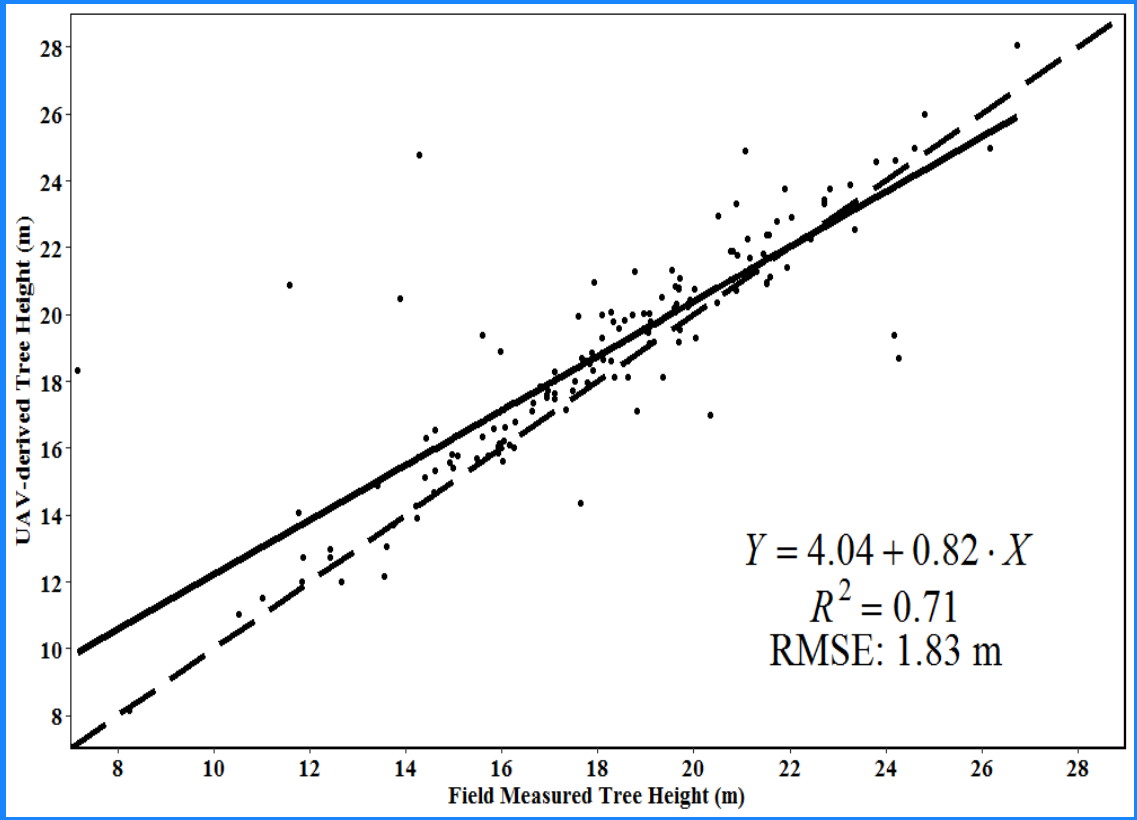


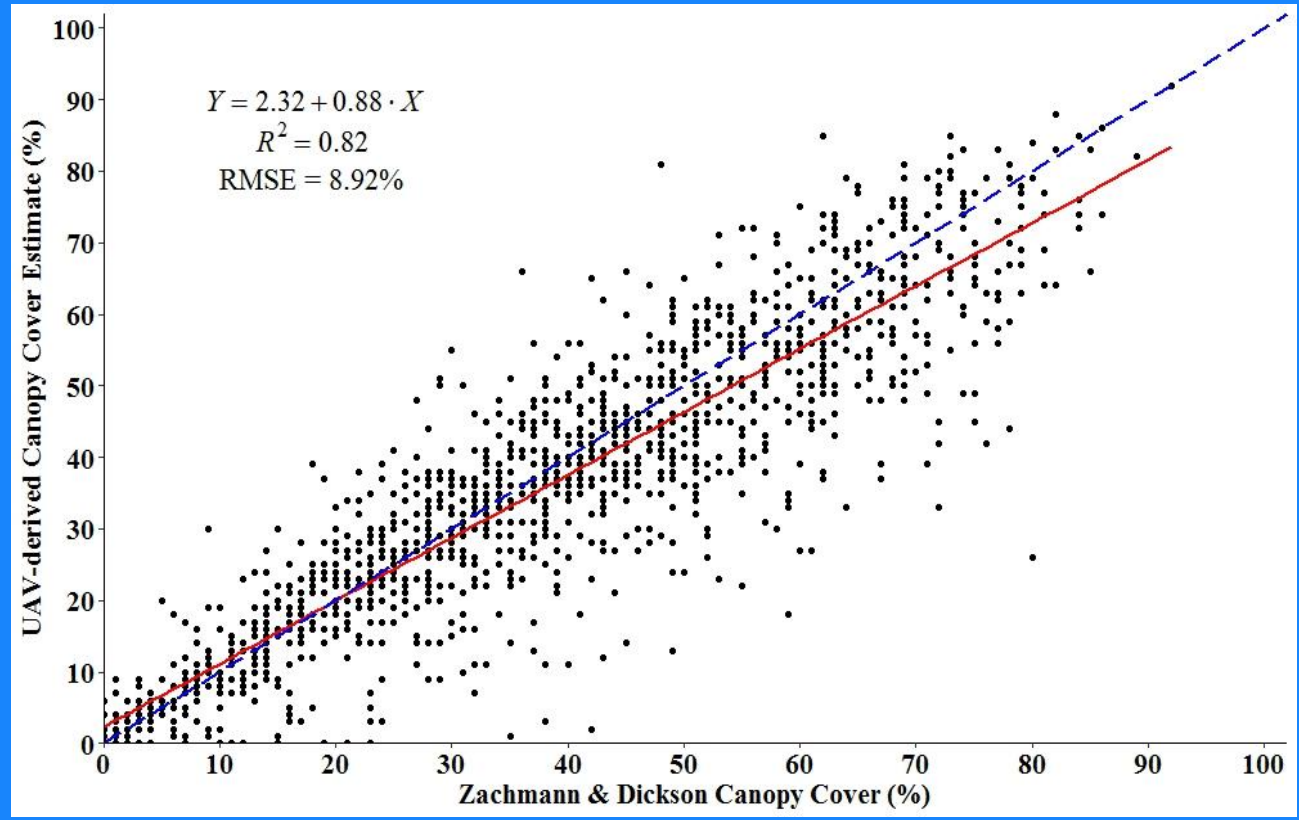


Sankey et al., 2017. Remote Sensing of Environment (http://dx.doi.org/10.1016/j.rse.2017.04.007)

Results are consistent with our previous UAV studies

- UAV Structure-from-Motion data can be used to accurately estimate individual tree height and forest canopy cover





Shin et al., 2018. Remote Sensing (https://doi.org/10.3390/rs10081266)

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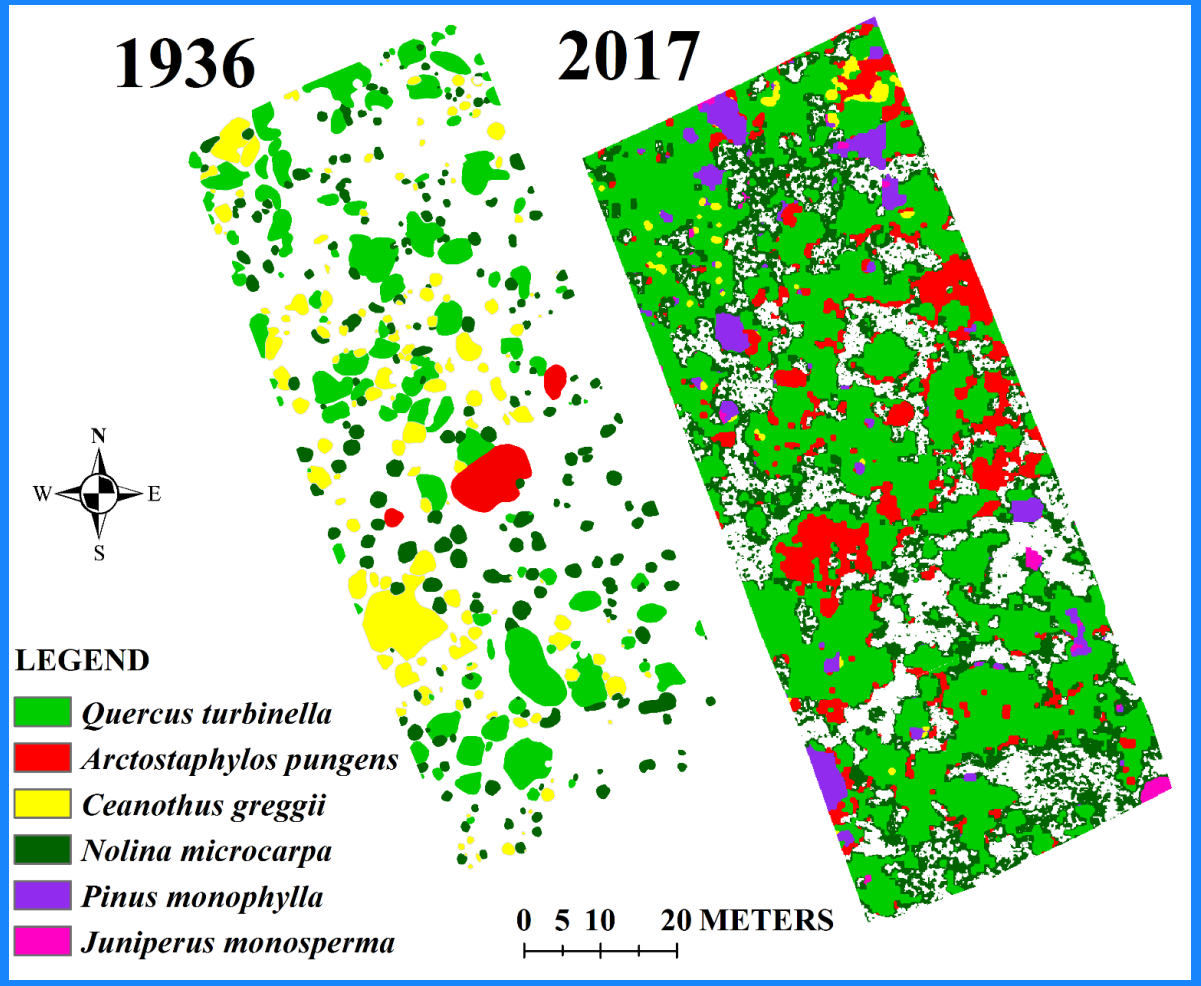
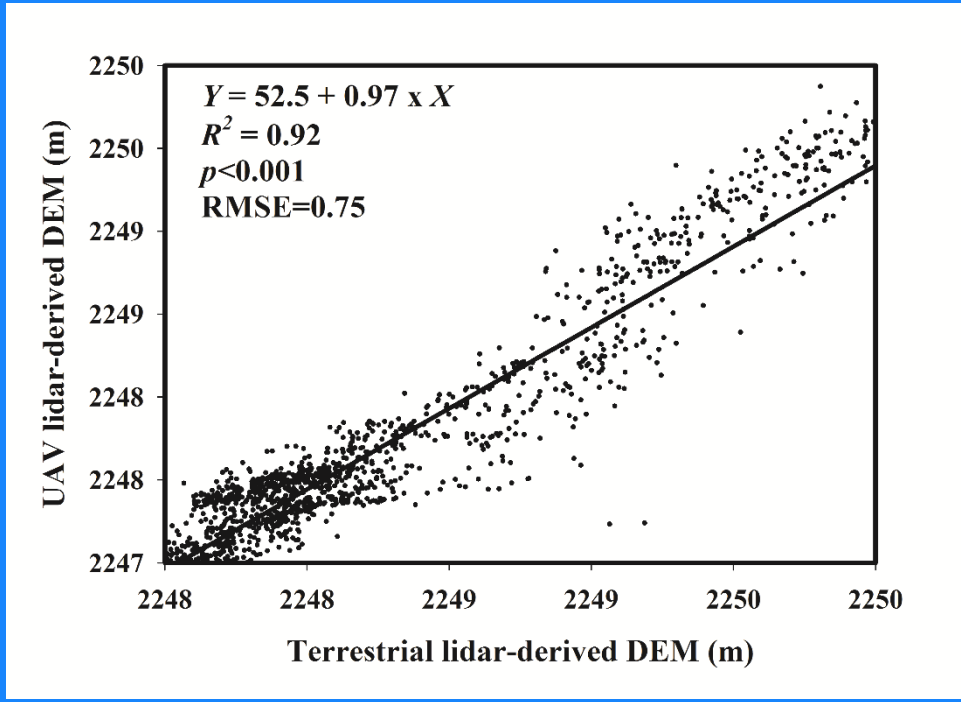


- UAV-derived height estimates also allow accurate classification of shrub species and change detection over many decades.

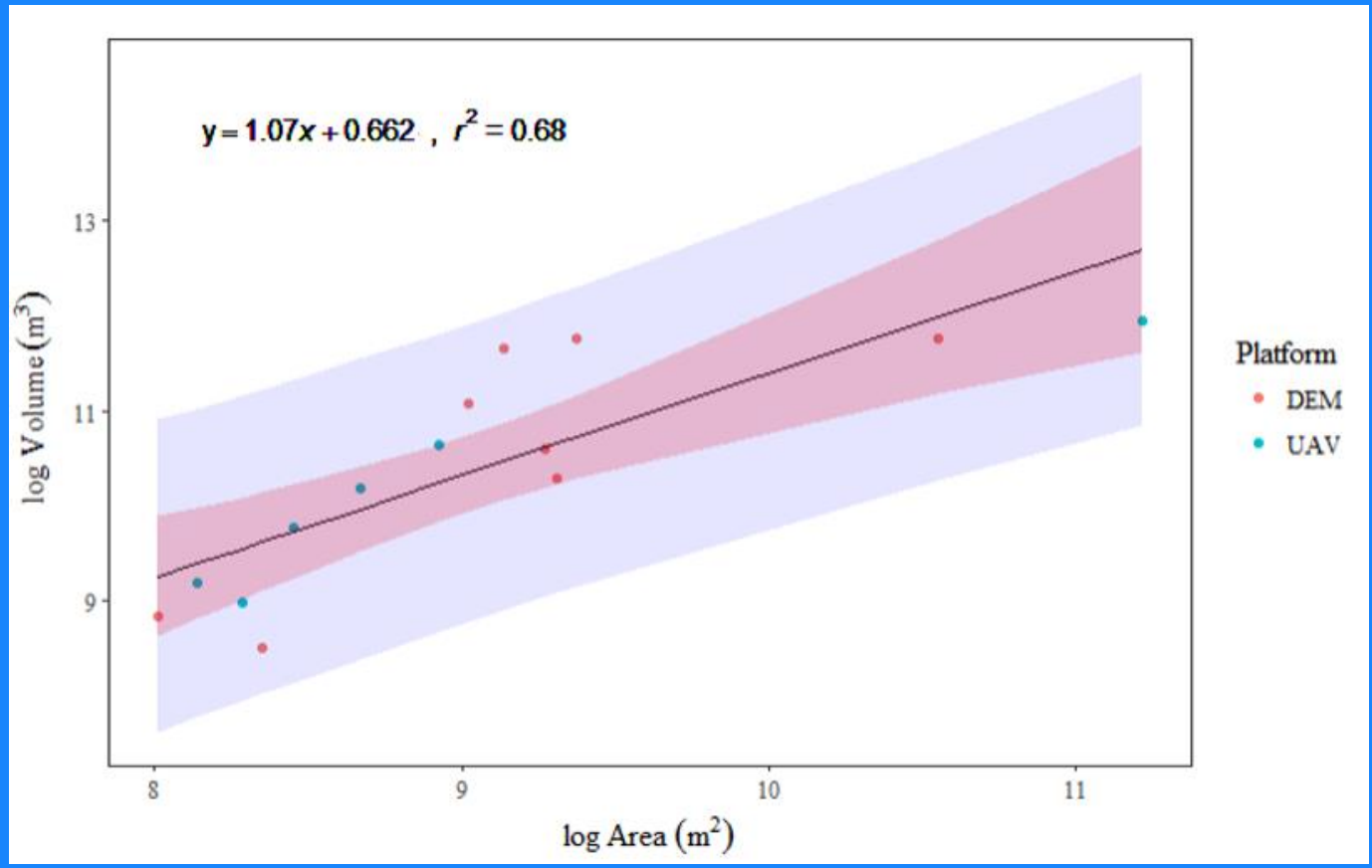
Sankey et al., 2019. Rangeland Ecology and Management (https://doi.org/10.1016/j.rama.2019.04.002)

Results are consistent with our previous UAV studies

UAV lidar and Structure-from-Motion data can generate accurate DEM



Sankey et al., 2017. Remote Sensing of Environment (http://dx.doi.org/10.1016/j.rse.2017.04.007)



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Acknowledgement

Our instruments were funded by Northern Arizona University’s Office of Vice President for Research. Our work was funded by Salt River Project.