

**Project Title:** Spatial-temporal models for FIA data: Combining plots across time and space for time-specific and change estimates of forest biomass stocks

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**Period of Report:** August 1, 2024 – January 31, 2025

## Progress

We have made some substantial changes to the spatial-temporal, plot-level model, allowing the model to separate variation at local and ecoregion scales. These adjustments have delayed the submission of the corresponding manuscript, but have improved the performance of the model and deepened our understanding of the process, ultimately benefiting the final product. We plan to submit what will be primary result of this project for publication by the end of March.

During this period, our team has published two manuscripts. May and Finley (2025) presents methods for incorporating noisy satellite data into purely spatial plot-level models with FIA data. We plan to use the techniques developed here to eventually incorporate remote sensing data into our spatial-temporal models. Critically, Shannon et al. (2024), led by Dr. Finley's graduate student Elliot Shannon, presented an effective spatial-temporal area-level model, which is an important step towards the plot-level models that are the focus of this project.

## Next Period Plans

The remaining major milestones in our proposed research are 1) product delivery, in the form of peer-reviewed manuscripts and software, and 2) incorporation of remote sensing data within the spatial-temporal model. In the next period, our primary focus will be on product delivery. A manuscript is currently being prepared for submission that will depict the core contributions of this project; we are excited to release this work. Graduate student Victoria Karnes, working under PI May and funded by this project, continues to work on the incorporation of remote sensing data, developing Landsat time-series harmonics optimized for spatial-temporal monitoring of forest attributes.

## Problems/Delays

None.

## References

- May, P. B. and Finley, A. O. (2025). Calibrating satellite maps with field data for improved predictions of forest biomass. *Environmetrics*, 36(1):e2892.
- Shannon, E. S., Finley, A. O., Domke, G. M., May, P. B., Andersen, H.-E., Gaines III, G. C., and Banerjee, S. (2024). Toward spatio-temporal models to support national-scale forest carbon monitoring and reporting. *Environmental Research Letters*, 20(1):014052.