

Project Title: Toward operational FIA model-based estimation of high-dimensional forest inventory parameters to support inference at user-defined spatial scales.

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Period of Report: January 1, 2024 – July 31, 2024

1 Progress

This has been a productive reporting period. Key highlights include:

1. Developed a univariate spatio-temporal model for CONUS county-level forest carbon along with associated manuscript. The manuscript is currently under review (pre-print citation below). We also presented initial results at the American Statistical Association's Joint Statistical Meeting (JSM) (talk citation below).
 - Shannon, E.S.¹, A.O. Finley, P.B. May, G.M. Domke, H.-E. Andersen, G.C. Gaines, and S. Banerjee. Spatio-temporal areal models to support small area estimation: An application to national-scale forest carbon monitoring. <https://arxiv.org/abs/2407.09909>.
 - Shannon, E.S., A.O. Finley, P.B. May, G.M. Domke, H.-E. Andersen, G.C. Gaines III, and S. Banerjee. Spatio-temporal areal models to support small area forest carbon estimation. American Statistics Association, Joint Statistical Meeting. August 6, 2024. Portland, OR.
2. Elliot Shannon is developing a multivariate extension to the univariate model noted above. The model formulation and software development is underway. We presented initial results at JSM (talk citation below).
 - Shannon, E.S., A.O. Finley, P.B. May, S. Banerjee. A Multivariate Spatio-Temporal Fay-Herriot Model for Forest Carbon Pools Across the Contiguous US. American Statistics Association, Joint Statistical Meeting. August 6, 2024. Portland, OR.
3. We continue to develop methods for change-of-support (COS) problems that will be applicable to USFS SAE (pre-print citation below). We are also continuing work on methods for large spatial datasets, again these methods will contribute to ongoing SAE work.

¹PhD student here at MSU working on a dual PhD in Forestry and Statistics.

- Zhang, L, A.O. Finley, A. Nothdurft, and S. Banerjee. Bayesian modeling of incompatible spatial data: A case study involving post-Adrian storm forest damage assessment. <https://arxiv.org/abs/2311.11256>.
 - Peruzzi, M., S. Banerjee, D.B. Dunson, and A.O. Finley. Grid-Parametrize-Split (GriPS) for improved scalable inference in spatial big data analysis. <https://arxiv.org/abs/2101.03579>.
4. Paul May has led development of a point-referenced method to address COS and incomplete and noisy remotely sensed predictors for modeling forest biomass/carbon. The paper is currently under review (pre-print below).
- May, P.B. and A.O. Finley. Calibrating satellite maps with field data for improved predictions of forest biomass. <https://arxiv.org/abs/2407.07134>.

2 Next Period Plans

Continue progress on all points above. Additionally we are starting work on methods for highly-multivariate spatial and spatial-temporal outcomes, as outlined in the proposal.

3 Problems/Delays

None.