

Elliot S. Shannon

Curriculum Vitae

Department of Forestry
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Education

- 2021 – 2025 **Dual PhD, Forestry and Statistics**, Michigan State University
- 2017 – 2020 **BS Biology, Mathematics minor**, George Fox University

PhD Thesis

- Title *Bayesian spatio-temporal models for forest inventory small area estimation*
- Advisor Dr. Andrew O. Finley
- Summary Environmental and ecological data collection efforts have proliferated as innovative technologies such as remote sensing platforms have advanced. At the same time, national forest inventory (NFI) programs have been implemented to monitor forest ecosystem structure and health through the systematic measurement of forest attributes, including carbon storage and aboveground biomass density. These data have traditionally been used to estimate forest parameters of interest, which inform management and policy-making decisions. Still, efforts to better model environmental data and produce reliable estimates of parameters of interest at varying scales have also received recent attention. Now, increased demand for estimates within small domains has led to the development of specialized statistical methods to produce reliable estimates in sparse data settings, known collectively as small area estimation (SAE) methods. Further, NFI data are routinely indexed in both space and time, meaning statistical associations can be defined for both spatial and temporal domains, allowing researchers to implement a wide variety of models based on the well-developed theory of spatio-temporal statistics. Together, these methodological developments allow for reliable estimation of forest parameters of interest in small areas, and provide seamless quantification of forest changes and trends over time. We apply these methodological developments to United States (US) NFI data to evaluate their effectiveness and to examine trends in forest carbon and biomass change in response to prominent disturbance agents.

Research Interests

Spatio-temporal statistics, Bayesian modeling, small area estimation, wildfire risk assessment, carbon monitoring

Publications

7. **Elliot S. Shannon**, Andrew O. Finley, Paul B. May, Hans-Erik Andersen, Harold Zald and Grant M. Domke. Modeling biomass and forest land loss associated with 20 years of West Coast fires. 2025. *In prep.*
6. Naresh Khanal, Raju Pokharel, **Elliot S. Shannon**, Jagdish Poudel, Shivan GC and Emily Silver. 2025. Historical trend of market coverage and competition of various wood products in Michigan. *To be submitted to Forestry.*
5. **Elliot S. Shannon**, Andrew O. Finley and Paul B. May. 2025. Quantifying impacts of natural gas development on forest carbon. *Submitted to Nature Energy*. bioRxiv: <https://doi.org/10.1101/2025.06.23.661107>.
4. **Elliot S. Shannon**, Andrew O. Finley, Paul B. May, Grant M. Domke, Hans-Erik Andersen, George C. Gaines III, Arne Nothdurft and Sudipto Banerjee. 2025. Leveraging national forest inventory data to estimate forest carbon density status and trends for small areas. *Forest Ecology and Management*. DOI: <https://doi.org/10.1016/j.foreco.2025.122999>.
3. **Elliot S. Shannon**, Andrew O. Finley, Grant M. Domke, Paul B. May, Hans-Erik Andersen, George C. Gaines III and Sudipto Banerjee. 2025. Toward spatio-temporal models to support national-scale forest carbon monitoring and reporting. *Environmental Research Letters*. DOI: <https://doi.org/10.1088/1748-9326/ad9e07>.
2. Naresh Khanal, Raju Pokharel, Jagdish Poudel, Shivan Gc, **Elliot S. Shannon** and Andrew O. Finley. 2024. Analysis of location, feedstock availability, and economic impacts of potential mass timber processing facilities in Michigan. *Forest Policy and Economics*. DOI: <https://doi.org/10.1016/j.forpol.2024.103203>.
1. **Elliot S. Shannon**, Andrew O. Finley, Daniel J. Hayes, Sylvia N. Noralez, Aaron R. Weiskittel, Bruce D. Cook and Chad Babcock. 2024. Quantifying and correcting geolocation error in spaceborne LiDAR forest canopy observations using high spatial accuracy data: A Bayesian model approach. *Environmentrics*. DOI: <https://doi.org/10.1002/env.2840>.

Teaching Experience

Teaching Assistant at Michigan State University

2024 - 2025 FOR 372: **Ecological Monitoring and Data Analysis**
Spring 2024, Spring 2025

2023 - 2024 FOR 128: **Practical Computing and Data Science Tools**
Fall 2023, Fall 2024

Fall 2023 STT 802: **Design of Experiments**

2022 - 2023 FOR/STT 875 **R Programming for Data Sciences**
Summer 2022, Summer 2023

Undergraduate Teaching Assistant at George Fox University

Fall 2020 BIOL 390: **Plant Biology**

Instructor at George Fox University Science Outreach Program

Fall 2018 **Forest Ecology**

Presentations

Aug 2025 **Joint Statistical Meeting**, Nashville, TN
June 2025 **Partnership for Small Area Estimation Meeting**, Missoula, MT
June 2025 **2025 WNAR/IMS Annual Meeting**, Whistler, BC
Feb 2025 **MSU Statistics and Probability Graduate Student Seminar**, East Lansing, MI
Jan 2025 **MSU Forestry Graduate Student Symposium**, East Lansing, MI
Aug 2024 **Joint Statistical Meetings**, Portland, OR
Apr 2024 **FIA User Group Meeting**, Tucson, AZ
Aug 2023 **Joint Statistical Meetings**, Toronto, Canada

Professional Memberships

American Statistical Association
American Geophysical Union
International Society for Bayesian Analysis
Institute of Mathematical Statistics
The International Biometric Society

Service

2024-2025 MSU Forestry Graduate Student Association Activities Chair
2024-2025 MSU Forestry Graduate Committee Representative