United States Department of Agriculture

**Final Report**

| Title: | A regional-scale study of invasive plant impacts on forest ecosystem |
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|---|---|---|---|
| **Sponsoring Agency** | NIFA | **Project Status** | COMPLETE |
| **Funding Source** | Mcintire Stennis | **Reporting Frequency** | Final |
| **Accession No.** | 1010323 | **Project No.** | IND011531MS |
| **Project Start Date** | 10/01/2016 | **Project End Date** | 09/30/2021 |
| **Reporting Period Start Date** | 10/01/2016 | **Reporting Period End Date** | 09/30/2021 |
| **Submitted By** | Julie Estrada | **Date Submitted to NIFA** | 01/31/2022 |


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**Recipient Organization**

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**Performing Department**

Forestry & Natural Resources


**Non-Technical Summary**


The Central Hardwood Forest is one of the most important forest ecosystems in the eastern U.S., harboring high diversity of native species and providing valuable economic and recreational opportunities to the citizens of the region. With the ongoing fragmentation, new fire regimes, modern land-use and forest management practices, and other exogenous factors, invasive exotic plants are moving into these economically and ecologically important forest ecosystems, in some places reaching epidemic proportions. The health and longevity of many of these forest ecosystems are at risk. The long-term invasion of exotic plants can alter the composition and reduce the diversity of these ecosystems, especially those mast-bearing, fire-mediated oak and hickory species. Such a compositional change could result in dramatic declines in the wildlife population and diminished economic opportunities for the human inhabitants of these largely rural regions.

Moreover, forest plays an important role in U.S. economy. In the Central Hardwood Forest region alone, over 255,000 men and women are employed in forestry related jobs (AFPA 2012). On the other hand, invasive species cost the American public about $1,300 per household each year in an earlier estimation (Pimentel et al. 2005). Therefore, research of the impact of invasive species on forest health and strategies to remediate the impact will have huge economic implications.


**Accomplishments**

**Major goals of the project**

My long-term research goal is to provide mechanistic and predictive understanding of invasion patterns and process from regional to continental-scales. The overarching goal of this project is to understand the impacts of invasive plants on forest ecosystem dynamics at the regional level by including spatial heterogeneity and system stochasticity. The specific objectives are:

1. Evaluate the extent and severity of invasive plants impact on tree growth, mortality, and recruitment.
2. Understand the impact of plant invasions on soil organic carbon pools and temperature sensitivity

**What was accomplished under these goals?**

1. Our research modeled the spread of an importantant invasive pest - spotted lanten fly
2. Our research revealed the spread pattern of emerald ash borer (see Ward et al. J. Appl. Ecol. paper for details)
3. One MF student graduated, whose work was focused on the impact of invasive pest on water quantity and quality issues.

**What opportunities for training and professional development has the project provided?**

1. The project produced research opportunities for one undergraduate students (a female minority student)
2. Postdocs and graduate students working on the project were sent to professional conferences to present their research findings and to learn new developments in the field
3. Junior scientists on the team were coached by more senior scientists about mentoring, teaching, and research skills.

**Accession No. 1010323** **Project No. IND011531MS**

**How have the results been disseminated to communities of interest?**

1. Research findings have been disseminated through invited and contributed presentations
2. Research data and tool have been made available online (free access) to managers and other researchers

**What do you plan to do during the next reporting period to accomplish the goals?**

{Nothing to report}

**Participants**

**Actual FTE's for this Reporting Period**

| Role | Non-Students or faculty | Students with Staffing Roles | | | Computed Total by Role |
|---|---|---|---|---|---|
| | | Undergraduate | Graduate | Post-Doctorate | |
| Scientist | 0.6 | 0 | 0 | 0 | 0.6 |
| Professional | 0.3 | 0.2 | 1 | 2 | 3.5 |
| Technical | 0 | 0 | 0 | 0 | 0 |
| Administrative | 0 | 0 | 0 | 0 | 0 |
| Other | 0.2 | 0 | 0 | 0 | 0.2 |
| Computed Total | 1.1 | 0.2 | 1 | 2 | 4.3 |

**Student Count by Classification of Instructional Programs (CIP) Code**

| Undergraduate | Graduate | Post-Doctorate | CIP Code |
|---|---|---|---|
| 1 | 2 | 2 | 03.01 Natural Resources Conservation and Research. |

**Target Audience**

There are three groups of target audiences we reached during the reached:
1) Scientific community, which was informed through professional meetings and conferences
2) Natural resources professionals, which were reached through research articles and online tools
3) General public, which were reached through online tools

**Products**

| Type | Status | Year Published | NIFA Support Acknowledged |
|---|---|---|---|
| Journal Articles | Published | 2021 | YES |

**Citation**

Ward, S.F., A.M. Liebhold, R.S. Morin, and †S. Fei. 2021. Population dynamics of ash across the eastern USA following invasion by emerald ash borer. Forest Ecology and Management 479: 118574

| Type | Status | Year Published | NIFA Support Acknowledged |
|---|---|---|---|
| Journal Articles | Accepted | 2021 | YES |

**Citation**

Cook, R., S.Ward, A. Liebhold, and S Fei. Spatial dynamics of spotted lanternfly, Lycorma delicatula, invasion of the Northeastern United States. Neobiota.

**Other Products**

| **Accession No. 1010323** | **Project No. IND011531MS** |
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**Product Type**

Other

**Description**

An invasive pest impact dashboard has been developed and currently available to the general public free of charge. https://mapsweb.lib.purdue.edu/AFPE/

**Changes/Problems**

{Nothing to report}