ML 2018 Project Abstract
For the Period Ending June 30, 2023

PROJECT TITLE: Expanding and Strengthening the Prioritization of Terrestrial Invasive Species in Minnesota
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FUNDING SOURCE: Environment and Natural Resources Trust Fund
LEGAL CITATION: ML 2018, Ch 214, Art 4, Sec 2, Subd 6a

APPROPRIATION AMOUNT: $151,601
AMOUNT SPENT: $151,601
AMOUNT REMAINING: $0

Sound bite of Project Outcomes and Results
Online tools were developed to facilitate stakeholder engagement with MITPPC's species prioritization process; the biennial update of the species prioritization was completed ; 7 additional species were evaluated; it was determined that simple estimates of climate suitability, such as plant hardiness zones, are reasonable to use for MITPPC's invasive insects evaluation.

Overall Project Outcome and Results
MITPPC evaluates a widely-solicted list of recommended invasive species and prioritizes the list every other year. To facilitate stakeholder engagement with MITPPC's species prioritization process, the researcher has developed online communication tools such as accessible web content and forms, making the MITPPC prioritization process and outcomes transparent

Climate suitability is among the decision criteria MITPPC uses to evaluate the risk a terrestrial invasive species (TIS) may pose to Minnesota. The cold Minnesota climate can be an important deterrent to many TIS establishing or becoming widespread.

There are many different methods for forecasting climate suitability, ranging from those based on simple thresholds (e.g., plant hardiness zones) to those based on more complex algorithms (e.g., statistical correlation, process-oriented, etc.). In addition, for complex models in particular, there are many decisions during model development that can affect the final forecast. Evidence is presently lacking to inform whether a certain method(s) or approach may be more useful for invasive species applications, like the MITPPC species evaluations. Assessing the reliability of suitability models (also called species species distribution models) is also an active area of research.

This project focuses on evaluating methods for estimating climate suitability of invasive species, especially insects.

We tested how multiple modeling decisions affected the forecasts produced by a popular machine-learning model called MaxEnt. Nine invasive insects prioritized by MITPPC were used as case studies to compare the effect of numerous tools and recommendations on MaxEnt model results. Specifically, we looked at the effects of spatial thinning, model optimization, and invasion origin on a model's performance in an independent region (when possible).

We compared multiple, commonly used methods for modeling climate suitability of invasive insects. The models, which ranged in complexity, were analyzed for trade-offs between model accuracy and resource investment (e.g., time, required expertise).

Project Results Use and Dissemination

Six peer reviewed publications have derived from this research project. All peer reviewed publications are permanently archived. Multiple public presentations were made academic conferences and conservation organizations. A full listing may be found on the MITPPC webpage dedicated to this research project.