

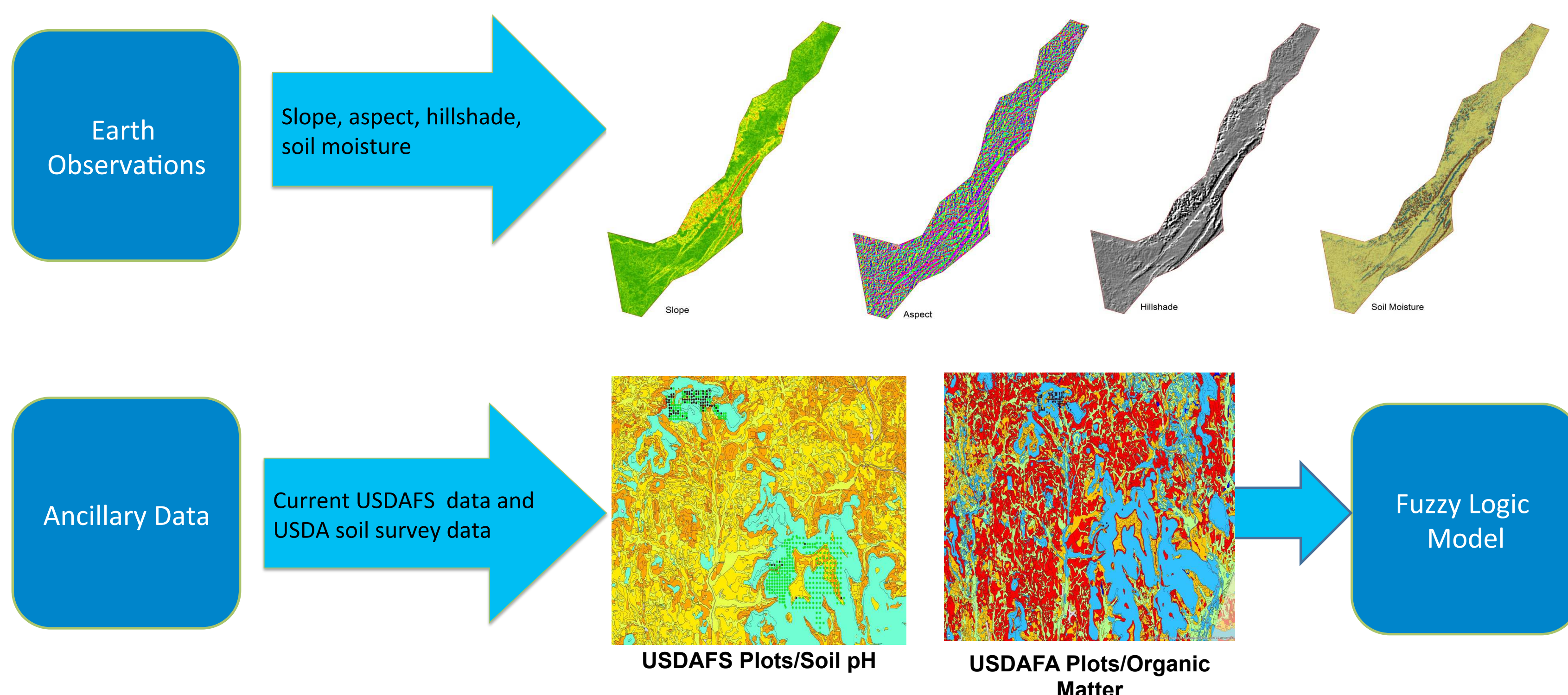
Using Earth Observations to Map and Model the Spread of Invasive Asiatic Bush Honeysuckle on the Cumberland Plateau

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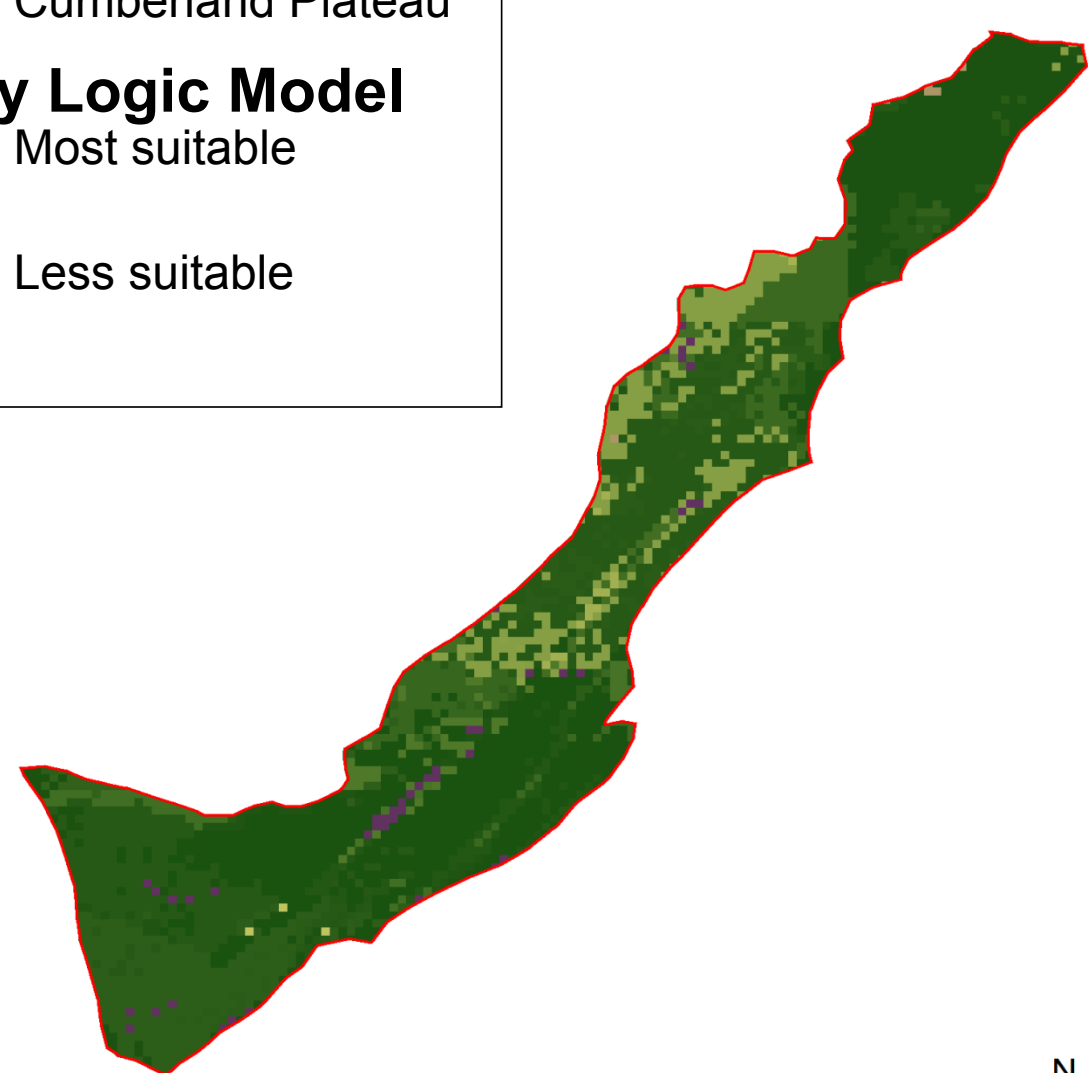
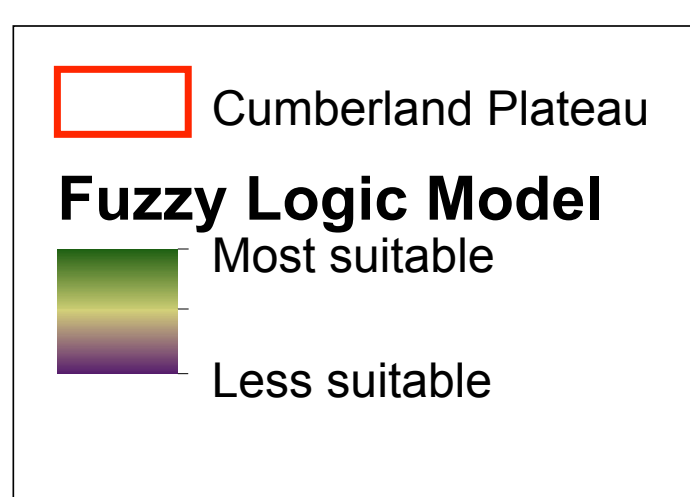
Abstract

Invasive terrestrial plant groups, such as Asiatic bush honeysuckle, are capable of altering a habitat or ecosystem to such an extent that the inherent functions of the system are radically changed. These plants can change the structure of the soil, create erosion problems, and alter the availability of resources, such as water. These changes can have cascading effects felt throughout the entire ecosystem. Asiatic bush honeysuckle has spread rapidly throughout the Cumberland Plateau, averaging complete coverage of 0.1-0.4 hectares per year in several areas. Maps of this invasive shrub group are required to identify problematic areas in order to prioritize sites for management. The goal of this project was to map the location, density, and probability of movement for Asiatic bush honeysuckle throughout the Cumberland Plateau. Ground-survey data were collected by the United States Department of Agriculture Forest Service Southern Research Station (USDAFS SRS). The data were then used to build a Geographic Information Systems (GIS) database, where imagery were incorporated from Landsat 7 Enhanced Thematic Mapper Plus (ETM+), Landsat 8 Operational Land Imager (OLI), and Terra Moderate Resolution Imaging Spectroradiometer (MODIS) Leaf Area Index (LAI) and Fraction of Photosynthetically Active Radiation (FPAR). Using the Normalized Difference Vegetation Index (NDVI) and the Reaction-Diffusion (R-D) model of the species, a spread and habitat suitability model was constructed. Relative density and spread maps for Asiatic bush honeysuckle were derived, which predicted the spread rate and prioritized areas to focus current and future management.

Methods



Results



- ▶ Due to correlation between USDA Forest Service plots and soil pH and soil organic matter composition, soil pH and soil organic matter were used in Fuzzy Logic model
- ▶ No correlation between USDA Forest Service plots and variables derived from aster-based Digital Elevation Model
- ▶ No correlation between USDA Forest Service plots and indices derived from Terra MODIS and Landsat imagery

Conclusions

- ▶ Landsat/ASTER-based DEM data
 - Enhanced in situ data
 - Predicted habitat suitability, Asiatic bush honeysuckle, Cumberland Plateau
- ▶ Soil pH/organic matter composition
 - Fuzzy logic model
 - Predicted Asiatic bush honeysuckle, Cumberland Plateau

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