

# Using Temporal Signatures, Multispectral Imagery, Machine Learning, and Unpiloted Aerial Systems (UAS) to Map the Distribution of Understory Invasive Species in the Temperate Deciduous Forest

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## Introduction



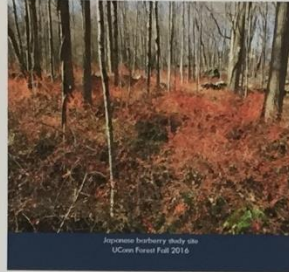
Invasive species negatively impact forest regeneration and native biodiversity in temperate deciduous forest understories.



Japanese barberry provides a favorable microclimate for the black-legged tick, a major vector of tick-borne diseases like Lyme disease.

Invasion by non-native plant species is a major concern regarding forest ecosystem health and biodiversity.

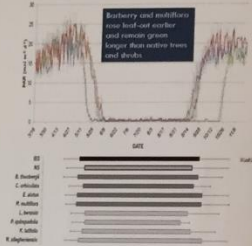
Despite extensive research on invasive species, fundamental questions remain on how to accurately map the distribution of invasive species populations.



Japanese barberry study site UConn Forest Fall 2016

## Phenological Signatures

We hypothesize that the RGB and multispectral imagery sensors will detect Japanese barberry and multiflora rose in the understory largely because of their unique phenological signatures



Diets, L. Volin, M. Marek, J. Volin, C. Witharana. The Role of Phenology in Invasive Plant Species Detection in Temperate Forest Understory (Unpublished doctoral dissertation). University of Connecticut, Connecticut, USA.

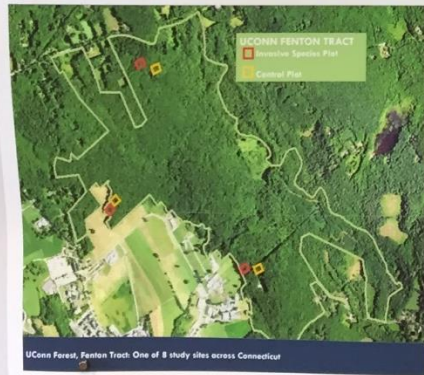


April 24, 2017, Japanese barberry



April 22, 2017, Multiflora rose

## Experimental Methods



UConn Forest, Fenton Tract. One of 8 study sites across Connecticut

This study is being conducted to determine whether Unpiloted Aerial Systems (UAS) equipped with multispectral and RGB sensors can be used to accurately map the spatial distribution of invasive nonnative shrub species including:

- Japanese barberry, *Berberis thunbergii*,
- Multiflora rose, *Rosa multiflora*.



Simple leaf of Japanese barberry



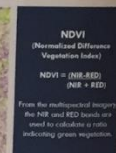
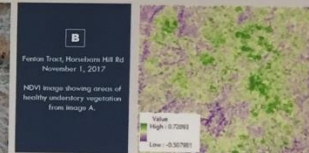
Compound leaf of Multiflora Rose



Fenton Tract, Harshbarn Hill Rd November 1, 2017



Fenton Tract, Harshbarn Hill Rd November 1, 2017



Fenton Tract, Harshbarn Hill Rd November 1, 2017

## Anticipated Outcomes

The results from this research will contribute to 1) new insights into applying machine learning techniques to multispectral remote sensing imagery for identifying and mapping understory invasive species and 2) capturing extended leaf phenology during the late winter months and late fall.

### Machine Learning Workflow

