



Mapping Invasive *Rhamnus cathartica* using Unmanned Aerial Vehicle (UAV) Technology

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Introduction

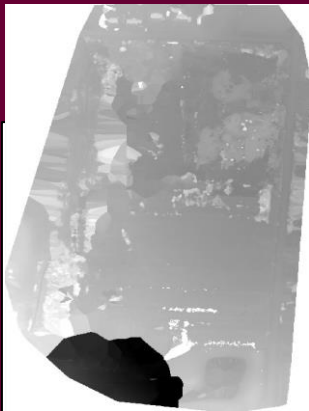
- *Rhamnus cathartica*, also known as Common Buckthorn, is an invasive shrub species found in North America. It can be found within forested areas
- Buckthorn is difficult to map & monitor because it is found underneath tree canopy and can grow throughout the interior of forested areas
- The purpose of this study was to develop a simple and repeatable strategy for monitoring Buckthorn growth by using UAV technology

Study Area

- The drone imagery was captured at Saginaw Valley State University's campus.

Data Collection

- The drone flown for the mission was the DJI Matrice 100 UAV.
- The Zenmuse Z3 RGB sensor was used to capture imagery
- Images were taken on November 3rd, 2020



RGB Generated Image

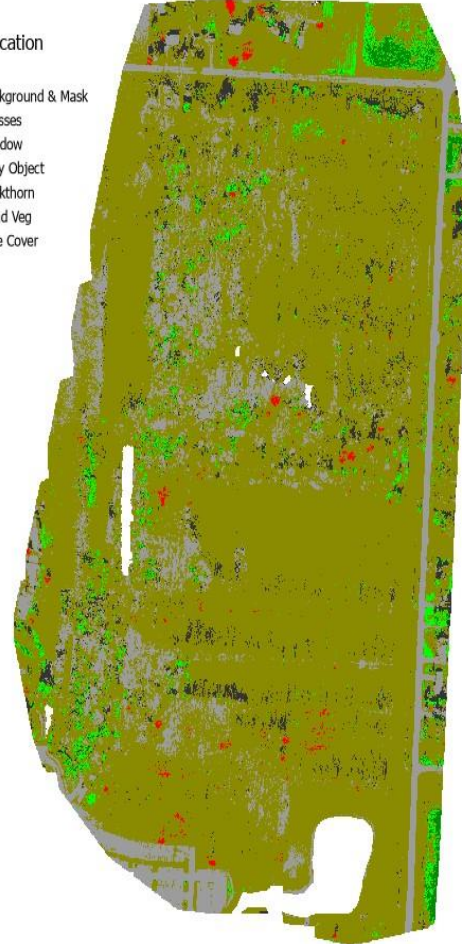


DSM Generated Image

Classification Method

- We performed a supervised pixel-based classification on a stacked image containing:
 - A digital surface model (DSM)
 - A red, green, blue image
- We created 6 basic classes and produced a maximum likelihood classification

- Classification Value
- Background & Mask
 - Grasses
 - Shadow
 - Gray Object
 - Buckthorn
 - Dead Veg
 - Tree Cover



Results

- Buckthorn was under-classified & over-classified with the error of classification found within the Grass class.

Land Cover	Omission Error	Commission Error	Overall Accuracy	Kappa
Buckthorn	0.3	0.35	0.8	0.76
Shadow	0.08	0.13		
Grass	0.28	0.34		
Tree Cover	0.2	0		
Gray Objects	0.02	0.14		
Dead Vegetation	0.3	0.19		

Discussion & Conclusions

- Pixel-Based classification of underneath forested canopies can be used to accurately display the location of *R. cathartica* within a forest.
- These findings indicate that this classification scheme can be useful for conservation agencies as a relatively inexpensive and simple method for monitoring Common Buckthorn growth within a forest's canopy.
- In the future, it would be essential to try to further separate the grass class (which includes well-maintained lawns & winter crop fields) from *R. Cathartica*. Since both the grass and buckthorn have similar pixel values, the software has difficulty differentiating the two classes. One technique that we have been implementing is using the occurrence and co-occurrence methods found in ENVI software, which utilize Haralick textures to develop a new image, where specific texture attributes are assigned to a "band" to be displayed.
 - I.e: skewedness, entropy, variance

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