Using sUAS and Multispectral Sensors to Quantify Feral Hog Damage in Forages

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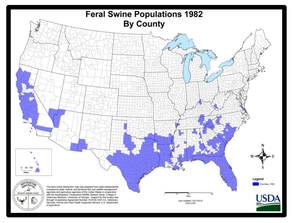
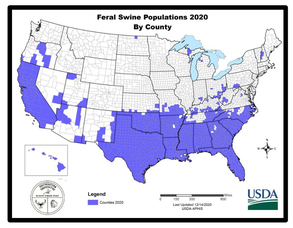
Introduction

The feral hog population and their range continues to expand. USDA estimates agriculture damages at $1.5 billion annually. Vast areas have been difficult to accurately and efficiently quantify feral hog damage to forages and other crops. The ability to accurately quantify damage could be a valuable tool for those seeking federal or state aid. This information could also be powerful for proactive states trying to regulate and prevent the introduction of such a nuisance animal.





Objectives

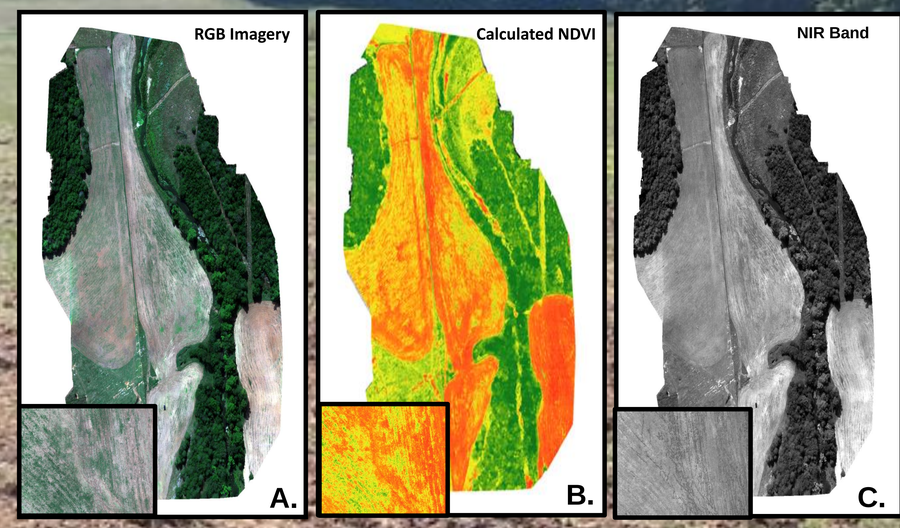
- To efficiently collect whole field imagery of feral hog damage in forages by using an Unmanned Aerial System and a multi-spectral sensor.
- To develop a workflow that accurately highlights and efficiently quantifies damage.

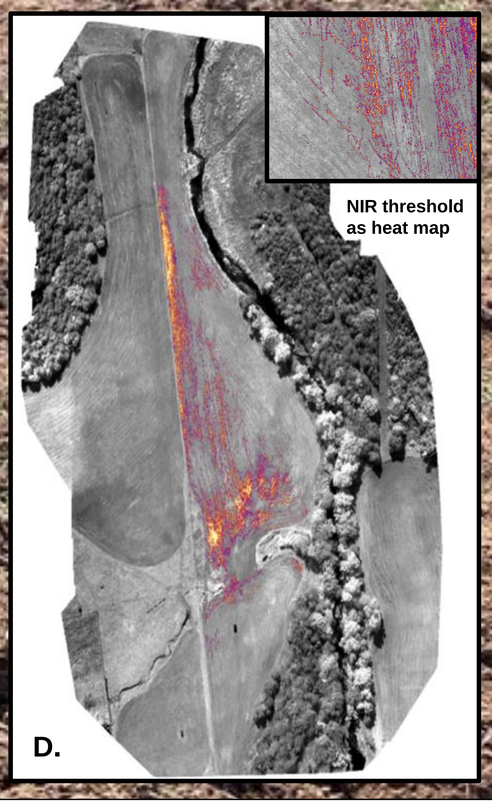
Equipment and Methods

- Small unmanned aerial systems (sUAS) a Matrice 300 RTK (SZ DJI Technology Co., Ltd., Shenzhen China) equipped with a multispectral sensor were flown to collect imagery.
- The 5 band Micasense RedEdge sensor (AgEagle Sensor Sysems Inc. Wichita, Kansas 67226) captured narrow spectral bands of blue, green, red, NIR and Red edge.
- Handheld RTK GPS was used to mark and provide ground reference information of damage.
- Fencing incidentally protected a parallel field that was undamaged. This field provided a valuable control for comparisons.

Findings

- Zooming in, damage can be seen in RGB Imagery although occluded by some vegetation **(A)**. RGB imagery is more difficult to extract quantitative values from because each pixel is a composite of three separate color values. Once separated, these three bands along with any other available bands can be used to calculate indices that produce a single value for each pixel that facilitates extraction of qualitative values.
- Indices traditionally used for vegetative analysis were thought to be able to facilitate detection of disturbed areas void of vegetation such as exposed soils. However, initial tests in cut hay fields and partially emerged plantings contained exposed soil that was difficult to distinguish from damage **(B)**.
- While early attempts at using established vegetative indices were unsuccessful, disturbed soil turned by feral hogs is distinguishable when looking at the raw Red Edge and NIR imagery **(C)**.
- The team is currently exploring a threshold approach to map this observable damage in an attempt to ultimately develop an index or workflow using a combination of these two bands (Red Edge, NIR) that accurately highlights damage represented as a heat map **(D)**. The results can be used to visualize and quantify the extent of damage across a whole field.





Conclusion

Feral hogs are a growing problem, the ability to quantify damage is valuable but difficult. This project demonstrates the potential value of sUAS and multispectral imagery in efficiently quantifying hog damage in forage production systems.

We would like to recognize Becky McPeake Wildlife Extension Specialist - U of A System Division of Agriculture and Cooperator John David Miller for their support of this project.

This project is partially funded by the Arkansas Department of Agriculture for the Arkansas Feral Swine Pilot Project Areas under the USDA Natural Resources Conservation Service in partnership with the USDA APHIS Wildlife Services - Arkansas and the Arkansas Game and Fish Commission.