NATIONAL CONSORTIUM FOR REMOTE SENSING EDUCATION, RESEARCH, AND APPLICATIONS

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Multi-Temporal UAS Imagery for Monitoring Natural Disturbance Based Management Practices

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Introduction: Unmanned Aerial Systems (UAS) are an excellent data collection tool for modern day natural resource management. The versatility provided by UAS allows for the collection of high-resolution data at a temporal scale not easily attained with other methods. This high-resolution data allows land managers to better monitor the impact of Natural Disturbance Based Management (NDBM) practices, such as selective timber harvests or controlled burns. Disturbance events, whether planned or unplanned, greatly affect the dynamics of an environment. By using UAS to survey land holdings before and after disturbance events, land managers can better understand temporal patterns and trends to ascertain the sustainability and effectiveness of ongoing land management practices.

Project Background: Using UAS platforms equipped with RGB, multispectral, and thermal cameras, high-accuracy GPS units, and Light Detection and Ranging (LiDAR), we are able to collect a wide array of accurate data from forest or grassland environments. As part of the Digital Forestry initiative at Purdue University, we are investing heavily in the use of such technologies for modern day natural resource management.

Project Objectives:

- Determine the cost-effectiveness and accuracy of various UAS technologies for quantifying NDBM practices.
- Conduct repeated flight missions over properties where NDBM practices have been employed to monitor the long-term effect of said practices.

Preliminary Results: Initial results from this project have shown the effectiveness in using UAS for mapping at the hundred-acre scale and below for both forest environments and grasslands. Currently, I have collected a wide variety of high-resolution pre-disturbance datasets from both natural and plantation style forests as well as grasslands. Pre-disturbance datasets have been collected using RGB, Multispectral, and LiDAR sensors to create a well-rounded dataset for future use. Initial post burn flights have been conducted over multiple weeks following a prescribed burn of a natural grassland. Weather related limitations have prevented many properties from conducting NDBM practices in the Summer of 2022, though selective harvests and burns are planned in the Fall of 2022.

FOR FURTHER READING:

Miller, Z., Hupy, J., Hubbard, S., & Shao, G. (2022). Precise quantification of land cover before and after planned disturbance events with UAS-derived imagery. Drones, 6(2), 52. https://doi.org/10.3390/drones6020052

Figure 1. Example dataset collected from a highly complex, natural forest environment pre-controlled burn. This specific property was also the location of a selective harvest multiple years ago, allowing for the analysis of two NDBM practices at one site.

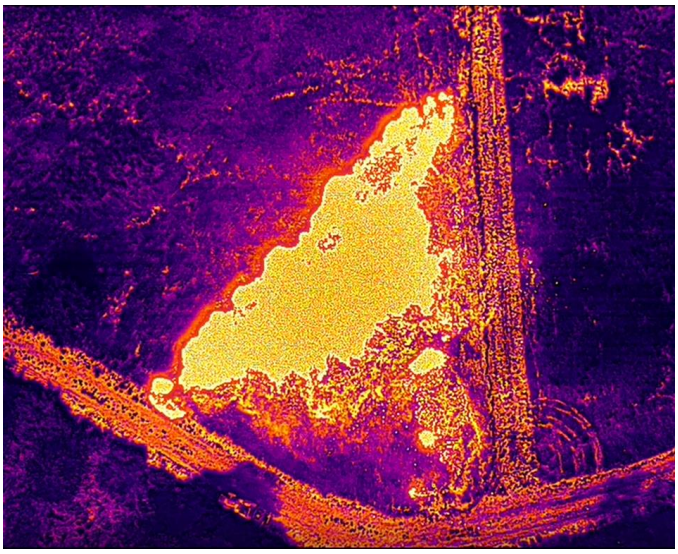

Figure 2. High resolution thermal imagery that was captured during a prescribed burn event in a natural grassland. This site has been repeatedly flown multiple times since with a multispectral camera to capture vegetation regrowth. The multispectral camera allows us to monitor vegetation health in ways not discernable with the naked eye.