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Pyrophytic Tree Classification in Berea Forest using Unmanned Aerial Systems

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Introduction

Pyrophyte - Tree species adapted to endure fire.

> -Passive Pyrophyte - Resist the effects of fire.

-Active Pyrophyte - Requires fire to spread, germinate, and regrow

Despite its defenses, a pyrophyte can be overwhelmed and destroyed by After decades of total fire fire. suppression policies along with rising average temperatures as a result of climate change, forest fires have grown in intensity, frequency, and coverage.

the assistance of Unmanned With Aerial Systems (UAS), foresters can survey the distribution of pyrophytic sustainable develop trees and approaches to forest management that restore the natural ecosystem and reduce the threat of forest fires.

Study Area

The Department of Forestry at Berea College is researching the effectiveness of prescribed burns in forest management. The Department is burning eight units on the southwestern slope of the West Pinnacle. Our research is focused on Burn Unit 1 (Map 1). The Burn Unit is located on the southwestern slope of West Pinnacle mountain (Figure 2). The study area is located in a temperate deciduous forest (Map 2).



Which sensor (Anafi, Sequoia, or combined) will classify pyrophytic trees best in Berea College Forest?



i, HERE, Garmin, INCREMENT P, USGS, EPA, Esri, HERE, Garmin, H

1ap contributors, and the GIS user communit





Pyrophytic Tree Classification in Berea Forest using Unmanned Aerial Systems

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Research Question

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ifications		Table 1: UAS Spatial and Spectral Resolutions		
			Anafi	Sequoia
Data Collected	on	Ground Sampling Distance	3.1 cm	9.2 cm
		Blue Band (450-495 nm)	Х	
Mavic and Par		Green Band (495-570 nm)	Х	Х
	rot	Red Band (620-750 nm)	Х	Х
		Red Edge Band (680-730 nm)		Х
book Coquaia		NIR Band (780-2,500 nm)		Х
ensor. Sequola		TIR Band (10,600-12,500 nm)	Х	
assessments on Maps 3-5	of	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	$\leftarrow \text{Increasing Frequency (v)} \\ \begin{array}{c c} 10^8 & 10^6 & 10^4 & 10^2 \\ \hline 1 & 1 & 1 & 1 \\ \hline ve & FM & AM \\ \hline Radio waves & & \\ \hline 10^0 & 10^2 & 10^4 & 10^6 \\ \hline Increasing Wavelength (\lambda) \\ \end{array}$	$10^{0} v (Hz)$ aves $10^{8} \lambda (m)$
<image/>				

Sequoia Binary Classification 0: Unclassified 1: Ground 2: Pyrophytic 3: Non-Pyrophytic 4: Masked



the highest classification with The combined accuracy is the overall imagery of the Parrot Anafi and Sequoia (Map 5). Despite having a lower spatial resolution, it has the The Anafi most spectral bands. Classification was the next most accurate followed by the Sequoia Classification. When identifying pyrophytic trees in a forest, stacking imagery from the Sequoia and Anafi will provide the most precise data.

Pros of Example Based Feature Extraction:

Quick processing

- Easy workflow

Based Feature Cons of Example Extraction:

- Poor tree crown delineation for a temperate, deciduous forest

- Object-based classification rather than pixel-based

- Cannot account for trees in the understory

Next Steps:

object-based Refine the classification approach

- Test the classification algorithm against a larger area

classification other Explore algorithms

