

Farming with Drones

Learning from the ground up



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Overview

- How I got here
- What I have learned
- What's next



Advanced Crop and Field Scouting with the use of Unmanned Aerial Systems

- Applied for grant in December 2016
- Grant Awarded February 17
- Orientation Meeting February 22
- Received the drone February 23
- Passed the pilot test February 24
- Started flying that afternoon
- Covered over 2000 acres in 2017 & approximately 3000 acres in 2018





Current Regulations Summary

- Must have an FAA Remote Pilot Certificate with small UAS rating.
- Must have permit from NCDOT to operate commercially.
- Only fly one aircraft at a time; Must remain within unaided line of sight.
- Only fly 30 minutes before sunrise to 30 minutes after sunset and in twilight with appropriate anti-collision lighting.
- Fly no higher than 400 feet above the ground or from object of interest.
- Cannot fly over people not participating in the operation!
- Various other rules and requirements.
- Exceptions are allowed with written approval from the FAA.

Status of drones in the industry

- ▶ 400 producers across the nation
- ▶ Drone used on farm?
 - ▶ 34% said yes
 - ▶ 2/3 of those that used a drone hired someone to do it
- ▶ Only 13% said they owned a drone
- ▶ Only 6% planned to purchase a drone this year



Equipment

- DJI Matrice 100 Smarter Farming Package from PrecisionHawk
- Visible Spectrum Camera
 - 380-750 nm
- Multi-Spectrum Camera
 - Blue, Green, and Near-Infrared
 - 750-2500 nm
- Flight control and image processing by PrecisionHawk



Wheat Examples



Wheat Examples



Wheat Examples

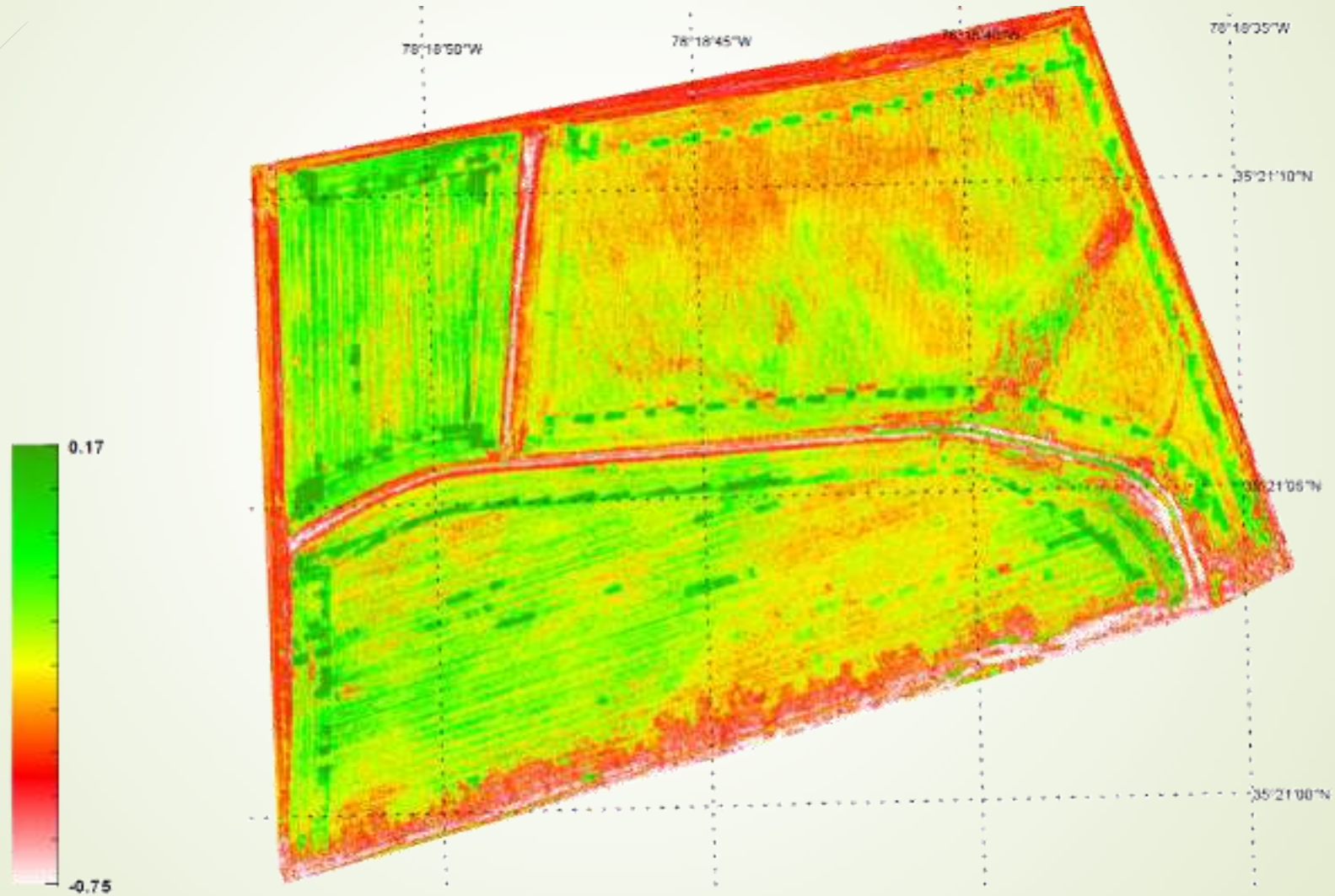
- Overlap is readily visible.
- Patterns are very visible from above.
- Don't assume you know what is going on in an image.
- Stand problem or nutrient deficiency?



Wheat Examples



Wheat Examples



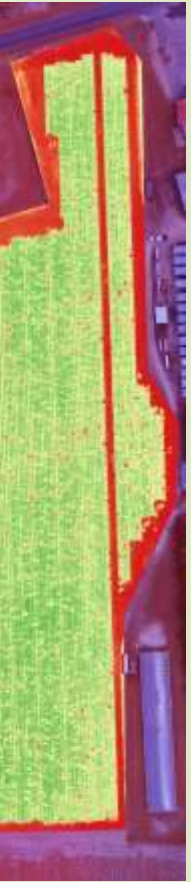
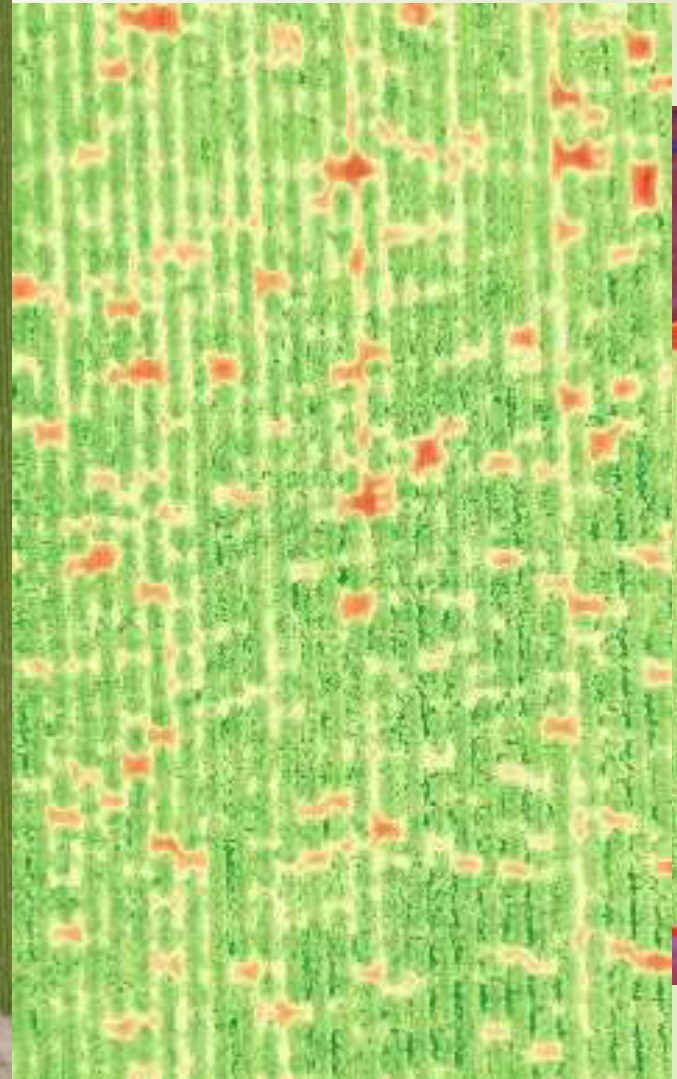
Tobacco Examples



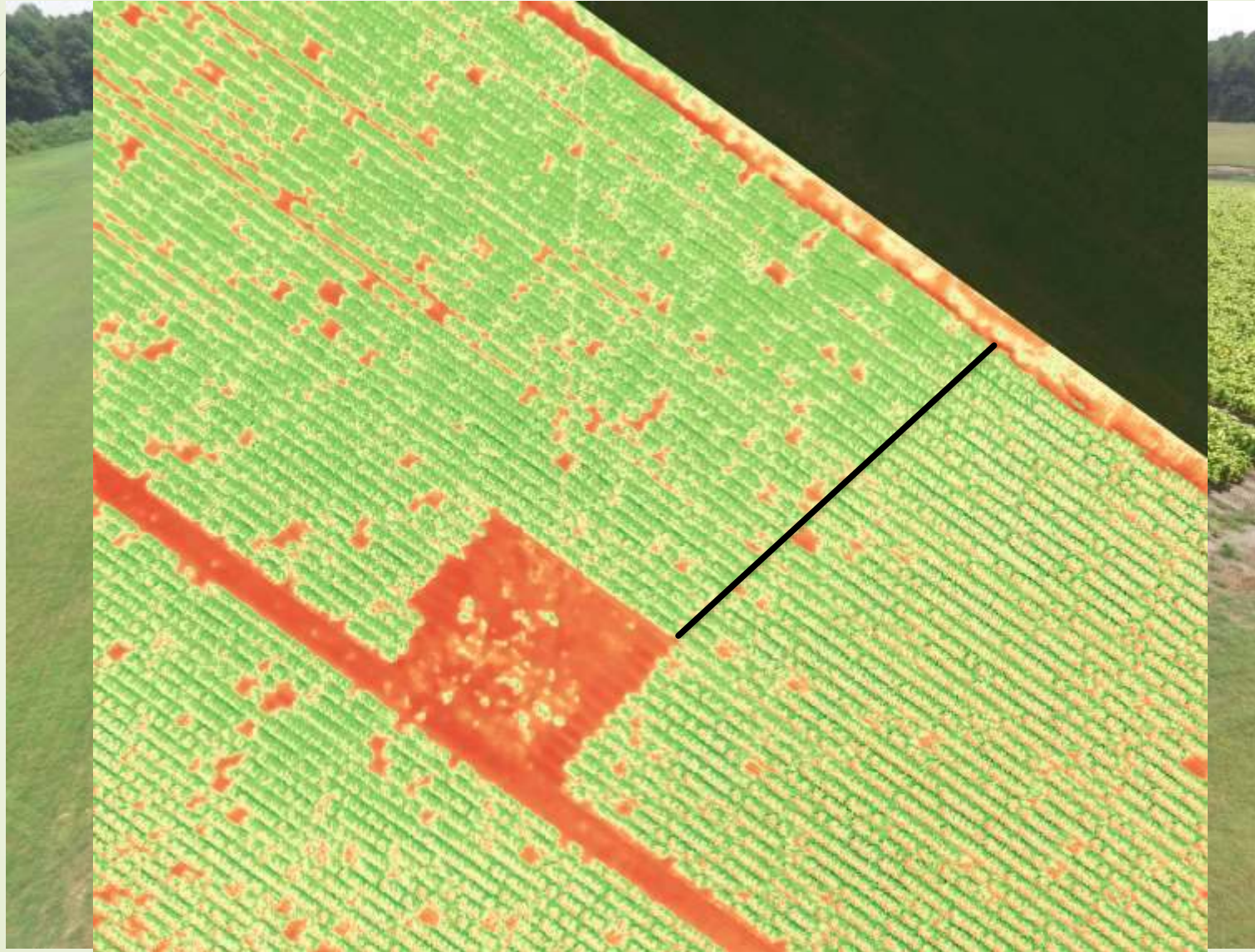
Tobacco Examples



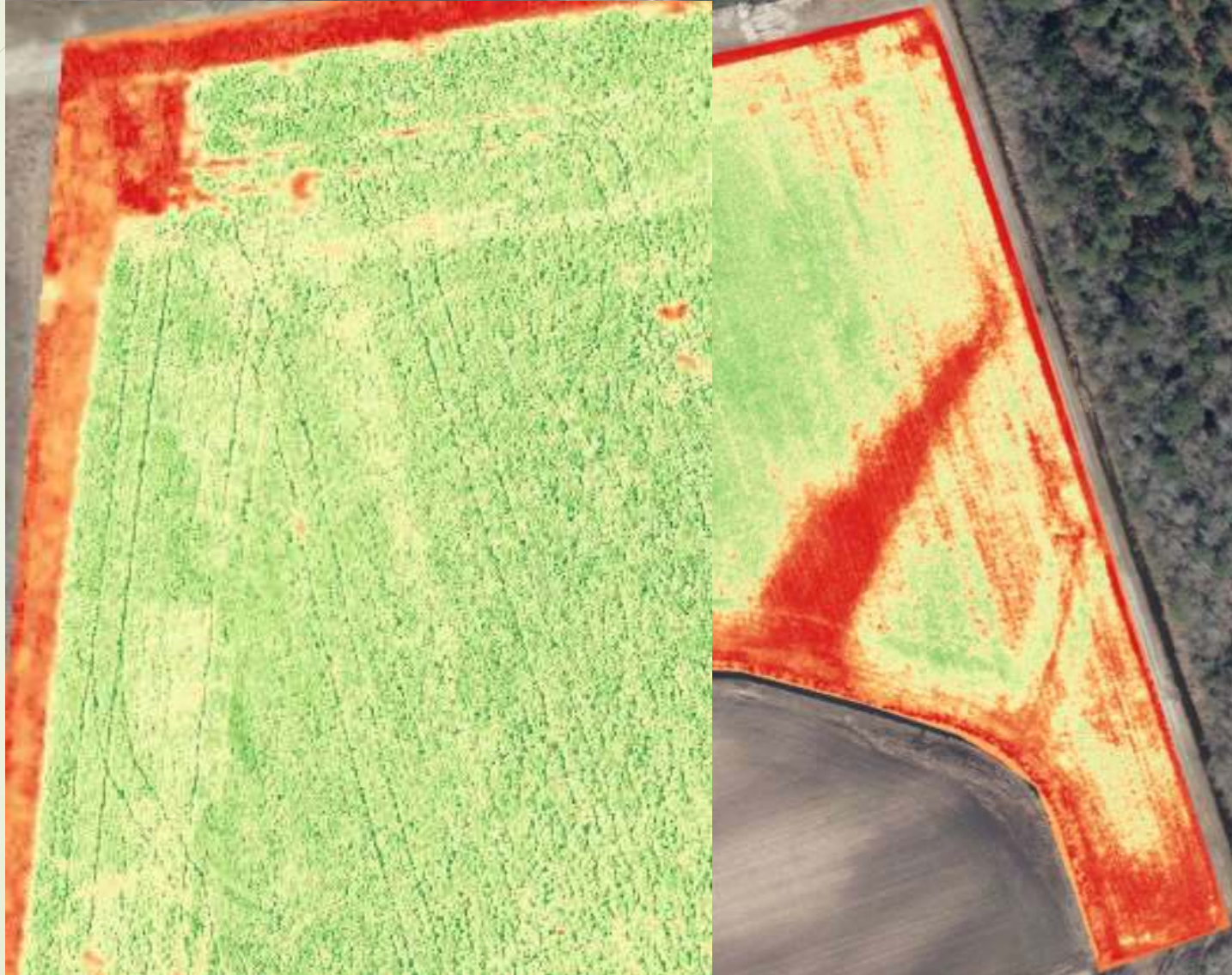
Tobacco Examples



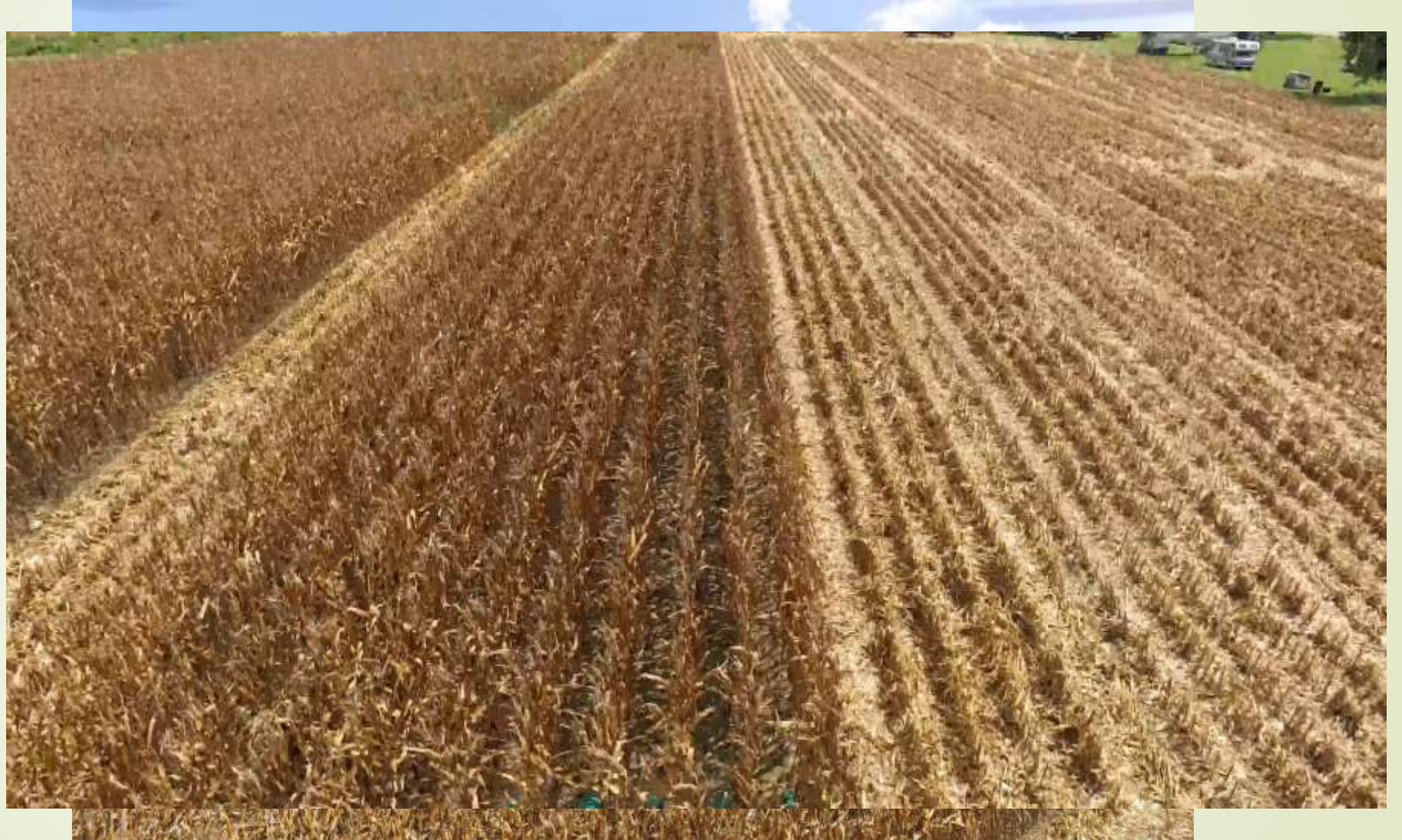
Tobacco Examples



Soybean Example



Other Uses – Advertising

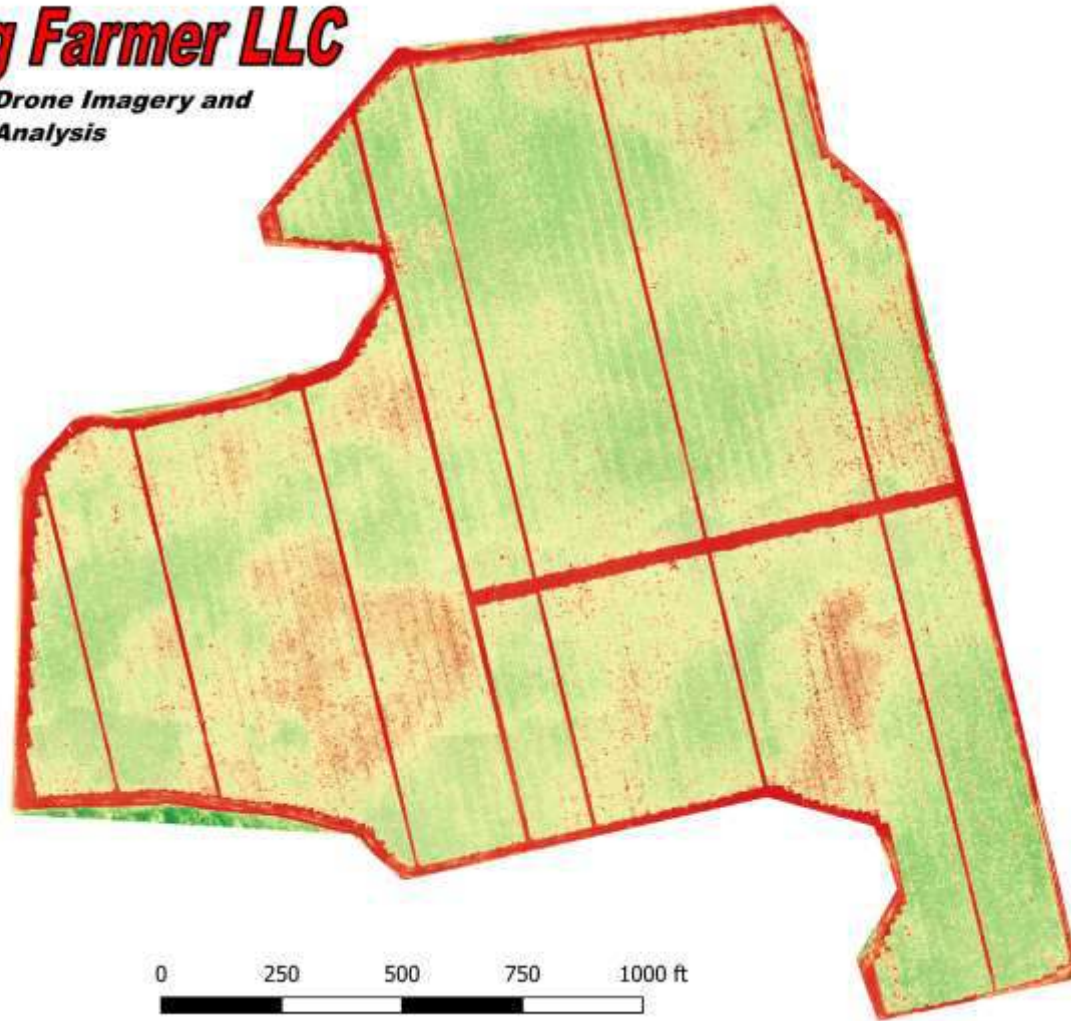
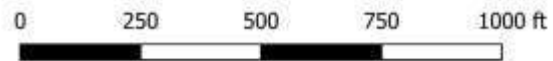


Other Uses – Irrigation



Legend

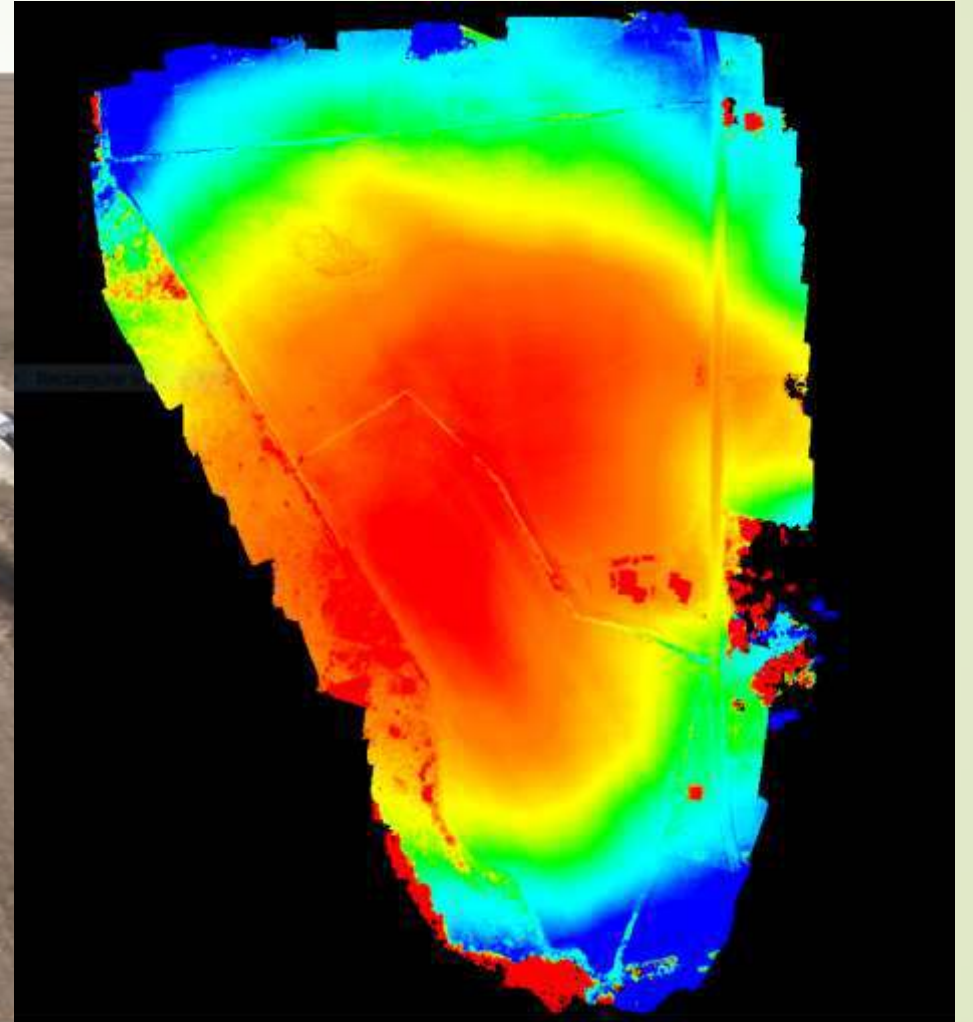
ENDVI Image



Other Uses – Drainage



Other Uses - Drainage



Other Uses - Photography



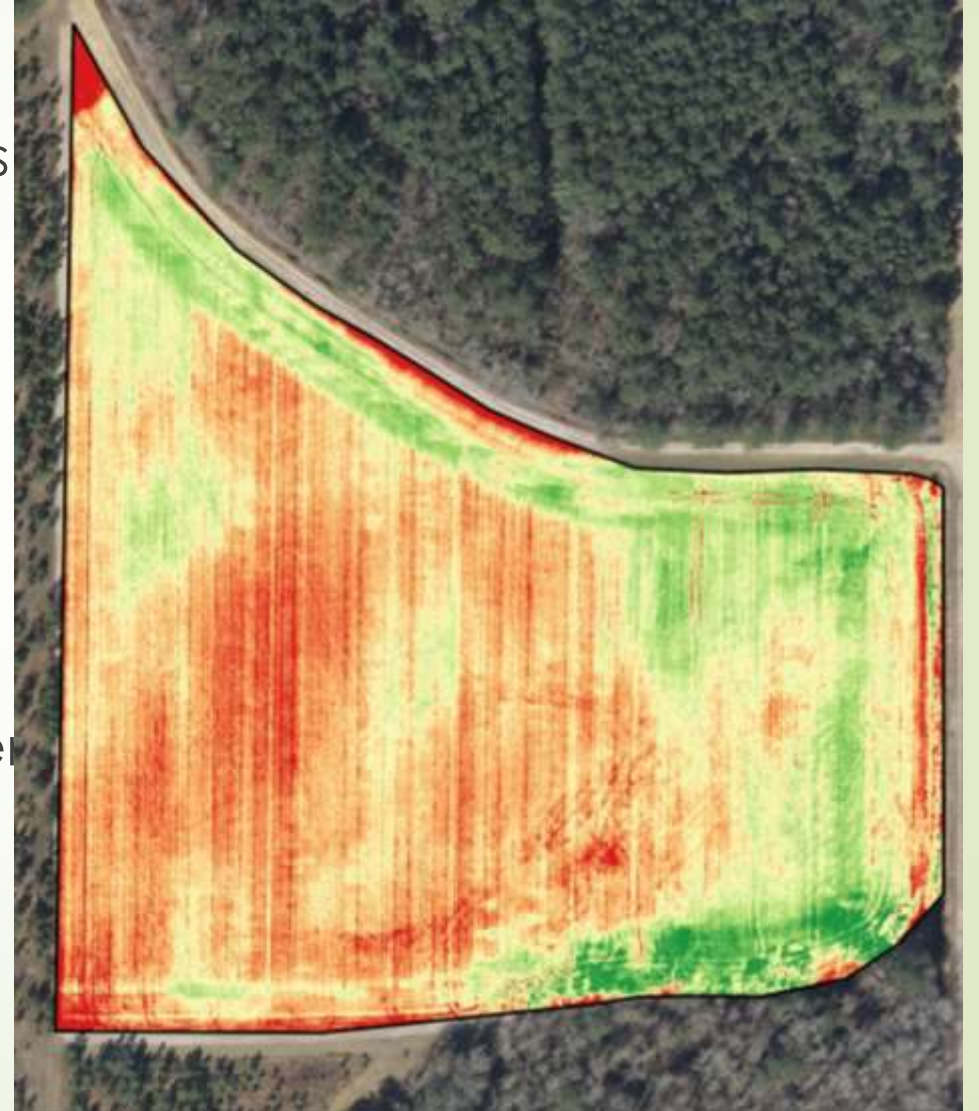


Wrapping up

- ▶ Most likely won't save time scouting.
 - ▶ Help target scouting where the problems are.
- ▶ Drone imagery can (and likely will) make you question what you do.
 - ▶ Questioning leads to measurement which leads to improvement.
- ▶ Drones are not a silver bullet or a magic wand.
 - ▶ It still takes boots in the field.
- ▶ The more exact and defined your goal is, the happier you will be with your results.
- ▶ Don't forget the infrastructure required to handle big data.
 - ▶ Farm Data Management plan

Where do we go next?

- Variable Rate Application Maps
- Stand counts and Plant counts
- Disease Management
- Reporting and Documentation
- Livestock Management
- Timber Land Management
- Traffic studies
- Environmental Impact assessment
- Public Safety





After that, where do we go?

- ▶ IoT, RFID, and Blockchain will be integral in future drone use.
 - ▶ Soil sensors mixed in seed that are read via drone
 - ▶ Geo-reference where plants came from in a field
 - ▶ Livestock tracking
- ▶ Autonomous drones stationed across the farm that fly fields on command and automatically upload images after each flight.
- ▶ Drones that fly pasture and rangeland periodically to count livestock and check health.
- ▶ Infrastructure Limited right now.



Questions?



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