

***Drones in Agriculture -
Yeah that's cool, but
what can they do for my
farm?***

Curtis Pate, PCA, CCA, part 107



Overview

- UAVs / Drones, The Past
- UAVs Strengths and Limitations
- Other platform Strengths and Limitations
- Promises Fulfilled, what can we really do now
- Not quite here yet... what is in the near future?
- Forward looking, what does the potential future look like?

Why do we call UAVs Drones

- WWII Target Practice – UK, Queen Bee and her “Drones”

UAVs Past

- Analog, hand flown, wild west of “no rules”



UAVs Past

- Analog, hand flown, wild west of “no rules”



UAV Strengths and Limitations

- Quick Response and Flexibility
- Flight time of day, mission time
- There is a limit to how many acres a UAV can image in a day
- Resolution (GSD), 4X concept
- Resource taxing

Other platform options

- Manned Fixed wing
 - Efficient for large acreages
 - Not responsive to changing needs/one shot flights
 - Compromise on GSD
- Satellite
 - The King of frequent passes
 - Lowest cost
 - Unrealistically low cost, with resolution to match

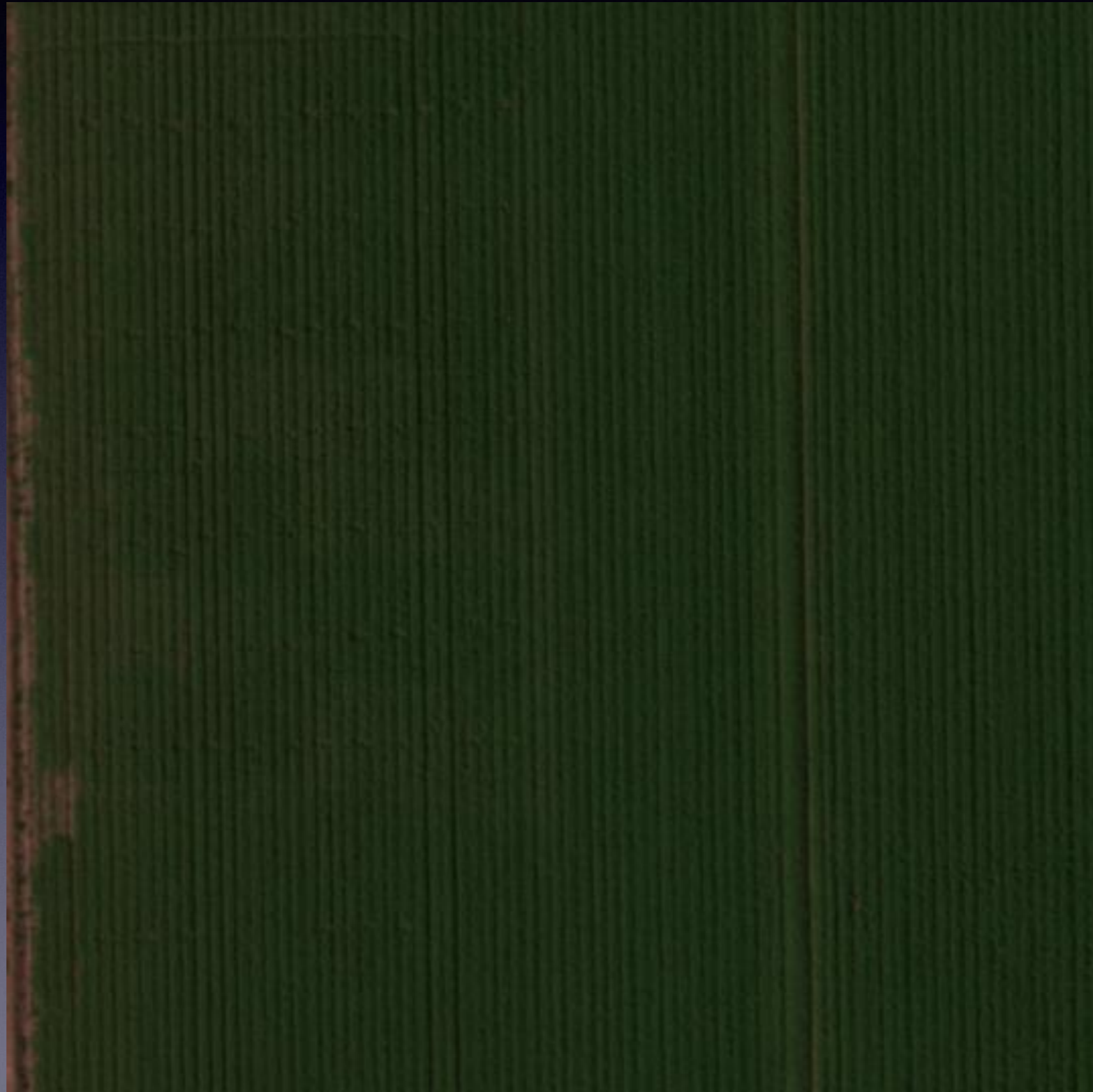
Imagery Options

- RGB (Visible)
- Calculated indices (NDVI, etc) using NIR and R.E.
- Thermal
- Filtered RGB
- Size and Number matter, Sensor reality
- If it's not Geo-Tagged it's just a picture

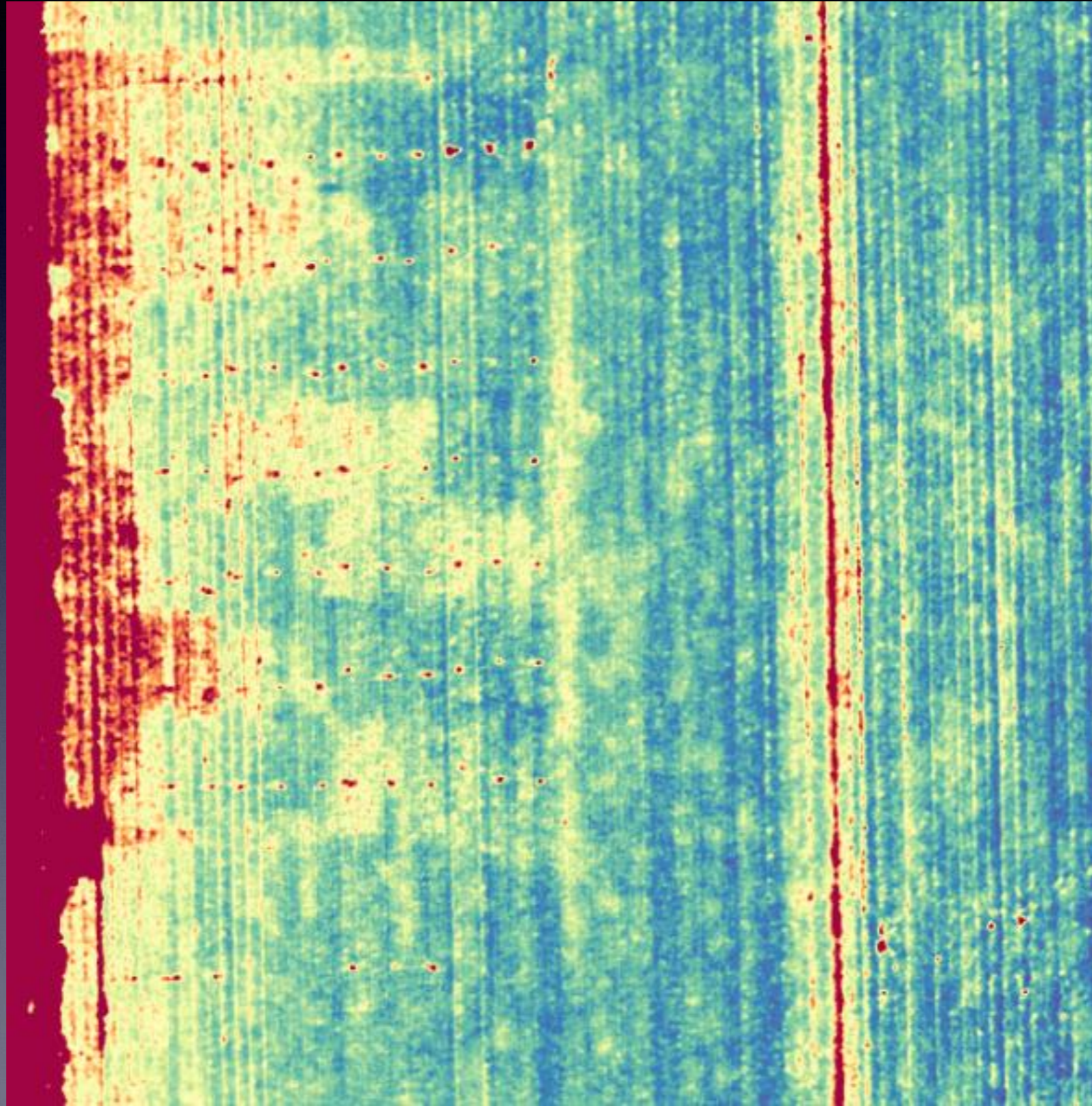
What does this mean...

- Plant populations of plants as small as 1"
- Weed population analysis
- Crop Stress analysis
- Tree Counts with canopy density
- Land leveling analysis
- Import imagery into scouting app for ground truthing.

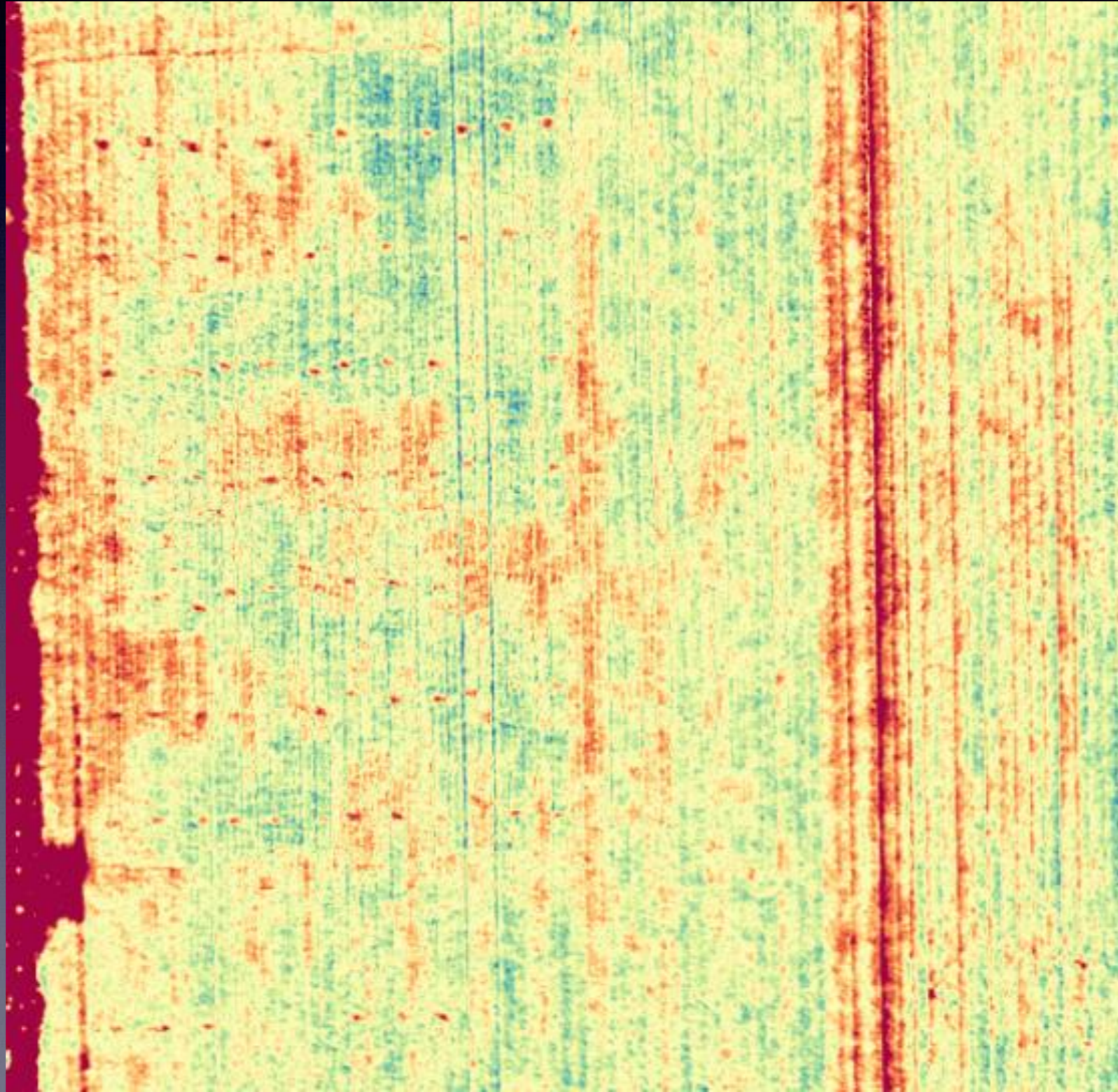
RGB



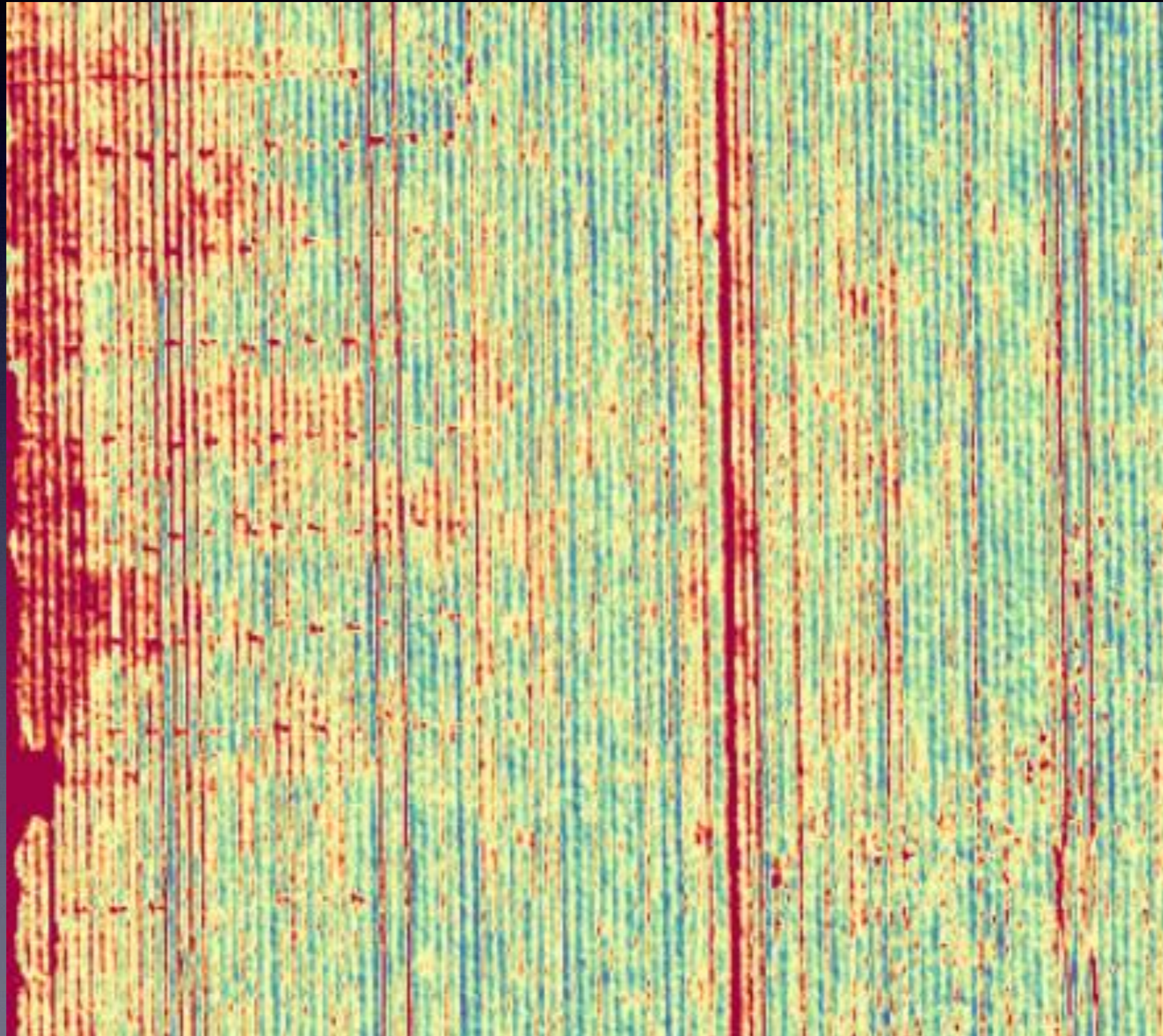
NDVI



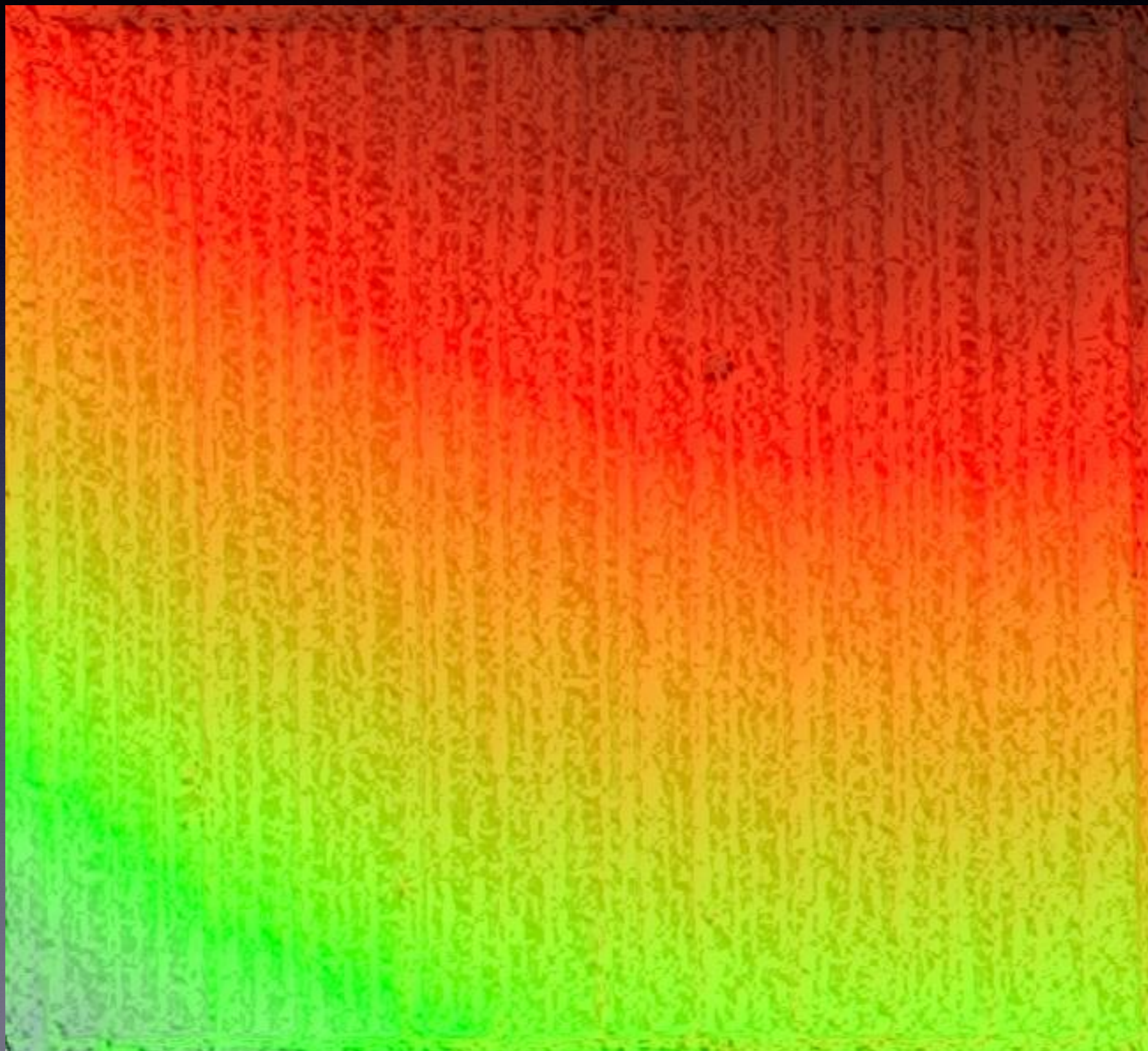
NDRE



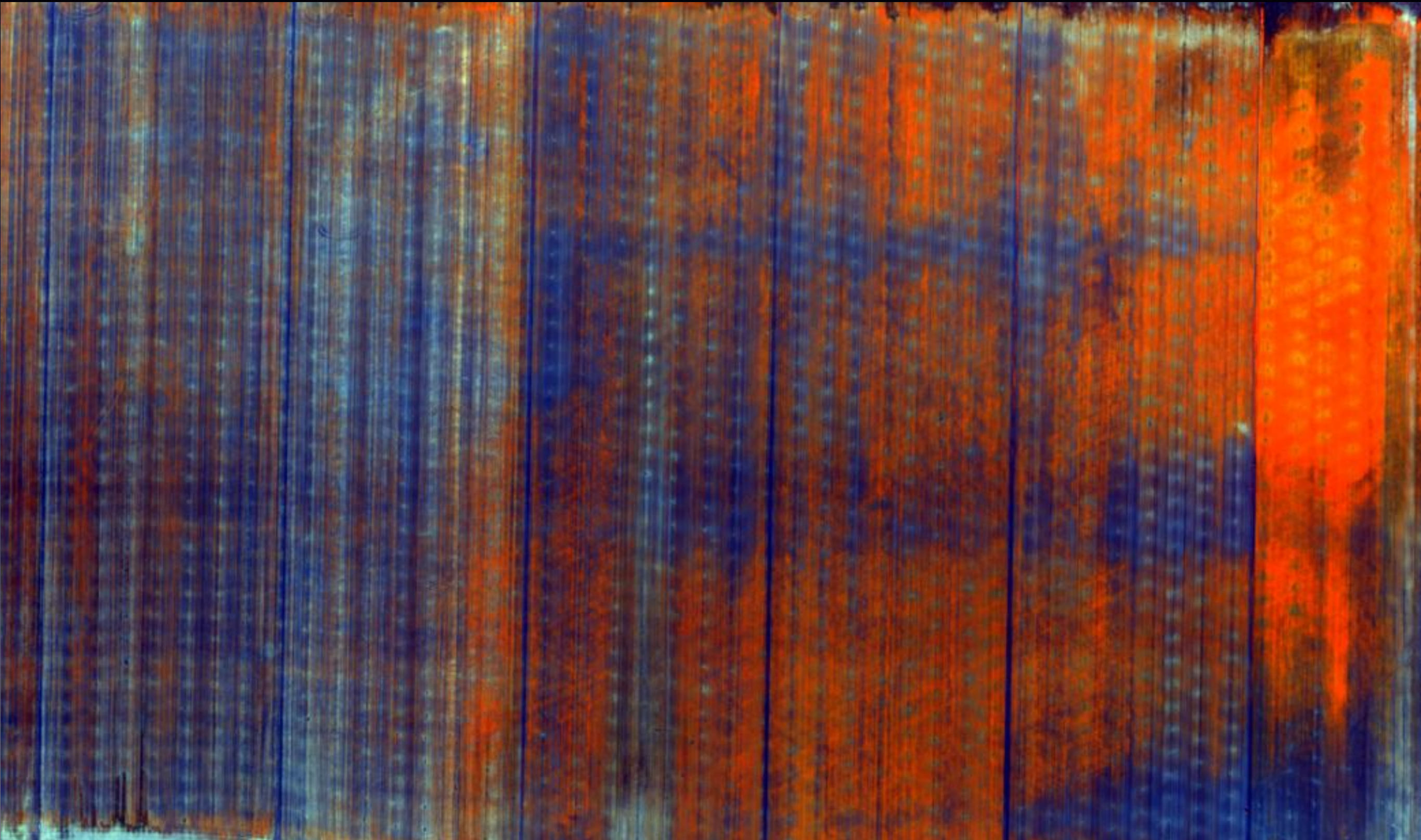
OSAVI



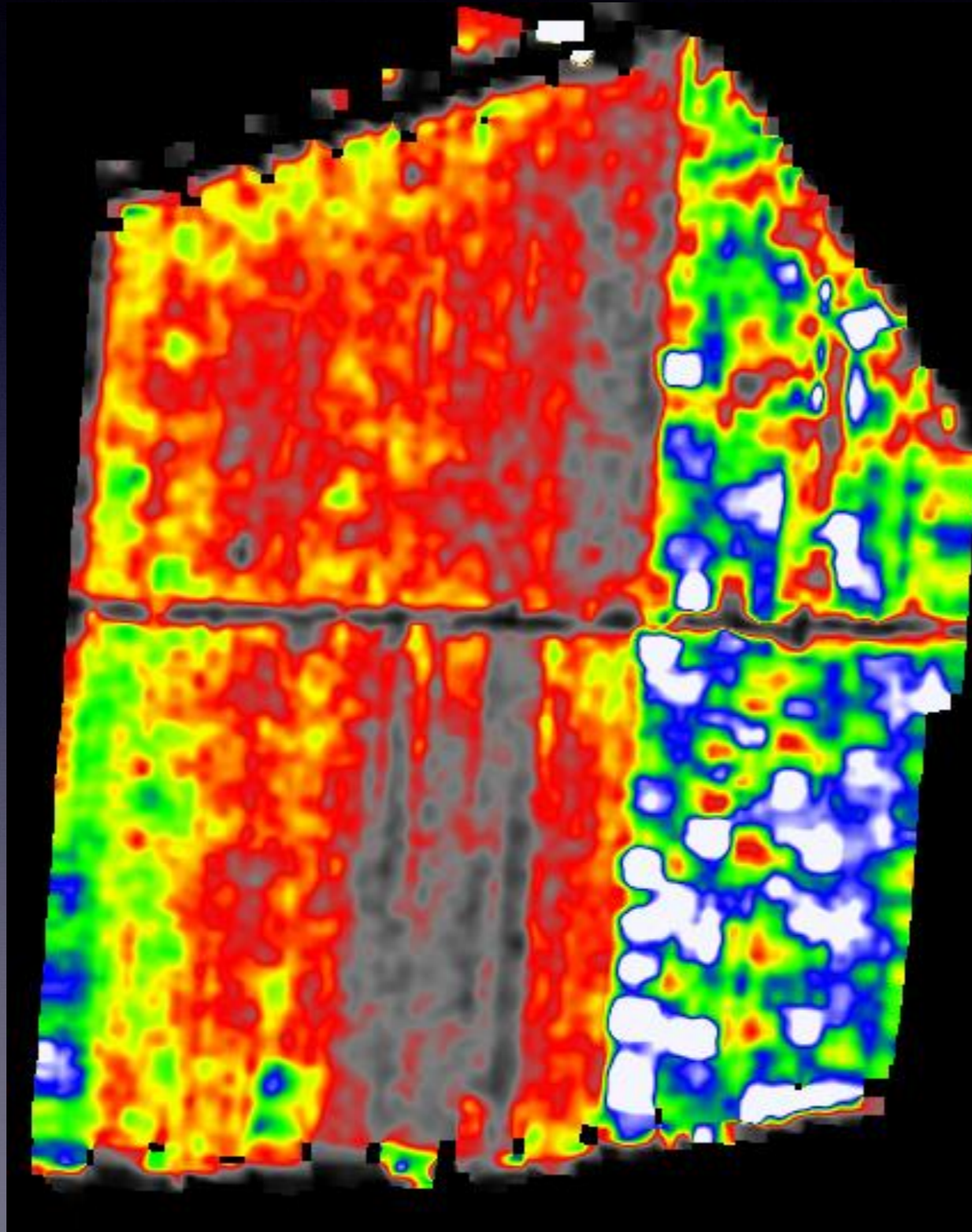
DSM



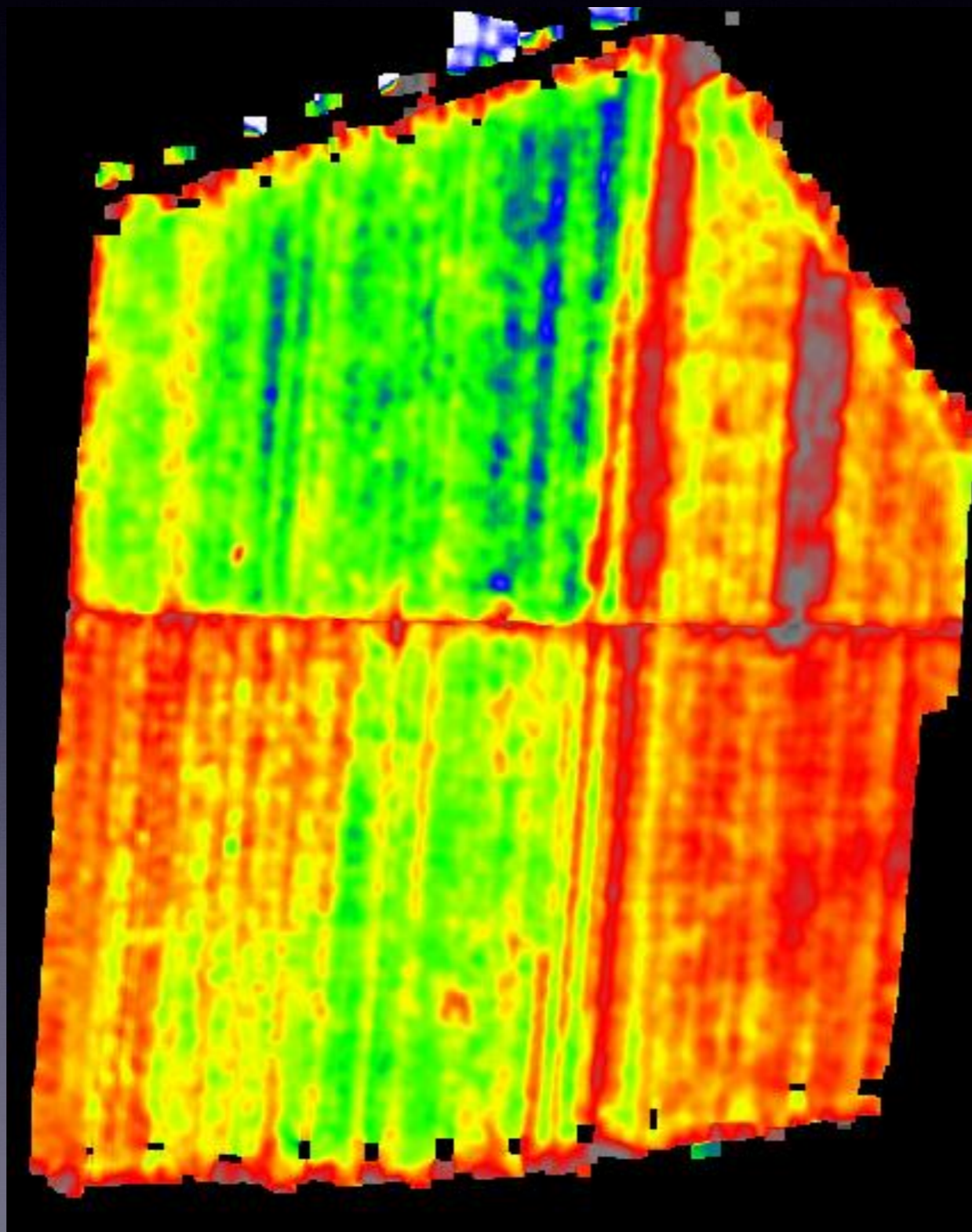
Weed Detect



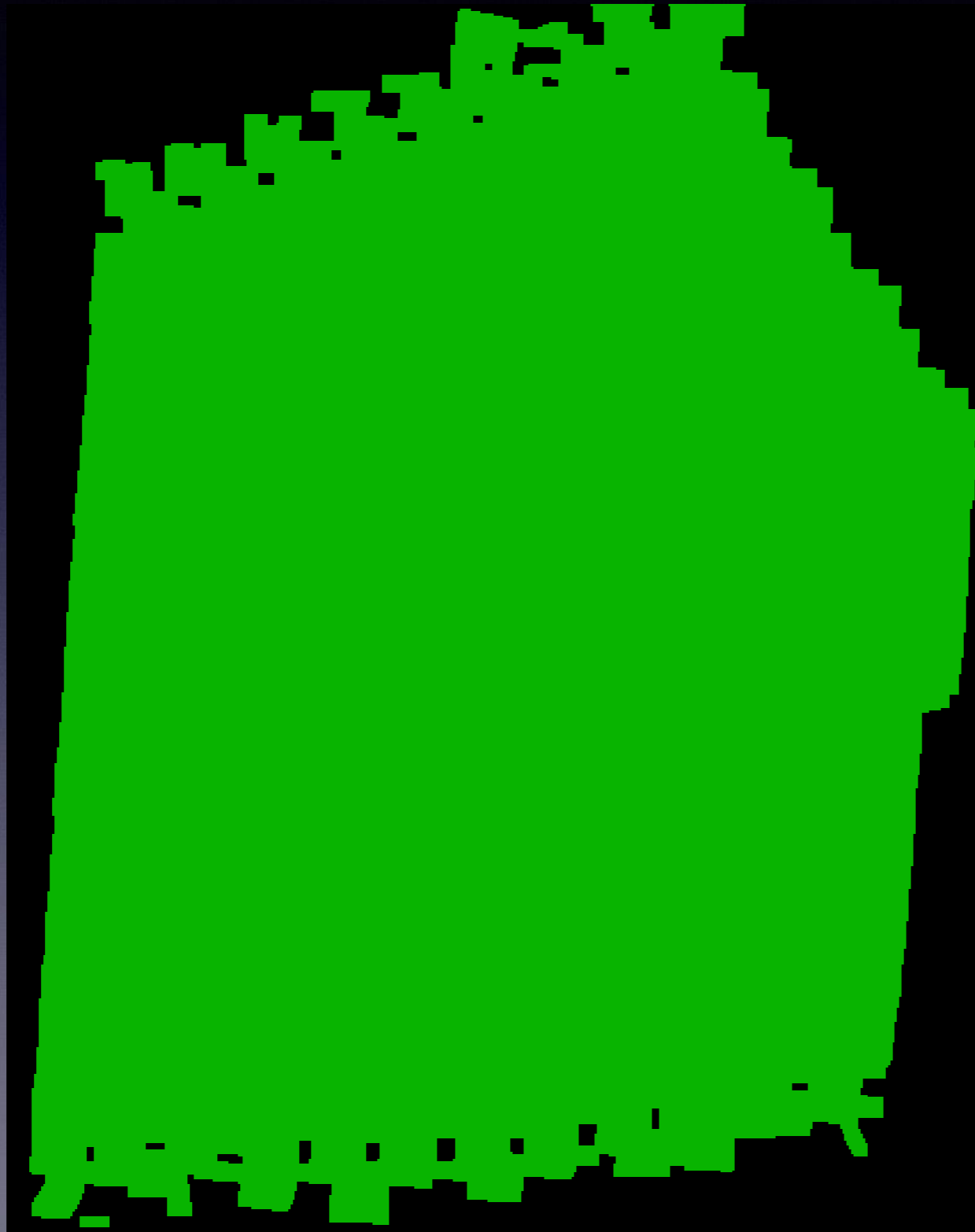
Population Density



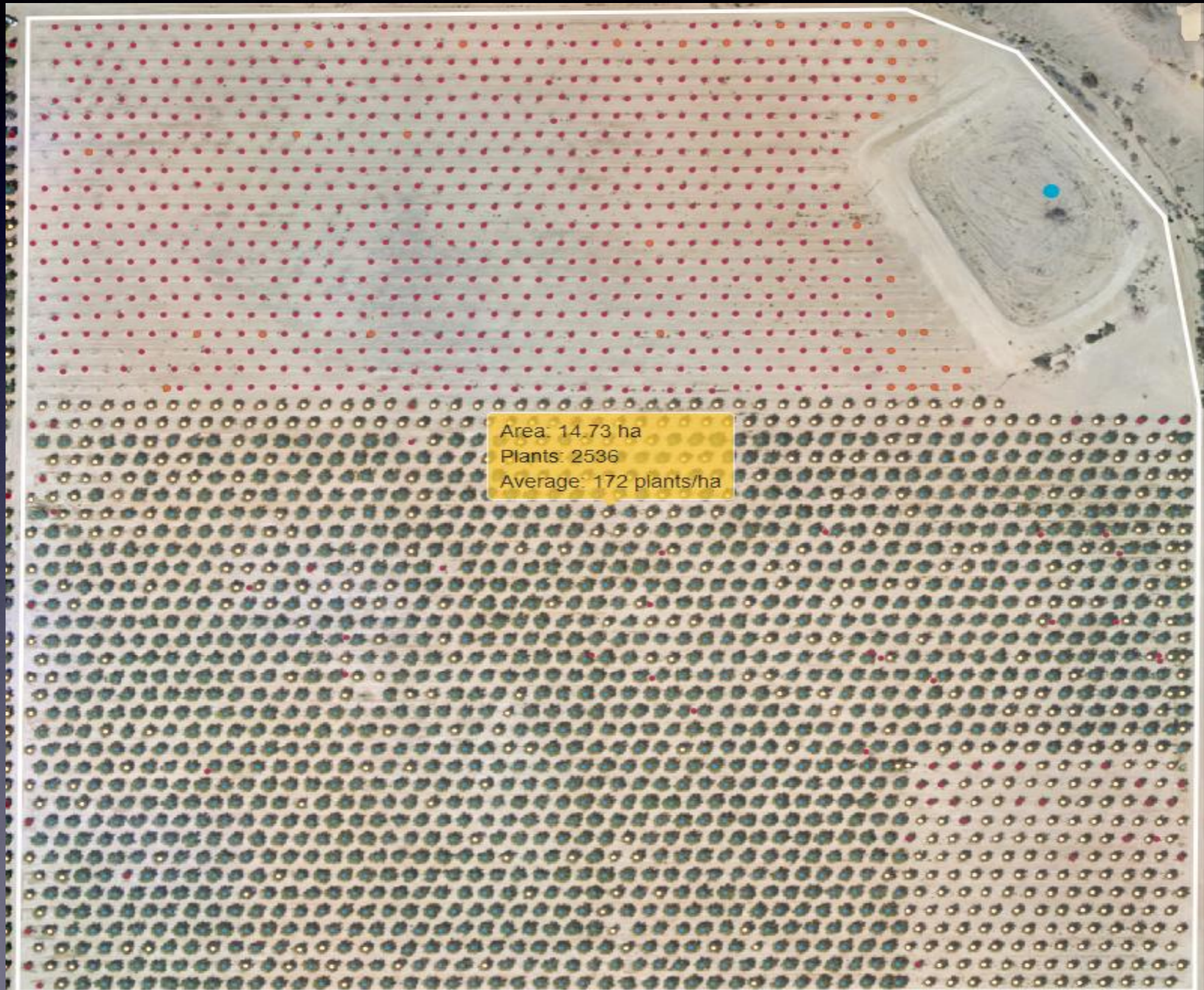
Plant Size



Emergence Fraction



Tree Count



What else can we do...

- Beneficial insect release
- Pollination
- Thermography

Not quite yet....

- BVLOS – Beyond Visual Line of Sight
- Extended operating hours – “Night Flight”
- Multiple aircraft operated by one pilot
- Pesticide Application
- Swarm Technology

Forward looking

- Robotics for hand labor replacement (not just auto thinning)
- Drone Tractors/spray rigs
- Hyper-Spectral?
- Long range/flight time for VERY remote

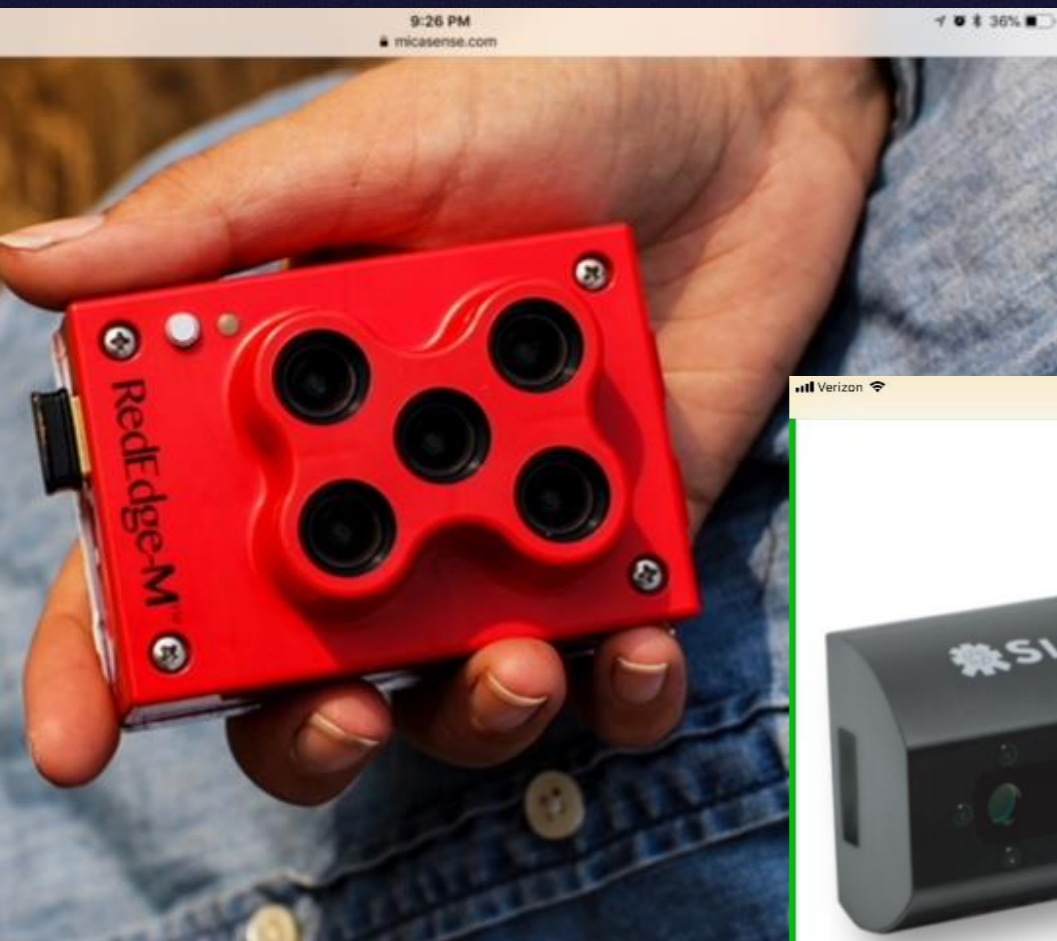
What do we fly?

- Birds - DJI M100s, M600 and Mavic Pros



What do we fly?

- Sensors – SlantRange, MicaSense RedEdge, Flir XT and X3



What do we fly?

- Parabug



Questions?