Using Drone Technology for Turfgrass Management

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Drones for Turfgrass Management

- Drones becoming cheaper, safer, easier to operate
- FAA Regulations - Safety, Pilot Licensing
- Uses:
  - Bird's eye view (regular digital image / video)
  - Advanced vegetation / stress mapping
    - Spectral reflectance (NDVI), thermal (turf temperature)
    - Image processing and interpretation requirements

Kansas State University

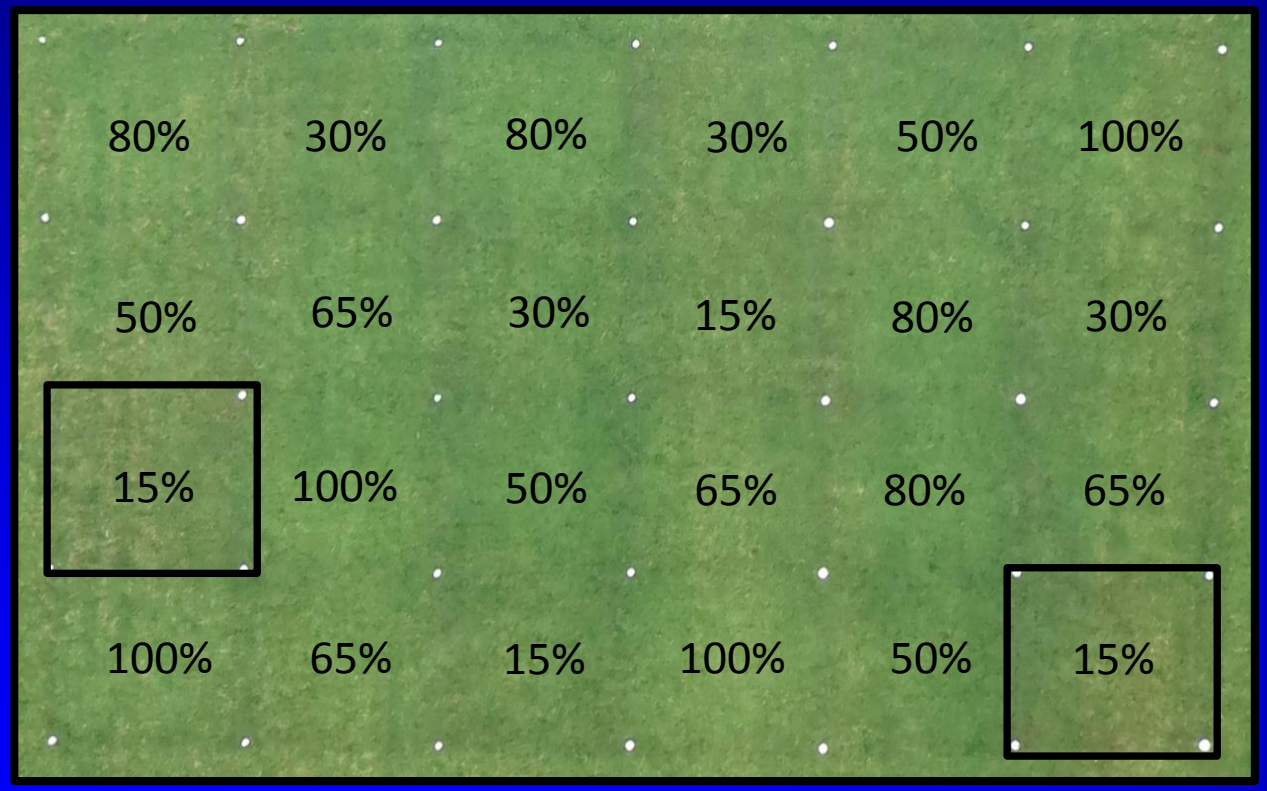
Research

Early Drought-Stress Detection Using Remote Sensing and Drones

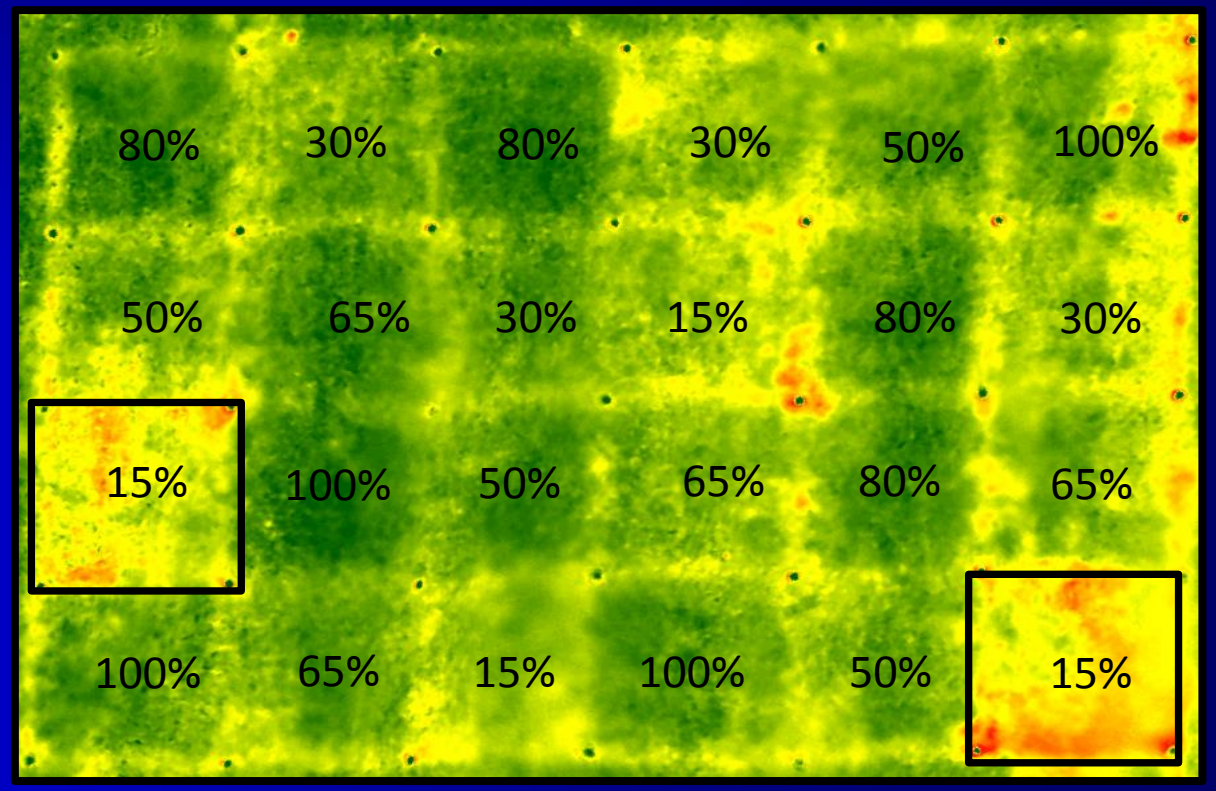
Aerial View, Irrigation Treatment Plots, June 15

Goal: Identify drought stressed areas before becomes visible

Digital photo



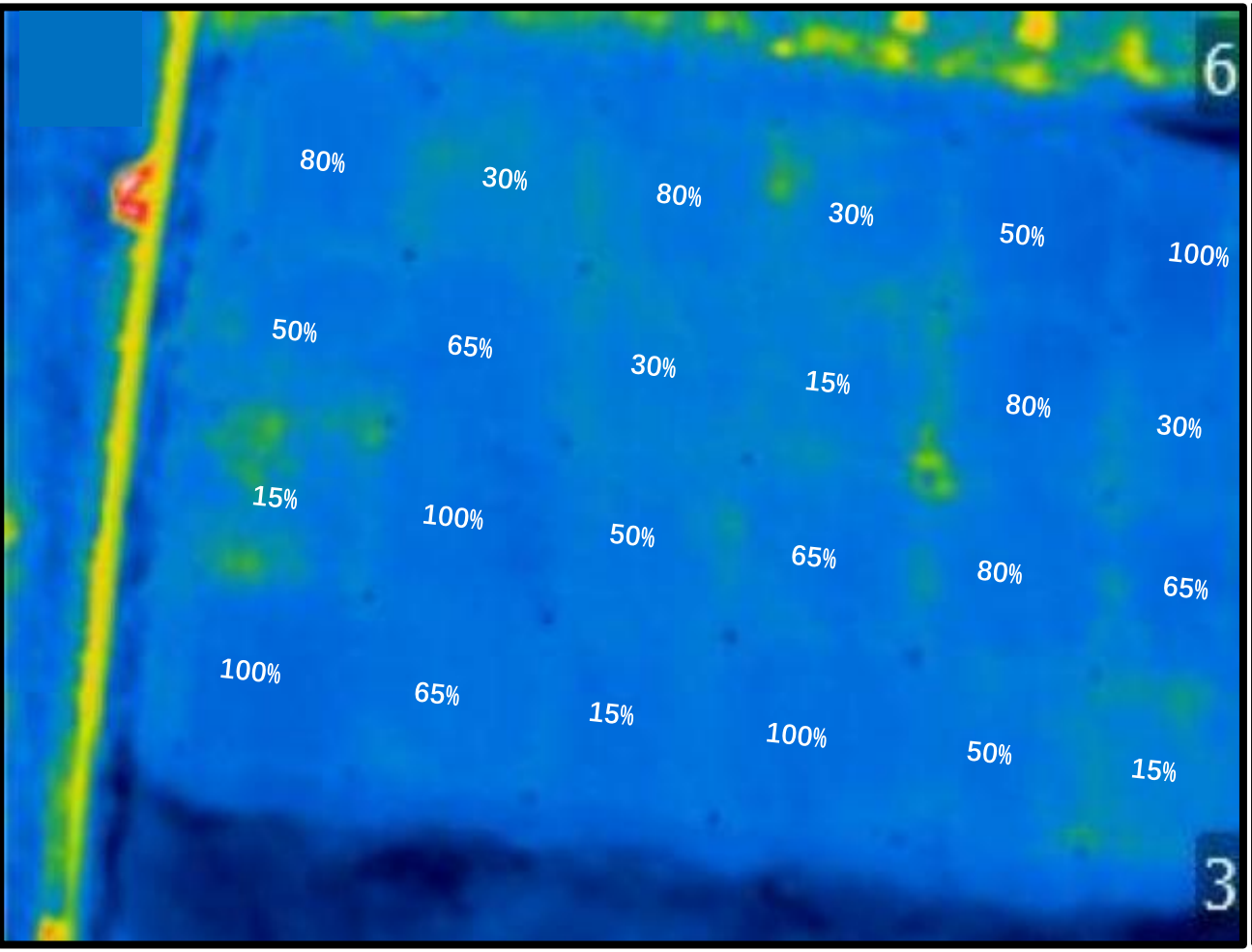
Spectral Reflectance (Near Infrared band)



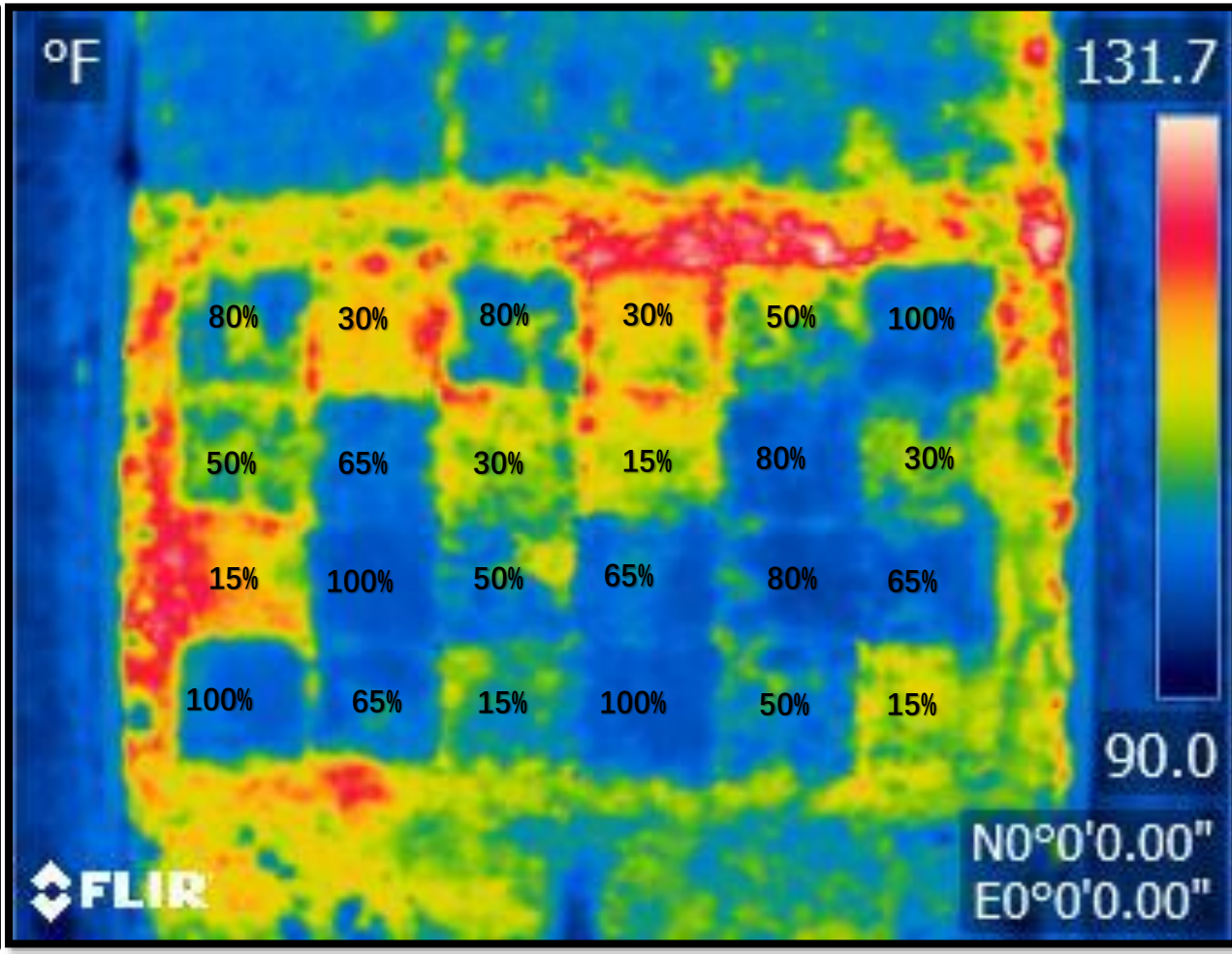
Creeping bentgrass, 5/8 inch mow height; well watered (100%) to very dry (15%)

Canopy temperature (Thermal Imaging) Across Irrigation Treatments

June 15



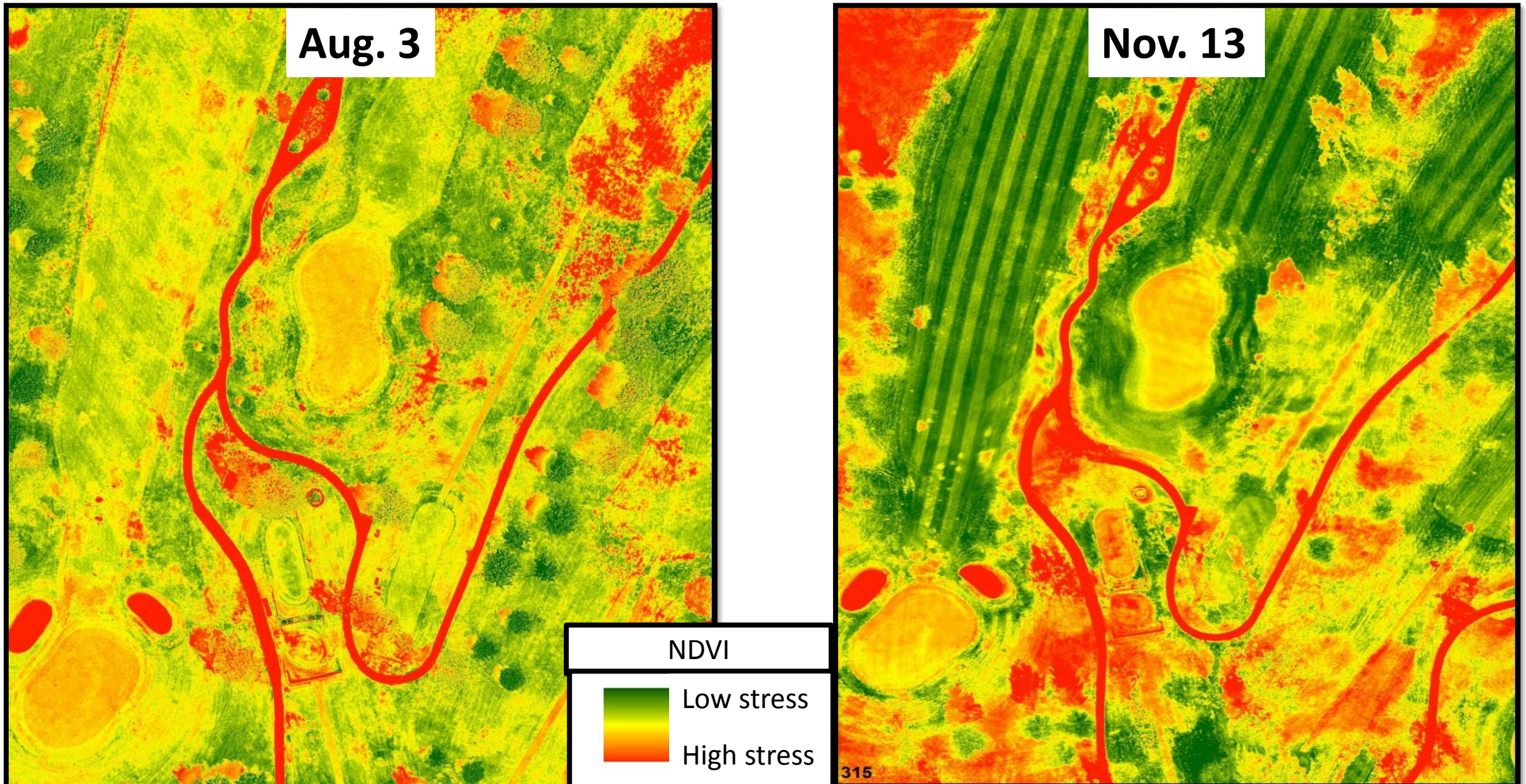
August 4



Summary

- Ultra-high resolution remote sensing with drones can detect drought stress before it is visible to the human eye
- Actual field measurements more complex
  - Requires ground truthing by turfgrass managers

Manhattan Country Club Golf Course, Manhattan, Kansas
Changes throughout Growing Season



Traffic, Disease Mapping

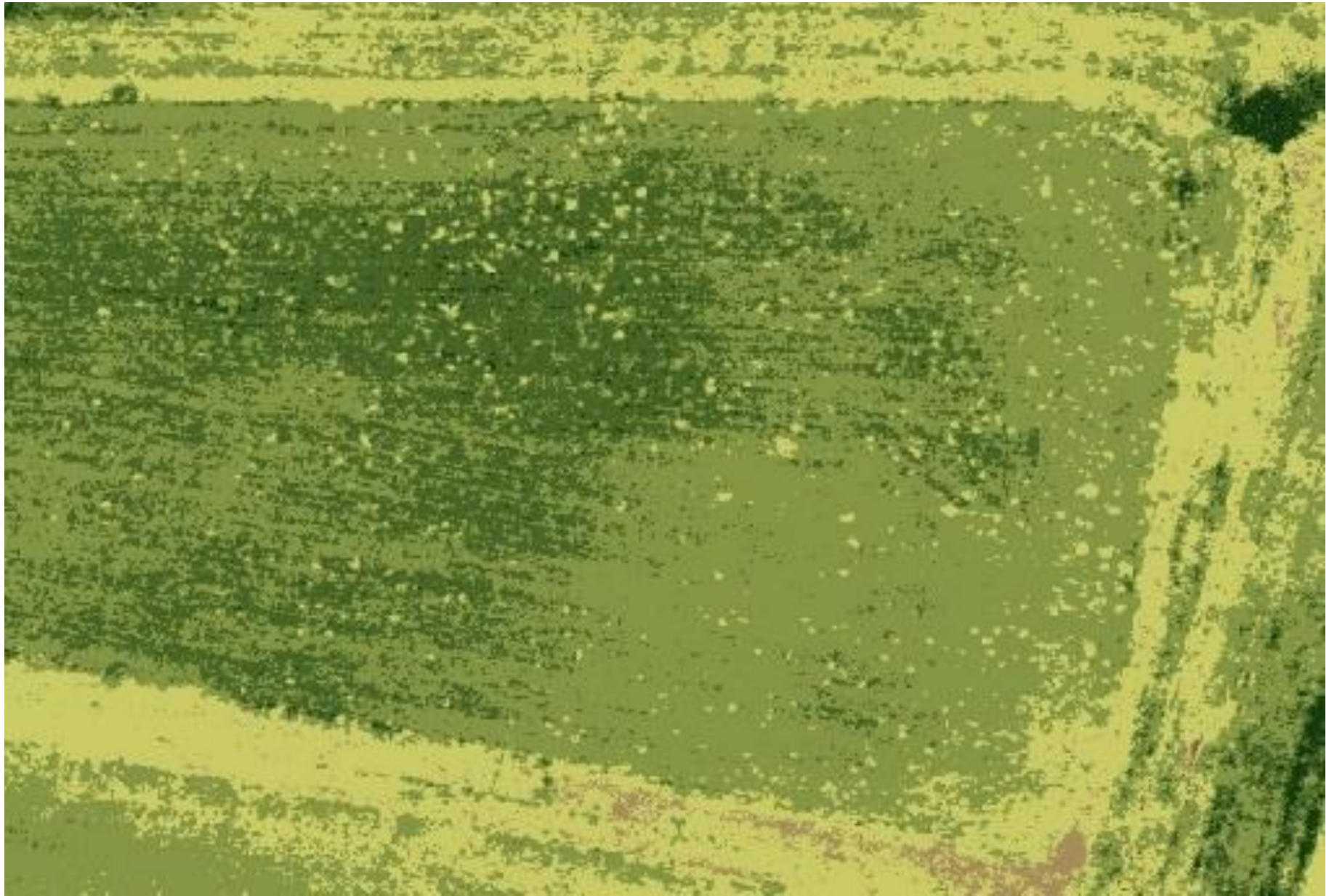
Culpeper Sports Complex
Culpeper VA Parks & Rec

Dr. David McCall
-Virginia Tech Univ.

Dr. Dana Sullivan
-Turf Scout

Digital image from drone
Green:Red ratio

Spring Dead Spot Disease Mapping



NDVI Traffic Mapping

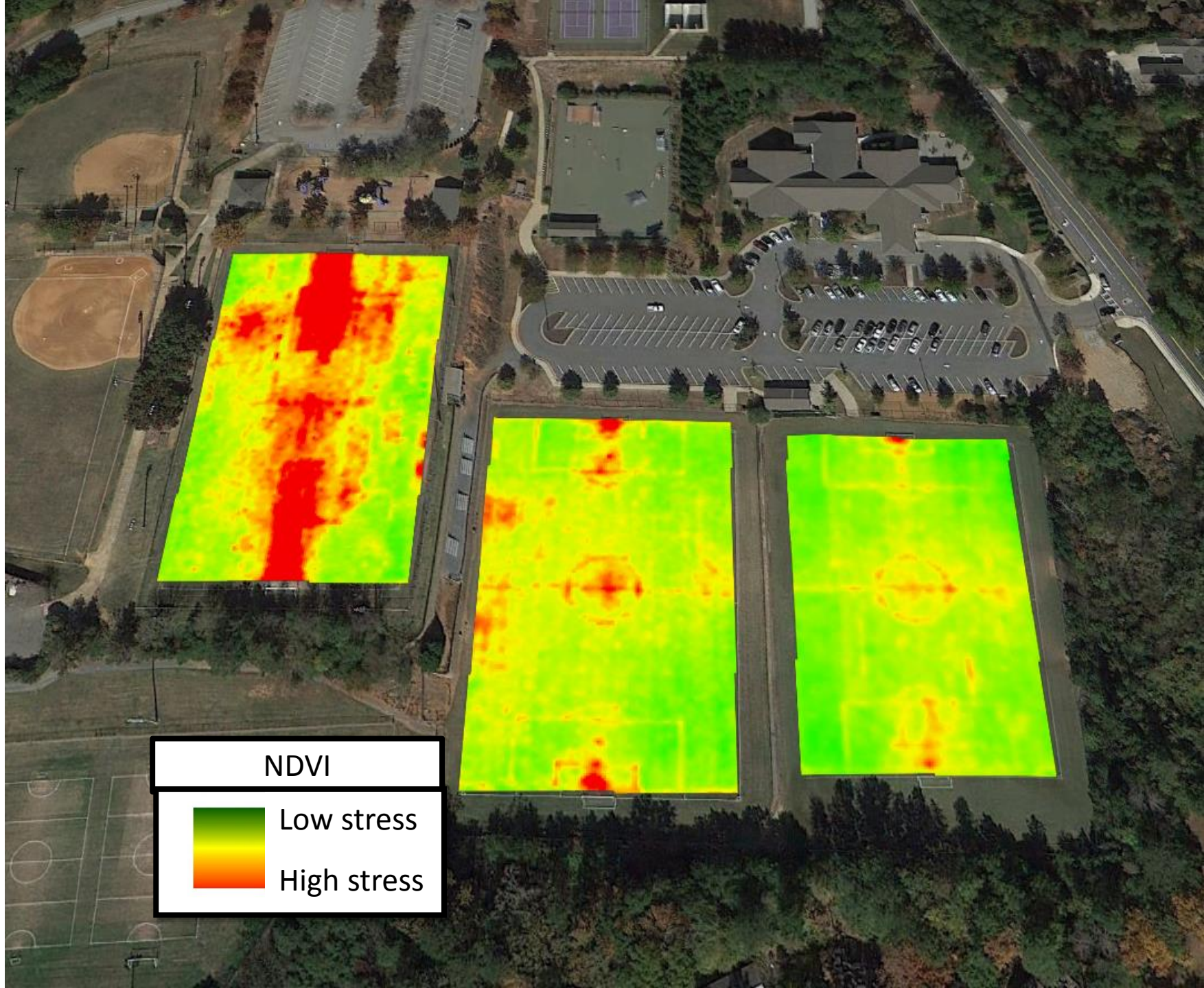
Park in Roswell, GA

Dr. Chase Straw
-Texas A&M Univ.

Processed by Kathy Rice
-Toro

Measured by Ground-based proximal sensors

- Conceptually the same as images from drones



Traffic Mapping

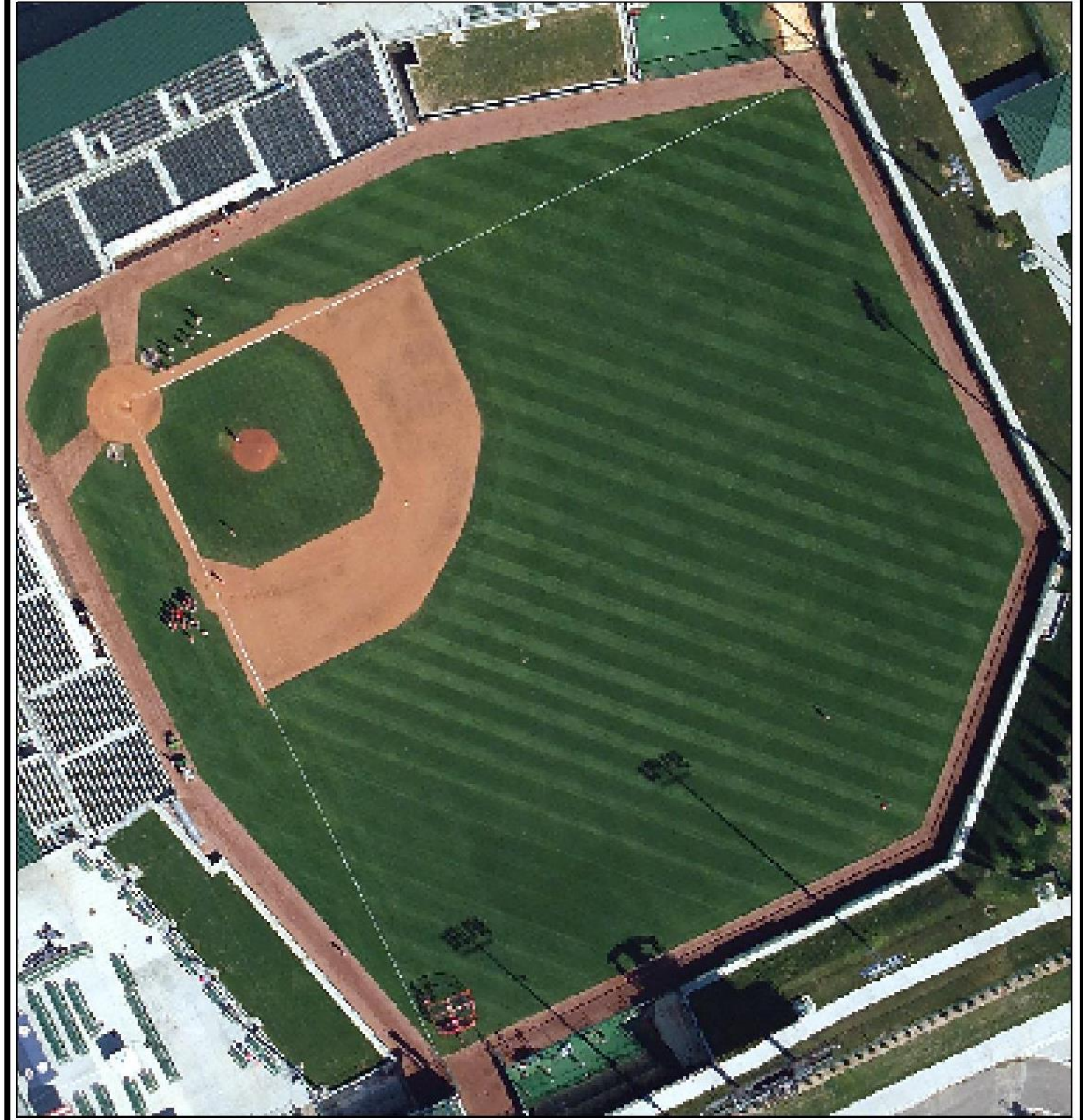
Haymarket Park
Lincoln, NE

Dr. Kyle Holland
-Holland Scientific

Processed by Aaron Schepers

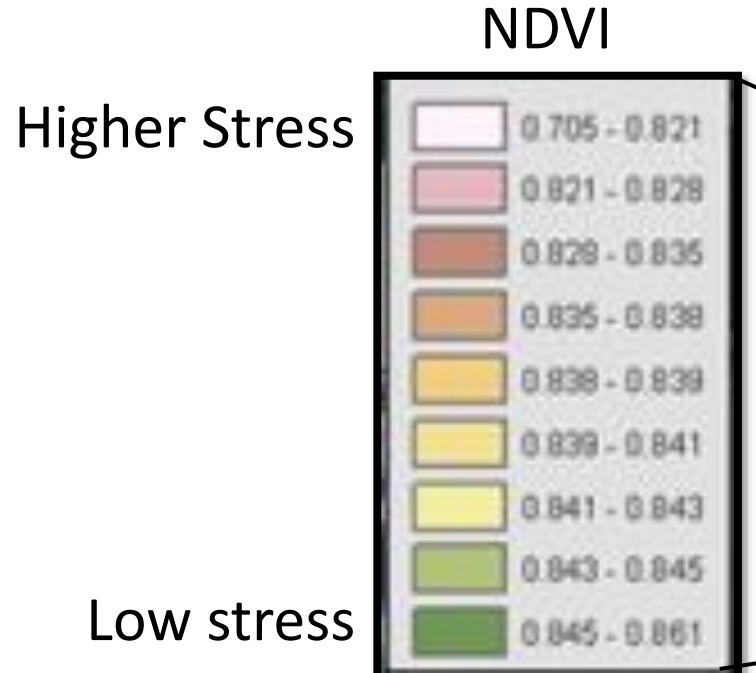
Measured by
Ground-based
proximal sensors

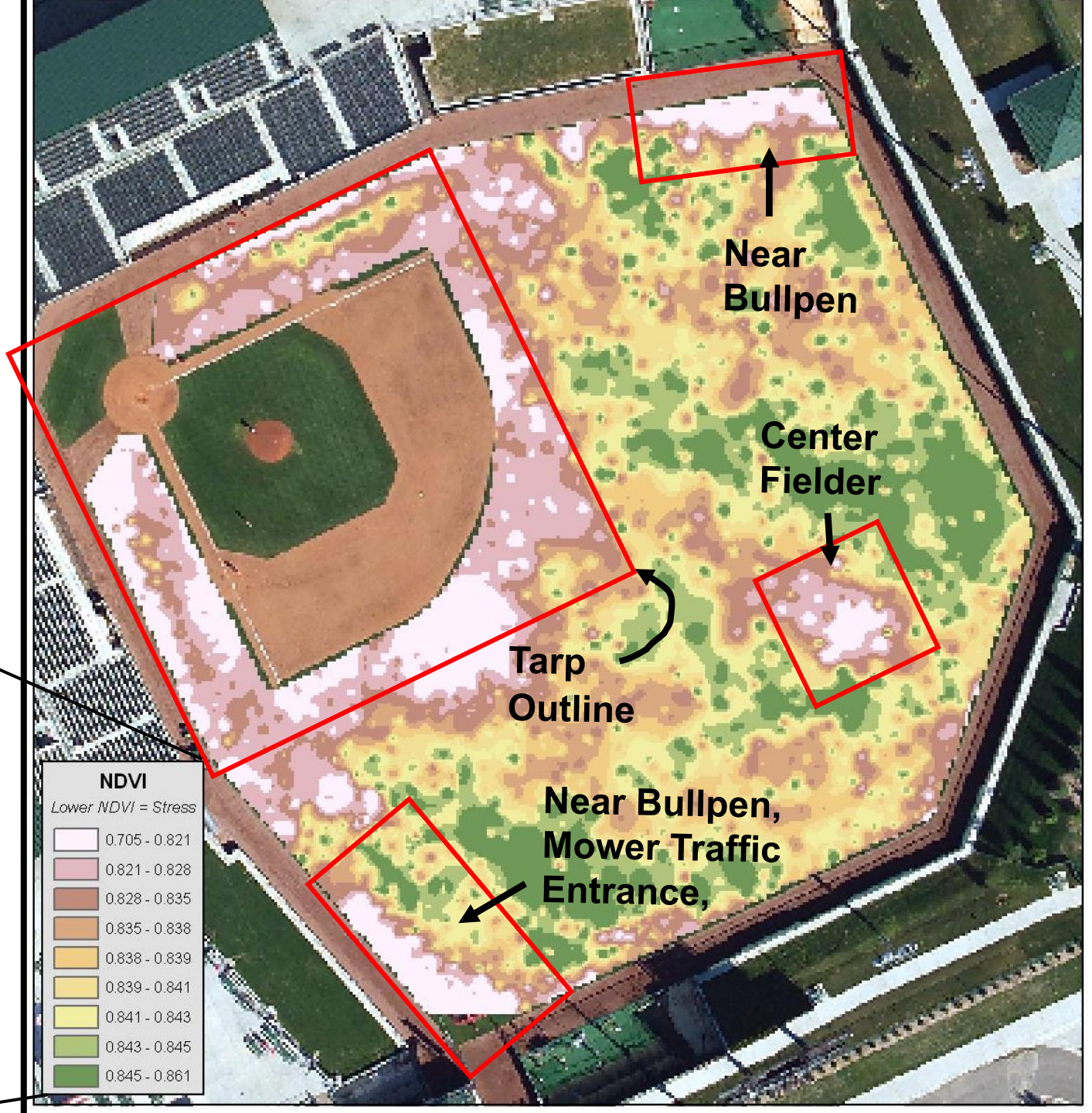
- Conceptually the same as images from drones



Ground-based NDVI measurements

- Conceptually the same as images from drones
- Measurements with drones = faster





Integration into Turfgrass Management

- Diagnose patterns of turfgrass stress **before visible**
- Frequent measurements throughout growing season
  - ✓ Dynamics of various turfgrass stressors
  - ✓ Historical record
  - ✓ Turf manager's key role (Ground Truthing)
- Drone Pilot: Turfgrass manager or consultant
- Collection, processing, and interpretation of drone remote sensing data
- Artificial Intelligence (AI) learning(?)
- 3D Mapping

Acknowledgements / Questions?

- Dr. Deon van der Merwe
  - GD Animal Health, Deventer, the Netherlands
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- Irrigation Innovation Consortium (IIC)
- Kansas Turfgrass Foundation (KTF)
- K-State Poly UAS Program
- K-State Turf Group