

Managing Vegetables with Aerial Imagery

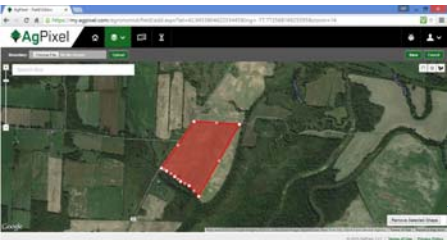
Bill Verbeten
Empire Ag Imagery LLC

Take Home Points

- ▶ Plane-Based Imagery Produces Geo-Referenced Scans of Fields Using Different Types of Imagery
- ▶ Aerial Imagery of Bare Soil Can Map Tile Lines, Poorly Drained Areas, Soil Erosion, and Soil Properties
- ▶ Aerial Imagery of Vegetable Fields Can Count Crop Populations, Detect Crop Damage, Pest Outbreaks, and Monitor Crop Growth & Development


Mapping Fields

▶ Step 1: Load or Draw SHP file into Flight Plan



Mapping Fields

▶ Flight Plans




Mapping Fields

▶ Step 2: Fly the Fields At the Right Time Of Day and Weather Conditions



Mapping Fields

▶ Number of Pictures, Overlap, & Resolution



Mapping Fields

▶ Step 3: Imagery Processing Delivered the Day After Flying




Mapping Fields

▶ Step 4: Using Imagery to Inspect Fields



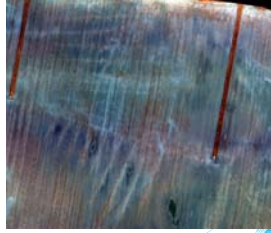
Types of Imagery Used to Scan Fields

- ▶ RGB - Erosion, Weeds, Soil Properties
- ▶ Enhanced Color - Drainage, Plant Growth
- ▶ NDVI - Plant Health, Plant Growth, Weeds, Harvest Timing



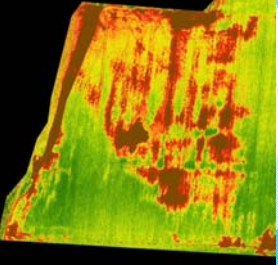
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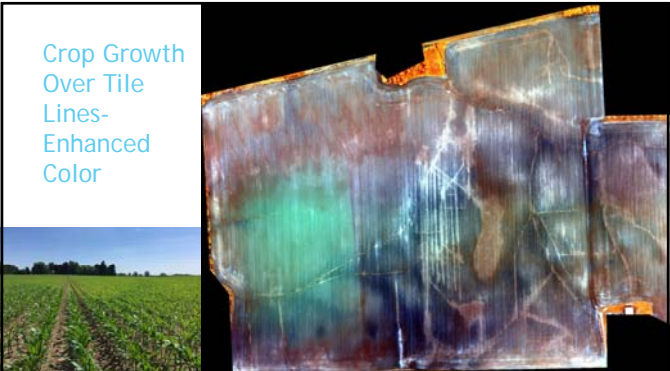


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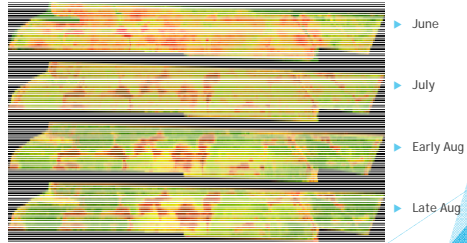
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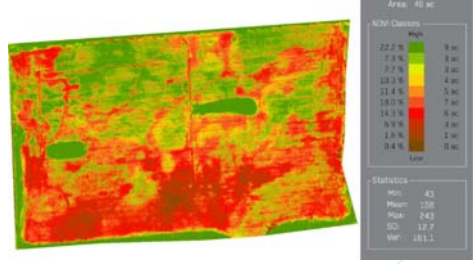
Crop Growth Over Tile Lines-Enhanced Color



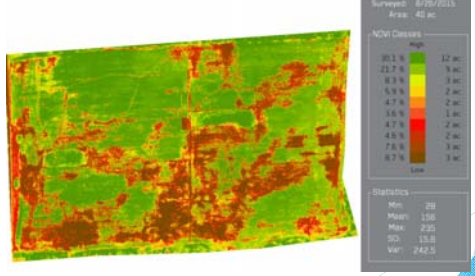
Poor Lima Bean Growth Due to Drainage-NDVI



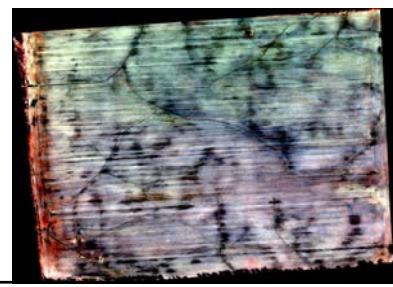
Measuring Areas of Poor Growth in Lima Beans-NDVI



Measuring Areas of Poor Growth in Lima Beans-NDVI



Mapping Surface Drainage Ditches-Enhanced Color



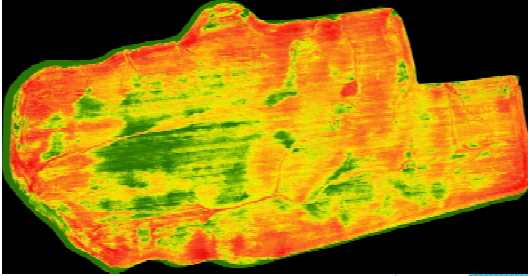
Mapping Soil Erosion-RGB



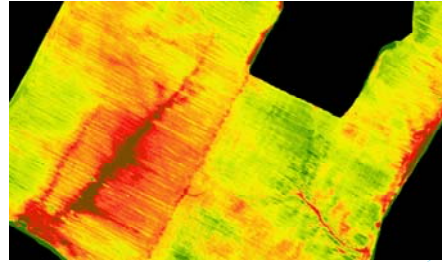
Mapping Soil Erosion-RGB



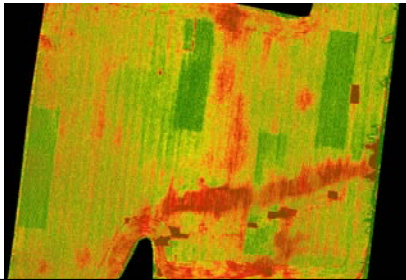
Bare Soil Properties-NDVI



Bare Soil Properties-NDVI



Nitrogen, Drainage, & Planting Gaps in Corn-NDVI

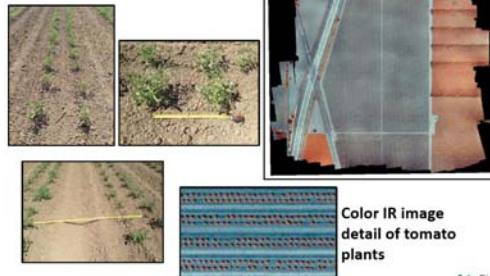


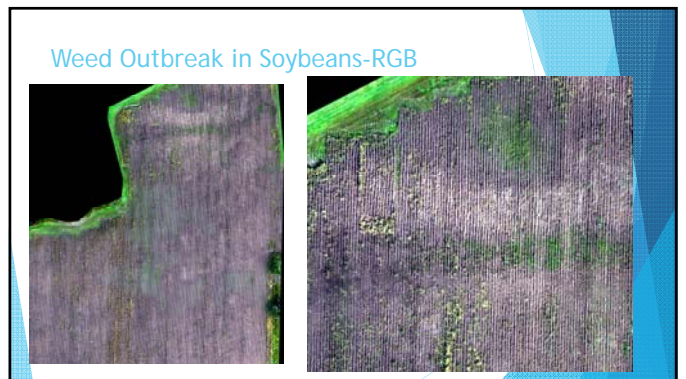
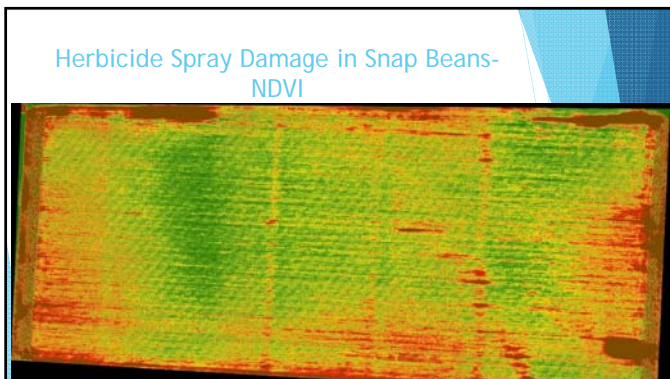
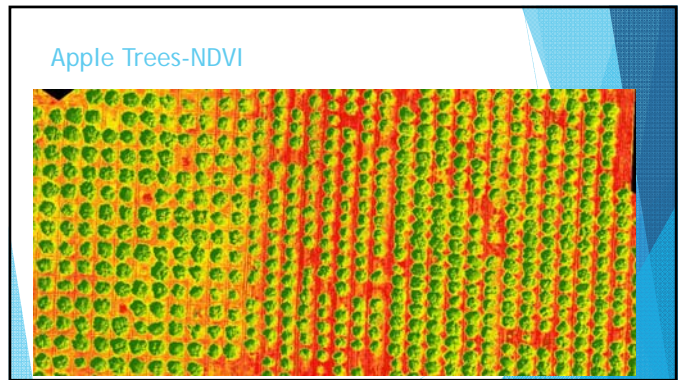
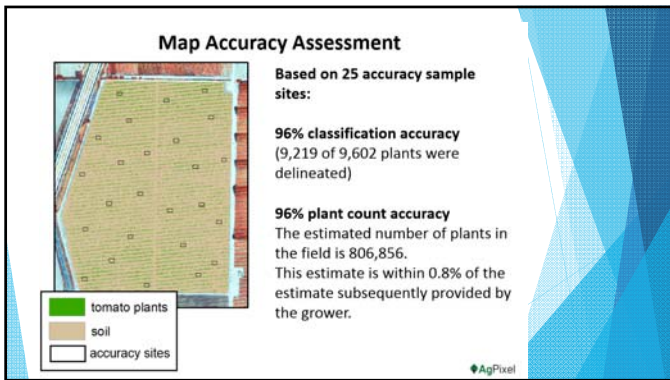
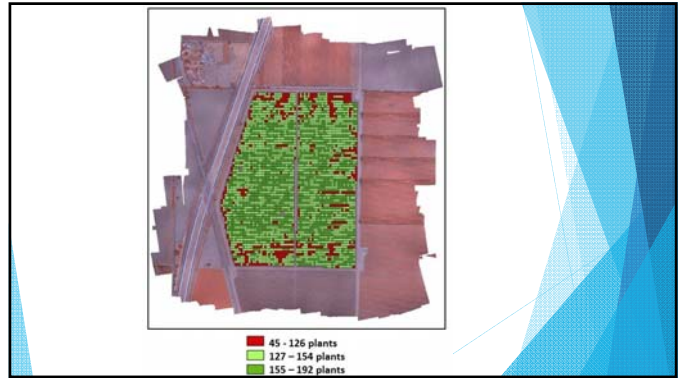
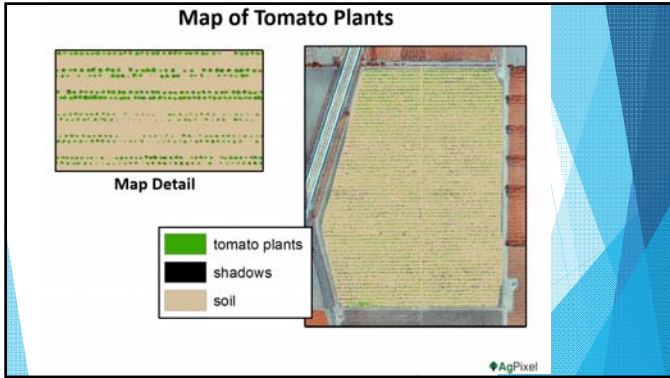
Planting Gaps in Corn-NDVI

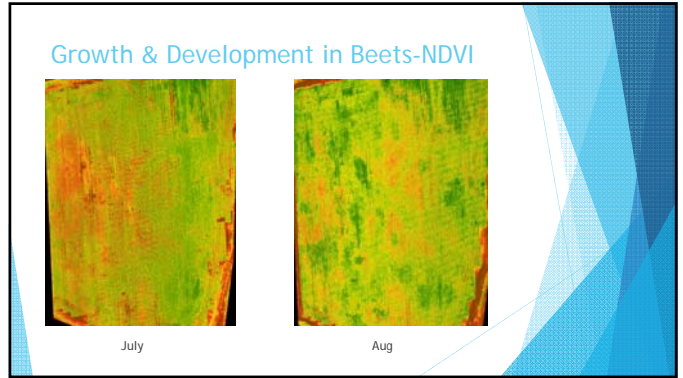
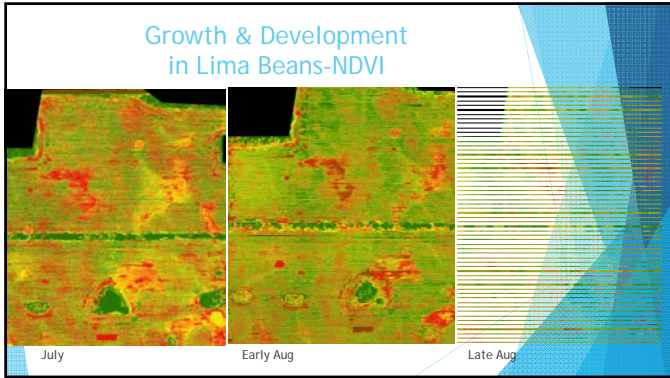


Counting Plant Populations

Tomatoes
Color Infrared Orthomosaic
(1.5 in Cessna data)

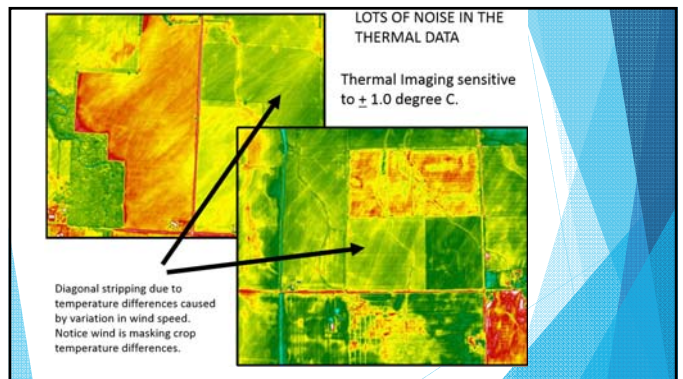
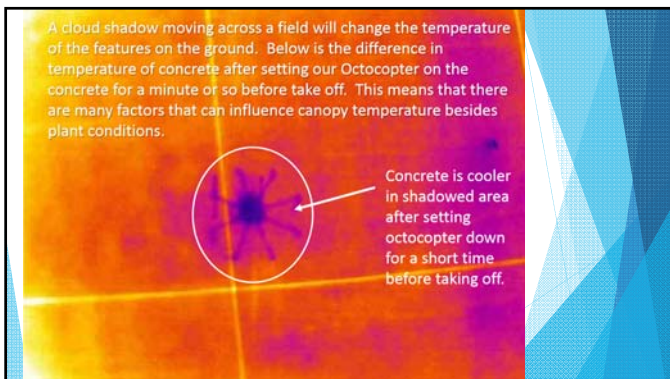






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- ### Why not use Thermal Imagery?
- ▶ Too sensitive to interference & shadows
 - ▶ Cannot orthorectify, difficult to geo-reference, coarser resolution
 - ▶ If interference is minimized, the thermal imagery is highly correlated to NDVI



NDVI map on the left vs. thermal image on the right. Both datasets were acquired at the same time on August 1, 2014 over a corn field in southwest Nebraska. Notice the thermal image does not cover the entire field because the entire field was not captured in the single acquisition where the spectral imagery can be compiled into a mosaic for the entire field. Notice the similar patterns in both images, suggesting that the information obtained using the two measurement methods is very similar between the two datasets.

NDVI Map Thermal Map

AgPixel
imagery to intelligence

AERIAL IMAGERY: AIRCRAFT vs. SATELLITE
AgPixel's data products, created from high-resolution aerial imagery, provide detailed, pixel-level intelligence for timely analysis.

AgPixel standard product resolution
10-inch pixels (8.25 m)

Study both images. In which close-up can you see corn stalks blown over?

Sample resolution

Hail Damage in Soybeans-NDVI

Impact of Cover Crops on Lima Beans-NDVI