

Genomes to Fields 2014 Workshop

Airplane aerial imagery

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Chicago, IL

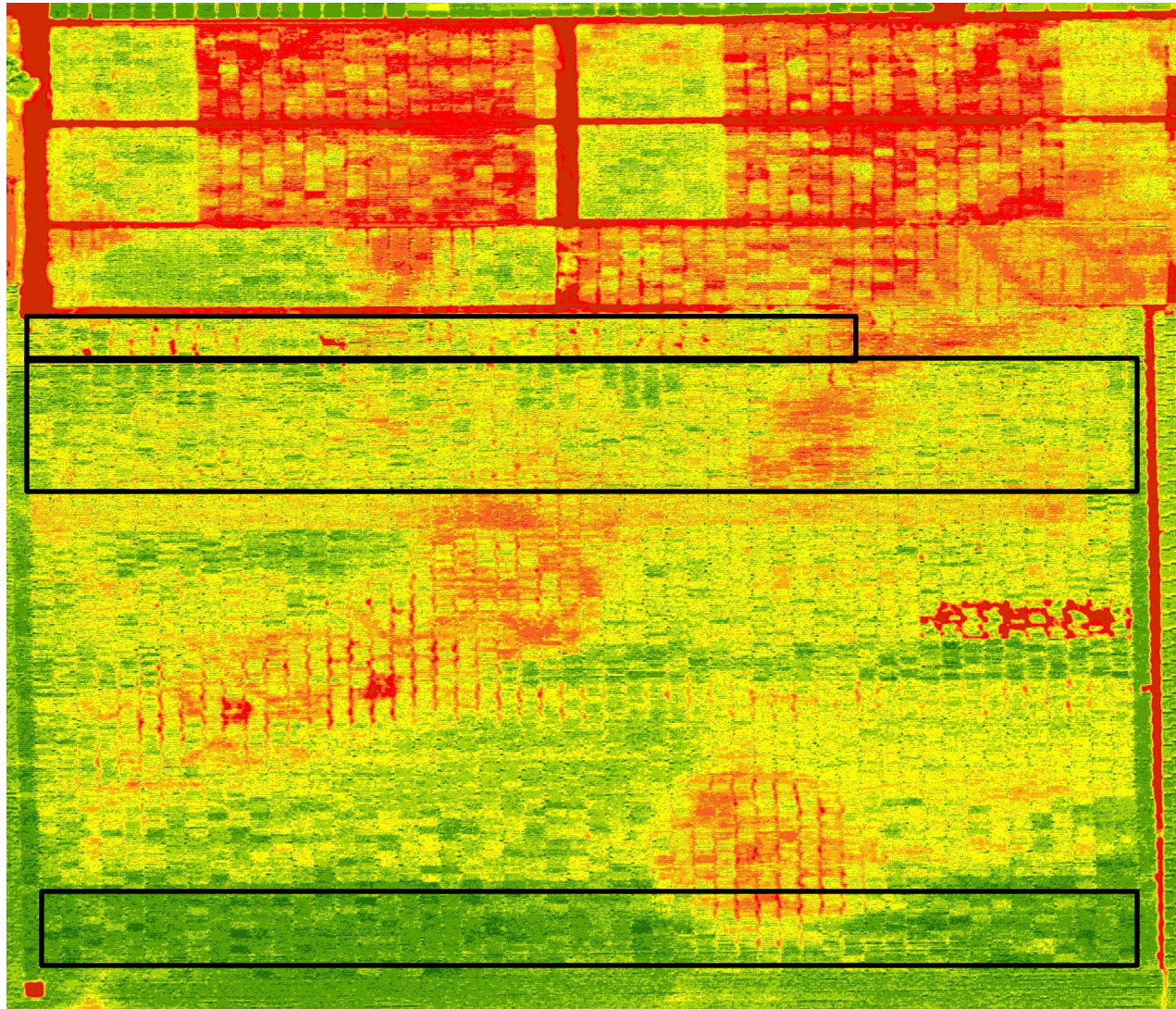
December 10

2014 Data Collection

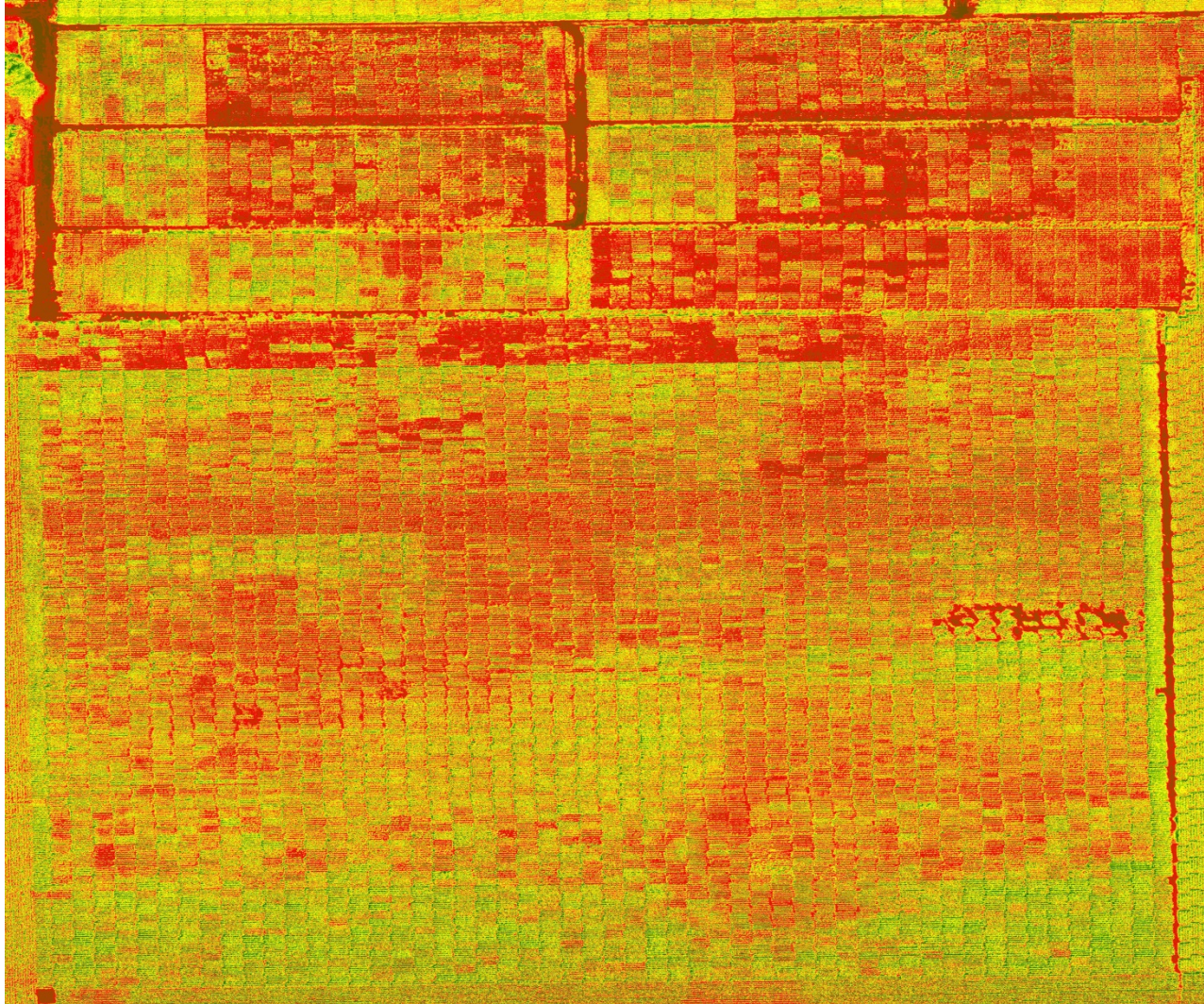
- ✧ Three Cessna flights (Roboflight Incorporated)
 - ✧ Flight 1 on 8/14/2014 at 3,000 feet
 - ✧ Resolution approximately 25 cm/pixel
 - ✧ Flights 2 and 3 at 1,000 feet
 - ✧ Resolution approximately 4-7 cm/pixel
- ✧ Normalized difference vegetative index
 - ✧ $(\text{NIR} - \text{Red}) / (\text{NIR} + \text{Red})$
 - ✧ NIR=760 nm, Red=660 nm



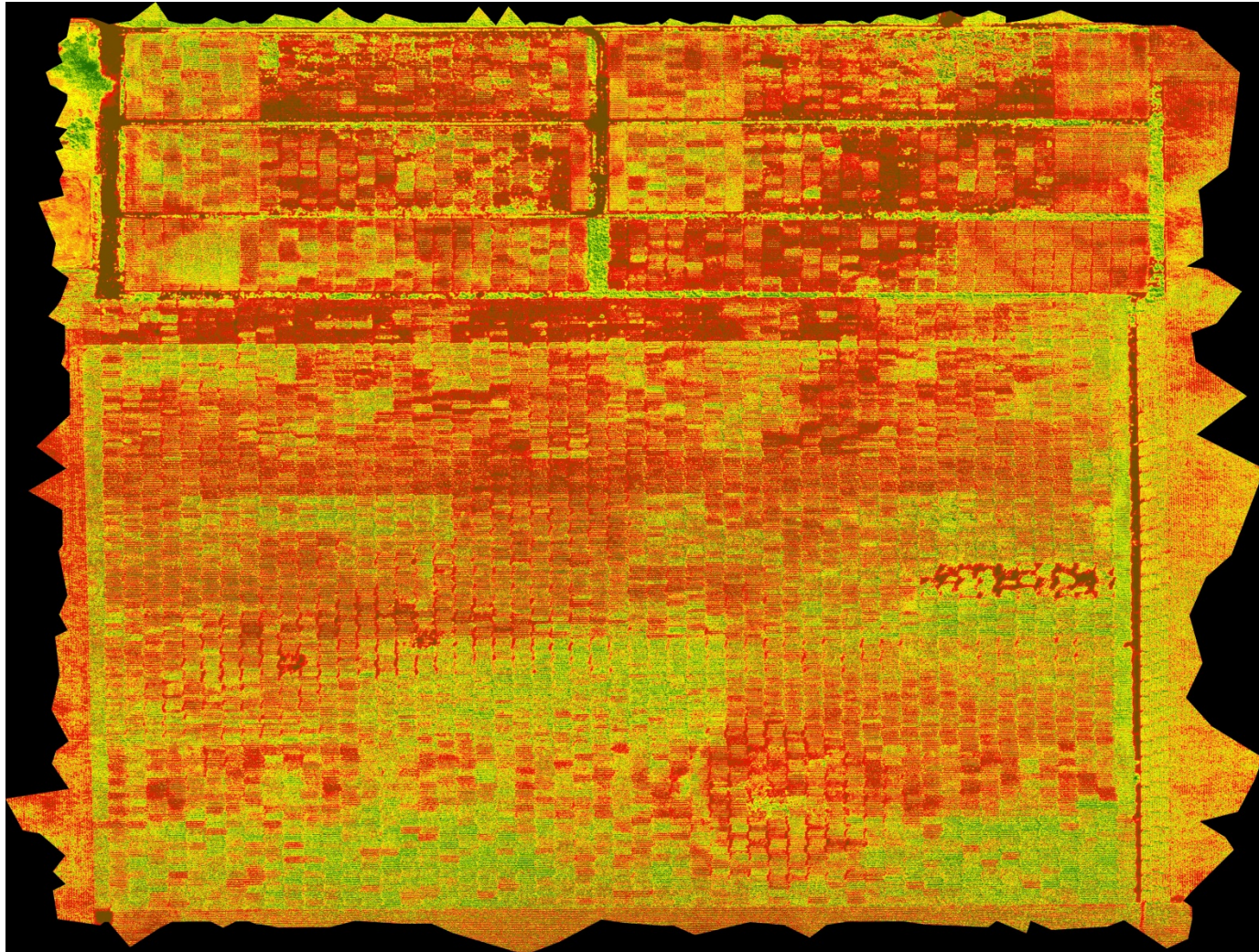
8/14/2014



9/7/2014



9/18/2014

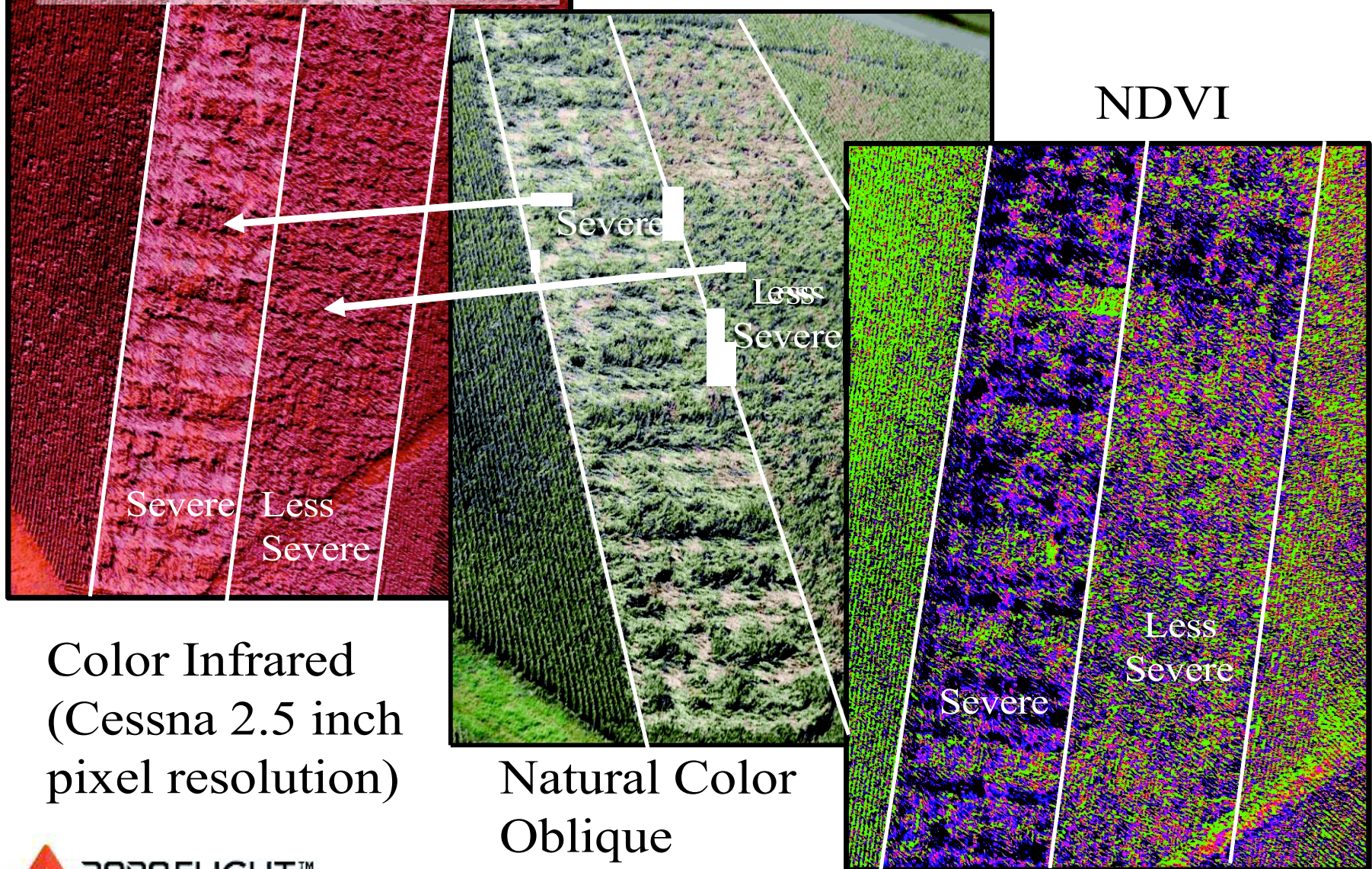


Lodging from the ground



Corn Root Lodging in University Genetic Breeding Plots

Corn Genetics susceptible to root lodging



Color Infrared
(Cessna 2.5 inch
pixel resolution)

Natural Color
Oblique

Analysis plans

- ✧ Average NDVI on a plot basis
 - ✦ Compute average NDVI from row-to-row (30" width) in 2 row plots
- ✦ Correlate NDVI with phenotype
 - ✦ Grain yield for all locations
 - ✦ Flowering dates in Ames where available and wide variation in flowering times



Future Plans

- ✧ Stand counts and plant spacing
 - ✧ Season long imagery to model phenology
 - ✧ Additional indices
 - ✧ Senescence Index (PSRI) $(\text{Red}-\text{Green})/\text{NIR}$
 - ✧ Leaf Structure $(\text{NIR}-\text{Blue})/(\text{Green}-\text{Blue})$
 - ✧ Chlorophyll Index (CI) $(\text{NIR}/\text{Green})-1$
 - ✧ Biomass Ratio NIR/Red
 - ✧ Leaf Area Index (SAVI) $(\text{NIR}-\text{Red})(1+L)/(\text{NIR}+\text{Red}+L)$
- Blue=460 nm, Green=510 nm, Red=660, NIR=760 nm, L=soil baseline



Phenotypic prediction

- ✧ Conduct more intense ground phenotyping at a subset of locations (as some did 2014 inbreds)
- ✧ Conduct season long imaging with best available imaging platform (gold standard: collaborative effort with NLAE, Ames, planned in 2015)
- ✧ Conduct season long imaging at as many locations as possible
 - ✧ Cessna in 2015 as in 2014
 - ✧ Add as many locations as feasible with at least Cessna-quality images
- ✧ Questions
 - ✧ What phenotypes can be predicted from best available platform?
 - ✧ What phenotypes can be predicted from the Cessna?
- ✧ Based on those 2 questions, predict phenotypes at additional imaged locations to correlate phenotype and performance

