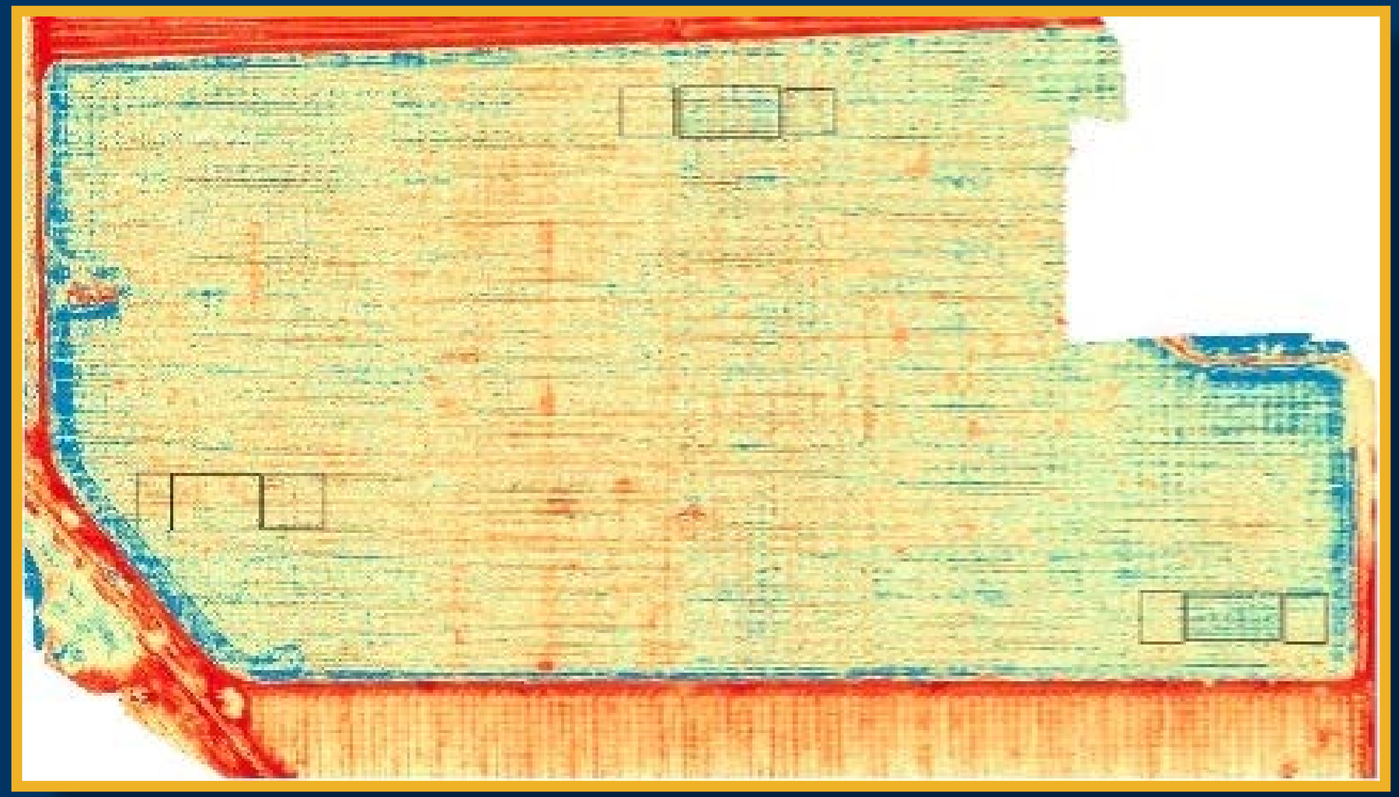
Nitrogen Management Webtool Seminar for CCAs and Crop Consultants



What do we want from an N-management program?

Optimize fertilizer use by using in-season measurements to get a better idea of the crop nitrogen status.

Producing an N recommendation

What is required?

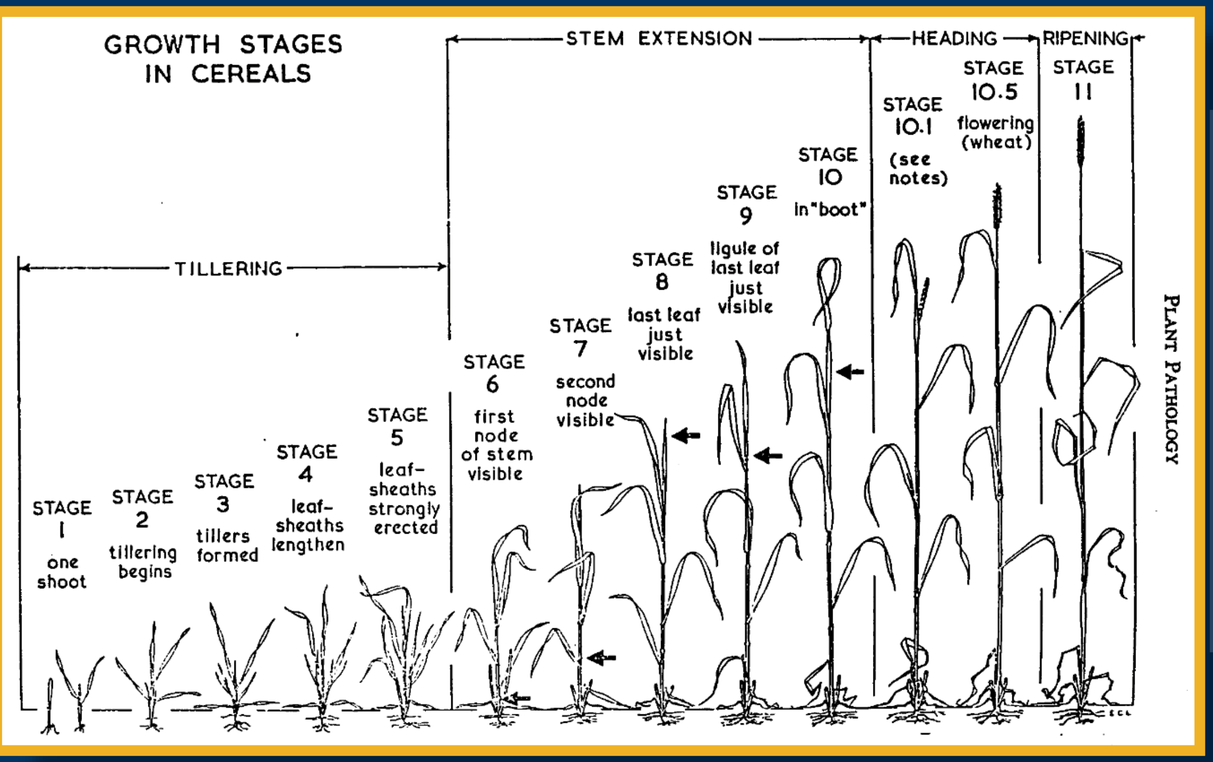
- Reducing pre-season fertilizer
  Shifting a greater percentage of fertilizer to in-season

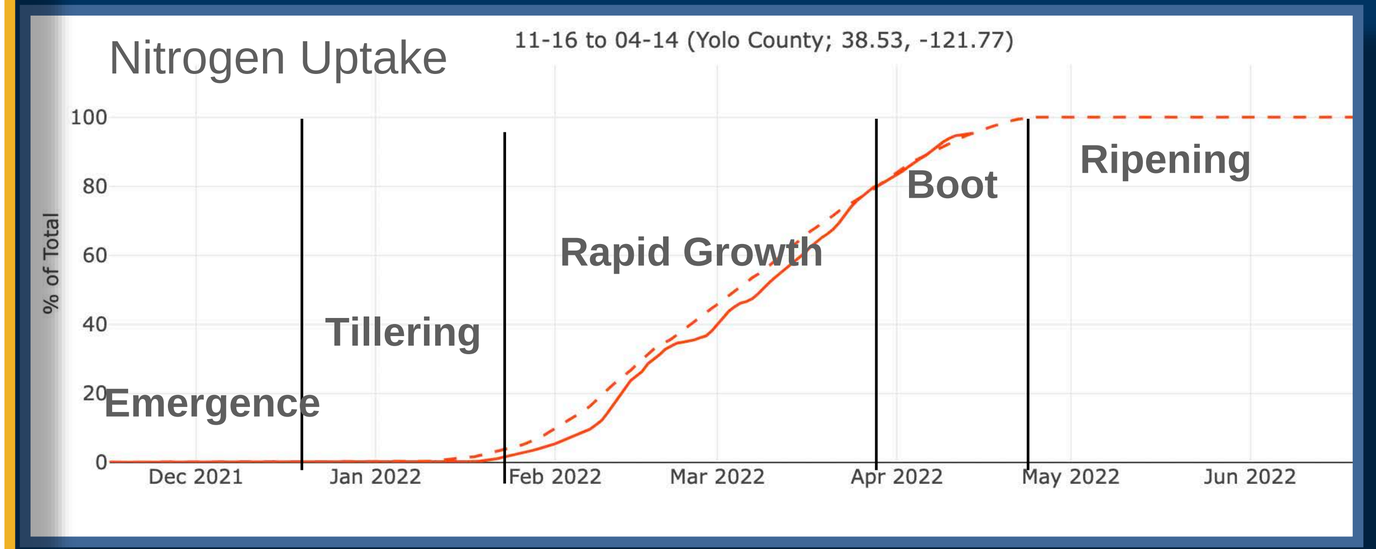
- Soil Samples: pre-plant and at tillering

- Establishment of a Nitrogen-rich Reference Zone

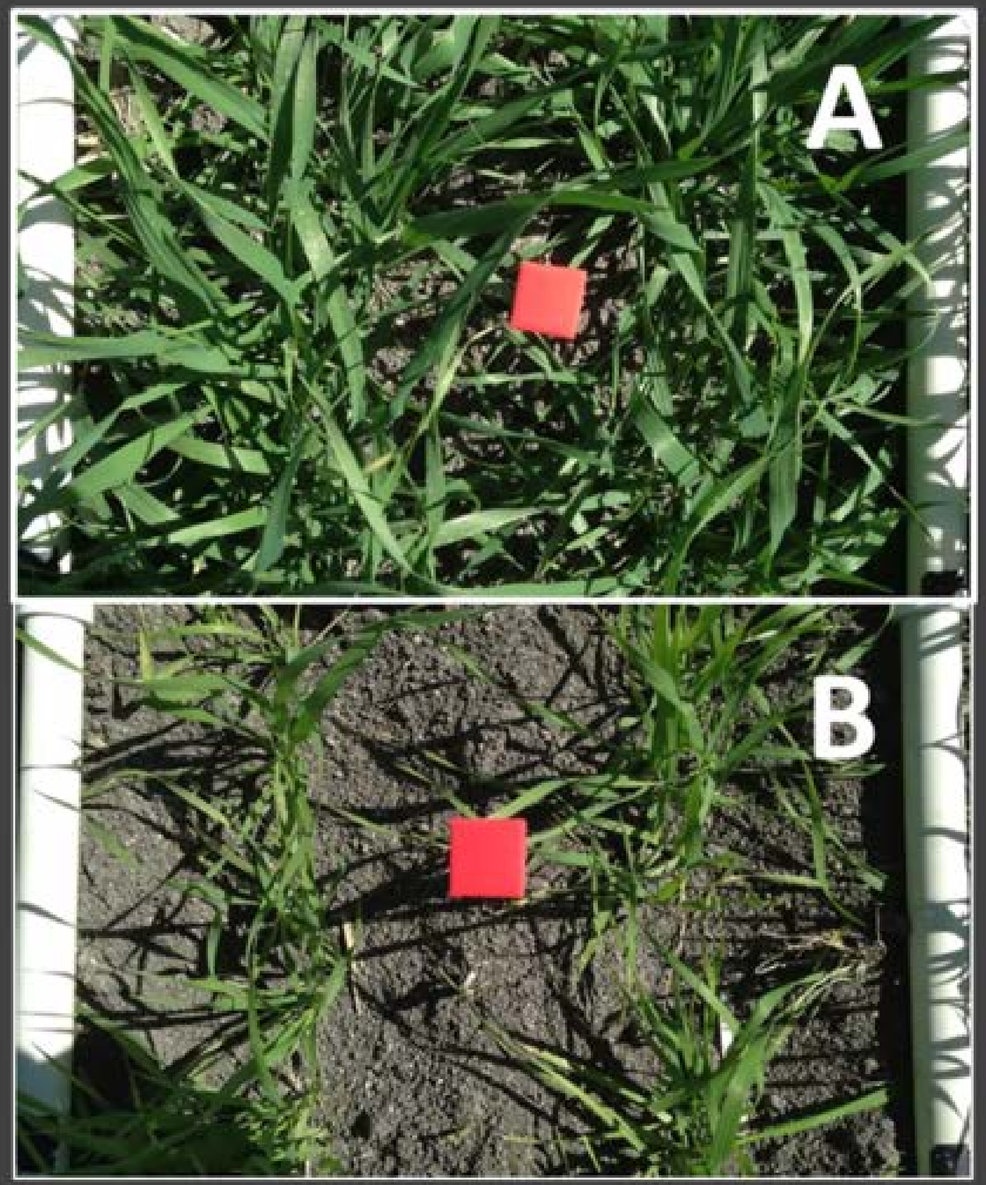
- NDVI Readings via Drone or Satellite

Principles in Wheat Biology





Concepts: Timing is key!



A. Fertilizer N applied
100% pre-plant

B. Fertilizer N applied
80% at tillering and
20% at flowering

Soil Nitrate Quick Tests

Collect a representative soil sample

Quickly determine a ballpark estimate of crop nitrogen availability

Soil Nitrate Quick Tests

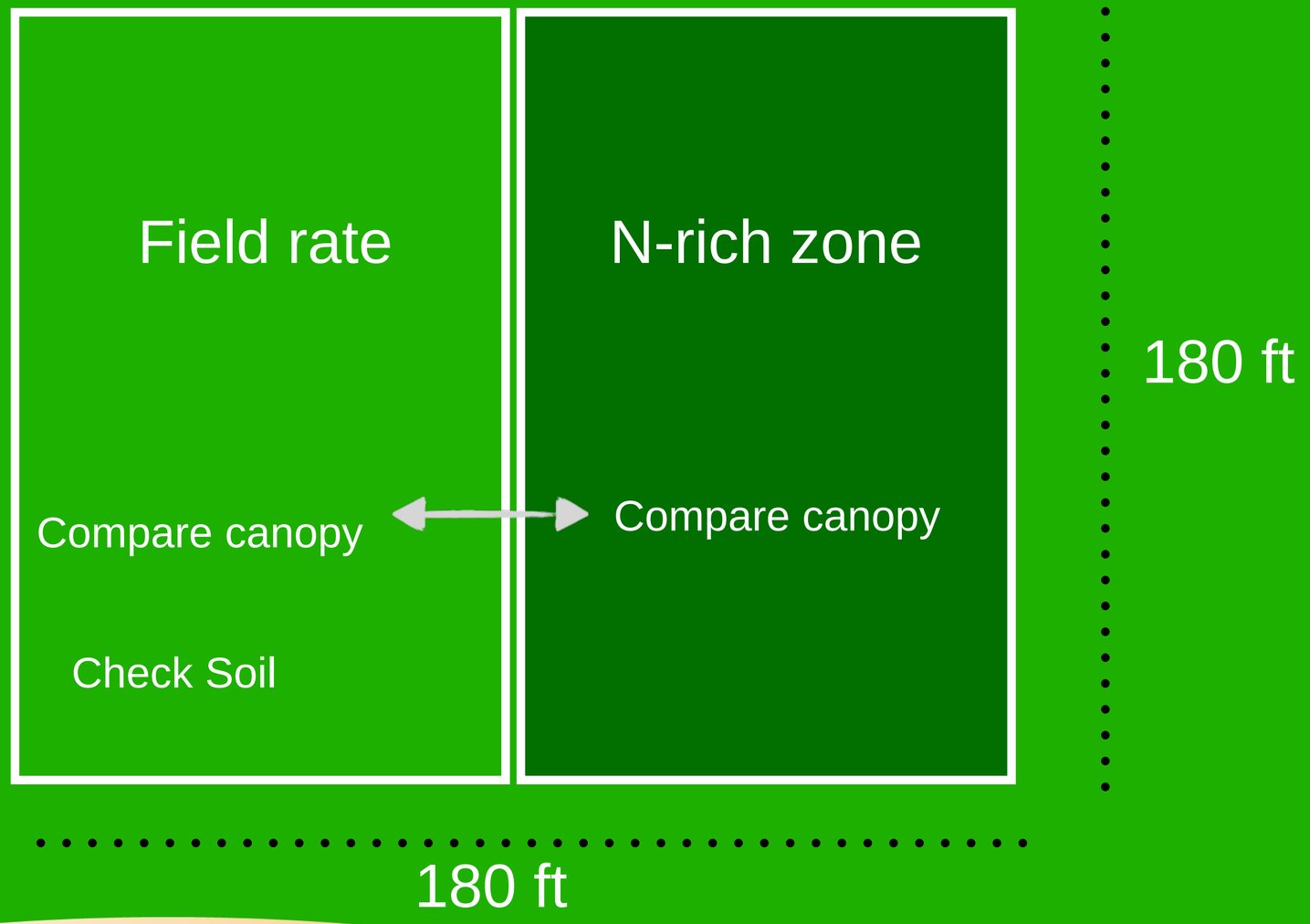
UC
CE

Nitrogen-rich reference zone goals

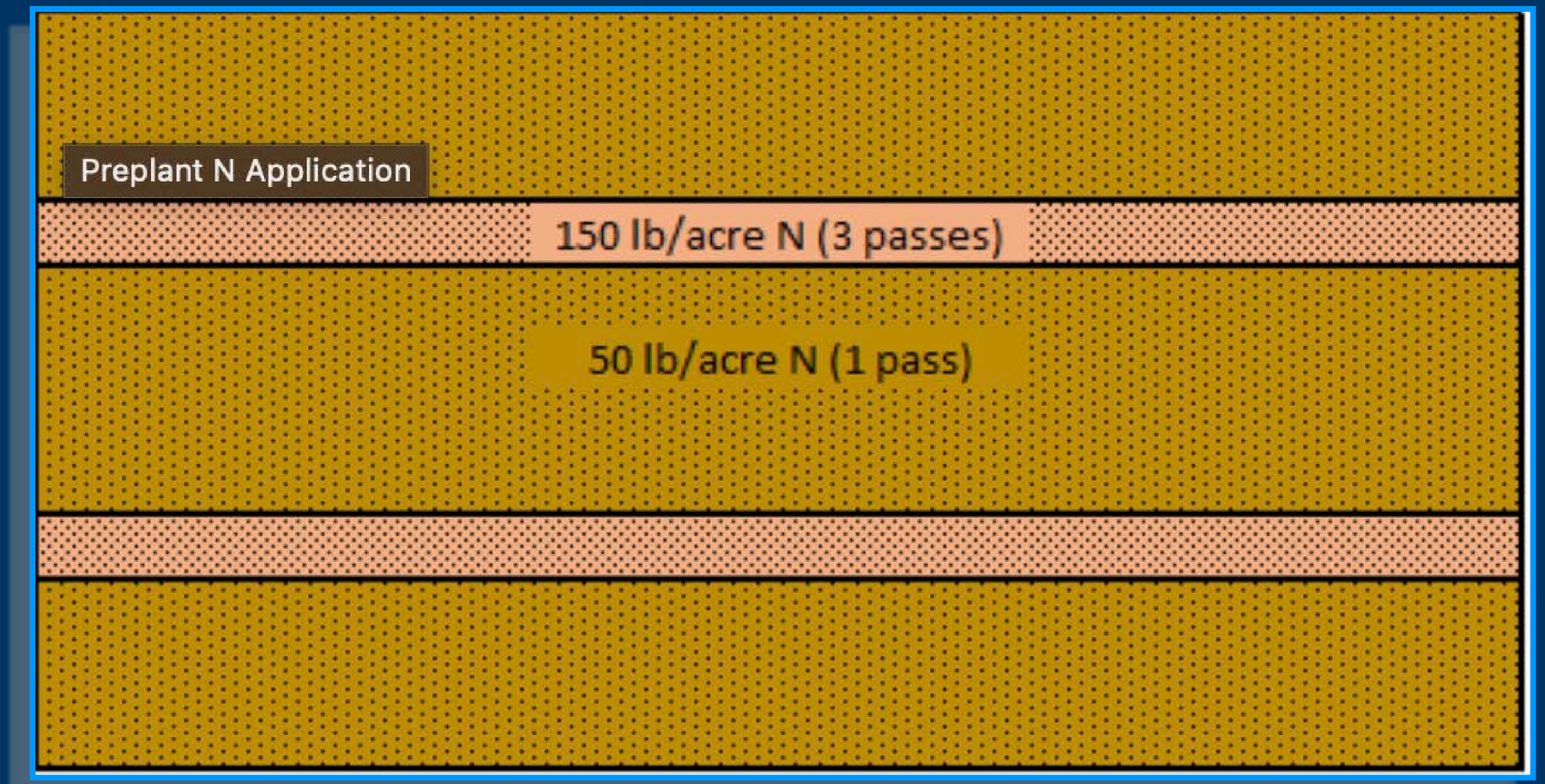
- Create a sufficiently high nitrogen zone where the crop is guaranteed to be satisfied.
- Evaluate relative ‘greenness’ of the field using canopy reflectance measurements

Nitrogen-rich reference zones

Plot Layout
(for satellites, drones or handheld can be smaller)



Nitrogen-rich reference zones



Strip Width

45 ft – Planet

100 ft - Sentinel

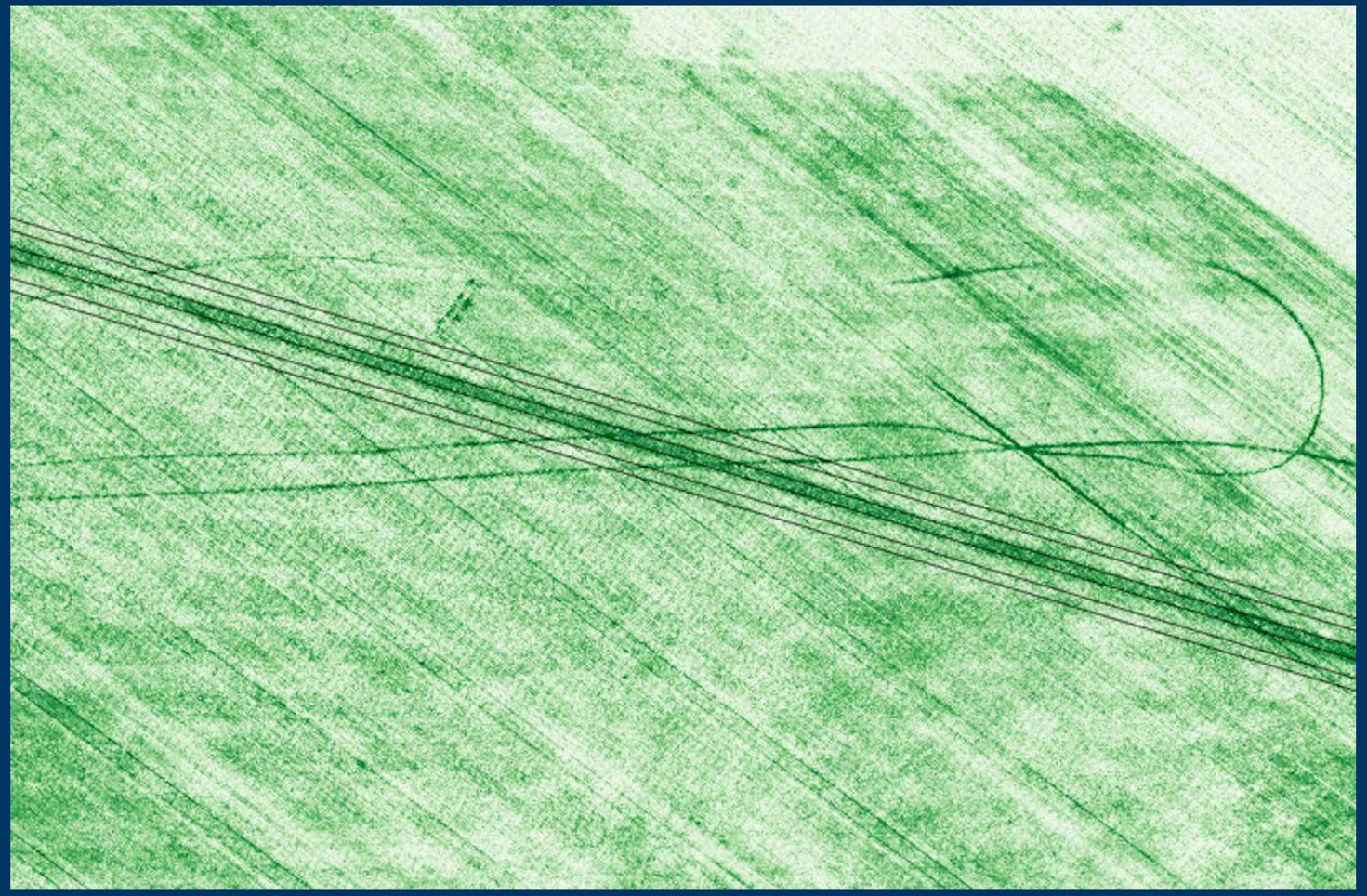
Will this work with satellite imagery?

Canopy Reflectance

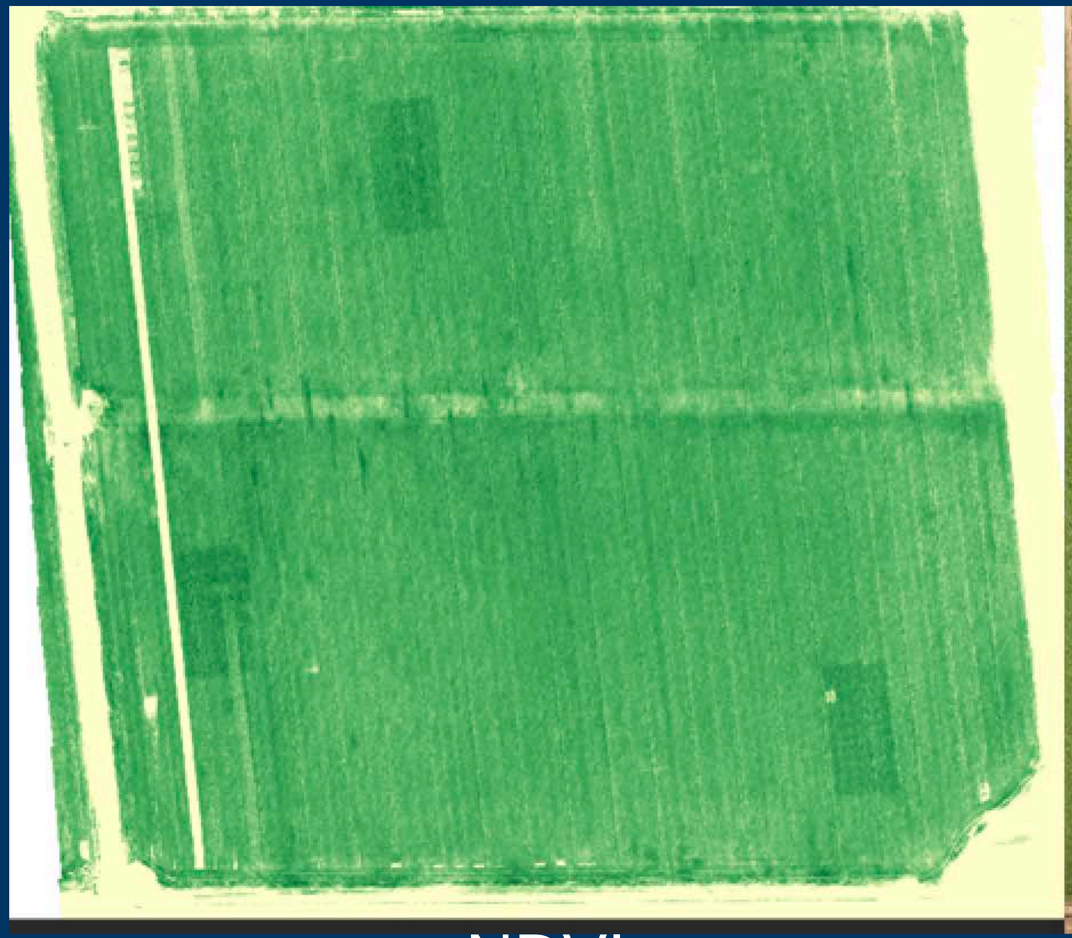
(NDVI= Normalized Difference Vegetative Index)

Gather information on relative canopy greenness compared to reference zone

NDVI



Drone Imaging



NDVI

RBG (standard color photo)

NDVI

Trimble Greenseeker*

Collect multiple representative samples, take an average.

**availability?*

app.climateengine.com/climateEngine

Update

Variable

Type:
Remote Sensing

Dataset:
Landsat 5/7/8/9 Surface Reflectance

Variable:
NDVI (Vegetation Index)

Computation Resolution (Scale):
30 m

Processing

Statistic (over day range):
Maximum

Calculation:
Values

Time Period

Period of Record: 1984-01-01 to 2022-03-09

Last 90 Days of Data

Start Date: 2021-12-10
End Date: 2022-03-09

GET MAP LAYER

MENU | Map

Climate Engine

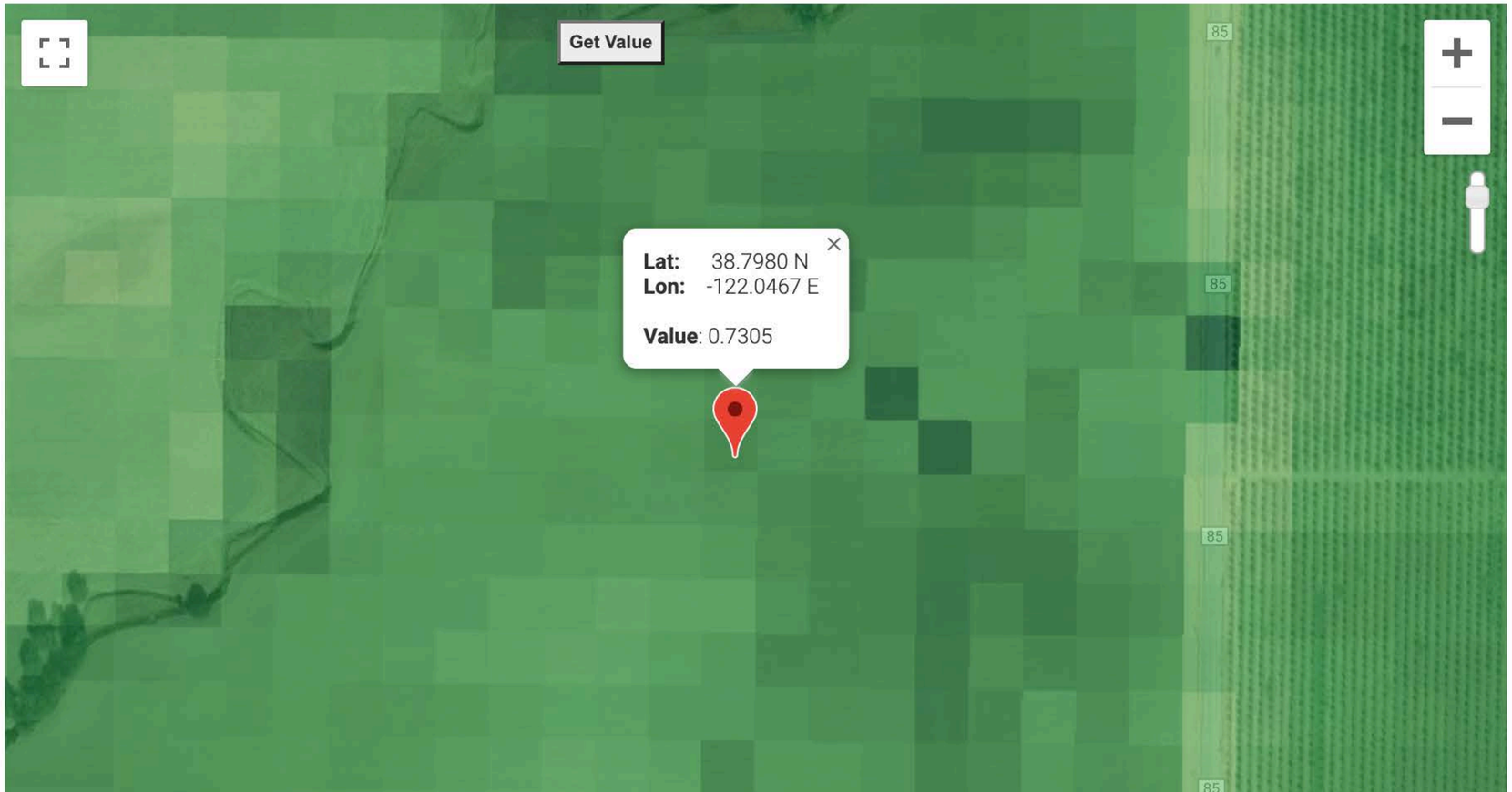
Colors | Map | Layers | Masking | Download | Link | Reset | Logout

NDVI (Landsat 5/7/8/9 SR)

2021-12-10 to 2022-03-09, Maximum

0 0.2 0.4 0.6 0.8

NDVI



Other Resources for NDVI

Planet (Planet Labs PBC)

One Soil (app) uses Sentinel Satellite

NDVI: Sufficiency Index

NDVI value of the field

÷

NDVI value of the reference zone

(the happy part of the field)

NDVI: Sufficiency Index

0.67 / 0.73 = 0.91

In other words: the field is 91% satisfied (and could use more N)

How do we measure canopy vigor?

NDVI= 0.45

NDVI= 0.52

Sufficiency Index

0.45/0.52 =0.87

NDVI= 0.49

NDVI= 0.52

Sufficiency Index

~~0.51/0.52~~ =0.94

Field rate

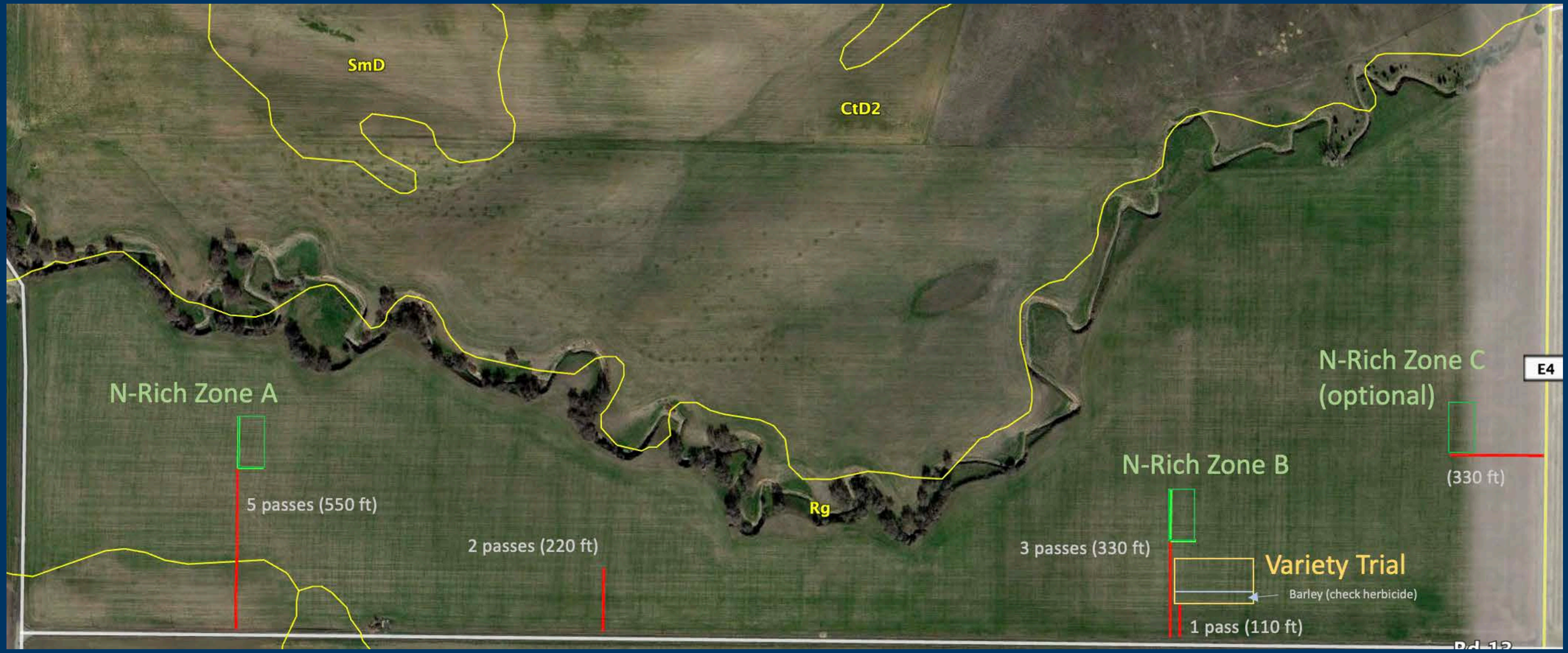
N-rich zone

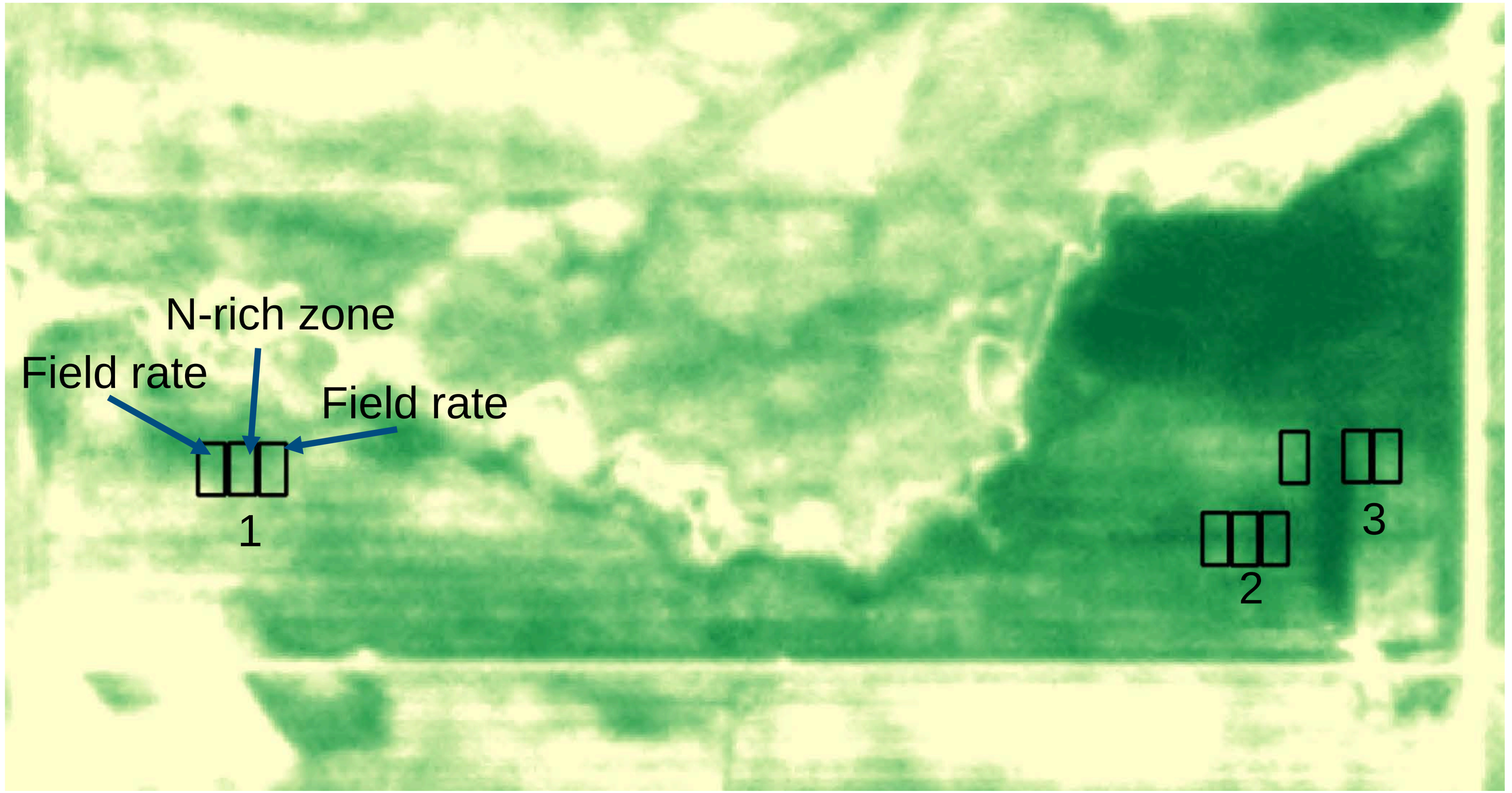
Sufficiency Index					
SI	<	0.97	=	N	deficiency possible
SI	<	0.93	=	N	deficiency likely

What should we check next?

University of California
Agriculture and Natural Resources

Case Study: Yolo County Wheat 2020





University of California
Agriculture and Natural Resources

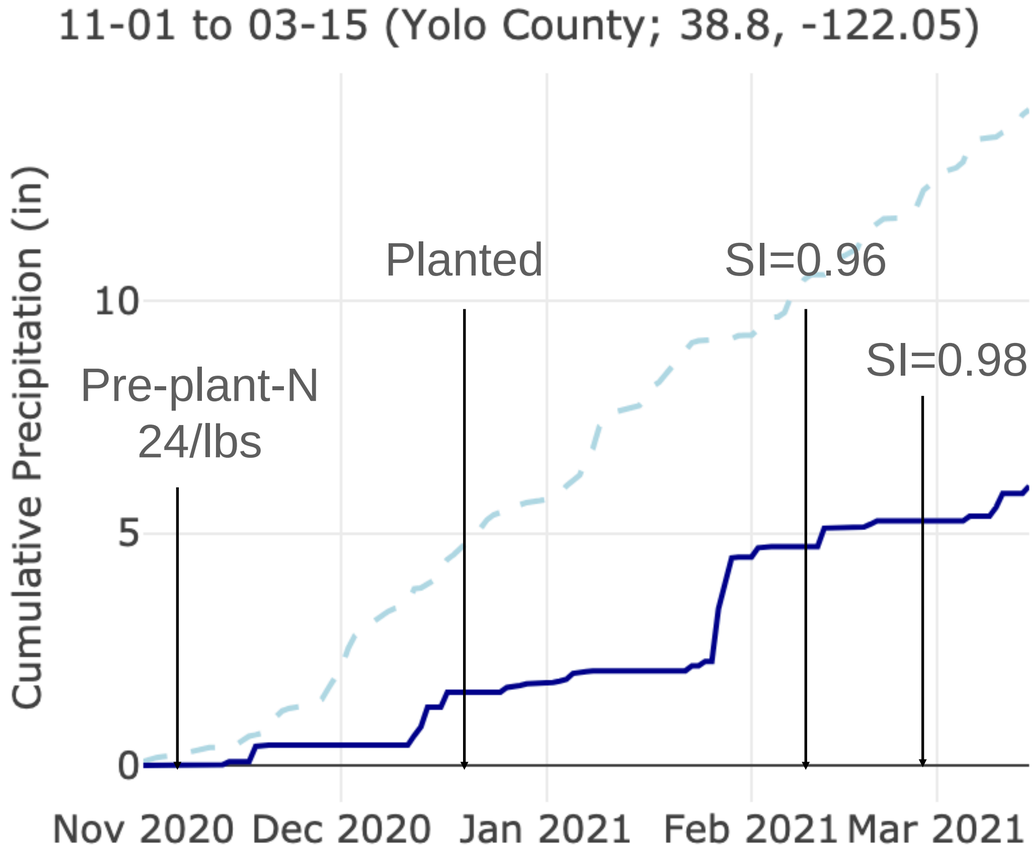
Webtool

https://smallgrain-n-management.plantsciences.ucdavis.edu/

Yolo County Case Study Overview

- Decent stand establishment
- Some Italian ryegrass pressure
  (particularly around area of previous experiment)
- Drought stress early and throughout season
- Reduced yield estimate
- Skipped top-dress application
- Net savings due to unused fertilizer

Case Study: Canopy Measurements at Tillering



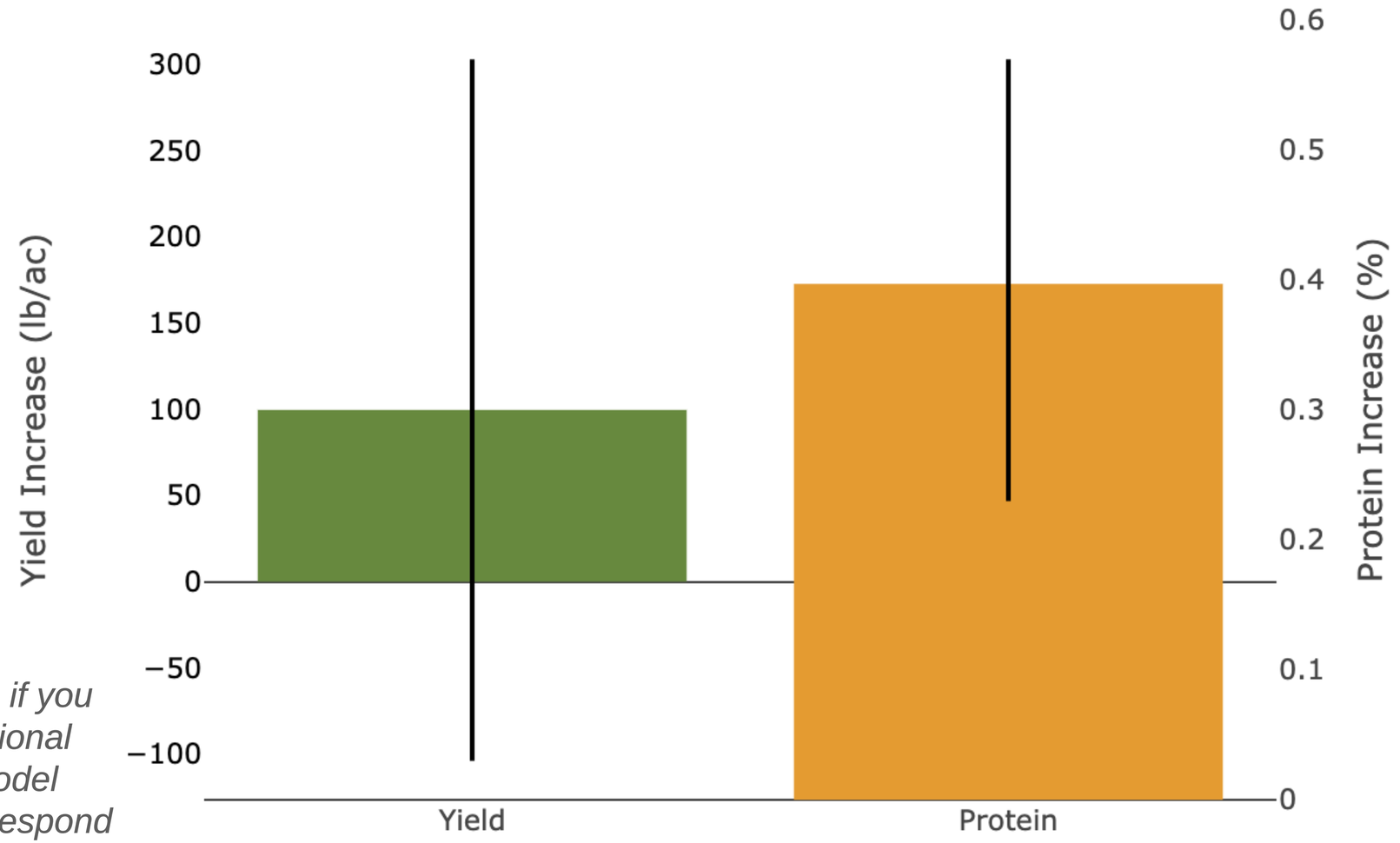
12/21/2020 - Planted
2/9 SI = 0.96
2/25 SI = 0.98

Soil Test Results:
40 lb N equivalent in the soil

Sufficiency Index					
SI	<	0.97	=	N	deficiency possible
SI	<	0.93	=	N	deficiency likely

University of California
Agriculture and Natural Resources

Recommendation for Yolo County Case Study: 0 lbs additional fertilizer



"Given the data provided, if you add 10 pounds of additional fertilizer or more the model predicts that the yield will respond between -100 or by +300. Therefore, it does not make sense to add more fertilizer"*

University of California
Agriculture and Natural Resources

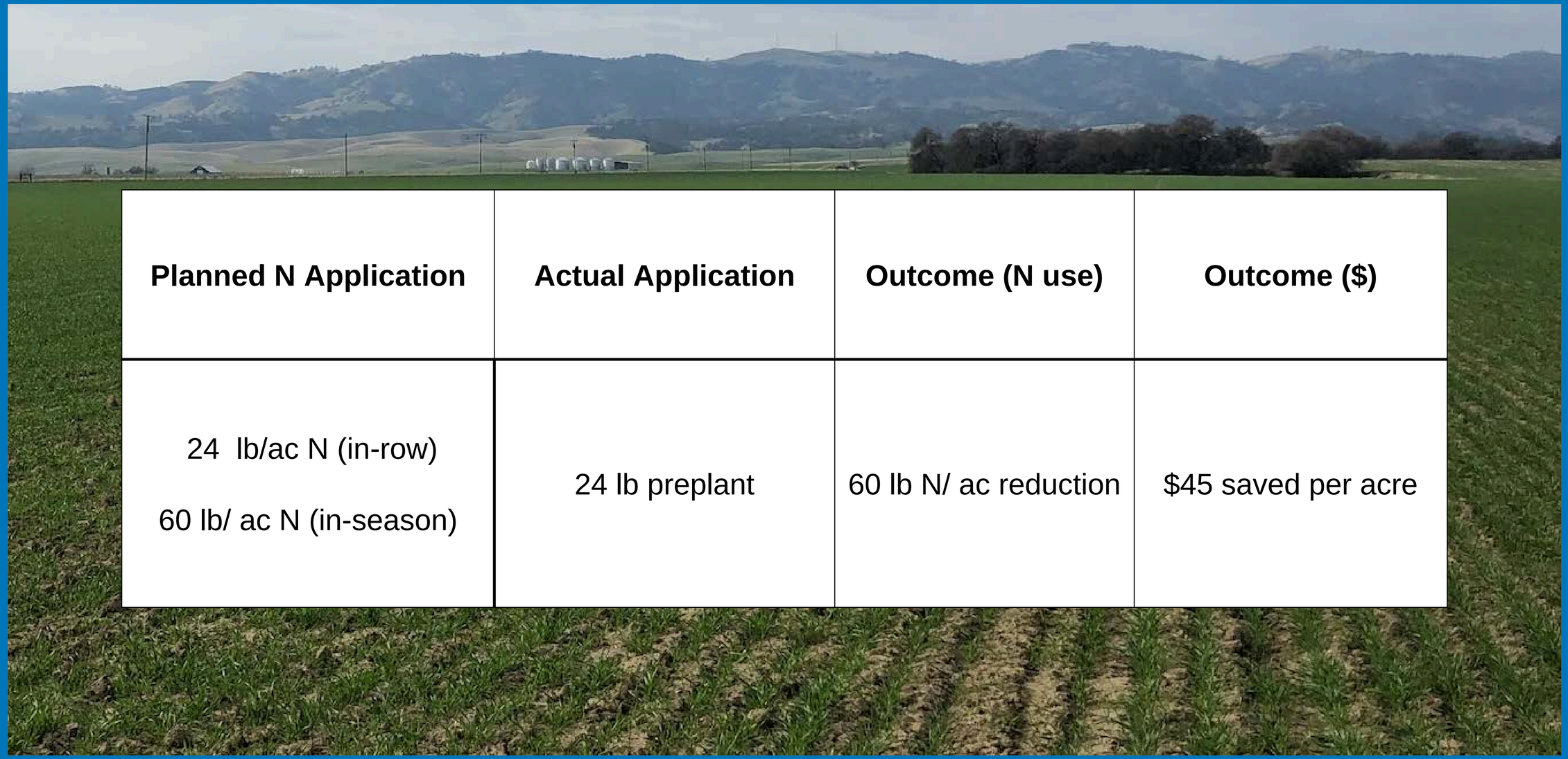
The model won't generate a graph unless you manually increase the fertilizer rate in the webtool, This is what the model returns when you simulate an addition of 10 pounds of fertilizer

What actually happened?

Simulated In-season Fertilizer Application
March 26th (no rain opportunity prior to that)

	Yield Average	Statistical Outcome
Field Rate (no in-season)	2253 lb/ ac	baseline
Top Dress (simulated in-season)	2415 lb/ ac	Not significantly different

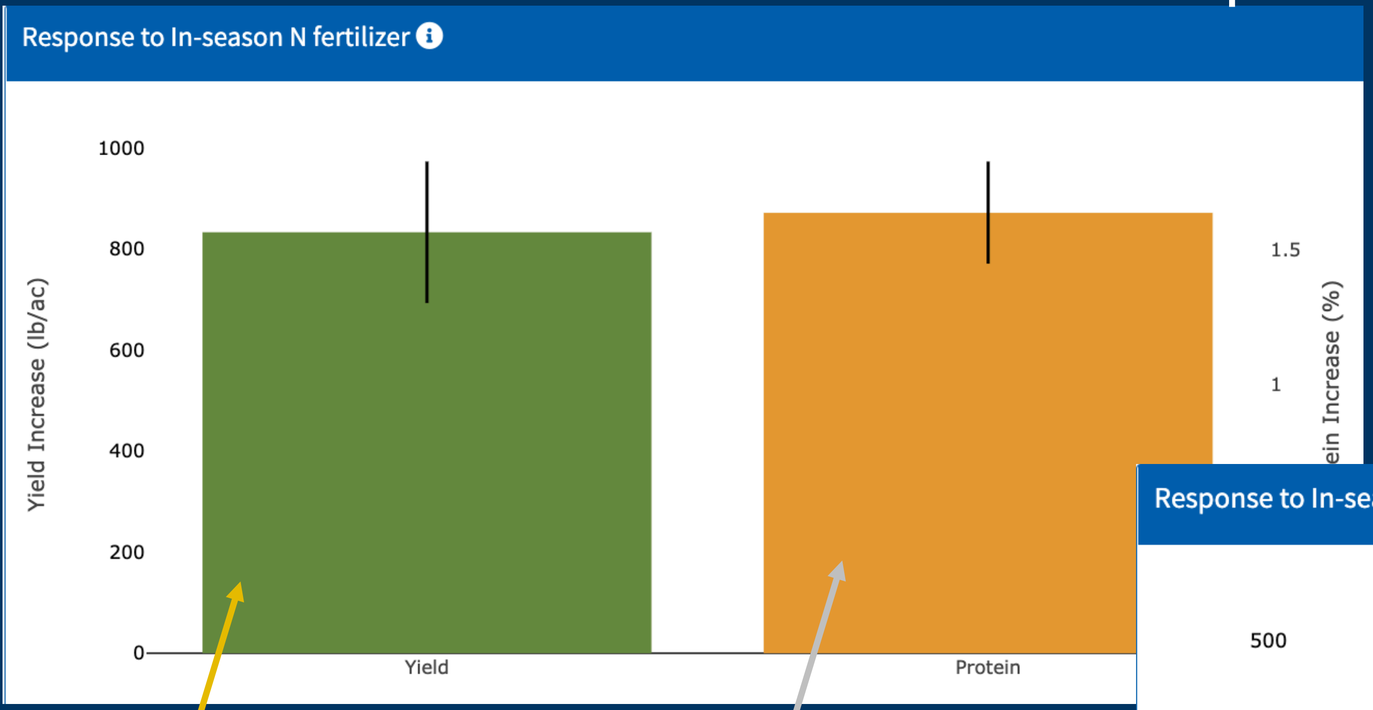
Grower saved $45 per acre ±



Planned N Application	Actual Application	Outcome (N use)	Outcome ($)
24 lb/ac N (in-row) 60 lb/ ac N (in-season)	24 lb preplant	60 lb N/ ac reduction	$45 saved per acre

Interpretation

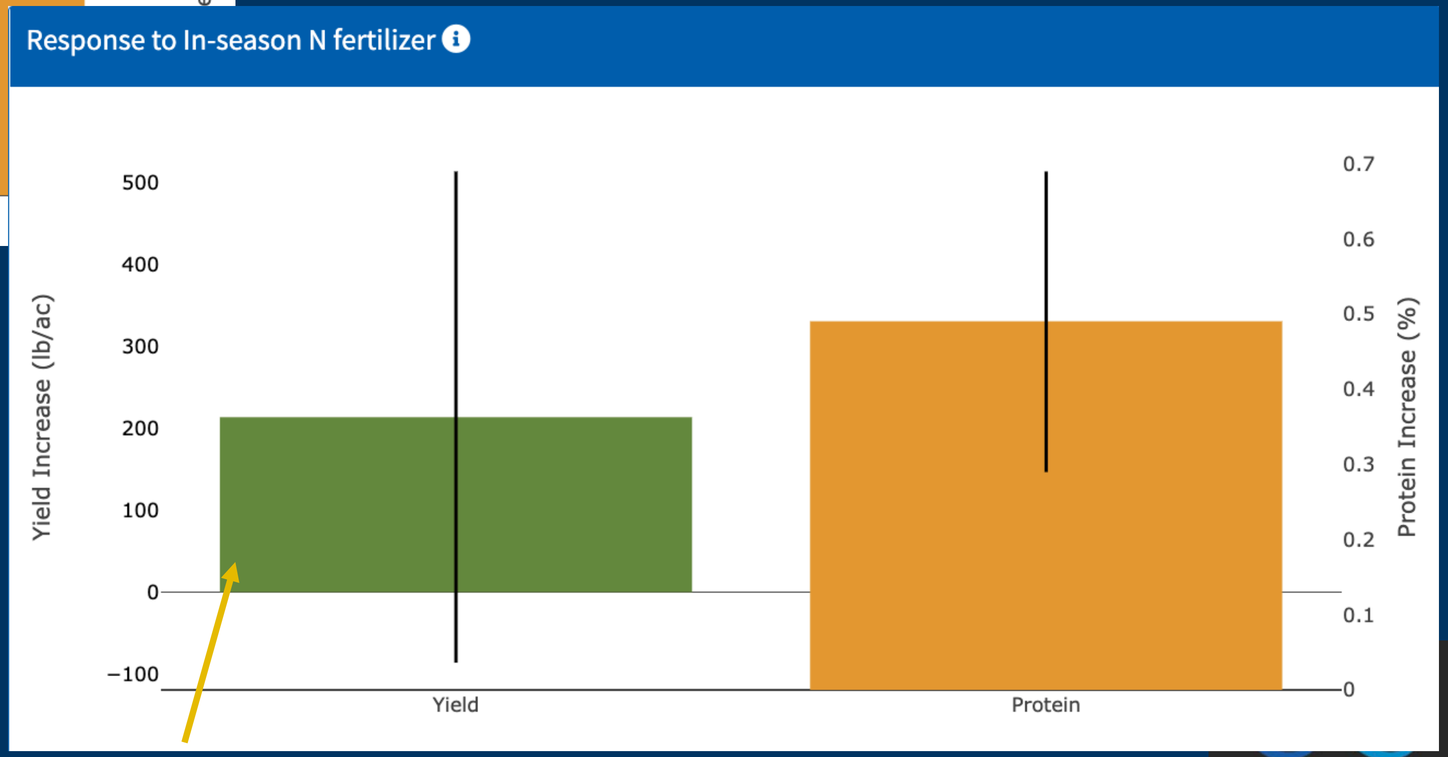
N Recommendation: 60 lbs



"If you add 60 lbs of N, you will see a yield increase between 700 and 900 lb/ acre"

You can also expect a protein increase between 1.4 and 1.6%

N Recommendation: 0 lbs



"It does not make sense to add additional fertilizer for a yield increase because it would not make a difference given the estimated range"

Webtool
Important things to remember

- Adjust yields in the case of drought stress/ frost damage/ flooding: Grower intuition is important
- Soil quick tests expire after about a year. Using a reference 10 ppm solution can help your eyes adjust to what 10 ppm should look like
- Error bars matter: final results are insignificant if error bars reach below zero.

Helpful Links

Nitrogen Rich Reference Zones
https://ucanr.edu/blogs/blogcore/postdetail.cfm?postnum=42576

Nitrogen Management Web-Tool
https://smallgrain-n-management.plantsciences.ucdavis.edu/

Nitrate Quick Test PDF (with links to different resources)
https://ucanr.edu/sites/small-grains/files/325749.pdf

Nitrate Quick Test Demonstration Video
https://www.youtube.com/watch?v=LaMxiDsov04&t=37s

Helpful Links

Climate Engine
https://app.climateengine.com/climateEngine

One Soil
https://onesoil.ai/en/

Planet
https://www.planet.com/

Thank You

Team
Mark Lundy
Taylor Nelsen
Nicholas Clark
Michelle Leinfelder-MIles
Sarah Light
Thomas Getts
Giuliano Galdi
Anthony Fulford
Gabriel Rosa
Micah Levinson

Grower Collaborators
Colin Muller
Fritz Durst
Kim Gallagher
D.T. Farming
Darrin Culp
Dennis Lewallens

Contact:
Michelle Leinfelder-Miles, Delta Crops Advisor
UCCE San Joaquin, Yolo, and Solano
mmleinfeldermiles@ucanr.edu
209.953.6100

Konrad Mathesius, Agronomy Advisor
UCCE Yolo, Solano, Sacramento
kpmathesius@ucanr.edu
530.218.7567