UF INSTITUTE OF FOOD AND AGRICULTURAL SCIENCES (UF/IFAS) BEST MANAGEMENT PRACTICE (BMP) RESEARCH & EXTENSION EXAMPLES

Michael Dukes, Ph.D., P.E.

Blue-Green Algae Task Force
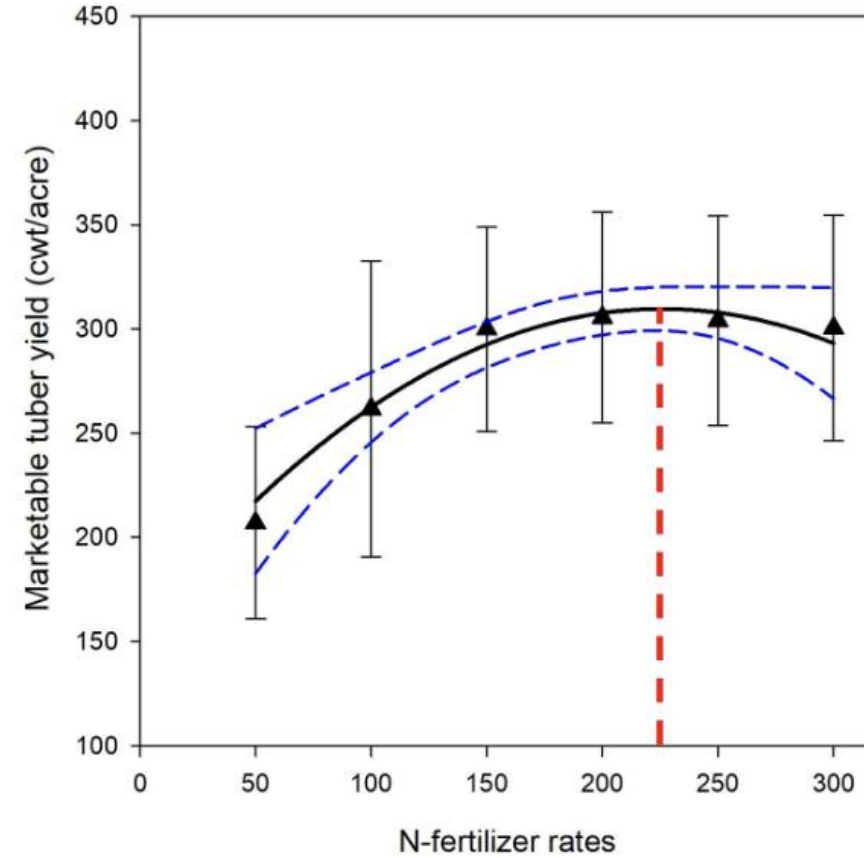
June 4, 2024

BMP Research & Education Funding

- FDACS-OAWP: water quality & conservation

- FDACS-AES: IFAS nutrient management project

- Other sources: USDA, NRCS, FDEP, WMDs, Industry groups, etc.

FDACS: Florida Department of Agriculture and Consumer Services
OAWP: Office of Agricultural Water Policy
AES: Agricultural Environmental Services
USDA: United States Department of Agriculture

NRCS: Natural Resources Conservation Services
FDEP: Florida Department of Environmental Protection
WMDs: Water Management Districts

Historical Fertilizer Rate Research

Marketable Yield - Atlantic and FL1867
2011-2014

Mean marketable yield

$\text{Yield}_{mkt} = 157.4865 + 1.3490\ N_{rate} - 0.0030\ N_{rate}^2$

$r^2 = 0.12$, $n = 155$, $(dy/dN) = 225$ lbN/ac

95% Confidence Band

CORN NITROGEN (N) MANAGEMENT

Dr. Lakesh Sharma, Asst. Prof., SWS Gainesville, Live Oak

Dr. Sudeep Sidhu, Asst. Prof., AGR NFREC

Mr. Jay Capasso, Water RSA, Live Oak

Dr. Shivendra Kumar, Agronomic RSA, Live Oak

Dr. Vivek Sharma, Asst. Prof., ABE Gainesville, Live Oak

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- N rate update
- N placement
- Cultivars X N rate
- N inhibitors
- Variety trials
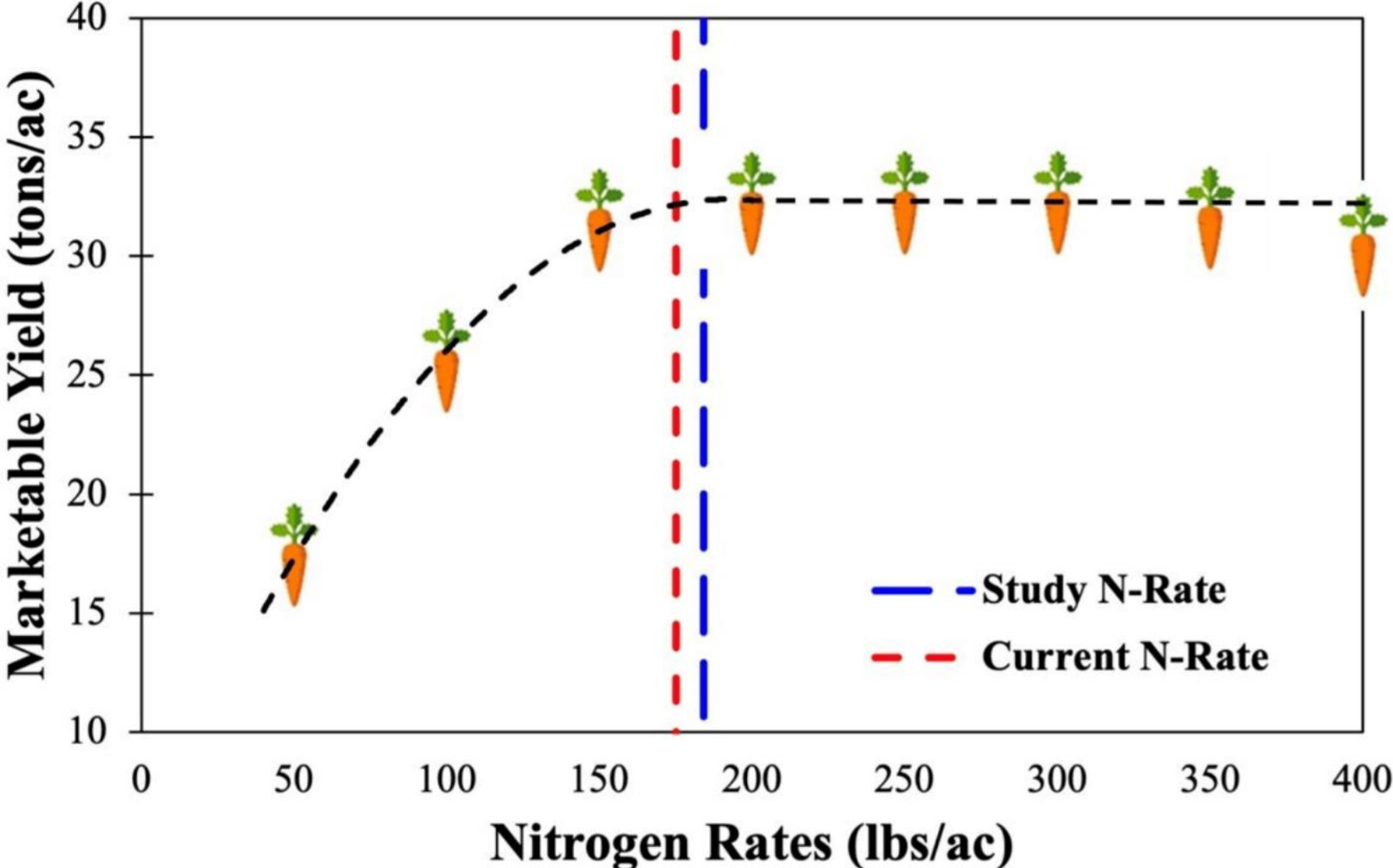- Controlled release N
- Farm demos

CARROT N BMP RESEARCH AND EXTENSION

Mr. Bob Hochmuth, Regional Vegetable Agent, NFREC-SV, Live Oak

Nitrogen BMP research on carrots in Suwannee Valley

Carrot N Rate Update

POTATO BMP RESEARCH

Dr. Lincoln Zotarelli, Professor & Potato Specialist, Hort. Sci., Gainesville

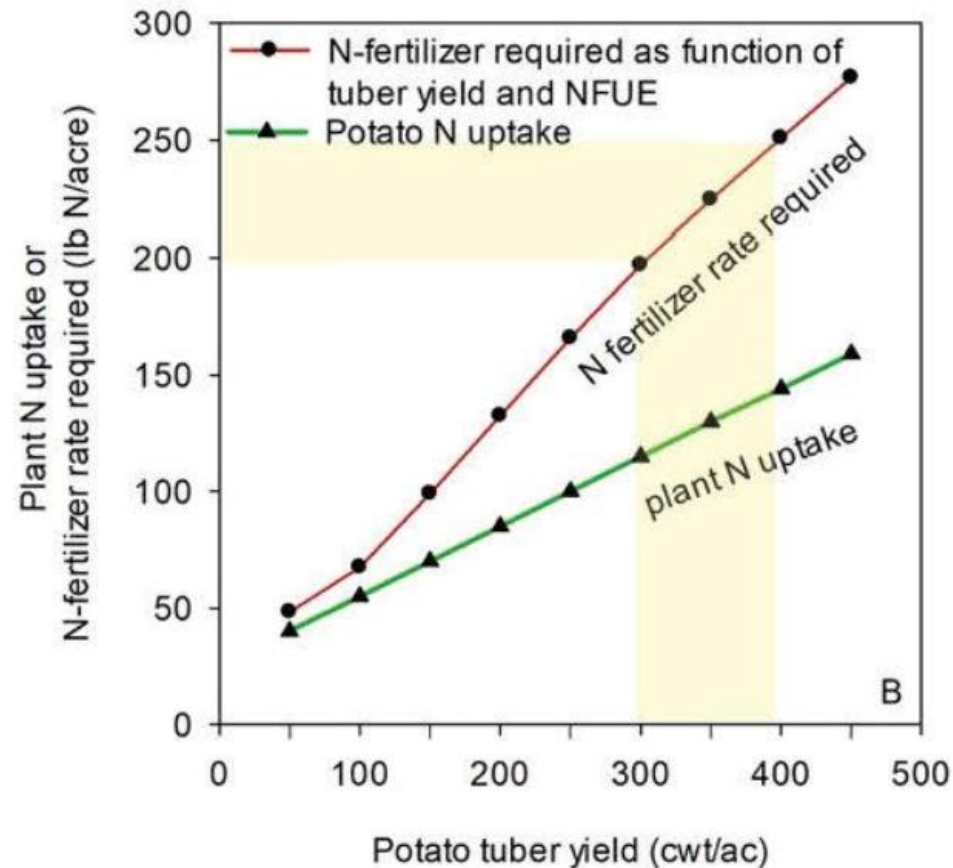**Dr. Lakesh Sharma, Asst. Prof., SWES, Gainesville**

Dr. Christian Christiansen, Ext. Admin. & HAEC, Gainesville

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Potato N Rate Update

NITROGEN FERTILIZATION GUIDELINES FOR POTATO PRODUCTION IN FLORIDA

Lincoln Zotarelli, Tara Wade, Gary K. England, and Christian T. Christensen

SOIL MOISTURE SENSORS FOR IRRIGATION MANAGEMENT

Dr. Charles Barrett, Water RSA, NFREC, Live Oak (formerly)

Dr. Vivek Sharma, UF-ABE, Gainesville

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Extension Agent Engagement

- Field days
- In-service trainings
- Farm visits, installs, follow-ups
- **In-season workshops with live data**

2018
20 units

2022-2023
76 units

ROW CROP RESEARCH AND DEMONSTRATION

Dr. Shavendra Kumar, Row Crop RSA, NFREC-SV, Live Oak

Dr. Sudeep Sidhu, Asst. Prof., AGR NFREC

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Nutrient Management On-Farm Demo

4Rs - Right Place, Right Rate,
Right Source, Right Time

Florida Stakeholder Engagement Program (STEP)

- An innovative extension program to engage growers, ag. industry, agricultural research, and extension in an interactive real-world system to increase productivity, sustainability, and profitability.
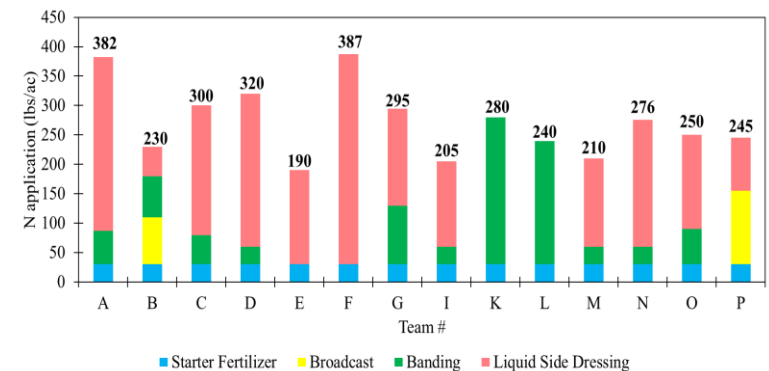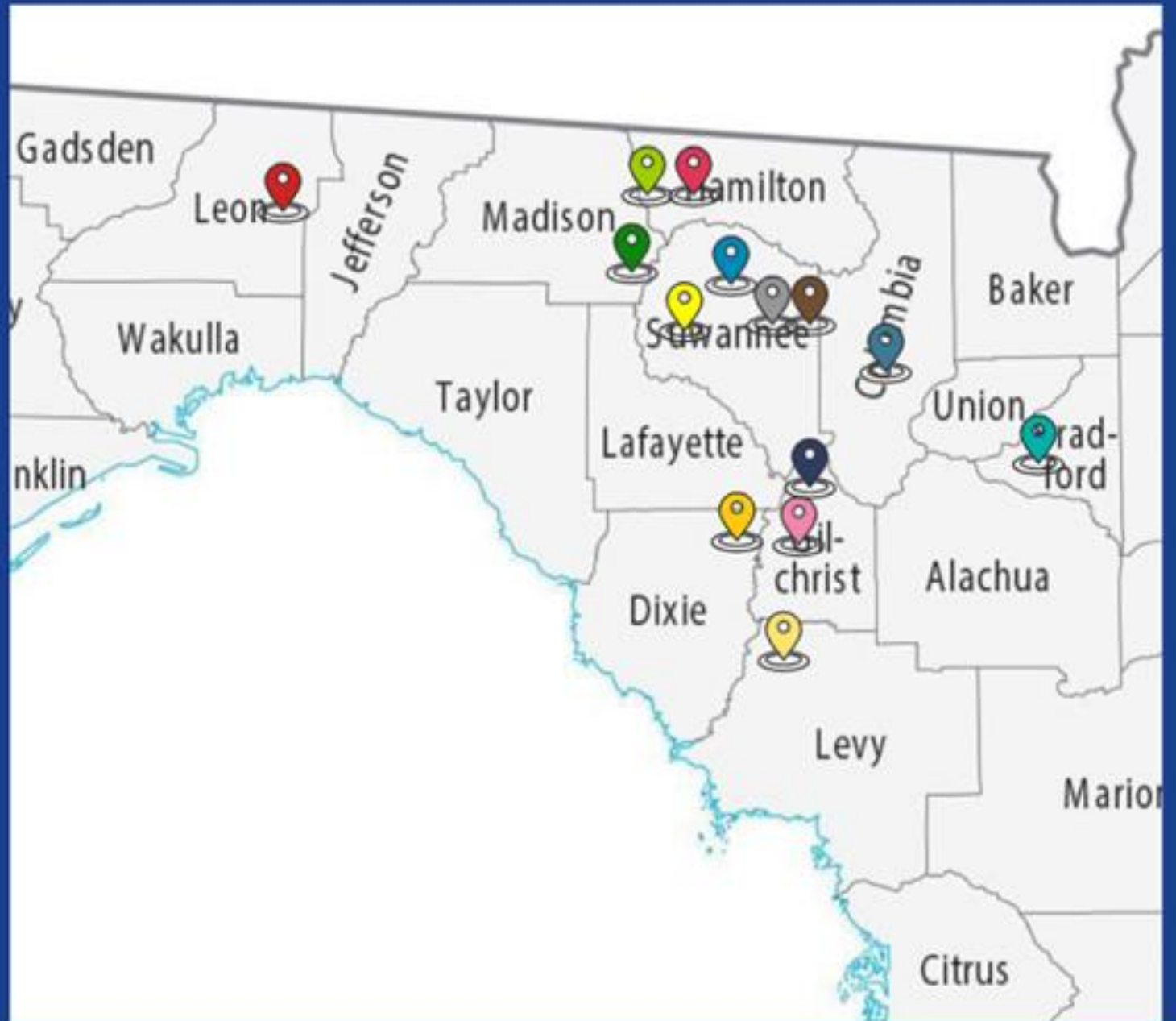
Competition

Peer-to-peer interaction

Action-oriented learning experimental

Ongoing work

- FDACS-OAWP research
  - o Controlled release fertilizer
  - o Rates updates, corn, cotton, hemp...
  - o Sod based rotation
  - o Emerging tech, e.g. mobile drip irrigation

- Demonstration & evaluation

- IFAS Melich-3 Phosphorous soil test calibration, potato (NE FL) & tomato (SW FL) FY21-22, continuing

- IFAS Nutrient Management project

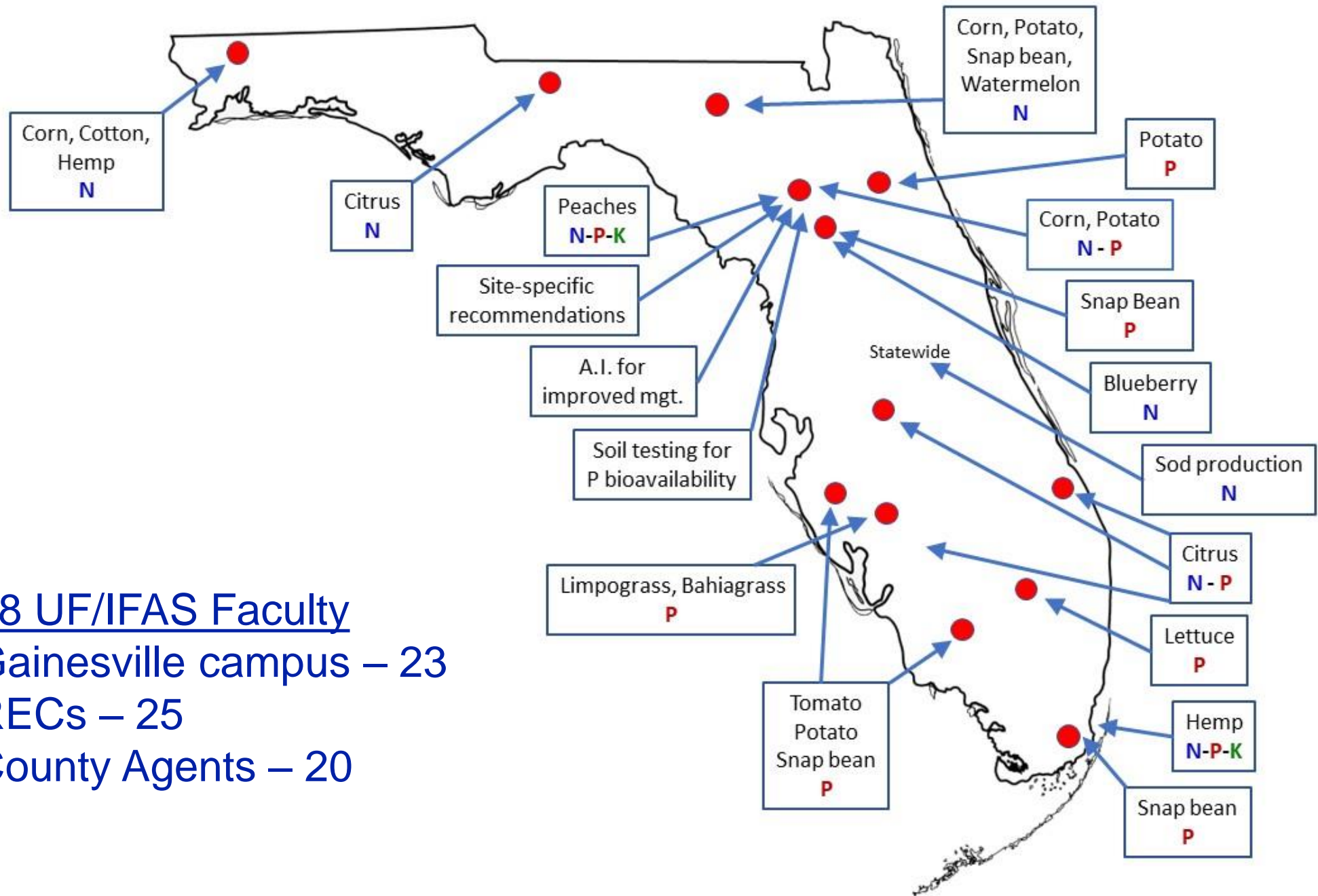# IFAS NUTRIENT MANAGEMENT WORK

Dr. Tom Obreza, Professor SWES, Gainesville

Legislative Directive

- House Bill 5001
  - Fertilizer rates: tomato, potato, citrus, corn, snap beans…plus "any other crop."
  - Normal and economical crop production.
  - Maximize crop yield and quality.
  - Minimize nutrient inefficiencies.

- Senate Bill 1000
  - Develop recommendations for site-specific nutrient management.

Crop	Planted acres	
Forages	Very high	☑
Citrus (harvested acres)	369,500	☑
Peanuts	165,000	
Sugarcane on sand	100,000	
Grain/silage corn	95,000	☑
Cotton	92,000	☑
Cucurbits	58,700	☑
Sweet corn	34,400	
Snap bean	27,000	☑
Tomato	23,000	☑
Potato	21,000	☑
Pepper	11,200	
Strawberry	10,400	
Cabbage	8,900	
Blueberry	5,700	☑

Corn, Potato, Snap bean, Watermelon
N

Corn, Cotton, Hemp
N

Citrus
N

Peaches
N-P-K

Site-specific recommendations

A.I. for improved mgt.

Soil testing for P bioavailability

Potato
P

Corn, Potato
N - P

Snap Bean
P

Statewide

Blueberry
N

Sod production
N

Limpograss, Bahiagrass
P

Citrus
N - P

Lettuce
P

Tomato Potato Snap bean
P

Hemp
N-P-K

Snap bean
P

68 UF/IFAS Faculty
Gainesville campus – 23
RECs – 25
County Agents – 20

PRECISION AGRICULTURE & ARTIFICIAL INTELLIGENCE

Yiannis Ampatzidis, Assoc. Prof., SWFREC, Immokalee

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AGROVIEW

THE MOST ACCURATE PERENNIAL CROP INVENTORY PLATFORM

Agroview is a turn-key solution that is transforming perennial crop agriculture with proven deep learning systems that provide best-in-class data analytics, including:

- ☑ Tree Counts
- ☑ Missing Tree Count ("Gaps")
- ☑ Revenue Recovery/Replant Maps
- ☑ Height
- ☑ Canopy Size
- ☑ Leaf Density Index (Per Tree NDVI)
- ☑ NPK Nutrient Analysis
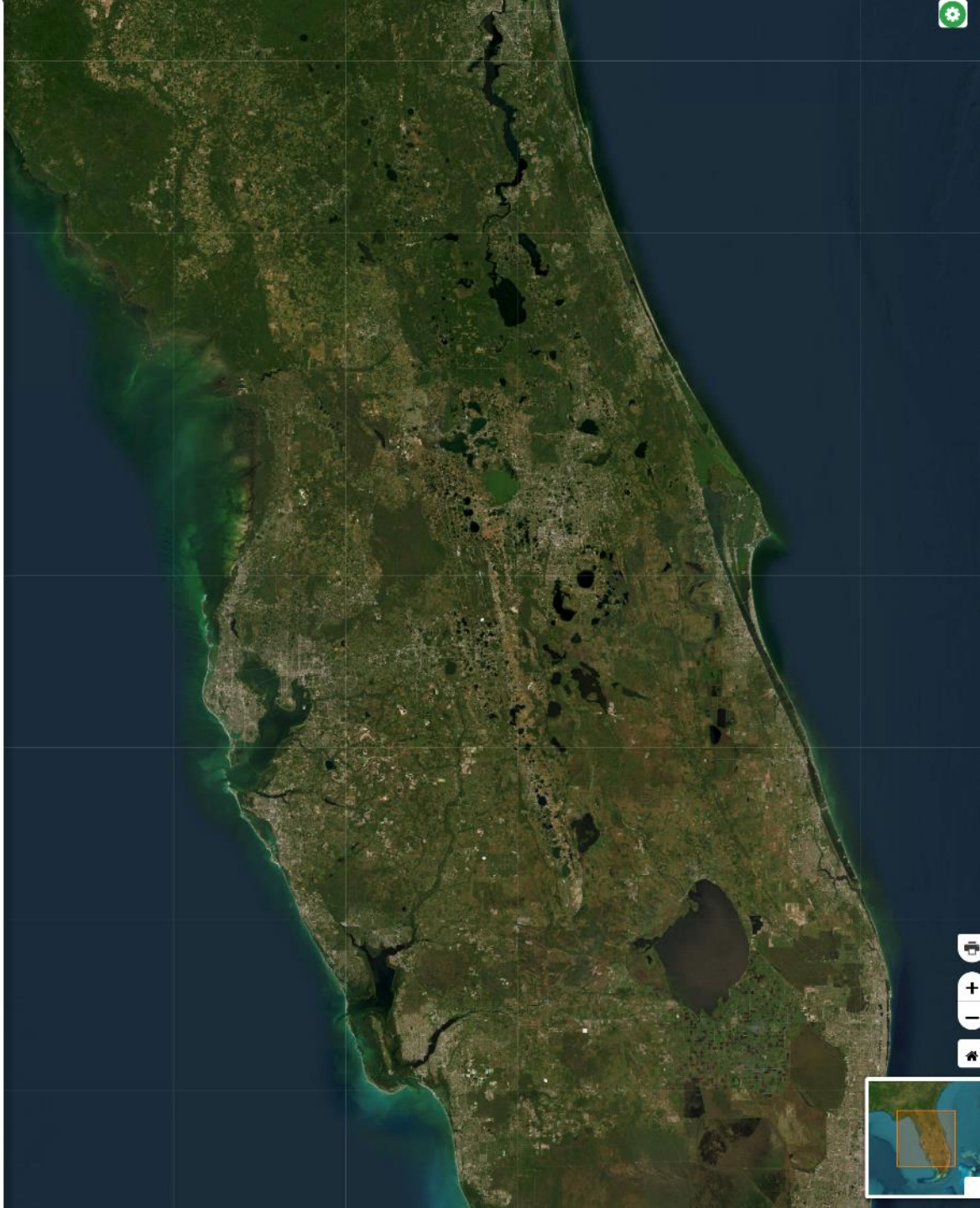- ☑ Full Block Nutrient Report

Fruit Count & Size

Inventory, Health & Fertility 2

Inventory, Health & Fertility 1

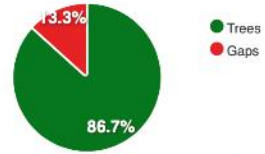Inventory, Health & Fertility 4

Inventory, Health & Fertility 3

INVENTORY, HEALTH & FERTILITY 3

Collection Date:	2020-12-20
Acres (Ac):	12.7
Total Trees:	2482
Total Gaps:	381

● Trees
● Gaps

13.3%
86.7%

Load Analysis

🌲 Block average:

Tree height:	7.1 ft	
Tree canopy area:	101 ft²	
Tree leaf density:	0.89	

Nutrient Analysis:

Nitrogen (N):	2.81%
Phosphorus (P):	0.18%
Potassium (K):	1.62%
Magnesium (Mg):	0.35%
Calcium (Ca):	3.01%
Sulfur (S):	0.37%
Boron (B):	95 ppm
Zinc (Zn):	25 ppm
Manganese (Mn):	48 ppm
Iron (Fe):	95 ppm
Copper (Cu):	30 ppm

INVENTORY, HEALTH & FERTILITY 3
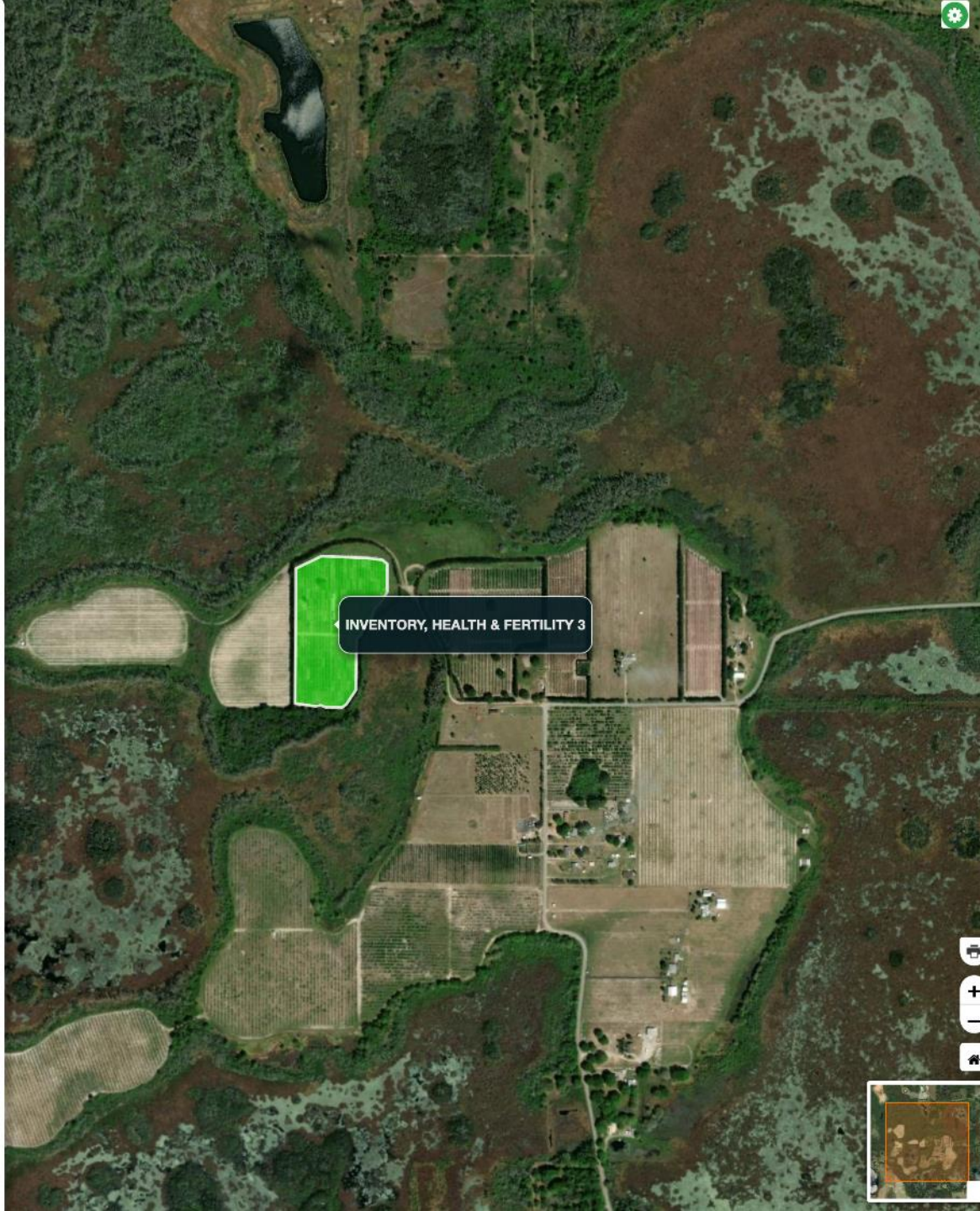
Histogram

INVENTORY, HEALTH & FERTILITY 3

[Rename Block](#)

BLOCK INVENTORY

☑ Trees   🟩 **2482** Trees
☐ Gaps   🟦 **381** Gaps

TREE DATA
☐ Preserve selection

🔘 Age
⚪ Health
⚪ Canopy Area
⚪ Height
⚪ Leaf Density ❓

AGE DATA

☑ Unselect all

2000
1600
1200
800
400
0

🟥 Reset   🟫 Intermediate   🟩 Mature
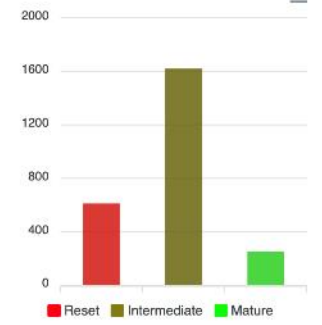
Click on bars to show/hide data
With an account, you can set Age ranges

EXPORT & OPTIONS

With an account, you can also download data as an Excel-friendly

Opacity for data points

——————○——— **0.8**

[Block Summary Report](#)

Reset
Intermed
Mature

Nutrient Analysis

INVENTORY, HEALTH & FERTILITY 3

NUTRIENT SELECTION: ☑ Show/Hide

- ⦿ Nitrogen (N)
- ○ Phosphorus (P)
- ○ Potassium (K)
- ○ Magnesium (Mg)
- ○ Calcium (Ca)
- ○ Sulfur (S)
- ○ Boron (B)
- ○ Zinc (Zn)
- ○ Manganese (Mn)
- ○ Iron (Fe)
- ○ Copper (Cu)

Zones	Trees	Gaps	Trees Ratio
🟥 Deficient	632	175	78.3%
🟫 Low	226	26	89.7%
🟩 Optimum	683	62	91.7%
🟦 High	828	113	88.0%
🟪 Excess	0	0	0

Range Values for Nitrogen

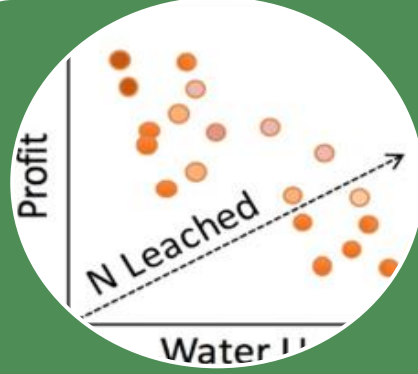| Zone	Min	Max
Deficient	0%	2.2%
Low	2.2%	2.5%
Optimum	2.5%	2.8%
High	2.8%	3%
Excess	3%	+

Generate Nutrition Report
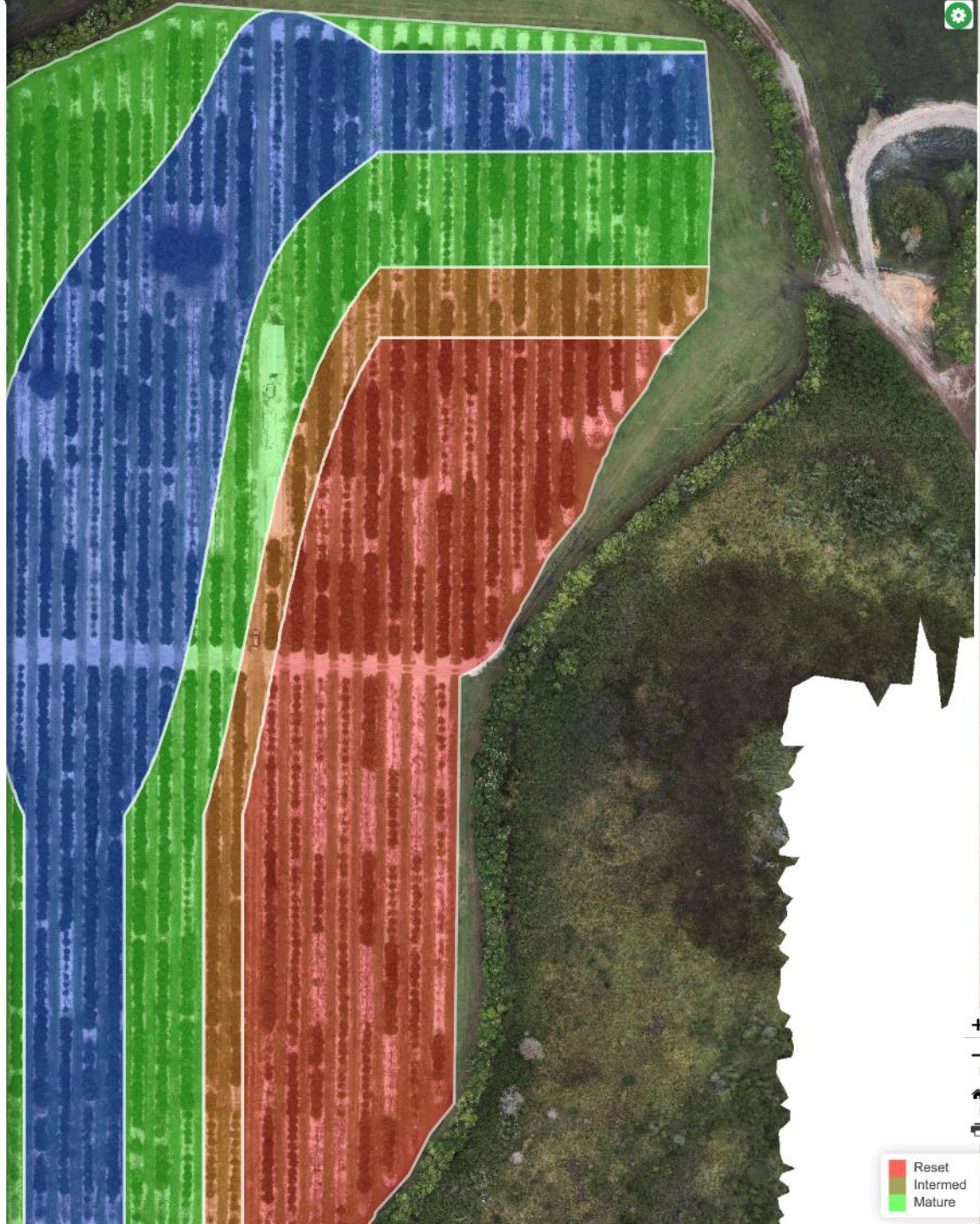
Reset
Intermed
Mature

Floridan Aquifer Collaborative Engagement for Sustainability

BMP Research

- Water use, quality, yield impacts of alternative irrigation & nutrient practices
- Digital decision toolkit

Modeling Platform

- Land use/mgmt. impacts on water quantity/quality, crop/forest production and regional economy
- Stakeholder valuation research (WTA/WTP)

Stakeholder Engagement

- Baseline & future scenarios
- Tradeoffs & synergies
- Reflexive Monitoring
- Communication research

Extension

- On-farm BMP demos
- In-Service Training programs
- Water Schools

Collaborative research and Extension

Future Research/Extension Needs

- Fertilizer ~~rate~~ *Management system* studies & nutrient use efficiency

- Additional education, on-farm demos, STEP

- Funding for BMP Regional Specialized Agents

- Applied sensor technology (UAVs, sensor improvement) --> Artificial Intelligence

- Monitor environmental impact

THANK YOU!

- mddukes@ufl.edu