Practical Applications for Testing in Turfgrass Systems

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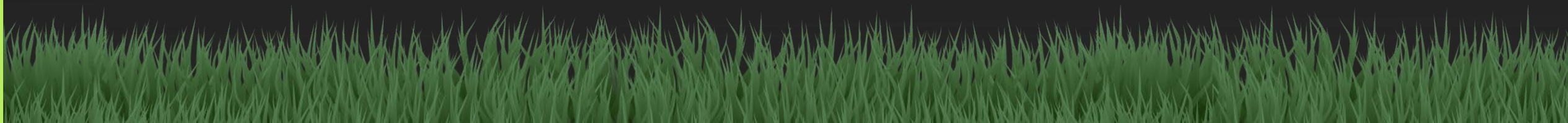
Practical Applications for Testing in Turfgrass Systems

Presented by Kyle Foreman

FGS Consulting

Why do we test?



Why do we test?

- Planning
- Analysis
- Measure Efficiencies

Today’s Agenda

Types of Testing for Turfgrass

Universal Rules for Testing

Sampling Procedures: A Quick Review

Methods for Interpretation

Practical Methods for Implementation

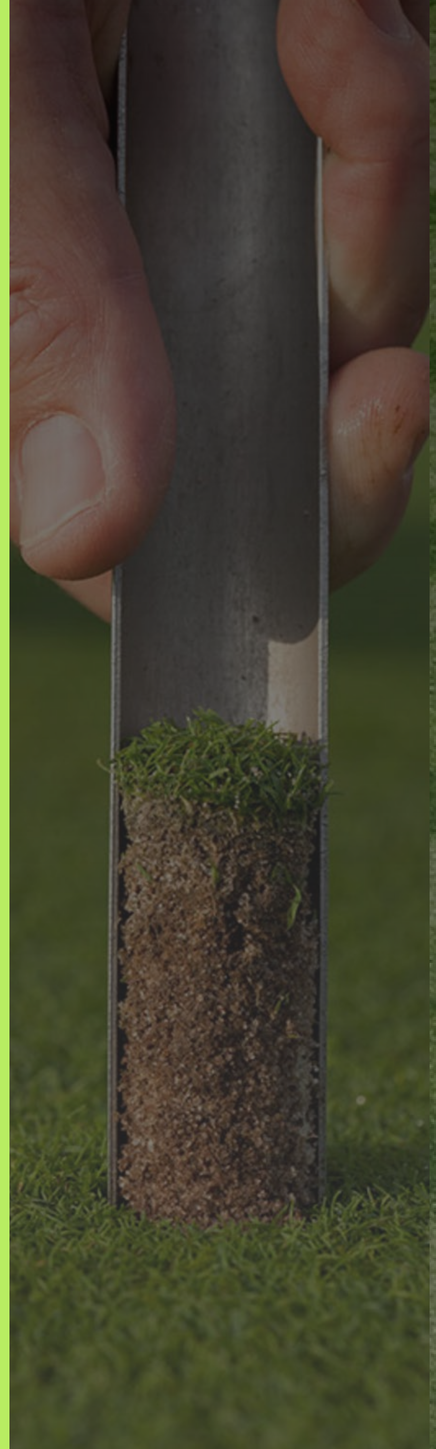
Types of Tests

- Chemical Soil
- Physical Soil
- Irrigation Water Quality
- Tissue
- Organic Matter
- Playability

General Rule #1

Be Consistent!

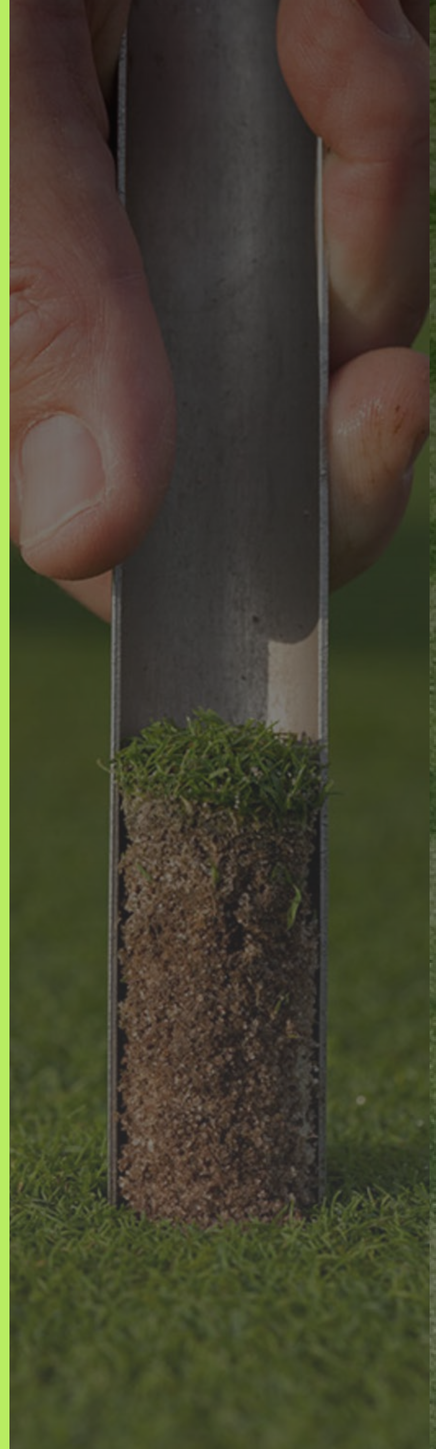
- Consistent Timing
- Consistent Depth
- Consistent Methods



General Rule #2

Have a Purpose!

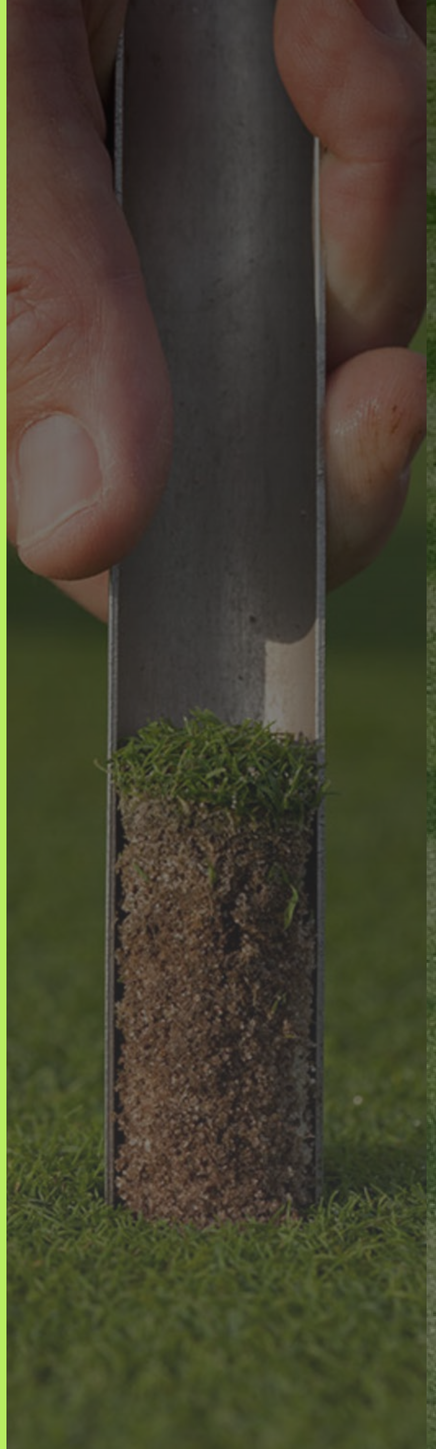
- Ask yourself: “What do I want to know



General Rule #3

Always keep your data!

- Allows for reference in the future
- Beneficial for employee turnover / change
- New discoveries in scientific community



Sampling Procedures - Soil Sample Example

- Sampling Depth
  - Recommended 4”
  - When in doubt… Remember Rule #1
- 40-30-20-10 Rule

Sample Locations

- How many locations to sample?
  - Rutgers Recommendation - 20-30 locations on a sports field
  - How many samples do we really need? Lets look at some data…

Sample Locations - By the Numbers

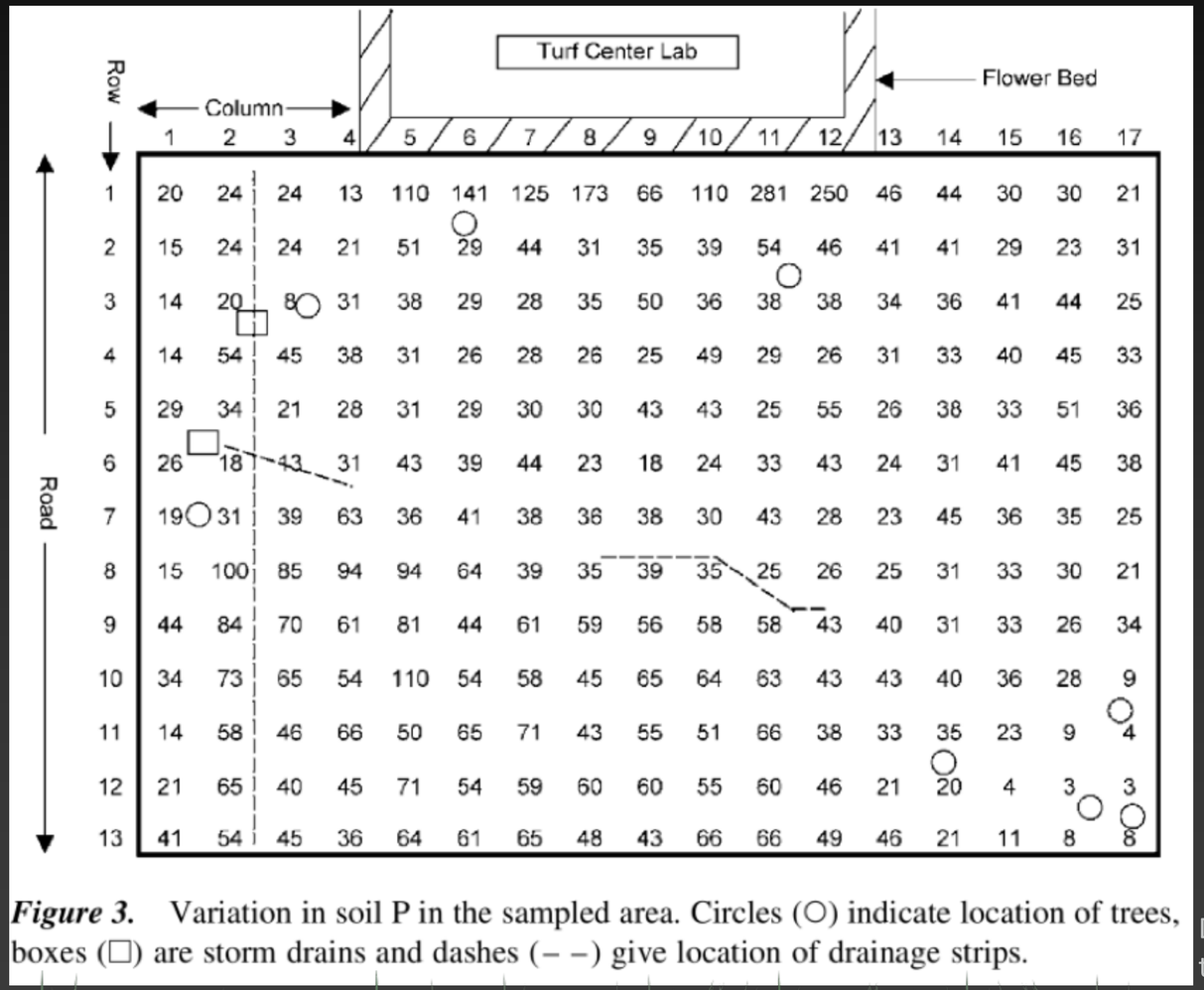
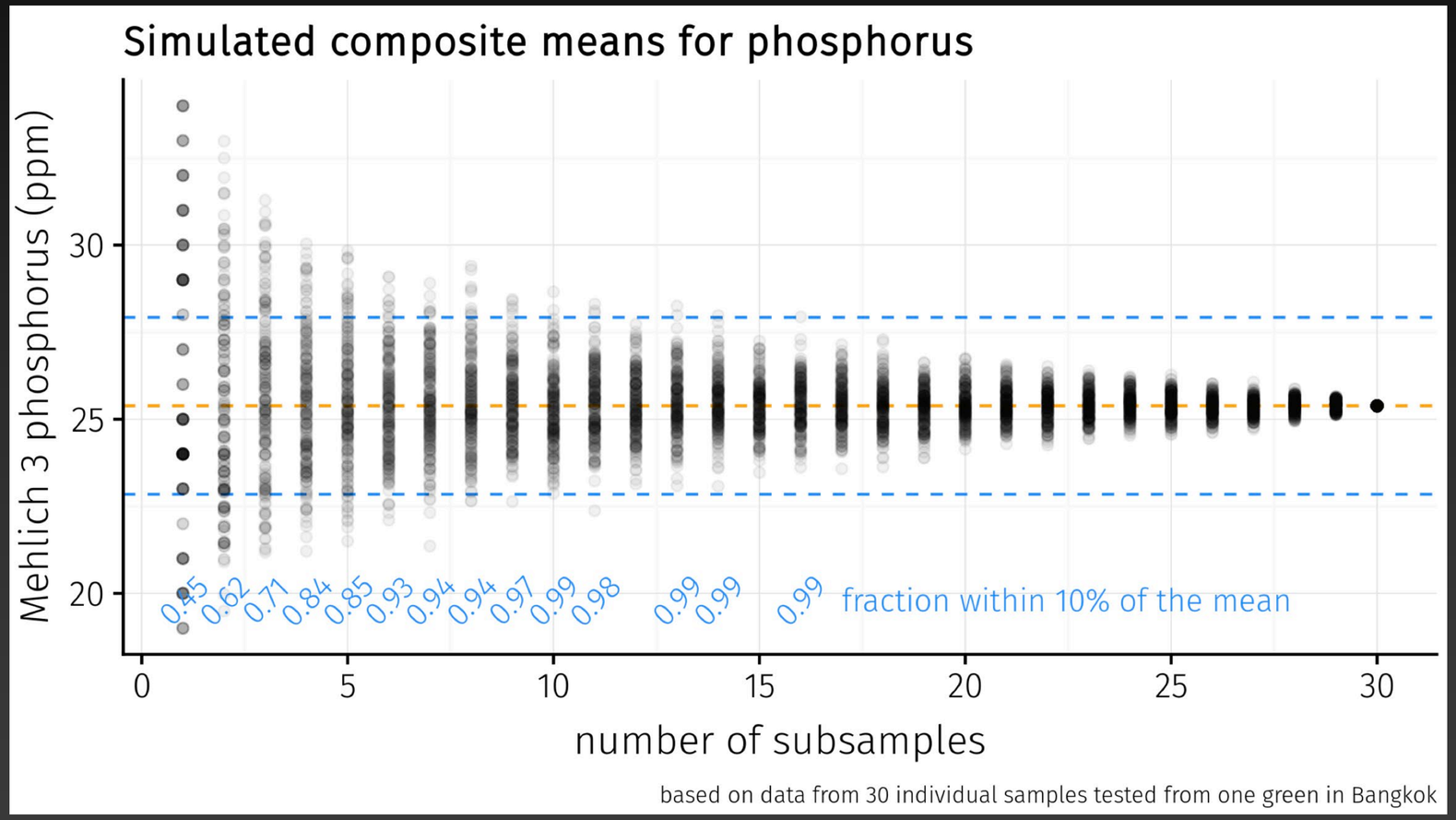


Figure 3. Variation in soil P in the sampled area. Circles (○) indicate location of trees, boxes (□) are storm drains and dashes (– –) give location of drainage strips.

- Donahoe (2002) Mehlich 1 Phosphorus levels
- Concluded that 20 subsamples are necessary for a representative composite sample per 1,000-2,000 m^2 (10,764 - 21,528ft^2)
- How much for a 75,000ft^2 athletic field?
  - 70-140 subsamples

Donohue, S. J. 2002. Evaluation of soil nutrient variability for development of turfgrass soil test sampling methods. *Commun. Soil. Sci. Plant Anal.* 33(15-18):p. 3335-3345.

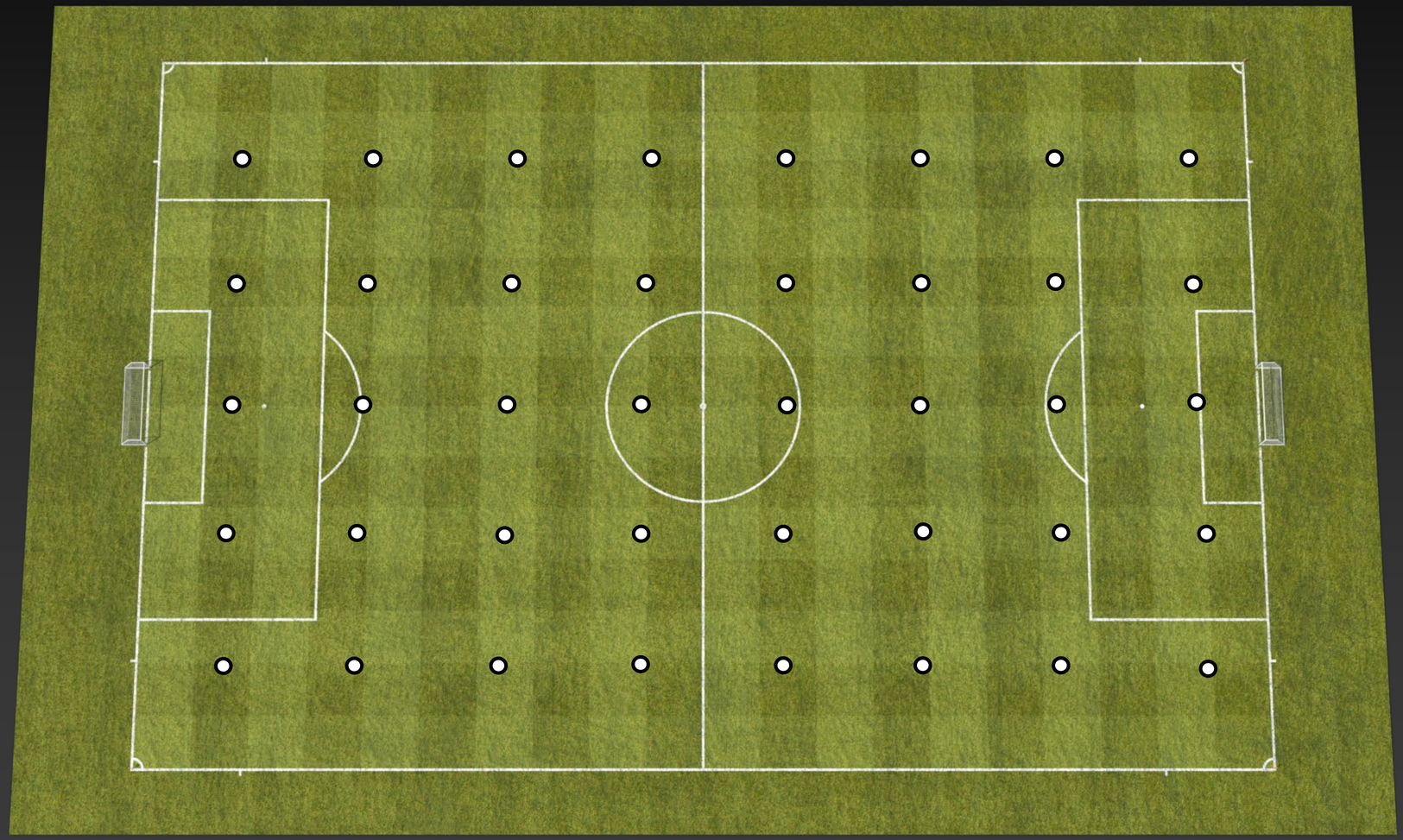
Sample Locations - By the Numbers



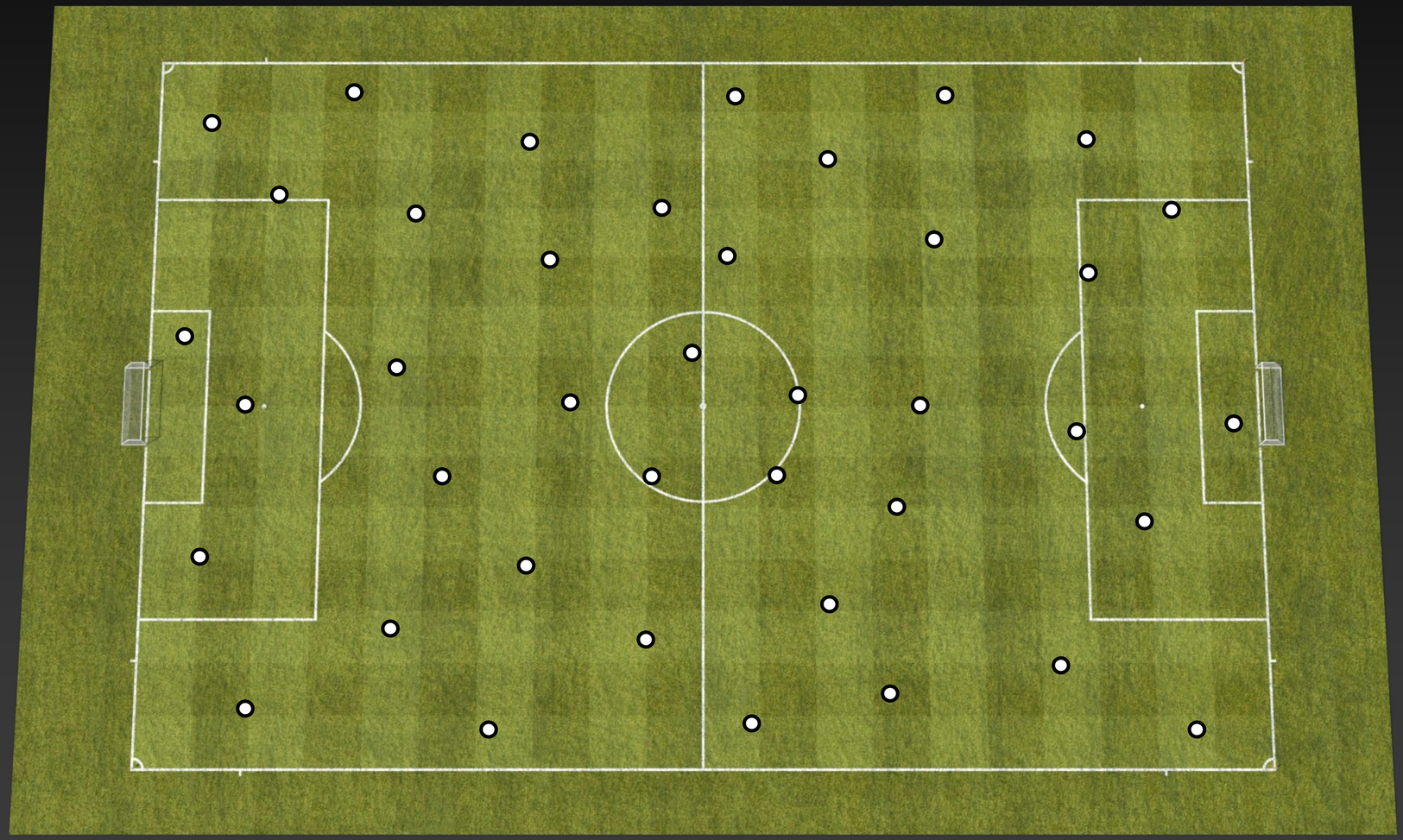
Credit: Micah Woods, Asian Turfgrass Center

- 30 Samples collected from a 1,092 m^2 green (11,755 ft^2)
- After 6 subsamples, composites were within 10% of the mean, 90% of the time.
- Six subsamples equals roughly 1 sample per 200 m^2 or 2000 ft^2
- Based on this, we need 38 subsamples for a 75,000 ft^2 field.

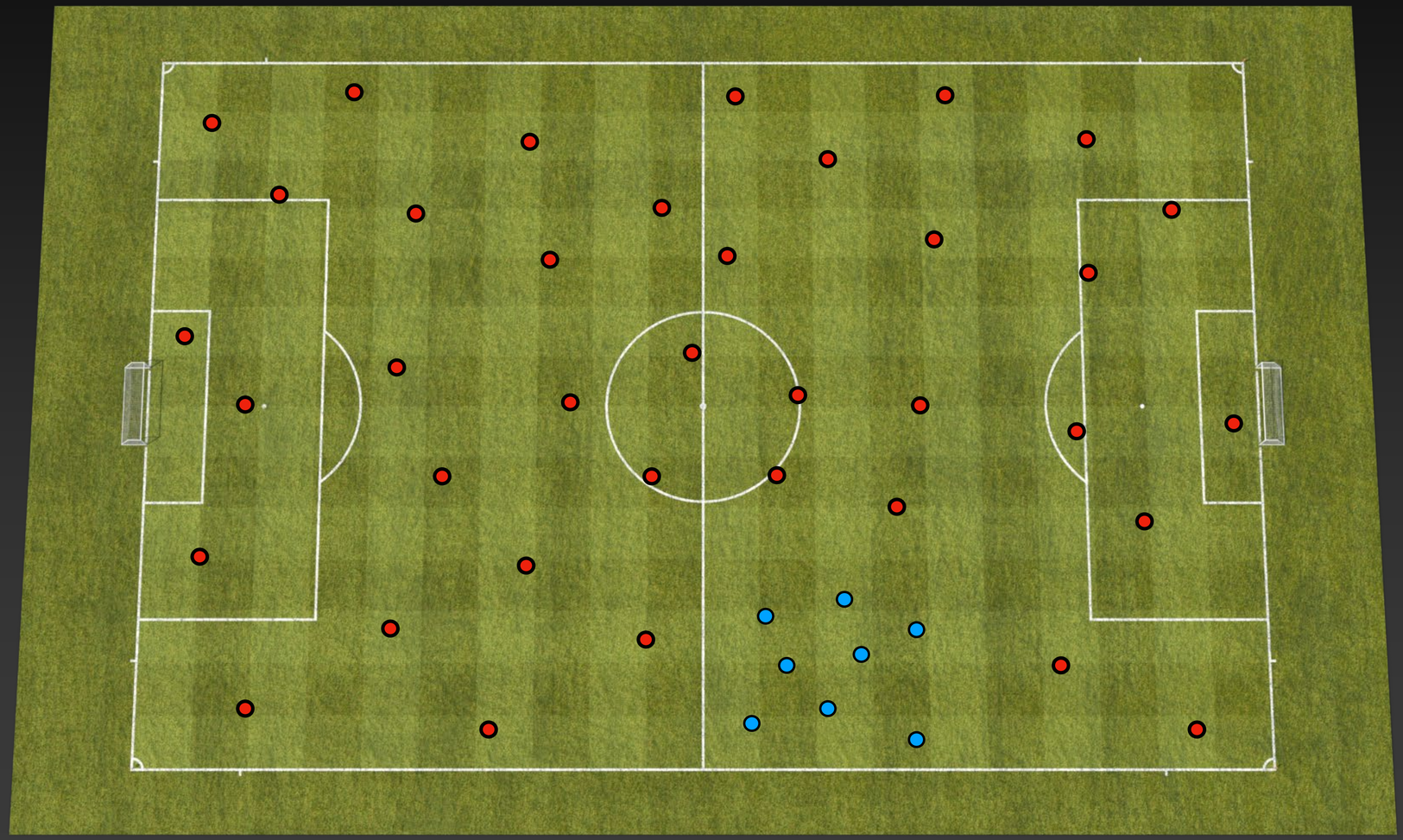
Sample Locations - Grid Sampling



Sample Locations - Random Sampling



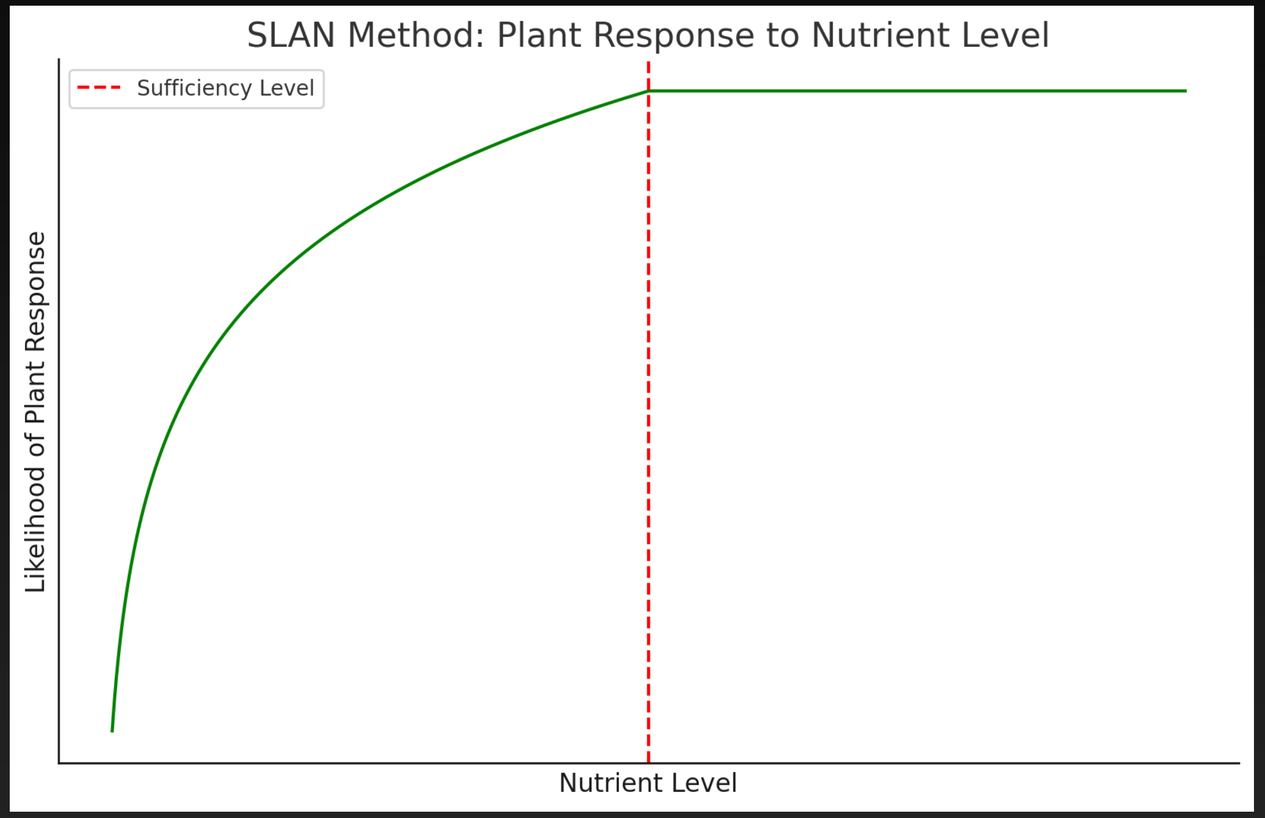
Sample Locations - Stratified Random Sampling



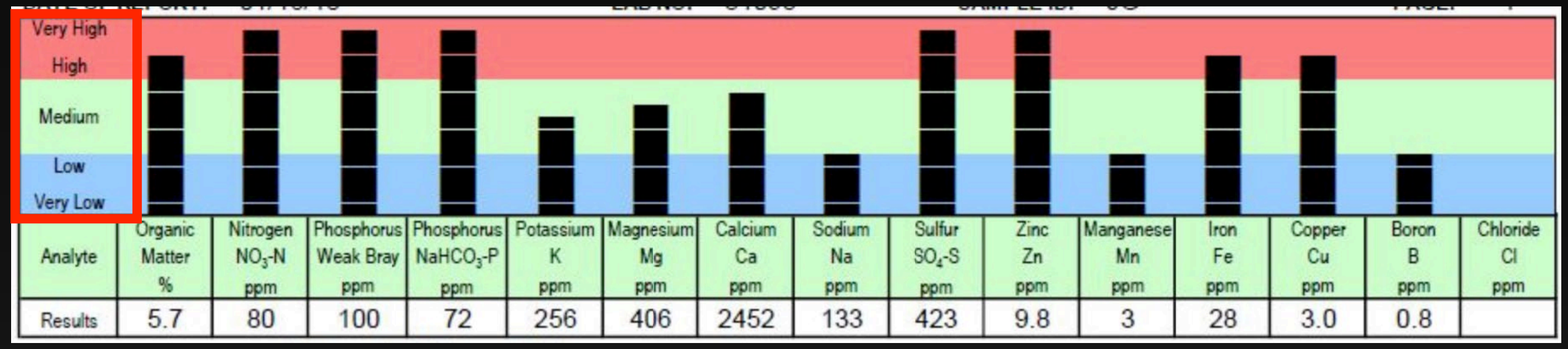
Interpreting Results

SLAN - Sufficiency Level of Available Nutrition

- There is a specific level of each nutrient sufficient for the optimal growth of a particular crop.
- This level is referred to as the 'sufficiency level.'



SLAN - Sufficiency Level of Available Nutrition



Analyte	Organic Matter %	Nitrogen NO_3-N ppm	Phosphorus Weak Bray ppm	Phosphorus $NaHCO_3$-P ppm	Potassium K ppm	Magnesium Mg ppm	Calcium Ca ppm	Sodium Na ppm	Sulfur SO_4-S ppm	Zinc Zn ppm	Manganese Mn ppm	Iron Fe ppm	Copper Cu ppm	Boron B ppm	Chloride Cl ppm
Results	5.7	80	100	72	256	406	2452	133	423	9.8	3	28	3.0	0.8	

University Extension
University of Missouri
Columbia

Soil Test Report

----------MU Laboratories----------

	County	Region
Submitted	Saint Louis	Processed

http://www.soiltest.psu.missouri.edu/

Sample ID: BACK YARD

This report is for:

Lab No:

Last Limed: unknown

Submitted by:
Firm No. Outlet:

SOIL TEST RESULTS			RATING					
			Very low	Low	Medium	High	Very high	Excess
pHs	6.5		**********					
Phosphorus (P)	229	lbs/a	**********	**********	**********	**********	**********	
Potassium (K)	452	lbs/a	**********	**********	**********	**********	**********	
Calcium (Ca)	5070	lbs/a	**********	**********	**********	**********	**********	**********
Magnesium (Mg)	511	lbs/a	**********	**********	**********	**********	**********	**********
Organic Matter:	3.1 %		Neutr. Acidity: 0.5 meq				CEC: 15.9 meq	

UGA extension
Ag & Environmental Services Labs

Soil, Plant, and Water Laboratory
2400 College Station Road
Athens, Georgia 30602-9105
Website: http://aesl.ces.uga.edu

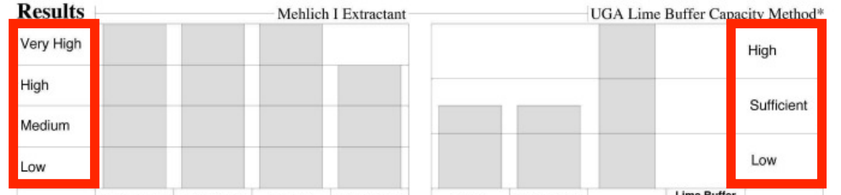
Soil Test Report

Sample ID

(CEC/CEA Signature)

Client Information	*Lab Information*	*Contact*
Sample: 3 Crop: Home Vegetable Garden	Lab #71631 Completed: Jun 23, 2015 Printed: Jun 23, 2015 Tests: S1 S6 S20N	**Soil, Plant, and Water Laboratory** 2400 College Station Road Athens, GA 30602 ph: 706-542-5350 e-mail: soiltest@uga.edu

Results



	Phosphorus (P)	Potassium (K)	Calcium (Ca)	Magnesium (Mg)	Zinc (Zn)	Manganese (Mn)	pH *	Lime Buffer Capacity (LBC)	
Soil Test Index	1007 lbs/Acre	878 lbs/Acre	16015 lbs/Acre	1315 lbs/Acre	47 lbs/Acre	105 lbs/Acre	7.3	723	Soil Test Index

BCSR - Base Cation Saturation Ratio

- Sets to define ‘ideal’ ratios for cations in the soil:
  - Calcium - 65-75%
  - Magnesium - 10-20%
  - Potassium - 3-5%

Lab Number				0441-1	0442-1
Total Exchange Capacity (ME/100 g)				94.90	83.28
pH (H_2O 1:1)				7.8	7.9
Organic Matter (360°C LOI) %				2.64	2.37
Estimated Nitrogen Release			lb/A	73	67
SOLUBLE SULFUR*			ppm	87	90
MEHLICH III		lb/A	P as P_2O_5	270	215
			ppm of P	59	47
BRAY II		lb/A	P as P_2O_5		
			ppm of P		
OLSEN		lb/A	P as P_2O_5	215	183
			ppm of P	47	40
CALCIUM*			lb/A	34250	30066
			ppm	17125	15033
MAGNESIUM*			lb/A	1062	920
			ppm	531	460
POTASSIUM*			lb/A	552	498
			ppm	276	249
SODIUM*			lb/A	336	334
			ppm	168	167
BASE SATURATION PERCENT					
Calcium	%			90.23	90.26
Magnesium	%			4.66	4.60
Potassium	%			0.75	0.77
Sodium	%			0.77	0.87
Other Bases	%			3.60	3.50
Hydrogen	%			0.00	0.00

MLSN - Minimum Levels of Sustainable Nutrition

- Provides minimum levels of specific nutrients needed for plant growth:
  - Potassium: 37ppm
  - Phosphorus: 21ppm
  - Calcium: 331ppm
  - Magnesium: 47ppm
  - Sulfur: 7ppm

A + B - C = Fertilizer to Apply

Where:

A = Anticipated use by the turf

B = MLSN Value

C = Soil test value

MLSN - Minimum Levels of Sustainable Nutrition

- How do we know how much the plant will use?
- For every 1 pound of N, we anticipate the plant using:
  - Potassium: 0.5 lbs
  - Phosphorus: 0.13 lbs
  - Calcium: 0.1 lbs
  - Magnesium: 0.05 lbs
  - Sulfur: 0.06 lbs

Kussow, W. R., D. J. Soldat, W. C. Kreuser, and S. M. Houlihan. 2012. Evidence, regulation, and consequences of nitrogen-driven nutrient demand by turfgrass. *ISRN Agronomy.* 2012:p. 1-9.

Why I like MLSN

- First method of interpreting soil tests that is specific to turfgrass
- Started with good-performing turf and worked backwards
- Methodology allows for site specific adjustments

Practical Applications - Using the MLSN Approach

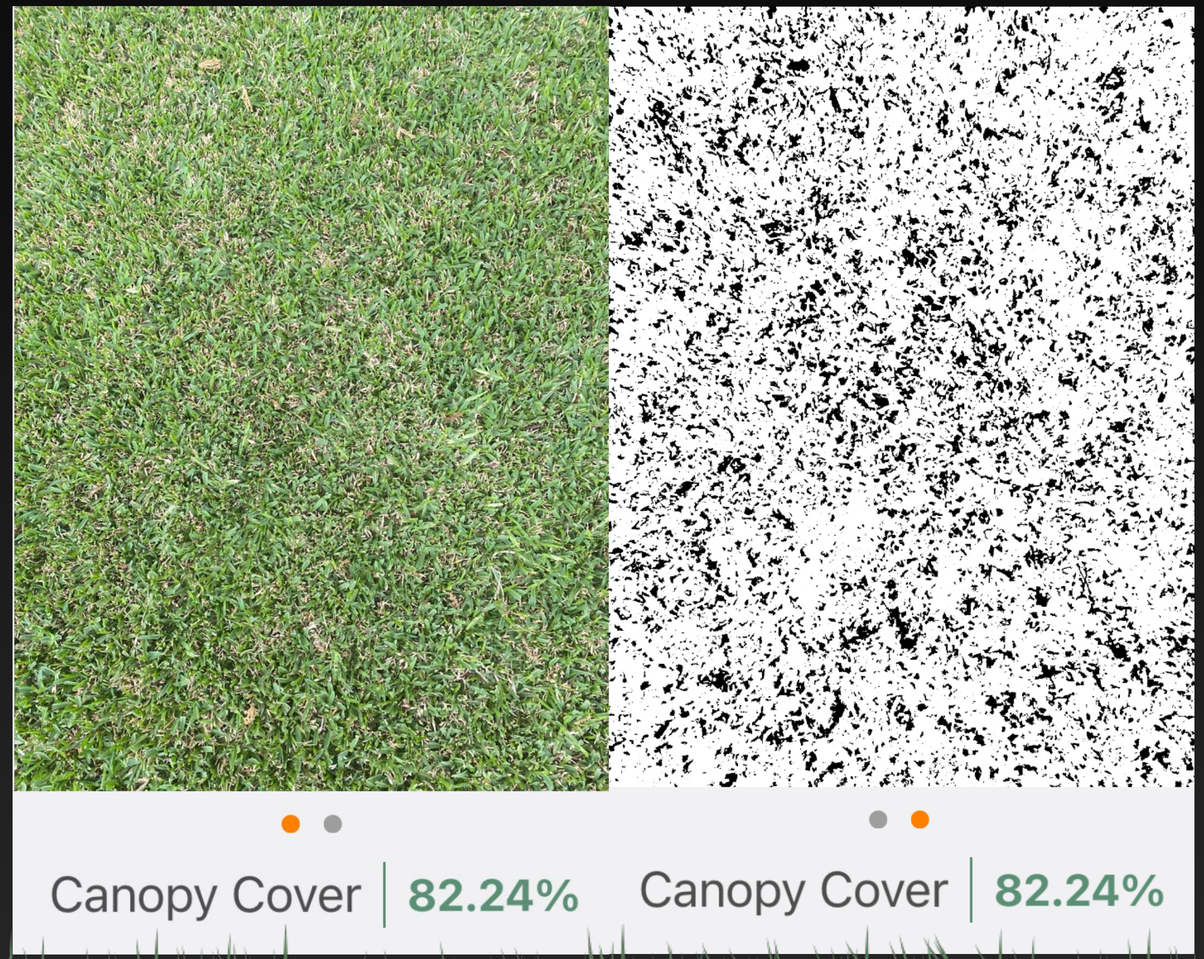
- First: Observe
- Second: Evaluate
- Third: Implement

Practical Methods to Evaluate Outcomes

- Always have a control plot, if possible
- OSB / Plywood is your friend

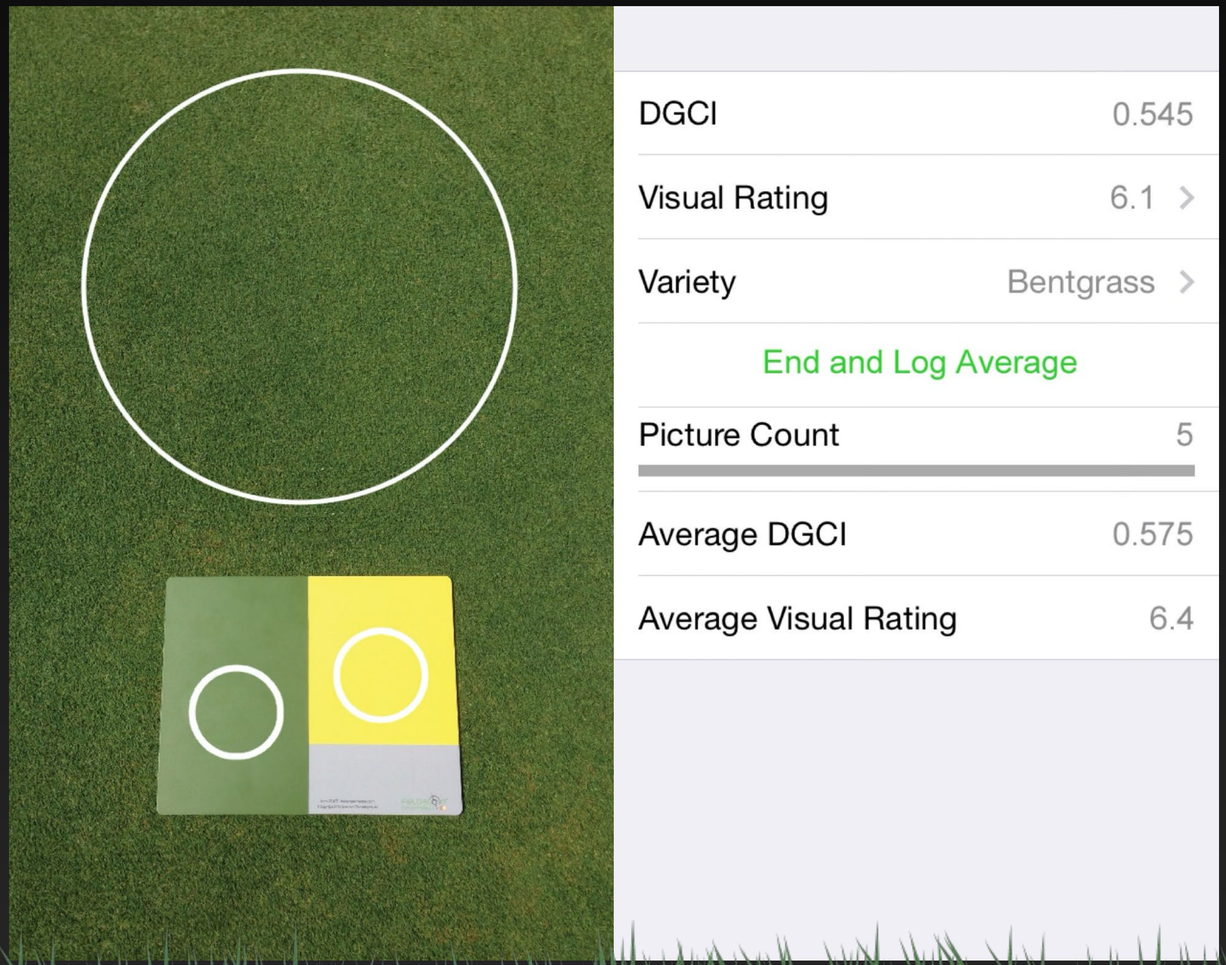
Practical Methods to Evaluate Outcomes

- Use Technology
  - Canopeo App



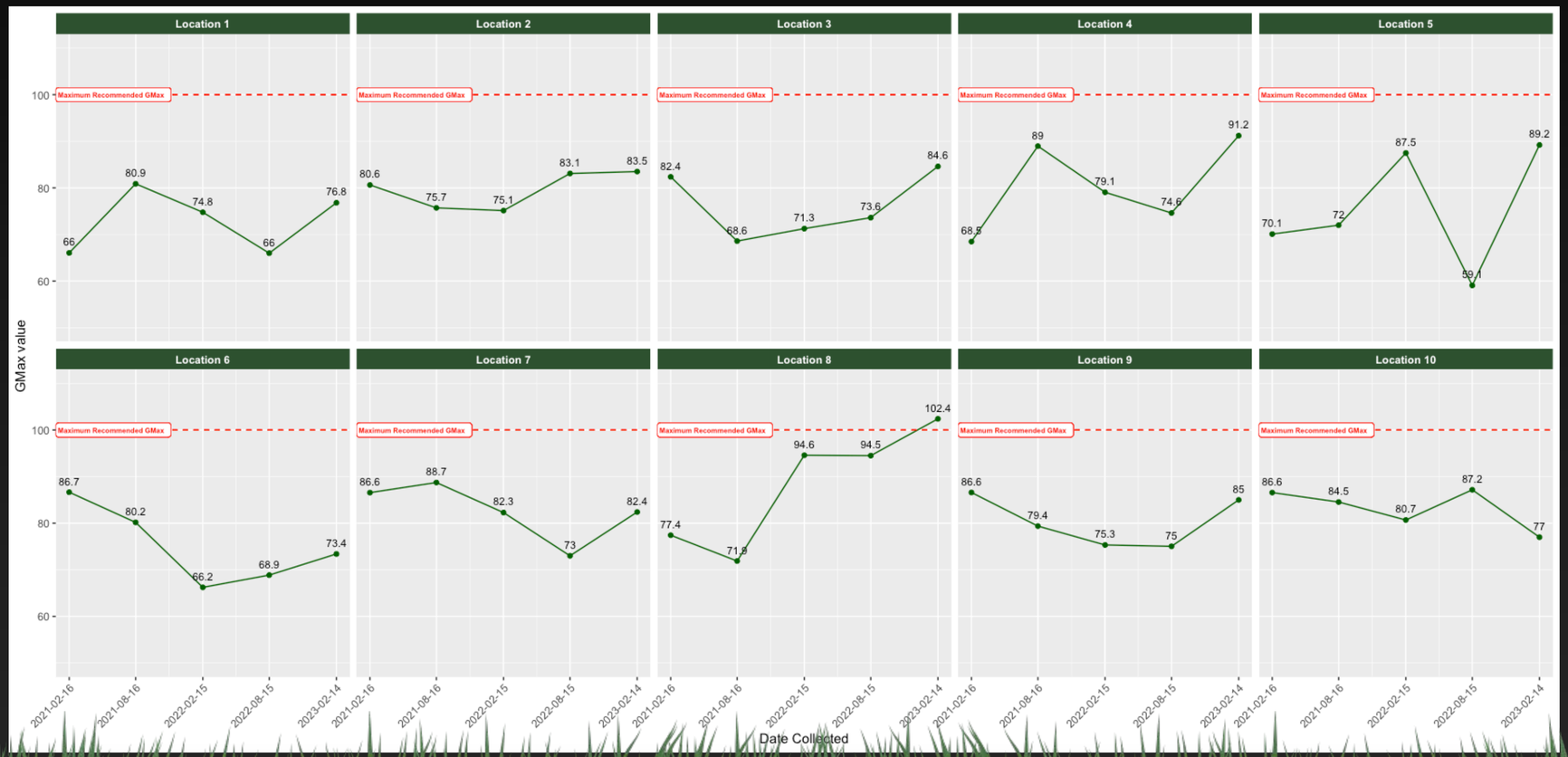
Practical Methods to Evaluate Outcomes

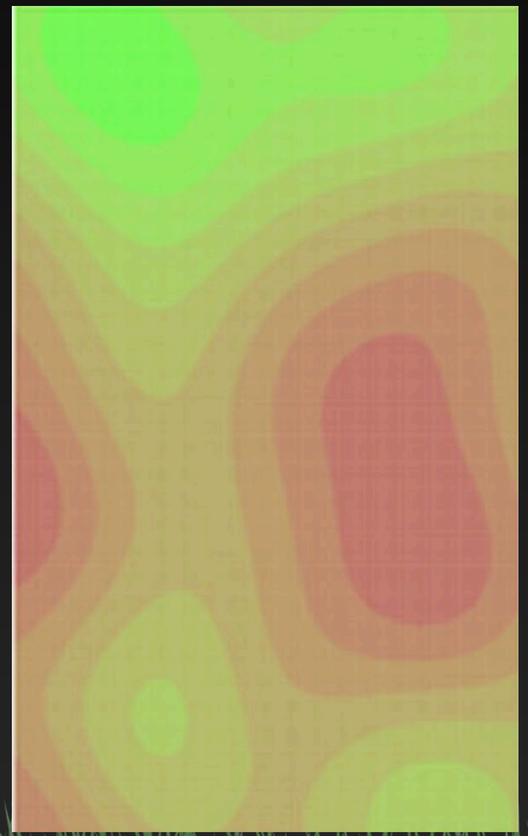
- Use Technology
  - GreenIndex+ Turf



Practical Methods to Evaluate Outcomes

- Track & Visualize the data. Are there noticeable trends?





Questions?