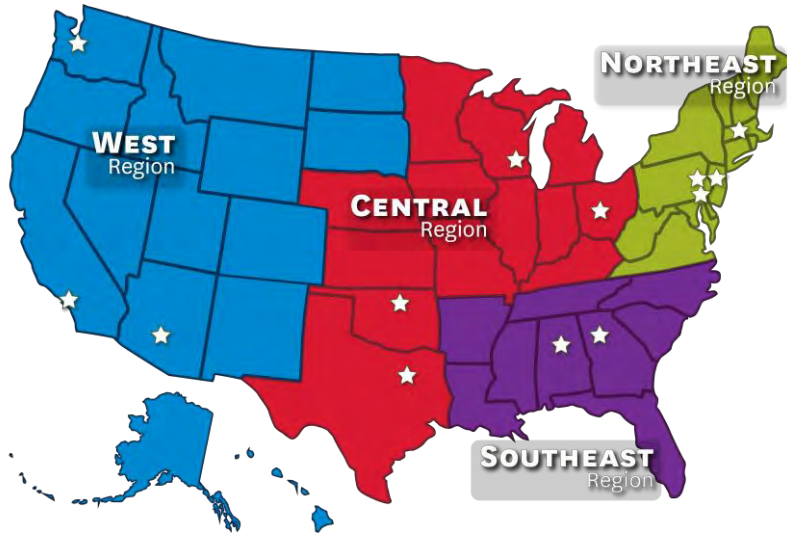


Using Science and Technology in Turf

Paul Jacobs | USGA Agronomist





- Course Consulting
- Educational articles and videos
- Championship agronomy
- Research

Green Section Record

- Link to be sent in email – or Google “Green Section Record”
- Research updates
- Technical articles
- Videos
- FREE!!

Why bunkers are not CONSISTENT
These key factors explain why consistency in bunkers is impossible to achieve.

USGA

Irrigation
Irrigating to maintain healthy turf around bunkers means some water will reach the bunker sand. Sand that receives irrigation will play more firmly than sand that doesn't.

Mother Nature
A bunker that is exposed to sun and wind will have drier, softer sand than one that is shaded.

Drainage
Bunkers that are poorly drained or contaminated with soil may have extremely firm playing conditions that are not desirable.

Play
Bunkers that receive lots of play may be softer and less smooth because golfers shift sand around when they play shots and rake footprints.

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Agenda – Science and Technology in Turf and Landscapes



The Basics

- Environments
- Drainage
- OM Management

Surface Management

- Mowing
- GPS Spraying
- PGRs
- Measuring playability

Emerging Trends

- MLSN vs. SLAN
- Clipping yield
- Water management
- Drones

The Basics

1. Growing environment
2. Drainage
3. Organic matter management
4. Good decision making

Ideal growing environments

1. Maximize light penetration
2. Air movement



Not-so-ideal growing environments



Ideal growing environments

1. Maximize light penetration

- a) Summer months – AM light critical for cool season turf

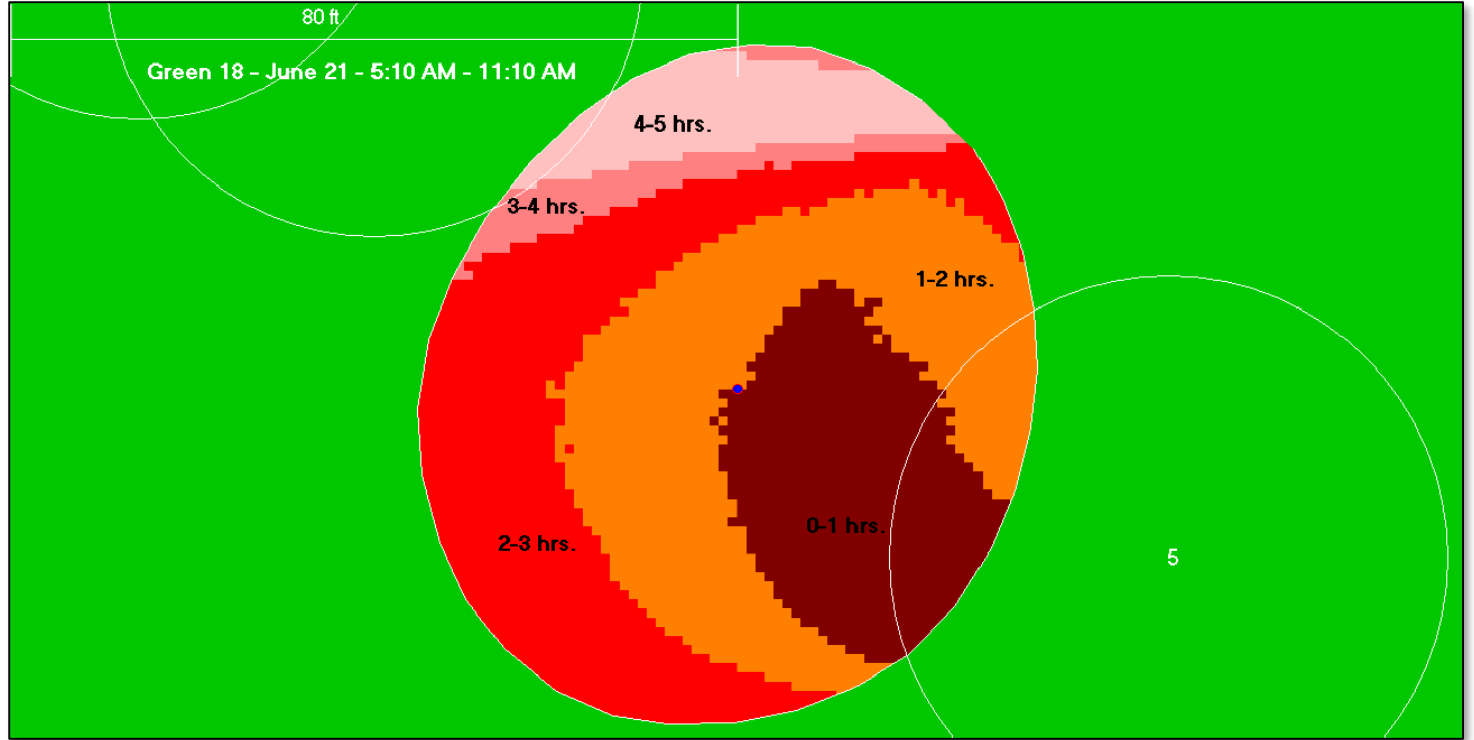


Morning Shade



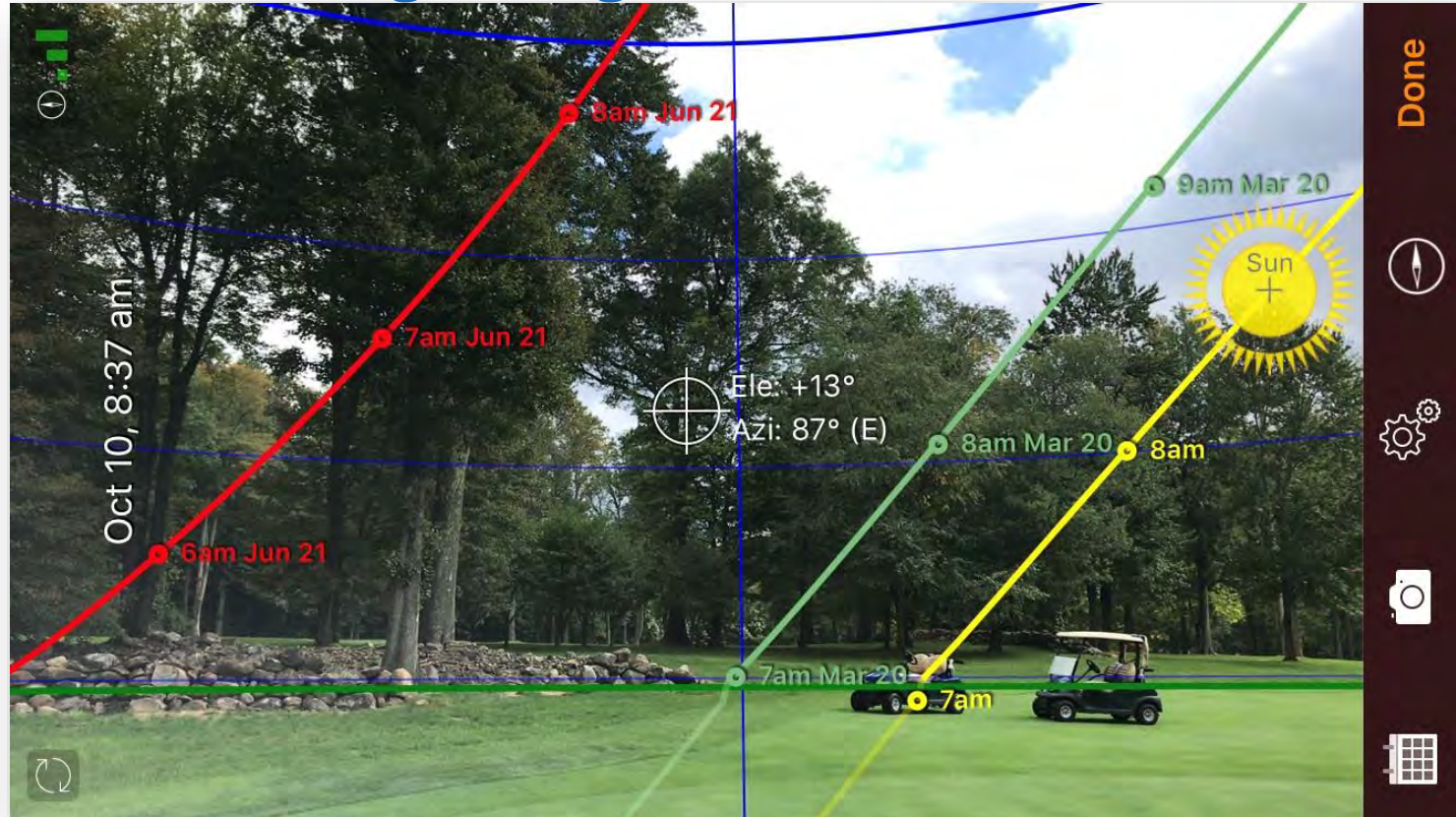
Technology to evaluate growing environments

ArborCom



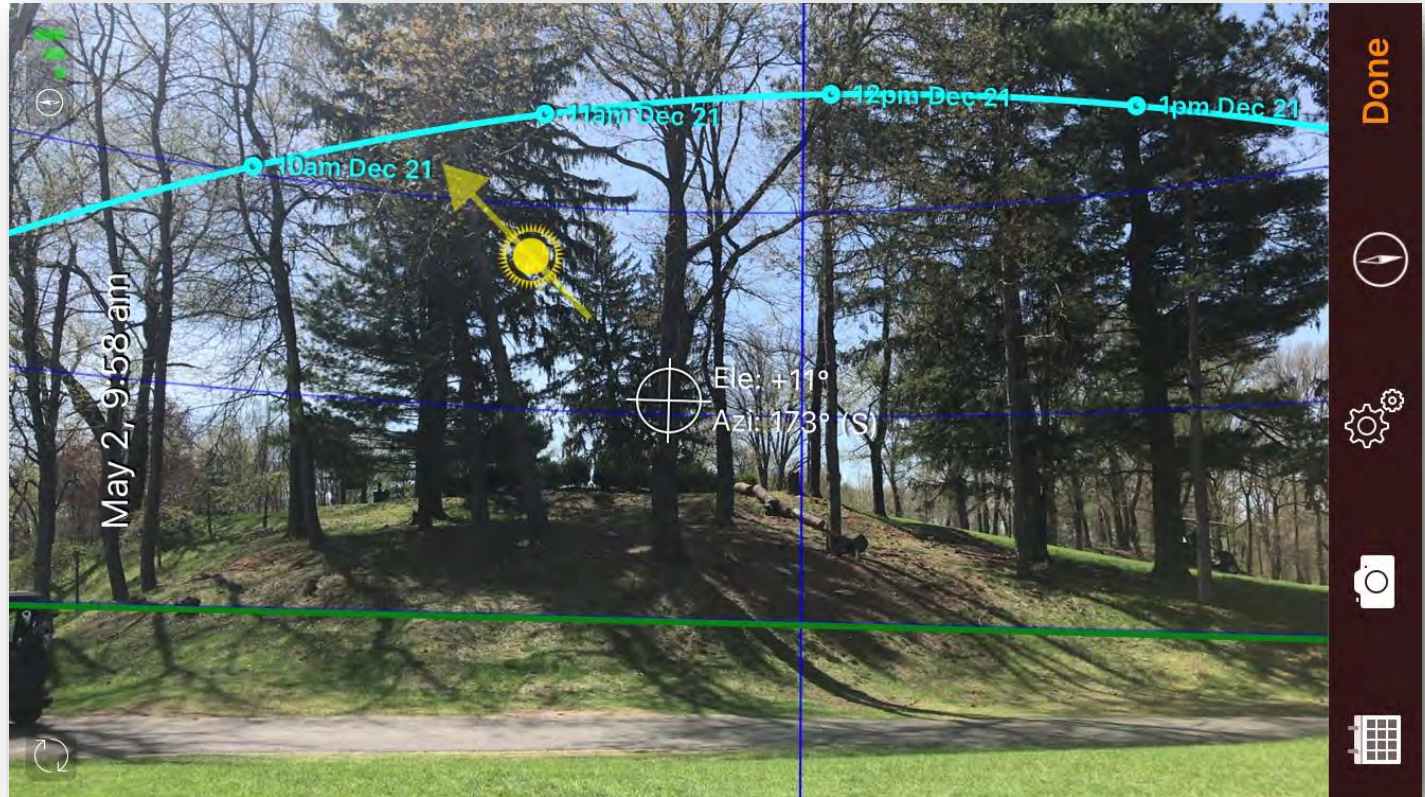
Technology to evaluate growing environments

Sunseeker

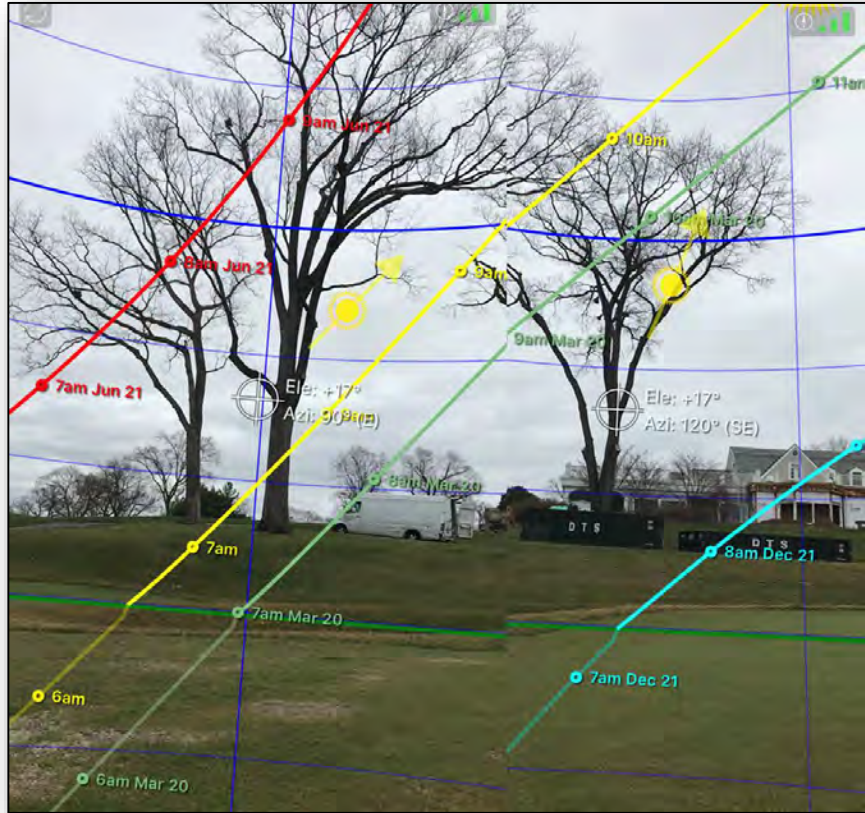


Technology to evaluate growing environments

Sunseeker



Quantifying light requirements



Drainage...not much as changed

Sand channel drainage best option for soil based greens



Drainage – Drill and Fill

- Improves internal drainage by “increasing depth of bathtub”



Organic Matter Management



Organic Matter Management

- Hollow core aeration
- Aggressive verticutting
- DryJect
- Sand Topdressing

DILUTION IS THE SOLUTION

Organic Matter Management

- Hollow core aeration



Organic Matter Management

- Aggressive verticutting



Organic Matter Management

- DryJect



Organic Matter Management

- DryJect “Top changer”



Organic Matter Management

- Sand Topdressing
- ✓ Thatch dilution
- ✓ Firmness
- ✓ Smoothness/speed
- ✓ Crown protection



Organic Matter Management

- Sand Topdressing
- ✓ Thatch dilution
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Rutgers Sand Topdressing Research

- Sand Topdressing can be difficult to incorporate into the dense turf canopy.
- Using finer sands makes it easier to incorporate, but could result in excess moisture retention near surface







Rutgers Sand Topdressing Research

1. Does TD with fine sands produce the negative affects we would expect to see?
 - a) i.e., Excess moisture retention in upper potion of profile?
2. Does backfilling aeration channels with coarse sand offset potential negative effects of using fine sand?

Rutgers Sand Topdressing Research

Sand	1,000 μ m Very Coarse	500 μ m Coarse	250 μ m Medium <small>lbs. / 1,000 sq. ft.</small>	150 μ m Fine	53 μ m Very Fine
Medium-coarse	0	33.8	57.7	8.4	0.1
Medium-fine	0	0.1	76.7	22.7	0.5
Fine-medium	0	5.7	25.8	66.8	1.7

Gravel 4.0 (5)	Gravel 2.0 (10)	V. Coarse 1.0 (18)	Coarse 0.5 (35)	Medium 0.25 (60)	Fine 0.15 (100)	V. Fine 0.05 (270)
$\leq 3\%$ Gravel $\leq 10\%$ Combined			$\geq 60\%$ Combined		$\leq 20\%$	$\leq 5\%^{***}$

Rutgers Sand Topdressing Research

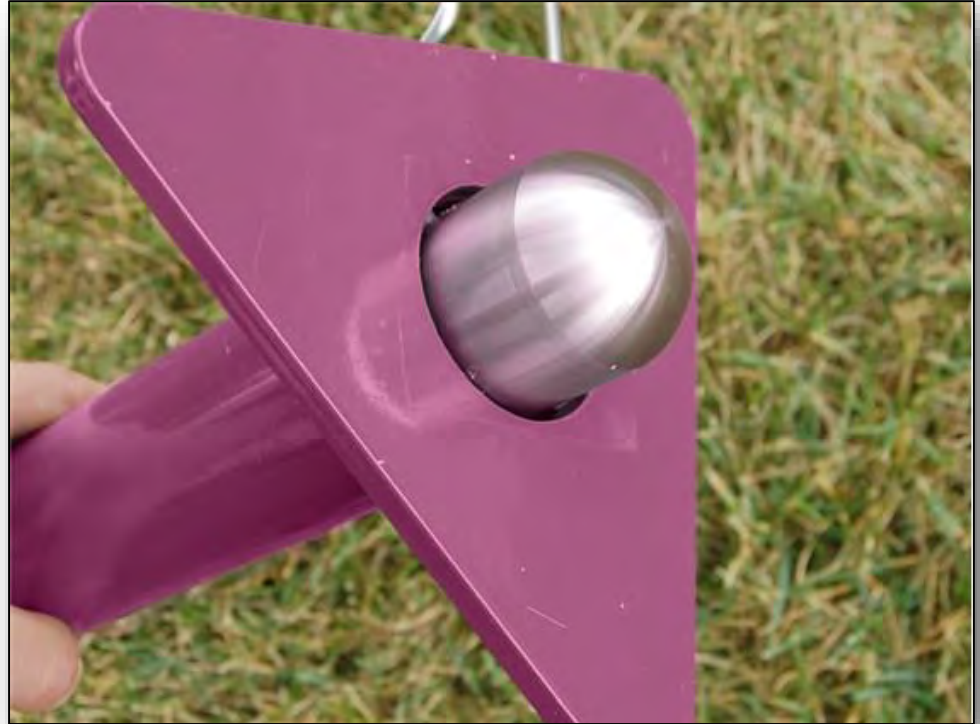
RESULTS

1. Any sand better than no sand.
2. Don't want all fines, but a Medium/Fine for TD is not producing negative effects.
 1. No Very Coarse and <5% Coarse particles
3. Particles >0.5 mm are more likely to get picked up by mowers anyway.

Surface Management

1. Measuring surface quality
2. Robotic mowing
3. GPS sprayers
4. PGRs

Measuring Speed and Firmness



Measuring Speed and Firmness

1. Quantitative measures help define conditions
2. Use to encourage consistency, not maximize speed
3. Slow greens are better than dead greens



Robotic Mowing



- Improved efficiency
 - a) Mow, roll, change hole locations, rake bunkers and fix ball marks with one person

GPS Sprayers



Other industries investing in technology

