OPENING GOLF
TO THE WORLD.

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# DRIVING SUSTAINABLE GOLF.

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# PAUL WOODHAM.

**Agronomy lead for Europe and UK**

# DATA COLLECTION AND THE GOLFER EXPERIENCE.

Measuring golf green agronomic and surface performance in championship and club situations.

# WHAT MAKES
# GOOD GOLF GREENS?

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# Establishing what ‘Quality’ means.




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# R&A Golf Course 2030 research.

**Golf Green Standards – A Framework for Sustainable Golf Courses**

**Quality** – “the degree of excellence of a thing”

**Performance** – “the capabilities of a thing”

- The most important stakeholders in regard to golf course condition is the golfers themselves.
- Difficulties arise when golfers do not always appreciate the practice of golf greenkeeping and the influence of environmental pressure.

**The question naturally has to be asked “from what background knowledge is the comparison made?”**

**“Without data, you’re just another person with an opinion” (Deming W.E 1982)**

# Quality and Performance cannot be considered without other considerations.

- Golf course design
- Willingness to develop the course
- Maintenance strategy
- Weather
- Budget
- Resources
- Usage levels
- Constraints – regulation

# Studies in Playing Quality.

When assessing overall performance, research suggests that greens should present a fair challenge to the golfer and reward the skill of the player.

Montieth (1929) suggests that ‘the ultimate aim is to provide a surface where a ball may be rolled with the greatest possible accuracy and one which will remain in good condition throughout as long a season as possible’.



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# Studies in Playing Quality.

Rightly or wrongly golf courses seem to be subjectively judged on either being better or worse than the neighbouring course based solely on ‘locker room’ chat and 19th hole bar room debate comparing greens of one course to another.

Comparisons are commonly centred on the ball roll speed (green speed) with survey results carried out by GCSAA suggesting that golfers consider green speed the number one factor about a golf course (Umminger and Merrill, 2002).

Also supported by Baker et al (1996a) – Green Speed as one of the most important criteria by which players judge course performance.



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# Greens Performance.

## Speed

Green speed affects the challenge and playability of a golf course, along with other performance characteristics, therefore enhancing the golfer's experience.

Consistent and appropriate green speed ensures fair and reliable putting conditions.

# Measuring Green Speed.

## Green Speed

Invented by Edward S Stimpson, the intention for the Stimpmeter was to develop a tool which would accurately, objectively and statistically gather valid measurements of putting green speed.

Developed to aid uniformity between and within greens, also to encourage each club to decide upon a speed its members are comfortable with then work toward speed uniformity for all greens on the course.

A green speed comparison table was developed by USGA following research and studies of more than 750 greens.


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# Studies in Playing Quality.

## Green Speed

The purpose of the USGA green speed comparison table was not to propose minimum standards for different categories, but rather to provide an objective test of green speed to enable superintendents to work towards more uniform putting surfaces over 18 greens.

A revision following the development of the classifications in 1977 was the intention as data used to compile them was considered limited and insufficient to be reliable (Radko, 1977) with a subsequent review still demanding further investigation (Radko, 1978).

To this date no further formal research revision has been undertaken.

| Speeds for Regular Membership Play | |
|---|---|
| 8’6 " | Fast |
| 7’6 “ | Medium-fast |
| 6’6” | Medium |
| 5’6” | Medium-slow |
| 4’6” | Slow |

| Speeds for Tournament Play | |
|---|---|
| 10’6” | Fast |
| 9’6” | Medium-Fast |
| 8’6” | Medium |
| 7’6” | Medium-slow |
| 6’6” | Slow |

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# Studies in Playing Quality.
# Green Speed

History tells us that publishing green speed ranges can lead to abuse such as in the case of Stimpmeter readings which may lead to
inter Club comparisons (Oatis, 1990).

Radko discussed, in the early 1980's, many clubs were attempting 'tournament speeds' for the entire season (Nikolai, 2005) with speed dominating players expectations.

Green speed is not the sole measure of quality.


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# Studies in Playing Quality – Chasing Speed

Nikolai (2005) suggests that management practices such as lowering mowing heights with the sole purpose of achieving speeds had, in many cases, led to agronomic problems such as increased moss, algae, thin stringy turf lacking turgidity and generally weak turf with more thatch accumulations.

The latter observations were noted by Radko during agronomy course visits in America during the early 1980's. His observations of diminishing greens quality were firmly linked to turfgrass stress caused through low mowing heights and insufficient nitrogen inputs.

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MACKENZIE & EBERT
INTERNATIONAL GOLF COURSE ARCHITECTS

# WORK ON HERITAGE COURSES

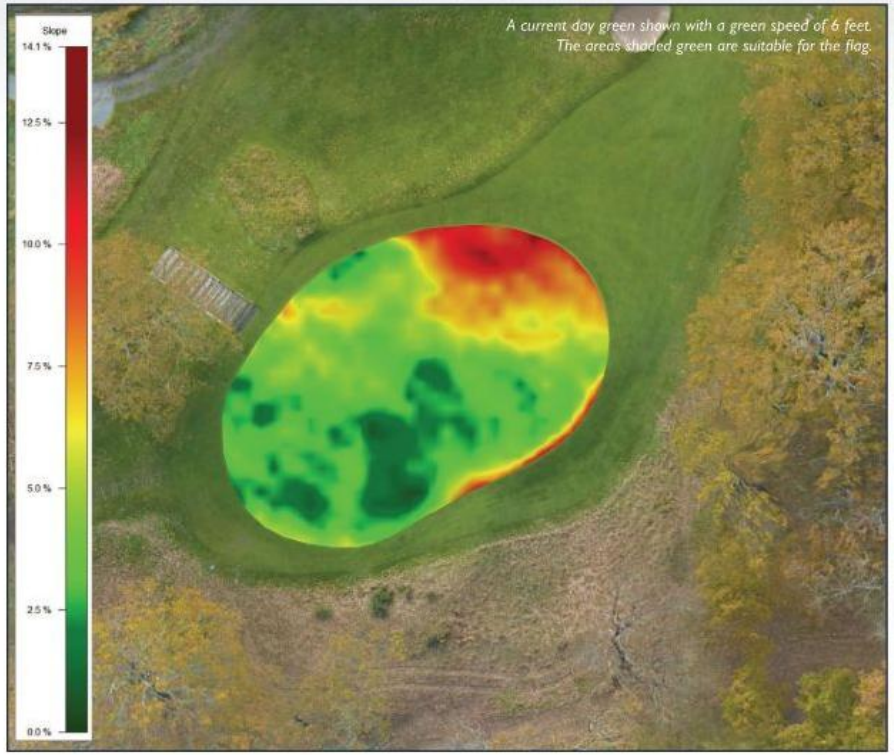
## GREEN SPEED & ITS IMPACT ON PIN POSITIONS, INTEREST & VARIETY

In both 2019 and 2021, we wrote about this subject and yet it remains a hot topic with Clubs. The reality is that current day members get used to playing greens at modern green speeds and many cannot imagine how they played when they were originally designed. Describing huge front sections of greens where the flag could once be located as false fronts is an incorrect definition. A false front is a feature where the very front of a green is folded over, most often to make the front of a green visible when it sits above the eyeline of the player. They were never intended to be used for flag positions. However, there are many "lost" sloping areas at the front of greens that are not false fronts and should be called "abandoned and forgotten front areas" because that is what they are.

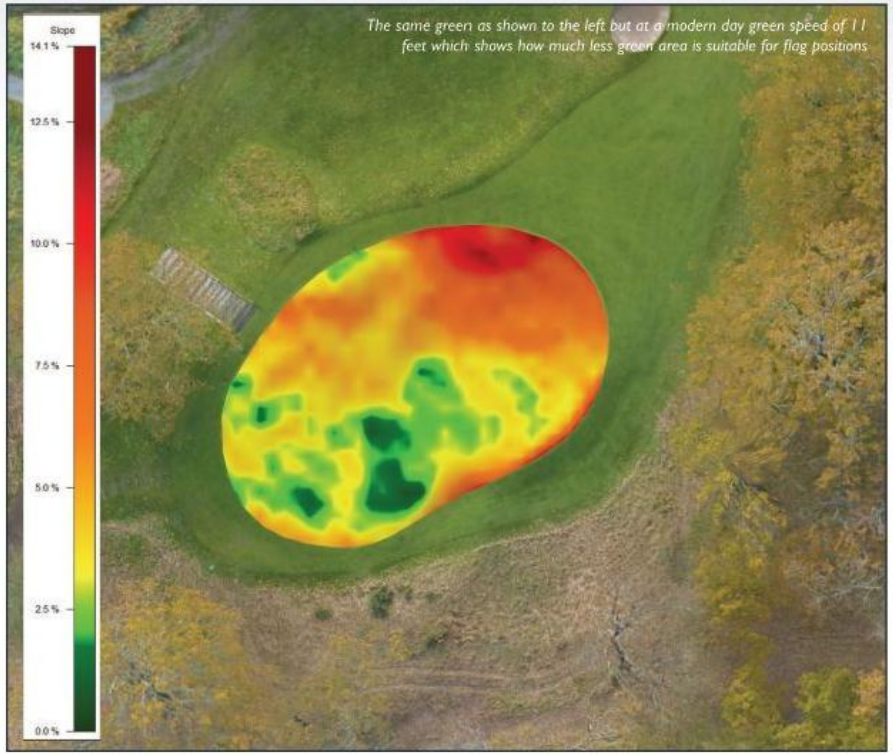
To help demonstrate this, below we have added an example of a green designed in the Golden Age, a century ago, when green speeds were something like 6 feet. At these speeds, slopes less than 6% (3.5 degrees) could be used for flag positions and the areas shaded green were originally good for hole locations. The next picture is the same green, unaltered, but showing the impact when greens are running at 11 feet with the same colour coding reflecting areas that are suitable for hole locations now and those which are not – the orange and red zones.

Not only is the usable area drastically reduced, but the variety and interest are greatly diminished too. Unless you view an old course as a museum to be left untouched for ever, even if it no longer makes sense in the modern game, it is difficult to defend doing nothing. That is not to say that every part of a green with severe slopes must be altered, but there is certainly a strong case to consider judicious reshaping to restore lost interest and variety.

The easiest thing is always not to act, but it is hoped that this example helps to alter perceptions.



*A current day green shown with a green speed of 6 feet. The areas shaded green are suitable for the flag.*



*The same green as shown to the left but at a modern day green speed of 11 feet which shows how much less green area is suitable for flag positions*



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# Studies in Playing Quality.
# Finding the Balance

Knoop (2002) suggests that the manager's aim should be to find how high turf can be mown without serious complaint whilst Nikolai (2005) encourages committee members and owners to ensure that the quest for speed does not cause undue stress on the turf.

Consistent physical pressure will raise the risk of turfgrass stress and disorders. Mowing will also create disturbance and influence the grass species composition.

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# GREEN FIRMNESS.



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# Studies in Playing Quality.
## Green Surface Firmness

Firmness is a key characteristic which is probably not understood when golfers are criticising disappointingly slow green speeds.

There may once have been a desire to replicate ‘target golf’ conditions and thus dictate agronomical practices which produce softer ‘more receptive’ surfaces.

The consequences of reducing green speeds were probably not considered. Quite simply “fast greens on soft surfaces cannot be sustainably achieved on soft surfaces.

Sirak (2010) cites Ernie Els who once said, “The only shot you need to succeed on the PGA Tour is the high shot with spin”.

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# Greens Performance.

## Firmness

The GS3 ball measures turf firmness, assessing ball control, bounce and turf health on each green. Holding a good firmness is essential for challenging and consistent playing conditions.

| Typical Range of Values: 0.300 – 0.500 | |
|---|---|
| 0.300 – 0.350 | Extremely Firm |
| 0.350 – 0.400 | Firm |
| 0.400 – 0.500 | Likely suitable for most facilities |
| >0.500 | Receptive |





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# Studies in Playing Quality.
# Smoothness and Trueness

Loss of smoothness and trueness on the surface can have a direct result on reducing green speed (Nikolai, 2005).

Every time the ball leaves the surface, whether through a vertical bobble (jump) or chatter (distinct vibrations but the ball does not leave the surface), or even snaking (lateral deviation from line), the ball roll momentum is liable to slow and thus reduce measurable green speed.

Research by Tiziami (1990) concluded that green speed was reduced by 5.6% where spike marks were left through heavy traffic.



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# Greens Performance Analysis: Smoothness

GS3 evaluates the regularity of the green by identifying surface imperfections and irregularities which could create bobble or chatter.

A smooth green is crucial for accurate ball roll and a consistent putting surface.

| Typical Range of Values: 0.0 – 16.0 | |
|---|---|
| 0.0 – 5.0 | High-quality ball roll with minimal vertical deviations. |
| 5.0 – 8.0 | These values fall outside the normal range. |
| >8.0 | Averages consistently above 8 are typically only seen after disruptive cultural practices and should improve with growth and recovery. |

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# Greens Performance Analysis:
# Trueness

GS3 senses lateral ball roll quality and uniformity of the putting green, allowing for a predictable ball trajectory.

| Typical Range of Values: 0.0 – 7.0 | |
|---|---|
| 0.0 – 1.0 | High-quality ball roll with minimal horizontal deviations. |
| 1.0 – 1.5 | These values fall outside the normal range. |
| >1.5 | Averages consistently above 1.5 are typically only seen after disruptive cultural practices and should improve with growth and recovery. |

# THE INFLUENCE OF ORGANIC MATTER.



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# Studies in Playing Quality.
# The Influence of Organic Matter

## One of the biggest influences on moisture retention within the upper profile is the extent of thatch (organic matter).

Research suggests that where organic matter concentration exceeds 4% (by weight) in sand-based greens, water movement through the profile is severely limited thus resulting in poor turf quality, Carrow (2004).

1% of organic matter by weight equals about 5% organic matter by volume. So where organic matter accumulates to an excess there is likely to be the production of poorer performing surfaces.

Further support for this understanding is given by Baker et al (1996)a who found that as organic matter accumulates, surface  hardness decreases, so do infiltration rates (Baker, 2008),



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# DATA COLLECTION AND THE GOLFER EXPERIENCE.

Analysis of Greens Performance data 2009 – 2020.

# Green Performance Data 2009-2020.
# Golf Course 2030 ITM of Parkland Greens

**12 years of data** taken from a range of course types, varying countries and regions, varying green construction profiles and different sward types.

**Tournament monitoring data** inc R&A Open, Amateur Championships, PGA European Tour Championships was excluded for this review of 'routine playing conditions'

Data from **443** different courses.

**73,843** sets of measurements collected from **13,568** greens. **7,945** greens soil analysis.

- **6,946** Parkland greens
- **3,730** Links greens
- **1,407** Heathland greens
- **1,485** Other types (Downland, Coastal, Moorland)

Specific review of **Parkland data** for R&A Golf Course 2030 projects.

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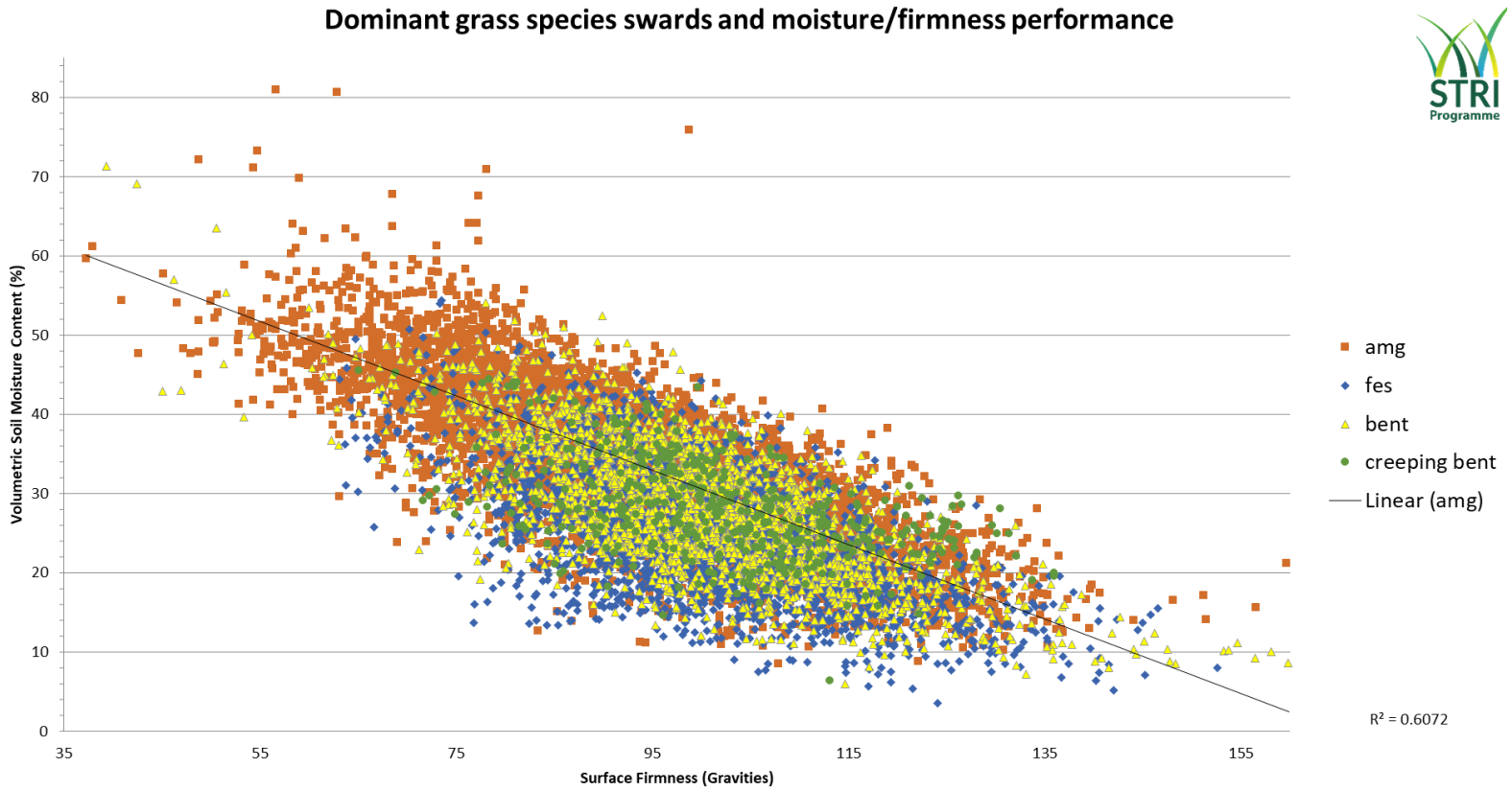
# Sward Composition and Surface Performance 2009-2020.

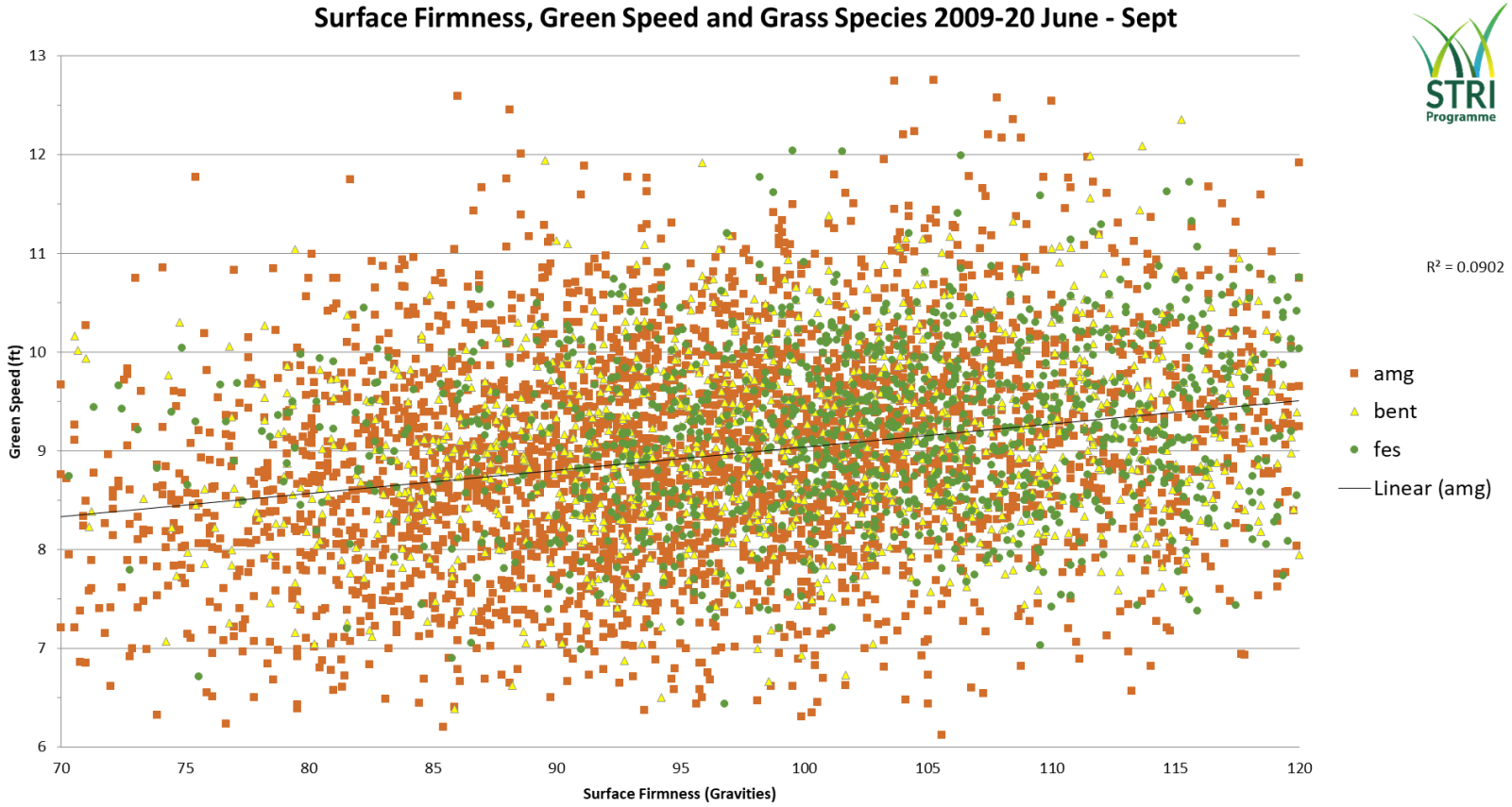



STRI Programme

## What this means

AMG is variable whereas fine grass dominant greens occupy a more consistent area of performance with target surface firmness and soil moisture content.

# Green Speed and Firmness.




**What this means**

There is a positive relationship between increased surface firmness and increasing green speed but not as strong as we would imagine.

Increased OM will soften the surface therefore more aggressive maintenance (lower cutting and increased rolling) is required to deliver acceptable green speed.

**A count from >7,500 greens has never resulted in average routine play speed above 9ft 8in**

# STUDYING DATA COLLECTION AN THE GOLFER EXPERIENCE.

Objective Data Assessing the Performance of Golf Greens as a Comparison to Golfers Perception of Playing Quality.

Players were surveyed to compare their subjective opinion of the same performance characteristics to see if there was a significant difference between player opinion and measured data.

Player ability was also studied to see if there were significant differences in the subjective opinions between low (<18) and high (≥18) handicap.

Three study days were undertaken during which AM and PM data was collected from three greens in conjunction with a player survey.



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# Hypothesis.

## $H_0$ - The golfer's perception of surface firmness, speed, and smoothness will not significantly differ from objective measurements of the same performance characteristics.

Based on the evidence provided the null hypothesis is rejected as there were significant differences ($p<0.05$) between measured data and golfer perception.

## $H_0$ - The higher handicap golfer (≥18) has the same ability as a lower handicap golfer (<18) to judge the playing quality of a golf green

There was significant association ($p<0.05$) between handicap category and firmness, and ($p<0.01$) between handicap and smoothness.

Conclusion can be drawn that player skill (handicap) does influence subjective assessment of firmness but not necessarily correctly.

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# The Outcomes.

This study highlights that subjective player opinion is an unreliable method of assessing playing quality. Golfers often misjudge speed, firmness, and smoothness, and their feedback can conflict with scientific measurements.

Player feedback is likely to be inconsistent at best and largely inaccurate.

Low handicap players were generally more critical of playing quality but not necessarily correct in their assessment.

This highlights the need for objective data-driven decisions in turf management rather than relying on player feedback alone.



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# GREENS PERFORMANCE ANALYSIS.

**GS3** measures speed, green firmness, trueness and smoothness.

Soil Moisture content, Organic Matter and Measuring growth adds valuable layers of information.

Other factors such as sward composition and soil physical performance completes the picture.



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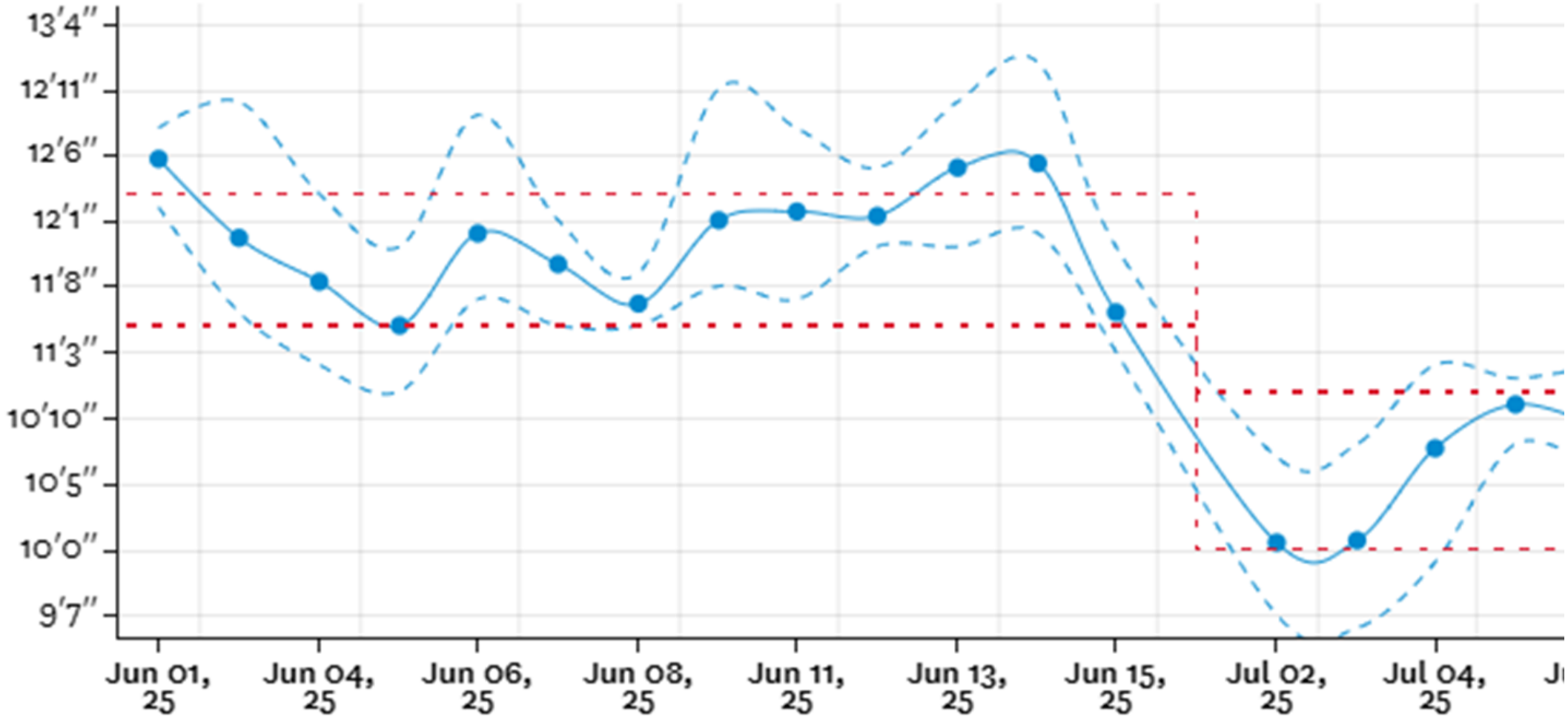
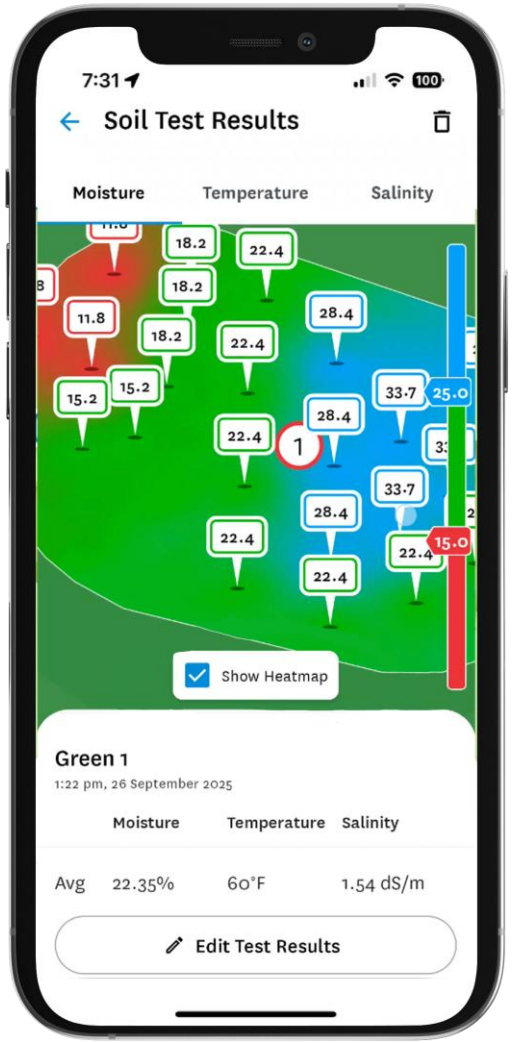
# Targets may change based on season






USGA GreenSection

# Visualize Performance Metrics







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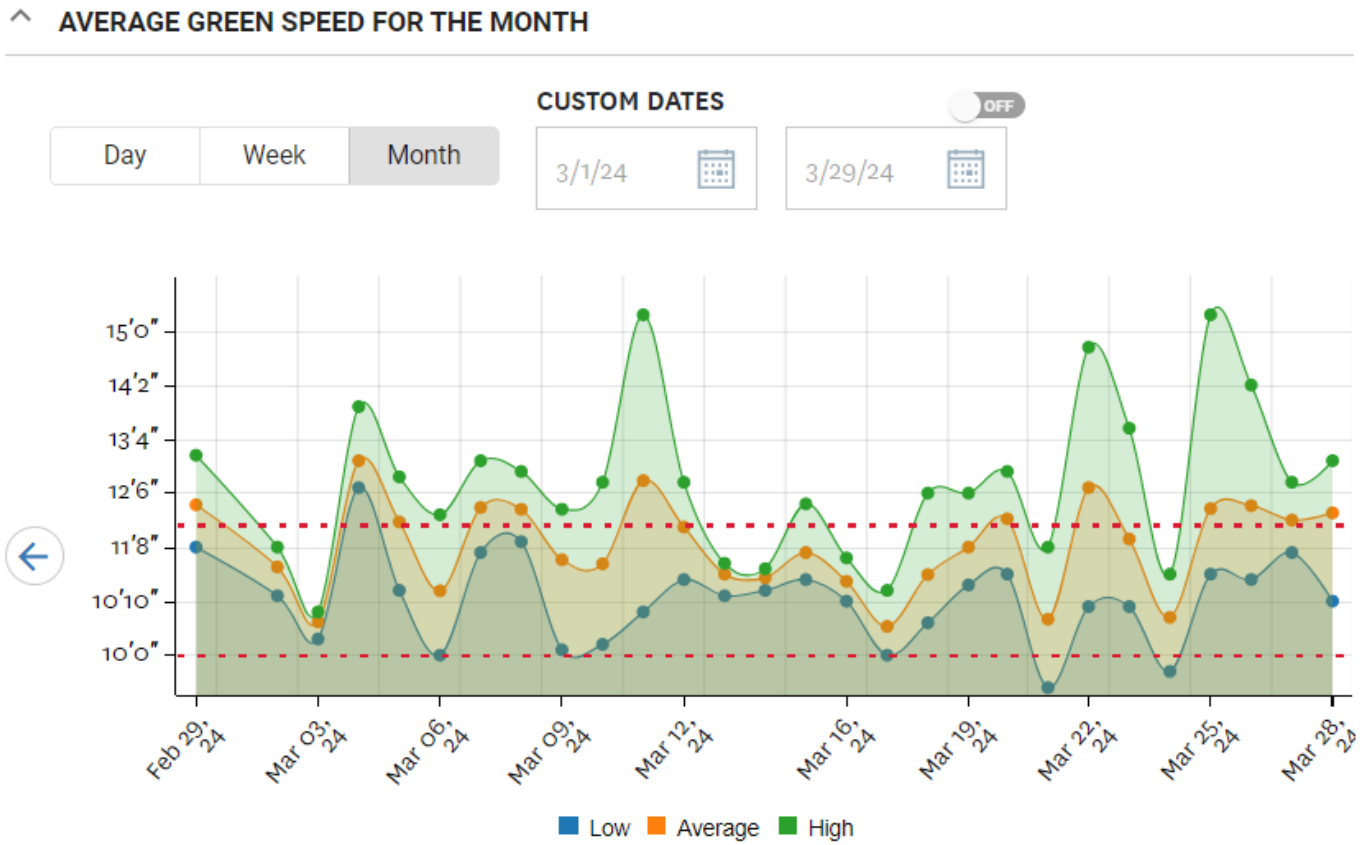
# Data-Driven Communication




USGA GreenSection

# Summary.

- Members think like customers, not owners.
- Greenkeeping is a balance of art and science
- Take time to stop and evaluate what's going on
- Use data to support the decision-making process and benchmark progress towards measurable targets
- Understand what influences the data
- Respect player feedback – it may be inconsistent at best but have your own data for the correct association of alignment



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# THANK YOU.