

# Un système moderne de gestion du gazon adaptée à chaque site

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Asian Turfgrass Center  
[www.asianturfgrass.com](http://www.asianturfgrass.com)

PACE Turf  
[www.paceturf.org](http://www.paceturf.org)

# Plan de la conférence

## 3 thèmes principaux

- Gestion durable du gazon
- Choix des graminées
- Gestion du gazon et du sol



# Plan de la conférence

## 7 chapitres

- Gestion durable du gazon
- Choix des graminées
- Conditions de jeu
- Croissance du gazon
- Eau
- Apport de nutriments
- Gestion de la matière organique

# Gestion durable du gazon

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## Documenting your progress toward sustainability

These practical, science-based sustainability metrics can help you and your facility measure and communicate concrete progress toward reaching sustainability goals.



Sustainability. The word is getting a bad rap these days, and justifiably so, as it is used (and misused) for every purpose under the sun — from advertising, chewing gum, to “greenwashing” environmentally damaging practices, to political campaigns and the workplace. Chances are, it won’t show up in your own job goal documents. But how can you meet a goal of sustainability when its meaning has become so vague and diluted that a recent Google search on “define sustainable” yielded more than 28 million entries? How do you develop metrics, strategies and plans around it (in a way that no one can pin down)? And how will you and your co-workers know how successful you’ve been without some system for measuring sustainability?

Without the ability to measure it, sustainability remains a vague, confusing and frustratingly unachievable goal. Without quantification, evaluating the achievement of sustainability goals becomes wholly subjective — in the eye of the beholder. Although you may think you’re doing a great job, you have no way to communicate it or to prove it, unless you have some way to measure and document it.

In this article, we present several simple monitoring approaches that can help take the math out of sustainability, and instead treat it as a measurable, science-based agronomic phenomenon. All of these procedures can easily be put into practice at your facility.

### The single biggest impact on sustainability: reducing turf acreage

Decreasing the number of highly maintained areas is without doubt the most effective way to increase sustainability by reducing almost all

inputs — including water, pesticides, fertilizers, labor, energy and money. A recent *ENR* Green Source World article (7) calculated savings of \$1,700 to \$7,000/ha/year in some markets for golf courses in the southwestern U.S. that have implemented turf reduction projects. Depending on the situation, superintendents have converted out-of-play areas, tee surroundings, study locations and other turf areas to native and/or low-maintenance vegetation, mulch, non-overseeded turf or other lower-input replacements.

Superintendent Sandy Clark, CGCS, of Barona Creek Golf Club in California, reduced turf acreage by 12 acres (4.65 hectares), more than half by replacing overseeded bermudagrass tee surroundings with native vegetation.

Several useful software tools can provide a local and firm quantification of turf acreage at the start of a turf reduction program, and periodically thereafter. Two applications, such as Google Earth ([www.google.com/earth/](http://www.google.com/earth/)) can quickly obtain approximate measurements of turf acreage using satellite photos from Google Maps. For more precise measurements of acreage, a superintendent can purchase a geo-referenced aerial photograph of the course that can be used with one of many geographic information systems software packages, or a company such as Coarse Vector can use ground-based GPS surveys to survey and inventory courses, and produce detailed maps and measurements for the entire property.

### Fertilizer inputs: How low can you go?

We have suggested for many years that most soil nutrient guidelines (including our own) overestimated the amounts of nitrogen, phosphorus, potassium and other key nutrient needs



Barona Creek, May, 2007



Barona Creek, March, 2008



Barona Creek (2) to reduce its fertilizer use by more than 20% (3) by using reduced inputs and improved soil fertility. Photos by L. Stowell. Credits for Google Maps images: 2007 — Image 06113 Digital Data; 2011 06113; 2012 Image 0611 — Image US Geological Survey; 2011 0611; 2012 Image.

for turf health. The operating principle in most cases was a desire to ensure that there is never a deficit in soil nutrients. But as economic and environmental concerns have grown, the emphasis has shifted to meeting the lowest levels of soil nutrients that will produce turf performance that meets expectations. This may seem like a subtle shift in thinking, but it can have enormous impacts on sustainability, as shown below.

To find out how low we could safely go in terms of soil nutrition, Pace Turf and the Asian Turfgrass Center pooled a huge database of more than 17,000 soil samples that had been collected from turf facilities over the past 20 years. Of these, we identified 1,500 samples that met our requirements (primarily that they were collected from areas where the turf was performing adequately) and then statistically analyzed the data to determine the lowest levels of each major nutrient that could consistently support good-quality turf.

The result was the Minimum Levels for Sus-

tainable Nutrition (MUSN) soil guidelines (Table 1), which were introduced last year (4) and call for reductions of 50% or more in many key soil nutrients. Since that time, the guidelines have been adopted by turf managers around the world, many of whom have been pleasantly surprised at how low they could go in terms of soil nutrition without seeing turf quality or playability.

We believe that most superintendents can make significant reductions to the soil nutrients applied at your location by using MUSN as a guide. To participate in the effort to identify more sustainable turf care-based guidelines, visit about the Global Soil Survey for Sustainable Turf (Page E2).

### Measure total pounds and toxicity levels of pesticides applied

Reducing the total pounds or tons of pesticides used is a good goal, but reducing the toxicity of the pesticides applied is equally important.

Determining the weight of pesticide (insecti-

## Nous recommandons :

- Réduire la surface de gazon entretenue intensivement
- Enregistrer les apports d'engrais
- Enregistrer les applications de pesticides
- Enregistrer la consommation d'eau
- Enregistrer la consommation en carburant et son coût
- Enregistrer la consommation en électricité
- Enregistrer l'utilisation de sable









# Choix des graminées

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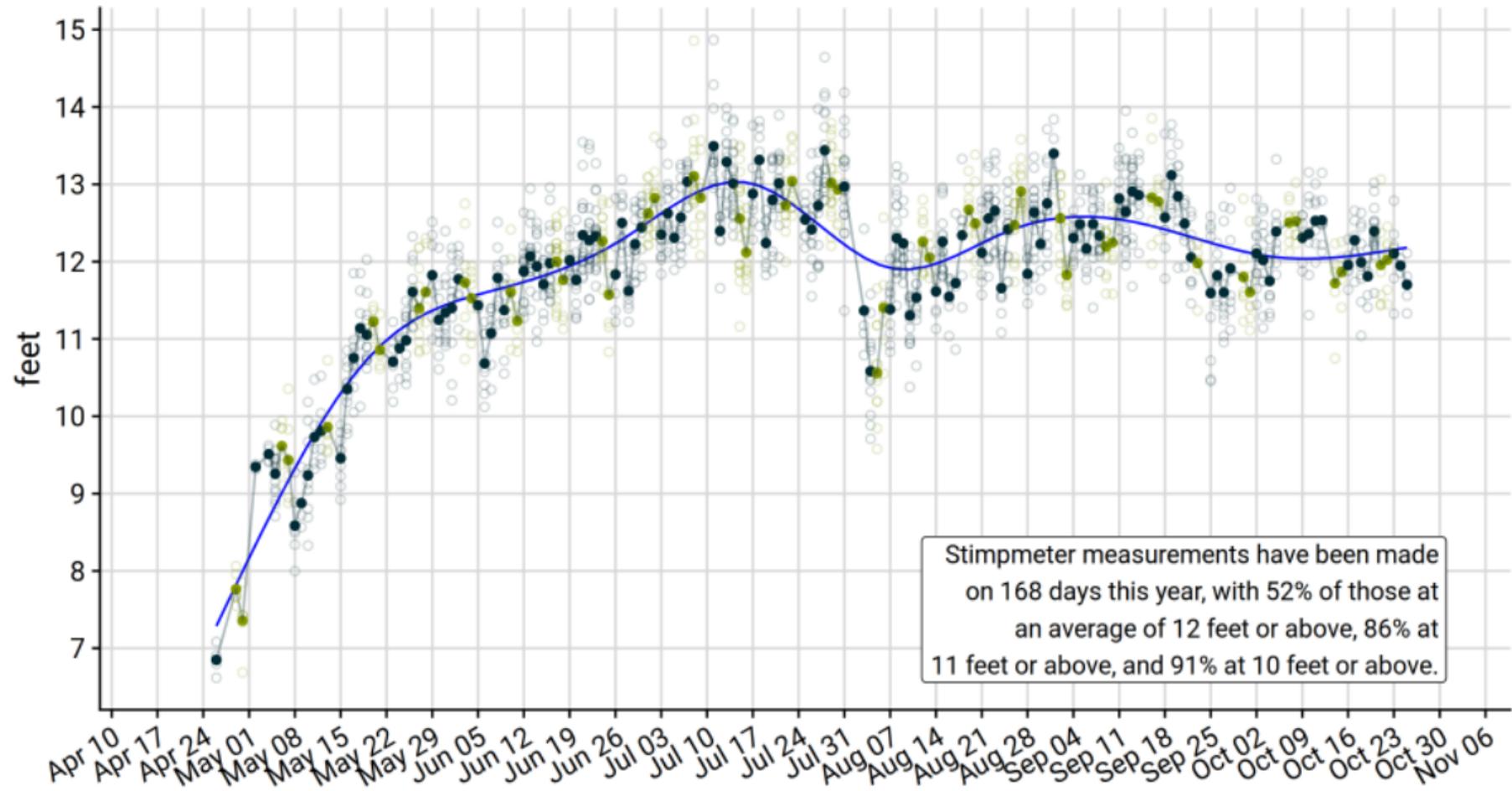


# Conditions de jeu

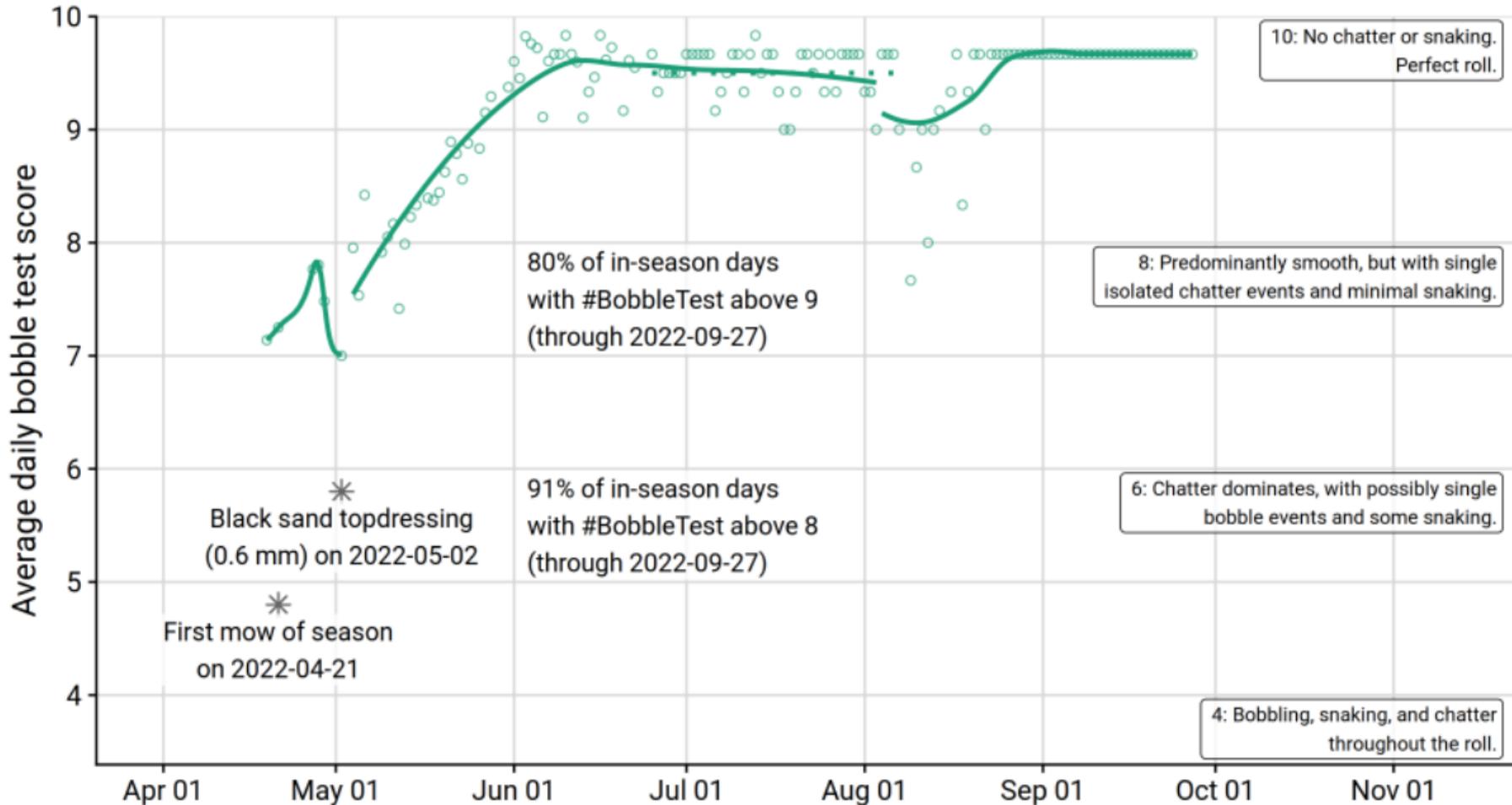
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# HNGC stimpmeter measurements 2023



# 2022 bobble test: smoothness and trueness of ball roll



# Mes recommandations

## Evaluer les conditions de jeu au moins une fois par semaine

- Vitesse de la balle
- qualité de la roue (test de sauttillement)
- fermeté de la surface<sup>1</sup>

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<sup>1</sup>Mesurer l'humidité du sol en même temps, si vous disposez d'une sonde.

# Mes recommandations

Comparer ensuite les résultats obtenus avec le niveau souhaité

**Objectif :** maximiser le nombre de jours dans l'année où les conditions de jeu atteignent le niveau souhaité

# Croissance du gazon

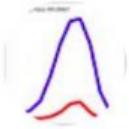
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# Qu'est ce qui est influencé par la croissance du gazon?

- Réparation des divots
- Réparation des pitches
- Besoins en eau
- Besoins en nutriments
- Certaines maladies
- Dégats liés au piétinement
- Vitesse des greens
- Fréquence des tontes
- Feutre (et tout ce qui est nécessaire à son contrôle)







**Eric Johnson**

@altshot2

Following



Nice day for harvest. #MLSN





Manabu Taya

May 18 · Edited · 🌐

1面この半量ぐらいでいきたい。

[See Translation](#)

— at [メイフラワーゴルフクラブ](#).

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1 Share



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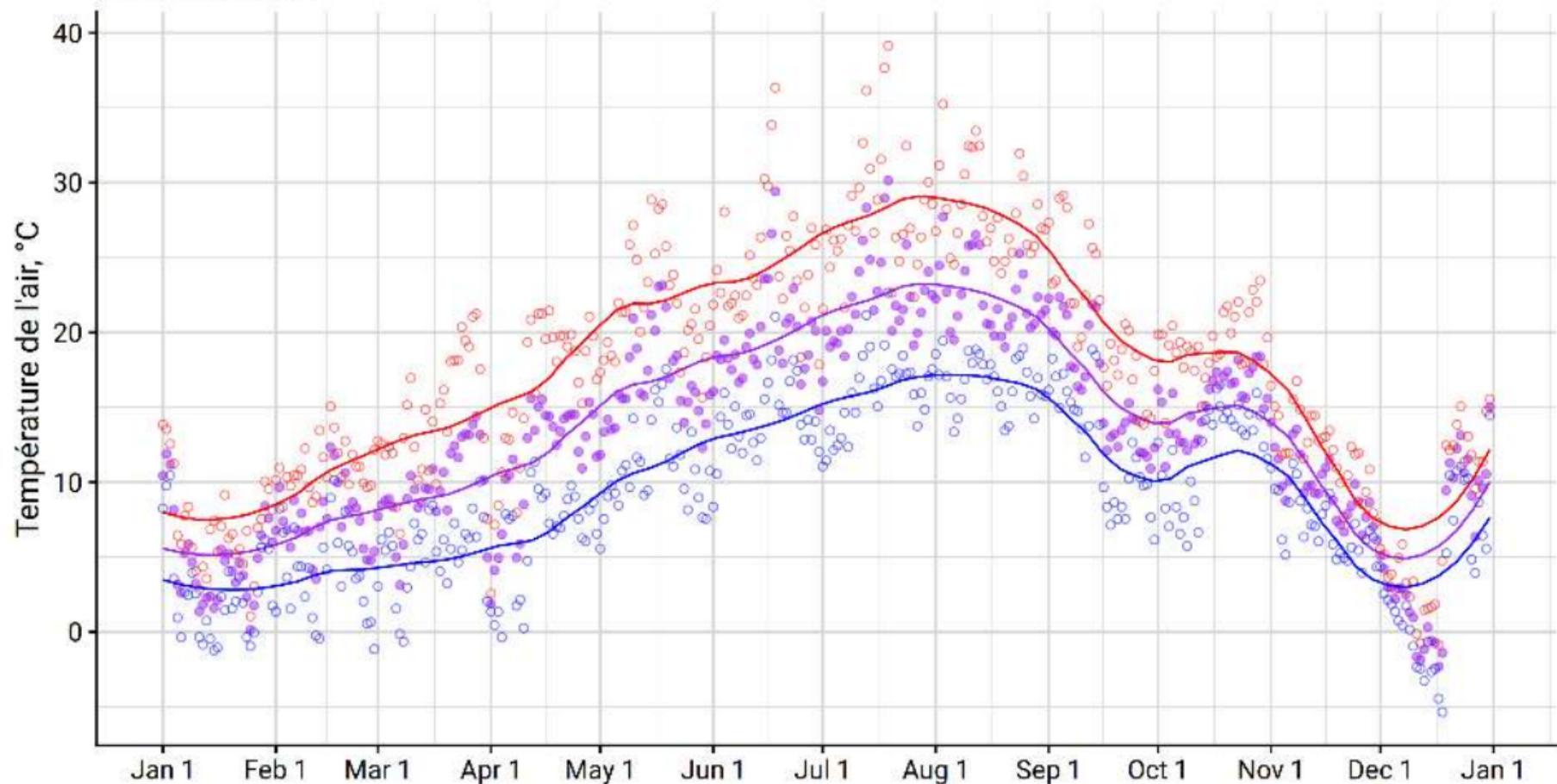


# Exemples d'utilisation des données

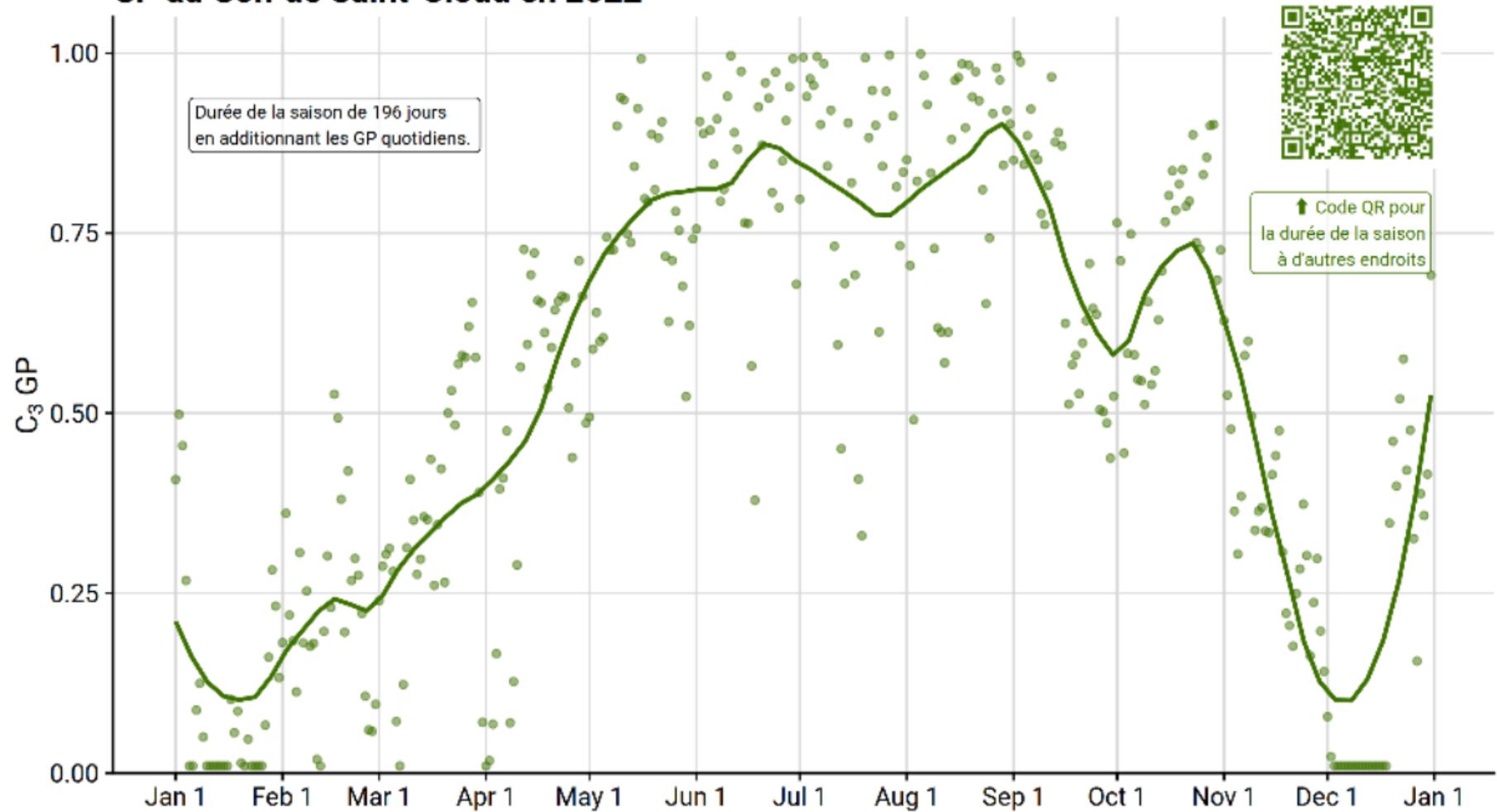
- Apport précis de nutriments basé sur la collecte des déchets de tonte
- Quand tondre à nouveau en se basant sur la croissance
- Effet des régulateurs de croissance
- Besoins en topdressing

# Résumé quotidien des températures en 2022

Golf de Saint-Cloud

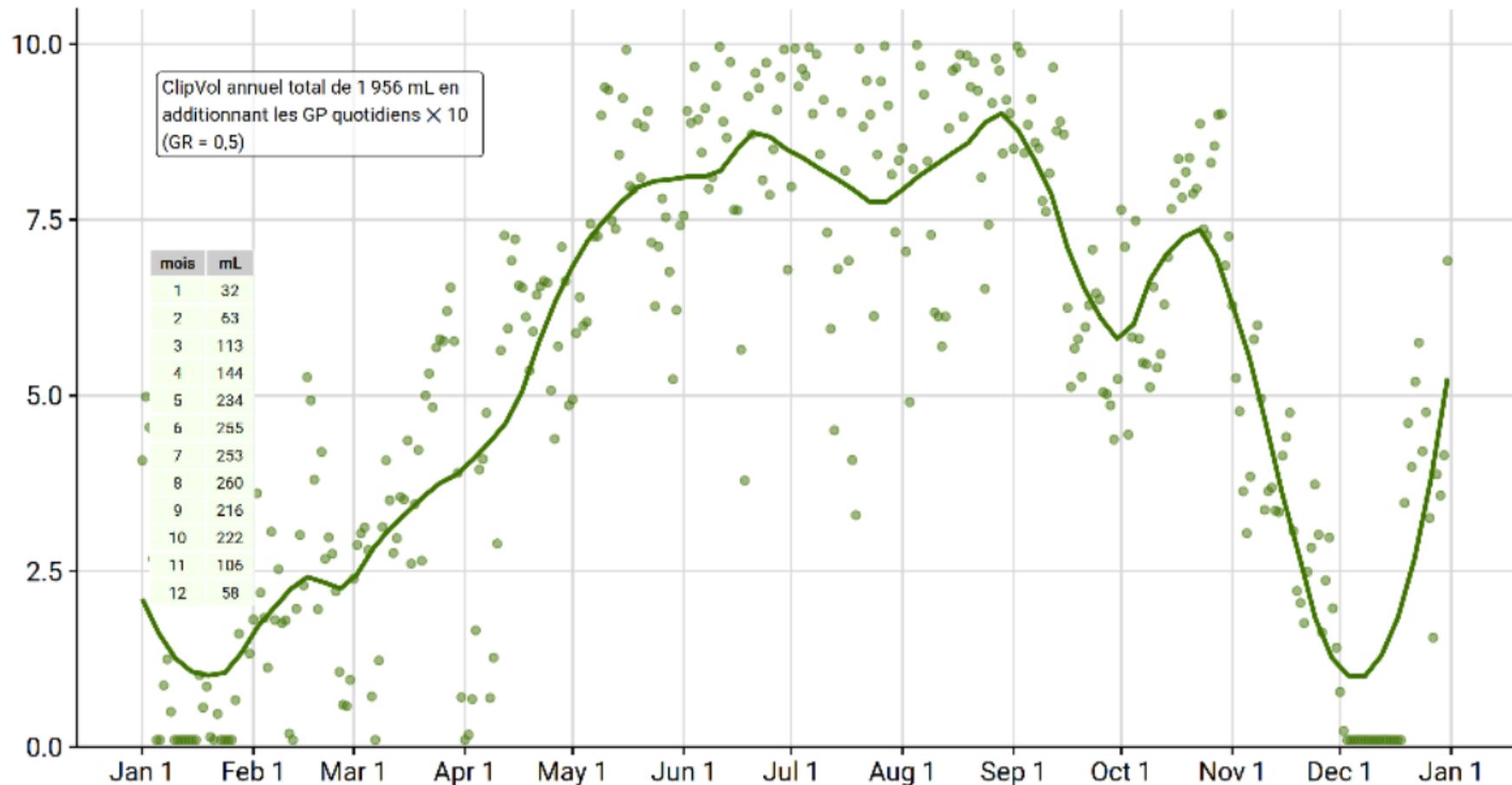


# GP au Golf de Saint-Cloud en 2022



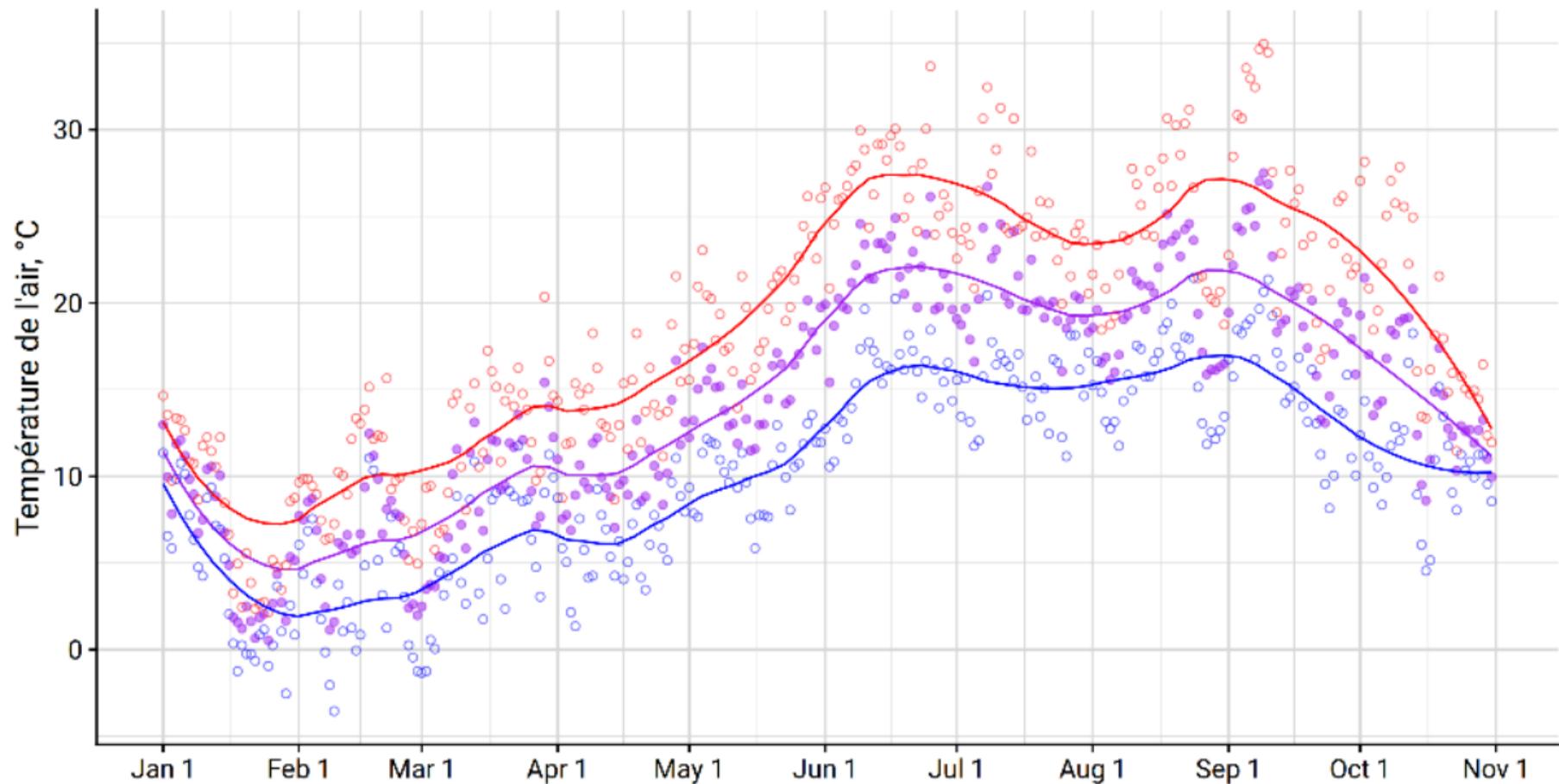
# Volume de tonte attendu pour le Golf de Saint-Cloud en 2022

sur la base d'un taux de croissance de 0,5

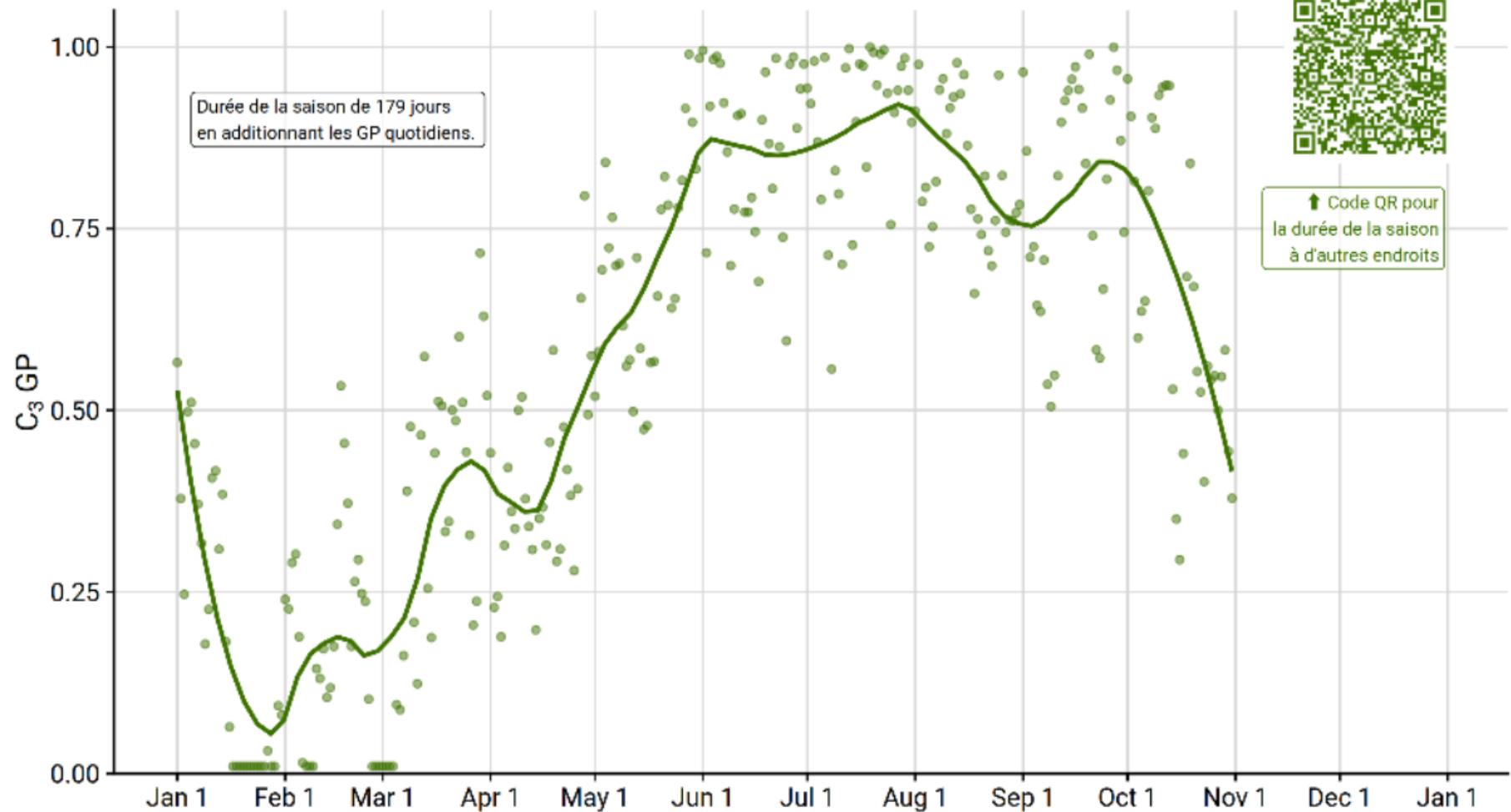


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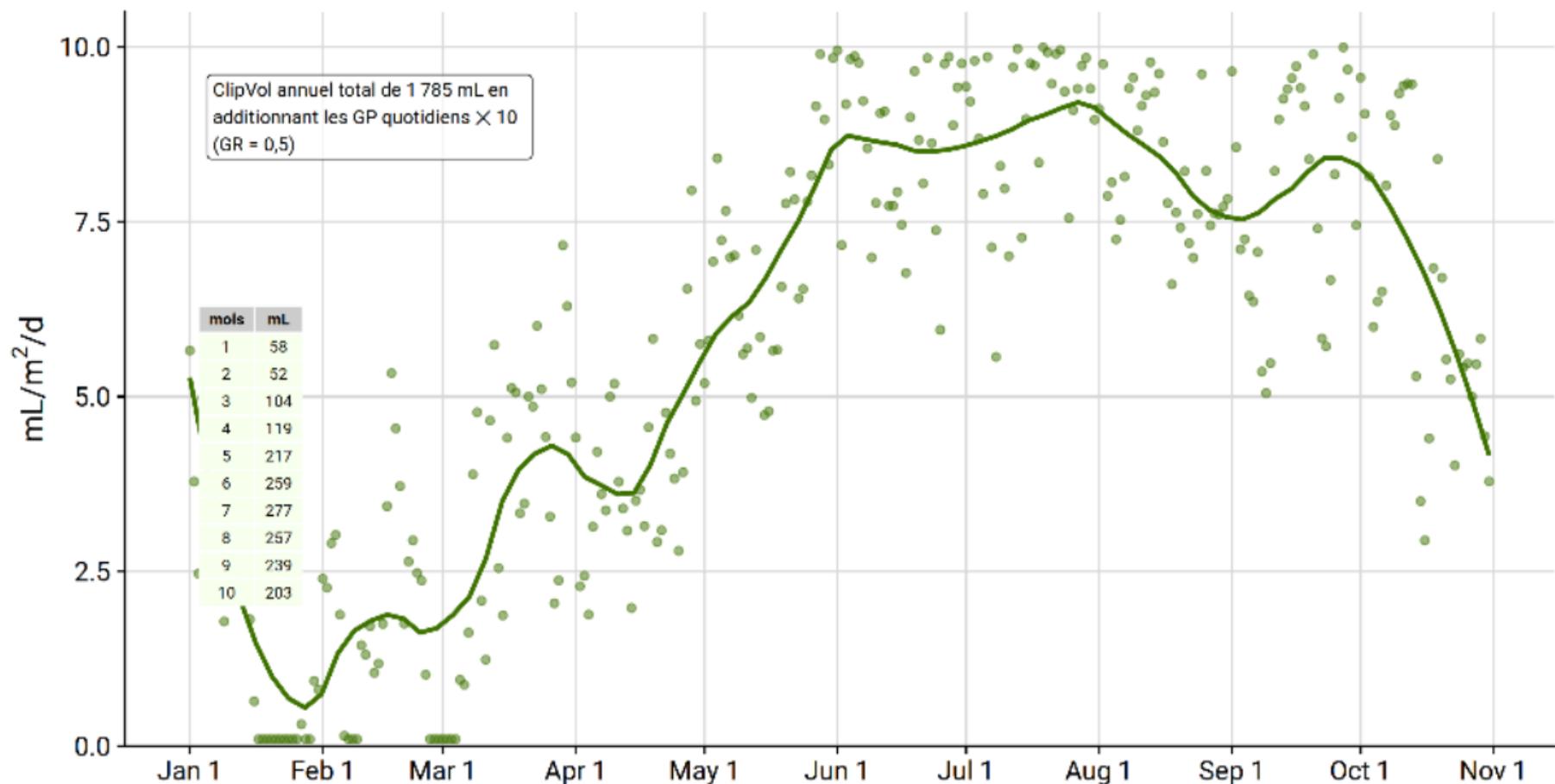


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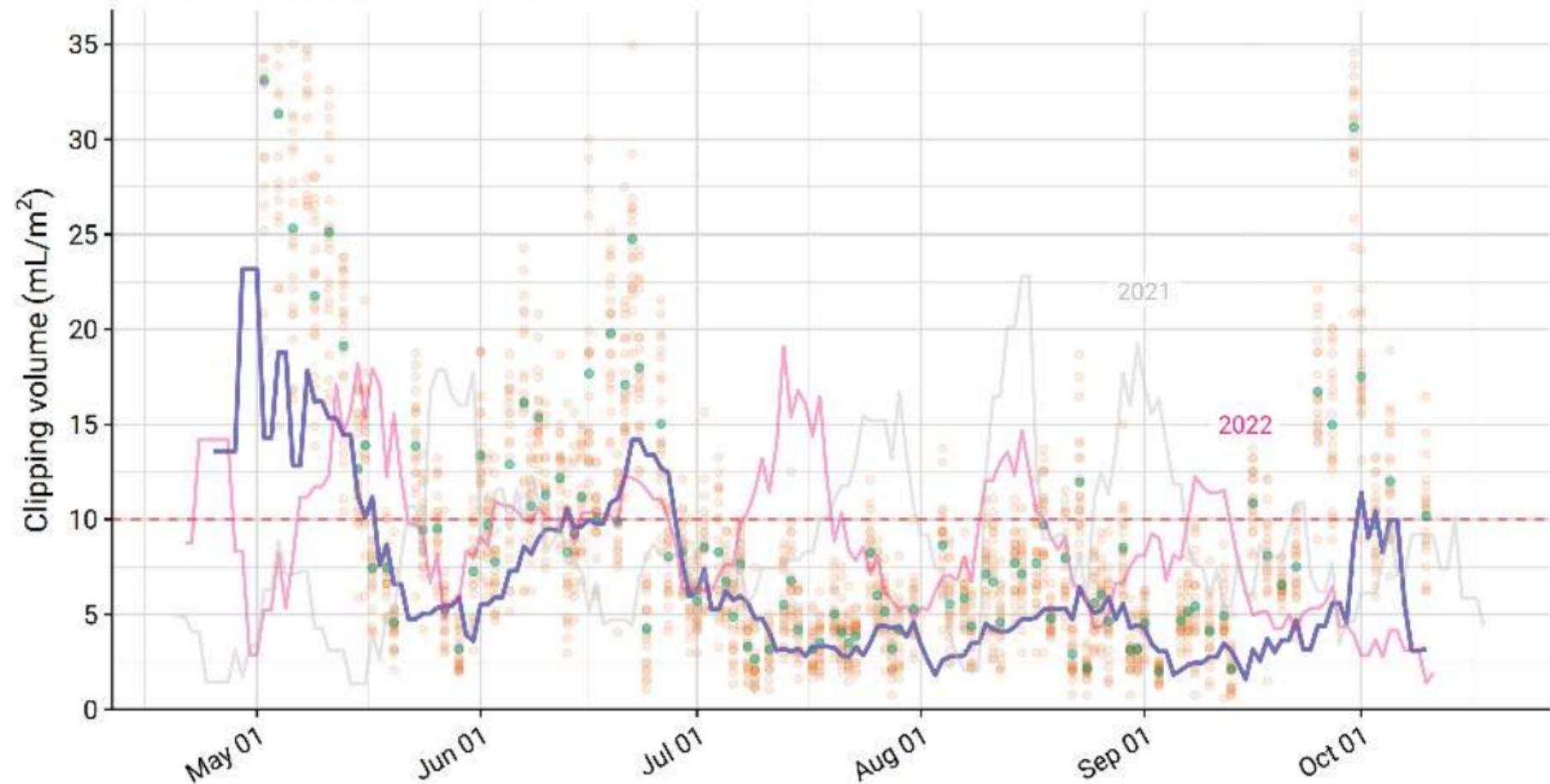


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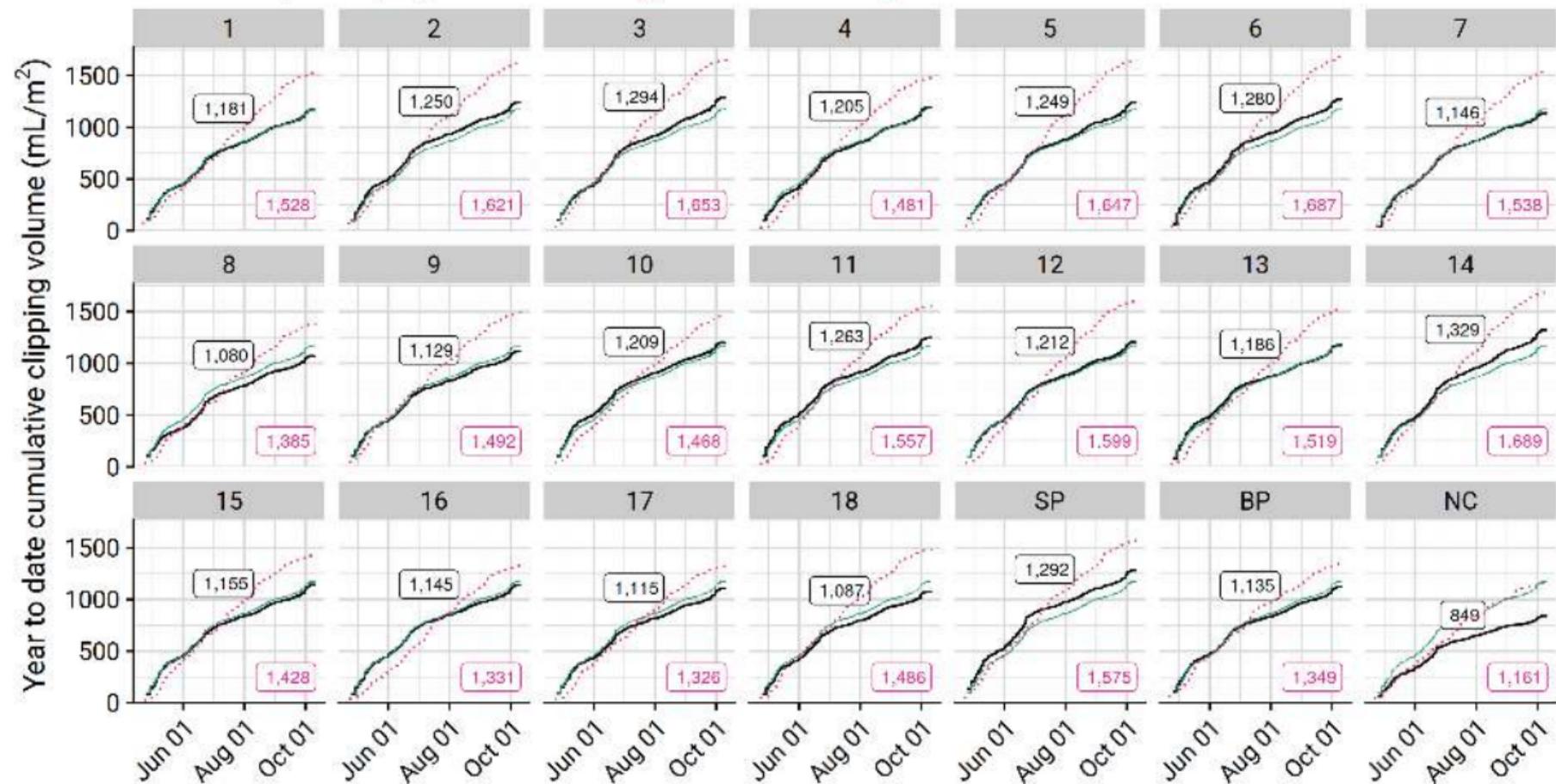


# Morning clipping volume in 2023



# Cumulative clipping volume green by green

2023 in black, 2022 in pink, and the 2023 average across all holes in green.



Eau

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Siam CC Plantation Course, Thailand

- Minimiser la surface de gazon irrigué
- Choisir des graminées consommant moins d'eau
- Utiliser des sondes d'humidité
- Utiliser des mouillants
- Faire pousser le gazon lentement
- Favoriser un système racinaire profond
- Utiliser des pigments pour la couleur
- Enregistrer et analyser la consommation d'eau

# Apport de nutriments

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Large éventail de données obtenues sur des gazons performants

## Prenez en compte 3 valeurs

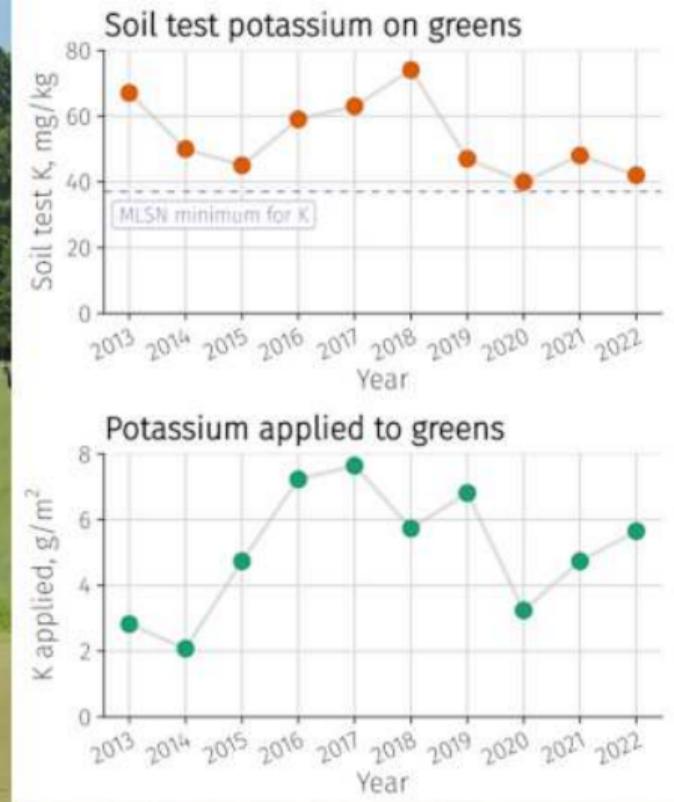
1. Besoins prévus de la plante pour la période donnée
2. La quantité minimale pour conserver intactes les réserves du sol
3. Les résultats de l'analyse de sol actuel

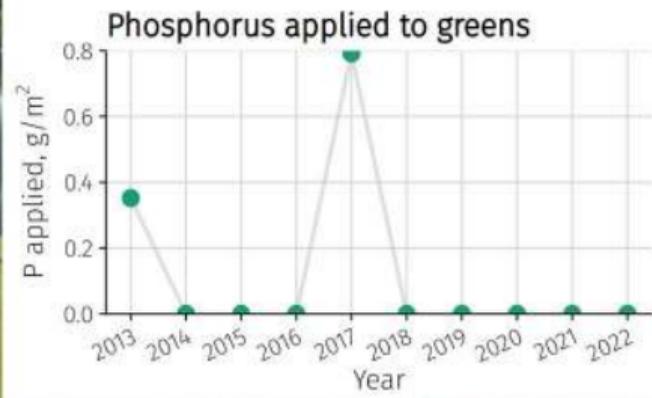
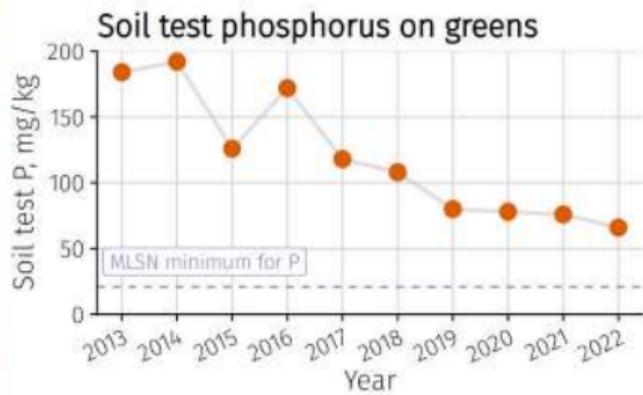
$$\underbrace{\text{besoins}}_{a + b} - \text{quantité présente dans le sol} \underbrace{c} = \underbrace{\text{besoins en engrais}}_Q$$

$a$  est le besoin estimé de la plante pour le site

$b$  est la valeur guide MLSN (NMND–Niveau Minimal pour une Nutrition Durable)

$c$  est le résultat de l'analyse de sol





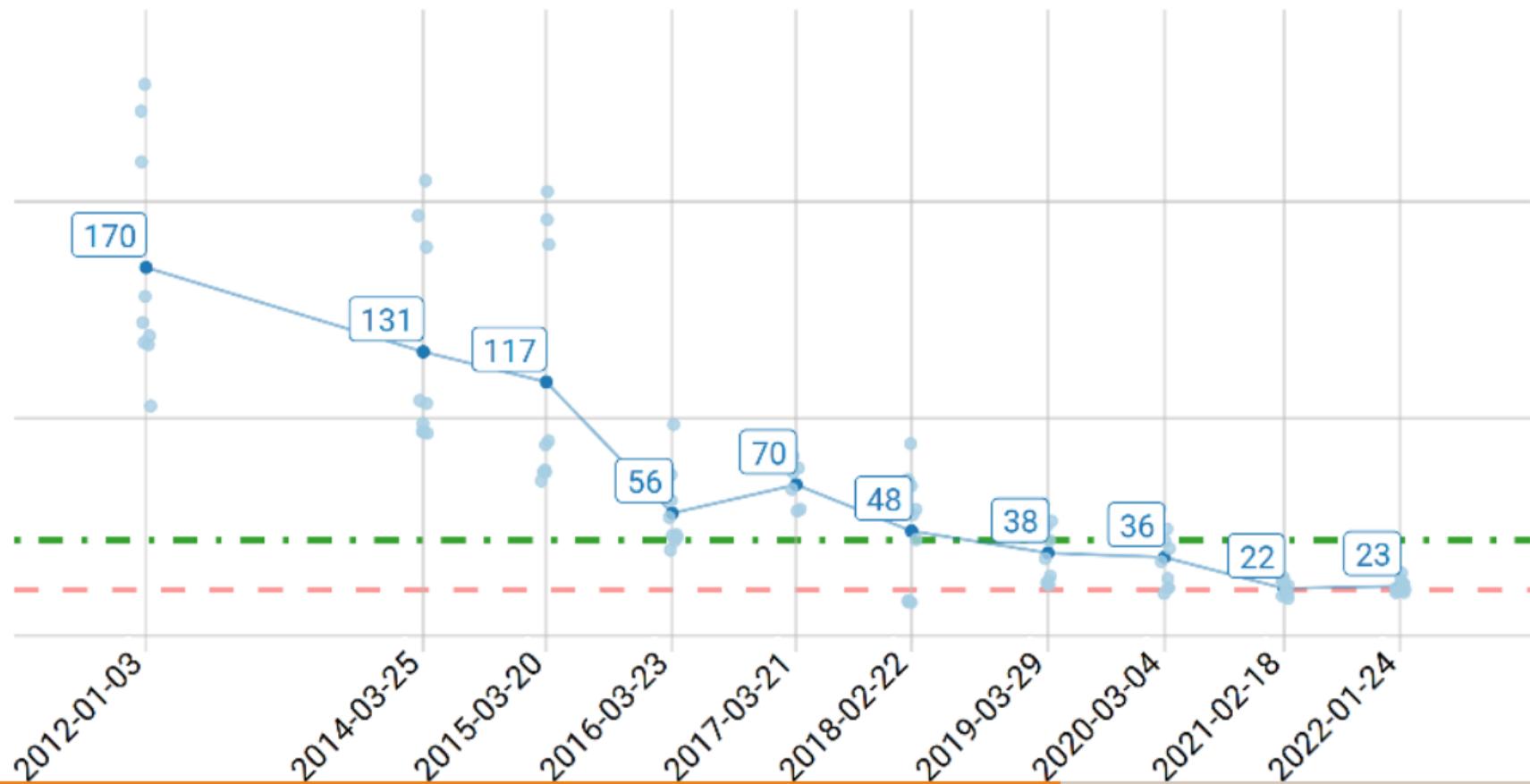
## Apports totaux en 10 ans

Potassium 51 g/m<sup>2</sup>

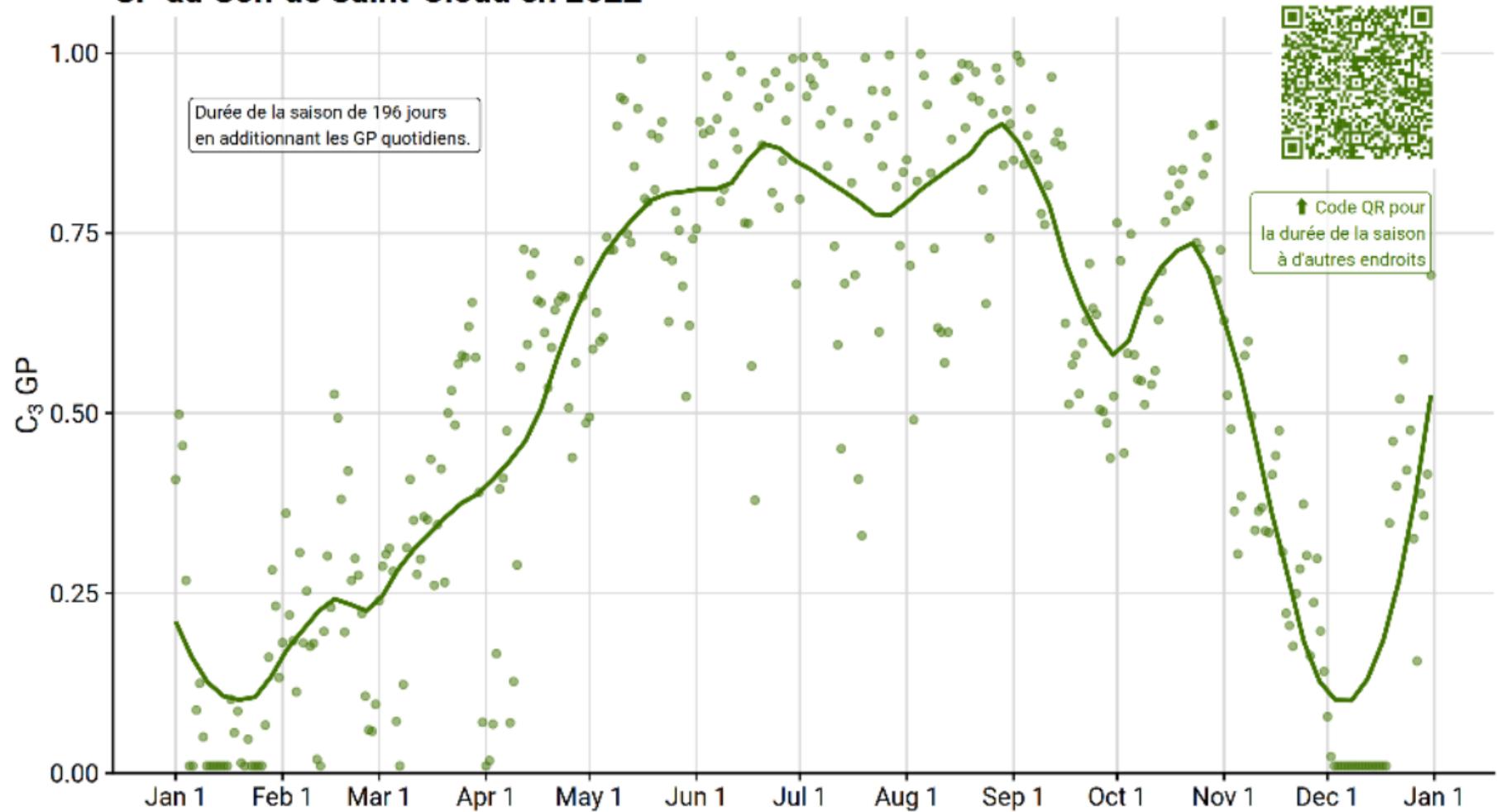
Phosphore 1.1 g/m<sup>2</sup>

# Phosphorus (P)

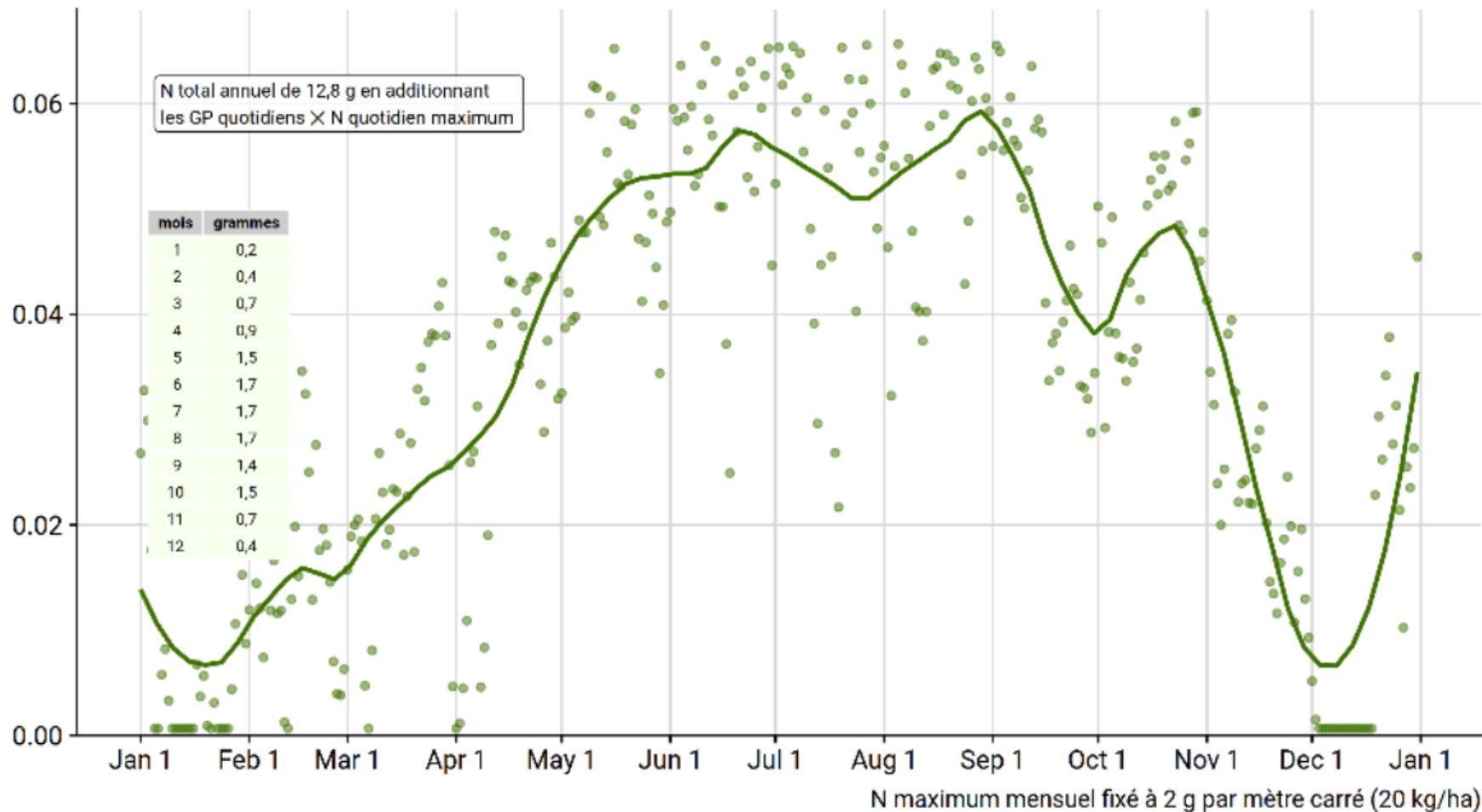
mg/kg



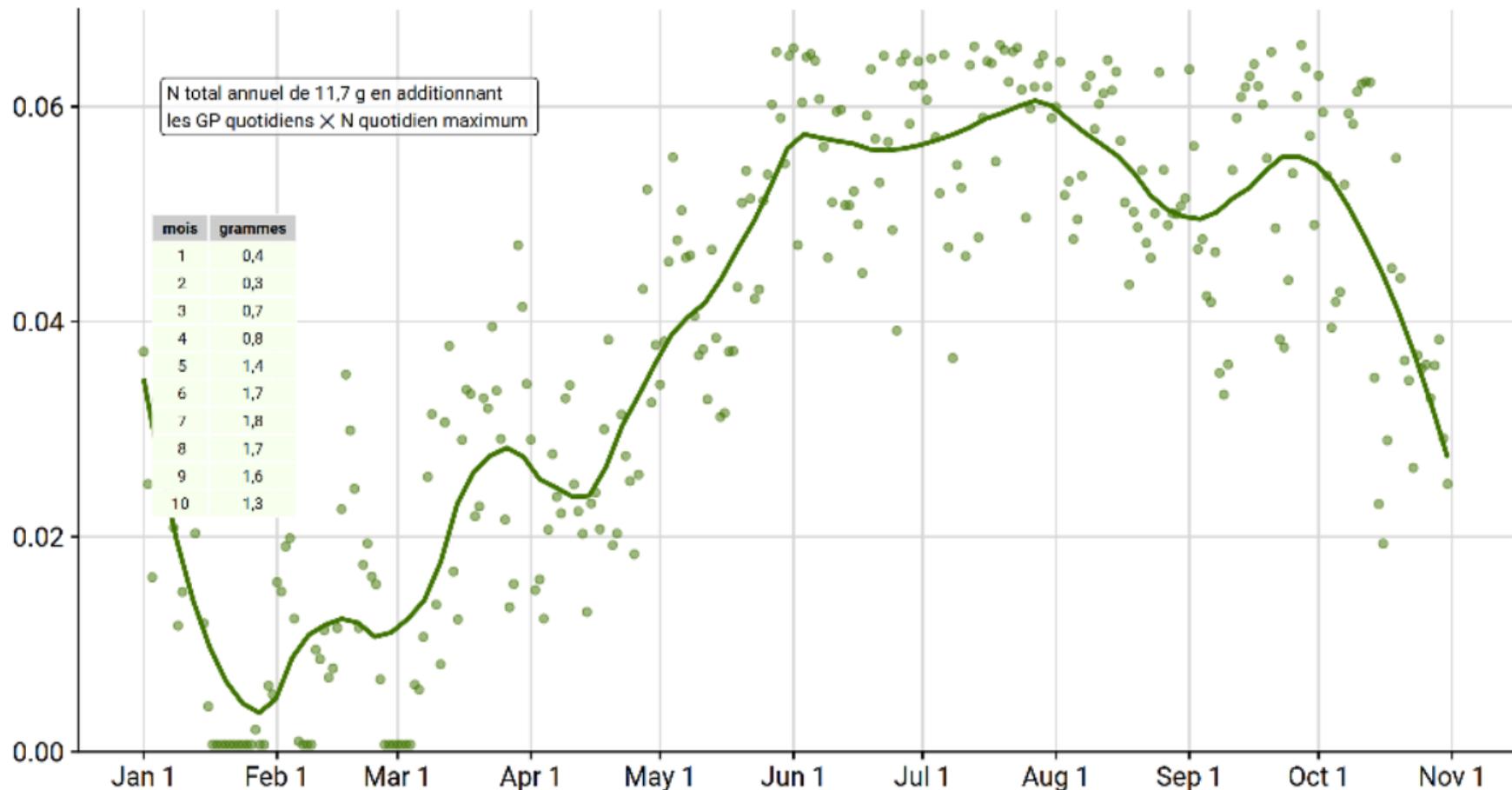
# GP au Golf de Saint-Cloud en 2022



# Prédit quotidiennement N par GP au Golf de Saint-Cloud en 2022



# Prédit quotidiennement N par GP au Golf de Saint-Cloud en 2023



N maximum mensuel fixé à 2 g par mètre carré (20 kg/ha)

# Gestion de la matière organique

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25 Juillet 2022 avec l'aimable autorisation de Chris Tritabaugh

# Définition de la matière organique du sol

Matière organique du sol : fraction organique du sol à l'exclusion des résidus végétaux et animaux non décomposés.  
Voir aussi humus

Humus : fraction bien décomposée, plus ou moins stable de la matière organique dans les sols minéraux

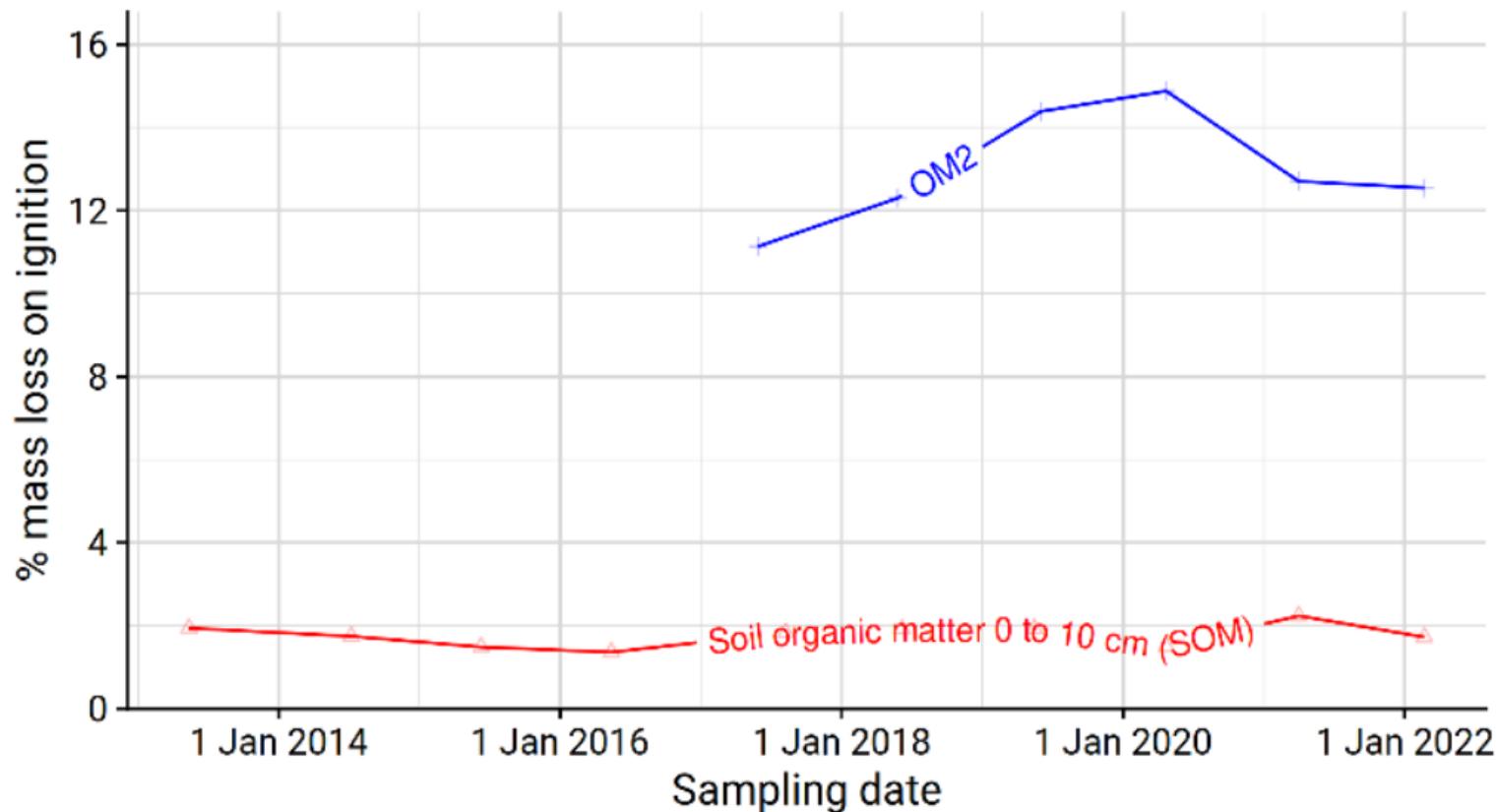
# Matière organique totale

Matière organique totale : matière organique présente dans un échantillon de sol qui n'a pas été tamisé. Ce test est effectué sur l'échantillon tel qu'il est reçu au laboratoire, sans retirer les résidus végétaux, vivants ou morts



# Zoysia (korai) putting greens

samples from Keya GC

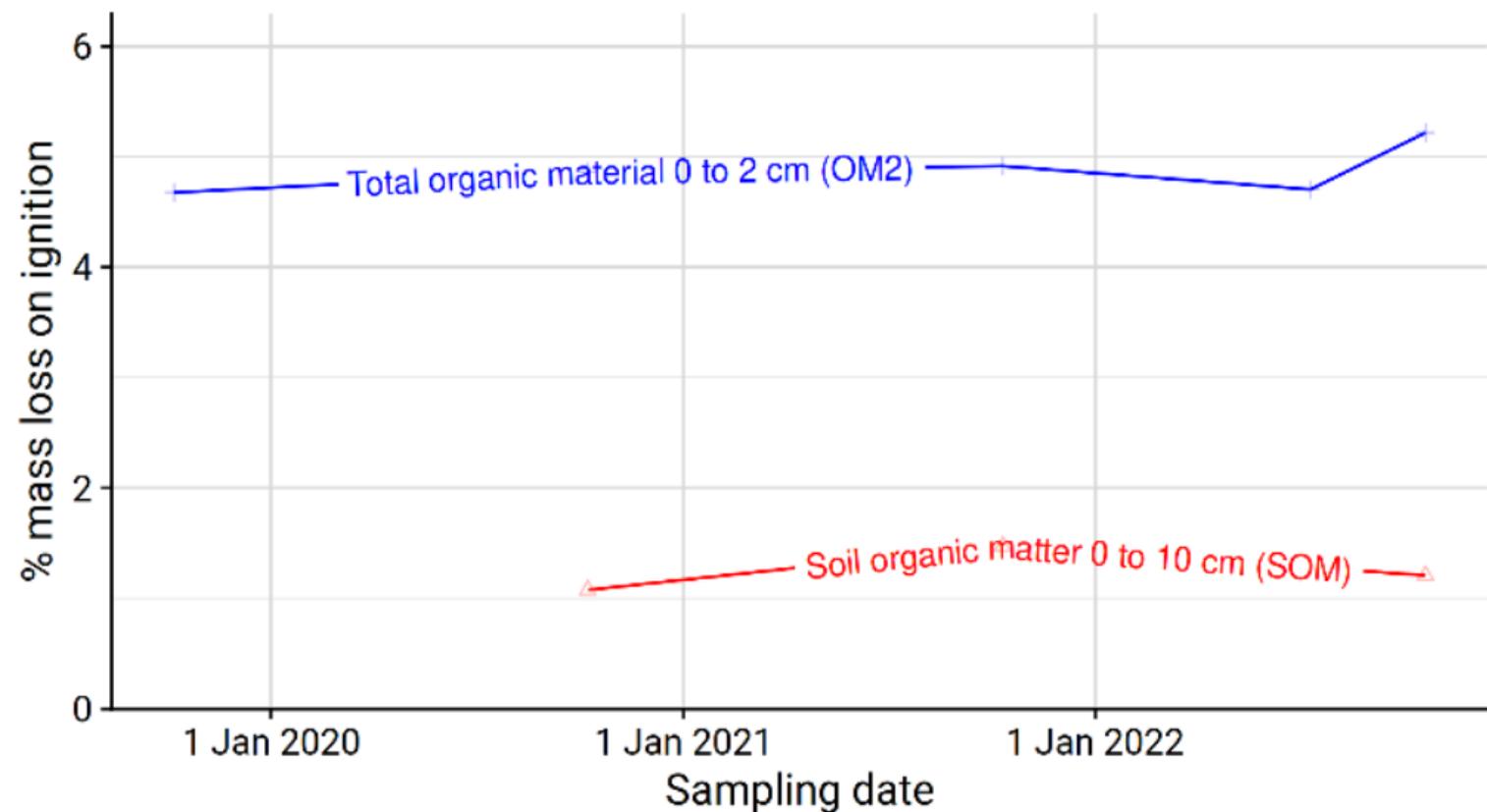


All soil tests conducted at Brookside Labs



# Creeping bentgrass putting greens

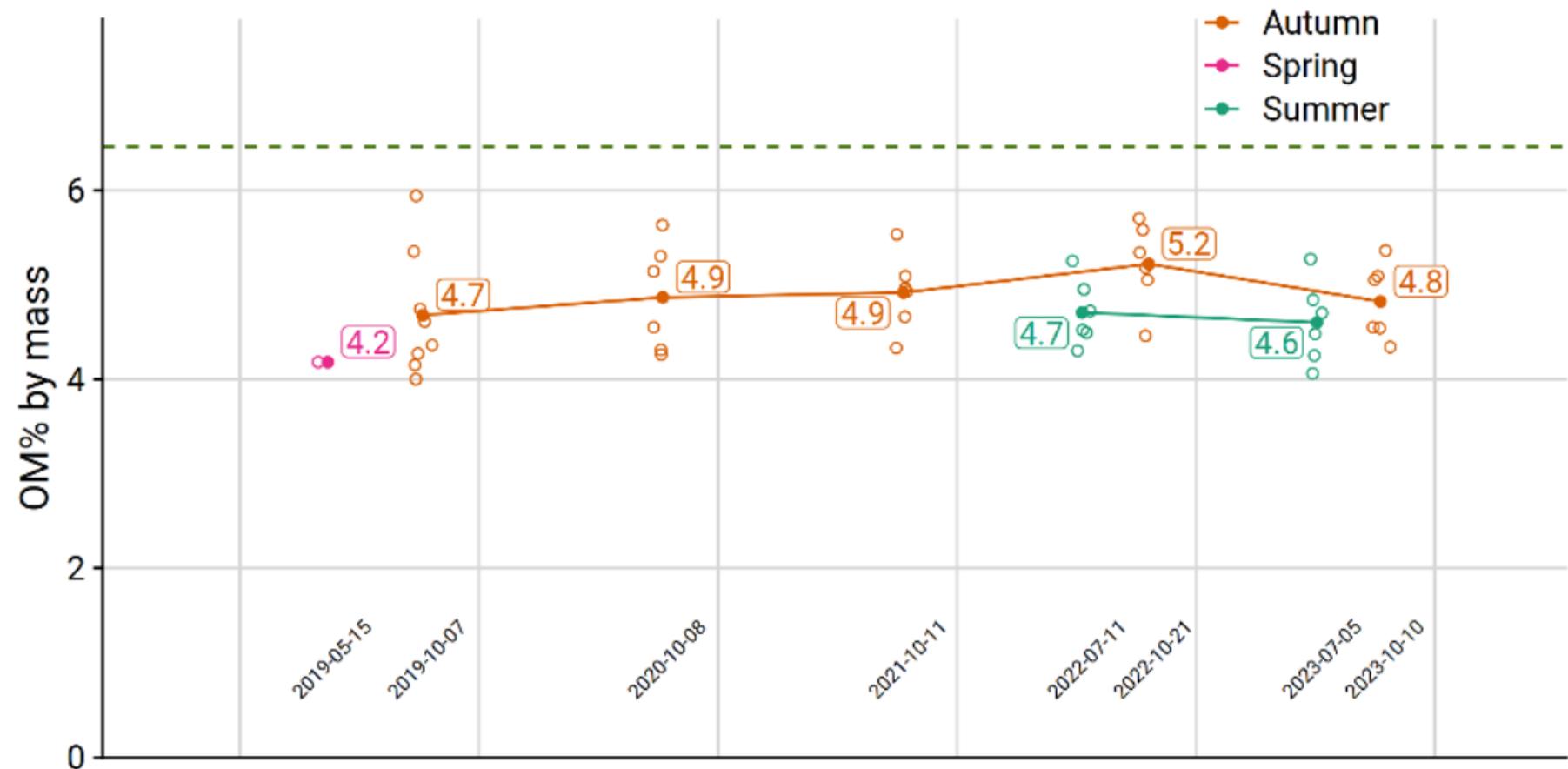
samples from Hazeltine National GC



All soil tests conducted at Brookside Labs

# Total organic material time series

0 to 2 cm







Au laboratoire



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[www.paceturf.org](http://www.paceturf.org)

