

Adapting fertilization to growth potential & MLSN

Micah Woods

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PACE Turf

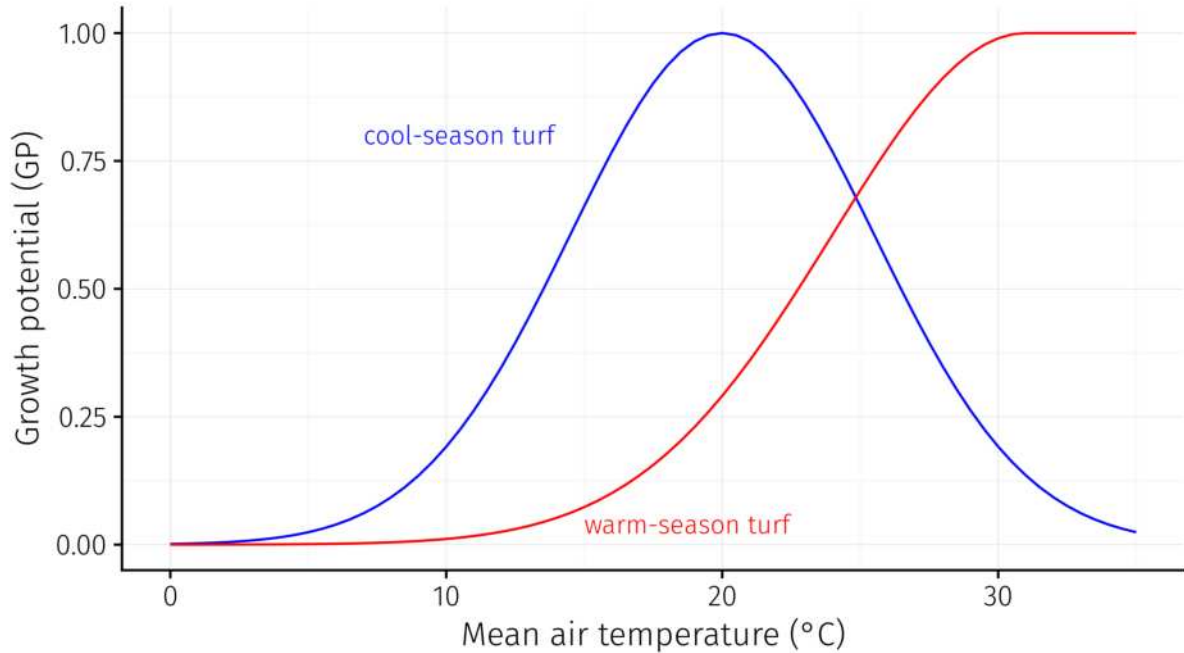
www.paceturf.org

Asian Turfgrass Center

www.asianturfgrass.com









References

Topical reference material from the PACE Turf, organized by subject.

MLSN

Minimum Levels for Sustainable Nutrition soil guidelines for turfgrass.

Growth potential and weather

Temperature-based growth potential (GP) plus weather tools.

Integrated pest management

IPM topics, planning tools, fungicide combination products, and photo tips.

Soil, water, and irrigation

Soil tests and salinity, water quality, irrigation, and cultural soil management.

Tools and spreadsheets

Field tools and techniques plus downloadable spreadsheets and calculators.

Diagnostic and soil labs

Where to send turf diagnostic samples and which soil analytical labs to use.

University field days

Upcoming university turfgrass research field days.

Video library

The PACE Turf video library.

Links and free resources

Links of interest, turf resources, and reference guides from the PACE Turf archive.



Références

Matériel de référence d'actualité du PACE Turf, organisé par sujet.

MLSN

Niveaux minimums pour les lignes directrices sur les sois de nutrition durable pour l'herbe de territoire.

Potentiel de croissance et météo

Potentiel de croissance basé sur la température (GP) plus outils météorologiques.

Gestion intégrée des ravageurs

Sujets IPM, outils de planification, produits combinés de fongicides et conseils photo.

Sol, eau et irrigation

Tests de sol et salinité, qualité de l'eau, irrigation et gestion culturelle des sols.

Outils et feuilles de calcul

Outils et techniques de terrain ainsi que des feuilles de calcul et des calculatrices téléchargeables.

Diagnostic et laboratoires de sol

Où envoyer des échantillons de diagnostic du gazon et quels laboratoires d'analyse du sol utiliser.

Journées universitaires sur le terrain

Journées de recherche sur le gazon universitaire à venir.

Vidéotheque

La vidéotheque PACE Turf.

Liens et ressources gratuites

Liens d'intérêt, ressources de gazon et guides de référence de l'archive PACE Turf.



Referenzen

Aktuelles Referenzmaterial aus dem PACE-Rasen, nach Themen organisiert.

MLSN

Mindestwerte für nachhaltige Ernährung
Bodenrichtlinien für Rasengras.

Wachstumspotenzial und Wetter

Temperaturbasiertes Wachstumspotenzial
(GP) plus Wetterwerkzeuge.

Integriertes Schädlingsmanagement

IPM-Themen, Planungstools, Fungizid-
Kombinationsprodukte und Fototipps.

Boden, Wasser und Bewässerung

Bodenuntersuchungen und Salzgehalt,
Wasserqualität, Bewässerung und
kulturelle Bodenbewirtschaftung.

Werkzeuge und Tabellen

Feldwerkzeuge und -techniken sowie
herunterladbare Tabellenkalkulationen und
Taschenrechner.

Diagnose- und Bodenlabore

Wohin man Rasendiagnoseproben sendet
und welche Bodenanalyzelabore zu
verwenden sind.

Universitätsfeldtage

Anstehende
universitätsrasenforschungsfeldtage.

Videobibliothek

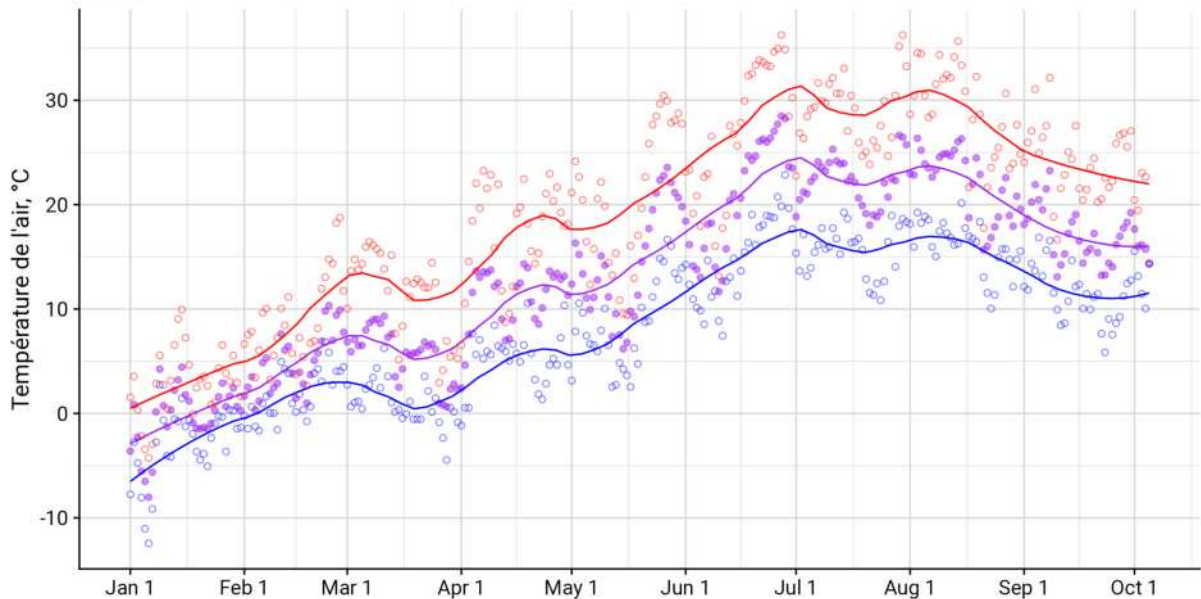
Die Video-Bibliothek von PACE Turf.

Links und freie Ressourcen

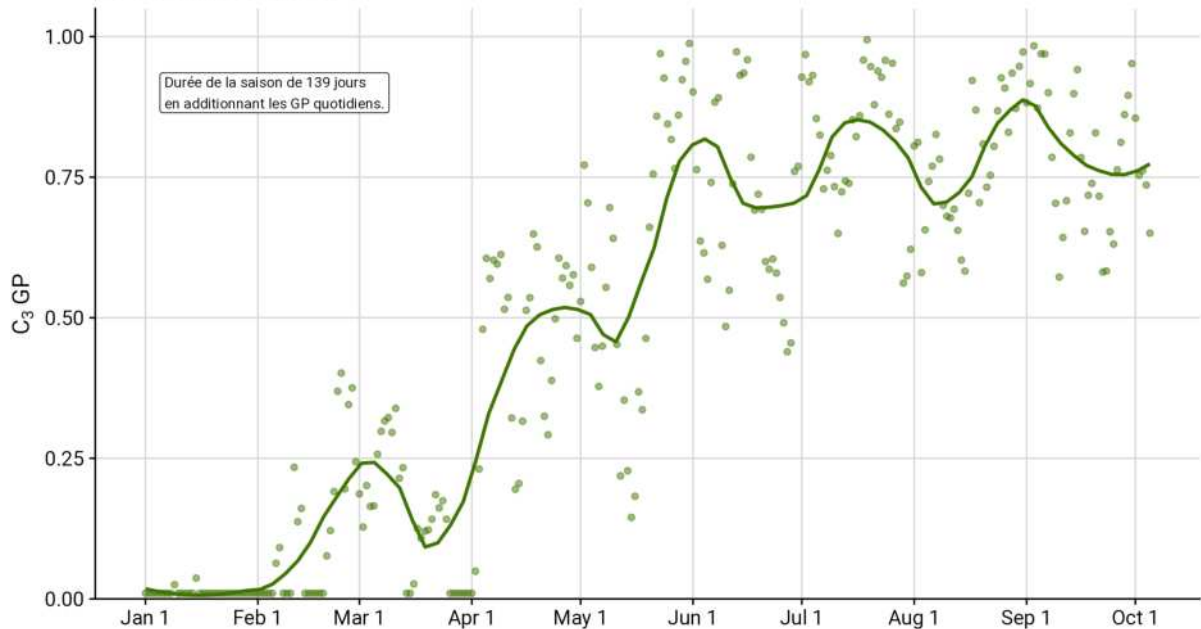
Links von Interesse, Rasenressourcen und
Referenzhandbücher aus dem PACE Turf
Archiv.

Résumé quotidien des températures en 2026

Sursee

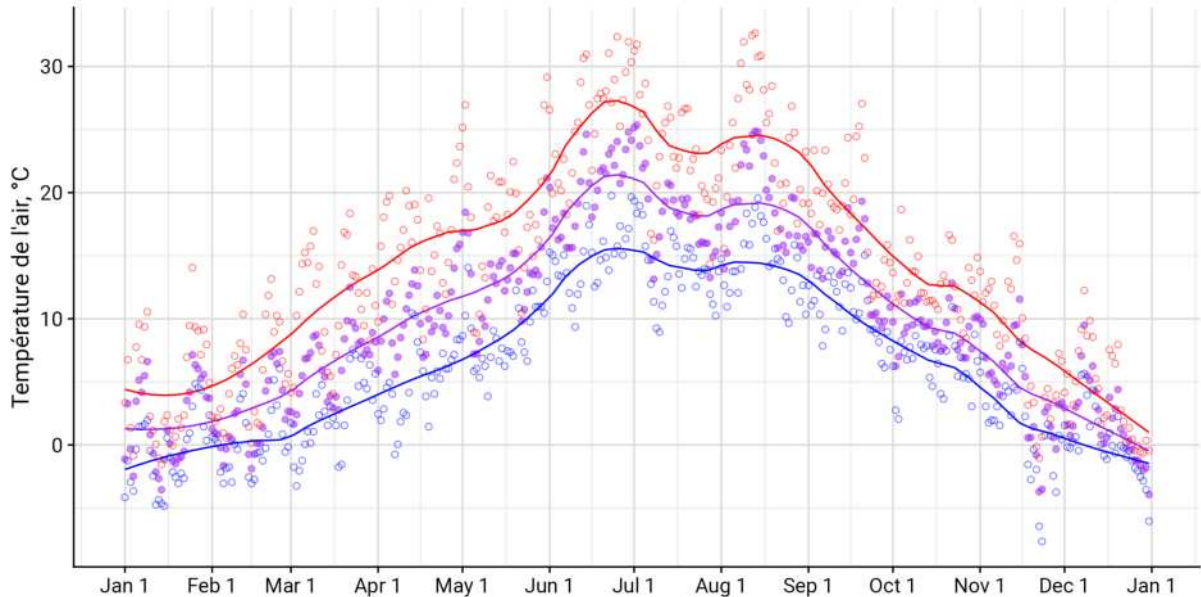


GP au Sursee en 2026

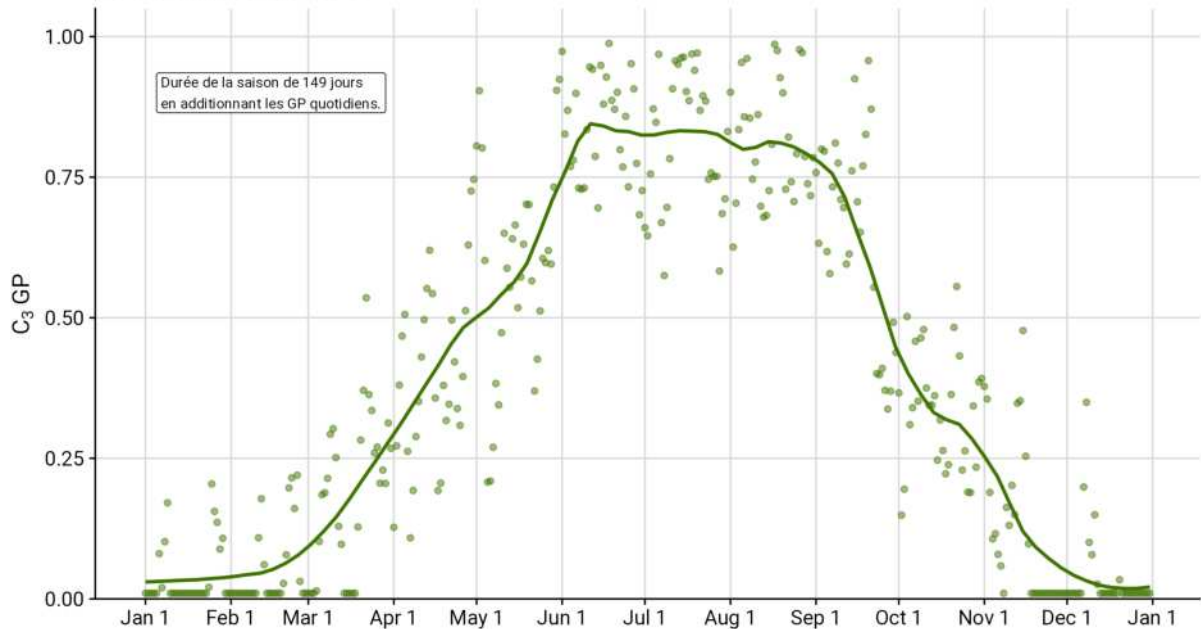


Résumé quotidien des températures en 2025

Sursee



GP au Sursee en 2025









Woods Performance System

- Grass grows (growth potential)
- Grass uses nutrients as it grows (MLSN)
- We can measure aboveground growth (Clipping Volume)
- We can measure belowground growth (OM246)
- We can use sand to adjust the surface OM%
- We need to produce a great golfing surface
- All these can be adjusted, measured, or estimated

Minimum Levels for Sustainable Nutrition (MLSN)

MLSN is designed to prevent nutrient deficiencies based on an analysis of the nutrients in the soil and the expected grass use of nutrients.

The two possible extremes

1. Supply nothing and assume the soil can provide all the grass requires.
2. Supply 100% (or more) of the nutrients the grass can use.¹

¹This approach makes the implicit assumption that the soil cannot supply the nutrients.

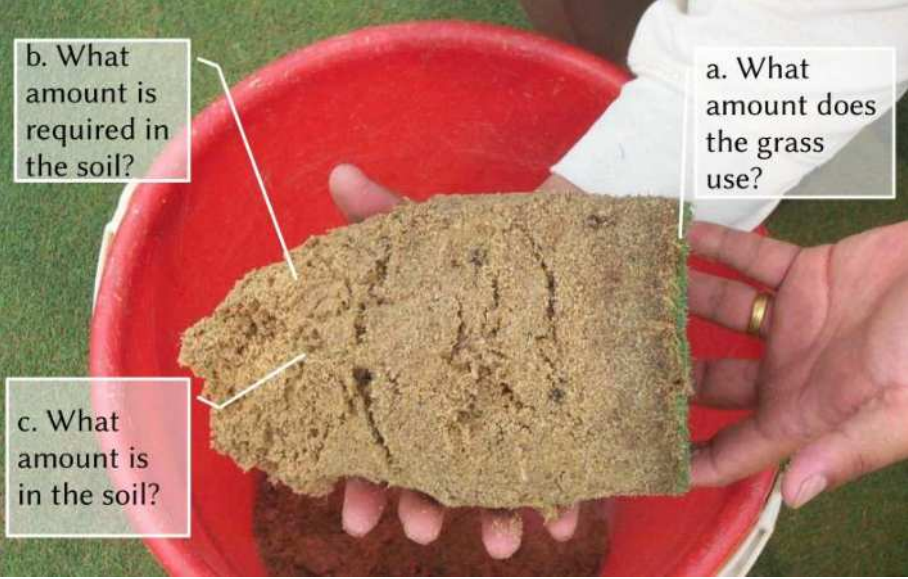
“How many more times do I have to say that applying nutrients to turfgrass growing on soil already well supplied with the nutrients is a waste of time and money?”

Wayne Kussow in “Manipulating Creeping Bentgrass Nutrition”
(1995)

Two questions

1. Is this element required as fertilizer?
2. If it is required, how much should I apply?

To answer those questions, we need to know *how much is used by the grass* and *how much can be supplied by the soil*.

A photograph showing a person's hand holding a rectangular core sample of soil and grass. The core is light brown and appears moist. It is being held over a red plastic bucket. Three callout boxes with white lines pointing to different parts of the core are overlaid on the image. The background is a green lawn.

b. What amount is required in the soil?

a. What amount does the grass use?

c. What amount is in the soil?

To answer those fundamental questions, we need to estimate 3 quantities

creeping bentgrass
Shanghai, China



FOR SUSTAINABLE TURF



3588



Instructions: Select 3 areas of good performing turf for sampling. Label each of the 3 paper sample bags as described in the "Soil Sample Preparation" flier. For each of the 3 sampling areas, pull 10 randomly distributed soil cores, and place the 10 cores in the appropriate paper sample bag. Sample soils to a depth of 4 inches using a 3/8 to 1 inch diameter probe. Pinch the thatch layer from the soil core. Place all three paper bags into the plastic zipper bag provided in the kit, and fasten zipper. Sample

Quality Analytical Services by:
Brookside Laboratories, Inc.
200 White Mountain Dr.
New Bremen, OH 45869
Phone: 419-977-2706

for Brookside use only

File Number: 29831

Number Received: _____

Date Received: _____

Transmit results in ppm

Change to PACE Turf, LLC (417)

for PACE use only

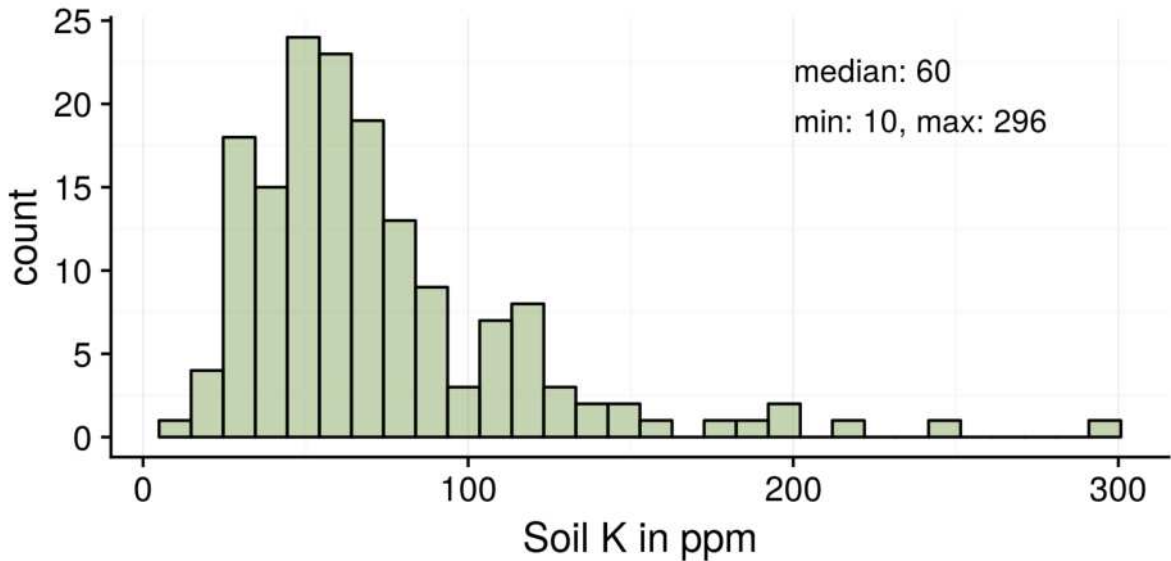
Shipped _____

Entered _____

Report emailed _____



Potassium

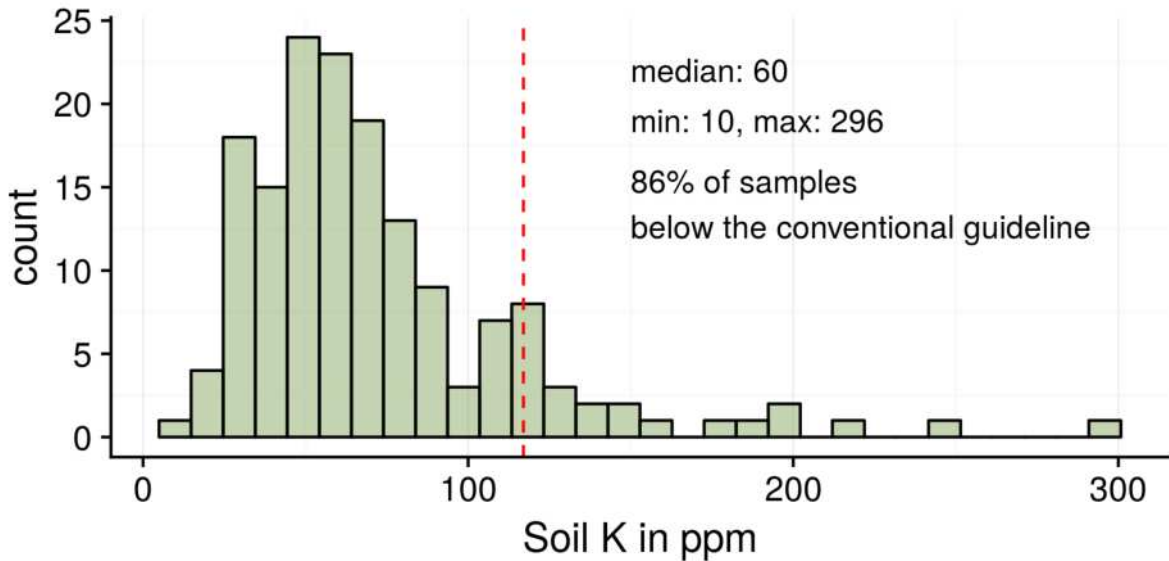


median: 60

min: 10, max: 296

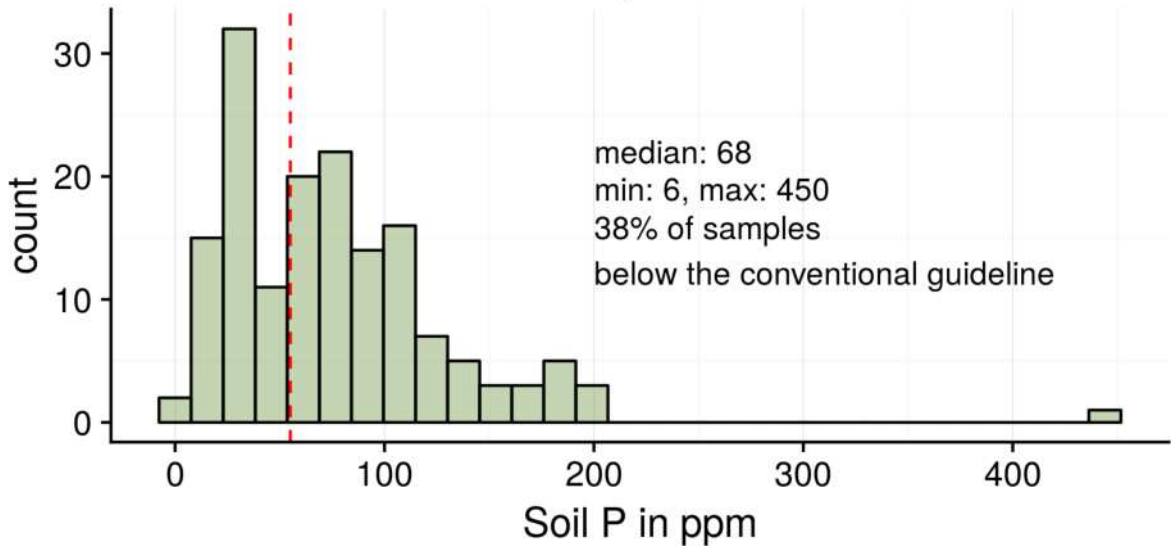
Mehlich 3 extraction

Potassium



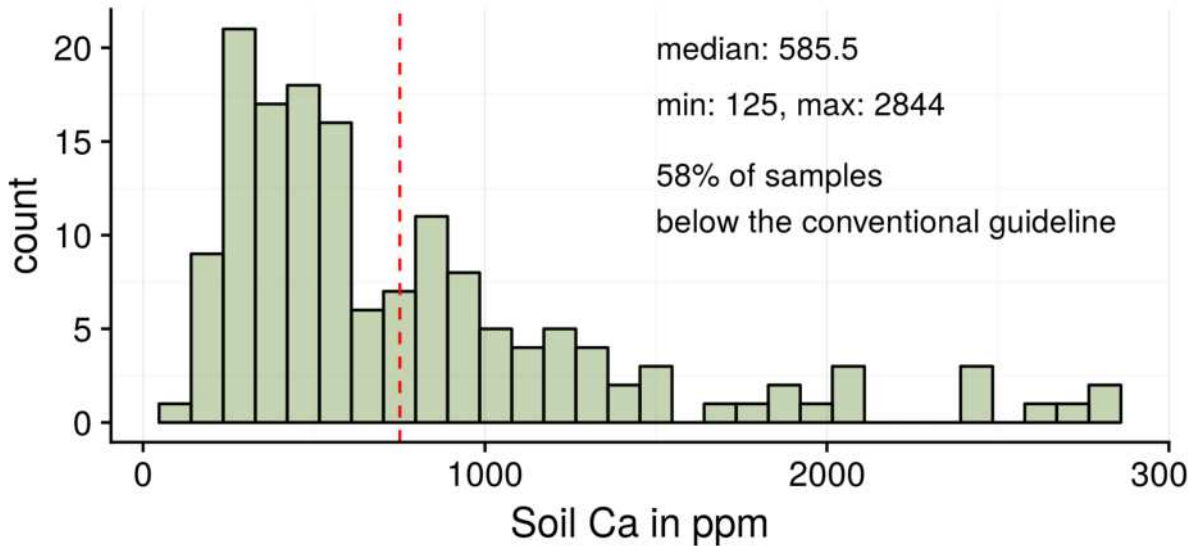
Mehlich 3 extraction

Phosphorus



Mehlich 3 extraction

Calcium



Mehlich 3 extraction, calcareous samples removed

MLSN matches modern turf & soil conditions

Reference

September 2014

Minimum Levels for Sustainable Nutrition Soil Guidelines

The Minimum Level for Sustainable Nutrition (MLSN) Guideline is a new, more sustainable approach to managing soil nutrient levels that can help you to decrease fertilizer inputs and costs, while still maintaining desired turf quality and playability levels. The MLSN guidelines were developed in a joint project between PACE Turf and the Asian Turfgrass Center. All soil analyses were conducted at Brookside Laboratories, New Bremen, OH.

	MLSN Soil Guideline
pH	>5.5
Potassium (K ppm)	37
Phosphorus (P ppm)	21
Calcium (Ca ppm)	331
Magnesium (Mg ppm)	47
Sulfur as sulfate (S ppm)	7

Nitrogen requirements are best determined based on **turf growth potential**, which incorporates site-specific weather and turf type to calculate nitrogen demand (Gelenkar and Stowell, 2005. Golf Course Management, p. 108-113, March, 2005).

How the guidelines were developed

From a database of over 17,000 soil samples, we selected 3,725 that were classified as having:

- not poor performing turfgrass
- pH 5.5 - 8.5: to avoid aluminum toxicity at pH less than 5.5, and to avoid alkalinity hazard at pH greater than 8.5
- total exchange capacity <6 cmol/kg

A log-logistic model provided a significant fit of the data, and was used to identify the concentration (in ppm) of each nutrient that 10% of the soil samples fell below, but were still performing well. This 10th percentile value is the MLSN soil guideline shown above.

For more information, see the Facebook MLSN page at: www.facebook.com/misnturf



www.paceturf.org

www.asianturfgrass.com

