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 (Gelernter 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 3,721 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/mlsnturf

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Analytical methods used to develop the Minimum Levels for Sustainable Nutrition Soil Guidelines

Electrical conductivity (1:2) converted to saturated paste equivalent, 1:2 soil method. Reference: Soil, Plant and Water Reference Methods for the Western Regions S-2.210, 2003. Values converted to saturated paste equivalent using following equation:

*Saturated paste equivalent EC dS/m = 2.1 * (1:2 EC dS/m) + 0.5)*

pH (1:1 in water). Reference: McLean, E.O. 1982. Soil pH and lime requirement. in Page, A.L. ed. Methods of soil analysis, part 2. Agronomy Monograph 9, 2nd ed. American Society of Agronomy and Soil Science Society of America, Madison, WI; pp. 199-223.

Mehlich III extractable sulfur, calcium, magnesium, potassium, sodium and phosphorus. Reference: Mehlich, A. 1984. Mehlich-3 soil test extractant: a modification of Mehlich-2 extractant. Comm. Soil Sci. Plant Anal. 15:1409-1416.

Sustainability Metrics

Decreases in these 7 inputs can document your progress towards sustainability

The goal of "sustainable turf" is a worthy one, but there has been too little technical discussion of what it means, how it can be achieved, and how to measure progress towards sustainability. We have selected the seven parameters below because reductions in each can produce significant improvements in costs and environmental inputs, and because each can be easily quantified:

1. **Reduce number of total maintained acres**. Reduce turf or heavily landscaped acres, and you will reduce water, equipment, manpower, fertilizer and pesticide inputs.
2. **Reduce total water used**. Accomplish this by switching to reclaimed water, improving irrigation efficiency, reducing turf acres.
3. **Reduce total nutrients applied**. Get more efficient with nitrogen, phosphorus, potassium and other key elements. The MSLN guidelines can help you here.
4. **Reduce total pounds and toxicity levels of pesticides applied.** Implement an IPM plan and track reductions in total pounds on the ground. You can also document incorporation of safer, Class 3 pesticides and biocontrol approaches, and decreases in more toxic Class 1 and Class 2 pesticides.
5. **Reduce manpower costs**
6. **Reduce fuel use costs and volumes**
7. **Reduce electrical use costs and kWhs used**

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