

Soil and Water Management: 3 problems, 3 solutions

Micah Woods, Ph.D.

Chief Scientist | Asian Turfgrass Center

www.asianturfgrass.com

10 March 2014

Sustainable Turfgrass Management in Asia

Pattaya, Thailand

Salinity



high soil salinity = grass failure

Chonburi, Thailand



salts move with water, first symptoms occur in low areas

San Diego, California
photo: www.paceturf.org



course is adjacent to
ocean, close to sea level

Mauritius



in the lowest areas,
seashore paspalum grows

Mauritius



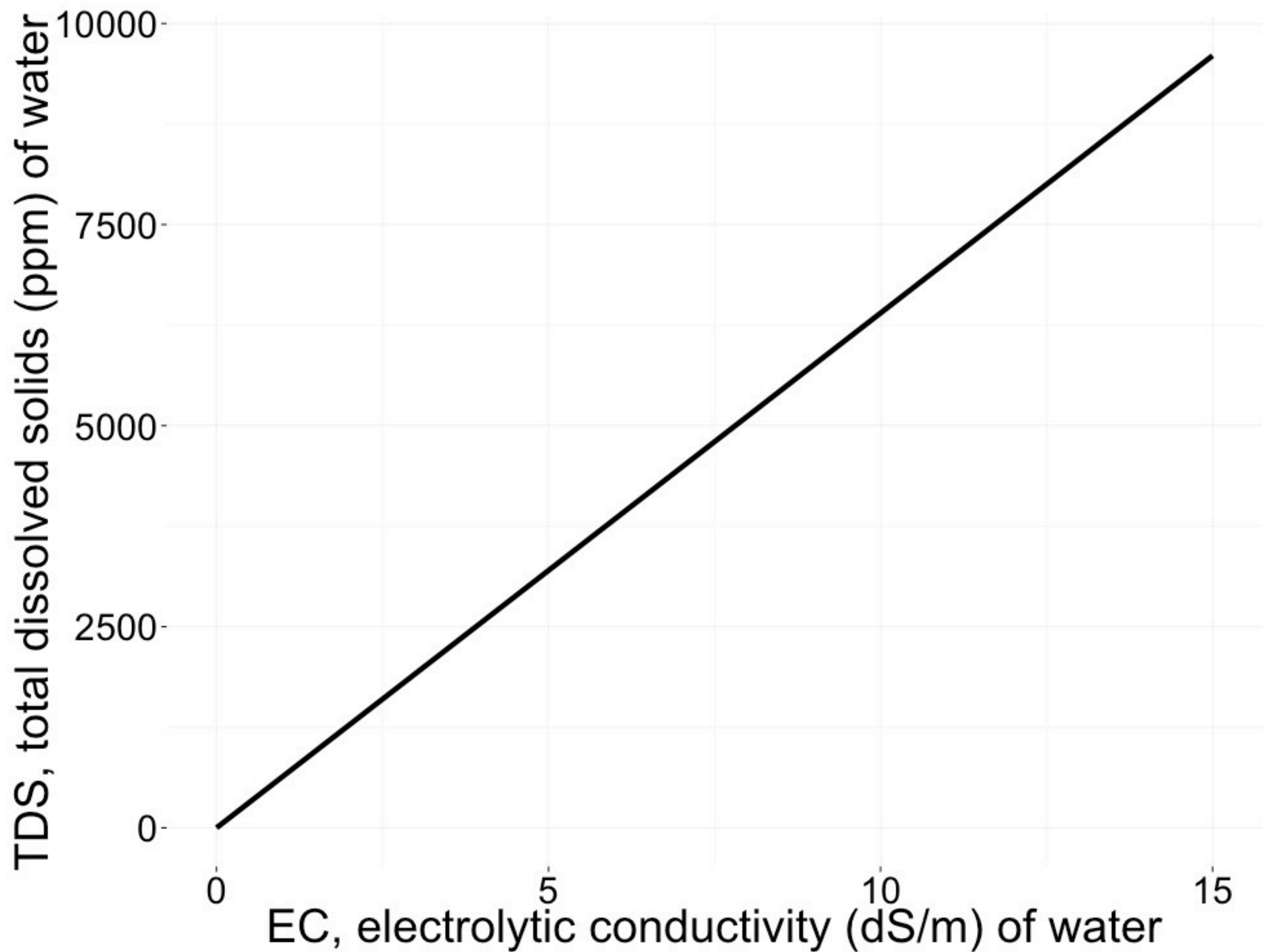
but even seashore paspalum
will die if too much salt
accumulates

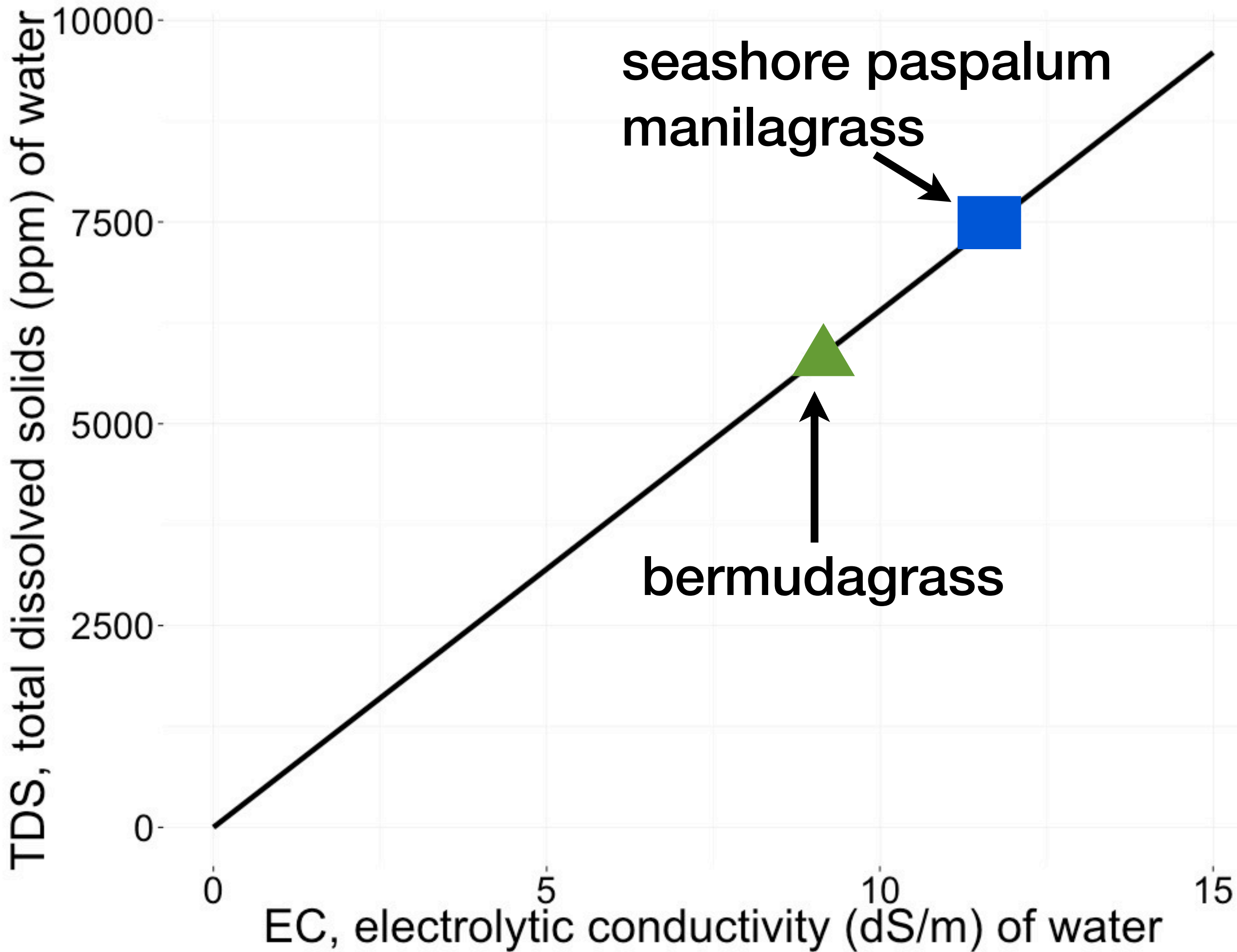
San Diego, California
photo: www.paceturf.org



salt can leach in aerification
hole, salts accummulate
around the holes

San Diego, California
photo: www.paceturf.org





Step 1:

$$LR = \frac{EC_w}{5EC_e - EC_w} \quad (1)$$

where...

LR is leaching requirement

EC_w is electrolytic conductivity of the irrigation water

EC_e is electrolytic conductivity of the soil extract at a level the grass can tolerate

Step 2:

$$\textit{Water Requirement} = \frac{ET}{1 - LR} \quad (2)$$

Step 1:

$$LR = \frac{2}{5(8)-2} = 0.05$$

Step 2:

$$Water\ Requirement = \frac{5mm}{1-0.05} = 5.3mm$$

Sodium hazard



sodium accumulation causes
clay particles to expand and
deflocculate

Jakarta, Indonesia



soils become hard and
water infiltration is disrupted

Tamil Nadu, India



gypsum ($\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)
supplies calcium to replace
sodium on soil exchange sites

Chiba, Japan



Ca^{2+} & flocculation at left,
 Na^+ & deflocculation at right

lab experiment, Thailand

Example:

CEC = 100 mmol_c/kg

exchangeable sodium percentage (ESP) = 15%

to reduce ESP in top 15 cm from 15% to 5%,
add 194 g CaSO₄ · 2H₂O per m²

Nutrient deficiencies



nitrogen deficiency is most
common, symptom is
irregular yellowing

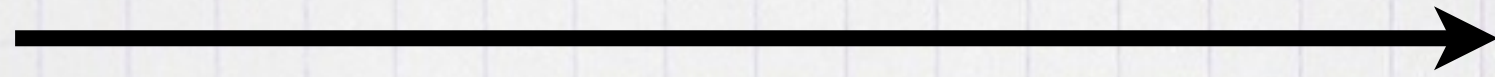
Miniverde, Japan



fairy ring symptoms are
more obvious in turf low in N

Tifeagle, Thailand

Enough K



No K



K deficiency symptoms

Penn A-1 bentgrass, USA



Iron deficiency,
interveinal yellowing

Carpetgrass, Thailand



November, 2012

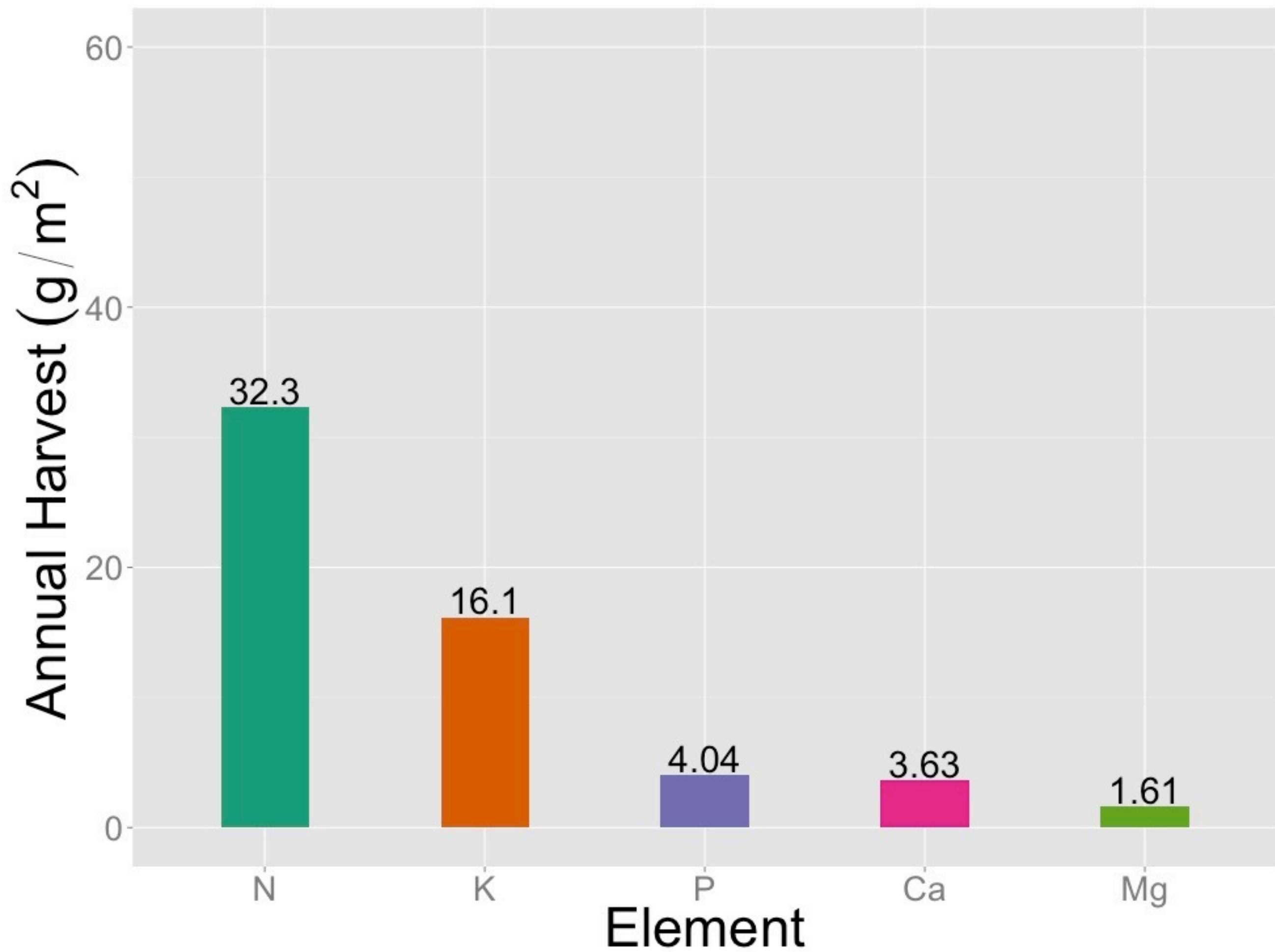
Minimum Levels for Sustainable Nutrition Soil Guidelines

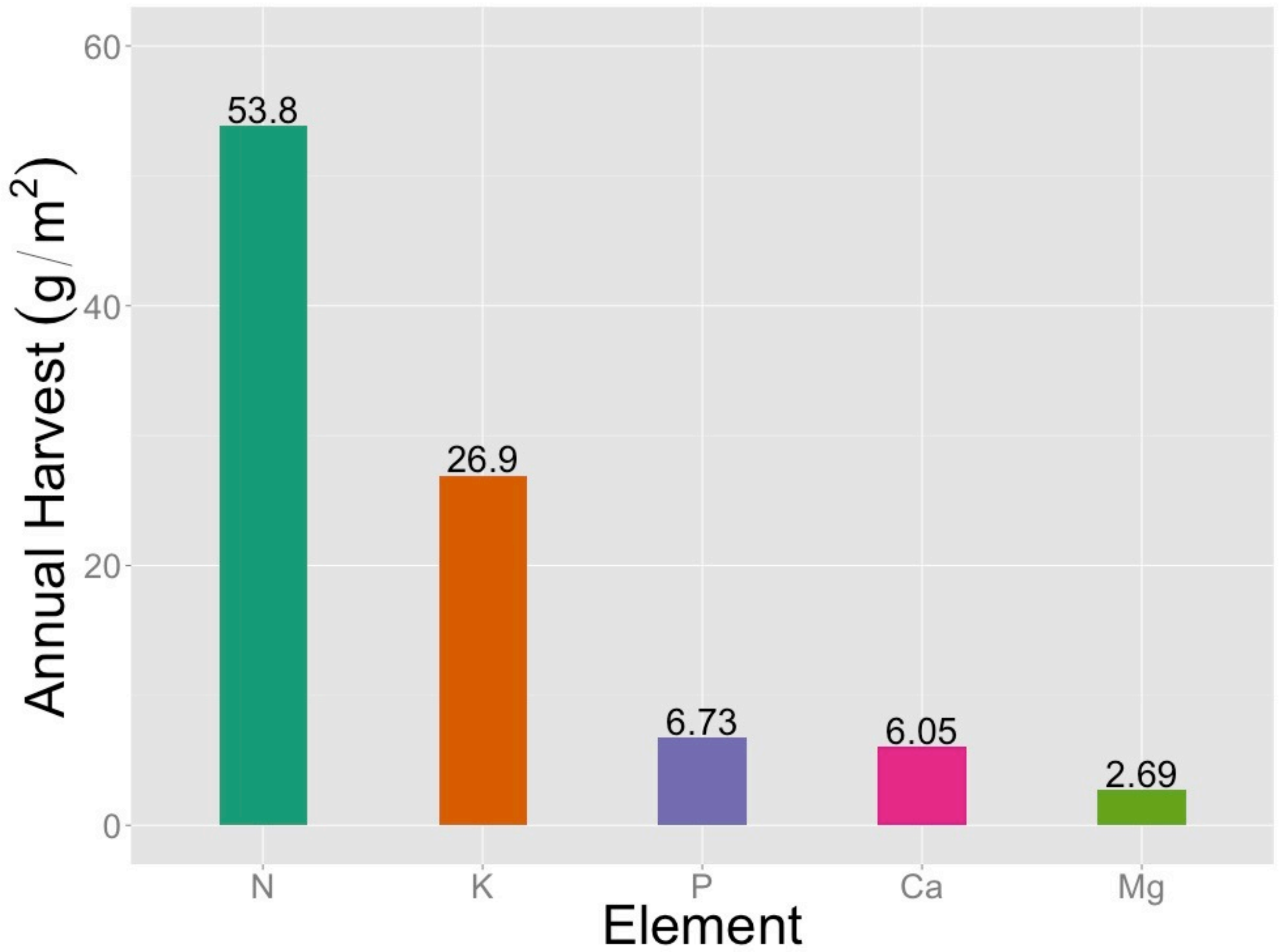
Minimum Level for Sustainable Nutrition (MLSN) is a new, more sustainable approach to managing soil nutrient levels that can help you to decrease fertilizer inputs and costs, while still maintaining desired turf quality and playability levels. The MLSN guidelines were developed in a joint project between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

	MLSN Soil Guideline
pH	>5.5
Potassium (K ppm)	35
Phosphorus (P ppm); pH<7.5, Mehlich 3	18
Phosphorus (P ppm); pH<7.5, Bray 2	25
Phosphorus (P ppm); pH>7.5, Olsen	6
Calcium (Ca ppm)	360
Magnesium (Mg ppm)	54
Sulfur as sulfate (S ppm)	13
Sodium (Na ppm)	<110
Electrical conductivity (EC dS/m)	<2
Total Nitrogen (N ppm)*	<3

Managing sodium and salts: In locations where poor quality irrigation water makes it difficult to meet the guideline of <110 ppm sodium or <2 dS/m salts, MLSN guidelines and overall management practices may need to be modified on a site-specific basis. For more information on salinity and sodium management, see Carrow RN and Duncan R., 1998. Salt affected turfgrass sites: assessment and management. Sleeping Bear Press, 173 pp.

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







www.asianturfseminar.com/downloads.html