

Effects of stocking rate on soil carbon, nitrogen, organic matter and related nutrients on bermudagrass pastures after 48 years of stocking

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Application: Bermudagrass pastures are subjected to an array of stocking rates based on design or default by management.

Introduction: The objectives of this study were to examine long term changes in soil nutrient status of different stocking rates on bermudagrass pastures.

Materials and Methods: ‘Coastal’ and common bermudagrass (BG) were established in different sized pastures at the Overton Center in 1968. Three different stocking rates of each BG were initiated in 1969 using cow-calf pairs. From 1969 through 1984, annual fertilization was 200-44-83 (N-P-K) with split applications of N. The BG pastures were grazed as pure stands through 1974. In fall 1974, all pastures were overseeded with mixtures of annual ryegrass plus clover and stocked starting in Feb-Mar to Oct each year through 1984. In fall 1984, all pastures were subdivided with one half overseeded with ryegrass + N fertilizer and the other half overseeded with clover without N fertilizer (Table 1). From spring 1985 to 2018, stocking rates from mid-February to late September averaged 0.95, 1.5, and 2.2 cow-calf pair/ac (1 pair = 1500 lb) for common BG, and 1.1, 1.7, and 2.8 cow-calf pair/ac for Coastal BG, respectively for low, medium, and high stocked pastures.

Table 1. Annual fertilizer^{1,2} applications on bermudagrass pastures during various periods.

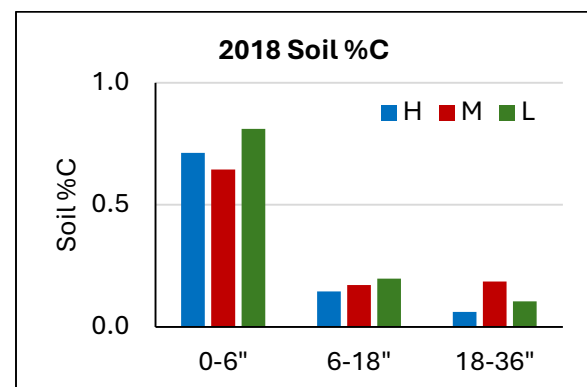
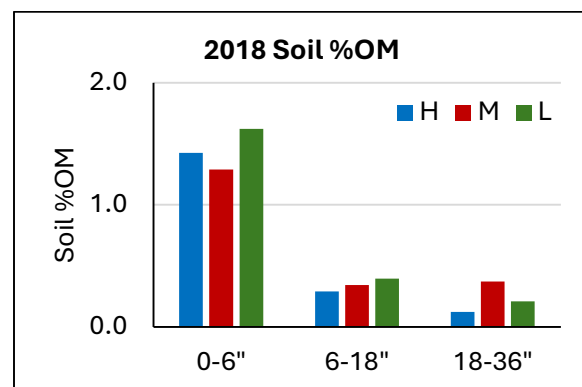
Period	No Years	Ryegrass + N			Clover + No N		
		N	P	K	N	P	K
		lb/ac			lb/ac		
1985-1989	5	410	0	0	0	0	85
1990-1997	8	250	0	0	0	0	85
1998-2004 ³	7	303	46	85	0	46	85
2005-2018 ⁴	14	278	30	54	0	30	54

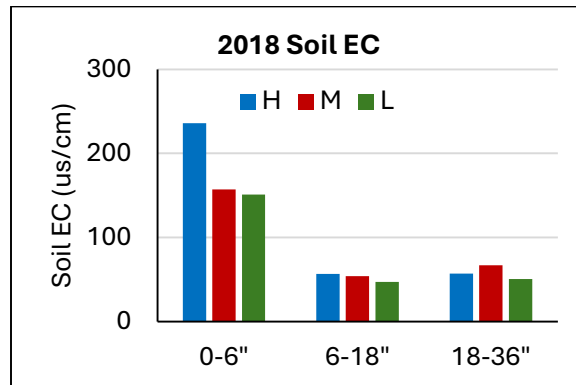
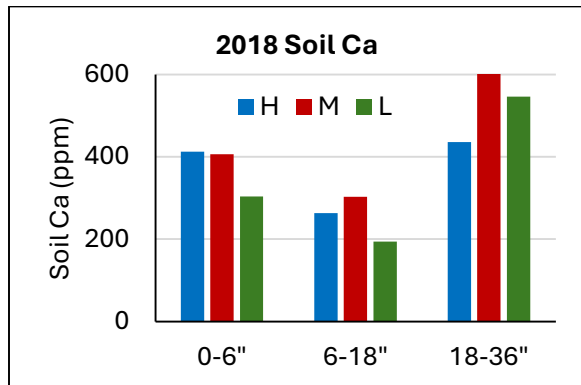
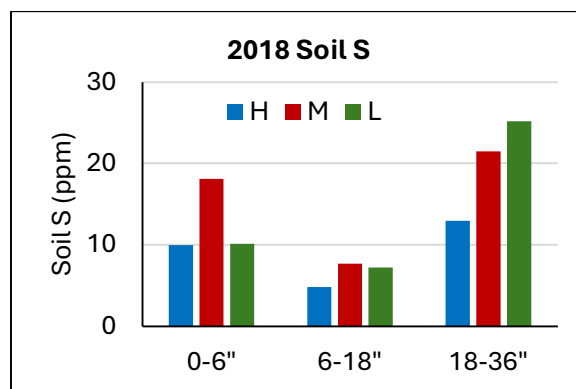
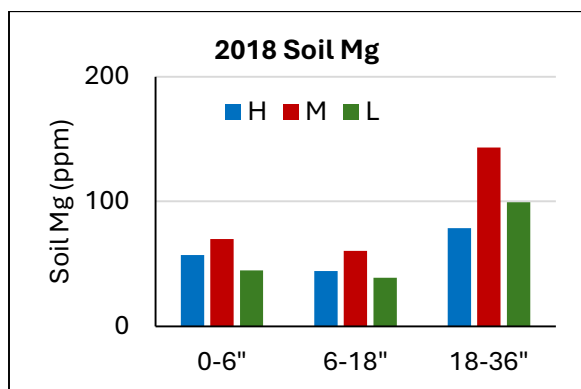
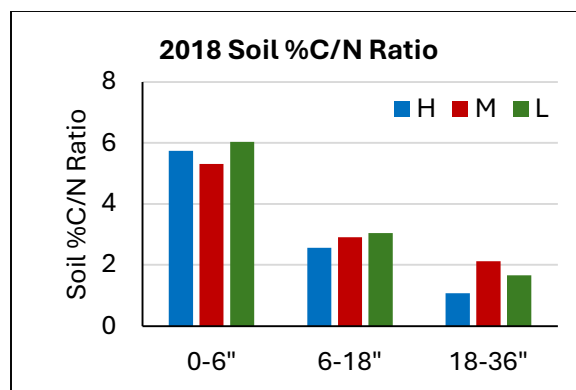
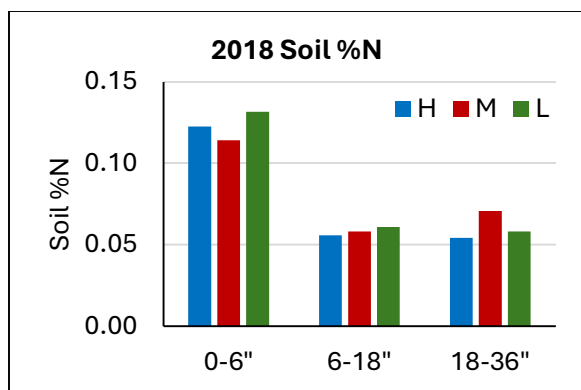
¹ Fertilizer P₂O₅ x 0.46 = P; K₂O x 0.83=K.

² Limestone was applied to all pastures at 6 t/ac from 1968-1984; 8 t/ac from 1985-2005; 3.5 t/ac from 2006-2013.

³ From 1998-2004, all pastures received S, Mg, and B at 50, 27, and 1.0 lb/ac, respectively.

⁴ From 2005-2018, all pastures received S, Mg, and B at 28, 15, and 0.7 lb/ac, respectively.





Results:

There were no substantial differences in soil %OM, %C, %N, or %C:N ratio due to stocking rate of pastures; however, much greater concentrations of all these nutrients were at the 0-6" depth. Soil electrical conductivity (EC) was greater on high stocked pastures at the 0-6" depth. Soil Mg, S, and Ca were greater in concentration at the 18-36" depth.

Conclusions and Implications:

Stocking rates ranging from about 1 cow-calf pair/ac to more than 2.5 pair/ac on sandy acid soils had limited to no effect on soil nutrient status at depths greater than 6". This provided documentation for no hazardous buildup of nutrients after 48 years of stocking.