

Botanical Composition of Management Zones in Pastures

John A. Guretzky, research assistant
Ken J. Moore, professor
Department of Agronomy

Introduction

The productivity and quality of forage in pastures is highly related to the botanical composition. As the soil and topographic properties of pastures change, so does the botanical composition. Management zones, created from the classification of soil and topographic properties into homogeneous groups, can be used to characterize the spatial variability in pastures. Our objective was to examine whether management zones, created with slope and soil electrical conductivity (EC) data in pastures at Rhodes, differ in botanical composition.

Materials and Methods

We conducted this study in four, cool-season grass pastures. The pastures were interseeded with 12 forage legumes in 1995. Each pasture was three acres and contained the following landscape positions: summit, backslope, toeslope, opposite backslope, and opposite summit. The pastures also were divided by three stocking systems: continuous, rotational, and nongrazed. The stocking systems have been in place since 1995.

We used a survey grade global position system (GPS) to determine elevation throughout the pastures. These data were used to create a digital elevation model (DEM) in ArcView 3.2 (ESRI, Redlands, California), a geographic information system (GIS). Percent slope was calculated from the DEM. In August 2000, we measured soil EC with an EM-38 (Geonics Limited, Mississauga, Ontario, Canada). The soil EC and slope data were then used in a fuzzy c-means clustering program (Australian Centre for Precision Agriculture, Sydney, Australia) to create the management zones. The relative

percent ground cover of each plant species was determined in May 2000 and 2001 in 300, 2 × 1 ft quadrants. The quadrants were randomly placed each year, and the positions were georeferenced and incorporated into ArcView. The data presented in this report represent the mean of the samples located in each zone across the four-replicated pastures.

Results and Discussion

Five management zones were created across the four, replicated pastures at Rhodes. Zone 1 had the lowest slope and soil EC, and from zone 1 to 5, soil EC increased (Table 1). Soil EC is highly related to soil moisture and textural characteristics. Slope was highest in zones 3 and 4 (Table 1).

The management zones differed in botanical composition (Figure 2). Smooth brome dominated zones 1 to 3. Reed canarygrass was opposite that of smooth brome and dominated zone 5. Smooth brome is not affected by slope, but it is displaced by reed canarygrass where soil EC is highest in the pastures. Legume content was highest in zones 3 and 4 where slopes were highest. Regardless of the soil EC, grasses out-compete legumes when slopes are < 10%. Because the botanical composition of pastures reflect changes in soil and topographic properties, management zones created from soil and topographic data show potential to be used as a tool by forage producers to predict potential productivity and nutritive value of forage on a whole-farm basis.

Acknowledgments

We would like to thank Roger Hintz and Trish Patrick in agronomy and Don Bullock from the University of Illinois for assistance during data collection and analysis and Ron Sealock and staff at the Rhodes Research Farm for assistance in managing the pastures

Table 1. Average slope (%) and soil electrical conductivity (EC) of five management zones created in pastures at Rhodes. Management zones were created using slope and soil EC data collected across four replicated pastures. Values represent the mean for each management zone (n = 4).

Management zone	Slope %	Soil EC mS/m
1	5	22.9
2	10	27.9
3	15	27.2
4	14	35.6
5	8	35.0

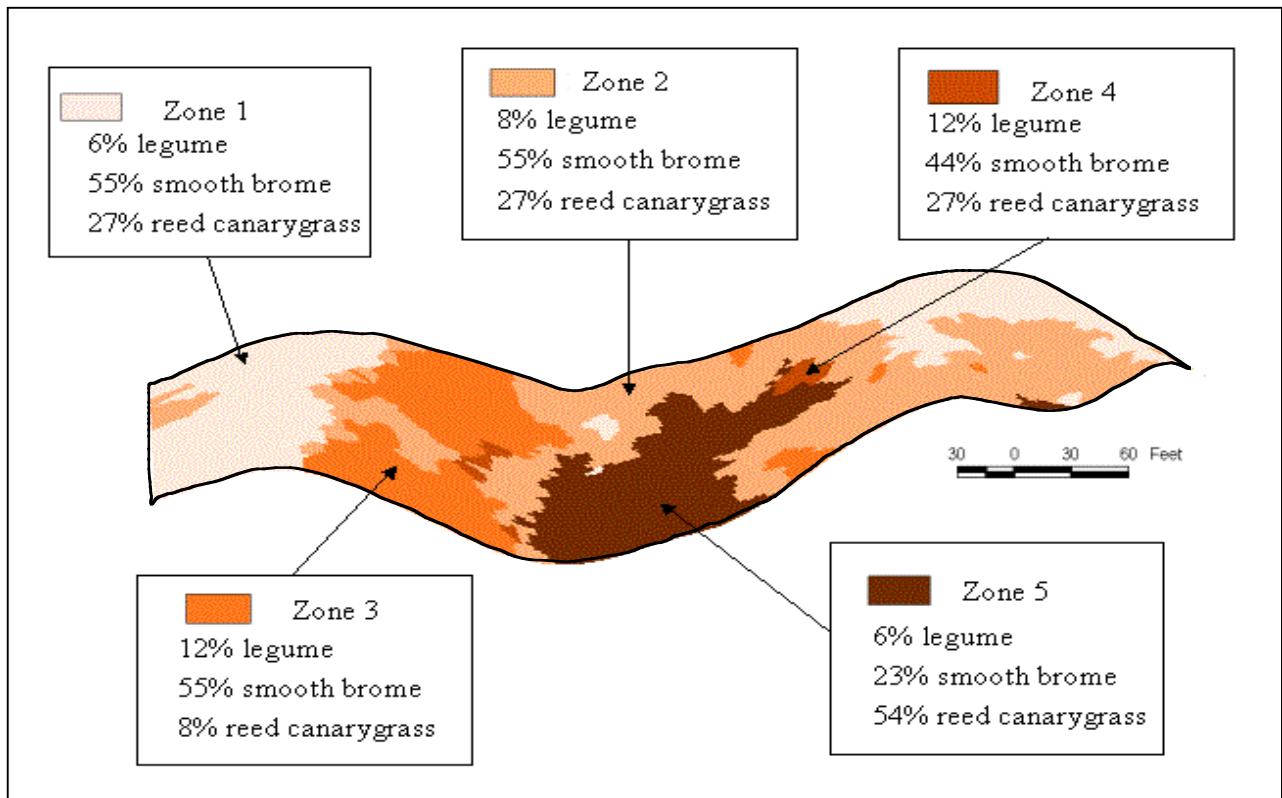


Figure 1. Botanical composition of the management zones created in pastures at Rhodes. The map represents one replicate. The replicate pastures were ~ 3 acres. Values for each species by zone represent the relative percent ground cover across the four replicates.