

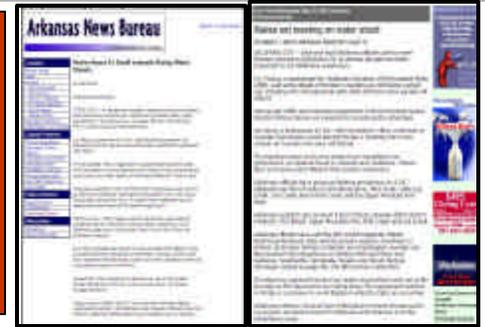
Introduction

Concerns over excessive Phosphorus (P) in surface water have spawned political controversy between the States of Arkansas and Oklahoma as well as potential lawsuits against potential P sources in Arkansas (see article at far upper right). One source of P that continues to be scrutinized is the loss of P from pastures amended by animal manure. This poster reviews: 1) the soil test P issue as it relates to livestock producers, 2) our approach to educating animal producers on proper soil testing, and 3) research on soil P variability in pastures.

Soil Phosphorus Variability in Pastures: Implications for Soil Sampling

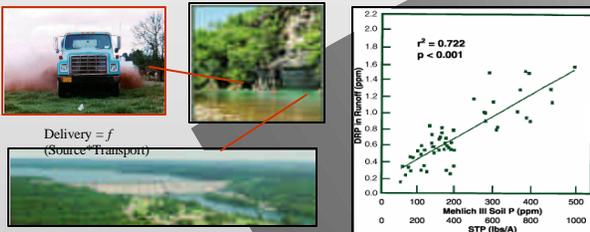
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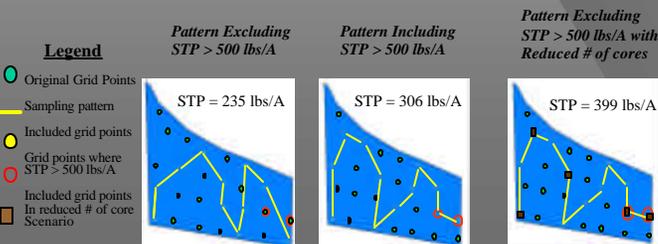
Soil Test P (STP) issues for Livestock Producers

Elevated phosphorus (P) in streams and lakes can lead to accelerated eutrophication. P losses from pastures to streams via runoff is not well understood. Pote et al. (1996) found a relationship between soil test phosphorus (STP) and dissolved reactive P in runoff



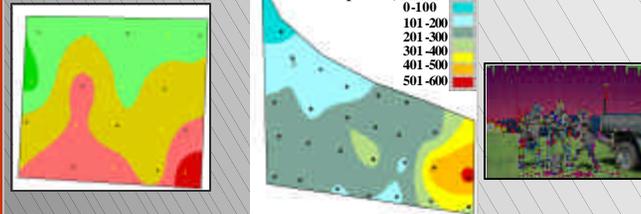
Research of this nature prompted the concept of "environmental STP thresholds" as a nutrient management strategy for manure applications to pasture. For example, if the STP level of a pasture exceeded a predetermined threshold, then manure application rates would be reduced or altogether eliminated. This has serious implications for livestock producers with pastures that have elevated STP. While thresholds are easy to administer, the concept raises questions about the scientific soundness as a water quality protection strategy. One concern is obtaining an estimate of STP from a pasture where STP may vary spatially and temporally. Of practical concern was the question of if livestock producers were using proper sampling techniques. For example we recommend collecting soil cores from 15 to 20 locations in a zig-zag pattern to form one composite sample from an individual pasture. If these recommendations are not followed, then

producers might obtain a biased estimate of STP for comparison with an environmental threshold. In many cases, poor sampling techniques could lead to unnecessarily restricting manure applications to pastures. For example, consider the simplified scenarios below for a pasture where STP was measured at grid locations and a 300 lbs/A environmental threshold was being used:



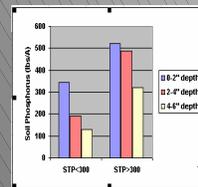
Soil Sampling Education for Livestock Producers

To help producers better understand the effect that soil sampling can have on STP values in pastures, we conducted numerous field demonstrations where we used GPS and GIS to grid soil sample and map STP variability. This allowed us to visually show STP variability. It also pointed out how uneven manure applications contribute to variability.

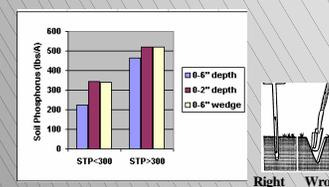


From these demonstrations, we were able to collect data that helped show the effects of sampling recommendations of STP values in pastures such as:

Effect of Sample Depth



Effect of Sample Shape



as well as the number of cores and sampling patterns (featured in panel at left).

From this work, we developed educational materials including:

- A fact sheet that was distributed to 7500 People

- A slide presentation delivered to over 3500 Livestock producers and to NRCS field personnel



STP Variability Research

Objective

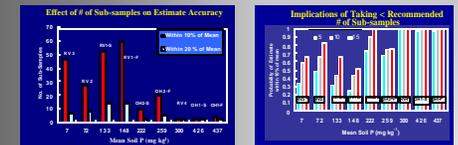
- To examine if our current sampling recommendations with respect to the number of cores taken for a composite sample are adequately accounting for spatial variability

Materials and Methods

Soil samples collected from grids in 12 pastures

- Grid points geo-referenced with DGPS
- Mehlich 3 Soil P determined with ICAP
- Soil P maps made using kriging and GIS
- PROC SURVEY SELECT (SAS) used to generate random samples from observed and interpolated values

Results



Conclusions

- Spatial Variability had greater impact in pastures with mean soil P below 150 mg kg⁻¹
- Pastures with means < 150 mg kg⁻¹ required 3 times as many sub-samples in zig-zag patterns to obtain an estimate with 10% of the observed mean
- Current sampling recommendations are adequate for dealing with variability if they are carefully

References

Pote, D. H., T. C. Daniel, A. N. Sharpley, P. A. Moore, Jr., D. R. Edwards, and D. J. Nichols. 1996. Relating Extractable Soil Phosphorus to Phosphorus Losses in Runoff. Soil Sci. Soc. Am. J. 60(3):855-859.