

**Introduction**

Arkansas is the second largest poultry producing state raising over 1.3 billion broilers annually. Poultry production is of great economic importance in Arkansas providing about 50% of the farm gate income for Arkansas agriculture. Therefore, an increasingly important issue in Arkansas, is water quality and nutrient management issues. A three phase EPA 319 grant was funded to assist the poultry industry in dealing with these environmental issues. The project had three components: research, technology transfer, and education outreach.

**Research**

The objective of the research was to determine factors that influence surface water runoff within watersheds. And to use the data collected from these runoff factors to develop a phosphorus index for pastures in Arkansas.

Several different components were evaluated to determine their influence on surface water runoff. These components were: slope, vegetation type, grazing practices, and soil type.

**Effect of Slope:** Rainfall simulations were conducted on a variable plot. The results showed that slope significantly affected the amount of surface runoff with the higher slopes resulting in higher runoff volumes. Another observation made during this research was that time of year also impacted the runoff volume with higher runoff volumes during the fall of the year.

**Effect of Vegetation Type:** Rainfall simulations were conducted on 25 paired plots with five different forage species (bluestem, switch grass, eastern gamma grass, tall fescue, and Bermuda grass). The results of this study suggested that fescue was the only forage type that significantly reduced surface runoff.

**Effect of Grazing Practices:** Runoff plots were constructed on a cattle farm inside a fenced area that had been only hayed for the past 7 years, just outside the fence where the cattle trails were located, and also in the over grazed pasture areas. Rainfall simulations were then conducted on the plots. Results from the rainfall simulations showed significantly higher runoff volumes from the cattle-trail, and over-grazed plots when compared to the plots in the hayed only pasture. Soil bulk density measurements followed similar patterns.

**Phosphorus Index for Pastures:** From the data collected during the surface runoff studies, a phosphorus index (P Index) for pastures was developed. Verification studies were then conducted to evaluate the accuracy of this tool. Poultry/beef cattle farms were selected and plots constructed. Treatments were applied to the plots using the phosphorus index and NRCS recommendations (using threshold soil test P level of 300lb/A). The runoff data from these plots showed a very high correlation between soluble reactive phosphorus (SRP) in the runoff and the P Index ( $r = 0.77, P > 0.0001$ ). For plots receiving litter treatments based on NRCS recommendations, there was a strong correlation between soil test P levels and SRP levels in runoff on the plots receiving no litter applications due to high soil test P levels. However, for plots receiving litter treatments there was no correlation between soil test P levels and SRP in the surface runoff.



Rainfall simulator used during the development of the P Index

**Technology Transfer**

The goal of the technology transfer component was to assure that the stakeholders or poultry growers, industry personnel, NRCS and CES agents obtained the information developed on the P Index during the research phase of the project. In addition, it was important to provide forums for poultry growers and company representatives to become better educated on the environmental issues as well as educate them on management practices they could utilize to assure good environmental stewardship. During the first year of the project, grower meetings, coordinated by the poultry companies and Arkansas Cooperative extension service,



were held in which over 1400 poultry producers were educated on proper soil sampling technique, proper poultry house construction, pending AFO/CAFO regulation, and the status of water quality. During the second year, grower meetings continued, which focused on the need for environmental stewardship as well as the producers role in preserving water quality. A newsletter was generated to inform poultry growers of the proposed EPA AFO/CAFO regulations. With the new EPA regulations in place, future activities will include newsletters explaining the use of alum as a best management practice, and a newsletter explaining the new EPA regulations, why they are important, and which producers will be affected and what is required to be in compliance. In October 2002 a Phosphorus workshop was held during which a rainfall simulation field demonstration was conducted, this allowed the participants to see first hand the technology utilized during the development of the P Index.



P.B. DeLaune demonstrating the use of Rainfall simulators for the phosphorus management workshop participants

**Education Outreach**

A ten-week, 2 hour/week continuing education course titled, Managing Animal Resources for Environmental Quality was held during the fall 2002 semester at the University of Arkansas. The course was made available to other college campuses in the state via satellite down link. The course was attended by approximately 20 county extension agents, industry personnel, conservation district personnel, and poultry science graduate students. The course covered diverse variety of topics concerning environmental issues including legal liability, basic soil science, the Phosphorus Index for Arkansas pastures, government cost-share funding available to farmers, and public perception concerning livestock farming in Arkansas. Classes were taught by university and extension guest speakers who were very knowledgeable in the topics addressed. The course was evaluated by the students via surveys, which indicated a strong approval rate (1.51, where ratings were 1-5, excellent-poor). Due to the comprehensive format of the course, there are currently ongoing discussions with Arkansas NRSC to require this course as part of their technician certification process.



Satellite communications classroom used for the environmental course

**Phosphorus Management Workshop:** A phosphorus management workshop was held in Fayetteville, AR. The workshop was attended by over 200 industry personnel, extension personnel, university researchers, and state legislators. Many topics concerning phosphorus in the environment were presented including P sources, TMDL's, P Index for pastures, Nutrient management planning, litter banking, and watershed education. A policy panel discussion was also included where political leaders from Arkansas answered questions concerning legislation involving phosphorus management in Arkansas watersheds.