USGS

WATER RESOURCES RESEARCH GRANT PROPOSAL

TITLE: Land Use, Groundwater Decline, and Soil Wetness Features of the Southern Mississippi Valley Alluvium

FOCUS CATEGORIES: M&P, GW, WW.

DESCRIPTORS: Groundwater Hydrology, Groundwater Movement, Land Use, Perched Water Table, Septic Tanks, Soil-Water Relationships, Urban Planning, Wastewater, Water Levels.

DURATION: March 1, 1999 to February 28, 2000.

FEDERAL FUNDS: Direct: $6,080 Indirect: $0 Total: $6,080

NON-FEDERAL FUNDS: Direct: $ 7,205 Indirect: $ 4,955 Total: $12,160

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CONGRESSIONAL DISTRICT OF RESEARCH UNIVERSITY: Associated with the Third Congressional District

STATEMENT OF CRITICAL REGIONAL WATER PROBLEMS

The most critical water problem for the inhabitants of the Southern Mississippi Valley Alluvium (SMVA), Major Land Resource Area 131, is disposal of wastewater with proper renovation, both from homes and from small communities. Failure to achieve proper renovation and disposal is a major health problem and certainly decreases the quality of life for residents of the area. Also, it deters small industries from moving into the area.

STATEMENT OF RESULTS AND BENEFITS

Society will greatly benefit from the identification of more soils that are suitable for wastewater renovation, possibly as much as 3 million acres. These soils will also be more beneficial to society than previously indicated for playgrounds, local roads, housing, and many other uses.

NATURE, SCOPE, AND OBJECTIVES OF RESEARCH

Objective I: To test the hypothesis that lowering of the groundwater of the Mississippi River Valley Alluvium (SMVA) has left relic wetness (redoximorphic) features in soils.

The chief deterrent to using soils for wastewater renovation is the natural occurrence of free-water. The wetness in soils is caused by (i) low hydraulic conductivity horizons within the soil or (ii) by the regional groundwater rising into the soil. If soils have horizons of low hydraulic conductivity and therefore perch water themselves, change in the regional groundwater will not influence their degree of wetness. However, in wet soils with high hydraulic conductivity, lowering of the groundwater will influence their moisture regime. Although soils in the SMVA area that contain horizons of less than 30-35% clay do not normally perch water, Rich Fielder (1998) compiled data indicating there are about 0.6 to 0.7 million acres of soils in the SMVA area which are classified as wet and have less than 18% clay in the subsoil. Thus, many soils may be drier than currently classified and more useful to society due to lowering of the regional groundwater.

Predictions of the occurrence of free-water in the soils of Arkansas are based almost entirely on the presence of wetness features (redoximorphic features). These features are due to the redistribution of iron and manganese when the soil is saturated and reduced.

Wetness features are used to estimate the occurrence of free-water because they present both a rapid and inexpensive method and are in most cases accurate estimators of free-water occurrence. Wetness features, however, can only be used as an indicated of free-water when a soil is in equilibrium with its environment. Thus use of wetness features to predict the occurrence of free-water is questionable for the soils that do not perch water

themselves. The groundwater of the SMVA has experienced decline primarily due to withdrawal of water for irrigation. Also, some tentative data (Owens, et al, 1998) indicate relic redoximorphic features are present within the area.

A reclassification of soils in the Southern Mississippi Valley Alluvium could change the realistic value and benefits of these soils to society, and in some cases change drastically. Soils that are now rated as unsuitable (ADH) or severe (NRCS) for onsite wastewater renovation may in fact be well suited to wastewater renovation. This could greatly improve the quality of life for people of this area.