



## WATER RESOURCES RESEARCH GRANT PROPOSAL

**Project ID:** AR3601

**Title:** Linkages Between Watershed Dynamics and Habitat Contraction of an Endemic Species in Little Red River Headwaters (LRRH)

**Focus Categories:** Surface Water, Hydrology

**Keywords:** Water levels, Water chemistry, Time series analysis, Streams, Rainfall runoff, Instream flow, Geochemistry, Numerical analysis, Fish Ecology, Data analysis

**Start Date:** 03/01/2001

**End Date:** 02/28/2002

**Federal Funds:** \$8,996

**Non-Federal Matching Funds:** \$47,076

**Congressional District:** 1

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### **Abstract**

Streamflow, which is strongly correlated with many critical physio-chemical characteristics of lotic systems, such as water temperature, channel morphology, and habitat diversity, can be considered a "master variable". This "master variable" may significantly limit the distribution and abundance of lotic species and may also regulate the ecological integrity of flowing water systems. Processes operating across a hierarchy of spatial scales determine stream characteristics. First, large-scale factors such as climate and precipitation determine the presence and magnitude of surface flows. Surface flow sets a template for finer scale properties operating on scales of stream reaches or reach units such as riffles. Watershed activities may both modify surface hydrological responses to precipitation (e.g. through release or retention of precipitation) and the transport of material from the watershed to streambeds. Management and conservation of watersheds, stream habitats, and stream fauna often fail to consider the role of a "master variable" or incorporate a hierarchical approach to conservation efforts.

Suspected reduction in base flow for tributaries of the Little Red River above Greers Ferry Lake has been linked to reduction in the range and abundance of the Yellowcheek darter (*Etheostoma moorei*), a species endemic to these tributaries. U.S. Fish and Wildlife Service (USFWS) has stated that conservation of newly established 'species of concern' such as Yellowcheek darter places a regional priority on identification of critical habitat, habitat conservation methods and prevention of further habitat degradation. The LRRH also includes the habitat of the endangered Speckled Pocketbook Mussel (*Lamprolaima streckeri*). The Arkansas Department of Environmental Quality has designated the upper tributaries of the Little Red as 'extraordinary resource waters' and 'ecologically sensitive water bodies'. Land use activities such as clear-cutting, pastureland and poultry farming have impacted the region. These activities combined with natural hydrologic conditions may severely restrict or impair endemic species habitat. The proposed study will

address these issues and serve to answer critical questions concerning the impact of changes in basin hydrology on habitat contraction.

We proposed to develop an ecosystem-based management approach to conservation of Yellowcheek darter and its endemic habitat. Conservation strategy requires a sustainable approach to habitat management, but with a hierarchical understanding of variable scale and influence. This approach is made possible through our research objectives, study design, and data collection. The relationship between Yellowcheek darter range plasticity and basin hydrology must be defined prior to implementation of a management strategy, especially those that require landowner cooperation. The data derived from this study will include: hydrologic parameters such as stage height, stream width and discharge; hydrochemical parameters such as pH, conductivity, total dissolved and suspended solids; and biological data such as Yellowcheek darter presence/absence. This study will provide a database to which we can compare historical records of these parameters as found in the EPA STORET and Yellowcheek darter research over the last twenty years. These data will allow the development of management strategies by using natural landscape 'units' for the protection of fish diversity. Combining hydrologic, hydrochemical and hydrobiological data is crucial to understanding habitat restriction and its effect on endemic species.