WATER RESOURCES RESEARCH GRANT PROPOSAL

Project ID: 2002OK2B

Title: Springs in Peril: Have Changes in Groundwater Input Affected Oklahoma Springs?

Project Type: Research

Focus Categories: Groundwater

Keywords: invertabrate fauna, biomonitoring, temporal change, dewatering, springs, groundwater-surface water interactions

Start Date: 03/01/2001

End Date: 02/28/2003

Federal Funds: $24,315

Non-Federal Matching Funds: $48,746

Congressional District: Oklahoma 4th

Principal Investigator:
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Abstract

Introduction and background. The proposed research will assess the status of Oklahoma springs with respect to groundwater input, and the effects of altered groundwater water flow rates on spring biota. Groundwater is an extremely important commodity in Oklahoma, with extensive use by agriculture, industry, municipalities, and private landowners. This extensive use of groundwater has reduced water levels in some aquifers, with possible consequent partial to complete water loss from associated springs. Because springs are located at the boundary between groundwater and surface flows, springs provide an excellent point to easily monitor changes in groundwater resources. A monitoring program involving 50 springs throughout the state was carried out in 1981 and 1982, with funding from the Oklahoma Water Resources Research Institute. The monitoring scheme used aquatic invertebrates and fish as biomonitors of spring conditions. Changes in spring conditions were expected to produce changes in the fauna of the affected springs; however, monitoring was not continued. In total, 149 invertebrate taxa were collected from the springs, which were located in 29 different counties, and were associated with seven major aquifers and several areas of alluvial and terrace groundwater.

Summary of the work plan. I propose to re-assess the same 50 springs that were studied in 1981-1982, after an interval of twenty years; that is, in 2001-2002. Landowners will be contacted and permission sought to re-sample springs. Invertebrates will be sampled and environmental conditions will be recorded at each spring. Light traps will also be used at several spring sites to capture adult aquatic insects for accurate species determination. Landowner questioners and flow measurements in 1981-1982 and 2001-2002 will be used to estimate flow changes. I will compare the invertebrate composition and enviormental conditions of springs collected in 1981-1982 and in 2001-2002. Changes in the invertebrate fauna during this time interval will be coupled with information on changes in flow and other environmental conditions to ascertain the relationship between changes in invertebrate fauna and changes in flow.

Objectives: The goals of this project are to (1) determine whether springs and spring organisms are imperiled by any recent changes in water flow, (2) determine whether the invertebrate fauna in some springs is more susceptible to flow changes than in other springs, and (3) increase the knowledge of the biodiversity of aquatic invertebrates in Oklahoma.

Benefits and outputs: (1) The status of small springs in Oklahoma is poorly known. Springs and the invertebrates, within them constitute unique communities that are highly susceptible to changes in groundwater input. This study will provide the information needed to broadly assess the condition of springs and the invertebrate faunas throughout the state, especially with respect to changes in groundwater flow. (2) The project will increase our knowledge of the distribution and biodiversity of freshwater invertebrates in Oklahoma. The fauna of springs, in particular, is poorly known and this study will likely find several new species. Specimens will be deposited at the Sam Noble Oklahoma Museum of Natural History. (3) One graduate student and several undergraduate students will be trained in field and laboratory techniques, including aquatic invertebrate identification. (4) A description of the project and a summary of results will be posted on the website of the Oklahoma Biological Survey. (5) Data records will be added to the species database at the Oklahoma Biological Survey. (6) Results will be presented at one or more meetings and in one peer-reviewed manuscript.