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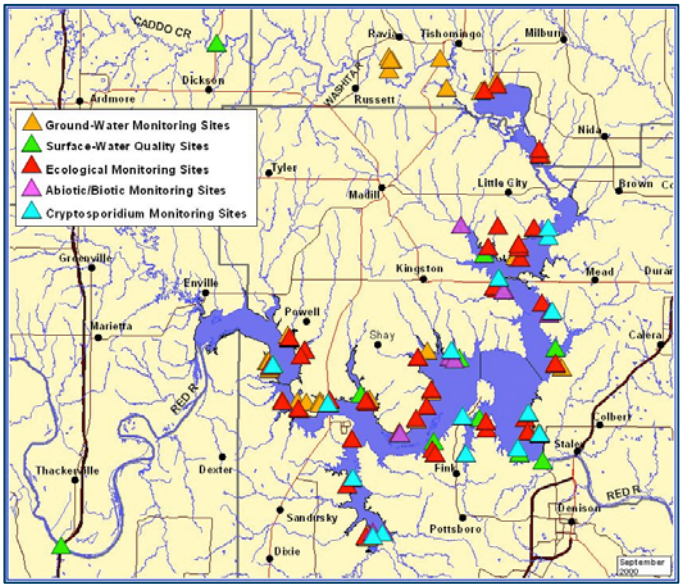
NATIONAL RISK MANAGEMENT RESEARCH LABORATORY
GROUND WATER AND ECOSYSTEMS RESTORATION RESEARCH

Development of Protocols and Decision-Support Tools for Assessing Watershed System Assimilative Capacity (SAC) in Support of Risk-Based Ecosystem Management/Restoration Practices

Introduction to the Problem

System assimilative capacity (SAC) is an important ecosystem characteristic for evaluating sustainability and assessing risk in a managed ecosystem. SAC also represents an important ecosystem restoration option. An appropriate evaluation of a system's capacity to assimilate stressors is needed before sound ecosystem management decisions can be made, particularly if active (intrusive) restoration practices are being considered.



Background

Lake Texoma, a Corps of Engineers lake on the Oklahoma/Texas border, serves as a major recreational and drinking water resource for southern Oklahoma and northern Texas. EPA is currently conducting research on Lake Texoma to develop decision-support tools and gather information that will help evaluate the transport and attenuation of contaminants and stressors in a lake ecosystem and link them to observable ecological effects. EPA is leading this research effort and is collaborating with the U.S. Geological Survey, U.S. Army Corps of Engineers, University of North Texas, and Oklahoma University in collecting and analyzing data to target stressor inputs into Lake Texoma.

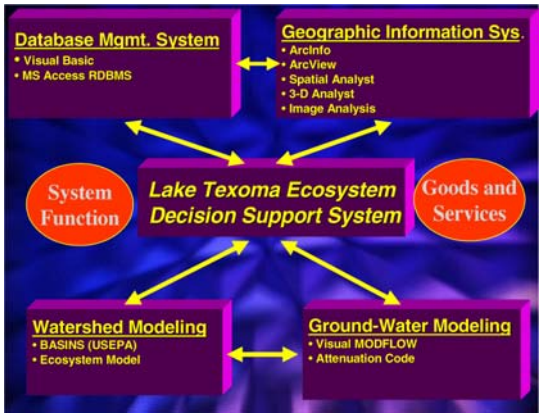
Objectives

The initial goal of the project will be to develop tools and gather information needed to evaluate the transport and attenuation of contaminants and stressors into the lake ecosystem and to link them to observable ecological effects. The final goal of the project will be to develop a model decision-support system. The system will provide the information needed to:

- Evaluate the transport and attenuation of stressors in the lake ecosystem and link them to observable ecological effects
- Determine whether the SAC is being exceeded
- Assist in the risk-based ecosystem/watershed management decision process

Approach

A number of representative site and chemical sources will be characterized in detail. The potential release scenarios include leaking underground storage tanks, landfills, and nonpoint sources (such as agricultural sites for pesticides and fertilizers and near-shore residential development areas). A detailed assessment of the transport and attenuation processes for different stressor scenarios will be developed. These assessments will be used to produce exposure indices based on location (transport path to lake), size (mass loading) and geological setting (attenuation values). Historical data, surveys, and geographical information system (GIS) data will be used to evaluate the relative numbers and placement of potential stressor sources in the Lake Texoma watershed.



Concurrent and coordinated ecological effects monitoring will be conducted to identify links, if present, between stressor input locations or events and alterations in ecosystem functions. A GIS/stressor, input/eco-effects database will be developed for watershed-level assessment of the potential risks to the Lake Texoma system and for development of SAC determination of various stressor types in the watershed/ecosystem.

Accomplishments to Date (February 2003)

Participating collaborators have collected numerous physical, chemical, and biological datasets from study sites in around and the lake ecosystem. Data have been collected from both surface water and ground water locations. Over 108 spatial datasets residing in five spatial databases have been collected and can be accessed and queried for GIS and modeling purposes. Historical water-quality biological and physical data were retrieved from EPA's STORET database. This historical data will be used with current data to identify possible links between past and present stessor inputs. A database management system is under development; it will include all the data collected during the project.

Near-Future Tasks

A study is being conducted on the stream inflows from the watershed into the lake. This study not only focuses on the potential stressors, but also the flow volume into the lake after high and low rainfall events. This information will help support the development of the hydrologic model of the lake; the model will eventually be included in the Lake Texoma Decision-Support System.

Investigators

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