USGS NATIONAL WATER-QUALITY ASSESSMENT PROGRAM

Knowledge of the quality of the Nation's streams and aquifers is important because of the implications to human and aquatic health and because of the significant costs associated with decisions involving land and water management, conservation, and regulation. In 1991, the U.S. Congress appropriated funds for the U.S. Geological Survey (USGS) to begin the **National Water-Quality Assessment Program** (NAWQA) Program to help meet the continuing need for sound, scientific information on the areal extent of the water-quality problems, how these problems are changing with time, and an understanding of the effects of human actions and natural factors on water quality conditions.

The NAWQA Program is assessing the water-quality conditions of more than 50 of the Nation's largest river basins and aquifers, known as Study Units. Collectively, these Study Units cover about one-half of the United States and include sources of drinking water used by about 70 percent of the U.S. population. Comprehensive assessments of about one-third of the Study Units are ongoing at a given time. NAWQA assessments rely heavily on existing information collected by the USGS and many other agencies as well as the use of nationally consistent study designs and methods of sampling and analysis. Such consistency simultaneously provides information about the status and trends in water-quality conditions in a particular stream or aquifer and, more importantly, provides the basis to make comparisons among watersheds and improve our understanding of the factors that affect water-quality conditions regionally and nationally.

The NAWQA Program features the following studies:

- Continued national-synthesis assessments on nutrients, aquatic ecology, trace elements, pesticides, and, to a lesser extent, volatile organic compounds.
- Regional and national assessments of status and trends. These assessments focus on
    - Surface-water-quality of streams and rivers in the 42 Study Units grouped within 8 major river basins in the U.S.
    - Ground-water-quality in about one-third of the Nation's 62 principal aquifers
- Watershed and aquifer ("Study-Unit") assessments

In this project, I ask you to use analogous reasoning to support the development of an accurate and rich conceptual model about a specific environmental issue using evidence collected from two watershed studies that were part of the NAWQA program.

Analogical reasoning is a method of processing information that compares the similarities between new and understood concepts, and then uses those similarities to gain understanding of the new concept. The use of analogical reasoning can be divided into four steps:

- Generating the analogy: A well understood case is compared to a less familiar or target case
- Understanding the analogous case: An understanding of the relationships between attributes in the familiar case is sought
- Determine validity of analogy: Similarities and relationships between the familiar case and the target case are evaluated
- Apply findings: Attributes from the familiar case are transferred to the target case

Project Directions

In our last project, you are to act as if you are an environmental consultant completing a project report for the federal government based upon the USGS NAWQA Program.

In this project, I ask you to (1) identify one specific problem or issue in two different watersheds so that you can compare the watershed processes and characteristics that affect your chosen issue in the two watersheds, (2) develop an evidence-supported conceptual model concerning the issue, and (3) propose a management, remediation or restoration plan that could be applied to the two watersheds to address your chosen issue. We are going to use published reports and data from the USGS NAWQA program as our source of evidence about the US watersheds. The product of your work should be a report that will be due on the last class day of the semester. The report should include a description of the comparison (i.e. analogy) of the two watersheds you use to support the development of your conceptual model, a descriptiuon and diagram of your conceptual model; graphs, tables or figures taken from USGS reports that support your conceptual model, and citations.

Here are some examples of questions students have addressed in the past. Previous projects focused on the South Platte River Watershed:

- How has water development affected water quality in the South Platte River Basin?
- Does land use contribute to contaminant inputs and affect habitat characteristics and biological communities in streams?
- What factors control the occurrence of uranium and radon, and are the reported concentrations a concern?
- Have mining and residential development in the mountains affected water quality?
- Does urban land use affect water quality?
- Have agricultural chemicals affected water quality?
- How do discharges from permitted municipal wastewater treatment plants affect nutrient levels in streams?
- What are the cumulative effects of mixed (urban/agriculture) land use on water quality?
- What is the relative status of water quality by land use in the South Platte River Basin?

Project Report: almost all work done by professional environmental scientists is written up as a project report. A key characteristic of scientific writing is that conclusions are justified with evidence. You can use USGS reports and websites as the source of figures, tables and graphs that provide the evidence to justify your analogy and conceptual model. In addition, you are also able to download and analyze specific data from the NAWQA web sites.

In your project report, you should have the following sections:

A. **Introduction**: Describe the major water quality issues in the two watersheds you have chosen to study through analogous reasoning. You should justify using citations the significance of the issue you will study. This section should also describe or list the major objectives of the project.

B. **Justification of Your Conceptual Model**: The next section should describe and justify the comparison of the two watersheds using the four steps for analogous reasoning described above, a description and diagram of your conceptual model, and evidence (i.e. data, graphs, and tables of USGS data from the two watersheds) that support your conceptual model.

C. **Management Plan**: This section describes a proposed watershed management plan, remediation plan, or restoration plan that directly addresses the issue. You should support the expected effectiveness of your plan using citations of other research reports.

If you need help developing a management plan for the watershed (http://www.epa.gov/owow/watershed/wacademy/), I suggest you review appropriate modules that are part of the EPA Watershed Academy. The Online training is a focal point in EPA's Office of Water for providing training and information on implementing watershed approaches. The Academy's self-paced training modules, webcast seminars and live training courses provide current information from national experts across a broad range of watershed topics.