



WATER RESOURCES RESEARCH GRANT PROPOSAL

Title: WATER QUALITY MONITORING SYSTEM EFFECTIVENESS
EVALUATION: DENVER WATER CASE STUDY

Focus Categories: WQL, M&P, EDU

Keywords: Water quality, Water quality monitoring, Watershed management

Duration: 3/00 - 2/01

Funds Requested:

Federal Funds: 4,530
Direct

Non-Federal Funds: <u>5,684</u>	<u>3,376</u>	<u>9,060</u>
Direct	Indirect	TOTAL

Principal investigators name(s) and university:

Principal Investigators: Jim C. Loftis, Colorado State University

Co-Principal Investigator: Robert C. Ward, Colorado State University

Congressional district: 4th

Statement of critical regional or state water problems

Water quality monitoring programs are increasingly being held accountable for the information they produce, especially as more information driven management programs are implemented (eg source water protection and Section 303d list development). Many municipalities along the front range of Colorado are under pressure to expand their raw water monitoring programs as development in the watersheds, supplying municipal water, increases and as the Safe Drinking Water Act regulations tighten. Budgets for monitoring, however, are under financial constraints.

Because of the financial and information constraints being placed on water quality monitoring programs, there is a need to evaluate municipal watershed monitoring programs to insure they are meeting information needs while operating in an efficient manner. The means to evaluate water quality monitoring programs have been evolving over the years, but the practical application of the technology has been limited.

Water Quality Monitoring System Effectiveness Evaluation:

Denver Water Case Study

Nature, Scope and Objectives

The purpose of this project is to assemble existing water quality monitoring system design theory, develop a means to use such theory to evaluate the information effectiveness of existing municipal watershed monitoring programs and apply the theory to Denver Water's watershed monitoring program as a case study.

Denver Water operates an extensive water quality monitoring program that extends over its entire source water area to the terminal reservoirs that feed the treatment plants. This raw water monitoring system evolved over the years as operational needs and various regulatory information requirements were placed on Denver. Denver Water has agreed to have its monitoring program evaluated as a means of testing the existing technology for evaluating the effectiveness of water quality monitoring programs.

Methods, Procedures, and Facilities

The existing knowledge on evaluation of water quality monitoring programs includes the following considerations:

1. Are the information objectives of the monitoring system clearly stated and documented? Are the objectives clearly related to management decision making? What is the legal basis (often same basis for decision making) for spending public money obtaining the desired information?
2. Is there a well-defined and documented data analysis protocol that converts data to the above information goals? The goal of such protocols is to ensure that the analysis of the data, to produce the desired information, is scientifically sound and defensible. Also, by specifying the data analysis methods, before the data are collected, reduces the 'found' data problem that is developing in the field of water quality monitoring. This problem stems from the fact that any data analysis method can be used with 'found' data to generate desired results - on both sides of an issue. By specifying precisely how data will be analyzed before it is collected, this problem is greatly reduced. In other words, the data are collected in a manner that is dictated by the way it will be analyzed to obtain the desired information.
3. Is there a widely accepted reporting format used to convey the information to the decision-makers? The operation of most monitoring systems begins to break down, badly, at this point. In general, the 'discipline' of water quality monitoring is still searching for effective and efficient ways to communicate complex water quality information to decision-makers and the public. Progress is being made (ala the Consumer Confidence Reports in which Denver Water is a leader), but there is a need to devote the CCR type of attention to all water quality information.

4. Are the operating procedures and practices for the entire monitoring system clearly defined, understood and documented? What QA/QC practices are used at each step in the process? What training is available for monitoring employees? The monitoring system is deemed to include components similar to the following:

- o Sampling methods
- o Laboratory methods
- o Data handling
- o Data analysis
- o Reporting
- o Information utilization

Thus, each component is carefully examined for completeness and quality control as well as documentation. The examination often has to address consistency in operation of the monitoring system over time. Changes in operations often result in additional variance in the data that masks water quality changes. Changes are more likely to occur in a monitoring program with no documentation and poor training.