

U.S. GEOLOGICAL SURVEY  
WATER RESOURCES DISCIPLINE  
COLORADO DISTRICT

A. TITLE

National Park Service Rocky Mountain Network Water-Quality Database

B. PROBLEM

The Inventory and Monitoring Program of the National Park Service (NPS) has organized 270 parks into 32 geographic networks to conduct systematic monitoring of vital signs to ensure the health of the park ecosystems. The intent of the NPS Vital Signs monitoring program is to provide park managers with key information on the status of trends in parks ecosystem health; define normal limits of variation in measurable features; provide early warning of situations that require management intervention; suggest remedial treatments and frame research hypotheses; and determine compliance with laws and regulations.

The Rocky Mountain Network (ROMN) is one of these newly aggregated networks. It consists of Rocky Mountain NP, Great Sand Dunes NM and Preserve, and Florissant Fossil Beds in Colorado and Glacier NP, Grant-Kohrs Ranch, and Little Big Horn Battlefield NM in Montana.

For ROMN to address its mission to preserve, protect, and maintain the health of park ecosystems for the enjoyment of future generations, its parks must rely on scientific information about the status and trends of ecosystem health. Water-quality data are a critical component to understanding ecosystem health and the condition of natural resources in the parks. The first step in addressing this mission is to identify, compile, evaluate, and refine available water-quality data associated with the parks and to organize these data into useful database.

C. OBJECTIVES AND SCOPE

The objective of this proposal is to identify, compile, evaluate, and refine available water-quality data in the ROMN and to provide these data to the parks in an accessible database that will enable them to identify and manage water-resources issues within their boundaries.

D. RELEVANCE AND BENEFITS

The USGS mission includes support of NPS and other DOI agency science needs. The USGS has considerable experience in the collection, management, and interpretation of water-quality data within the NPS Intermountain Region. This work will provide the NPS with a well-designed, highly functional, geospatial water-quality database that will enable the NPS to better understand and manage its water resources. This effort also provides USGS scientists with a better understanding of available data in the ROMN, which will enhance future research activities.

This work addresses the USGS's 1998-2008 Water Resources Strategic Directions, which identifies suitability of aquatic habitat for biota and effects of climate on water resources management as areas of specific emphasis. This work also addresses the following issues identified in the Colorado District Science Plan: Integrated watershed assessments,

atmospheric effects on water quality, and water budgets and water-quality assessments of national parks and wilderness areas.

#### E. APPROACH

1. The geographic scope of the study will include the six ROMN parks and areas within 3 miles upstream and one mile downstream of park boundaries, except areas outside the park with substantially different land use than park lands (e.g., towns, reservoirs, agriculture). Only water-quality samples that fall within the defined geographic area will be included in the water quality database. [FY2004]
2. USGS will modify the water-quality MS Access database created for the Northern Colorado Plateau Network so that it can be used for the Rocky Mountain Network. This will primarily involve populating the NCPN database with data from the ROMN. No significant changes in database structure will be made. [FY2005]
3. USGS will retrieve, preprocess, and import data from water quality datasets identified in Table 1, which consist of all relevant data in NWIS, STORET, and several data sets generated by USGS, or that USGS is familiar with. These data have undergone preliminary evaluations of data extent, quality, and completeness. Preprocessing will involve checking records for quality and completeness using preset criteria, specified by USGS and NPS. [FY2005]
4. NPS will identify and procure any additional data sets not included in Table 1 that they would like to have included in the database (e.g., data sets generated by state, local, or university entities). [FY2004]
5. If NPS identifies datasets other than those in Table 1, they will provide them in electronic format to USGS by Oct. 30, 2004, and will provide student assistance to help with preprocessing. The USGS will provide guidance by September 30, 2004 to the NPS for preprocessing, which will include primary keys for database links, required fields, formatting, and complete analytical descriptions and parameter codes. The student will be co-located with the USGS at the Denver Federal Center and the USGS will provide oversight for the student. The preprocessed datasets will be imported into the database by USGS. [FY2005]
6. USGS will post-process data in the water-quality database to eliminate duplicate or invalid records and sites and to consolidate parameters. [FY2005]
7. USGS will provide database documentation, a data dictionary, and documented protocols for periodic database updates. [FY2005]
8. USGS and NPS will work together to acquire a consistent set of relevant GIS layers for each park. Only existing coverages will be included. [FY2005]
9. USGS will create a simple geodatabase that will include existing coverages with required metadata (e.g., park boundaries, stream network, lakes, vegetation, soils, and geology). The purpose of the geodatabase will be to allow spatial analysis of the water-quality data. [FY2005]
10. USGS will provide a training session at the Denver Federal Center to ROMN staff on using and maintaining the water-quality database and the geodatabase. [FY2005]

## F. QUALITY-ASSURANCE PLAN

Although no new data will be collected as a part of this effort, available data will be closely scrutinized and filtered through a series of quality-assurance steps. These procedures will among other things ensure that: all data are associated with sites, included sites contain associated data, all sites plot in or immediately adjacent to the parks, the global positioning system reference datum are identified, data are not duplicated, values are within logical ranges for given constituents, units of measure are provided, data sources are correctly represented, and that constituents are correctly classified and encoded. Data that fail these and other tests will not be included in the final working database, but will be placed in a supplemental database so that excluded data will be documented.

## G. PRODUCTS

A draft water-quality database and a draft geodatabase for the Rocky Mountain Network will be provided on or before January 31, 2004. A final water-quality database and final geodatabase will be provided on or before April 30, 2005.

## H. WORK PLAN

Task #	Description	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05
1	Define geographic scope									
2	Modify NCPN db									
3	Populate ROMN db with datasets in Table 1									
4	Gather additional data sets									
5	NPS preprocesses additional data, USGS enters data									
6	Post-processing									
7	Create documentation									
8	Gather GIS layers									
9	Create geodatabase									
10	Training									

### Responsibilities

	USGS
	USGS and NPS
	Primarily NPS

I. COST

The cost of the work is \$73,800, to be used during fiscal years 2004 and 2005. Because the amount of work associated with organizing and refining the various input databases will not be known until the data have been retrieved and the refinement process is well underway, the exact cost of this work is uncertain. We anticipate that the \$73,800 will cover these costs. Because the work will be done under a reimbursable agreement, if actual costs are less than estimated, the balance will either be returned to the NPS or used to support the next phase of USGS ROMN work should the NPS so decide. If actual costs are greater than estimated, the USGS requests the option to negotiate an amendment with the NPS to cover the full cost of the database effort.

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Table 1: Summary of preliminary review of available water-quality databases in the Rocky Mountain Network

<b>Source</b>	<b>Park</b>	<b>Preliminary scoping</b>
USGS-WRD WEBB study	ROMO	Core stream sites (Andrews and Icy) and snow sites 92-03
USGS-WRD Lake Synoptic	ROMO	Lake synoptic 1999
EPA Western Lake Survey	ROMO	Lake synoptic in 1980s (stored in STORET)
USGS-ARMI study	ROMO	Ponds and lakes
BRD-USGS	ROMO	Loch Outlet and selected Lakes 1983-2003
3-Lakes Study	ROMO	Major Inlets to Three-Lakes system 2002-03
Gibson Synoptic	ROMO	Stream synoptic in RMNP
NWIS Colorado	ROMO	164 sites, includes some sites in other identified databases
STORET (modern)	ROMO	CDPHE and Colorado River Water, very coarse search
STORET (legacy)	ROMO	685 sites includes 131 USGS sites (horizon report)
NWIS Colorado	GRSA	14 GW, 1 pond, and 6 SW sites
NWIS New Mexico	GRSA	Medano Creek and Sand Creek sites
STORET (legacy & modern)	GRSA	58 sites including 5 USGS sites (horizon report)
NWIS Colorado	FLFO	2 wells
STORET (legacy & modern)	FLFO	31 sites including 3 USGS sites (horizon report)
USGS-WRD Lake Synoptic	GLAC	Lake synoptic in 1999, Many Glacier Synoptic in
EPA Western Lake Survey	GLAC	Lake synoptic in 1980s (stored in STORET)
USGS-ARMI study	GLAC	Ponds and small lakes
USGS-WRD	GLAC	Swiftcurrent Creek HBN station
NWIS Montana	GLAC	43 sites, additional sites along perimeter
STORET (legacy & modern)	GLAC	no horizon report
NWIS Montana	LIBI	24 sites mostly outside boundary
STORET (legacy & modern)	LIBI	10 sites including 3 USGS sites (horizon report)
NWIS Montana	GRKO	
STORET (legacy & modern)	GRKO	no horizon report