SCOPE of WORK
Rocky Mountain Network
Water Quality Planning

BACKGROUND AND OBJECTIVES

The Rocky Mountain Network (ROMN) is one of thirty-two National Park Networks established to maximize efficiency and comparability of inventory and monitoring efforts within the NPS units of the Rocky Mountain region. Six NPS units comprise the Rocky Mountain Network: Rocky Mountain National Park, Glacier National Park, Florissant Fossil Beds National Monument, Grant-Kohrs Ranch National Historic Site, Great Sand Dunes National Monument, and Little Bighorn Battlefield National Monument. These diverse NPS units were selected to represent the Rocky Mountain region's diverse natural and cultural heritage. Despite different legislative mandates, goals, objectives, staffing, and funding, these and other NPS units are plagued, to a greater or lesser extent, by the same suite of threats: loss of native species and degradation of natural habitats; altered disturbance regimes; invasive species; pollution; urban/boundary development; and inadequate scientific data with which to make informed management decisions.

In the National Park Service's Vital Signs Monitoring Program, water quality is given a high priority for long-term monitoring. This project will be an initial effort to synthesize the existing water quality data in the ROMN parks, identify significant water quality issues, and to develop conceptual models that link potential stressors to these issues.

The NPS-Water Resources Division views the overall water quality monitoring component of the Vital Signs program as generally consisting of three (3) phases or activities organized at the Network level. These steps include:

1. Planning and Assessment (Phase I)
2. Design (Phase II)
3. Implementation (Phase III)

(WRD Note: To facilitate integration of WQ monitoring with other Vital Signs and avoid confusion by Networks, WRD has subsequently adopted the Phase 1-3 terminology of Steve Fancy and the Vital signs process of the I & M Program (per May 2002 memorandum from Office of Associate Director too Regional Directors and I&M Coordinators).

Each phase includes multiple components that will ultimately produce a water quality information (monitoring) system (Ward, 1998) for each Network that Parks will use in their management of their aquatic resources. Phase I will include a Network-wide identification and assessment of key stressors to the water quality of significant water resources to the Network's Parks (e.g. point and non-point sources, air deposition contaminant concerns etc.), a survey of Park water quality issues (by questionnaire and follow-up meetings), retrieval of historical water quality data and evaluation of existing public data bases (e.g. EPA's Storage and Retrieval (STORET) water quality database, the USGS National Water Information System (NWIS), and National Park Service individual park reports (Baseline Water Quality Data Inventory and

Analysis reports, Level I Inventory reports etc.), review of previous scientific research at Parks dealing with water quality, retrospective analysis of previous water quality monitoring in and around Network Parks, development of various GIS data bases and mapping themes (e.g. land use), identification and location of past and current monitoring activities (sampling locations and analytes) by potential cooperative agencies (federal, state, and local), and the location of gaging stations for sources of flow/discharge information etc..

An important product of the Phase I effort will be a geographically referenced Network Geographic Information System (GIS) database consisting of several themes or layers of information useful to developing a monitoring system. Network-wide or more local maps at various scales could then be produced showing Park locations, their boundaries and their significant water bodies; political/regulatory boundaries (e.g. States); watershed boundaries; various major point dischargers (NPDES); types of land use; existing monitoring and gaging stations; nearby sites on EPA's Comprehensive Environmental Response Compensation and Liability Act list (CERCLIST) etc.; to mention only a few possible elements of a GIS database.

This and other information will then be available for the design of the water quality information system or monitoring program. Ward (1999) summarizes five (5) critical steps in the design of a water quality information system. The actual monitoring network design component and data collection procedures (steps 3 and 4 of Ward) would largely address, the who (staffing; in-house, cooperators, contractors etc.) of performing the actual sampling and analysis (laboratory), the what (field and laboratory measurements to collect at each monitoring station), the when (the sampling frequency appropriate at each monitoring station), the where (location of monitoring stations), and after presumably several iterations, arrive at a program cost that matches the Network funding available in conjunction with any support of cooperative agencies. A weakness of monitoring programs is that a few individuals often make these design decisions on an ad hoc basis without the design decisions being well documented or a purpose of the monitoring made clear. This can result in considerable data being collected without a means of converting it to useful information that can be used by resource managers. Another weakness is the selection of measurement parameters to be used for trend analysis without an understanding of the natural variability.

Reference Materials

The following websites can provide examples of program products/requirements:

http://science.nature.nps.gov/im/monitor/vsmAdmin.htm#Framework

http://science.nature.nps.gov/im/monitor/vsmTG.htm#TechGuide

http://www.nature.nps.gov/water/horizon.htm

http://www1.nature.nps.gov/im/units/gryn/monitoring.shtml

http://science.nature.nps.gov/im/monitor/Conceptual_models.htm

Objectives of this Task Agreement

1. Compile water quality data provided by NPS and other sources including EPA's STORET and NWIS, comparing observed values to state standards and EPA recommended values, highlighting those where exceedences, or near exceedences occur most often.
2. Analyze the quality and usefulness of past information to determine its value. Analysis would include an assessment of whether or not the data are accurate enough or comparable enough to use in comparisons, trend analyses, or even estimates of basic variability. Among things to consider are: spatial and temporal boundaries; media and analytes used; analytical methods; variability among samples.
3. Conduct trend analysis where data are adequate and directly related to park resources and GPRA management issues. Trend analysis would be compatible with the NPS-WRD Horizon reports **(http://www.nature.nps.gov/water/horizon.htm)**
4. Integrate 1:24,000 land use GIS coverage (most current, to be provided by NPS) in a GIS based on collaboration with ROMN data manager for the entire Hydrologic Unit Code (USGS) boundaries that encompass each park.
5. Work with the ROMN data manager to develop figures and GIS layers that show park-specific stream designated uses if information is available
6. Develop figures and GIS layers of active and discontinued monitoring stations .
7. Develop summaries that list each active, long-term monitoring station, its period of record, parameters measured, the total number of observations taken at each station, and the frequency of observations.
8. Develop summaries of discontinued stations, its period of record, parameters measured, the total number of observations taken at each station, and the frequency of observations.
9. Develop summaries of long-term, active monitoring stations and the respective variables that have been monitored at these sites.
10. Develop conceptual models that link potential stressors to identified water quality issues in the ROMN parks.
11. Prepare a final report summarizing the water quality monitoring conducted in each ROMN park and the ROMN as a whole. The report will include an identification of waters that may have water quality problems and natural resources sensitive to water quality problems and stressors associated with those waters as well as identification of Outstanding (and potential Outstanding) Natural Resource Waters. Reports will be made available on the ROMN website and will be fully down-loadable.
12. Provide all of the water quality data used in the analyses in a relational database (MS Access 97, 2000 or XP). All fields and codes should be clearly identified. Each water quality observations should have a source where it was obtained. Stations should be georeferenced and be linkable to the GIS coverages.
13. Information must be provided in the specified formats. GIS data should be in UTM NAD83 projection and be ESRI ArcGIS readable format as a shapefile (*.shp) or in the ARC/INFO interchange file format (*.E00). Tabluar datasets must be in Microsoft Access 97+. Reports must be in Microroft Word 97+ and in portable document format (*.pdf) that is compatible with Adobe Acrobat 5+. Figures should be submitted as uncompressed TIF images (16 or 24 bit color) with a resolution of 600dpi at the 8.5"x11

size.. All spatial and tabular datasets and figures must be accompanied with parsable FGDC compliant metadata.

14. The Cooperator will work with the ROMN data manager to ensure that all information is in the correct formats.
15. The Cooperator will participate in a minimum of two workshops over the course of this agreement.
16. The Cooperator will participate in periodic reviews with the NPS to insure data compatibility/information quality.

RESPONSIBILITIES

The National Park Service will:

- Provide technical and data management input and guidance and critical review (Susan O'Ney and Brent Frakes, Rocky Mountain Network I & M Program are the Project Technical Representatives).
- Work closely with cooperator personnel throughout the project to coordinate project activities, evaluate the progress of this project, and provide direction for data collection and protocol development
- Make all logistical arrangements for workshops.
- Ensure that project findings are updated in the service wide biological databases including ANCS+, Natural Resource Bibliography (Naturebib), and the Dataset Catalog via periodic review with Cooperator.

The Cooperator will:

- Compile and synthesize existing data relevant to water quality in the ROMN.
- Participate in workshops (minimum of two) as required.
- Provide interim reports (i.e., products), a final report, and an MS Access database of all information collected during the project
- Provide a Data Dictionary for the MS Access database
- Seek clarification from NPS, should issues arise as to the provision of data or formats required.

Both the National Park Service and the Cooperator will:

- Cooperatively determine type and timing of project activities, evaluate progress of research, and provide direction for ongoing data collection
- Jointly interpret and publish data, where appropriate, collected during this project

Products

1. Relational database of all water quality data
2. GIS coverage of all monitoring stations
3. Conceptual models linking water quality issues and stressors.
4. Final report containing summaries of the information collected in 1-15 (above) in format similar to Scott Woods' report for the GRYN (sample provided).

Timeline

	May-04	Jun-04	Jul-04	Aug-04	Sep-04	Oct-04	Nov-04	Dec-04	Jan-05	Feb-05
Begin CESU task agreement										
Collect and organize WQ data										
Collect information on land use										
Gather park information										
Develop conceptual models										
Prepare WQ Report										
Periodic reviews										