



Water Quality Monitoring

Affected Parks

Big South Fork NRRRA (BISO)
Blue Ridge Parkway (BLRI)
Obed Wild and Scenic River (OBRI)

Importance/Issues

The Big South Fork NRRRA (BISO) and the Obed Wild and Scenic River (OBRI) occupy the downstream portions of relatively large drainages; consequently, the health of aquatic systems in these parks is largely dependent on land use activities upstream of park boundaries. BISO lies within a predominately rural region, the economy of which has historically been closely linked with industries of resource extraction that adversely affect land and water resources in the absence of effective environmental controls. The New River, a major tributary to BISO, is the most heavily mined watershed in the Tennessee coal field, and has been subject to escalated timbering and oil and gas development in recent years. Acidic drainage and erosion from mined lands, along with contaminants associated with logging and oil and gas extraction are a continuing concern in the New River drainage and elsewhere in the BISO watershed.



Big South Fork of the Cumberland River

Water resources at OBRI have also been affected by extractive industries, albeit at a much lower intensity than at BISO. In recent years, the traditionally rural character within portions of the OBRI watershed has been



Water Quality Sampling at Rock Creek, OBRI

supplemented by municipal and suburban population growth and associated development of retirement communities and golf resorts, primarily along the I-40 highway corridor near Crossville. Proposed improvements to rural highways are likely to promote additional population growth and development in traditionally rural areas, both at OBRI and in adjacent high quality western tributaries to BISO. Increased municipal and industrial water demand and wastewater discharge, in conjunction with anticipated demand for tributary impoundment at residential developments and for agriculture, are potentially significant stressors to OBRI and BISO water resources in the future, especially during seasons of poorly sustained streamflow.

The Blue Ridge Parkway (BLRI), because of the linear park corridor that closely follows the crest of the Southern Appalachian Mountains, represents a different challenge. BLRI resource managers can more readily control headwater land use activities in much of the park, but external water resource stressors do exist where streams enter the park corridor from outside park boundaries and through acidic deposition in the highlands. BLRI water resources are diverse, and include high elevation seeps and springs, upland wetlands, and managed coldwater fisheries in larger BLRI land tracts.



Under undisturbed conditions, water chemistry in APHN Parks ranges from extremely dilute, soft water in the headwater drainages of the Blue Ridge and Cumberland Plateau to moderately soft water in the larger streams of the Cumberland Plateau. Surface waters of all APHN parks exhibit moderately acidic to circumneutral pH and are typically poorly buffered, except when influenced by limestone where larger streams have breached geologic contacts. This lack of buffering capacity renders APHN waters highly susceptible to degradation by acidic input, and park waters have been adversely affected by acid precipitation in the Blue Ridge highlands and by acid mine drainage on the Cumberland Plateau.

Monitoring Objectives

Our specific objectives are to:

- 1) Determine long-term trends in seasonal and annual concentrations of bacteria, nutrients, sediment, selected trace metals, and physical parameters in streams, rivers and wetlands within BISO, BLRI and OBRI, and;
- 2) Improve our understanding of the relationships among water quality and quantity, and park aquatic resources, including Network Vital Signs (freshwater mussels, rare fish, aquatic macroinvertebrates and cobble bar communities).

Protocol Development and Status

A draft *APHN Water Quality Monitoring Protocol* was completed in December 2005, and submitted for peer review. The revised protocol, incorporating peer review comments, is currently being finalized. The protocol describes, on a park-by-park basis, the justification for monitoring, the monitoring design, and the data collection, analysis, and reporting procedures that will be followed.

The protocol includes long term monitoring of core locations that will be sampled on a fixed schedule. Core monitoring will be supplemented with short term investigations and intensified sampling of key water resources. Site selection of fixed stations is, in part, based upon a compilation and analysis of historic water quality data in Network parks conducted by USGS. Data were analyzed for trends for selected water quality constituents from sites where monitoring occurred during the period from 1960 to 2000. The sampling design represents a geographically dispersed network of index sites, positioned so that trends in water quality associated with upstream pollution sources, as well as with pristine streams, can be captured as efficiently as possible.

APHN staff will conduct field water quality and laboratory bacteriological analyses in-house. Laboratory support will be provided through interagency agreements with the U.S. Forest Service Air Resource Management Laboratory (ARML) in Fort Collins, Colorado and with USGS Sediment Lab in Louisville, Kentucky for a suite of analytical constituents relevant to the monitoring objectives of all three parks. Water quality parameters have been selected to reflect potential impacts associated with major threats, including oil and gas extraction (BISO, OBRI), coal mining (BISO, OBRI), acid deposition (BLRI), agricultural development, industrial pollution, and sewage effluent (all parks). Analytical results will also provide a basis for characterizing pristine waters in the parks.

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