

Streams Monitoring in the Sonoran Desert and Southern Plains Networks

PROTOCOL SUMMARY

Importance

Riparian habitats constitute less than 2% of the land area in the American Southwest, but support the highest density and abundance of plants and animals of any habitat type, making streams and associated riparian areas critical to the ecological integrity of the region. Riparian areas supply food, cover, and water, and serve as migration routes and habitat connectors, for a variety of wildlife. They also help control water pollution, reduce erosion, mitigate floods, and increase groundwater recharge. Riparian systems perform numerous ecosystem functions important to human populations, yet are one of the most endangered forest types in the United States.

Because of their importance, streams were chosen as a focus for monitoring in the National Park Service (NPS) Sonoran Desert and Southern Plains networks. Portions of several major river systems (or their tributaries) are found within many units of both networks. Long-term monitoring of streams supports a comprehensive understanding of aquatic and riparian ecosystems and integrates 10 “vital signs,” or ecological indicators: stream channel morphology; riparian vegetation community dynamics, including exotic plant species status & trends and early detection; core water quality parameters, including nutrient dynamics, microorganisms, and pollutant metals; surface water quantity; and aquatic macroinvertebrates. In addition, fish will be monitored as funding is available.

Monitoring Objectives

The goal of this protocol is to detect broad-scale changes in aquatic and riparian ecological condition by observing selected ecological drivers, stressors, and processes. Specific, measurable objectives are to determine status and long-term trends in:

Stream channel morphology

- Cross-sectional area, sinuosity, channel slope, and sediment size distribution

Riparian vegetation

- Cover of dominant and common (>10%) perennial riparian species



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West Fork of the Gila River, Gila Cliff Dwellings NM.

- Frequency of uncommon perennial species and selected non-native invasive annual and perennial species

Core water quality parameters

- Daily, seasonal, and annual core water quality parameters (temperature, specific conductivity, pH, dissolved oxygen, turbidity)
- Seasonal and annual total nitrogen, total phosphorus, selected metals, and *E. coli* (when possible)

Surface water quantity

- Seasonal and annual base flow conditions
- Frequency, magnitude, and duration of low-flow and flood events
- Extent of wet and dry areas

Aquatic macroinvertebrates

- Abundance of selected taxa and community structure
- Selected multimetric indicators of biotic integrity

Fish

- Fish communities on local and regional scales

Methods

Stream channel morphology—Using survey-grade equipment, we locate 11 evenly distributed, permanent channel cross-sections in each stream segment in a park. We create a longitudinal profile, map habitat units, and perform particle-size surveys throughout each segment.



Streams monitoring, Montezuma Castle NM.

Riparian vegetation—Vegetation sampling is conducted on 20-m transects along each of the 11 permanent channel cross-sections. Vegetation data are recorded within three structural categories using the point-intercept method, with points spaced every meter. Soil cover is recorded to substrate class (e.g., sand, gravel). In the two meters surrounding the transect, frequency data are collected on plant taxa not encountered during point-intercept sampling. Data on tree and shrub recruitment are collected in a 20-m-wide band transect surrounding the permanent cross-section. Extremely large trees are mapped and vigor metrics are collected (e.g., basal area, height).

Core water quality parameters—A multiparameter datalogger (sonde) collecting continuous (15-min) core water quality measurements is deployed for two weeks seasonally at each index site. Nutrients, inorganics, metals contaminants, and *E. coli* samples are collected quarterly.

Surface water quantity—Stream discharge measurements are collected from USGS stream gages in or near the parks. Staff gages, crest gages, and logging pressure transducers are used to collect data at index reaches in stream segments.

Aquatic macroinvertebrates—Macroinvertebrates are collected in riffles for determining trend and for comparison with state indices of biotic integrity (IBIs), and in all habitats at each index reach. Methods are designed to be directly comparable to state and federal (EPA, NAWQA) methodologies.

Fish—The networks are working with adjacent land management agencies and state departments of fish and game to monitor fish communities in and around the parks, enabling the data to be analyzed in a regional context. Methods include electrofishing and seining.

Products, Scope, and Schedule

For each park, an annual summary report documenting effort and initial findings for the previous water year (October–September) is produced in April of each year. Comprehensive status and trends reports are produced after five years of data collection, and provide a much more detailed assessment of aquatic and riparian condition. The scale of inference is the individual park.

Streams information is also communicated through live presentations, resource briefs and other written summaries, and podcasts and other media produced and distributed through the network websites and the Learning Center of the American Southwest (www.southwestlearning.org).

Protocol Status

The protocol and standard operating procedures for Sonoran Desert Network parks completed internal review in April 2008, and are currently being revised to incorporate Southern Plains Network parks. A database and supporting documentation that meet NPS and FGDC standards are complete and available. Data availability varies by parameter and park; please check with the Project Contact (below).

Protocol Implementation

Parks where streams monitoring will be implemented.

Year	Park	Network
2011	Bent's Old Fort NHS	Southern Plains
	Washita Battlefield NHS	Southern Plains
2010	Chickasaw NRA	Southern Plains
	Lyndon B. Johnson NHP	Southern Plains
	Pecos NHP	Southern Plains
2007	Montezuma Castle NM	Sonoran Desert
	Tumacácori NHP	Sonoran Desert
	Tuzigoot NM	Sonoran Desert
2006	Gila Cliff Dwellings NM	Sonoran Desert

NHP = National Historical Park; NHS = National Historic Site;
 NM = National Monument; NP = National Park;
 NRA = National Recreation Area

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