

Status of Fish Communities at Hot Springs National Park (HOSP), 2009 & 2012

Fish communities are an important component of stream systems and are useful biological indicators of aquatic ecosystem health. Changes or shifts in stream habitat complexity and water quality often determine biotic communities, including fish. Many fish species are considered intolerant of habitat alterations and poor water quality; therefore, fish community composition offers a good indication of long-term environmental conditions within a stream. Many native fish populations have decreased in abundance throughout their ranges, largely because of land use changes that contribute to habitat degradation. The purpose for fish community monitoring at HOSP is to determine the status and long-term trends in fish diversity, abundance, and community composition and to correlate the long-term community data to overall water quality and habitat condition. Data collected through monitoring equips park managers with science-based understanding needed to make informed decisions on water quality issues that protect the entire aquatic community.

Methods:

For details on methods of site selection, fish sampling, and habitat and water quality data collection, and data analysis see Dodd et al. (2008) and Dodd and Mueller (2011).

- Fish communities were sampled within the park at one reach in Gulpha Creek and Bull Bayou during June 2009 and July 2012.
- A single pass with a backpack electrofishing unit was used to capture fish (see Figure 1). Fish were identified to species, measured and inspected for diseases or abnormalities.
- Physical habitat was collected to assess general channel morphology, fish cover, and bank conditions within the entire reach. Hourly water quality data (temperature, dissolved oxygen, pH, specific conductance, and turbidity) were collected using a logger deployed upstream of each reach for 24 hours.
- Biological metrics that reflect fish community diversity (species richness and Simpson's Diversity Index), abundance (catch per unit effort), composition (number and percent composition of sensitive taxa), and overall stream integrity (Index of Biotic Integrity) were calculated.



Figure 1. Electrofishing at Gulpha Creek.

Summary of Findings:

- Eighteen fish species were collected among the two creeks in 2009 and 14 species were collected in 2012. Six of these species are sensitive to human disturbance and poor water quality.
- Diversity was high for both streams although Bull Bayou had more fish species and higher fish abundance than Gulpha Creek in both years (Table 1).

Table 1. Fish metrics for samples collected at Gulpha Creek and Bull Bayou, 2009 and 2012.

	Gulpha Creek		Bull Bayou	
	2009	2012	2009	2012
Species Richness	7	8	17	12
Diversity (1- Simpson Index)	0.80	0.81	0.80	0.68
Abundance (catch/min)	1.8	2.5	2.9	4.0

- Gulpha Creek was rated as having fair index of biotic integrity in both years (Figure 2). Biotic integrity was rated as good for Bull Bayou in 2009 and rated as fair in 2012. Bull Bayou had a higher number of sensitive species than Gulpha Creek.

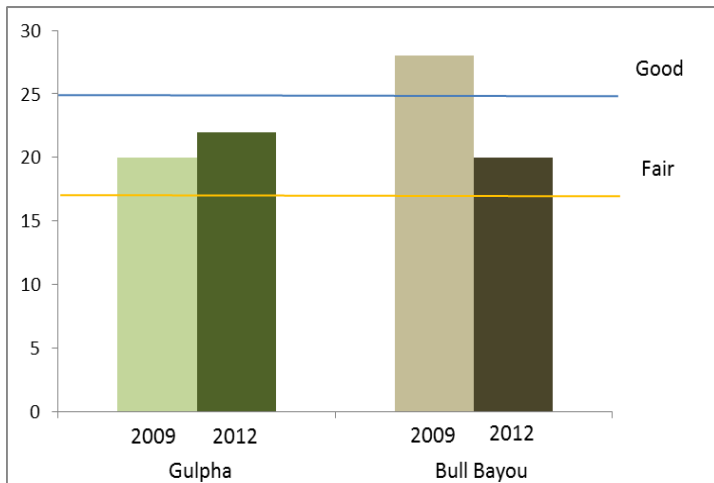


Figure 2. Index of Biotic Integrity scores for Gulpha Creek and Bull Bayou, 2009 and 2012.

- In-stream habitat conditions were favorable for supporting a native fish community representative of small Ouachita Mountain streams.
- Water quality parameters measured at both creeks were within the water quality standards for surface waters of the Ouachita region (ADEQ 2008)
- Findings by HTLN were similar to those found by the US Geological Survey in 2003 (Petersen and Justus 2005).

For More Information Contact:

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Citations:

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Dodd, H. R., D. G. Peitz, G. A. Rowell, D. E. Bowles, and L. M. Morrison. 2008. Protocol for monitoring fish communities in small streams in the Heartland Inventory and Monitoring Network. Natural Resource Report NPS/HTLN/NRR—2008/052. National Park Service, Fort Collins, Colorado.

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Petersen, J.C. and B.G. Justus. 2005. The fishes of Hot Springs National Park, Arkansas, 2003. U.S. Geological Survey, Reston, Virginia. Scientific Investigations Report 2005-5126.