

Methods for Monitoring Fish Communities of Buffalo National River and Ozark National Scenic Riverways in the Ozark Plateaus of Arkansas and Missouri, Version 2.0

Standard Operating Procedure (SOP) 3: Reach Selection Version 1.1

Revision History Log:

Previous version number	Revision date	Author	Changes made	Reason for change	New version number
1.0	11/9/2016	Dodd	Added reference to Table with new tributary sites	Targeted tributaries are sampled as described in DeBacker et al. 2012	1.1

A detailed description of stretch designation and selection was discussed in the Protocol Narrative. Briefly, sampling stretches were selected randomly using a method known as Generalized Random Tessellation Stratified (GRTS) sampling (Stevens and Olson 2004). Within each stretch, a sampling reach will be designated for fish community monitoring.

The reach is the representative portion of the stretch that is sampled. Sampling reaches will be established using a combination of geomorphic characteristics, such as stream width, stream depth (wadeable or nonwadeable), geomorphology (distribution of riffles, runs, and pools), and local habitat disturbance. In accordance with U.S. Geological Survey (USGS) National Water Quality Assessment (NAWQA) Program protocols (Fitzpatrick *et al.* 1998), reach lengths should be approximately equal to 20 times the mean wetted stream width (MWSW) at low flow with a minimum length of 150 m in small wadeable streams (those less than 1.5 m deep in most of the channel) and a maximum of 1,000 m in large nonwadeable streams.

In general, the downstream boundary of the mainstem and tributary sampling reaches will be placed at the head of the second riffle located upstream from the downstream stretch boundary (see Figure 2 in the Protocol Narrative). This is to ensure that mainstem reaches are not present in the confluence zone of the tributary or spring run that may designate the lower stretch boundary and to ensure that the tributary reaches are out of the flood-plain area of the mainstem.

The upstream boundary of the reach will be located at a distance approximately 20 MWSWs upstream from the downstream boundary. However, the reach must include portions of all available geomorphic channel units (riffles, runs, pools) typical of the stretch to ensure a representative

sample. Thus, reach length (and, therefore, the upper boundary placement) may need to be extended to guarantee all typical channel units are included in the sample. The upstream boundary of the reach also needs to be determined such that the reach avoids features such as bridges, dams, waterfalls, and major tributaries by at least 10 MWSWs. If the upstream boundary falls too close to a feature, then the location of the reach can be moved upstream or downstream to avoid the feature. Preferably, the downstream boundary of the relocated reach should be at the head of a riffle. Also, if the reach is near a bridge, it is preferable to move the reach upstream from the bridge, but be aware that “low-water bridges” can act as low-head dams with differing effects during periods of low and high streamflow.

Upstream and downstream boundaries will be temporarily marked with flagging tape during fish sampling. During initial establishment of the permanent reach, boundaries will be documented using a global positioning system (GPS) unit. Manufacturer’s manual should be consulted for proper use of the GPS unit for collecting location data.

Reach descriptions, GPS locations, and reach identification code (Table 1) are recorded on the field sheets (see SOPs 5 and 6 for forms). Each reach has a unique identification code that begins with the first four letters of the river (BUFF = Buffalo, CURR = Current, JACK = Jacks Fork), followed by a letter designating the reach as a mainstem site (M) or tributary (T), and a number designating that particular reach (Table 1). Both mainstem sites and tributaries in the selected sampling frame are numbered consecutively downstream, starting at the upstream-most site or tributary as 01. For example, CURRM01 is the first (or most upstream site) on the mainstem of the Current River and CURRT05 is the fifth tributary that will be sampled on the Current River (that is, four tributaries in the sampling frame are located upstream from this tributary).

References Cited

- Fitzpatrick, F. A., I. R. Waite, P. J. D’Arconte, M. R. Meador, M. A. Maupin, and M. E. Gurtz. 1998. Revised methods for characterizing stream habitat in the National Water-Quality Assessment Program. U.S. Geological Survey Water-Resources Investigations Report 98-4052. 67 p.
- Stevens, D. L. and A. R. Olson. 2004. Spatially balanced sampling of natural resources. *Journal of the American Statistical Association*. 99: 262-278.

Table 1. Mainstem and tributary sites sampled for monitoring fish communities at Buffalo National River and Ozark National Scenic Riverways. Site Type: M = Mainstem, T = Tributary. UTM is Universal Transverse Mercator coordinates (zone 15), horizontal datum is North American Datum 1983. Gear: BA = Barge, BP = Backpack, BT = Boat.

Reach ID	River Basin	Site Type	Site No.	Tributary Name	Panel No.	County	Lower Sample Reach UTM Easting	Lower Sample Reach UTM Northing	Reach Length (m)	Gear Used	Approximate % Effort by Gear
Buffalo National River											
BUFFM01	Buffalo	M	01		Biennial	Newton	464259.027	3981461.484	290	BT, BP	70, 30
BUFFM02	Buffalo	M	02		Biennial	Newton	490387.376	3987727.621	440	BT, BP	40, 60
BUFFM03	Buffalo	M	03		Biennial	Newton	499922.291	3983702.401	600	BT, BP	90, 10
BUFFM04	Buffalo	M	04		Biennial	Searcy	520396.874	3981741.881	620	BT, BA	60, 40
BUFFM05	Buffalo	M	05		Biennial	Searcy	529076.108	3984910.528	560	BT, BP	40, 60
BUFFM06	Buffalo	M	06		Biennial	Marion	545843.897	3995174.566	726	BT, BP	60, 40
BUFFT07	Buffalo	T	07	Mill	Biennial	Newton	487933.175	3990589.489	180	BA	100
BUFFT15	Buffalo	T	15	Davis	Biennial	Newton	504131.918	3985033.521	200	BP	100
BUFFT19	Buffalo	T	19	Calf	Biennial	Searcy	520457.523	3981019.421	165	BA	100
BUFFT20	Buffalo	T	20	Bear	Biennial	Searcy	526899.046	3983227.746	450	BA	100
BUFFT27	Buffalo	T	27	Clabber	1	Marion	540821.629	3998527.103	180	BP	100
BUFFT30	Buffalo	T	30	Middle	1	Marion	551487.935	3993528.202	150	BP	100
BUFFT31	Buffalo	T	31	Leatherwood	1	Marion	551410.833	3996233.100	150	BP	100
BUFFT05	Buffalo	T	05	Cecil	2	Newton	479870.761	3992741.028	232	BP	100
BUFFT09	Buffalo	T	09	Little Buffalo	2	Newton	490169.939	3987680.937	260	BT, BP	50,50
BUFFT23	Buffalo	T	23	Water	2	Searcy	537965.089	3989702.352	150	BP	100
Ozark National Scenic Riverways											
CURRM01	Current	M	01		Biennial	Shannon	623330.810	4141819.358	342	BA	100
CURRM02	Current	M	02		Biennial	Shannon	637113.180	4131465.688	450	BT, BP	70, 30
CURRM03	Current	M	03		Biennial	Shannon	642631.838	4126422.535	660	BT, BP	75, 25
CURRM04	Current	M	04		Biennial	Shannon	662104.165	4112724.645	702	BT, BP	80, 20
Reach ID	River Basin	Site Type	Site No.	Tributary Name	Panel No.	County	Lower Sample	Lower Sample	Reach Length	Gear Used	Approximate % Effort by

							Reach UTMX	Reach UTM Y	(m)	Gear	
CURRM05	Current	M	05		Biennial	Shannon	666087.431	4111411.528	1000	BT, BP	90, 10
CURRM06	Current	M	06		Biennial	Carter	685209.621	4079792.188	1000	BT, BP	90, 10
JACKM01	Jacks Fork	M	01		Biennial	Shannon	619901.956	4101344.874	290	BT, BP	85, 15
JACKM02	Jacks Fork	M	02		Biennial	Shannon	627579.024	4102191.921	286	BT, BP	80, 20
JACKM03	Jacks Fork	M	03		Biennial	Shannon	633452.088	4108220.025	320	BA	100
CURRT14	Current	T	14	Sinking	Biennial	Shannon	640779.257	4129682.694	500	BA	100
JACKT03	Jacks Fork	T	03	Shawnee	Biennial	Shannon	650814.727	4115153.041	150	BP	100
CURRT06	Current	T	06	Blair	1	Shannon	658985.647	4116351.733	150	BP	100
CURRT15	Current	T	15	Big West	1	Shannon	623206.262	4141756.210	150	BP	100
CURRT08	Current	T	08	Rocky	2	Shannon	661931.524	4110852.285	348	BA, BP	90, 10
CURRT16	Current	T	16	Big East	2	Shannon	648341.558	4123747.999	150	BP	100