

**Protocol for Monitoring Springs at Ozark National Scenic Riverways, Missouri.
Heartland I&M Network**

SOP 3: Reach Selection

Version 1.1 (12/1/2015)

Revision History Log:

Previous Version #	Revision Date	Author	Changes Made	Reason for Change	New Version #
1.0	12/1/2015	Bowles	Phillips Spring added	Spring is now monitored	1.1

This SOP describes procedures for establishing sample reaches and transects for monitoring aquatic vegetation, habitat, invertebrates, and fish in spring-runs.

I. Establishing Sampling Transects within the Spring-run

Procedure:

- A. The sample unit is the sample reach located downstream of the source. At OZAR, the source of large springs is characterized by a deep pool area, while the spring-run is the shallower (and often narrower) area of the spring with higher velocity. Sampling will be restricted to a sample reach within the spring-run.
- B. Establish the reach of the spring-run to be sampled:
 1. The upstream boundary of the sampling reach is located at the first wadeable area downstream of the spring source. The reach begins as close to the spring source as possible with the starting point based on accessibility and crew safety.
 2. Reach lengths were established using a weighting factor that is based on the minimum average width of 15 m (width of Pulltite Spring and Welch Spring) and a minimum reach length of 150 m (the minimum reach recommended by NAWQA; Moulton *et al.*, 2002).
 3. The weighting factor for each spring was determined by dividing its average width by 15.

4. The weighting factor was multiplied by 150 m to determine sampling reach length (Table 1).
5. The lower boundary is located downstream of the upper boundary at the distance specified in Table 1.

Table 1. Weighting factors and length of sampling reaches for large springs at OZAR.

Spring	Total Length (meters)	Average Width (meters)	Weight Factor (WF)	Sampling Reach Length (150 m X WF)	Transect Interval (meters)
Alley	800	19	$19/15 \approx 1.3$	190 m	19
Big	600	46	$46/15 \approx 3.1$	460 m	46
Blue	250	16	$16/15 \approx 1.1$	160 m	16
Phillips	575	15	$15/15 \approx 1.0$	150 m	15
Pulltite	250	15	$15/15 \approx 1.0$	150 m	15
Round	300	24	$24/15 \approx 1.6$	240 m	24
Welch	36	15	$15/15 \approx 1.0$	36 m	18

6. These established reaches are permanent sampling sites barring dramatic alterations in spring morphology that would require re-establishing the sampling reach. Locations of the upper and lower reach boundaries were recorded using GPS. For instructions on using the GPS, refer to the Trimble product manual
- C. During sampling, 11 transects are flagged for each spring-run using the appropriate spacing increments shown in Table 1. The upstream-most transect and the downstream-most transects fall on the upper and lower reach boundaries, respectively. The transect spacing interval is determined by dividing the reach length by 10 (Fig. 1). Due to the short length of the spring-run at Welch Spring, only 3 transects are used to remain consistent with spacing for other springs.
 - D. Aquatic vegetation, invertebrate, and physical habitat data are collected at points along each transect (see Fig. 1). Fish are collected within the entire reach.
 - E. When establishing transects, avoid walking in the spring-run and use a range finder to measure distances over 20 m.
 - F. Site names will be the actual names of the springs. They are: Alley Spring, Big Spring, Blue Spring, Phillips, Pulltite Spring, Round Spring, and Welch Spring.

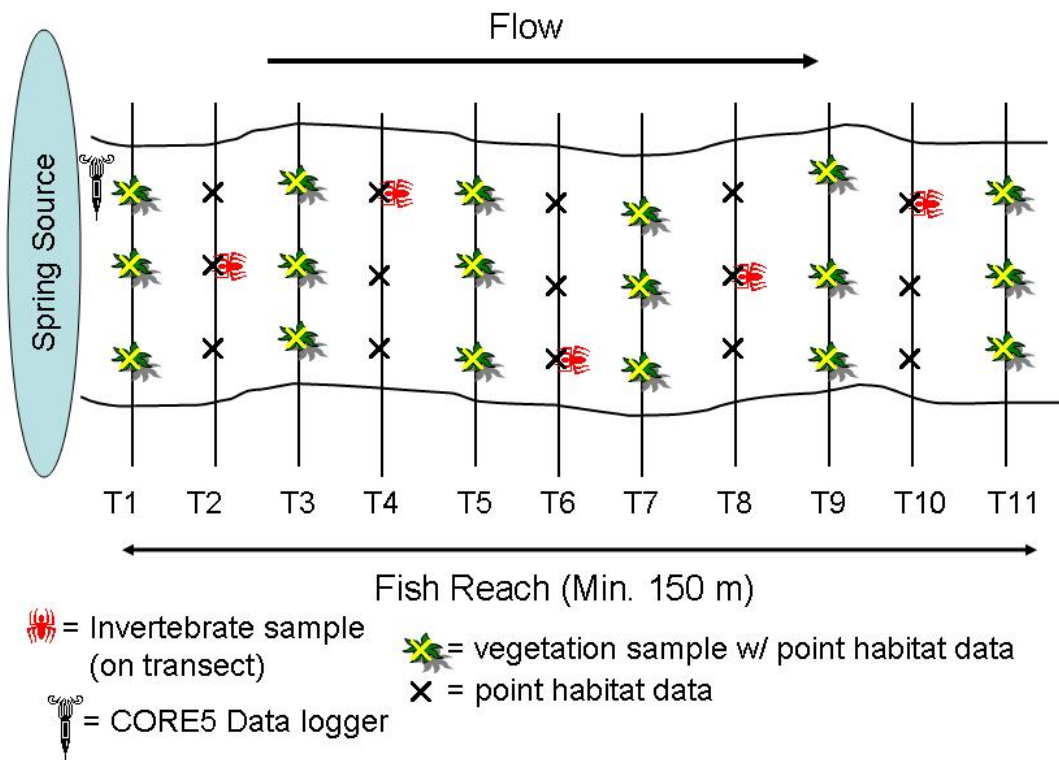


Figure 1. Diagram of transect layout in a spring-run showing locations of vegetation assessment plots, invertebrate samples, fish collection, and physical habitat data.