

Final Report

Survey for Freshwater Mussels in the South Fork Rivanna River at the
Proposed Route 29 Bypass Crossing

Project Number#
6029-002-F22; UPC 16160

Prepared by

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INTRODUCTION

A proposed bypass roadway for U. S. Route 29 may cross tributaries to Ivy Creek and a reach of the South Fork (SF) Rivanna River in Albemarle County, Virginia (Figures 1 and 2). In 2011, Ostby & Neves (2011) confirmed the presence of the federally endangered James spiny mussel (*Pleurobema collina*) in Ivy Creek, in proximity to the proposed bypass corridor. As part of that study, we intended to conduct a full survey of the SF Rivanna River at the proposed crossing in fall 2011; however, we were unable to complete that survey due to unfavorable river conditions. Rainfall and releases from the South Fork Rivanna River Reservoir limited clarity and produced strong flow conditions, which inhibited effective sampling. We made 5 separate visits to the South Fork Rivanna River site to assess conditions in October and November 2011. We also made an additional visit in early May 2012 to assess conditions. During each visit, we found water clarity too poor (visibility less than 25 cm) and at times discharge too great to successfully conduct a survey intended to detect small mussels, such as *P. collina*.

On June 4, 2012, visibility had increased to 80 cm and flow was sufficient to safely SCUBA within the deeper habitats. Survey efforts followed standard protocol for “Full Surveys” as defined by the Virginia Mussel Guidelines (VDGIF 2008). This report details the results of the SF Rivanna survey, extending from the SF Rivanna River Reservoir Dam to approximately 800 m downstream of the proposed U. S. Route 29 crossing—an approximately 1000 m reach of river.

METHODS

Full Survey

Biologists from Virginia Tech (B. J. K. Ostby, M.S. Johnson, T. Lane and J. Richards) conducted the survey of an approximately 1000 m reach of the SF Rivanna River on June 4th, 2012 to qualitatively assess species composition, abundance, and the possible presence of protected species. We used SCUBA and snorkeling as the preferred sampling methods. Survey efforts focused on riffle and run habitats, and in flow refuges near banks and around large woody debris and large substrates. These habitats are typically inhabited by mollusks in Atlantic slope drainages. However, all stream reaches were surveyed unless the habitat was deemed “unsuitable” for mollusks based on our site visit. The “unsuitability” of any stream reach(es) as habitat for mollusks is fully documented in the report. Both banks of the stream reach and exposed shoals were searched for mussel shells and muskrat middens to obtain a complete list of species at the site. The survey was conducted when water level and clarity were suitable to locate shells and live individuals with ease. Sufficient effort was expended to visually inspect all suitable habitats so that we could state with reasonable confidence that endangered and/or threatened species do or do not occur in the stream reaches sampled. Geographical Information System (GIS) programs were used to geo-reference the boundaries of each survey, the location of protected species, and the location of other pertinent features.

RESULTS

Weather and Stream Conditions

Weather on 4 June 2012 was ideal for conducting this survey. Skies were partly sunny; air temperature reached a high around 25°C. Water temperature was 18°C except at the left ascending side of channel near the dam, where a cold water release lower the temperature noticeably. Visibility was limited compared to other streams of the Rivanna River watershed.

Using SCUBA, we were able to detect mussels at a distance of 80 cm. The limited clarity and depth necessitated that we conduct most the survey using SCUBA.

Habitat and Species Observations

The approximately 1000 m surveyed reach of the SF Rivanna River was composed of three distinct habitats. From upstream to downstream they were 1) rapid/riffle, 2) shallow run and 3) deep run. Immediately downstream of the dam, the SF Rivanna River was riffle and rapid-flow habitat that distinctly shifted into shallow run habitat approximately 200 m downstream from the SF Rivanna Reservoir Dam (Figure 3). The stream bottom in the rapid/riffle habitat was composed of small boulder, cobble and gravel minimally embedded by fines. This section was covered by large beds of American water willow (*Justicia americana*). The stream was widest at the dam (~90 m). The river constricted to approximately 35 m wide approximately 150 m downstream of the dam and remained that width downstream to the survey start point.

From 200 m to 400 m downstream of the dam, the river was shallow run with a mix of substrates moderately to heavily embedded by sand (Figure 4). Mean depth was 0.5 to 1 m depth. This habitat eventually transitioned into deep run habitat approximately 400 m downstream of the dam.

The surveyed reach from the survey start point to 400 m downstream of the dam was mostly deep run habitat (90%) with either a sand/small gravel stream bottom or cobble/boulder stream bottom heavily embedded or covered by sand (Figure 5). Mean thalweg depth was 2 m. Maximum depth was 3 m, which we observed near the U. S. Route 29 bridge piers. Many habitats were covered with a layer of silt.

The surrounding local land use was urban and wooded lots. The riparian zone was forested. Riparian vegetation shaded 25% of the stream. There was a large storm drain emptying along the left ascending side below the dam. Its effluent had an orange tint in May, but was clear during the June survey.

In total, we expended 20 person-hours surveying and observed 16 live specimens of Eastern elliptio (*Elliptio complanata*), 29 live specimens of Eastern floaters (*Pyganodon cataracta*), and 29 live specimens of 11 paper pondshells (*Utterbackia imbecillis*) (Figure 6). We also found a fragmented shell of a triangle floater (*Alasmidonta undulata*). Mussels were uncommon and scattered throughout the reach. The only exception was an aggregation of *E. complanata*, which were almost all collected in a bed along the right ascending bank 500 m downstream of the dam. We found no evidence of live or dead *P. collina* or green floater (*Lasmigona subviridis*). We observed no snails. The Asian clam, *Corbicula fluminea*, was abundant and live specimens were relatively large—most were > 40 mm long.

DISCUSSION

The surveyed reach of the SF Rivanna River was unlike any other stream we have surveyed in the Rivanna River watershed. It was unusually deep for its size and drainage basin and unusually turbid even when other streams in the watershed, including those feeding the SF Rivanna Reservoir, were clear. The excessive turbidity was likely caused by productivity and sedimentation from the reservoir.

At a minimum, we thoroughly searched approximately 6000 m² of habitat that could be inhabited by freshwater mussels. Using a sampling effort equation from Smith (2006), we calculated a post hoc assessment of our detection rate. We determined that we had a high probability—0.99 on a scale from 0 to 1—to detect at least one specimen of a species present at density (μ) of at least 0.005 individuals per m². We had a moderate probability (0.69) of detecting one specimen of a species present at 0.001 individuals per m². Given these detection probabilities, it is highly improbable that we failed to detect protected species present at a limited density.

LITERATURE CITED

Smith, D. R. 2006. Survey design for detecting rare freshwater mussels. *Journal of the North American Benthological Society* 25(3): 701-711.

Ostby, B. J. K. and R. J. Neves. 2011. Survey for Freshwater Mussels in Ivy Creek, in Proximity to the Proposed Route 29 Bypass Corridor, Project Number# 6029-002-F22; UPC 16160. Virginia Department of Transportation, Richmond, VA. 20 pp.

Table 1. Mean, standard deviation and range of lengths in mm for each species.

Species	Length (mm)			Number Alive
	Mean	SD	Range	
<i>E. complanata</i>	115.4	15	83 - 132	16
<i>P. cataracta</i>	85.8	13.7	56 - 108	29
<i>U. imbecillis</i>	73.7	13.8	49 - 91	11

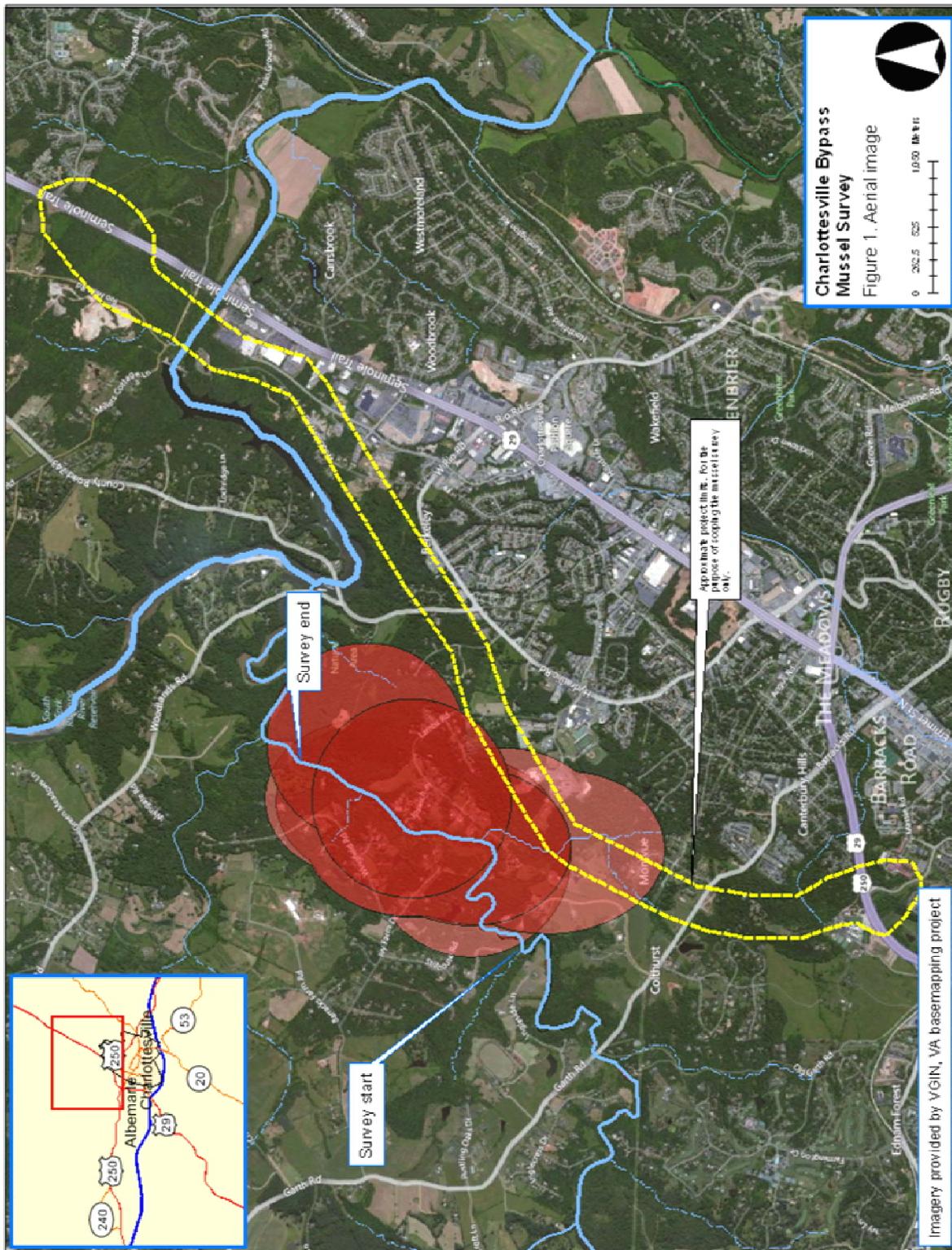


Figure 1. Aerial map provided by VDOT (September 2011) illustrating suggested survey limits for the Ivy Creek survey and location of proposed US 29 Bypass corridor crossing the SF Rivanna River..

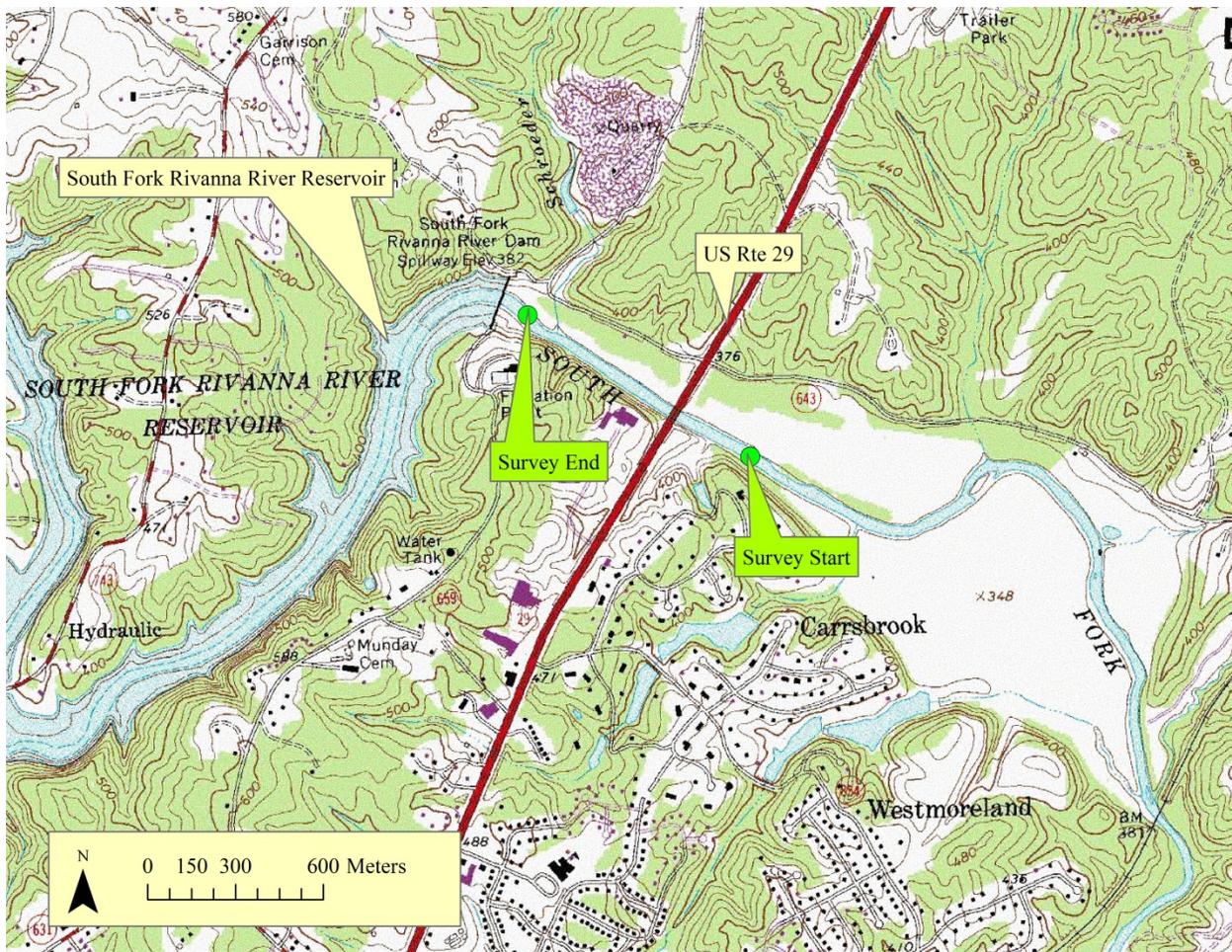


Figure 2. Topographic map of surveyed reaches of Ivy Creek and one of its major unnamed perennial tributaries.



Figure 3. The SF Rivanna downstream of the dam was riffle and rapid habitats overgrown with American water willow. We found a limited number of *E. complanata*, *P. cataracta*, and *U. imbecillis* in this habitat.

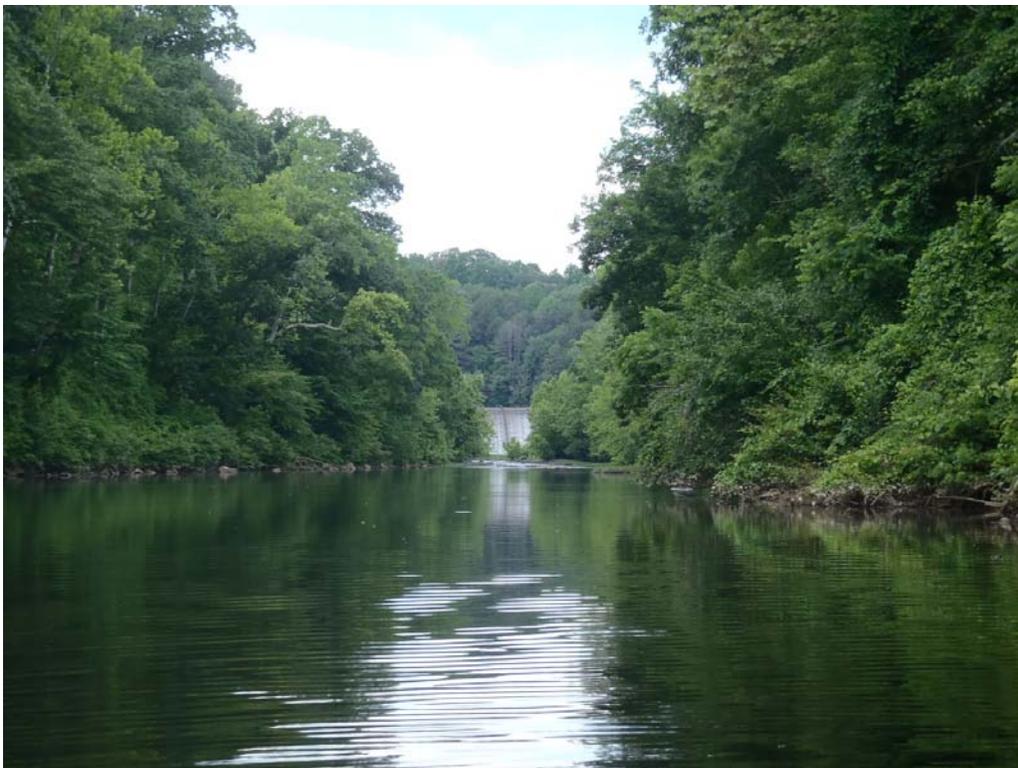


Figure 4. Shallow run habitat between the dam and existing bridge. We observed an aggregation of *E. complanata* along the right ascending bank.



Figure 5. Deep run habitat under and downstream of the bridge.



Figure 6. We observed live *P. cataracta*, *U. imbecillis*, and *E. complanata* in the surveyed reach (Pictured top to bottom).

VDOT Survey Collection Record

Site #: VPI06042012.1

Project #: 6029-002-F22; UPC 16160

Stream: South Fork Rivanna River

County: Albemarle

Description: Reach of the South Fork Rivanna River downstream of the Reservoir

Drainage: James

USGS Quadrangle Map: Charlottesville East

USGS HUC: Rivanna (02080204)

Projection: WGS84

Survey Start: 17S, E 722857.3, N 4219920.0; 38.099627, -78.458440

Survey End: 17S, E 722035.0, N 4220437.5; 38.104489, -78.46765

Accuracy: 5 m

Survey Date: 4 June 2012

Survey Effort: 20 person-hours

Personnel: B. J. K. Ostby, M.S. Johnson, T. Lane, J. Richards

Total Mussels Observed:

16 Live <i>Elliptio complanata</i>
29 Live <i>Pyganodon cataracta</i>
11 Live <i>Utterbackia imbecillis</i>
1 Shell <i>Alasmidonta undulata</i>

56 Total Live

Snails Observed: none

Other Mollusks: Live *Corbicula fluminea* (abundant)