

Final Report

Survey for Freshwater Mussels in Ivy Creek, in Proximity to the
Proposed Route 29 Bypass Corridor

Prepared by

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1401 East Broad Street
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December 2011

INTRODUCTION

A proposed bypass roadway for Route 29 may impact tributaries to Ivy Creek and a reach of the South Fork Rivanna River in Albemarle County, Virginia (Figures 1 and 2). Recent survey efforts suggest there is a strong likelihood that the federally endangered James spiny mussel (*Pleurobema collina*) persists in Ivy Creek (Beaty and Neves 1997, Stephenson 1997). At least two other native mussels are known to inhabit Ivy Creek, so it is possible that additional state-protected species, including the green floater (*Lasmigona subviridis*), may inhabit this stream and its perennial tributaries. Moreover, recent sampling conducted by Ostby and Angermeier (2011) has documented *P. collina* in several tributaries to the Rivanna River. In anticipation of U. S. Fish and Wildlife Service (USFWS) and Virginia Department of Game and Inland Fisheries (VDGIF) information requests, the Virginia Department of Transportation has requested that Virginia Tech survey stream reaches within the project study corridor and in the vicinity of the proposed bypass roadway. These reaches include a 1000 m reach of the South Fork Rivanna River, an approximately 3,000 m reach of Ivy Creek (Figures 1 and 2), and a 1,500 m reach of an Ivy Creek tributary.

We initially intended to conduct a full survey of the South Fork Rivanna River (800 m downstream to 200 m upstream of the proposed crossing), a comprehensive survey of a 3,000 m reach of Ivy Creek (as identified in the Figures 1 and 2), and a full survey (1,500) of an unnamed perennial Ivy Creek tributary in fall 2011. The primary objective of these surveys was to detect the presence of *P. collina* and other protected species; secondarily, we assessed the suitability of these streams to support *P. collina* and other protected mollusks. Survey efforts followed standard protocol for “Full Surveys” as defined by the Virginia Mussel Guidelines (VDGIF 2008). Unfortunately, due to rainfall and releases from the South Fork Rivanna River Reservoir, sampling conditions were never suitable to conduct a survey of South Fork Rivanna River. We

made 5 separate visits to the South Fork Rivanna River site to assess conditions in October and November 2011. 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, cryptic mussels, such as *P. collina* and *L. subviridis*. We have postponed our attempts to survey this reach until spring 2012, when we anticipate better conditions that are more amenable for detection of the targeted species. This report details the results of a survey of an extensive reach of Ivy Creek, and a survey of an extensive reach of one of its larger perennial tributaries (referred to as Tributary K by Neves and Beaty 1997).

METHODS

Full Survey

The mollusk fauna in each of the reaches identified above was surveyed by biologists to qualitatively assess species composition, abundance, and the possible presence of protected species. We used snorkeling and view scopes as the preferred sampling methods. In shallow waters, less than approximately 15 cm, unaided visual inspection was employed. 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 was 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. Surveys were conducted only 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

Ivy Creek

Biologists from Virginia Tech (B. J. K. Ostby, R. J. Neves, M. Beirlein, J. Price) and VDOT (S. Alexander) conducted the survey of an approximately 3,000 m reach of Ivy Creek on 17 and 18 October 2011. Weather on both days was ideal for conducting this survey. Skies were partly sunny to clear; air temperature reached a high around 26°C on both days. Recent rains had raised streams significantly the previous week; however, by the time we conducted the survey, flow in smaller Rivanna tributaries was low and clear, though likely above median flow for mid-October. Water temperature was 20°C.

We started the survey of Ivy Creek in a zone that transitioned from a free-flowing stream into an arm of the South Fork Rivanna Reservoir (WGS84, 38.095929, -78.504106; 17S, E 718863.90, N 4219401). Here flow slowed, depth increased, and the amount of silt and decaying plant matter covering the stream bottom increased greatly. The lower portion of Ivy Creek (extending 1,400 m upstream from the starting point) was extremely unstable and degraded (Figures 4 and 5). While many tributaries to the upper Rivanna River system are impacted by land use and incised into the surrounding landscape, this reach appears to be among the most disturbed that we have observed. The channel was deeply incised in the surrounding flood plain. Banks were often steep and in some places actively eroding. Bankfull heights were often 3 m above the stream surface. Bankfull width was 12-15 m and except at point bars, wetted width was 10 – 13 m. This reach was entirely run habitat, with a stream bottom that was 95% sand.

Many parts of the stream bottom were unstable—even at low flows sand was moving downstream and our feet often sunk 10 - 20 cm into the sandy bottom. The only habitat complexities in this entire 1,400 m reach were at outside bends across from point bars and where large woody debris had dammed the channel or otherwise redirected flow. Where large woody debris constricted or dammed flow, depth could change from 2 m to 0.2 m abruptly. Otherwise thalweg depth was usually 50 cm. The only place that larger substrates, such as boulders and cobbles, were observed was along the outside of bends where flow increased noticeably (this stream bottom type composed less than 5% of the downstream 1,400 m surveyed reach). Since the stream bottom was very homogenous, our ability to detect mussels at the stream bottom interface was extremely high.

Instream habitat improved approximately 1,400 upstream of the start point; here, other instream habitats typical of streams draining the Blue Ridge province, such as riffles, were first observed (Figure 6 and 7). Additionally, other substrate types became more prevalent. Nevertheless, riffles were still rare, sand continued to be the dominant substrate type, and the stream remained 2 to 3 m below the flood plain. The best instream habitat was observed approximately 200 m downstream of a private bridge (formerly a state road crossing to the survey terminus at 38.08371199, -78.51717202; 17S E 717753.94, N 4218014.50). While instream habitat greatly improved near and especially upstream of the bridge, there were multiple areas of bank erosion and undercutting. In the reach directly downstream of the private bridge, we found 2 live *P. collina* in a gravel and cobble substrate mix, moderately embedded by sand (38.0819630250334, -78.5141490027308; 17S, 718024.1, 4217827). Both were found in close proximity to each other. Their shell lengths were 54 and 57 mm. We also found 2 *Strophitus undulatus* (creeper) upstream of the bridge with lengths of 46 and 49 mm.

The surrounding local land use and riparian zone were inconsistent with the instream condition of the surveyed reach. The surrounding landscape was a mix of low density residences, small pastures and hay fields, and mature wooded lots that were often continuous. Riparian pastures showed few signs of recent grazing and appeared to be progressing to or in early stages of succession to native forests. Riparian vegetation shaded 50- 75% of the stream.

In total, we expended 22 person-hours surveying Ivy Creek and observed only 2 federally endangered *P. collina* and 2 live *S. undulatus* (photoed representatives of each species are Figures 8 and 9, respectively). We observed no snails. The Asian clam *Corbicula fluminea* was rare downstream of the private bridge crossing, but abundant upstream of the bridge to the survey terminus.

Unnamed Tributary to Ivy Creek (Tributary K)

On 18 October 2011, biologists from Virginia Tech (B. J. K. Ostby, J. Price) surveyed an approximately 1,500 m reach of the unnamed perennial tributary to Ivy Creek. Weather was ideal for the survey, with low and clear flows. Air temperature did not exceed 26°C, but water temperature was cooler at 19°C.

Downstream of a private bridge (formerly a state road) to its mouth, this tributary was similar to the reach of Ivy Creek at its confluence (Figure 10). It had unstable banks, and sand was the dominant substrate type. Upstream of the private bridge, this stream flowed mostly through a forested landscape. Unlike Ivy Creek, this stream was often influenced by an exposed bedrock streambed, had stable and low banks, and a considerable diversity of instream habitats and substrate types (Figures 11 and 12). Riffles and fast runs were minimally embedded by fine sediments. Mean thalweg depth was 0.3 m. Mean bankfull width was 5 m, and wetted width was 2 to 5 m. Banks were usually less than 1 m above the stream surface. We surveyed this

stream from its mouth to a point approximately 1,500 m upstream. Small tributaries feeding this stream were usually too small to support mussels and likely went dry during late summer and early fall (Figure 13). In an 8 person-hour effort, we found no evidence of freshwater mussels, snails or *C. fluminea*.

DISCUSSION

The degraded condition of the downstream portion of Ivy Creek is the likely consequence of ongoing and historically intense land use upstream or intense land use in the local riparian zone, or both. This stream transports a large volume of sediment and probably contributes a significant amount of sediment now filling the South Fork Rivanna River Reservoir. We have observed many tributaries in the Rivanna River system whose channels are incised and whose stream bottom is predominantly sand; however, none appear as unstable and deeply incised as the lower reach of Ivy Creek. The stream may also suffer extreme fluctuations in discharge (total volume of water in the channel). Stevenson (1997) observed a much narrower wetted width (3-5 m) than we did. Our surveys were conducted following a substantial rainfall occurring during a relatively wet autumn. While *P. collina* is often observed in sandy habitats or in gravel moderately embedded by sand, the stream bottom in the reach extending from 200 downstream of the private bridge to the impoundment is considerably unstable, such that we find it unlikely that it can support a viable, recruiting population of *P. collina* even though one live specimen and shells of this species have been observed here in the past (Figure 14). We suspect that mussel occurrences in this reach have likely been transported downstream to this habitat. Most live mussels have been observed closer to the private bridge crossing of Ivy Creek, in what we suspect was and continues to be more stable instream habitat.

The reach of Ivy Creek extending from approximately 200 m downstream of the private bridge to the upstream survey terminus provided many suitable habitats despite the marginal suitability of the channel itself. We found 2 live *P. collina* in this reach. Beaty and Neves (1997) and Stephenson (1997) both found evidence of this species in this reach. Because this species is difficult to detect, it likely resides in this reach at a higher density than our results would suggest. Despite its low density, this population appears to have recruited at least two individuals since the last survey effort. The two live specimens that we observed were less than 15 years old.

Previous survey efforts observed *Villosa constricta* in the same reach of Ivy Creek that we surveyed. However, we did not detect this species in 2011. This species typically has a higher level of occupancy and abundance than *P. collina* in Rivanna tributaries supporting native mussel assemblages. Our failure to detect it is atypical, but may be indicative of an assemblage of mussels responding negatively to a clearly disturbed stream.

The unnamed tributary to Ivy Creek (Tributary K) that we surveyed was large enough to support *P. collina*, but it may have had too high a gradient. We have seen *P. collina* in similar streams before, but those streams often have a lower gradient and a higher percentage of sand and small gravel. We expended a sufficient person-hour effort and covered a large amount of potential habitat to state with reasonable confidence that this stream does not support freshwater mussels. Neves and Beaty (1997) and Stevenson also surveyed this stream and found no evidence of mussels as well.

If the Route 29 Bypass project moves forward, efforts should be made to minimize impacts to what may be a low density, but persistent population of *P. collina* inhabiting selective instream habitats of Ivy Creek. Because this stream exhibits disturbance, is a suspected contributor of sediments to the South Fork Rivanna River Reservoir, and supports a population

of the endangered *P. collina*, it should be further assessed as a candidate for protective management and possible restoration.

LITERATURE CITED

Beaty, B. B. and R. J. Neves, 1997. Survey of the Freshwater Mussel Fauna at the Proposed U.S. Route 29 Bypass Crossing and 14 Unnamed Tributaries, Albemarle County, Virginia. Virginia Department of Transportation, Richmond, VA. 10 pp.

Ostby, B. J. K. and P. L. Angermeier. 2011. Semi-quantitative Freshwater Mussel Surveys in the Wards Creek, Rocky Creek, Buck Mountain Creek, and Swift Run Sub-watersheds of the Rivanna River. Unpublished data.

Stephenson, P. H. 1997. A Second Survey for Freshwater Mussel Fauna in Ivy Creek, Albemarle County, Virginia. Charlottesville-Albemarle Transportation Coalition, Charlottesville, VA. 12pp.

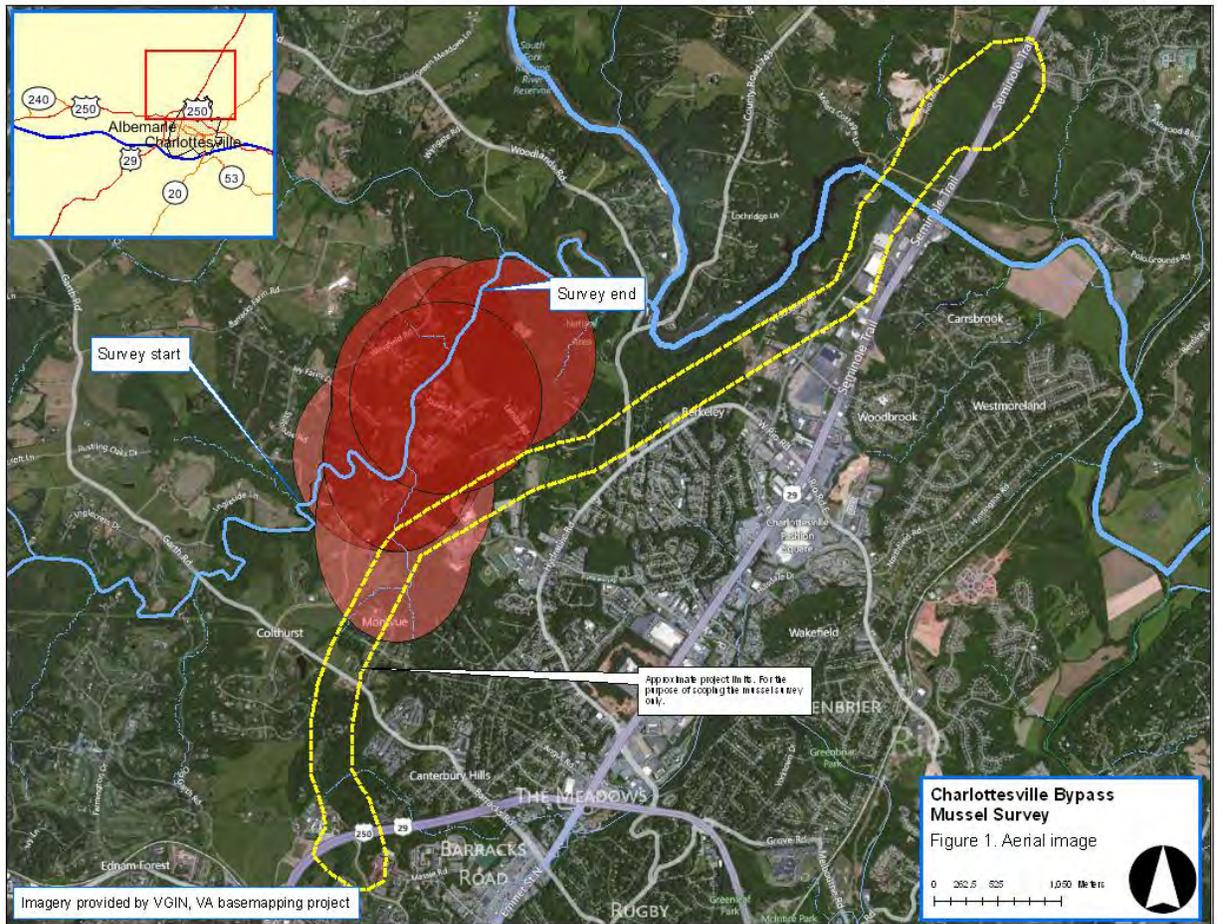


Figure 1. Aerial map provided by VDOT illustrating suggested survey limits for the Ivy Creek survey and location of proposed US 29 Bypass corridor as of September 2011.

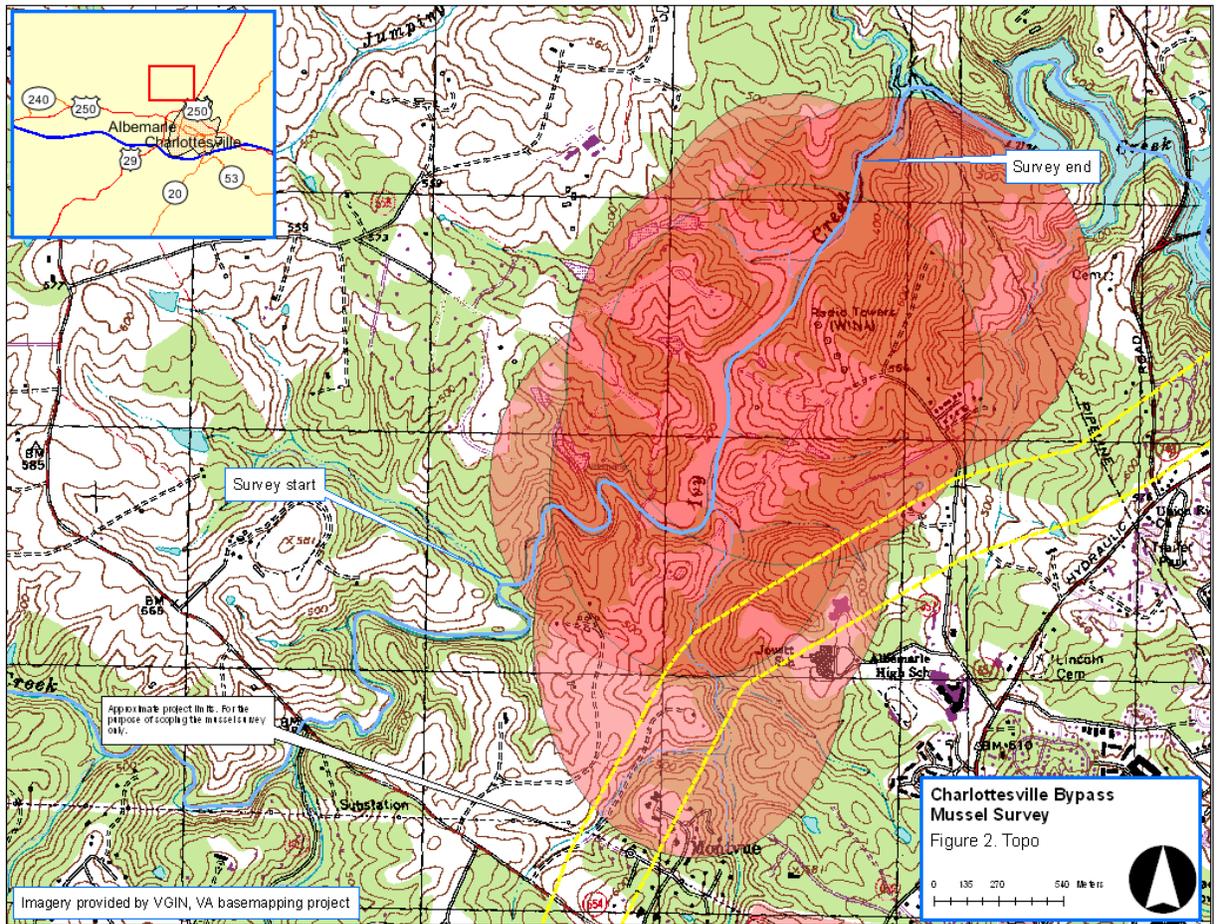


Figure 2. Detailed topographic map provided by VDOT of suggested survey limits on Ivy Creek.

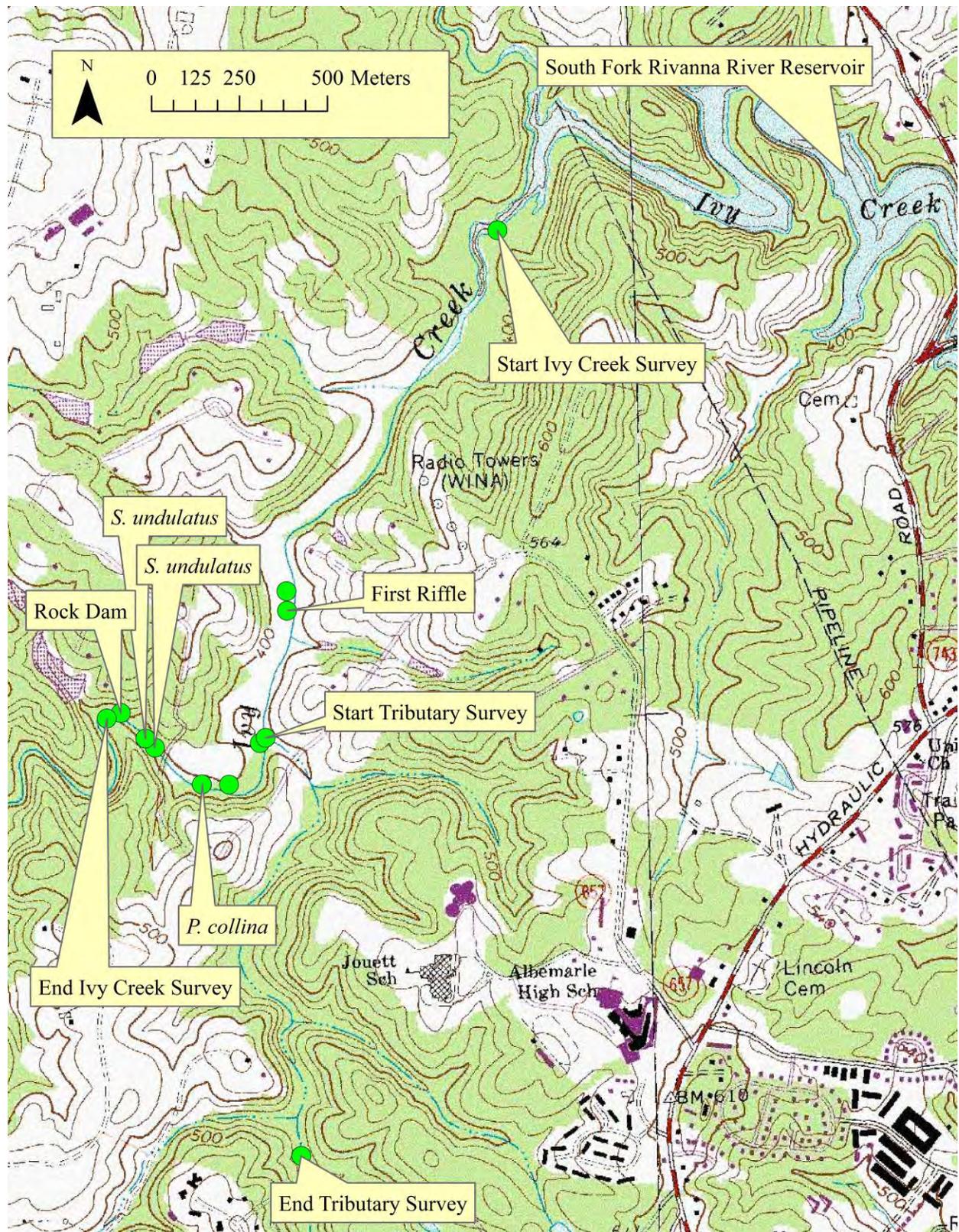


Figure 3. Topographic map of surveyed reaches of Ivy Creek and one of its major unnamed perennial tributaries.



Figure 4. Ivy Creek near downstream start point. A point bar is in the foreground photo (right).



Figure 5. Homogenous stream form typical of the downstream 2000 m of surveyed reach of Ivy Creek. Sand was the only substrate type in this photographed habitat.



Figure 6. Ivy Creek habitat appeared less impacted near the bridge crossing.



Figure 7. The upstream portion of Ivy Creek that we surveyed had a greater diversity of instream habitats, and its channel appeared more stable.



Figure 8. Live *P. collina* observed in Ivy Creek.



Live *S. undulatus* observed in Ivy Creek

Figure 9.



Figure 10. The reach of the unnamed tributary (Tributary K) downstream of the bridge and especially just upstream of its mouth, appeared to be more unstable than the reach upstream of the bridge.



Figure 11. Habitat typical of the reach of the unnamed tributary flowing through the forested landscape. While healed over, there are signs of past erosion along banks.



Figure 12. Unnamed tributary near upstream survey terminus.



Figure 13. This photographed stream was typical of those feeding the unnamed tributary.

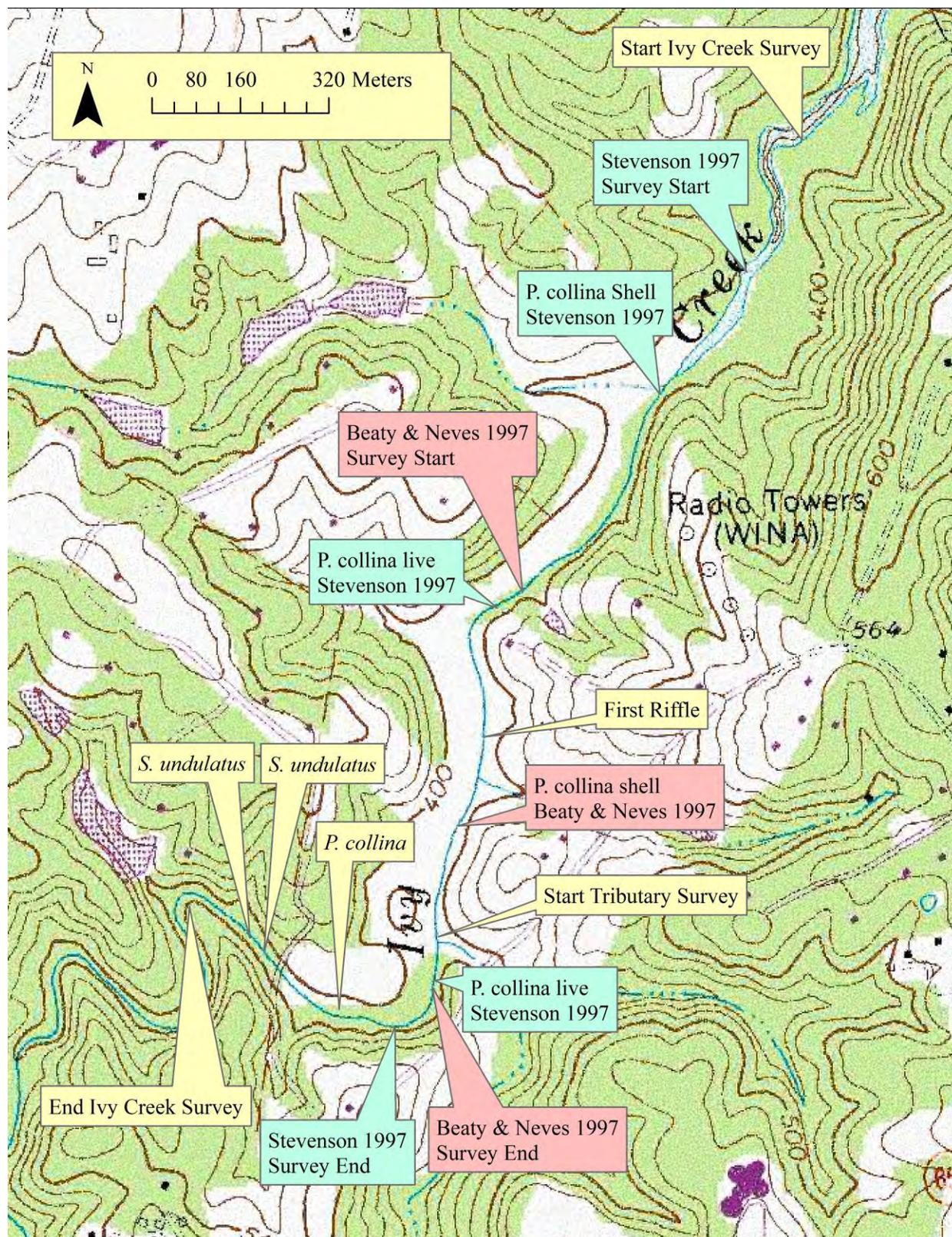


Figure 14. Survey boundaries and observations of *P. collina* in previous survey efforts in Ivy Creek. Because previous surveys did not use modern geo-referencing techniques, placement of earlier survey are based on maps in earlier reports.

VDOT Survey Collection Record #1

Site #: VPI 10172011.1

Project #: none provided

Stream: Ivy Creek

County: Albemarle

Description: Ivy Creek upstream from the South Fork Rivanna River Reservoir

Drainage: James

USGS Quadrangle Map: Charlottesville West and Charlottesville East

USGS HUC: Rivanna (02080204)

Projection: WGS84

Survey Start: 17S, E 718863.90, N 4219401; 38.095929, -78.504106;

Survey End: 17S, E 717753.94, N 4218014.50; 38.08371199, -78.51717202;

Accuracy: 5 m

Survey Date: 17 & 18 October 2011

Survey Effort: 22 person-hours

Personnel: B. J. K. Ostby, R. J. Neves, M. Bierlein, J. Price, S. Alexander

Total Mussels Observed: 2 Live *Pleurobema collina* (James spiny mussel)

2 Live *Strophitus undulatus* (creeper)

4 Total Live

Snails Observed: none

Other Mollusks: Live *Corbicula fluminea* (abundant)

VDOT Survey Collection Record #2

Site #: VPI 10172011.1

Project #: none provided

Stream: Unnamed tributary to Ivy Creek (Tributary K)

County: Albemarle

Description: Tributary to Ivy Creek draining from the south

Drainage: James

USGS Quadrangle Map: Charlottesville West and Charlottesville East

USGS HUC: Rivanna (02080204)

Projection: WGS84

Survey Start: 17S, E 718205.44, N 4217959.5; 38.0831120163202, -78.5120459832251

Survey End: 17S, E 718306.94, N 4216772; 38.072393, -78.511253

Accuracy: 5 m

Survey Date: 18 October 2011

Survey Effort: 8 person-hours

Personnel: B. J. K. Ostby, R. J. Neves, M. Bierlein, J. Price, S. Alexander

Total Mussels Observed: none

Snails Observed: none

Other Mollusks: none