

A Survey For Freshwater Mussel Fauna in
Little Bull Run and Catharpin Creek,
at the Proposed Site for Disney's America,
Prince William County, Virginia

Submitted to:

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Introduction

The Disney Development Company currently is planning to develop a tract in Prince William County, Virginia. Their consultant, Wetland Studies and Solutions, Inc., is acting on behalf of Disney Development Company to obtain permits from the U.S. Army Corps of Engineers under Section 404 of the Clean Water Act as well as a Section 401 water quality certification from the Virginia Department of Environmental Quality. As recommended by the U.S. Fish and Wildlife Service and in response to a Predischarge Notification from Wetland Studies and Solutions, Inc., this survey of the streams within the Disney property was requested to determine the presence of:

dwarf wedgemussel (*Alasmidonta heterodon*)
brook floater (*Alasmidonta varicosa*)

and other rare freshwater mussel species.

Methods

The two perennial streams on this site, Little Bull Run and Catharpin Creek in Prince William County, Virginia were surveyed for the presence of rare freshwater mussels. The Virginia Department of Environmental Quality determined that the North Fork of Broad Run, a stream in the southern area of the property, is not a perennial stream (Virginia Department of Environmental Quality, 1994). Therefore, this stream, as well as other smaller intermittent streams, were not examined. In Little Bull Run, the mussel survey extended from the Route 15 crossing upstream to the outfall of Silver Lake. In Catharpin Creek, mussel survey extended from the Route 15 crossing upstream to the western property boundary. Additionally, mussel survey occurred in a small segment of Catharpin Creek downstream of the Route 15 crossing. This stream reach is disjunct from the main survey area of Catharpin Creek; and, it is the only segment of Catharpin Creek within the Disney property and downstream of Route 15. Figure 1 delineates the general survey areas of Little Bull Run and Catharpin Creek. Five named mussel survey sites appear on this map:

Lower Catharpin Creek
Upper Catharpin Creek
Lower Little Bull Run
Middle Little Bull Run
Upper Little Bull Run

Figure 1 is derived from the U.S. Geological Survey topographic 7.5 minute map of the Thoroughfare Gap, Virginia quadrangle. The author added annotations to indicate relevant features and survey areas. Heavy bars indicate site boundaries where explicit map features do not form boundaries.

The survey focused on two species, the dwarf wedgemussel and the brook floater. Intensive searching was largely limited to those areas of habitat which are considered to be significant for the dwarf wedgemussel and the brook floater. Reported observations

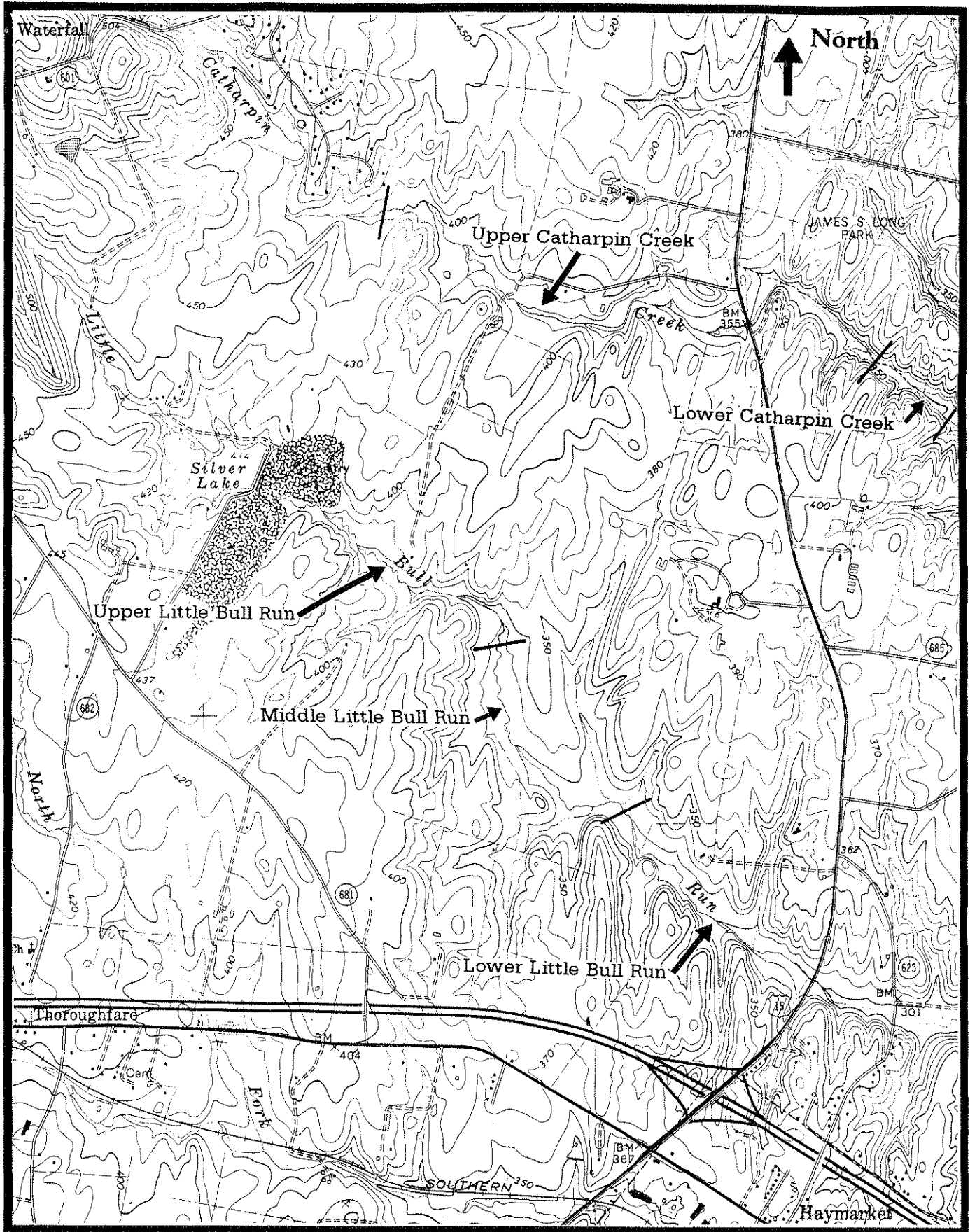


Figure 1. Mussel Survey Sites in Little Bull Run and Catharpin Creek, Prince William County, Virginia

indicate that throughout its range dwarf wedgemussel depends on environments that are lotic to seasonally lotic in nature (Michaelson, 1993). Riffles and runs are considered to be the most significant habitats for the brook floater (Clark and Berg, 1959; Johnson, 1970). Pools with thick silt and organic layers do not represent habitats for dwarf wedgemussel or brook floater. Survey methods included waterscoping, handpicking, and raking the substrate. In addition, stream banks were searched for muskrat middens of discarded shells and shells cast on bars by flood. Field surveys occurred on May 23, June 2, June 3, and June 4, 1994. Philip H. Stevenson conducted the field survey. Voucher specimens will be deposited in the Virginia Museum of Natural History, Martinsville, Virginia.

Results

The survey found four mussel species. Table 1 lists the species found. As can be seen in Table 1, none of the species found are Federally listed threatened or endangered or are candidate species. Similarly, none of the species receive special state protection. In Table 2, the presence of mussels is indicated for each general area within the streams. Sites are identified by the labels displayed in Figure 1. Table 2 details the number of specimens found of each species and how many of a given species were found as live specimens or shells. In the text which follows, each site is generally described; and, the overall survey results presented.

Lower Little Bull Run (LLBR) site was the downstream-most area investigated in Little Bull Run. This site extended from the Route 15 crossing upstream to a point roughly 1.2 air kilometers northwest of the crossing. The stream width measured from 2-5 meters wide. Stream habitats varied greatly in this area. The overall nature of the stream was short, narrow riffles separating much longer, wider pools and runs. Riffles were 1-2 meters wide. Their depth is typically under 0.1 meter. Shallow pools and slow runs comprised the majority of the stream habitats. These habitats tended to extend from bank to bank, roughly 3-5 meters, with typical depths being 0.2-0.3 meters deep and occasional depths to 0.5 meters. These deepest areas were located closest to Route 15. The stream was well-shaded with woodlands bordering the stream throughout except for one meadow associated with a breached beaver dam.

LLBR substrate varied according to habitat. Riffles typically had a coarse gravel/pebbly substrate with some small cobble. Bedrock exposures occurred very rarely. Runs and pools generally were a mix of very muddy gravel and sand. LLBR exhibited quite a bit of siltation. Most coarser substrates were partially embedded in silt, even in the flowing sections. Sand and gravel typically had a silt layer covering them. The most extreme siltation occurred in a reach associated with the breached beaver dam and former beaver pond. This area was roughly 300 meters upstream of Route 15. Here, the substrate was generally covered with a silt deposit.

Common Name	Scientific Name	Federal Status	State Status
<i>Anodonta cataracta</i>	eastern floater	None	None
<i>Elliptio complanata</i>	eastern elliptio	None	None
<i>Elliptio producta</i>	Atlantic spike	None	None
<i>Strophitus undulatus</i>	squawfoot	None	None

Table 1. Mussel Species Found in Little Bull Run and Catharpin Creek, Prince William County, Virginia

Species	Mussel Survey Sites				
	Little Bull Run			Catharpin Creek	
	Lower	Middle	Upper	Lower	Upper
<i>Anodonta cataracta</i>	30L, 15S	0	2L	0	0
<i>Elliptio complanata</i>	225L, 41S	0	5L, 2S	17L, 2S	1S
<i>Elliptio producta</i>	50L, 13S	0	18L, 8S	0	0
<i>Strophitus undulatus</i>	5L	0	0	1L	0

Table 2. Mussel Distribution by Survey Site in Little Bull Run and Catharpin Creek, Prince William County, Virginia

L = Live specimens, S = Shell found.

Mussels were common in LLBR. This site was also the area with the greatest number of individuals and species of mussels. Mussels tended to decrease in abundance as one proceeded upstream. Two factors seem to influence mussel abundance here. One is that mussels did not occur in wholly mud substrates, with the exception of some *Anodonta*. No mussels were found in the old beaver pond area. This area, in addition to being highly silted, was also very open as most trees had been removed by the beavers in the vicinity of the stream. A dense growth of filamentous alga occurred there. The second factor influencing distribution was water depth, with virtually no mussels occurring in the very shallow riffle areas. Mussels frequently occur at the transition zone between the riffles and the downstream pool/run areas.

In addition to mussels, fingernail clams (family Sphaeriidae) occurred in LLBR. These small, native clams were moderately common in the LLBR, especially in mostly sandy substrates. No *Corbicula* clams were observed. This exotic clam occurs in many Virginia streams. Its absence indicates it has yet to colonize this headwater area. No snails of the families Pleuroceridae and Viviparidae were encountered. While not uncommon in Virginia, these snails do seem to be indicative of somewhat better water quality. Fish were common in LLBR. Among the fishes seen was the tessellated darter (*Etheostoma olmstedi*).

Middle Little Bull Run (MLBR) site encompassed Little Bull Run from 1.2 air kilometers northwest of the Route 15 crossing to 2.1 air kilometers northwest of the Route 15 crossing. MLBR differed primarily from LLBR in that MLBR habitats were entirely composed of beaver ponds, marsh, and meadows. The extensive beaver damming in the generally level topography of this area has produced relatively wide pools. The stream channel seems very similar to that in LLBR; however, water depths in these pools typically are much deeper than in the lotic areas of Little Bull Run. The beaver ponds tend to be very open areas with little shade. Substrate is generally thick silt and mud in all former channel areas. No intensive searching was performed in the MLBR area as the habitat type was inappropriate for rare mussels.

Upper Little Bull Run (ULBR) site exhibited a return of stream conditions to a lotic nature. This site extended from MLBR to just below Silver Lake. The downstream boundary of this site occurs at the transition from the predominately ponded reach of Little Bull Run comprising the MLBR site. This boundary roughly coincides with where steeply sloped uplands approach the stream. Shallow riffles and runs composed the majority of habitat in this area with beaver dams impounding a small stream length in the middle of this site. The stream bed was from 2-4 meters wide, generally decreasing as one proceeded upstream. Riffle areas typically were 1 meter wide or less. Water depth was very shallow. Riffles were under 0.1 meter deep; and, pool/run habitats tended not to exceed 0.2 meters deep. Little Bull Run in this area was well-shaded throughout with a wooded border of varying width.

The substrate in ULBR differed somewhat as compared to the substrate in LLBR. This upper site was more lotic in nature.

Consequently, the substrate was generally coarser. Riffle substrate consisted of mostly pebbles and cobbles, with very little silt present. Bedrock exposures on the stream bottom were not uncommon in riffles, especially where the steepest slopes neared the stream. The substrate particles were noticeably more angular. Run habitats tended to have pebble, gravel, and sand substrates. Pool habitats, generally small, also had gravel and sand substrates. There was noticeably less mud and silt in the stream here than further downstream. The only exception is where beaver ponds occurred. The substrate there was mud, silt, and organic matter typical of beaver ponds. These ponds appear relatively recent as more of the trees and understory remain adjacent to the pond as compared to the downstream areas of MLBR.

Mussels were significantly less common in ULBR than LLBR. Also, one less species was found. Most of the mussels were found in one pool area very close to the MLBR boundary. Upstream of this pool, only one live *Elliptio complanata* and 5 live *E. producta* were found. Fish still commonly occurred here. Similarly to LLBR, no pleurocerid or viviparid snails were found; however, some other snails were seen commonly. This indicates somewhat of an overall improvement in water quality.

Upper Catharpin Creek (UCC) site is the largest contiguous site described. This site extends from the Route 15 crossing upstream to the western property boundary. The habitats were quite variable. Generally, this stream was composed of shallow riffle and run areas. Pools were dispersed along its length, occurring more commonly in the middle of the site. A significant part of the stream was impounded by beaver dams. This area extended from the unnamed road crossing upstream about 400 meters. Overall, the stream was from 1-5 meters wide. Riffle areas tended to be 1 meter wide and less than 0.1 meter deep. The pool areas were the only places which tended to occupy the entire stream bed, from bank to bank. Pools were 4-5 meters wide and 0.3-0.5 meters deep. Catharpin Creek was moderately shaded here. The woodland border tended to be narrower than in Little Bull Run.

The substrate in UCC was a mix of types, tending toward finer particle sizes. The riffle substrate was generally pebble and gravel mix. Run areas tended to have a sand and gravel sand mix. Pool substrate was usually a muddy sand and silt. There were no significant bedrock exposures in UCC. There were some places where the stream flowed over an eroding unconsolidated aggregate embedded in firm clay.

Only one mussel shell was found in the UCC site. This shell was found within 50 meters of the Route 15 crossing. No other evidence of freshwater mussels was seen in Catharpin Creek here. Similarly to Little Bull Run, no pleurocerid snails and viviparid snails were encountered. No fingernail clams or *Corbicula* clams were seen. Fish were moderately common and included tessellated darters.

Lower Catharpin Creek (LCC) site was a small reach of river disjunct from the UCC site. The LCC site more closely resembles the middle of the LLBR site rather than Catharpin Creek just upstream

in the UCC. The stream was wider than in the UCC site. The stream was typically 5 meters wide. The predominate stream habitat was slow run areas, 5 meters wide and 0.1 to 0.2 meters deep. Some small, narrow riffles did occur here. There was a pool area near the downstream end of this site. This pool area appears recently beaver dammed with the beaver dam breached not long after construction. This is inferred by the relatively unaltered nature of the stream substrate and bankside vegetation, as compared to the other beaver dammed areas encountered.

Substrate in LCC site was relatively coarse here, reflecting the streams more lotic nature. The riffles tended to be composed of pebbles and small cobbles with some gravel. Run substrates were generally a pebble/gravel mix with some cobble present. There were some bedrock exposures present, especially in the middle of this site. During high water this site is probably subject to scour. There was relatively little silt in most of this site.

Mussels were surprisingly common in this area. Two species of mussel were found, *Elliptio complanata* and *Strophitus undulatus*. Most mussels were found in the relatively deeper pool area near the lower end of the site. This pool area had a muddy sand substrate, in contrast to the coarser substrate of the run and riffle areas. Only one mussel was found in the upstream half of this site. Similar to other sites, no pleurocerid or viviparid snails were observed. Fingernail clams were common. *Corbicula* clams were not seen. Fish were common.

Discussion

Determining the potential for rare mussel species to occur at a site is not necessarily straightforward. While sampling can verify the presence of a species, verification of non-occurrence is much more difficult. Other factors must be considered in examining the potential for occurrence. The habitat quality, the mussel fauna, and other biota can indicate if rare species may occur at a site.

In general, it appears that much of the stream habitat in both Catharpin Creek and Little Bull Run is marginal for mussels. This seems to be mainly a factor of the small stream size. These streams both support mussel populations primarily in their lower reaches within the survey area. Catharpin Creek seems to have crossed some threshold for ability to support mussel populations at or near the Route 15 bridge, given the observations of mussels in the LCC site and their virtual absence in the UCC site. Little Bull Run in the ULBR site seems to be at the same threshold of unsuitability.

A second important influence on the suitability of stream habitat is the prevalence of beaver dams. Neither rare species of concern for this survey occurs in ponded situations. Beavers have altered a significant portion of Little Bull Run. The entire MLBR site was defined on the basis of it being virtually entirely beaver pond habitat. Areas of both the ULBR and LLBR sites were also rendered unsuitable for rare mussels by beaver activity. Additionally, a large beaver dam is located immediately downstream

of the Route 15 bridge, backing pool waters over an area which currently has a number of mussels. The pool bottom is apparently just beginning to become covered with silt. I believe that the mussels may not last long in that reach.

The degree of siltiness, particularly in Little Bull Run seems to indicate a low potential for rare mussels. In my recent collections of both the brook floater and the dwarf wedgemussel, neither species occurred in as silted appearing an environment (Stevenson, 1993a; Stevenson, 1993b; Stevenson, unpub. data). The siltiness is probably largely the result of agriculture in the watershed.

Rare species of freshwater mussels nearly always occur with other species of freshwater mussels. Both Little Bull Run and Catharpin Creek contain populations of common freshwater mussel species. These streams do meet this minimal qualification as potentially containing populations of rare species. The brook floater has been reported from Bull Run at Sudley Church, Prince William County (Clarke, 1981). Catharpin Creek and Little Bull Run do constitute part of the headwaters of Bull Run. However, I have sampled previously in Bull Run, Little Bull Run, and Catharpin Creek at 10 sites in 1991 and did not find any rare mussel species then. Additionally, the fauna I have observed at many of these other sites matched or exceeded the fauna here in species diversity.

In considering the potential for rare species further, I recently recorded several collections of the brook floater in Broad Run, Prince William County (Stevenson, 1993a; Stevenson, P.H., unpub. data). In 1993, at the sites where the brook floater was found, I recorded the mussel *Alasmidonta undulata* (triangle floater) and both pleurocerid and viviparid snails. At the site where I found the brook floater in 1991, both types of snails were found. In this survey, neither type of snail was found. I believe that this is due to generally unfavorable conditions, either recently past or present, extirpated these snails. The brook floater's association with these snails leads me to believe that conditions which eliminate the snails also eliminate the brook floater and other sensitive species. The triangle floater, while not a rare species, does seem to favor higher quality waters. Its absence lends further credence to an interpretation of the stream habitat as being degraded.

Another consideration is the presence of the tessellated darter (*Etheostoma olmstedi*) in both Little Bull Run and Catharpin Creek. I observed the tessellated darter commonly in both streams. This fish and the johnny darter (*Etheostoma nigrum*) have been shown to serve as a host for the parasitic glochidia life cycle stage of the dwarf wedgemussel (Michaelson, 1993). Jenkins and Burkhead (1993) report many locations for this darter calling it one of the most common darters in Virginia. Along with the johnny darter, virtually all streams in Virginia contain populations of one species or the other. Glochidial host is not a limiting factor for dwarf wedgemussel.

The overall composition of the mussel fauna also does not indicate a high potential for rare species. All species present are relatively tolerant of poor quality habitats and are very widespread in Virginia. They indicate only that the streams meet the minimum conditions for supporting a mussel fauna. The above information taken together with the lack of finds of any rare mussels, leads to the conclusion that neither the brook floater or the dwarf wedgemussel occur in either Little Bull Run or Catharpin Creek within the Disney property.

Summary

Four species of freshwater mussel were found. The species found in order of decreasing abundance are:

Eastern elliptio	<i>Elliptio complanata</i>
Atlantic spike	<i>Elliptio producta</i>
Atlantic floater	<i>Anodonta cataracta</i>
squawfoot	<i>Strophitus undulatus</i>

No rare species were found. Stream size and degree of siltation seem to exert the most influence on the fauna here, highly reducing the likelihood of rare species being present. Mussel species and other fauna also indicate a very low probability of either the brook floater (*Alasmidonta varicosa*) or the dwarf wedgemussel (*Alasmidonta heterodon*) being present.

References

- Clarke, Arthur H. 1981. The tribe Alasmidontini (Unionidae: Anodontinae), part I: Pegias, Alasmidonta, and Arcidens. Smithsonian Contributions to Zoology No. 326.
- Clarke, Arthur H. and Berg, Clifford O. 1959. The freshwater mussels of Central New York with an illustrated key to the species of northeastern North America. Cornell University Agricultural Experiment Station Memoir 367. 79 pages.
- Jenkins, R. E. and Burkhead, N. M. 1993. Freshwater Fishes of Virginia. American Fisheries Society. Bethesda, Maryland.
- Johnson, Richard I. 1970. The systematics and zoogeography of the Unionidae (Mollusca: Bivalvia) of the southern Atlantic slope region. Bulletin of the Museum of Comparative Zoology 140(6): 263-450.
- Michaelson, David L. 1993. Life History of the endangered dwarf wedgemussel, *Alasmidonta heterodon* (Lea 1829) (Pelecypoda: Unionidae), in the Tar River, North Carolina and Aquia Creek, Virginia. Unpublished MS Thesis. Virginia Polytechnic and State University. Blacksburg, Virginia. 122 pages.

Stevenson, Philip H. 1993a. A Survey of the Freshwater Mussel Fauna in Broad Run, Prince William County, Virginia. Unpublished report to Campbell and Paris Engineers, Chantilly, Virginia.

Stevenson, Philip H. 1993b. A Survey of the Freshwater Mussel Fauna in Cedar Run, Fauquier County, Virginia (Contract SCS-37-VA-93). Unpublished report to U. S. Department of Agriculture, Soil Conservation Service, Richmond, Virginia.

Virginia Department of Environmental Quality. 1994. Letter of February 15, 1994 to Michael Rolband, Wetland Studies and Solutions, Inc.