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A Survey of the Freshwater Mussel Fauna
in Cedar Run,
Fauquier County, Virginia
(Contract SCS-37-VA-93)

Technical Report to:

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Introduction

The Soil and Conservation Service currently seeks to build a proposed flood control impoundment on Cedar Run, Fauquier County, Virginia, near the town of Auburn. As part of the environmental assessment of the proposed project, the Soil Conservation Service funded a survey of Cedar Run to determine the presence of the federally listed-endangered dwarf wedgemussel (*Alasmidonta heterodon*), the state endangered brook floater (*Alasmidonta varicosa*), and other freshwater mussel species within and adjacent to the pool area of the proposed reservoir. The area surveyed extended from the County Route 670 crossing of Cedar Run upstream to the confluence of Cedar Run and Mill Run. Field surveys occurred on September 29 and October 5, 1993. Philip H. Stevenson conducted the field survey.

Five species of freshwater mussel were found, including the federally listed endangered dwarf wedgemussel (*Alasmidonta heterodon*). The species found in order of decreasing abundance are:

Atlantic spike (*Elliptio producta*)

eastern floater (*Anodonta cataracta*)

eastern elliptio (*Elliptio complanata*)

squawfoot (*Strophitus undulatus*)

dwarf wedgemussel (*Alasmidonta heterodon*)

Only one live specimen of dwarf wedgemussel was found. The specimen was found near the upstream end of the proposed reservoir pool. The brook floater (*Alasmidonta varicosa*) was not found during the mussel survey.

Cedar Run is located within the Potomac Basin. The dwarf wedgemussel has been collected previously from the Potomac Basin nearby in Aquia Creek (U. S. Fish and Wildlife Service, 1993). The brook floater has been collected in Broad Run, Prince William County, Virginia (P.H. Stevenson, unpublished data). Broad Run and Cedar Run join to form the Occoquan River, a Potomac tributary, well downstream of the survey area. Given the proximity of Cedar Run to documented populations of the two rare mussel species, local

ecological conditions are the determinants for the presence of either species. The overall quality of riffle/run habitats in Cedar Run is fair. There are a significant number of beaver dams of recent construction which are altering the stream habitat, converting generally slow flowing habitats to still water. Stream conditions appear affected somewhat by siltation, especially in the lower reaches. The riffle areas frequently have significant amounts of exposed bedrock which is a poor habitat for mussels. Cedar Run seems to be in better condition within the uppermost portions of the survey area, above the proposed reservoir pool.

Survey Techniques

The survey focused on the dwarf wedgemussel (*Alasmidonta heterodon*) and the brook floater (*Alasmidonta varicosa*). General survey sites within the survey area are indicated in Figure 1, a selected portion of the U.S. Geological Survey topographic map of the Catlett, Virginia 7.5 minute quadrangle. The general survey sites depicted are discussed in the Evaluation of Findings section later in the report.

Intensive searching was largely limited to those areas which are considered to be significant for the brook floater and dwarf wedgemussel. Areas of run and riffle habitat are considered most significant for the brook floater (Clark and Berg, 1959; Johnson, 1970). Dwarf wedgemussel also occur in relatively silt-free pool areas (U.S. Fish and Wildlife Service, 1993). 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. The entire survey area was traversed by foot to search for specimens. Voucher specimens will be deposited in the Virginia Museum of Natural History, Martinsville, Virginia.

Visual searches proved to be most effective, as spent shells were easily visible in the shallow waters of the riffle areas. Bank and bar searches were equally productive. Very few mussels were

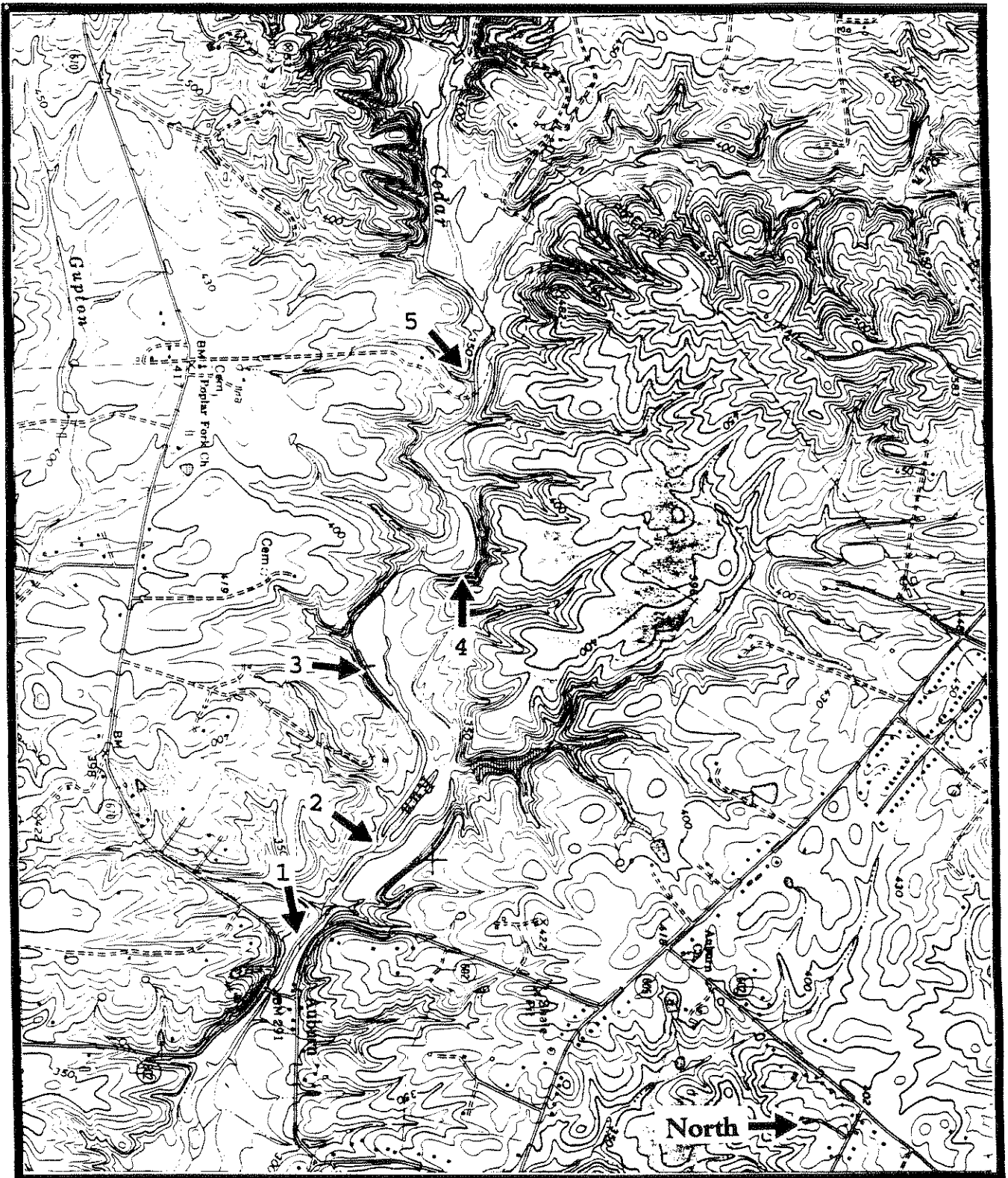


Figure 1. Mussel Survey Sites in Cedar Run,
Fauquier County, Virginia

found waterscoping; however, most live mussels were found this way. In well-lighted pool areas, visual searching complemented waterscoping. The deepest areas of large pools and beaver ponds were not searched as these silty habitats are inappropriate for the focus species.

Inventory of Species

The survey found five mussel species, including the endangered dwarf wedgemussel (*Alasmidonta heterodon*). Table 1 lists the species found and their federal and state legal status. In Table 2, the presence of mussels is indicated for each site where intensive searching was performed. Sites are identified by the numerical labels displayed in Figure 1. Table 2 indicates whether the given species was found as live specimens, or shell only. Shell here refers to both relict shells and recent shells. No fresh dead specimens were found.

The most common species is the Atlantic spike (*Elliptio producta*). The Atlantic spike can be considered to be a moderately common species in the survey area; however, few live individuals were found. This species frequently occurs in silty or muddy pool areas which were not well searched during this survey. Specimens of this species were found at the uppermost and lowermost ends of the survey area.

The eastern floater (*Anodonta cataracta*) was the second most commonly observed species. This species was found throughout the survey area. More live individuals were found of this species than of any other. All live individuals were found associated with sandy or muddy pools, a typical habitat for this species.

The eastern elliptio (*Elliptio complanata*) was the next most commonly observed species. This is a relatively large species, which makes the shells of this species relatively easy to find. Given that no live individuals were found, this species would be considered uncommon. This species is one of the most common mussels of North America and has broad ecological tolerances. The lack of

Common Name	Scientific Name	Federal Status	State Status
<i>Alasmidonta heterodon</i>	dwarf wedgemussel	Endangered	Endangered
<i>Anodonta cataracta</i>	eastern floater		
<i>Elliptio complanata</i>	eastern elliptio		
<i>Elliptio producta</i>	Atlantic spike		
<i>Strophitus undulatus</i>	squawfoot		

Table 1. Mussel Species Found in Cedar Run,
Fauquier County, Virginia

Species	Mussel Survey Sites					Total
	1	2	3	4	5	
<i>Alasmidonta heterodon</i>	0	0	0	1L	0	1L
<i>Anodonta cataracta</i>	3L, 5S	0	3S	1L, 1S	1L	5L, 9S
<i>Elliptio complanata</i>	1S	0	4S	3S	2S	10S
<i>Elliptio producta</i>	1L, 1S	2S	6S	7S	2S	1L, 18S
<i>Strophitus undulatus</i>	0	1S	2S	0	1L	1L, 3S

Table 2. Mussel Distribution by Survey Site in Cedar Run,
Fauquier County, Virginia

L = Live specimens, S = Shell found.

observations here probably reflects a low population in the headwater environment of Cedar Run. Unobserved individuals likely occurred in some of the large pools not thoroughly searched. Similar to the Atlantic spike, the eastern elliptio was found at the lowermost and uppermost ends of the survey area.

The squawfoot (*Strophitus undulatus*) was encountered very rarely. The find of an immature live specimen indicates recent reproduction of this species in Cedar Run. This species is uncommon to rare in Cedar Run. The squawfoot tends to prefer quieter waters; and, the few finds of this species may partly result from the concentration of search effort in riffle habitats. The only live specimen found was in the headwater of a beaver pond in site 5.

The dwarf wedgemussel (*Alasmidonta heterodon*) was the rarest mussel in Cedar Run. This species was found at only one site. Only one specimen was found; and, it was a live animal. In Figure 1, the arrow for site 4 points directly at the spot where the mussel was found. The habitat was a small, shallow, pooled area with coarse cobble/pebble substrate adjacent to a riffle. This area undoubtedly experiences good flow during moderate to high water conditions.

Evaluation of Findings

Site 1 was the downstream-most area investigated. This site includes a moderate sized riffle located immediately downstream of the Route 670 bridge. The site extends upstream to the confluence of two intermittent tributaries 0.4 kilometers west of the Route 670 bridge. The upstream terminus is a relatively long pool, circa 100 meters long. A long riffle area is located above the bridge and extends to the upstream pool. The riffle areas tend to be very narrow, under 2 meters wide, and very shallow. The downstream areas of the long riffle and the bridge riffle were the best habitats as there was good substrate. The middle to upper part of the long riffle had a significant amount of exposed bedrock, reducing its suitability as a mussel habitat.

Site 2 extends from the upstream end of Site 1 to the downstream end of a large seasonal island at Site 3. In general, pools dominate this section. The exception is the central area where two intermittent tributaries join Cedar Run. Here, the habitat is largely lotic in character. Siltation tends to be low in this area. Above this area there are three small riffles, each under 20 meters in length, which separate much longer pools. These riffles tend to be somewhat silted. Cattle have access to Cedar Run in this area; and, the cattle access points likely contribute to siltation here.

Site 3 includes the stream adjacent to a large seasonal island. The more northerly channel indicated on the U.S.G.S. map of the area was dry at the time of the survey. It appears that this channel would be dry in most years during typical summer flow conditions. This site is bordered on both upstream and downstream ends by long pools. Both pools are formed by apparently natural cobble bars. The upstream pool begins at the point where the seasonal channel diverges from Cedar Run. The head of the downstream pool is just above the downstream confluence of the seasonal channel and the main channel. The habitat adjacent to the seasonal island is entirely shallow riffle/run habitat. The most negative factor here for mussels is that there is much exposed bedrock throughout this site. The site is also somewhat silty. Livestock obviously have access here contributing to both siltation and eutrophication. The lack of pleurocerid snails, typical of good flowing conditions, lends support to the interpretation of this site as being somewhat degraded. While mussel shells were found here, this site is poor habitat. The shells found here probably originate upstream of this site.

Site 4 includes the area where the sole specimen of dwarf wedgemussel was found. The habitat here was a relatively long flowing reach with small rocky riffles. Stream substrate was cobbles, pebbles, gravel, and sand. No influences of livestock were observed here. Siltation was moderate here, even out of strong flow. This site has been defined to be relatively small as it is

limited to the better habitats in the immediate vicinity of the dwarf wedgemussel find. The site is bordered on its upper end by a very long beaver pond whose dam is located roughly 70 meters above the dwarf wedgemussel location. Habitat in this area was generally fair.

Site 5 was the uppermost area investigated. Included within this area is the large beaver pond which borders the upstream end of Site 4. There were three beaver ponds between Site 4 and the farm road crossing in Site 5. Lotic habitats were located from roughly 200 meters below the farm road crossing to about 200 meters above the crossing. There was frequent bedrock exposure in this area, making it a generally fair to poor habitat for mussels. The upper end of Site 5 was also a beaver pond which extended to the confluence with Mill Run. All live mussel found within Site 5 were associated with the beaver ponds in the downstream area.

Overall, the conditions of Cedar Run appear to be that of a stream which is in a somewhat degraded but stable state. Aquatic macrophytes, which are indicators of water quality, were very uncommon; however, the shading of much of the stream influences this. Another indicator of good water quality is the presence of pleurocerid snails; none were observed indicating either poor conditions or previously poor conditions. A possible source of some of the negative impacts is the adjacent farmland and pasture. Runoff from these lands probably contributed to the siltation of the creek. This seems to be more prominent in the lower survey area. It is also possible that past practices had more severe impacts on the stream and the stream has improved more recently.

Recommendations

The impoundment of Cedar Run will affect the mussel fauna of this area in several ways. Populations of the eastern elliptio and the eastern floater will likely be increased by the presence of the impoundment. The Atlantic spike population will likely remain approximately the same as it tolerates impoundments, but does not

tend to flourish there. The squawfoot will likely be negatively influenced, because it seems to tolerate pool condition which are somewhat influenced by stream flow; it likely will populate headwater areas of the impoundment pool. Any populations of dwarf wedgemussel which occur within the impoundment pool will be eliminated as this species does not tolerate living in these conditions (U.S. Fish and Wildlife Service, 1993). A possible mitigation of the impacts to the dwarf wedgemussel may be the lowering of the normal pool area should the current find of the dwarf wedgemussel prove to represent an extant and localized population.

Given the find of an endangered species within the pool area of the proposed reservoir, the primary recommendation is to conduct additional survey work to determine the population center for dwarf wedgemussel. This effort should be divided so as to determine if the population center is within the reservoir pool or if the individual found was at the extreme end of a population found in either the headwaters or tailwaters of the proposed impoundment. Reconnaissance survey should be conducted within Cedar Run and Mill Run upstream of their confluence. Survey should also be conducted below the Route 670 crossing of Cedar Run. Intensive survey should be conducted within the appropriate habitats of the original survey area. Areas which should receive intensive re-examination should include site 4 in the area of the dwarf wedgemussel find, the tributary confluence area of Site 2, and the riffle areas of Site 5 and Site 1. Selected pool areas can be examined while performing the intensive surveys. An estimated 7-10 days of field work should satisfy the above recommended survey work. As the intensive field surveys are needed to verify if the impoundment will extirpate a population of an endangered species, this field work should be performed under good to excellent conditions. The recommended time for initiation of this field work is 1994 after spring flows are reduced as current conditions have begun to deteriorate with leaf fall. The Soil Conservation Service should coordinate any proposed survey effort with the U.S. Fish and Wildlife Service and the

Virginia Department of Game and Inland Fisheries to ensure the requirements of these agencies are met regarding this effort.

References

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