

Inventory and Monitoring of the Dwarf Wedgemussel (*Alasmidonta heterodon*) in the
Connecticut River in New Hampshire and Vermont

By

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Abstract

Three Dwarf wedgemussel (DWM) (*Alasmidonta heterodon*) sites were surveyed from July 10 to August 29, 2001. The sites were located at Sumner Falls, Cornish Covered Bridge - south, and Horseback Ridge, all in Windsor Co., VT. The data collected during this survey was part of an on going effort to monitor DWM population changes in the Connecticut River. Line transects and quadrat surveys were conducted at the Sumner Falls site and line transects were conducted at both Cornish Covered Bridge-south and Horseback Ridge. A total of five live DWM were found during the quadrat survey resulting in a density of 0.026 DWM/0.25 m² and 11 DWM (0.64 DWM/person-hour), including three DWM found during the quadrat survey along the transect line, were found after searching 24 transects at the Sumner Falls site. The DWM/person-hours was the lowest detected when compared to past surveys. Twenty-seven DWM (DWM/person-hours = 3.0) were found at the Cornish Covered Bridge -south site after three people searched 13 transects. After searching 9 transects at the Horseback Ridge site a total of 28 live DWM (DWM/person-hour = 4.7) were found. These findings were similar to the results of past surveys. When compared to past surveys, the smaller (< 15 mm) and larger (> 39.9 mm) size classes were lacking at the Sumner Falls and Horseback Ridge sites.

Introduction

The dwarf wedge mussel (*Alasmidonta heterodon*) is listed as Federally endangered, and considered endangered by Vermont and New Hampshire. Past surveys have identified several dwarf wedge mussel (DWM) populations in the Connecticut River from Weathersfield Bow, VT, upstream to Sumner Falls in Hartford, VT, and three populations in Coos Co., NH. The endangered status of the DWM has prompted the USFWS to locate populations and implement long-term population monitoring plans for various DWM populations. Four sites are currently being monitored on a regular basis; Sumner Falls, Horseback Ridge, Covered Bridge – north, and Cornish Covered Bridge – south (Gabriel and Fichtel 1995). The main objectives of this study were to 1) resurvey three DWM sites that have been monitored in the past using similar protocol, 2) determine an overall DWM population trend by comparing past survey results with the data collected during this survey, and 3) use recently developed mussel monitoring protocols to evaluate their applicability to DWM populations in this section of the Connecticut River.

Methods

Surveys were conducted at Sumner Falls, Cornish Covered Bridge – south, and Horseback Ridge (Appendix I). The method used to conduct the survey at the Sumner Falls sites was different from past survey protocol. This survey was designed to survey shallow and deeper regions using quadrats and transect line searches. The survey was set up with 25 m transects running parallel to the shore starting at the scrap metal pile and out for 50 m, or until the DWM habitat was deemed poor (e.g., scoured sediment)(Fig. 1). Four 25 m transects were constructed with weighted rope and were marked off with tape every 6.5 m. Two transects were used inshore by snorkelers and two were used in deeper water, by divers. An attempt was made to survey 2% of the study area with quadrats so the transects were marked off every 6.5 m to help in the proper placement of the quadrats along the transect line. The 25 m transect lines were placed approximately 2 m apart. Two floating buoys were tied to bricks and used to mark the 50 m offshore position of the top and bottom of the survey area.

A combination of transect line and quadrats, with excavation, were conducted along the transect lines. Each 0.25 m² quadrat was searched for mussels at the surface every 6.5 m (four quadrates per 25 m transect line) and the sediment from every other quadrat was excavated down 10 cm and placed through a 0.5 cm sieve along each 25 m transect line. Every freshwater mussel found was identified and recorded, and the number of mussels found at the surface and below the surface was also recorded. All DWM found were counted, measured to the nearest mm, and returned to the substrate.

Excavation was used as outlined in Smith (2000) to minimize the population variance and to determine the amount of excavation needed to estimate population size with precision and accuracy in order to detect population trends. During a survey some mussels go undetected

because they are buried in the sediment. This survey design attempts to take into consideration the mussels found at the surface of the quadrat with the ones found in the excavation.

In combination with the quadrats, 100% searches were conducted along every other transect line (25 m X 0.5 m). Only DWM were counted and measured during the transect search. DWM found in a quadrat that was also located on a transect line was included in the quadrat and transect count.

Survey protocol conducted at Cornish Covered Bridge – south and Horseback Ridge was similar to past surveys when twenty-five meter length transects were set up 1 m apart, parallel to shore. The area between transects was visually searched for freshwater mussels using a mask and snorkel. Every mussel found along each transect line was counted and all of the DWM found, live or shell, were measured.

The survey at Cornish Covered Bridge – south was set up along the existing rebar markers that were placed during previous surveys downstream of the bridge (Fig. 2). The transects at the Horseback Ridge site were placed approximately 25 m upstream from a rock ledge outcropping (Fig. 3). Both sites were located on the New Hampshire side of the river.

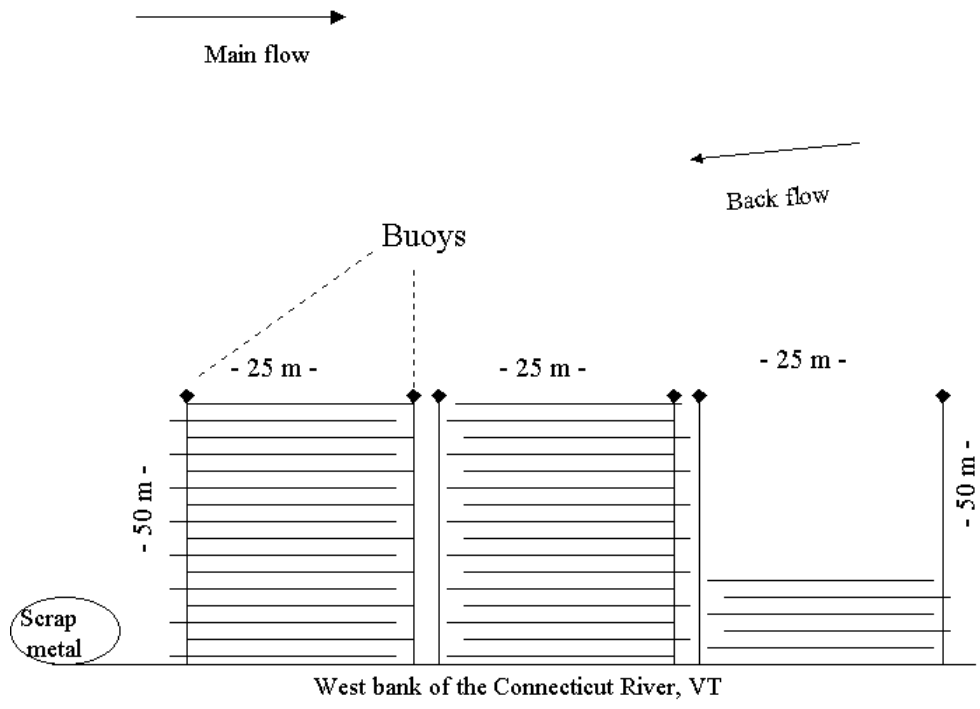


Fig. 1. Map showing study design for the Sumner Falls survey.

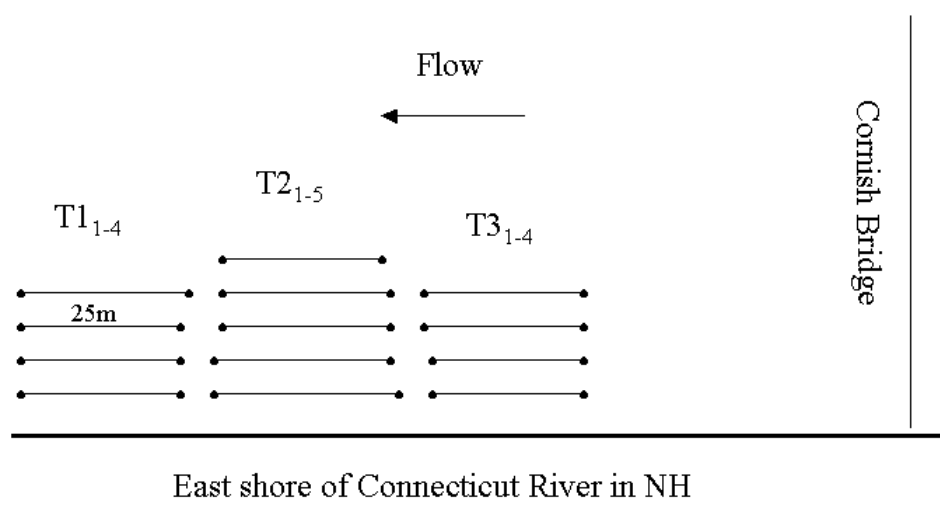


Fig. 2. Map showing study design for the Cornish Bridge – south survey.

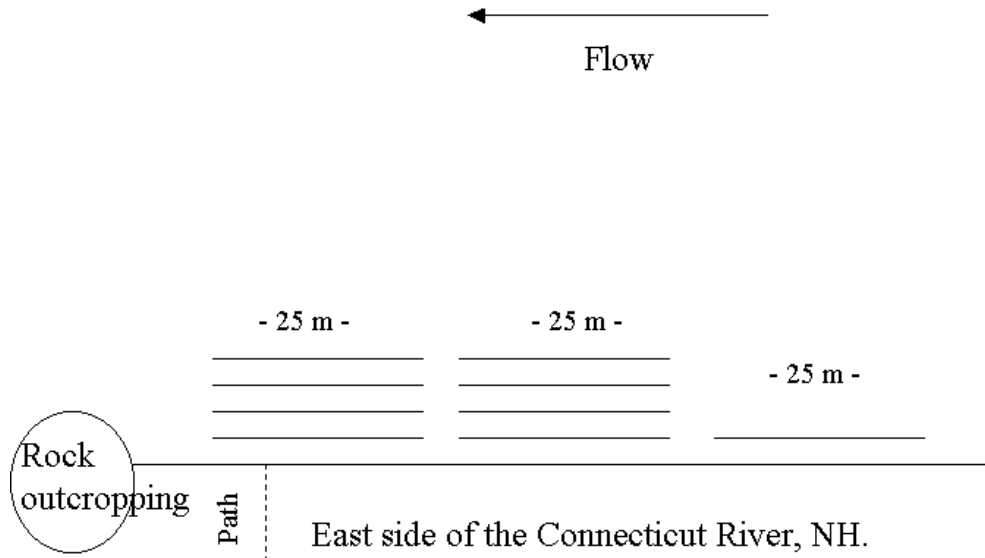


Fig. 3. Map showing study design for the Horseback Ridge survey.

Results

Sumner Falls- quadrats

A total of 192 quarter-meter square quadrats were surveyed, of which 92 were excavated. Only five live DWM were found in the quadrats resulting in a density of 0.026 DWM/0.25 m². No live DWM were found during the excavation portion of the survey (Table 1). Eastern *Elliptio* (*Elliptio complanata*) was the most abundant and the creeper (*Strophitus undulatus*) was the least abundant mussel found during the survey.

Table 1. Total number of live mussels and mussels density per/0.25 m² found during the Sumner Falls quadrat survey, Hartland, VT.

Mussel Species	Number found	Mussels/0.25 m ²
<i>Alasmidonta heterodon</i>	5	0.026
<i>Alasmidonta undulata</i>	3	0.016
<i>Elliptio complanata</i>	2229	11.60
<i>Lampsilis radiata</i>	131	0.68
<i>Strophitus undulatus</i>	1	0.005

Sumner Falls – transects

Approximately 300 m² area was searched during this survey. A total of 11 DWM (including three found during the quadrat survey along the transect line) were found after searching 24 transects for 17.25 hours (DWM/person-hour = 0.64)(Fig. 4). When the number of DWM found during the shallow water (snorkeling - DWM/person-hour = 0.30, n=5) survey was compared to the number of DWM found during the deepwater (diving - DWM/person-hour = 0.35, n=6) portion of the survey, the deepwater survey was slightly higher. The number of DWM/person-hour for this survey was the lowest detected in all of the past surveys even when the shallow water survey (snorkel) was compared to the past results (Fichtel 1991, Fichtel 1992, Fichtel 1993, Fichtel 1994, Gabriel and Fichtel 1995) (Fig. 4).

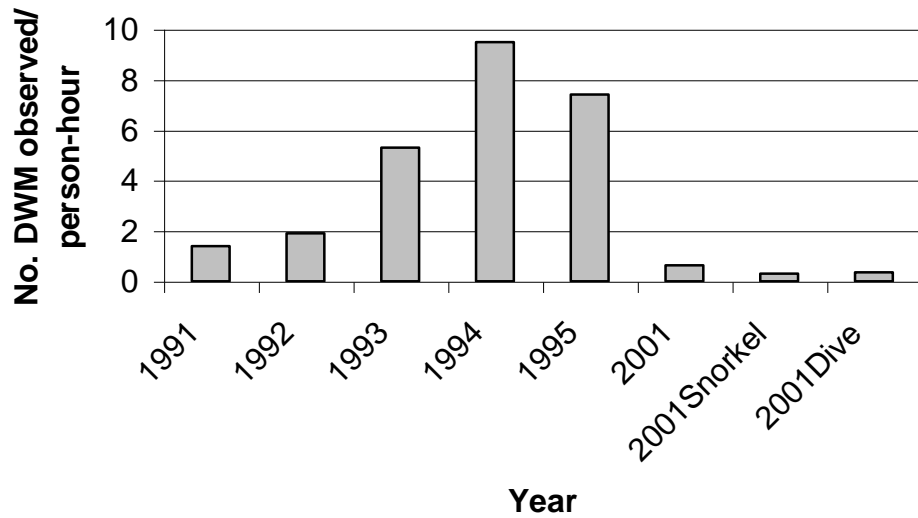


Fig. 4. DWM/person-hour reported during surveys conducted at Sumner Falls from 1991-1995 (Fichtel) and 2001 (snorkel + diving, snorkeling, and diving) for comparison.

DWM sizes ranged in length from 20.6 to 38.8 mm (Fig. 5). The size-class for the Sumner Falls site includes all DWM (live and shell) found in the quadrat and transect line survey. When length frequency was compared to past surveys, the 2001 survey had more lengths in the size class 30.0 –34.9 mm range, but the 1995 survey reported larger size classes (e.g., 40-49.9 mm), the 2001 survey lacked the larger size class.

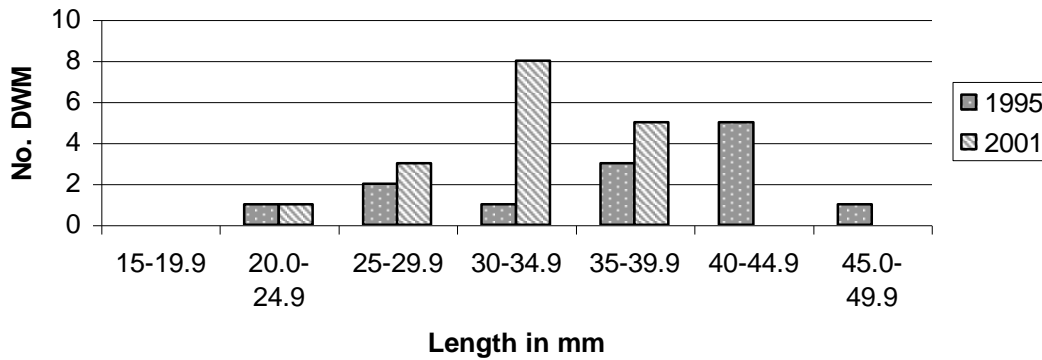


Fig. 5. Length frequency of DWM (live and shell) found at the Sumner Falls site during the transect survey in 2001 compared to 1995, Hartford, VT.

Cornish Covered Bridge – south

Approximately 325 m² area was covered during the survey. Four mussel species were found at the Cornish Covered Bridge site (Table 2). *Elliptio complanata* was the most abundant and triangle floater (*Alasmidonta undulata*) was the least abundant. A total of 27 DWM were found after three people searched 13 transects for 9 person-hours (DWM/person-hours = 3.0).

DWM (live and shell) sizes ranged from 19 to 42 mm (Fig. 6). The smaller size class (<15 mm) is lacking. A comparison of the length frequency reported in this survey to past surveys was not conducted because the length frequency information is lacking from past reports.

Table 2. Number of mussels found at the Cornish Bridge – south site Cornish, NH.

Mussel Species	Number found	No. observed/
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		person-hour
<i>Alasmidonta heterodon</i>	27	3
<i>Alasmidonta undulatus</i>	11	1.2
<i>Elliptio complanata</i>	1018	37.7
<i>Lampsilis radiata</i>	20	2.2

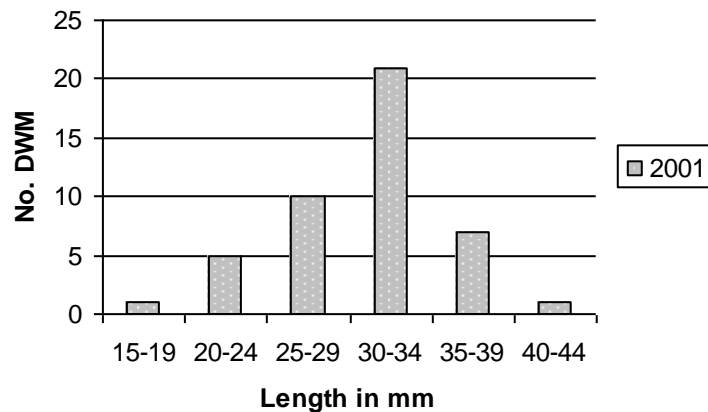


Fig. 6. Length frequency of the DWM (live and shell) found at the Cornish Covered Bridge - south site, Cornish, NH.

The DWM/person-hour detected during this survey (DWM/person-hour = 3.0) was slightly higher than the overall average DWM/person-hour of past surveys (Fichtel 1991 – 1994 and Gabriel and Fichtel 1995) (Fig. 7). The average number of DWM/person-hour was equal to 2, including the 1992 survey, and 2.5 DWM/person-hours, not including the 1992 survey.

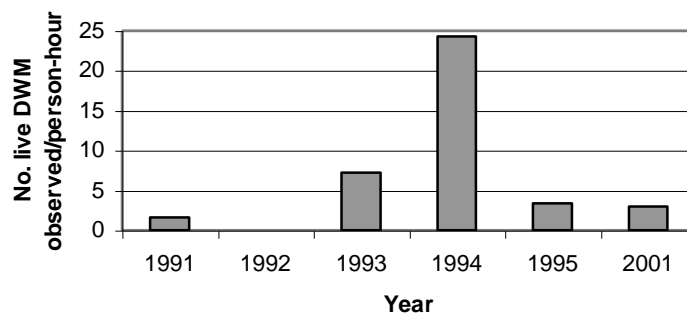


Fig. 7. DWM/person hour reported during surveys conducted at Cornish Covered Bridge-south from 1991-1995 (Fichtel) and 2001 for comparison.

Horseback Ridge

Approximately 225 m² was searched during this survey. Five mussel species were found at the Horseback Ridge site (Table 3). *Elliptio complanata* was the most abundant and *Alasmidonta undulatus* and *Strophitus undulatus* was the least abundant. A total of 28 DWM were found after two people searched 9 transects for 6 person-hours (DWM/person-hour = 4.7) (Table 3). The DWM/person-hour found during this survey was about the same when compared to the overall DWM/person-hour average from past surveys past surveys (DWM/person-hour average = 4.3) (Fichtel 1991 – 1994 and Gabriel and Fichtel 1995) (Fig. 8).

Table 3. Number of mussels found at the Horseback Ridge site Cornish, NH.

Mussel Species	Number found	No. observed/ person-hour
<i>Alasmidonta heterodon</i>	28	4.7
<i>Alasmidonta undulatus</i>	1	0.17
<i>Elliptio complanata</i>	743	123.8
<i>Lampsilis radiata</i>	49	8.20
<i>Strophitus undulatus</i>	2	0.30

DWM (live and shell) size ranged from 22 to 39 mm (Fig. 9). When compared to previous years (1993 and 1994), the 2001 survey lacks individuals in the larger class (> 40.0 mm) and small class (< 19.9 mm). The smaller size class (<15 mm) is lacking.

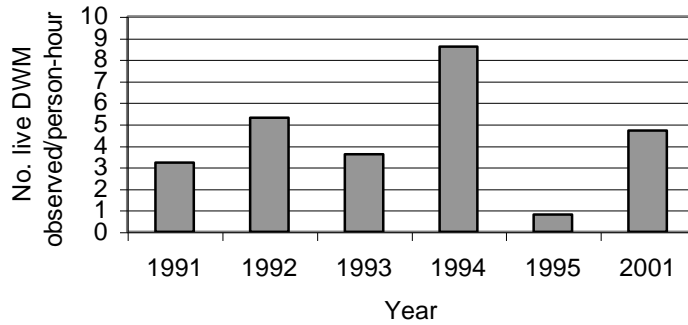


Fig. 8. DWM/person hour reported during surveys conducted at Horseback Ridge from 1991-1995 (Fichtel) and 2001 for comparison.

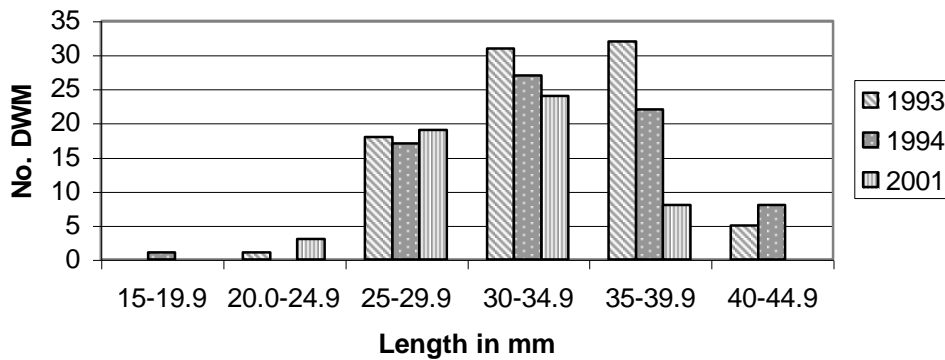


Fig. 9. Comparison of DWM (live and shell) lengths from surveys conducted in 1993 and 1994 at Horseback Ridge site.

Discussion and Future Work

The larger DWM size class (>39.9 mm) at Sumner Falls and Horseback Ridge sites appears to have decreased over time. This change in size class warrants close monitoring. A decrease in the larger size class indicates poor recruitment in the middle size classes. The reasons for this decline may be difficult to identify.

There is also a lack of the smaller size class (<15 mm) for all three sites in 2001 survey and past surveys. The absence of the smaller size class has been a common occurrence for many field researchers (Neves and Widlak 1987; Coker *et al.* 1921). Neves and Widlak (1987) attributed the lack of evidence of juvenile recruitment to insufficient sampling. Other researchers speculate the absence of the smaller size class is a result of decreased host fish availability or habitat changes (Weiss and Layzer 1995; Davenport and Warmuth 1965). The absence of the host fish is most likely not the reason for the absence of the smaller size class because tessellated darters (*Etheostoma olmstedi*), the host fish for the DWM, were observed at the survey sites, however they were not as common at the Sumner Falls site (Mickelson and Neves 1995).

The survey conducted at the Sumner Falls site was based on the sample design similar to the one outlined in Smith (2000). The quantitative sampling method was combined with quadrat excavation to reduce the variability in quadrat surveys and estimate population size with minimal error. Smith (2000) suggests monitoring mussel populations using quantitative surveys, however, populations with densities <0.4 m⁻² to be a costly and time-consuming endeavor under normal conditions. Unfortunately, the DWM population density calculated at the Sumner Falls site is 0.104 m⁻².

The Sumner Falls site is a difficult area to conduct surveys, especially deepwater surveys. Daily water surges caused by the Wilder Dam release upstream made the window of optimal survey conditions only a few hours. Once the water current increased, manipulating the equipment and diving was difficult and surveying was halted. If this site was to be monitored using quadrats, future surveys may want to consider using more than two divers and allowing several days to conduct the field work.

The overall DWM population trend appears to be steady at the Cornish Bridge – south and Horseback Ridge sites. Data collected at the Sumner Falls indicates a drop in the DWM population. The survey was not conducted under optimal conditions and warrants a resurvey in the near future when conditions are good. The survey method (searching transects) currently used at each of the sites may be adequate to detect major changes in the DWM population. However, the transect method fails to provide quantitative information and frequent surveys are needed to closely monitor the DWM population changes. Future surveys should continue to collect abundance information on the other mussel species during the survey in order to help monitor an overall population trend for all mussels in the area.

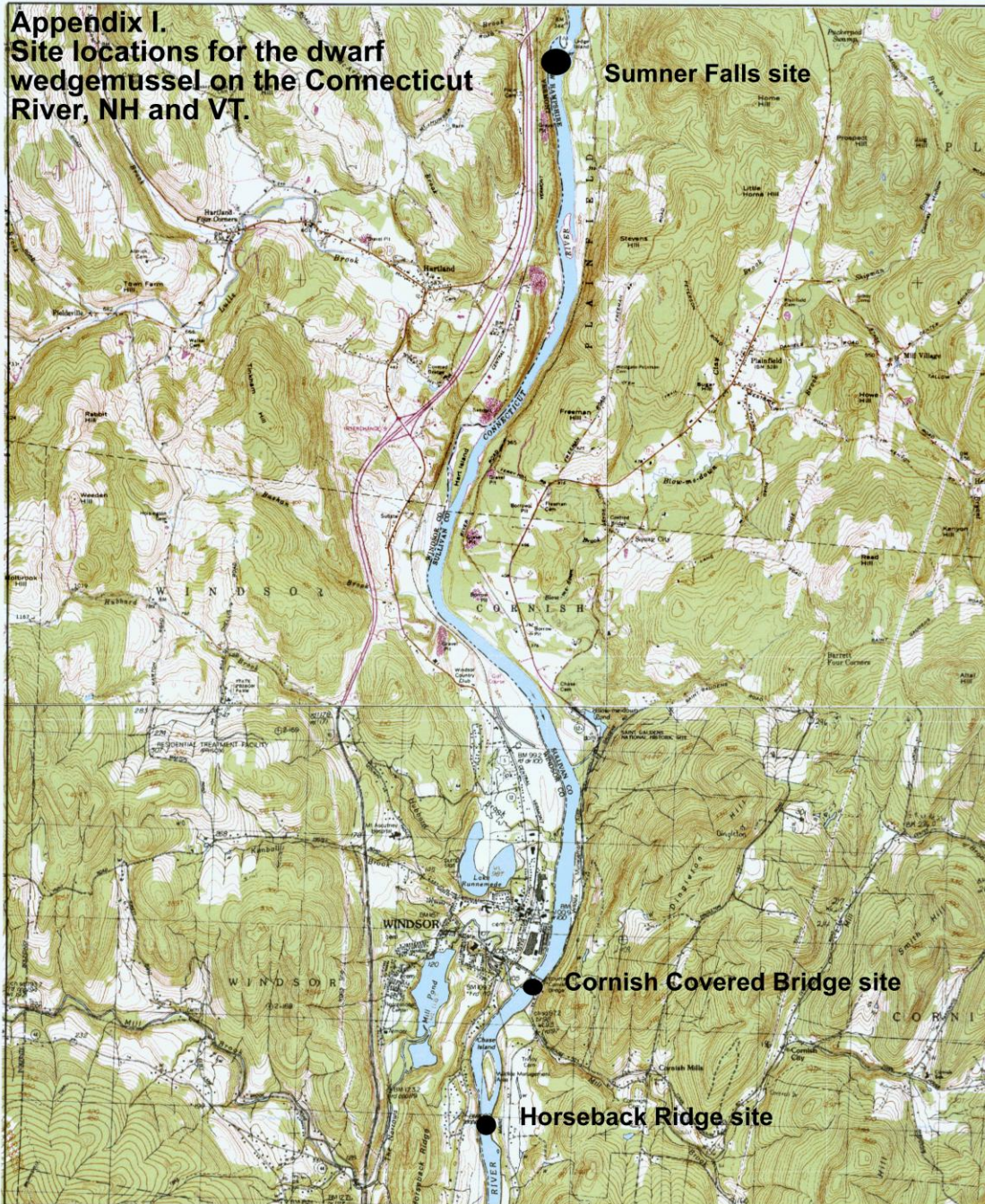
Quadrat surveys may not be the best way to monitor the DWM populations at any of the sites surveyed in this study if time and money was limited. The overall low DWM density at the three sites would require hundreds of quadrats to obtain the data needed to detect population changes. Quadrat surveys with excavation may also be difficult to conduct at the Cornish Bridge or Horseback Ridge sites because of the shallow water. Excavation could stir up the silt and reduce visibility during the survey. Before a quadrat survey is conducted at any of these sites currently being monitored, the estimated DWM density must be considered.

Acknowledgments

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Name: HARTLAND
Date: 12/12/2001
Scale: 1 inch equals 4444 feet

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