

# Mollusk Survey of the Tennessee River Near Watts Bar Nuclear Plant (Rhea County, Tennessee)

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Tennessee Valley Authority

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## **I. INTRODUCTION**

The Tennessee Valley Authority (TVA) is evaluating potential environmental impacts associated with renewing the operating licenses for Units 1 and 2 at its Watts Bar Nuclear Plant (WBN). TVA began construction on WBN in 1973, but Unit 1 did not begin full operation until 1996. Due to a predicted reduction in demand for power, TVA suspended the construction of Unit 2 in 1988. In 2007, the TVA board decided to reinstate construction of Unit 2, which is predicted to be completed by 2013.

WBN is located in Rhea County, Tennessee. It is adjacent to the Chickamauga Reservoir near Tennessee River Mile (TRM) 528 on the right descending bank, approximately two river miles below Watts Bar Dam. WBN is operated in closed cycle mode, using one of the two cooling towers for heat dissipation. Blowdown from the cooling towers is discharged through multi-port diffusers located in the main river channel at TRM 527.8. Makeup water and other raw water requirements of the facility are obtained from the intake pumping station at TRM 528. The WBN Supplemental Condenser Cooling Water (SCCW) system became operational in July 1999. The SCCW system withdraws water from the intake structure located immediately upstream of Watts Bar Dam at TRM 529.9, which formerly served Watts Bar Fossil Plant. The temperature of the water in the SCCW system reduces the temperature of the Unit 1 condenser flow when mixed within the Unit 2 Cooling Tower Basin, which enhances the performance of the steam cycle. Water from the SCCW system is discharged through the old Watts Bar Fossil Plant discharge structure located on the Tennessee River approximately TRM 529.1, which is 1.1 miles upstream of the nuclear plant intake.

The purpose of this study is to evaluate the current status of mussels (Family: Unionidae), snails, and their habitat at three long-term

monitoring sites near WBN. An additional sampling location was also surveyed to determine the efficacy of an experimental boulder field for enhancing mussel habitat within areas affected by releases from Watts Bar Dam (Figure 1, page 2).

TVA contracted Third Rock Consultants, LLC (Third Rock) to conduct a survey to characterize mussels, snails, and their habitat along the project area. Third Rock coordinated with Mainstream Commercial Divers to conduct the dive effort. Dr. Monte McGregor served as malacologist.

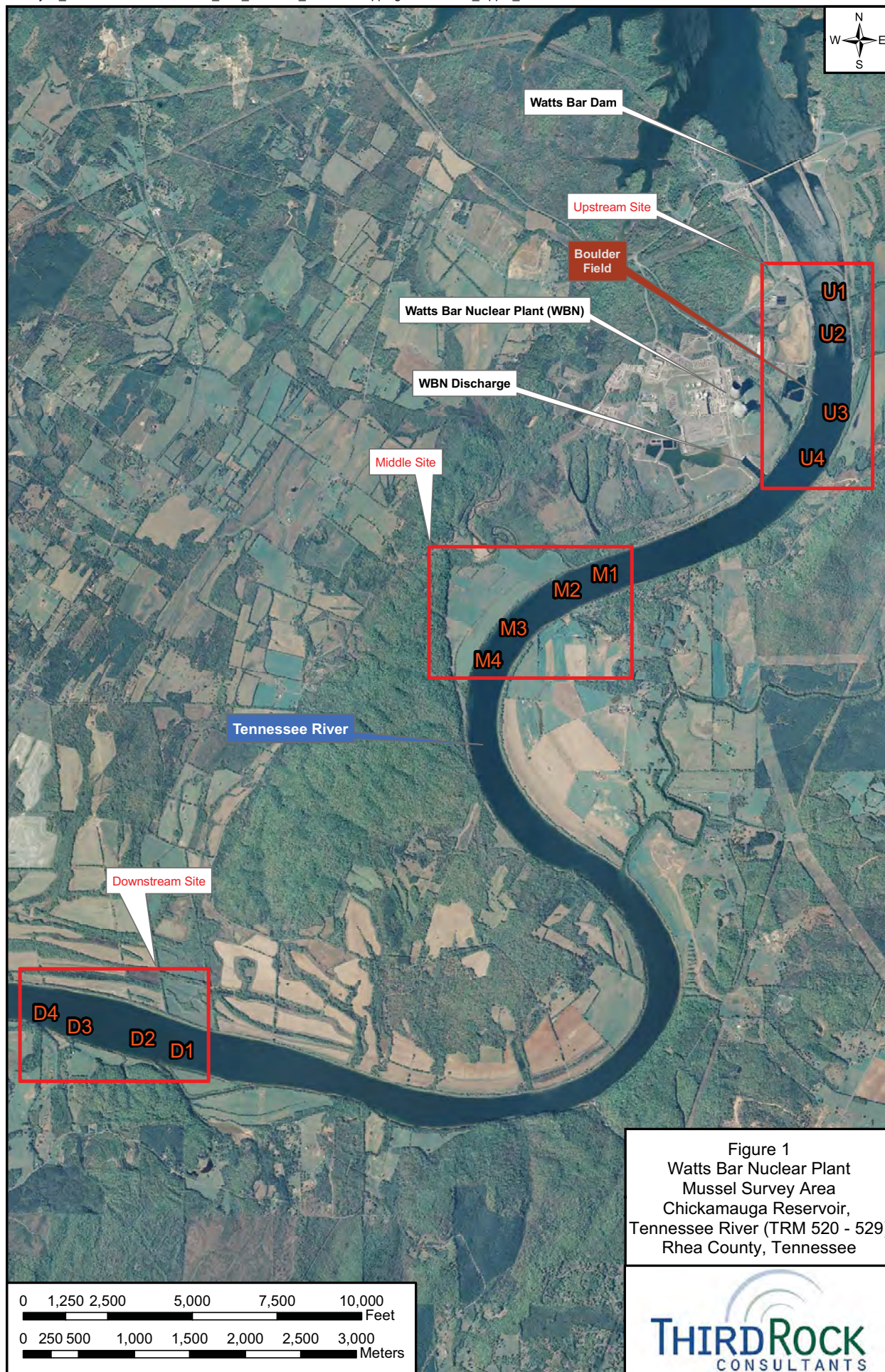
## **II. SITE DESCRIPTION**

### **A. Mollusk Sampling Sites**

Three reaches of the Tennessee River in the vicinity of WBN were surveyed using semi-quantitative and quantitative sampling methods similar to those used in past monitoring efforts to facilitate collection of comparable mussel and habitat data (Figure 1, page 2) including additional characterization of the snail community. The Upstream Site (TRM 528-529L) is located on the opposite side of the river and upstream from WBN. The Middle Site (TRM 526-527R) is located on the same side of the river as WBN and immediately downstream from the mouth of Yellow Creek and WBN discharges. The Downstream Site (TRM 520-521L) is located six river miles downstream and on the opposite side of the river from WBN. All three sites are along the inside edge of the navigation channel (near the overbank) in water approximately 3 to 7 meters (approximately 10 to 20 feet) deep.

Each of the three sites consisted of four sampling locations (transects) resulting in a total of 12 transects. At each location, a 100-meter long sampling transect (lines weighted to the riverbed), marked at 10 meter intervals, was anchored perpendicular to the bank and was used as a sampling guide by divers. Semi-quantitative samples were taken along each 10-





meter interval and quantitative samples were taken at the end of each 10-meter interval, resulting in 120 semi-quantitative and 120 quantitative samples. GPS coordinates (Tennessee State Plane, NAD1983) of the transect endpoints and any other notable features were recorded.

#### **B. Boulder Field Site**

Additional sampling was conducted within a man-made boulder field at approximately TRM 529.5. The Boulder Site is an experimental site where boulders were placed in the river to reduce riverbed substrate movement with the anticipation of improving habitat for mussels and fostering habitat suitable for reproduction (Figure 1, page 2).

### **III. MUSSEL AND HABITAT SURVEY METHODS**

*Semi-quantitative Sampling:* A total of 120 semi-quantitative samples were collected during the survey (40 per site). Four 100-meter long sampling transects were placed at historic collection locations in the three different sampling reaches (Upstream, Middle, and Downstream) (Ahlstedt 1991; Fraley *et al.* 2002). Divers collected all mussels (live and dead) and snails within 10 square-meter sample areas (1 meter wide by 10 meters long) along one side of each transect for a total sample area of 100 square meters per transect. Each 10 square meter area was exhaustively searched by the diver. A minimum of five minutes search time was spent per increment to ensure complete and thorough coverage, except where consistently poor habitat (e.g., bedrock or deep silt) was encountered. Actual time spent per sample was recorded to facilitate catch per hour calculations in conjunction with estimates of mussel and snail densities. The diver used visual and tactual (disturbing the substrate by hand) search methods, placing all live and dead mussels into a mesh collection bag that was retrieved and processed in the boat. The mesh size of the

collection bag was 6 millimeters. Small juveniles and snails encountered during the survey were placed in a bag with a mesh size of 3 millimeters.

*Quantitative Sampling:* Quantitative samples were collected at the end of each 10-meter transect, resulting in 40 quantitative samples per site. For quantitative samples, the diver excavated a whole-substrate sample from a 0.5-meter by 0.5-meter (0.25 square meter) quadrat. Samples were excavated to a depth of 10 to 15 centimeters, and material was placed into a 19-liter (5 gallon) bucket. Samples were sent to the boat for processing. Quantitative samples were processed by sieving the sample material through a series of nested sieves, with the smallest mesh size being no larger than 3 millimeters. Quantitative samples were collected at the end of each 10-meter increment on the opposite side of the transect line from where the semi-quantitative sample was collected.

*Boulder Sampling Site:* In 2000, an experimental effort to enhance native mussel habitat by providing refuge from high flow events resulting from dam discharges an artificial boulder field was created approximately 1 mile downstream of Watts Bar Dam. Specifically, the site was located along the right descending margin of the navigation channel between the loading facility at Watts Bar Fossil Plant and the intake structure for Watts Bar Nuclear Plant. Limestone boulders measuring at least 2 to 4 feet in any dimension were placed in six rows of 10 boulders each in an area covering approximately 70 by 100 feet (Fraley *et al.* 2002). Mussels were then stocked in three experimental plots, four corners of which were delineated with steel bars (= rebar). During the 2010 survey, an attempt was made to relocate those plots to determine the effectiveness of the boulders to enhance mussel habitat.



*Sample Processing:* A qualified malacologist with valid state and federal collecting permits identified and counted all live mussels and snails. Copies of current federal and state collecting permits to collect mussels were provided to the TVA Project Biologist prior to the survey (e.g., with the cost estimate) and were in-hand while on site. The onsite malacologist was responsible for ensuring proper handling of mussel and snail resources, accurate and complete collection of data, and adherence to the TVA work plan. All live unionid mussels (or up to 50 individuals of each common species if densities were high) were measured (length in whole millimeters) and aged (external annuli count) to document recruitment and age/size profiles of each population. An effort was made to measure and age all individuals within quantitative samples, with individuals from qualitative samples having lower priority if some individuals were omitted. Sex of sexually dimorphic species was recorded along with reproductive state (gravid/non-gravid) of female mussels if possible. Length, height, age, and digital image (with size reference) were recorded for all live individuals of federally listed species. *Dreissena polymorpha* (zebra mussel) infestation rates (e.g., percent coverage of shell) were noted for live unionid mussels. Snails collected during the survey were quantified, but not measured.

During processing, live mussels were kept wet and cool within mesh collection bags submerged in the river, and out-of-water time during processing was less than five minutes. Exposure to extreme temperature changes was avoided. All mussels from quantitative samples were processed via screening the contents of the bucket through a series of stacked sieves (12 millimeter and 6 millimeter mesh sizes). Contents were rinsed with river water and all live mussels were handpicked from the screens. Non-listed mussel species were carefully returned to the river from the water surface (boat) along each transect in the general area from

which they were collected. All federally listed mussels collected were returned by hand to the location from which they were collected. No live individuals of federally listed mussels were harmed or removed from the site. Digital images of each representative species encountered during the survey were recorded. No live individuals were harmed or removed from the site.

Dead unionids (shells only) were scored as either freshly dead (with or without soft tissues, nacre lustrous, valves typically intact, periostracum worn; animal probably dead less than one year), weathered dead (no soft tissues, nacre very dull or chalky, valves may or may not be intact, periostracum worn; animal probably dead more than one year), or relic (portion of a shell and/or extremely worn and chalky, valves not intact, little or no periostracum; animal dead from many years to many decades). Only freshly dead shells were quantified to provide an estimate of recent mortality at the time of the study.

*Habitat:* Within the location of each quantitative sample, depth and relative proportion of each substrate particle size (Wentworth Scale) were characterized. The substrate assessment accounted for all substrate within the sample (not just the surface) and was visually estimated by the diver. Depth was measured using a pneumophathometer attached to the diver lying flat on the riverbed. Water velocity and water chemistry (temperature, dissolved oxygen, pH, conductivity, and turbidity) were measured within 0.5 meter of the water surface and near the substrate surface at the upstream and downstream end of each site. GPS coordinates of these locations were recorded. Digital images of the site were recorded. In addition, all aquatic snails collected by all sampling techniques were identified and enumerated.

#### IV. RESULTS

The field survey was conducted between September 28 and 30, 2010. For all sampling methods combined, a total of 907 live unionid mussels (mean density = 1.19 mussels/m<sup>2</sup>, s<sup>2</sup> (variation) = 1.01; CPUE = 86.12; s<sup>2</sup> = 44.47) representing 17 species were recorded during the survey (Table 1, page 6). One federally endangered species, *Lampsilis abrupta*, was collected in the first transect of the Middle Site (M1). Additionally, a federal candidate species, *Plethobasus cyphus*, was found in the second transect of the Middle Site (M2) (Exhibit 3, page 18). Both individuals were measured for length, width and thickness, photographed, and returned by hand to the same 10-meter segment from which they were collected. Fingernail clam (*Musculium transversum*) and Asian clam (*Corbicula fluminea*) were also observed during the mussel survey but were not quantified. Also encountered during the survey (all methods combined) were 503 live snails (mean density = 3.32 mussels/m<sup>2</sup>, s<sup>2</sup> = 4.8; CPUE = 29.45, s<sup>2</sup> = 28.0) representing two species.

*Semi-Quantitative Sampling:* A total of 120, 10 square meter semi-quantitative samples were collected during the survey, resulting in the collection of 852 mussels. *Elliptio crassidens*, *Pleurobema cordatum*, *Cyclonaias tuberculata*, and *Quadrula pustulosa* accounted for over 90 percent of all live mussels collected over all three reaches. *E. crassidens* was the most commonly collected mussel in all three reaches. The *Pleurobema cordatum* was the second-most commonly collected mussel at the Upstream Site and Middle Site while the *Cyclonaias tuberculata* was the second-most abundant mussel in the Downstream Site.

Densities and catch per unit effort (CPUE) observed during the semi-quantitative search throughout the project area averaged 0.71 mussels/square meter. Mean CPUE was 86 mussels per hour. Semi-quantitative densities

ranged from 0 to 3.7 mussels/square meter and 0 to 396 mussels per hour, respectively (Table 2, pages 7 through 11). Total mussels and mean density observed per site are as follows: Upstream Site, 175 mussels (mean density = 0.44 mussels/square meter [m<sup>2</sup>], s<sup>2</sup> = 0.10); Middle Site, 341 mussels (mean density = 0.85 mussels/m<sup>2</sup>, s<sup>2</sup> = 0.16); Downstream Site, 336 mussels (mean density = 0.84 mussels/m<sup>2</sup>, s<sup>2</sup> = 0.28). When examining mussel abundance for each 10 meter transect across the Upstream, Middle, and Downstream Sites mussels were relatively evenly distributed along most transects, though trends were apparent along some transects (Table 2, pages 7 through 11). At Upstream Sites U2 and U3 mussels were more abundant between 5 and 55 meters, while sites M1 and M3 at the Middle Sites exhibited higher densities from 55 to 105 meters. At Downstream Site D3 abundance peaked from 35 to 74 meters and again from 95 to 105 meters, while at D4 mussel abundance was highest from 75 to 105 meters (Exhibits 1, 3, and 5, pages 16, 18, and 20; Tables 2 and 3, pages 7 through 15). A detailed spreadsheet of all survey results and GPS coordinates for all sampling locations are located in Appendices A and B, respectively. A photo log of representative mussels for each species is contained in Appendix C. A total of 312 snails representing two species – *Pleurocera canaliculata* and *Viviparus georgianus* – were collected from semi-quantitative samples. Total snails and mean density observed per site were as follows: Upstream Site, 128 snails (mean density = 0.32 snails/m<sup>2</sup>, s<sup>2</sup> = 0.04), Middle Site, 173 snails (mean density = 0.43 snails/m<sup>2</sup>, s<sup>2</sup> = 0.06), Downstream Site, 11 snails (mean density = 0.03 snails/m<sup>2</sup>, s<sup>2</sup> = 0.0).

**TABLE 1 – MUSSEL RESULTS SUMMARY**

Species Name	Common Name	All Sites Combined		Upstream Site		Middle Site		Downstream Site		Boulder Field Site	
MUSSELS		Total	Relative Abundance*	Total	Relative Abundance*	Total	Relative Abundance*	Total	Relative Abundance*	Total	Relative Abundance*
<i>Elliptio crassidens</i>	Elephant Ear	534	58.88	115	62.84	172	47.12	247	69.77	0	0.00
<i>Pleurobema cordatum</i>	Ohio Pigtoe	125	13.78	35	19.13	73	20.00	17	4.80	0	0.00
<i>Cyclonaias tuberculata</i>	Purple Wartyback	84	9.26	13	7.10	21	5.75	49	13.84	1	20.00
<i>Quadrula pustulosa</i>	Pimpleback	75	8.27	7	3.83	51	13.97	16	4.52	1	20.00
<i>Potamilus alatus</i>	Pink Heelsplitter	32	3.53	3	1.64	15	4.11	13	3.67	1	20.00
<i>Ellipsaria lineolata</i>	Butterfly	27	2.98	1	0.55	20	5.48	6	1.69	0	0.00
<i>Obliquaria reflexa</i>	Threehorn Wartyback	12	1.32	4	2.19	5	1.37	1	0.28	2	40.00
<i>Leptodea fragilis</i>	Fragile Papershell	5	0.55	2	1.09	1	0.27	2	0.56	0	0.00
<i>Quadrula metanevra</i>	Monkeyface	3	0.33	0	0.00	1	0.27	2	0.56	0	0.00
<i>Amblema plicata</i>	Threeridge	2	0.22	1	0.55	1	0.27	0	0.00	0	0.00
<i>Elliptio dilatata</i>	Spike	2	0.22	1	0.55	1	0.27	0	0.00	0	0.00
<i>Lampsilis abrupta</i>	Pink Mucket	1	0.11	0	0.00	1	0.27	0	0.00	0	0.00
<i>Megalanaia nervosa</i>	Washboard	1	0.11	0	0.00	1	0.27	0	0.00	0	0.00
<i>Plethobasus cyphus</i>	Sheepnose	1	0.11	0	0.00	1	0.27	0	0.00	0	0.00
<i>Fusconaia subrotunda</i>	Longsolid	1	0.11	0	0.00	0	0.00	1	0.28	0	0.00
<i>Pyganodon grandis</i>	Giant Floater	1	0.11	1	0.55	0	0.00	0	0.00	0	0.00
<i>Utterbackia imbecillis</i>	Paper Pondshell	1	0.11	0	0.00	1	0.27	0	0.00	0	0.00
<b>TOTAL MUSSELS</b>		907		183		365		354		5	
<b>SNAILS</b>											
<i>Viviparus georgianus</i>	Banded Mysterysnail	355	70.58	96	45.71	256	93.43	2	12.50	1	33.33
<i>Pleurocera canaliculata</i>	Silty Hornsnail	148	29.42	114	54.29	18	6.57	14	87.50	2	66.67
<b>TOTAL SNAILS</b>		503		210		274		16		3	
*Percent of total mussels/snails											



**TABLE 2 – SEMI-QUANTITATIVE SURVEY RESULTS**

Site Details				SPECIES															Totals, Densities, CPUE										
				MUSSELS																							SNAILS		
Site/ transect	Sample (distance from bank in meters)	Effort (min)	Method	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Elliptio dillitata</i>	<i>Lampsilis abrupta</i>	<i>Leptodea fragilis</i>	<i>Megalonaias nervosa</i>	<i>Obliquaria reflexa</i>	<i>Plethobasus cyphus</i>	<i>Pleurobema cordatum</i>	<i>Fusconaia subrotunda</i>	<i>Potamilus alatus</i>	<i>Pyganodon grandis</i>	<i>Quadrula metanevra</i>	<i>Quadrula pustulosa</i>	<i>Utterbackia imbecillis</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (mussels/sq m)	CPUE (Mussels/hour)	TOTAL Snails	Density (Snails/sq m)	CPUE (Snails/hour)	
U1	5-15	5	SQ													1							1	0.1	12	0	0	0	
	15-25	5	SQ				2																7	2	0.2	24	7	0.7	84
	25-35	5	SQ				1					1										2	1	2	0.2	24	3	0.3	36
	35-45	8	SQ																			5	1	0	0	6	0.6	45	
	45-55	9	SQ				1							1								2		2	0.2	13	2	0.2	13
	55-65	3	SQ											1										1	0.1	20	0	0	0
	65-75	6	SQ				1																1	0.1	10	0	0	0	
	75-85	6	SQ																				2	0	0	2	0.2	20	
	85-95	6	SQ				2																1	2	0.2	20	1	0.1	10
	95-105	7	SQ							1												2	4	1	0.1	9	6	0.6	51
U1 Total	5-105	60				7			1		1		2		1						11	16	12	0.12	12	27	0.27	27	
U2	5-15	7	SQ	1			25							10					1				37	3.7	317	0	0	0	
	15-25	4	SQ		1		3														2	2	4	0.4	60	4	0.4	60	
	25-35	7	SQ		1		12							1							4	4	14	1.4	120	8	0.8	69	
	35-45	7	SQ				2	1						1							6		4	0.4	34	6	0.6	51	
	45-55	6	SQ				1							1							1	1	2	0.2	20	2	0.2	20	
	55-65	6	SQ																		1	1	0	0	0	2	0.2	20	
	65-75	4	SQ				1																1	0.1	15	0	0	0	
	75-85	3	SQ														1						1	0.1	20	0	0	0	
	85-95	7	SQ									1		1							1	4	2	0.2	17	5	0.5	43	
	95-105	5	SQ													1						7	1	0.1	12	7	0.7	84	
U2 Total	5-105	56		1	2		44	1				1		14		1	1		1		15	19	66	0.66	71	34	0.34	36	
U3	5-15	6	SQ				13							1						1		2	15	1.5	150	2	0.2	20	
	15-25	7	SQ		3		7							2		1						1	13	1.3	111	1	0.1	9	
	25-35	5	SQ				7							3									10	1	120	0	0	0	
	35-45	5	SQ		1	1	5							2					2				11	1.1	132	0	0	0	
	45-55	6	SQ				8							2					1		2		11	1.1	110	2	0.2	20	
	55-65	6	SQ		2		2							2							1	2	6	0.6	60	3	0.3	30	
	65-75	3.5	SQ				2							1							1		3	0.3	51	1	0.1	17	
	75-85	6	SQ				1							4							1		5	0.5	50	1	0.1	10	
	85-95	5	SQ																				0	0	0	0	0	0	
	95-105	4	SQ											1									1	0.1	15	0	0	0	
U3 Total	5-105	54			6	1	45							18		1			4		5	5	75	0.75	84	10	0.1	11	

**TABLE 2 – SEMI-QUANTITATIVE SURVEY RESULTS, CONTINUED**

Site Details				SPECIES																		Totals, Densities, CPUE							
				MUSSELS																SNAILS									
Site/ transect	Sample (distance from bank in meters)	Effort (min)	Method	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Elliptio dilitata</i>	<i>Lampsilis abrupta</i>	<i>Leptodea fragilis</i>	<i>Megalonaias nervosa</i>	<i>Obliquaria reflexa</i>	<i>Plethobasus cyphus</i>	<i>Pleurobema cordatum</i>	<i>Fusconaia subrotunda</i>	<i>Potamilus alatus</i>	<i>Pyganodon grandis</i>	<i>Quadrula metanevra</i>	<i>Quadrula pustulosa</i>	<i>Utterbackia imbecillis</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (mussels/sq m)	CPUE (Mussels/hour)	TOTAL Snails	Density (Snails/sq m)	CPUE (Snails/hour)	
U4	5-15	6	SQ		3		5															1	6	8	0.8	80	7	0.7	70
	15-25	5	SQ																			4	6	0	0	0	10	1	120
	25-35	6	SQ				1													1		1	1	2	0.2	20	2	0.2	20
	35-45	5.5	SQ																			1	1	0	0	0	2	0.2	22
	45-55	6	SQ				3															5	2	3	0.3	30	7	0.7	70
	55-65	6	SQ				1															1		1	0.1	10	1	0.1	10
	65-75	5	SQ				2															3	4	2	0.2	24	7	0.7	84
	75-85	5	SQ		1																	10		1	0.1	12	10	1	120
	85-95	5.5	SQ				2								1							5		3	0.3	33	5	0.5	55
	95-105	6	SQ				2															4	2	2	0.2	20	6	0.6	60
U4 Total	5-105	56			4		16							1					1		35	22	22	0.22	24	57	0.57	61	
M1	5-15	5	SQ																					0	0	0	0	0	0
	15-25	5	SQ																					0	0	0	0	0	0
	25-35	5	SQ		1		1												2					4	0.4	48	0	0	0
	35-45	6	SQ			1	1		1										1		1	1	4	0.4	40	2	0.2	20	
	45-55	5	SQ				5																	5	0.5	60	0	0	0
	55-65	4	SQ				3															1	5	3	0.3	45	6	0.6	90
	65-75	6	SQ				3									1			1			1	5	0.5	50	1	0.1	10	
	75-85	5	SQ				5												1			5	6	0.6	72	5	0.5	60	
	85-95	5	SQ		1		5															6	6	0.6	72	6	0.6	72	
	95-105	5	SQ				2															1	7	2	0.2	24	8	0.8	96
M1 Total	5-105	51			2	1	25		1							1			5		3	25	35	0.35	41	28	0.28	33	
M2	5-15	5	SQ																					0	0	0	0	0	0
	15-25	5	SQ				3				1					2						2	6	0.6	72	2	0.2	24	
	25-35	6	SQ			1	5	1						8					1		1	2	16	1.6	160	3	0.3	30	
	35-45	5	SQ		1		5					1	2	1				2				1	12	1.2	144	1	0.1	12	
	45-55	6	SQ		1		9						3						6			7	19	1.9	190	7	0.7	70	
	55-65	5	SQ				2					1	2					1	6			3	12	1.2	144	3	0.3	36	
	65-75	5	SQ		2		2						1										5	0.5	60	0	0	0	
	75-85	5	SQ				4												1			2	5	0.5	60	2	0.2	24	
	85-95	5	SQ				1									1							2	0.2	24	0	0	0	
	95-105	5	SQ																			2	0	0	0	2	0.2	24	
M2 Total	5-105	52			4	1	31	1			1	2	1	15		4		1	16		1	19	77	0.77	89	20	0.2	23	

**TABLE 2 – SEMI-QUANTITATIVE SURVEY RESULTS, CONTINUED**

Site Details				SPECIES														Totals, Densities, CPUE											
				MUSSELS																				SNAILS					
Site/ transect	Sample (distance from bank in meters)	Effort (min)	Method	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Elliptio dilatata</i>	<i>Lampsilis abrupta</i>	<i>Leptodea fragilis</i>	<i>Megalonaias nervosa</i>	<i>Obliquaria reflexa</i>	<i>Plethobasus cyphus</i>	<i>Pleurobema cordatum</i>	<i>Fusconaia subrotunda</i>	<i>Potamilus alatus</i>	<i>Pyganodon grandis</i>	<i>Quadrula metanevra</i>	<i>Quadrula pustulosa</i>	<i>Utterbackia imbecillis</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (mussels/sq m)	CPUE (Mussels/hour)	TOTAL Snails	Density (Snails/sq m)	CPUE (Snails/hour)	
M3	5-15	5	SQ				1									2							4	3	0.3	36	4	0.4	48
	15-25	5	SQ	1	1	1	6							2					2			2	13	1.3	156	2	0.2	24	
	25-35	5	SQ			1	3							1	1				1			5	7	0.7	84	5	0.5	60	
	35-45	5	SQ				9									1			1			1	11	1.1	132	1	0.1	12	
	45-55	5	SQ		2	4	9							2	2				1			2	20	2	240	2	0.2	24	
	55-65	5	SQ		4	1	22			1				5							1	9	33	3.3	396	10	1	120	
	65-75	5	SQ				9							6	1				1	1		10	18	1.8	216	10	1	120	
	75-85	5	SQ				3							5								7	8	0.8	96	7	0.7	84	
	85-95	5	SQ		2	2	4														2	10	8	0.8	96	12	1.2	144	
	95-105	5	SQ		1		5								2							23	8	0.8	96	23	2.3	276	
M3 Total	5-105	50		1	10	9	71			1				23	7				6	1	3	73	129	1.29	155	76	0.76	91	
M4	5-15	5	SQ				5									1			1			6	7	0.7	84	6	0.6	72	
	15-25	5	SQ		1		8							3								3	12	1.2	144	3	0.3	36	
	25-35	5	SQ				5							7					2			5	14	1.4	168	5	0.5	60	
	35-45	5	SQ			1	2												2			1	5	0.5	60	1	0.1	12	
	45-55	6	SQ				1																1	0.1	10	0	0	0	
	55-65	5	SQ		1		10							4	1				3			6	19	1.9	228	6	0.6	72	
	65-75	6	SQ			1								7							2	4	8	0.8	80	6	0.6	60	
	75-85	5	SQ		2	3	3							3					2		2	6	13	1.3	156	8	0.8	96	
	85-95	5	SQ			1	4							7								3	12	1.2	144	3	0.3	36	
	95-105	5	SQ			3	2							4								11	9	0.9	108	11	1.1	132	
M4 Total	5-105	52			4	9	40							35	2				10		4	45	100	1	115	49	0.49	57	
D1	5-15	5	SQ		1		1					1							3				6	0.6	72	0	0	0	
	15-25	5	SQ		1	2	9							1									13	1.3	156	0	0	0	
	25-35	5	SQ		1		11																12	1.2	144	0	0	0	
	35-45	5	SQ		1		9									1							11	1.1	132	0	0	0	
	45-55	5	SQ				4							1							3	5	0.5	60	3	0.3	36		
	55-65	5	SQ		2		8														1	10	1	120	1	0.1	12		
	65-75	5	SQ		2		9												1			12	1.2	144	0	0	0		
	75-85	5	SQ		1		10															11	1.1	132	0	0	0		
	85-95	5	SQ		2		8												2			12	1.2	144	0	0	0		
	95-105	5	SQ			1	10							2								13	1.3	156	0	0	0		
D1 Total	5-105	50			11	3	79					1		4	1				6		4	105	1.05	126	4	0.04	5		

**TABLE 2 – SEMI-QUANTITATIVE SURVEY RESULTS, CONTINUED**

Site Details				SPECIES																Totals, Densities, CPUE					
				MUSSELS														SNAILS							
				Amblema plicata	Cyclonaias tuberculata	Ellipsaria lineolata	Elliptio crassidens	Elliptio dilitata	Lampsilis abrupta	Leptodea fragilis	Megalonaias nervosa	Obliquaria reflexa	Plethobasus cyphus	Pleurobema cordatum	Fusconaia subrotunda	Potamilus alatus	Pyganodon grandis	Quadrula metanevra	Quadrula pustulosa						
Site/ transect	Sample (distance from bank in meters)	Effort (min)	Method																	TOTAL Mussels	Density (mussels/sq m)	CPUE (Mussels/hour)	TOTAL Snails	Density (Snails/sq m)	CPUE (Snails/hour)
D2	5-15	5	SQ											1						1	0.1	12	0	0	0
	15-25	5	SQ				6							1			1			8	0.8	96	0	0	0
	25-35	5	SQ		1		7						1							9	0.9	108	0	0	0
	35-45	5	SQ				1													1	0.1	12	0	0	0
	45-55	5	SQ		2	1	5						1							9	0.9	108	0	0	0
	55-65	4	SQ		2		6													8	0.8	120	0	0	0
	65-75	5	SQ				9													9	0.9	108	0	0	0
	75-85	5	SQ		1		7						2							10	1	120	0	0	0
	85-95	5	SQ		1		8													9	0.9	108	0	0	0
	95-105	5	SQ				9							1		1	1			12	1.2	144	0	0	0
D2 Total	5-105	49			7	1	58						3	1	3		1	2		76	0.76	93	0	0	0
D3	5-15	4	SQ				2													2	0.2	30	0	0	0
	15-25	4	SQ				2											3		2	0.2	30	3	0.3	45
	25-35	4	SQ		1		6						1		1					9	0.9	135	0	0	0
	35-45	4	SQ		5	1	7													13	1.3	195	0	0	0
	45-55	5	SQ		5		6						2		1		1			15	1.5	180	0	0	0
	55-65	5	SQ		4	1	7										1			13	1.3	156	0	0	0
	65-75	5	SQ		2		10													12	1.2	144	0	0	0
	75-85	5	SQ		1		4						1							6	0.6	72	0	0	0
	85-95	5	SQ		3		3													6	0.6	72	0	0	0
	95-105	5	SQ		5		20			1			1		1		1			29	2.9	348	0	0	0
D3 Total	5-105	46			26	2	67			1			5		3		1	2		3	1.07	140	3	0.03	4
D4	5-15	2	SQ																	0	0	0	0	0	0
	15-25	2	SQ																	0	0	0	0	0	0
	25-35	3	SQ				2													2	0.2	40	0	0	0
	35-45	3	SQ		1		1						2							4	0.4	80	0	0	0
	45-55	5	SQ				1													1	0.1	12	0	0	0
	55-65	4	SQ				3													3	0.3	45	0	0	0
	65-75	3	SQ				2											1		2	0.2	40	1	0.1	20
	75-85	4	SQ				11						1					1		12	1.2	180	1	0.1	15
	85-95	5	SQ		4		6						1					1		11	1.1	132	1	0.1	12
	95-105	4	SQ				12						1					1		13	1.3	195	1	0.1	15
D4 Total	5-105	35	SQ		5		38						5					2	2	48	0.48	82	4	0.04	7

**TABLE 2 – SEMI-QUANTITATIVE SURVEY RESULTS, CONTINUED**

Site Details				SPECIES																			Totals, Densities, CPUE							
				MUSSELS																	SNAILS									
Site/ transect	Sample (distance from bank in meters)	Effort (min)	Method	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Eliipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Elliptio dilitata</i>	<i>Lampsilis abrupta</i>	<i>Leptodea fragilis</i>	<i>Megaloniaias nervosa</i>	<i>Obliquaria reflexa</i>	<i>Plethobasus cyphus</i>	<i>Pleurobema cordatum</i>	<i>Fusconaia subrotunda</i>	<i>Potamilus alatus</i>	<i>Pyganodon grandis</i>	<i>Quadrula metanevra</i>	<i>Quadrula pustulosa</i>	<i>Utterbackia imbecilis</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (mussels/sq m)	CPUE (Mussels/hour)	TOTAL Snails	Density (Snails/sq m)	CPUE (Snails/hour)		
Upstream Site				1	12	1	112	1	0	1	0	2	0	35	0	3	1	0	6	0	66	62	175	0.44 (SD 0.31)	47	128	0.32 (SD 0.19)	34		
Middle Site				1	20	20	167	1	1	1	1	2	1	73	0	14	0	1	37	1	11	162	341	0.85 (SD 0.40)	100	173	0.44 (SD 0.25)	51		
Downstream Site				0	49	6	242	0	0	1	0	1	0	17	1	7	0	2	10	0	9	2	336	0.84 (SD 0.28)	112	11	0.03 (SD 0.02)	4		
All Sites				2	81	27	521	2	1	3	1	5	1	125	1	24	1	3	53	1	86	226	852	0.71	86	312	0.26	29		

**TABLE 3 – QUANTITATIVE SURVEY RESULTS**

Site Details		Species											Totals, Densities		
Site	Sample (distance from bank in meters)	Mussels										Snails	Density (Mussels/sq m)	Total Snails	Density (Snails/sq m)
		<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Leptodea fragilis</i>	<i>Obliquaria reflexa</i>	<i>Pleurobema cordatum</i>	<i>Potamilus alatus</i>	<i>Quadrula pustulosa</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels		
U1	15												0	0	0.00
	25											2	0	2	8.00
	35										2	1	0	3	12.00
	45										4	1	0	5	20.00
	55										2		0	2	8.00
	65												0	0	0.00
	75					1							1	0	0.00
	85											2	0	2	8.00
	95											1	0	1	4.00
	105										2	4	0	6	24.00
U1 Total		0	0	0	0	1	0	0	0	0	10	11	1	21	8.40



**TABLE 3 – QUANTITATIVE SURVEY RESULTS, CONTINUED**

Site Details		Species											Totals, Densities			
		Mussels										Snails				
Site	Sample (distance from bank in meters)	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Leptodea fragilis</i>	<i>Obliquaria reflexa</i>	<i>Pleurobema cordatum</i>	<i>Potamilus alatus</i>	<i>Quadrula pustulosa</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (Mussels/sq m)	Total Snails	Density (Snails/sq m)
U2	15															
	25				1		1				2	2	2	8.00	4	16.00
	35										4	4	0	0.00	8	32.00
	45										6		0	0.00	6	24.00
	55										1	1	0	0.00	2	8.00
	65										1	1	0	0.00	2	8.00
	75												0	0.00	0	0.00
	85						1						1	4.00	0	0.00
	95										1	4	0	0.00	5	20.00
	105											2	0	0.00	2	8.00
U2 Total		0	0	0	1	0	2	0	0	0	15	14	3	1.33	29	12.89
U3	15											2	0	0.00	2	8.00
	25											1	0	0.00	1	4.00
	35												0	0.00	0	0.00
	45												0	0.00	0	0.00
	55										2		0	0.00	2	8.00
	65		1								1	2	1	4.00	3	12.00
	75										1		0	0.00	1	4.00
	85										1		0	0.00	1	4.00
	95												0	0.00	0	0.00
	105												0	0.00	0	0.00
U3 Total		0	1	0	0	0	0	0	0	0	5	5	1	0.40	10	4.00
U4	15										1		0	0.00	1	4.00
	25										2		0	0.00	2	8.00
	35									1	1	1	1	4.00	2	8.00
	45										1		0	0.00	1	4.00
	55										2	2	0	0.00	4	16.00
	65												0	0.00	0	0.00
	75				2						2	1	2	8.00	3	12.00
	85										6		0	0.00	6	24.00
	95										2		0	0.00	2	8.00
	105										1		0	0.00	1	4.00
U4 Total		0	0	0	2	0	0	0	0	1	18	4	3	1.20	22	8.80

**TABLE 3 – QUANTITATIVE SURVEY RESULTS, CONTINUED**

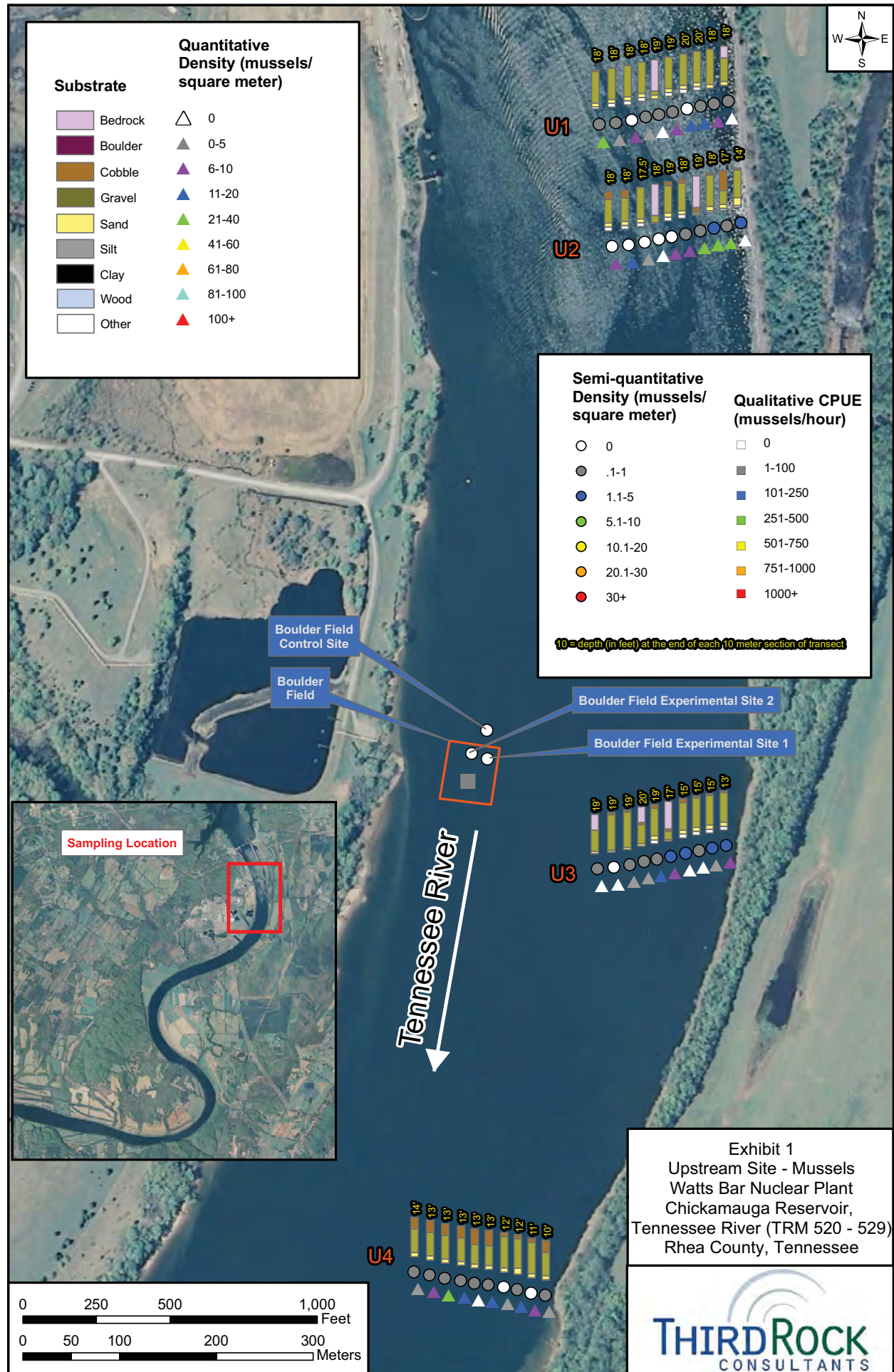
Site Details		Species											Totals, Densities			
		Mussels										Snails				
Site	Sample (distance from bank in meters)	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Leptodea fragilis</i>	<i>Obliquaria reflexa</i>	<i>Pleurobema cordatum</i>	<i>Potamilus alatus</i>	<i>Quadrula pustulosa</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (Mussels/sq m)	Total Snails	Density (Snails/sq m)
M1	5										1	5	0	0.00	6	24.00
	15												0	0.00	0	0.00
	25												0	0.00	0	0.00
	35									2			2	8.00	0	0.00
	45										1		0	0.00	1	4.00
	55												0	0.00	0	0.00
	75											1	0	0.00	1	4.00
	85									1		1	1	4.00	1	4.00
	95											5	0	0.00	5	20.00
	105										1	5	0	0.00	6	24.00
M1 Total		0	0	0	0	0	0	0	0	3	3	17	3	1.20	20	8.00
M2	15												0	0.00	0	0.00
	25											1	0	0.00	1	4.00
	35								1		1	2	1	4.00	3	12.00
	45											1	0	0.00	1	4.00
	55											2	0	0.00	2	8.00
	65									1		3	1	4.00	3	12.00
	75												0	0.00	0	0.00
	85											2	0	0.00	2	8.00
	95												0	0.00	0	0.00
	105											2	0	0.00	2	8.00
M2 Total		0	0	0	0	0	0	0	1	1	1	13	2	0.80	14	5.60
M3	15									1		4	1	4.00	4	16.00
	25											2	0	0.00	2	8.00
	35									1		5	1	4.00	5	20.00
	45									1		1	1	4.00	1	4.00
	55									1		2	1	4.00	2	8.00
	65										1	8	0	0.00	9	36.00
	75											4	0	0.00	4	16.00
	85											4	0	0.00	4	16.00
	95						1			1		4	2	8.00	4	16.00
	105						1			1		3	2	8.00	3	12.00
M3 Total		0	0	0	0	0	2	0	0	6	1	37	8	3.20	38	15.20

**TABLE 3 – QUANTITATIVE SURVEY RESULTS, CONTINUED**

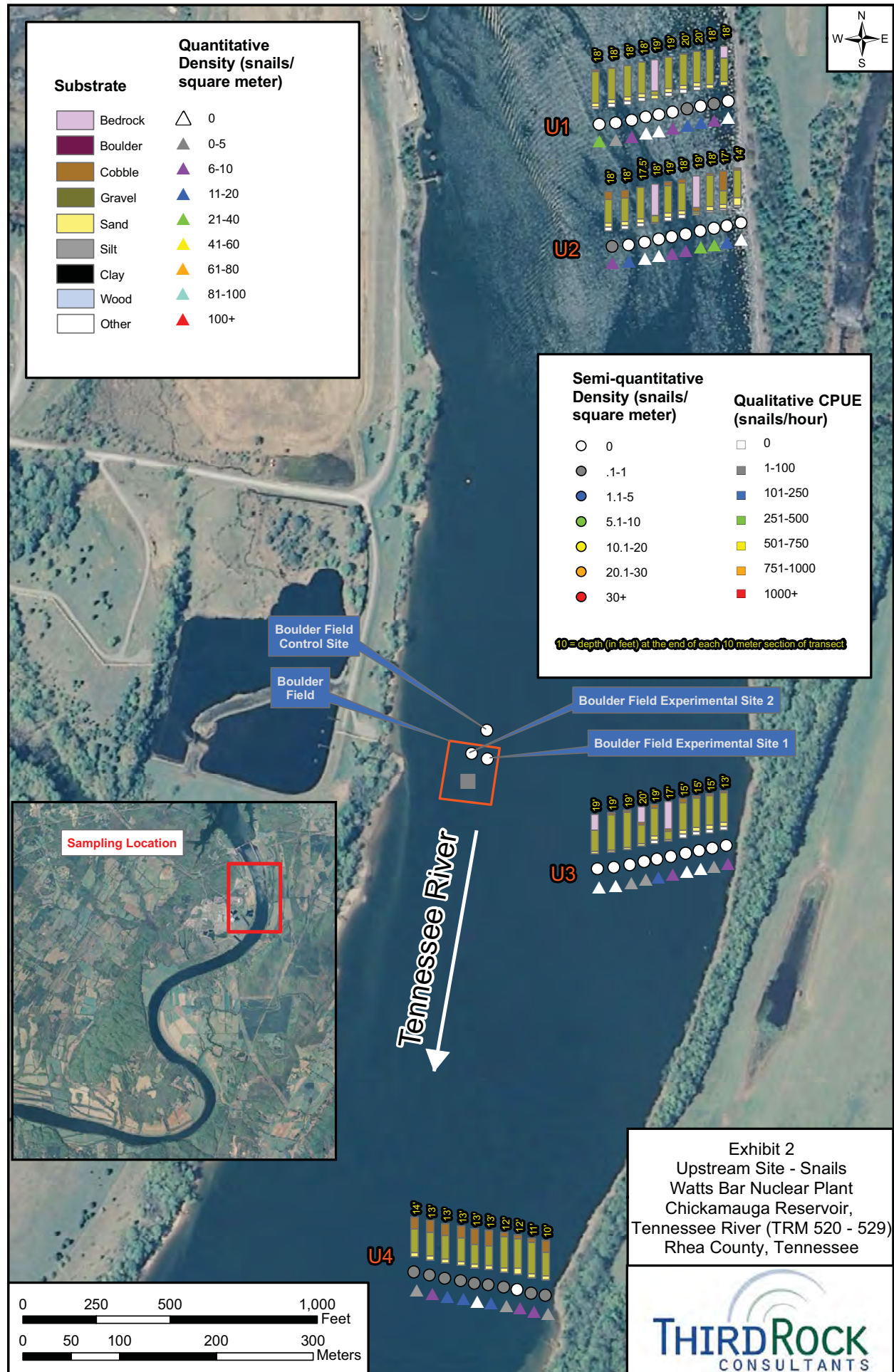
Site Details		Species											Totals, Densities			
		Mussels										Snails				
Site	Sample (distance from bank in meters)	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Leptodea fragilis</i>	<i>Obliquaria reflexa</i>	<i>Pleurobema cordatum</i>	<i>Potamilus alatus</i>	<i>Quadrula pustulosa</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (Mussels/sq m)	Total Snails	Density (Snails/sq m)
M4	15				2							5	2	8.00	5	20.00
	25									1		3	1	4.00	3	12.00
	35				1					1		5	2	8.00	5	20.00
	45									1		1	1	4.00	1	4.00
	55												0	0.00	0	0.00
	65				1					1		4	2	8.00	4	16.00
	75						1					3	1	4.00	3	12.00
	85										2	1	0	0.00	3	12.00
	95		1									3	1	4.00	3	12.00
	105				1							2	1	4.00	2	8.00
M4 Total		0	1	0	5	0	1	0	0	4	2	27	11	4.40	29	11.60
D1	20												0	0.00	0	0.00
	30									1			1	4.00	0	0.00
	40									1			1	4.00	0	0.00
	50												0	0.00	0	0.00
	60												0	0.00	0	0.00
	70										1		0	0.00	1	4.00
	80												0	0.00	0	0.00
	90												0	0.00	0	0.00
	100												0	0.00	0	0.00
	110												0	0.00	0	0.00
D1 Total		0	0	0	0	0	0	0	0	2	1	0	2	0.80	1	0.40
D2	15												0	0.00	0	0.00
	25									1			1	4.00	0	0.00
	35				1					1			2	8.00	0	0.00
	45												0	0.00	0	0.00
	55				1								1	4.00	0	0.00
	65				1					1			2	8.00	0	0.00
	75												0	0.00	0	0.00
	85								1				1	4.00	0	0.00
	95												0	0.00	0	0.00
	105												0	0.00	0	0.00
D2 Total		0	0	0	3	0	0	0	1	3	0	0	7	2.80	0	0.00

**TABLE 3 – QUANTITATIVE SURVEY RESULTS, CONTINUED**

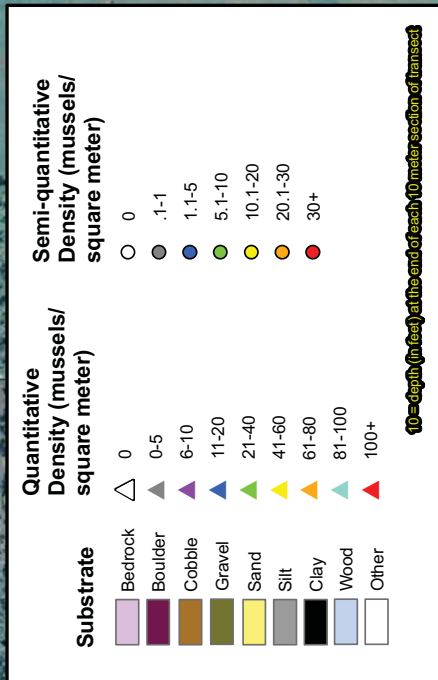
Site Details		Species										Totals, Densities				
		Mussels														Snails
Site	Sample (distance from bank in meters)	<i>Amblema plicata</i>	<i>Cyclonaias tuberculata</i>	<i>Ellipsaria lineolata</i>	<i>Elliptio crassidens</i>	<i>Leptodea fragilis</i>	<i>Obliquaria reflexa</i>	<i>Pleurobema cordatum</i>	<i>Potamilus alatus</i>	<i>Quadrula pustulosa</i>	<i>Pleurocera canaliculata</i>	<i>Viviparus georgianus</i>	TOTAL Mussels	Density (Mussels/sq m)	Total Snails	Density (Snails/sq m)
D3	15				1								1	4.00	0	0.00
	25										3		0	0.00	3	12.00
	35												0	0.00	0	0.00
	45												0	0.00	0	0.00
	55												0	0.00	0	0.00
	65												0	0.00	0	0.00
	75								1				1	4.00	0	0.00
	85								2				2	8.00	0	0.00
	95												0	0.00	0	0.00
	105												0	0.00	0	0.00
D3 Total		0	0	0	1	0	0	0	3	0	3	0	4	1.60	3	1.20
D4	15												0	0.00	0	0.00
	25												0	0.00	0	0.00
	35												0	0.00	0	0.00
	45					1							1	4.00	0	0.00
	55												0	0.00	0	0.00
	65												0	0.00	0	0.00
	75				1						1		1	4.00	1	4.00
	85								2	1			3	12.00	0	0.00
	95												0	0.00	0	0.00
	105												0	0.00	0	0.00
D4 Total		0	0	0	1	1	0	0	2	1	1	0	5	2.00	1	0.40
Upstream Site		0	1	0	3	1	2	0	0	1	48	34	8	0.8 (SD 0.50)	82	8.2 (SD 3.63)
Middle Site		0	1	0	5	0	3	0	1	14	7	94	24	2.4 (SD 1.70)	101	10.1 (SD 4.20)
Downstream Site		0	0	0	5	1	0	0	6	6	5	0	18	1.8 (SD 0.83)	5	0.5 (SD 0.50)
All Sites		0	2	0	13	2	5	0	7	21	60	128	50	1.7 (SD 0.81)	188	6.3 (SD 5.01)









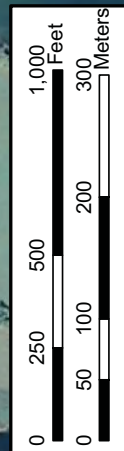


Tennessee River



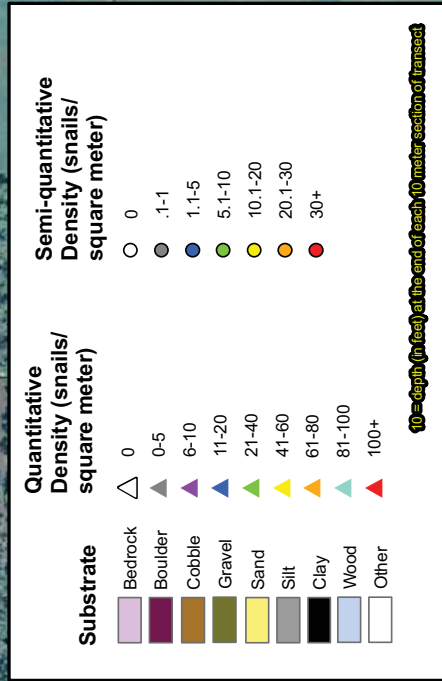
Sampling Location

Exhibit 3  
Middle Site - Mussels  
Watts Bar Nuclear Plant  
Chickamauga Reservoir,  
Tennessee River (TRM 520 - 529)  
Rhea County, Tennessee

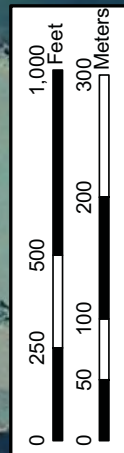


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Tennessee River



#### Exhibit 4

Middle Site - Snails  
Watts Bar Nuclear Plant  
Chickamauga Reservoir,  
Tennessee River (TRM 520 - 529)  
Rhea County, Tennessee







**Substrate**

- Bedrock
- Boulder
- Cobble
- Gravel
- Sand
- Silt
- Clay
- Wood
- Other

**Quantitative Density (mussels/square meter)**

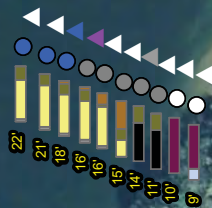
- 0
- 0-5
- 6-10
- 11-20
- 21-40
- 41-60
- 61-80
- 81-100
- 100+

**Semi-quantitative Density (mussels/square meter)**

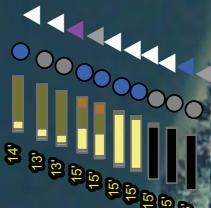
- 0
- .1-1
- 1.1-5
- 5.1-10
- 10.1-20
- 20.1-30
- 30+

Tennessee River

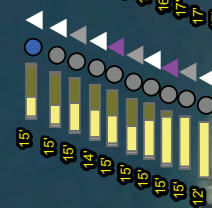
D4



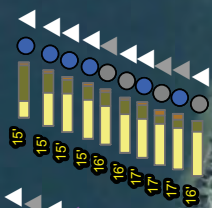
D3



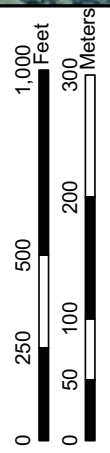
D2



D1



Sampling Location

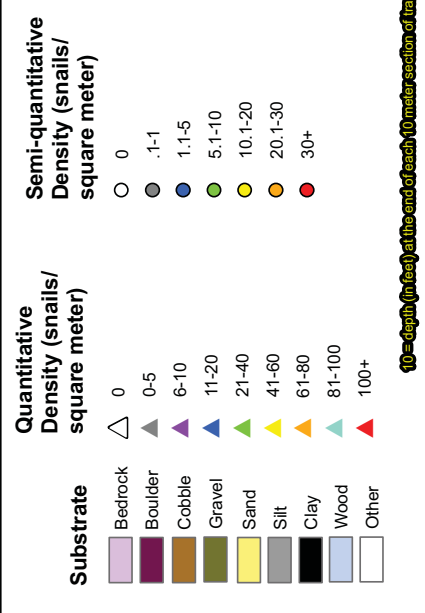


### Exhibit 5

Downstream Site - Mussels  
Watts Bar Nuclear Plant  
Chickamauga Reservoir,  
Tennessee River (TRM 520 - 529)  
Rhea County, Tennessee







Tennessee River

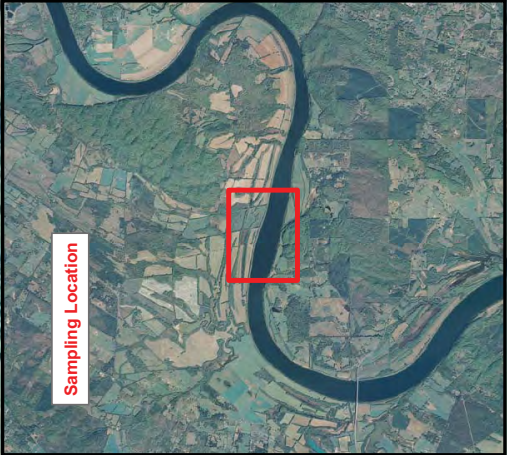
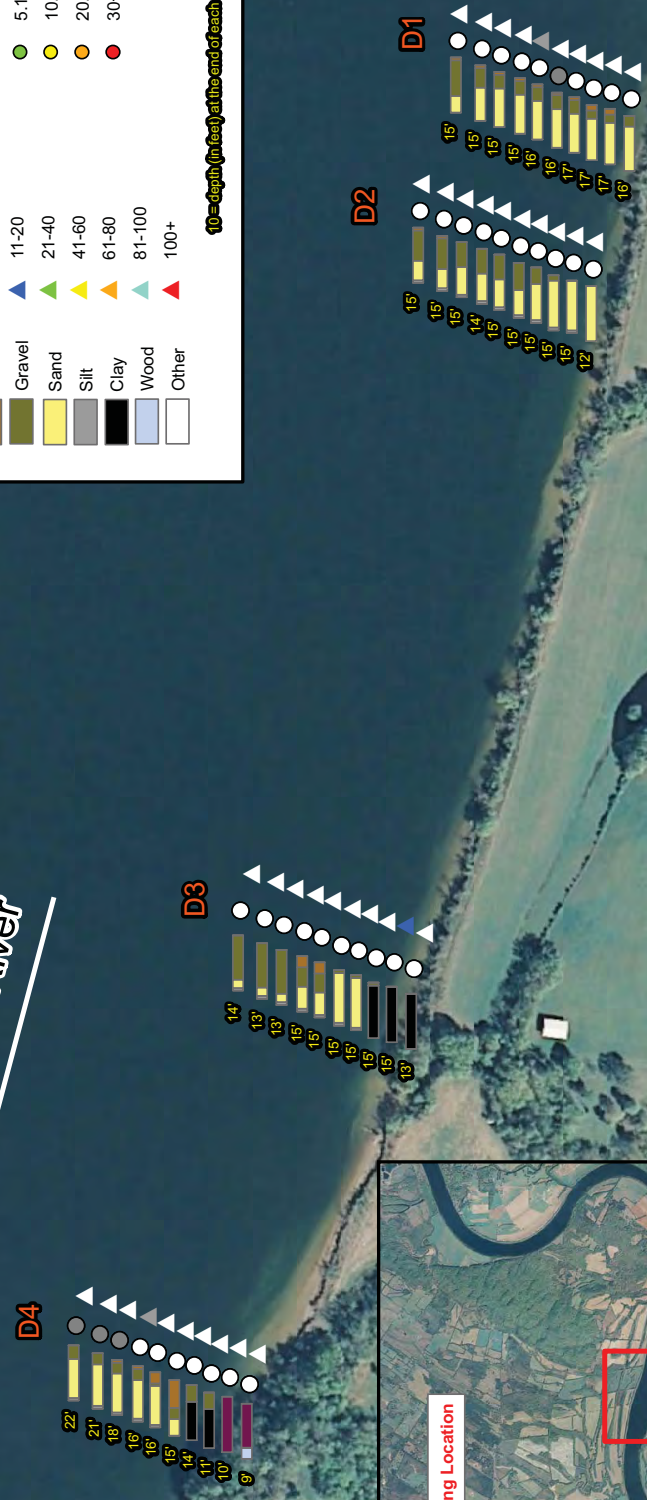


Exhibit 6  
Downstream Site - Snails  
Watts Bar Nuclear Plant  
Chickamauga Reservoir,  
Tennessee River (TRM 520 - 529)  
Rhea County, Tennessee





**Quantitative Sampling:** A total of 120, 0.25 square meter quantitative samples were collected from the three sites. Quantitative samples resulted in the collection of 50 live mussels representing six species. The two most commonly occurring species were *Q. pustulosa* and *E. crassidens*, which is similar to the results of the semi-quantitative sampling. The average mussel densities from a 100-meter transect using quantitative sampling ranged from 0.4 to 4.4 mussels/square meter with an average of 1.7 mussels/transect (Table 3, pages 11 through 15). Total mussels and mean density observed per site were as follows: Upstream Site, 8 mussels (mean density = 0.8 mussels/m<sup>2</sup>, s<sup>2</sup> = 0.21); Middle Site, 24 mussels (mean density = 2.4 mussels/m<sup>2</sup>, s<sup>2</sup> = 2.88); Downstream Site, 18 mussels (mean density = 1.8 mussels/m<sup>2</sup>, s<sup>2</sup> = 0.69).

Quantitative sampling resulted in the identification of 188 snails representing two species. Total snails and mean density observed per site are as follows: Upstream Site, 82 snails (mean density = 8.2 snails/m<sup>2</sup>, s<sup>2</sup> = 9.87); Middle Site, 101 snails (mean density = 10.1 snails/m<sup>2</sup>, s<sup>2</sup> = 17.64); Downstream Site, 18 snails (mean density = 0.5 snails/m<sup>2</sup>, s<sup>2</sup> = 0.25). Sand was the most abundant substrate at the Downstream (49 percent) and Middle Site (61 percent), with gravel comprising another 28 percent and 23 percent, respectively. Gravel accounted for 64 percent of the Upstream Site. Cobble was present in varying degrees at all three sites, silt only at the Downstream and Middle Site, and bedrock only at the Middle and Upstream Site. Boulder, clay, and wood were also found at the Downstream Site. Little variation in substrate was observed at the Upstream and Middle Site; however, at the Downstream Site the abundance of sand was limited to D1 and D2. Clay (at transects D3 and D4) and boulder (at D4) accounted for an increased proportion of the substrate.

Average depth was similar at the Upstream and Downstream Sites, 16.4 feet (SD 2.9) and 15 feet (SD 2.3), respectively. At the Middle Site, average depth was 20.3 (SD 4.1). Within sites, trends were similar with depths typically gradually increasing from near the bank to the channel.

Water chemistry (as measured with a Hydrolab turbidity meter) was relatively similar at each site, though several trends were noticed (Table 4, page 24). DO gradually increased from upstream to downstream, starting at U1 with 4.49 mg/L and ending at D4 with 7.1 mg/L, while spC gradually decreased from 186.6 µS at U1 to 180.7 µS at D4. Also, pH levels were generally higher at the Middle and Downstream sites. Turbidity was 0.0 throughout the project area.

While many weathered dead and relic shells were encountered, fresh dead shells were relatively few. Of the 907 live mussels recorded during the survey only 61 fresh dead mussels were encountered, yielding an estimated recent mortality rate of 6.3 percent. The fresh dead mussels were represented by the six most commonly encountered mussels *E. crassidens*, *P. cordatum*, *C. tuberculata*, *Q. pustulosa*, *P. alatus*, and *E. lineolata*. No *Dreissena polymorpha* were encountered during the survey, though *Corbicula fluminea* (Asian clams) were observed.

On average, the length of mussels collected in quantitative samples (47.9 millimeters) was nearly half that of mussels collected in semi-quantitative samples (98.1 millimeters), which characterizes the bias of semi-quantitative samples to miss smaller and completely buried mussels. Recruitment does appear to be occurring within the project area for some species. A total of 28 of the 907 individuals collected were estimated to be three years of age or younger. These young individuals represented only 4 of the 17 observed species: *Leptodea fragilis*, *Obliquaria reflexa*, *Potamilus*

*alatus*, and *Utterbackia imbilicis*. Though snail lengths were not measured, various size classes were observed for both snail species. A summary of age and length for each species is represented in Table 5, page 24.

*Experimental Boulder Field:* A total of three sites (two historic, one control) were sampled in or near the experimental boulder field. During the survey, only two historic sampling stations were re-located within the boulder field. Sampling stations within the boulder field were determined by the presence of pieces of concrete embedded with steel rods (re-bar) driven into the river bottom. Divers were unable to re-locate all four pieces of re-bar that were originally placed to delineate boulder field sampling stations. Sampling was conducted in these areas since no other areas with re-bar were located. A “control” site upstream of the survey area was also surveyed (Exhibits 1 and 2, pages 16 and 17). While the last several quantitative samples were being processed on the boat, a 20-minute qualitative search was conducted through the boulder field to determine if any live mussels were present. Quantitative sampling at three locations according to the boulder field sampling protocol failed to yield any mussels (mean density = 0.0 mussels/m<sup>2</sup>, s<sup>2</sup> = 0.0). The 20-minute qualitative sampling yielded a total of five live mussels (CPUE = 15 mussels/hour) and three snails (CPUE = 9 snails/hour) (Table 1, page 6; Exhibits 1 and 2, pages 16 and 17).

**TABLE 4 – WATER CHEMISTRY**

Date	Location	Depth	Temp (°C)	DO (mg/l)	pH	spC (µS)	Turbidity (NTU)
9/28/2010	U1	Surface	23.9	4.49	7.36	186.6	0
9/28/2010	U1	Bottom	23.9	4.5	7.54	185.8	0
9/29/2010	U4	Surface	23.87	5.59	7.43	183.7	0
9/29/2010	U4	Bottom	23.92	5.51	7.68	183.4	0
9/29/2010	M1	Surface	23.94	6.45	8.24	182.3	0
9/29/2010	M1	Bottom	23.8	5.7	8.11	182.9	0
9/29/2010	M4	Surface	24.22	6.62	8.3	184.5	0
9/29/2010	M4	Bottom	24.15	6.48	8.22	184.5	0
9/30/2010	D1	Surface	24.12	6.46	7.68	180.6	0
9/30/2010	D2	Bottom	23.96	6.11	7.89	180.4	0
9/30/2010	D3	Surface	24.57	7.09	8.86	180.7	0
9/30/2010	D4	Bottom	24.53	7.1	8.42	180.7	0

**TABLE 5 – LENGTH AND AGE SUMMARY**

Species	Average of Length (mm)	Min of Length (mm)	Max of Length (mm)	StdDev of Length (mm)	Average of Age (yr)	Min of Age (yr)	Max of Age (yr)	StdDev of Age (yr)	Percent of Mussels < 3 years of age	Percent of Mussels < 5 years of age
<i>Amblema plicata</i>	103.5	97	110	9.19	20.5	20	21	0.71		
<i>Cyclonaias tuberculata</i>	85.0	34	106	9.95	30.7	4	48	8.29		1.2
<i>Ellipsaria lineolata</i>	92.7	70	113	10.32	19.2	13	27	4.38		
<i>Elliptio crassidens</i>	116.1	89	140	8.28	31.0	9	46	6.31		
<i>Elliptio dilitata</i>	113.5	105	122	12.02	38.0	38	38			
<i>Lampsilis abrupta</i>	123.0	123	123		33.0	33	33			
<i>Leptodea fragilis</i>	77.4	46	113	25.42	3.3	1	6	2.22	40.0	60.0
<i>Megaloniaias nervosa</i>	187.0	187	187		53.0	53	53			
<i>Obliquaria reflexa</i>	36.6	14	63	12.99	5.7	1	23	5.77	16.7	66.7
<i>Plethobasus cyphus</i>	100.0	100	100		20.0	20	20			
<i>Pleurobema cordatum</i>	106.0	11	127	11.85	42.5	19	63	9.08		
<i>Fusconaia subrotunda</i>	68.0	68	68							
<i>Potamilus alatus</i>	72.3	15	180	53.64	3.3	0	15	4.49	56.3	62.5
<i>Pyganodon grandis</i>	163.0	163	163		12.0	12	12			
<i>Quadrula metanevra</i>	90.7	89	92	1.53	36.5	32	41	6.36		
<i>Quadrula pustulosa</i>	57.7	35	85	11.90	15.8	5	35	7.60		
<i>Utterbackia imbecillis</i>	45.0	45	45		3.0	3	3			100.0

## **APPENDICES**

## **APPENDIX A – SURVEY RESULTS**



Appendix A  
Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
L1	SQ	5	1	10	20	L	<i>Cyclonaias tuberculata</i>	L	-	1	78	24	-	0	0	0	0	20	80	0	0	0	0	100.0	16	4.9	
L1	SQ	5	2	20	30	L	<i>Cyclonaias tuberculata</i>	L	-	1	74	27	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	<i>Cyclonaias tuberculata</i>	L	-	1	85	46	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	<i>Cyclonaias tuberculata</i>	L	-	1	82	30	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	5	50	60	L	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	0	0	0	5	25	70	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	<i>Cyclonaias tuberculata</i>	L	-	1	75	25	-	0	0	0	5	25	70	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	<i>Cyclonaias tuberculata</i>	L	-	1	78	28	-	0	0	0	5	25	70	0	0	0	0	100.0	16	4.9	
L1	QN	0.25	6	60	70	L	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	0	0	0	5	25	70	0	0	0	0	100.0	16	4.9	
L1	SQ	5	7	70	80	L	<i>Cyclonaias tuberculata</i>	L	-	1	90	33	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	<i>Cyclonaias tuberculata</i>	L	-	1	73	-	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	8	80	90	L	<i>Cyclonaias tuberculata</i>	L	-	1	82	28	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	9	90	100	L	<i>Cyclonaias tuberculata</i>	L	-	1	94	36	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L1	SQ	5	9	90	100	L	<i>Cyclonaias tuberculata</i>	L	-	1	95	37	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L1	SQ	5	2	20	30	L	<i>Ellipsaria lineolata</i>	L	m	1	99	13	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	<i>Ellipsaria lineolata</i>	L	f	1	71	13	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	gravid
L1	SQ	5	10	100	110	L	<i>Ellipsaria lineolata</i>	L	-	1	80	-	-	0	0	0	5	65	30	0	0	0	0	100.0	15	4.6	
L1	SQ	5	1	10	20	L	<i>Elliptio crassidens</i>	L	-	1	101	29	-	0	0	0	0	20	80	0	0	0	0	100.0	16	4.9	
L1	SQ	5	2	20	30	L	<i>Elliptio crassidens</i>	WD	-	4	-	-	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	<i>Elliptio crassidens</i>	L	-	1	118	36	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	<i>Elliptio crassidens</i>	L	-	1	110	32	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	<i>Elliptio crassidens</i>	L	-	1	108	24	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	<i>Elliptio crassidens</i>	L	-	1	113	32	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	<i>Elliptio crassidens</i>	L	-	1	112	31	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	<i>Elliptio crassidens</i>	L	-	1	116	32	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	

Appendix A  
Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
L1	SQ	5	2	20	30	L	Elliptio crassidens	L	-	1	120	37	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	Elliptio crassidens	L	-	1	115	36	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	2	20	30	L	Elliptio crassidens	L	-	1	120	32	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	124	40	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	118	35	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	120	28	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	114	35	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	109	36	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	110	39	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	120	39	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	107	37	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	1	92	18	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	3	30	40	L	Elliptio crassidens	L	-	2	-	-	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	109	37	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	110	36	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	109	33	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	118	32	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	126	38	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	115	36	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	116	39	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	108	30	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	4	40	50	L	Elliptio crassidens	L	-	1	100	34	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	5	50	60	L	Elliptio crassidens	L	-	1	102	27	-	0	0	0	5	25	70	0	0	0	0	100.0	16	4.9	
L1	SQ	5	5	50	60	L	Elliptio crassidens	L	-	1	110	36	-	0	0	0	5	25	70	0	0	0	0	100.0	16	4.9	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
L1	SQ	5	5	50	60	L	Elliptio crassidens	L	-	1	114	38	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	5	50	60	L	Elliptio crassidens	L	-	1	130	32	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	5	50	60	L	Elliptio crassidens	WD	-	3	-	-	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	108	27	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	118	31	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	110	35	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	110	27	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	110	26	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	104	29	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	120	36	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	L	-	1	110	34	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	WD	-	5	-	-	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	6	60	70	L	Elliptio crassidens	FD	-	1	-	-	-	0	0	5	25	70	0	0	0	0	0	100.0	16	4.9	
L1	SQ	5	7	70	80	L	Elliptio crassidens	WD	-	3	-	-	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	125	37	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	115	30	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	110	26	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	118	31	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	121	34	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	111	32	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	111	33	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	104	29	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	SQ	5	7	70	80	L	Elliptio crassidens	L	-	1	112	30	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	
L1	QN	0.25	7	70	80	L	Elliptio crassidens	WD	-	1	-	-	-	0	0	5	25	70	0	0	0	0	0	100.0	15	4.6	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
L1	SQ	5	8	80	90	L	Elliptio crassidens	L	-	1	104	30	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	8	80	90	L	Elliptio crassidens	L	-	1	109	28	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	8	80	90	L	Elliptio crassidens	L	-	1	120	35	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	8	80	90	L	Elliptio crassidens	L	-	1	120	39	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	8	80	90	L	Elliptio crassidens	L	-	1	130	34	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	8	80	90	L	Elliptio crassidens	L	-	5	-	-	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	8	80	90	L	Elliptio crassidens	WD	-	5	-	-	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	9	90	100	L	Elliptio crassidens	L	-	8	-	-	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L1	SQ	5	9	90	100	L	Elliptio crassidens	FD	-	1	-	-	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L1	SQ	5	9	90	100	L	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L1	QN	0.25	9	90	100	L	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L1	SQ	5	10	100	110	L	Elliptio crassidens	WD	-	5	-	-	-	0	0	0	5	65	30	0	0	0	0	100.0	15	4.6	
L1	SQ	5	10	100	110	L	Elliptio crassidens	FD	-	2	-	-	-	0	0	0	5	65	30	0	0	0	0	100.0	15	4.6	
L1	SQ	5	10	100	110	L	Elliptio crassidens	L	-	10	-	-	-	0	0	0	5	65	30	0	0	0	0	100.0	15	4.6	
L1	SQ	5	1	10	20	L	Leptodea fragilis	WD	-	1	-	-	-	0	0	0	0	20	80	0	0	0	0	100.0	16	4.9	
L1	SQ	5	1	10	20	L	Obliquaria reflexa	L	-	1	48	6	-	0	0	0	0	20	80	0	0	0	0	100.0	16	4.9	
L1	SQ	5	2	20	30	L	Pleurobema cordatum	L	-	1	102	30	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	5	50	60	L	Pleurobema cordatum	L	-	1	95	34	-	0	0	0	5	25	70	0	0	0	0	100.0	16	4.9	
L1	SQ	5	8	80	90	L	Pleurobema cordatum	WD	-	1	-	-	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	10	100	110	L	Pleurobema cordatum	L	-	1	104	36	-	0	0	0	5	65	30	0	0	0	0	100.0	15	4.6	
L1	SQ	5	10	100	110	L	Pleurobema cordatum	L	-	1	111	38	-	0	0	0	5	65	30	0	0	0	0	100.0	15	4.6	
L1	SQ	5	4	40	50	L	Potamilus alatus	L	-	1	29	3	-	0	0	0	5	25	70	0	0	0	0	100.0	17	5.2	
L1	SQ	5	1	10	20	L	Quadrula pustulosa	L	-	1	54	14	-	0	0	0	0	20	80	0	0	0	0	100.0	16	4.9	
L1	SQ	5	1	10	20	L	Quadrula pustulosa	L	-	1	37	6	-	0	0	0	0	20	80	0	0	0	0	100.0	16	4.9	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
L1	SQ	5	1	10	20	L	<i>Quadrula pustulosa</i>	L	-	1	41	9	-	0	0	0	0	20	80	0	0	0	0	100.0	16	4.9	
L1	QN	0.25	2	20	30	L	<i>Quadrula pustulosa</i>	L	-	1	47	14	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	QN	0.25	3	30	40	L	<i>Quadrula pustulosa</i>	L	-	1	-	-	-	0	0	0	10	15	75	0	0	0	0	100.0	17	5.2	
L1	SQ	5	7	70	80	L	<i>Quadrula pustulosa</i>	L	-	1	55	-	-	0	0	0	5	25	70	0	0	0	0	100.0	15	4.6	
L1	SQ	5	9	90	100	L	<i>Quadrula pustulosa</i>	L	-	1	45	11	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L1	SQ	5	9	90	100	L	<i>Quadrula pustulosa</i>	L	-	1	48	8	-	0	0	0	5	35	60	0	0	0	0	100.0	15	4.6	
L2	SQ	5	3	25	35	L	<i>Cyclonaias tuberculata</i>	L	-	1	82	28	-	0	0	0	0	10	85	5	0	0	0	100.0	15	4.6	
L2	SQ	5	5	45	55	L	<i>Cyclonaias tuberculata</i>	L	-	1	87	33	-	0	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2	SQ	5	5	45	55	L	<i>Cyclonaias tuberculata</i>	L	-	1	86	-	-	0	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2	SQ	4	6	55	65	L	<i>Cyclonaias tuberculata</i>	L	-	1	85	-	-	0	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2	SQ	4	6	55	65	L	<i>Cyclonaias tuberculata</i>	L	-	1	78	-	-	0	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2	SQ	5	8	75	85	L	<i>Cyclonaias tuberculata</i>	L	-	1	95	32	-	0	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2	SQ	5	8	75	85	L	<i>Cyclonaias tuberculata</i>	WD	-	2	-	-	-	0	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2	SQ	5	9	85	95	L	<i>Cyclonaias tuberculata</i>	L	-	1	95	28	-	0	0	0	5	55	35	5	0	0	0	100.0	15	4.6	
L2	SQ	5	5	45	55	L	<i>Ellipsaria lineolata</i>	L	-	1	95	22	-	0	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2	SQ	4	6	55	65	L	<i>Ellipsaria lineolata</i>	FD	-	1	-	-	-	0	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2	SQ	5	2	15	25	L	<i>Elliptio crassidens</i>	L	-	6	-	-	-	0	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L2	SQ	5	2	15	25	L	<i>Elliptio crassidens</i>	FD	-	1	-	-	-	0	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L2	SQ	5	3	25	35	L	<i>Elliptio crassidens</i>	L	-	7	-	-	-	0	0	0	0	10	85	5	0	0	0	100.0	15	4.6	
L2	SQ	5	3	25	35	L	<i>Elliptio crassidens</i>	FD	-	1	-	-	-	0	0	0	0	10	85	5	0	0	0	100.0	15	4.6	
L2	QN	0.25	3	25	35	L	<i>Elliptio crassidens</i>	L	-	1	-	-	-	0	0	0	0	10	85	5	0	0	0	100.0	15	4.6	
L2	SQ	5	4	35	45	L	<i>Elliptio crassidens</i>	L	-	1	-	-	-	0	0	0	0	30	65	5	0	0	0	100.0	15	4.6	
L2	SQ	5	4	35	45	L	<i>Elliptio crassidens</i>	FD	-	3	-	-	-	0	0	0	0	30	65	5	0	0	0	100.0	15	4.6	
L2	SQ	5	4	35	45	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	0	30	65	5	0	0	0	100.0	15	4.6	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
L2 SQ	L2 SQ	5	5	45	55	L	<i>Elliptio crassidens</i>	L	-	5	-	-	-	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	5	45	55	L	<i>Elliptio crassidens</i>	WD	-	6	-	-	-	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2 QN	L2 QN	0.25	5	45	55	L	<i>Elliptio crassidens</i>	L	-	1	-	-	-	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	4	6	55	65	L	<i>Elliptio crassidens</i>	L	-	6	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	4	6	55	65	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	4	6	55	65	L	<i>Elliptio crassidens</i>	FD	-	4	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 QN	L2 QN	0.25	6	55	65	L	<i>Elliptio crassidens</i>	L	-	1	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 QN	L2 QN	0.25	6	55	65	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	7	65	75	L	<i>Elliptio crassidens</i>	L	-	9	-	-	-	0	0	0	45	50	5	0	0	0	100.0	14	4.3	
L2 SQ	L2 SQ	5	7	65	75	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	45	50	5	0	0	0	100.0	14	4.3	
L2 SQ	L2 SQ	5	8	75	85	L	<i>Elliptio crassidens</i>	L	-	7	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	8	75	85	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	9	85	95	L	<i>Elliptio crassidens</i>	L	-	8	-	-	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	9	85	95	L	<i>Elliptio crassidens</i>	WD	-	7	-	-	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	9	85	95	L	<i>Elliptio crassidens</i>	FD	-	1	-	-	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	10	95	105	L	<i>Elliptio crassidens</i>	L	-	8	-	-	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	10	95	105	L	<i>Elliptio crassidens</i>	WD	-	4	-	-	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	10	95	105	L	<i>Elliptio crassidens</i>	L	-	1	97	12	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	2	15	25	L	<i>Musculium transversum</i>	L	-	1	10	1	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	5	45	55	L	<i>Pleurobema cordatum</i>	L	-	1	105	32	-	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	4	6	55	65	L	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	110	39	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	103	40	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2 SQ	L2 SQ	5	3	25	35	L	<i>Fusconaia subrotunda</i>	L	-	1	68	-	-	0	0	0	10	85	5	0	0	0	100.0	15	4.6	Orange foot,

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#, % m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
L2	SQ	5	1	5	15	L	<i>Potamilus alatus</i>	FD	-	1	-	-	-	0	0	0	0	100	0	0	0	0	100.0	12	3.7	eroded shell
L2	SQ	5	1	5	15	L	<i>Potamilus alatus</i>	WD	-	1	-	-	-	0	0	0	0	100	0	0	0	0	100.0	12	3.7	
L2	SQ	5	1	5	15	L	<i>Potamilus alatus</i>	L	f	1	140	12	-	0	0	0	0	100	0	0	0	0	100.0	12	3.7	
L2	SQ	5	2	15	25	L	<i>Potamilus alatus</i>	L	-	1	33	0	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L2	QN	0.25	8	75	85	L	<i>Potamilus alatus</i>	L	-	1	34	0	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2	SQ	5	10	95	105	L	<i>Potamilus alatus</i>	L	-	1	30	0	-	0	0	0	55	35	5	0	0	0	100.0	15	4.6	
L2	SQ	5	10	95	105	L	<i>Quadrula metanevra</i>	L	-	1	89	-	-	0	0	0	5	55	35	5	0	0	100.0	15	4.6	
L2	SQ	5	2	15	25	L	<i>Quadrula pustulosa</i>	L	-	1	57	13	-	0	0	0	5	90	90	5	0	0	100.0	15	4.6	
L2	QN	0.25	2	15	25	L	<i>Quadrula pustulosa</i>	L	-	1	58	25	-	0	0	0	5	90	90	5	0	0	100.0	15	4.6	
L2	QN	0.25	3	25	35	L	<i>Quadrula pustulosa</i>	L	-	1	35	6	-	0	0	0	10	85	5	0	0	0	100.0	15	4.6	
L2	QN	0.25	5	45	55	L	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	0	50	45	5	0	0	0	100.0	15	4.6	
L2	QN	0.25	6	55	65	L	<i>Quadrula pustulosa</i>	L	-	1	69	22	-	0	0	0	45	50	5	0	0	0	100.0	15	4.6	
L2	SQ	5	10	95	105	L	<i>Quadrula pustulosa</i>	L	-	1	75	28	-	0	0	0	55	35	5	0	0	0	100.0	15	4.6	
L3	SQ	4	3	25	35	L	<i>Cyclonaias tuberculata</i>	L	-	1	90	36	-	0	0	0	5	0	0	0	95	0	100.0	15	4.6	
L3	SQ	4	4	35	45	L	<i>Cyclonaias tuberculata</i>	L	-	1	90	31	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	4	4	35	45	L	<i>Cyclonaias tuberculata</i>	L	-	1	90	34	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	4	4	35	45	L	<i>Cyclonaias tuberculata</i>	L	-	1	80	37	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	4	4	35	45	L	<i>Cyclonaias tuberculata</i>	L	-	1	78	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	4	4	35	45	L	<i>Cyclonaias tuberculata</i>	L	-	1	76	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	5	5	45	55	L	<i>Cyclonaias tuberculata</i>	L	-	1	80	30	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	5	5	45	55	L	<i>Cyclonaias tuberculata</i>	L	-	1	90	34	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	5	5	45	55	L	<i>Cyclonaias tuberculata</i>	L	-	1	77	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3	SQ	5	5	45	55	L	<i>Cyclonaias tuberculata</i>	L	-	1	78	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	



Appendix A  
Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
L3 SQ	5	5	45	55	L	Cyclonaias tuberculata	L	-	1	80	-	-	0	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ	5	6	55	65	L	Cyclonaias tuberculata	L	-	1	85	29	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ	5	6	55	65	L	Cyclonaias tuberculata	L	-	1	86	32	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ	5	6	55	65	L	Cyclonaias tuberculata	L	-	1	87	27	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ	5	6	55	65	L	Cyclonaias tuberculata	L	-	1	79	-	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ	5	7	65	75	L	Cyclonaias tuberculata	L	-	1	80	-	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ	5	7	65	75	L	Cyclonaias tuberculata	L	-	1	98	39	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ	5	8	75	85	L	Cyclonaias tuberculata	L	-	1	92	27	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ	5	9	85	95	L	Cyclonaias tuberculata	L	-	1	88	-	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ	5	9	85	95	L	Cyclonaias tuberculata	L	-	1	79	26	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ	5	9	85	95	L	Cyclonaias tuberculata	L	-	1	80	29	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ	5	10	95	105	L	Cyclonaias tuberculata	L	-	1	83	27	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ	5	10	95	105	L	Cyclonaias tuberculata	L	-	1	75	-	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ	5	10	95	105	L	Cyclonaias tuberculata	L	-	1	81	23	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ	5	10	95	105	L	Cyclonaias tuberculata	L	-	1	96	39	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ	5	10	95	105	L	Cyclonaias tuberculata	L	-	1	88	42	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ	4	4	35	45	L	Ellipsaria lineolata	L	m	1	80	16	-	0	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ	5	6	55	65	L	Ellipsaria lineolata	L	m	1	94	19	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ	4	1	5	15	L	Elliptio crassidens	L	-	2	-	-	-	0	0	0	0	0	0	0	100	0	0	100.0	13	4.0	dead mussels
L3 SQ	4	1	5	15	L	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	0	0	0	0	100	0	0	100.0	13	4.0	dead mussels
L3 QN	0.25	1	5	15	L	Elliptio crassidens	L	-	1	-	-	-	0	0	0	0	0	0	0	100	0	0	100.0	13	4.0	dead mussels
L3 SQ	4	2	15	25	L	Elliptio crassidens	L	-	2	-	-	-	0	0	0	0	0	0	0	100	0	0	100.0	15	4.6	dead mussels
L3 SQ	4	2	15	25	L	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	0	0	0	0	100	0	0	100.0	15	4.6	dead mussels
L3 SQ	4	3	25	35	L	Elliptio crassidens	L	-	1	90	9	-	0	0	0	0	5	0	0	95	0	0	100.0	15	4.6	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
L3 SQ		4	3	25	35	L	<i>Elliptio crassidens</i>	L	-	5	-	-	-	0	0	0	5	0	0	95	0	0	100.0	15	4.6	
L3 SQ		4	3	25	35	L	<i>Elliptio crassidens</i>	WD	-	2	-	-	-	0	0	0	5	0	0	95	0	0	100.0	15	4.6	
L3 SQ		4	4	35	45	L	<i>Elliptio crassidens</i>	L	-	7	-	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ		4	4	35	45	L	<i>Elliptio crassidens</i>	WD	-	2	-	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 QN		0.25	4	35	45	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ		5	5	45	55	L	<i>Elliptio crassidens</i>	L	-	6	-	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ		5	5	45	55	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ		5	6	55	65	L	<i>Elliptio crassidens</i>	L	-	7	-	-	-	0	0	0	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	6	55	65	L	<i>Elliptio crassidens</i>	WD	-	4	-	-	-	0	0	0	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	7	65	75	L	<i>Elliptio crassidens</i>	L	-	10	-	-	-	0	0	0	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	7	65	75	L	<i>Elliptio crassidens</i>	WD	-	3	-	-	-	0	0	0	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	7	65	75	L	<i>Elliptio crassidens</i>	FD	-	2	-	-	-	0	0	0	35	40	5	0	0	0	100.0	15	4.6	
L3 QN		0.25	7	65	75	L	<i>Elliptio crassidens</i>	WD	-	3	-	-	-	0	0	0	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	8	75	85	L	<i>Elliptio crassidens</i>	L	-	4	-	-	-	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ		5	9	85	95	L	<i>Elliptio crassidens</i>	L	-	3	-	-	-	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ		5	9	85	95	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ		5	10	95	105	L	<i>Elliptio crassidens</i>	L	-	20	-	-	-	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ		5	10	95	105	L	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ		5	10	95	105	L	<i>Leptodea fragilis</i>	L	m	1	113	-	-	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ		4	3	25	35	L	<i>Pleurobema cordatum</i>	L	-	1	103	41	-	0	0	0	5	0	0	95	0	0	100.0	15	4.6	
L3 SQ		5	5	45	55	L	<i>Pleurobema cordatum</i>	L	-	1	93	36	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ		5	5	45	55	L	<i>Pleurobema cordatum</i>	L	-	1	95	43	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 QN		0.25	5	45	55	L	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	5	90	5	0	0	0	100.0	15	4.6	
L3 SQ		5	6	55	65	L	<i>Pleurobema cordatum</i>	WD	-	2	-	-	-	0	0	0	35	40	5	0	0	0	100.0	15	4.6	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (Yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
L3 SQ		5	7	65	75	L	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	100	34	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ		5	9	85	95	L	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ		5	10	95	105	L	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ		5	10	95	105	L	<i>Pleurobema cordatum</i>	L	-	1	110	41	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ		4	3	25	35	L	<i>Potamilus alatus</i>	L	-	1	35	0	-	0	0	0	0	5	0	0	95	0	0	100.0	15	4.6	
L3 SQ			5	45	55	L	<i>Potamilus alatus</i>	L	-	1	38	0	-	0	0	0	5	90	40	5	0	0	0	100.0	15	4.6	
L3 QN	0.25	7	65	75	75	L	<i>Potamilus alatus</i>	L	-	1	35	0	-	0	0	0	20	35	40	5	0	0	0	100.0	15	4.6	
L3 QN	0.25	8	75	85	85	L	<i>Potamilus alatus</i>	L	-	1	34	0	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 QN	0.25	8	75	85	85	L	<i>Potamilus alatus</i>	L	-	1	35	0	-	0	0	0	0	80	15	5	0	0	0	100.0	13	4.0	
L3 SQ		5	10	95	105	L	<i>Potamilus alatus</i>	L	-	1	31	0	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 SQ		4	1	5	15	L	<i>Pyganodon grandis</i>	WD	-	1	-	-	-	0	0	0	0	0	0	0	100	0	0	100.0	13	4.0	dead mussels
L3 SQ		5	10	95	105	L	<i>Quadrula metanevra</i>	L	-	1	91	41	-	0	0	0	0	80	15	5	0	0	0	100.0	14	4.3	
L3 QN	0.25	4	35	45	45	L	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	0	5	90	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	5	45	55	L	<i>Quadrula pustulosa</i>	L	-	1	65	25	-	0	0	0	5	90	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	6	55	65	L	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	0	35	40	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	6	55	65	L	<i>Quadrula pustulosa</i>	L	-	1	70	23	-	0	0	0	35	40	40	5	0	0	0	100.0	15	4.6	
L3 SQ		5	7	65	75	L	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	0	35	40	40	5	0	0	0	100.0	15	4.6	
L4 SQ		3	4	35	45	L	<i>Cyclonaias tuberculata</i>	L	-	1	83	28	-	0	0	0	30	0	0	0	70	0	0	100.0	14	4.3	
L4 SQ		5	9	85	95	L	<i>Cyclonaias tuberculata</i>	L	-	1	-	-	-	0	0	0	20	75	75	5	0	0	0	100.0	21	6.4	
L4 SQ		5	9	85	95	L	<i>Cyclonaias tuberculata</i>	L	-	1	85	38	-	0	0	0	20	75	75	5	0	0	0	100.0	21	6.4	
L4 SQ		5	9	85	95	L	<i>Cyclonaias tuberculata</i>	L	-	1	74	-	-	0	0	0	20	75	75	5	0	0	0	100.0	21	6.4	
L4 SQ		5	9	85	95	L	<i>Cyclonaias tuberculata</i>	L	-	1	88	27	-	0	0	0	20	75	75	5	0	0	0	100.0	21	6.4	
L4 SQ		3	3	25	35	L	<i>Elliptio crassidens</i>	L	-	2	-	-	-	0	0	0	30	0	0	0	70	0	0	100.0	11	3.4	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
L4 SQ		3	4	35	45	L	<i>Elliptio crassidens</i>	L	-	1	-	-	-	0	0	0	30	0	0	70	0	0	100.0	14	4.3	
L4 SQ		5	5	45	55	L	<i>Elliptio crassidens</i>	L	-	1	89	10	-	0	0	0	20	30	0	0	0	0	100.0	15	4.6	
L4 SQ		4	6	55	65	L	<i>Elliptio crassidens</i>	L	-	2	-	-	-	0	0	0	5	70	5	0	0	0	100.0	16	4.9	
L4 SQ		4	6	55	65	L	<i>Elliptio crassidens</i>	L	-	1	-	-	-	0	0	0	5	70	5	0	0	0	100.0	16	4.9	
L4 SQ		3	7	65	75	L	<i>Elliptio crassidens</i>	L	-	2	-	-	-	0	0	0	20	70	5	0	0	0	100.0	16	4.9	
L4 QN		0.25	7	65	75	L	<i>Elliptio crassidens</i>	L	-	1	-	-	-	0	0	0	5	70	5	0	0	0	100.0	16	4.9	
L4 SQ		4	8	75	85	L	<i>Elliptio crassidens</i>	L	-	8	-	-	-	0	0	0	20	70	5	0	0	0	100.0	18	5.5	
L4 SQ		4	8	75	85	L	<i>Elliptio crassidens</i>	L	-	3	-	-	-	0	0	0	20	70	5	0	0	0	100.0	18	5.5	
L4 SQ		5	9	85	95	L	<i>Elliptio crassidens</i>	L	-	6	-	-	-	0	0	0	20	75	5	0	0	0	100.0	21	6.4	
L4 SQ		4	10	95	105	L	<i>Elliptio crassidens</i>	L	-	10	-	-	-	0	0	0	25	70	5	0	0	0	100.0	22	6.7	
L4 SQ		4	10	95	105	L	<i>Elliptio crassidens</i>	L	-	2	-	-	-	0	0	0	25	70	5	0	0	0	100.0	22	6.7	
L4 QN		0.25	4	35	45	L	<i>Leptodea fragilis</i>	L	-	1	65	1	-	0	0	0	30	0	0	70	0	0	100.0	14	4.3	
L4 SQ		3	4	35	45	L	<i>Pleurobema cordatum</i>	WD	-	2	-	-	-	0	0	0	30	0	0	70	0	0	100.0	14	4.3	
L4 SQ		3	4	35	45	L	<i>Pleurobema cordatum</i>	L	-	1	103	27	-	0	0	0	30	0	0	70	0	0	100.0	14	4.3	
L4 SQ		3	4	35	45	L	<i>Pleurobema cordatum</i>	L	-	1	105	45	-	0	0	0	30	0	0	70	0	0	100.0	14	4.3	
L4 SQ		4	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	91	30	-	0	0	0	20	70	5	0	0	0	100.0	18	5.5	
L4 SQ		5	9	85	95	L	<i>Pleurobema cordatum</i>	L	-	1	122	56	-	0	0	0	20	75	5	0	0	0	100.0	21	6.4	
L4 SQ		4	10	95	105	L	<i>Pleurobema cordatum</i>	L	-	1	103	30	-	0	0	0	25	70	5	0	0	0	100.0	22	6.7	
L4 QN		0.25	8	75	85	L	<i>Potamilus alatus</i>	L	-	1	32	0	-	0	0	0	20	70	5	0	0	0	100.0	18	5.5	
L4 QN		0.25	8	75	85	L	<i>Potamilus alatus</i>	L	-	1	28	0	-	0	0	0	20	70	5	0	0	0	100.0	18	5.5	
L4 QN		0.25	8	75	85	L	<i>Quadrula pustulosa</i>	L	-	1	-	-	-	0	0	0	20	70	5	0	0	0	100.0	18	5.5	
M1 QN		0.25	4	35	45	R	<i>Ambleria plicata</i>	WD	-	1	-	-	-	0	0	0	35	40	0	0	0	0	90.0	13	4.0	
M1 SQ		5	3	25	35	R	<i>Cyclonaias tuberculata</i>	L	-	1	87	16	-	0	0	0	10	80	10	0	0	0	100.0	15	4.6	
M1 SQ		5	9	85	95	R	<i>Cyclonaias tuberculata</i>	L	-	1	97	29	-	0	0	0	50	40	5	0	0	0	100.0	25	7.6	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (Yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M1	SQ	5	9	85	95	R	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	6	4	35	45	R	<i>Ellipsaria lineolata</i>	L	m	1	91	16	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	SQ	5	3	25	35	R	<i>Elliptio crassidens</i>	WD	-	2	-	-	-	0	0	0	10	80	10	0	0	0	0	100.0	15	4.6	
M1	SQ	5	3	25	35	R	<i>Elliptio crassidens</i>	L	-	1	114	46	-	0	0	0	10	80	10	0	0	0	0	100.0	15	4.6	
M1	SQ	6	4	35	45	R	<i>Elliptio crassidens</i>	FD	-	2	-	-	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	SQ	6	4	35	45	R	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	SQ	6	4	35	45	R	<i>Elliptio crassidens</i>	L	-	1	123	24	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	SQ	5	5	45	55	R	<i>Elliptio crassidens</i>	WD	-	2	-	-	-	0	0	30	35	30	5	0	0	0	0	100.0	12	3.7	
M1	SQ	5	5	45	55	R	<i>Elliptio crassidens</i>	L	-	1	120	29	-	0	0	30	35	30	5	0	0	0	0	100.0	12	3.7	
M1	SQ	5	5	45	55	R	<i>Elliptio crassidens</i>	L	-	1	114	26	-	0	0	30	35	30	5	0	0	0	0	100.0	12	3.7	
M1	SQ	5	5	45	55	R	<i>Elliptio crassidens</i>	L	-	1	122	28	-	0	0	30	35	30	5	0	0	0	0	100.0	12	3.7	
M1	SQ	5	5	45	55	R	<i>Elliptio crassidens</i>	L	-	1	119	-	-	0	0	30	35	30	5	0	0	0	0	100.0	12	3.7	
M1	SQ	5	5	45	55	R	<i>Elliptio crassidens</i>	L	-	1	133	35	-	0	0	30	35	30	5	0	0	0	0	100.0	12	3.7	
M1	SQ	4	6	55	5	R	<i>Elliptio crassidens</i>	WD	-	2	-	-	-	40	0	12	33	12	3	0	0	0	0	100.0	17	5.2	
M1	SQ	4	6	55	5	R	<i>Elliptio crassidens</i>	L	-	1	122	33	-	40	0	12	33	12	3	0	0	0	0	100.0	17	5.2	
M1	SQ	4	6	55	5	R	<i>Elliptio crassidens</i>	L	-	1	124	33	-	40	0	12	33	12	3	0	0	0	0	100.0	17	5.2	
M1	SQ	4	6	55	5	R	<i>Elliptio crassidens</i>	L	-	1	121	35	-	40	0	12	33	12	3	0	0	0	0	100.0	17	5.2	
M1	SQ	6	7	65	75	R	<i>Elliptio crassidens</i>	FD	-	3	-	-	-	0	0	20	55	20	5	0	0	0	0	100.0	22	6.7	
M1	SQ	6	7	65	75	R	<i>Elliptio crassidens</i>	L	-	1	115	31	-	0	0	20	55	20	5	0	0	0	0	100.0	22	6.7	
M1	SQ	6	7	65	75	R	<i>Elliptio crassidens</i>	L	-	1	114	35	-	0	0	20	55	20	5	0	0	0	0	100.0	22	6.7	
M1	SQ	6	7	65	75	R	<i>Elliptio crassidens</i>	L	-	1	115	36	-	0	0	20	55	20	5	0	0	0	0	100.0	22	6.7	
M1	SQ	5	8	75	85	R	<i>Elliptio crassidens</i>	WD	-	5	-	-	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	8	75	85	R	<i>Elliptio crassidens</i>	FD	-	2	-	-	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	8	75	85	R	<i>Elliptio crassidens</i>	L	-	1	124	35	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M1	SQ	5	8	75	85	R	<i>Eliptio crassidens</i>	L	-	1	120	37	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	8	75	85	R	<i>Eliptio crassidens</i>	L	-	1	132	39	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	8	75	85	R	<i>Eliptio crassidens</i>	L	-	1	115	34	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	8	75	85	R	<i>Eliptio crassidens</i>	L	-	1	115	33	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Eliptio crassidens</i>	FD	-	2	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Eliptio crassidens</i>	WD	-	2	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Eliptio crassidens</i>	L	-	1	102	27	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Eliptio crassidens</i>	L	-	1	108	32	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Eliptio crassidens</i>	L	-	1	122	32	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Eliptio crassidens</i>	L	-	1	130	31	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Eliptio crassidens</i>	L	-	1	110	35	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	10	95	105	R	<i>Eliptio crassidens</i>	WD	-	1	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	24	7.3	
M1	SQ	5	10	95	105	R	<i>Eliptio crassidens</i>	L	-	1	118	30	-	0	0	5	50	40	5	0	0	0	0	100.0	24	7.3	
M1	SQ	5	10	95	105	R	<i>Eliptio crassidens</i>	L	-	1	134	40	-	0	0	5	50	40	5	0	0	0	0	100.0	24	7.3	
M1	SQ	6	4	35	45	R	<i>Lampsilis abrupta</i>	L	m	1	123	33	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	6	7	65	75	R	<i>Potamilus alatus</i>	L	m	1	141	10	-	0	0	20	55	20	5	0	0	0	0	100.0	22	6.7	
M1	SQ	5	3	25	35	R	<i>Quadrula pustulosa</i>	L	-	1	52	14	-	0	0	0	10	80	10	0	0	0	0	100.0	15	4.6	
M1	SQ	5	3	25	35	R	<i>Quadrula pustulosa</i>	L	-	1	63	28	-	0	0	0	10	80	10	0	0	0	0	100.0	15	4.6	
M1	QN	0.25	3	25	35	R	<i>Quadrula pustulosa</i>	L	-	1	44	10	-	0	0	0	10	80	10	0	0	0	0	100.0	15	4.6	
M1	QN	0.25	3	25	35	R	<i>Quadrula pustulosa</i>	L	-	1	58	21	-	0	0	0	10	80	10	0	0	0	0	100.0	15	4.6	
M1	SQ	6	4	35	45	R	<i>Quadrula pustulosa</i>	L	-	1	46	8	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	QN	0.25	4	35	45	R	<i>Quadrula pustulosa</i>	FD	-	1	-	-	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	SQ	5	5	45	55	R	<i>Quadrula pustulosa</i>	FD	-	1	-	-	-	0	0	30	35	30	5	0	0	0	0	100.0	12	3.7	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M1	SQ	6	7	65	75	R	<i>Quadrula pustulosa</i>	L	-	1	58	12	-	0	0	20	55	20	5	0	0	0	0	100.0	22	6.7	
M1	SQ	5	8	75	85	R	<i>Quadrula pustulosa</i>	L	-	1	68	16	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	QN	0.25	8	75	85	R	<i>Quadrula pustulosa</i>	L	-	1	36	5	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	<i>Quadrula pustulosa</i>	FD	-	1	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M2	SQ	6	5	45	55	R	<i>Ambelma plicata</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	4	35	45	R	<i>Cyclonaias tuberculata</i>	L	-	1	90	38	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	6	5	45	55	R	<i>Cyclonaias tuberculata</i>	L	-	1	90	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	<i>Cyclonaias tuberculata</i>	L	-	1	85	30	-	0	0	0	20	75	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	<i>Cyclonaias tuberculata</i>	L	-	1	90	22	-	0	0	0	20	75	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	3	25	35	R	<i>Ellipsaria lineolata</i>	L	-	1	100	22	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	5	4	35	45	R	<i>Ellipsaria lineolata</i>	WD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	6	5	45	55	R	<i>Ellipsaria lineolata</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	<i>Ellipsaria lineolata</i>	FD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	2	15	25	R	<i>Elliptio crassidens</i>	L	-	1	119	36	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	SQ	5	2	15	25	R	<i>Elliptio crassidens</i>	L	-	1	115	30	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	SQ	5	2	15	25	R	<i>Elliptio crassidens</i>	L	-	1	130	45	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	SQ	5	2	15	25	R	<i>Elliptio crassidens</i>	WD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	SQ	6	3	25	35	R	<i>Elliptio crassidens</i>	L	-	1	130	45	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Elliptio crassidens</i>	L	-	1	124	40	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Elliptio crassidens</i>	L	-	1	108	29	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Elliptio crassidens</i>	L	-	1	114	35	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Elliptio crassidens</i>	L	-	1	116	39	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M2	SQ	6	3	25	35	R	Elliptio crassidens	FD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	Elliptio crassidens	WD	-	3	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	5	4	35	45	R	Elliptio crassidens	L	-	1	120	30	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	Elliptio crassidens	L	-	1	130	32	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	Elliptio crassidens	L	-	1	126	30	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	Elliptio crassidens	L	-	1	123	37	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	Elliptio crassidens	L	-	1	130	37	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	Elliptio crassidens	FD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	Elliptio crassidens	WD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	6	5	45	55	R	Elliptio crassidens	FD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	110	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	120	30	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	116	30	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	120	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	112	35	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	140	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	115	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	115	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	130	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	WD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Elliptio crassidens	FD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	QN	0.25	5	45	55	R	Elliptio crassidens	FD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	QN	0.25	5	45	55	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Elliptio crassidens	L	-	1	122	30	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	



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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M2	SQ	5	6	55	65	R	Elliptio crassidens	L	-	1	110	26	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	Elliptio crassidens	L	-	1	105	29	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	Elliptio crassidens	L	-	1	106	33	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	8	75	85	R	Elliptio crassidens	L	-	1	115	33	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	8	75	85	R	Elliptio crassidens	L	-	1	123	23	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	8	75	85	R	Elliptio crassidens	L	-	2	-	-	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	8	75	85	R	Elliptio crassidens	FD	-	2	-	-	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	8	75	85	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	9	85	95	R	Elliptio crassidens	L	-	1	-	-	-	0	0	0	5	40	50	5	0	0	0	100.0	24	7.3	
M2	SQ	5	9	85	95	R	Elliptio crassidens	WD	-	2	-	-	-	0	0	0	0	40	50	5	0	0	0	100.0	24	7.3	
M2	SQ	6	3	25	35	R	Elliptio dilitata	L	-	1	122	38	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	
M2	SQ	5	7	65	75	R	Leptodea fragilis	WD	-	1	-	-	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	2	15	25	R	Megalonaia nervosa	L	-	1	187	53	-	0	0	0	0	0	95	5	0	0	0	100.0	20	6.1	
M2	SQ	6	3	25	35	R	Obliquaria reflexa	WD	-	1	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	
M2	SQ	5	4	35	45	R	Obliquaria reflexa	L	-	1	35	4	-	0	0	0	0	0	95	5	0	0	0	100.0	23	7.0	
M2	SQ	5	6	55	65	R	Obliquaria reflexa	L	-	1	63	23	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	Obliquaria reflexa	WD	-	1	-	-	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	Plethobasus cyphus	L	-	1	100	20	-	0	0	0	0	20	75	5	0	0	0	100.0	24	7.3	
M2	SQ	6	3	25	35	R	Pleurobema cordatum	L	-	1	109	53	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	Pleurobema cordatum	L	-	1	120	58	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	Pleurobema cordatum	L	-	1	112	47	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	Pleurobema cordatum	L	-	1	103	46	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	Pleurobema cordatum	L	-	1	110	44	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M2	SQ	6	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	120	53	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	102	54	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	102	41	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Pleurobema cordatum</i>	WD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	5	4	35	45	R	<i>Pleurobema cordatum</i>	L	-	1	104	48	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	<i>Pleurobema cordatum</i>	L	-	1	104	49	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	4	35	45	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	6	5	45	55	R	<i>Pleurobema cordatum</i>	L	-	1	110	41	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	<i>Pleurobema cordatum</i>	L	-	1	110	49	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	<i>Pleurobema cordatum</i>	L	-	1	105	52	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	<i>Pleurobema cordatum</i>	FD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	105	37	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	125	42	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	2	15	25	R	<i>Potamilus alatus</i>	L	-	1	35	0	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	gravid
M2	SQ	5	2	15	25	R	<i>Potamilus alatus</i>	L	f	1	100	3	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	SQ	5	2	15	25	R	<i>Potamilus alatus</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	QN	0.25	3	25	35	R	<i>Potamilus alatus</i>	L	-	1	27	0	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	5	4	35	45	R	<i>Potamilus alatus</i>	L	-	1	28	0	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	
M2	SQ	5	9	85	95	R	<i>Potamilus alatus</i>	L	m	1	145	9	-	0	0	5	40	50	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	<i>Quadrula metanевра</i>	L	-	1	92	32	-	0	0	0	0	95	5	0	0	0	0	100.0	24	7.3	
M2	SQ	6	3	25	35	R	<i>Quadrula pustulosa</i>	L	-	1	60	13	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	6	3	25	35	R	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	
M2	SQ	5	4	35	45	R	<i>Quadrula pustulosa</i>	L	-	1	55	12	-	0	0	0	0	95	5	0	0	0	0	100.0	23	7.0	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M2	SQ	5	4	35	45	R	Quadrula pustulosa	L	-	1	62	17	-	0	0	0	0	0	95	5	0	0	0	100.0	23	7.0	
M2	SQ	6	5	45	55	R	Quadrula pustulosa	L	-	1	70	20	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Quadrula pustulosa	L	-	1	63	15	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Quadrula pustulosa	L	-	1	65	17	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Quadrula pustulosa	L	-	1	70	30	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Quadrula pustulosa	L	-	1	65	24	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Quadrula pustulosa	L	-	1	50	9	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	6	5	45	55	R	Quadrula pustulosa	WD	-	3	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	70	20	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	63	22	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	59	21	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	70	22	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	58	-	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	75	28	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	6	55	65	R	Quadrula pustulosa	WD	-	1	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	QN	0.25	6	55	65	R	Quadrula pustulosa	L	-	1	60	14	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	SQ	5	7	65	75	R	Quadrula pustulosa	WD	-	5	-	-	-	0	0	0	20	75	5	0	0	0	100.0	24	7.3		
M2	SQ	5	8	75	85	R	Quadrula pustulosa	L	-	1	70	26	-	0	0	0	20	75	5	0	0	0	100.0	24	7.3		
M2	SQ	5	8	75	85	R	Quadrula pustulosa	FD	-	2	-	-	-	0	0	0	20	75	5	0	0	0	100.0	24	7.3		
M2	SQ	5	9	85	95	R	Quadrula pustulosa	WD	-	1	-	-	-	0	0	5	40	50	5	0	0	0	100.0	24	7.3		
M2	SQ	5	10	95	105	R	Quadrula pustulosa	FD	-	1	-	-	-	0	0	20	35	40	5	0	0	0	100.0	24	7.3		
M2	SQ	5	7	65	75	R	Tritogonia verrucosa	WD	-	1	-	-	-	0	0	0	20	75	5	0	0	0	100.0	24	7.3		
M3	SQ	5	2	15	25	R	Amblema plicata	L	-	1	97	20	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M3	SQ	5	2	15	25	R	<i>Cyclonaias tuberculata</i>	L	-	1	93	27	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Cyclonaias tuberculata</i>	L	-	1	106	28	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Cyclonaias tuberculata</i>	L	-	1	86	26	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Cyclonaias tuberculata</i>	L	-	1	92	-	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Cyclonaias tuberculata</i>	L	-	1	98	31	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Cyclonaias tuberculata</i>	L	-	1	87	43	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Cyclonaias tuberculata</i>	L	-	1	90	35	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	9	85	95	R	<i>Cyclonaias tuberculata</i>	L	-	1	92	31	-	0	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	SQ	5	9	85	95	R	<i>Cyclonaias tuberculata</i>	L	-	1	96	30	-	0	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	SQ	5	9	85	95	R	<i>Cyclonaias tuberculata</i>	FD	-	1	-	-	-	0	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	SQ	5	10	95	105	R	<i>Cyclonaias tuberculata</i>	L	-	1	89	32	-	0	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	SQ	5	10	95	105	R	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	0	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	SQ	5	2	15	25	R	<i>Ellipsaria lineolata</i>	L	m	1	98	23	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	2	15	25	R	<i>Ellipsaria lineolata</i>	FD	f	1	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	3	25	35	R	<i>Ellipsaria lineolata</i>	L	m	1	110	26	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Ellipsaria lineolata</i>	L	m	1	92	17	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Ellipsaria lineolata</i>	L	f	1	80	18	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	gravid
M3	SQ	5	5	45	55	R	<i>Ellipsaria lineolata</i>	L	-	1	96	22	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Ellipsaria lineolata</i>	L	m	1	88	24	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M3	SQ	5	5	45	55	R	Ellipsaria lineolata	WD	-	1	-	-	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	Ellipsaria lineolata	L	m	1	104	-	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	9	85	95	R	Ellipsaria lineolata	L	m	1	93	16	-	0	0	5	5	80	5	0	0	0	0	95.0	22	6.7	
M3	SQ	5	9	85	95	R	Ellipsaria lineolata	L	f	1	70	13	-	0	0	5	5	80	5	0	0	0	0	95.0	22	6.7	gravid
M3	SQ	5	10	95	105	R	Ellipsaria lineolata	FD	-	1	-	-	-	0	0	20	5	70	5	0	0	0	0	100.0	22	6.7	
M3	SQ	5	1	5	15	R	Elliptio crassidens	L	-	1	-	-	-	0	0	0	35	60	5	0	0	0	0	100.0	16	4.9	
M3	SQ	5	2	15	25	R	Elliptio crassidens	L	-	6	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	2	15	25	R	Elliptio crassidens	WD	-	3	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	2	15	25	R	Elliptio crassidens	FD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	QN	0.25	2	15	25	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	3	25	35	R	Elliptio crassidens	L	-	3	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	3	25	35	R	Elliptio crassidens	WD	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	4	35	45	R	Elliptio crassidens	L	-	1	105	20	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	# of dead mussel shells
M3	SQ	5	4	35	45	R	Elliptio crassidens	L	-	8	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	# of dead mussel shells
M3	QN	0.25	4	35	45	R	Elliptio crassidens	FD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	# of dead mussel shells
M3	SQ	5	5	45	55	R	Elliptio crassidens	L	-	9	-	-	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	5	45	55	R	Elliptio crassidens	WD	-	3	-	-	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells

Appendix A  
Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
M3	QN	0.25	5	45	55	R	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Elliptio crassidens</i>	L	-	22	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Elliptio crassidens</i>	L	-	9	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Elliptio crassidens</i>	WD	-	3	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Elliptio crassidens</i>	FD	-	2	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	8	75	85	R	<i>Elliptio crassidens</i>	L	-	3	-	-	-	0	0	40	20	35	5	0	0	0	100.0	23	7.0	
M3	SQ	5	8	75	85	R	<i>Elliptio crassidens</i>	FD	-	2	-	-	-	0	0	40	20	35	5	0	0	0	100.0	23	7.0	
M3	SQ	5	9	85	95	R	<i>Elliptio crassidens</i>	L	-	3	-	-	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	SQ	5	9	85	95	R	<i>Elliptio crassidens</i>	L	-	1	120	11	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	SQ	5	9	85	95	R	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	SQ	5	9	85	95	R	<i>Elliptio crassidens</i>	FD	-	3	-	-	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	SQ	5	10	95	105	R	<i>Elliptio crassidens</i>	L	-	5	-	-	-	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	SQ	5	10	95	105	R	<i>Elliptio crassidens</i>	FD	-	1	-	-	-	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	QN	0.25	10	95	105	R	<i>Elliptio crassidens</i>	WD	-	1	-	-	-	0	0	20	5	70	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Leptodea fragilis</i>	L	-	1	90	6	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	
M3	QN	0.25	9	85	95	R	<i>Obliquaria reflexa</i>	L	-	1	35	4	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7	
M3	QN	0.25	10	95	105	R	<i>Obliquaria reflexa</i>	L	-	1	14	1	-	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	SQ	5	2	15	25	R	<i>Pleurobema cordatum</i>	L	-	1	115	32	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	2	15	25	R	<i>Pleurobema cordatum</i>	L	-	1	113	42	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	100	38	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M3	SQ	5	5	45	55	R	<i>Pleurobema cordatum</i>	L	-	1	110	25	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Pleurobema cordatum</i>	L	-	1	109	40	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	115	44	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	108	44	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	94	36	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	103	43	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	98	41	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Pleurobema cordatum</i>	L	-	1	104	36	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Pleurobema cordatum</i>	L	-	1	109	42	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Pleurobema cordatum</i>	L	-	1	95	44	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Pleurobema cordatum</i>	L	-	1	100	52	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Pleurobema cordatum</i>	L	-	1	112	48	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Pleurobema cordatum</i>	L	-	1	104	45	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	30	10	55	5	0	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	40	20	35	5	0	0	0	0	100.0	23	7.0	
M3	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	L	-	1	112	36	-	0	0	40	20	35	5	0	0	0	0	100.0	23	7.0	
M3	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	L	-	1	104	44	-	0	0	40	20	35	5	0	0	0	0	100.0	23	7.0	
M3	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	L	-	1	109	42	-	0	0	40	20	35	5	0	0	0	0	100.0	23	7.0	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M3	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	L	-	1	113	49	-	0	0	0	40	20	35	5	0	0	0	100.0	23	7.0	
M3	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	L	-	1	120	55	-	0	0	0	40	20	35	5	0	0	0	100.0	23	7.0	
M3	SQ	5	10	95	105	R	<i>Pleurobema cordatum</i>	L	-	1	101	42	-	0	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	SQ	5	10	95	105	R	<i>Pleurobema cordatum</i>	L	-	1	127	-	-	0	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	SQ	5	10	95	105	R	<i>Pleurobema cordatum</i>	WD	-	2	-	-	-	0	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M3	SQ	5	1	5	15	R	<i>Potamilus alatus</i>	L	m	1	136	6	-	0	0	0	0	35	60	5	0	0	0	100.0	16	4.9	
M3	SQ	5	1	5	15	R	<i>Potamilus alatus</i>	L	m	1	155	10	-	0	0	0	0	35	60	5	0	0	0	100.0	16	4.9	
M3	SQ	5	3	25	35	R	<i>Potamilus alatus</i>	L	f	1	112	6	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	gravid
M3	SQ	5	4	35	45	R	<i>Potamilus alatus</i>	L	f	1	122	7	-	0	0	0	0	0	95	5	0	0	0	100.0	20	6.1	gravid
M3	SQ	5	5	45	55	R	<i>Potamilus alatus</i>	L	-	1	87	2	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Potamilus alatus</i>	L	-	1	15	0+	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	SQ	5	7	65	75	R	<i>Potamilus alatus</i>	L	-	1	25	0	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells
M3	QN	0.25	1	5	15	R	<i>Quadrula pustulosa</i>	L	-	1	42	6	-	0	0	0	0	35	60	5	0	0	0	100.0	16	4.9	
M3	SQ	5	2	15	25	R	<i>Quadrula pustulosa</i>	L	-	1	56	11	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	2	15	25	R	<i>Quadrula pustulosa</i>	L	-	1	49	10	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	2	15	25	R	<i>Quadrula pustulosa</i>	FD	-	1	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	3	25	35	R	<i>Quadrula pustulosa</i>	L	-	1	65	15	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	QN	0.25	3	25	35	R	<i>Quadrula pustulosa</i>	L	-	1	40	8	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells
M3	SQ	5	4	35	45	R	<i>Quadrula pustulosa</i>	L	-	1	60	18	-	0	0	0	0	0	95	5	0	0	0	100.0	20	6.1	# of dead mussel shells
M3	SQ	5	4	35	45	R	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	20	6.1	# of dead mussel shells



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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M3	QN	0.25	4	35	45	R	<i>Quadrula pustulosa</i>	L	-	1	36	5	-	0	0	0	0	0	95	5	0	0	0	100.0	20	6.1	# of dead mussel shells
M3	SQ	5	5	45	55	R	<i>Quadrula pustulosa</i>	L	-	1	50	8	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	SQ	5	5	45	55	R	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	QN	0.25	5	45	55	R	<i>Quadrula pustulosa</i>	L	-	1	67	30	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	SQ	5	6	55	65	R	<i>Quadrula pustulosa</i>	WD	-	1	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	SQ	5	7	65	75	R	<i>Quadrula pustulosa</i>	L	-	1	58	15	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	QN	0.25	9	85	95	R	<i>Quadrula pustulosa</i>	L	-	1	36	5	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7		
M3	QN	0.25	10	95	105	R	<i>Quadrula pustulosa</i>	L	-	1	35	5	-	0	0	20	5	70	5	0	0	0	100.0	22	6.7		
M3	SQ	5	7	65	75	R	<i>Utterbackia imbecillis</i>	L	-	1	45	3	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M4	SQ	5	2	15	25	R	<i>Cyclonaias tuberculata</i>	L	-	1	85	23	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8		
M4	SQ	5	6	55	65	R	<i>Cyclonaias tuberculata</i>	L	-	1	88	29	-	0	0	10	10	75	5	0	0	0	100.0	22	6.7		
M4	SQ	5	8	75	85	R	<i>Cyclonaias tuberculata</i>	L	-	1	90	33	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7		
M4	SQ	5	8	75	85	R	<i>Cyclonaias tuberculata</i>	L	-	1	90	39	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7		
M4	QN	0.25	9	85	95	R	<i>Cyclonaias tuberculata</i>	L	-	1	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7		
M4	QN	0.25	2	15	25	R	<i>Ellipsaria lineolata</i>	WD	-	1	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8		
M4	QN	0.25	3	25	35	R	<i>Ellipsaria lineolata</i>	WD	-	1	-	-	-	0	0	0	15	80	5	0	0	0	100.0	20	6.1		
M4	SQ	5	4	35	45	R	<i>Ellipsaria lineolata</i>	L	m	1	90	14	-	0	0	5	80	15	0	0	0	0	100.0	17	5.2		
M4	SQ	6	7	65	75	R	<i>Ellipsaria lineolata</i>	L	m	1	95	17	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7		
M4	SQ	5	8	75	85	R	<i>Ellipsaria lineolata</i>	L	m	1	98	25	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7		
M4	SQ	5	8	75	85	R	<i>Ellipsaria lineolata</i>	L	m	1	100	27	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7		
M4	SQ	5	8	75	85	R	<i>Ellipsaria lineolata</i>	L	m	1	95	17	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7		

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M4	SQ	5	9	85	95	R	Ellipsaria lineolata	L	f	1	87	18	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	10	95	105	R	Ellipsaria lineolata	L	m	1	90	16	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	10	95	105	R	Ellipsaria lineolata	L	m	1	105	24	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	10	95	105	R	Ellipsaria lineolata	L	m	1	90	18	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	1	5	15	R	Elliptio crassidens	L	-	5	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	QN	0.25	1	5	15	R	Elliptio crassidens	L	-	2	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	SQ	5	2	15	25	R	Elliptio crassidens	L	-	8	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	SQ	5	3	25	35	R	Elliptio crassidens	L	-	5	-	-	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	QN	0.25	3	25	35	R	Elliptio crassidens	L	-	1	-	-	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	4	35	45	R	Elliptio crassidens	L	-	2	-	-	-	0	0	0	5	80	15	0	0	0	0	100.0	17	5.2	
M4	SQ	6	5	45	55	R	Elliptio crassidens	L	-	1	-	-	-	0	0	0	5	80	15	0	0	0	0	100.0	19	5.8	
M4	SQ	5	6	55	65	R	Elliptio crassidens	L	-	10	-	-	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	6	55	65	R	Elliptio crassidens	L	-	1	-	-	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	6	7	65	75	R	Elliptio crassidens	WD	-	6	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	7	65	75	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	Elliptio crassidens	L	-	3	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	9	85	95	R	Elliptio crassidens	L	-	4	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	10	95	105	R	Elliptio crassidens	L	-	2	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	10	95	105	R	Elliptio crassidens	WD	-	1	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	10	95	105	R	Elliptio crassidens	L	-	1	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	7	65	75	R	Obliquaria reflexa	L	-	1	32	3	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	2	15	25	R	Pleurobema cordatum	L	-	1	118	50	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M4	SQ	5	2	15	25	R	<i>Pleurobema cordatum</i>	L	-	1	110	46	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	SQ	5	2	15	25	R	<i>Pleurobema cordatum</i>	L	-	1	100	30	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	114	57	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	124	48	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	100	47	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	112	43	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	114	37	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	110	58	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	<i>Pleurobema cordatum</i>	L	-	1	112	57	-	0	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	107	36	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	104	38	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	106	42	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	L	-	1	107	43	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	5	6	55	65	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	6	7	65	75	R	<i>Pleurobema cordatum</i>	L	-	7	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	L	-	3	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	9	85	95	R	<i>Pleurobema cordatum</i>	L	-	7	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	9	85	95	R	<i>Pleurobema cordatum</i>	WD	-	1	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	10	95	105	R	<i>Pleurobema cordatum</i>	L	-	4	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	1	5	15	R	<i>Potamilus alatus</i>	L	-	1	22	0	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	SQ	5	6	55	65	R	<i>Potamilus alatus</i>	L	m	1	135	6	-	0	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	5	1	5	15	R	<i>Quadrula pustulosa</i>	L	-	1	53	12	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	QN	0.25	2	15	25	R	<i>Quadrula pustulosa</i>	L	-	1	56	-	-	0	0	0	0	0	95	5	0	0	0	100.0	19	5.8	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M4	SQ	5	3	25	35	R	Quadrula pustulosa	L	-	1	61	20	-	0	0	0	15	80	5	0	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	Quadrula pustulosa	L	-	1	63	18	-	0	0	0	15	80	5	0	0	0	0	100.0	20	6.1	
M4	SQ	5	3	25	35	R	Quadrula pustulosa	FD	-	1	-	-	-	0	0	0	15	80	5	0	0	0	0	100.0	20	6.1	
M4	QN	0.25	3	25	35	R	Quadrula pustulosa	WD	-	1	-	-	-	0	0	0	15	80	5	0	0	0	0	100.0	20	6.1	
M4	QN	0.25	3	25	35	R	Quadrula pustulosa	L	-	1	60	23	-	0	0	0	15	80	5	0	0	0	0	100.0	20	6.1	
M4	SQ	5	4	35	45	R	Quadrula pustulosa	L	-	1	61	12	-	0	0	0	80	15	0	0	0	0	0	100.0	17	5.2	
M4	SQ	5	4	35	45	R	Quadrula pustulosa	L	-	1	44	7	-	0	0	0	80	15	0	0	0	0	0	100.0	17	5.2	
M4	QN	0.25	4	35	45	R	Quadrula pustulosa	L	-	1	43	7	-	0	0	0	80	15	0	0	0	0	0	100.0	17	5.2	
M4	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	77	18	-	0	0	0	10	75	5	0	0	0	0	100.0	22	6.7	
M4	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	82	18	-	0	0	0	10	75	5	0	0	0	0	100.0	22	6.7	
M4	SQ	5	6	55	65	R	Quadrula pustulosa	L	-	1	45	6	-	0	0	0	10	75	5	0	0	0	0	100.0	22	6.7	
M4	QN	0.25	6	55	65	R	Quadrula pustulosa	L	-	1	74	-	-	0	0	0	10	75	5	0	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	Quadrula pustulosa	L	-	1	70	18	-	0	0	0	40	25	5	0	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	Quadrula pustulosa	L	-	1	60	18	-	0	0	0	40	25	5	0	0	0	0	100.0	22	6.7	
U1	SQ	5	2	15	25	L	Elliptio crassidens	L	-	1	120	24	-	0	0	0	90	10	0	0	0	0	0	100.0	18	5.5	
U1	SQ	5	2	15	25	L	Elliptio crassidens	L	-	1	115	24	-	0	0	0	90	10	0	0	0	0	0	100.0	18	5.5	
U1	SQ	5	2	15	25	L	Elliptio crassidens	WD	-	9	-	-	-	0	0	0	90	10	0	0	0	0	0	100.0	18	5.5	
U1	SQ	5	3	25	35	L	Elliptio crassidens	L	-	1	120	30	-	0	0	0	80	10	0	0	0	0	10	100.0	20	6.1	shells
U1	SQ	5	3	25	35	L	Elliptio crassidens	WD	-	2	-	-	-	0	0	0	80	10	0	0	0	0	10	100.0	20	6.1	shells
U1	SQ	8	4	35	45	L	Elliptio crassidens	WD	-	2	-	-	-	0	0	0	80	10	0	0	0	0	10	100.0	20	6.1	shells
U1	SQ	9	5	45	55	L	Elliptio crassidens	L	-	1	115	33	-	0	0	0	80	10	0	0	0	0	10	100.0	19	5.8	shells
U1	SQ	6	7	65	75	L	Elliptio crassidens	L	-	1	-	20	-	0	0	0	80	10	0	0	0	0	10	100.0	18	5.5	shells
U1	SQ	6	9	85	95	L	Elliptio crassidens	L	-	1	125	26	-	0	0	0	80	10	0	0	0	0	10	100.0	18	5.5	shells
U1	SQ	6	9	85	95	L	Elliptio crassidens	L	-	1	120	27	-	0	0	0	80	10	0	0	0	0	10	100.0	18	5.5	shells

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
U1	SQ	9	5	45	55	L	Leptodea fragilis	WD	-	1	-	-	-	0	0	0	80	10	0	0	0	0	10	100.0	19	5.8	shells
U1	QN	0.25	7	65	75	L	Leptodea fragilis	L	-	1	46	2	-	0	0	0	80	10	0	0	0	0	10	100.0	18	5.5	shells
U1	SQ	7	10	95	105	L	Leptodea fragilis	L	m	1	73	4	-	0	0	5	80	10	0	0	0	0	5	100.0	18	5.5	shells
U1	SQ	5	3	25	35	L	Obliquaria reflexa	L	-	1	21	2	-	0	0	0	80	10	0	0	0	0	10	100.0	20	6.1	shells
U1	SQ	9	5	45	55	L	Pleurobema cordatum	WD	-	1	-	-	-	0	0	0	80	10	0	0	0	0	10	100.0	19	5.8	shells
U1	SQ	9	5	45	55	L	Pleurobema cordatum	L	-	1	-	35	-	0	0	0	80	10	0	0	0	0	10	100.0	19	5.8	shells
U1	SQ	3	6	55	65	L	Pleurobema cordatum	L	-	1	-	40	-	80	0	0	10	10	0	0	0	0	0	100.0	19	5.8	shells
U1	SQ	5	1	5	15	L	Potamilus alatus	L	m	1	180	15+	-	30	0	0	60	10	0	0	0	0	0	100.0	18	5.5	
U2	SQ	7	1	5	15	L	Ambleria plicata	L	-	1	110	21	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	4	2	15	25	L	Cyclonaias tuberculata	L	-	1	55	8	-	0	0	50	35	10	0	0	0	0	5	100.0	17	5.2	shells
U2	SQ	7	3	25	35	L	Cyclonaias tuberculata	L	-	1	90	25	-	0	0	5	80	10	0	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	WD	-	4	-	-	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	130	26	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	130	24	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	120	28	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	112	27	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	115	35	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	118	32	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	115	27	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	125	27	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	110	25	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	120	31	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	118	25	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	115	32	-	0	0	5	70	20	0	0	0	0	5	100.0	14	4.3	shells

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	118	24	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	123	37	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	120	30	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	114	27	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	115	37	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	118	31	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	120	34	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	115	29	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	121	29	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	105	22	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	115	21	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	100	25	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	Elliptio crassidens	L	-	1	115	31	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	QN	0.25	1	15	25	L	Elliptio crassidens	L	-	1	121	28	-	0	0	50	35	10	0	0	0	5	100.0	17	5.2	shells
U2	SQ	4	2	15	25	L	Elliptio crassidens	L	-	1	115	-	-	0	0	50	35	10	0	0	0	5	100.0	17	5.2	shells
U2	SQ	4	2	15	25	L	Elliptio crassidens	L	-	1	125	-	-	0	0	50	35	10	0	0	0	5	100.0	17	5.2	shells
U2	SQ	4	2	15	25	L	Elliptio crassidens	L	-	1	110	-	-	0	0	50	35	10	0	0	0	5	100.0	17	5.2	shells
U2	SQ	7	3	25	35	L	Elliptio crassidens	WD	-	1	-	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	Elliptio crassidens	L	-	1	125	34	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	Elliptio crassidens	L	-	1	112	35	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	Elliptio crassidens	L	-	1	115	33	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	Elliptio crassidens	L	-	1	118	30	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	Elliptio crassidens	L	-	1	110	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	Elliptio crassidens	L	-	1	112	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,fg,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
U2	SQ	7	3	25	35	L	<i>Elliptio crassidens</i>	L	-	1	115	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	<i>Elliptio crassidens</i>	L	-	1	112	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	<i>Elliptio crassidens</i>	L	-	1	120	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	<i>Elliptio crassidens</i>	L	-	1	114	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	<i>Elliptio crassidens</i>	L	-	1	125	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	3	25	35	L	<i>Elliptio crassidens</i>	L	-	1	110	-	-	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	4	35	45	L	<i>Elliptio crassidens</i>	L	-	1	125	28	-	80	0	10	5	5	5	0	0	0	100.0	19	5.8	
U2	SQ	7	4	35	45	L	<i>Elliptio crassidens</i>	L	-	1	115	27	-	80	0	10	5	5	5	0	0	0	100.0	19	5.8	
U2	SQ	6	5	45	55	L	<i>Elliptio crassidens</i>	L	-	1	130	34	-	0	0	10	70	10	0	0	0	10	100.0	18	5.5	shells
U2	SQ	4	7	65	75	L	<i>Elliptio crassidens</i>	L	-	1	125	-	-	80	0	0	18	2	0	0	0	0	100.0	18	5.5	
U2	SQ	7	4	35	45	L	<i>Elliptio dilatata</i>	L	-	1	105	-	-	80	0	10	5	5	5	0	0	0	100.0	19	5.8	
U2	QN	0.25	2	15	25	L	<i>Obliquaria reflexa</i>	L	-	1	36	4	-	0	0	50	35	10	0	0	0	5	100.0	17	5.2	shells
U2	QN	0.25	8	75	85	L	<i>Obliquaria reflexa</i>	L	-	1	28	3	-	0	0	0	80	10	0	0	0	10	100.0	17.5	5.3	shells
U2	SQ	7	9	85	95	L	<i>Obliquaria reflexa</i>	L	-	1	37	4	-	0	0	20	60	10	0	0	0	10	100.0	18	5.5	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	98	19	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	110	29	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	105	31	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	100	31	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	105	31	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	115	36	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	95	29	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	110	30	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	105	30	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U2	SQ	7	1	5	15	L	<i>Pleurobema cordatum</i>	L	-	1	118	37	-	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
U2	SQ	7	3	25	35	L	<i>Pleurobema cordatum</i>	L	-	1	100	36	-	0	0	0	5	80	10	0	0	0	5	100.0	18	5.5	shells
U2	SQ	7	4	35	45	L	<i>Pleurobema cordatum</i>	L	-	1	100	41	-	80	0	0	10	5	5	0	0	0	0	100.0	19	5.8	
U2	SQ	6	5	45	55	L	<i>Pleurobema cordatum</i>	L	-	1	110	-	-	0	0	0	10	70	10	0	0	0	10	100.0	18	5.5	shells
U2	SQ	7	9	85	95	L	<i>Pleurobema cordatum</i>	L	-	1	102	34	-	0	0	0	20	60	10	0	0	0	10	100.0	18	5.5	shells
U2	QN	0.25	2	15	25	L	<i>Potamilus alatus</i>	WD	-	1	-	-	-	0	0	0	50	35	10	0	0	0	5	100.0	17	5.2	shells
U2	SQ	5	10	95	105	L	<i>Potamilus alatus</i>	L	-	1	33	2	-	0	0	0	20	60	10	0	0	0	10	100.0	18	5.5	shells
U2	SQ	3	8	75	85	L	<i>Pyganodon grandis</i>	L	f	1	163	12	-	0	0	0	0	80	10	0	0	0	10	100.0	17.5	5.3	shells
U2	SQ	7	1	5	15	L	<i>Quadrula pustulosa</i>	L	-	1	47	6	-	0	0	0	5	70	20	0	0	0	5	100.0	14	4.3	shells
U3	SQ	7	2	15	25	L	<i>Cyclonaias tuberculata</i>	L	-	1	83	42	-	0	0	0	5	75	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	7	2	15	25	L	<i>Cyclonaias tuberculata</i>	L	-	1	85	44	-	0	0	0	5	75	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	7	2	15	25	L	<i>Cyclonaias tuberculata</i>	L	-	1	72	40	-	0	0	0	5	75	10	0	0	0	10	100.0	15	4.6	shells
U3	QN	0.25	2	15	25	L	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	0	0	0	5	75	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	5	4	35	45	L	<i>Cyclonaias tuberculata</i>	L	-	1	92	44	-	0	0	0	10	70	10	0	0	0	10	100.0	15	4.6	shells
U3	QN	0.25	4	35	45	L	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	70	0	0	6	21	4	0	0	0	0	101.0	17	5.2	
U3	SQ	6	6	55	65	L	<i>Cyclonaias tuberculata</i>	L	-	1	90	48	-	0	0	0	10	70	10	0	0	0	10	100.0	19	5.8	shells
U3	SQ	6	6	55	65	L	<i>Cyclonaias tuberculata</i>	L	-	1	95	-	-	0	0	0	10	70	10	0	0	0	10	100.0	19	5.8	shells
U3	QN	0.25	6	55	65	L	<i>Cyclonaias tuberculata</i>	L	-	1	97	37	-	0	0	0	10	70	10	0	0	0	10	100.0	19	5.8	shells
U3	SQ	5	4	35	45	L	<i>Ellipsaria lineolata</i>	L	m	1	113	25	-	0	0	0	10	70	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	6	1	5	15	L	<i>Elliptio crassidens</i>	L	-	1	120	30	-	0	0	0	5	75	10	0	0	0	10	100.0	13	4.0	shells
U3	SQ	6	1	5	15	L	<i>Elliptio crassidens</i>	L	-	1	120	31	-	0	0	0	5	75	10	0	0	0	10	100.0	13	4.0	shells
U3	SQ	6	1	5	15	L	<i>Elliptio crassidens</i>	L	-	1	125	29	-	0	0	0	5	75	10	0	0	0	10	100.0	13	4.0	shells
U3	SQ	6	1	5	15	L	<i>Elliptio crassidens</i>	L	-	1	120	32	-	0	0	0	5	75	10	0	0	0	10	100.0	13	4.0	shells
U3	SQ	6	1	5	15	L	<i>Elliptio crassidens</i>	L	-	1	110	-	-	0	0	0	5	75	10	0	0	0	10	100.0	13	4.0	shells
U3	SQ	6	1	5	15	L	<i>Elliptio crassidens</i>	L	-	1	125	34	-	0	0	0	5	75	10	0	0	0	10	100.0	13	4.0	shells



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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
U3 SQ		6	1	5	15	L	Elliptio crassidens	L	-	1	110	35	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		6	1	5	15	L	Elliptio crassidens	L	-	1	110	40	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		6	1	5	15	L	Elliptio crassidens	L	-	1	125	33	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		6	1	5	15	L	Elliptio crassidens	L	-	1	110	27	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		6	1	5	15	L	Elliptio crassidens	L	-	1	115	31	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		6	1	5	15	L	Elliptio crassidens	L	-	1	108	32	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		6	1	5	15	L	Elliptio crassidens	L	-	1	123	41	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		7	2	15	25	L	Elliptio crassidens	L	-	6	-	-	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		7	2	15	25	L	Elliptio crassidens	L	-	1	102	12	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		7	2	15	25	L	Elliptio crassidens	WD	-	1	-	-	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		5	3	25	35	L	Elliptio crassidens	L	-	7	-	-	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		5	4	35	45	L	Elliptio crassidens	L	-	5	-	-	-	0	0	10	70	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		6	5	45	55	L	Elliptio crassidens	WD	-	1	-	-	-	70	0	6	21	4	0	0	0	0	0	101.0	17	5.2	
U3 SQ		6	5	45	55	L	Elliptio crassidens	FD	-	1	-	-	-	70	0	6	21	4	0	0	0	0	0	101.0	17	5.2	
U3 SQ		6	5	45	55	L	Elliptio crassidens	L	-	8	-	-	-	70	0	6	21	4	0	0	0	0	0	101.0	17	5.2	
U3 SQ		6	6	55	65	L	Elliptio crassidens	L	-	2	-	-	-	0	0	10	70	10	0	0	0	0	10	100.0	19	5.8	shells
U3 SQ	3.5	7	65	75	75	L	Elliptio crassidens	L	-	2	-	-	-	40	0	6	48	6	0	0	0	0	0	100.0	20	6.1	
U3 SQ		6	8	75	85	L	Elliptio crassidens	L	-	1	-	-	-	0	0	5	90	5	0	0	0	0	0	100.0	19	5.8	
U3 SQ		6	1	5	15	L	Pleurobema cordatum	L	-	1	105	52	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3 SQ		7	2	15	25	L	Pleurobema cordatum	L	-	1	105	35	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		7	2	15	25	L	Pleurobema cordatum	L	-	1	100	34	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		5	3	25	35	L	Pleurobema cordatum	L	-	1	110	41	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		5	3	25	35	L	Pleurobema cordatum	L	-	1	110	63	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3 SQ		5	3	25	35	L	Pleurobema cordatum	L	-	1	108	62	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
U3	SQ	5	4	35	45	L	<i>Pleurobema cordatum</i>	L	-	1	11	53	-	0	0	0	10	70	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	5	4	35	45	L	<i>Pleurobema cordatum</i>	L	-	1	96	47	-	0	0	0	10	70	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	6	5	45	55	L	<i>Pleurobema cordatum</i>	L	-	1	104	56	-	70	0	0	6	21	4	0	0	0	0	101.0	17	5.2	
U3	SQ	6	5	45	55	L	<i>Pleurobema cordatum</i>	L	-	1	102	50	-	70	0	0	6	21	4	0	0	0	0	101.0	17	5.2	
U3	SQ	6	6	55	65	L	<i>Pleurobema cordatum</i>	L	-	1	105	56	-	0	0	0	10	70	10	0	0	0	10	100.0	19	5.8	shells
U3	SQ	6	6	55	65	L	<i>Pleurobema cordatum</i>	L	-	1	105	52	-	0	0	0	10	70	10	0	0	0	10	100.0	19	5.8	shells
U3	SQ	3.5	7	65	75	L	<i>Pleurobema cordatum</i>	L	-	1	105	40	-	40	0	0	6	48	6	0	0	0	0	100.0	20	6.1	
U3	SQ	6	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	105	51	-	0	0	0	5	90	5	0	0	0	0	100.0	19	5.8	
U3	SQ	6	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	112	61	-	0	0	0	5	90	5	0	0	0	0	100.0	19	5.8	
U3	SQ	6	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	107	47	-	0	0	0	5	90	5	0	0	0	0	100.0	19	5.8	
U3	SQ	6	8	75	85	L	<i>Pleurobema cordatum</i>	L	-	1	115	58	-	0	0	0	5	90	5	0	0	0	0	100.0	19	5.8	
U3	SQ	4	10	95	105	L	<i>Pleurobema cordatum</i>	L	-	1	105	47	-	40	0	0	0	54	6	0	0	0	0	100.0	19	5.8	
U3	SQ	7	2	15	25	L	<i>Potamilus alatus</i>	L	m	1	135	10	-	0	0	0	5	75	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	6	1	5	15	L	<i>Quadrula pustulosa</i>	L	-	1	85	25+	-	0	0	0	5	75	10	0	0	0	10	100.0	13	4.0	shells
U3	SQ	5	4	35	45	L	<i>Quadrula pustulosa</i>	L	-	1	72	-	-	0	0	0	10	70	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	5	4	35	45	L	<i>Quadrula pustulosa</i>	L	-	1	60	26	-	0	0	0	10	70	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	6	5	45	55	L	<i>Quadrula pustulosa</i>	L	-	1	65	35	-	70	0	0	6	21	4	0	0	0	0	101.0	17	5.2	
U4	SQ	6	1	5	15	L	<i>Ambleria plicata</i>	WD	-	1	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	10	3.0	
U4	SQ	6	1	5	15	L	<i>Cyclonaias tuberculata</i>	L	-	1	92	-	-	0	0	0	30	60	10	0	0	0	0	100.0	10	3.0	
U4	SQ	6	1	5	15	L	<i>Cyclonaias tuberculata</i>	L	-	1	84	27	-	0	0	0	30	60	10	0	0	0	0	100.0	10	3.0	
U4	SQ	6	1	5	15	L	<i>Cyclonaias tuberculata</i>	L	-	1	60	10	-	0	0	0	30	60	10	0	0	0	0	100.0	10	3.0	
U4	SQ	5	8	75	85	L	<i>Cyclonaias tuberculata</i>	L	-	1	87	26	-	0	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	6	10	95	105	L	<i>Cyclonaias tuberculata</i>	WD	-	1	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	14	4.3	
U4	SQ	6	5	45	55	L	<i>Ellipsaria lineolata</i>	WD	-	1	-	-	-	0	0	0	40	50	10	0	0	0	0	100.0	13	4.0	

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zeb's (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
U4	SQ	6	1	5	15	L	<i>Elloptio crassidens</i>	L	-	5	-	-	-	0	0	30	60	10	0	0	0	0	100.0	10	3.0	
U4	SQ	6	1	5	15	L	<i>Elloptio crassidens</i>	WD	-	2	-	-	-	0	0	30	60	10	0	0	0	0	100.0	10	3.0	
U4	SQ	5	2	15	25	L	<i>Elloptio crassidens</i>	WD	-	3	-	-	-	0	0	10	80	10	0	0	0	0	100.0	11.0	3.4	
U4	SQ	6	3	25	35	L	<i>Elloptio crassidens</i>	L	-	1	-	-	-	0	0	10	75	15	0	0	0	0	100.0	12.0	3.7	
U4	SQ	5.5	4	35	45	L	<i>Elloptio crassidens</i>	WD	-	1	-	-	-	0	0	10	80	10	0	0	0	0	100.0	12	3.7	
U4	SQ	6	5	45	55	L	<i>Elloptio crassidens</i>	L	-	3	-	-	-	0	0	40	50	10	0	0	0	0	100.0	13	4.0	
U4	QN	0.25	5	45	55	L	<i>Elloptio crassidens</i>	WD	-	1	-	-	-	0	0	40	50	10	0	0	0	0	100.0	13	4.0	
U4	SQ	6	6	55	65	L	<i>Elloptio crassidens</i>	L	-	1	-	-	-	0	0	40	50	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5	7	65	75	L	<i>Elloptio crassidens</i>	L	-	2	-	-	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5	7	65	75	L	<i>Elloptio crassidens</i>	WD	-	3	-	-	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	QN	0.25	7	65	75	L	<i>Elloptio crassidens</i>	L	-	2	-	-	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5.5	9	85	95	L	<i>Elloptio crassidens</i>	WD	-	2	-	-	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5.5	9	85	95	L	<i>Elloptio crassidens</i>	L	-	1	-	-	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5.5	9	85	95	L	<i>Elloptio crassidens</i>	L	-	1	107	13	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	6	10	95	105	L	<i>Elloptio crassidens</i>	WD	-	3	-	-	-	0	0	30	60	10	0	0	0	0	100.0	14	4.3	
U4	SQ	6	10	95	105	L	<i>Elloptio crassidens</i>	L	-	2	-	-	-	0	0	30	60	10	0	0	0	0	100.0	14	4.3	
U4	SQ	5	8	75	85	L	<i>Elloptio dilitata</i>	WD	-	1	-	-	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5.5	9	85	95	L	<i>Pleurobema cordatum</i>	L	-	1	115	44	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	6	3	25	35	L	<i>Quadrula pustulosa</i>	L	-	1	62	24	-	0	0	10	75	15	0	0	0	0	100.0	12.0	3.7	
U4	QN	0.25	3	25	35	L	<i>Quadrula pustulosa</i>	L	-	1	46	11	-	0	0	10	75	15	0	0	0	0	100.0	12.0	3.7	
U4	SQ	6	6	55	65	L	<i>Quadrula pustulosa</i>	WD	-	2	-	-	-	0	0	40	50	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5.5	9	85	95	L	<i>Quadrula pustulosa</i>	WD	-	2	-	-	-	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
BF	SQ	20					<i>Cyclonaias tuberculata</i>	L	-	1	34	4	-	0	0	0	0	0	0	0	0	0	0.0		0.0	20 minute boulder field search

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Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
BF	SQ	20					<i>Elliptio crassidens</i>	WD	-	2	-	-	-	0	0	0	0	0	0	0	0	0	0.0	0.0	20 minute boulder field search	
BF	SQ	20					<i>Elliptio crassidens</i>	FD	-	1	-	-	-	0	0	0	0	0	0	0	0	0	0.0	0.0	20 minute boulder field search	
BF	SQ	20					<i>Leptodea fragilis</i>	WD	-	1	-	-	-	0	0	0	0	0	0	0	0	0	0.0	0.0	20 minute boulder field search	
BF	SQ	20					<i>Obliquaria reflexa</i>	L	-	1	49	8	-	0	0	0	0	0	0	0	0	0	0.0	0.0	20 minute boulder field search	
BF	SQ	20					<i>Obliquaria reflexa</i>	L	-	1	41	6	-	0	0	0	0	0	0	0	0	0	0.0	0.0	20 minute boulder field search	
BF	SQ	20					<i>Potamilus alatus</i>	L	f	1	146	15	-	0	0	0	0	0	0	0	0	0	0.0	0.0	20 minute boulder field search	
BF	SQ	20					<i>Quadrula pustulosa</i>	L	-	1	66	20+	-	0	0	0	0	0	0	0	0	0	0.0	0.0	20 minute boulder field search	
U1	QN	0.25	1	5	15	L	No Mussels	-	-	0	-	-	-	30	0	0	60	10	0	0	0	0	100.0	18	5.5	
U1	QN	0.25	6	55	65	L	No Mussels	-	-	0	-	-	-	80	0	0	10	10	0	0	0	0	100.0	19	5.8	
U1	SQ	6	8	75	85	L	No Mussels	-	-	0	-	-	-	0	0	0	80	10	0	0	0	10	100.0	18	5.5	shells
U2	SQ	6	6	55	65	L	No Mussels	-	-	0	-	-	-	0	0	10	70	10	0	0	0	10	100.0	19	5.8	shells
U2	QN	0.25	7	65	75	L	No Mussels	-	-	0	-	-	-	80	0	0	18	2	0	0	0	0	100.0	18	5.5	
U3	QN	0.25	3	25	35	L	No Mussels	-	-	0	-	-	-	0	0	5	75	10	0	0	0	10	100.0	15	4.6	shells
U3	SQ	5	9	85	95	L	No Mussels	-	-	0	-	-	-	0	0	5	90	5	0	0	0	0	100.0	19	5.8	
U3	QN	0.25	9	85	95	L	No Mussels	-	-	0	-	-	-	0	0	5	90	5	0	0	0	0	100.0	19	5.8	
U3	QN	0.25	10	95	105	L	No Mussels	-	-	0	-	-	-	40	0	0	54	6	0	0	0	0	100.0	19	5.8	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (Yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
U4	QN	0.25	6	55	65	L	No Mussels	-	-	0	-	-	-	0	0	40	50	10	0	0	0	0	100.0	13	4.0		
M1	SQ	5	1	5	15	R	No Mussels	-	-	0	-	-	-	0	0	0	25	70	5	0	0	0	100.0	5	1.5		
M1	QN	0.25	1	5	15	R	No Mussels	-	-	0	-	-	-	0	0	0	25	70	5	0	0	0	100.0	5	1.5		
M1	SQ	5	2	15	25	R	No Mussels	-	-	0	-	-	-	0	0	7	7	80	6	0	0	0	100.0	14	4.3		
M1	QN	0.25	2	15	25	R	No Mussels	-	-	0	-	-	-	0	0	7	7	80	6	0	0	0	100.0	14	4.3		
M1	QN	0.25	5	45	55	R	No Mussels	-	-	0	-	-	-	0	0	30	35	30	5	0	0	0	100.0	12	3.7		
M2	SQ	5	1	5	15	R	No Mussels	-	-	0	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8		
M2	QN	0.25	1	5	15	R	No Mussels	-	-	0	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8		
M2	QN	0.25	7	65	75	R	No Mussels	-	-	0	-	-	-	0	0	0	20	75	5	0	0	0	100.0	24	7.3		
M2	QN	0.25	9	85	95	R	No Mussels	-	-	0	-	-	-	0	0	5	40	50	5	0	0	0	100.0	24	7.3		
M4	QN	0.25	5	45	55	R	No Mussels	-	-	0	-	-	-	0	0	5	80	15	0	0	0	0	100.0	19	5.8		
L1	QN	0.25	1	10	20	L	No Mussels	-	-	0	-	-	-	0	0	0	20	80	0	0	0	0	100.0	16	4.9		
L1	QN	0.25	4	40	50	L	No Mussels	-	-	0	-	-	-	0	0	5	25	70	0	0	0	0	100.0	17	5.2		
L1	QN	0.25	5	50	60	L	No Mussels	-	-	0	-	-	-	0	0	5	25	70	0	0	0	0	100.0	16	4.9		
L1	QN	0.25	8	80	90	L	No Mussels	-	-	0	-	-	-	0	0	5	25	70	0	0	0	0	100.0	15	4.6		
L1	QN	0.25	10	100	110	L	No Mussels	-	-	0	-	-	-	0	0	5	65	30	0	0	0	0	100.0	15	4.6		
L2	QN	0.25	1	5	15	L	No Mussels	-	-	0	-	-	-	0	0	0	0	100	0	0	0	0	100.0	12	3.7		
L2	QN	0.25	4	35	45	L	No Mussels	-	-	0	-	-	-	0	0	0	30	65	5	0	0	0	100.0	15	4.6		
L2	QN	0.25	7	65	75	L	No Mussels	-	-	0	-	-	-	0	0	0	45	50	5	0	0	0	100.0	14	4.3		
L2	QN	0.25	9	85	95	L	No Mussels	-	-	0	-	-	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6		
L2	QN	0.25	10	95	105	L	No Mussels	-	-	0	-	-	-	0	0	5	55	35	5	0	0	0	100.0	15	4.6		
L3	QN	0.25	3	25	35	L	No Mussels	-	-	0	-	-	-	0	0	0	5	0	0	95	0	0	0	100.0	15	4.6	
L3	QN	0.25	6	55	65	L	No Mussels	-	-	0	-	-	-	0	0	20	35	40	5	0	0	0	100.0	15	4.6		
L3	QN	0.25	9	85	95	L	No Mussels	-	-	0	-	-	-	0	0	0	80	15	5	0	0	0	100.0	13	4.0		

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
L3	QN	0.25	10	95	105	L	No Mussels	-	-	0	-	-	-	0	0	0	80	15	5	0	0	0	100.0	14	4.3		
L4	SQ	2	1	5	15	L	No Mussels	-	-	0	-	-	-	0	80	0	0	0	0	0	20	0	100.0	9	2.7	riprap/wood debris	
L4	QN	0.25	1	5	15	L	No Mussels	-	-	0	-	-	-	0	80	0	0	0	0	0	20	0	100.0	9	2.7	riprap/wood debris	
L4	SQ	2	2	15	25	L	No Mussels	-	-	0	-	-	-	0	100	0	0	0	0	0	0	0	100.0	10	3.0	large riprap	
L4	QN	0.25	2	15	25	L	No Mussels	-	-	0	-	-	-	0	100	0	0	0	0	0	0	0	100.0	10	3.0	large riprap	
L4	QN	0.25	3	25	35	L	No Mussels	-	-	0	-	-	-	0	0	0	30	0	0	70	0	0	100.0	11	3.4		
L4	QN	0.25	5	45	55	L	No Mussels	-	-	0	-	-	-	0	0	0	20	30	0	0	0	0	100.0	15	4.6		
L4	QN	0.25	6	55	65	L	No Mussels	-	-	0	-	-	-	0	0	0	5	70	5	0	0	0	100.0	16	4.9		
L4	QN	0.25	9	85	95	L	No Mussels	-	-	0	-	-	-	0	0	0	20	75	5	0	0	0	100.0	21	6.4		
L4	QN	0.25	10	95	105	L	No Mussels	-	-	0	-	-	-	0	0	0	25	70	5	0	0	0	100.0	22	6.7		
U1	QN	0.25	3	25	35	L	Pleurocera canaliculata	L	-	2	-	-	-	0	0	0	80	10	0	0	0	10	100.0	20	6.1	shells	
U1	SQ	8	4	35	45	L	Pleurocera canaliculata	L	-	1	-	-	-	0	0	0	80	10	0	0	0	0	10	100.0	20	6.1	shells
U1	QN	0.25	4	35	45	L	Pleurocera canaliculata	L	-	4	-	-	-	0	0	0	80	10	0	0	0	0	10	100.0	20	6.1	shells
U1	QN	0.25	5	45	55	L	Pleurocera canaliculata	L	-	2	-	-	-	0	0	0	80	10	0	0	0	0	10	100.0	19	5.8	shells
U1	QN	0.25	10	95	105	L	Pleurocera canaliculata	L	-	2	-	-	-	0	0	0	80	10	0	0	0	0	5	100.0	18	5.5	shells
U2	QN	0.25	1	15	25	L	Pleurocera canaliculata	L	-	1	-	-	-	0	0	0	35	10	0	0	0	0	5	100.0	17	5.2	shells
U2	QN	0.25	2	15	25	L	Pleurocera canaliculata	L	-	1	-	-	-	0	0	0	35	10	0	0	0	0	5	100.0	17	5.2	shells
U2	QN	0.25	3	25	35	L	Pleurocera canaliculata	L	-	4	-	-	-	0	0	0	80	10	0	0	0	0	5	100.0	18	5.5	shells
U2	QN	0.25	4	35	45	L	Pleurocera canaliculata	L	-	6	-	-	-	80	0	0	5	5	5	0	0	0	0	100.0	19	5.8	
U2	QN	0.25	5	45	55	L	Pleurocera canaliculata	L	-	1	-	-	-	0	0	0	70	10	0	0	0	0	10	100.0	18	5.5	shells
U2	QN	0.25	6	55	65	L	Pleurocera canaliculata	L	-	1	-	-	-	0	0	0	70	10	0	0	0	0	10	100.0	19	5.8	shells
U2	QN	0.25	9	85	95	L	Pleurocera canaliculata	L	-	1	-	-	-	0	0	0	60	10	0	0	0	0	10	100.0	18	5.5	shells
U3	QN	0.25	5	45	55	L	Pleurocera canaliculata	L	-	2	-	-	-	70	0	0	21	4	0	0	0	0	0	101.0	17	5.2	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
U3	QN	0.25	6	55	65	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	10	70	10	0	0	0	10	100.0	19	5.8	shells
U3	QN	0.25	7	65	75	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	40	0	0	6	48	6	0	0	0	0	100.0	20	6.1	
U3	QN	0.25	8	75	85	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	5	90	5	0	0	0	0	100.0	19	5.8	
U4	QN	0.25	1	5	15	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	10	3.0	
U4	SQ	5	2	15	25	L	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	10	80	10	0	0	0	0	100.0	11.0	3.4	
U4	QN	0.25	2	15	25	L	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	10	80	10	0	0	0	0	100.0	11.0	3.4	
U4	QN	0.25	3	25	35	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	10	75	15	0	0	0	0	100.0	12.0	3.7	
U4	QN	0.25	4	35	45	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	10	80	10	0	0	0	0	100.0	12	3.7	
U4	SQ	6	5	45	55	L	<i>Pleurocera canaliculata</i>	L	-	3	-	-	-	0	0	0	40	50	10	0	0	0	0	100.0	13	4.0	
U4	QN	0.25	5	45	55	L	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	40	50	10	0	0	0	0	100.0	13	4.0	
U4	SQ	6	6	55	65	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	40	50	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5	7	65	75	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	QN	0.25	7	65	75	L	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5	8	75	85	L	<i>Pleurocera canaliculata</i>	L	-	4	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	QN	0.25	8	75	85	L	<i>Pleurocera canaliculata</i>	L	-	6	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	5.5	9	85	95	L	<i>Pleurocera canaliculata</i>	L	-	3	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	QN	0.25	9	85	95	L	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	13	4.0	
U4	SQ	6	10	95	105	L	<i>Pleurocera canaliculata</i>	L	-	3	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	14	4.3	
U4	QN	0.25	10	95	105	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	30	60	10	0	0	0	0	100.0	14	4.3	
M1	QN	0.25	4	35	45	R	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	15	35	40	0	0	0	0	90.0	13	4.0	
M1	QN	0.25	6	55	5	R	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	40	0	0	12	33	12	3	0	0	0	100.0	17	5.2	
M1	QN	0.25	10	95	105	R	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	5	50	40	5	0	0	0	100.0	24	7.3	
M2	QN	0.25	3	25	35	R	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	22	6.7	# of dead mussel
M3	QN	0.25	6	55	65	R	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	30	10	55	5	0	0	0	100.0	22	6.7	

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Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M3	SQ	5	9	85	95	R	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	5	5	80	5	0	0	0	95.0	22	6.7	shells
M4	SQ	6	7	65	75	R	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	8	75	85	R	<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
BF	SQ	20					<i>Pleurocera canaliculata</i>	L	-	2	-	-	-	0	0	0	0	0	0	0	0	0	0.0		0.0	20 minute boulder field search	
L1	SQ	5	5	50	60	L	<i>Pleurocera canaliculata</i>	L	-	3	-	-	-	0	0	0	5	25	70	0	0	0	100.0	16	4.9		
L1	QN	0.25	6	60	70	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	5	25	70	0	0	0	100.0	16	4.9		
L3	QN	0.25	2	15	25	L	<i>Pleurocera canaliculata</i>	L	-	3	-	-	-	0	0	0	0	0	0	0	100	0	0	100.0	15	4.6	dead mussels
L4	QN	0.25	7	65	75	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	5	20	70	5	0	0	100.0	16	4.9		
L4	SQ	5	9	85	95	L	<i>Pleurocera canaliculata</i>	L	-	1	-	-	-	0	0	0	0	20	75	5	0	0	100.0	21	6.4		
U1	SQ	5	2	15	25	L	<i>Viviparus georgianus</i>	L	-	5	-	-	-	0	0	0	0	90	10	0	0	0	100.0	18	5.5		
U1	QN	0.25	2	15	25	L	<i>Viviparus georgianus</i>	L	-	2	-	-	-	0	0	0	0	90	10	0	0	0	100.0	18	5.5		
U1	QN	0.25	3	25	35	L	<i>Viviparus georgianus</i>	L	-	1	-	-	-	0	0	0	0	80	10	0	0	0	100.0	20	6.1	shells	
U1	QN	0.25	4	35	45	L	<i>Viviparus georgianus</i>	L	-	1	-	-	-	0	0	0	0	80	10	0	0	0	100.0	20	6.1	shells	
U1	QN	0.25	8	75	85	L	<i>Viviparus georgianus</i>	L	-	2	-	-	-	0	0	0	0	80	10	0	0	0	100.0	18	5.5	shells	
U1	QN	0.25	9	85	95	L	<i>Viviparus georgianus</i>	L	-	1	-	-	-	0	0	0	0	80	10	0	0	0	100.0	18	5.5	shells	
U1	QN	0.25	10	95	105	L	<i>Viviparus georgianus</i>	L	-	4	-	-	-	0	0	0	5	80	10	0	0	0	100.0	18	5.5	shells	
U2	QN	0.25	2	15	25	L	<i>Viviparus georgianus</i>	L	-	2	-	-	-	0	0	0	50	35	10	0	0	0	100.0	17	5.2	shells	
U2	QN	0.25	3	25	35	L	<i>Viviparus georgianus</i>	L	-	4	-	-	-	0	0	0	5	80	10	0	0	0	100.0	18	5.5	shells	
U2	QN	0.25	5	45	55	L	<i>Viviparus georgianus</i>	L	-	1	-	-	-	0	0	0	10	70	10	0	0	0	100.0	18	5.5	shells	
U2	QN	0.25	6	55	65	L	<i>Viviparus georgianus</i>	L	-	1	-	-	-	0	0	0	10	70	10	0	0	0	100.0	19	5.8	shells	
U2	QN	0.25	9	85	95	L	<i>Viviparus georgianus</i>	L	-	4	-	-	-	0	0	0	20	60	10	0	0	0	100.0	18	5.5	shells	
U2	SQ	5	10	95	105	L	<i>Viviparus georgianus</i>	L	-	5	-	-	-	0	0	0	20	60	10	0	0	0	100.0	18	5.5	shells	



Appendix A  
Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
U2	QN	0.25	10	95	105	L	Viviparus georgianus	L	-	2	-	-	-	0	0	20	60	10	0	0	0	0	10	100.0	18	5.5	shells
U3	QN	0.25	1	5	15	L	Viviparus georgianus	L	-	2	-	-	-	0	0	5	75	10	0	0	0	0	10	100.0	13	4.0	shells
U3	QN	0.25	2	15	25	L	Viviparus georgianus	L	-	1	-	-	-	0	0	5	75	10	0	0	0	0	10	100.0	15	4.6	shells
U3	QN	0.25	6	55	65	L	Viviparus georgianus	L	-	2	-	-	-	0	0	10	70	10	0	0	0	0	10	100.0	19	5.8	shells
U4	SQ	6	1	5	15	L	Viviparus georgianus	L	-	6	-	-	-	0	0	30	60	10	0	0	0	0	0	100.0	10	3.0	
U4	SQ	5	2	15	25	L	Viviparus georgianus	L	-	6	-	-	-	0	0	10	80	10	0	0	0	0	0	100.0	11.0	3.4	
U4	QN	0.25	3	25	35	L	Viviparus georgianus	L	-	1	-	-	-	0	0	10	75	15	0	0	0	0	0	100.0	12.0	3.7	
U4	SQ	5.5	4	35	45	L	Viviparus georgianus	L	-	1	-	-	-	0	0	10	80	10	0	0	0	0	0	100.0	12	3.7	
U4	QN	0.25	5	45	55	L	Viviparus georgianus	L	-	2	-	-	-	0	0	40	50	10	0	0	0	0	0	100.0	13	4.0	
U4	SQ	5	7	65	75	L	Viviparus georgianus	L	-	3	-	-	-	0	0	30	60	10	0	0	0	0	0	100.0	13	4.0	
U4	QN	0.25	7	65	75	L	Viviparus georgianus	L	-	1	-	-	-	0	0	30	60	10	0	0	0	0	0	100.0	13	4.0	
U4	SQ	6	10	95	105	L	Viviparus georgianus	L	-	2	-	-	-	0	0	30	60	10	0	0	0	0	0	100.0	14	4.3	
M1	SQ	6	4	35	45	R	Viviparus georgianus	L	-	1	-	-	-	0	0	15	35	40	0	0	0	0	0	90.0	13	4.0	
M1	QN	0.25	6	55	5	R	Viviparus georgianus	L	-	5	-	-	-	40	0	12	33	12	3	0	0	0	0	100.0	17	5.2	
M1	QN	0.25	7	65	75	R	Viviparus georgianus	L	-	1	-	-	-	0	0	20	55	20	5	0	0	0	0	100.0	22	6.7	
M1	SQ	5	8	75	85	R	Viviparus georgianus	L	-	4	-	-	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	QN	0.25	8	75	85	R	Viviparus georgianus	L	-	1	-	-	-	0	0	5	50	45	0	0	0	0	0	100.0	25	7.6	
M1	SQ	5	9	85	95	R	Viviparus georgianus	L	-	1	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	SQ	5	10	95	105	R	Viviparus georgianus	L	-	2	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	24	7.3	
M1	QN	0.25	9	85	95	R	Viviparus georgianus	L	-	5	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	25	7.6	
M1	QN	0.25	10	95	105	R	Viviparus georgianus	L	-	5	-	-	-	0	0	5	50	40	5	0	0	0	0	100.0	24	7.3	
M2	SQ	5	2	15	25	R	Viviparus georgianus	L	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	QN	0.25	2	15	25	R	Viviparus georgianus	L	-	1	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	20	6.1	
M2	QN	0.25	3	25	35	R	Viviparus georgianus	L	-	2	-	-	-	0	0	0	0	95	5	0	0	0	0	100.0	22	6.7	

Appendix A  
Survey Results

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes	
M2	QN	0.25	4	35	45	R	Viviparus georgianus	L	-	1	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	23	7.0	
M2	SQ	6	5	45	55	R	Viviparus georgianus	L	-	5	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	QN	0.25	5	45	55	R	Viviparus georgianus	L	-	2	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	QN	0.25	6	55	65	R	Viviparus georgianus	L	-	3	-	-	-	0	0	0	0	0	95	5	0	0	0	100.0	24	7.3	
M2	QN	0.25	8	75	85	R	Viviparus georgianus	L	-	2	-	-	-	0	0	0	20	75	5	0	0	0	100.0	24	7.3		
M2	QN	0.25	10	95	105	R	Viviparus georgianus	L	-	2	-	-	-	0	0	20	35	40	5	0	0	0	100.0	24	7.3		
M3	QN	0.25	1	5	15	R	Viviparus georgianus	L	-	4	-	-	-	0	0	0	35	60	5	0	0	0	100.0	16	4.9		
M3	QN	0.25	2	15	25	R	Viviparus georgianus	L	-	2	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells	
M3	QN	0.25	3	25	35	R	Viviparus georgianus	L	-	5	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	# of dead mussel shells	
M3	QN	0.25	4	35	45	R	Viviparus georgianus	L	-	1	-	-	-	0	0	0	0	95	5	0	0	0	100.0	20	6.1	# of dead mussel shells	
M3	QN	0.25	5	45	55	R	Viviparus georgianus	L	-	2	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	SQ	5	6	55	65	R	Viviparus georgianus	L	-	1	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	QN	0.25	6	55	65	R	Viviparus georgianus	L	-	8	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	SQ	5	7	65	75	R	Viviparus georgianus	L	-	6	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	QN	0.25	7	65	75	R	Viviparus georgianus	L	-	4	-	-	-	0	0	30	10	55	5	0	0	0	100.0	22	6.7	# of dead mussel shells	
M3	SQ	5	8	75	85	R	Viviparus georgianus	L	-	3	-	-	-	0	0	40	20	35	5	0	0	0	100.0	23	7.0		
M3	SQ	5	9	85	95	R	Viviparus georgianus	L	-	6	-	-	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7		
M3	QN	0.25	8	75	85	R	Viviparus georgianus	L	-	4	-	-	-	0	0	40	20	35	5	0	0	0	100.0	23	7.0		
M3	SQ	5	10	95	105	R	Viviparus georgianus	L	-	20	-	-	-	0	0	20	5	70	5	0	0	0	100.0	22	6.7		
M3	QN	0.25	9	85	95	R	Viviparus georgianus	L	-	4	-	-	-	0	0	5	5	80	5	0	0	0	95.0	22	6.7		

Site	Method	Effort (m2,min)	Transect/ Sample	Min Dist bank (m,ft)	Max Dist bank(m,ft)	Bank (L,R)	Species	Cond. (L/FD/WD/R)	Reprod (m,f,g,u)	Abund	Length (mm)	Age (yr)	Asian or Zebs (#,% m2 or shell)	Be	Bo	Cb	Grav	Sd	St	Cl	Wd	Othr	TOTAL	Depth (ft)	Depth (m)	Notes
M3	QN	0.25	10	95	105	R	Viviparus georgianus	L	-	3	-	-	-	0	0	20	5	70	5	0	0	0	100.0	22	6.7	
M4	SQ	5	1	5	15	R	Viviparus georgianus	L	-	1	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	QN	0.25	1	5	15	R	Viviparus georgianus	L	-	5	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	QN	0.25	2	15	25	R	Viviparus georgianus	L	-	3	-	-	-	0	0	0	0	95	5	0	0	0	100.0	19	5.8	
M4	QN	0.25	3	25	35	R	Viviparus georgianus	L	-	5	-	-	-	0	0	0	15	80	5	0	0	0	100.0	20	6.1	
M4	QN	0.25	4	35	45	R	Viviparus georgianus	L	-	1	-	-	-	0	0	5	80	15	0	0	0	0	100.0	17	5.2	
M4	SQ	5	6	55	65	R	Viviparus georgianus	L	-	2	-	-	-	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	6	55	65	R	Viviparus georgianus	L	-	4	-	-	-	0	0	10	10	75	5	0	0	0	100.0	22	6.7	
M4	SQ	6	7	65	75	R	Viviparus georgianus	L	-	1	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	7	65	75	R	Viviparus georgianus	L	-	3	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	Viviparus georgianus	L	-	2	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	8	75	85	R	Viviparus georgianus	L	-	3	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	8	75	85	R	Viviparus georgianus	L	-	1	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	9	85	95	R	Viviparus georgianus	L	-	3	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	SQ	5	10	95	105	R	Viviparus georgianus	L	-	9	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	
M4	QN	0.25	10	95	105	R	Viviparus georgianus	L	-	2	-	-	-	0	0	30	40	25	5	0	0	0	100.0	22	6.7	20 minute boulder field search
BF	SQ	20					Viviparus georgianus	L	-	1	-	-	-	0	0	0	0	0	0	0	0	0	0.0		0.0	
L4	SQ	4	8	75	85	L	Viviparus georgianus	L	-	1	-	-	-	0	0	5	20	70	5	0	0	0	100.0	18	5.5	
L4	SQ	4	10	95	105	L	Viviparus georgianus	L	-	1	-	-	-	0	0	0	25	70	5	0	0	0	100.0	22	6.7	
														1780	360	8622	31638	46208	2685	1925	40	1180			0.0	

## **APPENDIX B – SAMPLING LOCATIONS**

Site	Latitude	Longitude
U4_End	35.59795543	-84.77822805
U4_Begin	35.59780573	-84.77702131
U3_End	35.60188838	-84.77613090
U3_Begin	35.60195829	-84.77504728
U2_End	35.60758548	-84.77584306
U2_Begin	35.60785504	-84.77478929
U1_End	35.60871804	-84.77595261
U1_Begin	35.60897126	-84.77497512
M4_End	35.58317151	-84.81005128
M4_Begin	35.58364802	-84.81101068
M3_End	35.58380384	-84.80938517
M3_Begin	35.58446123	-84.81030861
M2_End	35.58754066	-84.80369839
M2_Begin	35.58831364	-84.80435830
M1_End	35.58816922	-84.80260011
M1_Begin	35.58883717	-84.80294234
L4_End	35.55338457	-84.85512681
L4_Begin	35.55256843	-84.85559930
L3_End	35.55218806	-84.85190917
L3_Begin	35.55138130	-84.85216632
L2_End	35.55089414	-84.84619740
L2_Begin	35.55001966	-84.84637233
L1_End	35.55073002	-84.84489947
L1_Begin	35.54990022	-84.84517129
<i>L. Abrupta</i>	35.58752708	-84.80372479
Boulder Field Exp Site1	35.60292304	-84.77783435
Boulder Field Exp Site 2	35.60292447	-84.77788179
Boulder Field Control	35.60313829	-84.77770653
Boulder Qualitative Search	35.60329931	-84.77776361
Boulder Qualitative Search	35.60330015	-84.77774626
Boulder Qualitative Search	35.60236607	-84.77811037

## **APPENDIX C – PHOTO LOG**



*Project Area*



*Project Area*



*General Area of Transects 1 and 2 in the Upper  
Sampling Reach*



*Dive Boat Sampling Along Transect 3 of Upper  
Reach*



*Dive Boat Sampling Transect 1 of Middle Reach*



*Looking Downstream Toward Lower Reach*



*Amblema plicata*



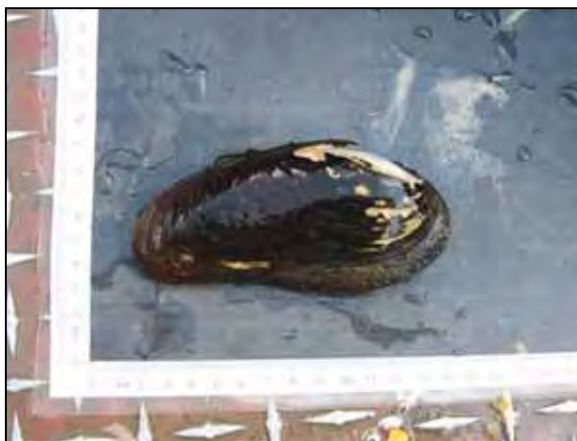
*Cyclonaias tuberculata*



*Ellipsaria lineolata*



*Elliptio crassidens*



*Elliptio dilatata*



*Fusconaia subrotunda*

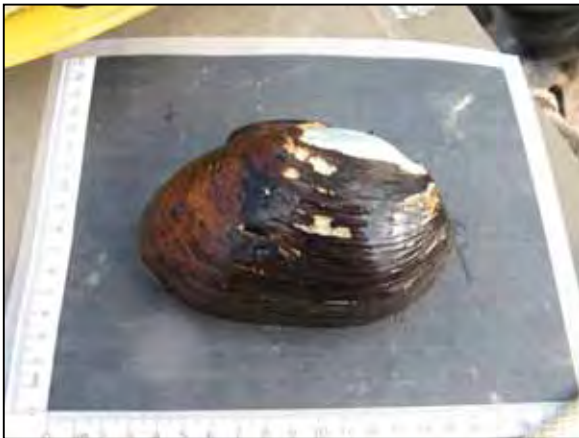




*Lampsilis abrupta*



*Lampsilis abrupta*



*Lampsilis abrupta*



*Leptodea fragilis*



*Megaloniaias nervosa*



*Obliquaria reflexa*



*Plethobasus cyphus*



*Pleurobema cordatum*



*Pleurocera canaliculata*



*Potamilus alatus*



*Pyganodon grandis*



*Quadrula metanerva*



*Quadrula pustulosa*



*Viviparus georgianus*