

Final Report

**Collection and Translocation of Mussels
from two
Township Bridge Reconstruction Corridors
in
Otter Tail County, Minnesota**

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and

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INTRODUCTION

This report contains the results of a project designed to collect and translocate unionid mussels in the Otter Tail River at two township bridge reconstruction corridors in Otter Tail County, Minnesota. The goal of this project was to collect all live unionid mussels within the construction footprint of each bridge site, and safely translocate the specimens upstream and out of harm from the construction activities. The work was conducted by Dr. Patrick A. Ceas (independent contractor), and Rick and Sharon Wicklund (Otter Tail County rescue divers). The construction footprint at each site is estimated to cover 150 feet, or extend from approximately 75 feet downstream to 75 feet upstream of the centerline of the existing bridges (Rick West, pers. comm.). Given that some downstream siltation and sedimentation is inevitable (even while using current BMP's), and that this siltation could adversely affect the local mussel community, the decision was made to extend the downstream collection zones beyond the 75' footprint. After consulting with Rick West (Otter Tail County Dept. of Highways) and Bonita Eliason (Supervisor, MN DNR Natural Heritage and Nongame Program), and reconnoitering the project corridors, it was decided that the downstream collection zones would extend 300 feet downstream of the existing centerline of each bridge. The upstream collection zones extended 100 feet from the bridge centerlines.

This work was conducted under Special Permit No. 10725, issued to Patrick Ceas from the Minnesota Department of Natural Resources, Division of Ecological Services.

GENERAL SITE DESCRIPTIONS

General locality information is as follows:

Hobart Township bridge: 1 mi. NW Luce, approximately 0.2 mi. west (upstream) of the southbound U.S. 10 bridge; SE/4, SE/4, Sec.13, NE/4, NE/4, Sec.24.

Gorman Township bridge: 2.5 mi. ESE Luce; NW/4, NW/4, Sec. 34.

The two bridge sites were divided into four stream segments, so that each bridge construction corridor contained an upstream and a downstream segment (Figures 1 & 2). These four stream segments were treated as individual sample sites, and will be referred to as "Hobart Upstream," "Hobart Downstream," "Gorman Upstream," and "Gorman Downstream."

Otter Tail River at Hobart Township Bridge

Hobart Downstream

The substrate was a relatively uniform mixture of sand and gravel, and the depth was fairly uniform across the channel averaging 2.5 feet with deeper holes reaching 4 feet. An occasional large boulder was present, and cobble was scattered intermittently. The stream bottom gradually sloped upwards towards the banks, where depths averaged 4-6 inches. Stream width ranged from 50-66 feet, and downstream flow was eastward. Stream flow was moderate throughout, and the entire stream segment could be characterized as a flowing pool or run, with quiet eddies

and backwaters. The stream margin along the north (and more upland) side was bordered by maturing trees, and along the south (bottomland) bank by grasses/willows before being replaced by riparian woods. Beyond the sloped riparian zones (which extended 50–200 feet) the rolling uplands were planted in cornfields.

Hobart Upstream

The dominant substrate was sand, with pockets of sand/gravel or sand/silt. Extensive beds of aquatic vegetation were also present. The stream was considerably wider and shallower (and with a slower flow) than at Hobart Downstream. Stream width reached 145 feet, and depth averaged less than 2 feet.

Otter Tail River at Gorman Township Bridge

Gorman Downstream

The substrate was a mixed sand/gravel/cobble, with some larger boulders present. The depth ranged from 1–4 feet (2.5 feet average), and width ranged from 55–85 feet. Stream flow was moderate throughout, and the entire stream segment could be characterized as a raceway, with quiet eddies along the stream margins. The stream margins were bordered by wild rice for 50–200 feet before being replaced with a riparian forest strip.

Gorman Upstream

As with the Hobart Bridge, Gorman Upstream was considerably wider than Gorman Downstream (perhaps due to a backing up of water and resulting back eddy / scouring effect caused by the narrow bridge?). The width ranged from 55–200 feet, and the depth averaged less than 2 feet. The substrate was a mixed sand/silt, and rice beds essentially divided the stream into three braided channels.

METHODS

The downstream segments extended from the centerline of the existing bridge to approximately 300 feet downstream (Figures 1 & 2; from bridge to point D), and the upstream segments extended 100 feet from the bridge centerlines (Figures 1 & 2; from bridge to point C). Although each stream segment was measured to begin at the centerline of the bridges, in reality these four stream segments extended beneath the entire bridge. Therefore, the stream substrate below each bridge was effectively searched twice; once while conducting the search for mussels in the downstream stream segment, and once while conducting the search for mussels in the upstream stream segment.

Each of the four sample sites was divided into three longitudinal subreaches that were approximately equal in width, with a midstream subreach, a right-descending bank subreach, and

a left-descending bank subreach. All three divers worked each sample site, with one diver per subreach. Each diver sampled his/her subreach and systematically worked from the downstream terminus to the upstream terminus in a grid-like pattern. Mussels were gathered by hand while snorkeling or scuba diving, and placed into mesh bags that were carried by the divers. Water clarity and, therefore, underwater visibility, were excellent. A defined area of substrate (approximately 1 meter square) was first visually searched and all mussels observed were collected. The diver next systematically disturbed the substrate within this particular area with his/her hands to a depth of 4–6 inches, sifting through the substrate and gathering all remaining mussels (all aquatic vegetation beds were also sampled thoroughly). The diver would then proceed either upstream or perpendicular to the current and begin the search process anew. Since mussels were quite numerous, the divers filled their mesh bags often; therefore, once a mesh bag was full the diver would take the mussels to a designated instream corral and deposit the mussels for further processing. The diver would then return and continue sampling. Once the entire stream segment was sampled the divers conducted a “quality control” search for mussels in each other’s subreaches. A total of 10.5 collector-hours was spent searching for mussels at the Hobart Downstream segment, 10.5 collector-hours were spent at the Gorman Downstream segment, 11 collector-hours were spent at the Hobart Upstream segment, and 4.5 collector-hours were spent at the Gorman Upstream segment.

Once all mussels were collected from a sample site (e.g., from Hobart Downstream), the following data were gathered for each species: total number of individuals, number of individuals per given age class (0–5 years, 6–10 years, over 10 years old), and the minimum and maximum sizes (in mm) for each age class. Since live individuals of a given species were always found, there was no need to record data on shell condition of dead individuals.

Mussels were translocated to stream segments that were well upstream of the construction corridors (Figures 1 & 2; between points A and B). At each bridge site, these translocation regions began approximately 300 feet upstream of the bridge (i.e., at least 200 feet upstream of the upstream footprint) and extended upstream for another 400 feet. The translocation sites were similar to the removal sites in stream morphometry, flow rates, and microhabitat characteristics,

Mussels were collected, aged and measured, and translocated from Hobart Downstream on 4 September 2001, from Gorman Downstream on 5 September 2001, and from Gorman Upstream on 6 September 2001. Mussels were collected from Hobart Upstream on 6 September 2001 and translocated to an upstream corral overnight. These mussels were aged and measured on 7 September 2001, and dispersed throughout the translocation site.

RESULTS

Otter Tail River at Hobart Township Bridge

Hobart Downstream

Four hundred sixty-eight individuals representing nine live species were collected and translocated (Table 1). Three species listed as Special Concern in Minnesota (black sandshell, fluted-shell, and creek heelsplitter) were collected. The fatmucket was the most abundant species, comprising 36% of all individuals found. The fluted-shell was the second most abundant species, comprising 20% of all individuals found. The black sandshell comprised just 4% of all individuals found, and the creek heelsplitter was represented by only two individuals. For each species, minimum and maximum sizes and numbers of individuals within each age class are given in Table 1.

Hobart Upstream

Eight hundred four individuals representing nine live species were collected and translocated (Table 2). Three species listed as Special Concern in Minnesota (black sandshell, fluted-shell, and creek heelsplitter) were collected. The fatmucket and white heelsplitter were almost equally common, and together comprised 65% of all individuals found. The fluted-shell was the third most abundant species, comprising 9.6% of all individuals found. The black sandshell and creek heelsplitter were uncommon, comprising a combined 2% of all individuals found. For each species, minimum and maximum sizes and numbers of individuals within each age class are given in Table 2.

Otter Tail River at Gorman Township Bridge

Gorman Downstream

Six hundred two individuals representing eight live species were collected and translocated (Table 3). Two species listed as Special Concern in Minnesota (black sandshell and fluted-shell) were collected. The fluted-shell was the most abundant species, representing 45% of all individuals found. The white heelsplitter was the second most abundant species, representing 20% of all individuals found. The black sandshell was relatively common at this site, representing 10% of all individuals found. For each species, minimum and maximum sizes and numbers of individuals within each age class are given in Table 3.

Gorman Upstream

One hundred six individuals representing eight live species were collected and translocated (Table 4). Three species listed as Special Concern in Minnesota (black sandshell, fluted-shell, and creek heelsplitter) were collected. The fatmucket and white heelsplitter collectively represented 63% of all individuals found. The fluted-shell was the third most abundant species, representing 18% of all individuals found. Only one creek heelsplitter and 3 black sandshells

were found. For each species, minimum and maximum sizes and numbers of individuals within each age class are given in Table 4.

Table 1. Age classes, numbers, and size ranges of mussels relocated from the downstream segment of the Hobart Township bridge replacement zone on the Otter Tail River.

Live Species	Number of inds. per age class (yrs)				Min. & Max. length (mm) in each age class					
	Age 0-5	Age 6-10	Age >10	Total	Age 0-5		Age 6-10		Age > 10	
					Min	Max	Min	Max	Min	Max
<i>Fusconia flava</i> Wabash pigtoe	-	1	3	4	-	-	-	72.5	90.5	101.5
<i>Lampsilis cardium</i> Plain pocketbook	2	18	33	53	80.5	90.0	95.0	127.5	101.5	140.0
<i>Lasmigona complanata</i> White heelsplitter	4	15	43	62	90.0	102.5	110.5	138.0	136.0	170.0
<i>Lampsilis siliquoides</i> Famnucket	15	130	22	167	64.0	107.0	79.0	126.0	122.0	130.0
<i>Lasmigona compressa</i> Creek heelsplitter	-	2	-	2	-	-	102.5	106.5	-	-
<i>Lasmigona costata</i> Fluted-shell	-	64	30	94	-	-	93.5	125.0	115.0	131.0
<i>Ligumia recta</i> Black sandshell	-	3	16	19	-	-	121.5	133.0	132.5	187.0
<i>Pyganodon grandis</i> Giant floater	9	10	6	25	78.5	99.5	88.0	106.0	94.0	116.5
<i>Strophitus undulatus</i> Squawfoot	11	29	2	42	75.0	82.5	80.5	108.0	115.5	119.0
Total #'s of Mussels	41	272	155	468						

Table 2. Age classes, numbers, and size ranges of mussels relocated from the upstream segment of the Hobart Township bridge replacement zone on the Otter Tail River.

Live Species	Number of inds. per age class (yrs)			Total	Min. & Max. length (mm) in each age class					
	Age 0-5	Age 6-10	Age >10		Age 0-5		Age 6-10		Age > 10	
					Min	Max	Min	Max	Min	Max
<i>Fuscania flava</i> Wabash pigtoe	10	22	14	46	60.0	76.5	65.0	97.5	92.5	120.0
<i>Lampsilis cardium</i> Plain pocketbook	11	12	12	35	76.0	93.0	106.0	120.0	100.0	125.0
<i>Lasmigona complanata</i> White heelsplitter	23	104	137	264	62.5	122.0	100.5	150.0	122.5	175.0
<i>Lampsilis stigeoidea</i> Fatmucket	59	162	39	260	48.5	87.5	73.0	127.5	95.8	140.0
<i>Lasmigona compressa</i> Creek heelsplitter	1	4	-	5	-	81.0	100.0	112.0	-	-
<i>Lasmigona costata</i> Fluted-shell	1	47	29	77	-	106.5	101.0	128.0	115.0	145.0
<i>Ligumia recta</i> Black sandshell	-	3	6	9	-	-	105.5	150.0	137.5	145.0
<i>Pyganodon grandis</i> Giant floater	22	35	-	57	72.5	105.9	93.0	110.0	-	-
<i>Strophitus undulatus</i> Squawfoot	5	42	4	51	70.0	90.0	78.0	96.5	91.0	105.0
Total #'s of Mussels	132	431	241	804						

Table 3. Age classes, numbers, and size ranges of mussels relocated from the downstream segment of the Gorman Township bridge replacement zone on the Otter Tail River.

Live Species	Number of inds. per age class (yrs)				Min. & Max. length (mm) in each age class					
	Age 0-5	Age 6-10	Age >10	Total	Age 0-5		Age 6-10		Age > 10	
					Min	Max	Min	Max	Min	Max
<i>Fuscania flava</i> Wabash pigtoe	14	13	3	44	52.0	89.0	88.5	94.0	-	-
<i>Lampsilis cardium</i> Plain pocketbook	25	4	-	29	55.0	75.0	80.5	100.5	-	-
<i>Lasnigona complanata</i> White heelsplitter	5	83	34	122	52.0	100.0	95.0	122.0	118.0	140.0
<i>Lampsilis siliquoides</i> Fatmucket	49	111	19	64	49.0	75.0	55.0	122.0	85.0	119.0
<i>Lasnigona compressa</i> Creek heelsplitter	-	-	-	-	-	-	-	-	-	-
<i>Lasnigona costata</i> Fluted-shell	36	189	48	273	51.0	97.0	89.5	114.0	91.0	116.0
<i>Ligumia recta</i> Black sandshell	18	27	19	64	55.5	103.5	103.0	132.0	121.0	145.5
<i>Pyganodon grandis</i> Giant floater	3	-	-	3	62.5	74.0	-	-	-	-
<i>Strophitus undulatus</i> Squawfoot	-	3	-	3	-	-	70.0	75.5	-	-
Total #'s of Mussels	150	430	123	602						

Table 4. Age classes, numbers, and size ranges of mussels relocated from the upstream segment of the Gorman Township bridge replacement zone on the Otter Tail River.

Live Species	Number of inds. per age class (yrs)				Total	Min. & Max. length (mm) in each age class					
	Age 0-5	Age 6-10	Age >10			Age 0-5		Age 6-10		Age > 10	
					Min	Max	Min	Max	Min	Max	
<i>Fusconia flava</i> Wabash pigtoe	4	1	1	6	51.5	60.0	-	69.0	-	78.0	
<i>Lampsilis cardium</i> Plain pocketbook	1	-	-	1	-	54.0	-	-	-	-	
<i>Lasmigona complanata</i> White heelsplitter	2	2	27	31	60.0	91.0	83.5	105.5	102.0	118.0	
<i>Lampsilis siligouidea</i> Fatmucket	14	11	11	36	52.0	73.5	61.5	86.0	79.0	97.0	
<i>Lasmigona compressa</i> Creek heelsplitter	1	-	-	1	-	69.0	-	-	-	-	
<i>Lasmigona costata</i> Fluted-shell	6	5	8	19	60.0	91.0	83.5	105.5	102.0	118.0	
<i>Ligumia recta</i> Black sandshell	1	1	2	4	-	80.0	-	121.5	129.5	131.5	
<i>Pyganodon grandis</i> Giant floater	4	2	2	8	48.0	67.0	73.0	78.0	80.5	89.5	
<i>Strophitus undulatus</i> Squawfoot	-	-	-	-	-	-	-	-	-	-	
Total #'s of Mussels	33	22	51	106							

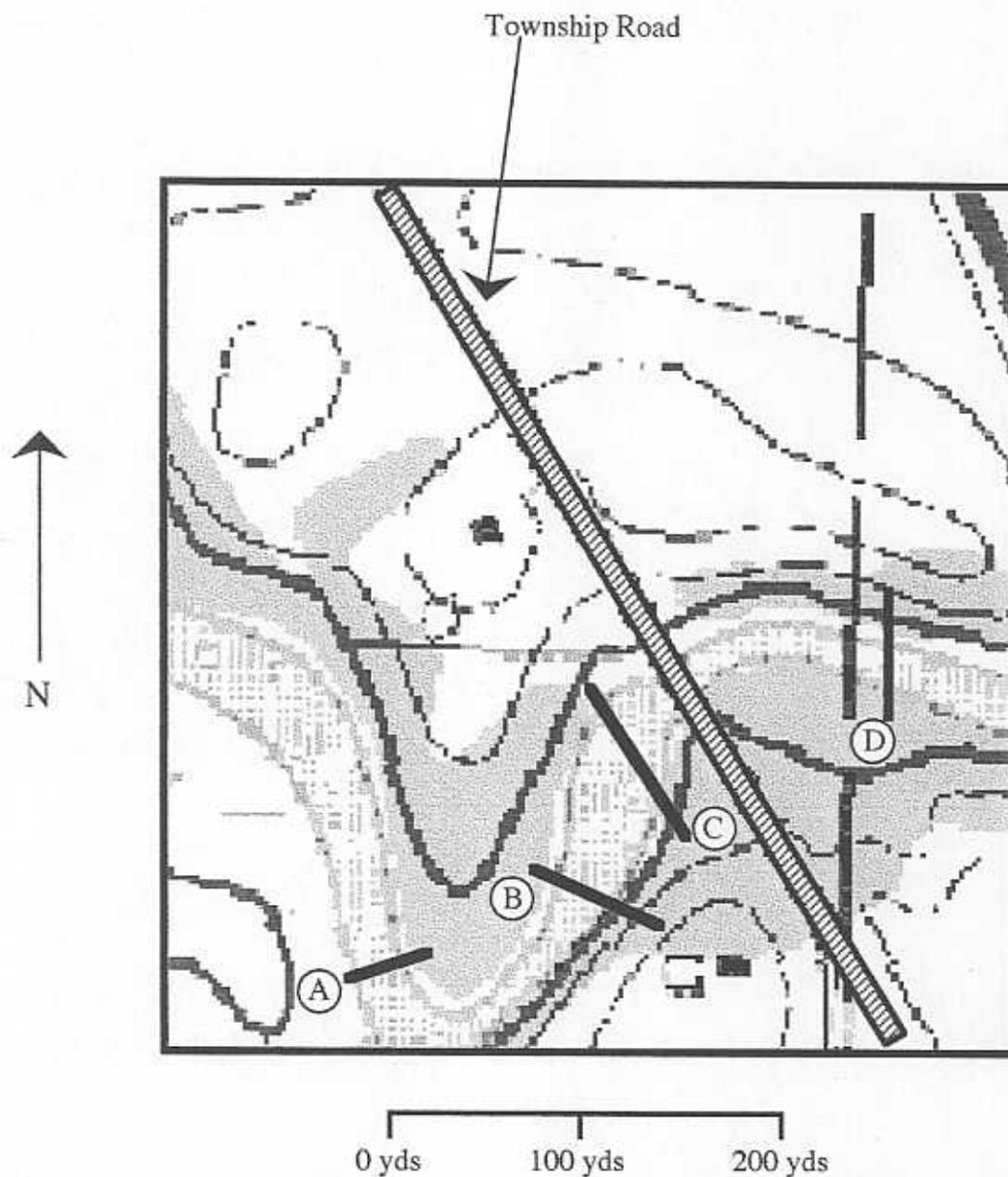


Figure 1. Hobart Township Bridge Site. "Hobart Downstream" is located between bridge and Point D; "Hobart Upstream" is located between bridge and Point C. Translocation area is located between Points A and B. USGS topo map downloaded and modified from Microsoft TerraServer web page.

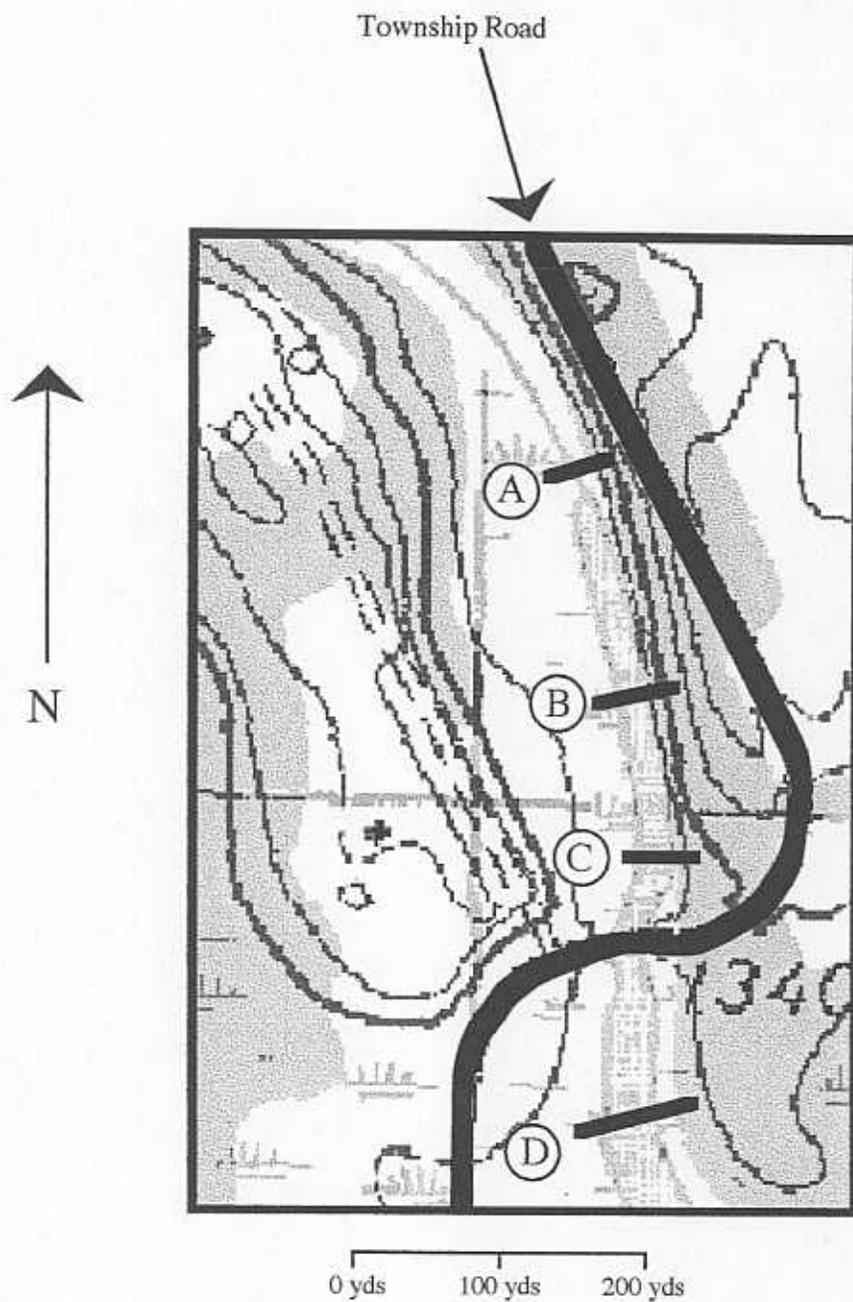


Figure 2. Gorman Township Bridge Site. "Gorman Downstream" is located between bridge and Point D; "Gorman Upstream" is located between bridge and Point C. Translocation area is located between Points A and B. USGS topo map downloaded and modified from Microsoft TerraServer web page.