

DISTRIBUTION AND ABUNDANCE OF *POTAMILUS CAPAX* AND
OTHER FRESHWATER MUSSELS IN THE ST. FRANCIS
RIVER SYSTEM, ARKANSAS AND MISSOURI, U.S.A.

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ABSTRACT – This survey of freshwater mussels in the St. Francis River and Floodway system, Arkansas and Missouri, was initiated primarily to document the occurrence and abundance of *Potamilus capax*, a federally-listed endangered species. The survey included qualitative sampling at 144 mainstem and tributary (ditch) sites in selected reaches totaling approximately 250 river miles and quantitative sampling at 11 of these sites.

Thirty-seven mussel species were found alive in the system. *Potamilus capax* was found in two areas: in adjacent reaches near the mouth of the river and in a variety of habitats near Marked Tree, Arkansas. Most specimens of the species were found in a mixture of sand, mud, and clay. Quantitative sampling yielded 0.02 *P. capax* per square meter in mainstem sites and 0.01 per square meter in ditch sites.

The survey extended the known distribution of *Potamilus capax* in the St. Francis system and demonstrated that the newly-discovered populations are at least as dense as those previously studied. Additional extensions of the species range in the drainage seem likely to occur when other tributaries are searched.

Key words: *Potamilus capax*, mussels, distribution, abundance, St. Francis River, Arkansas, Missouri.

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INTRODUCTION

In September 1986, the Memphis District, U.S. Army Corps of Engineers (USACE), contracted with the Tennessee Valley Authority (TVA) to conduct a freshwater mussel survey in selected five-mile reaches of the St. Francis River system. The objectives of this work were to (1) document the distribution of *Potamilus* [= *Proptera*] *capax*, commonly known as the fat pocketbook,

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within the survey area, and (2) describe the density and habitat of any live *P. capax* encountered. While *P. capax* was clearly the focus of this survey, distribution records of other freshwater mussel species also were to be collected.

Dennis (1985) summarized much of the existing information on the distribution, life history and ecology of *Potamilus capax*. Originally, the fat pocketbook occurred in larger streams throughout much of the Mississippi and Ohio River systems. Verified records exist from three areas: the upper Mississippi River (above St. Louis, Missouri), the Wabash River (Indiana), and the St. Francis River (Arkansas).

Collection records from recent years indicate *Potamilus capax* has been extirpated from much of its former range. This species is not known to persist in the Mississippi River north of Missouri or in any part of the Ohio River system, except possibly in the White River, Indiana. When Dennis compiled her review, the only known substantial population occurred in a short reach of the St. Francis River (Dennis, 1985). The reductions in range of *P. capax* previously had led the U.S. Fish and Wildlife Service to list the fat pocketbook as an endangered species (Anonymous, 1975).

The known distribution of *Potamilus capax* in the St. Francis River is derived from several recent reports. Gordon *et al.* (1980) prepared a checklist of Arkansas mollusk species by drainage and listed *P. capax* as occurring in the St. Francis River. Stansbery & Stein (1982) reported finding *P. capax* when their crew sampled the lower St. Francis River in 1978 as they investigated impacts from a chemical spill in Copperas Creek, a small tributary near Levesque, Cross County, Arkansas. In that report, Stansbery & Stein also included records of *P. capax* at Madison and Wittsburg in 1978 and downstream from the St. Francis Dam, near Marked Tree, in 1973.

A widespread search for rare or endangered mussels in the St. Francis, White and Cache rivers was conducted in 1978-1980 by Ecological Consultants, Inc., under contract to the USACE. In the report on that survey, Bates & Dennis (1983) indicated that *Potamilus capax* occurred only in an eight-mile reach of the St. Francis Floodway from Madison to Clark's Corner Cutoff (Floodway Miles 37-45). A more intensive search of St. Francis Floodway miles 26-69 and the lower ten miles of Straight Slough was conducted in 1984 by Ecosearch, Inc. In that study, Clarke (1985) found large numbers of live *P. capax* throughout the floodway reach and Straight Slough. In 1986, the Arkansas State Highway and Transportation Department conducted a mussel relocation project at Madison (Floodway Mile 37.6) to clear the vicinity of a proposed boat ramp (Harris, 1986). A total of 7,825 live freshwater mussels was removed from the project area, including 82 specimens of *P. capax*.

Considered together, these recent surveys indicate *Potamilus capax* is more widespread and more abundant in the St. Francis River system than was previously thought. This possibility prompted the USACE to design and fund an intensive survey.

PROJECT AREA

The St. Francis River is located in northeast Arkansas and southeast Missouri between Crowley's Ridge to the west and the Mississippi River to

the east. The river system has been substantially altered by local interests and the USACE in the process of protecting agricultural land. An elaborate system of ditches and levees has been constructed over the years to solve flooding problems in the extremely flat watershed. At present, the drainage system consists of two parts from Marked Tree (RM 155) to near the mouth (RM 10). The original river drains the eastern half of the watershed while the Oak Donnicks-St. Francis Floodway drains the western half. The floodways and their tributaries are manmade water courses. River reaches both upstream and downstream from Marked Tree include unmodified areas and areas that have been dredged or straightened.

The scope of work prepared by the USACE called for sampling to be conducted in 53 identified reaches of the St. Francis River, St. Francis Floodway, tributaries, and ditches. Approximately 250 miles of stream and ditch habitat were included in the identified reaches ranging from the mouth of the river to Wappapello Dam in the headwaters. In essence, the survey involved all of the river mainstem from Wappapello Dam (RM 305) downstream to the Siphons Access near Marked Tree (RM 155), several ditches near Marked Tree, selected five-mile reaches between Marked Tree and Forrest City (RM 55), and the lowermost 25 miles of the St. Francis Floodway and River (Tables 1 and 2).

STUDY METHODS

Before the survey, access points were examined to locate boat launch and takeout points throughout the length of the reaches to be sampled. These access points were important because the survey was proposed to include four sites within each five-mile reach even though much of the watershed was not accessible by road.

Specific sampling sites were chosen in the field based upon the apparent quality of mussel habitat, uniform spacing of sites within the river reach, and accessibility by land or water. When available, 7.5-minute topographic maps were used for navigation and site location. When possible, an entire reach was floated in the process of selecting and examining collection sites.

When a sampling site was selected, the three- to five-man crew used appropriate methods to conduct a qualitative search for live and fresh-dead mussels. Methods typically employed included feeling along the substrate with hands or feet, raking, and collecting dead shells along the banks. Where necessary, snorkel or scuba equipment was used to perform an adequate search.

Collecting continued in all habitats at the site until the crew leader was satisfied that no additional species were being found. All mussel specimens encountered were sorted by species, identified by the crew leader, and counted. Records kept on the qualitative search included the site location, number of man-minutes of search time, collection techniques, and numbers of live, fresh-dead (shells with shiny nacre) and relict (dull nacre) specimens of each mussel species encountered. Live specimens were returned to suitable habitat at the site; fresh-dead and unusual relict shells were labeled and returned to the TVA Fisheries Laboratory in Norris, Tennessee.

Identification of virtually all specimens encountered during the survey was made by the leader of each field crew. These identifications were based upon considerable experience with all genera represented, augmented by specific study of species likely to occur in the St. Francis watershed. Species identification and synonymies were clarified during an examination of St. Francis material housed at the Ohio State University Museum of Zoology (OSUM). Specifically with regard to *Potamilus capax*, specimens encountered during the access survey were compared to verified material

TABLE 1. Location of Mainstem St. Francis River Mussel Collection Sites, September-October 1986.

Site	RM	Location	<i>P. capax</i>
1	2.0	St. Francis River upstream from confluence with Mississippi River, Phillips Co., Arkansas	0
2	3.0	St. Francis River upstream from confluence with Mississippi River, Phillips Co., Arkansas	0
3	4.0	St. Francis River upstream from confluence with Mississippi River, Phillips Co., Arkansas	1 live
4	5.0	St. Francis River two miles above Phillips Bayou, Lee Co., Arkansas	1 live
5	6.0	St. Francis River three miles above Phillips Bayou, Lee Co., Arkansas	0
6	7.0	St. Francis River four miles above Phillips Bayou, Lee Co., Arkansas	0
7	8.5	St. Francis River five and one-half miles above Phillips Bayou, Lee Co., Arkansas	0
8	10.0	St. Francis River downstream from mouth of the L'Anguille River, Lee Co., Arkansas	1 live
9	11.0	St. Francis River downstream from mouth of the L'Anguille River, Lee Co., Arkansas	1 fresh-dead
10	12.0	St. Francis Floodway downstream from Huxtable Dam, Lee Co., Arkansas	0
11	13.0	St. Francis Floodway downstream from Huxtable Dam, Lee Co., Arkansas	0
12	14.0	St. Francis Floodway at Greer Place, Lee Co., Arkansas	0
13	16.0	St. Francis Floodway above Greer Place, Lee Co., Arkansas	0
14	17.5	St. Francis Floodway upstream from mouth of L'Anguille River, Lee Co., Arkansas	0
15	19.0	St. Francis Floodway below Highway 79 bridge crossing, Lee Co., Arkansas	1 fresh-dead
16	21.0	St. Francis Floodway above Highway 79 bridge crossing, Lee Co., Arkansas	1 fresh-dead*
17	22.2	St. Francis Floodway above Highway 79 bridge crossing, Lee Co., Arkansas	0
18	23.8	St. Francis Floodway above Sandy Slough, Lee Co., Arkansas	1 live
19	25.0	St. Francis Floodway above Cow Bayou, Lee Co., Arkansas	1 fresh-dead
*	37.0	Highway 70 bridge at Madison, St. Francis Co., Arkansas (access survey only)	1 live
20	55.3	One mile above Allen Bayou, St. Francis Co., Arkansas	3 fresh-dead
21	57.2	Three miles above Allen Bayou, St. Francis Co., Arkansas	0
22	58.4	Pilligrum Bend, St. Francis Co., Arkansas	0
23	59.4	Pilligrum Bend, St. Francis Co., Arkansas	0
24	65.0	Highway 306 bridge crossing below Johnson Bend (Grassy Lake Cutoff), Cross Co., Arkansas	0
25	65.7	Above Highway 306 bridge crossing below Johnson Bend (Grassy Lake Cutoff), Cross Co., Arkansas	0
26	66.7	At Short Bend, Cross Co., Arkansas	0
27	67.4	At Short Bend, Cross Co., Arkansas	0
28	69.1	Below Elbow Slough, Cross Co., Arkansas	0
29	70.0	Above Elbow Slough, Cross Co., Arkansas	0
30	70.2	Above Elbow Slough, Cross Co., Arkansas	0
31	71.5	Below Parkin Slough, Cross Co., Arkansas	0
32	74.3	At Ash Bend, Cross Co., Arkansas	0
33	75.2	Above Ash Bend, Cross Co., Arkansas	0
34	80.4	Above Tyronza River, Cross Co., Arkansas	0

TABLE 1. (cont.)

Site	RM	Location	<i>P. capax</i>
35	81.5	Above Tyrnza River, Cross Co., Arkansas	0
36	83.5	At Love Place, Cross Co., Arkansas	0
37	84.3	Above Love Place, Cross Co., Arkansas	0
38	106.1	One mile below Turnbull Bar, Cross Co., Arkansas	0
39	106.6	One-half mile below Turnbull Bar, Cross Co., Arkansas	0
40	106.9	Turnbull Bar, Cross Co., Arkansas	0
41	107.2	Sugar Bar, Cross Co., Arkansas	0
42	107.4	Sugar Bar, Cross Co., Arkansas	0
43	107.9	Above Sugar Bar, Cross Co., Arkansas	0
44	108.5	Cow Island, Poinsett Co., Arkansas	0
45	109.8	Above Cow Island, Poinsett Co., Arkansas	0
46	110.2	Off Highway 75 below Steep Gut Bayou, Poinsett Co., Arkansas	0
47	111.5	Below Ditch 41 near Boat Run, Poinsett Co., Arkansas	0
48	111.8	Above Ditch 41, Poinsett Co., Arkansas	0
49	152.7	At island below Left Hand Chute of Little River above Marked Tree, Poinsett Co., Arkansas	4 live 12 fresh-dead*
50	153.0	At mouth of Left Hand Chute of Little River above Marked Tree, Poinsett Co., Arkansas	0
51	153.6	Mouth of Ditch 45 between Siphons Access and Marked Tree, Poinsett Co., Arkansas	0
52	154.5	One-half mile below Siphons Access above Marked Tree, Poinsett Co., Arkansas	0
53	155.0	Below Siphons Access above Marked Tree, Poinsett Co., Arkansas	1 live 34 fresh-dead*
54	155.1	Pool below Siphons Access above Marked Tree, Poinsett Co., Arkansas	2 live
55	157.0	Sunken Lands near Oak Donnicks Gage, Poinsett Co., Arkansas	0
56	159.1	Sunken Lands below Donnicks at Lead Fork, Poinsett Co., Arkansas	0
57	165.9	Sunken Lands two miles below Deep Landing, Craighead Co., Arkansas	0
58	167.0	Sunken Lands one-half mile above Deep Landing, Craighead Co., Arkansas	0
59	168.7	Sunken Lands one-half mile below new ditch connecting Ditch 60, Craighead Co., Arkansas	0
60	169.3	Sunken Lands above mouth of Cackle Burr Slough, Craighead Co., Arkansas	0
61	180.0	Sunken Lands at mouth of side ditch (Newton Island), Craighead Co., Arkansas	0
62	181.0	Sunken Lands west of Big Slough Ditch, Craighead Co., Arkansas	0
63	185.8	Sunken Lands at power line crossing south of Highway 412 bridge crossing, Greene and Craighead Co., Arkansas	0
64	186.2	Sunken Lands south of Highway 412 bridge crossing, Greene and Craighead Co., Arkansas	0
65	186.8	Sunken Lands at side channel near Arkansas and Missouri state lines, Greene Co., Arkansas, and Dunklin Co., Missouri	0
66	187.2	Sunken Lands in back channel south of Highway 412 bridge crossing, Greene Co., AR and Dunklin Co., Missouri	0
67	191.2	Sunken Lands upstream from Highway 412 bridge crossing at Riverside, Greene Co., AR and Dunklin Co., Missouri	0
68	192.0	Sunken Lands north of 412 bridge at Riverside, Greene Co., AR, and Dunklin Co., Missouri	0

TABLE 1. (cont.)

Site	RM	Location	<i>P. capax</i>
69	193.2	Sunken Lands near Hargrove, Greene Co., Arkansas, and Dunklin Co., Missouri	0
70	193.4	Sunken Lands in channel (Indian Hills Island) north of Hargrove, Greene Co., Arkansas, and Dunklin Co., Missouri	0
71	194.5	Sunken Lands at access north of Bertig, Greene Co., Arkansas, and Dunklin Co., Missouri	0
72	195.8	Sunken Lands at channel above Indian Hills Island, Greene Co., Arkansas, and Dunklin Co., Missouri	0
73	197.0	Sunken Lands at channel below Gum Island, Greene Co., Arkansas, and Dunklin Co., Missouri	0
74	199.0	Sunken Lands at Bone Camp Island, Green Co., Arkansas, and Dunklin Co., Missouri	0
75	200.4	Sunken Lands upstream from Bone Camp Island, Greene Co., Arkansas, and Dunklin Co., Missouri	0
76	203.0	Sunken Lands above Bone Camp Island, Greene Co., Arkansas, and Dunklin Co., Missouri	0
77	208.8	Sunken Lands at ditch downstream of Highways 84 and 90 bridge crossings, Clay Co., Arkansas, and Dunklin Co., Missouri	0
78	209.6	Sunken Lands at Highways 84 and 90 bridge crossings, Clay Co., Arkansas, and Dunklin Co., Missouri	0
79	211.2	Sunken Lands at side channel near former railroad bridge, Clay Co., Arkansas, and Dunklin Co., Missouri	0
80	214.5	Sunken Lands at channel southeast of Nimmons at Ten Mile Island, Clay Co., Arkansas, and Dunklin Co., Missouri	0
81	223.0	Sunken Lands at Highway 1 bridge crossing below Browns Ferry, Clay Co., Arkansas, and Dunklin Co., Missouri	0
82	224.5	Sunken Lands one and one-half miles above Highway 1 bridge crossing, Clay Co., Arkansas, and Dunklin Co., Missouri	0
83	226.0	Sunken Lands at Big Bend northeast of Piggott, Clay Co., Arkansas, and Dunklin Co., Missouri	0
84	228.0	Sunken Lands two miles below Highway 62 bridge crossing at St. Francis, Clay Co. Arkansas, and Dunklin Co., Missouri	0
85	229.2	Sunken Lands just below Highway 62 bridge crossing at St. Francis, Clay Co., Arkansas, and Dunklin Co, Missouri	0
86	229.3	Sunken Lands above Highway 62 bridge crossing at St. Francis, Clay Co., Arkansas, and Dunklin Co., Missouri	0
87	230.3	Below Chalk Bluff, Clay Co., Arkansas, and Dunklin Co., Missouri	0
88	231.8	Above Chalk Bluff, Clay Co., Arkansas, and Dunklin Co., Missouri	0
89	234.0	Wilhelmina cutoff at confluence of St. Francis River, Dunklin and Butler Counties, Missouri	0
90	245.0	Middle of Wilhelmina cutoff, Dunklin and Butler Counties, Missouri	0
91	253.0	At Dekyngs Gage Highway 53 bridge crossing, Dunklin and Butler Counties, Missouri	0
92	254.5	Above Highway 53 bridge crossing, Dunklin and Butler Counties, Missouri	0
93	255.0	Below power line west of Glennonville, Dunklin and Butler Counties, Missouri	0
94	258.0	West of Caligoa, Dunklin and Butler Counties, Missouri	0
95	261.0	West of Caligoa, Dunklin and Butler Counties, Missouri	0

TABLE 1. (cont.)

Site	RM	Location	<i>P. capax</i>
96	264.5	North of Caligoa, Dunklin, Butler, and Stoddard Counties, Missouri	0
97	266.5	Below ditch approximately one-half mile near Highway JJ, Butler and Stoddard Counties, Missouri	0
98	269.5	Highway U bridge crossing to Powe, Butler Co., Missouri	0
99	275.0	Above Dudley Main Ditch, Stoddard Co., Missouri	0
100	275.5	Above Dudley Main Ditch, Butler and Stoddard Counties, Missouri	0
101	284.0	Below old Highway 60 bridge crossing at Fisk, Butler and Stoddard Counties, Missouri	0
102	285.5	At old Highway 60 bridge crossing at Fisk, Butler and Stoddard Counties, Missouri	0
103	285.8	Above old Highway 60 bridge crossing above Fisk, Butler and Stoddard Counties, Missouri	0
104	286.0	Above new Highway 60 bridge crossing above Fisk, Butler and Stoddard Counties, Missouri	0
105	293.0	Above Owens Cemetery, Butler and Stoddard Counties, Missouri	0
106	297.8	Above Rombauer railroad bridge at Mud Creek, Butler and Stoddard Counties, Missouri	0
107	301.8	Above Peppermint Creek, Butler and Stoddard Counties, Missouri	0
108	302.5	At Duck Creek, Butler and Stoddard Counties, Missouri	0
109	303.1	Above Duck Creek, Wayne County, Missouri	0
110	303.8	Below Mingo Creek, Wayne County, Missouri	0
111	304.7	At Iron Bridge gaging station, Wayne County, Missouri	0
112	305.3	Half-mile below Wappapello Dam, Wayne County, Missouri	0
113	305.5	Three hundred yards below Wappapello Dam, Wayne County, Missouri	0

**Potamilus capax* totals for these sites include some specimens found during the access survey.

TABLE 2. Location of all Ditch Sites Collected During the St. Francis River Mussel Survey, September-October 1986.

Site	Location	<i>P. capax</i>
1	Ditch 109 near Oak Donnicks Floodway nine-tenths of a mile above its mouth to Cross County Ditch, Poinsett and Cross Counties, Arkansas	0
2	Ditch 109 near Oak Donnicks Floodway (remnant portion of ditch), Poinsett and Cross Counties, Arkansas	0
3	Ditch 23 near Oak Donnicks Floodway downstream to its confluence with Ditch 10 near Bay Village, Poinsett Co., Arkansas	1 fresh-dead
4	Ditch 23 near Oak Donnicks Floodway above mouth of Ditch 10 approximately 300 yards, Poinsett Co., Arkansas	0
5	Ditch 23 near Oak Donnicks Floodway downstream from Highway 373 bridge crossing south of Anderson Tully (Stewart), Poinsett Co., Arkansas	0
6	Ditch 23 near Oak Donnicks Floodway upstream from Highway 373 bridge crossing south of Anderson Tully (Stewart), Poinsett Co., Arkansas	1 live 3 fresh-dead

TABLE 2. (cont.)

Site	Location	<i>P. capax</i>
7	Ditch 10 near Oak Donnick Floodway upstream from its mouth to Ditch 23 near Anderson Tully (Stewart), Poinsett Co., Arkansas	2 live
8	Ditch 10 near Oak Donnick Floodway at Highway 373 bridge crossing to Anderson Tully (Stewart), Poinsett Co., Arkansas	2 fresh-dead 3 live
9	Ditch 10 above Oak Donnick Floodway at Highway 14 bridge crossing to Lander, Poinsett Co., Arkansas	2 fresh-dead 0
10	Ditch 10 above Oak Donnick Floodway at Highway 214 bridge crossing to Promised Land Church, Poinsett Co., Arkansas	5 live
11	Ditch 10 above Oak Donnick Floodway at Highway 69 bridge crossing to Trumann, Poinsett Co., Arkansas	0
12	Ditch 10 above Oak Donnick Floodway upstream of Highway 69 bridge crossing to Trumann, Poinsett Co., Arkansas	1 live
13	Ditch 1 above Oak Donnick Floodway at Highway 214 bridge crossing near Pleasant Hill Church, Poinsett Co., Arkansas	0
14	Upstream confluence of Ditches 60 and 61 (Oak Donnick Floodway) just south of railroad bridge, Poinsett Co., Arkansas	1 fresh-dead
15	At channel flowing into mouths of Ditches 60 and 61 (Oak Donnick Floodway) upstream from railroad bridge, Poinsett Co., Arkansas	2 live
16	Ditch 60 (Oak Donnick Floodway) at small creek on left bank of ditch approximately two miles below Highway 63 bridge crossing west of Marked Tree, Poinsett Co., Arkansas	23 live 46 fresh-dead
17	Ditch 60 (Oak Donnick Floodway) below floodway dam, Poinsett Co., Arkansas	1 fresh-dead
18	Ditch 60 (Oak Donnick Floodway) below floodway dam, Poinsett Co., Arkansas	0
19	Ditch 60 (Oak Donnick Floodway) in pool above floodway dam, Poinsett Co., Arkansas	0
20	At side channel connecting Ditches 60 and 61 (Oak Donnick Floodway) in Sand Slough, Poinsett Co., Arkansas	0
21	Ditch 61 (Oak Donnick Floodway) just above confluence with Ditch 60, Poinsett Co., Arkansas	0
22	Ditch 61 (Oak Donnick Floodway) above Highway 63 bridge crossing west of Marked Tree, Poinsett Co., Arkansas	0
23	Unnumbered ditch above Oak Donnick Floodway upstream from Siphons Access north of Marked Tree, Poinsett Co., Arkansas	1 live
24	Unnumbered ditch above Oak Donnick Floodway approximately two and one-half mile above Siphons Access north of Marked Tree, Poinsett Co., Arkansas	1 live
25	Unnumbered ditch above Oak Donnick Floodway approximately five miles above Siphons Access north of Marked Tree, Poinsett Co., Arkansas	0
26	Mouth of Iron Mines Creek at Siphons Access north of Marked Tree, Poinsett Co., Arkansas	6 live 6 fresh-dead*
27	Iron Mines Creek one mile above Siphons Access north of Marked Tree, Poinsett Co., Arkansas	4 live 3 fresh-dead*
28	Tulot Seep Ditch at bridge crossing to Payneway above Highway 63 bridge crossing near Harrisburg Corner, Poinsett Co., Arkansas	1 fresh-dead
29	Tulot Seep Ditch at confluence of Ditch 33 one mile east of Trumann, Poinsett Co., Arkansas	0
30	Tulot Seep Ditch at start of Highway 198 west of Stevens Landing, Poinsett Co., Arkansas	0
31	Tulot Seep Ditch at Highway 69 above Ditch 31, Craighead Co., Arkansas	0

**P. capax* totals for these sites include some specimens found during the access survey.

in the McClung Museum (University of Tennessee) and OSUM. Shell and soft part characteristics of *P. capax* were discussed with several malacologists and knowledgeable field biologists to resolve any possible confusion.

Quantitative sampling was conducted only if live specimens of *Potamilus capax* were found during the qualitative search. Sampling consisted of carefully searching for mussels in ten-meter intervals along a cable laid across the width of the river or ditch. Typically two biologists would wade, snorkel, or use scuba equipment to check for mussels within one-half meter on each side of the cable. A full quantitative search included two transects at least 20 meters apart. In the lower St. Francis River, this procedure was modified to taking single transects 30 meters in length. These transects typically ran from the center of the river across the current toward one bank. Wherever the quantitative samples were taken, mussels found in each ten-meter interval were identified to species, counted, and recorded along with substrate composition and water depths.

All live and unbroken fresh-dead *Potamilus capax* specimens encountered during the access or float survey were measured using dial or vernier calipers. Measurements taken included maximum anterior-posterior length, maximum height from anterior of umbos to ventral margin, and maximum thickness across the two shells. These data were recorded to the nearest 0.1 mm.

RESULTS

TVA crews conducted this survey between September 29 and October 24, 1986. Most of the survey was performed under exceptional field conditions. At the time, the southeastern United States was still suffering from a record drought and water levels in the St. Francis River system were usually at or near record lows. As the survey started, water temperatures were near 80°F but dropped to below 60°F before the field work was completed. Visibility in the water was described by area residents as being "unusually good" but was rarely more than 15 cm.

Sampling conditions near the mouth of the river were substantially worse than elsewhere in the system. Upstream flood water in the Mississippi River backed into the St. Francis, raising it six to eight meters. Flow was negligible, but selection and sampling of suitable mussel habitats were severely hampered by the high water.

TVA biologists searched for *Potamilus capax* and other freshwater mussels at 144 sites in the St. Francis River watershed: 113 sites in the mainstem and 31 sites in ditches or tributaries. Sites examined are identified in Tables 1 (mainstem locations) and 2 (ditch and tributary locations). These sites also are indicated on maps (Figs. 1-6).

In all, 14,606 live or fresh-dead mussels were encountered. These specimens represented 37 species, including *Potamilus capax*. Site-by-site records for these species are presented in Appendix A and are summarized in Table 3.

A total of 77 quantitative samples were taken at 17 sites (Tables 4 and 5). These ten-square-meter samples yielded 211 live mussels representing 17 species. The 19 mainstem samples produced 0.84 mussels per square meter while the 58 ditch and tributary samples produced 0.09 mussels per square meter.

Measurement data were taken from 146 live and unbroken fresh-dead

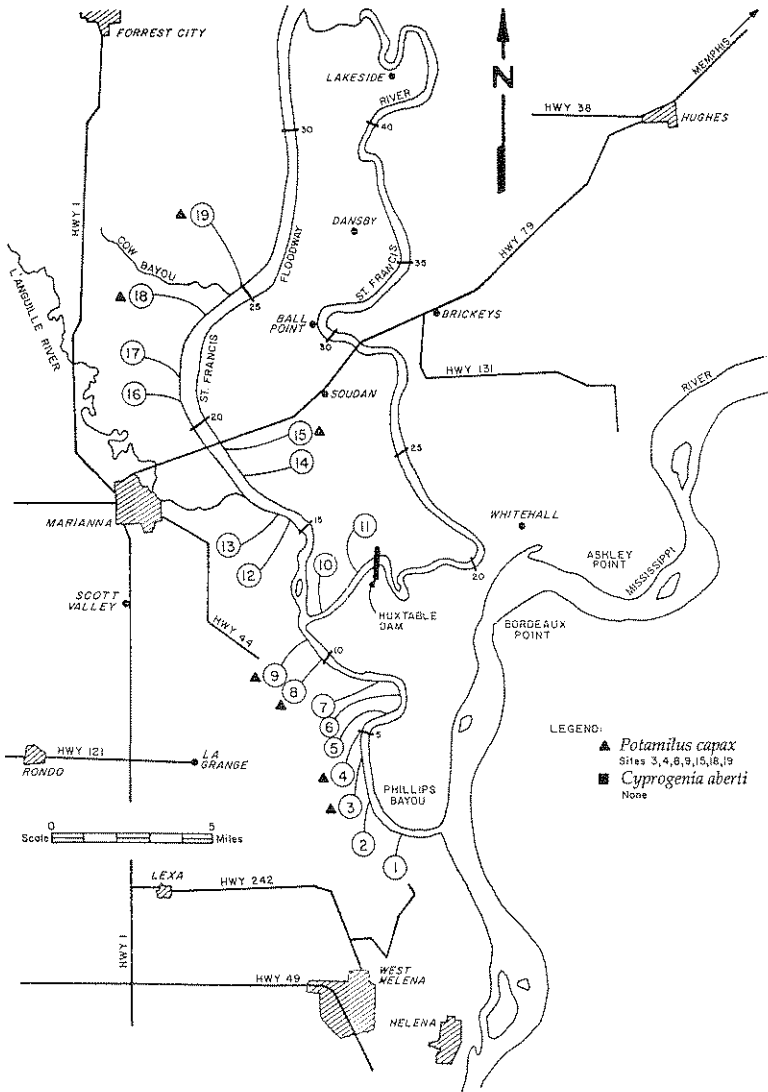


FIG. 1. Lower St. Francis River freshwater mussel collecting sites below Forest City, Arkansas.

Potamilus capax specimens encountered while locating access points and during the survey. Length, height and thickness data on each of these specimens are presented in Appendix B. The length data from each site are summarized by 10 millimeter intervals in Table 6.

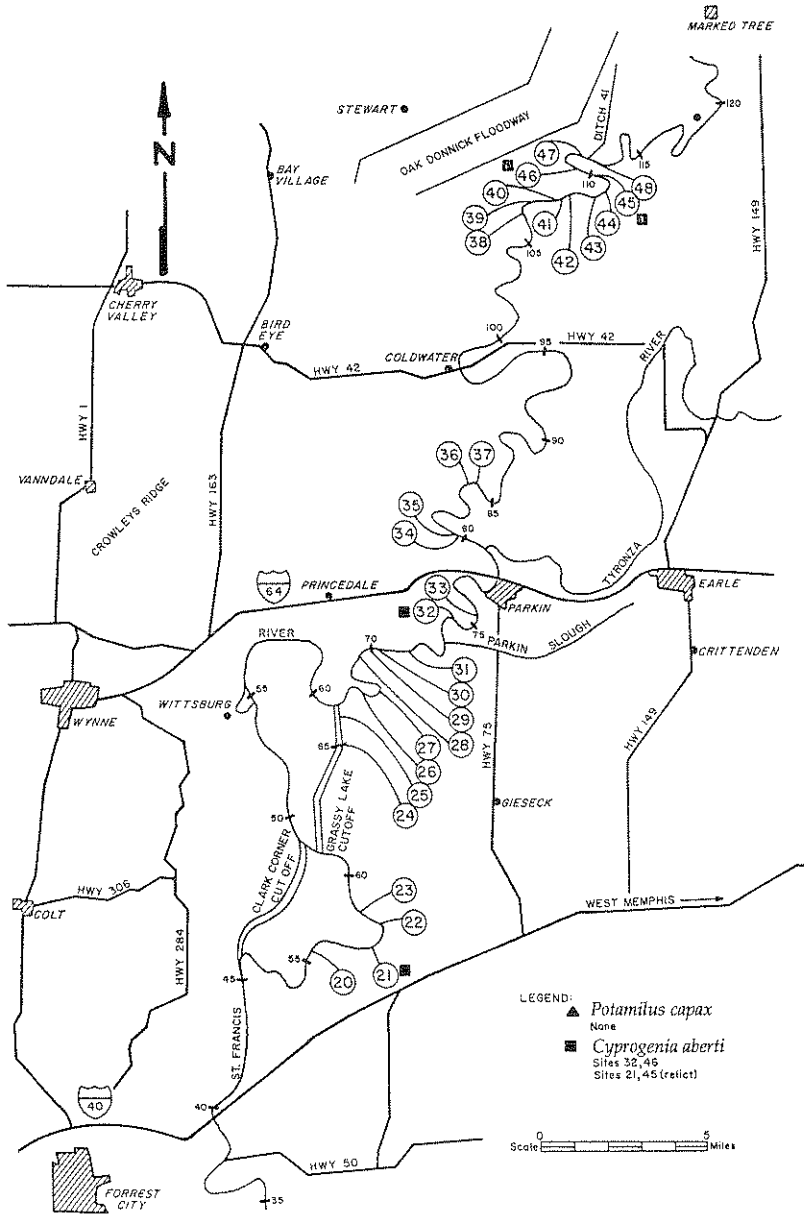


FIG. 2. Lower St. Francis River freshwater mussel collecting sites below Marked Tree, Arkansas.

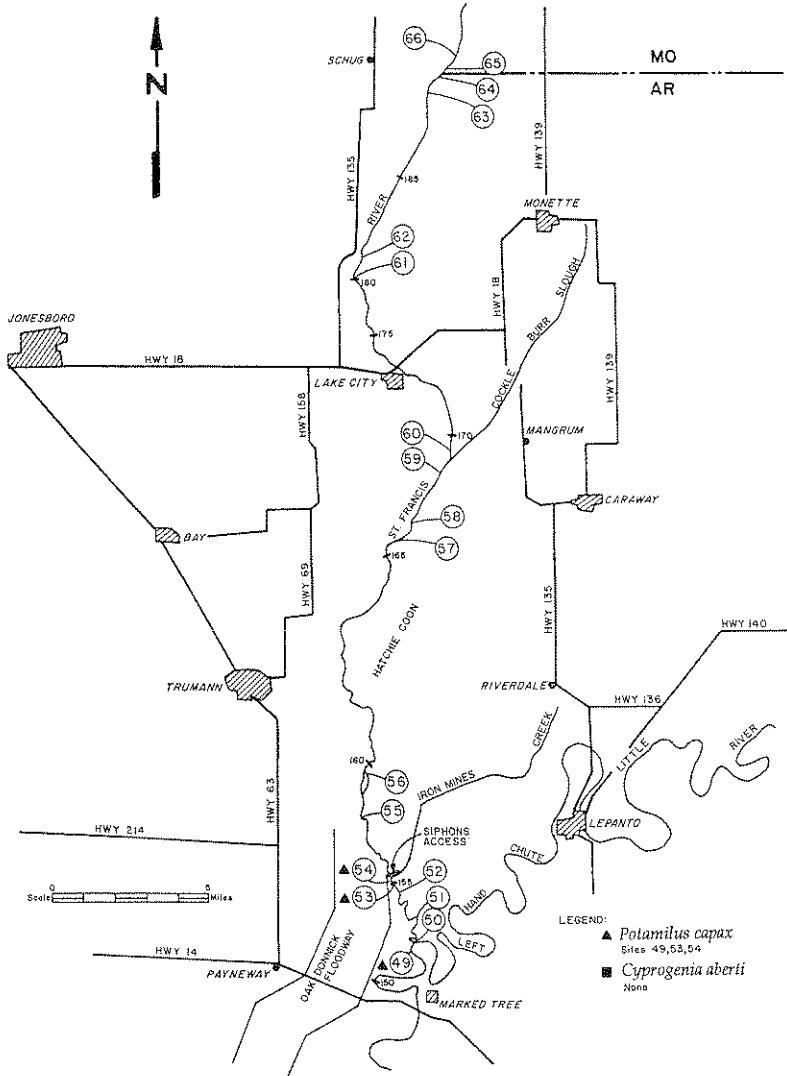


FIG. 3. Middle to lower St. Francis River freshwater mussel collecting sites below Paragould, Arkansas.

DISCUSSION

Mussel Distribution

The collection-by-collection results presented in Appendix A and summarized in Table 3 indicate the range and relative abundance of *Potamilus*

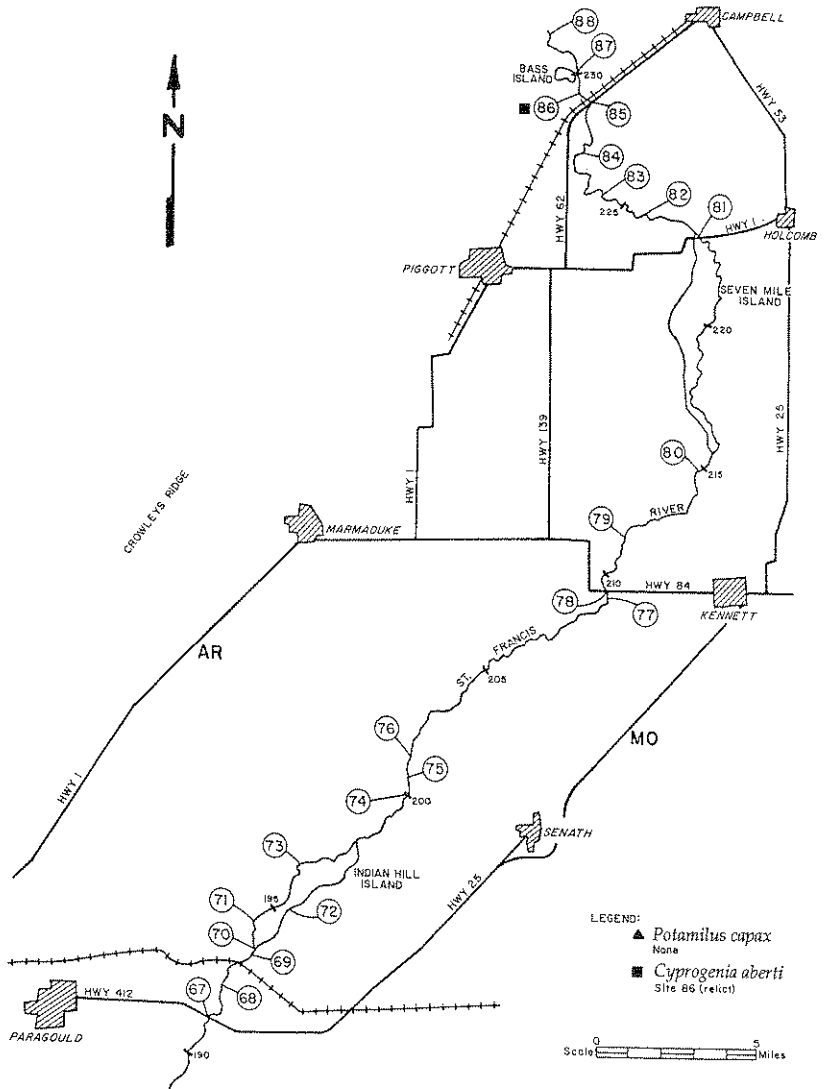


FIG. 4. Upper St. Francis River freshwater mussel collecting sites below Paragould, Arkansas.

capax and other mussel species encountered during this survey of the St. Francis River system. By themselves, these numbers do not provide a complete picture of mussel distribution patterns in the watershed. While the St. Francis River system downstream from Wappapello Dam flows exclusively on the Mississippi River floodplain deposits, mussel distribution appears to

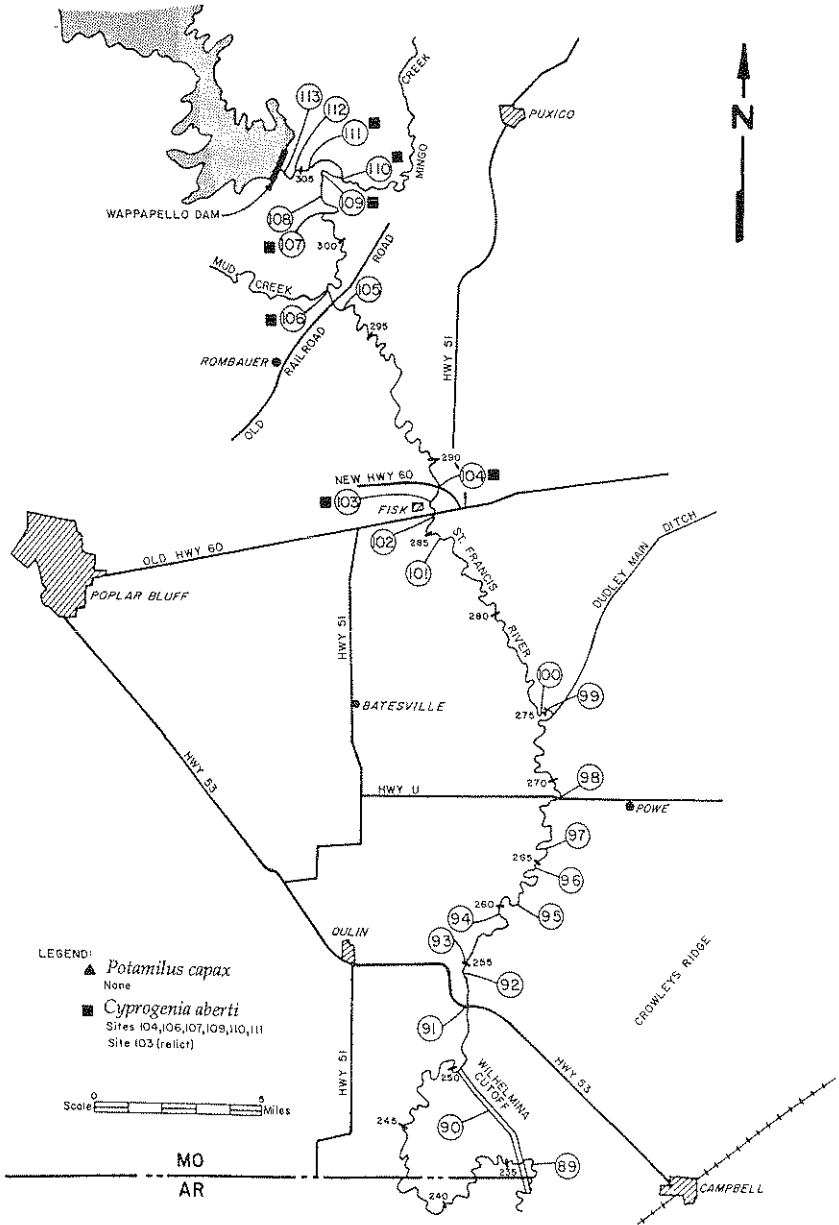


FIG. 5. Upper St. Francis River freshwater mussel collecting sites below Wappapello Dam, Missouri.

TABLE 3. Summary of live and fresh-dead freshwater mussel records, St. Francis River survey, September-October 1986.

Reaches (river miles)	River and floodway areas									
	2.0-25.0		55.3-155.1		157.0-229.3		230.3-275.5		284.0-305.5	
	No. sites	%	No. sites	%	No. sites	%	No. sites	%	No. sites	%
Species										
<i>Actinonaias ligamentina</i>									153	10.86
<i>Amblema plicata</i>	4	2.61	7150	64.47	188	19.34	8	6.25	531	37.69
<i>Anodonta grandis</i>	3	1.96	162	1.46	30	3.09			4	0.28
<i>Anodonta imbecillis</i>			18	0.16					3	0.21
<i>Anodonta suborbiculata</i>					5	0.51				
<i>Arcidens confragosus</i>			65	0.59	5	0.51			3	0.21
<i>Cyprogenia aberti</i>			10	0.09					17	1.21
<i>Fusconaia ebena</i>	1	0.65	40	0.36	1	0.10				
<i>Fusconaia flava</i>			60	0.54	25	2.57	1	0.78	56	3.97
<i>Lampsilis radiata hydiana</i>			4	0.04						
<i>Lamp. t. f. anodontoides</i>	2	1.31	112	1.01	65	6.69	15	11.72	4	0.28
<i>Lamp. teres f. teres</i>	1	0.65	6	0.05	7	0.72	9	7.03	13	0.92
<i>Lampsilis ovata</i>			82	0.74	21	2.16	2	1.56	11	0.78
<i>Lasmigona complanata</i>	2	1.31	29	0.26	40	4.12			11	0.78
<i>Leptodea fragilis</i>	22	14.38	488	4.40	146	15.02	50	39.06	96	6.81
<i>Ligumia recta</i>			3	0.03						
<i>Megalonaias nervosa</i>	4	2.61	467	4.21	11	1.13			1	0.07
<i>Obliquaria reflexa</i>	25	16.34	120	1.08	70	7.20	4	3.13	18	1.28
<i>Ellipsaria lineolata</i>			15	0.14						
<i>Plectomerus dombeyanus</i>			7	0.06	1	0.10			31	2.20
<i>Pleurobema rubrum</i>			76	0.69	1	0.10			1	0.07
<i>Pleurobema sintoxia</i>			184	1.66					18	1.28
<i>Potamilus capax</i>	8	5.23	25	0.23						
<i>Potamilus ohiensis</i>	26	16.99	167	1.51	36	3.70	20	15.63	7	0.50
<i>Potamilus purpuratus</i>	12	7.84	429	3.87	75	7.72	18	14.06	35	2.48
<i>Quadrula metanevra</i>			132	1.19	1	0.10			7	0.50
<i>Quadrula nodulata</i>	16	10.46	115	1.04	1	0.10				
<i>Quadrula pustulosa</i>	2	1.31	639	5.76	105	10.80			317	22.50
<i>Quadrula quadrula</i>	20	13.07	349	3.15	93	9.57	1	0.78	35	2.48
<i>Strophitus undulatus</i>									2	0.14
<i>Toxolasma texasensis</i>					3	0.31				
<i>Tritogonia verrucosa</i>	1	0.65	74	0.67	15	1.54			6	0.43
<i>Truncilla donaciformis</i>			7	0.06					25	1.77
<i>Truncilla truncata</i>	4	2.61	55	0.50	16	1.65			4	0.28
<i>Unio merus declivis</i>					11	1.13				
<i>Unio merus tetralasmus</i>										
<i>Villosa lienosa</i>										
Total specimens	153	100.00	11090	100.00	972	100.00	128	100.00	1409	100.00
Species included	17		30		25		10		26	

Lower River and Floodway. — The St. Francis Floodway joins the original river channel downstream from Huxtable Dam approximately 10 miles before the confluence with the Mississippi River near Helena, Arkansas (Fig. 1). Nineteen collecting sites were examined in this area: 11 sites in the lower St. Francis River (sites 1-11), and eight sites in the St. Francis Floodway (sites

TABLE 3. (cont.)

Species	Reaches	River	%	Ditch	%	Grand	%
	No. sites	totals		totals		totals	
		113		31		144	
<i>Actinonaias ligamentina</i>		153	1.11			153	1.05
<i>Amblema plicata</i>		7881	57.31	90	10.54	7971	54.57
<i>Anodonta grandis</i>		199	1.45	67	7.85	266	1.82
<i>Anodonta imbecillis</i>		21	0.15	14	1.64	35	0.24
<i>Anodonta suborbiculata</i>		5	0.04	18	2.11	23	0.16
<i>Arcidens confragosus</i>		73	0.53	11	1.29	84	0.58
<i>Cyprogenia aberti</i>		27	0.20			27	0.18
<i>Fusconaia ebena</i>		42	0.31			42	0.29
<i>Fusconaia flava</i>		142	1.03	4	0.47	146	1.00
<i>Lampsilis radiata hydiana</i>		4	0.03			4	0.03
<i>Lamp. t. f. anodontoides</i>		198	1.44	38	4.45	236	1.62
<i>Lamp. teres f. teres</i>		36	0.26			36	0.25
<i>Lampsilis ovata</i>		116	0.84	13	1.52	129	0.88
<i>Lasmigona complanata</i>		82	0.60	59	6.91	141	0.97
<i>Leptodea fragilis</i>		802	5.83	79	9.25	881	6.03
<i>Ligumia recta</i>		3	0.02			3	0.02
<i>Megalonaias nervosa</i>		483	3.51			483	3.31
<i>Obliquaria reflexa</i>		237	1.72	17	1.99	254	1.74
<i>Ellipsaria lineolata</i>		15	0.11			15	0.10
<i>Plectomerus dombeyanus</i>		39	0.28			39	0.27
<i>Pleurobema rubrum</i>		78	0.57			78	0.53
<i>Pleurobema sintoxia</i>		202	1.47	1	0.12	203	1.39
<i>Potamilus capax</i>		33	0.24	109	12.76	142	0.97
<i>Potamilus ohioensis</i>		256	1.86	66	7.73	322	2.20
<i>Potamilus purpuratus</i>		569	4.14	91	10.66	660	4.52
<i>Quadrula metanevra</i>		140	1.02			140	0.96
<i>Quadrula nodulata</i>		132	0.96	71	8.31	203	1.39
<i>Quadrula pustulosa</i>		1063	7.73	2	0.23	1065	7.29
<i>Quadrula quadrula</i>		498	3.62	84	9.84	582	3.98
<i>Strophitus undulatus</i>		2	0.01			2	0.01
<i>Toxolasma texasensis</i>		3	0.02	1	0.12	4	0.03
<i>Tritogonia verrucosa</i>		96	0.70			96	0.66
<i>Truncilla donaciformis</i>		32	0.23	1	0.12	33	0.23
<i>Truncilla truncata</i>		79	0.57	5	0.59	84	0.58
<i>Unio merus declivis</i>		11	0.08			11	0.08
<i>Unio merus tetralasmus</i>				10	1.17	10	0.07
<i>Villosa lienosa</i>				3	0.35	3	0.02
Total specimens		13752	100.00	854	100.00	14606	100.00
Species included		35		23		37	

12-19).

Habitat conditions at all sites examined in this area were relatively consistent. Substrate consisted of sand and mud overlain with flocculent silt.

A total of 17 mussel species was found in this area, including *Potamilus capax* (Table 3). Ten of the species were represented by five or fewer specimens. *Potamilus ohioensis* was the most abundant species, followed by *Obliquaria reflexa*, *Leptodea fragilis* and *Quadrula quadrula*. Eight specimens of *P. capax* were found. During their studies, Bates & Dennis (1983)

TABLE 4. Quantitative sampling results, mainstem sites, St. Francis River mussel survey, September-October 1986.

Species	Site River mile	3 4.0	4 5.0	8 10.0	18 23.8	19 25.0	49 152.7	Avg. sq. m	No. speci- mens
<i>Amblema plicata</i>							0.75	0.16	30
<i>Anodonta grandis</i>							0.02	0.01	1
<i>Arcidens confragosus</i>							0.02	0.01	1
<i>Fusconaia flava</i>							0.02	0.01	1
<i>Lamp. t. f. anodontoides</i>							0.02	0.01	1
<i>Lasmigona complanata</i>							0.05	0.01	2
<i>Leptodea fragilis</i>		0.03			0.03		1.12	0.25	47
<i>Megaloniaias nervosa</i>					0.07		0.38	0.09	17
<i>Obliquaria reflexa</i>			0.03	0.03			0.15	0.04	7
<i>Potamilus capax</i>							0.08	0.02	3
<i>Potamilus ohioensis</i>			0.07				0.25	0.06	12
<i>Potamilus purpuratus</i>		0.03	0.03		0.03		0.35	0.09	17
<i>Quadrula nodulata</i>							0.12	0.03	5
<i>Quadrula pustulosa</i>							0.12	0.03	5
<i>Quadrula quadrula</i>				0.03	0.03		0.15	0.04	8
<i>Tritogonia verrucosa</i>							0.08	0.02	3
Totals									
No./sq. m		0.07	0.13	0.03	0.17	0.00	3.70		
No. samples (10 sq. m)		3	3	3	3	3	4		
No. mussels found		2	4	1	5	0	148		160

found 16 mussel species in this area and Clarke (1985) found 12 species between St. Francis Floodway miles 25-35.

Few specimens of commercially important mussel species (*Amblema plicata* and *Megaloniaias nervosa*) were collected; however, discussions with local fishermen and the large number of cull piles observed during the access survey indicate a viable commercial mussel fishery exists in this area. The high water and poor sampling conditions during the sample period probably led us to underestimate the abundance and diversity of the fauna in this area.

Lower River. — Thirty-five sites were examined in the largely unmodified portion of the St. Francis River from Allen Bayou (RM 55.3, site 20) upstream to the Siphons Access near Marked Tree (RM 155.1, site 54). Twenty-nine of these sites were located in four widely spaced five- or ten-mile reaches of the river between RM 55 and RM 112 (Fig. 2). Included in this area are two sites (24 and 25) in Grassy Lake Cutoff, a manmade bypass of the original river channel. The other six sites were located between Marked Tree (RM 150) and the Siphons Access (Fig. 3).

River substrate in this area consisted of sloping, muddy banks and shifting sand across the width of the river channel. Gravel bars occurred only at four sites (21, 32, 35, and 45). The substrate in Grassy Lake Cutoff was similar to other parts of the area except that the banks were more vertical and there were wide expanses of packed sand in the channel.

TABLE 6. Lengths of *Potamilus capax* specimens encountered alive or as fresh-dead shells in the St. Francis River watershed, September-October, 1986.

Sites	Mean	20	30	40	50	60	70	80	90	100	110	120	130	140	Totals
3	54.10				1										1
4	95.70								1						1
8	84.30						1								1
9	88.00						1								1
15	101.40									1					1
16	83.20						1								1
18	80.90						1								2
19	105.10									1					2
*	90.67						1								1
49	92.63	1			1		2	5	1	1					3
53	0.00		2	2	1	1	15	10	1	1	2	2	1		16
54	77.60			1					1						35
River site totals	90.12	1	0	2	5	1	4	24	15	5	3	4	0	1	65
D 6	108.20									1					1
D 7	110.15								1			1			2
D 8	84.70			1			1	1		1					4
D 10	95.00						1	3		1					5
D 12	112.40										1				1
D 14	83.60							1							1
D 15	32.80	1	1							1					1
D 16	0.00	1	11	16	13	3	1	1	2	1		1			2
D 23	123.40														49
D 24	123.00											1			1
D 26	85.39			1	1		1	1	3			1			1
D 27	64.83				1	4	1	1				1			7
Ditch site totals	64.47	2	12	17	16	7	1	6	10	3	2	4	1	0	81
Grand totals	75.89	3	12	19	21	8	5	30	25	8	5	8	1	1	146

* Site visited only during access survey.

Thirty mussel species were found in this area (Table 3). The vast majority of individuals and species occurred in narrow bands where the shifting sand in the channel met the mud or clay of the banks. Few mussels were found in the relatively firm sand substrate in the river channel even though it appeared stable at several sites.

By far the most abundant species in this area was *Amblema plicata*. Common species included *Quadrula pustulosa*, *Leptodea fragilis*, *Megaloniaias nervosa* and *Potamilus purpuratus*. Uncommon species in this area were *Lampsilis hydiana*, *Ligumia recta* and *Truncilla donaciformis*. Only seven live specimens of *Plectomerus dombeyanus* were found in this area but large numbers of old dead (relict) specimens were observed at many sites. Some of these specimens may have died from previous low flow conditions; however, that explanation could not account for the vast numbers of dead *P. dombeyanus* found among live mussels of other species.

Thousands of mussels occurred at each of the four sites with a gravel bar. At two sites (RM 57.2, site 21, and RM 74.3, site 32), there appeared to be more mussels than rocks. These sites also yielded several species found very rarely elsewhere in the area. Mussel species found only at the gravel bars were *Cyprogenia aberti*, *Pleurobema rubrum*, *Pleurobema sintoxia* and *Quadrula metanevra*. Pleurocerid snails (*Pleurocera* sp.) were present only on the gravel bars at sites 21 and 32. These snails were not found at any other site during the entire survey.

In this area, *Potamilus capax* was found only in the reach between Marked Tree and the Siphons Access (RM 152.7-155.1, sites 49-54). Since river reaches between Marked Tree (RM 150) and RM 112 were not included in the survey, it is uncertain where *P. capax* drops out of the community.

As crews floated through the area, they encountered commercial mussel fishermen at several sites. These individuals were hand collecting ("hogging") and using compressed air equipment while diving to harvest *Amblema plicata*, *Megaloniaias nervosa* and *Potamilus purpuratus*. These observations and several cull piles indicate this portion of the river still supports a viable mussel fishery.

Middle River. — The 70-mile section of the St. Francis River between the Marked Tree Siphons (RM 157) and Highway 62 bridge (RM 229), known as the "Sunken Lands," is a braided series of channels, oxbows, sloughs and ditches (Figs. 3 and 4). In some places within this area, the river indicated on maps was dry and the water was flowing in other natural or manmade channels. Sampling occurred at 32 sites in this area, some in the identified river channel and some in other flowing-water channels within the various five-mile reaches.

Aquatic habitat in this area was surprisingly diverse. Typically, the stream banks were forested and extremely low, often with water standing around the trunks and roots of cypress or gum trees. Along the edges of what appeared to be well defined channels, there was a band of detritus and soft mud. This was followed by a complete transition through mud, muddy sand, loose sand, and hard packed sand out in the current. Often there were large pockets of firm mud with only a light cover of fine silt.

Twenty-five species were found in the Sunken Lands. Mussels were evenly distributed throughout this area although they were not particularly

abundant. The dominant species were *Amblema plicata*, *Leptodea fragilis*, *Quadrula pustulosa* and *Quadrula quadrula*. *Unio merus declivis* and *Toxolasma texasensis* were only found in the Sunken Lands and both species came from only a few sites. *Potamilus capax* was not encountered alive upstream from the channel feeding ditches 60 and 61.

Upper River. — Between RM's 230 and 275, the St. Francis River has been straightened and dredged but between RM's 275 and 305 (Wappapello Dam) the river is largely unmodified. Fourteen sites were sampled in the upper dredged portion of the river (sites 87-100) and 13 sites (101-113) were sampled in the original channel below Wappapello Dam (Figs. 4 and 5).

Habitat in the dredged portion of the river consisted of steep vertical banks, large expanses of shifting sand, occasional mud flats, numerous snags, and drift. The unmodified portion had a narrow channel composed of stable sand, especially at sites closest to Wappapello Dam. This portion also included a few gravel bars. Stream banks were forested in the unmodified area and were covered with grasses and shrubs in the dredged area.

Ten mussel species were reported from the dredged area and 26 species were found in the unmodified area. *Potamilus capax* was not encountered. Of the species present in the dredged portion, *Leptodea fragilis* was the most abundant, followed by *Potamilus ohioensis*, *Potamilus purpuratus* and *Lampsilis teres* form *anodontooides*. Only 128 mussels were found scattered along the sides of mud flats or on sand bars at the 14 sites within this area.

In the less modified portion, large numbers of young mussels were encountered, especially at sites closest to the dam (RM 303.1-305.5, sites 109-113). The abundant species in this area were *Amblema plicata* and *Quadrula pustulosa*, followed by *Actinonaias ligamentina* and *Leptodea fragilis*. Seventeen specimens of *Cyprogenia aberti* were found; all at sites with large amounts of gravel substrate. *Actinonaias ligamentina* occurred at eight sites between RM's 284-305. This species was not found anywhere else during the survey.

Ditches and Tributaries. — Ten reaches included in this survey were manmade ditches or modified St. Francis River tributaries (Fig. 6). All of these water courses except the unnumbered ditch drain into Oak Donnick Floodway west and south of Marked Tree. The unnumbered ditch flows into the St. Francis River downstream from the Siphons Access.

A total of 31 sites were sampled in these ditches. In ditches with flowing water, the habitat consisted of vertical banks dropping off into sand- or clay-lined channels. Ditches with low or moderate current had substrates that were various mixtures of sand and mud. Ditches carrying high flows (like Ditch 60) had substrates that were often scoured to firm clay but also had large expanses of shifting sand. In ditches which appeared to be older than the others based on bankside vegetation (Iron Mines Creek and Tulot Seep Ditch), the substrate seemed to be more stable and included distinct patches of various mud and sand combinations.

Twenty-three mussel species were found at the ditch sites (Table 3). Live mussels were present in all ditches with flowing water at the time of the survey. The most abundant mussel species found in the ditches was *Potamilus capax*, followed by *Potamilus purpuratus*, *Amblema plicata*, *Quadrula quadrula* and *Leptodea fragilis*. Ten specimens of *Unio merus*

tetralasmus and three specimens of *Villosa lienosa* were found only at sites in Ditches 1 and 10. In both locations, these species were collected in damp mud with no surface water present. Ditch 123 was not sampled because it was completely dry and overgrown.

Potamilus capax

The focus of this survey, the fat pocketbook, was represented by 142 specimens (61 live and 81 fresh-dead) found at 24 collection sites during the float survey. These records form the basis for the following comments on species distribution, habitat, and population factors. Measurement data on several *Potamilus capax* specimens encountered during the access survey also are included in the population factors discussion.

Distribution. — As indicated in preceding sections and Appendix A, *Potamilus capax* was found at seven sites in the lower St. Francis Floodway and River, at three sites in the St. Francis River between Marked Tree and the Siphons Access, and at fourteen sites in the ditches. The fat pocketbook was not found at any sites in the original river channel between RM 55 and RM 110 or upstream from the southern tip of the Sunken Lands. In the Sunken Lands, *P. capax* was found alive in the feeder channel to Ditches 60 and 61 (sites D-14 and D-15), and a relict specimen was found in the ponded area (RM 157.0, site 55) approximately two RM's further upstream.

In general, *Potamilus capax* appears to inhabit manmade parts of this watershed and to be absent in the natural areas. Sites where Bates & Dennis (1983), Clarke (1985) and Harris (1986) found *P. capax* all fall into this pattern. Live specimens have been found throughout the length of the floodway all the way downstream to its mouth (and the downstream 11 miles of the river) and upstream as far as small ditches (like Tulot Seep Ditch), north of Marked Tree (Figs. 1, 3 and 6).

Exceptions to this pattern are the specimens which exist in the Sunken Lands and Iron Mines Creek just above the Siphons, and those in the original river channel and the unnumbered ditch just downstream from the Siphons Access (Fig. 6). The Sunken Lands are connected to the floodway system through Ditches 60 and 61 and the old river channel is fed from the Sunken Lands whenever the siphons are used.

This apparent distribution pattern of *Potamilus capax* was not shared with any other mussel species encountered during this survey. Other species were either found in both the floodway and river systems or were restricted to short reaches, often associated with atypical habitats.

Mussel communities in major portions of the St. Francis River system have yet to be examined. When this is done, the present distribution pattern of *Potamilus capax* might be altered. At present, however, the pattern suggests that the fat pocketbook gains access to new sites through the floodway system. This could occur because the fish host exists in the floodway but does not have sufficient access to the remaining parts of the original river channel. Other possible explanations for this distribution pattern could include the existence of several relict *P. capax* populations in various parts of the drainage, or as yet unidentified habitat preferences of *P. capax* or its fish host.

Habitat. — During the survey, TVA biologists were unable to predict the habitat in which *Potamilus capax* would be found. Overall, habitats which contained a mixture of sand, mud and clay ("sticky mud") were most likely to yield a fat pocketbook.

Streambanks along *Potamilus capax* habitat ranged from low sloping banks with heavy canopy to those where the vegetation consisted only of a few scattered bushes and shrubs. Substrates where *P. capax* was found ranged from mud (ooze), to mixtures of sand, mud, and clay, to shifting sand. The largest concentration of *P. capax* occurred at a ditch site (D-16) with a sand, gravel, and mud mixture that appeared relatively stable, although the surrounding habitat consisted of shifting sand.

Abundance. — In qualitative searches (Table 3), *Potamilus capax* comprised 5% of the total number of mussels collected in the lower river and floodway area, 0.2% in the lower river area, and nearly 13% in the ditches. As discussed earlier, *P. capax* was not present in the Sunken Lands or the upper river. When all qualitative data are considered, the fat pocketbook comprised one percent of the total (142 of 14,606 specimens).

At sites where quantitative sampling was conducted, *Potamilus capax* average 0.02 per square meter in 19 river samples (Table 4), and 0.01 per square meter in 58 ditch samples (Table 5). During his study, Clarke (1985) found 226 live *P. capax* in 77,657 square meters of floodway and slough habitat, or 0.0029 *P. capax* per square meter. A more appropriate comparison with data from the present survey would be to say Clarke's 226 specimens came from 58,152 square meters of habitat in which *P. capax* was found alive, or 0.0039 specimens per square meter. Differences in field procedures may account for some of the order-of-magnitude difference between these abundance estimates; however, *P. capax* appears to have been at least as abundant where it was found during this survey as it was in the areas Clarke examined.

Population Structure. — As indicated in Results and Appendix B, 146 *Potamilus capax* specimens encountered during the access and float surveys were measured in three dimensions (length, height and thickness). Graphic inspection of the relationships between pairs of these measurements suggested very high correlations among all three. For simplicity, the following discussion deals only with length — the measurement which provided the greatest spread of the specimens.

Lengths of the *Potamilus capax* specimens ranged from 28.0 to 140.2 mm (Appendix B) and included some individuals in each ten millimeter interval between these extremes (Table 6). The interval totals in Table 6 include large numbers of specimens in the 80-90 and 90-100 mm ranges. There also are relatively large numbers of specimens in the 40-50 and 50-60 mm ranges, suggesting a bimodal distribution. Examination of Table 6 indicates that most of the 40-60 mm length specimens (29) came from site D-16, a small creek entering Ditch 60 downstream from Highway 63 bridge. At this site, a large number of small *P. capax* specimens were moving in the extremely shallow, clear water. Both the movement of these specimens and their high density in the remaining width of the creek made finding them easy. This combination of circumstances was not encountered at any other collection site.

With or without including specimens from site D-16, there appear to be fewer individuals in the lower length groups than expected. The low numbers of the shortest length intervals could be attributable to the typical inability of mussel sampling to locate small specimens. Low numbers in the 60-70 and 70-80 mm intervals may suggest environmental stress when those age classes were spawned. These low numbers also might suggest rapid growth at a particular life stage or previous time period.

In general, these measurement data suggest that a variety of size classes exist in *Potamilus capax* populations in the St. Francis River watershed. Larger and smaller individuals occur both in the mainstem and tributary watercourses.

For other mussel species and, perhaps with *Potamilus capax* populations in other rivers, this discussion of length data would be tied closely to age of the specimens as indicated by growth rests on the shells. In the St. Francis River, TVA biologists were unable to make consistent, reliable counts of growth rests on *P. capax* shells. Not uncommonly, one count of growth rests could be made on one side of a specimen and a substantially different count could be made on the other. *Potamilus capax* has an extremely smooth and uniform shell which, at least in the St. Francis River, is so difficult to age with reasonable certainty that we have chosen not to add what we feel would be mostly speculation about age and growth.

SUMMARY

This survey of the St. Francis River and Floodway system was conducted to document the occurrence and abundance of *Potamilus capax* and other mussel species throughout the reaches selected for study by the USACE. The sampling objective was to visit four sites in each five-mile reach. In actuality, the survey averaged between two and three sites per reach. This level of effort was sufficient to recognize distribution patterns for most of the species, including *P. capax*. For many of these species (but not *P. capax*), habitat present at specific sites appears to be more important than geographic locations within the watershed.

Potamilus capax was found to exist in two areas: in adjacent reaches near the mouth of the river, and in a variety of habitats from the southwest to the north of Marked Tree, Arkansas. When combined with the results from previous studies, *P. capax* appears to occur throughout the St. Francis-Oak Donnick floodway system and in small portions of the original river system that still have contact with the floodway. Additional survey work and identification of the fish host may be required to substantiate and explain this apparent pattern.

Habitats in which the fat pocketbook occurred ranged from pure shifting sand to flocculent mud. More specimens of the species were found in a mixture of sand, mud and clay ("sticky mud") than in any other type of substrate.

In terms of relative abundance, the 142 fat pocketbook specimens encountered alive or as fresh-dead shells during the survey constituted one percent of all 14,606 mussels examined. Where quantitative sampling was conducted, *Potamilus capax* averaged 0.02 per square meter in mainstem sites and 0.01 per square meter in ditch sites. These values are approximately one order of magnitude higher than estimates that can be calculated from prior data; however, differences in field procedure are likely to account for some of this disparity.

Length data were used to represent population structure largely because specimens could not be aged accurately. Measured lengths indicate all size classes are present in both mainstem and ditch locations. Few very small specimens were

encountered, a situation that is typical of most mussel surveys and thought to represent the difficulty in locating small shells. The fewer than expected number of shells in the 60-80 millimeter range might reflect missing length (age) classes or a period of rapid growth.

This survey has extended the known distribution of *Potamilus capax* in the St. Francis River system and indicated that the newly-discovered populations are at least as abundant as those previously studied. Additions to the range of this species in the watershed are likely as other ditches and tributaries are searched.

ACKNOWLEDGEMENTS

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In the field, during part of the survey we were joined by Alan Buchanan and Leroy Koch, both from the Missouri Department of Conservation. Their participation was appreciated and quite enjoyable. All of the other members of the field crews were TVA employees. These TVA biologists not only tolerated long hours, unexpected field conditions, and extended absences from their families but maintained a level of enthusiasm for the work that made the survey an enjoyable experience. Without their individual commitments, this project never would have been completed so successfully.

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APPENDIX A. Site records for mainstem and tributary collections, St. Francis watershed, Arkansas and Missouri, September-October 1986.

Species	River samples																								
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Actinonaias ligamentina	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Amblema plicata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anodonta grandis	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anodonta imbecillis	-	-	-	1	1	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Anodonta suborbiculata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arcidens corrigosus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cyprogenia aberii	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fusconaias ebena	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Fusconaias flava	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lampsilis radiata hydianna	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lampsilis teres f. arodontoides	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lampsilis teres s.s.	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lampsilis ovata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lasernigona complanata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Leptodea fragilis	1	2	2	2	2	2	-	2	1	1	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ligumia recta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Megalonaias nerosa	-	2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Obliquaria reflexa	-	13	-	1	-	-	-	-	-	-	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilipsaria linolata	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Plectroperus dombejanus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pleurobema rubrum	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pleurobema sintoxia	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potamilius capax	-	-	-	1	1	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potamilius ohioensis	-	-	-	1	5	-	-	-	7	3	1	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Potamilius purpuratus	1	-	1	1	-	-	-	1	6	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7
Quadrula mexicana	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Quadrula notulata	-	-	-	-	-	-	-	8	1	-	3	2	-	-	-	-	-	-	-	-	-	-	-	-	2
Quadrula pustulosa	-	1	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-	2
Quadrula quadrata	-	8	-	1	1	-	-	3	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Strophitus undulatus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Toxoloma texasensis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tritogonia verrucosa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
Truncilla donaciformis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Truncilla truncata	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Unionemus declivis	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	2	32	5	13	4	2	10	22	6	9	14	2	1	0	1	5	4	19	2	242	1259	233	493	74	44

APPENDIX A (cont.)

Species	River samples																									
	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	
Site >	198	250	300	750	329	213	81	252	350	269	275	77	326	168	149	72	90	80	50	320	1	295	672	36	122	
River mile >	687	674	681	700	702	715	743	752	804	815	835	843	861	866	869	872	874	879	883	869	1002	1115	1118	1527	1530	
<i>Actinonaias ligamentina</i>																										
<i>Amblyema plicata</i>																										
<i>Anodontia grandis</i>	5	3	5	7	1	5	1	3		4	3	2	5	1	5	4		4	6			2	14	16	12	
<i>Anodontia imbecillis</i>	1	1	1							1			4								1	2	1			
<i>Anodontia suborbiculata</i>																										
<i>Arctidens confragosus</i>	1	3			2	3	3	2		7	13	7	1							1		2	3	2	1	
<i>Cyrogenia aberti</i>																										
<i>Fusconaiia ebena</i>																										
<i>Fusconaiia ebena</i>				6	1			2	5	1	2	1		2								2				
<i>Fusconaiia flava</i>					2			10		4	4		7			1				8	3	9	4	1		
<i>Lampsilis radiata hydiana</i>	1				2																	1				
<i>Lampsilis teres f. anodontoides</i>	1				3	1	18	2		2	3		2	1	1					2		2	7	4		
<i>Lampsilis teres</i> s.s.	2																									
<i>Lampsilis ovata</i>				1	7	3	4	4	9	2	4	2		3			2						9			
<i>Lampsilis ovata</i>		2		4																						
<i>Lasmigona complanata</i>																										
<i>Leptodea fragilis</i>	16	6	10	39	17	15	36	13	13	33	25	50	4			8	2	8	9	7		1	18	58	1	
<i>Ligumia recta</i>																										
<i>Megalomaias nervosa</i>																										
<i>Obliaquaria reflexa</i>	26	9	24	19	18	23	17	9	17	7	12	34	3							14		2	11	15	11	
<i>Ellipsaria limolata</i>																					2	35	1	5	8	
<i>Plectomerus dombejanus</i>																										
<i>Pleurobema rubrum</i>																										
<i>Pleurobema rubrum</i>																										
<i>Pleurobema sinuata</i>																										
<i>Potamilus capax</i>																										
<i>Potamilus ohioensis</i>																										
<i>Potamilus purpuratus</i>	8			1	5	2	1	5	2	1	5	2	3	1		2	2			3			3	15	9	
<i>Quadrula metanevra</i>	22	4	15	41	23	12	18	20	7	20	13	10	4	7	7	5	3	5	4	13		3	41	20	8	
<i>Quadrula nodulata</i>	2			2	2																					
<i>Quadrula pustulosa</i>	7	7	8	2	3	14	40	41	38	60	55	133				8	1	3	8	72	13	9	28	5	1	
<i>Quadrula quadrata</i>																										
<i>Strophitus undulatus</i>																										
<i>Toxolasma texasensis</i>																										
<i>Tritogonia verrucosa</i>																										
<i>Truncilla donaciformis</i>	1																									
<i>Truncilla truncata</i>																										
<i>Unionites declivis</i>																										
Total	291	285	388	888	409	309	422	380	485	483	474	416	356	177	165	113	99	105	83	507	117	342	835	208	175	

APPENDIX A (cont.)

Species	River samples																											
	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75			
Site > River mile >	153.6	154.5	155.0	155.1	157.0	159.1	165.9	167.0	168.7	169.3	180.0	181.0	185.8	186.2	186.8	187.2	191.2	192.0	195.2	193.4	194.5	195.8	197.0	199.0	200.4			
<i>Actinonaias ligamentina</i>																												
<i>Amblyema plicata</i>	6		2		11	47	1	26	32	7						2	2	30	11									
<i>Anodonta grandis</i>	12	13	19		2		2	7	1	3	3		3					1		2								
<i>Anodonta imbecillis</i>																												
<i>Anodonta suborbiculata</i>					3			1											1									
<i>Arcidens confragosus</i>	5	2						1												1								
<i>Cyprogenia aberti</i>																												
<i>Fusconaia ebena</i>						1																						
<i>Fusconaia flava</i>						5	1	2	1	7						1	5											
<i>Lampsilis radiata hydiana</i>																												
<i>Lampsilis teres f. anodontoides</i>	1	1	8																									
<i>Lampsilis teres</i> s.s.																												
<i>Lampsilis ovata</i>							6	1					1						2	5								
<i>Lasmigona complanata</i>	2	1	2		3	4		8	3	13	1							1	1	2								
<i>Leptodea fragilis</i>	1	7			1	1	3	2	1	3	3	2				1	2	8	5	12	3	6	9	22	3			
<i>Ligumia recta</i>																												
<i>Megalonaias nervosa</i>					4	2																						
<i>Obliquaria reflexa</i>			1	1			1	1								4	9	7	4		1				1	4		
<i>Ellipsaria lineolata</i>																												
<i>Plectonemus dombevanus</i>						1																						
<i>Pleurobema rubrum</i>																												
<i>Pleurobema sintoxia</i>																												
<i>Potamilus capax</i>				16	2																							
<i>Potamilus ohioensis</i>	7	32	42		2													1	3						1	1		
<i>Potamilus purpuratus</i>	17	11	19					1	1		1	1				1		3	2	3		2	2	11				
<i>Quadrula metanera</i>																												
<i>Quadrula nodulata</i>																												
<i>Quadrula pustulosa</i>						13	2	6	4	5	1							2	10	8	10				1	3		
<i>Quadrula quadrula</i>						2		4	1	2	1	15						1	16	5	3	11			3	13	12	1
<i>Strophitus undulatus</i>																												
<i>Toxolasma texanensis</i>																												
<i>Tritogonia verrucosa</i>																												
<i>Truncilla donaciformis</i>																												
<i>Truncilla truncata</i>						2																						
<i>Unio merus</i>							1	1	1	3																		
<i>Unio merus</i> acclivis																												
Total	51	71	109	2	33	76	18	60	48	54	10	5	7	0	11	47	72	48	36	9	20	27	61	14	1			

APPENDIX A (cont.)

Species	River samples														Total	No. sites
	101	102	103	104	105	106	107	108	109	110	111	112	113			
Site > River mile >	284.0	285.5	285.8	286.0	286.8	287.8	301.8	302.5	303.1	303.8	304.7	305.3	305.5			
<i>Actinonaias ligamentina</i>	1	11	90	16	-	20	13	-	-	1	1	-	-	153	8	
<i>Amblyema plicata</i>	-	13	4	2	1	8	3	22	13	35	232	192	6	7881	66	
<i>Anodontia grandis</i>	-	-	-	-	1	1	-	-	-	-	2	1	-	199	48	
<i>Anodontia imbecillis</i>	-	-	-	-	1	1	-	-	-	-	-	-	1	21	15	
<i>Anodontia suborbiculata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	5	3	
<i>Arcidena corfragosus</i>	-	-	-	-	-	-	-	-	-	1	1	1	-	73	28	
<i>Cypragonia aberti</i>	-	-	-	-	1	3	5	1	1	3	4	-	-	27	9	
<i>Fusconata ebena</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	42	15	
<i>Fusconata flava</i>	-	3	5	1	-	10	6	-	-	-	30	-	1	142	29	
<i>Lampsilis radiata hydiana</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	4	3	
<i>Lampsilis teres f. anodontoides</i>	-	2	1	-	-	-	-	-	-	-	1	-	-	198	43	
<i>Lampsilis ovata</i>	5	1	-	1	1	1	-	-	-	-	-	3	1	36	20	
<i>Lasmigona complanata</i>	2	1	-	-	-	1	2	-	1	3	-	1	-	116	36	
<i>Lepidodea fragilis</i>	-	1	-	-	-	1	-	-	2	3	3	1	-	82	36	
<i>Lepidodea fragilis</i>	18	12	2	1	-	10	5	5	2	10	7	23	1	802	97	
<i>Ligumia recta</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	3	2	
<i>Megalonaias nervosa</i>	-	-	1	-	-	-	-	-	-	-	-	-	-	483	29	
<i>Obliquaria reflexa</i>	-	-	-	-	-	1	1	1	-	1	10	4	-	237	48	
<i>Ellipsaria lineolata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	15	4	
<i>Plectomerus donthyanus</i>	-	3	1	1	-	3	-	-	1	-	7	15	-	39	11	
<i>Pleurobema rubrum</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	78	12	
<i>Pleurobema striatata</i>	-	-	8	3	-	7	-	-	-	-	-	-	-	202	10	
<i>Potamilus capax</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	33	10	
<i>Potamilus ohioensis</i>	-	2	-	-	-	-	-	-	-	3	1	-	-	256	56	
<i>Potamilus purpuratus</i>	3	12	1	2	3	2	2	-	1	5	2	2	1	569	76	
<i>Quadrula metanera</i>	-	-	-	3	-	2	1	-	-	-	-	-	-	140	14	
<i>Quadrula nodulata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	132	27	
<i>Quadrula pustulosa</i>	1	7	9	14	2	22	11	38	9	15	84	104	1	1063	62	
<i>Quadrula quadrata</i>	-	7	4	-	-	-	-	-	-	3	3	17	1	498	53	
<i>Stropharia undulatus</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	2	2	
<i>Toxolasma texasensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	3	3	
<i>Tritogonia verrucosa</i>	-	-	-	-	-	4	1	-	-	1	-	-	-	96	29	
<i>Truncilla donaciformis</i>	-	-	-	-	-	-	-	12	3	4	-	6	-	32	11	
<i>Truncilla truncata</i>	-	-	-	-	-	-	-	-	-	1	1	2	-	79	24	
<i>Unionmerus declivis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	11	5	
Total	30	74	127	46	9	96	50	79	30	88	389	376	15	13752		

APPENDIX A (cont.)

Species	Ditch samples																
	Site >	D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10	D-11	D-12	D-13	D-14	D-15	D-16
<i>Amblyema plicata</i>	-	-	-	-	-	3	7	1	4	-	1	-	2	-	-	-	15
<i>Anodonta grandis</i>	4	-	-	-	1	-	7	1	-	1	-	1	1	4	-	2	-
<i>Anodonta imbecillis</i>	-	-	-	-	-	-	-	-	1	-	-	-	1	-	-	-	12
<i>Anodonta subreticulata</i>	2	-	-	-	-	3	1	-	-	-	-	-	-	-	-	2	-
<i>Arcidens confragosus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Fusconata fiana</i>	-	-	-	-	-	3	16	2	2	-	-	-	1	6	1	-	2
<i>Lampsilis leres form anodontoides</i>	-	-	-	-	2	4	1	-	2	-	-	-	-	-	-	-	-
<i>Lampsilis ovata</i>	1	-	-	-	-	1	1	3	5	-	2	-	1	-	-	-	1
<i>Leptodea fragilis</i>	-	-	-	-	-	3	7	6	4	-	2	-	2	-	3	1	27
<i>Obliquaria reflexa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Pleurobema sinuata</i>	-	-	-	-	-	1	-	-	-	-	-	-	-	-	-	-	-
<i>Potamilus capax</i>	-	-	1	1	-	1	4	4	5	-	5	-	1	-	1	2	69
<i>Potamilus ohioensis</i>	-	-	-	-	-	1	-	3	9	-	1	-	1	-	2	-	17
<i>Potamilus purpuratus</i>	-	-	-	-	-	9	24	2	1	-	1	-	1	1	2	1	9
<i>Quadrula nodulata</i>	-	-	1	-	-	-	-	-	51	-	1	-	-	-	1	2	-
<i>Quadrula pustulosa</i>	-	-	-	-	-	1	1	-	-	-	-	-	-	-	-	-	-
<i>Quadrula quadrata</i>	-	-	-	-	-	-	10	4	31	-	7	-	15	1	-	-	1
<i>Toxolasma texasensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
<i>Truncilla donaciformis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-
<i>Truncilla truncata</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1
<i>Unionemertus tetralasmus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
<i>Villosa lienosa</i>	-	-	-	-	-	-	-	-	-	1	-	-	-	2	-	-	-
Total	7	0	4	4	3	28	80	26	115	11	19	1	25	15	10	12	155

APPENDIX A (cont.)

Species	Ditch samples																Total spec. sites
	Site > D-17	D-18	D-19	D-20	D-21	D-22	D-23	D-24	D-25	D-26	D-27	D-28	D-29	D-30	D-31		
<i>Ambleria plicata</i>	3	1	-	3	-	-	-	7	5	5	5	19	1	2	6	90	
<i>Anodonta grandis</i>	-	-	-	2	-	-	4	2	-	2	5	4	9	8	10	67	
<i>Anodonta imbecillis</i>	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	14	
<i>Anodonta suborbiculata</i>	-	-	-	5	-	-	1	-	1	1	1	1	1	-	-	18	
<i>Aricidea confragosus</i>	-	-	-	-	-	-	-	-	2	1	-	1	-	-	3	11	
<i>Fusconia flava</i>	-	-	-	-	-	-	-	1	1	-	-	1	-	-	-	4	
<i>Lampsilis teres</i> form <i>anodontoides</i>	-	-	-	-	-	-	-	1	-	-	-	1	1	1	-	38	
<i>Lampsilis ovata</i>	-	-	-	-	-	-	-	5	-	6	5	3	2	7	12	59	
<i>Lesnigona complanata</i>	-	-	-	1	-	4	1	3	4	4	-	3	-	-	2	79	
<i>Lepidoea fragilis</i>	-	1	1	1	-	-	-	5	1	-	-	-	-	-	-	17	
<i>Oblivaria reflexa</i>	-	-	10	-	-	-	-	-	-	-	-	-	-	-	-	10	
<i>Pleurobema sinuata</i>	-	-	-	-	-	-	1	1	-	7	7	-	-	-	-	109	
<i>Potamilius capax</i>	1	-	-	-	-	-	-	-	-	-	2	-	-	-	-	66	
<i>Potamilius ohioensis</i>	-	-	-	8	-	-	6	8	1	5	2	-	-	-	-	91	
<i>Potamilius purpuratus</i>	1	-	-	1	-	-	3	5	2	9	8	8	3	4	4	71	
<i>Quadrula nodulata</i>	-	-	-	-	-	-	-	-	-	1	13	-	-	-	-	14	
<i>Quadrula pustulosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2	
<i>Quadrula quadrata</i>	-	-	-	-	-	-	-	3	2	4	1	2	2	1	-	84	
<i>Toxolasma texasensis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
<i>Truncilla donaciformis</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	
<i>Truncilla truncata</i>	-	-	-	-	-	-	-	-	4	-	-	-	-	-	-	5	
<i>Unionmerus tetrastemus</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10	
<i>Villosa henosa</i>	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3	
Total	4	5	11	20	0	5	19	42	22	51	39	43	19	26	37	854	

APPENDIX B. Individual measurements of *Potamilus capax* specimens encountered during the access or float surveys of the St. Francis River system, September-October 1986.

Site no.	Locality	Length	Height	Thickness
<u>Mainstem</u>				
3	RM 4.0	54.1	43.7	35.4
4	RM 5.0	95.7	70.7	57.2
8	RM 10.0	84.3	63.5	49.9
9	RM 11.0	88.0	66.6	52.3
15	RM 19.0	101.4	76.9	62.8
16	RM 20.5	83.2	64.8	52.3
18	RM 23.8	79.6	62.0	53.4
		82.2	61.4	48.9
19	RM 25.0	105.1	82.2	63.4
*	RM 37.0	70.5	51.6	45.4
		96.2	67.7	51.8
		105.3	76.9	62.2
49	RM 152.7	21.9	15.5	11.9
		58.6	43.9	34.7
		77.8	58.8	44.0
		78.3	58.0	49.8
		86.1	62.4	54.7
		86.2	64.2	53.2
		86.3	62.5	51.3
		88.5	67.6	52.9
		89.8	64.6	54.6
		96.6	69.7	56.4
		96.9	72.9	60.3
		108.0	75.6	62.4
		113.2	80.9	67.7
		125.7	89.8	71.6
		128.3	90.6	71.5
		140.2	107.7	80.9
53	RM 155.0	46.0	28.4	22.9
		49.6	30.0	24.3
		52.4	31.5	23.6
		56.1	39.5	30.0
		69.8	49.7	38.6
		81.2	59.2	50.6
		82.5	60.5	49.5
		83.2	59.4	50.4
		83.3	61.4	49.9
		84.0	59.4	51.6
		84.3	60.4	49.7
		85.2	63.6	55.3
		86.4	64.9	49.5
		86.7	63.2	50.6
		87.4	60.9	51.3
		87.4	64.0	56.7
		87.9	63.9	50.8

APPENDIX B (cont.)

Site no.	Locality	Length	Height	Thickness
		89.4	61.0	51.9
		89.5	66.3	53.8
		89.7	65.4	52.0
		90.4	64.7	55.4
		90.8	65.4	52.7
		91.2	67.7	56.0
		91.5	70.8	58.2
		92.3	65.5	54.3
		92.4	69.4	59.3
		94.1	68.2	59.2
		94.3	69.5	60.5
		95.4	68.2	56.9
		99.8	72.4	59.3
		108.0	84.1	62.4
		113.1	78.6	62.7
		118.6	83.5	63.5
		125.0	86.1	69.8
		125.6	89.3	72.4
54	RM 155.1	55.7	43.1	35.6
		99.5	73.9	57.7
<u>Ditches</u>				
D-6	Ditch 23 near Oak Donnicks	108.2	79.1	62.4
D-7	Ditch 10 near Anderson Tully	99.9	76.3	56.2
		120.4	87.7	72.0
D-8	Ditch 10 at Rt 373 bridge	54.1	39.5	32.2
		84.9	67.6	54.0
		94.7	76.3	60.3
		105.1	79.1	59.3
D-10	Ditch 10 at Rt 214 bridge	85.3	59.3	50.0
		90.6	50.3	50.2
		90.8	70.8	60.4
		99.0	75.9	66.0
		109.3	77.3	66.1
D-12	Ditch 10 at Rt 69 bridge	112.4	77.3	62.4
D-14	Ditch 60 & 61 so. of railroad	83.6	61.3	55.8
D-15	Ditch 60 & 61 no. of railroad	28.6	21.2	15.4
		37.0	28.1	21.2
D-16	Ditch 60 at small creek	28.0	20.0	14.0
		30.0	21.0	15.0
		32.4	24.8	19.8
		33.1	26.9	20.5
		34.0	24.0	18.0
		34.0	25.0	18.0
		34.3	26.7	21.7
		36.0	26.0	19.0
		37.5	28.5	22.9
		37.7	28.0	20.9
		38.2	29.4	22.9

APPENDIX B (cont.)

Site no.	Locality	Length	Height	Thickness
		39.6	30.7	24.0
		40.0	30.6	24.0
		40.2	30.4	24.9
		40.8	30.3	24.4
		40.8	30.9	24.2
		41.0	30.0	21.0
		41.0	30.0	22.0
		42.0	29.0	23.0
		42.1	32.8	24.8
		43.6	32.2	26.1
		44.0	34.8	28.1
		44.3	32.4	24.1
		45.0	32.0	26.0
		46.0	33.0	22.0
		47.0	33.0	26.0
		47.4	36.7	30.3
		49.1	36.3	31.5
		50.1	38.1	31.8
		51.0	36.0	29.0
		51.0	38.0	31.0
		52.0	38.0	30.0
		52.0	40.0	30.0
		52.7	40.5	32.7
		53.0	41.5	34.4
		53.5	40.5	33.3
		54.0	40.0	32.0
		55.0	39.0	32.0
		56.0	40.0	34.0
		56.0	40.0	32.0
		58.0	43.0	33.0
		61.0	43.0	38.0
		62.0	42.0	33.0
		69.7	51.9	42.8
		78.3	57.5	49.9
		87.2	67.2	54.9
		90.0	66.0	53.0
		96.4	70.5	57.5
		111.4	82.4	62.9
D-23	unnumbered above siphons	123.4	93.8	72.5
D-24	unnumbered 2.5 mi. above	123.0	90.2	70.4
D-26	mouth of Iron Mines Cr.	42.7	30.9	24.8
		58.8	44.9	44.6
		88.6	66.3	56.5
		90.0	69.2	57.7
		91.0	67.0	58.7
		95.8	73.2	61.0
		130.8	89.0	68.0
D-27	Iron Mines Cr. 1 mi. up	55.1	44.1	34.8
		61.3	43.5	36.9
		62.1	45.9	37.6

APPENDIX B (cont.)

Site no.	Locality	Length	Height	Thickness
		62.3	46.9	38.9
		69.4	51.7	41.8
		84.5	62.6	54.6
		120.3	89.9	68.5
	Grand means	75.3	55.2	44.8

* Site visited only during access survey.

