Freshwater Mussels of the James River Tributaries, South Dakota

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For:

SD GFP, 2004

Introduction:

Freshwater mussels are declining across North America with 18 of 300 species north of Mexico extinct, and 44 listed or proposed for listing as endangered (Bogan 1996). South Dakota has 35 native mussel species, of which 17 are listed by the state as critically imperiled (two are federally endangered), five as imperiled and three as rare (SD Natural Heritage Program 2002). Programs, such as the state Comprehensive Wildlife Conservation Plan, are being designed to conserve rare and imperiled species, however knowledge of the occurrence and distribution of mussel species in South Dakota was lacking. An ecoregional planning workshop held by the Nature Conservancy in November 2002 to identify targets for aquatic conservation in the Dakota Mixed Grass Prairie ecoregion, which includes the James River Basin, revealed that information regarding the occurrence and distribution of tributary mussels was incomplete for eastern South Dakota (Paula Gagnon, Freshwater Initiative - The Nature Conservancy, Chicago IL, pers. comm.). Surveys of mussels in South Dakota have recently been conducted in the Big Sioux River and its tributaries (Skadsen and Perkins 2000), in the Missouri National Recreational River below Gavin's Point Dam (Perkins and Backlund 2000), and in the Vermillion River in 1975 (Perkins 1975). However, surveys of tributary mussels in the James River Basin, which contains over 1/3 the drainage area of eastern South Dakota had not been conducted previous to the study presented in this report. The purpose of this report was to increase the knowledge of mussel occurrence and distribution in South Dakota by surveying 13 tributaries in the James River Basin for Unionid mussels.

Methods:

Thirteen (13) tributaries were surveyed in the James River Basin (Table 1). Three sites per stream were surveyed, except for Rock Creek where landowner permission was granted for only two sites. One site was done on Snake Creek to compensate for the lack of sites on Rock Creek. Sites were chosen based upon perennial flows and potential for groundwater (Wall et al. 2001). Stream banks, streambeds and sandbars were surveyed by wading or walking upstream and downstream of each site for several hundred meters, similar to methods used by Skadsen and Perkins (2000). Many streams were at bankful or above during the time of survey, which limited the amount of bank exposed. In these cases the stream was waded in a zigzag pattern for several hundred meters to feel for live mussels and shells with feet, where upon specimens were retrieved by hand. This method proved to be effective, and many more shells and mussels were discovered where visual inspection of the bank produced nothing. When mussels or shells were discovered by visual inspection or feeling with feet, shallow areas were surveyed by feeling with hands while deeper areas were sampled using a three-pronged rake. Live mussels were identified in the field and released. Samples of mussels that were difficult to identify in the field were vouched and identified in the laboratory. Dead shells were collected and identified in the laboratory.

Results/Discussion:

The following six mussel species were found among the 13 surveyed tributaries (Figure 1): giant floater (*Pyganodon grandis*), fragile papershell (*Leptodea fragilis*), white heelsplitter (*Lasmigona complanata*), pink heel splitter (*Potamilus alatus*), pink papershell (*Potamilus ohiensis*), and fat mucket (*Lampsilis siliquoidea*) (Appendix A). A total of 602 mussels were found across all study sites, 76% of which were dead specimens (a dead mussel is represented by either a single or pair of valves). Only three species were represented among live specimens (Table 1), whereas all six species found were observed among the dead specimens (Table 2).

Firesteel, Foster and Redstone Creeks were the most species-diverse tributaries, with four species occurring in each (Tables 1 and 2; Appendix A). Rock Creek, Snake Creek and the south fork of 12 Mile Creek had only a single species each. No specimens were found in Middle Pearl Creek; only unidentifiable shell fragments. The low species richness across the study area may be a result of recent low water conditions, causing drying of the substrate and subsequent mussel mortality. This was evidenced by the high proportion of dead mussels observed in such creeks as Foster and Timber Creeks (Figure 2), and by speaking with property owners who informed us of such recent conditions.

Pyganodon grandis was the most widely distributed species across the study area, occurring in 11 of the 13 tributaries (Tables 1 and 2). Of these, dead specimens occurred in 10 creek systems while live specimens were found in seven. Live *P. grandis* beds were found at three study sites: PONY2 (found 5.0 mussels/minute), PONY3 (1.7 mussels/min), and RED2 (0.4 mussels/min).

The second most widely distributed species was *Leptodea fragilis*, occurring in a total of 10 tributaries (Tables 1 and 2). Dead mussels were found in all 10 tributaries and a single live specimen was present at site ELM2.

Table 1. The presence/absence of live mussel species for each surveyed tributary.

	Pyganodon grandis	*Leptodea fragilis*	*Lasmigona complanata*	*Potamilus alatus*	*Potamilus ohiensis*	*Lampsilis siliquoidea*
Dry Run						
Elm River	✓	✓	✓			
Firesteel Creek	✓		✓			
Foster Creek						
Middle Pearl Creek						
Pony Creek	✓					
Redstone Creek	✓		✓			
Rock Creek						
Sand Creek	✓					
Shue Creek	✓					
Snake Creek						
S. Fk. 12 Mile Creek	✓					
Timber Creek						

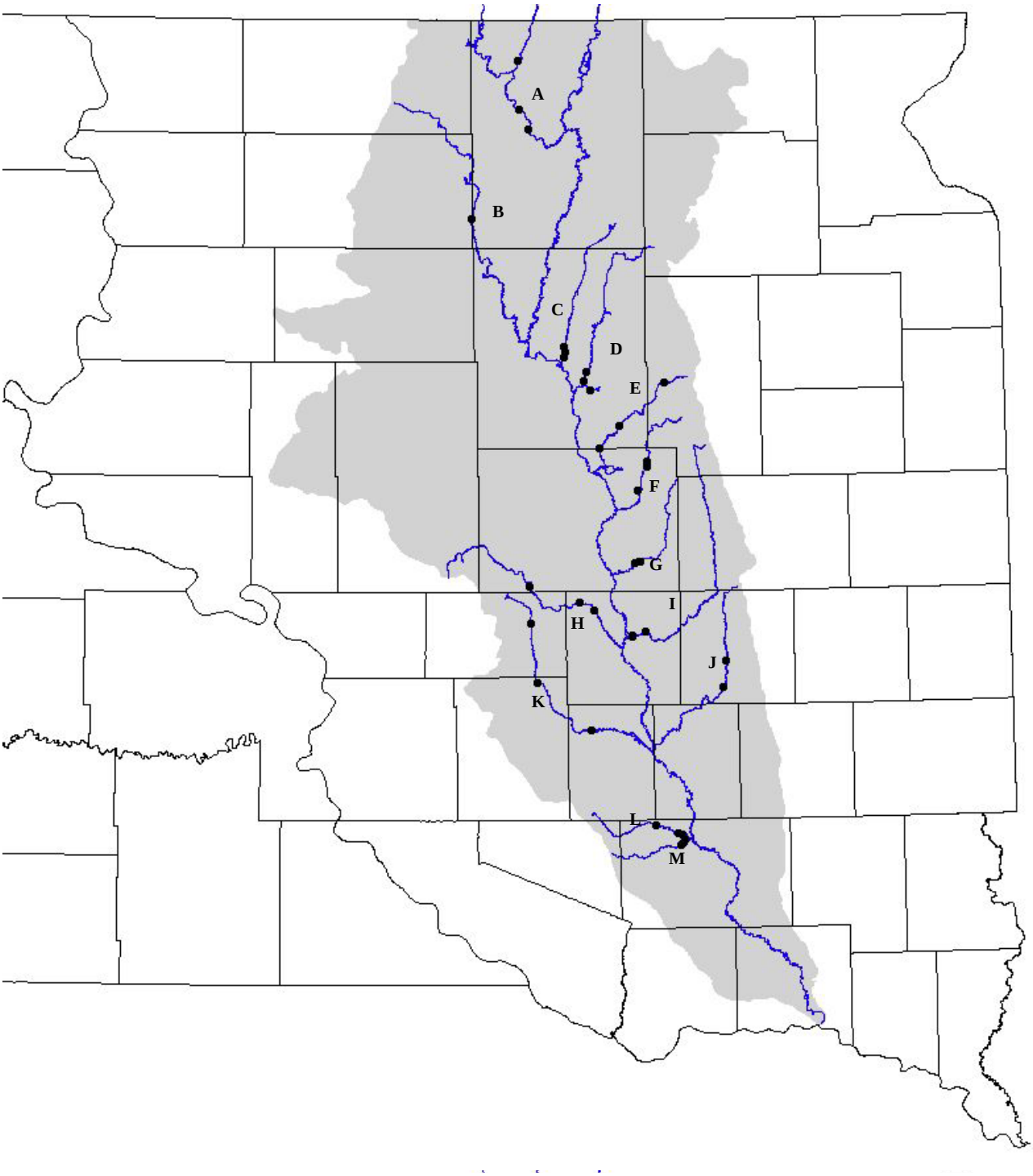

Figure 1. Sites and tributaries surveyed for mussels in the James River Basin. A=Elm River, B=Snake Creek, C=Dry Run, D=Timber Creek, E=Foster Creek, F=Shue creek, G=Middle Pearl Creek, H=Sand Creek, I=Redstone Creek, J=Rock Creek, K=Firesteel Creek, L=South Fork of Twelvemile Creek, M=Pony Creek.

Table 2. The presence/absence of dead mussel species for each surveyed tributary.

	Pyganodon grandis	*Leptodea fragilis*	*Lasmigona complanata*	*Potamilus alatus*	*Potamilus ohiensis*	*Lampsilis siliquoidea*
Dry Run	✓	✓				
Elm River	✓	✓	✓			
Firesteel Creek	✓	✓	✓	✓		
Foster Creek	✓	✓	✓			✓
Middle Pearl Creek						
Pony Creek	✓	✓				
Redstone Creek	✓	✓	✓		✓	
Rock Creek	✓					
Sand Creek	✓	✓				
Shue Creek	✓	✓	✓			
Snake Creek		✓				
S. Fk. 12 Mile Creek						
Timber Creek	✓	✓	✓			

Lasmigona complanata was found in a total of seven tributaries (Tables 1 and 2). Dead specimens were found in all seven of these creeks, whereas live specimens were found only in three. *L. complanata* was found co-existing with *Pyganodon grandis* in the mussel bed at site RED2 (2 specimens found).

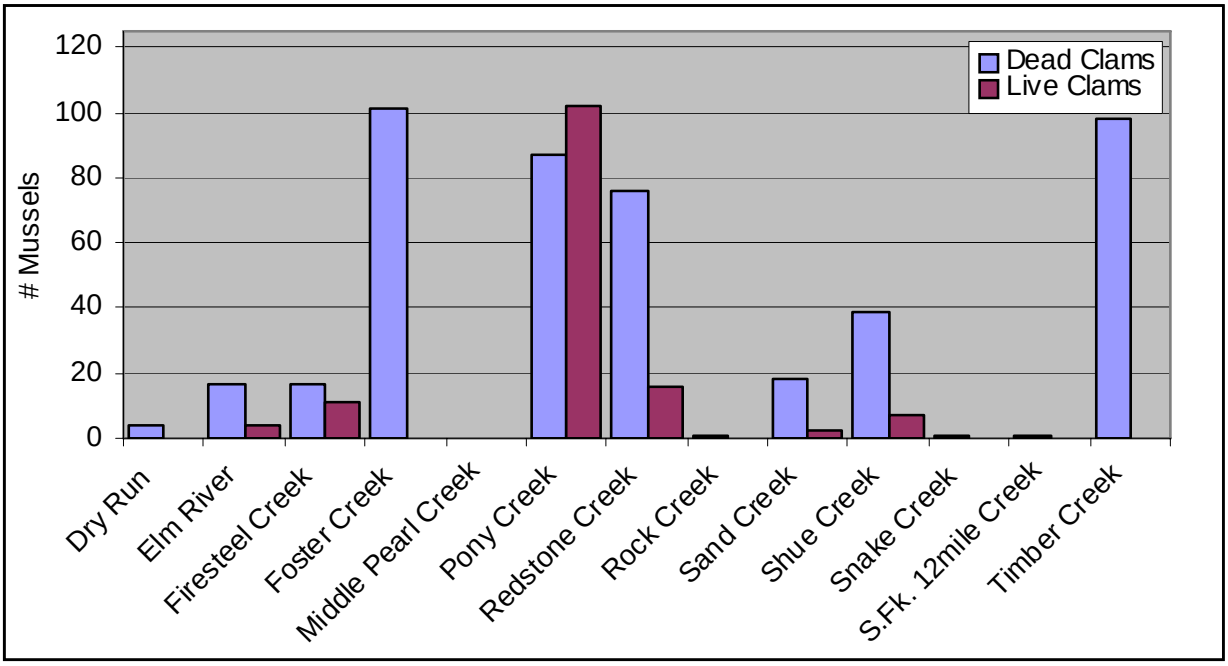

Figure 2. The number of lives and dead mussels found in each tributary.

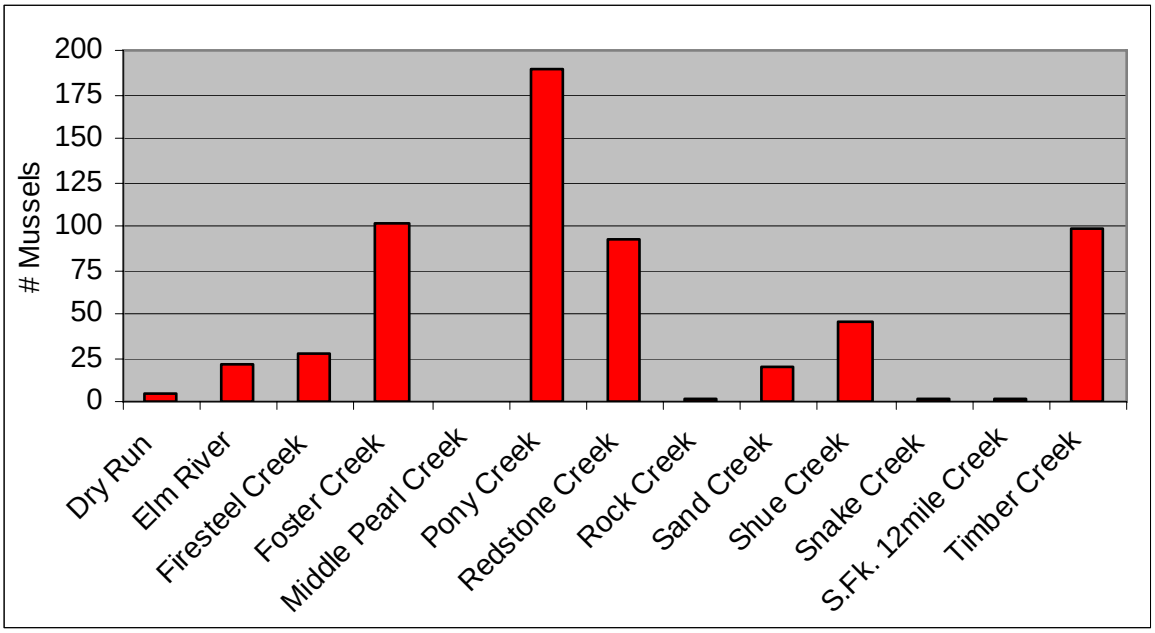

Figure 3. The abundance of mussels (live and dead) found in each tributary.

Pony Creek had the greatest abundance of mussels, (totaling 189 live and dead specimens), followed by Foster Creek (101 mussels) and Timber Creek (98 mussels) (Figure 3). Middle Pearl Creek had the lowest mussel abundance (no specimens found), followed by Rock Creek, Snake Creek and the south fork of 12 Mile Creek (all of which had a single dead mussel).

Summary:

Thirteen James River tributaries surveyed were depauverate of mussel species with only six species found. Species found were common species with the most abundant being the giant floater (*Pyganodon grandis*), followed by the fragile papershell (*Leptodea fragilis*), and the white heelsplitter (*Lasmigona complanata*). Low species diversity may be attributed to the intermittency of smaller streams within this basin.

References:

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Appendix A: Number of live and dead mussels found at each site.

		SPECIES	*Pyganodon grandis*		*Leptodea fragilis*		*Lasmigona complanata*		*Potamilus alatus*		*Potamilus ohiensis*		*Lampsilis siliquoidea*	
SITE	TWPRNGSEC	STREAM	live	dead	live	dead	live	dead	live	dead	live	dead	live	dead
DRY1	11706217	Dry Run	0	2	0	1	0	0	0	0	0	0	0	0
DRY2	11706229	Dry Run	0	1	0	0	0	0	0	0	0	0	0	0
DRY3	11706229	Dry Run	0	0	0	0	0	0	0	0	0	0	0	0
ELM1	12706414	Maple River	2	7	0	0	1	0	0	0	0	0	0	0
ELM2	12506402	Elm River	0	5	1	2	0	3	0	0	0	0	0	0
ELM3	12506436	Elm River	0	0	0	0	0	0	0	0	0	0	0	0
FIRE1	10706402	Firesteel Creek	0	0	0	0	0	0	0	0	0	0	0	0
FIRE2	10506307	Firesteel Creek	0	1	0	2	0	0	0	0	0	0	0	0
FIRE3	10406236	Firesteel Creek	6	10	0	2	5	1	0	1	0	0	0	0
FOS1	11605927	Foster Creek	0	2	0	0	0	0	0	0	0	0	0	0
FOS2	11406007	Foster Creek	0	3	0	3	0	0	0	0	0	0	0	0
FOS3	11306104	Foster Creek	0	70	0	20	0	1	0	0	0	0	0	2
MIDPRL1	11006034	Middle Pearl Creek	0	0	0	0	0	0	0	0	0	0	0	0
MIDPRL2	11006035	Middle Pearl Creek	0	0	0	0	0	0	0	0	0	0	0	0
MIDPRL3	10906003	Middle Pearl Creek	0	0	0	0	0	0	0	0	0	0	0	0
PONY1	9905905	Pony Creek	3	12	0	19	0	0	0	0	0	0	0	0
PONY2	9905905	Pony Creek	75	15	0	18	0	0	0	0	0	0	0	0
PONY3	10005933	Pony Creek	24	11	0	12	0	0	0	0	0	0	0	0
RED1	10706020	Redstone Creek	0	3	0	4	0	1	0	0	0	0	0	0
RED2	10706020	Redstone Creek	14	55	0	2	2	1	0	0	0	2	0	0
RED3	10706014	Redstone Creek	0	4	0	1	0	3	0	0	0	0	0	0
ROCK1	10605715	Rock Creek	0	0	0	0	0	0	0	0	0	0	0	0
ROCK2	10505715	Rock Creek	0	1	0	0	0	0	0	0	0	0	0	0
SAND1	10906426	Sand Creek	2	9	0	2	0	0	0	0	0	0	0	0
SAND2	10806215	Sand Creek	0	3	0	2	0	0	0	0	0	0	0	0
SAND3	10806130	Sand Creek	0	2	0	0	0	0	0	0	0	0	0	0
SFK12-1	10006017	S.Fk. 12mile Creek	0	0	0	0	0	0	0	0	0	0	0	0
SFK12-2	10005929	S.Fk. 12mile Creek	1	0	0	0	0	0	0	0	0	0	0	0
SFK12-3	10005930	S.Fk. 12mile Creek	0	0	0	0	0	0	0	0	0	0	0	0
SHUE1	11206015	Shue Creek	2	20	0	1	0	6	0	0	0	0	0	0
SHUE2	11306024	Shue Creek	0	3	0	0	0	0	0	0	0	0	0	0
SHUE3	11306025	Shue Creek	5	9	0	0	0	0	0	0	0	0	0	0
SNAKE1	12106601	Snake Creek	0	0	0	1	0	0	0	0	0	0	0	0
TIMB1	11606213	Timber Creek	0	37	0	46	0	4	0	0	0	0	0	0
TIMB2	11606226	Timber Creek	0	8	0	3	0	0	0	0	0	0	0	0
TIMB3	11606131	Timber Creek	0	0	0	0	0	0	0	0	0	0	0	0
	SPECIES TOTAL	134												
	TOTAL LIVE	143												
	TOTAL DEAD	459												
	TOTAL (dead and alive)	602												