ILLINOIS NATURAL HISTORY SURVEY
PRAIRIE RESEARCH INSTITUTE

Freshwater mussels of the Saline River and Ohio River tributaries in Illinois

Diane K. Shasteen, Sarah A. Bales, Alison L. Price

INHS Technical Report 2012 (04)

Prepared for:

Illinois Department of Natural Resources: Office of Resource Conservation

U.S. Fish & Wildlife Service

Illinois Natural History Survey

Issued January 30, 2012

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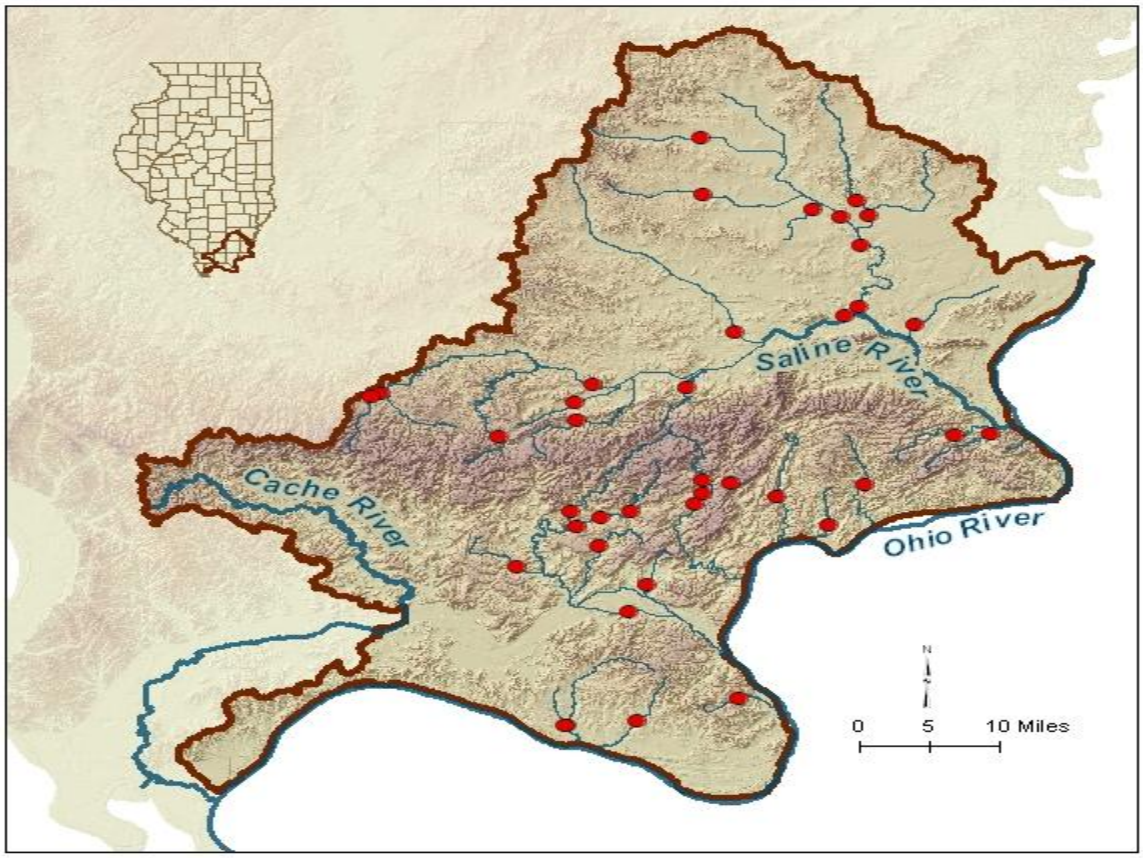

2012

Illinois Natural History Survey, Prairie Research Institute, University of Illinois
Illinois Department of Natural Resources

Diane Shasteen, Sarah Bales, Alison Price

Preface

While broad geographic information is available on the distribution and abundance of mussels in Illinois, systematically collected mussel-community data sets required to integrate mussels into aquatic community assessments do not exist. In 2009, a project funded by a US Fish and Wildlife Service State Wildlife Grant was undertaken to survey and assess the freshwater mussel populations at wadeable sites from 33 stream basins in conjunction with the Illinois Department of Natural Resources (IDNR)/Illinois Environmental Protection Agency (IEPA) basin surveys. Inclusion of mussels into these basin surveys contributes to the comprehensive basin monitoring programs that include water and sediment chemistry, instream habitat, macroinvertebrate, and fish, which reflect a broad spectrum of abiotic and biotic stream resources. These mussel surveys will provide reliable and repeatable techniques for assessing the freshwater mussel community in sampled streams. These surveys also provide data for future monitoring of freshwater mussel populations on a local, regional, and watershed basis.

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Introduction

Freshwater mussel populations have been declining for decades and are among the most seriously impacted aquatic animals worldwide (Bogan 1993, Williams et al. 1993). It is estimated that nearly 70% of the approximately 300 North American mussel taxa are extinct, federally-listed as endangered or threatened, or in need of conservation status (Williams et al. 1993, Strayer et al. 2004). In Illinois, 25 of the 62 extant species (44%) are listed as threatened or endangered (Illinois Endangered Species Protection Board 2011). While broad geographic information is available on the distribution and abundance of mussels in Illinois, systematically collected mussel-community data sets required to integrate mussels into aquatic community assessments do not exist. Sampling of mussels has been very sporadic and limited in the Ohio River tributaries and Saline River drainages and only one report (Hunter/ESE, Inc. 1989) pertaining to all aquatic fauna of these drainages has been published. This report summarizes the mussel survey conducted in the Ohio River tributaries/Saline River drainages in 2010 in conjunction with IDNR and IEPA basin surveys.

The Ohio River tributaries (ORT) include Massac, Bay, Lusk, Big Grand Pierre, and Big Creek systems. This system drains an area of 1331 km^2 (514 mi^2) through scenic rock bluff areas in upstream segments and deep cut banks in the lower reaches near their confluences with the Ohio River (Page et al. 1992). The drainage lies within two natural divisions, Shawnee Hills and Coastal Plain (Schwegman 1973), and four counties, Hardin, Johnson, Massac, and Pope. The topography of the drainage ranges from the broad bottomlands of the Bay Creek area to the rugged forested Shawnee Hills of the Lusk Creek area (IDNR 1997). Another Ohio River tributary, the Saline River (SR) system drains a larger area, 3048 km^2 (1177 mi^2) and encompasses nine counties including Saline, Hamilton, White, Franklin, Gallatin, Hardin, Williamson, Pope, and Johnson (Page et al. 1992). The drainage encompasses three natural divisions including the Shawnee Hills, Wabash Border, and Southern Till Plain (Schwegman 1973).

Land-use and Instream Habitat

The ORT are located in a predominately forested (~60%) landscape with small agricultural farms (~30%) within the Shawnee National Forest. Urban areas account for less than four percent of land use in this region (IDA 2000, Page et al. 1992). The SR drainage is dominated by agricultural lands (70-80%) in a more populated area (3-8% land use). This drainage contains wetland areas (10-15%), many of which were created by surface mining in the region (IDA 2000). Due to the mining industry, the streams in this region have been degraded by brines from oil wells, acid water from abandoned coal mines and stream channelization conducted to

facilitate coal transportation (Page et al. 1992).

Substrates throughout these two drainages were highly variable. The ORT substrates were a combination of gravel, clay, cobble, and silt. Lesser amounts of bedrock, boulder, and sand were present in this drainage. All of the sites in this drainage were naturally meandering and located in heavily forested areas with the exception of Bay Creek Ditch, a man-made channelized drainage ditch located in southern Pope County. The dominant substrate in Bay Creek Ditch was silt. In the SR drainage, substrate composition consisted of sand, clay, gravel and silt. Bedrock, boulder and cobble were only recorded at one site, Rock Creek, an ephemeral creek located in Hardin County. Due to extensive mining practices in the SR drainage, most streams are channelized and lack natural vegetation in the riparian zone (Hunter/ESE 1989, Page et al. 1992). Both drainages had an average water depth near 0.5 m, with the maximum water depth of the ORT (1.1 m) slightly higher than the SR drainage (0.8 m).

Methods

During the 2010 survey, freshwater mussel data were collected at 39 sites: 19 ORT and 20 in the SR drainage (Figure 1). Locations of sampling sites are listed in Table 1 along with information regarding IDNR/IEPA sampling at the site. In most cases, mussel survey locations were the same as IDNR/IEPA sites.

Live mussels and shells were collected at each sample site to assess past and current freshwater mussel occurrences. Live mussels were surveyed by hand grabbing and visual detection (e.g. trails, siphons, exposed shell) when water conditions permitted. Efforts were made to cover all available habitat types present at a site including riffles, pools, slack water, and areas of differing substrates. A four-hour timed search method was implemented at most sites, and a 16-hour survey was completed at one site (Site 17) to fulfill the sampling objectives for a separate project (Table 1). Live mussels were held in the stream until processing.

Following the timed search, all live mussels and shells were identified to species and recorded (Table 2). For each live individual, shell length (mm), gender, and an estimate of the number of growth rings recorded. Shell material was classified as recent dead (periostracum present, nacre pearly, and soft tissue may be present) or relict (periostracum eroded, nacre faded, shell chalky) based on condition of the best shell found. A species was considered extant at a site if it was represented by live or recently dead shell material (Szafoni 2001). The nomenclature employed in this report follows Turgeon et al. (1998) except for recent taxonomic changes to the gender ending of purple lilliput and lilliput (*Toxolasma lividum* and *T. parvum*), which follows Williams et al. (2008; Appendix 1). Voucher specimens were retained and deposited in the Illinois Natural History Survey Mollusk Collection. All non-vouchered live mussels were returned to the stream reach where they were collected.

Parameters recorded included extant and total species richness, presence of rare or listed species, and individuals collected, expressed as catch-per-unit-effort (CPUE; Table 2). A population was considered to indicate recent recruitment if individuals less than 30 mm in length or with 3 or fewer growth rings were recorded. Finally, mussel resources were classified as Unique, Highly Valued, Moderate, Limited, or Restricted (Table 2) based on the above parameters (Table 3) and following criteria outlined in Table 4 (Szafoni 2001).

Results

Species Richness

A total of 24 species of freshwater mussels were observed in the Saline River/Ohio River Tributaries, all 24 species were live (Table 2). In the ORT, 14 species were observed with 13 species recorded live. The SR drainage had 22 observed species, 21 species recorded live. Ten species occurred in both drainages, while 3 were unique to the ORT and 11 were unique to the SR drainage. Across all sites, the number of live species collected, the number of extant species collected (live + dead), and the total number of species collected (live + dead + relict) ranged from 0 to 18. The giant floater (*Pyganodon grandis*) had the most occurrences across sites sampled with live mussels present (10 of 23 sites; 43%; Figure 2). The Texas lilliput (*Toxolasma texasiensis*), pondmussel (*Ligumia subrostrata*), mapleleaf (*Quadrula quadrula*), pondhorn (*Uniomerus tetralasmus*), fragile papershell (*Leptodea fragilis*), yellow sandshell (*Lampsilis teres*), and lilliput (*Toxolasma parvum*) were other commonly occurring species (Figure 2), occupying between 30% and 40% of these sites. Site 17, the North Fork Saline River near Equality had the greatest species richness with 18 live species recorded from a 16-hour survey. At the end of the regular 4 hour sample, 9 live species had been recorded at this site.

Abundance and Recruitment

A total of 1365 individuals were collected across 39 sites. The number of live specimens collected at a given site ranged from 0 to 577, with an average of 59 mussels per site where live mussels were collected (23 of 39 sites; Table 2). A total of 168 collector-hours were spent sampling with an average of 8 mussels collected per hour. Thirteen sites yielded more than 10 individuals and 4 of the 7 sites yielded more than 50 live individuals. The most common species collected at ORT sites were the fatmucket (*Lampsilis siliquoidea;* (n=174), Texas lilliput (n=52), pondmussel (n=48) and paper pondshell (*Utterbackia imbecillis*; n=39), which together comprised nearly 87% of the collections. In the SR drainage, the mapleleaf (n=463), wartyback (*Quadrula nodulata*; n=175), and white heelsplitter (*Lasmigona complanata*; n=131) were most common comprising over 76% of the collections. In these drainages combined, the above mentioned species plus the fragile papershell (n=46), yellow sandshell (n=42) and threeridge (*Amblema plicata*; n=32) made up nearly 90% of the total collection (Table 2).

Mussel abundance at individual sites ranged from none to moderately high, with CPUE ranging from 0 - 37 individuals/collector-hour (Table 2). In the ORT, extant mussel populations were found at 10 of the 19 sites and CPUE averaged 9 individuals per collector-hour. Similar results were obtained from the SR drainage where extant mussel populations were found at 13 of the 20 sites and CPUE averaged near 11.

Recruitment for each species was determined by the presence of individuals less than 30 mm or with 3 or fewer growth rings. Smaller (i.e., younger) mussels are harder to locate by hand grab methods and large sample sizes can be needed to accurately assess population reproduction. However, a small sample size can provide evidence of recruitment if it includes individuals that are small or possess few growth rings. Alternatively, a sample consisting of very large (for the species) individuals with numerous growth rings suggests a senescent population.

Recruitment at individual sites ranged from none observed to high across the two drainages. Recruitment levels, referred to in Table 3 as Reproduction Factor, varied from 1 to 5, with 5 sites exhibiting high to very high recruitment. Bay Creek (site 28; ORT) and Harris Creek (site 19; SR) exhibited recruitment over 50% and recruitment was 30 to 50% at 3 other sites (13, 23 and 34; Figure 3, 4). Four other sites (two in each drainage) exhibited moderate recruitment, while no observed recruitment was recorded at 30 sites during this survey.

Mussel Community Classification

Based on the data collected in the 2010 basin survey, nearly 70% of sites in the two drainages (12-ORT, 15-SR) have Restricted or Limited mussel communities using the current MCI classification system (Table 4, Figure 3, 4). Only three sites, all located on the North Fork Saline River, ranked as Highly Valued mussel resources due to their high species richness, listed species present, moderate recruitment and relatively high CPUE. Seven sites in the ORT drainage were ranked as Moderate mussel resources, along with two sites in the SR drainage (Table 4, Figure 3, 4).

Noteworthy Finds

This survey collected 24 total species (live + dead + relict) all of which were represented by live individuals. None of the 24 species recorded during this survey were new to the ORT drainage and only one species, the fat pocketbook (*Potamilus capax*) had never been recorded in the SR drainage. The fat pocketbook was listed as a federally endangered species in 1976 due to a marked reduction in the overall range of the species. Current populations are known from the St. Francis River drainage in Arkansas, the Mississippi River in Missouri, and the lower Wabash and Ohio River in Indiana, Kentucky and Illinois (Cummings et al. 1990). Habitat for the fat pocketbook is slow to moderately flowing water over silt and sand substrates, and freshwater drum (*Aplodinotus grunniens*) is considered the host fish (Cummings and Mayer 1993).

Freshwater drum are known to occur in the Saline River drainage and were collected at site 9 (n=2) and site 17 (n=4) during the 2010 IDNR fish survey (personal communication, Scott Shasteen, IEPA). Relict shell was collected at site 9 and 3 live individuals of fat pocketbook were collected at site 17. Dead and relict shells of this species were also found at sites 8, 9, and 13, which are the North Fork Saline, Middle Fork Saline and the Saline River mainstem sites.

Discussion

There is limited mussel community information relating to these drainages from past surveys and reports. Only one known intensive survey for mussels was completed in 1989 on the ORT and SR drainages (Hunter/ESE, Inc. 1989). Twenty-three sites (9 in the ORT, 14 in the SR) were sampled during that survey. Eleven species of mussels were recorded in the ORT drainage and 17 were recorded in the SR drainage. Results from our survey were comparable to the 1989 survey, including the existence of a relatively intact mussel community in the North Fork Saline River. Two species, threeridge and creeper, were detected in 1989 in the ORT drainage but were not found during our surveys. Other historical information for these drainages comes from shell surveys that have been conducted over the last several years by IDNR biologist John E. Schwegman (INHS Mollusk Collections Database). These shell records have provided valuable information regarding species presence in the drainages, although the status of living mussel communities was not determined during those surveys. More thorough sampling would need to be conducted in these drainages to determine the mussel community composition of these drainages, especially at sites where Mr. Schwegman has located shell material of species not found during this basin survey.

According to these past surveys and other historical records from the INHS collection database, 27 species are known from the ORT drainage and 25 species are known from the SR drainage. Records for live species post- 1969 include 15 species for the ORT drainage and 19 species for the SR drainage (Tiemann et al. 2007). Species that were not detected in the ORT drainage during our survey includes the threeridge (*Amblema plicata*), spike (*Elliptio dilatata*), Wabash pigtoe (*Fusconaia flava*), wartyback (*Quadrula nodulata*), pimpleback (*Quadrula pustulosa*), flat floater (*Anodonta suborbiculata*), creeper (*Strophitus undulatus*), white heelsplitter (*Lasmigona complanata*), threehorn wartyback (*Obliquaria reflexa*), pink papershell (*Potamilus ohiensis*), purple lilliput (*Toxolasma lividum*), deertoe (*Truncilla truncata*) and little spectaclecase (*Villosa lienosa*). Only three of these species, flat floater, creeper and threeridge, were known from sites sampled during our survey. All of the other species from this list were collected at other sites located throughout the drainage. From this historic list, only the threeridge, creeper, purple lilliput, and deertoe have been found live in this drainage since 1969. In the SR drainage the Wabash pigtoe, pimpleback, pistolgrip (*Tritogonia verrucosa*) and little spectaclecase were not detected during our survey. Of these species the pimpleback and

pistolgrip have been detected live post-1969. Several of the species not detected in the ORT drainage were found live in the SR drainage including the threeridge, wartyback, flat floater, white heelsplitter, threehorn wartyback, pink papershell, and deertoe; however, the only connectivity between the two drainages is the Ohio River. Among all sites in the ORT and SR, we did not collect 14 species that were known historically. Most of the historical records for these species were located at sites that were not sampled during our survey, and many of these species are fairly common throughout the state. Three species, spike, purple lilliput and little spectaclecase, are state-listed and considered rare throughout their range in Illinois. More thorough sampling, especially at historical sites, would need to be conducted to determine if any of these species are extant or extirpated from these drainages.

Recruitment

Nine sites exhibited moderate to high recruitment in the ORT (5) and SR (4) drainages. In the SR drainage, the highest number of species displaying recruitment occurred in the North Fork Saline River (Figure 5). These findings suggest that the mussel communities of the North Fork Saline River are viable and self-maintaining at this time. Data collected during this survey indicate that very recent recruitment may not be occurring at the 30 remaining sites in these drainages. Many of the mussels found at these sites were highly eroded and over 20 years of age as depicted in Figure 6. Sampling methods to target juvenile mussels would be necessary to better assess the reproductive status of these populations.

Mussel community of the Ohio River Tributaries and Saline River

Our surveys documented the existence of 14 species in the ORT and 22 in the SR drainage. While these numbers are less than the historical species counts, they are nearly the same as the mussel communities known since 1969. Many of the streams (27 of 39) in this region have Restricted or Limited mussel communities; however, a few bright spots remain. In the ORT drainage, Lusk Creek, Big Grand Pierre, Bay Creek, and three tributaries to Bay Creek ranked as Moderate mussel communities. Five of these sites also displayed recent recruitment indicating that these populations are viable and self-maintaining at this time. Nearly all of the streams in this drainage are considered full support for aquatic life based on biological, physiochemical, physical habitat, and toxicity data collected by the IEPA (IEPA 2008). Although able to support aquatic life based on these standards, several of the streams sampled are considered ephemeral and may lack the water availability needed to support a mussel community.

In the SR drainage, many of the streams have been impacted by mining, agriculture, and stream channelization. Only the mussel communities collected at the North Fork Saline sites suggest relatively intact freshwater mussel communities, since the number of extant species was nearly the same or greater than historic species records or relict shell collected. This river was also

where the federally endangered fat pocketbook, the only new species of mussel found in either drainage, was detected. The fat pocketbook is an increasingly rare species in Illinois that is now only found in large rivers that form the eastern border of Illinois. The detection of the species in the Saline River drainage could be a sign that the species has previously undetected populations in smaller tributaries or is perhaps expanding its range. The fact that the species was not detected live until the eighth hour of sampling could indicate that it is less common or harder to detect. From this survey, it seems reasonable to assume that the North Fork Saline is capable of supporting a biologically significant freshwater mussel fauna, including a federally endangered species, and should be protected from further disturbance.

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Table1. 2010 Saline River and Ohio River tributaries Intensive Basin Survey. Types of samples include MU-mussel sampling, BE-boat electrofishing, ES-electric fish seine, SH-fish seine hauls, FF-fish flesh contaminate, H-habitat, M-macroinvertebrate, S-sediment, W-water chemistry, CM-continuous water monitoring. * indicates 16-hour sample completed.

Site Number	IEPA Code	Stream	Types of Samples	County	Location	Watershed Area (km²)
Saline River Drainage						
1	ATHJ-LE-D1	Little Saline River	MU,ES,M,H,W	Williamson	0.6 mi US Lake of Egypt Spillway Rd	29.7
2	ATHJ-LE-C1A	Little Saline River	MU,ES,M,H,W	Williamson	SI Power Coop outfall	29.7
3	ATHG-07	Sugar Creek	MU,ES,M,H,S,W	Johnson	Parker Rd; SW of New Burnside	34.0
4	ATH-LE-C1	South Fk Saline River	MU,ES,M,H,W	Williamson	0.4 mi NW of Lake of Egypt Dam	118.5
5	ATHE-01	Pond Creek	MU,ES,M,H,S,W	Saline	Battleford Rd; 1 mi E of Stonefort	35.4
6	ATHD-03	Little Saline River	MU,ES,M,H,S,W	Pope	Bynum Rd; 1.8 mi SSE Stonefort	42.2
7	ATHC-01	Battleford Creek	MU,ES,M,H,S,W	Saline	Battleford Rd; 1.4 mi SW Mitchellsville	31.8
8	ATG-03	Middle Fk Saline Rive	MU,W	Saline	Rd 3 mi SE Harrisburg	630.8
9	AT-05	Saline River	MU,BE,M,H,S,W	Gallatin	Rd SW edge Equality	1431.2
10	ATFFA-01	Hogg Creek	MU,SH,M,H,S,W	Hamilton	1000E Rd; 2.5 mi SW of Dale	51.1
11	ATFEA-01	Long Branch	MU,ES,M,H,S,W	Saline	Raleigh Chapel Rd, 6 mi N of Raleigh	40.2
12	ATFD-01	Brush Creek	MU,ES,M,H,S,W	Saline	Cottonwood Rd E of 45	29.7
13	ATF-08	North Fk Saline River	MU,W	Saline	2.4 mi E of Texas City	679.1
14	ATFJC-02	Bear Creek	MU,ES,M,H,S,W	Gallatin	Washington Rd W of Omaha	180.2
15	ATFJ-01	Cane Creek	MU	Gallatin	1.5 mi SW of Omaha	287.8
16	ATF-	North Fk Saline River	MU	Gallatin	Zion Cemetery Rd at Elba	890.8
17	ATF-03*	North Fk Saline River	MU,BE,FF,M,H,S,W	Gallatin	Rt 13 BR NE Equality	1153.1
18	ATZM-05	Cypress Ditch	MU,ES,M,H,S,W	Gallatin	Parker Rd; SW of Junction	60.3
19	ATB-01	Harris Creek	MU,ES,M,H,S,W,CM	Hardin	Harris Creek Rd	41.0
20	ATBA-01	Rock Creek	MU,ES,M,H,S,W,CM	Hardin	Rock Creek Baptist Church @ Rock Creek	26.4
Ohio River Tributaries						
21	AO-03	Big Creek	MU,BE,SH,M,H,S,W,CM	Hardin	0.3 mi us confl Goose Cr; Iron Furnace	48.0
22	AN-01	Three mile Creek	MU,ES,M,H,S,W,CM	Hardin	3 mile creek Rd; 2 mi NW Rosiclare	13.6
23	AL-02	Big Grand Pierre Cree	MU	Pope	Grande Pierre Dr; off of 34	126.4
24	AL-01	Big Grand Pierre Cree	MU,ES,M,H,S,W,CM	Pope	Rt 146 2 mi W of Rt 34	145.6
25	AK-07	Lusk Creek	MU	Pope	Ragan Rd off of Eddyville blacktop	46.6
26	AK-06	Lusk Creek	MU	Pope	2.9 Mi EWE Eddyville; Rose Ford	98.6
27	AK-02	Lusk Creek	MU,BE,FF,M,H,P,S,W,CM	Pope	2.8 mi SE Eddyville	111.3
28	AJ-09	Bay Creek	MU,ES,M,H,S,W	Pope	Rushing Rd off of 147; .5 mi NW Robbs	93.0
29	AJG-17	Hayes Creek	MU	Pope	Rt 145 Br; 2 mi E Glendale	24.3
30	AJG-19	Hayes Creek	MU	Pope	Rt 145 Br; at Glendale	49.0
31	AJG-18	Hayes Creek	MU,ES,M,H,S,W,CM	Pope	Bull Pen Rd; S of Robbs	61.3
32	AJE-01	Johnson Creek	MU,ES,M,H,S,W	Johnson	Reevesville Rd; E of Vienna	26.3
33	AJD-01	Sugar Creek	MU,ES,M,H,S,W,CM	Pope	Route 145 just west Glendale Lake	26.5
34	AJK-01	Bay Creek Ditch	MU,ES,M,H,S,W	Pope	Janssen Rd to Holmes Corner; SW Brownfi	430.3
35	AJB-01	Flat Lick Branch	MU,ES,M,H,S,W	Pope	outside of Brownfield	28.8
36	AH-01	Dog Creek	MU,ES,M,H,S,W,CM	Pope	FR 1402; 3 mi SE of Bay City	13.6
37	AF-02	7 mile Creek	MU,ES,M,H,S,W	Massac	Waldo Church Rd; Metropolis	22.3
38	AEA-01	Weaver Creek	MU,ES,M,H,S,W	Massac	Massac Creek Rd (Gurley Rd); Metropolis	15.9
39	AE-03	Massac Creek	MU,ES,M,H,S,W	Massac	Massac Creek Rd (Gurley Rd); Metropolis	45.2

Table 2. Mussel data for sites sampled during 2010 surveys (Table 1). Numbers in columns are live individuals collected; "D" and "R" indicates that only dead or relict shells were collected. Shaded boxes indicate historic collections at the specific site location obtained from the INHS Mollusk Collection records. Species in bold are federally or state-listed species or species in Greatest Need of Conservation by IL DNR. Proportion of total is number of individuals of a species divided by total number of individuals at all sites. Extant species is live + dead shell and total species is live + dead + relict shell. NDA represents no historical data available. MCI scores and Resource Classification are based on values in Tables 3 and 4 (R= Restricted, L= Limited, M= Moderate, HV= Highly Valued, and U= Unique). **includes *Elliptio dilatata, Fusconaia flava, Toxolasma lividum,* and *Villosa lienosa*, which are not represented in the table.

	Site Number																								Proportion
Species	3	5	7	8	9	11	12	13	14	15	16	17	18	19	23	24	25	26	27	28	29	32	34	35	**of Total**
Subfamily Anodontinae																									
Anodonta suborbiculata												1													0%
Anodontoides ferussacianus																		1	R		3				0%
Arcidens confragosus					2							1													0%
Lasmigona complanata					27			25			12	67													10%
Pyganodon grandis				D	3			2	3		D	8	R			1		4	R	1	1		7	1	2%
Strophitus undulatus																									0%
Utterbackia imbecillis								D				1			1			7				D	25	6	3%
Subfamily Ambleminae																									
Amblema plicata					5			6			12	9													2%
Megalonaias nervosa					3							3													0%
Quadrula nodulata					5			13			9	148													13%
Quadrula pustulosa																									0%
Quadrula quadrula				3	30			54	1	1	99	275				1									34%
Tritogonia verrucosa																									0%
Uniomerus tetralasmus			5	R		1	1											1			1	5		2	1%
Subfamily Lampsilinae																									
Lampsilis cardium															1	1									0%
Lampsilis siliquoidea													R		3	10	31	85	45						13%
Lampsilis teres					5			20		4	6	5				1							1		3%
Leptodea fragilis				6	3			1		1	8	22				R				R			5		3%
Ligumia subrostrata	1	3		R		21	1							1	D	2		D		R	8	1		37	5%
Obliquaria reflexa					1						2	10													1%
Potamilus alatus											R	1				1		1							0%
Potamilus capax				R	R			D				3													0%
Potamilus ohiensis				D	4			1				4													1%
Toxolasma parvum		2	1		1	7		D				1										6		1	1%
Toxolasma texasiensis							1		1	1						1			1		4	4	15	27	4%
Truncilla donaciformis								1				14													1%
Truncilla truncata								1			1	4											R		0%
																									Total
Individuals	1	5	6	9	89	29	3	124	5	7	149	577	0	1	5	18	31	99	46	1	17	16	53	74	1365
Live Species	1	2	2	2	12	3	3	10	3	4	8	18	0	1	3	8	1	6	2	1	5	4	5	6	24
Extant Species	1	2	2	4	12	3	3	13	3	4	9	18	0	1	4	8	1	7	2	1	5	5	5	6	24
Total Species	1	2	2	7	13	3	3	13	3	4	10	18	2	1	4	9	1	7	4	3	5	5	6	6	24
Historical Species	NDA	NDA	NDA	1	2	NDA	NDA	3	NDA	3	NDA	17	NDA	NDA	7	7	2	1	6	3	5	1	2	1	30**
Catch per unit effort (CPUE)	0.3	1.3	1.5	2.3	20.4	7.2	0.8	31.0	1.3	1.8	37.0	36.0	0	0.3	1.3	4.5	7.8	24.8	11.5	0.3	4.2	4.0	13.3	18.6	
Mussel Community Index (MCI)	4	6	6	7	10	6	4	14	6	7	12	13	0	8	10	8	6	11	7	8	7	9	11	8	
Resource Classification	R	L	L	L	M	L	R	HV	L	L	HV	HV	R	M	M	M	L	M	L	M	L	M	M	M	

Table 3. Mussel Community Index (MCI) parameters and scores.

Extant species in sample	Species Richness		Catch per Unit Effort (CPUE)	Abundance (AB) Factor
0	1		0	1
1-3	2		1-10	2
4-6	3		>10-30	3
7-9	4		>30-60	4
10+	5		>60	5
% live species with recent recruitment	Reproduction Factor		# of Intolerant species	Intolerant species Factor
0	1		0	1
1-30	3		1	3
>30-50	4		2+	5
>50	5			

Table 4. Freshwater mussel resource categories based on species richness, abundance, and population structure. MCI = Mussel Community Index Score

Unique Resource MCI ≥ 16	Very high species richness (10 + species) &/or abundance (CPUE > 80); intolerant species typically present; recruitment noted for most species
Highly Valued Resource MCI = 12- 15	High species richness (7-9 species) &/or abundance (CPUE 51-80); intolerant species likely present; recruitment noted for several species
Moderate Resource MCI = 8 - 11	Moderate species richness (4-6 species) &/or abundance (CPUE 11-50) typical for stream of given location and order; intolerant species likely not present; recruitment noted for a few species
Limited Resource MCI = 5 - 7	Low species richness (1-3 species) &/or abundance (CPUE 1-10); lack of intolerant species; no evidence of recent recruitment (all individuals old or large for the species)
Restricted Resource MCI = 0 - 4	No live mussels present; only weathered dead, sub-fossil, or no shell material found.

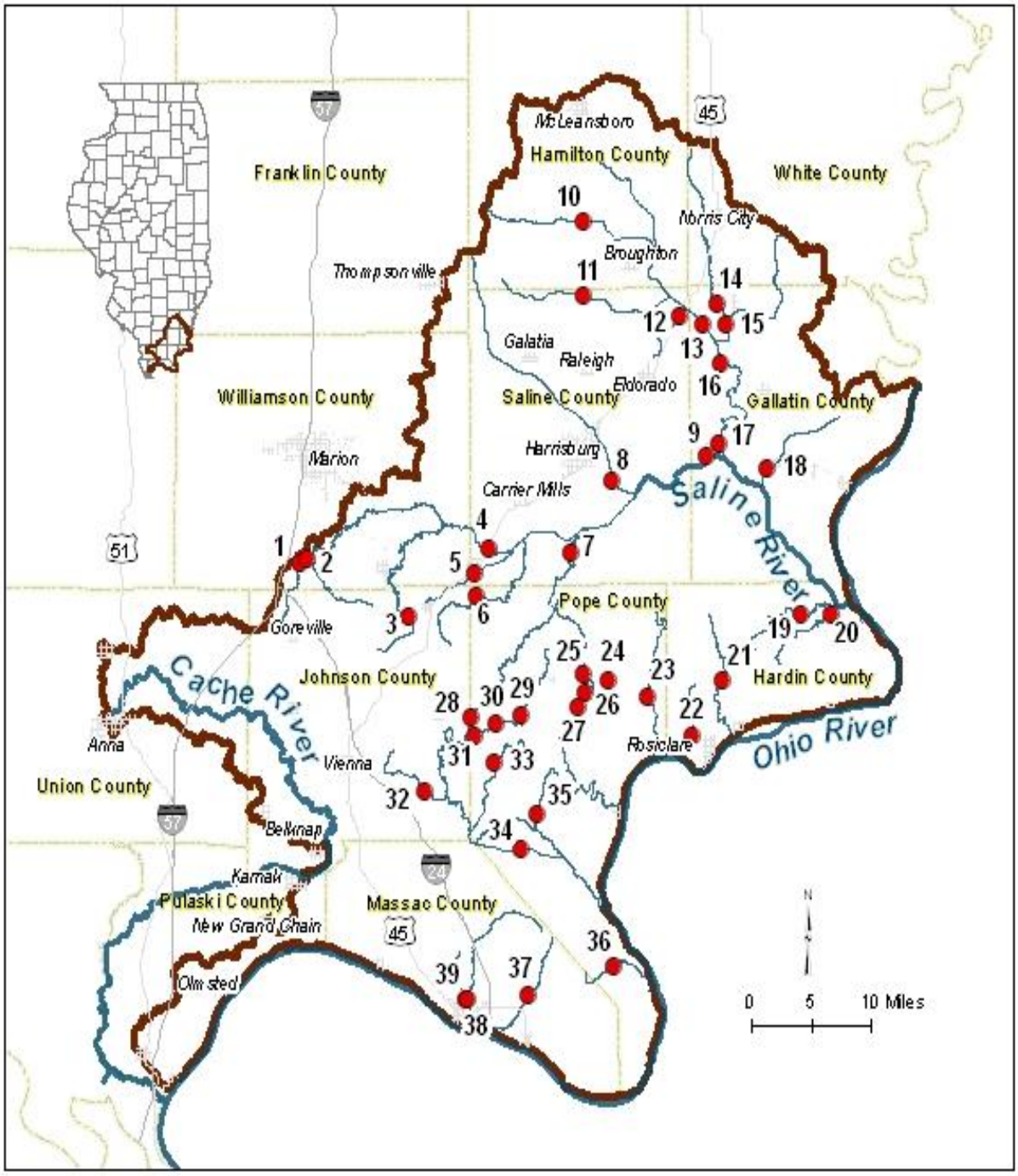

Figure 1. Sites sampled in the Saline River/Ohio Tributaries during 2010. Site codes referenced in Table 1.

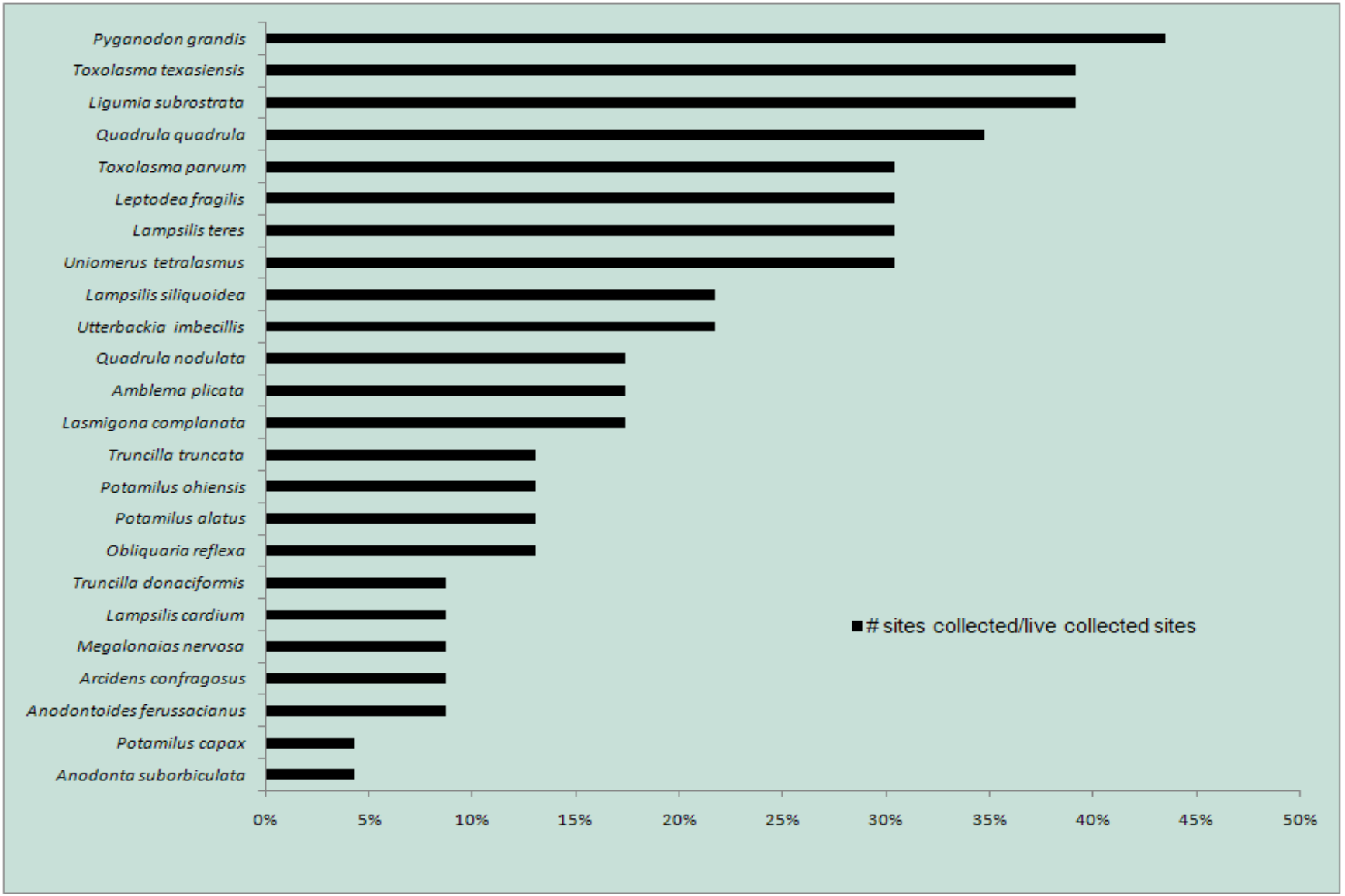

Figure 2. Number of sites where a species was collected live compared to the number of total sites sampled (23 total sites).

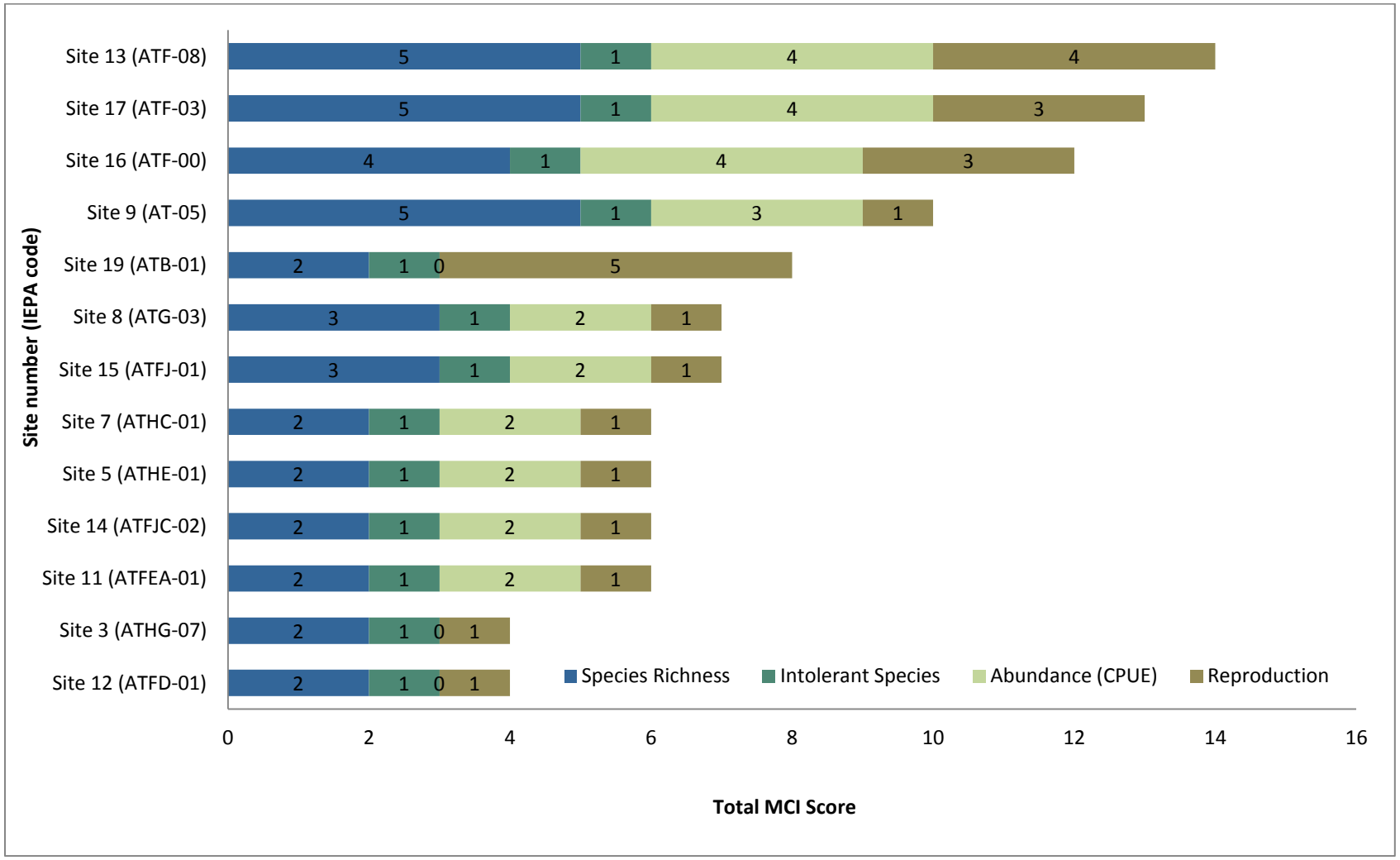

Figure 3. Comparison of Mussel Community Index (MCI) and MCI component scores for Saline River drainage sites based on factor values from Table 3.

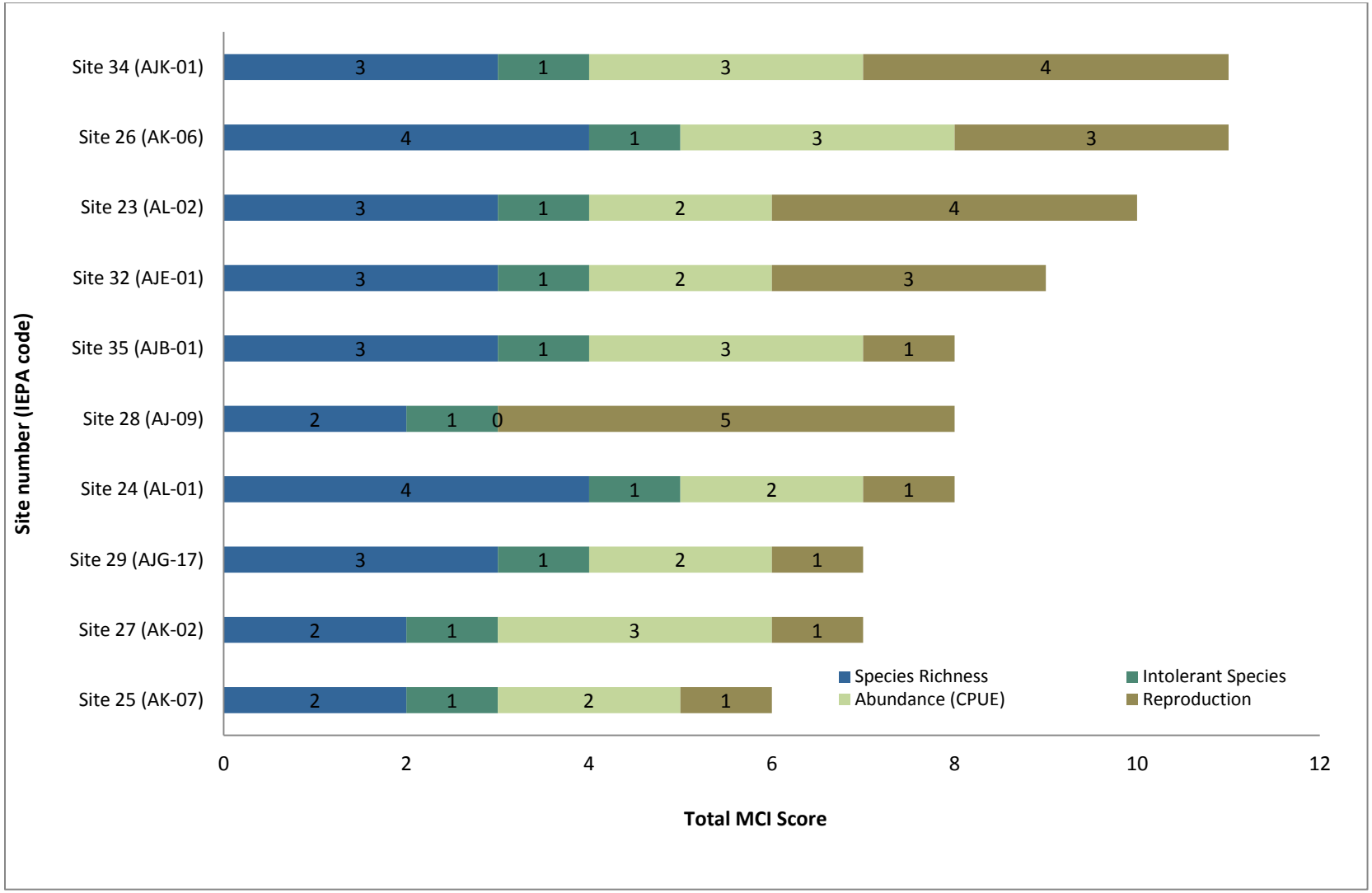

Figure 4. Comparison of Mussel Community Index (MCI) and MCI component scores for Ohio River tributaries drainage sites based on factor values from Table 3.

Figure 5. Live mussel species collected at North Fork Saline (Site 19). Note condition and age of shells.

Figure 6. Live fatmuckets collected at Lusk Creek (Site27). Note condition and age of shells.

Appendix 1. Scientific and common names of species

Scientific Name	**Common Name**	
Anodonta suborbiculata	flat floater	
Anodontoides ferussacianus	cylindrical papershell	
Arcidens confragosus	rock pocketbook	
Lasmigona complanata	white heelsplitter	
Pyganodon grandis	giant floater	
Strophitus undulatus	creeper	
Utterbackia imbecillis	paper pondshell	
Subfamily Ambleminae		
Amblema plicata	threeridge	
Elliptio dilatata	**spike**	**ST**
Fusconaia flava	Wabash pigtoe	
Megalonaias nervosa	washboard	
Quadrula nodulata	wartyback	
Quadrula pustulosa	pimpleback	
Quadrula quadrula	mapleleaf	
Tritogonia verrucosa	pistolgrip	
Uniomerus tetralasmus	pondhorn	
Subfamily Lampsilinae		
Lampsilis cardium	plain pocketbook	
Lampsilis siliquoidea	fatmucket	
Lampsilis teres	yellow sandshell	
Leptodea fragilis	fragile papershell	
Ligumia subrostrata	pondmussel	
Obliquaria reflexa	threehorn wartyback	
Potamilus alatus	pink heelsplitter	
Potamilus capax	**fat pocketbook**	**FE**
Potamilus ohiensis	pink papershell	
Toxolasma lividum	**purple lilliput**	**ST**
Toxolasma parvum	lilliput	
Toxolasma texasiensis	Texas lilliput	
Truncilla donaciformis	fawnsfoot	
Truncilla truncata	deertoe	
Villosa lienosa	**little spectaclecase**	**SE**