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Freshwater mussels of the Rock River tributaries: Pecatonica, Kishwaukee, and Green River basins in Illinois

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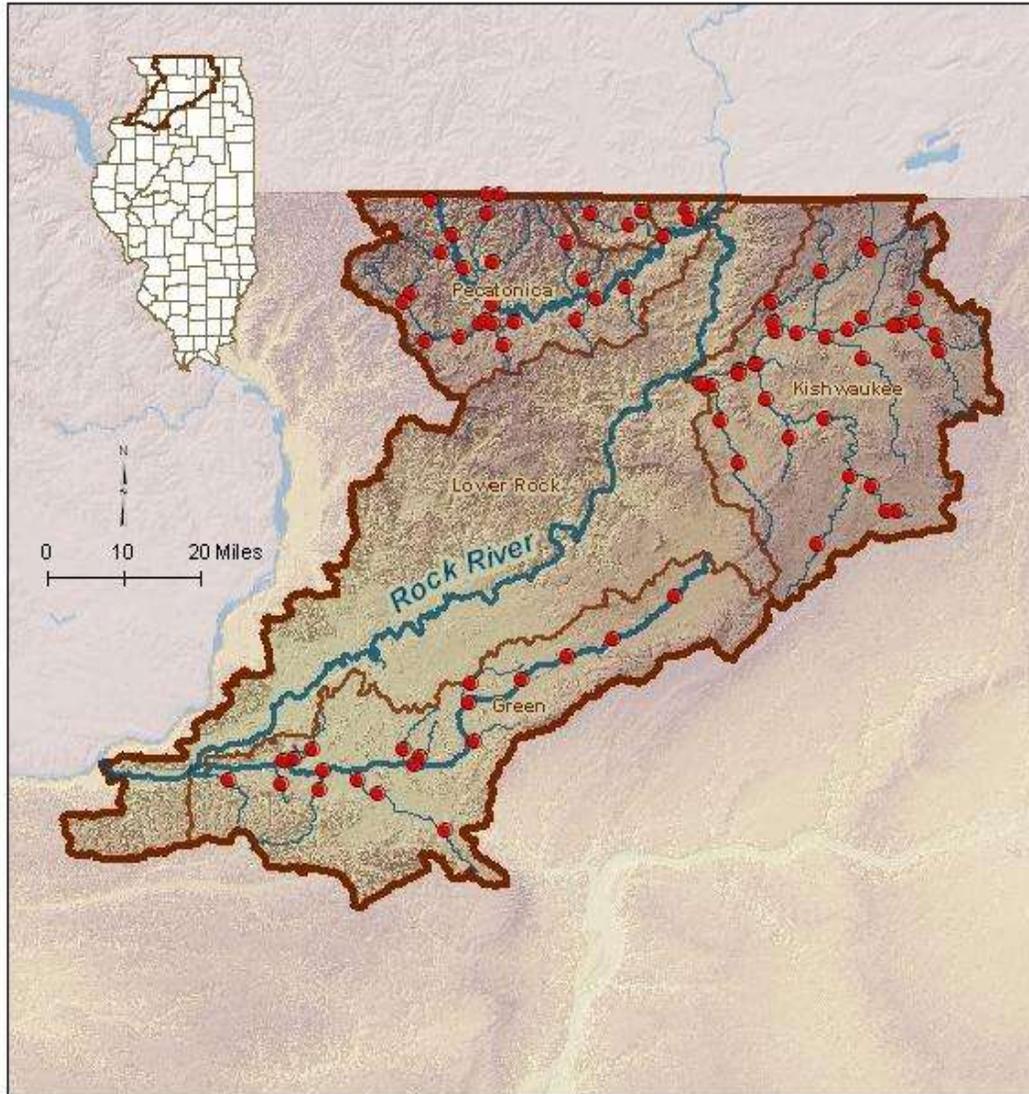
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Preface

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) and an additional 5 species are species in greatest need of conservation (SGNC; IDNR 2005). 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. This report summarizes the mussel surveys conducted in the Rock River tributaries, specifically the Pecatonica, Kishwaukee, and Green River basins from 2009 to 2012 in conjunction with IDNR and IEPA basin surveys and previously ranked disturbance sites.

The Pecatonica, Kishwaukee and Green Rivers form the principal drainage of the Rock River. These basins encompass five natural divisions including Rock River Hill Country, Northeastern Morainal, Grand Prairie, Upper Mississippi and Illinois River Bottomlands, and the Middle Mississippi Border (Schwegman 1973). The Pecatonica basin, containing Yellow, Sugar, and Pecatonica Rivers, drains 2,085 km² (805 mi²) in Winnebago, Stephenson, Jo Daviess, and Carroll counties. Originating in Wisconsin, this highly sinuous river flows in a southerly and easterly direction through rolling hills and narrow valleys entering the Rock River at Rockton (Page et al. 1992). The Kishwaukee basin drains approximately 3,238 km² (1,250 mi²) in McHenry, Boone, Winnebago, Ogle, DeKalb, Lee, and Kane counties. Originating near Woodstock in McHenry County, the Kishwaukee basin is characterized by open oak woodland and prairie country on low undulating land; steeper topography occurs in the northern parts of Boone and Winnebago counties (Page et al. 1992). The Kishwaukee River is formed by two branches (North and South Branch) that unite approximately 12 miles above its mouth, on the Rock River three miles south of Rockford (IDNR 2000a). The Green basin drains 2,929 km² (1,131 mi²) in Whiteside, Lee, Henry, and Bureau counties. Originating in Lee County near Steward, this highly modified river flows west-southwest through the Green River Lowland Section of the Grand Prairie Natural Division before its confluence with the Rock River near Carbon Cliff in Henry County (Page et al. 1992, Schanzle and Kruse 1994).

Land use and Instream Habitat

Ecologically, the landscape of the Pecatonica basin is similar to Wisconsin, with ample grasslands and a leader in the production of forage crops and dairy products. The sale of

livestock accounts for 70% of the total annual receipts from agriculture (IDNR 2000b, Illinois Department of Agriculture (IDA) 2000). Urban areas continue to grow in this region, with Freeport (pop. 25,638) being the largest city (US Census Bureau 2010). Likewise, the two largest cities in the Kishwaukee basin, DeKalb (pop. 43,862) and Belvidere (pop. 25,585) have increased in population by 10,000 over the last 10 years (IEPA 1996, US Census Bureau 2010). The majority of the land is devoted to agriculture (79%) with croplands accounting for 2/3 of the surface area (IDA 2000). The flow of the Kishwaukee River is generally unimpeded except for a dam in Belvidere. The Green basin is more rural than the Pecatonica and Kishwaukee basins and the largest towns located in this region include Amboy (pop. 2,500) and Cambridge (pop. 2,160) (US Census Bureau 2010). The majority of the watershed is agricultural; primarily row crops (IDNR 2000a, IDA 2000). Streams in this region have been drastically impacted by anthropogenic changes in the form of channelization, tiling, dredging, and flow alteration. The Green River originally flowed through two swamps, Inlet Swamp in Lee County and Winnebago Swamp in Lee, Whiteside, and Bureau counties (Page et al. 1992). A drainage district was formed in 1887, and since that time nearly all of the streams in this basin have been channelized and dredged resulting in a network of straightened channels surrounded by agricultural levees (Schanzle & Kruse 1994).

Substrates, like the topography of these basins, are highly variable. The Pecatonica basin contains predominately silt and sand interspersed with lesser amounts of cobble and gravel. The substrates in the Kishwaukee vary from gravel in the upper reaches changing to sand and silt as it proceeds downstream. This region as a whole contains a homogenous mixture of sand, gravel and cobble. Excessive sand deposits from years of dredging are located in many reaches in the Green basin with substrates in this region predominately sand and silt. The majority of sites had wadeable water depths; however, sampling sites on the lower portions of the Pecatonica and Green Rivers were limited due to non-wadeable water depths most years (e.g., depth>1m).

Methods

During the 2009-2012 survey, freshwater mussel data were collected at 82 sites; these include 29 Pecatonica, 33 Kishwaukee, and 20 Green basin sites (Figure 1; Table 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. At two sites, mussel data were collected on more than one occasion to fulfill sampling objectives for other analyses (Table 1).

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 one-hour survey was completed at two sites due to water levels and siltation (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 were 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 lilliput (*Toxolasma 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 4) and following criteria outlined in Table 5 (Szafoni 2001).

Results

Species Richness

A total of 29 species of freshwater mussels were observed in the Rock River tributaries, 28 of which were live (Table 2). Across all sites the number of live and extant (live + dead) species collected at a site ranged from 0 to 17, and the total number of species collected (live + dead + relict) ranged from 0 to 18. The number of live species collected at a site ranged from 0 to 13 in the Pecatonica and Kishwaukee basins and from 0 to 11 in the Green basin. Species richness at individual sites ranged from 0 to 17 extant species and 0 to 18 total species in the Pecatonica basin, 0 to 14 extant species and 0 to 16 total species in the Kishwaukee basin, and 0 to 12 extant species and 0 to 15 total species in the Green basin.

The plain pocketbook (*Lampsilis cardium*) was the most widespread species in the Rock River tributaries, collected at 40 of 82 total sites (49%, Table 3). The Wabash pigtoe (*Fusconaia flava*)

and pimpleback (*Quadrula pustulosa*) were encountered at 41% and 34% of Pecatonica sites, respectively (Figure 2a). In the Kishwaukee, fatmucket (*Lampsilis siliquoidea*) was encountered at 70% of the sites with plain pocketbook occurring at 64% of sites (Figure 2b). The plain pocketbook and white heelsplitter (*Lasmigona complanata*) were the most widespread species in the Green basin, found at 55% and 40% of sites, respectively (Figure 2c).

Abundance and Recruitment

A total of 4079 individuals were collected across 82 sites. The number of live individuals collected at a site ranged from 1 to 440, with an average of nearly 50 mussels per site (Table 2a-e). Live individuals collected ranged from 1 to 155 at Pecatonica sites, 1 to 440 at Kishwaukee sites, and 1 to 106 at Green sites. A total of 325 collector-hours were spent sampling with an average of over 12 mussels collected per hour. The most commonly collected species across all sites was the plain pocketbook, which comprised nearly 19% of all individuals collected (n=769). It was the most commonly collected species in the Kishwaukee (n=533 ~20%; Table 2c, d) and the Green (n=210 ~36%; Table 2e) basins. In the Pecatonica basin, pimpleback (n=214), Wabash pigtoe (n=76) and mucket (*Actinonaias ligamentina*; n=76) were the most commonly collected species (Table 2a, b). Extant mussel populations were found at nearly 90% of the sites sampled (73 of 82; Table 2a-e).

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 very high across the basin. Recruitment levels, referred to in Table 4 as Reproduction Factor, varied from 1 to 5, with 8 sites exhibiting high to very high recruitment. We observed recruitment in over 50% of species collected at one site in each of the basins; Lena Creek (site 10, Pecatonica; Figure 3a), North Branch Kishwaukee River (site 31, Kishwaukee; Figure 3b) and the Green River (site 28, Green; Figure 3c). Five sites across all basins exhibited high recruitment (>30-50%) including Sugar River (site 25), Kishwaukee River (sites 34 and 42), Fairfield Ditch #1 (Site 72) and Green River (site 80; Figures 3a-c). Twenty-one other sites exhibited moderate recruitment, while no observed recruitment was recorded at 47 sites during this survey (Figures 3a-c).

Mussel Community Classification

Based on data collected in the 2009-2012 basin surveys, nearly 60% of the sites in the Rock River tributaries are classified as Moderate, Highly Valued, or Unique mussel resources under

the current MCI classification system (Table 5, Figure 2a-c). Eight sites were classified as Unique resources due to the presence of intolerant species, number of mussels collected, species richness of the site and high recruitment. These Unique resource sites included three Yellow River sites (13, 16, 19; Pecatonica), two Kishwaukee River sites (37 and 42), two South Branch Kishwaukee River sites (52 and 56), and Kilbuck Creek (site 60). Nineteen sites were classified as Highly Valued (6 Pecatonica, 11 Kishwaukee and 2 Green sites) and 21 sites were ranked as Moderate mussel resources. The 24 remaining sites were considered Limited or Restricted mussel resources, including five sites where no mussels (live or shell) were found.

Noteworthy Finds

This survey collected 28 live species and 29 total species; historically, 33 species were known from the Rock River tributaries (Cummings and Mayer 1997, Tiemann et al. 2007). Five historical species not collected during this survey included the rock pocketbook (*Arcidens confragosus*), purple wartyback (*Cyclonaias tuberculata*), scaleshell (*Leptodea leptodon*), pondmussel (*Ligumia subrostrata*), and rainbow (*Villosa iris*). All but one of these species, pondmussel, are federally or state listed, or species of greatest need of conservation (SGNC; IDNR 2005) in Illinois. Additionally, the scaleshell is considered extirpated in Illinois.

Six species that are state listed or SGNC in Illinois found alive during this survey include the slippershell mussel (*Alasmodonta viridis*; n=8), creek heelsplitter (*Lasmigona compressa*, n=27), fluted shell (*Lasmigona costata*, n=60), spike (*Elliptio dilatata*, n=10), black sandshell (*Ligumia recta*, n=33), and ellipse (*Venustaconcha ellipsiformis*, n=102). These individuals, except for one creek heelsplitter, were collected in the Pecatonica and Kishwaukee basins. The first basin records for deertoe (*Truncilla truncata*, n=13) were collected from three sites in the Green basin (site 74, Coal Creek; sites 76 and 80, Green River).

Discussion

In contrast to the Rock River mainstem, only a few previous surveys and publications have been completed on the major tributaries to the Rock River (Schanzle and Kruse 1994, Helms 2002, Klocek and Barghusen 2010). Few sites sampled in our surveys had prior collection information in the Pecatonica and Kishwaukee basins. In the Pecatonica basin, a few historical records (1926) exist for the mainstem while more recent surveys (2000s) of Raccoon and Yellow Creeks, and Sugar River have occurred (INHS Mollusk Database). Helms (2002) and Klocek and Barghusen (2010) sampled portions of the South Branch Kishwaukee River (6 sites; 6 species) and Kishwaukee basins (18 sites; 21 species), respectively. Species composition in the Kishwaukee basin was nearly the same between past and recent surveys, with an additional three species, pink heelsplitter (*Potamilus alatus*), pink papershell (*Potamilus ohioensis*), and fawnsfoot (*Truncilla donaciformis*), being recorded during our survey. Klocek and Barghusen

reported the collection of deertoe (dead shell); no historical records exist for this species in the Kishwaukee basin. However, this species was collected alive during our survey in the Green River basin.

Schanzle and Kruse (1994) sampled 29 sites reporting 13 live mussel species, 19 total species, and 163 total mussels during 116 collector-hours with an average of less than 2 mussels collected per hour in the Green River basin. We sampled 20 sites reporting 19 live species, 21 total species, and 586 live mussels during 82 collector-hours with an average of over 7 mussels per hour. All sites surveyed by Schanzle and Kruse were sampled at the exact location or close proximity during our surveys. Additional live species recorded during this survey included Wabash pigtoe, fatmucket, fragile papershell (*Leptodea fragilis*), pink heelsplitter, fawnsfoot and deertoe. Schanzle and Kruse reported a relict shell of spike and yellow sandshell (*Lampsilis teres*), neither species were collected during our surveys.

Based on these recent surveys, we identified five species that may be extirpated in the Rock River tributaries. Live or dead occurrences were not recorded for rock pocketbook, purple wartyback, scaleshell, pondmussel or rainbow. Nearly all records for these species are shell records found pre-1918. The only exception is rainbow, which was collected as relict shell in 1996 and 2012 on the Kishwaukee River. The rainbow is historically known from the northeastern section of Illinois with the Kishwaukee basin being its most westerly range. Rock pocketbook and purple wartyback occur statewide but are uncommon or rare throughout their range (Cummings and Mayer 1992). Scaleshell is presumed extirpated from the entire state (Cummings and Mayer 1992). The range for the pondmussel is generally central and southern Illinois. We believe that a population was never established for the pondmussel, and only one record exists, pre-1930, with imprecise locality and collection information, making this a possible spurious record (INHS Mollusk Collection). All of these species, with the exception of pondmussel, are SGNC or state or federally listed and presumed extirpated from the basin (Appendix 1).

Recruitment

The Kishwaukee basin displayed moderate to very high recruitment at nearly 50% of sites sampled. However, 70% to 80% of sites sampled in the Pecatonica (20 of 29) and Green (16 of 20) basins displayed no recent recruitment. Our findings suggest that many of the mussel communities of the Kishwaukee basin, along with Yellow Creek, Pecatonica River and Green River, are viable and self-maintaining at this time. Sampling methods to target juvenile mussels would be necessary to better assess the reproductive status of these populations.

Mussel community of the Rock River Tributaries

While the three basins discussed in this paper are all tributaries to the Rock River, they are characterized by different topography, stream habitats, and mussel communities. The Pecatonica basin in Illinois is heavily influenced by land use and physical geography of Wisconsin, as both the Pecatonica and Sugar Rivers originate in that state before curving south and east into northern Illinois. Mussels collected in the Yellow, Pecatonica, and Sugar Rivers accounted for over 90% of the individuals collected in the basin. Many locations on these three rivers are considered full support for aquatic resources (IEPA 2012) and two streams, Sugar and Raccoon Creek, are recognized as Biologically Significant due to high levels of fish diversity, (IDNR 2000). The other tributaries in this basin held few live mussels (most less than 7 individuals), and few species (most 1 to 2).

In the Kishwaukee, three streams are recognized as Biologically Significant because they support a high level of mussel and fish diversity. These segments include the Kishwaukee River in Boone, McHenry, and Winnebago counties, the entire segment of Rush Creek in McHenry County, and Piskasaw Creek upstream from West Branch in McHenry County (IDNR 2000). These streams were also classified as “Unique Aquatic Resources” in the biological assessment of stream quality (Bertrand et al. 1993) and are considered full support for aquatic resources (IEPA 2012). According to the current MCI classification system, Unique, or Highly Valued mussel communities exist in several streams including Rush, Beaver, and Kilbuck Creek, North, South, and East South Branch Kishwaukee River, and Kishwaukee River.

The Green basin has been heavily altered by channelization and dredging. Approximately half of the sites sampled in this region have been designated non-support for aquatic life by the IEPA (2012). Seventy percent of the sites were considered Limited or Restricted mussel resources according to the current MCI classification system. However, there appears to be slight recovery in the mussel communities especially in the lower portions of the Green River, Coal Creek, and Mud Creek. These sites exhibited the highest mussel diversity in the basin with up to 15 total species found. It is interesting to note that most of these sites could not be sampled effectively until the drought of 2012, due to high water levels. Three of the four highest recruitment levels were also documented during the 2012 surveys.

Summary

Although there is limited historical information from the Rock River tributaries it appears that the system is stable as 28 of the 29 total species were collected alive and only five known species (most recorded prior to 1918 as relict shell) were not collected. The most abundant and diverse mussel communities persist in the Kishwaukee basin; nearly 2700 mussels of 23 species

were collected in this region. Twenty-three species were also collected in the Peconica basin with Unique and Highly Valued mussel communities persisting in Yellow Creek, Sugar River and Peconica River. The Green basin held the least diverse mussel communities, however it appears that these communities are recovering after years of dredging and channelization as 19 live species were collected compared with 13 collected in 1991-92. Other threats to water quality in all of these basins include nutrients and organic enrichment (e.g., low dissolved oxygen) attributed to agriculture and municipal point source pollution and habitat alterations attributed to hydrologic and habitat modifications (IEPA 1996). Additional impairments from these threats include sedimentation/siltation, total suspended solids, mercury, polychlorinated biphenyls, fecal coliform, and total phosphorus (IEPA 2012). Even with these threats to water quality, stable freshwater mussel communities, as well as moderate to very high recruitment levels, were detected at many of sites within Rock River tributaries indicating viable, self-maintaining populations that should be protected from further disturbance.

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Table1a. 2009-2012 Rock River tributaries (Pecatonica basin). Types of samples include MU-mussel sampling, F-fish community sampling, FF-fish flesh contaminate, CM-continuous monitoring, H-habitat, M-macroinvertebrate, P-pesticide, S- sediment, W-water chemistry, and D-discharge.

Site Number	IEPA Code	Stream	Types of Samples	County	Location	Watershed area
1	PW-07	Pecatonica River	MU, F, H, M, W	Stephenson	E edge Winslow	2663.70
2	PW-12	Pecatonica River	MU	Stephenson	Bobstown Landing; McConnell Road bridge	2870.66
3	PWQ-04	Waddams Creek	MU, F, D, H, M, W	Stephenson	3 mi NE Lena; Unity Road bridge	47.14
4	PW-19	Pecatonica River	MU,	Stephenson	4.0 mi W Cedarville; Damascus Landing	3015.45
5	PWPC-01	East Branch Richland Creek	MU	Stephenson	2.8 mi NE Orangeville; Henderson Road bridge	20.30
6	PWP-06	Richland Creek	MU	Stephenson	2.5 Mi N Orangeville; West Street Line Road bridge	108.65
7	PWP-05	Richland Creek	MU, F, FF, D, H, M,	Stephenson	At Orangeville; Orangeville Road bridge	151.52
8	PWPA-01	Cedar Creek	MU, F, D, H, M, S, W	Stephenson	0.3 mi N Cedarville; Rt 26 bridge	71.91
9	PW-04	Pecatonica River	MU	Stephenson	At Freeport; Rt 26 bridge	3419.22
10	PWNE-L-C7	Lena Creek	MU	Stephenson	3 mi SW of Lena, US Baumgartner tributary	24.82
11	PWN-06	Yellow Creek	MU, F, D, H, M, S, W	Stephenson	4.8 Mi SSW Lena; West Raders Road bridge	116.79
12	PWNC-PC-D1	Spring Creek	MU	Stephenson	2 mi SE of Pearl City; Schuman Road bridge	11.69
13	PWN-09	Yellow Creek	MU	Stephenson	6.0 mi SW Freeport; Bolton Road bridge	346.25
14	PWN-03	Yellow Creek	MU, F, D, H, M, W	Stephenson	0.5 mi SW Freeport; Fairgrounds Road bridge	409.17
15	PWN-05	Yellow Creek	MU, F, D, H, M, S,W	Stephenson	SW Edge Of Freeport; Krape Park	419.17
16	PWN-10	Yellow Creek	MU	Stephenson	At Freeport; Rt 26 bridge	431.35
17	PWNA-04	Crane Grove Creek	MU, F, D, H, M, W	Stephenson	4.2 mi S Freeport; Crane Grove Road bridge	27.63
18	PWN-01	Yellow Creek	MU	Stephenson	SE edge Freeport; Rt 20 bridge	491.18
19	PWI-01	Rock Run	MU, F, D, H, M, W	Stephenson	1.3 mi W Davis; Rt 75 bridge	59.29
20	PWIA-01	Pink Creek	MU, F, W	Winnebago	3 mi NW Pecatonica	29.90
21	PWH-01	Sumner Creek	MU, F, D, H, M, W	Stephenson	3 mi SW Pecatonica; Bolen Road bridge	48.80
22	PW-02	Pecatonica River	MU, F, FF, M, W	Winnebago	N edge Pecatonica; County Road bridge	4395.75
23	PWF-01	Coolidge Creek	MU	Winnebago	4 mi NE Pecatonica; Telegraph Road bridge	44.23
24	PW-01	Pecatonica River	MU, F, M, W	Winnebago	At Harrison; Rt 75 bridge	4598.39
25	PWB-03	Sugar River	MU, F, FF, D, H, M,	Winnebago	3.2 mi NW Shirland	1804.06
26	PWBA-01	North Branch Otter Creek	MU	Winnebago	3.7 mi NNE Davis	24.66
27	PWBA-02	Otter Creek	MU, F, D, H, M, W, S	Winnebago	2.5 mi NE Durand; Wheeler Road Bridge	108.02
28	PWA-01	Raccoon Creek	MU, F, D, H, M, W	Winnebago	3.6 mi NE Shirland	134.18
29	PWA-02	Raccoon Creek	MU, F, D, H, M, W	Winnebago	Rockton Road; Nygren Wetland Preserve	149.63

Table 1b. 2009-2012 Rock River tributaries (Kishwaukee basin). Types of samples include MU-mussel sampling, F-fish community sampling, FF-fish flesh contaminate, CM-continuous monitoring, H-habitat, M-macroinvertebrate, P-pesticide, S- sediment, W-water chemistry, and D-discharge.

Site Number	IEPA Code	Stream	Types of Samples	County	Location	Watershed area
30	PQ-13	Kishwaukee River	MU, F, D, H, M, W	McHenry	5.0 mi E Marengo; McCue Road bridge	69.62
31	PQJ-01	North Branch Kishwaukee River	MU, F, D, H, M, W	McHenry	Kishwaukee Valley Road; McCann Berry Farm	93.87
32	PQJ-99	North Branch Kishwaukee River	MU	Mchenry	2.2 mi NE Marengo; Garden Valley Road bridge	102.90
33	PQI-10	(East) South Branch Kishwaukee	MU, F, D, H, M, W	McHenry	2 mi SE Union; Seeman Road bridge	144.45
34	PQ-20	Kishwaukee River	MU	McHenry	1.0 mi NE Marengo; Deerpass Road bridge	429.56
35	PQ-07	Kishwaukee River	MU, F, H, M, W	McHenry	N of Marengo; Rt. 23 bridge	434.14
36	PQH-01	Rush Creek	MU, F, D, H, M, W	McHenry	4.0 mi NW Marengo; River Road bridge	79.95
37	PQ-10	Kishwaukee River	MU	Boone	0.5 mi N of Garden Prairie; Garden Prairie Road bridge	569.70
38	PQF-09	Coon Creek	MU, F, D, H, M, W	McHenry	4.5 mi WSW Marengo; Grange Road bridge	245.91
39	PQF-06	Coon Creek	MU	Boone	3.0 mi E Belvidere; Business Rt 20 bridge	395.08
40	PQE-06	Piscasaw Creek	MU, F, D, H, M, W	McHenry	2.5 mi SW Harvard; Beck's Woods Conservation Area	168.31
41	PQEA-01	Moakler Creek	MU	Mchenry	1 mi S Chemung; Island Road bridge	23.77
42	PQ-14	Kishwaukee River	MU, F, H, M, W	Boone	Belvidere City Park; below dam	1378.21
43	PQ-09	Kishwaukee River	MU, F, H, M, W	Boone	4 mi W Belvidere; Distillery Road bridge	1611.02
44	PQD-05	Beaver Creek	MU	Boone	1.0 mi E Poplar Grove; Beaverton Road bridge	101.62
45	PQDA-01	Mosquito Creek	MU	Boone	5.3 mi NW Belvidere; Olson Road bridge	11.36
46	PQD-07	Beaver Creek	MU	Boone	3.0 mi W Belvidere; Rt. 20 bridge	173.34
47	PQC-13	South Branch Kishwaukee River	MU, F, H, M, W	DeKalb	4.5 mi SW DeKalb; Keslinger Road bridge	151.85
48	PQC-02	South Branch Kishwaukee River	MU, F, D, H, M, W	DeKalb	2.0 mi WSW Sycamore; Rt. 64 bridge	237.38
49	PQCLA-01	Union Ditch # 3	MU, F, D, H, M, W	Kane	6.0 mi SE of Sycamore; County Line Road bridge	226.36
50	PQCL-01	(East) South Branch Kishwaukee	MU	Dekalb	5 mi E Dekalb; Hartman bridge	231.22
51	PQCL-03	(East) South Branch Kishwaukee	MU, F, D, H, M, W	DeKalb	1 mi SE Sycamore; Airport Road bridge	242.29
52	PQC-09	South Branch Kishwaukee River	MU	Dekalb	1 mi W Kingston; Glidden bridge	736.95
53	PQCB-01	Owens Creek	MU	Dekalb	2 mi SW Kirkland; Base Ln Road bridge	100.01
54	PQC-11	South Branch Kishwaukee River	MU, F, D, H, M, W	DeKalb	5.0 mi SE Rockford; McNeal Road bridge	1032.40
55	PQCK-01	Mayberry/Rossetter Farm Creek	MU	Winnebago	3 mi S Cherry Valley on River Road	24.92
56	PQC-14	South Branch Kishwaukee River	MU	Winnebago	Deer Run Forest Preserve	1091.36
57	PQ-12	Kishwaukee River	MU, F, D, H, M, W	Winnebago	2 mi SE Perryville; Blackhawk Road bridge	2819.48
58	PQ-19	Kishwaukee River	MU	Winnebago	Rotary Forest Preserve	2850.35
59	PQB-06	Kilbuck Creek	MU, F, D, H, M, W	Ogle	2.5 mi SE Lindenwood; Mowers Road bridge	134.79
60	PQB-04	Kilbuck Creek	MU	Ogle	2 mi E Davis Junction; Rt 72 bridge	300.07
61	PQB-02	Kilbuck Creek	MU	Winnebago	4 mi S Rockford near New Milford; Rt 251 bridge	360.54
62	PQB-03	Kilbuck Creek	MU, F, D, H, M, W	Winnebago	Baxter Road; Killbuck Bluffs Forest Preserve	360.54

Table 1c. 2009-2012 Rock River tributaries (Green basin). Types of samples include MU-mussel sampling, F-fish community sampling, FF-fish flesh contaminate, CM-continuous monitoring, H-habitat, M-macroinvertebrate, P-pesticide, S- sediment, W-water chemistry, and D-discharge. Sites sampled on more than one occasion are noted with an asterisk (*).

Site Number	IEPA Code	Stream	Types of Samples	County	Location	Watershed area
63	PBU-10	Willow Creek	MU, F, D, H, M	Lee	5 mi NNW West Brooklyn; 2400E bridge	113.34
64	PB-10	Green River	MU, F, D, H, M	Lee	SE edge of Amboy; Rt 52 bridge	464.42
65	PB-19	Green River	MU	Lee	2.5 mi S Walton; Walton Road bridge	591.19
66*	PB-06	Green River	MU, F, D, H, M	Lee	NE of Walnut; Harmon Road bridge	682.37
67	PB-02	Green River	MU	Whiteside	1 mi S Deer Grove; downstream Rt. 88 bridge	821.45
68	PBS-01	Winnebago Ditch	MU, F, D, H, M	Whiteside	1.5 mi N Deer Grove	149.77
69	PBP-01	Walnut Special Ditch	MU, F, D, H, M	Bureau	2 mi NE New Bedford	97.85
70	PBO-10	Fairfield Union Special Ditch	MU, F, D, H, M	Bureau	5.5 mi ESE Hoopole; 2400N bridge	19.50
71	PB-08	Green River	MU, F, D, H, M	Bureau	6 mi WSW New Bedford	1249.19
72	PBM-11	Fairfield Ditch #1	MU, F, D, H, M	Bureau	3 mi ESE of Hoopole, County Line; 2500 N bridge	30.97
73	PBJA-05	Coal Creek	MU, D, H, M	Bureau	1 mi S Sheffield	73.51
74	PBJA-03	Coal Creek	MU, F, D, H, M	Henry	2 mi NNW Annawan	372.40
75	PBJ-04	Mud Creek-East	MU	Henry	3.5 mi NE Atkinson	621.91
76	PB-28	Green River	MU	Henry	4.5 mi NNW Atkinson	2192.76
77	PBI-02	Spring Creek	MU, D, H, M	Henry	2.5 mi WNW Atkinson	174.87
78	PBG-12	Big Slough Drainage Ditch	MU	Henry	7 mi SSW Spring Hill	50.33
79	PBG-10	Big Slough Ditch	MU, D, H, M	Henry	3 mi NNE Geneseo; 1550E bridge	68.35
80*	PB-04	Green River	MU, F,S	Henry	2.5 mi N Geneseo; Rt. 82 bridge	2525.37
81	PBE-01	Geneseo Creek	MU	Henry	W edge Geneseo; Rt 6 bridge	64.93
82	PBD-02	Mineral Creek	MU, D, H, M	Henry	2 mi SE Village of Green River; Rt. 6 bridge	58.70

Table 2. Mussel data for sites sampled during 2009-2012 surveys (Tables 1a, b) in the Pecatonica tributaries (a), Pecatonica River, Yellow and Sugar Creeks (b), Upper Kishwaukee (c), Lower Kishwaukee (d), Green River (e), and summary of all basins (f). 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). Sites with more than one sample denoted by A, B. Sites with one hour sample denoted by *.

a. Pecatonica tributaries

Species	Site Number													Proportion of total
	3	5	7	8	10	12	17	19	21	23	27	28	29	
Subfamily Anodontinae														
<i>Alasmidonta viridis</i>							2							3.08%
<i>Anodontoides ferussacianus</i>		D	1	9	7	7	2	1		1		R		43.08%
<i>Lasmigona complanata</i>			D		D								R	0.00%
<i>Lasmigona compressa</i>				1								1		3.08%
<i>Pyganodon grandis</i>	1		1		R		R			13	D	R	R	23.08%
<i>Strophitus undulatus</i>					D								R	0.00%
Subfamily Ambleminae														
<i>Amblema plicata</i>											D		R	0.00%
<i>Elliptio dilatata</i>	R											R		0.00%
<i>Fusconaia flava</i>									R			1	4	7.69%
<i>Quadrula pustulosa</i>													6	9.23%
Subfamily Lampsilinae														
<i>Lampsilis cardium</i>												1	1	3.08%
<i>Lampsilis siliquoidea</i>												3	1	6.15%
<i>Toxolasma parvum</i>													R	0.00%
<i>Venustaconcha ellipsiformis</i>			1					R						1.54%
Individuals	1	0	3	10	7	7	4	1	0	14	0	6	12	65
Live Species	1	0	3	2	1	1	2	1	0	2	0	4	4	8
Extant Species	1	1	4	2	3	1	2	1	0	2	2	4	4	11
Total Species	2	1	4	2	4	1	3	2	1	2	2	7	9	12
Historical Species	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA	NDA
Catch per unit effort (CPUE)	0.26	0.00	0.77	2.56	1.74	3.33	1.03	0.26	0.00	3.50	0.00	1.54	3.08	
Mussel Community Index (MCI)	4	0	7	6	10	6	8	4	0	6	0	7	7	
Resource Classification	R	R	L	L	M	L	M	R	R	L	R	L	L	

b. Peconica River, Yellow and Sugar Creeks

Species	Site Number													Proportion of total
	1	2	4	9	11	13	14	15	16	18	22	24	25	
Subfamily Anodontinae														
<i>Alasmidonta marginata</i>						1	1	5	9	1				2.30%
<i>Anodontoides ferussacianus</i>					4	4	R	1		D				1.22%
<i>Lasmigona complanata</i>	6	1	1	D	1	D	R	R	2	1	5	4		2.85%
<i>Lasmigona compressa</i>						1	1							0.27%
<i>Lasmigona costata</i>								1	20	1				2.98%
<i>Pyganodon grandis</i>			1	2	3	D	D	D		D		3		1.22%
<i>Strophitus undulatus</i>					3	22	2	7	D	8			1	5.83%
<i>Utterbackia imbecillis</i>			2	5								2		1.22%
Subfamily Amblemini														
<i>Amblema plicata</i>	1	R		R		2	1	1	19	1	D	1		3.52%
<i>Cyclonaias tuberculata</i>														0.00%
<i>Elliptio dilatata</i>	R	R	R			2	R	R	3	2				0.95%
<i>Fusconaia flava</i>	17	R	3	7	3	3	D	2	2	4	12	15	3	9.62%
<i>Pleurobema sintoxia</i>	1		1			11	4	2	13	3				4.74%
<i>Quadrula pustulosa</i>	37	4	10	15		R	R	12	11	19	27	18	55	28.18%
<i>Tritogonia verrucosa</i>	30	4	13	D							R		3	6.78%
Subfamily Lampsilinae														
<i>Actinonaias ligamentina</i>	3					R		4	66	2	1			10.30%
<i>Lampsilis cardium</i>	3	1				R	R	2	6	7		1	4	3.25%
<i>Lampsilis siliquoidea</i>	9	4	4	2			R			1		D		2.71%
<i>Lampsilis teres</i>										R				0.00%
<i>Leptodea fragilis</i>	10	1	2	5						3	10	9	18	7.86%
<i>Ligumia recta</i>	1		1						1	D	1	1		0.68%
<i>Toxolasma parvum</i>								D					R	0.00%
<i>Truncilla donaciformis</i>	2		1								1	1		0.68%
<i>Venustaconcha ellipsiformis</i>				R		11	3	4	3	D				2.85%
Individuals	120	15	39	36	14	57	12	41	155	53	57	55	84	738
Live Species	12	6	11	6	5	9	6	11	12	13	7	10	6	21
Extant Species	12	6	11	8	5	11	8	13	13	17	8	11	6	22
Total Species	13	9	12	10	5	14	14	15	13	18	9	11	7	23
Historical Species	NDA	NDA	NDA	NDA	NDA	NDA	NDA	10	NDA	NDA	13	2	7	
Catch per unit effort (CPUE)	30.77	3.85	10.00	17.91	3.59	11.38	3.08	10.51	39.74	13.18	14.62	14.10	21.00	
Mussel Community Index (MCI)	15	7	13	9	7	16	10	14	17	16	13	14	12	
Resource Classification	HV	L	HV	M	L	U	M	HV	U	U	HV	HV	HV	

c. Upper Kishwaukee

Species	Site Number															Proportion of total
	30	31	32	33	34	35	36	37	38	39	40	42	43	44	46	
Subfamily Anodontinae																
<i>Alasmidonta marginata</i>		R	1	4	R			21			R		3		D	2.21%
<i>Alasmidonta viridis</i>	2	R	R				3				1	R		R		0.46%
<i>Anodontoides ferussacianus</i>	1	4	29	4	D		12	6			R			D		4.26%
<i>Lasmigona complanata</i>	99	31	12	114	1	2		37	3	1	3	R	D	R	D	23.04%
<i>Lasmigona compressa</i>	1	D	2	D	D	R		7			1			R	D	0.84%
<i>Lasmigona costata</i>								R	3	D	1	2	2	D	D	0.61%
<i>Pyganodon grandis</i>	6	R		6				1		4		1		D	1	1.44%
<i>Strophitus undulatus</i>	1	19	1	82			6	22	1	1		1	1			10.27%
<i>Utterbackia imbecillis</i>			1		D			15								1.22%
Subfamily Ambleminae																
<i>Amblema plicata</i>						R		R	8	R		R		1		0.68%
<i>Elliptio dilatata</i>			R				R				R	R		R		0.00%
<i>Fusconaia flava</i>	9			6	2	R		4	2	3		R		1		2.05%
<i>Pleurobema sintoxia</i>								1								0.08%
<i>Quadrula pustulosa</i>												9	7			1.22%
Subfamily Lampsilinae																
<i>Actinonaias ligamentina</i>								3				1	10			1.06%
<i>Lampsilis cardium</i>				1		1		163	51	15		22	25		2	21.29%
<i>Lampsilis siliquoidea</i>		4	1	223	1	4	R	85	1	4		R		R	2	24.71%
<i>Leptodea fragilis</i>												6	1		2	0.68%
<i>Ligumia recta</i>													2			0.15%
<i>Potamilus alatus</i>												1				0.08%
<i>Toxolasma parvum</i>		R														0.00%
<i>Truncilla donaciformis</i>												1				0.08%
<i>Venustaconcha ellipsiformis</i>		13				R	13	20			R	1		D	D	3.57%
Individuals	119	71	47	440	4	7	34	385	69	28	6	45	51	2	7	1315
Live Species	7	5	7	8	3	3	4	13	7	6	4	10	8	2	4	21
Extant Species	7	6	7	9	6	3	4	13	7	7	4	10	9	6	9	21
Total Species	7	10	9	9	7	7	6	15	7	8	8	16	9	11	9	23
Historical Species	NDA	9	NDA	3	NDA	8	6	NDA	13	7	7	17	NDA	NDA	7	
Catch per unit effort (CPUE)	29.75	17.75	11.75	110.00	1.00	1.75	8.10	96.49	17.25	7.00	1.50	11.28	12.75	0.51	1.79	
Mussel Community Index (MCI)	13	14	11	13	10	6	13	16	11	10	11	17	13	9	14	
Resource Classification	HV	HV	M	HV	M	L	HV	U	M	M	M	U	HV	M	HV	

d. Lower Kishwaukee

Species	Site Number																Proportion of Total
	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	
Subfamily Anodontinae																	
<i>Alasmidonta marginata</i>		1		2	4	2		4		13	2	7	1	9	D		3.27%
<i>Alasmidonta viridis</i>					D												0.00%
<i>Anodontoides ferussacianus</i>	1		3	2			5		D				1	2	1		1.09%
<i>Lasmigona complanata</i>	3		D	D	1	19	11	R	1	5			40	40	R	D	8.73%
<i>Lasmigona compressa</i>			1	8	1		1										0.80%
<i>Lasmigona costata</i>				1	4	7				9	2	7					2.18%
<i>Pyganodon grandis</i>	3	2	1	11	25	2	11	D	D	1	D		1	2	2		4.44%
<i>Strophitus undulatus</i>		1	R	4	3	2		1		8		2	13	4		R	2.76%
<i>Utterbackia imbecillis</i>											D					D	0.00%
Subfamily Ambleminae																	
<i>Amblema plicata</i>			1	4	4	38				R			1	25	5		5.67%
<i>Elliptio dilatata</i>						R								3			0.22%
<i>Fusconaia flava</i>				4	5	7		1		7	1	3	5	20	D	R	3.85%
<i>Quadrula pustulosa</i>					3	7		D		16	3	2		1		R	2.33%
Subfamily Lampsilinae																	
<i>Actinonaias ligamentina</i>		3		1	3	256		6		68	13	54	3	7	D	D	30.11%
<i>Lampsilis cardium</i>		5		3	3	24	1	5		85	18	8	13	67	20	1	18.40%
<i>Lampsilis siliquoidea</i>	4	4	5	20	60	6	6	7		11	1	3	R	11	10	3	10.98%
<i>Leptodea fragilis</i>		1		1		2		R		2	D	3				D	0.65%
<i>Ligumia recta</i>										3	2	21					1.89%
<i>Potamilus ohioensis</i>										D							0.00%
<i>Toxolasma parvum</i>	3				R	R									D		0.22%
<i>Truncilla donaciformis</i>						D				D							0.00%
<i>Venustaconcha ellipsiformis</i>					R			R			R			25	8	R	2.40%
Individuals	14	17	11	61	116	372	35	24	1	228	42	110	78	216	46	4	1375
Live Species	5	7	5	12	12	12	6	6	1	12	8	10	9	13	6	2	18
Extant Species	5	7	6	13	13	13	6	8	3	14	11	10	9	13	11	5	22
Total Species	5	7	7	13	15	15	6	11	3	15	12	10	10	13	12	9	22
Historical Species	NDA	7	NDA	11	NDA	NDA	NDA	16	NDA	16	17	13	NDA	9	8	11	
Catch per unit effort (CPUE)	3.50	4.36	2.82	15.25	29.00	93.00	8.75	5.97	0.25	57.14	10.50	27.50	20.00	54.00	11.50	0.95	
Mussel Community Index (MCI)	9	10	7	12	14	16	9	9	4	17	14	14	11	17	12	5	
Resource Classification	M	M	L	HV	HV	U	M	M	R	U	HV	HV	M	U	HV	L	

e. Green River

Species	Site Number																				Proportion of Total		
	63	64	65	66A	66B	67	68	69	70	71	72	73	74	75	76	77	78*	79	80A*	80B		81	82
Subfamily Anodontinae																							
<i>Anodontoides ferussacianus</i>	R	R				R	1				D	R			D								0.17%
<i>Lasmigona complanata</i>		7	4	3	D		2	D		8	2		3		4			D		D			5.63%
<i>Lasmigona compressa</i>		D			1																		0.17%
<i>Pyganodon grandis</i>		11	1		3											2	5	8		D			5.12%
<i>Strophitus undulatus</i>						1	2				1	D	4	4		1		9					3.75%
<i>Utterbackia imbecillis</i>														51	5		D			17			12.46%
Subfamily Amblemini																							
<i>Amblema plicata</i>		R													R					R			0.00%
<i>Fusconaia flava</i>		R				2				14			10	16	2					6			8.53%
<i>Quadrula nodulata</i>													17	6	1					1			4.27%
<i>Quadrula pustulosa</i>													R		R					8			1.37%
<i>Quadrula quadrula</i>													11							2	D		2.22%
<i>Tritogonia verrucosa</i>													2		1					2			0.85%
Subfamily Lampsilinae																							
<i>Actinonaias ligamentina</i>					R																		0.00%
<i>Lampsilis cardium</i>		44	29	11	52	32				2			8	10	8			R	1	13			35.84%
<i>Lampsilis siliquoidea</i>		11	5	1	3	2	D								R					R			3.75%
<i>Lampsilis teres</i>																							0.00%
<i>Leptodea fragilis</i>			R		1	4				2			2	17	10					8			7.51%
<i>Potamilus alatus</i>						2								2	8					6			3.07%
<i>Potamilus ohioensis</i>										R					4								0.68%
<i>Toxolasma parvum</i>						1					12												2.22%
<i>Truncilla donaciformis</i>																1							0.17%
<i>Truncilla truncata</i>													2		3						8		2.22%
Individuals	0	73	39	15	60	44	5	0	0	26	15	0	59	106	47	3	5	17	1	71	0	0	586
Live Species	0	4	4	3	5	7	3	0	0	4	3	0	9	7	11	2	1	2	1	10	0	0	19
Extant Species	0	5	4	3	6	7	4	1	0	4	4	1	9	7	12	2	2	3	1	12	1	0	19
Total Species	1	8	5	3	7	8	4	1	0	5	4	2	10	7	15	2	2	4	1	14	1	0	21
Historical Species	1	6	6	2	2	1	1	3	1	6	NDA	2	9	1	1	3	4	4	1	1	0	1	
Catch per unit effort (CPUE)	0.00	18.25	9.75	3.76	15.00	11.00	1.25	0.00	0.00	6.52	3.76	0.00	14.79	26.50	11.75	0.75	5.00	4.26	0.25	17.75	0.00	0.00	
Mussel Community Index (MCI)	0	8	7	6	8	9	7	0	0	7	10	0	9	11	14	4	6	6	4	13	0	0	
Resource Classification	R	M	L	L	M	M	L	R	R	L	M	R	M	M	HV	R	L	L	R	HV	R	R	

Table 3. Summary of sites sampled during 2009-2012 (82 sites, 325 total hours). ***Arcidens confragosus*, *Cyclonaias tuberculata*, *Leptodea leptodon*, *Ligumia subrostrata*, and *Villosa iris* are included in historical total but not represented in the table.

Species	Total individuals	# of sites live	# of sites extant	# of sites relict	Proportion of total live
Subfamily Anodontinae					
<i>Alasmidonta marginata</i>	91	19	2	3	2.23%
<i>Alasmidonta viridis</i>	8	4	1	4	0.20%
<i>Anodontoides ferussacianus</i>	109	24	7	7	2.67%
<i>Lasmigona complanata</i>	477	34	13	7	11.69%
<i>Lasmigona compressa</i>	27	13	5	2	0.66%
<i>Lasmigona costata</i>	60	13	3	1	1.47%
<i>Pyganodon grandis</i>	134	30	10	5	3.29%
<i>Strophitus undulatus</i>	238	32	3	3	5.83%
<i>Utterbackia imbecillis</i>	98	8	4	0	2.40%
Subfamily Ambleminae					
<i>Amblema plicata</i>	113	16	2	11	2.77%
<i>Elliptio dilatata</i>	10	4	0	13	0.25%
<i>Fusconaia flava</i>	206	34	2	6	5.05%
<i>Pleurobema sintoxia</i>	36	8	0	0	0.88%
<i>Quadrula nodulata</i>	25	4	0	0	0.61%
<i>Quadrula pustulosa</i>	270	19	1	5	6.62%
<i>Quadrula quadrula</i>	13	2	1	0	0.32%
<i>Tritogonia verrucosa</i>	55	7	1	1	1.35%
Subfamily Lampsilinae					
<i>Actinonaias ligamentina</i>	504	18	2	2	12.36%
<i>Lampsilis cardium</i>	769	40	0	3	18.85%
<i>Lampsilis siliquoidea</i>	522	34	2	7	12.80%
<i>Lampsilis teres</i>	0	0	0	1	0.00%
<i>Leptodea fragilis</i>	120	23	2	2	2.94%
<i>Ligumia recta</i>	33	9	1	0	0.81%
<i>Potamilus alatus</i>	19	5	0	0	0.47%
<i>Potamilus ohioensis</i>	4	1	1	1	0.10%
<i>Toxolasma parvum</i>	16	3	2	5	0.39%
<i>Truncilla donaciformis</i>	7	6	2	0	0.17%
<i>Truncilla truncata</i>	13	3	0	0	0.32%
<i>Venustaconcha ellipsiformis</i>	102	11	3	8	2.50%
					Totals
					Individuals collected
					4079
					Live species collected
					28
					Extant species
					28
					Total species collected
					29
					Historical species
					33*

Table 4. Mussel Community Index (MCI) parameters and scores.

Extant species in sample	Species Richness	Catch per Unit Effort (CPUE)	Abundance (AB) Factor
0	1	0	0
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 5. 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 2a. Peconica basin

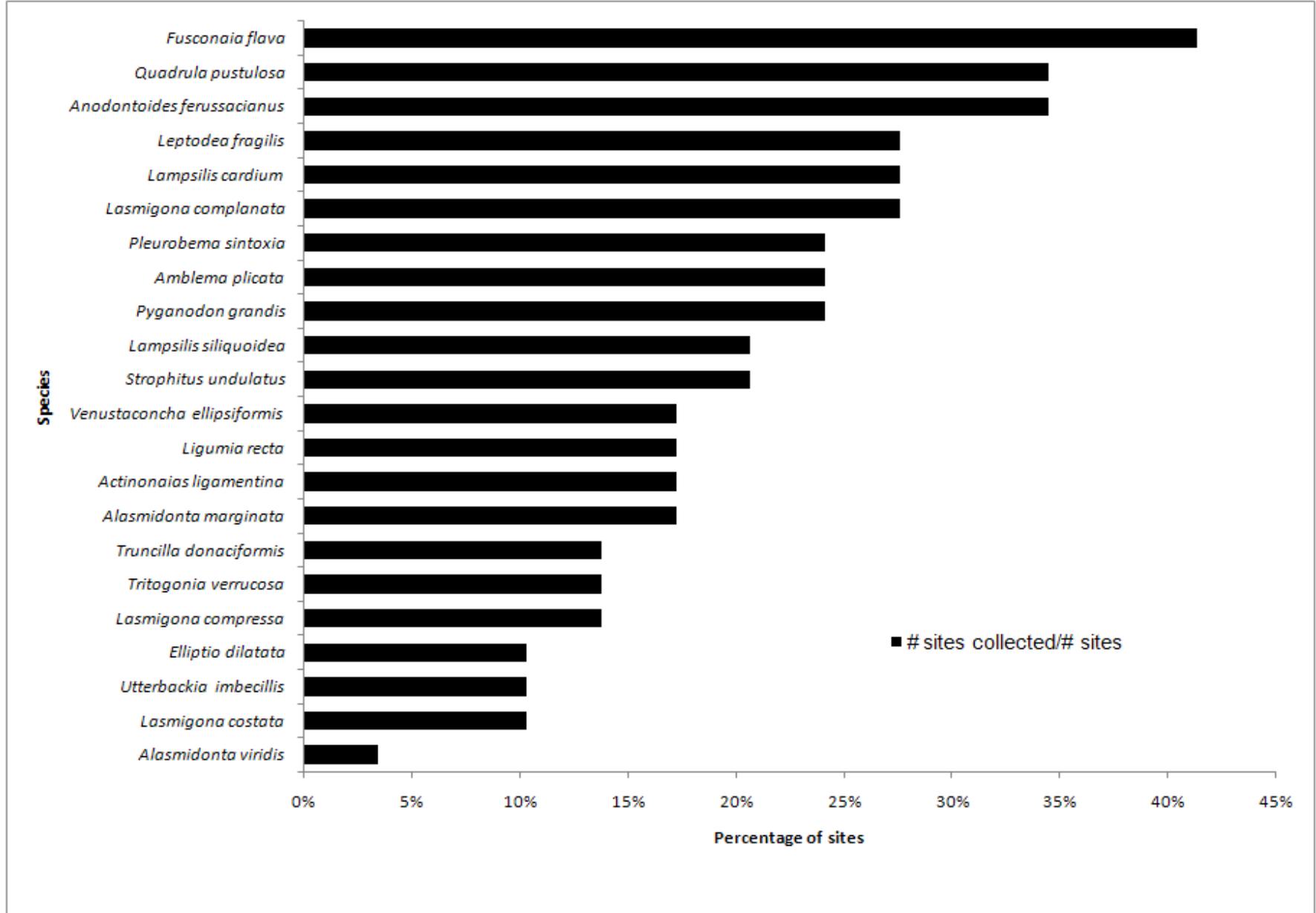


Figure 2b. Kishwaukee basin

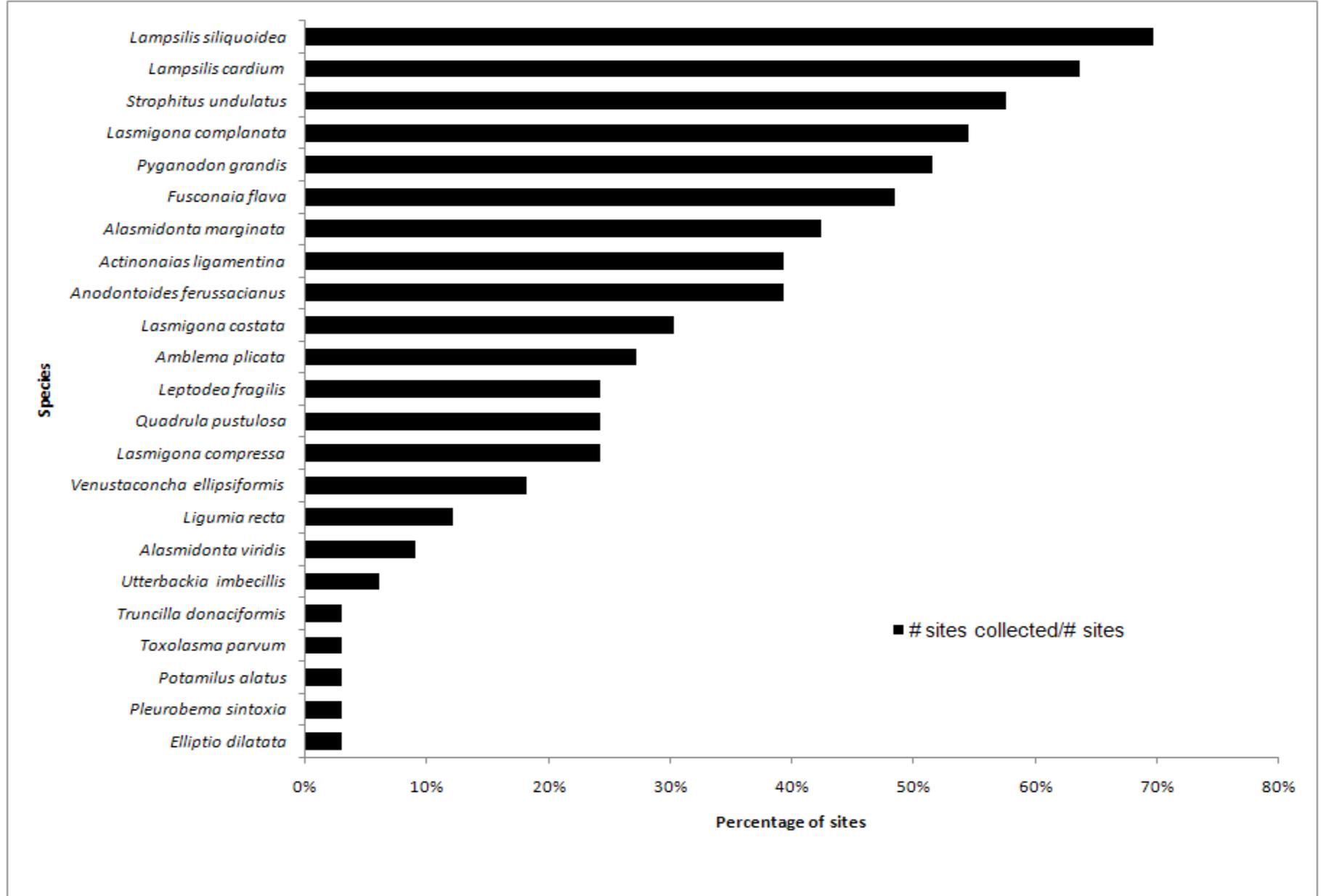


Figure 2c. Green basin

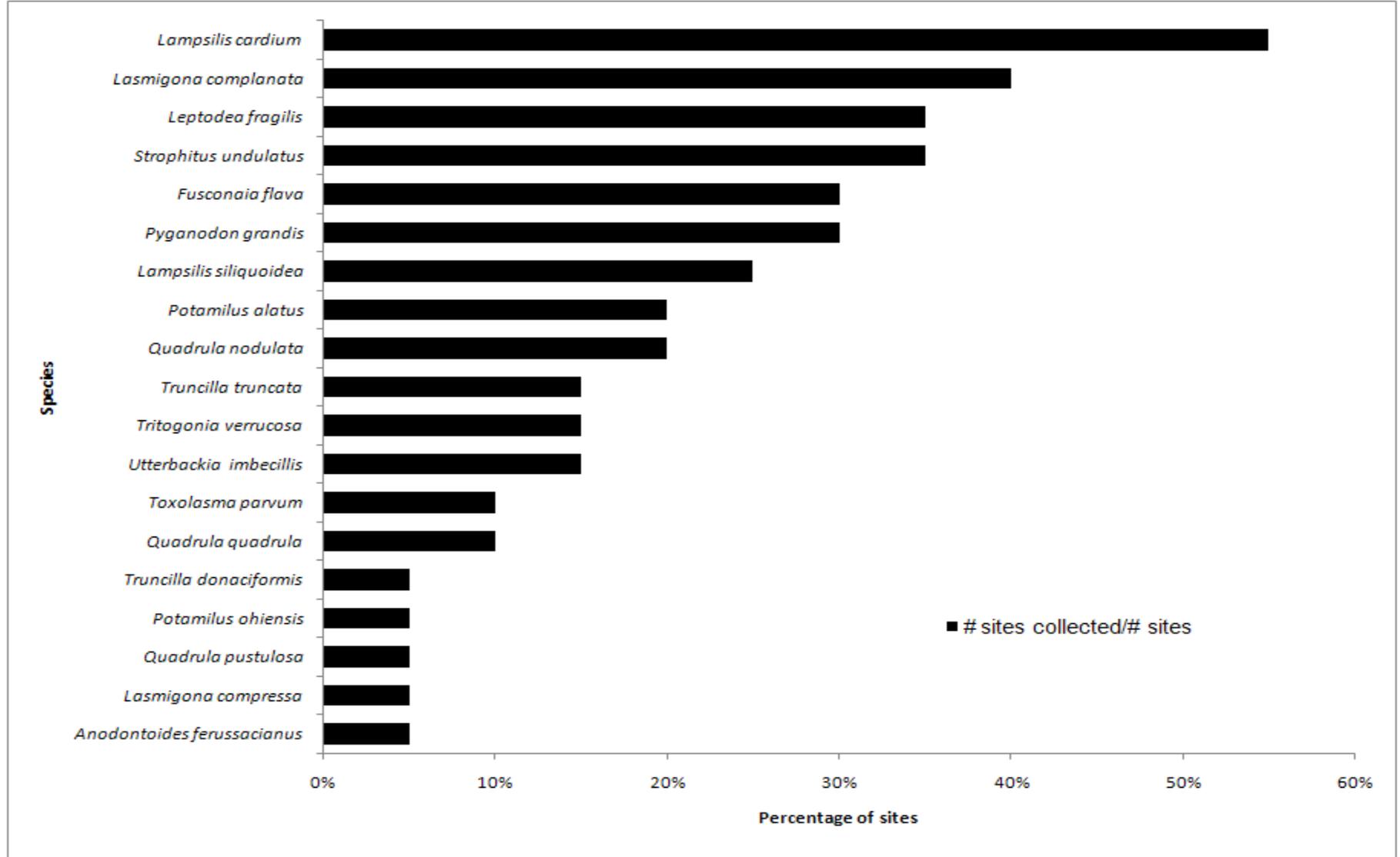


Figure 2. Number of sites where a species was collected live compared to the number of sites sampled in the Pecatonica (a. 29 sites), Kishwaukee (b. 33 sites), and Green River basins (c. 20 sites).

Figure 3a. Pecatonica basin

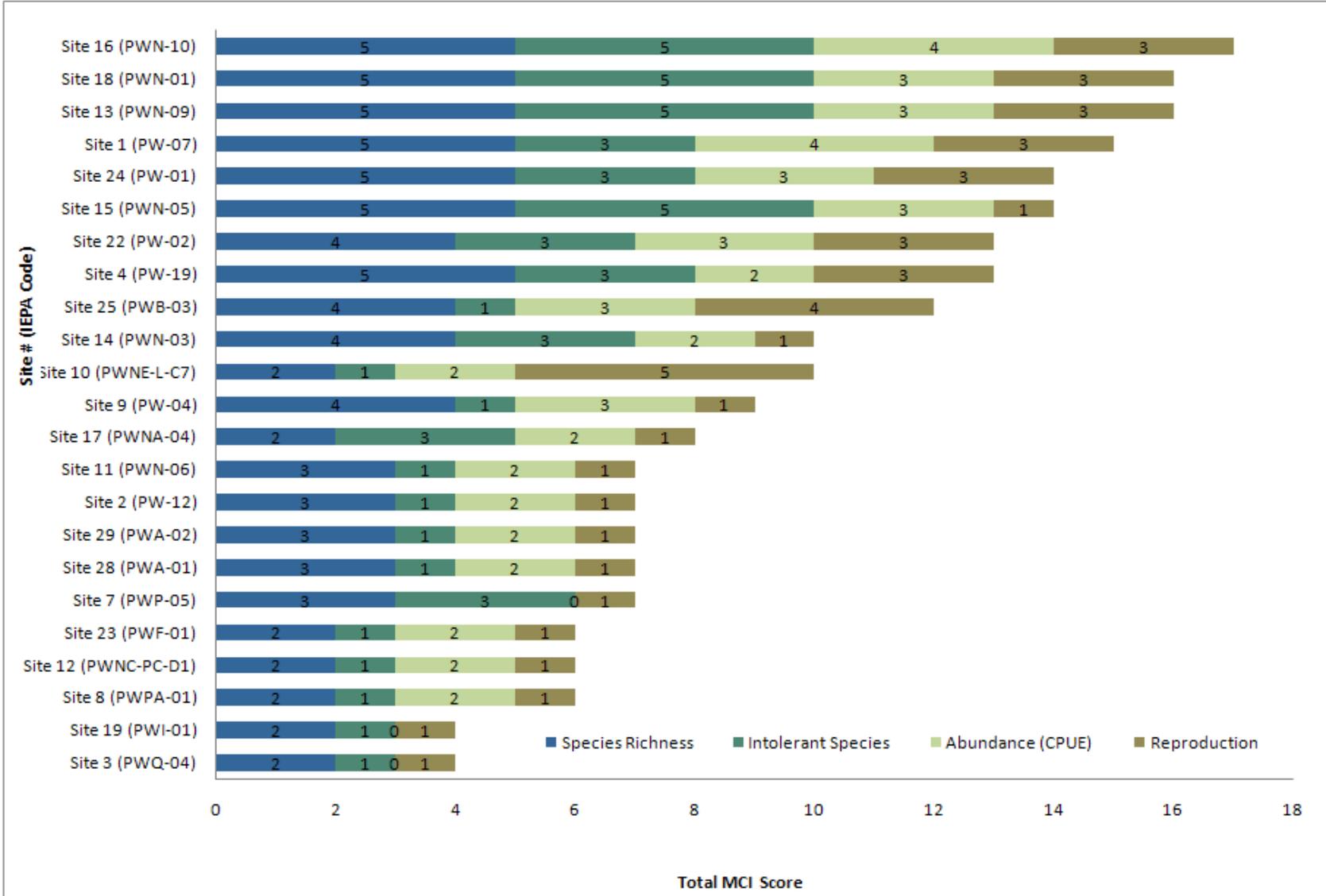


Figure 3b. Kishwaukee basin

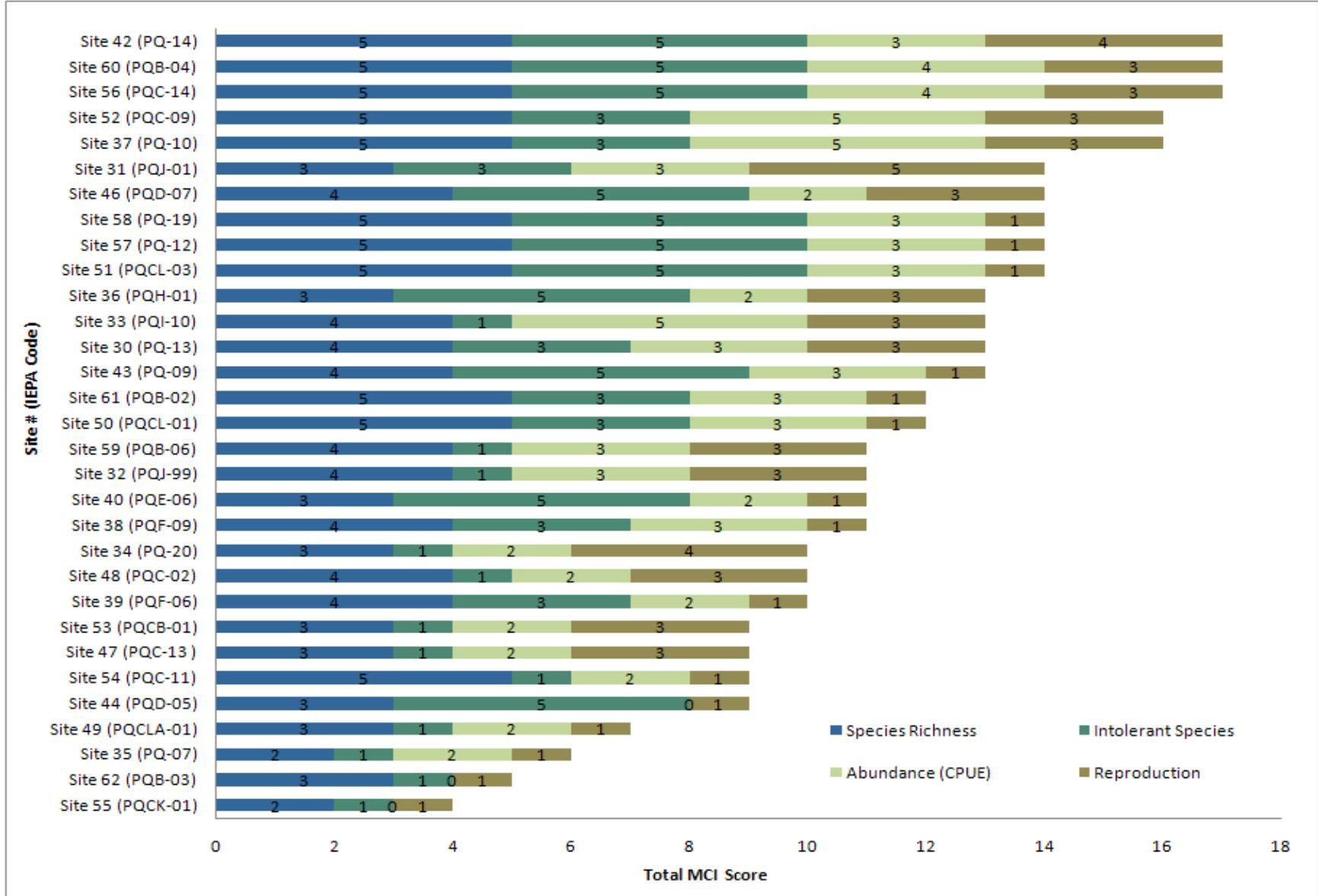


Figure 3c. Green basin

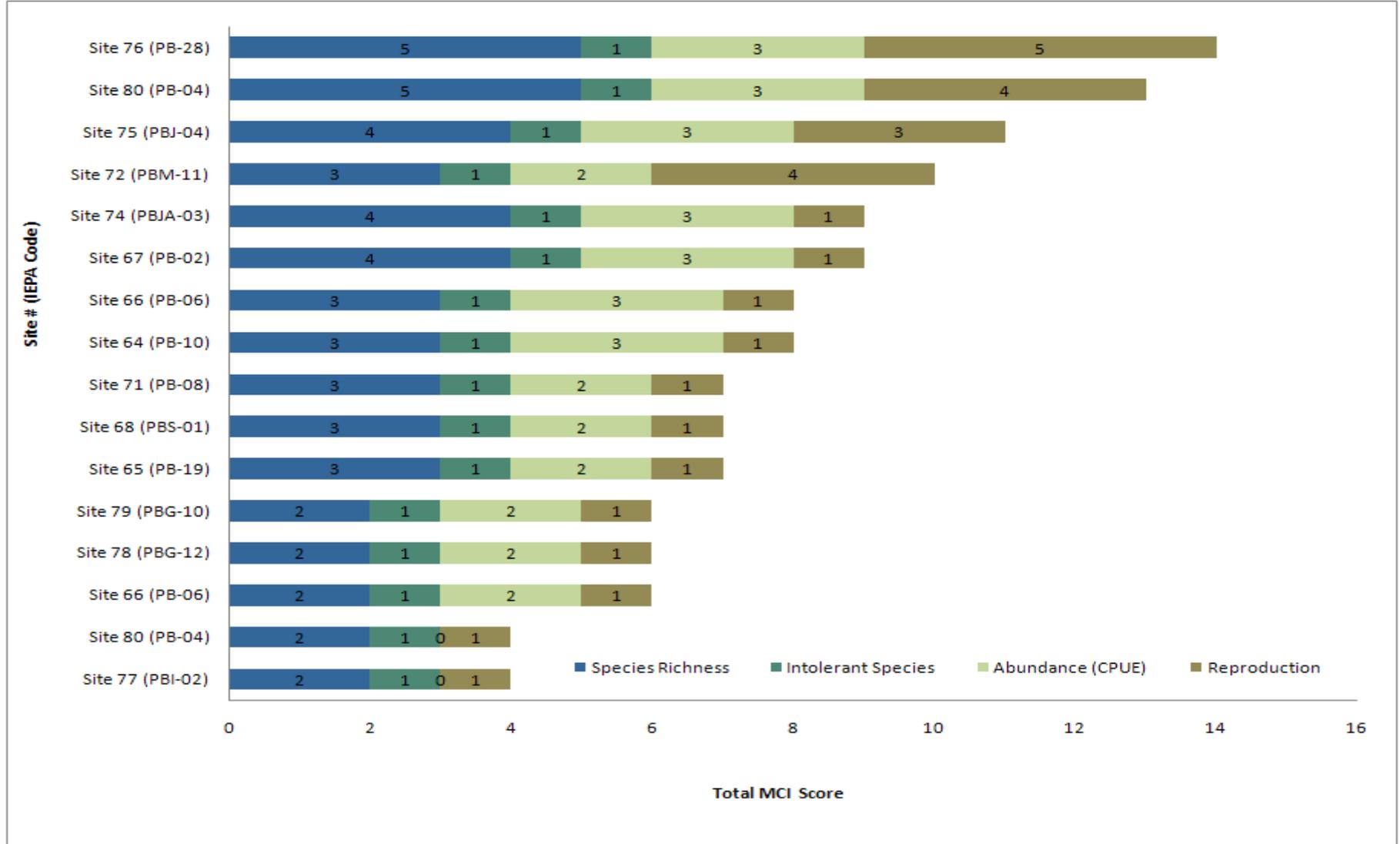


Figure 3. Comparison of Mussel Community Index (MCI) and MCI component scores for Rock River tributary sites based on factor values from Table 3. Pecatonica (a), Kishwaukee (b), and Green River basins (c).

Appendix 1. Scientific and common names of species, status refers to conservation status in Illinois at time of printing (December 2012); X = Extirpated, FE = Federally endangered, SE = State endangered, ST = State threatened, SGNC = State greatest need of conservation

Scientific Name	Common Name	Status
Subfamily Anodontinae		
<i>Alasmidonta marginata</i>	elktoe	
<i>Alasmidonta viridis</i>	slippershell mussel	ST
<i>Anodontoides ferussacianus</i>	cylindrical papershell	
<i>Arcidens confragosus</i>	rock pocketbook	SGNC
<i>Lasmigona complanata</i>	white heelsplitter	
<i>Lasmigona compressa</i>	creek heelsplitter	SGNC
<i>Lasmigona costata</i>	flutedshell	SGNC
<i>Pyganodon grandis</i>	giant floater	
<i>Strophitus undulatus</i>	creeper	
<i>Utterbackia imbecillis</i>	paper pondshell	
Subfamily Ambleminae		
<i>Amblema plicata</i>	threeridge	
<i>Cyclonaias tuberculata</i>	purple wartyback	ST
<i>Elliptio dilatata</i>	spike	ST
<i>Fusconaia flava</i>	Wabash pigtoe	
<i>Pluerobema sintoxia</i>	round pigtoe	
<i>Quadrula nodulata</i>	wartyback	
<i>Quadrula pustulosa</i>	pimpleback	
<i>Quadrula quadrula</i>	mapleleaf	
<i>Tritogonia verrucosa</i>	pistolgrip	
Subfamily Lampsilinae		
<i>Actinonaias ligamentina</i>	mucket	
<i>Lampsilis cardium</i>	plain pocketbook	
<i>Lampsilis siliquoidea</i>	fatmucket	
<i>Lampsilis teres</i>	yellow sandshell	
<i>Leptodea fragilis</i>	fragile papershell	
<i>Leptodea leptodon</i>	scaleshell	FE, X
<i>Ligumia recta</i>	black sandshell	ST
<i>Ligumia subrostrata</i>	pondmussel	
<i>Potamilus alatus</i>	pink heelsplitter	
<i>Potamilus ohiensis</i>	pink papershell	
<i>Toxolasma parvum</i>	lilliput	
<i>Truncilla donaciformis</i>	fawnsfoot	
<i>Truncilla truncata</i>	deertoe	
<i>Venustaconcha ellipsiformis</i>	ellipse	SGNC
<i>Villosa iris</i>	rainbow	SE