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Mississippi River - Pool 22, 24 and the Chain of Rocks - Ebonyshell Mussel (*Fusconia ebena*) Survey

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INTRODUCTION

OBJECTIVES

The objectives of this project were to: 1. Locate and determine the status of existing ebonyshell populations in Mississippi River Pool 22 and the Chain of Rocks area; 2. Provide information for the development of a management strategy for this specie and it's associated habitat; 3. Locate potential parent stocks for this specie for the purpose of propagation for supplemental stockings and reintroduction. 4. Update Illinois' Natural Heritage Data Base for this specie.

BACKGROUND

The ebonyshell mussel (*Fusconaia ebena*) inhabits large rivers with a sand/gravel/cobble substrate. It is presently listed as state threatened and is considered to be "extirpated" from the Illinois River. Historically, the Mississippi has been a stronghold for this mussel specie. Over the last half-century, this specie's population has declined at an alarming rate. One factor that is hypothesized to be a major contributor to this mussels demise is the creation of dams that block the migration of this specie's host fish; the skipjack herring. Over the last five to ten years, it has been reported that the skipjack's populations have been rebounding. A number of different locations are reported to support numbers that have not been observed in years. These areas, plus sites with known ebony shell populations, were targeted for this survey.

METHODS

Recent mussel population surveys, both published and unpublished, were searched for ebonyshell records. This search resulted in six sites with the potential to contain the ebonyshell mussel. These sites were: Hadley Island (an Illinois mussel sanctuary) in Pool 22 at approximately river mile 316.0, Adams County, Illinois; Orton Island in Pool 22 at river mile 323, Marion County, Missouri; Fabius Island in Pool 22 at river mile 322, Marion County, Missouri; River mile 317 - 318 in Pool 22, Marion County, Missouri; and the Hadley - McCraney Bed at river mile 297 in Pool 24, Pike County, Illinois.

Three sites at the Chain of Rocks, in the open part of the river, were also sampled. These were Mosenthein Island at river mile 186.9, Madison County, Illinois; the first dike down river from the Chain of Rocks at river mile 189.5, Madison County, Illinois and River mile 188.0, St. Louis County, Missouri. These sites had not been previously sampled and were loosely hypothesized to contain ebonyshell based on the abundance of skipjack herring found at these sites.

All of the above sites were time dived with the diver retrieving **all** mussels encountered. Dive time was determined based on previous knowledge of site, amount of mussels encountered, and size of area to be sampled. Position points throughout each surveyed site were recorded using a Global Positioning System (GPS) unit. Live mussels were identified, tallied, recorded, and returned to the river. Dead shell was classified (weathered or fresh dead) and returned to the river. All ebonyshell were collected and transported to holding cages at the Ted Shanks

Conservation Area, Ralls County, Missouri. These mussels will be transported to Missouri State University in the spring of 2009, captive bred, and after recovery of the glocidia, returned to the site they were collected from.

Dive services were provided by Mainstream Commercial Divers, Inc. based out of Murray, Kentucky. Samples were processed by Dean Corgiat of the Illinois Department of Natural Resources and Travis Moore of the Missouri Department of Conservation. Assistance was also provided by Tim Kelley of the Illinois Department of Natural Resources, Matt Afflerbaugh of the Missouri Department of Conservation, Therran Hobson of The Nature Conservancy, and George Smith, volunteer for the Missouri Department of Conservation.

RESULTS AND DISCUSSION

This survey was conducted between September 29, and October 10, 2008. A total of 3,818 native mussels were collected (Table 1). The four most commonly occurring species throughout the survey were the threehorn wartyback (comprising 24 % of the total sample), the hickorynut (comprising 17 % of the total sample), the mapleleaf (comprising 16 % of the total sample), and the butterfly (comprising 12 % of the total sample). These four species collectively accounted for 70 % of the total sample for all sites sampled.

A total of 22 live species were collected from the seven survey sites (Table 1). Of these, five species are listed as either threatened, endangered, or watch listed in Illinois and/or Missouri (Table 2).

Twenty ebonyshell were collected during this survey. Nineteen were taken at the Hadley Island site and one was collected at the Orton Island site. Another nine ebonyshell mussels were collected at Fabius Island (8) and Blackbird Island (1) during a study that was conducted the week following this survey. These mussel were also "stock piled" at Ted Shanks Conservation Area. This made for a total of 29 individuals collected.

SAMPLE SITES

Hadley Island

The Hadley Island site was sampled upriver (river mile 316.2) from the 316.0 light and day mark down river to approximately river mile 315.3. All sampling was done between 30 and 150 meters off of the left descending bank of the island at six different points. Water depth ranged from 15 to 21 feet. The substrate was comprised of a cobble - sand mix.

Nineteen state threatened ebony shell mussels were collected at this site, as well as 102 state threatened butterfly mussels and 37 state threatened black sandshells.

Six timed searches totaling 15.83 hours were performed. A total of 1,463 individual mussels were collected. The hickorynut, mapleleaf, and threehorn wartyback, respectively, were the three most common species encountered at this site (Table 3). Nineteen different species were

Table 1. Species list and numbers of mussels collected during ebonyshell project.

SPECIES	NUMBER
Quadrula nodulata - Wartyback	13
Lampsilis teres - Yellow Sandshell	23
Actinonaias ligamentina - Mucket	2
Fusconaia ebena - Ebony shell	20
Quadrula quadrula - Maple leaf	613
Amblema plicata - Threeridge	232
Potamilus ohiensis - Pink papershell	4
Quadrula pustulosa - Pimpleback	410
Megalonaias nervosa - Washboard	124
Lasmigona complanata - White heelsplitter	4
Pyganodon grandis - Giant floater	1
Leptodea fragilis - Fragile paper shell	16
Potamilus alatus - Pink heelsplitter	1
Fusconaia flava - Wabash pigtoe	76
Truncilla truncata - Deertoe	5
Lampsilis cardium - Plain Pocketbook	76
Obliquaria reflexa - Threehorn Wartyback	922
Obovaria olivaria - Hickorynut	646
Ligumia recta - Black Sandshell	78
Ellipsaria lineolata - Butterfly	465
Quadrula metanevra - Monkeyface	86
Tritogonia verrucosa - Pistolgrip	1
TOTAL	**3,818**

Table 2. Endangered, threatened or watch-listed mussel species in Illinois and/or Missouri collected during ebonyshell project.

SPECIES	**STATUS**
Ligumia recta - Black Sandshell	IL. - Threatened, MO. - S1S2
Ellipsaria lineolata - Butterfly	IL. - Threatened
Quadrula nodulata - Wartyback	MO. - S3
Fusconaia ebena - Ebony shell	IL. - Threatened, MO. - Endangered
Obovaria olivaria - Hickorynut	MO. - S2S3

S1 = Critically imperiled in the state; S2 = Imperiled in the state; S3 = Rare and uncommon; S#S# = Range between two of the ranks... denotes range of uncertainty

Table 3. Species and number of mussel collected at the Hadley Island survey site

SPECIES	NUMBER
Quadrula nodulata - Wartyback	5
Lampsilis teres - Yellow Sandshell	16
Actinonaias ligamentina - Mucket	1
Fusconaia ebena - Ebony shell	19
Quadrula quadrula - Maple leaf	258
Amblema plicata - Threeridge	64
Potamilus ohiensis - Pink papershell	4
Quadrula pustulosa - Pimpleback	201
Megalonaias nervosa - Washboard	27
Lasmigona complanata - White heelsplitter	2
Leptodea fragilis - Fragile paper shell	11
Fusconaia flava - Wabash pigtoe	52
Truncilla truncata - Deertoe	4
Lampsilis cardium - Plain Pocketbook	49
Obliquaria reflexa - Threehorn Wartyback	257
Obovaria olivaria - Hickorynut	316
Ligumia recta - Black Sandshell	37
Ellipsaria lineolata - Butterfly	102
Quadrula metanevra - Monkeyface	38
TOTAL	**1,463**

collected qualifying this bed as one with a high diversity. The "catch per unit effort" was 1.54 mussels per minute indicating a bed with an average concentration of mussels.

Orton Island

The Orton Island site was sampled at the toe of the island, approximately 30 to 50 meters off shore (right descending bank). Water depth was 20.4 feet. The substrate was a cobble - sand mix.

One ebony shell mussel (Illinois state threatened, Missouri state endangered) was collected at this site, as well as 28 butterfly mussels (Illinois state threatened), 6 black sandshells (Illinois state threatened, S1S2 Missouri state ranking), 95 hickorynut (S2S3 Missouri state ranking), and 5 wartyback (S3 Missouri state ranking). (Note: This site is in Missouri waters but is considered "channel border.")

One timed search of 1.35 hours was performed. A total of 292 individuals were collected. The hickorynut, mapleleaf, threehorn wartyback, and butterfly mussel, respectively, were the four most common species encountered at this site (Table 4). Thirteen different species were collected, making this a fairly diverse bed. The "catch per unit effort" was 3.60 mussels per minute, indicating a relatively high mussel density.

Fabius Island

The Fabius Island site was sampled at two different locations along the right descending bank (see attached map). All sampling was done between 20 and 100 meters from shore. Water depth was from 17 to 18 feet. The substrate ranged from cobble to a sand - silt - cobble mix.

No ebony shell mussels (Illinois state threatened, Missouri state endangered) were collected at this site during this sampling. However, eight were collected at this site during a project we conducted the next week and added to the holding cages. Two hundred seventy eight butterfly mussels (Illinois state threatened), 22 black sandshells (Illinois state threatened, S1S2 Missouri state ranking), and 62 hickorynut (S2S3 Missouri state ranking) were the additional "rare" species collected. (Note: This site is in Missouri waters but is considered "channel border.")

Dive time was not measured at this site due to a "time keeping" error. A total of 959 individuals were collected. The butterfly mussel, threehorn wartyback, and the mapleleaf, respectively, were the three most common species encountered at this site (Table 5). The sample consisted of 15 different species making for a highly diverse bed.

River Miles 317.3 and 318.4

River mile 317.3 was sampled approximately 30 meters off shore of the right descending bank. Water depth was 21 feet. The substrate consisted of sand - cobble - silt with numerous dead shell mixed in.

Table 4. Species and number of mussels collected at the Orton Island survey site.

SPECIES	NUMBER
Quadrula nodulata - Wartyback	5
Fusconaia ebena - Ebony shell	1
Quadrula quadrula - Maple leaf	29
Amblema plicata - Threeridge	13
Quadrula pustulosa - Pimpleback	11
Megalonaias nervosa - Washboard	2
Fusconaia flava - Wabash pigtoe	1
Lampsilis cardium - Plain Pocketbook	3
Obliquaria reflexa - Threehorn Wartyback	89
Obovaria olivaria - Hickorynut	95
Ligumia recta - Black Sandshell	6
Ellipsaria lineolata - Butterfly	28
Quadrula metanevra - Monkeyface	9
TOTAL	**292**

Table 5. Species and number of mussel collected at the Fabius Island survey site

SPECIES	NUMBER
Quadrula quadrula - Maple leaf	147
Amblema plicata - Threeridge	26
Quadrula pustulosa - Pimpleback	74
Megalonaias nervosa - Washboard	81
Lasmigona complanata - White heelsplitter	1
Leptodea fragilis - Fragile paper shell	4
Fusconaia flava - Wabash pigtoe	6
Truncilla truncata - Deertoe	1
Lampsilis cardium - Plain Pocketbook	9
Obliquaria reflexa - Threehorn Wartyback	212
Obovaria olivaria - Hickorynut	62
Ligumia recta - Black Sandshell	22
Ellipsaria lineolata - Butterfly	278
Quadrula metanevra - Monkeyface	35
Potamilus alatus - Pink heelsplitter	1
TOTAL	**959**

No ebony shell mussels (Illinois state threatened, Missouri state endangered) were collected at this site during this sampling. Thirty-two butterfly mussels (Illinois state threatened), 7 black sandshells (Illinois state threatened, S1S2 Missouri state ranking),110 hickorynut (S2S3 Missouri state ranking) and 3 wartyback (S3 Missouri state ranking) were the additional "rare" species collected. (Note: This site is in Missouri waters but is considered "channel border.")

One timed search of 2.58 hours was performed. A total of 646 individuals were collected. The threehorn wartyback, hickorynut, and the mapleleaf, respectively, were the three most common species encountered at this site (Table 6). Fourteen different species were collected, making this a highly diverse bed. The "catch per unit effort" was 3.87 mussels per minute, indicating a relatively high mussel density.

River Mile 318.4 was sampled for 0.2 man hours. No mussels were encountered.

Hadley - McCraney Site

The Hadley - McCraney site was sampled at two different points (See attached map). All sampling was done between 50 and 100 meters off of the left descending bank upriver of the Hadley - McCraney Diversion Ditch. Water depth ranged from 13 to 22.5 feet. The substrate was comprised of a large cobble - sand mix.

No state threatened ebony shell mussels were collected at this site. Twenty-five state threatened butterfly mussels and 6 state threatened black sandshells were the additional "rare" species collected..

Two timed searches totaling 2.2 hours were performed. A total of 458 individual mussels were collected. The threeridge, pimpleback, and mapleleaf, respectively, were the three most common species encountered at this site (Table 7). Fifteen different species were collected qualifying this bed as one with a high diversity. The "catch per unit effort" was 3.47 mussels per minute indicating a bed with a high density of mussels.

Chain of Rocks

Three different sites below the Chain of Rocks were sampled: Mosenthein Island at river mile 186.9, left descending bank; the first dike down river from the Chain of Rocks at river mile 189.5, left descending bank; and at a stretch of old rip rap at river mile 188.0, right descending bank. All substrates consisted of sand. No mussels were found at any of the three sites.

Table 6. Species and number of mussel collected at the River Mile 317.3 survey site

SPECIES	NUMBER
Quadrula nodulata - Wartyback	3
Lampsilis teres - Yellow Sandshell	2
Actinonaias ligamentina - Mucket	1
Quadrula quadrula - Maple leaf	106
Amblema plicata - Threeridge	33
Quadrula pustulosa - Pimpleback	36
Megalonaias nervosa - Washboard	10
Pyganodon grandis - Giant floater	1
Fusconaia flava - Wabash pigtoe	2
Lampsilis cardium - Plain Pocketbook	4
Obliquaria reflexa - Threehorn Wartyback	299
Obovaria olivaria - Hickorynut	110
Ligumia recta - Black Sandshell	7
Ellipsaria lineolata - Butterfly	32
TOTAL	**646**

Table 7. Species and number of mussel collected at the Hadley - McCraney survey site.

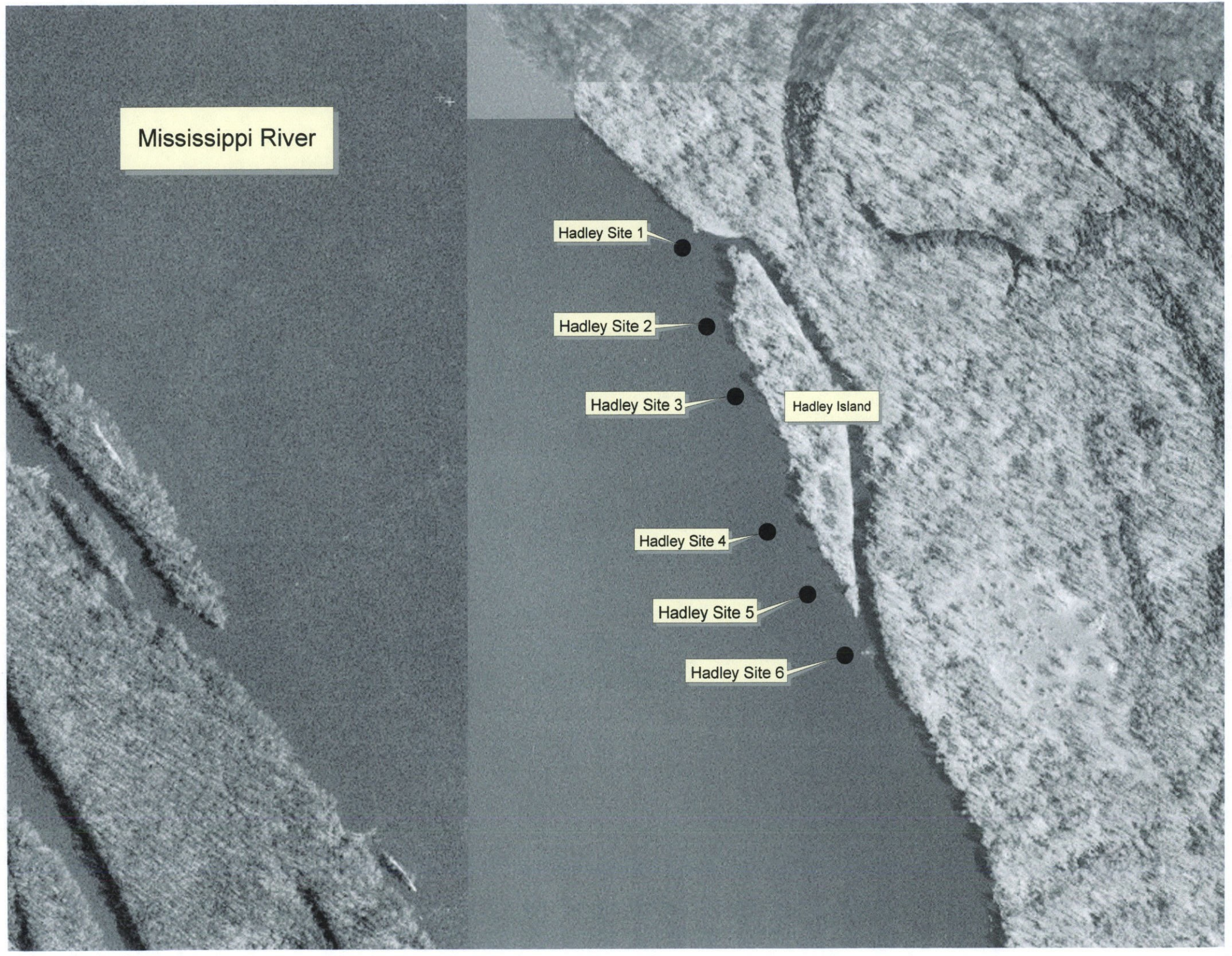
SPECIES	NUMBER
Lampsilis teres - Yellow Sandshell	5
Quadrula quadrula - Maple leaf	73
Amblema plicata - Threeridge	96
Quadrula pustulosa - Pimpleback	88
Megalonaias nervosa - Washboard	4
Lasmigona complanata - White heelsplitter	1
Leptodea fragilis - Fragile paper shell	1
Fusconaia flava - Wabash pigtoe	15
Lampsilis cardium - Plain Pocketbook	11
Obliquaria reflexa - Threehorn Wartyback	65
Obovaria olivaria - Hickorynut	63
Ligumia recta - Black Sandshell	6
Ellipsaria lineolata - Butterfly	25
Quadrula metanevra - Monkeyface	4
Tritogonia verrucosa - Pistolgrip	1
TOTAL	**458**

CONCLUSIONS

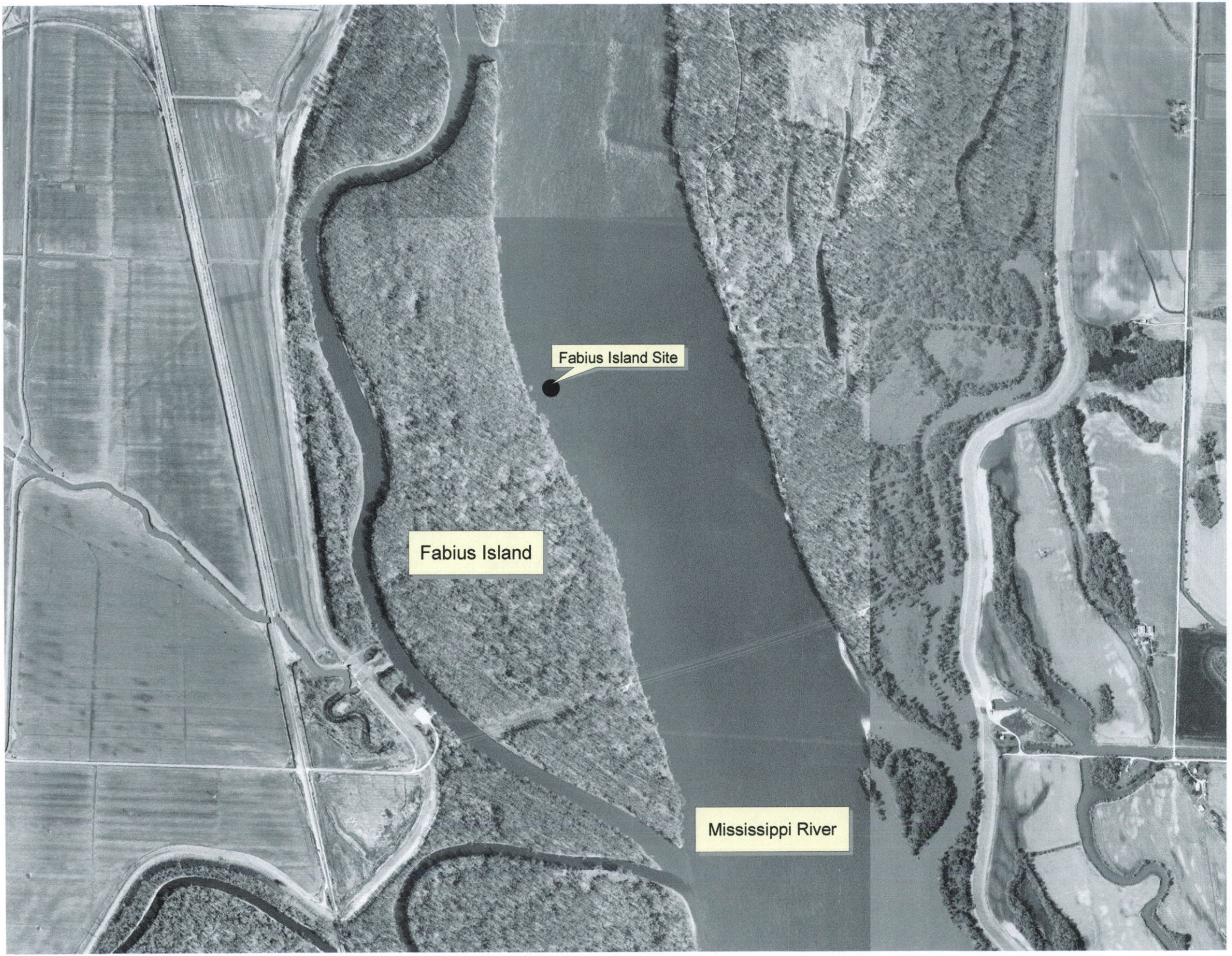
This survey resulted in a good amount of highly valuable data. Not only was the number of ebonyshell collected surprisingly high (29), the number of other rare species encountered was encouraging. A total of 465 butterfly mussels (Illinois listed - threatened), 78 black sandshells (Illinois listed - threatened, Missouri listed - S1-S2), 646 hickorynut (Missouri listed - S2 - S3), and 13 wartyback (Missouri listed - S3).

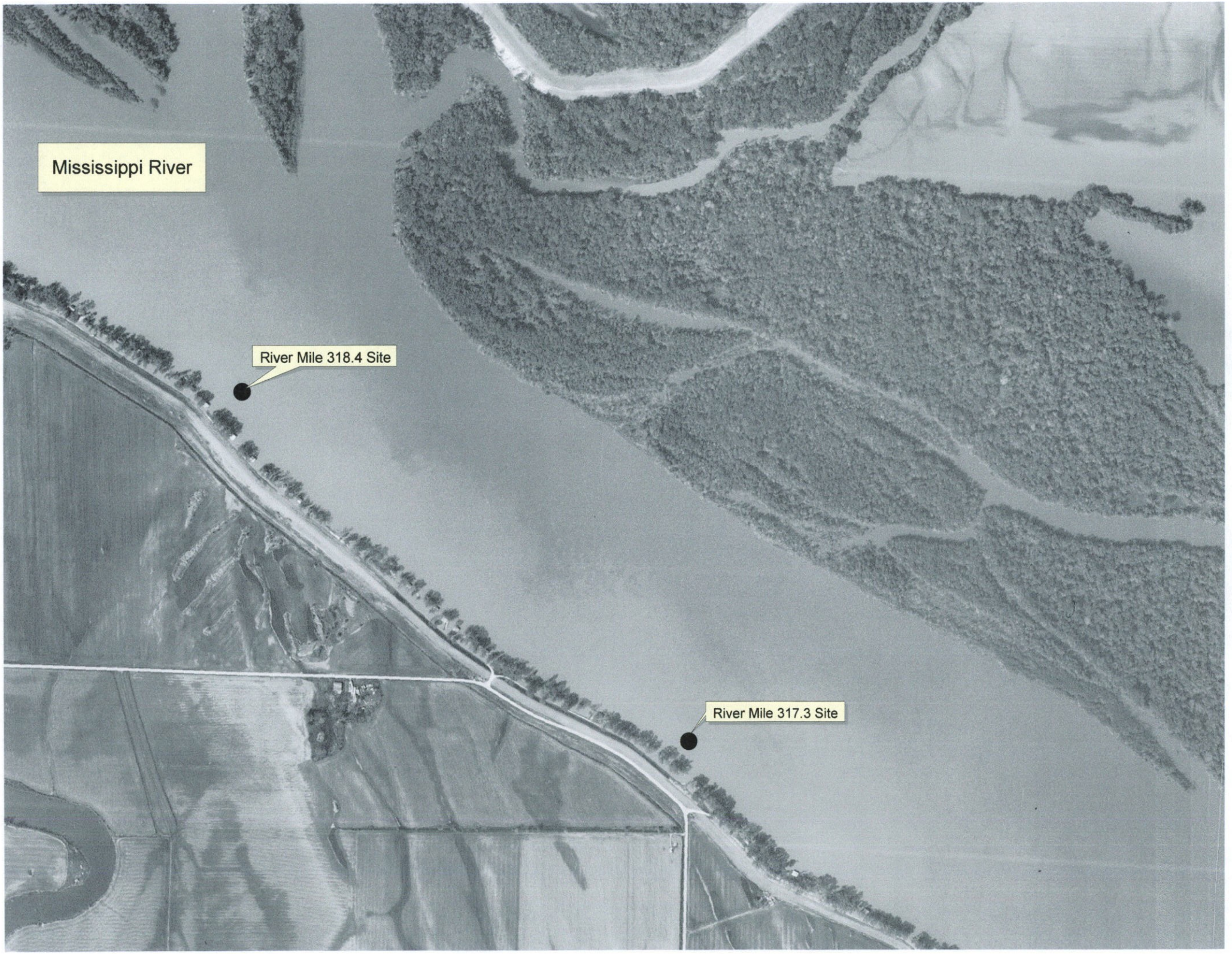
The Hadley - McCraney Bed, designated as an Illinois Natural Area Site in 2002, had four more mussel species (fragile papershell, pistolgrip, yellow sandshell, and white heelsplitter) added to its species list. This increases the total number of species collected at this site to sixteen.

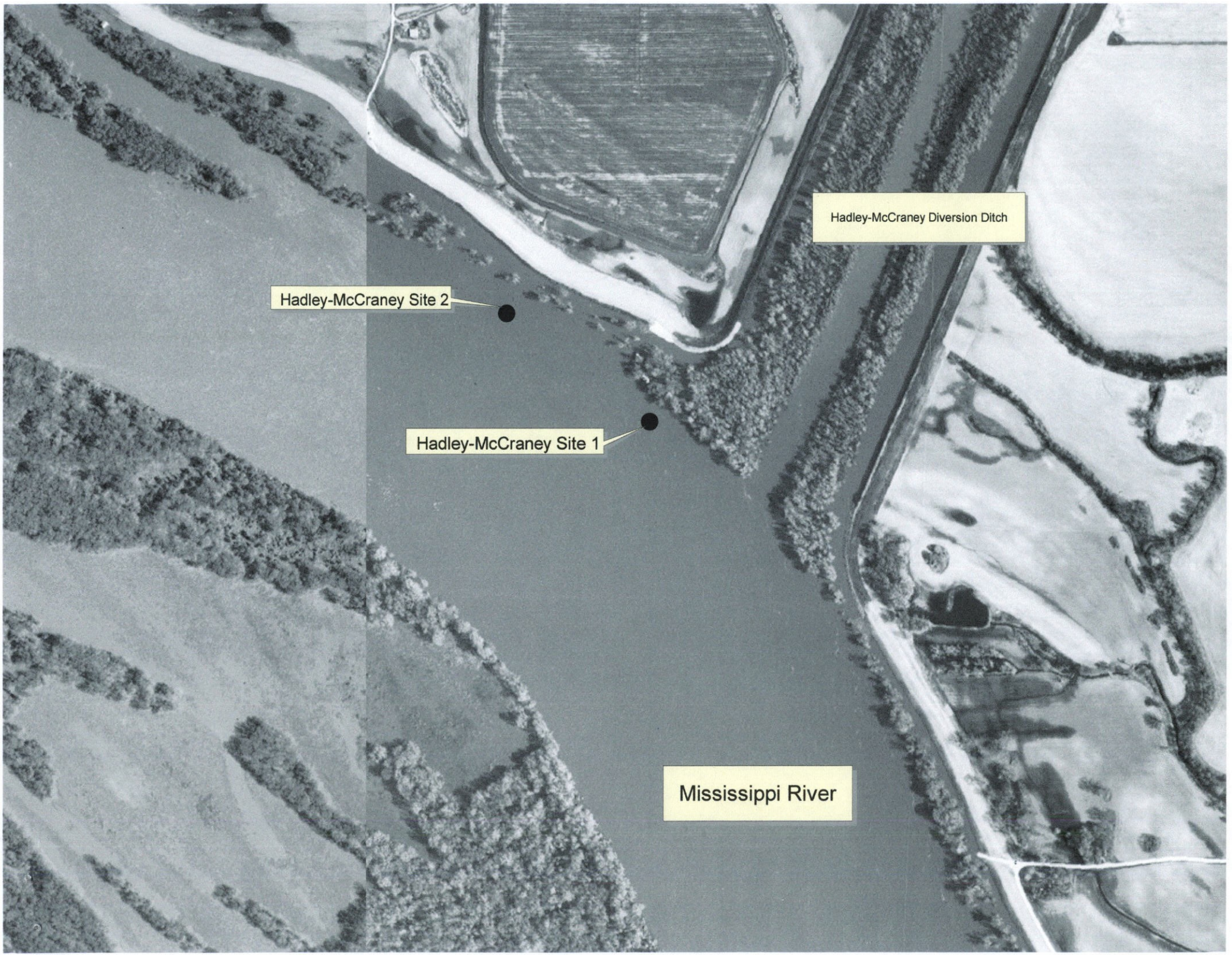
Several seemingly important indicators as to the presence of the ebonyshell emerged during this project. The first indicator appears to be the substrate. At all of the sites where ebonyshell was collected (including the project that was conducted the following week) the substrate was comprised of some type of cobble. It could be small or large, or mixed with some sand or silt, cobble was always present. Another indicator was how the bed was situated within the river. Areas considered "channel borders"(as defined as "an area adjacent to, or within close proximity to, the navigation channel") seemed to be a preferred habitat type. We have encountered ebonyshell in only one other "habitat type;" that being behind Blackbird Island in Pool 24 of the Mississippi River (this was only one individual). Lastly, the black sandshell was present in every bed in which the ebonyshell was collected. As a matter of fact, whenever a collection bag was sent up to the boat by the diver that had an ebonyshell in it, black sandshell(s) were also present within the bag. This did not occur with any other "uncommon" species (this excludes threehorn wartybacks, threeridges, mapleleafs, etc.).


Mississippi River
Hadley Site 1
Hadley Site 2
Hadley Site 3
Hadley Island
Hadley Site 4
Hadley Site 5
Hadley Site 6

Mississippi River
Orton Island
Orton Island Site


Fabius Island Site
Fabius Island
Mississippi River


Mississippi River
River Mile 318.4 Site
River Mile 317.3 Site


Hadley-McCraney Diversion Ditch
Hadley-McCraney Site 2
Hadley-McCraney Site 1
Mississippi River