

## **Survey of the Fishes of the Kingsbury State Fish and Wildlife Area, LaPorte County, Indiana**

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### **Introduction**

The Kankakee River is the northernmost tributary of the Mississippi River in Indiana. The source of the Kankakee is just west of South Bend, Indiana, and the river flows southwesterly until joining the Illinois River in eastern Illinois. Major Indiana tributaries of the Kankakee River are the Yellow and Iroquois Rivers. In total, the Kankakee River and its major and minor tributaries drain nearly 8100 sq km of north-west Indiana (3). The basin has been extensively drained, and most of the original channel of the Kankakee River has been replaced by a series of ditches. The land bordering the Kankakee River is largely agricultural. One area where the channel and the surrounding land have been least modified is the Kingsbury State Fish and Wildlife Area (KSFWA), a tract of 1820 ha in LaPorte County, Indiana. The northern shore of the Kankakee River forms the KSFWA's southeastern border. The KSFWA is a natural swampy lowland where construction of drainage ditches by the Indiana Department of Natural Resources is ongoing to accommodate further development of the area for deer and rabbit management.

The main purpose of this study was to make regular collections of fish from three different stream habitats in the KSFWA to see if there were differences in species diversity. The habitats chosen were a relatively unmodified stream, an old ditch, and a new drainage ditch. Another purpose of this study was to compare the types of fish we collected to species records compiled for the Kankakee River basin by earlier workers. Previous reports on fish on the Kankakee River basin include reports by Hay (2), Robertson and Ledet (3) as well as records listed in the state reports by Gerking (1) for Indiana and Smith (4) for Illinois. None of these reports contain any records specifically from the KSFWA.

### **Methods**

Samples were taken by seine on a monthly basis from March through November, 1983, inclusive. Dates were: 18 March; 22-23 April; 12 May; 8 June; 13 July; 15 August; 9 September; 14 October; and 18 November.

Three localities were chosen. Locality 1 (at KSFWA parking lot 4B) was a relatively undisturbed tree-lined stream passing through cultivated fields and brushland. The stream bed was sandy-bottomed, and current was relatively swift. Maximum depth was 1.5 m (although mid-channel depth averaged about 0.5 m), and width varied from 3-4.5 m. Locality 2 was a section of Breckenridge Ditch from 1-1.5 km upstream of its confluence with the Kankakee River. This ditch was clogged with tree limbs and aquatic vegetation. The sides of its channel were extremely silty, but the middle of the channel was sandy. Average depth at the middle of the channel was about 0.8 m, and maximum depth of pools was 1.8 m. Width of the stream was 4-6 m, and current was moderately swift. The stream for locality 1 is a minor tributary of Breckenridge Ditch about

2 km from the collecting site for locality 2. Locality 3 was a newly constructed ditch parallel to and directly across a dirt road (River Road) from locality 2. This ditch was constructed to drain a large swampy wetland. Flow was controlled by a gate operated by the DNR at parking lot 5F. The ditch was about 3.5-4 m wide and varied from 1.8-2.3 m maximum depth above the gate at all seasons. Below the gate, average depth of the channel was nearly 1 m in the spring, but only pools (maximum depth 0.7 m) connected with shallow (> .10 m) rivulets existed in the summer and fall. The bottom of the entire channel was extremely silty, there was little aquatic or emergent vegetation, and, depending upon water level, flow was moderately swift. In the spring months (March-June), we could collect from the source of the ditch to its confluence with the Kankakee River, a distance of about 1 km. In the remaining months, however, our collections from locality 3 were limited to pools near KSFWA parking lot 5F.

All collections were made between 1000-1500 hrs, and average time for a collection was about 90 min. About 0.5 km usually was sampled per collection except as noted above for locality 3. Specimens were preserved upon collection in 10% formalin. After sorting and identification, specimens were placed in 60% isopropyl alcohol. Specimens are currently stored at Saint Mary's College.

### Results and Discussion

#### Analysis of Collections

From our samples, we preserved a total of 2849 individuals from 33 species representing 13 families (Tables 1-3). All specimens were saved except for some *Cyprinus carpio*, *Catostomous commersoni*, *Notemigonus crysoleucas*, *Ictalurus melas*, and *I. nebulosus*. Specifically, we saved 663 individuals of 12 species from locality 1, 552 individuals of 28 species from locality 2, and 1634 individuals of 25 species from locality 3.

Only eight species were found in all three localities. These were: *Esox americanus*, *C. carpio*, *C. commersoni*, *Erimyzon sucetta*, *I. melas*, *Lepomis cyanellus*, *L. gibbosus* and *Perca flavescens*. Only single individuals of *E. sucetta* and *L. gibbosus* were obtained, however, from locality 1, and only one *C. commersoni* came from locality 3.

Each locality had at least one species not found at other localities, but such species were represented by single specimens except in two instances. *Nocomis biguttatus* was collected only at locality 1 (April-1). *Moxostoma macrolepidotum* (August-1),

TABLE 1. Fish preserved from locality 1. An asterisk (\*) indicates that not all of the fish collected were preserved.

| Species                       | MONTH |    |    |    |    |    |    |    |    |     | TOTAL |
|-------------------------------|-------|----|----|----|----|----|----|----|----|-----|-------|
|                               | 3     | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 |     |       |
| <i>Esox americanus</i>        |       |    |    |    | 1  | 4  | 4  | 1  | 3  | 13  |       |
| <i>Cyprinus carpio</i>        |       |    |    |    | 2* | 2  |    |    |    | 4   |       |
| <i>Nocomis biguttatus</i>     |       |    |    |    |    | 1  |    |    |    | 1   |       |
| <i>Rhinichthys atratulus</i>  |       | 1  | 1  | 3  | 2  | 12 |    |    |    | 19  |       |
| <i>Catostomous commersoni</i> |       | 6  | 4  |    | 2* | 8  | 3  | 3* |    | 26  |       |
| <i>Erimyzon sucetta</i>       |       |    | 1  |    |    |    |    |    | 11 | 2   |       |
| <i>Ictalurus melas</i>        |       |    |    |    | 1  |    | 2  |    |    | 3   |       |
| <i>Cottus bairdi</i>          | 109   | 34 | 35 | 36 | 12 | 32 | 65 | 47 | 48 | 408 |       |
| <i>Lepomis cyanellus</i>      |       | 3  |    | 1  |    | 2  | 2  |    | 2  | 10  |       |
| <i>Lepomis gibbosus</i>       |       |    |    |    |    | 1  |    |    |    | 1   |       |
| <i>Perca flavescens</i>       |       |    |    |    | 1  | 1  |    |    |    | 2   |       |
| <i>Etheostoma nigrum</i>      | 32    | 10 | 17 | 7  | 10 | 27 | 28 | 16 | 27 | 174 |       |

TABLE 2. Fish preserved from locality 2. An asterisk (\*) indicates that not all of the fish collected were preserved.

| Species                         | MONTH |   |    |    |     |    |    |    |    |   | TOTAL |
|---------------------------------|-------|---|----|----|-----|----|----|----|----|---|-------|
|                                 | 3     | 4 | 5  | 6  | 7   | 8  | 9  | 10 | 11 |   |       |
| <i>Amia calva</i>               |       |   |    |    |     |    | 2  | 1  |    |   | 3     |
| <i>Umbra limi</i>               |       |   |    |    |     | 1  |    |    |    |   | 1     |
| <i>Esox americanus</i>          | 2     |   |    | 1  | 7   | 6  | 9  | 3  | 5  |   | 33    |
| <i>Esox lucius</i>              |       |   |    |    |     | 3  | 2  | 1  | 2  |   | 8     |
| <i>Cyprinus carpio</i>          |       |   |    |    | 1   | 1  | 3  | 3* |    |   | 7     |
| <i>Notemigonus crysoleucas</i>  | 1     | 4 | 4  | 18 | 5   | 56 | 14 | 7  | 9  |   | 118   |
| <i>Semotilus atromaculatus</i>  | 4     | 1 |    |    |     |    |    |    |    |   | 5     |
| <i>Rhinichthys atratulus</i>    |       |   | 1  |    |     |    |    |    |    |   | 1     |
| <i>Ictiobus bubalus</i>         |       |   |    |    |     |    |    |    | 1  |   | 1     |
| <i>Moxostoma macrolepidotum</i> |       |   |    |    |     | 1  |    |    |    |   | 1     |
| <i>Catostomus commersoni</i>    | 1     | 5 | 6  | 4  | 3*  | 6  | 7  | 1  | 1  |   | 34    |
| <i>Minytrema melanops</i>       |       |   |    | 1  | 1   | 2  |    |    |    |   | 4     |
| <i>Erimyzon sucetta</i>         |       | 1 |    | 1  | 2   |    |    |    | 2  |   | 6     |
| <i>Ictalurus melas</i>          |       | 5 | 18 | 7  | 12* | 1  | 7  | 9  | 10 |   | 69    |
| <i>Ictalurus natalis</i>        | 1     |   | 2  | 4  | 8*  | 3  | 2  | 5  | 5  |   | 30    |
| <i>Ictalurus nebulosus</i>      |       |   | 2  | 7  | 3   | 6  | 3  | 6  | 2  |   | 29    |
| <i>Noturus gyrinus</i>          |       | 1 | 1  |    |     |    |    |    |    |   | 2     |
| <i>Apredoderus sayanus</i>      | 1     |   |    |    | 2   |    |    |    |    | 1 | 4     |
| <i>Fundulus dispar</i>          |       | 2 |    |    |     |    |    |    |    |   | 2     |
| <i>Cottus bairdi</i>            |       |   | 3  | 1  |     |    |    |    |    |   | 4     |
| <i>Micropterus salmoides</i>    |       |   |    |    | 2   |    |    |    |    |   | 2     |
| <i>Lepomis cyanellus</i>        | 5     | 1 | 1  | 1  |     | 15 | 2  | 6  | 26 |   | 57    |
| <i>Lepomis gibbosus</i>         |       | 2 |    |    | 1   | 4  | 2  | 5  | 2  |   | 16    |
| <i>Lepomis macrochirus</i>      |       |   | 1  | 1  | 6   | 40 | 4  | 3  | 5  |   | 60    |
| <i>Pomoxis nigromaculatus</i>   |       |   | 1  |    |     |    |    |    |    |   | 1     |
| <i>Perca flavescens</i>         |       | 1 |    | 7  | 7   |    |    |    |    |   | 16    |
| <i>Percina maculata</i>         |       |   |    | 1  |     |    |    |    |    |   | 1     |
| <i>Etheostoma nigrum</i>        | 1     | 3 | 12 | 9  | 2   | 6  |    |    | 4  |   | 37    |

*Minytrema melanops* (June through August—4), *Fundulus dispar* (April—2), and *Percina maculata* (June—1) were found only at locality 2. Four species found only at locality 3 were each represented by single specimens from the May or June collections: *Dorosoma cepedianum*, *Notropis spilopterus*, *Pimephales notatus*, and *Labidesthes sicculus*. Water levels in the ditch at locality 3 were high during May and June, providing a continuous channel at least 1 m deep from the gate at parking lot 5F to the Kankakee River.

Three species were found in localities 1 and 2, but not locality 3. These were, with numbers of specimens (locality 1:locality 2) in parentheses: *Rhinichthys atratulus* (19:1), *Cottus bairdi* (408:4), and *Etheostoma nigrum* (174:37). There were no species common to localities 1 and 3, but not locality 2.

There were, however, 13 species found at localities 2 and 3 but not locality 1. These were, with number of specimens (locality 2:locality 3) in parenthesis: *Amia calva* (3:2), *Umbra limi* (1:24), *Esox lucius* (8:2), *N. crysoleucas* (118:950), *Semotilus atromaculatus* (5:3), *Ictiobus bubalus* (1:6), *Ictalurus natalis* (30:1), *I. nebulosus* (29:66), *Noturus gyrinus* (2:1), *Apredoderus sayanus* (4:1), *Micropterus salmoides* (2:30), *Lepomis macrochirus* (60:153), and *Pomoxis nigromaculatus* (1:33).

The dominant fish at locality 1 were *Cottus bairdi* and *Etheostoma nigrum*, the only species collected each month and in any numbers. Only 2-6 species were collected in any month at locality 1 except for July (8) and August (10). The limited fish fauna locality 1 is probably representative of the local natural diversity in a shallow, relatively

TABLE 3. Fish preserved from locality 3. An asterisk (\*) indicates that not all of the fish collected were preserved.

| Species                        | MONTH |     |    |    |    |    |    |    |    |  | TOTAL |
|--------------------------------|-------|-----|----|----|----|----|----|----|----|--|-------|
|                                | 3     | 4   | 5  | 6  | 7  | 8  | 9  | 10 | 11 |  |       |
| <i>Amia calva</i>              |       |     |    |    |    | 1  | 1  |    |    |  | 2     |
| <i>Dorosoma cepedianum</i>     |       |     | 1  |    |    |    |    |    |    |  | 1     |
| <i>Umbra limi</i>              | 8     | 11  |    | 4  |    |    |    |    | 1  |  | 24    |
| <i>Esox americanus</i>         | 13    | 1   |    |    |    | 1  |    | 2  | 1  |  | 18    |
| <i>Esox lucius</i>             |       | 1   | 1  |    |    |    |    |    |    |  | 2     |
| <i>Cyprinus carpio</i>         | 57*   | 16* | 16 | 9  | 21 | 3  | 3  | 1  | 6  |  | 132   |
| <i>Notemigonus crysoleucas</i> | 797   | 14  | 83 | 12 | 37 | 7  |    |    |    |  | 950   |
| <i>Semotilus atromaculatus</i> |       |     | 3  |    |    |    |    |    |    |  | 3     |
| <i>Notropis spilopterus</i>    |       |     | 1  |    |    |    |    |    |    |  | 1     |
| <i>Pimephales notatus</i>      |       |     | 1  |    |    |    |    |    |    |  | 1     |
| <i>Ictiobus bubalus</i>        |       |     |    |    | 6  |    |    |    |    |  | 6     |
| <i>Catostomous commersoni</i>  |       |     |    | 1  |    |    |    |    |    |  | 1     |
| <i>Erimyzon sucetta</i>        | 1     | 2   | 1  | 12 | 1  | 2  |    |    | 2  |  | 21    |
| <i>Ictalurus melas</i>         | 2     | 5   | 31 | 16 | 12 | 9  | 18 | 5  | 10 |  | 108   |
| <i>Ictalurus natalis</i>       |       |     |    |    |    |    |    |    | 1  |  | 1     |
| <i>Ictalurus nebulosus</i>     | 1     | 6   | 9  | 4  | 14 | 13 | 10 | 3  | 6  |  | 66    |
| <i>Noturus gyrinus</i>         |       |     |    | 1  |    |    |    |    |    |  | 1     |
| <i>Apredoderus sayanus</i>     |       |     |    |    |    |    | 1  |    |    |  | 1     |
| <i>Labidesthes sicculus</i>    |       |     |    |    |    | 1  |    |    |    |  | 1     |
| <i>Micropterus salmoides</i>   | 4     | 1   | 1  | 2  | 2  | 3  | 2  | 5  | 10 |  | 30    |
| <i>Lepomis cyanellus</i>       | 4     | 4   |    | 3  |    |    |    |    |    |  | 11    |
| <i>Lepomis gibbosus</i>        | 19    | 5   | 1  | 13 | 7  | 4  |    | 0  | 3  |  | 58    |
| <i>Lepomis macrochirus</i>     |       |     | 58 | 33 | 33 | 3  | 4  | 9  | 8  |  | 153   |
| <i>Perca flavescens</i>        | 3     |     | 4  | 2  |    |    |    |    |    |  | 9     |
| <i>Pomoxis nigroma culatus</i> | 16    | 1   | 3  | 7  | 6  |    |    |    |    |  | 33    |

swiftly flowing, sandy-bottomed stream. There are a few *Lepomis*, and some *Esox americanus*, *Cyprinus carpio*, and *Catostomous commersoni* moved into the area during the summer, but usually the stream is dominated by two small carnivores, one benthic (*C. bairdi*) and the other nektonic (*E. nigrum*).

The dominant fish at locality 2 were: eosoids (*Esox americanus* and *E. lucius*), the cyprinid *Notemigonus crysoleucas*, catostomids (especially *Catostomous commersoni*), ictalurids (especially *Ictalurus melas*), centrarchids (especially *Lepomis cyanellus* and *L. macrochirus*) and percids (*Perca flavescens* and *Etheostoma nigrum*). Species diversity was rather constant throughout the year at locality 2 with 11-15 species collected each month except March (8 species).

Species composition of localities 2 and 3 were more similar to each other than either was to locality 1. Certain habitat similarities between localities 2 and 3, therefore, must have been more important to species diversity than the fact that localities 1 and 2 are directly connected while locality 3 is separate from the other two streams. The most important similarity between localities 2 and 3 is probably closeness to the river. The collecting site at locality 2 was only 1-1.5 km upstream from its confluence with the Kankakee River, and at locality 3, we were able to collect from the gate at parking lot 5F to the Kankakee River during high water periods. The fish fauna of both localities 2 and 3, therefore, were more directly influenced by movement of fish from the main channel of the river than the fish community at locality 1, 2 km upstream of locality 2.

Although species composition was similar between localities 2 and 3, there were some differences in the dominant forms. *Umbra limi* was abundant in the spring at

locality 3 and absent at this time at locality 3. *C. carpio* was a more abundant species at locality 3 than locality 2, especially in the March-July collections while water levels were high at locality 3. Suckers generally were not as dominant at locality 3 as at locality 2. *C. commersoni* was represented by only a single specimen at locality 3, and *Minytrema melanops* and *Moxostoma macrolepidotum* were absent at locality 3. *Ictiobus bubalus* and *Erimyzon sucetta*, however, were more abundant at locality 3 than locality 2. Among ictalurids, *Ictalurus melas* was a dominant form at both locales, but *I. natalis* was represented by just one specimen at locality 3 while it was frequently collected at locality 2. Among centrarchids, *L. cyanellus* was less common and *Micropterus salmoides* was more common at locality 3 than locality 2, and *Pomoxis nigromaculatus* was represented by 33 specimens at locality 3, but by only one specimen at locality 2.

During the high water periods (March-July), diversity was similar at locality 3 (12-15 species) to that previously noted for locality 2. Since the diversity and species groups involved were similar for localities 2 and 3, why were there such differences, as noted above, in the dominant forms between the two streams? Locality 2 was the older ditch. It had a good growth of aquatic and emergent vegetation, numerous snags and fallen limbs on the bottom, and a relatively constant water depth—seasonal fluctuations were >0.5 m. The passing through or stranding of fish, especially larger esocids and catostomids, resulted in the minor, but noticeable changes in seasonal diversity at locality 2. We believe, therefore, that our collections from locality 2 represent natural associations of fish resulting from their residence in or seasonal movements through the collecting area.

Locality 3 was freshly dug and had little aquatic or shore-line vegetation. With the sluice gate at parking lot 5F controlling the draining of the swamp upstream, current and water-level were dependent upon manipulation by the DNR of the situation. These factors, coupled with the heavy siltation, made locality 3 seemingly poor permanent fish habitat. When the sluice was opened during high water in spring, a greater diversity and number of species were taken. The May collection yielded 214 individuals of 15 species. The large numbers of *C. carpio* and *N. crysoleucas* collected in spring may simply indicate an influx of individuals from the swamp or river during periods of high water. When the sluice was closed in July, water depth above the gate became too deep for seining, while below the gate, the stream generally dried over the summer and fall months into a series of pools connected by rivulets accessible only to very small fish. Only 31 individuals from 7 species were collected from these pools in October. Most likely the larger individuals of species collected from these pools in summer months, such as some *Amia calva* and *M. salmoides*, were trapped when decreasing water levels made escape to the river or the swamp impossible.

The composition of the collections from locality 3, therefore, cannot be considered representative of a stable fish community. The differences in dominant species between localities 2 and 3 is likely the result of the chance movement or stranding of individuals at locality 3 due to shifting water levels. Individuals from locality 3 were collected while in a connecting link of rather inhospitable habitat during movements either from the swamp or the river.

#### Relation to Previous Records

The only species collected not previously recorded by Gerking (1) or Smith (4) from any portion of the Kankakee River drainage is *Ictiobus bubalus*. Based on Gerking (1), four species were recorded for the first time from Indiana portions of the Kankakee drainage: *Dorsoma cepedianum*, *M. macrolepidotum*, *E. lucius*, and *M. salmoides*. All of these species, however, have been recorded from Illinois portions of the Kankakee system, and their presence in our samples is not surprising. Eleven species had been recorded from other portions of the Kankakee River in Indiana by

Gerking (1), but not previously from LaPorte County. These new LaPorte County records are: *A. calva*, *E. sucetta*, *M. melanops*, *C. carpio*, *I. melas*, *I. nebulosus*, *I. natalis*, *Fundulus dispar*, *L. macrochirus*, *Pomoxis nigromaculatus*, and *Labidesthes sicculus*. Again, the occurrence of these forms in our samples could be expected.

Some 53 species have been reported by Gerking (1) and Smith (4) from the Kankakee River drainage but were not collected at KSFWA in our study (Table 4). In addition, a fishery survey by Robertson and Ledet (3) on the Kankakee River revealed three species, *Anguilla rostrata*, *Ictiobus niger* and *Carpionodes velifer*, not recorded in the system by Gerking (1), Smith (4), or the present study. Our collections reveal, therefore, that the streams sampled at KSFWA contain >40% of the total number of species known from the Kankakee River system. Also, there are some other species of probable occurrence in the Kankakee River basin that have not been recorded as of yet in the scientific literature. Such species include, for example, *Ichthyomyzon castaneus*, *Lepiosteus oculatus*, *Nocomis micropogon*, *Notropis atherinoides*, *Pylodictis olivaris*, and *Etheostoma blennoides*, among others known from connecting river basins. Confirmation of their occurrence in the Kankakee River system awaits further collecting.

The Kankakee River system thus has a recorded fish diversity of about 90 species with a potential for probably a dozen more. The absence of many of these species from the streams sampled at KSFWA can most obviously be related to lack of adequate habitat. The complete absence of many cyprinid genera and the representation of *Notropis* by only one specimen of *N. spilopterus*, however, is clearly quite striking. We do not believe that the lack of these forms is an artifact of collection, but that it does, indeed, represent the actual situation. It would seem an over-simplification to blame the absence of so many characteristic stream fish of northwestern Indiana (such as *N. cornutus* or *N. texanus*) on inadequate habitat, but we can offer no further explanation at this time. It will be interesting to sample other small tributaries of the Kankakee River in nearby areas to see if their minnow fauna is as depauperate in species diversity as that of the streams we sampled at KSFWA.

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TABLE 4. Species reported from the Kankakee River drainage from LaPorte County, other Indiana Counties, and from Illinois but not represented in the Kingsbury State Fish and Wildlife Area Collections. Indiana records from Gerking (1949), and Illinois records from Smith (1979).

| Species                       | LaPorte<br>County | Other<br>Indiana | Illinois |
|-------------------------------|-------------------|------------------|----------|
| <i>Ichthymyzon fossor</i>     |                   |                  | X        |
| <i>Ichthyomyzon unicuspis</i> |                   |                  | X        |
| <i>Lampetra appendix</i>      | X                 |                  |          |
| <i>Lepiosteus osseus</i>      |                   |                  | X        |
| <i>Salmo gairdneri</i>        | X                 |                  |          |
| <i>Salmo trutta</i>           | X                 | X                |          |
| <i>Hybopsis amblops</i>       |                   |                  | X        |
| <i>Phenacobius mirabilis</i>  |                   | X                | X        |
| <i>Notropis chalybaeus</i>    |                   | X                | X        |
| <i>Notropis cornutus</i>      | X                 | X                | X        |
| <i>Notropis dorsalis</i>      |                   |                  | X        |
| <i>Notropis emiliae</i>       |                   |                  | X        |
| <i>Notropis heterodon</i>     | X                 | X                |          |
| <i>Notropis heterolepis</i>   |                   | X                | X        |
| <i>Notropis hudsonius</i>     | X                 | X                |          |
| <i>Notropis lutrensis</i>     |                   |                  | X        |
| <i>Notropis rubellus</i>      |                   | X                | X        |
| <i>Notropis stramineus</i>    | X                 | X                | X        |
| <i>Notropis texanus</i>       | X                 | X                | X        |
| <i>Notropis umbratilus</i>    | X                 | X                | X        |
| <i>Notropis volucellus</i>    | X                 | X                | X        |
| <i>Ericymba buccata</i>       | X                 | X                | X        |
| <i>Phoxinus erythrogaster</i> |                   |                  | X        |
| <i>Pimephales vigilax</i>     |                   |                  | X        |
| <i>Campostoma anomalum</i>    | X                 | X                | X        |
| <i>Ictiobus cyprinellus</i>   |                   |                  | X        |
| <i>Capriodes cyprinus</i>     |                   | X                | X        |
| <i>Moxostoma anisurum</i>     |                   |                  | X        |
| <i>Moxostoma carinatum</i>    |                   |                  | X        |
| <i>Moxostoma duquesnei</i>    | X                 |                  | X        |
| <i>Moxostoma erythrurum</i>   |                   | X                | X        |
| <i>Hypentilium nigricans</i>  |                   | X                | X        |
| <i>Erimyzon oblongus</i>      | X                 |                  | X        |
| <i>Ictalurus punctatus</i>    |                   | X                | X        |
| <i>Noturus flavus</i>         |                   | X                | X        |
| <i>Fundulus diaphanus</i>     |                   | X                |          |
| <i>Fundulus notatus</i>       | X                 | X                | X        |
| <i>Morone chrysops</i>        |                   | X                |          |
| <i>Micropterus dolomieu</i>   |                   | X                | X        |
| <i>Lepomis gulosus</i>        |                   | X                | X        |
| <i>Lepomis humilis</i>        |                   | X                | X        |
| <i>Lepomis megalotis</i>      | X                 | X                | X        |
| <i>Lepomis microlophus</i>    |                   | X                |          |
| <i>Lepomis punctatus</i>      |                   |                  | X        |
| <i>Ambloplites rupestris</i>  | X                 | X                | X        |
| <i>Pomoxis annularis</i>      |                   |                  | X        |
| <i>Stizostedion vitreum</i>   |                   | X                |          |
| <i>Percina caprodes</i>       |                   | X                | X        |
| <i>Percina phoxocephala</i>   |                   | X                | X        |
| <i>Etheostoma caeruleum</i>   |                   | X                | X        |
| <i>Etheostoma microperca</i>  | X                 | X                | X        |
| <i>Etheostoma spectabile</i>  |                   |                  | X        |
| <i>Etheostoma zonale</i>      |                   | X                |          |

