

SURVEY AND REVIEW OF THE FISHES
OF
MAMMOTH CAVE NATIONAL PARK, KENTUCKY

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ABSTRACT

The Green River in Mammoth Cave National Park (MCNP) was sampled during 1990 to document the fish fauna. Fifty-two species were collected from 24 sites, including three species considered rare in Kentucky (*Etheostoma maculatum*, *E. tippecanoe*, and *Percina evides*). Acceptable literature and museum records document 32 additional species from Park surface and subterranean waters. Twenty-six of these were collected recently in or near the Park, including *Amblyopsis spelaea* and *Typhlichthys subterraneus*, both federal candidates for listing, from Mammoth Cave subterranean drainages; six other records are old or require verification (*Ammocrypta asprella*, *A. pellucida*, *Ericymba buccata*, *Hybopsis storeriana*, *Notropis whipplei*, and *Phenacobius uranops*). Nearly two thirds of the upper Green River drainage fauna occurs in MCNP. The Park freshwater fish fauna is perhaps the most diverse in the National Park system.

INTRODUCTION

The fish fauna of the Green River in Kentucky is among the most diverse in the state and is nationally important from the standpoint of fish zoogeography and conservation. With 226 native species, Kentucky supports about one quarter of the North American freshwater fish fauna (Burr and Warren 1986). Two thirds (151 species) of the Kentucky fauna are known from the Green River drainage, which within Kentucky is second only to the Cumberland River in fish diversity.

Prior to Pleistocene glaciation, the Green River along with the Tradewater River (and perhaps the Salt River) were headwater tributaries to the ancestral Ohio River, which was much smaller and more isolated than today. In part because of this

isolation, the Green River supports the most unusual fish fauna in the lower Ohio-upper Mississippi basin, including five endemics (*Etheostoma barbouri*, *E. barrenense*, *E. bellum*, *E. rafinesquei*, and *Moxostoma atripinne*), one species exclusively shared with the Kentucky River (*Percina (Odontopholis)* sp.), three species of cavefishes (*Amblyopsis spelaea*, *Chologaster agassizi*, and *Typhlichthys subterraneus*), and an admixture of Coastal Plain fishes that compliments the primarily upland fauna (Retzer et al. 1983, Burr and Page 1986, Burr and Warren 1986). The Green River also probably served as an important refugium and epicenter for reinvasion for northern fishes displaced by Pleistocene glaciers that did not extend south into Kentucky (Branson 1985, Burr and Page 1986, Burr and Warren 1986).

Although much of the Green River fauna is extant, a large number of species are considered rare at the federal or state level. Five species (*Amblyopsis spelaea*, *Ammocrypta asprella*, *A. pellucida*, *Cycleptus elongatus*, and *Percina macrocephala*) are candidates for listing as endangered or threatened by the United States Fish and Wildlife Service (USFWS) (1989), and 19 additional species have been assigned conservation statuses by the Kentucky Academy of Science-Kentucky State Nature Preserves Commission (KAS-KSNPC) (Warren et al. 1986). All of these fishes have been adversely affected by habitat alteration (e.g., pollution, dam building, channelization). Many have been collected from the Green River in and just upstream from MCNP (Burr and Warren 1986), which is perhaps the best remaining unimpounded segment of the river. However, a thorough survey of the Park's fish fauna has never been published.

As one of our nation's principal conservation agencies, the National Park Service (NPS) plays an important role in protecting fish and wildlife resources through the wise use and preservation of National Park land and water. In order to protect and conserve the MCNP fish fauna, the NPS must have current information regarding the fauna of the Park. The NPS, therefore, contracted with the Kentucky State Nature Preserves Commission (KSNPC) through the Eastern National Park and Monument Association to undertake an examination of the fishes within MCNP. Our primary objectives were to

1. conduct a field survey of MCNP fishes, with special emphasis on non-game species, USFWS listed and candidate species (1989, 1990), and those monitored by the KAS-KSNPC (Warren et al. 1986);
2. review the literature regarding the historic and recent fish fauna of MCNP and attempt to determine species extirpated from the Park; and
3. provide general observations regarding habitat conditions for members of the fauna.

Recent studies of MCNP fishes concentrated on the Nolin River and the Green River downstream from Cave Island. These river segments are impounded, and the studies were conducted using electrofishing equipment (Sickel et al. 1979, Laflin 1988). This method of collection is selective for large fishes (Reynolds 1983) and may result in under-representation of non-game fishes because of difficulty in seeing small fishes and collector bias for certain species (e.g., game and commercial species). We concentrated on the poorly sampled, free-flowing segment of the Green River and on fishes under-represented in electrofishing samples. By combining information from this effort with results of previous studies, a more complete picture of the MCNP fish fauna results.

STUDY AREA DESCRIPTION

MCNP is located in Barren, Edmonson, and Hart counties in south-central Kentucky (Fig. 1). The Park lies in the Shawnee Hills Mammoth Cave Plateau Subsection of the Interior Low Plateaus Physiographic Province (Quarterman and Powell 1978). To the north, the area is bounded by the Ohio River Hills and Lowland Subsection, and to the south by the Pennyroyal Plain Subsection of the Highland Rim. The Green River meanders approximately 40 km (25 mi) from east to west through the Park and is deeply entrenched in Mississippian-age limestone. Surface lithology throughout the Park is composed of soluble limestone, but ridgetops mainly north of the river and west of Turnhole Bend are capped with Mississippian- and Pennsylvanian-age sandstone and siltstone. The vast majority of the Park is covered with second-growth deciduous forest.

Flowing surface streams in the Park are limited to northern tributaries to the Green River. These streams include Buffalo and Ugly creeks, Cub Run, and Nolin River, which is impounded approximately 12 km (7.5 mi) above the mouth and flows south for more than 9.6 km (6 mi) through the western section of the Park. Surface streams are essentially nonexistent because of extensive karst development south of the river in the Pennyroyal Plain and Mammoth Cave Plateau (McGrain 1962, Kuehne 1966). Water moves down through the soluble limestone, reaches beds that dip gently northward, and flows toward the Green River. The development of the extensive Mammoth Cave system is attributed to this dissolution process and downcutting of the Green River. All of these underground streams ultimately emerge as numerous springs along the river.

The Green and Nolin rivers are impounded by Lock and Dam 6 located immediately downstream from the Park at river mile 181.7 (Fig. 1). The structure was constructed in 1906 and 1907 (NPS 1983) and was deactivated by the United States Army Corps of Engineers (1981). The entire segment of Nolin River within MCNP is impounded. The extent to which the Green River is impounded in the



Figure 1. Mammoth Cave National Park and Green River collection sites.

Park varies and is affected by rainfall and the discharge from Nolin and Green river reservoirs; the latter is approximately 160 km (100 mi) upstream from the Park (NPS 1983). During high water, the pool extends upstream to the vicinity of Mammoth Cave Ferry and Cave Island (mile 197.1-197.8) (K. Kern, *pers. comm.*; *pers. obs.*). As river discharge declines, deep, slow-moving riverine habitat extends downstream several kilometers. It should be noted that the United States Army Corps of Engineers is studying the feasibility of removing Lock and Dam 6 from the river (G. Gregory, *pers. comm.*). This would restore natural riverine habitat to this section of the Green River and Nolin River downstream from Nolin River Reservoir Dam. Upstream from Cave Island, the river is characterized by alternating riffle-run-pool habitat. Gravel and sand substrates predominate, but bedrock underlies some sections of the river. The Green River within MCNP has been designated a Kentucky Wild River (Miller, Wihry, and Lee Incorporated 1979).

From its headwaters in Casey County, the Green River flows west approximately 280 km (175 mi) to MCNP and encompasses approximately 5136 sq km (1983 sq mi) of drainage area (Bower and Jackson 1981, Kentucky Division of Water 1986). Land use is highly varied but includes extensive agricultural land, several small to medium-sized communities, and a major impoundment, Green River Reservoir. Several Kentucky highways and Interstate 65 cross the river upstream from the Park. Although the Green River generally meets all designated uses based on water-quality standards (Kentucky Division of Water 1990), the river was badly polluted with oilfield brine and associated wastes in the 1960's (Charles 1964). Sinkholes in the vicinity of MCNP have long been used as waste dumps by individuals and communities, a practice that continues today. Additional information regarding natural characteristics and human alteration of the Green River drainage are provided by Burr and Warren (1986).

METHODS

Fishes were collected from 24 sites in the Green River in MCNP between 19 April and 6 September 1990 (Table 1, Fig. 1). The Nolin River and much of the Green River downstream from Cave Island were not sampled because Laflin (1988) thoroughly electrofished these areas from 1983 through 1987, and our emphasis was the documentation of non-game and rare fishes that with few exceptions do not normally occur in impounded rivers. We made an effort to sample all habitats at each site using seines and occasionally gill nets. All specimens collected were either identified in the field, counted, and released, or fixed in 10% formalin, preserved in 35-40% isopropanol, and subsequently deposited at the Southern Illinois University at Carbondale (SIUC) Ichthyological collection. Nomenclature follows Robins et al. (1980), Page and Burr (1982), Okazaki (1984), Burr and Warren (1986), and Smith and Stearley (1989).

Table 1. Green River collection site locations by river mile in Mammoth Cave National Park, Kentucky. (Edmonson County unless indicated otherwise).

Site	Location
1.	183.6 just upstream from Nolin River. 19 Apr 1990.
2.	188.6 at Crump Island; 6.2 km ENE Brownsville. 10 Jul 1990.
3.	188.8 at Buffalo Creek. 10 Jul 1990.
4.	190.9 at upstream end Stice Island; 9.7 km NE Rhoda. 10 Jul, 16 Aug 1990.
5.	192.1 at upstream end Boardcut Island; 6.5 km ENE Rhoda. 11 Jul 1990.
6.	192.5, E bank; 6 km ENE Rhoda. 19 Apr, 11 Jul, 16 Aug 1990.
7.	193.7 at upstream end Sand Cave Island; 10.6 km ESE Brownsville. 11 Jul 1990.
8.	195.9 just downstream from Running Branch; 15.1 km ENE Rhoda. 11 Jul 1990.
9.	197.8 at downstream end Cave Island. 16 Aug 1990.
10.	198.1 at upstream end Cave Island; 14 km E Brownsville. 19 Apr, 11 Jul, 14 Aug 1990.
11.	198.6 at downstream end Floating Mill Island; 14.2 km E Brownsville. 14 Aug 1990.
12.	199.4 at upstream end unnamed island; 14 km ENE Brownsville. 19 Apr 1990.
13.	199.9 nr mouth Big Hollow; 14.5 km ENE Brownsville. 20 Apr, 16 Aug 1990.
14.	200.4 adjacent Nappers Rollover; 9.5 km W Northtown. 16 Aug 1990.
15.	200.8 just upstream from Sank Hollow; 15 km ENE Brownsville. 16 Aug 1990.
16.	201.7; 3.8 km N Mammoth Cave; 7.9 km W Northtown. 6 Sep 1990.
17.	203.1 at upstream end unnamed island; 6.6 km W Northtown. 15 Aug 1990.
18.	203.5 at Houchins Hollow; 5.8 km W Northtown. 6 Sep 1990.
19.	204 at upstream end Three Sisters Island. 15 Aug 1990.
20.	205.2; 4.3 km WNW Northtown. 6 Sep 1990. Hart County.
21.	206; 3.8 km NW Northtown. 6 Sep 1990. Hart County.
22.	206.6 nr Wilson Cave Hollow; 4.0 km NW Northtown. 15 Aug 1990. Hart County.
23.	207.4 at upstream end unnamed island. 15 Aug 1990. Hart County.
24.	207.8 upstream end MCNP; 4.5 km NNW Northtown. 15 Aug 1990. Hart County.

LITERATURE AND MUSEUM RECORD REVIEW

Perhaps the earliest report regarding the fishes of MCNP was presented by Bailey (1933) who provided a partial list of species from the cave region including many collected by Giovannoli from the Green River near the Mammoth Cave outlet in 1929. The fish populations at five sites downstream from Nolin River Reservoir were studied by Carter (1968b) to evaluate success in controlling tailwater temperature from multilevel dam releases. Unfortunately, individual species often were not identified, and collection results were pooled preventing determination of specimens collected from the river in MCNP. As part of an assessment of potential additions to the Kentucky wild river system (Clay et al. 1971), Carter (1970) examined the fish fauna of the Green River at Houchins Ferry, above Mammoth Cave Ferry, and at Dennison Ferry, and in Buffalo Creek, a tributary in MCNP at river mile 188.8. To determine impacts from proposed alterations to Green River Lock and Dam 6 just downstream from the Park, Sickel et al. (1979) collected fishes at several sites in the Green River including samples near Houchins Ferry and at Cave Island. Laflin (1988) reported results of electrofishing surveys conducted from 1970 to 1987 of the entire length of the Green and Nolin rivers in MCNP and included collections reported by Carter (1970). His study was directed primarily toward sport fishes with emphasis on muskellunge (*Esox masquinongy*). Other informative studies of fishes of the Green River drainage include Charles (1964, 1973), Carter (1968a, 1969), Laflin (1980, 1987), Harker et al. (1981), Warren and Cicerello (1982), Retzer et al. (1983), and Weddle (1986).

The Mammoth Cave system is a subterranean tributary to the Green River with a distinctive fish fauna that has long been of interest to naturalists. *Amblyopsis spelaea*, the northern cavefish, was described by DeKay (1842) from Mammoth Cave specimens. This and other cavefishes (i.e., *Chologaster agassizi* and *Typhlichthys subterraneus*) subsequently were studied in the Mammoth Cave system by a series of researchers including Tellkamp (1845), Putnam (1872), Woods and Inger (1957), and Barr and Kuehne (1962, 1971). Observations regarding the presence and behavior of epigeal stream fishes in the cave system were presented by Kuehne (1966) and Leitheuser and Holsinger (1983).

Museum records for fishes from the Park were obtained from Cornell University (CU), Field Museum of Natural History (FMNH), Harvard University Museum of Comparative Zoology (MCZ), National Museum of Natural History (NMNH), SIUC, and University of Michigan Museum of Zoology (UMMZ) (Table 2). These sources provided important records for 46 species, including those collected by Giovannoli and reported by Bailey (1933), and several considered rare by the USFWS (1989, 1990) and/or the KAS-KSNPC (Warren et al. 1986) (i.e., *Amblyopsis spelaea*, *Ammocrypta asprella*, *A. pellucida*, *Phenacobius uranops*, and

Table 2. Museum records for fishes collected from Mammoth Cave National Park (MCNP). (CU = Cornell University, FMNH= Field Museum of Natural History, MCZ = Harvard University Museum of Comparative Zoology, NMNH = National Museum of Natural History, SIUC = Southern Illinois University at Carbondale, and UMMZ = University of Michigan Museum of Zoology.)

Amblyopsis spelaea

Cedar Sink Cave stream - UMMZ 146991, 31 Aug 1939, L. Hubricht.
Mammoth Cave - CU, 1 specimen, 27 Dec 1875, J. Sloan.

~~*Ammocrypta rosalia*~~

Green River at Mammoth Cave - NMNH 89467, 2 specimens, Jul-Aug 1929, L. Giovannoli.

Ammocrypta pellucida

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Anguilla rostrata

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Aplodinotus grunniens

Green River at Three Sisters Island - SIUC 8413, 1 specimen, 4 Jul 1981, M. L. Warren, Jr. et al.

Campostoma oligolepis

Green River at/just above Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli; UMMZ, 3 Sep 1941.

Catostomus commersoni

Buffalo Creek - FMNH 43972 and 43980, Oct 1947, J. W. Winn and M. E. K. Winn.

Chologaster agassizi

Buffalo Creek - FMNH 43978, Oct 1947, J. W. Winn and M. E. K. Winn.

Cottus carolinae

Buffalo Creek - FMNH, May and Oct 1947, J. W. Winn and M. E. K. Winn.
Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Table 2 (continued).

Dorosoma cepedianum

Green River at Five Islands - SIUC, 4 Jul 1981, M. L. Warren, Jr. et al.

Green River at Three Sisters Island - SIUC 8405, 1 specimen, 4 Jul 1981,
M. L. Warren, Jr. et al.

Etheostoma bellum

Green River at Three Sisters Island - SIUC, 1 specimen, 4 Jul 1981, M. L.
Warren, Jr. et al.

Etheostoma flabellare

Buffalo Creek - FMNH, May 1947, J. W. Winn and M. E. K. Winn.

Etheostoma nigrum

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Etheostoma spectabile

Buffalo Creek - FMNH, May and Oct 1947, J. W. Winn and M. E. K. Winn.

Fundulus notatus

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Hiodon tergisus

Green River at Mammoth Cave - NMNH 89444, Jul-Aug 1929, L.
Giovannoli.

Green River at Three Sisters Island - SIUC 8404, 1 specimen, 4 Jul 1981,
M. L. Warren, Jr. et al.

Hybopsis aestivalis

Green River at Mammoth Cave - NMNH 89449, Jul-Aug 1929, L.
Giovannoli.

Hybopsis amblops

Green River at Mammoth Cave - MCZ 30691, 80 specimens, 3 Feb 1874,
F. W. Putnam.

Table 2 (continued).

~~*Hybopsis dissimilis*~~

Green River at Mammoth Cave - MCZ 30691, 12 specimens, 3 Feb 1874,
F. W. Putnam; NMNH 89450, Jul-Aug 1929, L. Giovannoli.
Green River at Three Sisters Island - SIUC 8406, 14 specimens, 4 Jul 1981,
M. L. Warren, Jr. et al.

~~*Hybopsis storeriana*~~

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Hypentelium nigricans

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Labidesthes sicculus

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Micropterus salmoides

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Minytrema melanops

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Moxostoma carinatum

Green River at Mammoth Cave - NMNH 203007, 3 specimens, Jul-Aug
1929, L. Giovannoli.
Green River at Five Islands - SIUC 9693, 3 specimens, 4 Jul 1981, M. L.
Warren, Jr. et al.

Moxostoma duquesnei

Green River at Three Sisters Island - SIUC 8410, 1 specimen, 4 Jul 1981,
M. L. Warren, Jr. et al.

Notemigonus crysoleucas

Green River at Mammoth Cave - MCZ 30691, 2 specimens, 3 Feb 1874, F.
W. Putnam.

~~*Notemigonus*~~

Green River at Mammoth Cave - MCZ 30691, 4 specimens, 3 Feb 1874, F.
W. Putnam.

Table 2 (continued).

Notropis ariommus

Green River at Mammoth Cave - MCZ 30691, 6 specimens, 3 Feb 1874, F. W. Putnam.

Notropis atherinoides

Green River at Mammoth Cave - MCZ 30691, 16 specimens, 3 Feb 1874, F. W. Putnam; NMNH, Jul-Aug 1929, L. Giovannoli.

Green River at River Styx - FMNH, 1 May 1947, J. W. Winn and M. E. K. Winn.

Notropis chrysocephalus

Buffalo Creek - FMNH, Oct 1947, J. W. Winn and M. E. K. Winn.

Green River at Mammoth Cave - MCZ 30691, 2 specimens, 3 Feb 1874, F. W. Putnam.

Notropis emiliae

Green River at Mammoth Cave - MCZ 30691, 39 specimens, 3 Feb 1874, F. W. Putnam.

Notropis photogenis

Green River at Mammoth Cave - MCZ 30691, 3 specimens, 3 Feb 1874, F. W. Putnam; NMNH, Jul-Aug 1929, L. Giovannoli.

Green River at Five Islands - SIUC 9691, 1 specimen, 4 Jul 1981, M. L. Warren, Jr. et al.

Green River at Three Sisters Island - SIUC 8407, 1 specimen, 4 Jul 1981, M. L. Warren, Jr. et al.

Notropis rubellus

Green River at Three Sisters Island - SIUC, 1 specimen, 4 Jul 1981, M. L. Warren, Jr. et al.

Notropis spilopterus

Green River at Mammoth Cave - MCZ 30691, 3 Feb 1874, F. W. Putnam; NMNH, Jul-Aug 1929, L. Giovannoli.

Green River at Five Islands - SIUC 9692, 32 specimens, 4 Jul 1981, M. L. Warren, Jr. et al.

Green River at Three Sisters Island - SIUC 8408, 23 specimens, 4 Jul 1981, M. L. Warren, Jr. et al.

Table 2 (continued).

Notropis volucellus

Green River at Three Sisters Island - SIUC 8409, 1 specimen, 4 Jul 1981,
M. L. Warren, Jr. et al.

Notropis whipplei

Green River at Mammoth Cave - MCZ 30691, 3 Feb 1874, F. W. Putnam.

Noturus eleutherus

Green River just above Mammoth Cave - UMMZ, 3 Sep 1941.

Percina caprodes

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Green River at Three Sisters Island - SIUC 8411, 2 specimens, 4 Jul 1981,
M. L. Warren, Jr. et al.

Percina copelandi

Green River at Five Islands - SIUC 9694, 1 specimen, 4 Jul 1981, M. L.
Warren, Jr. et al.

Green River at Three Sisters Island - SIUC 8412, 3 specimens, 4 Jul 1981,
M. L. Warren, Jr. et al.

Percina phoxocephala

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Phenacobius uranops

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Phoxinus erythrogaster

Buffalo Creek - FMNH, May and Oct 1947, J. W. Winn and M. E. K. Winn.

Green River at Mammoth Cave - NMNH, Jul-Aug 1929, L. Giovannoli.

Pimephales notatus

Buffalo Creek - FMNH, Oct 1947, J. W. Winn and M. E. K. Winn.

Green River at Mammoth Cave - MCZ 30691, 3 Feb 1874, F. W. Putnam;
NMNH, Jul-Aug 1929, L. Giovannoli.

Table 2 (continued).

Semotilus atromaculatus

Buffalo Creek - FMNH, May and Oct 1947, J. W. Winn and M. E. K. Winn.

Stillhouse Hollow Cave - FMNH, Nov 1950, L. P. Woods and R. F. Inger.

Typhlichthys subterraneus

Stillhouse Hollow Cave - FMNH 62051, 15 Nov 1950, 6 specimens, L. P. Woods and R. F. Inger.

Mammoth Cave - FMNH 62050, 1 specimen, 14 Nov 1950, L. P. Woods and R. F. Inger; CU, 2 specimens, Summer 1952, R. Dooley.

Floyd Collins Crystal Cave - FMNH 62047, 2 specimens, P. Smith and Huston.

Typhlichthys subterraneus). Essentially all of the aforementioned published and museum information was summarized by Burr and Warren (1986), who presented an accurate synopsis of the distribution, habitat, and other information regarding Kentucky fishes, including those in MCNP.

RESULTS

We collected 52 species of fishes from 24 sites in the Green River within MCNP in 1990 (Table 3). Individuals of the nine most numerous species (*Campostoma oligolepis*, *Notropis buchanani*, *N. rubellus*, *N. spilopterus*, *N. volucellus*, *Percina copelandi*, *P. phoxocephala*, *Pimephales notatus*, and *P. vigilax*) comprised 70% (2985) of the specimens collected. We secured three species considered rare by the KAS-KSNPC (Warren et al. 1986) (*Etheostoma maculatum*, *E. tippecanoe*, and *Percina evides*) as well as several new Park records (*Alosa chrysochloris*, *Etheostoma rafinesquei*, *E. stigmaeum*, *E. tippecanoe*, *E. zonale*, *Fundulus catenatus*, and *Percina sciera*). An additional 32 species are known from the Park based on accepted museum and literature records (Table 4).

SPECIES ACCOUNTS

The following accounts discuss the distribution and status of each fish species known from MCNP based on accepted literature or museum records and 1990 field collections. We discussed species in alphabetical order within each of three categories: federal candidate species, KAS-KSNPC listed species, and other species. Unless otherwise noted, general distribution and habitat comments are based on Burr and Warren (1986).

FEDERAL CANDIDATE SPECIES

Amblyopsis spelaea DeKay. Northern cavefish.

This obligate cave-dweller occurs in hypogean streams from Edmonson County north to Meade County (Burr and Warren 1986, Keith 1988) and is of special concern in Kentucky (Warren et al. 1986). It recently has been observed in several Mammoth Cave subterranean drainage basins (Leitheuser and Holsinger 1983).

Ammocrypta asprella (Jordan). Crystal darter.

Although not collected during this effort, the Green River within and upstream from the Park perhaps holds the most promise for rediscovering this rare fish in Kentucky. Three of the six accepted Kentucky records are from the Green River drainage, and the most recent collection from the state was made by Giovannoli in 1929 from the river at Mammoth Cave (NMNH 89467) (Burr and Warren 1986). The Green River in the Park also provides an abundance of clean sand and gravel habitat with steady to strong current that crystal darters live on and in (Kuehne and Barbour 1983, Page 1983). Finally, a single specimen recently collected from the Kanawha River in West Virginia after many unsuccessful years of collecting added *A. asprella* to that state's fauna and confirmed the continued existence of the crystal darter in the Ohio River Basin after a hiatus of 41 years (Cincotta and Hoeft 1987). This suggests that continued sampling in appropriate Green River habitat within and upstream from the Park is justified and may yield this endangered Kentucky darter (Warren et al. 1986).

Ammocrypta pellucida (Putnam). Eastern sand darter.

This darter is sporadically distributed and localized from the Green River eastward in Kentucky, and was collected in the Park at Mammoth Cave by Giovannoli in 1929 (NMNH). The eastern sand darter frequents rivers with moderate current and small gravel and sand substrates. Although this type of habitat is common in the Park, there are no recent (post-1969) records for the Green River and the continued existence of *A. pellucida* in the drainage and Park requires verification.

KENTUCKY ACADEMY OF SCIENCE-
KENTUCKY STATE NATURE PRESERVES COMMISSION SPECIES

Etheostoma maculatum Kirtland. Spotted darter.

This darter is considered threatened by KAS-KSNPC (Warren et al. 1986) and previously was known from the Park vicinity only from an unverified Nolin River record (Carter 1968b). We collected 14 mainly young-of-the-year and juvenile specimens from eight sites from Cave Island (site 10) upstream. The spotted darter inhabits rivers with rapid flow and substrates of pebble, cobble, and boulder and is probably a permanent though uncommon resident of the Green River upstream from Cave Island.

Table 3. Species composition and number of fish specimens collected by site from the Green River in Mammoth Cave National Park during 1990.

Species	1	2	3	4	5	6	7	8	9	10	11
<i>Alosa chrysocloris</i>	-	-	-	-	1	5	-	-	-	-	-
<i>Ambloplites rupestris</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Aplodinotus grunniens</i>	-	-	-	1	-	1	-	-	-	-	-
<i>Camptostoma oligolepis</i>	-	15	-	12	10	14	15	-	1	48	17
<i>Cottus caroliniae</i>	-	-	-	-	-	1	-	-	-	14	8
<i>Cyprinus carpio</i>	-	-	-	-	54	6	-	-	-	-	-
<i>Dorosoma cepedianum</i>	-	29	-	-	-	1	1	-	5	6	3
<i>Etheostoma bellum</i>	-	-	-	-	-	-	-	-	-	6	-
<i>Etheostoma blennioides</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Etheostoma caeruleum</i>	-	-	-	-	1	1	-	-	-	-	-
<i>Etheostoma maculatum</i>	-	-	-	-	-	-	-	-	-	2	-
<i>Etheostoma nigrum</i>	-	-	-	9	2	25	-	-	-	-	1
<i>Etheostoma rafinesquei</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Etheostoma stigmaeum</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Etheostoma tippecanoe</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Etheostoma zonale</i>	-	-	-	-	-	-	-	-	-	4	-
<i>Fundulus catenatus</i>	-	-	-	3	1	-	-	-	-	-	1
<i>Hiodon tergisus</i>	-	-	-	-	-	-	-	-	-	4	-
<i>Hybopsis aestivale</i>	-	-	-	-	-	-	-	-	11	-	13
<i>Hybopsis amblopi</i>	-	-	-	-	-	5	1	1	-	-	-
<i>Hybopsis dissimilis</i>	-	2	-	4	3	2	-	-	-	9	7
<i>Hypentelium nigricans</i>	-	2	1	1	1	3	1	-	-	7	3
<i>Ictalurus bubalus</i>	-	7	-	1	-	15	-	-	-	3	23
<i>Ictalurus punctatus</i>	1	-	-	1	-	3	-	-	-	-	5
<i>Labidesthes sicculus</i>	-	-	-	5	-	2	-	-	-	5	4
<i>Lepaosteus osseus</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Lepomis megalotis</i>	-	4	3	42	-	16	2	1	-	1	-
<i>Micropterus dolomieu</i>	-	-	-	-	-	-	-	-	-	1	1
<i>Micropterus punctulatus</i>	-	1	-	12	3	21	-	2	-	5	5
<i>Morone chrysops</i>	-	1	-	-	-	-	-	-	-	-	-
<i>Moxostoma anisurum</i>	1	-	-	1	-	-	-	-	-	-	-
<i>Moxostoma erythrum</i>	-	24	-	5	4	9	9	-	-	11	1
<i>Moxostoma macrolepidotum</i>	1	-	-	-	-	-	-	-	-	-	-
<i>Notemigonus crysoleucas</i>	-	-	-	-	-	-	-	-	-	-	1
<i>Notropis ariommus</i>	-	-	-	2	-	-	-	-	-	1	1
<i>Notropis atherinoides</i>	-	-	-	-	-	-	17	-	-	24	4
<i>Notropis buchani</i>	-	-	-	2	-	5	-	-	60	16	4
<i>Notropis chrysocephalus</i>	-	2	-	3	7	3	4	1	-	17	18
<i>Notropis emiliae</i>	-	-	-	2	-	-	-	-	-	-	-
<i>Notropis photogenia</i>	-	-	-	-	-	-	5	-	1	1	1
<i>Notropis rubellus</i>	-	-	-	13	-	2	-	-	18	118	11
<i>Notropis spilopterus</i>	-	1	-	95	11	32	73	1	9	72	76
<i>Notropis volucellus</i>	-	1	-	36	3	113	5	-	54	60	42
<i>Percina caprodes</i>	-	3	-	3	2	33	3	-	-	10	3
<i>Percina copelandi</i>	-	-	-	3	-	14	2	-	-	15	10
<i>Percina eides</i>	-	-	-	-	-	-	-	-	-	4	1
<i>Percina phoxocephala</i>	-	-	-	4	6	22	4	2	2	6	3
<i>Percina sciera</i>	-	-	-	-	1	-	-	-	1	-	-
<i>Pimephales notatus</i>	-	-	-	17	43	54	1	-	3	53	20
<i>Pimephales vigilax</i>	-	6	-	63	5	59	-	3	11	3	4
<i>Pygidictis olivaris</i>	-	-	-	-	-	-	-	-	-	-	-
<i>Semotilus atromaculatus</i>	-	1	-	2	6	-	-	-	-	-	-
Total individuals	3	99	4	342	164	467	143	11	176	526	291
Total species	3	15	2	26	19	27	15	7	12	29	29

12	13	14	15	16	17	18	19	20	21	22	23	24	Total specimens
-	-	-	-	-	-	-	-	-	-	-	-	-	6
-	-	-	-	1	-	-	-	-	-	-	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	2
-	37	-	9	10	3	-	6	3	1	1	9	16	227
-	2	-	2	3	3	2	2	-	-	2	3	3	45
-	-	-	-	-	-	-	-	-	-	-	-	-	60
-	1	17	2	2	-	-	-	-	2	-	-	-	69
-	-	-	1	-	-	1	5	-	1	2	-	-	16
-	-	-	-	-	1	-	-	-	-	-	-	-	1
-	-	-	-	1	-	-	-	-	-	-	-	-	3
-	2	-	-	1	2	2	-	-	2	2	1	-	14
-	-	-	-	1	-	-	-	-	-	-	-	-	38
-	-	-	-	-	-	-	-	-	-	-	1	-	1
1	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	-	-	-	-	1	-	-	-	-	-	-	1
-	1	-	8	1	1	7	9	-	2	8	8	1	50
-	-	-	-	-	-	-	-	-	-	-	2	-	7
-	-	-	-	-	-	-	-	-	-	-	-	1	5
-	2	-	7	16	1	-	-	1	15	-	-	1	67
-	-	-	-	-	-	-	-	-	-	-	-	1	8
-	2	-	1	2	2	3	3	-	5	3	-	2	50
-	1	-	-	-	1	-	-	-	-	-	1	-	22
-	-	-	-	-	-	-	-	-	-	-	-	6	55
-	2	-	1	-	4	-	-	-	-	-	1	2	20
-	5	1	6	5	-	1	2	-	-	-	5	4	45
-	-	-	-	-	-	-	1	-	-	-	-	-	1
-	-	4	-	3	-	1	2	12	4	-	-	1	96
-	-	-	-	-	-	-	2	1	-	-	-	1	6
-	4	1	6	2	6	1	9	5	2	-	-	9	94
-	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	1	-	-	-	-	-	-	-	-	-	-	3
1	-	-	-	-	-	4	-	1	-	-	-	1	70
-	-	-	-	-	-	-	-	-	-	-	-	-	1
-	-	-	-	-	-	-	-	-	-	-	-	-	1
1	10	-	3	-	-	2	7	-	1	-	-	5	33
5	-	2	-	-	-	-	3	-	-	-	-	1	56
-	188	-	-	62	-	-	-	-	-	1	-	-	338
-	5	3	2	-	1	2	12	-	1	-	5	7	93
-	-	-	-	-	-	-	-	-	-	-	-	-	2
-	6	3	2	1	2	1	3	-	3	-	3	6	38
31	35	-	52	31	36	20	15	9	7	22	18	43	481
9	13	1	21	13	10	25	8	12	5	-	7	22	516
11	35	-	20	83	21	9	-	5	43	-	1	15	557
3	1	-	7	-	-	1	3	-	8	-	1	2	83
1	10	-	7	3	15	3	-	2	2	2	1	12	102
-	3	-	1	-	2	8	7	-	8	9	3	7	53
-	4	-	8	6	25	3	3	5	-	6	-	-	109
-	-	-	-	-	-	-	-	-	-	1	-	-	3
3	20	8	57	7	22	11	14	69	15	2	24	32	475
3	2	-	1	5	2	1	3	6	1	1	-	1	180
-	1	-	-	-	-	-	-	-	-	-	-	-	1
-	1	-	-	-	-	-	-	-	-	-	-	2	12
69	393	41	224	259	160	109	119	131	128	62	94	204	4219
11	26	10	22	22	20	22	21	13	20	14	18	27	

Table 4. Fishes collected from Mammoth Cave National Park with occurrence location and United States Fish and Wildlife Service (USFWS) and Kentucky Academy of Science-Kentucky State Nature Preserves Commission (KAS-KSNPC) conservation status. (*=collected in 1990, **=literature or museum record believed extant, ***=old literature record or requires verification. 1=Green River, 2=Nolin River, 3=Buffalo Creek, 4=Mammoth Cave system. C=candidate for listing, E=Endangered, T=threatened and S=special concern.)

Name	Occurrence location	Status	
		USFWS	KAS-KSNPC
<i>Alosa chrysochloris</i> -Skipjack herring*	1	-	-
<i>Ambloplites rupestris</i> -Rock bass*	1, 3	-	-
<i>Amblyopsis spelaea</i> -Northern cavefish**	4	C	S
<i>Ammocrypta opacirostris</i> -Crystal darter***	1	C	E
<i>Ammocrypta pellucida</i> -Eastern sand darter***	1	C	S
<i>Anguilla rostrata</i> -American eel**	1	-	-
<i>Aplodinotus blydeni</i> -Freshwater drum*	1	-	-
<i>Aplodinotus blydeni</i> -Gigscale stoneroller*	1, 3	-	-
<i>Carassius auratus</i> -Goldfish**	2	-	-
<i>Catostomus commersoni</i> -White sucker**	3, 4	-	-
<i>Chologaster agassizi</i> -Spring cavefish**	3, 4	-	-
<i>Cottus bairdii</i> -Banded sculpin*	1, 3, 4	-	-
<i>Cyprinus carpio</i> -Common carp*	1, 2	-	-
<i>Dorosoma cepedianum</i> -Gizzard shad*	1, 2	-	-
<i>Ericymba buccata</i> -Silverjaw minnow***	4	-	-
<i>Esox americanus</i> -Grass pickerel**	3	-	-
<i>Esox masquinongy</i> -Muskellunge**	1	-	-
<i>Etheostoma bellum</i> -Orangefin darter*	1	-	-
<i>Etheostoma blennioides</i> -Greenside darter*	1	-	-
<i>Etheostoma caeruleum</i> -Rainbow darter*	1, 3	-	-
<i>Etheostoma flabellare</i> -Fantail darter**	3	-	-
<i>Etheostoma caeruleum</i> -Spotted darter*	1	-	T
<i>Etheostoma caeruleum</i> -Bluegill*	1	-	-
<i>Etheostoma caeruleum</i> -Tucky snubnose darter*	1	-	-
<i>Etheostoma spectabile</i> -Orangethroat darter**	3	-	-
<i>Etheostoma sigmaeum</i> -Speckled darter*	1	-	-
<i>Etheostoma tippecanoe</i> -Tippecanoe darter*	1	-	S
<i>Etheostoma zonale</i> -Banded darter*	1	-	-
<i>Fundulus catenatus</i> -Northern studfish*	1	-	-
<i>Fundulus notatus</i> -Blackstripe topminnow**	1	-	-
<i>Hiodon tergisus</i> -Mooneye*	1	-	-
<i>Hybopsis amabilis</i> -Speckled chub*	1	-	-
<i>Hybopsis amblops</i> -Bigeye chub*	1	-	-
<i>Hybopsis amblops</i> -Streamline chub*	1	-	-
<i>Hybopsis amblops</i> -Silver chub***	1	-	-
<i>Hypentelium nigricans</i> -Northern hog sucker*	1, 3	-	-
<i>Ictiobus bubalus</i> -Smallmouth buffalo*	1	-	-
<i>Ictalurus punctatus</i> -Channel catfish*	1	-	-
<i>Labidesthes sicculus</i> -Brook silverside*	1, 2	-	-
<i>Lepisosteus osseus</i> -Longnose gar*	1	-	-
<i>Lepomis cyanellus</i> -Green sunfish**	1	-	-

Table 4 (Continued).

Name	Occurrence location	Status	
		USFWS	KAS-KSNPC
<i>Lepomis gulosus</i> -Warmouth**	1, 2	-	-
<i>Lepomis macrochirus</i> -Bluegill**	1, 2	-	-
<i>Lepomis megalotis</i> -Longear sunfish*	1,2,3	-	-
<i>Lepomis microlophus</i> -Redear sunfish**	1	-	-
<i>Micropterus dolomieu</i> -Smallmouth bass*	1	-	-
<i>Micropterus punctulatus</i> -Spotted bass*	1, 2	-	-
<i>Micropterus salmoides</i> -Largemouth bass**	1, 2	-	-
<i>Minytrema melanops</i> -Spotted sucker**	1, 2	-	-
<i>Morone chrysops</i> -White bass*	1, 2	-	-
<i>Moxostoma anisurum</i> -Silver redhorse*	1	-	-
<i>Moxostoma carinatum</i> -River redhorse**	1, 2	-	-
<i>Moxostoma duquesnei</i> -Black redhorse**	1	-	-
<i>Moxostoma erythrurum</i> -Golden redhorse*	1, 2	-	-
<i>Moxostoma macrolepidotum</i> -Shorthead redhorse*	1	-	-
<i>Notemigonus crysoleucas</i> -Golden shiner*	1	-	-
~~Notropis~~ <i>Rosefin</i> shiner**	1	-	-
<i>Notropis ariommus</i> -Popeye shiner*	1	-	-
<i>Notropis atherinoides</i> -Emerald shiner*	1, 4	-	-
<i>Notropis buechanani</i> -Ghost shiner*	1	-	-
~~Notropis~~ <i>crayfish</i> striped shiner*	1, 3	-	-
~~Notropis~~ <i>lugnose</i> minnow*	1	-	-
<i>Notropis photogenis</i> -Silver shiner*	1	-	-
<i>Notropis rubellus</i> -Rosyface shiner*	1	-	-
<i>Notropis spilopterus</i> -Spotfin shiner*	1, 4	-	-
<i>Notropis volucellus</i> -Mimic shiner*	1	-	-
~~Notropis~~ <i>whipplet</i> Steelcolor shiner***	1	-	-
<i>Noturus eleutherus</i> -Mountain madtom**	1	-	-
<i>Oncorhynchus mykiss</i> -Rainbow trout**	1, 4	-	-
<i>Percina caprodes</i> -Logperch*	1	-	-
<i>Percina copelandi</i> -Channel darter*	1	-	-
<i>Percina evides</i> -Gilt darter*	1	-	S
<i>Percina phoxocephala</i> -Slenderhead darter*	1	-	-
<i>Percina sciera</i> -Dusky darter*	1	-	-
<i>Phenacobius uranops</i> -Stargazing minnow***	1	-	S
<i>Phoxinus erythrogaster</i> -Southern redbelly dace**	1, 3	-	-
<i>Pimephales notatus</i> -Bluntnose minnow*	1, 3	-	-
<i>Pimephales vigilax</i> -Bullhead minnow*	1	-	-
<i>Pomoxis annularis</i> -White crappie**	1, 2	-	-
<i>Pomoxis nigromaculatus</i> -Black crappie**	2	-	-
<i>Pylodictis olivaris</i> -Flathead catfish*	1	-	-
<i>Semotilus atromaculatus</i> -Creek chub*	1, 3, 4	-	-
<i>Stizostedion vitreum</i> -Walleye**	1	-	-
<i>Typhlichthys subterraneus</i> -Southern cavefish**	4	-	S

Etheostoma tippecanoe Jordan and Evermann. Tippecanoe darter.

The single female specimen collected at site 18 is the first record for MCNP. The Tippecanoe darter, a KAS-KSNPC special concern fish (Warren et al. 1986), is uncommon in the Green River but was recently reported from sites up- and downstream from the Park (Burr et al. 1990). The gravel riffle habitat frequented by this bottom-dweller is common in the Green River upstream from Cave Island and should support additional populations.

Percina evides (Jordan and Copeland). Gilt darter.

We collected 53 specimens of the gilt darter, half of which were juveniles, from 11 sites, all in the free-flowing segment of the Green River upstream from Cave Island (site 9). A single specimen collected from the river near Mammoth Cave (NMNH 130960) (Denoncourt 1969) is the only previous record for the Park. This darter frequents swift riffles over cobble, pebble, and gravel substrates. Though apparently not as common or widespread in the Park as other *Percina* (i.e., *P. copelandi* and *P. phoxocephala*), the gilt darter is likely a permanent resident in abundant suitable habitat upstream from Cave Island.

Phenacobius uranops Cope. Stargazing minnow.

The only MCNP record for *P. uranops* was collected in 1929 from the Green River at Mammoth Cave (NMNH). This fish ultimately may be rediscovered in gravel-bottomed riffles or runs in the Green River upstream from Cave Island. However, most Green River records for this KAS-KSNPC special concern fish (Warren et al. 1986) are from the upper reaches of the drainage.

Typhlichthys subterraneus Girard. Southern cavefish.

This cavefish is of special concern in Kentucky (Warren et al. 1986) and is generally uncommon in caves in the karst region of the Shawnee Hills and Highland Rim. Barr and Kuehne (1962) indicated that this is the most common cavefish in Mammoth Cave, and Leitheuser and Holsinger (1983) confirmed that *T. subterraneus* is present in several Mammoth Cave drainage basins.

OTHER SPECIES

Alosa chrysochloris (Rafinesque). Skipjack herring.

We collected six young-of-the-year specimens of this schooling inhabitant of the state's largest rivers from sites 5 and 6. Although the skipjack herring is known

from the mainstream Barren River, there are no previous records from MCNP or the upper Green River.

Ambloplites rupestris (Rafinesque). Rock bass.

Carter (1970) collected specimens from two Green River sites and Buffalo Creek, and Laflin (1988) reported specimens from several areas electrofished on the Green River. Although we only collected one specimen, considerable pool habitat with cover is present in the Park, and the rock bass is probably common.

Anguilla rostrata (Lesueur). American eel.

This catadromus fish is sporadically distributed across the state and known from MCNP only from collections made by Giovannoli at Mammoth Cave in 1929 (NMNH) and one specimen collected by Laflin (1988) from the Green River at the upstream end of MCNP. The movements of the eel are impeded by dams (Pflieger 1975), and it may be less common in the Green River and elsewhere than it was prior to their construction.

Aplodinotus grunniens Rafinesque. Freshwater drum.

The drum is a common inhabitant of medium to large rivers statewide and has been collected from the Park by Carter (1970), Sickel et al. (1979), Warren et al. (SIUC), and Laflin (1988). Only two specimens were collected during this study, but figures presented by Laflin (1988) indicate that anglers harvest large numbers from the Park.

Campostoma oligolepis Hubbs and Green. Largescale stoneroller.

This cyprinid is generally distributed and abundant in upland streams from the Tennessee River east to the upper Green River and the upper Cumberland River below the Falls. It is very common and widely distributed in the Green River and is also known from Buffalo Creek (Carter 1970).

Carassius auratus (Linnaeus). Goldfish.

One specimen of this introduced exotic was collected from Nolin River in MCNP by Laflin (1988) in 1983. Although sporadically distributed statewide, the reproductive status of the goldfish in Kentucky is unknown.

Catostomus commersoni (Lacepede). White sucker.

The white sucker occurs in Buffalo Creek (Carter 1970, FMNH), and Kuehne (1966) observed or collected this epigeal fish from streams in the Mammoth Cave

system. Although primarily a small stream fish, the white sucker occasionally occurs in large rivers as indicated by specimens collected by Laflin (1988) below Nolin River dam.

Chologaster agassizi Putnam. Spring cavefish.

The spring cavefish is sporadic to occasional in caves, springs, spring runs, and nearby surface streams in the Mammoth Cave area, the eastern limit of its range in Kentucky. *Chologaster agassizi* occurs in the Mammoth Cave system (Putnam 1872, Poulson 1963), where it is a regular component of the cave fauna (Kuehne 1966, Leiteuser and Holsinger 1983), and also has been collected from Buffalo Creek (FMNH).

Cottus carolinae (Gill). Banded sculpin.

In addition to the 45 specimens we collected from 12 sites, the banded sculpin has been reported from the Park by Carter (1970), Sickel et al. (1979), and Laflin (1988). This fish primarily inhabits springs and upland headwater streams and avoids turbid rivers. Based on the sources mentioned and our findings, it is probably common in both kinds of habitat in the Park.

Cyprinus carpio Linnaeus. Common carp.

The common carp is native to Eurasia and was stocked in North American waters as a potential food fish beginning in 1831 (Courtenay et al. 1986). During this study, we secured 54 young-of-the-year specimens from quiet backwaters at the upstream end of Boardcut Island (site 5). As judged from the findings reported by Carter (1970), Sickel et al. (1979), and Laflin (1988), this fish commonly occurs throughout the Green and Nolin rivers in MCNP.

Dorosoma cepedianum (Lesueur). Gizzard shad.

The gizzard shad is widely distributed and abundant statewide and in MCNP, as revealed by the large number of specimens electrofished from the Nolin and Green rivers by Laflin (1988). We observed large schools during this study.

Ericymba buccata Cope. Silverjaw minnow.

Leitheuser and Holsinger (1983) reported that *Ericymba* occurs regularly in the Mammoth Cave system. This observation needs verification because the nearest known populations of this distinctive fish are in the extreme upper and lower sections of the Green River drainage.

Esox americanus Lesueur. Grass pickerel.

The only record for the grass pickerel in MCNP is based on a single specimen collected from lower Buffalo Creek by Carter (1970) where it may persist. It occurs in sluggish, low-gradient habitats with various kinds of cover such as that found in the Green River downstream from Cave Island.

Esox masquinongy Mitchill. Muskellunge.

This fish has been stocked in the Green River in the vicinity of MCNP for several years according to Laflin (1988), who electrofished several specimens from Nolin River near the Park. The muskellunge inhabits medium to large rivers with submerged cover. Although native to streams from the Green River eastward, *E. masquinongy* has been widely stocked in the state.

Etheostoma bellum Zorach. Orangefin darter.

The orangefin darter is a Green River endemic that was previously collected from the Park by Carter (1970) at Dennison Ferry and by Warren et al. at Three Sisters Island (SIUC). Only 16 specimens were taken by us, but *E. bellum* apparently is most common in gravel to cobble riffles with moderate to swift currents in the upper reaches of the Barren and Green rivers (Kuehne and Barbour 1983, Burr and Warren 1986).

Etheostoma blennioides Rafinesque. Greenside darter.

In addition to the single specimen we collected at site 17, the only previous record for MCNP is one specimen from Dennison Ferry (Carter 1970). The greenside darter is widespread in Kentucky, tolerates a variety of conditions (Kuehne and Barbour 1983, Burr and Warren 1986), and is perhaps an uncommon or sporadic member of the MCNP fish fauna.

Etheostoma caeruleum Storer. Rainbow darter.

In addition to the three specimens collected during this effort, the only records for the rainbow darter in MCNP are from Buffalo Creek and the Green River at Dennison Ferry (Carter 1970). This fish typically inhabits upland streams such as Buffalo Creek and generally avoids large rivers such as the mainstream Green River.

Etheostoma flabellare Rafinesque. Fantail darter.

The only records for *E. flabellare* in MCNP are two collections from Buffalo Creek (Carter 1970, FMNH). This darter inhabits upland streams with sand and gravel substrates statewide, and probably persists in Buffalo Creek and other

perennial tributaries to the Nolin and Green rivers in the Park (e. g., Second and Ugly creeks).

Etheostoma nigrum Rafinesque. Johnny darter.

The johnny darter is widely distributed in Kentucky and occurs in streams with slow to moderate current. Previous records for the Park are from the Green River at Mammoth Cave (NMNH) and Cave Island (Sickel et al. 1979). We took 38 specimens in 1990, primarily from shoreline areas with slow current and sand and silt substrates in the Lock and Dam 6 pool. The johnny darter may be common in this abundant, but difficult to sample habitat downstream from Cave Island.

Etheostoma rafinesquei Burr and Page. Kentucky snubnose darter.

This Green River endemic typically occupies rock-bottomed upland streams. The single female specimen secured was likely a waif from such habitat upstream.

Etheostoma spectabile (Agassizi). Orangethroat darter.

This inhabitant of generally small upland streams has been collected from Buffalo Creek (Carter 1970, FMNH), and probably persists in this and other small perennial streams in MCNP.

Etheostoma stigmaeum (Jordan). Speckled darter.

One breeding male, secured from a gravel substrate at site 12 during April high water conditions, is the first record for the Park. The speckled darter is occasional to generally distributed in the upper reaches of the Green River drainage and may not be a permanent resident of the Park.

Etheostoma zonale (Cope). Banded darter.

The banded darter, widely distributed in the eastern two thirds of Kentucky, was collected from gravel and cobble riffles at most sites upstream from Cave Island. Though not previously reported, *E. zonale* may be common in the Green River within the Park.

Fundulus catenatus (Storer). Northern studfish.

Seven specimens of this topminnow were seined from quiet backwaters near islands (sites 4, 5, 11, and 23). Although the nearest populations are in the upper Green (Green County) and Barren (Warren County) rivers, and there are no previous MCNP records, the northern studfish is likely a resident of the Park.

Fundulus notatus (Rafinesque). Blackstripe topminnow.

This fish was collected from the Green River at Mammoth Cave in 1929 (NMNH) and at Cave Island (Sickel et al. 1979). *Fundulus notatus* may be present in low-gradient habitats in the Green or Nolin rivers, and may sporadically invade the Park from the lower Green River drainage, where it is common and widely distributed.

Hiodon tergisus Lesueur. Mooneye.

Five young-of-the-year specimens of this widespread big-river fish were collected during this effort. Previous collections were made at Mammoth Cave (NMNH), Cave Island (Sickel et al. 1979), and Three Sisters Island (SIUC), and Laflin (1988) electrofished 47 specimens from the Green River throughout MCNP in 1984.

~~*Hybopsis aestivalis*~~ (Girard). Speckled chub.

This bottom-dweller is widely distributed in the main channel of medium to large streams across the state. The only previous specimen from the Park was taken by Giovannoli in 1929 from the Green River at Mammoth Cave (NMNH 89449). We collected 67 specimens, many of which were young-of-the-year or juveniles, from firm gravel or sand substrates commonly inhabited by speckled chubs.

Hybopsis amblops (Rafinesque). Bigeye chub.

We collected eight specimens of the bigeye chub from four sites. All of the specimens were young-of-the-year or juveniles taken from sand and/or small gravel substrates in slow current. The bigeye chub occurs throughout the eastern two-thirds of Kentucky, but the only previous record for MCNP is the collection of 80 specimens from the Green River at Mammoth Cave by Putnam in 1874 (MCZ 30691). The Green River provides an abundance of habitat for the bigeye chub; its absence in previous studies may be a sampling artifact.

~~*Hybopsis dissimilis*~~ (Kirtland). Streamline chub.

The streamline chub is occasional and locally common in the upper reaches of rivers from the Green River system eastward. Previous MCNP collections were made from the Green River at Mammoth Cave by Putnam in 1874 (MCZ 30691) and Giovannoli in 1929 (NMNH 89450), and at Three Sisters Island by Warren et al. in 1981 (SIUC 8406). We took 50 specimens mainly from deep, flowing chutes, or pooled areas with little current (e.g., sites 2 and 4). With abundant habitat upstream from Mammoth Cave Ferry, the streamline chub may be more common in the Park than these results suggest.

Hybopsis storeriana (Kirtland). Silver chub.

The only record for the silver chub in MCNP is a 1929 collection by Giovannoli from the Green River at Mammoth Cave (NMNH). This bottom-dwelling fish is not common in the upper Green River (three records), but it frequents mixed gravel, sand, and silt habitats in rivers and ultimately may be secured again from such habitats in the Park.

Hypentelium nigricans (Lesueur). Northern hog sucker.

In Kentucky, this fish is generally distributed in small to large streams with moderate to swift current from the Tennessee River basin eastward. We collected 22 mainly young-of-the-year and juvenile specimens. As judged from these findings and specimens reported by Carter (1970) and Laflin (1988), the northern hog sucker is probably common in the Park.

Ictiobus bubalus (Rafinesque). Smallmouth buffalo.

In addition to the 55 young-of-the-year specimens we obtained, Laflin (1988) collected a few specimens while electrofishing in 1983 and 1984. This fish generally thrives statewide in large rivers, such as in the Green River downstream from Cave Island (site 9), and likely is more common in the Park than sampling suggests.

Ictalurus punctatus (Rafinesque). Channel catfish.

The channel catfish is generally distributed in Kentucky and occurs in streams and impoundments with a variety of substrates. We only collected 20 specimens, but Laflin (1988) reported that an average of 501 channel catfish were harvested yearly by anglers in the Park between 1983 and 1987.

Labidesthes sicculus (Cope). Brook silverside.

Generally distributed and common statewide, *L. sicculus* frequents quiet backwater areas in streams, lakes, and reservoirs. Previous records for the Park include one specimen from the Nolin River (Laflin 1988) and 10 from three Green River sites (NMNH, Carter 1970, Sickel et al. 1979). We took *L. sicculus* in limited numbers from the Green River throughout the Park.

Lepisosteus osseus (Linnaeus). Longnose gar.

Previous records of the longnose gar in MCNP were reported by Carter (1970) from the Green River above Houchins Ferry and by Laflin (1988) who electrofished specimens at several Green River sites from Houchins Ferry to the upstream boundary of the Park. We noted one dead specimen at site 19 and observed a large

school in slack water near site 16. This species characteristically occupies sluggish habitat in medium to large rivers statewide and is likely quite common in the Park.

Lepomis cyanellus Rafinesque. Green sunfish.

The only specimens of *L. cyanellus* from the Park were collected from the Green River near Houchins Ferry (Sickel et al. 1979). This highly adaptable and widely distributed fish may be common in MCNP, especially in backwaters and low-gradient areas.

Lepomis gulosus (Cuvier). Warmouth.

Laflin (1988) reported specimens from the Green River at Mammoth Cave Ferry and Nolin River. This fish occupies low gradient streams with cover, a common habitat in Nolin River and the Green River downstream from Cave Island. The warmouth is common in western Kentucky lowland habitats. Populations in the upper Green River and other eastern Kentucky streams may have been introduced.

Lepomis macrochirus Rafinesque. Bluegill.

This highly adaptable fish is generally distributed in Kentucky and a common inhabitant of the Park (Laflin 1988).

Lepomis megalotis (Rafinesque). Longear sunfish.

The longear sunfish is distributed statewide and inhabits rivers, lakes, and reservoirs of all sizes. As judged from the findings of Carter (1970), Sickel et al. (1979), Laflin (1988), and our study, the longear sunfish is generally distributed and abundant in streams of the Park.

Lepomis microlophus (Gunther). Redear sunfish.

Sickel et al. (1979) reported two specimens from the Green River near Houchins Ferry. According to Burr and Warren (1986), *L. microlophus* occurs in lowland habitats with soft substrates in western Kentucky. Specimens from east of the lower Green River may have been introduced.

Micropterus dolomieu Lacepede. Smallmouth bass.

In addition to the six young-of-the-year or juvenile specimens we secured, records for *M. dolomieu* from the Park are limited to seven specimens reported by Carter (1970) and Sickel et al. (1979). MCNP is near the western distributional limit of the smallmouth bass in the Green River, and this inhabitant of clear, upland streams with rock bottoms apparently is uncommon in the Park.

Micropterus punctulatus (Rafinesque). Spotted bass.

The spotted bass is generally distributed in rivers, lakes, and reservoirs across the state and is a common inhabitant of the Green and Nolin rivers (Carter 1970, Laflin 1988).

Micropterus salmoides (Lacepede). Largemouth bass.

The largemouth bass is generally distributed in a wide variety of habitats throughout the state and, as judged from angler harvest data presented by Laflin (1988), is common in the Park.

Minytrema melanops (Rafinesque). Spotted sucker.

This fish is widely distributed in Kentucky and frequents rivers and lakes with clay to gravel bottoms and slow current. Although not collected by us, the spotted sucker has been reported consistently in low numbers from the Park (NMNH, Carter 1970, Sickel et al. 1979, Laflin 1988).

Morone chrysops (Rafinesque). White bass.

The white bass frequents sand or rock substrates or open water in medium to large streams and reservoirs statewide. Although we secured only one specimen, according to angler harvest data presented by Laflin (1988), white bass may be common in the Green and Nolin rivers during some years.

Moxostoma anisurum (Rafinesque). Silver redhorse.

In addition to the three specimens we took, the only records of *M. anisurum* from MCNP are 11 specimens collected by Sickel et al. (1979) from the Green River near Houchins Ferry and at Cave Island. This sucker occurs sporadically in the eastern two-thirds of the state and may be relatively common in MCNP. However, it is difficult to collect from swift and/or deep riverine habitats.

Moxostoma carinatum (Cope). River redhorse.

We did not collect the river redhorse but it has been recorded from the Green River in MCNP by Giovannoli in 1929 (NMNH), Warren et al. in 1981 (SIUC), and Laflin (1988). It is sporadic to occasional in major rivers east of the lower Green River drainage. *Moxostoma carinatum* frequents pools and fast shoals with rock bottoms and permanent flow and is likely a common Park resident.

Moxostoma duquesnei (Lesueur). Black redhorse.

The black redhorse inhabits rock-bottomed pools in rivers of the eastern four fifths of the state. Although we did not collect the black redhorse, it has been taken in the Park (SIUC, Carter 1970, Laflin 1988). Based on 1984 electrofishing results (Laflin 1988), *M. duquesnei* is generally distributed and common in the Green River.

Moxostoma erythrurum (Rafinesque). Golden redhorse.

The golden redhorse is the most common and generally distributed sucker statewide and in the Park.

Moxostoma macrolepidotum (Lesueur). Shorthead redhorse.

Based on data presented by Carter (1970) and Laflin (1988), this redhorse is widely distributed in the Green River within the Park but apparently is less common than either *M. erythrurum* or *M. duquesnei*. Typical habitat consists of swift, clean streams with rock bottoms.

Notemigonus crysoleucas (Mitchill). Golden shiner.

Three specimens of the golden shiner have been collected from MCNP, two secured from the Green River at Mammoth Cave by Putnam in 1874 (MCZ) and one that we secured from the Green River at Floating Mill Island (site 11). This fish is generally distributed and common in a variety of habitats from the lower Green River westward. The golden shiner occurs sporadically in the upper Green River drainage and may be a rare resident of the Park or introduced occasionally through use as a baitfish.

~~Notropis~~ (Cope). Rosefin shiner.

The only specimens of this shiner from the Park were collected by Putnam in 1874 from the Green River at Mammoth Cave (MCZ 30691). Although the Park is near the western distributional limit of the rosefin shiner in the upper Green River drainage, specimens have been reported from nearby downstream tributaries such as Pigeon Creek (Harker et al. 1981). This suggests that persistent collecting efforts over rock substrates in or adjacent to riffles may yield specimens from the Park.

Notropis ariommus (Cope). Popeye shiner.

The popeye shiner is sporadically distributed in rock-bottomed riffles and flowing pools from the upper Green River eastward in Kentucky. Previous records from the Park include six specimens taken by Putnam in 1874 from the Green River at Mammoth Cave (MCZ 30691) and two specimens reported by Carter (1970) from

the same general area. We collected 33 specimens from 10 sites, indicating that the popeye shiner is rather uncommon in the Park or difficult to collect because of habitat affinity (i.e., deep water).

Notropis atherinoides Rafinesque. Emerald shiner.

This shiner typically occurs in the main channels of the largest rivers across the state. We collected 56 specimens from seven sites.

Notropis buchanani Meek. Ghost shiner.

The ghost shiner is occasional in big rivers and their major tributaries throughout Kentucky, where it normally occurs along stream margins and in quiet waters. Although we collected specimens from only eight sites, *N. buchanani* is quite common in suitable habitat within the Park (e.g., sites 9 and 13).

Notropis chrysocephalus (Rafinesque). Striped shiner.

With the exception of the Coastal Plain and lower Green River, the striped shiner is generally distributed and abundant in a variety of stream habitats throughout the state. We collected it from 17 sites and it was previously reported from Buffalo Creek (Carter 1970, FMNH).

Notropis emiliae (Hay). Pugnose minnow.

In MCNP, this inhabitant of natural lakes, wetlands, and quiet pools in streams is at the eastern limit of its range in Kentucky. Records for the Park include 39 specimens collected in 1874 by Putnam from the Green River at Mammoth Cave (MCZ 30691) and two specimens collected near Houchins Ferry by Sickel et al. (1979). We collected two specimens from quiet backwaters at the upstream end of Stice Island; similar habitat is present though limited downstream from Mammoth Cave.

Notropis photogenis (Cope). Silver shiner.

The silver shiner is occasional and common throughout the eastern half of Kentucky. We collected only 38 specimens from 14 sites in the Green River, perhaps reflecting the difficulty of sampling the deep waters frequented by this shiner.

Notropis rubellus (Agassizi). Rosyface shiner.

This shiner is generally distributed and abundant in small to large upland streams with rock bottoms from the upper Green River eastward. It is common in

the Green River within the Park and was abundant in flowing water upstream from Mammoth Cave Ferry.

Notropis spilopterus (Cope). Spotfin shiner.

With the exception of the Coastal Plain and the Tradewater and Pond river systems, this shiner is generally distributed and abundant statewide in streams with rocky riffles and swift current. It was first collected from the Park in 1874 by Putnam (MCZ 30691) and, as judged from our collections, is widespread and abundant in the Green River of MCNP.

Notropis volucellus (Cope). Mimic shiner.

This shiner inhabits flowing pools of medium to large streams statewide and is abundant and widespread in the Green River within the Park.

~~*Notropis whingeri*~~ (Girard). Steelcolor shiner.

The steelcolor shiner is rare in the Green River drainage upstream from the Barren River confluence and is known only from the Park from an 1874 collection by Putnam (MCZ) from the Green River at Mammoth Cave. Typical habitat is small to medium rivers near riffles with swift current.

Noturus eleutherus Jordan. Mountain madtom.

A 1941 collection from the Green River just above Mammoth Cave (UMMZ) is the only record for MCNP. This bottom-dwelling fish is sporadically distributed in Kentucky but is most common in the upper Green river drainage. The mountain madtom frequents clean-swept cobble, pebble, and gravel riffles and shoals such as those found in the Green River upstream from Mammoth Cave Ferry.

Oncorhynchus mykiss Walbaum. Rainbow trout.

This native of the Pacific northwest has been stocked in a variety of habitats throughout the state. Laflin (1988) collected one specimen of *O. mykiss* in 1984 from the Green River below Sand Cave and reported that numerous specimens were harvested from Park waters by anglers from 1983 to 1987. Leitheuser and Holsinger (1983) observed several in Pike Spring Cave and watched two consume specimens of the federally endangered Kentucky Cave Shrimp (*Palaemonias ganteri*). They suggested that trout stocked regularly in Nolin River Reservoir tailwaters or Lynn Camp Creek (upstream from Munfordville) follow temperature gradients into the Park. Rainbow trout, now residents of Pike Spring, pose a potentially serious management problem. Leitheuser and Holsinger (1983) recommended that trout be eliminated from Pike Spring for the benefit of *P. ganteri*.

Percina caprodes (Rafinesque). Logperch.

The logperch occurs in a variety of habitats and is generally distributed across the state. Although the findings of previous studies suggest the logperch is uncommon within the Park, our efforts revealed that *P. caprodes* is widely distributed and moderately common.

Percina copelandi (Jordan). Channel darter.

The channel darter is sporadic and uncommon in the upper Green River drainage and was previously collected from the Park only twice (SIUC). We found that *P. copelandi* inhabited gravel deposits in and near riffles throughout the Green River and was moderately common.

Percina phoxocephala (Nelson). Slenderhead darter.

Previous records from the Park are limited to those made from the Green River at Mammoth Cave and Dennison Ferry (Carter 1970, NMNH). We found that the slenderhead darter was moderately common in and near gravel riffles and in slow moving sand and gravel bottomed pools throughout the Green River.

Percina sciera (Swain). Dusky darter.

The dusky darter is a common inhabitant of streams from the Green River drainage westward and from the upper Kentucky River drainage eastward. However, we collected only three specimens suggesting that the dusky darter may be difficult to collect or uncommon in suitable sluggish or backwater habitats in the Park.

Phoxinus erythrogaster (Rafinesque). Southern redbelly dace.

Phoxinus erythrogaster typically inhabits well-shaded, small streams throughout the eastern two thirds of the state that have permanent flow, clear, cool water, and silt-free sand/gravel bottoms. We did not take this fish, but Giovannoli secured specimens in 1929 from the Green River at Mammoth Cave (NMNH), and Carter (1970) reported 51 specimens from two Buffalo Creek sites. This fish is a permanent resident of perennial surface streams in (e.g., Buffalo Creek) and near (e.g., Second Creek) MCNP and occurs in sinking creeks that flow north into the Park from the Mississippi Plateau (i.e., Pennyroyal Plain)(Kuehne 1966).

Pimephales notatus (Rafinesque). Bluntnose minnow.

We collected the ecologically adaptable bluntnose minnow from 20 of 24 sites sampled. This is one of the most abundant and widespread fishes in the Green River and the remainder of the state.

Pimephales vigilax (Baird and Girard). Bullhead minnow.

The bullhead minnow is occasional to generally distributed in backwater and low-gradient habitats throughout the state and is often most common in large rivers. We secured specimens from 19 of 24 sites. *Pimephales vigilax* appears to be most common downstream from Cave Island in the backwaters of Lock and Dam 6.

Pomoxis annularis Rafinesque. White crappie.

This fish occurs throughout the state in habitats with abundant cover and slow to no current. According to Laflin (1988), white crappie are harvested in great numbers by anglers in the Park.

Pomoxis nigromaculatus (Lesueur). Black crappie.

The black crappie frequents low-gradient habitat with cover that is similar to areas inhabited by the white crappie. However, in contrast to the large number of *P. annularis* harvested and electrofished from the Park, Laflin (1988) collected only one black crappie. According to Burr and Warren (1986), this fish occurs throughout the state but is generally less common than *P. annularis*.

Pylodictis olivaris (Rafinesque). Flathead catfish.

The flathead catfish is generally distributed and common statewide including the Park, as judged from angler harvest figures presented by Laflin (1988). This fish inhabits impoundments and low- to moderate-gradient rivers with abundant cover.

Semotilus atromaculatus (Mitchill). Creek chub.

The creek chub is one of the most ubiquitous fishes in Kentucky and a predominant species in small streams such as Buffalo Creek (Carter 1970, FMNH). It generally avoids big rivers like the Green River where we collected only 12 young-of-the-year or juvenile specimens.

Stizostedion vitreum (Mitchill). Walleye.

The walleye is sporadically distributed in large rivers statewide and was collected by Laflin (1988) from two sites in the Green River in 1984.

DISCUSSION

Eighty-four species of fishes representing 17 families are known from MCNP based on accepted literature and museum records and the results of 1990 field efforts (Table 4). Of the 52 species collected during 1990 (*), seven are new records for the Park. *Etheostoma rafinesquei*, *E. stigmaeum*, *E. tippecanoe*, *E. zonale*, and *Percina sciera* occur nearby (Burr and Warren 1986) and probably were not collected from the Park previously because of limited sampling in appropriate habitat and the collection methods employed (i.e., electrofishing). The new records for *Alosa chrysochloris* and *Fundulus catenatus* are intra-drainage range extensions. We did not take 32 other species collected previously from the Park. Many of these are cavefishes, game or commercial species, or small-stream fishes that were missed because of collecting methods or habitats sampled. Twenty-six (**) have been collected recently in or near the Park (Sickel et al. 1979, Leitheuser and Holsinger 1983, Burr and Warren 1986, Laflin 1988), but records for several (*Ammocrypta asprella*, *A. pellucida*, *Ericymba buccata*, *Hybopsis storeriana*, *Notropis whipplei*, and *Phenacobius uranops*) are old or require verification (***). The sighting of members of several genera of epigeal fishes (*Ambloplites*, *Carpiodes*, *Erimyzon*, *Hybopsis*, *Ictalurus*, *Lepomis*, and *Notropis*) in the Mammoth Cave system by Leitheuser and Holsinger (1983) also requires verification.

The 52 species collected in 1990 compares favorably with the results of previous studies of MCNP fishes. Carter (1970) collected 41 species but sampled only three Green River sites in addition to Buffalo Creek. Ten of the 41 species were not taken in 1990. Five (*Catostomus commersoni*, *Esox americanus*, *Etheostoma flabellare*, *E. spectabile*, and *Phoxinus erythrogaster*) were only collected from Buffalo Creek, and five others (*Lepomis macrochirus*, *Micropterus salmoides*, *Minytrema melanops*, *Moxostoma duquesnei*, and *Pomoxis annularis*) occur more widely in the Park. Eight of the 30 species secured by Sickel et al. (1979) from two sites sampled on the Green River in the Park were not collected in 1990. Six of these (*Fundulus notatus*, *Lepomis cyanellus*, *L. macrochirus*, *L. microlophus*, *Minytrema melanops*, and *Pomoxis annularis*) are known from MCNP, but *F. notatus* is only known from two records. *Morone saxatilis* is a transplanted, introduced species in Kentucky that is known from below Nolin River Reservoir dam (Burr and Warren 1986) and may occur in MCNP. Finally, Sickel's record for *Phenacobius mirabilis* is unsubstantiated. This fish inhabits the Green River lowlands, and the only previous upper Green River drainage records (Hoyt and Robison 1980) are also unsubstantiated (Burr and Warren 1986). Laflin (1988) collected 57 species from the Park exclusive of those reported by Carter (1970). Of the 19 not collected in 1990, 13 (*Anguilla rostrata*, *Catostomus commersoni*, *Esox masquinongy*, *Lepomis gulosus*, *L. macrochirus*, *Micropterus salmoides*, *Minytrema melanops*, *Moxostoma carinatum*, *M. duquesnei*, *Oncorhynchus mykiss*, *Pomoxis annularis*, *P. nigromaculatus*, and *Stizostedion vitreum*) are acceptable Park records. Five of the remainder (*Carpiodes carpio*, *C. cyprinus*, *C. velifer*, *Ictiobus cyprinellus*, and *Lepisosteus oculatus*) potentially occur in MCNP but

are not included by Burr and Warren (1986). The final fish collected by Laflin, *Hybopsis storeriana*, was included in the synoptic list with no further documentation.

Two-thirds (69%) of the 121 fishes documented from the upper Green River drainage (Burr and Warren 1986) are known from MCNP. Differences in diversity between the Nolin (15 species) and Green (74 species) rivers in the Park (Table 4) reflect greater sampling effort and habitat diversity in the latter. Any real faunistic differences between the rivers result from habitat degradation in the lower Nolin River because historically the rivers likely shared the majority of the upper Green River fauna.

Potential additions to the Park fauna are listed in Table 5. Many of these fishes inhabit the lower Green River drainage, which lies immediately to the west of the Mammoth Cave area and supports a lowland fauna that is distinctively different from the Park's upland fauna (Burr and Warren 1986). Several members of the MCNP fauna are more common in this region than in the Park (e.g., *Esox americanus*, *Fundulus notatus*, *Lepomis gulosus*, *Notemigonus crysoleucas*, *Notropis atherinoides*, *N. emiliae*), suggesting the lower Green River as a source for additions.

Aquatic systems within and upstream from the Park provide highly important habitats for a diverse array of fishes and other aquatic organisms. The Cave system includes well documented fish and invertebrate faunas of national importance (Leitheuser and Holsinger 1983), but also harbors undescribed invertebrates and epigean fishes whose ecology in the Mammoth Cave system is unknown (Kuehne 1966, Leitheuser et al. 1984). Free-flowing riffle-run-pool habitat in the Green River also is highly important and is typical of the varied conditions present in all of our large rivers prior to alteration (e.g., impoundment, channelization). Lotic situations provide habitats for many fishes, for example darters and madtoms, that are highly adapted for life on and in the bottom of well-oxygenated, flowing streams. These fishes along with many invertebrates, including most unionids, generally do not thrive in impounded streams such as the Nolin River and lower segment of the Green River in the Park. The protection of these unique, high-quality systems in and upstream from MCNP is imperative to maintain the Park's highly diverse aquatic fauna, perhaps the most diverse freshwater fauna in the National Park system.

Table 5. Potential additions to the Mammoth Cave National Park fish fauna.

Scientific Name	Common Name
<i>Ameiurus melas</i>	Black bullhead
<i>Ameiurus natalis</i>	Yellow bullhead
<i>Ammocrypta clara</i>	Western sand darter
<i>Aphredoderus sayanus</i>	Pirate perch
<i>Carpionodes carpio</i>	River carpsucker
<i>Carpionodes cyprinus</i>	Quillback
<i>Carpionodes velifer</i>	Highfin carpsucker
<i>Cycleptus elongatus</i>	Blue sucker
<i>Dorosoma petenense</i>	Threadfin shad
<i>Erimyzon oblongus</i>	Creek chubsucker
<i>Etheostoma barbouri</i>	Teardrop darter
<i>Etheostoma kennicotti</i>	Stripetail darter
<i>Etheostoma squamiceps</i>	Spottail darter
<i>Gambusia affinis</i>	Mosquitofish
<i>Hiodon alosoides</i>	Goldeye
<i>Hybognathus nuchalis</i>	Mississippi silvery minnow
<i>Ichthyomyzon bdellium</i>	Ohio lamprey
<i>Ichthyomyzon greeleyi</i>	Mountain brook lamprey
<i>Ichthyomyzon unicuspis</i>	Silver lamprey
<i>Ictiobus cyprinellus</i>	Bigmouth buffalo
<i>Lampetra aepyptera</i>	Least brook lamprey
<i>Lepisosteus oculatus</i>	Spotted gar
<i>Lepomis humilis</i>	Orangespotted sunfish
<i>Morone saxatilis</i>	Striped bass
<i>Notropis amnis</i>	Pallid shiner
<i>Notropis fumeus</i>	Ribbon shiner
<i>Notropis umbratilis</i>	Redfin shiner
<i>Noturus elegans</i>	Elegant madtom
<i>Noturus exilis</i>	Slender madtom
<i>Noturus gyrinus</i>	Tadpole madtom
<i>Noturus miurus</i>	Brindled madtom
<i>Noturus nocturnus</i>	Freckled madtom
<i>Percina macrocephala</i>	Longhead darter
<i>Percina maculata</i>	Blackside darter
<i>Percina shumardi</i>	River darter
<i>Percina vigil</i>	Saddleback darter
<i>Percina</i> species undescribed	Blackfin darter
<i>Stizostedion canadense</i>	Sauger

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