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PRESENT AND HISTORIC DISTRIBUTION OF FISHES IN SOUTH FORK WILDCAT CREEK, TIPPECANOE, CLINTON AND TIPTON COUNTIES, INDIANA

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ABSTRACT. The fish fauna of the South Fork Wildcat Creek watershed, Tippecanoe, Clinton, and Tipton counties, was studied at 88 sites to evaluate species diversity and the historical and present distribution of fish assemblages. In 2004, we used a targeted watershed survey design (n = 80) to spatially increase extrapolated data coverage produced by a random probability sampling of the Wabash River drainage. Few historic collections have been made in the watershed, with only three sites collected prior to 1950, seven sites from a survey of Tippecanoe County in 1994, and an additional 11 sites from monitoring activities between 1995 and 2003. In all, 73 species have been collected from the South Fork Wildcat Creek watershed, with only 21 species recorded from all sampling events. Dominant species include *Semotilus atromaculatus*, *Campostoma anomalum*, and *Pimephales notatus*. *Etheostoma camurum* and *Luxilus cornutus* have not been collected since the 1945 surveys. However, the absence of *Luxilus cornutus* is likely a result of taxonomic changes that resulted in *Luxilus cornutus* and *Luxilus chrysocephalus* being recognized as separate species. Six species (*Ichthyomyzon unicuspis*, *Lepisosteus osseus*, *Notropis volucellus*, *Notropis wickliffi*, *Pylodictis olivaris*, and *Lepomis microlophus*) have not been collected since 1994. In 2004, an additional 12 species (*Campostoma oligolepis*, *Nocomis biguttatus*, *Notemigonus crysoleucus*, *Phoxinus erythrogaster*, *Carpiodes velifer*, *Carpiodes carpio*, *Ictalurus punctatus*, *Noturus gyrinus*, *Gambusia affinis*, *Lepomis gulosus*, *Poxomis nigromaculatus*, and *Aplodinotus grunniens*) were the first verified records for the watershed.

Keywords: Wabash River drainage, watershed condition, fish assemblage

The Clean Water Act mandates state water quality agencies to restore and protect the surface waters of the nation. Incumbent upon meeting this goal is to have basic information on watersheds of Indiana and other states. Few studies have targeted entire watersheds (Carney et al. 1998; Simon et al. 2005), with most intensive studies focusing on county level investigations such as that of Fisher et al. (1998) for Tippecanoe County. The need to restore and protect the Wabash River begins in the tributary streams. The South Fork Wildcat Creek has been designated by the State of Indiana as an Outstanding State Resource Water; however, Outstanding State status is not based on biological assemblages. As watersheds change due to anthropogenic input, knowledge of the aquatic assemblage is imperative for trend assessment.

No surveys of the South Fork Wildcat Creek watershed exist prior to 1940. The ichthyofauna of this watershed was first examined by Gerking (1945), who collected fish from 412 sites across Indiana (three from the South Fork Wildcat Creek watershed) between 1940 and 1943, and compiled all other historical records known at the time. Fisher et al. (1998) compiled species lists from seven sites in the South Fork Wildcat Creek watershed during sampling in 1994. During 1995, the U.S. Environmental Protection Agency randomly selected sites in an intensive survey of the Eastern Corn Belt Plain. This resulted in six sites being sampled in the South Fork of the Wildcat Creek watershed. The Indiana Department of Environmental Management (IDEM) sampled five sites between 1998 and 2003 as part of the stratified random sampling design for Indiana watersheds (IDEM 1998, 2001). In all, 21 collections were recorded

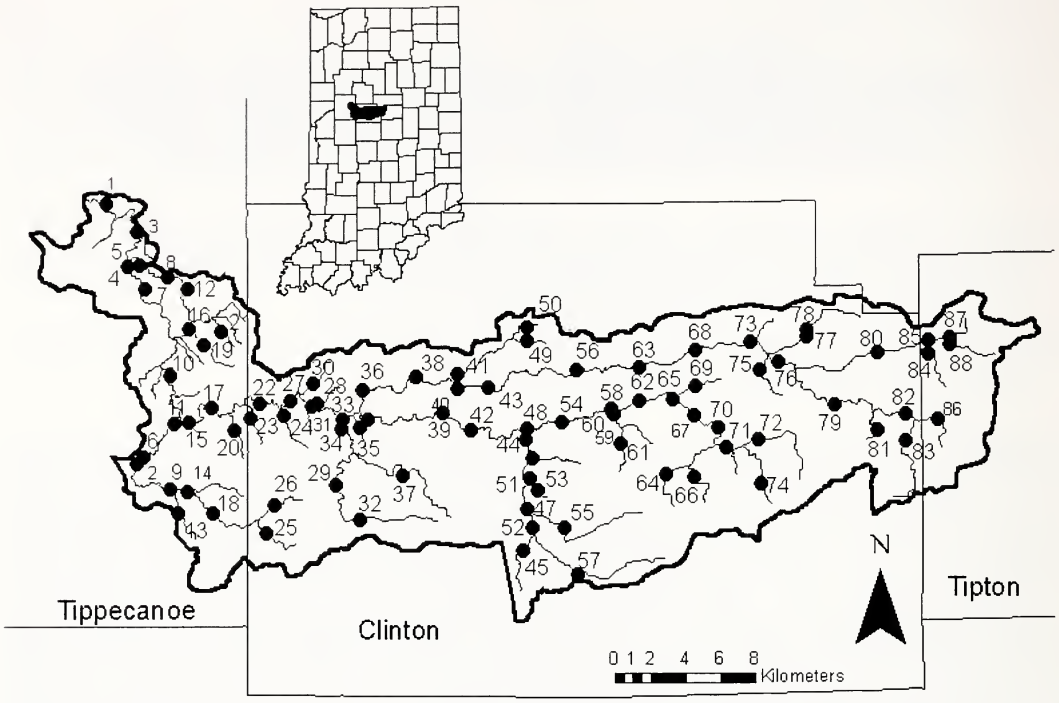

Figure 1.—Distribution of sites in the South Fork Wildcat Creek watershed from 1945 to 2004 (Gerking 1945; Fisher et al. 1998). Numbers refer to site location in Table 1.

from the South Fork Wildcat Creek watershed from 1940 to 2003 (Table 1).

In order to further our knowledge of protected and high quality waterbodies in Indiana, the current study is an intensive survey of the South Fork Wildcat Creek watershed (n = 80) (Table 1). This study was conducted by IDEM in August 2004. The objective of this study was to determine the current composition and distribution of fish assemblages inhabiting the waters of the South Fork Wildcat Creek watershed and compare the fish assemblages with that found during past surveys.

METHODS

Study area.—The South Fork Wildcat Creek watershed drains approximately 637 km^2 of southeastern Tippecanoe, central Clinton and northwestern Tipton counties (Fig. 1). The watershed drains from east to west, entering the Wildcat Creek system near West Lafayette. The watershed is located in the Eastern Corn Belt Plain ecoregion (Omernik & Gallant 1988), with agriculture being the primary landuse (80%) (Choi & Engel 2003). The watershed supports a wide range of stream conditions, from portions of the mainstem designated as State Outstanding Resource Waters to agricultural drainage ditches in the headwaters. This wide range of ecological conditions provides diverse habitat settings for fish assemblages.

Study design.—Sampling in the South Fork Wildcat Creek watershed utilized a combination of approaches based on both random and targeted sampling designs. Gerking (1945) targeted locations across the state in order to document, as fully as possible, the distribution of species found. Fisher et al. (1998) targeted sites within the geopolitical boundaries of Tippecanoe County with the intention of documenting the site specific fish assemblage data for future comparisons. From 1995–2003 a random sampling design was used that equally weighted streams in the Wabash River drainage. Sites from 1995 were part of a Regional Environmental Monitoring and Assessment Program (REMAP) for the Eastern Corn Belt Plain designed by the U.S. Environmental Protection Agency (EPA). Sites from 1998–2003 were compiled to pro-

vide an assessment of stream water quality for state reporting requirements. Sites for the random sampling designs were selected using Environmental Monitoring and Assessment Program (EMAP) selection methods, which equally weight all stream segments to assess and characterize overall water quality and biotic integrity of the watershed. Sampling included all rivers, streams, canals, and ditches within the Wabash River drainage, including the entire South Fork Wildcat Creek watershed, as indexed in the EPA River Reach File 3. Intensive sampling done in 2004 used a targeted design to evaluate stream water quality and biological condition of the South Fork Wildcat Creek watershed. This targeted approach was spatially intensive, maintaining evenness across the watershed providing a comprehensive inventory of fish assemblages.

Five study periods are summarized, including the baseline study of Gerking (1945) conducted from 1940–1943; collections made by Fisher et al. (1998) in 1994; two probability sampling events, one in 1995 (REMAP) and the second from 1998–2003 (IDEM probability sampling); and the intensive watershed study during 2004. Data reported in this study are based on vouchered fish specimens deposited at the Aquatic Research Center, Indiana Biological Survey, Bloomington, Indiana and at the Museum of Biodiversity, Ohio State University, Columbus, Ohio.

Field collections.—Fish assemblages were assessed from daytime inventories using a variety of equipment. Gerking (1945) primarily used ¼-inch mesh seines of lengths from 8–40 feet (2.5–12 m) and gill nets at selected sites. Collections made post-Gerking (1945) used seines and varying types of electrofishing gear. Small streams (< 3.3 m wetted width) were sampled using seines or a backpack or long-line unit, and wadeable streams (> 3.3 m wetted width) were sampled using a long-line or tote-barge electrofishing unit. Sampling from 1994–2004 was conducted in all representative habitats along a linear reach of stream based on 15 times the wetted width with minimum distances of 50 m and maximum distances of 500 m. All fish encountered were netted and placed into a live-well until completion of the sample zone. Individual fish were identified to species, counted, batch weighed by species, and minimum and maximum length recorded. All individuals were inspected for deformities, eroded fins, lesions, and tumor (DELT) anomalies. Fish were identified using regional identification manuals (Gerking 1955; Smith 1973; Trautman 1981).

Calculations of biological integrity.—The Index of Biotic Integrity (IBI) was used to calculate the results of the fish assemblage data to assess the stream for its ability to support aquatic life (Simon 1992; Simon & Dufour 1998; Simon & Stahl 1998; Simon 2006b). The IBI is composed of 12 metrics that assess the community's species and trophic composition (feeding and reproductive guilds) and fish condition and health. The total IBI score, integrity class and attributes help define fish community characteristics. The Indiana IBI ranks stream quality along a condition gradient with scores ranging from 12 to 60. Scores of 60 represent streams of the highest biological integrity, while scores of 12 represent highly degraded stream systems.

Indiana narrative biological criteria [327 IAC 2-1-3(2)] states that "all waters, except those designated as limited use, will be capable of supporting a well-balanced, warm water aquatic community" (IDEM 2006a). The water quality standard definition of a "well-balanced aquatic community" is "an aquatic community, which is diverse in species composition, contains several different trophic levels, and is not composed mainly of strictly pollution tolerant species" [327 IAC 2-1-9(60)] (IDEM 2006a). A stream segment is non-supporting for aquatic life use when the monitored fish community receives an IBI score of less than 36, which is considered poor or very poor (IDEM 2006b).

RESULTS AND DISCUSSION

Fish assemblages.—Based on a combination of all survey data, 72 species have been collected from the South Fork Wildcat Creek watershed between 1940 and 2004 (Table 2). This number of species represents 36% of the entire fish fauna of Indiana (Simon et al. 2002). The ichthyofauna of the watershed was summarized by Gerking (1945) based on his collections and compiled historical records prior to 1945. No records existed for the South Fork Wildcat Creek watershed prior to 1940, and only three of Gerking's 412 sites were located in the watershed. Gerking (1945) recorded 35 species from these three sites. Fisher et al. (1998) compiled a species list for Tip-

Table 1.—Site locations sampled in the South Fork Wildcat Creek watershed. Site numbers correspond to Table 2 and are shown in Figure 1. Source codes are as follows: a Gerking (1954), b Fisher et al. (1998), c REMAP (1995), d IDEM (1998–2003), e IDEM Stressor ID (2004).

Site No.	Source	County	Locality	Latitude	Longitude
1	b	Tippecanoe	S Fk Wildcat Creek @ CR 100 N	40° 25.56′	−86° 47.18′
2	c	Tippecanoe	Lauramie Creek @ 8 S Rd	40° 17.54′	−86° 46.6′
3	b, e	Tippecanoe	S Fk Wildcat Creek @ SR 26 Near Lafayette	40° 25.5′	−86° 46.5′
4	d, e	Tippecanoe	S Fk Wildcat Creek @ CR 5A E	40° 23.59′	−86° 46.28′
5	e	Tippecanoe	Trib of S Fk Wildcat Creek @ CR 550 E	40° 24.1′	−86° 45.57′
6	e	Tippecanoe	Lauramie Creek @ CR 800 S	40° 18.5′	−86° 45.50′
7	a, b, e	Tippecanoe	S Fk Wildcat Creek @ CR 200 S	40° 23.19′	−86° 45.46′
8	a	Tippecanoe	Unnamed Trib @ CR 7 E	40° 23.41′	−86° 44.49′
9	e	Tippecanoe	Lauramie Creek @ CR 9 S	40° 17.7′	−86° 44.46′
10	b, e	Tippecanoe	S Fk Wildcat Creek @ CR 500 S	40° 20.37′	−86° 44.43′
11	b, e	Tippecanoe	Lauramie Creek @ New Castle Rd	40° 19.8′	−86° 44.34′
12	e	Tippecanoe	Trib of S Fk Wildcat Creek @ CR 200 S	40° 23.19′	−86° 44.3′
13	e	Tippecanoe	Anderson Ditch @ CR 1000 S	40° 16.22′	−86° 44.26′
14	b	Tippecanoe	Lauramie Creek @ U.S. 52	40° 17.3′	−86° 44.2′
15	b, e	Tippecanoe	S Fk Wildcat Creek @ CR 900 E	40° 19.11′	−86° 43.59′
16	e	Tippecanoe	Trib of S Fk Wildcat Creek @ CR 900 E	40° 22.3′	−86° 43.58′
17	e	Tippecanoe	S Fk Wildcat Creek @ 1000 E	40° 19.37′	−86° 43.5′
18	e	Tippecanoe	Lauramie Creek @ CR 1000/10 S	40° 16.22′	−86° 43.3′
29	e	Tippecanoe	Trib of S Fk Wildcat Creek @ CR 1000 E	40° 21.34′	−85° 43.24′
20	e	Tippecanoe	Trib of S Fk Wildcat Creek @ CR 700 S	40° 18.57′	−86° 42.9′
21	e	Tippecanoe	Trib of S Fk Wildcat Creek @ CR 350 S	40° 21.59′	−86° 42.42′
22	e	Clinton	S Fk Wildcat Creek @ CR 950 W	40° 19.45′	−86° 41.8′
23	e	Clinton	Trib of S Fk Wildcat Creek @ CR 250 N	40° 19.18′	−86° 41.31′
24	e	Clinton	Trib of S Fk Wildcat Creek @ CR 250 N	40° 19.23′	−86° 40.9′
25	e	Clinton	McClellan Fickle Ditch @ CR 180 S	40° 15.44′	−86° 40.54′
26	e	Clinton	Lauramie Creek @ CR 900 W	40° 16.38′	−86° 40.32′
27	e	Clinton	S Fk Wildcat Creek @ CR 850 W	40° 19.50′	−86° 39.55′
28	a, e	Clinton	S Fk Wildcat Creek @ Mulberry Jefferson Rd	40° 19.40′	−86° 39.3′
29	e	Clinton	Lick Run @ Newcastle Road	40° 17.13′	−86° 38.6′
30	e	Clinton	Trib of S Fk Wildcat Creek @ Gasline Rd	40° 20.20′	−86° 38.59′
31	d	Clinton	S Fk Wildcat Creek @ W Mulberry-Jefferson Rd	40° 19.45′	−86° 38.50′
32	e	Clinton	Lick Run @ CR 600 W	40° 16.10′	−86° 37.8′
33	e	Clinton	Trib of S Fk Wildcat Creek @ CR 600 W	40° 19.0′	−86° 37.6′
34	e	Clinton	Spring Creek @ CR 200 N	40° 18.58′	−86° 37.50′
35	e	Clinton	S Fk Wildcat Creek @ CR 580 W	40° 19.14′	−86° 37.48′
36	e	Clinton	Kilmore Creek @ CR 600 W Near Hamilton	40° 20.9′	−86° 37.0′
37	c, e	Clinton	Heavilon Ditch @ CR 450 W	40° 17.31′	−86° 35.24′
38	e	Clinton	Kilmore Creek @ CR 400 W	40° 20.32′	−86° 34.50′
39	e	Clinton	S Fk Wildcat Creek @ CR 300 W	40° 19.26′	−86° 33.45′
40	a	Clinton	Kilmore Creek @ 2 mi. S Cambria	40° 20.10′	−86° 33.11′
41	e	Clinton	Boyles Ditch @ CR 400 N	40° 20.37′	−86° 33.11′
42	c, e	Clinton	S Fk Wildcat Creek @ CR 200 N	40° 18.54′	−86° 32.37′
43	e	Clinton	Kilmore Creek @ CR 130 W	40° 20.12′	−86° 31.55′
44	e	Clinton	Unnamed Trib @ CR 100 N	40° 18.2′	−86° 30.9′
45	e	Clinton	Trib of Prairie Creek @ SR 38/39	40° 15.10′	−86° 30.35′
46	e	Clinton	Prairie Creek @ CR 150 N	40° 18.36′	−86° 30.26′
47	e	Clinton	Prairie Creek @ Clay St	40° 16.27′	−86° 30.25′
48	e	Clinton	S Fk Wildcat Creek @ CR 00 Rd	40° 18.55′	−86° 30.22′
49	e	Clinton	Trib of Boyles Ditch @ CR 00 Rd	40° 21.39′	−86° 30.21′
50	e	Clinton	Unnamed Trib @ CR 00 Rd	40° 22.4′	−86° 30.21′

Table 1.—Continued.

Site No.	Source	County	Locality	Latitude	Longitude
51	e	Clinton	Prairie Creek @ Kyger St	40° 17.24′	−86° 30.18′
52	e	Clinton	Prairie Creek @ Kelley Rd	40° 15.52′	−86° 30.10′
53	e	Clinton	Trib of Prairie Creek @ Washington Ave	40° 17.3′	−86° 29.57′
54	e	Clinton	S Fk Wildcat Creek @ CR 130 E	40° 19.8′	−86° 28.57′
55	e	Clinton	Mann Ditch @ CR 150 S	40° 15.52′	−86° 28.53′
56	e	Clinton	Kilmore Creek @ CR 180 E	40° 20.43′	−86° 28.23′
57	e	Clinton	Prairie Creek @ CR 180 E	40° 14.27′	−86° 28.21′
58	e	Clinton	S Fk Wildcat Creek @ CR 300 E	40° 19.31′	−86° 26.60′
59	d	Clinton	Unnamed Trib @ CR 250 N	40° 19.25′	−86° 26.55′
60	e	Clinton	Trib of S Fk Wildcat Creek @ CR 250 N	40° 19.21′	−86° 26.52′
61	e	Clinton	Trib of S Fk Wildcat Creek @ Michigantown Rd	40° 18.28′	−86° 26.37′
62	e	Clinton	S Fk Wildcat Creek @ CR 400 E	40° 19.46′	−86° 25.51′
63	e	Clinton	Kilmore Creek @ CR 400 E	40° 20.47′	−86° 25.51′
64	e	Clinton	Talbert Ditch @ CR 500 E	40° 17.30′	−86° 24.48′
65	e	Clinton	S Fk Wildcat Creek @ CR 300 N	40° 19.48′	−86° 24.31′
66	e	Clinton	Walker Ditch @ SR 29	40° 17.24′	−86° 23.40′
67	c	Clinton	S Fk Wildcat Creek @ Michigantown Rd	40° 19.19′	−86° 23.39′
68	e	Clinton	Kilmore Creek @ SR 29	40° 21.20′	−86° 23.35′
69	e	Clinton	Jenkins Ditch @ SR 29	40° 20.12′	−86° 23.35′
70	e	Clinton	S Fk Wildcat Creek @ CR 200 N	40° 18.57′	−86° 22.39′
71	c, e	Clinton	S Fk Wildcat Creek @ CR 730 E	40° 18.19′	−86° 22.22′
72	e	Clinton	S Fk Wildcat Creek @ CR 830 E	40° 18.33′	−86° 21.5′
73	d, e	Clinton	Kilmore Creek @ CR 500 N	40° 21.34′	−86° 21.22′
74	e	Clinton	Cripe Ditch @ Western Walker Rd	40° 17.13′	−86° 20.60′
75	e	Clinton	Davis Ditch @ CR 400 N	40° 20.41′	−86° 20.60′
76	e	Clinton	Kilmore Creek @ CR 900 E	40° 20.55′	−86° 20.15′
77	e	Clinton	Kilmore Creek @ CR 1000 E	40° 21.44′	−86° 19.7′
78	e	Clinton	Stump Creek @ CR 1000 E	40° 21.56′	−86° 19.7′
79	c, e	Clinton	Swamp Creek @ CR 1100 E	40° 19.36′	−86° 17.58′
80	e	Clinton	Kilmore Creek @ CR 750 W	40° 21.12′	−86° 16.16′
81	e	Clinton	Trib of Swamp Creek @ CR 1250 E	40° 18.50′	−86° 16.16′
82	e	Clinton	Swamp Creek @ CR 1350 E	40° 19.18′	−86° 15.8′
83	e	Clinton	Paris Ditch @ CR 1350 E	40° 18.27′	−86° 15.8′
84	e	Tipton	Lydy Fillenworth Ditch @ CR 600 W	40° 21.9′	−86° 14.11′
85	e	Tipton	Shanty Creek @ CR 600 W	40° 21.32′	−86° 14.44′
86	e	Tipton	Mott Ditch@ CR 600 W	40° 19.7′	−86° 13.52′
87	e	Tipton	Shanty Creek @ CR 500 W	40° 21.25′	−86° 13.19′
88	e	Tipton	Collier Ditch @ CR 1100 W	40° 21.39′	−86° 13.19′

pecanoe County that incorporated data from seven sites in the South Fork Wildcat Creek watershed. Collections made between June and December 1994 recorded 47 species. In 1995, REMAP recorded 38 species from six sites. Forty-four species were recorded from five locations in the watershed through IDEM sampling efforts between 1998 and 2003. In 2004, IDEM conducted the most intensive survey of the South Fork Wildcat Creek watershed and collected 65 species from 80 sites.

Combination of records from sampling periods from 1995–2004 show that the dominant species by number included creek chub (*Semotilus atromaculatus*) (19%), central stoneroller (*Campostoma anomalum*) (14%), and bluntnose minnow (*Pimephales notatus*) (9%) (Table 3).

Fish assemblages during 1942–1945.—Gerking (1945) documented 35 species from three sites in the South Fork Wildcat Creek watershed (Table 2). Sampling sites were not chosen to represent the highest quality streams in the watershed, but were representative of the prevailing conditions at the time. Gerking (1945) reported common shiner (*Luxilus cor-*

Table 2.—List of fish species collected from the South Fork Wildcat Creek watershed. Numbers indicate the sites at which each species has been collected based on information in Table 1 and Figure 1.* This species was identified as *Lucxilus cornutus chrysocephalus*, and is now recognized as a valid species, *Luxilus chrysocephalus.*

Species	Gerking (1945)	Fisher et al., (1994)	REMAP (1995)	IDEM (1998–2003)	IDEM Stressor ID (2004)
Petromyzontidae					
Ichthyomyzon unicuspis		3, 10			
Lepisosteidae					
Lepisosteus osseus		10			
Clupidae					
Dorosoma cepedianum		3, 7	7, 37	73	3, 7, 10, 22, 27, 28, 39, 56, 63, 68, 76
Cyprinidae					
Campostoma anomalum	7, 28	1, 3, 7, 10, 11, 14, 15	2, 37, 42, 67, 71, 79	4, 31, 59, 73	3–6, 9–11, 16, 17, 20, 22–24, 28–30, 32–34, 36–39, 41–44, 48, 51–58, 60–62, 65, 68–73, 75, 80
Campostoma oligolepis					13, 18, 26, 35, 45–47, 76–79, 85
Cyprinella spiloptera	7, 28	1, 3, 7, 10, 11, 15	37, 67, 79	4, 31, 73	3, 4, 7, 9, 10, 15, 17, 22, 27, 28, 33–36, 39, 42, 43, 46, 48, 54, 56, 58, 62, 63, 65, 68, 73, 76, 79, 80, 85, 87
Cyprinella whipplei		1, 3, 7		73	3, 10, 35
Cyprinus carpio		3, 7, 10	2, 79	31, 73	3, 9, 10, 15, 22, 26, 35, 39, 45, 47, 48, 56, 58, 63, 68, 73, 76
Ericymba buccata	7, 28, 40	1, 3 ,10, 11, 14	2, 37, 67, 71	4, 8, 73	4, 1, 16, 18, 33–36, 38, 39, 43, 46, 48, 52, 54–57, 62, 70, 73, 76
Hybognathus nuchalis	7			4	4
Hybopsis amblops	7, 28	1, 3, 7, 10, 11	2, 37	4, 31, 73	3, 4, 6, 22, 28, 33–36, 39, 42, 43, 46, 48, 54, 56, 63, 68, 73
Luxilus chrysocephalus		3, 7, 10, 11, 12, 15	2, 37, 42, 67, 71, 79		6, 9, 18, 34, 42, 46–48, 51, 52, 55, 58, 62, 68, 79
*Luxilus cornutus**	7, 28, 40				

Table 2.—Continued.

Species	Gerking (1945)	Fisher et al., (1994)	REMAP (1995)	IDEM (1998–2003)	IDEM Stressor ID (2004)
Lythrurus umbratilis	7, 28	3, 10, 11, 12, 15	67, 79	59, 73	4, 26, 32, 39, 42, 46, 48, 52, 54, 56, 68, 73, 80, 81, 87
Nocomis biguttatus					37
Nocomis micropogon	7	1, 3, 7, 10, 11, 15	2	4, 31	4, 10, 33, 35
Notemigonus crysoleucus					26, 32, 37
Notropis rubellus	7, 28	7, 10, 11		31	10, 11, 28, 33–36, 43
Notropis stramineus	7	1, 3, 7, 10, 11, 15	2, 37, 67, 71	4, 31, 73	3, 4, 6, 9, 33, 35, 36, 38, 39, 42, 43, 46, 48, 51, 54, 56, 58, 62, 65, 68, 73, 76, 80
Notropis volucellus	7, 28	1			
Notropis wickliffi		1			
Phenacobius mirabilis	7	1, 3			35
Phoxinus erythrogaster					4, 13, 16, 19, 20, 23, 24, 30, 45, 57
Pimephales notatus	7, 28, 40	1, 3, 7, 10, 11, 14, 15	2, 37, 42, 67, 71, 79	4, 8, 31, 59, 73	3, 4, 6, 9, 10, 13, 15–18, 22, 23, 26–30, 32–34, 36–39, 42–48, 51, 52, 54–58, 60–65, 68, 70–76, 79, 80, 83–85, 87
Pimephales promelas		15			33, 43, 57
Rhinichthys obtusus		3, 11, 14		8, 59	4, 6, 9, 13, 16, 18–20, 23, 24, 29, 30, 32–35, 37, 41, 42, 45, 46, 51–55, 57, 58, 60–62, 64, 65, 69–72, 75, 81, 82
Semotilus atromaculatus	7	3, 10, 11, 14	2, 37, 42, 67, 71, 79	8, 59, 73	4–6, 9, 11–13, 16, 18–20, 23–26, 29, 30, 32–39, 41–58, 60–65, 68–81, 83–85, 87
Esocidae					
Esox americanus	28			8	3, 5, 12, 22, 36, 38, 43, 56, 81–83, 85

Table 2.—Continued.

Species	Gerking (1945)	Fisher et al., (1994)	REMAP (1995)	IDEM (1998–2003)	IDEM Stressor ID (2004)
Catostomidae					
Carpiodes carpio					7, 39
Carpiodes cyprinus			79	73	7, 10, 15, 22, 27, 28
Carpiodes velifer					10, 15, 17
Catostomus commersonii	28	7, 11, 14, 15	2, 37, 67, 71, 79	59, 73	4, 6, 9–11, 13, 16–18, 20, 22–24, 26, 29, 32–39, 42, 43, 46–48, 51–58, 60–63, 65, 68–76, 79–81, 83
Erimyzon oblongus	40		79	73	30, 62, 63, 68, 70, 72, 77, 79–84, 87
Hypentelium nigricans	7	1, 3, 7, 10, 11, 14, 15	2, 37, 42, 67, 71, 79	4, 31, 73	3–7, 9–11, 15, 17, 22, 27, 28, 33–36, 38, 39, 42, 43, 46, 48, 51, 54, 56, 58, 62, 63, 65, 68, 70, 73, 76
Minytrema melanops			67	73	15, 35, 39, 46, 48, 54, 56, 58, 62, 63, 65, 68, 73, 79, 80, 85
Moxostoma anisurum	7	3, 10, 15		4	3, 4, 7, 15, 17, 22, 27, 35, 39
Moxostoma duquesnei		1, 3, 7, 10, 15	37	4, 31, 73	3, 4, 7, 10, 15, 17, 22, 27, 28, 33, 35, 36, 38, 39, 42, 43, 48, 56, 58, 63, 68, 76, 79
Moxostoma erythrurum	7, 28	3, 15	37, 67	4, 31, 73	3, 4, 7, 9, 10, 15, 17, 22, 27, 28, 33, 35, 36, 38, 39, 43, 48, 54, 56, 58, 63, 65, 68, 73, 76
Moxostoma macrolepidotum		1, 7		31	1, 7, 15, 28
Ictaluridae					
Ameiurus melas		3	79		26, 57, 81, 83, 85
Ameiurus natalis		3, 11, 14	42, 67, 79	73	9, 10, 26, 37, 38, 43, 44, 46–48, 51, 52, 56, 62–65, 68, 70, 72, 73, 76, 77, 79, 80, 83, 85–87

Table 2.—Continued.

Species	Gerking (1945)	Fisher et al., (1994)	REMAP (1995)	IDEM (1998–2003)	IDEM Stressor ID (2004)
Ameiurus nebulosus			2, 42		56, 65
Ictalurus punctatus					3, 7, 35
Noturus flavus	7	3	37		39, 43
Noturus gyrinus					80, 85
Noturus miurus	7	10		4	4, 10, 43, 56
Pylodictis olivaris		1			
Fundulidae					
Fundulus notatus			79	73	64, 70, 76–78, 80, 82, 84, 85
Poeciliidae					
Gambusia affinis					64
Centrarchidae					
Ambloplites rupestris	7, 28	3, 7, 10, 11	2, 37, 67	4, 31	4, 7, 9–11, 15, 17, 18, 22, 27, 28, 33, 35, 36, 38, 42, 43, 46–48, 51, 52, 54, 56, 58, 62, 65, 71, 72, 79
Lepomis cyanellus	28	1, 3, 7, 10, 11	37, 42, 67, 71, 79	8, 59, 73	3, 4, 9–12, 17, 18, 24, 26–29, 32, 34–39, 43–49, 51, 53, 55–57, 61–63, 65, 68, 70–73, 75–88
Lepomis gulosus					27
Lepomis humilis				31, 73	22, 28, 73, 79, 83
Lepomis macrochirus	28	3, 7, 10	37, 79	4, 73	3, 4, 7, 9, 10, 15, 22, 23, 27, 28, 33–39, 42, 48, 54, 55, 62, 63, 68, 70, 73, 76–80, 85, 87
Lepomis megalotis	28, 40	1, 3, 7, 10, 11, 14, 15	2, 37, 42, 67, 71, 79	4, 31, 73	3, 4, 6, 7, 9, 10, 12, 15, 17, 22, 27, 28, 33–36, 38, 39, 42, 43, 46–48, 51, 52, 54, 56–58, 62, 63, 65, 68, 70, 72, 73, 76–80, 85, 87
Lepomis microlophus		3			
Micropterus dolomieu	7, 28	1, 3, 7, 10, 11, 15	2, 37, 67	4, 31	3, 4, 6, 7, 9–11, 15, 17, 22, 23, 27, 28, 33–36, 38, 39, 42, 43, 46, 48, 54, 56, 58, 62, 65, 70

Table 2.—Continued.

Species	Gerking (1945)	Fisher et al., (1994)	REMAP (1995)	IDEM (1998–2003)	IDEM Stressor ID (2004)
Micropterus punctulatus	7	1, 3, 10		73	4, 10, 18, 26, 28, 33, 34, 39, 44, 48, 55, 58, 61, 63, 65, 68, 73, 75–79, 85
Micropterus salmoides	40			73	3, 42, 47, 48, 58, 62, 65, 68, 70, 73, 80, 83, 85
Pomoxis annularis		3		73	3, 68
Pomoxis nigromaculatus					35
Percidae					
Etheostoma blennioides	7, 40	1, 3, 7, 10, 11, 15	2, 37, 42, 67, 71, 79	4, 31, 73	3, 4, 6, 7, 9–11, 15, 17, 18, 22, 27, 28, 33–36, 38, 39, 42, 43, 46, 48, 51, 54, 56, 58, 62, 63, 65, 68, 70, 72, 73, 76, 80, 87
Etheostoma caeruleum	7, 28, 40	1, 3, 7, 10, 11, 15	37, 42, 67, 71, 79	4, 31, 73	3, 4, 6, 7, 9–11, 15, 17, 22, 23, 27–29, 33–36, 38, 39, 42, 43, 47, 48, 51, 52, 54, 56, 58, 62, 63, 65, 68, 70, 71, 73, 76, 78
Etheostoma camurum	7				
Etheostoma flabellare	7	11, 14	37		28, 36, 43
Etheostoma microperca			71		12, 62, 64, 71, 72, 74
Etheostoma nigrum	28, 40	3, 10, 11, 14	2, 37, 42, 67, 71, 79	4, 59, 73	3, 4, 6, 7, 9–11, 15, 18, 22–29, 32–39, 42–48, 51, 52, 54–58, 60, 62–65, 68–73, 75, 76, 79, 80, 87
Etheostoma spectabile		3, 10, 11, 14	2, 42, 67, 71, 79	8	3–6, 9–11, 13, 16–20, 23–26, 29, 30, 32, 35, 37, 42, 44–49, 51, 52, 54, 55, 58, 61–64, 69–72, 75, 77, 78, 80, 81, 87
Percina caprodes			37		28
Percina maculata				73	27, 43, 56, 63, 68, 73
Percina sciera		1, 3, 10, 11	2, 37	4	3, 4, 10, 11, 15, 17, 22, 28, 33, 38, 43, 63

Table 2.—Continued.

Species	Gerking (1945)	Fisher et al., (1994)	REMAP (1995)	IDEM (1998–2003)	IDEM Stressor ID (2004)
Sciaenidae					
Aplodinotus grunniens					3, 7, 10, 33, 35, 63
Cottidae					
Cottus bairdii	7	3, 10, 11, 14	2, 37	4	4, 6, 9, 11, 13, 16, 18, 23, 24, 29, 32, 34, 36–38, 41–43

nutus chrysocephalus) from the watershed. The taxonomy of the *Luxilus* group post-Gerking has changed, and it is clear that the species reported by Gerking is actually the striped shiner (*Luxilus chrysocephalus*). Although these two species occur in the Great Lakes basin, only *Luxilus chrysocephalus* is present in the Ohio River basin. Gerking (1945) was the last to report the bluebreast darter (*Etheostoma camurum*) from the South Fork Wildcat Creek watershed. This species, which was recently removed from the state endangered species list, is believed to be extirpated from the watershed. No further record of the species is known from the South Fork Wildcat Creek watershed; however, the species has been collected from the Wabash River near the mouth of Wildcat Creek (B.E. Fisher, Indiana DNR, pers. comm.).

Fish assemblages during 1994.—Fisher et al. (1998) collected 47 species, which included most of the species previously collected by Gerking (Table 2) and added 18 new records for the South Fork Wildcat Creek watershed, including silver lamprey (*Ichthyomyzon unicuspis*), longnose gar (*Lepisosteus osseus*), gizzard shad (*Dorsoma cepedianum*), steelcolor shiner (*Cyprinella whipplei*), carp (*Cyprinus carpio*), channel shiner (*Notropis wickliffi*), fathead minnow (*Pimephales promelas*), western blacknose dace (*Rhinichthys obtusus*), river carpsucker (*Carpiodes carpio*), black redhorse (*Moxostoma duquesnei*), shorthead redhorse (*Moxostoma macrolepidotum*), black bullhead (*Ameiurus melas*), yellow bullhead (*Ameiurus natalis*), flathead catfish (*Pylodictis olivaris*), redear sunfish (*Lepomis microlophus*), white crappie (*Pomoxis annularis*), orangethroat darter (*Etheostoma spectabile*), and dusky darter (*Percina sciera*) (Table 2). Fisher et al. documented the last records for six species (*Ichthyomyzon unicuspis*, *Lepisosteus osseus*, *Notropis volucellus*, *Notropis wickliffi*, *Pylodictis olivaris*, and *Lepomis microlophus*) from the South Fork Wildcat Creek Watershed. All of the species last collected by Fisher et al. are large-river habitat species that may have entered the South Fork Wildcat Creek from the mainstem Wabash River. Fisher's sites were less than 14 river miles (22.5 km) from the mouth of the Wabash River.

Fish assemblages during 1994–1995.—During this period, 38 species were collected during a survey of the Eastern Corn Belt Plain (Table 2; Simon unpubl. data). Six species were newly recorded from the watershed including: quillback (*Carpiodes cyprinus*), spotted sucker (*Minytrema melanops*), brown bullhead (*Ameiurus nebulosus*), blackstripe topminnow (*Fundulus notatus*), least darter (*Etheostoma microperca*), and logperch (*Percina caprodes*) (Table 2). All of the sucker species records are large-river habitat species. These species are more difficult to collect and are not generally present in small streams. The least darter (Etheostoma microperca) is one of the smallest fish in North America and is often overlooked and easily missed due to gear problems. By using the smallest standard barmesh (5 mm stretch), the capture of the least darter was recorded. The logperch is a large- to moderate-sized river species that occurs in run habitat types.

Fish assemblages during 1998–2003.—During this period 44 species were collected from five sites in the South Fork Wildcat Creek watershed (Table 2). Two species were newly recorded during this time period, including orangespotted sunfish (*Lepomis humilis*) and blackside darter (*Percina maculata*)

Table 3.—Comparison of probabilistic data collected from three periods in the South Fork Wildcat Creek watershed from 1995 to 2004. REMAP - Regional Environmental Monitoring and Assessment Program (1995); Probability - Random sampling design on Upper Wabash River drainage (1995–2003); Stressor - Targeted sampling design on South Fork Wildcat Creek drainage (2004).

	REMAP		Probability		Stressor		Total	
Species	Count	%	Count	%	Count	%	Count	%
Clupeidae								
Dorosoma cepedianum	1	<1%	12	1%	90	<1%	103	<1%
Cyprinidae								
Campostoma anomalum	417	22%	56	3%	3399	15%	3872	14%
Campostoma oligolepis					549	2%	549	2%
Cyprinella spiloptera	18	1%	65	4%	367	2%	450	2%
Cyprinella whipplei		<1%	1	<1%	9	<1%	10	<1%
Cyprinus carpio	16	1%	17	1%	67	<1%	100	<1%
Ericymba buccata	18	1%	36	2%	173	1%	227	1%
Hybognathus nuchalis			1	<1%			1	<1%
Hybopsis amblops	8	<1%	30	2%	337	1%	375	1%
Luxilus chrysocephalus	69	4%			92	<1%	161	1%
Lythrurus umbratilis	3	<1%	12	1%	79	<1%	94	<1%
Nocomis biguttatus					1	<1%	1	<1%
Nocomis micropogon	6	<1%	12	1%	4	<1%	22	<1%
Notemigonus crysoleucus					12	<1%	12	<1%
Notropis rubellus			14	1%	50	<1%	64	<1%
Notropis stramineus	39	2%	39	2%	255	1%	333	1%
Phenacobius mirabilis					1	<1%	1	<1%
Phoxinus erythrogaster					137	1%	137	1%
Pimephales notatus	205	11%	390	22%	1996	9%	2591	10%
Pimephales promelas	2				3	<1%	5	<1%
Rhinichthys obtusus			7	<1%	1742	7%	1749	7%
Semotilus atromaculatus	224	12%	220	13%	4773	21%	5217	19%
Esocidae								
Esox americanus			3	<1%	44	<1%	47	<1%
Catostomidae								
Carpiodes carpio	1	<1%		<1%	9	<1%	10	<1%
Carpiodes cyprinus	2	<1%	1	<1%	10	<1%	13	<1%
Carpiodes velifer					6	<1%	6	<1%
Catostomus commersonii	126	7%	44	3%	1205	5%	1375	5%
Erimyzon oblongus	12	1%	6	<1%	39	<1%	57	<1%
Hypentelium nigricans	63	3%	36	2%	440	2%	539	2%
Minytrema melaonps	1	<1%	27	2%	60	<1%	88	<1%
Moxostoma anisurum			1	<1%	20	<1%	21	<1%
Moxostoma duquesnei	8	<1%	75	4%	333	1%	416	2%
Moxostoma erythrurum	6	<1%	97	6%	319	1%	422	2%
Moxostoma macrolepidotum			1	<1%	5	<1%	6	<1%
Ictaluridae								
Ameiurus melas	2	<1%			11	<1%	13	<1%
Ameiurus natalis	10	1%	45	3%	107	<1%	162	1%
Ameiurus nebulosus	2	<1%			2	<1%	4	<1%
Ictalurus punctatus					4	<1%	4	<1%
Noturus flavus	1	<1%			2	<1%	3	<1%
Noturus gyrinus					3	<1%	3	<1%
Noturus miurus			1	<1%	8	<1%	9	<1%

Table 3.—Continued.

Species	REMAP		Probability		Stressor		Total	
	Count	%	Count	%	Count	%	Count	%
Fundulidae								
Fundulus notatus	14	1%	4	<1%	47	<1%	65	<1%
Poeciliidae								
Gambusia affinis					6	<1%	6	<1%
Centrarchidae								
Ambloplites rupestris	9	<1%	4	<1%	153	1%	166	1%
Lepomis cyanellus	22	1%	92	5%	742	3%	856	3%
Lepomis gulosus					2	<1%	2	<1%
Lepomis humilis			16	1%	22	<1%	38	<1%
Lepomis macrochirus	3	<1%	22	1%	150	1%	175	1%
Lepomis megalotis	63	3%	192	11%	781	3%	1036	4%
Micropterus dolomieu	5	<1%	3	<1%	164	1%	172	1%
Micropterus punctulatus			17	1%	55	<1%	72	<1%
Micropturus salmoides			4	<1%	34	<1%	38	<1%
Pomoxis annularis			1	<1%	2	<1%	3	<1%
Poxomis nigromaculatus					1	<1%	1	<1%
Percidae								
Etheostoma blennioides	119	6%	59	3%	1007	4%	1185	4%
Etheostoma caeruleum	152	8%	23	1%	836	4%	1011	4%
Etheostoma flabellare	8	<1%			5	<1%	13	<1%
Etheostoma microperca	1	<1%			108	<1%	109	<1%
Etheostoma nigrum	113	6%	29	2%	1150	5%	1292	5%
Etheostoma spectabile	128	7%	1	<1%	724	3%	853	3%
Percina caprodes	1	<1%			1	<1%	2	<1%
Percina maculata			1	<1%	13	<1%	14	<1%
Percina sciera	3	<1%	24	1%	44	<1%	71	<1%
Sciaenidae								
Aplodinotus grunniens					11	<1%	11	<1%
Cottidae								
Cottus bairdii	8	<1%	6	<1%	408	2%	422	2%

(Table 2). *Percina maculata* prefers woody debris habitats, while *Lepomis humilis* is characteristic of open, turbid, prairie streams. Those species collected during these sampling events that were not previously recorded in 1994 sampling events include: Mississippi silvery minnow (*Hybognathus nuchalis*), grass pickerel (*Esox americanus*), orangespotted sunfish (*Lepomis humilis*), largemouth bass (*Micropturus salmoides*), and blackside darter (*Percina maculata*) (Table 2).

Fish assemblages during 2004.—During this time period 65 species were collected from 80 sites (Table 2). Eleven species were newly collected during this period including: largescale stoneroller (*Campostoma oligolepis*), hornyhead chub (*Nocomis biguttatus*), golden shiner (*Notemigonus crysoleucus*), southern redbelly dace (*Phoxinus erythrogaster*), river carpsucker (*Carpiodes carpio*), highfin carpsucker (*Carpiodes velifer*), channel catfish (*Ictalurus punctatus*), tadpole madtom (*Noturus gyrinus*), mosquitofish (*Gambusia affinis*), warmouth (*Lepomis gulosus*), black crappie (*Poxomis nigromaculatus*), and freshwater drum (*Aplodinotus grunniens*) (Table 2).

Fish fauna similarity concordance.—During 2004, we re-sampled four of the seven sites sampled by Fisher et. al. (1998) from 1994. These four sites were located in Tippecanoe County. The South Fork Wildcat Creek, SR 26 near Lafayette, had 43 species recorded during 1994 and 2004 with a simi-

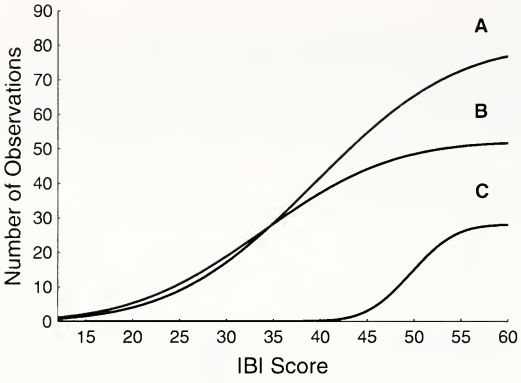

Figure 2.—Cumulative frequency distribution of IBI scores for the South Fork Wildcat Creek watershed for the 2004 survey. A = all sites, B = headwater sites (drainage area < 51.8 km^2), and C = wadeable/mainstem sites (drainage area > 51.8 km^2).

larity coefficient of 51.2%. The site on South Fork Wildcat Creek, CR 200 S bridge, yielded 42 species with a similarity coefficient of 26.2%, while a third site on South Fork Wildcat Creek yielded 37 species with similarity of 54.1%. The last site, Lauramie Creek, New Castle Road, had 26 species with a similarity coefficient of 53.8%.

Condition of the South Fork Wildcat Creek watershed.—Based on the 2004 intensive watershed survey, the South Fork Wildcat Creek watershed had an index of biotic integrity scores that range from 12 to 56 (mean = 39; Fig. 2). Seventy percent of the watershed is exceeding the State minimum IBI score with 29% achieving IBI scores ≥48, which is considered to be "good" to "excellent" condition. Thirty percent of the watershed is considered to be biologically impaired (IBI score <36). All sites demonstrating biological impairments (IBI ≤35) were headwater streams with drainage areas less then 51.8 km^2 (Fig. 2). IBI scores for these headwater streams range from 12 to 56 (mean = 34). Conversely, IBI scores for those streams with drainage areas greater then 51.8 km^2 range from 42 to 54 (mean=50; Fig. 2). Restoration efforts should focus on headwater streams in the watershed in order to protect the biological integrity of the larger streams in the watershed.

The current comprehensive study of the fishes of the South Fork Wildcat Creek watershed advances our understanding of this rich and diverse watershed increasing the known species from the watershed to 73. The need for comprehensive inventories of watershed-specific fish assemblages is vital for trend assessment and to determine changes to specific guild or sensitive species. With continued emphasis being placed on maintaining and improving the water quality and biological integrity of watersheds, further efforts should be made to restore headwater streams in the South Fork Wildcat Creek watershed.

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