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The Pallid Shiner, *Notropis amnis* Hubbs and Greene, A Rare Illinois Fish

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ABSTRACT

The pallid shiner, *Notropis amnis*, a minnow thought to have been extirpated from Illinois, was collected in the Kankakee River in Will County, near Custer Park in 1978, 1979, 1981, and 1982. Specimens were collected in lentic areas of the river having negligible current and a sand-silt substrate. Thirty-six other species of fishes were collected in seine hauls with *N. amnis*, the most common being *N. spilopterus*, *Pimephales notatus*, *P. vigilax*, *N. stramineus*, and *Lepomis humilis*. Cluster analyses of the minnows, using water quality variables, indicated that *N. amnis* preferred conditions most similar to those chosen by *P. vigilax* and *P. promelas*.

INTRODUCTION

The pallid shiner, *Notropis amnis* Hubbs and Greene, is one of the rarest and least known American fishes (Smith, 1979). Its range extends from the Mississippi River in Minnesota and Wisconsin south to the Amite River in Louisiana and west to the Guadalupe River in Texas (Clemmer, 1980). This fish is rare in the northern half of its range, and since 1970 most specimens have been taken from backwaters of the Mississippi River in Wisconsin, primarily between the Wisconsin-Illinois border and Prairie du Chien (Don Fago, Wisconsin Department of Natural Resources, personal communication). This species has shown the most marked decline of any fish in Missouri and may have been eliminated from that state (Pfleiger 1975). It was thought to be extirpated from Illinois until its recent collection in the Kankakee River. Since 1978, Illinois Natural History Survey biologists have collected 18 specimens, 15 in August collections and 3 in November. Prior to these collections only 22 specimens of *N. amnis* were considered Illinois records, the last collected in 1963 (Table 1). This note will add to the information on this

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rare species by describing the habitat, water-quality parameters, and species associations at collection locations. Specimens upon which this paper is based are retained in the Ichthyological Collection of the Illinois Natural History Survey, Champaign, Illinois.

SITE DESCRIPTION

Fishes were collected in the Kankakee River, 0.6 km to 1.1 km north of Custer Park, Will County, Illinois, approximately 23 km upstream of its confluence with the Des Plaines River. Pallid shiners were collected at Stations 3R, 5L and 5R within the Braidwood Aquatic Monitoring Area (Figure 1). This area incorporates the riverside intake (3R) and discharge (4R) structures for Commonwealth Edison's Braidwood Generating Station, scheduled for on-line activity in 1985. Station 3R was located on a narrow river reach approximately 125 m wide. When a single specimen of *N. amnis* was collected at Station 3R in 1978, water velocity was negligible there due to low flow, which exposed a riffle immediately upstream that channeled water to the opposite bank. Seining areas at Station 3R were characterized by a steep-sided, shaded, muddy bank with some undercut roots. The substrate was primarily silt-covered bedrock. Stations 5L and 5R were within a wide (250 m) area of the river, lentic in nature. Station 5 was approximately 500 m downstream from Station 3. The shoreline at Stations 5L and 5R was mildly sloping with sparse aquatic vegetation. The substrate at unshaded Station 5L was primarily fine sand and silt with some large rocks and cinder blocks near the bank. The substrate at partially shaded Station 5R was predominantly fine sand with some silt.

METHODS

All fishes were collected using a 7.65-m by 1.22-m nylon seine (King 4.76 mm^2 mesh) that included a 1.22 -m by 1.22-m by 1.22-m bag. Two discrete 15-m sites within each station were seined once on each of two separate dates approximately 1 week apart. These four seine hauls represented the total seining effort at a station during a given sampling month. Sampling was conducted in May, August, and November 1977-79 and in August 1981-82. All small fishes were fixed in 10-percent formalin, returned to the laboratory, soaked in tap water for 24 hours, and preserved in 70-percent ethanol. After preservation, specimens were measured for total length and weight. Large fishes were processed in the field and released.

Water-quality measurements for each station included current velocity, temperature, dissolved oxygen, depth, turbidity, pH, and conductivity. Due to the proximity of the two sampling sites within a station, one set of water-quality values was used to characterize that station on a given day. These characteristics were assigned to each fish collected, and weighted mean parameter values for each species were calculated from fishes collected at all stations during August 1979. Cluster analysis (Statistical Analysis System 1979; Standardized, Mean = 0, Standard Deviation = 1) incorporating these mean values was performed on all minnows (Cyprinidae) to detect natural assemblages of species.

RESULTS AND DISCUSSION

Notropis amnis from the Kankakee River was found in areas of slight current, no measurable current, and backflow (Table 2). Although turbidities during collecting periods were low, the river is subject to dramatic increases in turbidity (as high as 300 NTU) during storm periods. All *N. amnis* were collected in seinable areas at water depths no greater than 1.5 m. Water temperatures varied seasonally, with specimens collected in water 6.0°C to 29.5°C. These quantitative data supplement earlier obsrevations, such as turbidity ranging from "clear" to "very muddy" (Hubbs, 1951) and that *N. amnis* is somewhat tolerant of turbidity (Clay, 1975). Pflieger (1975) states that this species is intolerant of excessive siltation and turbidity. Several studies have shown that *N. amnis* resides in slowly moving waters (Hubbs, 1951; Miller and Robison, 1973; Clay, 1975; Pflieger, 1975). When collected from the Mississippi River, it has been found in flowing water over sand bars (Harlan and Speaker, 1969; Eddy and Underhill, 1974).

Station 5, where most of the specimens were collected (10 at Station 5L, 7 at 5R, 1 at 3R), was a slack-water, depositional area despite fluctuating levels of river discharge — unlike other stations within the study area that were periodically scoured by currents. Year-round slow current and depositional substrate appear to be the preferred habitat of *N. amnis*, since no specimens were collected in any other habitat type despite extensive sampling throughout the monitoring area.

Good water quality throughout the study area, as indicated by the analysis of 54 water quality parameters (Skelly and Sule, 1980), and a variety of habitats are important to the maintenance of the diverse Kankakee River assemblage of fishes, totaling at least 72 species. The Kankakee River in Illinois is noted for its good water quality, diverse aquatic life, and scenic beauty (Ivens et al. 1981).

Notropis amnis seldom enters the mouth of tributary streams (Hubbs, 1951; Eddy and Underhill, 1974). The lentic characteristics within the mouth of Horse Creek, a third order stream (Horton-Strahler system) entering the Kankakee River within the study area, were quite similar to those of Station 5, yet no pallid shiners were collected from that creek. Hubbs (1951) suggested that *N. amnis* in its northern range is confined to the large lowland rivers, possibly because large rivers are warmer than small to medium-sized streams. Small streams like Horse Creek are also subject to sudden increases in current that may be unacceptable to *N. amnis*.

Fishes collected in seine hauls at stations where *N. amnis* was collected included 36 other species representing 8 families (Table 3). Species and abundance of fishes collected varied by date and station. However, the most common associations and those found during each sampling period included *Notropis spilopterus* and *Pimephales notatus*. *P. vigilax* and *Notropis stramineus* were abundant during several collections, and *Lepomis humilis* was occasionally common. *N. spilopterus* is the only member of this group that is considered tolerant of high gradient streams. The others are characteristic of quiet pools and backwaters of medium to moderately large streams. Both *N. spilopterus* and *L. humilis* are somewhat tolerant of turbid conditions (Pflieger, 1975).

The cluster analysis of minnows (Figure 2), based on weighted mean water-quality values assigned to each species (Table 4), showed that *N. amnis* was quite distant from most species except *P. vigilax* and *P. promelas*. *Pimephales vigilax* was restricted to the slowly moving right side of the river and Station 5L during August 1979, whereas *P. notatus* was common throughout the study area, and hence, its distance from *N. amnis* in the cluster.

Notropis amnis has not been officially listed as endangered or threatened in Illinois, because it was believed to have been extirpated (Brigham et al., 1981). This species, now known to exist in Illinois waters, has been proposed by the Illinois Endangered Species Technical Advisory Committee on Fishes for consideration as a threatened species. Additional studies, especially on the Mississippi and Kankakee Rivers, are critical if the exact status of this fish in Illinois is to be determined.

Authors' Note: Additional information concerning *Notropis amnis* is now available in: Becker, G.C. 1983. Fishes of Wisconsin. University of Wisconsin Press, Madison. 1052 pp.

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Table 1. Locations where *Notropis amnis* has been collected in Illinois.

River	Location	County	Date	Number of Specimens	Collectors	Catalogue Number
—	Berwyn	Cook	1900	3	A. P. Ford	FMNH 61753[a]
Rock	Oxbow Island	Rock Island	10 July 1925	3*	—	—
Sangamon	3.2 km W Dewey	Champaign	17 Aug 1928	2	Thompson & Hunt	INHS 87962[b]
Sangamon	2.4 km S Fisher	Champaign	17 Aug 1928	1	Thompson & Hunt	INHS 87960
Sangamon	1.6 km E Fisher	Champaign	18 Aug 1928	2	Thompson & Hunt	INHS 87961
Little Muddy	8.0 km E Tamaroa	Jefferson	Oct 1940	2	A C. Bauman	UMMZ 163053[c]
Mississippi	6.4 km W Blackhawk	Carroll	19 Aug 1963	1	Russell & Bystry	INHS 21843
Kankakee	8.8 km ESE Ritchie	Will	Oct 1963	8	Muench	INHS 4860
Kankakee	1.1 km N Custer Park	Will	9 Aug 1978	1	Sule	INHS 27071
Kankakee	0.6 km N Custer Park	Will	9 Nov 1978	1	Sule	INHS 27078
Kankakee	1.1 km N Custer Park	Will	15 Nov 1978	2	Sule	—
Mississippi	3.2 km N Cordova	Rock Island	12 April 1979	1	Lutterbie	INHS 27091
Kankakee	1.1 km N Custer Park	Will	9 Aug 1979	1	Sule	INHS 27603
Kankakee	1.1 km N Custer Park	Will	15 Aug 1979	8	Sule	INHS 27602
Kankakee	1.1 km N Custer Park	Will	6 Aug 1981	2	Skelly	INHS 87557
Kankakee	1.1 km N Custer Park	Will	11 Aug 1981	1	Skelly	INHS 97559
Kankakee	1.1 km N Custer Park	Will	2 Aug 1982	2	Skelly	INHS 87959

*Specimens not examined. Reported in Hubbs (1951).
[a]Field Museum of Natural History, Chicago, Illinois.
[b]Illinois Natural History Survey, Champaign, Illinois.
[c]University of Michigan Museum of Zoology, Ann Arbor, Michigan.

Table 2. Physical measurements and water quality parameters associated with specimens of *Notropis amnis* collected from the Kankakee River, Illinois, in 1978, 1979, 1981, and 1982.

Date	Station	Specimen	TL mm	Wt. g	KTL	Vel. Cm/Sec	pH	Turbidity N.T.U.	Depth m	Temp °C	D.O mg/l	Conductivity µmhos/cm
9 Aug 1978	5R	1	41	0.42	0.61	4.0	9.2	15	1.5	27.2	10.0	625
9 Nov 1978	3R	1	45	0.74	0.81	0.0	8.6	3	0.5	11.0	11.8	600
15 Nov 1978	5L	1	54	1.12	0.71	0.0	8.7	7	0.5	6.0	13.8	500
15 Nov 1978	5L	2	53	1.13	0.76	0.0	8.7	7	0.5	6.0	13.8	500
9 Aug 1979	5L	1	38	0.41	0.75	1.2	8.8	37	0.5	27.6	7.2	690
15 Aug 1979	5L	1	40	0.52	0.81	0.0	8.2	27	0.5	21.9	7.4	600
15 Aug 1979	5L	2	40	0.47	0.73	0.0	8.2	27	0.5	21.9	7.4	600
15 Aug 1979	5L	3	43	0.59	0.74	0.0	8.2	27	0.5	21.9	7.4	600
15 Aug 1979	5R	1	40	0.40	0.62	-2.8	8.2	37	0.5	20.4	7.3	600
15 Aug 1979	5R	2	41	0.42	0.61	-2.8	8.2	37	0.5	20.4	7.3	600
15 Aug 1979	5R	3	39	0.39	0.66	-2.8	8.2	37	0.5	20.4	7.3	600
15 Aug 1979	5R	4	41	0.48	0.70	-2.8	8.2	37	0.5	20.4	7.3	600
15 Aug 1979	5R	5	28	0.13	0.59	-2.8	8.2	37	0.5	20.4	7.3	600
6 Aug 1981	5L	1	36	0.33	0.71	-5.2	7.9	32	0.6	23.0	6.9	580
6 Aug 1981	5L	2	31	0.23	0.77	-5.2	7.9	32	0.6	23.0	6.9	580
11 Aug 1981	5R	1	22	0.16	1.50	0.0	8.0	50	0.6	23.0	7.2	520
2 Aug 1982	5L	1	38	0.37	0.67	0.0	8.4	16	0.5	29.5	9.6	660
2 Aug 1982	5L	2	33	0.25	0.70	0.0	8.4	16	0.5	29.5	9.6	660

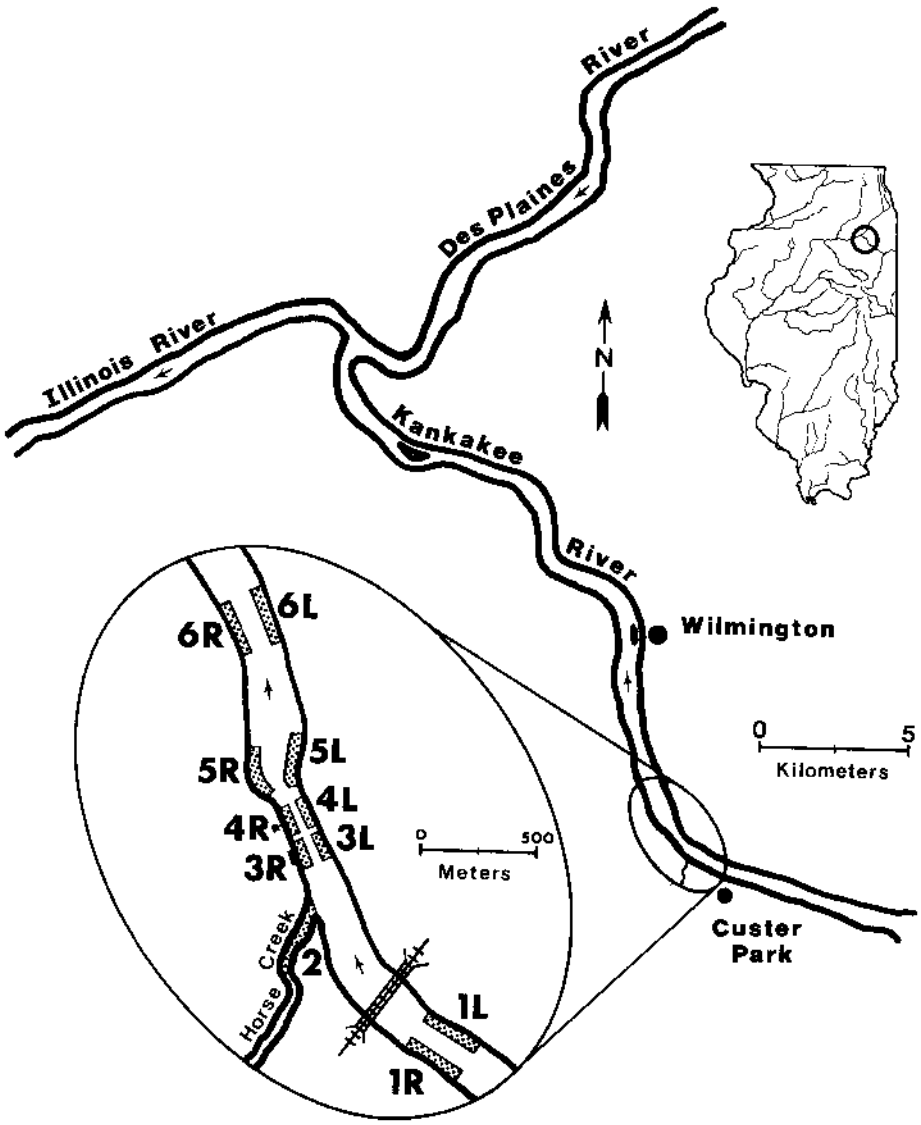

Fig. 1. Locations of sampling stations within the Braidwood Aquatic Monitoring Area of the Kankakee River.

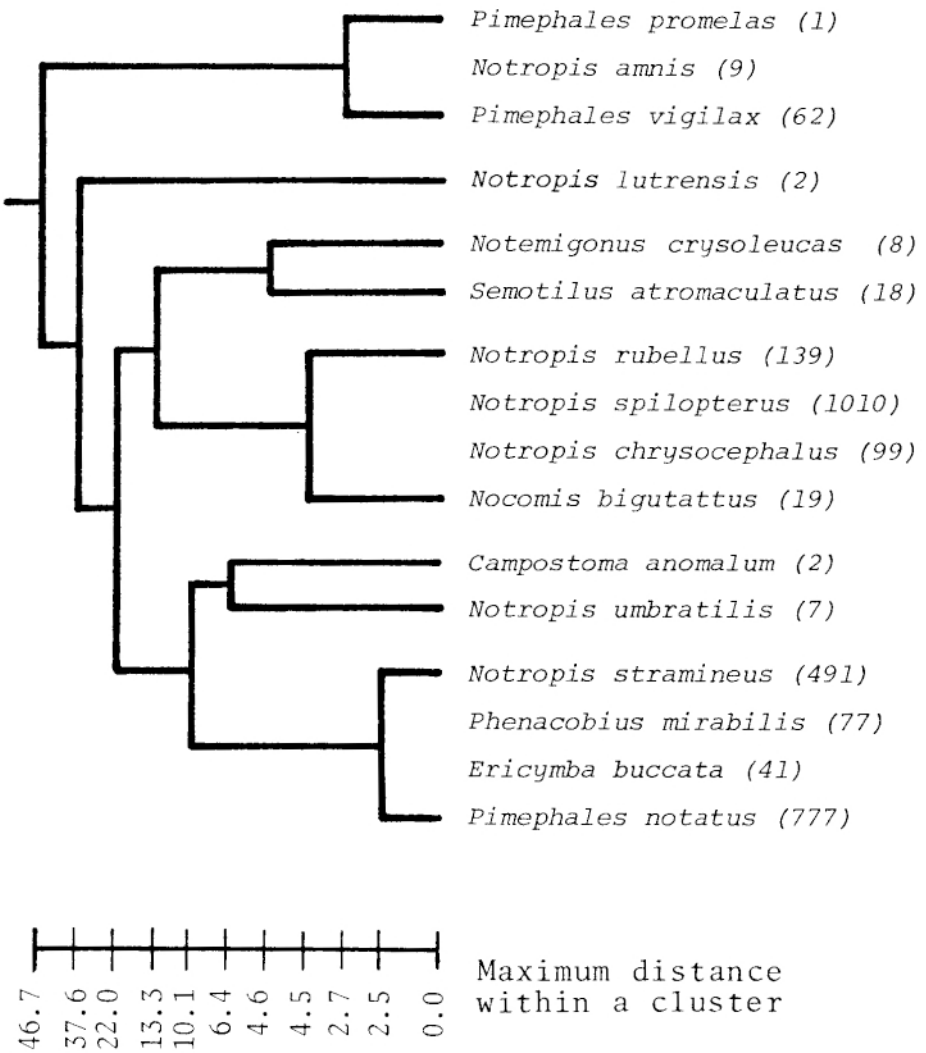

Fig. 2. Cluster analysis of Kankakee River cyprinid fishes by water quality parameters during August 1979. (N) = number of fishes included in the analysis.

Table 3. Number of fishes and percentages of the total catch by each species collected during a given month from four, 15-meter seine hauls at stations where *Notropis amnis* was collected.

	Nov. 1978 3R		Nov. 1978 5I.		Aug. 1978 5R		Aug. 1979 5I.		Aug. 1979 5R		Aug. 1981 5L		Aug. 1981 5R		Aug. 1982 5L.	
	No.	% No.	No.	% No.	No.	% No.	No.	% No.	No.	% No.	No.	% No.	No.	% No.	No.	% No.
Dorosoma cepedianum					1	0.20	—	—	—	—	1	1.15	8	287	1	1.49
Esox americanus	—	—	1	0.81	—	—					1	1.15	2	0.72		
Esox lucius					—	—	1	0.99	—	—	2	2.30	—	—	—	—
Campostoma anomalum					—	—	—	—	—	—	—	—	—	—	1	1.49
Cyprinus carpio	—	—	—	—	—	—	—	—	—	—	2	2.30	1	0.36		
Ericymba buccata	—				3	0.60	—	—	3	0.60	—	—	—	—	—	—
Nocomis biguttatus	—	—	—	—	—	—	—	—	4	0.80	—	—	—	—	—	—
Notemigonus crysoleucas	—	—	2	1.63			6	5.94	—	—	1	1.15	—	—	4	5.97
Notropis amnis	1	0.04	2	1.63	1	0.20	4	3.96	5	1.00	2	2.30	1	0.36	2	2.99
N. buchanani	1	0.04	—	—							1	1.15	—	—	—	—
N. chrysocephalus	1	0.04			5	1.01	10	9.90	19	3.80	—	—	—	—	1	1.49
N. lutrensis	—	—	—	—	—	—							1	0.36		
N. rubellus	43	1.85			1	0.20	12	11.88	24	4.80	—	—	—	—	—	—
N. spilopterus	994	42.72	5	407	13	2.62	16	15.84	207	41.40	7	8.05	14	5.02	1	1.49
N. stramineus	120	5.16	—	—	184	37.02	1	0.99	99	19.80	—	—	40	14.34	—	—
N. umbratilis	10	0.43			—	—	—	—	—	—	—	—	—	—	—	—
N. volucellus	60	2.58	—	—	—	—	—				1	1.15	4	1.43		
Notropis spp.	12	0.52			2	0.40	—	—	—	—	—	—	—	—	—	—
Phenacobius mirabilis	—	—	—	—	6	1.21	—	—	17	3.40	1	1.15	13	4.66		
Pimephales notatus	515	22.13	1	0.81	180	36.22	18	17.82	25	5.00	15	17.24	43	15.41	12	17.91
P. promelas			1	0.81	—	—	—	—	1	0.20	—	—				
P. vigilax	567	24.37	67	54.47	44	8.85	3	2.97	36	7.20	6	6.90	96	34.41	—	—
Moxostoma anisurum			—	—	—	—	—	—	1	0.20	—	—	1	0.36		
M. erythrurum	—	—	1	0.81	—	—		—	1	0.20		—	—	—	—	—
Moxostoma spp.					29	5.84	—	—	6	1.20	1	1.15	6	2.15	2	2.99
Fundulus notatus	—	—	—	—	1	0.20	1	0.99				—	1	0.36	1	1.49
Labidesthes sicculus	1	0.04	—				1	0.99	—	—	—	—	—	—	—	—
Ambloplites rupestris	—		1	0.81			—	—	—	—	—	—	1	0.36	—	—
Lepomis cyanellus	—	—	7	5.69	—	—	3	2.97	—	—	1	1.15			2	2.99
L. gibbosus	—	—	—	—	—			—		—	1	1.15	—	—	—	—
L. humilis	1	0.08	28	22.76	—	—	5	4.95	1	0.20	13	14.92	16	5.73	6	8.96
L. megalotis	—	—	—	—	3	0.60					3	3.45	11	3.94	—	—
Lepomis spp.					—	—	2	1.98	—	—	3	3.45	1	0.36	11	16.42
Micropterus dolomieui	—	—	—	—	—		3	2.97	5	1.00	—	—	7	2.51	—	—
M. salmoides			1	0.81	7	1.41	2	1.98	—	—	4	4.50	2	0.72	9	13.43
Pomoxis annularis	—	—	2	1.63	—		9	8.91	3	0.60	11	12.64	3	1.08	—	—
P. nigromaculatus			3	2.44	—	—	—	—	—	—	10	11.49	7	2.51	4	5.97
Etheostoma nigrum	—	—	1	0.81	14	2.82	3	2.97	36	7.20					8	11.94
Percina maculata	—	—	—		3	0.60	1	0.99	6	1.20	—	—	—	—	2	2.99
P. phoxocephala	—	—	—	—	—	—	—	—	1	0.20	—					
No. individuals	2326		123		497		101		500		87		279		67	
No. species	12		15		15		18		19		19		20		14	

Table 4. Weighted mean water quality values for Kankakee River minnows collected on 9 and 15 August 1979.

Species	N	Vel. (cm/sec)	Temp (°C)	D.O. (mg/l)	Depth (m)	Turbidity N.T.U.	pH	Conductivity μ mhos/cm
Pimephales promelas	1	3.0	20.40	7.30	0.50	37.0	8.20	600
Notropis amnis	9	1.8	21.70	7.32	0.50	33.7	8.27	610
P. vigilax	62	3.7	21.78	7.12	0.63	33.2	8.30	620
N. lutrensis	2	2.0	26.90	6.40	1.00	28.0	8.60	700
Notemigonus crysoleucas	8	1.6	26.76	7.18	0.50	34.0	8.68	681
Semotilus atromaculatus	18	4.1	26.17	7.34	0.53	18.1	8.62	725
Notropis rubellus	139	6.9	25.61	6.41	0.51	35.8	8.49	679
N. spilopterus	1010	3.8	24.38	7.25	0.57	31.6	8.45	671
N. chrysocephalus	99	3.3	25.40	7.12	0.51	44.2	8.37	665
Nocomis biguttatus	19	3.2	24.16	6.80	0.61	40.5	8.39	654
Campostoma anomalum	2	10.0	26.20	8.00	0.50	18.1	8.62	725
Notropis umbratilis	7	12.7	25.84	7.14	0.50	24.7	8.40	707
N. stramineus	491	5.2	23.69	7.86	0.54	20.4	8.39	682
Phenacobius mirabilis	77	7.1	24.29	7.81	0.53	16.3	8.41	701
Ericymba buccata	41	7.2	23.94	8.27	0.50	10.1	8.40	708
Pimephales notatus	777	6.9	24.22	8.19	0.51	11.4	8.41	710