BRAIDWOOD STATION

KANKAKEE RIVER FISH MONITORING PROGRAM, 2010

Prepared for

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ABSTRACT

Forty-three species of fish representing 13 families were collected from the Kankakee River and Horse Creek in 2010. Neither the river redhorse (*Moxostoma carinatum*), currently listed as threatened in Illinois (Illinois Endangered Species Protection Board, 2009) or the pallid shiner (*Notropis amnis*), currently listed as endangered in Illinois, were collected in 2010. However, an unidentified lamprey species was collected during one of the electrofishing sampling efforts. This represents the first time that a lamprey species (Petromyzontidae) has been observed during the long-term monitoring program near Braidwood Station. Electrofishing and seining efforts resulted in the collection of 3798 fish weighing 173.1 kg. Spotfin shiner (23.0%), longear sunfish (16.0%), bluntnose minnow (15.7%), bullhead minnow (10.5%), largemouth bass (6.3%), and sand shiner (5.6%) were the most common species collected.

Eight (0.21%) of the 3798 fish collected exhibited some form of external anomaly. Lesions (40.0%), eroded fins (30.0%), and anchor worm (30.0%) accounted for all of the ten anomalies observed. Tumors, malformations, fish lice, leeches, black spot, and cysts were not observed on any of the 3798 fish collected in 2010. The low incidence of DELT (Deformities, Eroded fins, Lesions, and Tumors) anomalies noted during these studies continues to indicate that the fish assemblage in this portion of the Kankakee River is in very good condition during the August sampling period.

Mean relative weights (W_r) of fish within the study area ranged from 87.2 for bigmouth buffalo to 115.1 for gizzard shad. With the possible exception of a few individuals, the remaining fish that were collected were in good to excellent condition during the August sampling period. The species most commonly afflicted with anomalies were channel catfish, rock bass, and freshwater drum (2 individuals each). The highest percentage of fish with anomalies occurred at Location 1L where one (0.85%) of the 118 fish examined exhibited some form of external anomaly.

Spawning success and population structure were evaluated for four selected species. Recruitment for longear sunfish, smallmouth bass, and rock bass appeared to be weak in 2010 based on

seining and electrofishing data. In contrast, largemouth bass recruitment appeared to be very strong. As a point of interest, due to recent stocking efforts in the Kankakee River by the Illinois Department of Natural Resources, twenty walleye measuring from 135 to 586 mm in total length were collected during the 2010 sampling program. Seventeen of these fish (85.0%) were most likely Age 0 fish that measured from 135 to 193 mm. The remaining three fish measured 276, 439, and 586 mm, respectively. Based on length frequency data, at least four age classes of walleye were collected during 2010.

No identifiable change in the fish community has occurred due to the operation of the Braidwood Station intake and discharge. Fish communities sampled in the vicinity of the intake and discharge have occasionally resulted in the capture of fewer species than those observed at the other locations. Variability in the catch rate, species diversity, and condition of fish by location appears to be related to differences in habitat rather than Station operation. In particular, extensive beds of aquatic macrophtyes have developed near the Station in recent years, which can influence the ability to capture fish and perhaps alter species composition over time. Based on visual observations, there was a substantial decline in aquatic macrophytes within the study area during August 2009 and 2010 compared to 2007-2008. The reduction in aquatic vegetation in 2009 and 2010 likely influenced the numbers and composition of the fish collected, primarily sunfish species and other taxa that utilize this habitat for spawning and protection against predation.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF TABLES
(Continued)

LIST OF FIGURES

1.0 INTRODUCTION

Construction of the Braidwood Nuclear Generating Station and its associated riverside intake and discharge structures provided an opportunity to gather fisheries information from the Kankakee River near the Station. These studies were initiated to determine the effects of construction and plant operation on the river. Units I and II began commercial operation on 29 July and 17 October, 1988, respectively.

The Kankakee River is a seventh order stream that encompasses a drainage area of approximately 13,400 km^2 (Healy 1979). The geology, hydrology, and water quality of the Kankakee River combine to form a diversity of habitats and aquatic life, creating one of the finest rivers in Illinois (Smith 1971, Skelly & Sule 1983, Brigham et al. 1984). The river is a scenic, cultural, recreational and industrial resource (Barker et al. 1967, Graham et al. 1984) that has remained relatively unaltered while still meeting the needs of the public, municipalities, and private interests.

The Braidwood Station Aquatic Monitoring Area, near Custer Park, Will County, Illinois, consists of a 2.5-km reach of the Kankakee River and its tributary, Horse Creek (Figure 1-1) and is located 23.5 km upstream from the confluence of the Kankakee and Des Plaines Rivers (Kwak 1991). The monitoring program in the Kankakee River and Horse Creek near the intake and discharge structures was initiated by Westinghouse Electric Corporation in October 1972 and continued through March 1973. A report, issued 30 November 1973, discussed results and projections of construction impact. Results were also discussed in the Braidwood Station Environmental Report and the Braidwood Final Environmental Statement.

The Illinois Natural History Survey annually conducted sampling near Braidwood Station from 1977 through 1990, excluding 1980 when no sampling occurred. In 1991 and 1992, the program was continued by Lawler, Matusky & Skelly Engineers (LMS), using a modified sampling design that included a reduction of electrofishing effort by one-half (LMS 1992). The sampling program was conducted for one year by Environmental Science & Engineering in 1993. Following 1993, LMS again conducted sampling on the Kankakee River from 1994 to 2004. In 2005, LMS

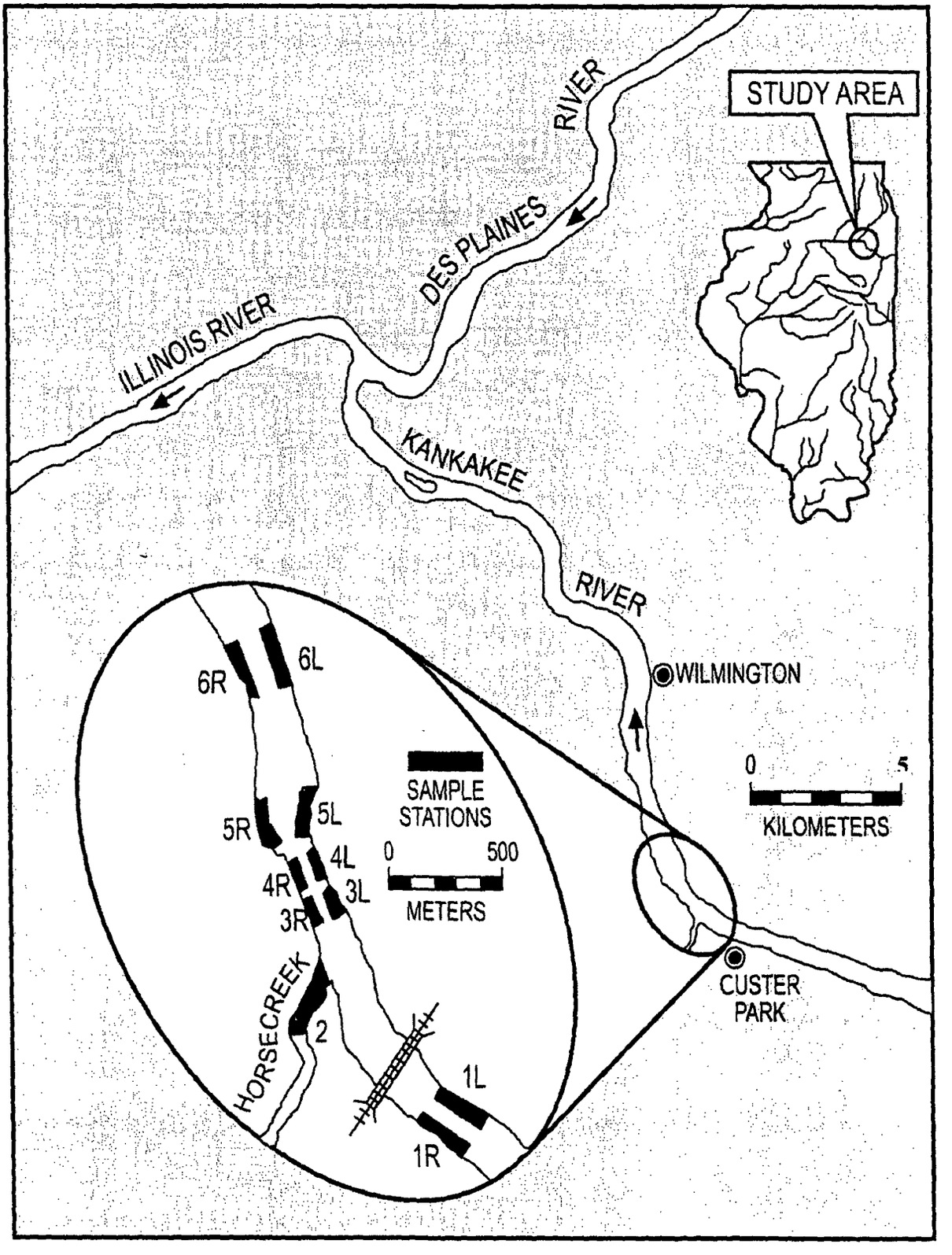

FIGURE 1-1. FISH SAMPLING LOCATIONS IN THE KANKAKEE RIVER NEAR BRAIDWOOD STATION.

merged with HDR Engineering Incorporated (HDR). Sampling has been conducted by HDR since 2005. The summer sampling program near Braidwood Station has remained relatively unchanged since 1991. This continuing database allows documentation of environmental changes, the resulting response of the fish community, and an estimation of the environmental quality of the river.

The objectives of the 2010 program were to:

1. Evaluate the year-to-year changes in the fish populations of the Kankakee River, including their annual reproduction, recruitment, and condition.

2. Provide a basis for examining the effects of Station operation, if any, on the Kankakee River and Horse Creek fishery.

2.0 METHODS

2.1 Electrofishing

Electrofishing was conducted using a boat-mounted boom-type electrofisher utilizing a 5000 watt, 230 volt AC, 10 amp, three-phase Model GDP-5000 Multiquip generator equipped with volt/amp meters and a safety-mat cutoff switch. The electrode array consisted of three pairs of stainless steel cables (1.5 m long, 6.5 mm in diameter) arranged 1.5 m apart and suspended perpendicular to the longitudinal axis of the boat 1.5 m off the bow. Each of the three electrodes was powered by one of the phases. Electrofishing samples were collected on 2-3 August during the first sampling effort and on 16-17 August during the final survey period.

Sampling was conducted at five locations in the Kankakee River and at one site in Horse Creek (Location 2). Each sampling location (except for Location 2) consists of two stations, designated by the location number and "R" or "L", indicating the right or left side of the river as one looks upstream (Figure 1-1 & Table 2-1). Electrofishing was conducted along the shoreline on each side of the river at Locations 1, 3, 4, 5, and 6. At Locations 1, 5, and 6, each station [(L)eft and (R)ight banks] was electrofished for 30 minutes. Because of the close proximity of Locations 3 and 4, sampling boundaries for those locations were smaller and sampling duration was reduced accordingly to 15 minutes. In Horse Creek, the entire width of the stream was electrofished for 30 minutes from its mouth to a point approximately 75 m (250 ft) upstream. Electrofishing was conducted such that the first "run" at each location was in a downstream direction through the middle of the shocking zone. The second "run" was conducted in an upstream direction, adjacent to the first "run" and as close to the bank as water depth allowed. The third "run", if necessary, was made in a downstream direction outside of, but adjacent to, the two previous runs (Figure 2-1). Sampling was restricted to the hours between one-half hour after sunrise to one-half hour before sunset.

TABLE 2-1

FISH SAMPLING LOCATIONS IN THE KANKAKEE RIVER NEAR BRAIDWOOD NUCLEAR STATION

LOCATION	DESCRIPTION
1	Approximately 1000 m upstream of the Station's cooling pond make-up water intake structure. This sampling transect is not influenced by intake or discharge of cooling pond water.
2	Located in Horse Creek from its confluence with the Kankakee River up to 300 m upstream, or as far as water depth and obstructions allow. Horse Creek represents a potential fish spawning area for Kankakee River fishes.
3	Located in the area of Braidwood Station's intake structure.
4	Located in the area of Braidwood Station's discharge structure. This area may be affected by thermal and chemical discharges from the cooling pond.
5	Located approximately 300 m downstream form the discharge structure. This site represents near-field recovery from possible impacts associated with discharge from the cooling pond.
6	Located approximately 1.6 km downstream from the discharge structure, this location represents far-field recovery from possible impacts associated with discharge from the cooling pond.

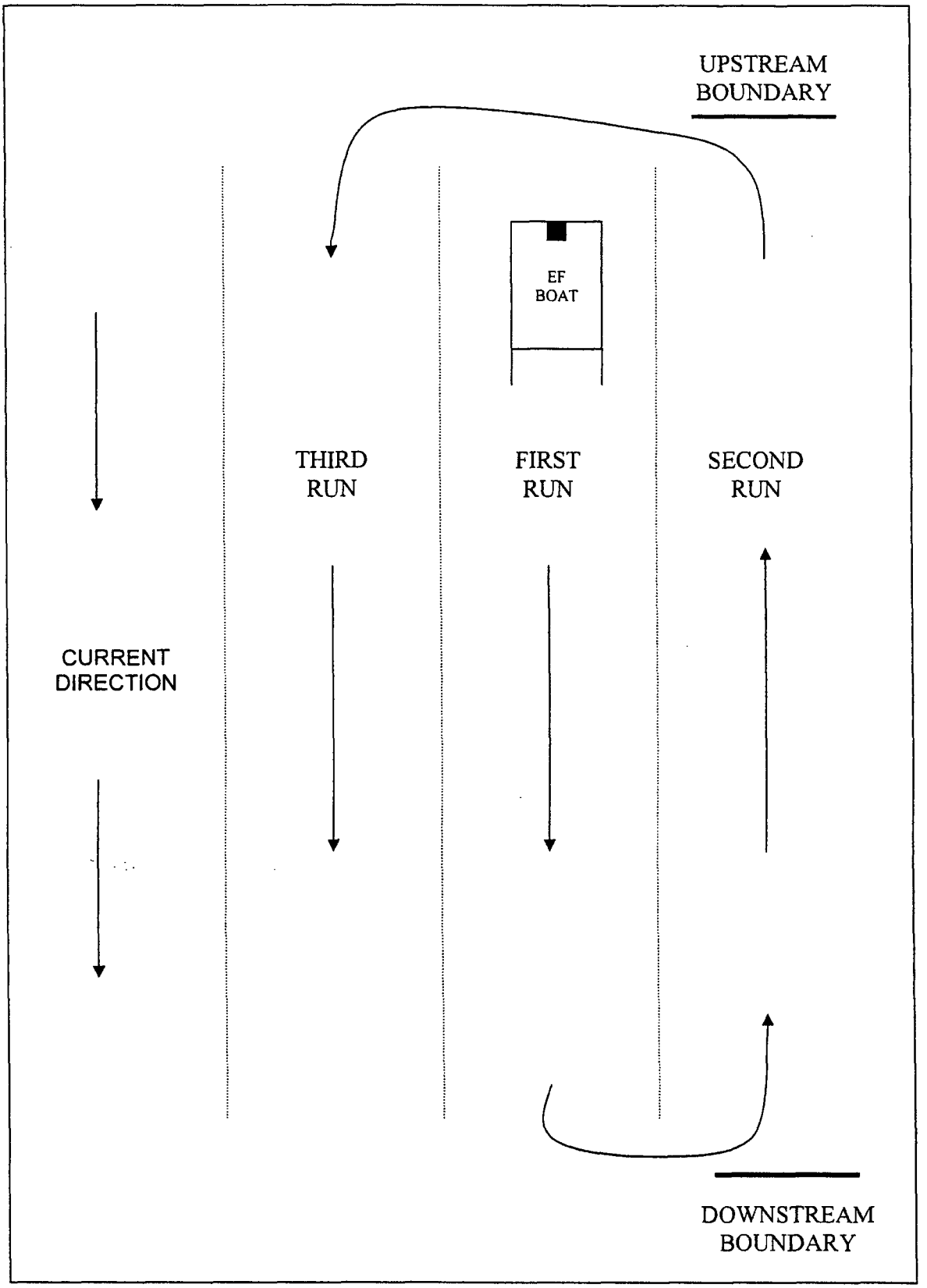

FIGURE 2-1. ILLUSTRATION OF ELECTROFISHING BOAT PATH DURING SAMPLING IN THE BRAIDWOOD STATION MONITORING AREA.

2.2 Seining

Shoreline seining was used as a second collection method at each of the eleven stations described previously (Figure 1-1 and Table 2-1). Seine samples were collected on 3-4 August during the first sampling effort and on 18 August during the final survey period. Seine dimensions were 25 ft by 4 ft of 3/16-inch ace mesh, with a 4-ft by 4-ft bag of 3/16-inch ace mesh. Two seine hauls were made at each station during each sampling effort. Each haul was made in a upstream direction covering approximately 30 meters of shoreline, with the second haul being conducted upstream of the first. Seine collections were performed concurrently with electrofishing sampling, but not at the same stations during the same day. Seining was restricted to the hours commencing one-half hour after sunrise to one-half hour before sunset.

2.3 Sample Processing

All fish were identified to the lowest positive taxonomic level and enumerated. For each gear type, up to 25 individuals of a species were measured for total length (mm) and weight (g) at each station. Any remaining individuals of that species were counted and weighed en masse. Minnow species (excluding carp) were counted and weighed en masse. Specimens that could not be positively identified in the field were returned to the laboratory for identification. References used to facilitate identification included Pflieger (1975), Smith (1979), and Trautman (1981). All fish were also examined externally for evidence of disease, parasites, abnormalities, and emaciation. A voucher collection of fish species identified during the study has been compiled and stored at Exelon Nuclear's Quad Cities Station.

2.4 Water Quality Measurements

Three physicochemical parameters (temperature, dissolved oxygen [DO], and pH) were measured in conjunction with the sampling program. These data were collected at each station prior to each sampling effort. Additionally, conductivity was measured prior to each electrofishing collection. All of the physicochemical measurements were taken at mid-depth in the water column. Temperature (°C), dissolved oxygen (ppm), and conductivity (µmhos) were measured using an

YSI Model 85 handheld oxygen, conductivity, salinity, and temperature meter. A Cole-Parmer pH Tester1 was used to determine pH. All instruments were calibrated prior to each sampling event.

2.5 **Diversity Index**

Diversity indices (Shannon 1948) were computed for electrofishing and seine collections taken at each location and were compared with those calculated in previous years. Shannon-Wiener's Diversity Index was calculated for each fish species using:

$$H_o = -\sum_{i=1}^{s} \frac{n_i}{n} \log_2 \frac{n_i}{n}$$

where:

H_o = the symbol for the amount of diversity in a group of S species.

n_i = the number of individuals of the i_{th} species in the sample.

n = the total number of individuals in the sample.

s = the total number of species in the sample.

2.6 **Relative Weights**

Condition indices are frequently used as indicators of physiological well-being. One of the more traditional approaches to the assessment of condition uses the Fulton-type (Anderson and Gutreuter 1983) condition factor (K). As indicators of physiological well-being, condition index values should reflect proximate body composition of individual fish, e.g., lipid content, protein content, caloric content, etc. (Murphy et al. 1991). Stange and Pelton (1987) found little relationship between K and fat percentage in composite samples of forage fishes. However, strong correlations have been demonstrated between relative weight (W_r) and proximate fat content in several species (Murphy et al. 1991). Thus, W_r is a reliable index of fat reserves in these species and, as such, is a useful indicator of short-term growth potential or potential for

resistance to nutritional stress. Most Illinois State agencies, including the Illinois Department of Natural Resources (IDNR) and the Illinois Natural History Survey (INHS), currently utilize W_r as the preferred measure of condition.

Development of the W_r index (Wege and Anderson 1978) represents a refinement of the relative condition factor concept which allows for interpopulational comparisons by making the standard weight-length regression species-specific rather than population-specific or state-specific. Relative weight is calculated as:

$$W_r = \frac{W}{W_s} X\ 100$$

where:

W = measured weight

W_s = the length-specific standard weight predicted by a weight-length regression constructed to represent the species as a whole

Length specific standard weight functions are in the form:

$$\log_{10} W_s = a + (b\ X \log_{10} total\ length)$$

where:

a = the Y intercept

b = the slope

Murphy et al. (1991) published relative weight equations for 26 species. Equations used in this report to calculate W_r (Table 2-2) are the same as those proposed in that publication. Minimum lengths of fish for these calculations are included in this table and are necessary for most species

TABLE 2-2

INTERCEPT (a) AND SLOPE (b) PARAMETERS FOR STANDARD WEIGHT (Wr) EQUATIONS WITH MINIMUM TOTAL LENGTHS RECOMMENDED FOR APPLICATION[a]

SPECIES	INTERCEPT (a)	SLOPE (b)	MINIMUM LENGTH (mm)	REFERENCES OR DEVELOPER
Gizzard shad	-5.376	3.170	180	Anderson & Gutreuter (1983)
Rainbow trout	-5.194	3.098	200	Anderson (1980)
Brook trout	-5.085	3.043	130	Whelan & Taylor (1984)
Chinook salmon	-4.661	2.901	200	Halseth et al. (1990)
Northern pike	-5.369	3.059	100	Willis (1989)
Common carp	-4.418	2.859	280	Stephen (1978)
Bigmouth buffalo	-4.956	3.092	280	Stephen (1978)
Smallmouth buffalo	-5.069	3.092	280	Stephen (1978)
River carpsucker	-4.754	2.952	-	Stephen (1978)
White sucker	-5.070	3.060	-	Anderson (1980)
Channel catfish	-5.649	3.243	280	Anderson (1980)
Flathead catfish	-5.156	3.082	280	D. Laue
Striped bass	-4.924	3.007	150	Brown & Murphy (1991)
White bass	-5.066	3.081	115	Brown & Murphy (1991)
Hybrid bass	-5.201	3.139	115	Brown & Murphy (1991)
Largemouth bass	-5.316	3.191	150	Wege & Anderson (1978)
Smallmouth bass	-4.983	3.055	180	Anderson (1980)
Rock bass	-4.883	3.083	100	Marteney (1983)
Bluegill	-5.374	3.316	80	Hillman (1982)
Green sunfish	-4.814	3.056	80	D. Gabelhouse, Jr. (1984a)
Black crappie	-5.618	3.345	100	Neumann & Murphy (1992)
White crappie	-5.642	3.332	100	Neumann & Murphy (1992)
Walleye	-5.453	3.180	150	Murphy et al. (1990)
Sauger	-5.446	3.157	70	Guy et al. (1990)
Yellow perch	-5.386	3.230	100	Willis et al. (1991)
Freshwater drum	-5.433	3.208	100	M. Brown

[a] From Murphy et al. 1991.

because: 1) the accuracy in weighing fish decreases markedly for individuals shorter than the established minimum length, and 2) minimum lengths represent the length at which the variance to mean ratio for $\log_{10}$ sharply increases (Murphy et al. 1991).

3.0 RESULTS AND DISCUSSION

3.1 Species occurrence. Eighty-three species of fish representing 19 families have been collected from the Kankakee River and Horse Creek from 1977 through 2010 (Table 3-1). No threatened or endangered species were collected in 2010. However, river redhorse (*Moxostoma carinatum*), currently listed as threatened (Illinois Endangered Species Protection Board 2009), and pallid shiner (*Notropis amnis*), currently listed as endangered in Illinois, have been collected on an irregular basis during most years of this sampling program. Since 1990, the number of river redhorse collected (14 specimens) during these studies has declined substantially from those observed in the 1970's and 1980's (357 specimens). Based on these data, river redhorse has become much less abundant in the Kankakee River near Braidwood Station during recent years. All but two (99.5%) of the 373 river redhorse collected since 1977 have been captured by electrofishing, while 68.7% of the 568 pallid shiners collected have been captured by minnow seine (Table 3-2).

A single Petromyzontidae (lamprey) species was observed during one of the electrofishing sampling efforts in 2010. However, the fish was lost overboard before it could be identified to species. This represents the first time that an individual from this family has been collected during this long-term monitoring program. The lamprey measured approximately 150 mm (6 inches) in length. The specimen was most likely attached to fish that was dipped and brought into the boat during the 17 August electrofishing effort at Location 6R.

3.2 Relative Abundance and CPE. Electrofishing and seining efforts in 2010 resulted in the capture of 3798 fish representing 43 species and 13 families (Table 3-3). Spotfin shiner was the most abundant species collected, representing 23.0% (874 individuals) of the total catch by number. Longear sunfish (16.0%), bluntnose minnow (15.7%), bullhead minnow (10.5%), largemouth bass (6.3%), and sand shiner (5.6%) were the only other species to individually comprise more than 5% of the numerical catch. Electrofishing and seining biomass was dominated by carp (29.7%), channel catfish (18.3%), smallmouth bass (8.7%), largemouth bass (6.0%), and freshwater drum (5.5%).

TABLE 3-1

FISH TAXA COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK IN THE BRAIDWOOD STATION AQUATIC MONITORING AREA

Braidwood Station - 1977-2010

SCIENTIFIC NAME	COMMON NAME
Petromyzontidae	
	Lampreys
Lepisosteidae	
Lepisosteus osseus	Longnose gar
Amiidae	
Amia calva	Bowfin
Anguillidae	
Anguilla rostrata	American eel
Clupeidae	
Dorosoma cepedianum	Gizzard shad
Dorosoma petenense	Threadfin shad
Salmonidae	
Onchorhynchus mykiss	Rainbow trout
Umbridae	
Umbra limi	Central mudminnow
Esocidae	
Esox americanus	Grass pickerel
Esox lucius	Northern pike
Cyprinidae	
Carassius auratus	Goldfish
Cyprinella lutrensis	Red shiner
Cyprinella spilopterus	Spotfin shiner
Cyprinus carpio	Common carp
Campostoma anomalum	Central stoneroller
Notropis buccatus	Silverjaw minnow
Notropis amnis	Pallid shiner
Hybopsis dorsalis	Bigmouth shiner
Luxilis chrysocephalus	Striped shiner
Lythrurus umbratilis	Redfin shiner
Nocomis biguttatus	Hornyhead chub
Notemigonus crysoleucas	Golden shiner
Notropis atherinoides	Emerald shiner
Notropis buchanani	Ghost shiner
Notropis stramineus	Sand shiner
Notropis rubellus	Rosyface shiner
Notropis volucellus	Mimic shiner
Opsopoeodus emiliae	Pugnose minnow
Phenacobius mirabilis	Suckermouth minnow
Pimephales notatus	Bluntnose minnow
Pimephales promelas	Fathead minnow
Pimephales vigilax	Bullhead minnow
Scardinius erthropthalmus	Rudd
Semotilus atromaculatus	Creek chub

TABLE 3-1 (Continued)

FISH TAXA COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK IN THE BRAIDWOOD STATION AQUATIC MONITORING AREA

Braidwood Station - 1977-2010

SCIENTIFIC NAME	COMMON NAME
Catostomidae	
Ictiobus bubalus	Smallmouth buffalo
Ictiobus cyprinellus	Bigmouth buffalo
Ictiobus niger	Black buffalo
Carpiodes carpio	River carpsucker
Carpiodes cyprinus	Quillback
Moxostoma anisurum	Silver redhorse
Moxostoma carinatum	River redhorse
Moxostoma duquesnei	Black redhorse
Moxostoma erythrurum	Golden redhorse
Moxostoma macrolepidotum	Shorthead redhorse
Hypentelium nigricans	Northern hog sucker
Catostomus commersoni	White sucker
Minytrema melanops	Spotted sucker
Erimyzon oblongus	Creek chubsucker
Erimyzon sucetta	Lake chubsucker
Ictaluridae	
Ameiurus melas	Black bullhead
Ameiurus natalis	Yellow bullhead
Ameiurus nebulosus	Brown bullhead
Ictalurus punctatus	Channel catfish
Noturus flavus	Stonecat
Noturus gyrinus	Tadpole madtom
Aphredoderidae	
Aphredoderus sayanus	Pirate perch
Cyprinodontidae	
Fundulus notatus	Blackstripe topminnow
Poeciliidae	
Gambusia affinis	Mosquitofish
Atherinidae	
Labidesthes sicculus	Brook silverside
Percichthyidae	
Morone chrysops	White bass
Morone mississippiensis	Yellow bass
Morone americana	White perch
Centrarchidae	
Micropterus dolomieu	Smallmouth bass
Micropterus salmoides	Largemouth bass
Lepomis cyanellus	Green sunfish
Lepomis gibbosus	Pumpkinseed
Lepomis gulosus	Warmouth
Lepomis humilis	Orangespotted sunfish

TABLE 3-1 (Continued)

FISH TAXA COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK IN THE BRAIDWOOD STATION AQUATIC MONITORING AREA

Braidwood Station - 1977-2010

SCIENTIFIC NAME	COMMON NAME
Lepomis macrochirus	Bluegill
Lepomis megalotis	Longear sunfish
Lepomis microlophus	Redear sunfish
Ambloplites rupestris	Rock Bass
Pomoxis annularis	White crappie
Pomoxis nigromaculatus	Black crappie
Percidae	
Sander vitreum	Walleye
Perca flavescens	Yellow perch
Percina caprodes	Logperch
Percina maculata	Blackside darter
Percina phoxocephala	Slenderhead darter
Etheostoma caeruleum	Rainbow darter
Etheostoma microperca	Least darter
Etheostoma nigrum	Johnny darter
Etheostoma zonale	Banded darter
Sciaenidae	
Aplodinotus grunniens	Freshwater drum

TABLE 3-2

TOTAL CATCH OF PALLID SHINER AND RIVER REDHORSE COLLECTED DURING THE BRAIDWOOD STATION AQUATIC MONITORING PROGRAM

Braidwood Station - 1977-2010

	PALLID SHINER				RIVER REDHORSE			
	SHOCK		SEINE		SHOCK		SEINE	
Year	No.	CPE[a]	No.	CPE[b]	No.	CPE[a]	N0.	CPE[b]
1977	0	0.00	0	0.00	69	3.45	1	0.02
1978	0	0.00	1	0.02	10	0.50	0	0.00
1979	0	0.00	9	0.20	46	2.30	0	0.00
1981	0	0.00	3	0.07	26	1.30	0	0.00
1982	0	0.00	2	0.05	10	0.50	0	0.00
1983	0	0.00	1	0.02	4	0.20	0	0.00
1984	0	0.00	49	1.11	5	0.25	0	0.00
1985	1	0.05	15	0.34	18	0.90	0	0.00
1986	0	0.00	4	0.09	102	5.10	1	0.02
1987	0	0.00	0	0.00	17	0.85	0	0.00
1988	0	0.00	0	0.00	9	0.45	0	0.00
1989	0	0.00	0	0.00	11	0.55	0	0.00
1990	2	0.10	12	0.27	30	1.50	0	0.00
1991	0	0.00	152	3.45	1	0.12	0	0.00
1992	3	0.33	27	0.61	0	0.00	0	0.00
1993	0	0.00	0	0.00	5	0.56	0	0.00
1994	5	0.56	4	0.09	2	0.22	0	0.00
1995	9	1.00	10	0.23	0	0.00	0	0.00
1996	12	1.33	22	0.50	1	0.11	0	0.00
1997	1	0.12	20	0.45	1	0.12	0	0.00
1998	7	0.78	3	0.07	0	0.00	0	0.00
1999	82	9.11	2	0.05	1	0.11	0	0.00
2000	8	0.89	12	0.27	0	0.00	0	0.00
2001	15	1.67	12	0.27	0	0.00	0	0.00
2002	5	0.56	2	0.05	0	0.00	0	0.00
2003	8	0.90	10	0.23	1	0.11	0	0.00
2004	8	0.90	7	0.16	0	0.00	0	0.00
2005	7	0.78	5	0.11	0	0.00	0	0.00
2006	2	0.22	6	0.14	0	0.00	0	0.00
2007	1	0.11	0	0.00	0	0.00	0	0.00
2008	2	0.24	0	0.00	1	0.12	0	0.00
2009	0	0.00	0	0.00	1	0.11	0	0.00
2010	0	0.00	0	0.00	0	0.00	0	0.00
Totals	178	0.41[c]	390	0.28[d]	371	0.85[c]	2	<0.01[d]

[a]Based on 20.00-hours of effort from 1977-1990; 8.45 hours in 1991; 9.00 hours from 1992-1996, 1998-2002, 2004-2007 and 2009-2010; and 8.5 hours in 1997 and 2008 and 8.75 hours of effort in 2003 (all three due to a fallen tree in Horse Creek).
[b]Based on 44 seine hauls.
[c]Based on 438.20 total hours of effort.
[d]Based on 1408 total seine hauls.

TABLE 3-3

TOTAL CATCH BY METHOD FOR FISH SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station – 2010

TAXON	ELECTROFISHING				SEINING				TOTAL			
	NUMBER		WEIGHT		NUMBER		WEIGHT		NUMBER		WEIGHT	
	No.	%	(g)	%	No.	%	(g)	%	No.	%	(g)	%
Lamprey spp.	1	<0.1	10	<0.1					1	<0.1	10	<0.1
Longnose gar	1	<0.1	31	<0.1	1	0.1	44	1.0	2	0.1	75	<0.1
Gizzard shad	40	1.9	1027	0.6	18	1.1	39	0.9	58	1.5	1066	0.6
Grass pickerel	1	<0.1	40	<0.1					1	<0.1	40	<0.1
Northern pike	3	0.1	2910	1.7					3	0.1	2910	1.7
Carp	15	0.7	51,328	30.5					15	0.4	51,328	29.7
Hornyhead chub					1	0.1	6	0.1	1	<0.1	6	<0.1
Ghost shiner					1	0.1	2	<0.1	1	<0.1	2	<0.1
Redfin shiner					7	0.4	34	0.8	7	0.2	34	<0.1
Striped shiner					4	0.2	12	0.3	4	0.1	12	<0.1
Rosyface shiner	2	0.1	3	<0.1	2	0.1	4	0.1	4	0.1	7	<0.1
Spotfin shiner	191	9.1	478	0.3	683	40.4	1614	35.9	874	23.0	2092	1.2
Sand shiner	74	3.5	133	0.1	140	8.3	270	6.0	214	5.6	403	0.2
Fathead minnow	6	0.3	21	<0.1	4	0.2	13	0.3	10	0.3	34	<0.1
Blunmose minnow	349	16.5	733	0.4	246	14.6	534	11.9	595	15.7	1267	0.7
Bullhead minnow	159	7.5	331	0.2	238	14.1	520	11.6	397	10.5	851	0.5
Carpsucker spp.	1	<0.1	1	<0.1					1	<0.1	1	<0.1
River carpsucker	13	0.6	6317	3.7					13	0.3	6317	3.7
Quillback	3	0.1	1215	0.7	1	0.1	10	0.2	4	0.1	1225	0.7
Smallmouth buffalo	1	<0.1	1500	0.9					1	<0.1	1500	0.9
Bigmouth buffalo	1	<0.1	2300	1.4					1	<0.1	2300	1.3
Northern hog sucker	1	<0.1	728	0.4					1	<0.1	728	0.4
Spotted sucker	2	0.1	1934	1.1					2	0.1	1934	1.1
Redhorse spp.	31	1.5	84	<0.1	15	0.9	33	0.7	46	1.2	117	0.1
Silver redhorse	78	3.7	8255	4.9	2	0.1	64	1.4	80	2.1	8319	4.8
Golden redhorse	14	0.7	6883	4.1					14	0.4	6883	4.0
Tadpole madtom					1	0.1	7	0.2	1	<0.1	7	<0.1

TABLE 3-3 (Continued).

TOTAL CATCH BY METHOD FOR FISH SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2010

TAXON	ELECTROFISHING				SEINING				TOTAL			
	NUMBER		WEIGHT		NUMBER		WEIGHT		NUMBER		WEIGHT	
	No.	%	(g)	%	No.	%	(g)	%	No.	%	(g)	%
Channel catfish	19	0.9	31,672	18.8	11	0.7	17	0.4	30	0.8	31,689	18.3
Blackstripe topminnow	3	0.1	11	< 0.1	8	0.5	12	0.3	11	0.3	23	< 0.1
Brook silverside	7	0.3	12	< 0.1	21	1.2	23	0.5	28	0.7	35	< 0.1
Yellow bass	1	< 0.1	8	< 0.1					1	< 0.1	8	< 0.1
Sunfish spp.	17	0.8	21	< 0.1	49	2.9	60	1.3	66	1.7	81	< 0.1
Rock bass	87	4.1	4573	2.7	2	0.1	23	0.5	89	2.3	4596	2.6
Green sunfish	51	2.4	604	0.4	6	0.4	55	1.2	57	1.5	659	0.4
Orangespotted sunfish	35	1.7	154	0.1	13	0.8	46	1.0	48	1.3	200	0.1
Bluegill	67	3.2	1493	0.9	18	1.1	97	2.2	85	2.2	1590	0.9
Longear sunfish	541	25.7	5716	3.4	65	3.8	473	10.5	606	16.0	6189	3.6
Smallmouth bass	50	2.4	15,083	8.9	4	0.2	16	0.4	54	1.4	15,099	8.7
Largemouth bass	192	9.1	10,115	6.0	48	2.8	297	6.6	240	6.3	10,412	6.0
White crappie	1	< 0.1	4	< 0.1	27	1.6	86	1.9	28	0.7	90	0.1
Black crappie	1	< 0.1	48	< 0.1	1	0.1	3	0.1	2	0.1	51	< 0.1
Johnny darter	12	0.6	15	< 0.1	28	1.7	33	0.7	40	1.1	48	< 0.1
Logperch	3	0.1	10	< 0.1	12	0.7	27	0.6	15	0.4	37	< 0.1
Blackside darter	7	0.3	13	< 0.1	11	0.7	21	0.5	18	0.5	34	< 0.1
Banded darter	1	< 0.1	1	< 0.1	1	0.1	1	< 0.1	2	0.1	2	< 0.1
Walleye	20	0.9	3289	2.0					20	0.5	3289	1.9
Freshwater drum	7	0.3	9460	5.6					7	0.2	9460	5.5
Totals	2109		168,564		1689		4496		3798		173,060	
Total taxa	42				33				47			
Total species	38				31				43			

Electrofishing efforts collected 2109 individuals representing 38 species (Table 3-3). The catch was dominated by longear sunfish, which comprised 25.7% of all fish captured. Bluntnose minnow (16.5%), largemouth bass (9.1%), spotfin shiner (9.1%), and bullhead minnow (7.5%), were the only other species to numerically comprise more than 5% of the total catch. Excluding gizzard shad, centrarchids dominated the catch comprising 50.4% of the electrofishing catch and were represented by nine species. Cyprinids (including carp) comprised 38.5% of the catch (seven species), catostomids 7.0% (eight species), and percids 2.1% (five species) of all fish collected. Electrofishing biomass was dominated by carp, which constituted 30.5% of the 168.6 kg collected. Other species that individually contributed more than 5% of the total biomass included channel catfish (18.8%), smallmouth bass (8.9%), largemouth bass (6.0%), and freshwater drum (5.6%). Rough fish (carp and sucker species) accounted for 47.8% (80.5 kg) of the total electrofishing biomass collected.

The mean electrofishing catch-per-effort (CPE) for fish collected at all locations combined was 234.3 fish/hr (Table 3-4). This value is higher than the 33-yr average of 176.3 fish/hr (Table 3-5) and well within the range of values reported since 1977. Electrofishing CPE's since 1994 have been higher than those reported during the earlier years of these studies (1977-1993). Electrofishing CPE has ranged from 35.2 fish/hr in 1982 to 486.3 fish/hr in 2002. In 2010, CPE by location ranged from 76.0 fish/hr at Location 1R to 576.0 fish/hr at Location 3L.

A total of 1689 fish representing 31 species and nine families was collected by seine in 2010. (Table 3-3). Spotfin shiner was the dominant species collected, comprising 40.4% (683 individuals) of all fish captured. The second most abundant species taken was bluntnose minnow (14.6%), followed by bullhead minnow (14.1%), and sand shiner (8.3%). Total biomass of fish taken by seine was 4.5 kg. Taxa collected by minnow seine that individually comprised greater than 5% of the total catch by weight included spotfin shiner (35.9%), bluntnose minnow (11.9%), bullhead minnow (11.6%), longear sunfish (10.5%), largemouth bass 6.6%), and sand shiner (6.0%).

Haul seining mean CPE for all locations combined in 2010 was 38.4 fish/seine haul. This value is lower than the 33-yr average of 58.0 fish/seine haul (Table 3-5). CPE's of fish collected by

TABLE 3-4

FISH CAPTURED BY ELECTROFISHING IN THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2010

TAXON	1L[a]	1R[a]	2[a]	3L[b]	3R[b]	4L[b]	4R[b]	5L[a]	5R[a]	6L[a]	6R[a]	TOTAL[c]	%
Lamprey spp.											1	1	<0.1
Longnose gar	1											1	<0.1
Gizzard shad				1		3	2	9	15	7	3	40	1.9
Grass pickerel										1		1	<0.1
Northern pike									1	2		3	0.1
Carp	6	3	1		1		1	1	1		1	15	0.7
Rosyface shiner							2					2	0.1
Spotfin shiner	18		22	2	12	3	22	6	29	12	65	191	9.1
Sand shiner	1		9	7	17	8	10	4	5	2	11	74	3.5
Fathead minnow	1					1	1		1	2		6	0.3
Bluntnose minnow	13		14	25	13	60	40	2	57	86	39	349	16.5
Bullhead minnow			1	3	4	10	2	76	47	5	11	159	7.5
Carpsucker spp.							1					1	<0.1
River carpsucker							6		5	2		13	0.6
Quillback				1	1				1			3	0.1
Smallmouth buffalo							1					1	<0.1
Bigmouth buffalo									1			1	<0.1
Northern hog sucker			1									1	<0.1
Spotted sucker									2			2	0.1
Redhorse spp.		1	1	3	3	3	1	1	5	6	7	31	1.5
Silver redhorse	1		60	4	3	4	1	1	1		3	78	3.7
Golden redhorse	3	2	6		1	1	1					14	0.7
Channel catfish	7	2	2		2		1		4		1	19	0.9
Blackstripe topminnow		2		1								3	0.1
Brook silverside				3		2			1	1		7	0.3

TABLE 3-4 (Continued).

FISH CAPTURED BY ELECTROFISHING IN THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2010

TAXON	1L[a]	1R[a]	2[a]	3L[b]	3R[b]	4L[b]	4R[b]	5L[a]	5R[a]	6L[a]	6R[a]	TOTAL[c]	%
Yellow bass									1			1	<0.1
Sunfish spp.	2	1		5		1	1	2	5			17	0.8
Rock bass	6	2	12	16	8	12			21	8	2	87	4.1
Green sunfish	2	10	7	6	3	8	1		4	6	4	51	2.4
Orangespotted sunfish		1		7	2	6		7	6	6		35	1.7
Bluegill	2	7	8	18		8	12	3	1	6	2	67	3.2
Longear sunfish	23	24	49	157	30	66	22	6	67	75	22	541	25.7
Smallmouth bass	4	1	9	1	9	4	11	1	5	5		50	2.4
Largemouth bass	9	15	18	20	9	11	19	57	18	10	6	192	9.1
White crappie									1			1	<0.1
Black crappie				1								1	<0.1
Johnny darter	2	4				1			2		3	12	0.6
Logperch	1			2								3	0.1
Blackside darter			1	4		1			1			7	0.3
Banded darter						1						1	<0.1
Walleye			14		5					1		20	0.9
Freshwater drum		1	1	1	1		1			2		7	0.3
Total fish	102	76	236	288	124	214	159	176	308	245	181	2109	
Total Taxa	18	15	19	22	18	21	22	14	28	20	16	42	
CPE (fish/hr)	102.0	76.0	236.0	576.0	248.0	428.0	318.0	176.0	308.0	245.0	181.0	234.3	

[a] Based on 1.00 hrs effort.
[b] Based on 0.50 hrs effort.
[c] Based on 9.0 hrs effort.

TABLE 3-5

TOTAL CATCH OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 1977-2010

	ELECTROFISHING		SEINING		
YEAR	No.	CPE[a]	No.	CPE[b]	TOTALS
1977	2417	120.9	10,576	240.4	12,993
1978	2329	116.5	1387	31.5	3716
1979	1391	69.6	3039	69.1	4430
1981	2050	102.5	1221	27.8	3271
1982	703	35.2	369	8.4	1072
1983	1024	51.2	1166	26.5	2190
1984	1471	73.6	1455	33.1	2926
1985	2633	131.7	7278	165.4	9911
1986	2599	130.0	968	22.0	3567
1987	2478	123.9	2256	51.3	4734
1988	4008	200.4	2050	46.6	6058
1989	3617	180.9	1489	33.8	5106
1990	2545	127.3	1770	40.2	4315
1991	1825	216.0	3185	72.4	5010
1992	1012	112.4	2163	49.2	3175
1993	1578	175.3	477	10.8	2055
1994	1930	214.4	1276	29.0	3206
1995	2007	223.0	1382	31.4	3389
1996	3220	357.8	5570	126.5	8790
1997	3657	430.2	3193	72.6	6850
1998	2401	266.8	2538	57.7	4939
1999	2431	270.1	942	21.4	3373
2000	2250	250.0	4200	95.5	6450
2001	3994	443.8	2185	49.7	6179
2002	4377	486.3	3548	80.6	7925
2003	2834	323.9	3316	75.4	6150
2004	1500	166.7	1373	31.2	2873
2005	2247	249.7	3118	70.9	5365
2006	2428	269.8	1619	36.8	4047
2007	2148	238.7	3525	80.1	5673
2008	2279	268.1	1591	36.2	3870
2009	1753	194.8	2352	53.5	4105
2010	2109	234.3	1689	38.4	3798
TOTALS	77,245	176.3[c]	84,266	58.0[d]	161,511

[a]Based on 20.0 hrs of electrofishing effort from 1977-1990; 8.45 hours of effort in 1991; 9.00 hours of effort from 1992-1996, 1998-2002, 2004-2007, and 2009-2010; 8.5 hours of effort in 1997 and 2008; and 8.75 hours of effort in 2003.
[b]Based on 44 seine hauls.
[c]Based on 438.2 total hours of electrofishing effort.
[d]Based on 1452 total seine hauls.

minnow seine have been highly variable on an annual basis ranging from 8.4 fish/seine haul in 1982 to 240.4 fish/seine haul in 1977.

An observation made during recent years is that an increasing proportion of the Kankakee River has been populated by large beds of aquatic macrophtyes. This is noteworthy because the extensive vegetation that has occurred throughout much of the study area during recent years (particularly 2005-2007) has had an effect on sample collections, sampling efficiency, and perhaps species utilization of these areas when compared to previous years (HDR/LMS 2006-2008 and HDR 2009). However, in 2009, 2010, and to a lesser extent 2008, the development of aquatic macrophtyes in the Kankakee River was much less than observed in 2005, 2006, and 2007. River flows in 2009 and 2010 were higher for a longer period of time in the spring and early summer than those observed during 2005-2007. Development of aquatic macrophtyes may have been inhibited by the higher, more turbid flows that occurred in 2009 and 2010.

3.3 Historical Comparison

Based on sampling efforts conducted during the last three years (2007-2010), the relative abundance of spotfin shiner, bullhead minnow, bluntnose minnow, longear sunfish, and sand shiner, have remained relatively high (Table 3-6). In addition, silver redhorse, bluegill, largemouth bass, and gizzard shad abundance seems to be increasing. Rock bass has also been commonly collected since 2008. All of the species listed in Table 3-6 are relatively common to abundant in this portion of the Kankakee River near Braidwood Station.

In 2010, spotfin shiner was the most abundant species collected (Table 3-6), followed by longear sunfish, bluntnose minnow, bullhead minnow, and largemouth bass. Cyprinids accounted for four of the top 10 species collected. Cyprinids, gizzard shad, and centrarchids (Appendix Table B-1) have typically dominated catches of fish in the Kankakee River. The percent contribution of non-cyprinid species to the catch from 1996-2010 has generally decreased because of the large numbers of cyprinids and/or gizzard shad that have been captured. Although not reflected in the percent contribution to the catch, the numbers of non-cyprinid species collected from 1996-2010 have generally been similar to those observed during most years.

TABLE 3-6

PERCENT COMPOSITION BY TOTAL ABUNDANCE AND RANK OF DOMINANT FISH SPECIES COLLECTED BY ELECTROFISHING AND SEINING FROM ALL STATIONS IN THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2008-2010

	YEAR		
SPECIES	2010	2009	2008
Spotfin shiner	23.0 (1)[a]	29.6 (1)[a]	15.1 (2)
Longear sunfish	16.0 (2)	6.3 (5)	16.8 (1)
Bluntnose minnow	15.7 (3)	10.9 (3)	12.0 (3)
Bullhead minnow	10.5 (4)	17.3 (2)	9.4 (4)
Largemouth bass	6.3 (5)	2.1(11)	2.7(12)
Sand shiner	5.6 (6)	7.8 (4)	7.1 (5)
Rock bass	2.3 (7)	2.1(12)	3.5 (7)
Bluegill	2.2 (8)	2.6 (9)	1.7 (16)
Silver redhorse	2.1 (9)	0.7(13)	0.4(21)
Gizzard shad	1.5 (10)	0.3(18)	0.9(16)

[a]Numbers in parenthesis represent species rank.

Since 1993, carp has been the dominant species collected in terms of total biomass, except in 1999 when gizzard shad ranked first, in 2004 when smallmouth bass ranked first, and in 2009 when golden redhorse ranked first (Table 3-7 and Appendix Table B-2). Smallmouth bass, carp, and either golden or silver redhorse have all been substantial contributors to the total weight of fish collected (ranking from first to fifth) during the last ten years. As was the case from 2005 through 2010, channel catfish can also contribute heavily to the total biomass collected during some years. Historically, the percent composition by biomass of dominant fish species collected by electrofishing and seining has been relatively consistent during most years. Dominant taxa collected during this period include carp, gizzard shad, channel catfish, smallmouth bass, redhorse species, carpsucker species, and longear sunfish.

A review of historical trends in total catch can be useful for evaluating the stability and long term productivity of a fishery. Catches of fish have exhibited considerable variability from year to year during the Braidwood Monitoring program (Table 3-5). Since 1994, the catch-per-effort of fish has been higher than most previous years. The decline in the numbers of fish collected from 1991 through 1995 was attributed to a reduction in the sampling program beginning in 1991, which decreased electrofishing effort by more than half (LMS 1996). In addition, the number of fish collected during any given year is influenced by seine collections, which can be highly variable between years. During years that produce large numbers of fish in seine collections (primarily minnows and small sunfish species), total catch is typically high. Conversely, when seine catches are low, the total number of fish collected is also generally low. Electrofishing CPE in 2010 (234.38 fish/hr) was higher than the 33-yr mean of 176.3 fish/hr. Electrofishing CPE in 2010 was within the range of values reported since 1995 and slightly higher than all of the values reported during the 1977 through 1995 sampling period. The 2010 seining CPE of 38.4 fish/haul was less than the 33-yr mean of 58.0 fish/haul. Seining CPE's have varied markedly during the 33 years of sampling, ranging from 8.4 fish/haul in 1982 to 240.4 fish/haul in 1977.

3.4 Length Frequency Distributions.

Length-frequency distributions were used to estimate age groups of four dominant species (rock bass, longear sunfish, smallmouth bass, and largemouth bass) collected from the Kankakee River. Age groups can be separated and identified as peaks in a standard length-frequency histogram;

TABLE 3-7

PERCENT COMPOSITION BY BIOMASS AND RANK OF DOMINANT FISH SPECIES COLLECTED BY ELECTROFISHING AND SEINING FROM ALL STATIONS IN THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2008-2010

	YEAR		
SPECIES	2010	2009	2008
Carp	29.7 (1)[a]	12.8 (3)	26.7 (1)
Channel catfish	18.3 (2)	18.6 (2)	16.3 (2)
Smallmouth bass	8.7 (3)	5.6 (4)	8.4 (4)
Largemouth bass	6.0 (4)	4.7 (6)	1.2 (14)
Freshwater drum	5.5 (5)	5.0 (5)	3.5 (6)
Silver redhorse	4.8 (6)	3.6 (7)	6.1 (5)
Golden redhorse	4.0(7)	25.5 (1)[a]	14.7 (3)
River carpsucker	3.7 (8)	2.8 (9)	2.6 (10)
Longear sunfish	3.6 (9)	1.4(16)	3.2 (8)
Rockbass	2.6 (10)	2.0 (11)	3.3 (7)

[a]Numbers in parenthesis represent species rank.

however, small sample size, differential growth between sexes of the same species, and/or the lack of well-defined breaks in length categories of older fish, hampers accurate interpretation of older age-classes.

Eighty-nine fish measuring from 33 to 210 mm in total length are included in the length-frequency analysis of rock bass (Figure 3-1). Based on this information, at least four or five age classes of fish were collected. Only one (1.1%) Age 0 rock bass measuring 33 mm in TL was collected in 2010. Peaks in the length frequency histogram occurred at 70-100 mm (Age 1), 120-150 mm (Age 2), and from 160-190 mm (Age 3). The four fish larger than 200 mm were most likely Age 4 fish. Recruitment of Age 0 rock bass was weak in 2010 based on these data. In contrast, the 2007 (Age 3), 2008 (Age 2), and 2009 (Age 1) year-classes appear to be moderate to relatively strong based on data collected in 2010.

The length-frequency of 421 longear sunfish measuring from 34 to 132 mm is presented in Figure 3-2. Two hundred ninety-two (69.4%) of the 421 fish that were measured ranged from 30 to 80 mm in total length (primarily Age 1), while the remaining 129 fish (30.6%) measured from 80 to 140 mm in total length. The majority of these fish were Age 2, but a few of the largest individuals may have been Age 3.

Recruitment of longear sunfish appeared to be weak in 2010 based upon the relatively few Age 0 fish (< 50 mm) observed in the length frequency histogram. Similar results were noted for this species from 2005-2009 when recruitment was also reported be relatively weak based on information collected during electrofishing and seining sampling efforts. However, during 2005 (HDR/LMS 2006) and 2007 (HDR/LMS 2008) relatively large numbers (1666 and 1081 fish, respectively) of young-of-year fish measuring less than 50 mm in total length were identified only as sunfish species. Because species assignment to these very small fish is likely to contribute an unknown margin of error, only fish larger than 40 or 50 mm in total length were identified to species. Based on historical data, a large portion of these fish were longear sunfish. Longear sunfish has been the most abundant sunfish species taken during most previous years of sampling. If this assumption is correct, recruitment of this species in 2005 and 2007 would have been strong. The large contribution of Age 1 longear sunfish to the catch in 2006 and 2008 appears to validate the assumption that the majority of these unidentified Age 0 sunfish were indeed longear

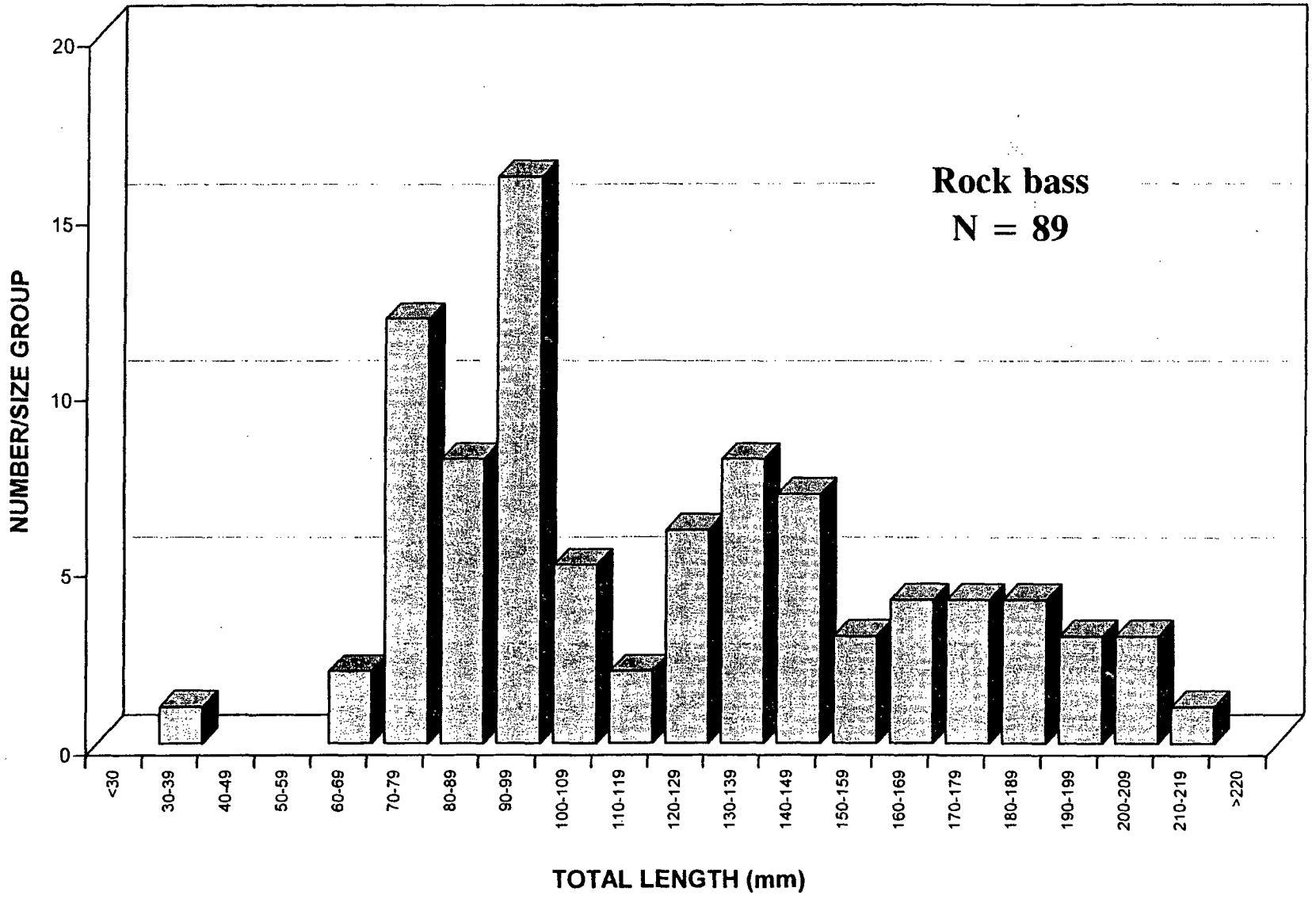

FIGURE 3-1. LENGTH-FREQUENCY DISTRIBUTION FOR ROCK BASS COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

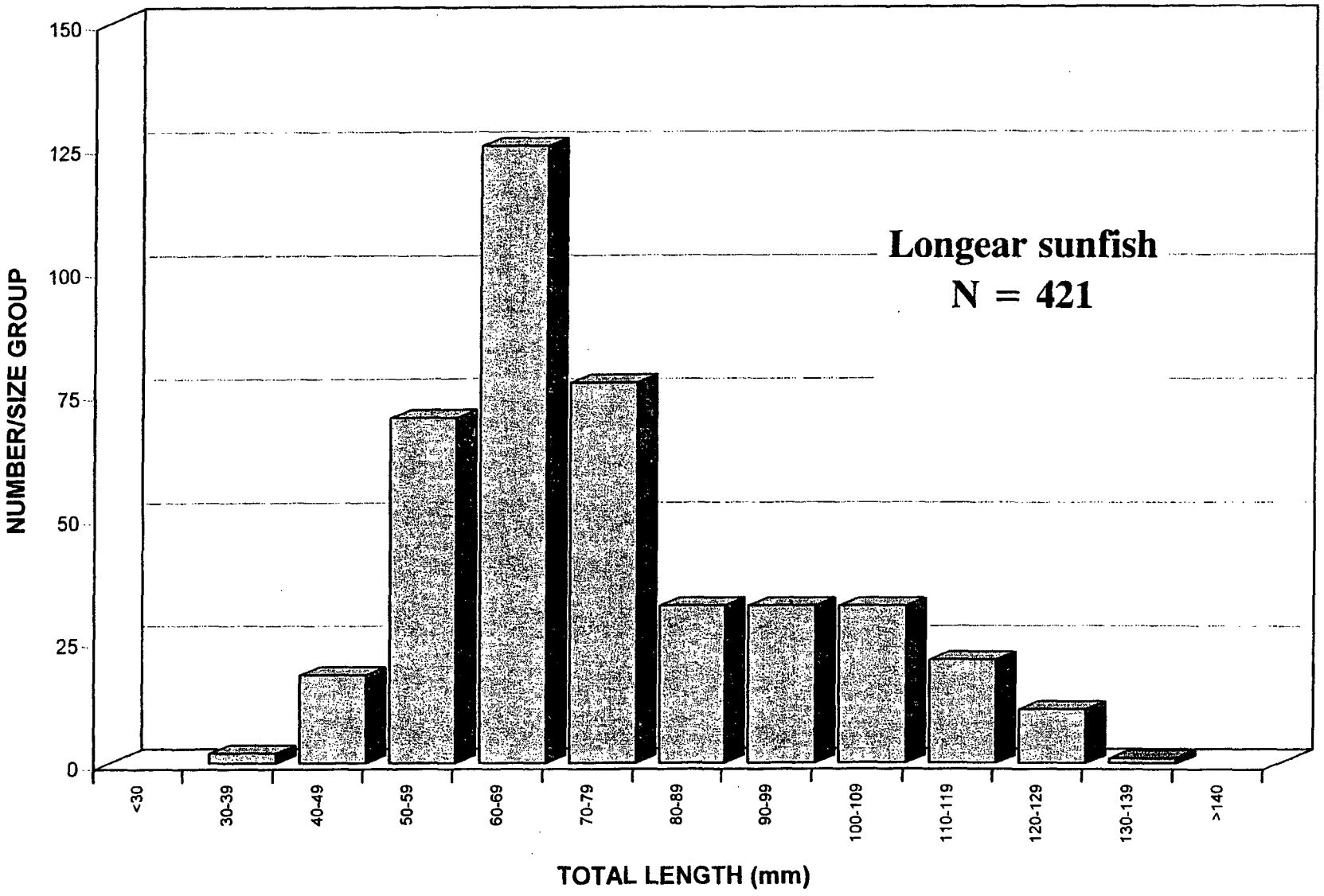

FIGURE 3-2. LENGTH-FREQUENCY DISTRIBUTION FOR LONGEAR SUNFISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

sunfish. Similar results have been noted during almost all previous years of this long-term data base. Recruitment of longear sunfish has been classified as strong to very strong during most years of these studies. This is not surprising because longear sunfish is one of the most abundant species found in this section of the Kankakee River. However, only two small young-of-year fish were classified as sunfish species in 2009 and only 16 were classified as sunfish species in 2010. However, Age 1 fish were the major component of the catch in 2010, which suggest that the low numbers of YOY fish captured in 2009 may have been attributed to gear bias, unfavorable sampling conditions, or some other unknown factor.

The vigorous rooted aquatic plant growth that had occurred within the Kankakee River during the past few years (primarily 2005-2007) had been conducive to the survival of longear sunfish and other small fish species by affording protection from predators. Weed growth was much less extensive in 2010, 2009, and to a lesser extent in 2008, which may explain the decline in young-of-year sunfish species captured during recent years. Reduced spawning habitat and increased predation could explain the decline of numbers collected. In contrast, only one fish (0.2%) larger than 130 mm was collected. Becker (1983) states that relatively few longear sunfish live to be older than Age 4. This may account for the low occurrence of longear sunfish greater than 150 mm in total length that have been collected during these studies.

Fifty-four smallmouth bass were collected during 2010. Specimens ranged in length from 49 to 434 mm (Figure 3-3). Several age classes of fish were represented in the catch, with peaks in the length frequency histogram occurring at 70 mm (Age 0), from 130 to 190 mm (Age 1), from 200 to 250 mm (Age 2), and from 260 to 320 mm (Age 3). Young-of-year smallmouth bass were strong contributors to the catch from 1994-1999, 2001-2004, and again in 2007, 2008, and 2009. However, only a relatively small portion of the smallmouth bass collected in 2000 and 2005 were Age 0 (LMS 2001 and HDR/LMS 2006). In 2006, Age 0 smallmouth bass made a moderate contribution to the total catch (HDR/LMS 2007), but the Age 0 fish that were collected were smaller than those captured during most previous years. As a result, these fish may have incurred higher mortality than would have been expected if they had been larger and in better condition to survive predation and over-wintering mortality. In 2007, only 15 (4.5%) Age 1 smallmouth bass measuring from 120 to 200 mm were collected, suggesting that the recruitment and survival of the 2006 year class in this portion of the Kankakee River was indeed weak in 2006. Recruitment of

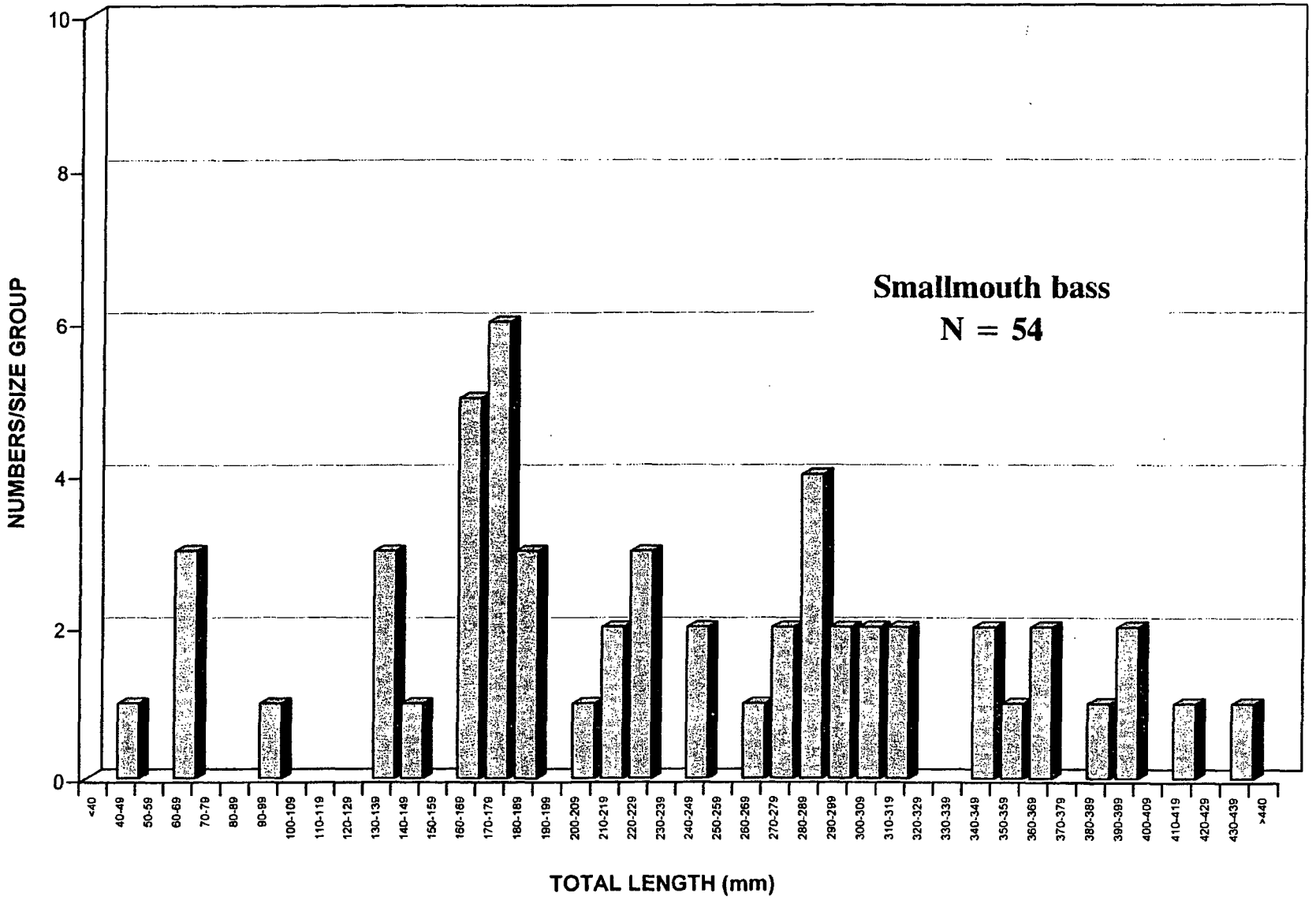

FIGURE 3-3. LENGTH-FREQUENCY DISTRIBUTION OF SMALLMOUTH BASS COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

smallmouth bass in 2010 also appeared weak based on the three fish < 100 mm TL captured by electrofishing and seining efforts in 2010.

An additional grouping of smallmouth bass in the 2010 length-frequency histogram occurs from 340 to 400 mm (Age 4 or Age 5). Only two (3.7%) fish larger than 400 mm were collected in 2010. These fish were most likely Age 5 or older. Although in 2010, peaks in the length-frequency histogram of smallmouth bass > 100 mm in total length can be difficult to distinguish because of the small sample size (49 specimens), the 2005-2010 year classes (Ages 0-5) all appear to be represented in the catch.

Two hundred twenty-five largemouth bass, measuring from 50 to 474 mm in total length, were collected in 2010 (Figure 3-4). Based upon the fish collected during 2010, at least four or five age classes of largemouth bass were included in the catch. One hundred seventy-two (76.4%) largemouth bass less than 100 mm in total length were captured in 2010, while 44 (19.6%) fish from 100 to 210 mm were collected. The remaining nine fish (4.0%) ranged from 310 to 470 mm. During most years, either Age 0 and/or Age 1 largemouth bass have dominated the catch, while relatively few fish older than Age 2 have been collected. Notable in the length frequency histogram for 2010 is the absence of any fish measuring from 210 to 310 mm. This indicates that few, if any, largemouth bass from the 2007 (Age 3) or 2008 (Age 2) year-classes were collected. Recruitment of largemouth bass in the Kankakee River near Braidwood Station appeared to be very strong in 2010 based on the data collected by electrofishing and seining.

In addition to those four species, 20 walleye measuring from 135 to 586 mm in total length were collected in 2010. Seventeen (85%) of these fish measured from 135 to 193 mm and were Age 0, while one 276 mm fish was Age 1. The last two fish measured 439 and 586 mm, respectively. The 439 mm walleye was most likely Age 3 and the 586 mm individual was most likely Age 5. At least four age classes of walleye were included among the 20 fish captured in 2010.

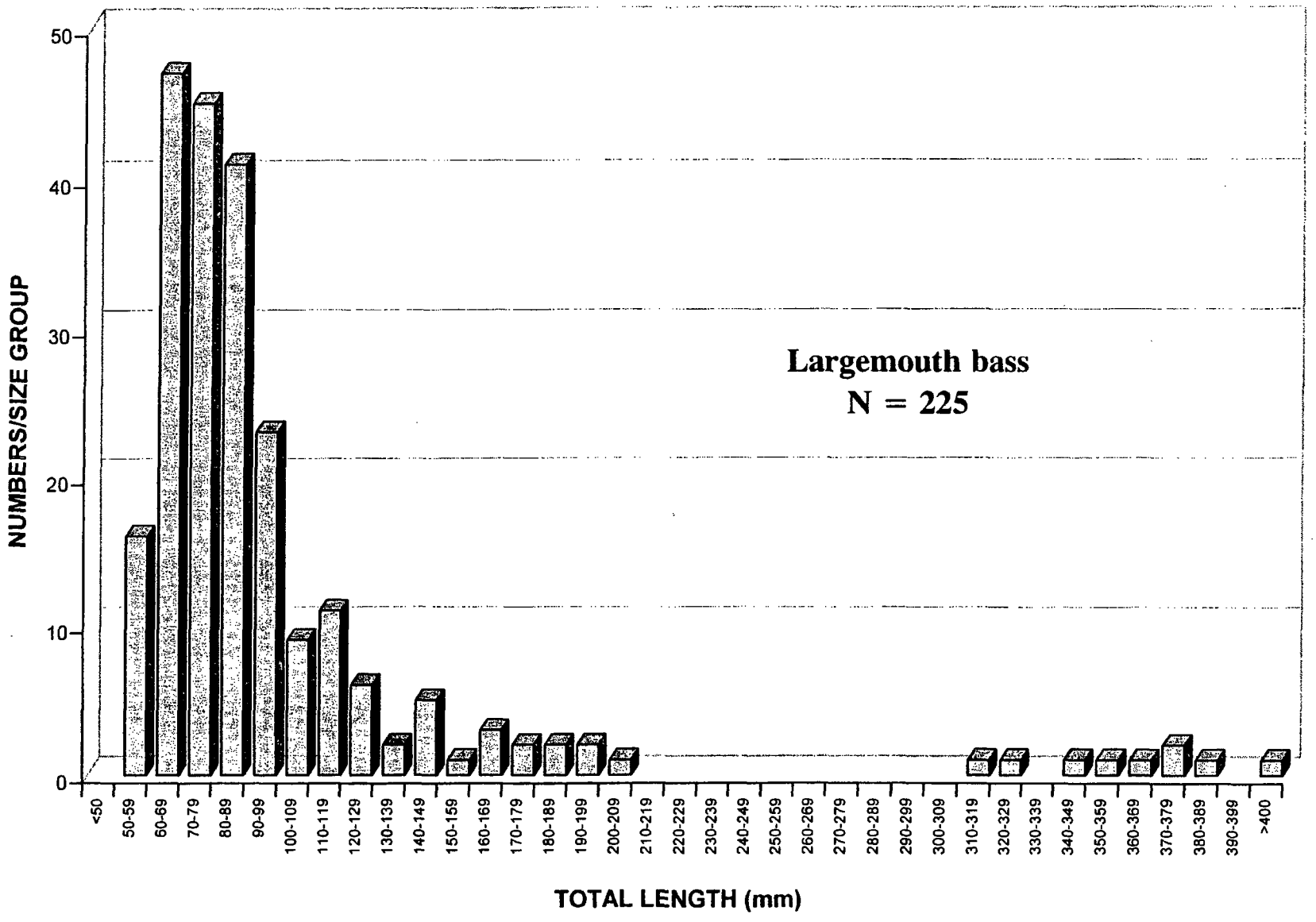

FIGURE 3-4. LENGTH-FREQUENCY DISTRIBUTION OF LARGEMOUTH BASS COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

3.5 COMMUNITY CHARACTERISTICS

3.5.1 Diversity

Mean diversity indices were calculated for each of the 11 individual electrofishing and seining locations in 2010. Electrofishing diversity values ranged from 2.33 at Location 5L to 3.53 at Location 5R (Table 3-8). The average diversity index for all locations in 2010 was 3.11. This value is slightly higher than most years reported since 1977. The mean diversity index has ranged from 2.36 in 1982 to 3.74 in 2005. It should be noted that the average diversity indices were not calculated using weighted means, but are simply means of means. They should therefore be viewed with some degree of caution.

Mean diversity indices for each location sampled by seining ranged from 1.44 at Location 5L to 3.23 at Location 3L (Table 3-9). Diversity indices in the Kankakee River appear to reflect habitat quality and the flow characteristics at each location during the time of collection, rather than any affect associated with the Braidwood Station intake or blowdown. Average seining diversity indices (all locations) by year has ranged from 1.08 in 1983 to 2.97 in 2001. The average seining diversity index of 2.49 in 2010 is well within the range of values reported during the 33 years of this long-term sampling program.

3.5.2 Anomalies

In 2010, eight (0.21%) of the 3798 fish collected from the Kankakee River and Horse Creek exhibited some form of external anomaly (Table 3-10). Two of the eight fish were channel catfish, two were rock bass, two were freshwater drum, one was a northern hog sucker, and one was a largemouth bass. Two fish exhibited multiple anomalies. The northern hog sucker exhibited eroded fins and lesions and one of the two rock bass with anomalies also exhibited eroded fins and lesions. In total, five species were noted to exhibit at least one type of external anomaly. During previous studies (1991-2009), fish with external anomalies have comprised from 0.1% of the fish examined in 2001 to 4.9% of the fish examined in 1993. The majority of fish during those years were afflicted with eroded fins, parasitic leeches, cysts, or anchor worm. In 2010, anchor worm (*Lernaea spp.*) was the only parasite observed and accounted for three

TABLE 3-8

MEAN DIVERSITY INDICES FOR THE CATCH OF FISH AT EACH LOCATION COLLECTED BY ELECTROFISHING

Braidwood Station - 1977-2010

YEAR	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R	MEAN ALL LOCATIONS
1977	3.31	2.89	3.15	-	-	-	-	3.33	3.31	3.22	2.94	3.16
1978	3.12	2.51	3.02	2.68	2.56	2.91	2.75	2.92	3.73	3.09	2.42	2.88
1979	3.04	2.83	3.23	2.75	2.72	2.55	2.65	3.29	3.05	3.07	2.94	2.92
1981	3.16	3.20	3.29	3.11	2.84	2.87	2.90	3.53	3.38	3.01	2.86	3.10
1982	2.65	2.31	3.24	2.15	2.26	2.11	1.93	2.73	1.17	3.16	2.23	2.36
1983	2.72	2.91	3.31	2.63	2.28	2.13	1.66	3.04	2.46	2.79	2.42	2.58
1984	2.55	2.82	2.93	2.35	2.42	2.38	2.53	2.90	2.40	2.32	2.68	2.57
1985	2.66	2.89	3.61	2.44	3.56	2.23	2.77	3.04	3.33	2.64	3.10	2.93
1986	3.09	3.29	3.05	2.87	3.17	3.04	2.84	3.26	3.19	2.88	3.18	3.08
1987	2.93	2.97	3.45	2.74	2.34	2.75	2.71	3.39	2.51	2.97	2.50	2.84
1988	3.22	2.90	3.52	2.14	3.04	2.86	2.43	2.59	3.68	2.60	2.86	2.89
1989	3.05	2.97	2.92	2.61	3.15	2.60	3.29	3.86	3.47	2.80	3.06	3.07
1990	3.36	3.09	2.88	2.69	2.82	2.73	3.09	3.40	2.03	3.40	2.83	2.94
1991	2.76	3.23	1.79	2.58	2.63	2.87	3.01	2.64	2.32	2.53	2.74	2.65
1992	2.97	2.58	2.14	2.22	2.33	2.82	2.97	3.60	3.13	2.61	3.20	2.78
1993	3.33	2.68	2.71	2.90	2.22	2.86	2.93	3.37	3.37	2.52	2.11	2.82
1994	3.05	2.81	4.02	2.52	2.98	2.50	3.20	3.12	3.51	2.66	2.18	2.96
1995	3.57	3.36	3.12	3.28	2.83	3.22	3.28	3.58	2.57	3.59	3.19	3.24
1996	3.44	3.62	3.24	2.80	2.73	2.80	3.60	3.40	3.11	3.37	3.28	3.22
1997	2.19	3.84	3.17	2.38	3.14	3.31	3.61	2.05	1.50	1.38	2.65	2.66

TABLE 3-8 (Continued)

MEAN DIVERSITY INDICES FOR THE CATCH OF FISH AT EACH LOCATION COLLECTED BY ELECTROFISHING

Braidwood Station - 1977-2010

YEAR	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R	MEAN ALL LOCATIONS
1998	3.76	3.34	2.07	3.33	3.36	2.50	1.68	3.06	2.70	2.61	3.18	2.87
1999	2.85	3.50	3.28	3.33	3.63	3.23	3.45	2.84	2.82	3.35	2.96	3.20
2000	3.14	3.23	3.22	2.69	3.11	2.76	3.17	3.44	2.66	3.50	3.15	3.10
2001	2.91	3.56	3.47	3.05	3.00	3.04	3.31	3.17	3.64	3.55	3.02	3.25
2002	3.64	3.74	3.12	3.66	3.07	3.48	3.23	3.57	3.90	3.56	3.15	3.47
2003	3.43	3.62	3.38	2.50	3.10	2.91	2.76	3.37	3.14	3.04	2.69	3.08
2004	3.72	3.15	3.55	2.55	3.08	2.31	3.21	3.51	3.84	3.09	3.25	3.21
2005	3.88	3.92	4.13	3.99	3.56	3.78	3.12	3.76	3.52	4.15	3.31	3.74
2006	3.56	2.53	3.40	2.29	2.57	2.68	3.65	2.97	3.33	3.40	2.92	3.03
2007	3.73	3.12	3.44	3.92	3.65	3.78	3.77	4.01	3.35	4.03	3.89	3.71
2008	3.42	2.53	3.86	2.61	3.45	3.25	3.12	3.60	3.87	3.13	3.69	3.32
2009	2.60	2.88	3.38	3.57	3.63	3.20	3.13	2.53	3.45	3.27	3.08	3.16
2010	3.46	3.06	3.35	2.66	3.51	3.13	3.38	2.33	3.53	2.90	2.90	3.11

TABLE 3-9

MEAN DIVERSITY INDICES FOR THE CATCH OF FISH AT EACH LOCATION COLLECTED BY SEINING

Braidwood Station - 1977-2010

YEAR	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R	MEAN ALL LOCATIONS
1977	2.52	2..21	2.71	2.81	2.16	2.89	2.15	2.55	2.66	2.60	2.50	2.52
1978	1.56	2.15	1.47	1.45	2.19	1.39	1.69	2.49	2.24	1.29	2.33	1.84
1979	2.00	1.85	1.80	1.81	1.31	2.42	1.73	2.81	2.26	1.29	2.33	1.96
1981	1.95	2.25	1.82	2.14	0.78	1.73	1.17	2.72	2.88	1.67	2.61	1.97
1982	1.51	1.10	1.63	0.91	0.00	0.72	0.82	2.39	2.30	0.80	0.81	1.18
1983	1.19	1.11	0.76	0.46	0.23	0.95	0.82	2.26	2.08	0.47	1.55	1.08
1984	1.29	1.05	1.11	1.83	0.71	1.07	0.22	1.99	1.86	0.84	1.32	1.21
1985	2.17	2.69	2.80	1.84	2.05	2.42	2.53	2.19	3.07	1.32	2.99	2.37
1986	1.53	2.24	1.26	1.75	0.87	1.44	1.46	2.49	1.74	2.34	1.74	1.71
1987	1.83	2.34	2.62	1.72	1.35	1.67	2.25	2.24	2.27	1.45	1.52	1.93
1988	1.23	2.30	1.78	1.87	2.00	1.81	1.40	2.64	2.64	0.96	1.90	1.87
1989	2.20	1.64	1.35	1.89	1.86	2.03	2.16	2.25	2.28	2.05	2.48	2.02
1990	1.54	1.28	1.06	1.84	0.51	1.22	0.51	2.80	3.22	2.48	2.03	1.68
1991	1.87	1.90	1.76	2.02	2.13	2.39	2.35	2.63	2.28	2.29	2.03	2.15
1992	1.80	1.67	0.99	2.38	1.15	2.84	1.53	3.46	2.59	1.51	0.93	1.90
1993	1.08	1.37	0.00	0.52	0.73	1.61	0.66	1.58	2.73	1.26	1.41	1.18
1994	2.71	3.31	3.00	2.47	3.08	1.47	2.78	2.86	3.00	2.94	2.61	2.75
1995	3.29	2.30	2.04	3.17	2.91	3.16	2.02	3.01	2.94	3.02	2.83	2.79
1996	2.78	2.42	2.52	2.43	2.97	2.52	2.59	3.49	2.51	2.62	2.78	2.69
1997	3.02	2.00	2.76	2.90	2.69	2.98	2.38	1.53	2.49	3.21	2.92	2.63

TABLE 3-9 (Continued)

MEAN DIVERSITY INDICES FOR THE CATCH OF FISH AT EACH LOCATION COLLECTED BY SEINING

Braidwood Station - 1977-2010

YEAR	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R	MEAN ALL LOCATIONS
1998	3.23	2.60	1.50	2.00	3.11	2.34	1.04	2.21	1.83	2.25	1.77	2.17
1999	2.16	1.92	2.15	1.81	1.14	2.87	1.97	2.22	2.60	2.32	2.55	2.16
2000	2.25	1.27	1.21	2.45	0.56	2.13	1.97	2.10	2.45	1.59	2.29	1.84
2001	3.09	2.63	3.02	2.76	2.62	3.09	3.32	2.95	3.05	3.39	2.80	2.97
2002	2.93	2.80	2.46	3.02	2.64	3.39	2.84	3.04	3.31	2.76	2.80	2.91
2003	1.29	2.29	2.44	2.68	1.67	2.35	2.99	2.84	3.09	2.79	2.61	2.46
2004	3.39	2.77	3.22	2.94	1.48	2.82	2.78	2.73	3.01	3.15	2.40	2.79
2005	2.18	2.31	2.90	2.50	3.15	2.76	2.23	2.75	1.85	2.51	1.53	2.43
2006	1.91	1.56	2.52	3.08	2.10	2.73	2.66	2.58	2.09	2.52	2.71	2.40
2007	3.44	3.16	2.69	2.56	3.23	3.10	2.24	3.05	2.52	2.97	3.30	2.93
2008	1.46	3.07	2.76	3.04	2.09	2.93	2.74	2.84	3.40	2.88	2.99	2.74
2009	1.65	1.92	2.04	3.02	1.96	1.53	2.23	1.93	2.21	2.38	2.65	2.14
2010	2.02	2.26	1.99	3.23	2.31	2.48	2.87	1.44	3.21	2.92	2.69	2.49

TABLE 3-10

NUMBER OF ANOMALIES ASSOCIATED WITH FISH COLLECTED AT EACH SAMPLING LOCATION ON THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2010

	SAMPLING LOCATION											
ANOMALY	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R	TOTAL
Eroded fin	1		1			1						3
Lesions			1	1		1	1					4
Anchor worm *(Lernaea spp.)*									1	2		3
Total Anomalies	1	0	2	1	0	2	1	0	1	2	0	10
Total Fish	118	118	386	347	292	308	368	560	623	446	232	3798
Percent[a]	(0.85)	(0.0)	(0.52)	(0.29)	(0.0)	(0.65)	(0.27)	(0.0)	(0.16)	(0.45)	(0.0)	(0.26)

[a] Percent of total fish sampled with external anomalies by location.

(30.0%) of the 10 total anomalies noted. Anchor worm was noted on two of the freshwater drum and one of the rock bass taken during electrofishing sampling.

DELT (Deformities, Eroded fins, Lesions, or Tumors) anomalies were noted on five (0.13%) of the 3798 fish collected. Lesions occurred on four individuals and eroded fins (fin rot) occurred on three individuals. As noted in the previous paragraph, one rock bass and one northern hog sucker exhibited both eroded fins and lesions (five fish with seven total DELT anomalies). Tumors, malformations, fish lice, leeches, cysts, and black spot were not observed on any of the fish examined in 2010. The numbers of fish noted with external anomalies by location were all low with the greatest number of fish (2) with anomalies occurring at Location 2 in Horse Creek (0.52% of all fish examined), Location 4L (0.65% of all fish examined), and Location 6L (0.45% of all fish examined). The highest percentage of fish with anomalies occurred at Location 1L where one (0.85%) of the 118 fish observed exhibited some form of external anomaly. The low percentage of individuals with DELT anomalies noted in 2010 indicates that the resident fish assemblage in this portion of the Kankakee River was in good condition (as defined by Karr, 1981) during the August sampling period.

3.5.3 Relative Weight

Inherent in the development of the W_s equations used to calculate W_r is the objective of modeling the growth form of a species for fish in better-than-average condition. A mean W_r value close to 100 (90-110) over a range of size groups may reflect optimal health and utilization of food resources for a given population (Anderson and Gutrueter 1983). When relative weight values are considerably less than 100, problems may exist in food availability and/or feeding relationships.

A total of 215 fish (15 species) that met the minimum length criteria of the W_r equations was collected (Table 3-11 and Appendix Table C-1). Of the 15 species collected, only eight were represented by more than 10 individuals. Relative weights by species, as well as by individuals within a species, were highly variable. Mean relative weight by species ranged from 87.2 for bigmouth buffalo to 115.1 for gizzard shad. Several factors can influence W_r, including sample size, fish size, sex, food availability, competition, and spawning condition. With the possible

TABLE 3-11

MEAN RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKE RIVER AND HORSE CREEK NEAR BRAIDWOOD STATION - AUGUST 2010

SPECIES	No.	(Wr)	RANGE
Gizzard shad	3	115.1	100.5 - 129.2
Carp	15	89.0	76.4 - 104.5
River carpsucker	8	106.6	85.2 - 131.0
Bigmouth buffalo	1	87.2	87.2
Smallmouth buffalo	1	110.0	110.0
Channel catfish	19	92.3	63.2 - 110.7
Northern pike	3	87.4	73.8 - 100.6
Rock bass	49	106.4	84.4 - 130.7
Bluegill	25	108.5	70.5 - 140.0
Green sunfish	15	103.4	76.7 - 135.0
Smallmouth bass	34	99.9	71.9 - 117.6
Largemouth bass	21	110.5	85.3 - 139.8
Black crappie	1	95.9	95.9
Walleye	13	91.0	68.2 - 113.6
Freshwater drum	7	106.2	96.1- 113.0

exceptions of the one bigmouth buffalo, three northern pike, and perhaps the 15 carp that were collected (W_r = 87.2, 87.4, and 89.0, respectively), the remaining species examined appeared to reflect optimal health and utilization of food resources based upon the relative weights of fish that were collected during the August 2010 Braidwood Fish Monitoring Program. Twelve of the 15 species examined exhibited a W_r score of greater than 90.0 and eight species (gizzard shad, river carpsucker, smallmouth buffalo, rock bass, bluegill, green sunfish, largemouth bass, and freshwater drum) scored greater than 100.

3.6 Physicochemical Data

Water quality data recorded in conjunction with fish sampling was measured at each location prior to every sample collection (Appendix Tables A-1 to A-4). During August 2010, water temperature ranged from 24.9 °C at Location 3L on August 4 to 29.0 °C at Location 4R (the Braidwood Station discharge) on August 3. Water temperatures were slightly warmer during the second sampling period. Dissolved oxygen ranged from 5.2 to 17.0 ppm, pH from 7.9 to 8.5, and conductivity from 433 to 659 µmhos/cm. With the exception of the relatively high dissolved oxygen readings that were recorded on August 3, the physicochemical data collected in 2010 was similar to values reported during earlier years of these studies. Each of the measured water quality parameters observed were within the range of values capable of supporting a healthy fishery.

Since 1981, mean monthly discharge for the Kankakee River (Site Number 05527500) has been calculated from flow data recorded by the United States Geological Survey (USGS) near Wilmington, Illinois (Figure 3-5 and Appendix Table A-5). Based on preliminary data, the mean monthly river flows for January and June 2010 were substantially higher than the mean monthly flows for all years combined (January 1981- August 2009). In contrast, the mean monthly river flow for September 2010 was one of the lowest reported since 1981. Mean monthly river flows for the remaining months in 2010 were all similar to or slightly less than the mean for all years combined. These data should be viewed with caution because the current water year's data is still preliminary. October through December 2010 preliminary mean monthly river flows were not available when this report was being prepared.

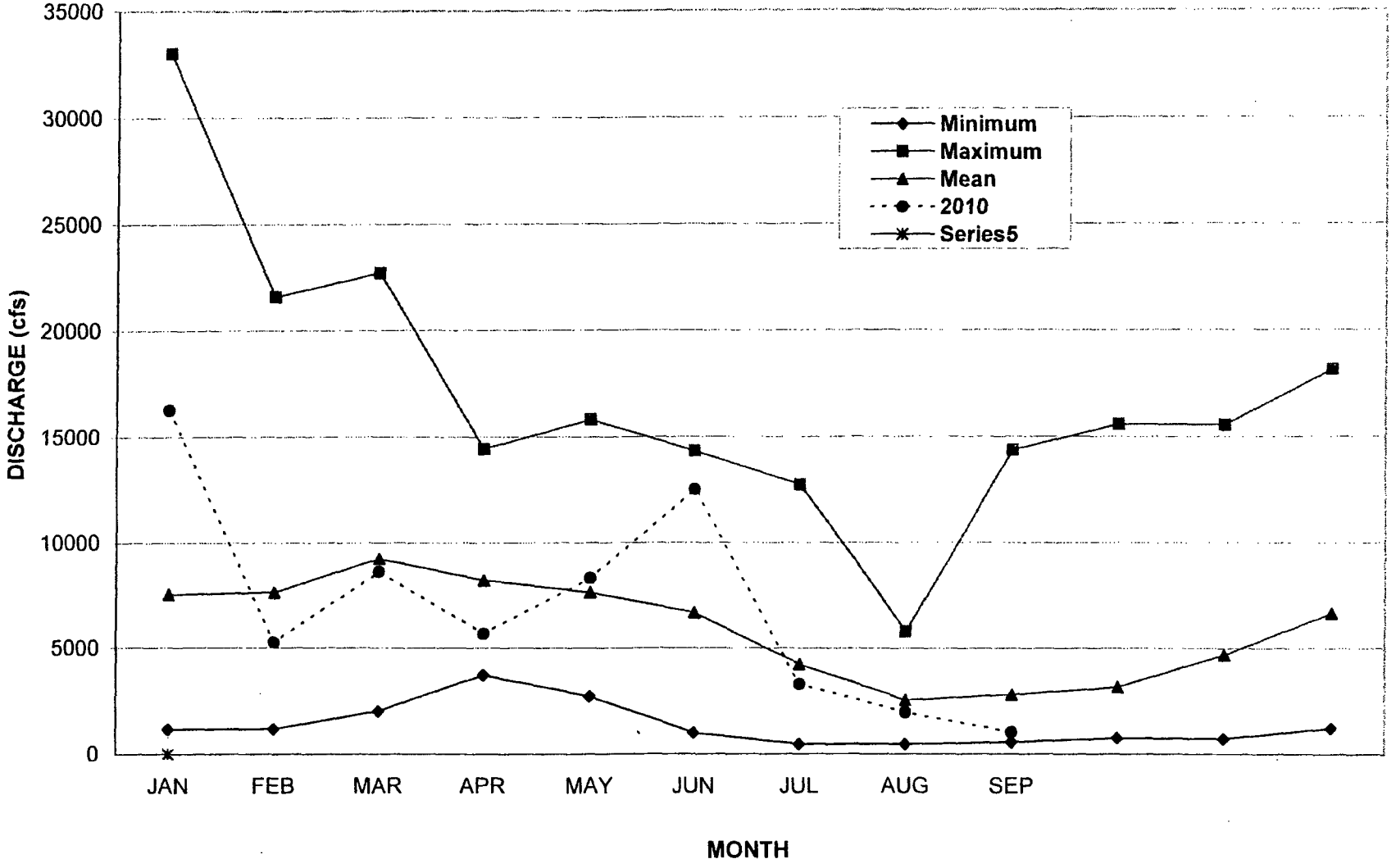

FIGURE 3-5. MONTHLY MEAN, MAXIMUM AND MINIMUM KANKAKEE RIVER FLOWS RECORDED BY THE USGS GAUGING STATION NEAR WILMINGTON, ILLINOIS, JANUARY 1981 THROUGH SEPTEMBER 2010. (MEAN DOES NOT INCLUDED PROVISIONAL DATA OF SEPTEMBER 2009 - AUGUST 2010).

Mean monthly river flow (excluding provisional data) since 1981 has averaged 6007 cfs (Appendix Table A-5). Highest mean monthly river flows have occurred during March and April, while the lowest flows have occurred during the months of August through October. River flows in 2010 ranged from 1010 cfs in September to 16,266 cfs in January.

With the exception of the August 4 sampling date, river flow during each sampling date in 2010 was similar to or below the 29-yr mean August monthly average of 2525 cfs (Appendix Table A-5). Preliminary flow data for the three sampling dates during the first sampling period on August 2, 3, and 4, were 2480, 2380, and 5650 cfs, respectively. The increased flow observed on August 4 was the result of a strong thunderstorm that produced heavy wind and rainfall during the evening of August 3. River flows dropped quickly within a few days following this event. Flow data for the three sampling dates during the second sampling period on August 16, 17, and 18, were 1370, 1250, and 1180 cfs, respectively. River flows were higher during the first sampling period in August 2010 when compared to the second sampling period. River flows in the Kankakee River can be highly variable over a relatively short period of time.

4.0 SUMMARY

1. Forty-three species of fish representing 13 families were collected from the Kankakee River and Horse Creek during the Braidwood Station Aquatic Monitoring Program in August 2010.

2. No pallid shiner or river redhorse were collected during the 2010 fisheries surveys in the Kankakee River near Braidwood Station. Pallid shiner is currently listed as endangered, while the river redhorse is currently listed as threatened in Illinois. No other protected species were observed in 2010.

3. A total of 3798 fish weighing 173.1 kg was collected during electrofishing and seining efforts in 2010.

4. Spotfin shiner (23.0%), longear sunfish (16.0%), bluntnose minnow (15.7%), bullhead minnow (10.5%), largemouth bass (6.3%), and sand shiner (5.6%) were the most abundant species collected in 2010.

5. Carp (29.7%), channel catfish (18.3%), smallmouth bass (8.7%), largemouth bass (6.0%) and freshwater drum (5.5%) comprised 68.2% of the total biomass (173.1 kg) sampled during electrofishing and seining efforts in 2010.

6. Electrofishing resulted in the capture of 2109 fish representing 38 species. Longear sunfish was the most abundant species observed, accounting for 25.7% of all fish collected, followed by bluntnose minnow (16.5%), largemouth bass (9.1%), spotfin shiner (9.1%), and bullhead minnow (7.5%). Electrofishing biomass was dominated by carp, which constituted 30.5% of the 168.6 kg collected. Carp and sucker species accounted for 47.8% of the total electrofishing biomass. Electrofishing CPE was 234.3 fish/hr in 2010, which is higher than the 33-yr average of 176.3 fish/hr.

7. Thirty-one species were among the 1689 fish collected in seine samples. Spotfin shiner dominated the catch comprising (40.4%) of all fish collected, followed by bluntnose minnow (14.6%), bullhead minnow (14.1%), and sand shiner (8.3%). Seining biomass (4.5 kg) was dominated by cyprinid species with spotfin shiner comprising 35.9%, bluntnose minnow 11.9%, bullhead minnow 11.6%, longear sunfish 10.5%, largemouth bass 6.6%, and sand shiner 6.0% of the total biomass collected. No other species individually comprised more than 5% of the total biomass collected. Seining CPE in 2010 (38.4 fish/haul) was less than the 33-yr mean of 58.0 fish/haul. Fewer sunfish species were collected in 2009 and 2010 than during most recent years, which may be attributed to the decline in aquatic vegetation observed throughout the entire sampling area.

8. The mean diversity index of fish collected by electrofishing for all locations combined in 2010 was 3.11, which is slightly higher than most years reported since 1977. The mean diversity index for electrofishing has ranged from 2.36 in 1982 to 3.74 in 2005. The mean diversity index of fish collected by seining in 2010 was 2.49, which is well within the range of values reported since 1977. The mean seining diversity index has ranged from 1.08 in 1983 to 2.97 in 2001.

9. Only eight (0.21%) of the 3798 fish collected in 2010 exhibited some form of external anomaly. Lesions (40.0%), eroded fins (30.0%), and anchor worm (30.0%) accounted for all of the ten anomalies observed. Tumors, malformations, fish lice, black spot, leeches, and cysts were not observed in 2010. Two of the eight fish afflicted were channel catfish, two were rock bass, two were freshwater drum, and one specimen each of northern hog sucker and largemouth bass was also observed with an external anomaly. The largest percentage (0.85%) of fish collected with anomalies was observed at Location 1L. The very low incidence of DELT (Deformities, Eroded fins, Lesions, and Tumors) anomalies observed in 2010, which occurred on only five (0.13%) of the 3798 fish examined, continues to indicate that the fish assemblage in this portion of the Kankakee River is in good condition during the August sampling period.

10. Mean relative weights (W_r) of fish near the Braidwood Station ranged from 87.2 for bigmouth buffalo (one individual) to 115.1 for gizzard shad. With the exception of a few individuals, fish collected in the Kankakee River during the August sampling period were in good to excellent condition. Eight species (gizzard shad, river carpsucker, smallmouth buffalo, rock bass, green sunfish, bluegill, largemouth bass, and freshwater drum) exhibited mean relative weight scores of more than 100.

11. Based on length frequency data collected by electrofishing and seining sampling efforts in 2010, recruitment of rock bass, longear sunfish, and smallmouth bass appeared to be weak in this portion of the Kankakee River, while largemouth bass recruitment appeared to be very strong.

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APPENDIX A

PHYSICOCHEMICAL DATA

LIST OF TABLES

TABLE A-1

ANCILLARY MEASUREMENTS RECORDED CONCURRENTLY WITH ELECTROFISHING SAMPLES FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - August 2-3, 2010

PARAMETER	1L[a]	1R[a]	2[a]	3L[b]	3R[a]	4L[b]	4R[a]	5L[b]	5R[b]	6L[b]	6R[b]
Time	1410	1500	1355	1315	1700	1230	1740	1140	1045	0850	0955
Temperature (°C)	25.5	25.6	26.0	25.4	25.7	25.6	29.0	25.4	26.4	26.2	26.3
Dissolved oxygen (ppm)	16.0	15.9	8.5	8.6	17.0	7.5	16.5	6.8	7.0	7.2	6.3
pH	8.3	8.3	8.4	8.2	8.4	8.2	8.3	8.1	8.1	8.2	8.1
Conductivity (µmhos/cm)	536	541	579	526	521	525	598	524	529	502	524

[a]Samples collected on August 2, 2010.
[b]Samples collected on August 3, 2010.

TABLE A-2

ANCILLARY MEASUREMENTS RECORDED CONCURRENTLY WITH ELECTROFISHING SAMPLES FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - August 16-17, 2010

PARAMETER	1L[a]	1R[a]	2[a]	3L[b]	3R[b]	4L[b]	4R[b]	5L[b]	5R[b]	6L[b]	6R[b]
Time	1605	1520	1600	1210	1130	1300	1055	0915	0955	0815	0720
Temperature (°C)	27.5	26.8	27.6	26.3	26.5	26.8	27.7	26.5	27.5	26.6	26.9
Dissolved oxygen (ppm)	7.5	6.5	8.0	5.9	5.7	7.2	6.1	6.2	7.3	6.4	6.1
pH	7.9	8.0	8.5	8.0	8.1	8.1	8.1	8.1	8.1	8.0	8.2
Conductivity (μmhos/cm)	619	613	610	619	611	619	646	608	615	608	616

[a]Samples collected on August 16, 2010.
[b]Samples collected on August 17, 2010.

TABLE A-3

ANCILLARY MEASUREMENTS RECORDED CONCURRENTLY WITH SEINING SAMPLES FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - August 3-4, 2010

PARAMETER	1L[a]	1R[a]	2[a]	3L[b]	3R[a]	4L[b]	4R[a]	5L[b]	5R[b]	6L[b]	6R[b]
Time	1415	1440	1500	0850	1550	0920	1615	0945	1015	0805	1045
Temperature (°C)	25.5	26.3	26.6	24.9	26.2	25.0	27.7	25.2	26.2	25.8	26.0
Dissolved oxygen (ppm)	7.9	9.5	8.1	5.3	11.2	5.2	8.8	6.0	5.6	6.2	5.9
pH	8.2	8.3	8.3	8.1	8.3	8.1	8.2	8.1	8.2	8.1	8.1
Conductivity (µmhos)	521	523	560	435	515	433	598	444	513	507	515

[a]Samples collected on August 3, 2010.
[b]Samples collected on August 4, 2010.

TABLE A-4

ANCILLARY MEASUREMENTS RECORDED CONCURRENTLY WITH SEINING SAMPLES FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - August 18, 2010

PARAMETER	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R
Time	1420	1440	1515	1345	1400	1330	1300	1200	1230	1115	1145
Temperature (°C)	26.9	25.4	25.8	27.6	26.9	26.2	26.5	26.6	25.9	25.7	25.5
Dissolved oxygen (ppm)	6.0	5.4	8.8	7.0	6.3	6.4	6.0	6.4	5.8	6.2	5.5
pH	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.2	8.3	8.2
Conductivity (µmhos)	657	636	619	632	626	633	659	628	641	599	629

TABLE A-5

MEAN MONTHLY DISCHARGE (ft^3/sec) IN THE KANKAKEE RIVER NEAR WILMINGTON, ILLINOIS

Braidwood Station 1981 - 2010

YEAR	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
1981	2025	4148	4124	9038	15810	12510	6809	5775	5141	4649	3613	4335	6663
1982	5247	11180	22730	10340	5752	5684	4013	2331	1173	1084	5742	18150	7951
1983	5585	6594	5788	11680	14320	4536	4190	1380	914	1402	2340	11210	5994
1984	2229	11740	13430	9309	11210	6695	2610	1323	832	1661	3744	5842	6051
1985	8104	9273	17780	11810	3232	2602	1477	2102	1462	2379	15530	9610	7279
1986	3565	5865	6447	4353	7370	8941	6268	1655	1321	7820	4585	6796	5581
1987	3675	5984	4261	4965	7270	6179	2272	1692	1580	1579	1810	8991	4354
1988	7882	5615	5208	9074	2852	997	467	451	729	1380	4180	4394	3768
1989	6483	4291	5372	6554	4387	8271	3677	2090	9075	3094	3447	2390	5093
1990	5499	11660	15440	6689	9927	4872	6434	5793	3068	8879	11260	14940	8871
1991	16220	9839	14960	10930	9917	5017	1252	757	839	2114	6405	7306	7296
1992	4098	6291	6132	5424	2695	2441	4081	2387	3036	2643	11540	7024	4816
1993	17270	6036	13800	14420	6606	14320	12710	3871	14370	15570	9215	8659	11570
1994	5813	7811	8031	11890	6147	4753	5062	2505	1778	1360	4219	6415	5648
1995	7699	3448	6960	11590	12300	6797	3300	3302	950	934	4026	1931	5436
1996	2217	1859	2777	4008	11210	13260	9389	5600	1666	1856	3146	6081	5422
1997	6031	13660	13360	6217	6374	13990	4245	4047	1836	1265	1653	3031	6476
1998	10240	7889	16620	11740	13230	8657	6792	3002	1058	1082	1115	1378	7067
1999	5501	7517	7079	10930	7010	6008	2424	851	544	754	712	1493	4402
2000	1166	1631	2794	4218	4105	7598	6700	1536	850	1144	1804	1599	3095
2001	1738	13190	7986	5691	3442	7695	2343	1186	1261	9202	5535	6438	5642
2002	4051	10920	10380	11490	15700	4786	1794	2309	813	822	969	1207	5604
2003	1359	1184	2018	3708	7492	3793	12720	2648	1608	1568	5477	5707	4274
2004[a]	4210	2078	6593	4525	4485	11030	2479	3568	3819	1633	5846	10120	5032
2005[a]	17490	10460	5486	5247	2899	1932	811	1193	843	1106	1556	1556	4215
2006[a]	4548	3430	6125	6767	6146	3330	2622	2063	2940	4838	4763	4763	4361
2007[a]	12450	4838	12550	8701	5166	2545	1360	4568	2901	1840	2583	8558	5672
2008[a]	33001	21586	8891	7795	5301	9415	2223	2041	11596	4584	4109	16287	10569
2009[a]	13486	11448	14812	9084	9328	4905	2032	1188	**1449**[b]	**3966**	**7590**	**6695**	**7165**
2010[a]	**16266**	**5275**	**8634**	**5699**	**8328**	**12501**	**3281**	**1948**	**1010**	[c]	[c]	[c]	
Mean[d]	7548	7637	9239	8213	7644	6674	4226	2525	2786	3152	4676	6650	6007

[a] Data taken from US Army Corp of Engineers website.
[b] Numbers in bold characters represent provisional river flow data.
[c] Data not available at time of printing.
[d] Mean calculated from January 1981 to August 2009 (does not include provisional data collected from September 2009 through August 2010).

APPENDIX B

HISTORICAL CATCH DATA

LIST OF TABLES

TABLE B-1

PERCENT OF TOTAL CATCH OF THE FIVE DOMINANT SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 1978-2010

1978	
Gizzard shad	16.1
Bluntnose minnow	15.1
Longear sunfish	9.4
Sand shiner	7.3
Smallmouth bass	6.5
Total	69.7

1979	
Spotfin shiner	23.5
Bluntnose minnow	18.4
Sand shiner	11.1
Smallmouth bass	5.6
Rock bass	4.8
Total	63.4

1981	
Spotfin shiner	10.2
Golden redhorse	9.8
Bluntnose minnow	7.7
Shorthead redhorse	6.8
Rock bass	6.1
Total	40.6

1982	
Smallmouth bass	9.3
Golden redhorse	7.7
Striped shiner	7.7
Green sunfish	7.0
Rosyface shiner	6.5
Total	38.2

1983	
Striped shiner	18.0
Spotfin shiner	11.6
Bluntnose minnow	9.8
Smallmouth bass	8.4
Sand shiner	7.5
Total	54.7

1984	
Spotfin shiner	14.3
Striped shiner	9.5
Bullhead minnow	8.2
Green sunfish	7.9
Smallmouth bass	7.7
Total	47.6

1985	
Bluntnose minnow	23.8
Spotfin shiner	13.5
Striped shiner	8.9
Smallmouth bass	6.6
Golden redhorse	6.5
Total	59.3

1986	
Bluntnose minnow	20.8
Longear sunfish	13.1
Golden redhorse	9.3
Rock bass	7.5
Smallmouth bass	6.3
Total	57.0

1987	
Spotfin shiner	21.9
Bluntnose minnow	13.2
Longear sunfish	10.4
Gizzard shad	6.0
Bullhead minnow	5.8
Total	57.3

1988	
Smallmouth bass	21.4
Gizzard shad	15.8
Longear sunfish	7.8
Rosyface shiner	6.8
Bluntnose minnow	6.5
Total	58.3

1989	
Longear sunfish	19.4
Smallmouth bass	12.2
Bluntnose minnow	10.5
Rock bass	5.5
Green sunfish	5.4
Total	53.0

1990	
Gizzard shad	36.2
Longear sunfish	13.6
Spotfin shiner	5.6
Golden redhorse	5.2
Rock bass	4.8
Total	65.4

1991	
Gizzard shad	24.3
Spotfin shiner	17.1
Bluegill	13.6
Bullhead minnow	9.7
Bluntnose minnow	6.6
Total	71.3

1992	
Spotfin shiner	31.1
Striped shiner	9.7
Smallmouth bass	9.5
Bluntnose minnow	8.4
Longear sunfish	6.9
Total	65.6

1993	
Longear sunfish	20.8
Gizzard shad	12.0
Rock bass	8.6
Smallmouth bass	6.4
Spotfin shiner	6.1
Total	53.9

TABLE B-1 (Continued)

PERCENT OF TOTAL CATCH OF THE FIVE DOMINANT SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 1978-2010

1994	
Golden redhorse	26.6
Gizzard shad	11.0
Striped shiner	10.9
Bluntnose minnow	9.9
Sand shiner	6.8
Total	65.2

1995	
Bluntnose minnow	24.6
Gizzard shad	15.1
Bluegill	10.8
Longear sunfish	8.4
Bullhead minnow	8.3
Total	67.2

1996	
Bluntnose minnow	30.0
Bullhead minnow	11.2
Carp	9.2
Sand shiner	8.9
Spotfin shiner	8.2
Total	67.5

1997	
Gizzard shad	38.5
Bluntnose minnow	17.2
Sand shiner	7.6
Spotfin shiner	7.2
Longear sunfish	3.9
Total	74.4

1998	
Bluntnose minnow	34.7
Gizzard shad	26.2
Longear sunfish	7.3
Sand shiner	4.1
Bluegill	3.4
Total	75.7

1999	
Bluntnose minnow	23.1
Bullhead minnow	19.2
Spotfin shiner	6.9
Longear sunfish	6.4
Gizzard shad	5.6
Total	61.2

2000	
Spotfin shiner	39.1
Bluntnose minnow	20.3
Bullhead minnow	12.5
Longear sunfish	8.9
Sand shiner	5.1
Total	85.9

2001	
Bluntnose minnow	21.1
Bullhead minnow	14.0
Spotfin shiner	13.2
Longear sunfish	11.4
Sand shiner	8.4
Total	85.9

2002	
Bluntnose minnow	20.2
Striped shiner	13.5
Bullhead minnow	12.4
Brook silverside	7.1
Spotfin shiner	7.1
Total	60.3

2003	
Carp	24.0
Longear sunfish	16.3
Bluntnose minnow	11.8
Spotfin shiner	10.2
Bullhead minnow	8.9
Total	71.2

2004	
Spotfin shiner	16.8
Longear sunfish	13.4
Bluntnose minnow	12.8
Sand shiner	7.9
Orangespotted sunfish	5.7
Total	56.6

2005	
Bluntnose minnow	12.5
Spotfin shiner	9.1
Sand shiner	6.8
Smallmouth bass	5.9
Brook silverside	5.5
Total	39.8

TABLE B-1 (Continued)

PERCENT OF TOTAL CATCH OF THE FIVE DOMINANT SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 1978-2010

2006	
Longear sunfish	35.7
Bluntnose minnow	16.8
Spotfin shiner	7.4
Gizzard shad	6.6
Rock bass	4.2
Total	70.7

2007	
Brook silverside	20.9
Bullhead minnow	8.9
Longear sunfish	7.0
Bluntnose minnow	6.3
Smallmouth bass	5.8
Total	48.9

2008	
Longear sunfish	16.8
Spotfin shiner	15.1
Bluntnose minnow	12.0
Bullhead minnow	9.4
Sand shiner	7.1
Total	60.4

2009	
Spotfin shiner	29.6
Bullhead minnow	17.3
Bluntnose minnow	10.9
Sand shiner	7.8
Longear sunfish	6.3
Total	71.9

2010	
Spotfin shiner	23.0
Longear sunfish	16.0
Bluntnose minnow	15.7
Bullhead shiner	10.5
Largemouth bass	6.3
Total	71.5

TABLE B-2

PERCENT BIOMASS OF TOTAL CATCH OF THE FIVE DOMINANT SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 1978-2010

1978	
Carp	22.6
Quillback	15.4
Smallmouth bass	12.9
Golden redhorse	9.7
Silver redhorse	9.1
Total	69.7

1979	
Golden redhorse	14.9
Smallmouth bass	14.9
Carp	14.1
Rock bass	9.6
Quillback	9.3
Total	62.8

1981	
Shorthead redhorse	21.0
Golden redhorse	18.3
Carp	15.6
Smallmouth bass	7.9
Rock bass	5.2
Total	68.0

1982	
Carp	26.9
Silver redhorse	17.6
Golden redhorse	11.7
Smallmouth bass	10.0
Quillback	9.3
Total	75.5

1983	
Quillback	36.0
Carp	16.5
Golden redhorse	11.6
Smallmouth bass	8.1
Silver redhorse	5.5
Total	77.7

1984	
Quillback	28.2
Golden redhorse	18.8
Silver redhorse	13.4
Smallmouth bass	9.6
Northern hogsucker	7.6
Total	77.6

1985	
Smallmouth bass	25.9
Golden redhorse	16.7
Quillback	13.5
Carp	9.3
Rock bass	8.2
Total	73.6

1986	
Golden redhorse	26.6
Quillback	13.3
Rock bass	9.9
Smallmouth bass	9.2
Gizzard shad	7.1
Total	66.1

1987	
Golden redhorse	16.6
Smallmouth bass	15.1
Gizzard shad	14.1
Quillback	13.4
Rock bass	9.4
Total	68.6

1988	
Golden redhorse	25.3
Smallmouth bass	13.5
Gizzard shad	12.6
Carp	10.3
Quillback	9.9
Total	71.6

1989	
Carp	25.2
Golden redhorse	15.7
Smallmouth bass	12.8
Rock bass	7.2
River redhorse	6.5
Total	67.4

1990	
Golden redhorse	21.6
Carp	16.6
River redhorse	13.0
Quillback	10.8
Silver redhorse	7.1
Total	69.1

1991	
Carp	29.9
Gizzard shad	18.6
Golden redhorse	12.1
Silver redhorse	9.6
Quillback	7.7
Total	77.9

1992	
Smallmouth bass	22.0
Carp	17.4
Gizzard shad	9.6
Channel catfish	9.4
Golden redhorse	8.6
Total	67.0

1993	
Carp	19.2
Golden redhorse	16.5
Silver redhorse	13.3
Smallmouth bass	12.2
Quillback	10.9
Total	72.1

TABLE B-2 (Continued)

PERCENT BIOMASS OF TOTAL CATCH OF THE FIVE DOMINANT SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 1978-2010

1994	
Carp	49.5
Golden redhorse	12.1
Silver redhorse	6.1
Channel catfish	5.3
Smallmouth bass	4.5
Total	77.5

1995	
Carp	38.1
Smallmouth bass	8.8
Silver redhorse	8.1
Golden redhorse	5.9
Bigmouth buffalo	5.4
Total	66.3

1996	
Carp	30.3
Quillback	11.4
Golden redhorse	9.9
Smallmouth bass	8.2
Gizzard shad	6.2
Total	66.0

1997	
Carp	27.0
Silver redhorse	24.4
Gizzard shad	14.3
Golden redhorse	7.7
Smallmouth bass	6.3
Total	79.7

1998	
Carp	30.8
Silver redhorse	13.5
Gizzard shad	11.8
Golden redhorse	9.6
Smallmouth bass	6.3
Total	72.0

1999	
Gizzard shad	19.0
Carp	14.0
Golden redhorse	14.0
Silver redhorse	12.3
Smallmouth bass	7.2
Total	66.5

2000	
Carp	23.4
Smallmouth bass	10.8
Gizzard shad	8.7
Channel catfish	8.5
Golden redhorse	8.5
Total	59.9

2001	
Carp	43.3
Smallmouth bass	15.0
Gizzard shad	7.2
Golden redhorse	6.7
Longear sunfish	4.8
Total	59.9

2002	
Carp	29.8
Smallmouth bass	18.2
Golden redhorse	6.6
Gizzard shad	5.7
Channel catfish	5.5
Total	65.8

2003	
Carp	24.0
Longear sunfish	16.3
Bluntnose minnow	11.8
Spotfin shiner	10.2
Bullhead minnow	8.9
Total	71.2

2004	
Smallmouth bass	20.1
Carp	16.9
Longear sunfish	11.6
Gizzard shad	10.1
Silver redhorse	7.7
Total	66.4

2005	
Carp	25.2
Smallmouth bass	16.1
Channel catfish	12.0
Northern hog sucker	6.9
Golden redhorse	6.5
Total	66.7

TABLE B-2 (Continued)

PERCENT BIOMASS OF TOTAL CATCH OF THE FIVE DOMINANT SPECIES COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 1978-2010

2006	
Carp	31.6
Gizzard shad	14.4
Channel catfish	12.6
Smallmouth bass	9.2
Golden redhorse	8.8
Total	76.6

2007	
Carp	31.4
Golden redhorse	14.2
Channel catfish	12.6
Smallmouth bass	9.1
River carpsucker	6.9
Total	74.2

2008	
Carp	26.7
Channel catfish	16.3
Golden redhorse	14.7
Smallmouth bass	8.4
Silver redhorse	6.1
Total	72.2

2009	
Golden redhorse	25.5
Channel catfish	18.6
Carp	12.8
Smallmouth bass	5.6
Freshwater drum	5.0
Total	67.5

2010	
Carp	29.7
Channel catfish	18.3
Smallmouth bass	8.7
Largemouth bass	6.0
Freshwater drum	5.5
Total	68.2

APPENDIX C

RELATIVE WEIGHTS

LIST OF TABLES

TABLE C-1

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

GIZZARD SHAD Alpha = -5.376 Beta = 3.170 Minimum Length = 180

		No.	TL(mm)	Wgt(gm)	Wr
3L	At Intake, Left Bank	1	241	173	115.63
	Location Average				115.63
5R	Near Field Recorvery, Right Bank	1	234	176	129.15
	Location Average				129.15
6L	Far Field Recovery, Left Bank	1	314	348	100.53
	Location Average				100.53
	TAXON AVERAGE	****			115.10 ****

COMMON CARP Alpha = -4.418 Beta = 2.859 Minimum Length = 280

		No.	TL(mm)	Wgt(gm)	Wr
1L	Above Intake, Left Bank	1	649	3200	76.37
		2	652	3800	89.51
		3	694	4400	86.70
		4	672	4050	87.50
		5	675	4900	104.52
		6	715	5200	94.09
	Location Average				89.78
1R	Above Intake, Right Bank	1	620	3100	84.32
		2	623	3450	92.55
		3	659	3700	84.53
	Location Average				87.13
2	Horse Creek	1	391	928	94.30
	Location Average				94.30

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

COMMON CARP — Alpha = -4.418 Beta = 2.859 Minimum Length = 280

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	555	2250	83.99

Location Average 83.99

4R Discharge Area, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	496	1550	79.79

Location Average 79.79

5L Near Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	711	5400	99.29

Location Average 99.29

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	617	3100	85.49

Location Average 85.49

6R Far Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	543	2300	91.40

Location Average 91.40

TAXON AVERAGE **** 88.96 ****

RIVER CARPSUCKER — Alpha = -4.754 Beta = 2.952 Minimum Length = 200

4R Discharge Area, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	284	370	120.23
2	321	453	102.54
3	376	703	99.77
4	380	733	100.83
5	399	890	106.00
6	428	880	85.20

Location Average 102.43

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	399	1100	131.01
2	433	1150	107.59

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

RIVER CARPSUCKER Alpha = -4.754 Beta = 2.952 Minimum Length = 200

		No.	TL(mm)	Wgt(gm)	Wr
6L	Far Field Recovery, Left Bank				
	Location Average				119.30
	TAXON AVERAGE	****			106.65 ****

BIGMOUTH BUFFALO Alpha = -4.956 Beta = 3.092 Minimum Length = 280

		No.	TL(mm)	Wgt(gm)	Wr
5R	Near Field Recorvery, Right Bank				
		1	512	2300	87.23
	Location Average				87.23
	TAXON AVERAGE	****			87.23 ****

SMALLMOUTH BUFFALO Alpha = -5.069 Beta = 3.092 Minimum Length = 280

		No.	TL(mm)	Wgt(gm)	Wr
4R	Discharge Area, Right Bank				
		1	450	1500	109.99
	Location Average				109.99
	TAXON AVERAGE	****			109.99 ****

CHANNEL CATFISH Alpha = -5.649 Beta = 3.243 Minimum Length = 280

		No.	TL(mm)	Wgt(gm)	Wr
1L	Above Intake, Left Bank				
		1	535	1550	98.01
		2	621	2600	101.39
		3	365	413	90.25
		4	431	768	97.89
		5	444	791	91.56
		6	587	1900	88.93
		7	603	1950	83.65
	Location Average				93.10

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

CHANNEL CATFISH Alpha = -5.649 Beta = 3.243 Minimum Length = 280

1R Above Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	652	2700	89.90
2	479	1000	90.50
Location Average			90.20

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
1	486	1050	90.66
2	602	2050	88.41
Location Average			89.54

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	607	2100	88.17
2	689	3500	97.44
Location Average			92.81

4R Discharge Area, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	551	1100	63.22
Location Average			63.22

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	457	1050	110.68
2	481	1000	89.29
3	526	1450	96.87
4	627	2400	90.71
Location Average			96.89

6R Far Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	589	2300	106.47
Location Average			106.47

TAXON AVERAGE **** 92.32 ****

NORTHERN PIKE Alpha = -5.369 Beta = 3.059 Minimum Length = 100

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	577	1050	87.85

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

NORTHERN PIKE — Alpha = -5.369 Beta = 3.059 Minimum Length = 100

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
		Location Average	87.85

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	722	1750	73.75
2	264	110	100.63
		Location Average	87.19
		TAXON AVERAGE ****	87.41 ****

ROCK BASS — Alpha = -4.883 Beta = 3.083 Minimum Length = 100

1L Above Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	109	22	87.91
2	109	26	103.89
3	196	170	111.28
		Location Average	101.03

1R Above Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	156	82	108.50
		Location Average	108.50

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
1	125	49	128.36
2	140	63	116.37
3	171	100	99.69
4	174	114	107.72
5	199	164	102.44
6	118	35	109.51
7	124	39	104.72
8	131	48	108.82
9	163	91	105.16
10	176	133	121.32
11	198	206	130.69
		Location Average	112.26

3L At Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	126	40	102.24

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

ROCK BASS Alpha = -4.883 Beta = 3.083 Minimum Length = 100

3L At Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
2	169	100	103.38
3	202	184	109.75
4	131	42	95.21
5	133	51	110.34
6	135	50	103.31
7	154	62	85.36
8	176	111	101.25
9	180	130	110.65
10	186	124	95.39
Location Average			101.69

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	169	112	115.78
2	204	172	99.53
3	207	199	110.08
4	210	200	105.83
5	147	70	111.24
Location Average			108.49

4L Discharge Area, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	110	23	89.35
2	121	38	110.04
3	150	74	110.49
4	166	81	88.49
5	100	20	104.24
6	182	116	95.42
Location Average			99.67

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	126	45	115.02
2	133	53	114.67
3	137	50	98.73
4	137	54	106.63
5	143	57	98.62
6	146	62	100.62
7	186	154	118.47
Location Average			107.54

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	128	52	126.61
2	139	61	115.19
3	100	21	109.45
4	141	58	104.81

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

ROCK BASS — Alpha = -4.883 Beta = 3.083 Minimum Length = 100

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr

Location Average 114.01

6R Far Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	142	59	104.32
2	140	51	94.20

Location Average 99.26

TAXON AVERAGE **** 106.35 ****

BLUEGILL SUNFISH — Alpha = -5.374 Beta = 3.316 Minimum Length = 80

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
1	179	138	110.51
2	82	11	117.27
3	103	21	105.11
4	120	37	111.59
5	141	70	123.68
6	168	110	108.71

Location Average 112.81

3L At Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	136	50	99.58
2	82	7	74.63
3	82	9	95.95
4	85	8	75.71
5	109	19	78.82

Location Average 84.94

4L Discharge Area, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	95	11	71.99
2	90	9	70.47

Location Average 71.23

4R Discharge Area, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	147	91	140.03
2	124	32	86.57
3	132	62	136.32

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

BLUEGILL SUNFISH Alpha = -5.374 Beta = 3.316 Minimum Length = 80

4R Discharge Area, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
4	157	143	176.90
5	159	82	97.27
6	184	168	122.79
Location Average			126.65

5L Near Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	93	16	112.36
Location Average			112.36

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	87	14	122.65
2	116	33	111.37
3	134	57	119.23
4	107	28	123.52
Location Average			119.19

6R Far Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	164	112	119.89
Location Average			119.89

TAXON AVERAGE **** 108.52 ****

GREEN SUNFISH Alpha = -4.814 Beta = 3.056 Minimum Length = 80

1L Above Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	84	12	102.94
Location Average			102.94

1R Above Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	80	9	89.62
2	81	8	76.69
3	107	21	85.98
Location Average			84.10

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

GREEN SUNFISH Alpha = -4.814 Beta = 3.056 Minimum Length = 80

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
1	110	28	105.36
2	93	19	119.42
3	100	20	100.70
4	171	106	103.58

Location Average 107.26

3L At Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	110	22	82.78

Location Average 82.78

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	114	40	134.95
2	105	30	130.13

Location Average 132.54

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	88	13	96.74

Location Average 96.74

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	93	19	119.42
2	107	28	114.65

Location Average 117.03

6R Far Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	86	11	87.81

Location Average 87.81

TAXON AVERAGE **** 103.38 ****

LARGEMOUTH BASS Alpha = -5.528 Beta = 3.273 Minimum Length = 150

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
1	176	80	120.65
2	187	69	85.33

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

LARGEMOUTH BASS Alpha = -5.528 Beta = 3.273 Minimum Length = 150

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
3	203	122	115.33
4	181	63	86.69
5	193	105	117.10
6	382	881	105.17

Location Average 105.04

3L At Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	323	426	88.06
2	374	836	106.95

Location Average 97.51

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	199	102	102.91
2	474	1700	100.14
3	314	436	98.86
4	341	610	105.59
5	374	992	126.91

Location Average 106.88

4R Discharge Area, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	179	98	139.84
2	355	819	124.28
3	162	60	118.69

Location Average 127.60

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	165	65	121.08

Location Average 121.08

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	364	871	121.77

Location Average 121.77

6R Far Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	163	59	114.38

Location Average 114.38

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

LARGEMOUTH BASS Alpha = -5.528 Beta = 3.273 Minimum Length = 150

6R Far Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
TAXON AVERAGE	****		110.51 ****

SMALLMOUTH BASS Alpha = -4.983 Beta = 3.055 Minimum Length = 180

1L Above Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	287	358	106.67
2	300	381	99.16
3	363	624	90.71
4	392	1002	115.18
Location Average			102.93

1R Above Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	396	1000	111.44
Location Average			111.44

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
1	207	118	95.41
2	210	111	85.89
3	284	346	106.46
4	434	963	81.11
5	289	336	98.02
6	352	504	80.49
Location Average			91.23

3L At Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	228	164	98.71
Location Average			98.71

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	228	142	85.47
2	296	359	97.34
3	349	624	102.29
4	270	261	93.72
5	275	274	93.02
6	318	462	100.63
7	340	561	99.61

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

SMALLMOUTH BASS Alpha = -4.983 Beta = 3.055 Minimum Length = 180

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
Location Average			96.01

4L Discharge Area, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	268	247	90.73
Location Average			90.73

4R Discharge Area, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	180	58	71.87
2	229	198	117.59
3	246	220	104.98
4	310	450	105.95
5	419	1050	98.47
6	183	82	96.61
7	186	98	109.87
Location Average			100.76

5L Near Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	290	354	102.18
Location Average			102.18

5R Near Field Recorvery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	213	138	102.25
Location Average			102.25

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	306	458	112.20
2	362	691	101.30
3	242	223	111.88
4	283	370	115.08
5	387	947	113.21
Location Average			110.73

TAXON AVERAGE **** 99.87 ****

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

BLACK CRAPPIE — Alpha = -5.618 Beta = 3.345 Minimum Length = 100

3L At Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	154	48	95.94
Location Average			95.94
TAXON AVERAGE		****	95.94 ****

WALLEYE — Alpha = -5.453 Beta = 3.180 Minimum Length = 150

2 Horse Creek

No.	TL(mm)	Wgt(gm)	Wr
1	150	20	68.24
2	155	32	98.38
3	159	36	102.06
4	160	32	88.93
5	151	34	113.59
6	171	46	103.47
7	193	57	87.26
8	276	173	84.91
9	586	1800	80.60
Location Average			91.94

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	152	30	98.14
2	157	25	73.79
3	159	32	90.72
Location Average			87.55

6L Far Field Recovery, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	439	826	92.67
Location Average			92.67
TAXON AVERAGE		****	90.98 ****

FRESHWATER DRUM — Alpha = -5.433 Beta = 3.208 Minimum Length = 100

1R Above Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	454	1250	101.41

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2010.

FRESHWATER DRUM Alpha = -5.433 Beta = 3.208 Minimum Length = 100

1R	Above Intake, Right Bank	No.	TL(mm)	Wgt(gm)	Wr
				Location Average	101.41
2	Horse Creek	No.	TL(mm)	Wgt(gm)	Wr
		1	521	2000	104.33
				Location Average	104.33
3L	At Intake, Left Bank	No.	TL(mm)	Wgt(gm)	Wr
		1	526	1900	96.12
				Location Average	96.12
3R	At Intake, Right Bank	No.	TL(mm)	Wgt(gm)	Wr
		1	351	610	112.98
				Location Average	112.98
4R	Discharge Area, Right Bank	No.	TL(mm)	Wgt(gm)	Wr
		1	419	1050	110.19
				Location Average	110.19
6L	Far Field Recovery, Left Bank	No.	TL(mm)	Wgt(gm)	Wr
		1	445	1300	112.46
		2	459	1350	105.74
				Location Average	109.10
				TAXON AVERAGE ****	106.18 ****