

**BRAIDWOOD STATION
KANKAKEE RIVER FISH MONITORING PROGRAM, 2012**

Prepared for
EXELON NUCLEAR

February 2013

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Environmental Science & Engineering Consultants
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Woodstock, Illinois 60098

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Prepared for

EXELON NUCLEAR
Warrenville, Illinois

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The field work and data analysis for this project was conducted by HDR Engineering, Inc. (HDR). Flow data for the Kankakee River near Wilmington, Illinois was obtained from the United States Geological Survey's (USGS 05527500) internet web site (www.usgs.gov).

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ABSTRACT

Forty-three species of fish representing 12 families were collected from the Kankakee River and Horse Creek in 2012. No threatened, endangered, or unusual species were collected during either the electrofishing or seining sampling efforts in August, 2012. Electrofishing and seining resulted in the collection of 3009 fish weighing 98.4 kg. Longear sunfish (15.9%), very small unidentified sunfish species (13.1%), bullhead minnow (12.9%), bluntnose minnow (11.9%), largemouth bass (9.6%), spotfin shiner (9.2%), and blackstripe topminnow (8.2%) were the most common species collected.

Nine (0.30%) of the 3009 fish collected exhibited some form of external anomaly. Lesions (70.0%), eroded fins (20.0%), and deformities (10.0%) accounted for all of the 10 anomalies observed. Tumors, fish lice, leeches, black spot, anchor worm, and cysts were not observed on any of the 3009 fish collected in 2012. 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 92.0 for northern pike to 123.7 for redear sunfish. With the possible exception of a very 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 was golden rehorse (six individuals), followed by rock bass, largemouth bass, and northern hog sucker (one individual each). The highest percentage of fish with anomalies occurred at Location 3R where two (0.99%) of the 202 fish examined exhibited some form of external anomaly.

Spawning success and population structure were evaluated for four selected species. Recruitment for rock bass appeared to be moderately weak in 2012, while longear sunfish recruitment appeared to be moderate based on seining and electrofishing data. However, longear sunfish recruitment may have been actually strong based on the number of small individuals that were

identified only to *Lepomis* species. Many of these 395 very small individuals were likely longear sunfish. Smallmouth bass and largemouth bass recruitment appeared to be moderately strong and very strong, respectively. As a point of interest, due to recent stocking efforts in the Kankakee River by the Illinois Department of Natural Resources, 34 walleye measuring from 136 to 587 mm in total length were collected during the 2012 sampling program. Twenty-seven (79.4%) of these individuals were most likely Age 0 or Age 1 fish that measured from 136 to 197 mm. Based on length frequency data, at least four age classes of walleye were included among the 34 walleye captured.

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 macrophytes 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 increase in aquatic macrophytes within the study area during 2012 compared to August 2009, 2010, and 2011. The increase in aquatic vegetation during 2012 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. Much of the increase in aquatic vegetation noted in 2012 can be attributed to the extremely low river flows that occurred throughout the Kankakee River during the entire year.

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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 km² (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

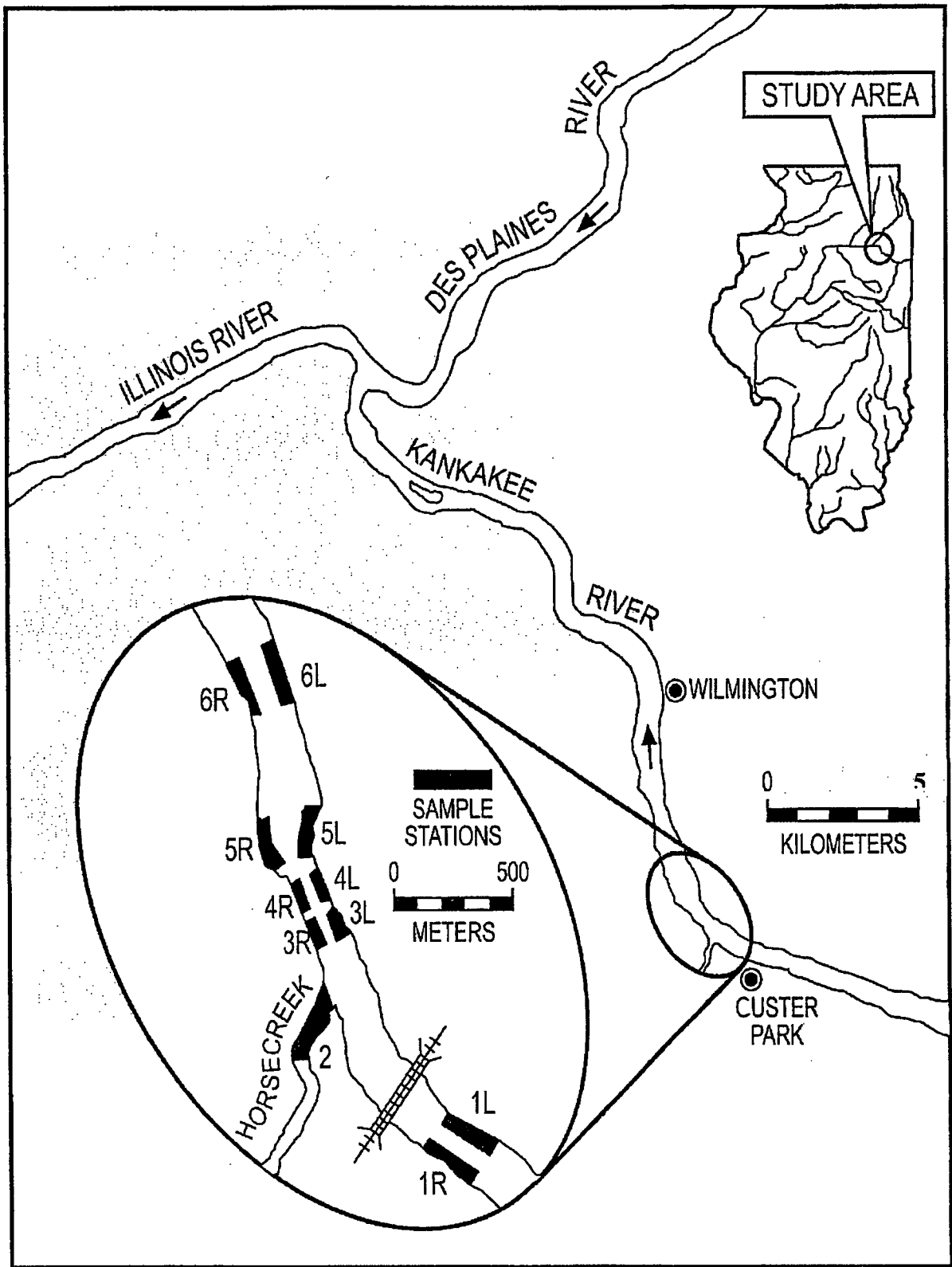


FIGURE 1-1. FISH SAMPLING LOCATIONS IN THE KANKAKEE RIVER NEAR BRAIDWOOD STATION.

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 2012 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 8 August during the first sampling effort and on 22 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 period of time ranging from 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 from 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.

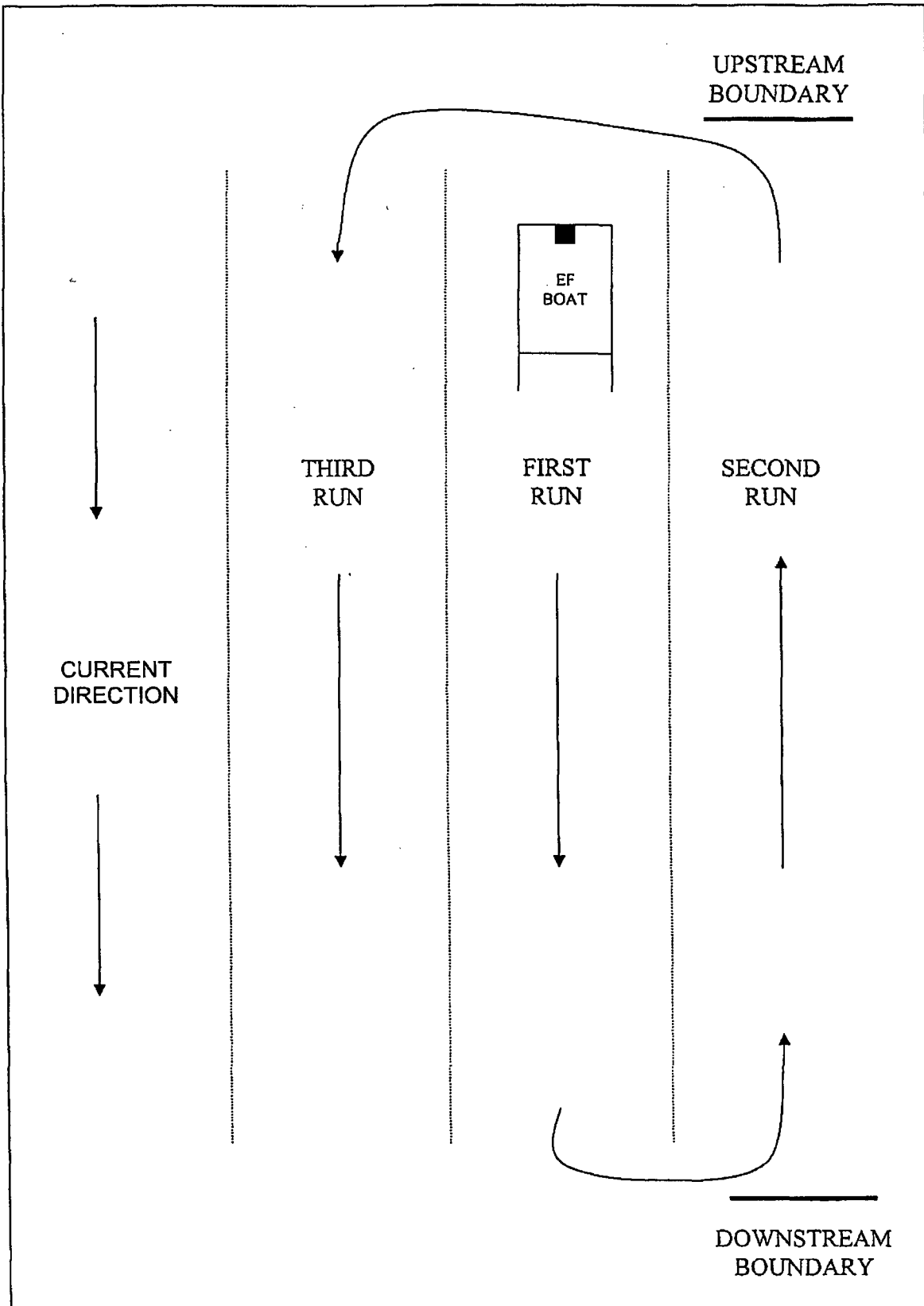


FIGURE 2-1. ILLUSTRATION OF ELECTROFISHING BOAT PATH DURING SAMPLING IN THE BRAIDWOOD STATION MONITORING AREA.

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 9 August during the first sampling effort and on 21 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 (designated as A and B) were made at each location during each sampling effort. Each haul was made in an upstream direction covering approximately 30 meters of shoreline, with the second haul being conducted upstream of the first. Seine collections may be performed concurrently with electrofishing sampling, but not at the same location 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 30 handheld conductivity and temperature meter and an YSI Model 55 handheld dissolved oxygen 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:

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

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:

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

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 (W_r)
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	Martenev (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-four species of fish representing 19 families have been collected from the Kankakee River and Horse Creek from 1977 through 2012 (Table 3-1). No threatened or endangered species were collected in 2012. However, river redhorse (*Moxostoma carinatum*), currently listed as threatened in Illinois, and pallid shiner (*Notropis amnis*), currently listed as endangered in Illinois (Illinois Endangered Species Protection Board 2009), have been collected on an irregular basis during most years of this sampling program. Since 1990, the number of river redhorse collected (14 specimens) 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 390 (68.4%) of the 570 pallid shiners have been captured by minnow seine (Table 3-2).

3.2 Relative Abundance and CPE. Electrofishing and seining efforts in 2012 resulted in the capture of 3009 fish representing 43 species and 12 families (Table 3-3). Longear sunfish was the most abundant species collected, representing 15.9% (479 individuals) of the total catch by number. Sunfish species (13.1%), bullhead minnow (12.9%), bluntnose minnow (11.9%), largemouth bass (9.6%), spotfin shiner (9.2%), and blackstripe topminnow (8.2%) were the only other species to individually comprise more than 5% of the numerical catch. Electrofishing and seining biomass was dominated by carp (26.2%), golden redhorse (15.1%), smallmouth bass (13.7%), channel catfish (8.9%), walleye (8.7%), largemouth bass (5.6%), and longear sunfish (5.6%).

Electrofishing efforts resulted in the collection 1894 individuals representing 37 species (Table 3-3). The catch was dominated by longear sunfish, which comprised 20.6% of all fish captured. Bullhead minnow (14.4%), bluntnose minnow (11.9%), largemouth bass (10.9%), spotfin shiner (10.7%), blackstripe topminnow (5.5%), and sand shiner (5.2%) were the only other species to numerically comprise more than 5% of the total catch. Excluding the 15 gizzard shad that were captured by electrofishing (excluded for historical comparisons), cyprinids (including carp) dominated the catch comprising 45.0% of the electrofishing catch and were represented by nine

TABLE 3-1

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

Braidwood Station - 1977-2012

SCIENTIFIC NAME	COMMON NAME
Petromyzontidae	Lampreys
Lepisosteidae	
<i>Lepisosteus osseus</i>	Longnose gar
Amiidae	
<i>Amia calva</i>	Bowfin
Anguillidae	
<i>Anguilla rostrata</i>	American eel
Clupeidae	
<i>Dorosoma cepedianum</i>	Gizzard shad
<i>Dorosoma petenense</i>	Threadfin shad
Salmonidae	
<i>Onchorhynchus mykiss</i>	Rainbow trout
Umbridae	
<i>Umbra limi</i>	Central mudminnow
Esocidae	
<i>Esox americanus</i>	Grass pickerel
<i>Esox lucius</i>	Northern pike
Cyprinidae	
<i>Carassius auratus</i>	Goldfish
<i>Cyprinella lutrensis</i>	Red shiner
<i>Cyprinella spilopterus</i>	Spotfin shiner
<i>Cyprinus carpio</i>	Common carp
<i>Campostoma anomalum</i>	Central stoneroller
<i>Notropis buccatus</i>	Silverjaw minnow
<i>Notropis amnis</i>	Pallid shiner
<i>Hybopsis dorsalis</i>	Bigmouth shiner
<i>Luxilus chrysocephalus</i>	Striped shiner
<i>Lythrurus umbratilis</i>	Redfin shiner
<i>Nocomis biguttatus</i>	Hornyhead chub
<i>Notemigonus crysoleucas</i>	Golden shiner
<i>Notropis atherinoides</i>	Emerald shiner
<i>Notropis buchanani</i>	Ghost shiner
<i>Notropis stramineus</i>	Sand shiner
<i>Notropis rubellus</i>	Rosyface shiner
<i>Notropis volucellus</i>	Mimic shiner
<i>Opsopoeodus emiliae</i>	Pugnose minnow
<i>Phenacobius mirabilis</i>	Suckermouth minnow
<i>Pimephales notatus</i>	Bluntnose minnow
<i>Pimephales promelas</i>	Fathead minnow
<i>Pimephales vigilax</i>	Bullhead minnow
<i>Scardinius erthrophthalmus</i>	Rudd
<i>Semotilus atromaculatus</i>	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 - 1977-2012

SCIENTIFIC NAME	COMMON NAME
Catostomidae	
<i>Ictiobus bubalus</i>	Smallmouth buffalo
<i>Ictiobus cyprinellus</i>	Bigmouth buffalo
<i>Ictiobus niger</i>	Black buffalo
<i>Carpiodes carpio</i>	River carpsucker
<i>Carpiodes cyprinus</i>	Quillback
<i>Moxostoma anisurum</i>	Silver redhorse
<i>Moxostoma carinatum</i>	River redhorse
<i>Moxostoma duquesnei</i>	Black redhorse
<i>Moxostoma erythrurum</i>	Golden redhorse
<i>Moxostoma macrolepidotum</i>	Shorthead redhorse
<i>Hypentelium nigricans</i>	Northern hog sucker
<i>Catostomus commersoni</i>	White sucker
<i>Minytrema melanops</i>	Spotted sucker
<i>Erimyzon oblongus</i>	Creek chubsucker
<i>Erimyzon sucetta</i>	Lake chubsucker
Ictaluridae	
<i>Ameiurus melas</i>	Black bullhead
<i>Ameiurus natalis</i>	Yellow bullhead
<i>Ameiurus nebulosus</i>	Brown bullhead
<i>Ictalurus punctatus</i>	Channel catfish
<i>Noturus flavus</i>	Stonecat
<i>Noturus gyrinus</i>	Tadpole madtom
<i>Pylodictis olivaris</i>	Flathead catfish
Aphredoderidae	
<i>Aphredoderus sayanus</i>	Pirate perch
Cyprinodontidae	
<i>Fundulus notatus</i>	Blackstripe topminnow
Poeciliidae	
<i>Gambusia affinis</i>	Mosquitofish
Atherinidae	
<i>Labidesthes sicculus</i>	Brook silverside
Percichthyidae	
<i>Morone chrysops</i>	White bass
<i>Morone mississippiensis</i>	Yellow bass
<i>Morone americana</i>	White perch
Centrarchidae	
<i>Micropterus dolomieu</i>	Smallmouth bass
<i>Micropterus salmoides</i>	Largemouth bass
<i>Lepomis cyanellus</i>	Green sunfish
<i>Lepomis gibbosus</i>	Pumpkinseed
<i>Lepomis gulosus</i>	Warmouth
<i>Lepomis humilis</i>	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 - 1977-2012

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

TABLE 3-2

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

Braidwood Station - 1977-2012

Year	PALLID SHINER				RIVER REDHORSE			
	ELECTROFISHING		MINNOW SEINE		ELECTROFISHING		MINNOW SEINE	
	No.	CPE ^a	No.	CPE ^b	No.	CPE ^a	No.	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
2011	2	0.22	0	0.00	0	0.00	0	0.00
2012	0	0.00	0	0.00	0	0.00	0	0.00
Totals	180	0.39 ^c	390	0.25 ^d	371	0.81 ^c	2	<0.01 ^d

^aBased 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 2009-2012; 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).

^bBased on 44 seine hauls.

^cBased on 456.20 total hours of effort.

^dBased on 1540 total seine hauls.

TABLE 3-3

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

Braidwood Station - 2012

TAXON	ELECTROFISHING				SEINING				TOTAL			
	NUMBER		WEIGHT		NUMBER		WEIGHT		NUMBER		WEIGHT	
	No.	%	(g)	%	No.	%	(g)	%	No.	%	(g)	%
Longnose gar	3	0.2	155	0.2					3	0.1	155	0.2
Gizzard shad	15	0.8	219	0.2	2	0.2	8	0.2	17	0.6	227	0.2
Grass pickerel	12	0.6	188	0.2	12	1.1	231	6.4	24	0.8	419	0.4
Northern pike	1	0.1	410	0.4					1	< 0.1	410	0.4
Carp	11	0.6	25,815	27.2	2	0.2	32	0.9	13	0.4	25,847	26.2
Redfin shiner	11	0.6	20	< 0.1	18	1.6	58	1.6	29	1.0	78	0.1
Striped shiner	22	1.2	58	0.1	5	0.4	16	0.4	27	0.9	74	0.1
Rosyface shiner					6	0.5	14	0.4	6	0.2	14	< 0.1
Spotfin shiner	203	10.7	434	0.5	74	6.6	200	5.6	277	9.2	634	0.6
Sand shiner	98	5.2	174	0.2	9	0.8	20	0.6	107	3.6	194	0.2
Fathead minnow	2	0.1	6	< 0.1	2	0.2	8	0.2	4	0.1	14	< 0.1
Bluntnose minnow	225	11.9	558	0.6	133	11.9	305	8.5	358	11.9	863	0.9
Bullhead minnow	272	14.4	672	0.7	115	10.3	314	8.7	387	12.9	986	1.0
Creek chub					1	0.1	3	0.1	1	< 0.1	3	< 0.1
Hornyhead chub	2	0.1	9	< 0.1					2	0.1	9	< 0.1
River carsucker	2	0.1	2250	2.4					2	0.1	2250	2.3
Spotted sucker	1	0.1	94	0.1					1	< 0.1	94	0.1
Silver redhorse	1	0.1	235	0.2					1	< 0.1	235	0.2
Black redhorse	2	0.1	929	1.0					2	0.1	929	0.9
Golden redhorse	20	1.1	14,839	15.6					20	0.7	14,839	15.1
Northern hog sucker	2	0.1	1440	1.5					2	0.1	1440	1.5
Black bullhead					1	0.1	1	< 0.1	1	< 0.1	1	< 0.1
Channel catfish	7	0.4	8754	9.2	17	1.5	25	0.7	24	0.8	8779	8.9
Tadpole madtom					1	0.1	2	0.1	1	< 0.1	2	< 0.1
Blackstripe topminnow	104	5.5	115	0.1	143	12.8	160	4.4	247	8.2	275	0.3
Mosquitofish					5	0.4	11	0.3	5	0.2	11	< 0.1
Brook silverside	47	2.5	58	0.1					47	1.6	58	0.1

TABLE 3-3 (Continued).

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

Braidwood Station - 2012

TAXON	ELECTROFISHING				SEINING				TOTAL			
	NUMBER		WEIGHT		NUMBER		WEIGHT		NUMBER		WEIGHT	
	No.	%	(g)	%	No.	%	(g)	%	No.	%	(g)	%
Sunfish spp.	64	3.4	64	0.1	331	29.7	337	9.4	395	13.1	401	0.4
Rock bass	24	1.3	1435	1.5	21	1.9	58	1.6	45	1.5	1493	1.5
Green sunfish	8	0.4	221	0.2					8	0.3	221	0.2
Orangespotted sunfish	19	1.0	97	0.1	12	1.1	64	1.8	31	1.0	161	0.2
Bluegill	17	0.9	310	0.3	11	1.0	38	1.1	28	0.9	348	0.4
Longear sunfish	390	20.6	4762	5.0	89	8.0	753	20.9	479	15.9	5515	5.6
Redear sunfish	1	0.1	80	0.1					1	< 0.1	80	0.1
Smallmouth bass	47	2.5	13,391	14.1	8	0.7	109	3.0	55	1.8	13,500	13.7
Largemouth bass	206	10.9	4714	5.0	83	7.4	803	22.3	289	9.6	5517	5.6
White crappie					1	0.1	4	0.1	1	< 0.1	4	< 0.1
Johnny darter	7	0.4	7	< 0.1	8	0.7	9	0.2	15	0.5	16	< 0.1
Logperch	1	0.1	18	< 0.1	1	0.1	10	0.3	2	0.1	28	< 0.1
Blackside darter	5	0.3	15	< 0.1	4	0.4	8	0.2	9	0.3	23	< 0.1
Slenderhead darter	1	0.1	4	< 0.1					1	< 0.1	4	< 0.1
Banded darter	4	0.2	4	< 0.1					4	0.1	4	< 0.1
Walleye	34	1.8	8566	9.0					34	1.1	8566	8.7
Freshwater drum	3	0.2	3756	4.0					3	0.1	3756	3.8
Totals	1894		94,876		1115		3601		3009		98,477	
Total taxa	38				28				44			
Total species	37				27				43			

species. Centrarchids comprised 41.3% of the catch (eight species), percids 2.8% (six species), catostomids 1.5% (six species) of all fish collected. Electrofishing biomass was dominated by carp, which constituted 27.2% of the 94.876 kg collected. Other species that individually contributed more than 5% of the total biomass included golden redhorse (15.6%), smallmouth bass (14.1%), channel catfish (9.2%), walleye (9.0%), longear sunfish (5.0%) and largemouth bass (5.0%). Rough fish (carp and sucker species) accounted for 48.0% of the total electrofishing biomass collected.

The mean electrofishing catch-per-effort (CPE) for fish collected at all locations combined was 210.4 fish/hr (Table 3-4). This value is higher than the 35-yr average of 178.3 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 2012, CPE by location ranged from 119.0 fish/hr at Location 1R to 378.0 fish/hr at Location 4L.

A total of 1115 fish representing 27 species and ten families was collected by seine in 2012 (Table 3-3). Small sunfish (*Lepomis*) species that averaged one gram in weight was the dominant taxa collected, comprising 29.7% (331 individuals) of all fish captured. The second most abundant species taken was blackstripe topminnow (12.8%), followed by bluntnose minnow (11.9%), bullhead minnow (10.3%), longear sunfish (8.0%), and largemouth bass (7.4%). Total biomass of fish taken by seine was 3.6 kg. Taxa collected by minnow seine that individually comprised greater than 5% of the total catch by weight included largemouth bass (22.3%), longear sunfish (20.9%), sunfish spp. (9.4%), bullhead minnow (8.7%), bluntnose minnow (8.5%), grass pickerel (6.4%), and spotfin shiner (5.6%).

Haul seining mean CPE for all locations combined in 2012 was 25.3 fish/seine haul. This value is lower than the 35-yr average of 56.4 fish/seine haul (Table 3-5). CPE's of fish collected by 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. Extensive beds of aquatic vegetation in the Kankakee River near Braidwood Station in 2012 made seining extremely difficult. This contributed to the below average number of fish that were captured and influenced the species composition of the individuals that were captured. Species such as blackstripe topminnow, mosquitofish, brook

TABLE 3-4

FISH CAPTURED BY ELECTROFISHING IN THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2012

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	%
Longnose gar									2	1		3	0.2
Gizzard shad	1							8	2	4		15	0.8
Grass pickerel		3	3	2		1	1		1		1	12	0.6
Northern pike			1									1	0.1
Carp	3						1		4		3	11	0.6
Redfin shiner							1		6	1	3	11	0.6
Striped shiner	4	2	1	1		2	3	3	3	1	2	22	1.2
Spotfin shiner	72	6	6	7	4	10	13	19	22	14	30	203	10.7
Sand shiner	38	10		1	3	15	5	3	16	2	5	98	5.2
Fathead minnow									2			2	0.1
Bluntnose minnow	47	10	52	3	12	20	27	1	19	25	9	225	11.9
Bullhead minnow	7	6	57	3	4	23	27	48	44	40	13	272	14.4
Hornylead chub							1					1	0.1
River carpsucker					1			1				2	0.1
Spotted sucker											1	1	0.1
Silver redhorse		1										1	0.1
Black redhorse			1	1								2	0.1
Golden redhorse	7	1	3	2	1		2		2	2		20	1.1
Northern hog sucker				1			1					2	0.1
Channel catfish	4	1								1	1	7	0.4
Blackstripe topminnow	4	15	3	11	5	12	7	5	15	14	13	104	5.5
Brook silverside	3		7	1	1	4	1	11	8	10	1	47	2.5

TABLE 3-4 (Continued).

FISH CAPTURED BY ELECTROFISHING IN THE KANKAKEE RIVER AND HORSE CREEK

Braidwood Station - 2012

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	%
Sunfish spp.	3	2	2		1		2	7	17	25	5	64	3.4
Rock bass	8	4	1	2	2	1	1	1	1	1	2	24	1.3
Green sunfish			7		1							8	0.4
Orangespotted sunfish				2		9			4	1	3	19	1.0
Bluegill		1					2	2	5	4	3	17	0.9
Longear sunfish	28	33	35	65	33	57	44	7	40	19	29	390	20.6
Redear sunfish									1			1	0.1
Smallmouth bass	12	5		5	3	7	4	1	4	3	3	47	2.5
Largemouth bass	20	16	10	14	13	20	11	25	33	18	26	206	10.9
Johnny darter	1	1		1		4						7	0.4
Logperch									1			1	0.1
Blackside darter		1							2	1	1	5	0.3
Slenderhead darter				1								1	0.1
Banded darter			1			2	1					4	0.2
Walleye	5	1	3		1	2	4	1	10	5	2	34	1.8
Freshwater drum	2		1									3	0.2
Total fish	269	119	194	123	85	189	159	143	264	193	156	1894	
Total Taxa	19	19	18	19	15	16	21	16	25	22	21	38	
CPE (fish/hr)	269.0	119.0	194.0	246.0	170.0	378.0	318.0	143.0	264.0	193.0	156.0	210.4	

^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 - 1977-2012

YEAR	ELECTROFISHING		SEINING		TOTALS
	No.	CPE ^a	No.	CPE ^b	
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
2011	2215	246.1	1432	32.5	3647
2012	1894	210.4	1115	25.3	3009
TOTALS	81,354	178.3 ^c	86,813	56.4 ^d	168,167

^aBased 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 2009-2012; 8.5 hours of effort in 1997 and 2008; and 8.75 hours of effort in 2003.

^bBased on 44 seine hauls.

^cBased on 456.2 total hours of electrofishing effort.

^dBased on 1540 total seine hauls.

silverside, and largemouth bass were much more common in the catch during 2012 compared to previous years.

An observation made during recent years is that an increasing proportion of the Kankakee River has been populated by large beds of aquatic macrophytes. 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 2009-2011). However, in 2009, 2010, 2011, and to a lesser extent 2008, the development of aquatic macrophytes in the Kankakee River was much less than observed in 2005, 2006, and 2007. River flows in 2009-2011 were higher for a longer period of time in the spring and early summer than those observed during 2005-2007. Development of aquatic macrophytes was inhibited by the higher, more turbid flows that occurred in 2009, 2010, and 2011. In 2012, the Kankakee River near Braidwood Station exhibited very low flows throughout the summer. As a result, the river was once again populated by extensive beds of aquatic macrophytes that surpassed the levels observed during 2005-2007.

3.3 Historical Comparison

Based on sampling efforts conducted during the last three years (2010-2012), the relative abundance of spotfin shiner, bullhead minnow, bluntnose minnow, longear sunfish, and sand shiner, have remained relatively high (Table 3-6). In addition, largemouth bass, blackstripe topminnow, brook silverside, and bluegill abundance seems to be increasing. Longear sunfish, rock bass, and smallmouth bass have also been commonly collected throughout the course of these studies. All of the species listed in Table 3-6 are moderately common to abundant in this portion of the Kankakee River near Braidwood Station.

In 2012, longear sunfish the most abundant species collected (Table 3-6), followed by bullhead minnow, bluntnose minnow, largemouth bass, and spotfin shiner. Cyprinids accounted for four of the top 10 species collected. Cyprinid and centrarchid species (Appendix Table B-1) have dominated the catches of fish collected in the Kankakee River. The percent contribution of non-cyprinid species to the catch from 1996-2012 has generally decreased because of the large

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 - 2010-2012

SPECIES	YEAR		
	2012	2011	2010
Longear sunfish	15.9 (1)	13.6 (2)	16.0 (2)
Bullhead minnow	12.9 (2)	9.4 (3)	10.5 (4)
Bluntnose minnow	11.9 (3)	8.8 (4)	15.7 (3)
Largemouth bass	9.6 (4)	3.0 (8)	6.3 (5)
Spotfin shiner	9.2 (5)	33.3 (1) ^a	23.0 (1) ^a
Blackstripe topminnow	8.2 (6)	0.7 (15)	0.3 (26)
Sand shiner	3.6 (7)	6.7 (5)	5.6 (6)
Smallmouth bass	1.8 (8)	1.5 (11)	1.4 (13)
Brook silverside	1.6 (9)	1.1 (14)	0.7 (18)
Rock bass	1.5 (10)	2.1 (10)	2.3 (7)

^aNumbers in parenthesis represent species rank.

numbers of cyprinids and/or gizzard shad that have been captured. With the exception of blackstripe topminnow and brook silverside, the numbers of non-cyprinid species collected from 1996-2012 have generally been similar to those observed during most years.

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 2012, 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, buffalo species, and longear sunfish. Walleye was the third most abundant species collected in terms of biomass in 2011 and ranked fifth in 2012. In 2011, most of these fish were collected in one small area at Location 6L. River temperatures were high during the first week of sampling and most of these fish were concentrated in a very small area located directly in front of a tiled underground drainage culvert that was discharging cool water into the Kankakee River. In 2012, the 34 walleye that were collected were more evenly distributed throughout the entire sampling area.

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 2012 (210.4 fish/hr) was higher than the 35-yr mean of 178.3 fish/hr. Electrofishing CPE in 2012 was

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 - 2010-2012

SPECIES	YEAR		
	2012	2011	2010
Carp	26.2 (1)	28.8 (1) ^a	29.7 (1) ^a
Golden redhorse	15.1 (2)	14.7 (2)	4.0 (7)
Smallmouth bass	13.7 (3)	6.1 (6)	8.7 (3)
Channel catfish	8.9 (4)	7.0 (5)	18.3 (2)
Walleye	8.7 (5)	8.2 (3)	1.9 (11)
Largemouth bass	5.6 (6)	2.1 (12)	6.0 (4)
Longear sunfish	5.6 (7)	3.5 (8)	3.6 (9)
Freshwater drum	3.8 (8)	4.7 (7)	5.5 (5)
River carpsucker	2.3 (9)	1.3 (15)	3.7 (8)
Rock bass	1.5 (10)	3.5 (9)	2.6 (10)

^aNumbers in parenthesis represent species rank.

within the range of values reported since 1995 and higher than all but two of the values reported during the 1977 through the 1994 sampling period. The 2012 seining CPE of 25.3 fish/haul was less than half of the 35-yr mean of 56.4 fish/haul. Seining CPE's have varied markedly during the 35 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; 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.

Gizzard shad have been included in the length-frequency histograms during years in which adequate numbers of individuals have been collected. However, only 17 fish of this species were collected in 2012. Therefore, a length-frequency histogram was not developed for this species during 2012. All of the gizzard shad collected during the current study were either young-of-year or Age 1 fish ranging from 61 to 157 mm in total length (Smith, 1979).

Forty-five fish measuring from 30 to 220 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. Twenty-seven (60.0%) Age 0 rock bass measuring from 30 to 66 mm in TL were collected in 2012. A second grouping of eight (17.8%) Age 1 fish ranging from 80 to 110 mm, a third grouping of seven (15.6%) Age 3 fish ranging from 150 to 180 mm, and three additional fish larger than 190 mm were also collected. The three fish larger than 190 mm in total length were most likely Age 4 fish. Based on the length-frequency histogram, Age 2 rock bass may not have been collected during the 2012 August sampling period. Recruitment for this species in 2012 appeared to be moderate based on these data.

The length-frequency of 444 longear sunfish measuring from 22 to 157 mm is presented in Figure 3-2. Sixty of these fish measured from 20 to 60 mm (13.5%) and were most likely Age 0 fish. A

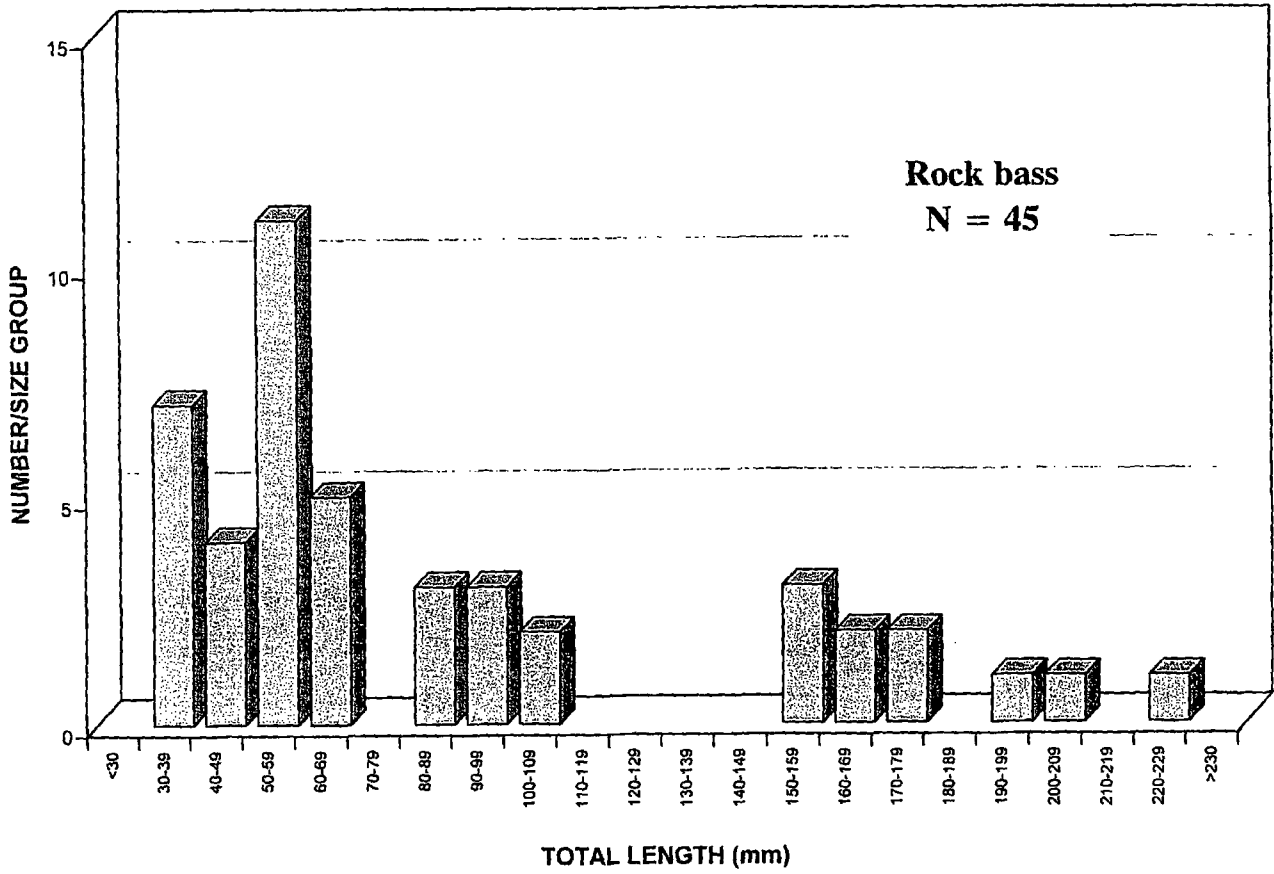


FIGURE 3-1. LENGTH-FREQUENCY DISTRIBUTION FOR ROCK BASS COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2012.

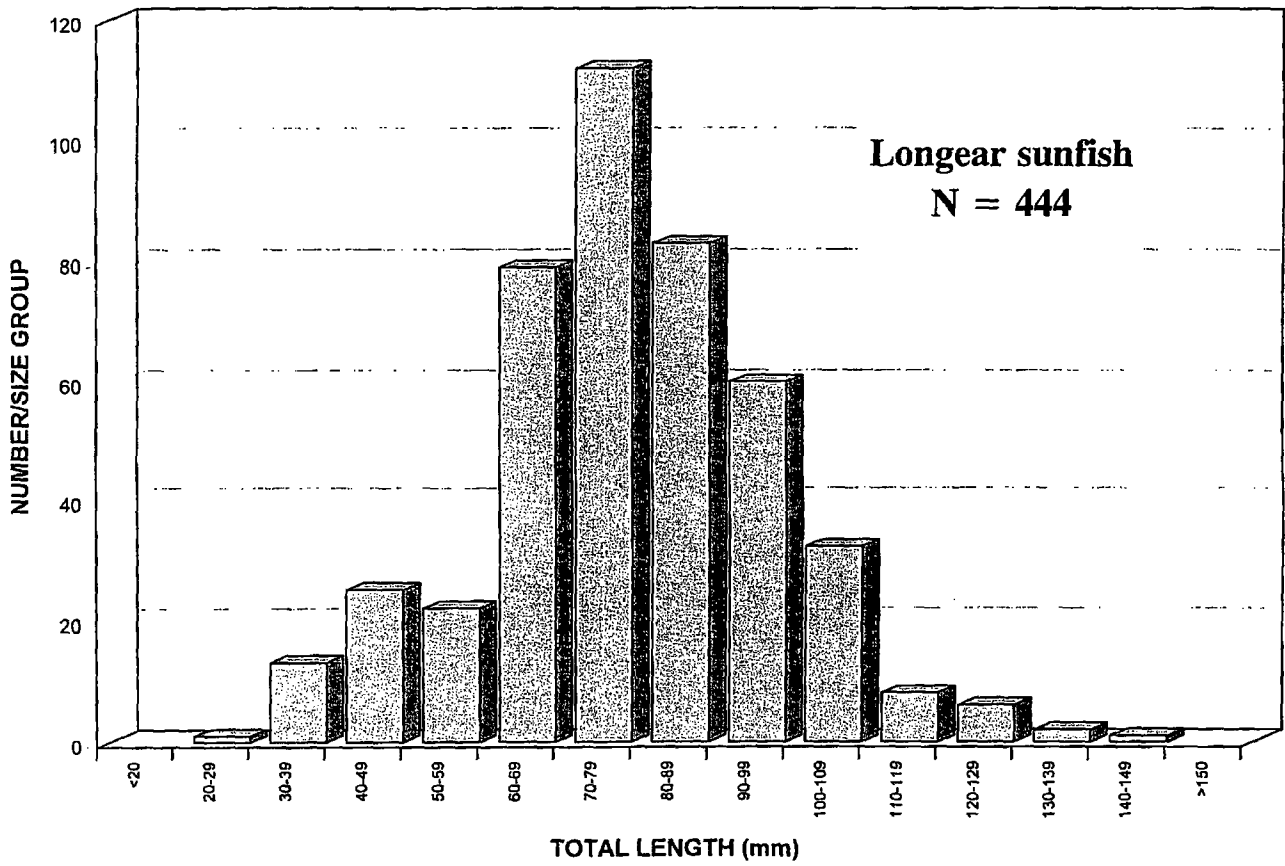


FIGURE 3-2. LENGTH-FREQUENCY DISTRIBUTION FOR LONGEAR SUNFISH COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2012.

few of the larger individuals could have possibly been small Age 1 fish. Three hundred sixty-six (82.4%) of the 444 fish that were measured ranged from 60 to 110 mm in total length (primarily Age 1 and Age 2), while only 17 fish (3.8%) greater than or equal to 110 mm in total length were collected. The majority of these fish were most likely Age 3, but a few of the smaller individuals may have been Age 2, while the largest individuals could possibly have been Age 4.

Recruitment of longear sunfish appeared to be moderately weak in 2012 based upon the number of Age 0 fish (<60 mm) observed in the length frequency histogram. Similar results were noted for this species from 2005-2011 when recruitment was also reported to 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 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 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, only 16 were classified as sunfish species in 2010 and only five were classified as sunfish species in 2011. However, Age 1 fish were a major component of the catch in 2010 and 2011, which suggest that the low numbers of YOY fish captured in 2009 and 2010 may have been attributed to gear bias, unfavorable sampling conditions, or some other unknown factor. In 2012, 395 (13.1%) of 3009 fish collected by electrofishing and minnow seine were identified as *Lepomis spp.* Most likely, a large percentage of these fish were longear sunfish.

The vigorous rooted aquatic vegetation that occurred within the Kankakee River from 2005-2007 and again in 2012 was conducive to the survival of longear sunfish and other forage species because it provided increased areas of refuge from predation. Weed growth was much less extensive during 2008 through 2011, which may explain the decline in young-of-year sunfish species captured during recent years. Only three fish (0.7%) larger than 130 mm were collected in 2011 and 2012. 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-five smallmouth bass were collected during 2012. Specimens ranged in length from 56 to 462 mm (Figure 3-3). Several age classes of fish were represented in the catch, with peaks in the length frequency histogram occurring at 80 mm (Age 0), from 140 to 200 mm (Age 1), and at 390 mm (Age 4). Nine Age 2 or Age 3 fish were collected that ranged in length from 270 to 380 mm in total length. 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 small portion of the smallmouth bass collected in 2000, 2005, and 2010 were Age 0 (LMS 2001 and HDR/LMS 2006, HDR 2011). 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 overwintering 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 smallmouth bass in 2011 appeared to be moderately strong based upon the 20 (35.7%) fish that were collected and measured from 40 to 80 mm in total length. Similar results were observed in 2012 when 26 (47.3%) of the 55 fish measured less than 110 mm.

Three (5.5%) fish larger than 400 mm were collected in 2012. The largest of the three fish measured 462 mm in total length and was most likely Age 5 or older. Although in 2012, peaks in the length-frequency histogram of smallmouth bass >110 mm in total length is difficult to distinguish because of the small sample size (29 specimens), the 2007-2012 year classes all appear to be represented in the catch.

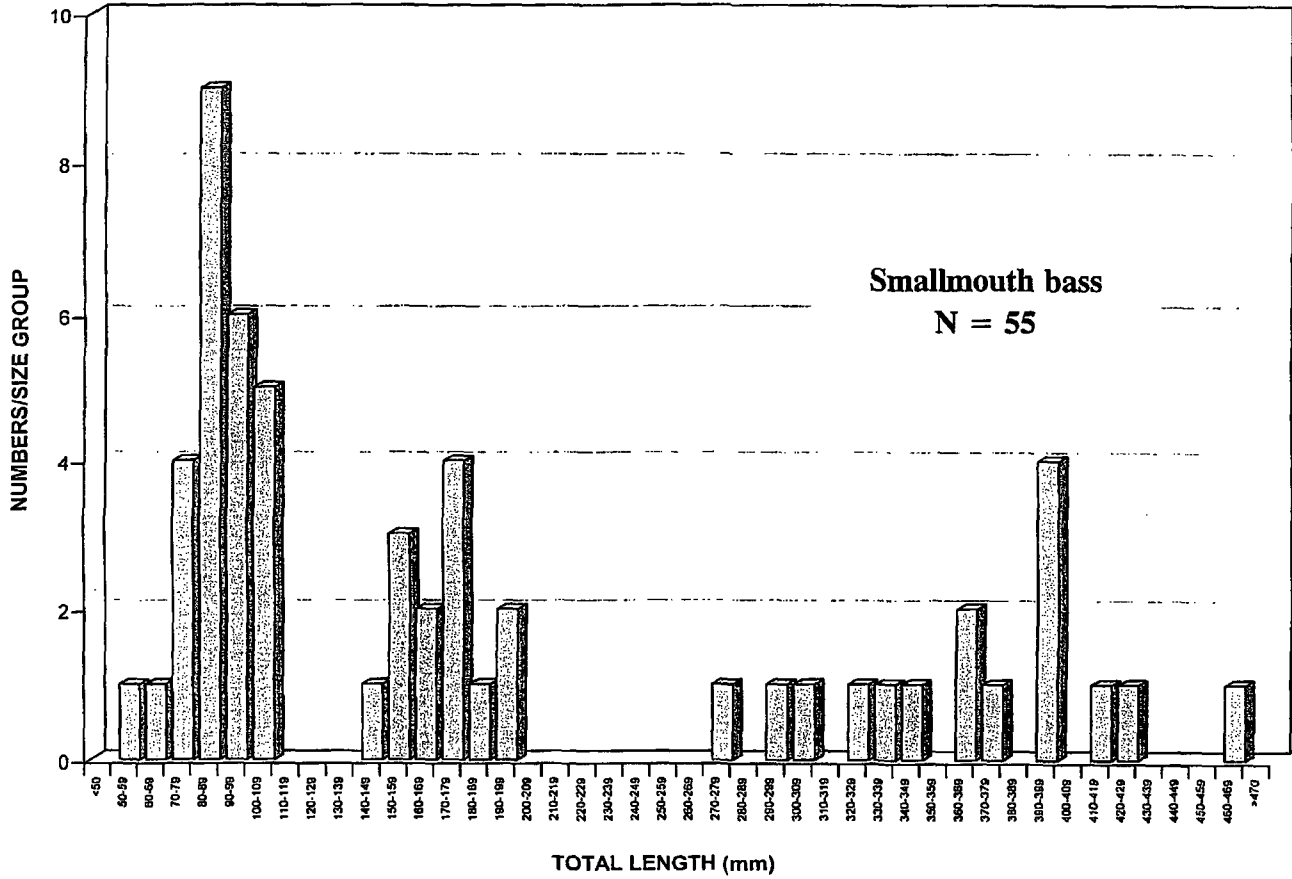


FIGURE 3-3. LENGTH-FREQUENCY DISTRIBUTION OF SMALLMOUTH BASS COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2012.

Two hundred eighty-nine largemouth bass, measuring from 64 to 282 mm in total length, were collected in 2012 (Figure 3-4). Based upon the fish collected during 2012, at least four age classes of largemouth bass were included in the catch. Two hundred and sixty-nine (93.1%) largemouth bass less than 130 mm in total length were captured in 2012, while 19 (6.6%) fish from 150 to 250 mm were collected. The remaining individual measured 282 mm. During most years, either Age 0 and/or Age 1 largemouth bass have dominated the catch, while few fish older than Age 2 have been collected. Notable in the length frequency histogram for 2010 and 2012 is the absence of any fish measuring greater than 300 mm. This indicates that few, if any, largemouth bass from the 2007 (Age 5), 2008 (Age 4), or 2009 (Age 3) year-classes were collected. Recruitment of largemouth bass in the Kankakee River near Braidwood Station appeared to be strong in 2011 and 2012 based on the data collected by electrofishing and seining.

In addition to those five species, 34 walleye measuring from 136 to 587 mm in total length were collected in 2012. Twenty-seven (79.4%) of these fish measured from 136 to 197 mm and were either Age 0 or Age 1 fish, while one fish measured 368 mm and was most likely either Age 2 or Age 3. Four fish (11.8%) measured from 411 to 481 mm (Age 3 or Age 4), while the remaining two individuals were likely either Age 4 or Age 5 fish that measured 569 and 587 mm, respectively. Based on the data collected during, at least four age classes of walleye were included among the 34 fish captured in 2012.

3.5 COMMUNITY CHARACTERISTICS

3.5.1 Diversity

Mean diversity indices were calculated for each of the 11 individual electrofishing and seining locations in 2012. Electrofishing diversity values ranged from 2.62 at Location 3L to 3.83 at Location 5R (Table 3-8). The average diversity index for all locations in 2012 was 3.24. This value is 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.

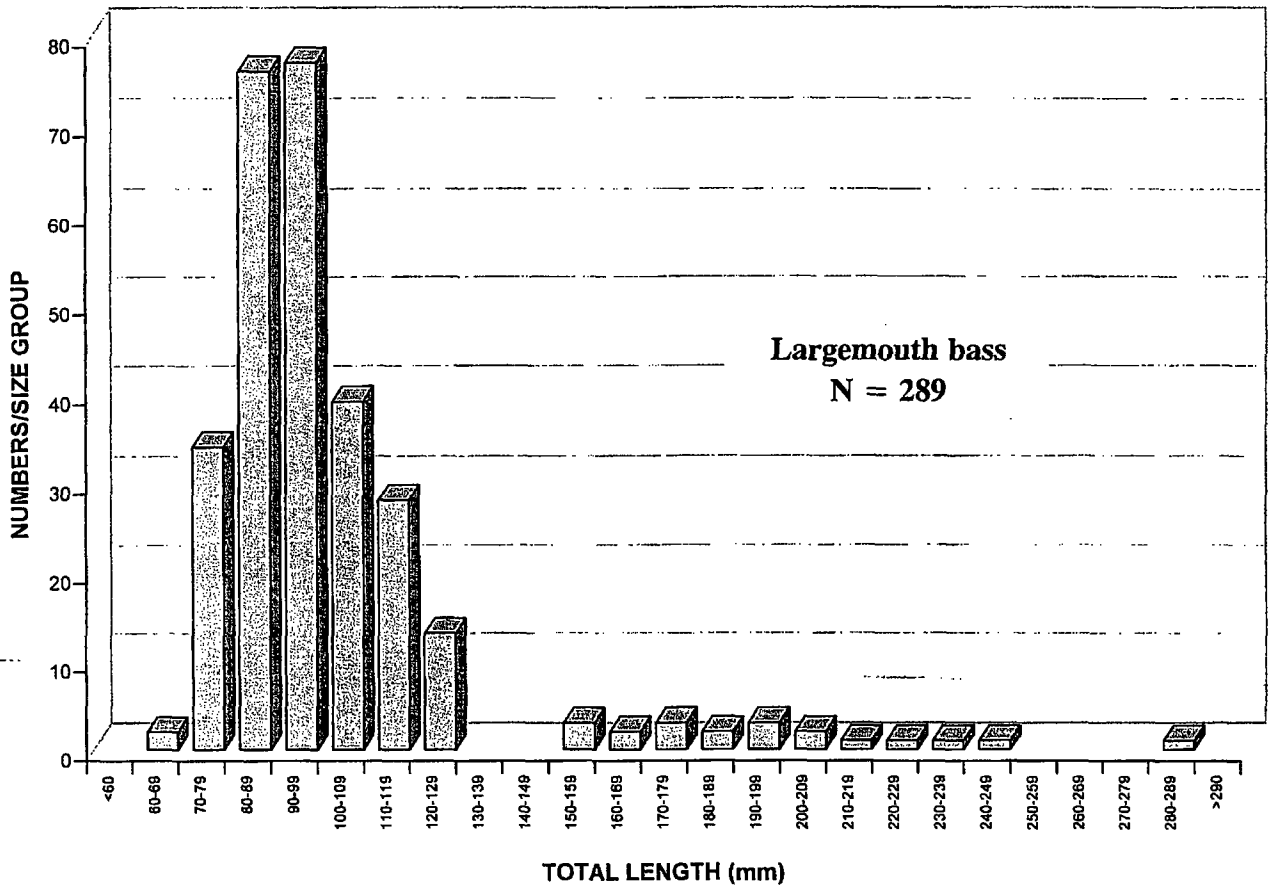


FIGURE 3-4. LENGTH-FREQUENCY DISTRIBUTION OF LARGEMOUTH BASS COLLECTED FROM THE KANKAKEE RIVER AND HORSE CREEK, AUGUST 2012.

TABLE 3-8

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

Braidwood Station - 1977-2012

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 - 1977-2012

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
2011	3.35	3.14	3.48	2.94	3.26	3.27	2.89	2.44	3.42	3.72	3.08	3.18
2012	3.30	3.41	2.87	2.62	2.92	3.25	3.28	3.04	3.83	3.57	3.52	3.24

Mean diversity indices for each location sampled by seining ranged from 2.17 at Location 5L to 3.18 at Location 2 (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 2.77 in 2012 was the sixth highest reported since 1977 and well within the range of values reported during the 35 years of this long-term sampling program.

3.5.2 Anomalies

In 2012, nine (0.30%) of the 3009 fish collected from the Kankakee River and Horse Creek exhibited some form of external anomaly (Table 3-10). In total, four species were noted to exhibit at least one type of external anomaly. Six of the 9 fish were golden redhorse, while the remaining three individuals included a largemouth bass, a rock bass, and a northern hog sucker. One of the six golden redhorse exhibited lesions and eroded fins. During previous studies (1991-2011), 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. Parasites, including leeches, black spot, anchor worm, fish lice, and cysts, were not noted on any of the fish examined in 2011 or 2012.

DELT (Deformities, Eroded fins, Lesions, or Tumors) anomalies were noted on all nine of the fish with external anomalies. Lesions occurred on seven individuals, eroded fins occurred on two individuals, and a malformation (crooked spine) occurred on one individual. Tumors were not observed on any of the fish examined in 2012. The number of fish observed with external anomalies by location were all relatively low. The greatest number of fish with anomalies by sampling area occurred at Location 3L where two (0.99%) of the 202 fish examined exhibited some form of DELT anomaly. No anomalies were noted at five of the 11 sampling locations examined during August 2012 (Table 3-10). The low incidence of individuals with DELT anomalies noted in 2012 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.

TABLE 3-9

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

Braidwood Station - 1977-2012

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 - 1977-2012

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
2011	1.51	2.49	2.03	2.37	1.91	2.33	2.57	1.57	2.44	1.27	1.64	2.01
2012	2.80	2.88	3.18	2.95	2.47	2.66	2.73	2.17	2.80	2.99	2.87	2.77

TABLE 3-10

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

Braidwood Station - 2012

ANOMALY	SAMPLING LOCATION											TOTAL
	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R	
Eroded fin			1			1						2
Lesions	1		1	2			2		1			7
Deformities	1											1
Total Anomalies	2	0	2	2	0	1	2	0	1	0	0	10
No. of Fish with Anomalies	2	0	1	2	0	1	2	0	1	0	0	9
Total Fish Collected	366	187	283	202	161	297	283	232	409	301	288	3009
Percent*	(0.55)	(0.00)	(0.35)	(0.99)	(0.00)	(0.34)	(0.71)	(0.00)	(0.24)	(0.00)	(0.00)	(0.30)

* Percent of total fish with external anomalies by location.

3.5.3 Relative Weight

Inherent in the development of the W_r 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 112 fish (12 species) that met the minimum length criteria of the W_r equations was collected (Table 3-11 and Appendix Table C-1). Of the 12 species collected, only four 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 92.0 for northern pick to 123.7 for redear sunfish. Several factors can influence W_r , including sample size, fish size, sex, food availability, competition, and spawning condition. Each of the 12 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 2012 Braidwood Fish Monitoring Program. Five of the 12 species examined exhibited a W_r score from 92.0 to 98.6, while the remaining seven species all exhibited a W_r score of greater than 100.0 (rock bass, bluegill, green sunfish, redear sunfish, smallmouth bass, largemouth bass, and freshwater drum).

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 2012, water temperature ranged from 23.3 °C at Location 3L on August 22 to 29.5 °C at Location 5L on August 8. Water temperatures were warmer during the first sampling period due to an extended period of unusually warm air temperatures in July and early August. Dissolved oxygen levels were also slightly higher during the second sampling period and ranged from 9.8 to 11.5 ppm, pH from 7.6 to 8.4, and conductivity from 593 to 744 μ mhos/cm. The physicochemical data collected in 2012 was similar to values reported during previous years of these studies. Each of

TABLE 3-11

**MEAN RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKE RIVER
AND HORSE CREEK NEAR BRAIDWOOD STATION - AUGUST 2012**

SPECIES	No.	(Wr)	RANGE
Carp	7	96.5	84.9 - 113.3
River carpsucker	2	96.4	83.8 - 109.0
Channel catfish	4	98.6	85.4 - 107.6
Northern pike	1	92.0	90.2
Rock bass	12	115.2	84.2 - 131.2
Bluegill	9	119.3	96.5 - 132.7
Green sunfish	3	101.6	83.4 - 126.6
Redear sunfish	1	123.7	123.7
Smallmouth bass	19	106.2	83.5 - 122.1
Largemouth bass	23	115.3	104.0 - 171.7
Walleye	28	92.8	81.1 - 138.6
Freshwater drum	3	115.6	114.6 - 117.2

the measured water quality parameters observed were well 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 through October 2012 were all substantially below the mean monthly flows for all years combined (January 1981- September 2012). In fact, river flows in April 2012 were the lowest reported since 1981. These data are preliminary, but the river flows in the Kankakee River were obviously well below average during the first nine months of the year. October through December 2012 preliminary river flows were not available at the time this report was prepared.

Mean annual river flow in the Kankakee River near Braidwood Station from 1981 through 2011 has ranged from 3095 cfs in 2000 to 11,570 cfs in 1993. The mean annual river flows since 1981 (excluding 2012 data) has averaged 6031 cfs (Appendix Table A-5). Highest mean monthly river flows have generally occurred in March and April, while the lowest flows have occurred during the months of August through October. River flows in 2012 ranged from 700 cfs in July to 6985 cfs in May. River flows in the Kankakee River during 2012 can be characterized as being extremely low throughout the first nine months of the year.

River flows during the first sampling period on August 8 (703 cfs) and August 9 (775 cfs) were substantially below the 32-yr mean of 2431 cfs (Appendix Table A-5). During the second sampling period on August 21 (775 cfs) and August 22 (775 cfs) flows were similar to those observed during the first week of sampling when the flows were extremely low. River flows were the highest during the first few days of August and continued to decline throughout the remainder of the month. River flows in the Kankakee River can be highly variable over a relatively short period of time.

3-33

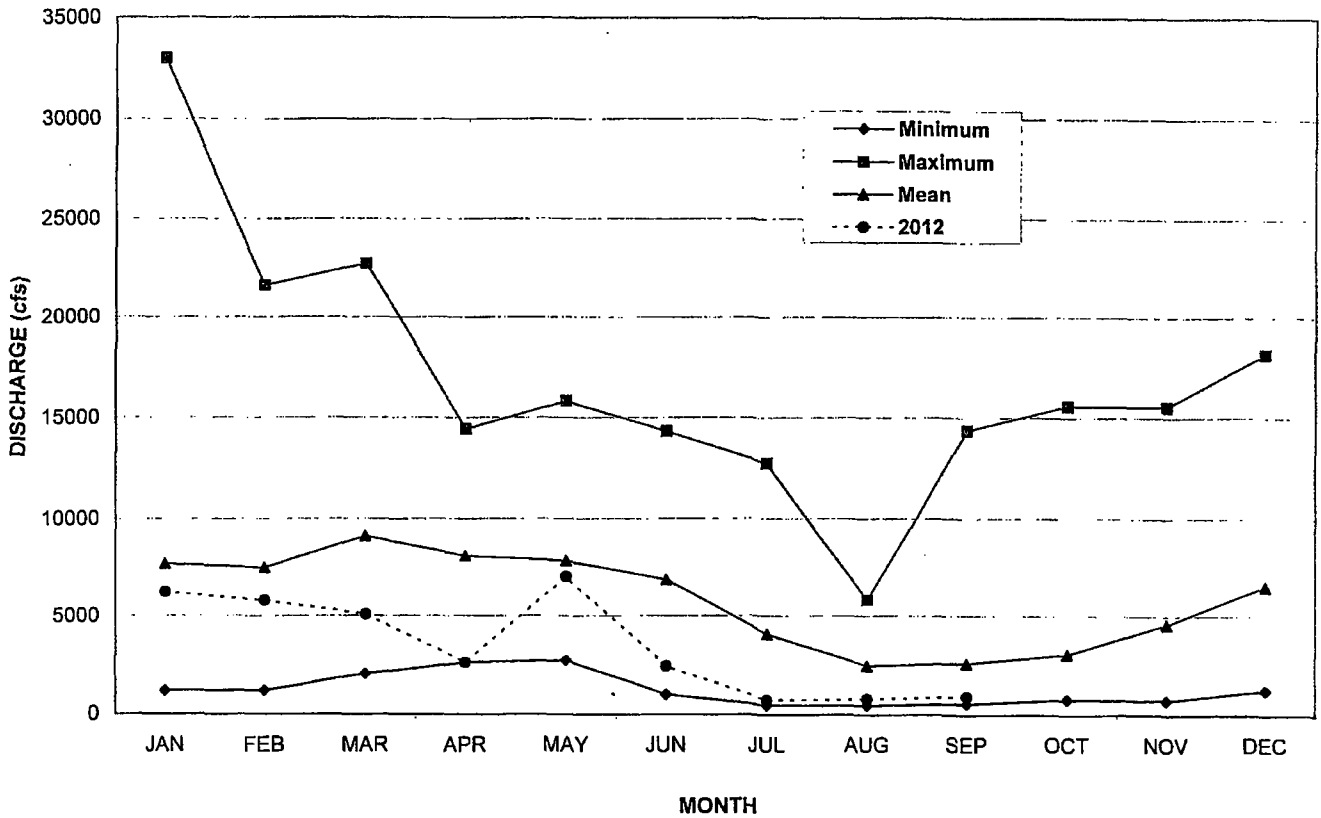


FIGURE 3-5. MONTHLY MEAN, MAXIMUM AND MINIMUM KANKAKEE RIVER FLOWS RECORDED BY THE USGS GAUGING STATION NEAR WILMINGTON, ILLINOIS, JANUARY 1981 THROUGH SEPTEMBER 2012.

4.0 SUMMARY

1. Forty-three species of fish representing 12 families were collected from the Kankakee River and Horse Creek during the Braidwood Station Aquatic Monitoring Program in August 2012. Sampling was hindered by the excessive growth of rooted and floating aquatic plants that were fostered by low flows and warm temperatures.
2. No threatened or endangered species were collected during the 2012 fisheries surveys in the Kankakee River near Braidwood Station. Neither pallid shiner nor river redhorse were collected in 2012. Pallid shiner is currently listed as endangered, while the river redhorse is currently listed as threatened in Illinois. Both of these species have been collected during several of the previous years of these studies.
3. A total of 3009 fish weighing 98.4 kg was collected during electrofishing and seining efforts in 2012.
4. Longear sunfish (15.9%), sunfish spp. (13.1%), bullhead minnow (12.9%), bluntnose minnow (11.9%), largemouth bass (9.6%), spotfin shiner (9.2%), and blackstripe topminnow (8.2%) were the most abundant species collected in 2012.
5. Carp (26.2%), golden redhorse (15.1%), smallmouth bass (13.7%), channel catfish (8.9%), walleye (8.7%), largemouth bass (5.0%), and longear sunfish (5.0%) comprised 82.6% of the total biomass (98.4 kg) collected during electrofishing and seining efforts in 2012.
6. Electrofishing captured 1894 fish representing 37 species. Longear sunfish was the most abundant species observed, accounting for 20.6% of all fish collected, followed by bullhead minnow (14.4%), bluntnose minnow (11.9%), largemouth bass (10.9%), spotfin shiner (10.7%), blackstripe topminnow (5.5%), and sand shiner (5.2%). Electrofishing biomass was dominated by carp, which constituted 27.2% of the 94.9 kg collected. Carp and sucker species accounted for 48.0% of the total electrofishing biomass. Electrofishing CPE was 210.4 fish/hr in 2012, which is higher than the 35-yr average of 178.3 fish/hr.
7. Twenty-seven species were among the 1115 fish collected in seine samples. Small unidentified sunfish species that average approximately one gram dominated the catch comprising (29.7%) of all fish collected, followed by blackstripe topminnow (12.8%), bluntnose minnow (11.9%), bullhead minnow (10.3%), longear sunfish (8.0%), and largemouth bass (7.4%). Seining biomass (3.6 kg) was dominated by largemouth bass (22.3%), longear sunfish (20.9%), and unidentified sunfish spp. (9.4%), bullhead minnow (8.7%), bluntnose minnow (8.5%), grass pickerel (6.4%), and spotfin shiner (5.6%). No other species individually comprised more than 5% of the total biomass collected. Seining CPE in 2012 (25.3 fish/haul) was less than the 35-yr mean of 56.4 fish/haul.

8. The mean diversity index of fish collected by electrofishing for all locations combined in 2011 was 3.24, 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 2012 was 2.77, which is the sixth highest reported since 1977. The mean seining diversity index has ranged from 1.08 in 1983 to 2.97 in 2001.
9. Only nine (0.30%) of the 3009 fish collected in 2012 exhibited some form of external anomaly. Lesions (70.0%), eroded fins (20.0%), and deformities (10.0%) accounted for all of the 10 anomalies observed. Tumors, fish lice, black spot, leeches, anchor worm, and cysts were not observed in 2012. One of the nine fish afflicted with anomalies exhibited two anomalies. Six of the nine fish with anomalies were golden redbreast, while the remaining three individuals included a largemouth bass, a rock bass, and a northern hog sucker. The largest percentage (0.99%) of fish collected with anomalies was observed at Location 3L. No anomalies were observed at five of the 11 sampling locations examined. The very low incidence of DELT (Deformities, Eroded fins, Lesions, and Tumors) anomalies observed in 2012, 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_p) of fish near the Braidwood Station ranged from 92.0 for northern pike (one individual) to 123.7 for redear sunfish (one individual). With the exception of a few individuals, fish collected in the Kankakee River during the August sampling period were in good to excellent condition. Seven species (rock bass, bluegill, green sunfish, redear sunfish, smallmouth bass, 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 recruitment of rock bass was moderately weak and longear sunfish recruitment appeared to be moderate in this portion of the Kankakee River during August 2012. Smallmouth bass recruitment appeared to moderately strong and largemouth bass recruitment was strong based on these same data. Recruitment analysis of longear sunfish based on data collected during the course of these studies can be unreliable because of the number of very small young-of-year sunfish that may be identified only as *Lepomis* species. Three hundred ninety-five individuals that weighed approximately one gram were identified as only *Lepomis* species in 2012. A large percentage of these fish were most likely longear sunfish.

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APPENDIX A
PHYSICOCHEMICAL DATA

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TABLE A-1

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

Braidwood Station - August 8, 2012

PARAMETER	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R
Time	1200	1250	1335	1435	1400	1515	1625	1025	0920	0720	0825
Temperature (°C)	29.1	29.2	28.9	28.7	28.5	28.8	28.5	29.5	28.3	27.4	28.1
Dissolved oxygen (ppm)	8.34	8.15	8.41	7.65	7.80	8.05	7.13	8.35	7.20	6.73	6.93
pH	7.7	7.9	7.8	7.8	7.8	7.9	8.0	7.7	7.6	7.6	7.7
Conductivity (µmhos/cm)	605	605	609	606	605	608	625	629	632	633	632

A-1

TABLE A-2

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

Braidwood Station - August 22, 2012

PARAMETER	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R
Time	0745	0855	1625	0915	1025	1145	1100	1335	1245	1520	1430
Temperature (°C)	23.5	23.5	25.4	23.3	23.8	24.3	24.4	25.2	25.1	25.6	25.4
Dissolved oxygen (ppm)	10.74	10.56	10.77	9.89	9.97	10.59	10.62	10.15	11.52	10.2	10.10
pH	8.1	8.0	8.2	8.0	8.0	8.1	8.1	8.2	8.2	8.1	8.1
Conductivity (µmhos/cm)	694	692	690	703	699	686	718	681	609	696	695

TABLE A-3

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

Braidwood Station - August 9, 2012

PARAMETER	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R
Time	0745	0815	1255	1215	1150	1130	1100	0945	1015	0845	0930
Temperature (°C)	26.6	26.7	24.3	27.2	27.2	27.2	27.1	26.7	26.9	26.8	26.8
Dissolved oxygen (ppm)	7.26	7.30	7.54	8.27	7.75	7.15	8.64	6.85	7.05	7.30	7.06
Ph	7.7	7.7	8.1	7.8	7.8	7.7	7.8	7.8	7.8	7.7	7.7
Conductivity (µmhos)	612	612	593	6014	609	610	602	623	623	627	621

A.3

TABLE A-4

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

Braidwood Station - August 21, 2012

PARAMETER	1L	1R	2	3L	3R	4L	4R	5L	5R	6L	6R
Time	1140	1115	1555	1505	1503	1430	1215	1355	1240	1315	1255
Temperature (°C)	24.7	23.5	26.3	25.3	24.4	25.8	24.6	24.7	24.4	25.9	25.4
Dissolved oxygen (ppm)	10.21	9.14	10.44	10.74	9.86	10.51	9.45	8.90	8.72	10.82	8.92
pH	8.4	8.3	8.4	8.3	8.3	8.3	8.4	8.2	8.2	8.3	8.2
Conductivity (µmhos)	690	699	744	671	701	696	679	701	717	715	716

AD

TABLE A-5

MEAN MONTHLY DISCHARGE (ft³/sec) IN THE KANKAKEE RIVER NEAR WILMINGTON, ILLINOIS

Braidwood Station 1981 - 2012

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	3966	7590	6695	7165
2010 ^a	16266	5275	8634	5699	8328	12501	3281	1948	1010	923	1099	2429	5616
2011 ^a	4038	5760	9706	11744	12791	10414	3729	1849	1028	1595	2566	6523	5979
2012 ^a	6196 ^b	5763	5080	2605	6985	2412	700	769	894	c	c	c	c
Mean ^d	7668	7446	9105	8070	7806	6840	4071	2431	2574	3056	4586	6512	6031

^aData taken from US Army Corp of Engineers website.^bNumbers in bold characters represent provisional river flow data.^cData not available at time of printing.^dMean calculated from January 1981 to August 2012.

APPENDIX B
HISTORICAL CATCH DATA

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TABLE B-1

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

Braidwood Station - 1978-2012

1978		1979		1981	
Gizzard shad	16.1	Spotfin shiner	23.5	Spotfin shiner	10.2
Bluntnose minnow	15.1	Bluntnose minnow	18.4	Golden redhorse	9.8
Longear sunfish	9.4	Sand shiner	11.1	Bluntnose minnow	7.7
Sand shiner	7.3	Smallmouth bass	5.6	Shorthead redhorse	6.8
Smallmouth bass	6.5	Rock bass	4.8	Rock bass	6.1
Total	69.7	Total	63.4	Total	40.6
1982		1983		1984	
Smallmouth bass	9.3	Striped shiner	18.0	Spotfin shiner	14.3
Golden redhorse	7.7	Spotfin shiner	11.6	Striped shiner	9.5
Striped shiner	7.7	Bluntnose minnow	9.8	Bullhead minnow	8.2
Green sunfish	7.0	Smallmouth bass	8.4	Green sunfish	7.9
Rosyface shiner	6.5	Sand shiner	7.5	Smallmouth bass	7.7
Total	38.2	Total	54.7	Total	47.6
1985		1986		1987	
Bluntnose minnow	23.8	Bluntnose minnow	20.8	Spotfin shiner	21.9
Spotfin shiner	13.5	Longear sunfish	13.1	Bluntnose minnow	13.2
Striped shiner	8.9	Golden redhorse	9.3	Longear sunfish	10.4
Smallmouth bass	6.6	Rock bass	7.5	Gizzard shad	6.0
Golden redhorse	6.5	Smallmouth bass	6.3	Bullhead minnow	5.8
Total	59.3	Total	57.0	Total	57.3
1988		1989		1990	
Smallmouth bass	21.4	Longear sunfish	19.4	Gizzard shad	36.2
Gizzard shad	15.8	Smallmouth bass	12.2	Longear sunfish	13.6
Longear sunfish	7.8	Bluntnose minnow	10.5	Spotfin shiner	5.6
Rosyface shiner	6.8	Rock bass	5.5	Golden redhorse	5.2
Bluntnose minnow	6.5	Green sunfish	5.4	Rock bass	4.8
Total	58.3	Total	53.0	Total	65.4
1991		1992		1993	
Gizzard shad	24.3	Spotfin shiner	31.1	Longear sunfish	20.8
Spotfin shiner	17.1	Striped shiner	9.7	Gizzard shad	12.0
Bluegill	13.6	Smallmouth bass	9.5	Rock bass	8.6
Bullhead minnow	9.7	Bluntnose minnow	8.4	Smallmouth bass	6.4
Bluntnose minnow	6.6	Longear sunfish	6.9	Spotfin shiner	6.1
Total	71.3	Total	65.6	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 - 1978-2012

1994		1995		1996	
Golden redhorse	26.6	Bluntnose minnow	24.6	Bluntnose minnow	30.0
Gizzard shad	11.0	Gizzard shad	15.1	Bullhead minnow	11.2
Striped shiner	10.9	Bluegill	10.8	Carp	9.2
Bluntnose minnow	9.9	Longear sunfish	8.4	Sand shiner	8.9
Sand shiner	6.8	Bullhead minnow	8.3	Spotfin shiner	8.2
Total	65.2	Total	67.2	Total	67.5
1997		1998		1999	
Gizzard shad	38.5	Bluntnose minnow	34.7	Bluntnose minnow	23.1
Bluntnose minnow	17.2	Gizzard shad	26.2	Bullhead minnow	19.2
Sand shiner	7.6	Longear sunfish	7.3	Spotfin shiner	6.9
Spotfin shiner	7.2	Sand shiner	4.1	Longear sunfish	6.4
Longear sunfish	3.9	Bluegill	3.4	Gizzard shad	5.6
Total	74.4	Total	75.7	Total	61.2
2000		2001		2002	
Spotfin shiner	39.1	Bluntnose minnow	21.1	Bluntnose minnow	20.2
Bluntnose minnow	20.3	Bullhead minnow	14.0	Striped shiner	13.5
Bullhead minnow	12.5	Spotfin shiner	13.2	Bullhead minnow	12.4
Longear sunfish	8.9	Longear sunfish	11.4	Brook silverside	7.1
Sand shiner	5.1	Sand shiner	8.4	Spotfin shiner	7.1
Total	85.9	Total	85.9	Total	60.3
2003		2004		2005	
Carp	24.0	Spotfin shiner	16.8	Bluntnose minnow	12.5
Longear sunfish	16.3	Longear sunfish	13.4	Spotfin shiner	9.1
Bluntnose minnow	11.8	Bluntnose minnow	12.8	Sand shiner	6.8
Spotfin shiner	10.2	Sand shiner	7.9	Smallmouth bass	5.9
Bullhead minnow	8.9	Orangespotted sunfish	5.7	Brook silverside	5.5
Total	71.2	Total	56.6	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 - 1978-2012

2006		2007		2008	
Longear sunfish	35.7	Brook silverside	20.9	Longear sunfish	16.8
Bluntnose minnow	16.8	Bullhead minnow	8.9	Spotfin shiner	15.1
Spotfin shiner	7.4	Longear sunfish	7.0	Bluntnose minnow	12.0
Gizzard shad	6.6	Bluntnose minnow	6.3	Bullhead minnow	9.4
Rock bass	4.2	Smallmouth bass	5.8	Sand shiner	7.1
Total	70.7	Total	48.9	Total	60.4
2009		2010		2011	
Spotfin shiner	29.6	Spotfin shiner	23.0	Spotfin shiner	33.3
Bullhead minnow	17.3	Longear sunfish	16.0	Longear sunfish	13.6
Bluntnose minnow	10.9	Bluntnose minnow	15.7	Bullhead minnow	9.4
Sand shiner	7.8	Bullhead shiner	10.5	Bluntnose minnow	8.8
Longear sunfish	6.3	Largemouth bass	6.3	Sand shiner	6.7
Total	71.9	Total	71.5	Total	71.8
2012					
Longear sunfish	15.9				
Bullhead minnow	12.9				
Bluntnose minnow	11.9				
Largemouth bass	9.6				
Spotfin shiner	9.2				
Total	59.5				

TABLE B-2

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

Braidwood Station - 1978-2012

1978		1979		1981	
Carp	22.6	Golden redhorse	14.9	Shorthead redhorse	21.0
Quillback	15.4	Smallmouth bass	14.9	Golden redhorse	18.3
Smallmouth bass	12.9	Carp	14.1	Carp	15.6
Golden redhorse	9.7	Rock bass	9.6	Smallmouth bass	7.9
Silver redhorse	9.1	Quillback	9.3	Rock bass	5.2
Total	69.7	Total	62.8	Total	68.0
1982		1983		1984	
Carp	26.9	Quillback	36.0	Quillback	28.2
Silver redhorse	17.6	Carp	16.5	Golden redhorse	18.8
Golden redhorse	11.7	Golden redhorse	11.6	Silver redhorse	13.4
Smallmouth bass	10.0	Smallmouth bass	8.1	Smallmouth bass	9.6
Quillback	9.3	Silver redhorse	5.5	Northern hogsucker	7.6
Total	75.5	Total	77.7	Total	77.6
1985		1986		1987	
Smallmouth bass	25.9	Golden redhorse	26.6	Golden redhorse	16.6
Golden redhorse	16.7	Quillback	13.3	Smallmouth bass	15.1
Quillback	13.5	Rock bass	9.9	Gizzard shad	14.1
Carp	9.3	Smallmouth bass	9.2	Quillback	13.4
Rock bass	8.2	Gizzard shad	7.1	Rock bass	9.4
Total	73.6	Total	66.1	Total	68.6
1988		1989		1990	
Golden redhorse	25.3	Carp	25.2	Golden redhorse	21.6
Smallmouth bass	13.5	Golden redhorse	15.7	Carp	16.6
Gizzard shad	12.6	Smallmouth bass	12.8	River redhorse	13.0
Carp	10.3	Rock bass	7.2	Quillback	10.8
Quillback	9.9	River redhorse	6.5	Silver redhorse	7.1
Total	71.6	Total	67.4	Total	69.1
1991		1992		1993	
Carp	29.9	Smallmouth bass	22.0	Carp	19.2
Gizzard shad	18.6	Carp	17.4	Golden redhorse	16.5
Golden redhorse	12.1	Gizzard shad	9.6	Silver redhorse	13.3
Silver redhorse	9.6	Channel catfish	9.4	Smallmouth bass	12.2
Quillback	7.7	Golden redhorse	8.6	Quillback	10.9
Total	77.9	Total	67.0	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 - 1978-2012

1994		1995		1996	
Carp	49.5	Carp	38.1	Carp	30.3
Golden redhorse	12.1	Smallmouth bass	8.8	Quillback	11.4
Silver redhorse	6.1	Silver redhorse	8.1	Golden redhorse	9.9
Channel catfish	5.3	Golden redhorse	5.9	Smallmouth bass	8.2
Smallmouth bass	4.5	Bigmouth buffalo	5.4	Gizzard shad	6.2
Total	77.5	Total	66.3	Total	66.0
1997		1998		1999	
Carp	27.0	Carp	30.8	Gizzard shad	19.0
Silver redhorse	24.4	Silver redhorse	13.5	Carp	14.0
Gizzard shad	14.3	Gizzard shad	11.8	Golden redhorse	14.0
Golden redhorse	7.7	Golden redhorse	9.6	Silver redhorse	12.3
Smallmouth bass	6.3	Smallmouth bass	6.3	Smallmouth bass	7.2
Total	79.7	Total	72.0	Total	66.5
2000		2001		2002	
Carp	23.4	Carp	43.3	Carp	29.8
Smallmouth bass	10.8	Smallmouth bass	15.0	Smallmouth bass	18.2
Gizzard shad	8.7	Gizzard shad	7.2	Golden redhorse	6.6
Channel catfish	8.5	Golden redhorse	6.7	Gizzard shad	5.7
Golden redhorse	8.5	Longear sunfish	4.8	Channel catfish	5.5
Total	59.9	Total	59.9	Total	65.8
2003		2004		2005	
Carp	24.0	Smallmouth bass	20.1	Carp	25.2
Longear sunfish	16.3	Carp	16.9	Smallmouth bass	16.1
Bluntnose minnow	11.8	Longear sunfish	11.6	Channel catfish	12.0
Spotfin shiner	10.2	Gizzard shad	10.1	Northern hog sucker	6.9
Bullhead minnow	8.9	Silver redhorse	7.7	Golden redhorse	6.5
Total	71.2	Total	66.4	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 - 1978-2012

2006		2007		2008	
Carp	31.6	Carp	31.4	Carp	26.7
Gizzard shad	14.4	Golden redhorse	14.2	Channel catfish	16.3
Channel catfish	12.6	Channel catfish	12.6	Golden redhorse	14.7
Smallmouth bass	9.2	Smallmouth bass	9.1	Smallmouth bass	8.4
Golden redhorse	8.8	River carpsucker	6.9	Silver redhorse	6.1
Total	76.6	Total	74.2	Total	72.2
2009		2010		2011	
Golden redhorse	25.5	Carp	29.7	Carp	28.8
Channel catfish	18.6	Channel catfish	18.3	Golden redhorse	14.7
Carp	12.8	Smallmouth bass	8.7	Walleye	8.2
Smallmouth bass	5.6	Largemouth bass	6.0	Bigmouth buffalo	7.4
Freshwater drum	5.0	Freshwater drum	5.5	Channel catfish	7.0
Total	67.5	Total	68.2	Total	66.1
2012					
Carp	26.2				
Golden redhorse	15.1				
Smallmouth bass	13.7				
Channel catfish	8.9				
Walleye	8.7				
Total	72.6				

APPENDIX C
RELATIVE WEIGHTS

LIST OF TABLES

Table No.	Title	Page No.
C-1	Relative Weights of Fish Collected from the Kankakee River and Horse Creek, August 2012.	C-1

TABLE C-1

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.

COMMON CARP		Alpha = -4.418	Beta = 2.859	Minimum Length = 280	
1L	Above Intake, Left Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	706	5150	96.62
		Location Average			96.62
4R	Discharge Area, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	553	2250	84.87
		Location Average			84.87
5R	Near Field Recovery, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	595	3000	91.79
		2	630	3800	98.73
		Location Average			95.26
6R	Far Field Recovery, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	627	4300	113.26
		2	568	2950	103.07
		3	687	4300	87.22
		Location Average			101.18
		TAXON AVERAGE			**** 96.51 ****
RIVER CARPSUCKER		Alpha = -4.754	Beta = 2.952	Minimum Length = 200	
3R	At Intake, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	418	1050	109.01
		Location Average			109.01
5L	Near Field Recovery, Left Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	478	1200	83.85
		Location Average			83.85
		TAXON AVERAGE			**** 96.43 ****

TABLE C-1 (Continued)

**RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.**

RIVER CARPSUCKER		Alpha = -4.754	Beta = 2.952	Minimum Length = 200	
5L	Near Field Recovery, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
CHANNEL CATFISH		Alpha = -5.649	Beta = 3.243	Minimum Length = 280	
1L	Above Intake, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	534	1500	95.43
		2	569	1650	85.44
		3	588	2300	107.06
		Location Average			95.98
6L	Far Field Recovery, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	658	3300	106.66
		Location Average			106.66
		TAXON AVERAGE			**** 98.65 ****
NORTHERN PIKE		Alpha = -5.369	Beta = 3.059	Minimum Length = 100	
2	Horse Creek	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	418	410	91.96
		Location Average			91.96
		TAXON AVERAGE			**** 91.96 ****
ROCK BASS		Alpha = -4.883	Beta = 3.083	Minimum Length = 100	
1L	Above Intake, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	201	171	103.57
		2	153	90	126.43
		3	170	117	118.77
		4	172	134	131.21
		Location Average			120.00
1R	Above Intake, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	157	99	128.43
		2	162	108	127.20

TABLE C-1 (Continued)

**RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.**

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

		No.	TL(mm)	Wgt (gm)	Wr
1R	Above Intake, Right Bank	-----	-----	-----	-----
			Location Average		127.82
3L	At Intake, Left Bank	-----	-----	-----	-----
		1	168	80	84.23
			Location Average		84.23
3R	At Intake, Right Bank	-----	-----	-----	-----
		1	105	26	116.59
			Location Average		116.59
4R	Discharge Area, Right Bank	-----	-----	-----	-----
		1	108	25	102.78
			Location Average		102.78
5R	Near Field Recovery, Right Bank	-----	-----	-----	-----
		1	153	82	115.19
			Location Average		115.19
6L	Far Field Recovery, Left Bank	-----	-----	-----	-----
		1	220	258	118.29
			Location Average		118.29
6R	Far Field Recovery, Right Bank	-----	-----	-----	-----
		1	198	172	109.12
			Location Average		109.12
				TAXON AVERAGE	**** 115.15 ****

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

		No.	TL(mm)	Wgt (gm)	Wr
1R	Above Intake, Right Bank	-----	-----	-----	-----
		1	96	20	126.42

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.

BLUEGILL SUNFISH		Alpha = -5.374	Beta = 3.316	Minimum Length = 80	
1R	Above Intake, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		Location Average			126.42
4R	Discharge Area, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	122	44	125.63
		Location Average			125.63
5L	Near Field Recovery, Left Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	114	27	96.53
		Location Average			96.53
5R	Near Field Recovery, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	96	20	126.42
		2	96	21	132.74
		3	107	25	110.28
		Location Average			123.15
6L	Far Field Recovery, Left Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	100	18	99.37
		2	112	35	132.70
		Location Average			116.04
6R	Far Field Recovery, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	141	70	123.68
		Location Average			123.68
		TAXON AVERAGE		****	119.31 ****

GREEN SUNFISH		Alpha = -4.814	Beta = 3.056	Minimum Length = 80	
2	Horse Creek	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	177	144	126.64
		2	102	20	94.79
		Location Average			110.71

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.

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

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	90	12	83.37
Location Average			83.37
TAXON AVERAGE			**** 101.60 ****

REDEAR SUNFISH

Alpha = -5.164 Beta = 3.227 Minimum Length = 100

5R Near Field Recovery, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	145	80	123.70
Location Average			123.70
TAXON AVERAGE			**** 123.70 ****

LARGEMOUTH BASS

Alpha = -5.528 Beta = 3.273 Minimum Length = 150

1L Above Intake, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	186	124	156.07
2	248	216	106.03
Location Average			131.05

3R At Intake, Right Bank

No.	TL(mm)	Wgt(gm)	Wr
1	153	72	171.73
2	192	95	107.77
3	221	149	106.66
Location Average			128.72

4L Discharge Area, Left Bank

No.	TL(mm)	Wgt(gm)	Wr
1	158	70	150.28
2	159	81	170.34
3	165	73	135.99
4	171	82	135.90
5	177	99	146.56
6	182	100	135.14
7	190	101	118.57
8	206	122	109.92

TABLE C-1 (Continued)

**RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.**

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

4L	Discharge Area, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		9	215	138	108.10
		Location Average			134.53
5L	Near Field Recovery, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		1	163	92	178.36
		Location Average			178.36
5R	Near Field Recovery, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		1	171	92	152.47
		2	197	106	110.54
		3	203	110	103.98
		4	231	205	126.96
		Location Average			123.49
6L	Far Field Recovery, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		1	282	345	111.21
		Location Average			111.21
		TAXON AVERAGE		****	132.13 ****

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

1L	Above Intake, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		1	196	123	117.51
		Location Average			117.51
1R	Above Intake, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		1	305	453	112.09
		2	412	1100	108.61
		3	193	99	99.14
		Location Average			106.61
3L	At Intake, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		1	187	100	110.29
		2	331	528	101.76

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.

SMALLMOUTH BASS		Alpha = -4.983	Beta = 3.055	Minimum Length = 180	
3L	At Intake, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		3	396	885	98.62
		Location Average			103.56
4L	Discharge Area, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	390	905	105.67
		2	462	1200	83.50
		Location Average			94.59
4R	Discharge Area, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	425	1070	96.09
		Location Average			96.09
5L	Near Field Recovery, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	378	819	105.21
		Location Average			105.21
5R	Near Field Recovery, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	392	906	104.15
		2	346	703	118.33
		Location Average			111.24
6L	Far Field Recovery, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	299	405	106.48
		2	361	758	112.07
		3	368	726	101.22
		Location Average			106.59
6R	Far Field Recovery, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	276	319	107.11
		2	326	605	122.14
		3	392	935	107.48
		Location Average			112.24

TABLE C-1 (Continued)

**RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.**

SMALLMOUTH BASS		Alpha = -4.983	Beta = 3.055	Minimum Length = 180	
6R	Far Field Recovery, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		----	-----	-----	-----
		TAXON AVERAGE		****	106.18 ****
WALLEYE		Alpha = -5.453	Beta = 3.180	Minimum Length = 150	
1L	Above Intake, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		----	-----	-----	-----
		1	163	46	120.50
		2	171	51	114.72
		3	181	47	88.24
		Location Average			107.82
1R	Above Intake, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		----	-----	-----	-----
		1	569	1650	81.14
		Location Average			81.14
2	Horse Creek	No.	TL(mm)	Wgt (gm)	Wr
		----	-----	-----	-----
		1	171	61	137.22
		2	183	45	81.59
		3	197	62	88.92
		Location Average			102.57
3R	At Intake, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		----	-----	-----	-----
		1	194	60	90.35
		Location Average			90.35
4L	Discharge Area, Left Bank	No.	TL(mm)	Wgt (gm)	Wr
		----	-----	-----	-----
		1	181	50	93.88
		2	192	54	84.04
		Location Average			88.96
4R	Discharge Area, Right Bank	No.	TL(mm)	Wgt (gm)	Wr
		----	-----	-----	-----
		1	176	52	106.73
		2	170	40	91.67
		3	176	45	92.36
		4	192	56	87.15

TABLE C-1 (Continued)

**RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.**

WALLEYE		Alpha = -5.453	Beta = 3.180	Minimum Length = 150	
4R	Discharge Area, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		Location Average			94.48
5L	Near Field Recovery, Left Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	172	46	101.57
		Location Average			101.57
5R	Near Field Recovery, Right Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	154	30	94.15
		2	368	705	138.61
		3	150	27	92.13
		4	152	24	78.51
		5	154	29	91.01
		6	162	36	96.17
		7	168	39	92.81
		8	170	41	93.96
		Location Average			97.17
6L	Far Field Recovery, Left Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	411	674	93.25
		2	436	773	88.64
		3	438	726	82.04
		4	481	1040	87.26
		5	587	1900	84.62
		Location Average			87.16
		TAXON AVERAGE			**** 95.47 ****

FRESHWATER DRUM		Alpha = -5.433	Beta = 3.208	Minimum Length = 100	
1L	Above Intake, Left Bank	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	355	656	117.16
		2	481	1700	114.58
		Location Average			115.87
2	Horse Creek	No.	TL (mm)	Wgt (gm)	Wr
		-----	-----	-----	-----
		1	452	1400	115.20

TABLE C-1 (Continued)

RELATIVE WEIGHTS OF FISH COLLECTED FROM THE KANKAKEE RIVER
AND HORSE CREEK, AUGUST 2012.

FRESHWATER DRUM

Alpha = -5.433 Beta = 3.208 Minimum Length = 100

2 Horse Creek

No.	TL (mm)	Wgt (gm)	Wr
Location Average			115.20
TAXON AVERAGE		****	115.65 ****

Braidwood Environmental Audit – Request for Additional Information Response

Question #: AQ-10 Category: Aquatic Ecology

Statement of Question:

Provide the following references:

- (a) Commonwealth Edison Company. 1973. Braidwood Station Environmental Report- Volume II. Aquatic Ecology Sections. July 1973.
- (b) Larimore, R.W. 1989. Kankakee River Fishes of the Braidwood Station Aquatic Monitoring Area, August 1989 [*sic – should be August 1988*]. Illinois Natural History Survey Aquatic Biology Technical Report. January 1989.
- (c) EA Engineering, Science, and Technology (EA). 2012. Braidwood Station 2011 Benthos Monitoring and Historical Fish and Benthos Comparisons. July 2012.
- (d) Exelon Nuclear (Exelon). 2009. Standard Operating Procedures for Braidwood Station's Fisheries Monitoring Program in the Kankakee River and Horse Creek. July 2009.
- (e) Exelon Nuclear (Exelon). 2009. Final Report: Characterization of Unionid Communities near the Braidwood Nuclear Station Kankakee River Discharge Location. January 2009.
- (f) Exelon Nuclear (Exelon). 2009. Application for an Incidental Take Permit for Threatened or Endangered Species and Conservation Plan. May 11, 2009.
- (g) Exelon Nuclear (Exelon). 2011. Braidwood Station Kankakee River Fish Monitoring Program, 2010.
- (h) (Exelon Nuclear 2011 b) Exelon Nuclear. 2011. Braidwood Station Kankakee River Fish Monitoring Program, 2010.
- (i) Illinois Department of Natural Resources (IDNR). 2008. Status of Fish Communities and Sport Fishery in the Kankakee River and Tributary Streams: 2005 Basin Survey. Fisheries Region II, Streams Program. April 2008.
- (j) Illinois Department of Natural Resources (IDNR). 2000. Permit No NE2000125-proposed operation and maintenance of the Braidwood Nuclear Station cooling pond dam, Will County. Office of Water Resources. December 20, 2000.

Response:

The requested reference documents are attached, except for:

1. Item AQ-10(b), which is a duplicate of the document requested by and provided in response to item AQ-6(c); and
2. Item AQ-10(h), which is a duplicate of the document requested by and provided in response to item AQ-10(g).

List Attachments Provided:

1. Commonwealth Edison Company. 1973. Braidwood Station Environmental Report- Volume II. Aquatic Ecology Sections. July 1973.
2. See response to item AQ-6(c).
3. EA Engineering, Science, and Technology (EA). 2012. Braidwood Station 2011 Benthos Monitoring and Historical Fish and Benthos Comparisons. July 2012.
4. Exelon Nuclear (Exelon). 2009. Standard Operating Procedures for Braidwood Station's Fisheries Monitoring Program in the Kankakee River and Horse Creek. July 2009.
5. Exelon Nuclear (Exelon). 2009. Final Report: Characterization of Unionid Communities near the Braidwood Nuclear Station Kankakee River Discharge Location. January 2009.
6. Exelon Nuclear (Exelon). 2009. Application for an Incidental Take Permit for Threatened or Endangered Species and Conservation Plan. May 11, 2009.
7. Exelon Nuclear (Exelon). 2011. Braidwood Station Kankakee River Fish Monitoring Program, 2010.
8. See response to item AQ-10(g).
9. Illinois Department of Natural Resources (IDNR). 2008. Status of Fish Communities and Sport Fishery in the Kankakee River and Tributary Streams: 2005 Basin Survey. Fisheries Region II, Streams Program. April 2008.
10. Illinois Department of Natural Resources (IDNR). 2000. Permit No NE2000125-proposed operation and maintenance of the Braidwood Nuclear Station cooling pond dam, Will County. Office of Water Resources. December 20, 2000.