

THREE MILE ISLAND AQUATIC STUDY
MONTHLY REPORT FOR NOVEMBER 1982

by

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INTRODUCTION

The ecology of York Haven Pond near the Three Mile Island Nuclear Station (TMINS) has been under investigation since February 1974. Studies initiated in April 1974 include analysis of ambient water quality, ichthyoplankton (far-field), ichthyoplankton entrainment, macroinvertebrates, fish population dynamics, impingement of fishes, creel survey, and thermal plume mapping.

This report discusses the progress of investigations conducted in November 1982.

COMPLIANCE WITH ENVIRONMENTAL TECHNICAL SPECIFICATIONS (ETS)

Objective: To determine compliance with the nonradiological (aquatic) environmental monitoring programs specified in sections 3.1.1.a.(4), 3.1.2.a., 4.2, and 4.6.1 of the ETS and to insure that said programs are performed as detailed in the Generation Procedures Manual.

Progress: Compliance with all programs specified in the ETS and detailed in the Procedures Document was achieved in November (Table 1), except for creel surveys. The third creel survey periods (1701-2100 h) could not be conducted at the East Dam, West Dam, and General Reservoir areas due to darkness.

A program by program summary of the progress for November follows.

MACROINVERTEBRATES

Objectives: To describe the diversity and distribution of the benthic macroinvertebrates occurring at the five benthos sampling stations near TMINS.

Progress: Replicate (4) benthos samples were taken on 1 and 15 November (Table 1). Enumeration, determination of dry weights, and identification of specimens have been completed through 15 November.

ICHTHYOPLANKTON

Objectives: (1) To determine the species composition, abundance, and distribution of ichthyoplankton in York Haven Pond; and (2) To investigate ichthyoplankton entrained at TMINS Unit 1 and 2 Intakes.

Far-Field

Progress: Work continued on the section for the 1982 annual report. The following statistical tests were applied to 1982 data: analysis of variance (ANOVA), t-test, Kendall's coefficient of rank correlation,

and stepwise multiple linear regression. The two 1980 regression models to predict 1982 Discharge and day densities were tested, tabulated, and graphed. The following tables were typed and proofed: computer generated day and night data, ANOVA and Student-Newman-Keuls multirange test results, and percentage similarity values. Five figures for the results section were drafted and finalized; eight other figures were drafted.

Entrainment

Progress: The following summary tables for the annual report were typed and proofed: total number of ichthyoplankton taken in surface and oblique tows; occurrence by species; density by species and depth; density by species, time, and depth; density by family and depth; density by family, time, and depth; density by species for 1982 compared to other years; percent similarity of species composition by unit, time, and depth; number and density for day and night collections at Station TM-LF-13A4 (Midchannel); estimated numbers entrained by times and by extended sample periods; and day and night estimates of percent entrainment (Units 1 and 2 compared to center channel stations).

TRAPNET

Objectives: (1) To determine the distribution and relative abundance of fishes in the Three Mile Island area vulnerable to trapnet; (2) To provide specimens for movements studies; (3) To monitor the occurrence of diseased fishes; (4) To provide specimens for radiation analysis; and (5) To determine reproductive status for fishes throughout the year.

Progress: Samples were taken on 3-5 and 16-18 November (Table 1). A total of 146 fish of 9 species was taken on 3-5 November (Table 2). Most fish (52) and most species (9) were taken at Station 9B2 while

greatest biomass (23.40 kg) occurred at 11A3. Common fishes included the pumpkinseed (32.2% of the total catch), bluegill (17.1%), channel catfish (15.8%), black crappie (13.0%), and white crappie (12.3%). Seventeen channel catfish, 5 rock bass, 1 brown bullhead, and 1 large-mouth bass were tagged. One previously tagged channel catfish was recaptured. Leeches parasitized 13 channel catfish. No pattern of parasite infection was observed with respect to the location of TMINS. One white crappie was missing its left eye. One redbreast sunfish X pumpkinseed hybrid was collected at Station 11A2.

Twenty-nine fish of eight species were taken on 16-18 November (Table 3). Most fish (9) were taken at Station 11A2, greatest biomass (1.25 kg) at 11A3, and most species (4) at 11A2 and 9B2. The rock bass was the most abundant species and comprised 44.8% of the total catch. Eight rock bass were tagged and one previously tagged rock bass was recaptured.

SEINE

Objectives: (1) To determine the species composition of fish upstream and downstream from the TMINS Discharge vulnerable to seine; (2) To determine the relative condition factor for important species; and (3) To determine the reproductive status for fishes throughout the year.

Progress: Collections were made at the 10 stations on 4 and 16 November (Table 1). A total of 8,195 fish of 17 species was taken on 4 November (Table 4). Most fish (3,311) and greatest biomass (486.9 g) occurred at Station 10A2. Stations 13B5, 10B5, 16A5, and 10A2 all recorded 9 species. The spotfin shiner was the most abundant species at all stations and comprised 95.3% of the total catch. Slight black spot infestations were observed on 32 spotfin shiner, 12 golden shiner,

1 creek chub, 1 bluegill, and 1 tessellated darter. Glochidia parasitized 9 bluegill, 2 pumpkinseed, 2 tessellated darter, and 1 spotfin shiner. Four mimic shiner and two spotfin shiner were pugheaded. Anchor worms infested two spotfin shiner and leeches one tessellated darter. One spotfin shiner had scoliosis and one pumpkinseed had exophthalmia.

Seining on 16 November yielded 3,662 fish of 11 species (Table 5). Most fish (2,244), most species (7), and greatest biomass (455.0 g) were taken at Station 13B5. The spotfin shiner was the most abundant species at all stations except 4A2 and comprised 97.1% of the total catch. Slight black spot infestations were observed on 24 spotfin shiner, 1 bluntnose minnow, and 1 banded killifish. Glochidia parasitized 23 spotfin shiner, 4 tessellated darter, 3 bluegill, 2 swallowtail shiner, 2 mimic shiner, 1 rock bass, and 1 pumpkinseed. Anchor worms parasitized two spotfin shiner and one mimic shiner was pugheaded.

Collections taken on 18 October have now been processed; 7,264 fish of 11 species were taken (Table 6). Most fish (3,270) and greatest biomass (484.0 g) were taken at Station 13B5 while most species (7) occurred at 10B5 and 10A2. The spotfin shiner was the most abundant species at all stations except 4A2 and comprised 97.0% of the total catch. Slight black spot infestations were observed on 27 spotfin shiner, 2 bluegill, 2 tessellated darter, 1 golden shiner, and 1 pumpkinseed. Anchor worms parasitized 3 spotfin shiner, 1 spottail shiner, 1 mimic shiner, and 1 pumpkinseed. One pumpkinseed was parasitized by glochidia. One spotfin shiner was observed with each of the following anomalies: scoliosis, pugheadedness, and mandibular deformity.

No pattern of parasite infection or anomaly was observed with respect to the location of TMINS from any of the above samples.

IMPINGEMENT OF FISH

Objectives: (1) To determine the numbers and species impinged on the river water intake screens; (2) To determine day-night differences in impingement frequency; and (3) To determine the extent of mortality of impinged fish.

Progress: Impingement surveys were conducted on 9-10 and 23-24 November at the TMINS Unit 1 and 2 Intakes (Table 1). Unit 1 impinged 3 fish weighing 21.7 g (Tables 7 through 10). Two of the fish were young and alive. The estimated impingement for Unit 1 for November was 45 fish weighing 325.5 g (0.7 lb).

Unit 2 impinged 18 fish of 6 species weighing 23.0 g (Tables 11 through 14). Most fish were young and dead. Fish biomass was highest during the 9-10 November survey. The estimated impingement for Unit 2 was 270 fish weighing 345.0 g (0.8 lb).

The total estimated impingement at TMINS in November was 315 fish weighing 670.5 g (1.5 lb).

ELECTROFISHING

Objectives: (1) To provide specimens for radiation analysis and movements studies; and (2) To determine the relative abundance of fishes vulnerable to electrofishing in various parts of York Haven Pond.

Progress: Sampling was conducted on six nights in November (Table 1). Twenty-four collections in 12 zones yielded 850 specimens of 21 species (Table 15). The pumpkinseed (240 specimens), rock bass (126), smallmouth bass (120), and redbreast sunfish (103) were most abundant. A total of 150 fish was tagged for movements studies.

MOVEMENTS OF FISHES

Objective: To determine if fishes in waters receiving the TMINS effluent mix with fishes from other areas.

Progress: A total of 182 fish was tagged and 12 previously tagged were recaptured in November. Recaptured fishes included the channel catfish (one specimen), rock bass (7), smallmouth bass (3), and largemouth bass (1). The channel catfish was recaptured in the same area in which it was tagged. One rock bass moved 0.5 km upstream, three moved 0.3 to 0.5 km downstream, and three were recaptured in the same areas in which they were tagged. The three smallmouth bass were recaptured in the same areas in which they were tagged. The largemouth bass moved 1.6 km downstream.

CREEL SURVEYS

Objectives: (1) To determine the extent and success of sport fishing; and (2) To determine information on angler residence and use of catch.

Progress: Creel surveys were conducted in all areas on 3, 6, 18, and 21 November (Table 1). The third creel survey periods (1701-2100 h) were not conducted at the East Dam, West Dam, and General Reservoir areas due to darkness. The 103 anglers interviewed fished 137.51 hours and caught 150 fish (Tables 16 through 19). The actual harvest was 95 fish or 63.3% of the total catch. The mean catch per effort (c/e) was 1.09. Most anglers (70) fished at the York Haven Generating Station (YHGS). The largest total catch (94), most fish kept (55), and most hours fished (89.26) were recorded at the YHGS; however, the highest c/e (1.17) was recorded in the General Reservoir.

Smallmouth bass (65) was the predominant species caught by anglers. Other species frequently caught included the walleye (30), unidentified sunfish (22), and rock bass (20).

Approximately 77% of the anglers interviewed lived in York or Dauphin counties. Most anglers reported that they eat some of their catch.

AMBIENT WATER QUALITY

Objective: To determine the concentrations of selected water quality parameters in ambient river areas and the TMINS effluent.

Progress: Water quality samples were collected on 1 and 15 November at the five river stations (Table 1). Data were analyzed and tabulated; results are presented in Table 20.

On 1 November values for sulfate, total dissolved solids, and total copper were highest at Station 1A1 (upstream of the TMINS Discharge); alkalinity was highest at 1A2. Station 11A2 had the highest values for total and dissolved zinc, while values for pH and dissolved oxygen were highest at 9B1.

On 15 November values for sulfate (1A1) and dissolved zinc (1A2) were highest at the upstream stations. Turbidity and total dissolved solids were highest at Station 11A2.

Parameters, for which State water quality criteria have been established, were not exceeded at any station on 1 or 15 November.

POPULATION ESTIMATES OF FISHES

Objectives: (1) To determine if differences exist in fish populations between areas receiving the TMINS effluent; and (2) To estimate populations in other areas available for recruitment.

Progress: Fall population estimate sampling was completed on 1 November (Table 1). Data will be tabulated and results presented in the annual report.

Table 1

Sampling conducted in compliance with the Generation Procedures Manual in November 1982.

PROGRAM	Nov 1-6	Nov 7-13	Nov 14-20	Nov 21-27
Macroinvertebrates	X		X	
Ichthyoplankton:				
Far-Field ¹				
Entrainment ¹				
Trapnet	X		X	
Seine	X		X	
Impingement of Fish		X		X
Electrofishing	X		X	
Movements of Fishes	X		X	
Creel Surveys.	X		X	X
Ambient Water Quality	X		X	
Population Estimates of Fishes	X			

¹ Sampling terminated for 1982 as of 31 August.

Table 2

Fishes taken by trapnet on 3-5 November 1982 near TMINS.

Station	TM-AQE-1A3		TM-AQE-11A2		TM-AQE-11A3		TM-AQE-9R2		Total	% Catch
Date	3-4		4-5		3-4		4-5			
Time	0953-0952	0956-1145	0940-0936	0938-1135	0930-0913	0917-1010	0917-0847	0850-0940		
Air Temp (C)	17.0, 21.5	21.5, 6.0	16.5, 20.5	20.5, 7.0	15.5, 20.5	20.5, 6.5	16.0, 21.0	21.0, 5.0		
Water Temp (C)	15.5, 16.5	16.5, 12.5	16.0, 17.5	17.5, 12.5	16.0, 17.5	17.5, 12.5	15.5, 17.0	17.0, 12.5		
Dissolved Oxygen (mg/l)	12.5, 13.9	13.9, 10.4	10.4, 9.5	9.5, 9.6	10.2, 9.7	9.7, 9.5	11.4, 10.2	10.2, 8.9		
pH	8.1, 8.2	8.2, 8.0	7.7, 8.0	8.0, 7.8	7.5, 7.5	7.5, 7.7	8.0, 8.2	8.2, 7.6		
Secchi Disc (cm)	56, 46	46, 28	56, 56	56, 28	56, 56	56, 28	66, 58	58, 30		
River Stage (m)	0.93, 0.93	0.93, 0.97	0.93, 0.93	0.93, 0.97	0.93, 0.93	0.93, 0.97	0.93, 0.93	0.93, 0.97		
Weather	Fog, Overcast	Overcast, Clear	Fog, Overcast	Overcast, Clear	Fog, Overcast	Overcast, Clear	Fog, Partly Cloudy	Partly Cloudy, Partly Cloudy		
No. of Specimens	32	8	11	9	20	14	33	19	146	
No. of Species	6	4	5	4	6	6	8	5	9	
Brown bullhead	-	-	-	-	-	-	1	-	1	0.7
Channel catfish	3	-	-	-	8	9	3	-	23	15.8
Rock bass	-	-	-	-	3	1	1	-	7	4.8
Redbreast sunfish	1	-	2	-	1	-	1	1	4	2.7
Pumpkinseed	10	1	4	4	3	1	9	15	47	32.2
Bluegill	9	4	2	1	-	1	8	-	25	17.1
Lepomis hybrid	1	-	-	-	-	-	-	-	1	0.7
Largemouth bass	-	-	-	-	-	-	-	1	1	0.7
White crappie	3	1	2	2	2	1	6	1	18	12.3
Black crappie	5	2	1	2	3	1	4	1	19	13.0

Table 3

Fishes taken by trapnet on 16-18 November 1982 near THINS.

Station	TH-AQF-1A3		TH-AQF-11A2		TH-AQF-11A3		TH-AQF-9B2		Total	% Catch
Date	16-17	17-18	16-17	17-18	16-17	17-18	16-17	17-18		
Time	0938-0937	0940-0937	0927-0924	0926-0922	0917-0911	0913-0910	0859-0857	0900-0854		
Air Temp (C)	1.5, 2.0	2.0, 4.5	1.5, 2.5	2.5, 4.5	1.0, 1.5	1.5, 4.5	0.5, 0.0	0.0, 3.5		
Water Temp (C)	4.5, 4.0	4.0, 5.0	4.5, 4.5	4.5, 4.5	4.5, 4.5	4.5, 5.0	5.5, 3.5	3.5, 5.5		
Dissolved Oxygen (mg/l)	10.4, 12.0	12.0, 12.2	11.0, 12.0	12.0, 12.4	10.8, 12.1	12.1, 12.3	10.9, 12.2	12.2, 12.3		
pH	7.1, 7.3	7.3, 7.4	7.1, 7.3	7.3, 7.4	7.0, 7.3	7.3, 7.7	6.9, 7.3	7.3, 7.8		
Secchi Disc (cm)	46, 135	135, 152*	41, 117	117, 132	41, 102	102, 130	36, 107	107, 107		
River Stage (m)	1.08, 1.08	1.08, 1.06	1.08, 1.08	1.08, 1.06	1.08, 1.08	1.08, 1.06	1.08, 1.08	1.08, 1.06		
Weather	Clear, Overcast	Overcast, Overcast	Clear, Partly Cloudy	Partly Cloudy, Overcast	Clear, Partly Cloudy	Partly Cloudy, Overcast	Clear, Partly Cloudy	Partly Cloudy, Overcast		
No. of Specimens	3	4	4	5	4	2	3	4	29	
No. of Species	2	1	3	1	2	1	3	2	8	
Gizzard shad	-	-	-	-	-	-	-	-	1	3.4
Golden shiner	-	-	1	-	-	-	-	2	1	3.4
Shorthead redhorse	-	-	-	-	-	-	-	-	3	10.3
Rock bass	2	4	-	5	3	-	-	2	13	44.8
Pumpkinseed	-	-	-	-	-	-	-	-	3	10.3
White crappie	-	-	1	-	1	2	-	-	4	13.8
Black crappie	-	-	2	-	-	-	1	2	2	6.9
Walleye	1	-	-	-	-	-	1	-	2	6.9

* Clear to bottom at indicated depth.

Table 4

Fishes taken by seine on 4 November 1982 near IMINS.

Station	TM-AQF-13B5	TM-AQF-10B5	TM-AQF-16A5	TM-AQF-1A2	TM-AQF-16A1	TM-AQF-10A2	TM-AQF-9B6	TM-AQF-9A1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	1545	1229	1520	1502	1416	1359	1331	1314	1254	1442		
Air Temp (C)	13.5	17.5	14.0	14.0	14.5	15.0	15.5	16.0	16.0	14.0		
Water Temp (C)	15.5	17.5	16.0	15.5	16.0	16.5	16.5	16.5	16.5	15.5		
Dissolved Oxygen (mg/l)	10.8	11.8	10.0	10.3	13.5	10.8	9.8	10.1	10.4	9.8		
pH	8.1	8.4	8.6	7.9	8.3	7.7	7.5	7.6	7.7	7.6		
Secchi Disc (cm)	56	69	64	33	51	53	58	56	61	58		
River Stage (m)	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93		
Weather	Light Rain	Overcast	Heavy Rain	Heavy Rain	Heavy Rain	Light Rain	Light Rain	Heavy Rain	Heavy Rain	Heavy Rain		
No. of Specimens	1662	522	1060	69	15	3311	1312	168	57	19	8195	
No. of Species	9	9	9	4	3	9	4	5	3	5	17	
No. of Hauls	4	5	5	5	4	4	4	4	4	4	43	
Gizzard shad	-	-	-	-	-	-	-	-	-	-	-	-
Golden shiner	5	97	1	-	-	1	-	-	-	-	1	+
Comely shiner	-	-	-	-	-	1	-	-	-	-	104	1.3
Common shiner	1	-	-	-	-	-	-	-	-	-	1	+
Spottail shiner	1	-	3	-	-	-	-	-	-	-	1	+
Swallowtail shiner	2	-	4	-	1	1	-	-	3	-	9	0.1
Spotfin shiner	1638	282	1006	50	12	3296	1305	157	51	12	7809	95.3
Mimic shiner	7	2	37	-	2	6	5	3	-	-	62	0.8
Bluntnose minnow	3	2	1	-	-	1	1	-	-	-	8	0.1
Creek chub	-	1	-	-	-	-	-	-	-	-	1	+
Fallfish	-	-	2	-	-	-	-	-	-	-	2	+
Banded killifish	-	1	-	-	-	-	-	-	-	-	1	+
Redbreast sunfish	-	-	-	-	-	-	-	-	-	-	1	+
Pumpkinseed	2	33	-	17	-	2	1	-	-	2	56	0.7
Bluegill	3	103	3	1	-	-	-	-	-	1	113	1.4
Smallmouth bass	-	-	-	-	-	-	-	2	-	-	1	+
Tessellated darter	-	1	3	1	-	-	-	1	-	-	1	+
+ Less than 0.05%.								5	3	3	16	0.2

Table 5

Fishes taken by seine on 16 November 1982 near TMINS.

Station	TM-AQF-1385	TM-AQF-10B5	TM-AQF-16A5	TM-AQF-1A2	TM-AQF-16A1	TM-AQF-10A2	TM-AQF-9B6	TM-AQF-9A1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	1536	1234	1513	1451	1405	1347	1325	1310	1256	1430		
Air Temp (C)	4.5	6.5	7.0	7.0	6.5	7.0	7.0	6.5	6.5	6.5		
Water Temp (C)	6.0	6.0	6.0	7.0	6.5	7.0	7.0	6.5	6.5	6.5		
Dissolved Oxygen (mg/l)	12.0	12.1	12.8	11.2	11.5	11.4	11.5	11.8	11.5	11.0		
pH	8.0	7.7	7.9	7.3	7.3	7.3	7.3	7.3	7.3	7.3		
Secchi Disc (cm)	66	127	69*	46	41	41	41	38	36	28		
River Stage (m)	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08	1.08		
Weather	Partly Cloudy	Clear	Partly Cloudy	Partly Cloudy	Clear	Clear	Clear	Clear	Clear	Clear		
No. of Specimens	2244	141	205	8	6	446	592	5	1	14	3662	
No. of Species	7	5	3	1	2	5	2	1	1	3	11	
No. of Hauls	2	5	5	5	4	4	4	5	5	4	43	
Golden shiner	4	21	-	-	-	-	-	-	-	-	25	0.7
Spottail shiner	-	-	-	-	-	-	-	-	-	-	1	+
Swallowtail shiner	15	-	3	-	1	-	-	-	-	-	19	0.5
Spotfin shiner	2196	114	196	8	5	440	591	5	1	-	3556	97.1
Mimic shiner	18	-	6	-	-	2	1	-	-	-	27	0.7
Bluntnose minnow	3	-	-	-	-	-	-	-	-	-	3	0.1
Banded killifish	-	2	-	-	-	-	-	-	-	-	2	0.1
Rock bass	-	1	-	-	-	-	-	-	-	-	1	+
Pumpkinseed	1	3	-	-	-	-	-	-	-	-	8	0.2
Bluegill	7	-	-	-	-	1	-	-	-	-	2	0.3
Tessellated darter	-	-	-	-	-	2	-	-	-	3	11	0.3
										9	9	0.2

* Clear to bottom at indicated depth.

+ Less than 0.05%.

Table 6

Fishes taken by seine on 18 October 1982 near TMINS.

Station	TM-AQF-13B5	TM-AQF-10B5	TM-AQF-16A5	TM-AQF-1A2	TM-AQF-16A1	TM-AQF-10A2	TM-AQF-9E6	TM-AQF-9A1	TM-AQF-9B3	TM-AQF-4A2	Total	% Catch
Time	0850	1133	0912	0936	1023	1036	1052	1108	1120	1000		
Air Temp (C)	2.0	7.5	2.0	3.0	4.5	5.0	5.5	6.0	7.5	4.0		
Water Temp (C)	9.0	11.0	8.0	9.0	9.0	9.5	9.5	9.5	10.0	10.0		
Dissolved Oxygen (mg/l)	11.5	10.4	10.8	10.2	10.2	10.4	10.4	10.8	10.4	11.8		
pH	8.2	8.1	7.7	7.7	7.6	7.6	7.7	7.6	7.6	8.2		
Secchi Disc (cm)	124*	97	66*	94	94*	89	81	91	86	41		
River Stage (m)	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95		
Weather	Fog	Partly Cloudy	Fog	Clear	Clear	Clear	Clear	Clear	Partly Cloudy	Clear		
No. of Specimens	3270	930	140	354	1	72	2422	11	1	63	7264	
No. of Species	5	7	3	3	1	7	4	2	1	3	11	
No. of Hauls	1	6	5	5	5	4	4	4	4	5	43	
Golden shiner	-	25	-	-	-	-	-	-	-	-	25	0.3
Common shiner	-	-	-	-	-	1	-	-	-	-	1	+
Spottail shiner	-	-	-	-	-	6	-	-	-	-	6	0.1
Swallowtail shiner	2	-	1	-	-	-	1	-	-	-	4	0.1
Spotfin shiner	3227	856	132	342	1	58	2419	10	1	-	7046	97.0
Mimic shiner	3	3	7	-	-	2	1	-	-	-	16	0.2
Bluntnose minnow	-	-	-	-	-	2	1	-	-	-	3	+
Banded killifish	-	1	-	-	-	2	1	-	-	-	1	+
Pumpkinseed	10	23	-	11	-	2	-	-	-	-	25	1.0
Bluegill	28	20	-	1	-	1	-	-	-	32	83	1.1
Tessellated darter	-	2	-	-	-	-	-	1	-	6	8	0.1

* Clear to bottom at indicated depth.

+ Less than 0.05%.

Table 7

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 9-10 November 1982.

Date	9	10	10							
Time	2000	0400	1200							
Volumetric Flow Rate (m ³ /s)	0.84	0.84	0.84							
Number of River Water Pumps:										
Nuclear Service	1	1	1							
Secondary Service	1	1	1							
Decay Heat	0	0	0							
Intake Velocity (cm/s)	NA	NA	NA							
River Flow (m ³ /s)	334.8	340.5	342.6							
Air Temp (C)	14.0	9.0	8.0							
Water Temp (C)	9.5	9.0	9.0							
Condition of Fish	Alive Dead		Alive Dead		Alive Dead		Total			
Bluegill	-	-	-	-	1	-	1	-	-	-
Total	-	-	-	-	1	-	1	-	-	-

NA Not Available.

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Table 8

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 9-10 November 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Bluegill	101-105	1 Juvenile	20.8	1
Total			20.8	1

Table 9

Number of fishes impinged at the Unit 1 Intake during a 24-hour impingement survey on 23-24 November 1982.

Date	23		24		24			
Time	2000		0400		1200			
Volumetric Flow Rate (m ³ /s)	0.84		0.84		0.84			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Decay Heat	0		0		0			
Intake Velocity (cm/s)	NA		NA		NA			
River Flow (m ³ /s)	214.9		226.4		230.7			
Air Temp (C)	16.0		11.5		8.0			
Water Temp (C)	11.0		11.0		10.5			
Condition of Fish							Total	
Bluegill	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Total	1	1	-	-	-	-	1	1
NA Not Available.	1	1	-	-	-	-	1	1

Table 10

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 1 Intake on 23-24 November 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Bluegill	31-35	2 Young	0.9	2
Total			0.9	2

Table 11

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 9-10 November 1982.

Date	9		10		10			
Time	2000		0400		1200			
Volumetric Flow Rate (m ³ /s)	1.58		1.58		1.58			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Intake Velocity (cm/s)	NA		NA		NA			
River Flow (m ³ /s)	334.8		340.5		342.6			
Air Temp (C)	14.0		9.0		9.0			
Water Temp (C)	9.0		9.0		9.0			
Condition of Fish							Total	
	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Spotfin shiner	-	1	-	-	-	-	-	1
Bluntnose minnow	-	1	-	-	-	-	-	1
Redbreast sunfish	-	1	1	1	-	1	1	3
Pumpkinseed	-	-	-	2	-	-	-	2
Bluegill	-	-	-	-	-	1	-	1
Total	-	3	1	3	-	2	1	8
NA Not Available.								

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Table 12

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 9-10 November 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Spotfin shiner	26-30	1 Young	0.2	1
Bluntnose minnow	36-40	1 Juvenile	0.6	1
Redbreast sunfish	26-35, 41-50	3 Young, 1 Juvenile	5.3	4
Pumpkinseed	41-45, 51-55	2 Young	4.6	2
Bluegill	46-50	1 Juvenile	1.9	1
Total			12.6	9

Table 13

Number of fishes impinged at the Unit 2 Intake during a 24-hour impingement survey on 23-24 November 1982.

Date	23		24		24			
Time	2000		0400		1200			
Volumetric Flow Rate (m ³ /s)	1.58		1.58		1.58			
Number of River Water Pumps:								
Nuclear Service	1		1		1			
Secondary Service	1		1		1			
Intake Velocity (cm/s)	NA		NA		NA			
River Flow (m ³ /s)	214.9		226.4		230.7			
Air Temp (C)	16.5		12.0		8.5			
Water Temp (C)	11.0		11.5		11.0			
Condition of Fish							Total	
Spotfin shiner	Alive	Dead	Alive	Dead	Alive	Dead	Alive	Dead
Redbreast sunfish	-	-	-	-	-	1	-	1
Green sunfish	-	3	-	-	-	2	-	5
Bluegill	1	-	-	-	-	-	1	-
Total	-	-	-	-	-	2	-	2
NA Not Available.	1	3	-	-	-	5	1	8

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Table 14

Summary of length, weight, reproductive status, and number of fishes impinged at the Unit 2 Intake on 23-24 November 1982.

Species	Fork Length Range (5 mm groups)	Reproductive Status	Total Weight (g)	Total Number
Spotfin shiner	41-45	1 Juvenile	0.7	1
Redbreast sunfish	36-45	5 Young	6.2	5
Green sunfish	46-50	1 Young	1.8	1
Bluegill	26-30, 41-45	2 Young	1.7	2
Total			10.4	9

Table 15

Fishes captured by the AC electrofisher near TMINS in November 1982.

Zone	1688	4A1	16A2	13A1	10A3	9B5	15B2	15A1	15A2	10B1	10B3	11B1
Date	1 Nov	1 Nov	1 Nov	1 Nov	1 Nov	1 Nov	2 Nov	2 Nov	2 Nov	2 Nov	2 Nov	2 Nov
Time	1739	1834	1934	2008	2044	2129	1746	1837	1913	1952	2033	2122
Duration (min)	16	17	17	20	17	17	19	17	16	19	18	17
Air Temp (C)	16.0	15.0	14.0	14.0	14.0	14.0	14.0	16.5	17.0	15.0	15.0	14.0
Water Temp (C)	14.0	12.5	13.0	14.0	14.0	13.5	16.0	15.5	16.0	17.0	15.0	14.0
Dissolved Oxygen (mg/l)	12.4	13.8	14.1	13.6	13.4	12.0	19.0	11.9	12.0	12.3	12.0	10.8
pH	7.9	8.2	7.8	7.8	7.6	7.5	9.0	8.9	8.7	8.9	8.3	8.1
Conductivity (micromhos/cm)	350	390	380	450	450	450	280	425	430	440	410	350
Secchi Disc (cm)	91*	76	61	61	63	61	61	66	61	61	76	102*
Volts	195	190	185	175	185	175	195	195	185	185	185	195
Amps	5.0	6.5	7.5	7.0	8.0	7.5	5.0	7.0	7.5	8.5	9.0	6.5
Gizzard shad	-	-	-	1	-	-	-	-	1	-	1	-
Muskellunge	-	-	-	-	-	-	-	-	-	-	-	-
Common carp	-	2	2	1	1	-	5	-	1	-	2	-
Golden shiner	-	-	-	-	-	-	-	-	-	-	-	-
Quillback	-	1	-	-	7	14	7	4	17	5	1	2
White sucker	4	-	-	1	-	-	-	-	-	-	-	-
Northern hog sucker	-	-	-	-	-	-	-	-	2	-	-	-
Shorthead redhorse	1	-	-	-	-	-	-	-	-	-	-	-
Yellow bullhead	-	-	-	-	-	-	-	-	1	-	1	-
Channel catfish	-	1	3	-	-	-	-	-	-	-	-	2
Rock bass	24	6	3	6	9	2	4	1	2	-	1	1
Redbreast sunfish	11	5	-	11	1	-	5	3	7	7	3	1
Green sunfish	-	-	-	-	-	-	-	-	-	-	-	-
Pumpkinseed	1	62	6	1	4	5	11	3	-	9	59	43
Bluegill	1	3	-	-	1	-	6	-	-	1	-	8
Smallmouth bass	30	4	5	10	8	3	2	9	1	1	4	-
Largemouth bass	1	9	-	-	-	-	-	-	-	-	-	-
White crappie	-	2	-	-	-	-	2	-	-	-	1	9
Black crappie	2	2	-	-	-	-	1	-	-	-	2	8
Yellow perch	-	1	-	-	-	-	2	-	-	-	1	1
Walleye	9	2	1	3	6	6	-	-	2	-	10	-
No. of Specimens	84	100	20	34	37	30	51	23	37	28	89	77
No. of Species	10	13	6	8	8	5	13	7	10	6	13	10

* Clear to bottom at indicated depth.

Table 15 continued.

Zone	15B2	1688	4A1	16A2	15A2	15A1	11B1	10B3	10B1	13A1	10A3	9B5	Total
Date	16 Nov	16 Nov	16 Nov	16 Nov	16 Nov	14 Nov	18 Nov	18 Nov	18 Nov	18 Nov	18 Nov	18 Nov	
Time	1742	1833	1926	2004	2038	2111	1734	1811	1845	1923	1956	2028	
Duration (min)	18	14	17	18	14	15	19	19	16	16	17	16	
Air Temp (C)	1.0	1.0	0.0	0.0	1.0	0.0	5.0	6.0	7.0	7.0	7.0	7.0	
Water Temp (C)	4.0	4.0	4.0	4.0	4.0	3.5	6.0	6.5	7.0	7.0	7.5	7.0	
Dissolved Oxygen (mg/l)	14.4	13.0	11.7	11.5	12.8	12.7	13.2	12.6	12.7	12.0	12.0	12.0	
pH	8.2	8.3	7.9	7.8	8.2	8.3	8.1	7.9	7.6	7.5	7.4	7.4	
Conductivity (micromhos/cm)	350	310	260	260	350	350	325	310	310	290	300	300	
Secchi Disc (cm)	152*	112*	76	81	112	107	107*	152	130	122	122	137	
Volts	190	195	200	195	195	190	200	200	205	210	205	205	
Amps	5.5	4.5	5.0	5.0	5.0	5.0	5.0	6.0	5.5	5.0	5.5	5.5	
Gizzard shad	-	-	2	-	-	-	-	-	-	1	-	-	6
Muskellunge	-	-	1	-	-	-	-	-	-	-	-	1	3
Common carp	-	-	-	-	-	-	-	-	-	-	-	-	13
Golden shiner	-	-	-	-	-	-	-	-	-	-	-	-	2
Quillback	-	-	-	-	-	-	-	-	-	-	-	-	61
White sucker	-	2	3	-	-	-	-	-	-	-	-	2	11
Northern hog sucker	-	-	-	-	-	-	-	-	-	-	-	-	1
Shorthead redhorse	-	-	-	-	-	-	-	-	-	-	1	-	4
Yellow bullhead	-	-	1	-	-	-	-	-	-	-	-	-	3
Channel catfish	-	-	-	-	-	-	-	-	-	-	-	-	5
Rock bass	15	22	-	6	12	1	-	2	3	3	2	1	126
Redbreast sunfish	1	14	-	1	4	4	2	3	6	13	-	1	103
Green sunfish	-	-	-	-	-	-	-	-	-	-	-	-	1
Pumpkinseed	4	1	7	1	1	-	5	4	11	1	1	-	240
Bluegill	1	-	-	-	-	-	3	-	-	-	-	-	25
Smallmouth bass	-	17	-	2	1	9	3	1	1	6	3	-	120
Largemouth bass	-	-	-	-	-	-	3	-	-	-	-	-	25
White crappie	-	-	-	-	-	-	6	-	2	-	-	-	21
Black crappie	-	-	-	-	-	-	2	-	-	-	-	-	11
Yellow perch	-	-	-	-	-	-	-	-	1	-	-	-	15
Walleye	1	-	2	2	3	-	-	1	-	-	-	1	54
No. of Specimens	22	56	16	12	21	14	24	11	23	26	7	5	850
No. of Species	5	5	6	5	5	3	7	5	5	7	5	6	21

Table 16

Creel survey data from the GR for each survey day in November 1982.

Day	3 Wed Fog, Partly Cloudy			6 Sat Partly Cloudy Windy, Clear Windy			18 Thu Fog, Partly Cloudy			21 Sun Fog, Partly Cloudy			
River Stage (m)	0.93			1.01			1.06			1.02			
Air Temperature (C)	18.0	24.0	NA	5.5	8.5	NA	5.0	9.5	NA	11.0	12.0	NA	
Water Temperature (C)	16.0	17.0	NA	11.0	11.0	NA	5.0	5.5	NA	8.0	8.5	NA	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)	b			b			b			b			
c) evening (1701-2100)	c			c			c			c			
Total Per Time Period:													TOTAL
Anglers	3	4	NO SURVEY	-	5	NO SURVEY	5	1	NO SURVEY	7	4	NO SURVEY	29
Fish Caught	7	21	NO SURVEY	-	7	NO SURVEY	1	4	NO SURVEY	5	9	NO SURVEY	54
Fish Kept	7	19	NO SURVEY	-	2	NO SURVEY	1	2	NO SURVEY	2	7	NO SURVEY	40
Hours Fished	3.50	8.00	NO SURVEY	-	11.50	NO SURVEY	4.50	3.00	NO SURVEY	5.50	10.25	NO SURVEY	46.25
Catch/Effort (h)	2.00	2.62	NO SURVEY	-	0.61	NO SURVEY	0.22	1.33	NO SURVEY	0.91	0.88	NO SURVEY	1.17
Day Totals:													
Anglers	7			5			6			11			
Fish Caught	28			7			5			14			
Fish Kept	26			2			3			9			
Hours Fished	11.50			11.50			7.50			15.75			
Catch/Effort (h)	2.43			0.61			0.67			0.89			
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Rock bass	2K	-	-	-	-	-	-	-	-	-	-	-	2K
Sunfishes (<i>Lepomis</i> spp.) ¹	1K	11K	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	3R	-	NO SURVEY	12K 3R
Smallmouth bass	-	2R	NO SURVEY	-	2K 5R	NO SURVEY	1K	2K 2R	NO SURVEY	2K	7K 2R	NO SURVEY	14K 11R
Crappies (<i>Pomoxis</i> spp.) ¹	4K	8K	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	12K -

¹ General Identification.
K Kept.
R Released.
NA Not Available.

Table 17

Creel survey data from the West Dam for each survey day in November 1982.

Day	3 Wed Fog, Partly Cloudy			6 Sat Partly Cloudy Windy, Clear Windy			18 Thu Fog, Overcast			21 Sun Fog, Partly Cloudy			
River Stage (m)	0.93			1.01			1.06			1.02			
Air Temperature (C)	17.0	23.5	NA	5.0	7.0	NA	5.0	9.5	NA	11.0	14.0	NA	
Water Temperature (C)	16.0	16.5	NA	8.0	9.0	NA	5.0	6.0	NA	8.0	9.5	NA	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)	b			b			b			b			
c) evening (1701-2100)	c			c			c			c			
Total Per Time Period:													TOTAL
Anglers	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-
Fish Caught	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-
Fish Kept	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-
Hours Fished	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-
Catch/Effort (h)	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	-
Day Totals:													
Anglers	-			-			-			-			
Fish Caught	-			-			-			-			
Fish Kept	-			-			-			-			
Hours Fished	-			-			-			-			
Catch/Effort (h)	-			-			-			-			
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
NA Not Available.													

Table 18

Creel survey data from the East Dam for each survey day in November 1982.

Day	3 Wed Fog, Partly Cloudy 0.93			6 Sat Partly Cloudy, Clear 1.01			18 Thu Overcast, Partly Cloudy 1.06			21 Sun Fog, Partly Cloudy 1.02			
River Stage (m)													
Air Temperature (C)	16.5	23.5	NA	5.5	8.0	NA	5.0	12.5	NA	11.0	15.0	NA	
Water Temperature (C)	14.0	16.0	NA	7.5	10.5	NA	6.0	7.0	NA	8.0	8.5	NA	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	
Total Per Time Period:													TOTAL
Anglers	-	-	NO SURVEY	-	4	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	4
Fish Caught	-	-	-	-	2	-	-	-	-	-	-	-	2
Fish Kept	-	-	-	-	-	-	-	-	-	-	-	-	-
Hours Fished	-	-	-	-	2.00	-	-	-	-	-	-	-	2.00
Catch/Effort (h)	-	-	NO SURVEY	-	1.00	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	1.00
Day Totals:													
Anglers	-	-	-	-	4	-	-	-	-	-	-	-	
Fish Caught	-	-	-	-	2	-	-	-	-	-	-	-	
Fish Kept	-	-	-	-	-	-	-	-	-	-	-	-	
Hours Fished	-	-	-	-	2.00	-	-	-	-	-	-	-	
Catch/Effort (h)	-	-	-	-	1.00	-	-	-	-	-	-	-	
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Sunfishes (<i>Lepomis</i> spp.) ¹	-	-	NO SURVEY	-	2R	NO SURVEY	-	-	NO SURVEY	-	-	NO SURVEY	2R

¹ General identification.

R Released.

NA Not Available.

Table 19

Creel survey data from the YHGS for each survey day in November 1982.

Day	3 Wed Fog, Partly Cloudy 0.93			6 Sat Clear, Partly Cloudy 1.01			18 Thu Overcast, Partly Cloudy 1.06			21 Sun Fog, Overcast, Partly Cloudy 1.02			
River Stage (m)													
Air Temperature (C)	19.0	23.5	21.5	9.5	8.5	5.5	8.5	10.5	11.5	10.5	14.5	14.0	
Water Temperature (C)	16.0	16.0	16.0	10.0	10.5	10.5	5.5	6.5	6.5	8.0	9.5	9.5	
Times:													
a) morning (0900-1300)	a			a			a			a			
b) afternoon (1301-1700)		b			b			b			b		
c) evening (1701-2100)			c			c			c			c	
Total Per Time Period:													TOTAL
Anglers	-	10	5	6	4	5	6	4	7	3	8	12	70
Fish Caught	-	45	10	4	7	1	1	-	-	5	3	18	94
Fish Kept	-	28	7	1	5	-	1	-	-	3	1	9	55
Hours Fished	-	14.50	4.75	1.75	2.67	5.09	5.50	9.50	9.00	3.50	7.50	25.5	89.26
Catch/Effort (h)	-	3.10	2.10	2.29	2.62	0.20	0.18	-	-	1.43	0.40	0.70	1.05
Day Totals:													
Anglers		15			15			17			23		
Fish Caught		55			12			1			26		
Fish Kept		35			6			1			13		
Hours Fished		19.25			9.51			24.00			36.50		
Catch/Effort (h)		2.86			1.26			0.04			0.71		
Species	a	b	c	a	b	c	a	b	c	a	b	c	Total
Rock bass	-	8K	4K	-	5K 1R	-	-	-	-	-	-	-	17K 1R
Sunfishes (<i>Lepomis</i> spp.) ¹	-	5R	-	-	-	-	-	-	-	-	-	-	5R
Smallmouth bass	-	20K 10R	3K 2R	1K 2R	1R	-	-	-	-	-	-	1K	25K 15R
Crappies (<i>Pomoxis</i> spp.) ¹	-	-	1R	-	-	-	-	-	-	-	-	-	1R
Walleye	-	2R	-	1R	-	1R	1K	-	-	3K 2R	1K 2R	8K 9R	13K 17R

¹ General identification.

K Kept.

R Released.

Table 20

Summary of selected physicochemical parameters taken on 1 and 15 November 1982 near the THNS. Values are expressed in mg/l except for water temperature (C), pH, and turbidity (NTU).

Location	Date	Water Temperature (C)	pH	Dissolved Oxygen	Turbidity (NTU)	Alkalinity as CaCO ₃	Sulfate	Total Dissolved Solids	Total Copper	Dissolved Copper	Total Zinc	Dissolved Zinc
TH-AQ1-1A1	1 Nov	13.0	7.8	9.5	2.9	72.6	106.0	281	0.020	0.002	0.013	0.004
TH-AQ1-1A2		12.5	8.3	11.9	2.9	91.0	51.4	189	0.016	0.002	0.009	0.003
TH-AQ1-11A1		13.0	8.1	11.0	2.7	81.1	79.0	262	0.014	0.002	0.008	0.004
TH-AQ1-11A2		13.0	8.2	10.8	2.7	78.6	86.8	257	0.011	0.002	0.016	0.013
TH-AQ1-9B1		13.0	8.4	12.4	2.5	80.6	78.6	239	0.011	0.002	0.008	0.004
TH-AQ1-1A1	15 Nov	6.0	7.1	10.5	19.0	56.0	36.6	163	0.010	0.003	0.014	0.011
TH-AQ1-1A2		6.0	7.2	10.2	32.5	54.0	22.6	155	0.008	0.003	0.024	0.012
TH-AQ1-11A1		6.0	7.1	10.4	27.5	56.0	30.9	167	0.008	0.003	0.021	0.011
TH-AQ1-11A2		6.0	7.2	10.4	33.0	55.5	31.3	168	0.010	0.003	0.024	0.010
TH-AQ1-9B1		6.0	7.1	10.5	29.0	55.0	31.7	164	0.006	0.003	0.017	0.009
					MEAN VALUES FOR NOVEMBER 1982							
TH-AQ1-1A1	Nov	9.5	-	10.0	11.0	64.3	71.3	222	0.015	0.002	0.014	0.008
TH-AQ1-1A2		9.2	-	11.0	17.7	72.5	37.0	172	0.012	0.002	0.016	0.008
TH-AQ1-11A1		9.5	-	10.7	15.1	68.6	55.0	204	0.011	0.002	0.014	0.008
TH-AQ1-11A2		9.5	-	10.6	17.8	67.0	59.0	212	0.010	0.002	0.020	0.012
TH-AQ1-9B1		9.5	-	11.4	15.8	67.8	55.2	202	0.008	0.002	0.012	0.006