A REPORT ON THE FISH POPULATIONS IN CONOWINGO POND RELATIVE TO THE NPDES PERMIT APPLICATION FOR THE PEACH BOTTOM ATOMIC POWER STATION, PENNSYLVANIA

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1.0 INTRODUCTION AND BACKGROUND

This report presents the results of aquatic sampling in October and November 1993 as support for the recent filing by Philadelphia Electric Company (PECO) to update their 316 (a) submission under the National Pollution Discharge Elimination System (NPDES), for the Peach Bottom Atomic Power Station (PBAPS), York County, Pennsylvania. Sampling occurred in Conowingo Pond, a mainstem impoundment on the Susquehanna River, near the PBAPS. Services were performed by personnel of RMC Environmental Services, Inc. (RMC) under contract to PECO. The objective of the studies was to determine the relative abundance and distribution of fishes in Conowingo Pond, particularly the thermal effluent, and compare those results with the historic record.

The vast amount of data gathered in Conowingo Pond during the PBAPS's pre- and post-operational phases enabled RMC to establish bench marks on relative abundance, species composition, and distribution of fishes to which future data could be compared. Accordingly, a study plan was submitted to the Pennsylvania Department of Environmental Resources (PADER) to update the fishery data, as all routine sampling was suspended in 1987. The study plan was revised and comments by PADER and the Pennsylvania Fish and Boat Commission (PFBC) were incorporated. The inclusion of electrofishing (a gear not frequently utilized during the pre- and post-operational phases) was suggested by the PFBC to determine usage of the heated discharge as refugia by fish, particularly game fishes during the colder months. All other proposed sampling techniques (seine, trawl, and trap net) utilized protocols previously established.

Sampling commenced on 5 October 1993 shortly after final approval of the study plan by PADER. During the initial seine, trawl, and trap net sampling episodes in early October, PBAPS Unit #3 was shutdown for its scheduled maintenance outage, and Unit #2 was temporarily out-of-service. Therefore, no thermal effluent was detected (Table 1.0-1). By late October Unit #2 was back on line. Electrofishing on 28 October revealed a detectable thermal effluent. All sampling in

November occurred with Unit #2 at 100%. Unit #3 did not return to service until 15 November. The trawl and electrofishing programs in November occurred after 15 November when Unit #3 was operating at 62 to 100%. The water temperature of the thermal effluent in November ranged from 4.0 to 20.7 F above the ambient temperature.

2.0 METHODS

Fishes were sampled by seine, trawl, and trap net at the same locations which were sampled during the pre- and post-operational periods (1966 - 1973 and 1974 - 1987, respectively). However, the 1993 fisheries sampling was concentrated near the PBAPS, in and outside the thermal effluent. Similarly, electrofishing occurred at sites near PBAPS that had been sampled from 1983 through 1986 (a post-operational period) for other studies. The description and location of all the seine, trawl, trap net, and electrofishing stations are presented in Tables 2.0-1 through 2.0-5 and Figures 2.0-1 through 2.0-5. A brief description of each gear type and the disposition of the catch are given below.

2.1 Seine

Seine surveys were conducted at seven shoreline stations once in October and November 1993 (Figure 2.0-1). Station 214 is located within the PBAPS thermal effluent. Data recorded at each station were weather, time (start and end), air and surface water temperatures, and estimated water depth. A 10 by 4 foot straight seine with 1/4 inch mesh was used. The seine was deployed and moved parallel to shore for a short distance, then moved into shore to trap fish. Since size and habitat of seine stations varied, effort was made to collect a representative qualitative sample based on complete coverage of all available habitats, rather than a specific number of hauls at each station.

All specimens collected at a station were preserved in 10% formalin except for large fish (> 100 mm fork length, FL) which were identified, measured, and released near the site of capture. In the laboratory, the fish were removed from formalin, rinsed twice in water, and

preserved in 40% isopropanol. All specimens in each collection were identified and measured to within a 5 mm FL interval.

2.2 Trawl

Trawl surveys were divided into zones and transects and sampled once in October and November 1993. Two zones (405 and 408) and three transects (2, 4, and 7) were sampled (Figures 2.0-2 and 2.0-3). Zone 405 is affected by the thermal effluent from PBAPS, while Zone 408 is a control. Each zone consisted of three stations with a nearshore and offshore component to each, while each transect was composed of an east shore, mid-pond, and west shore station. Transect Station 371 is influenced by PBAPS discharge. Data recorded during each survey were weather, time (start and end), Secchi disc transparency, air temperature, water temperature at the surface, 5 foot, 10 foot and bottom, and water depth. A 16 foot semi-balloon trawl with 1/4 inch mesh liner in the cod end was used to sample the zone and transect stations. The trawl was deployed off the stern of the boat and hauled for 10 minutes in an upstream direction. After 10 minutes the trawl was retrieved, the boat was returned to the center of the station, and catch was removed from the net and processed. All specimens in each collection were identified, measured to the nearest mm FL, and released.

2.3 Trap Net

Trap nets were set at four locations once in October and November 1993 (Figure 2.0-4). Station 110 is within the PBAPS thermal effluent. Data recorded at each station were weather, time (set and retrieve), Secchi disc transparency, air temperature, water temperature at the surface, 5 foot, 10 foot and bottom, and water depth. The trap net has a 3 by 6 foot trap with a 3 by 50 foot lead consisting of 1/2 inch square mesh. Trap nets were set with the lead perpendicular to the shoreline. After 24 hours the nets were retrieved, the catch removed and processed, and reset for a second 24 hour period. All specimens in each collection were identified, measured to the nearest mm FL, and released.

2.4 Electrofishing

Nighttime electrofishing surveys were conducted at four stations once in October and November 1993 (Figure 2.0-5). Stations 161 and 190 are influenced by the thermal discharge from PBAPS. The electrofishing system consisted of a Coffelt VVP-15 variable voltage pulsator, powered by a 3.5 kw generator, and mounted in a 18 foot aluminum boat equipped with flood lights. Fish were collected using pulsed DC current to minimize fish injury.

Data recorded for each station were weather, time (start and end), air and surface water temperatures, surface dissolved oxygen, voltage, and amperage. Sampling consisted of a 30-minute run and was typically completed in one-pass. The boat-mounted boom shocker was maneuvered slowly through the site, as close to shore as possible. Stunned fish were netted at the bow and placed in a boat mounted live well. Large stunned specimens of common carp and quillback were not netted, but were counted by the netting crew and recorded. At the end of 30 minutes, the boat was returned to the center of the station, and the catch processed. Each fish was identified to species, measured to the nearest mm FL, and released. If a collection contained more than 100 specimens of a single species, a subsample of 100 specimens was selected for individual processing, and the remainder counted.

2.5 Data Analysis

The data from each of the gear types were compiled and expressed as catch per effort by station and month. The monthly catch per effort was compared to the historic record to determine if any changes have occurred. Seine catches were expressed as number of species per collection, while trap net catches were presented as number of fish caught per 24 hours. The trawl data were analyzed to estimate the relative abundance as the number of each species collected per 10 minute haul. Electrofishing data were expressed as the number of fish per 30 minutes. The catch per effort was calculated by dividing the total number of fish collected in a month or at a station by the number of collections, 10 minute hauls, hours, or minutes sampled during that month or at that

station.

3.0 RESULTS

3.1 Seine Catches

A combined total of 19 species was collected in October and November 1993 (Tables 3.1-1 and 3.1-2). The number of species varied between station, ranging from 4 at Station 203 to 12 at 212. The common fishes in order of decreasing abundance were the spotfin shiner, bluntnose minnow, bluegill, and spottail shiner. Abundance of each species varied between stations and/or months. The spotfin shiner was common at all stations and accounted for over 56% of the total catch at all stations combined. It was most abundant at Stations 212 and 202. The bluntnose minnow comprised over 30% of the total catch; it was common at Stations 208, 212, and 202 and in November. The bluegill was common at Stations 210, 214 (plume), and 209. The spottail shiner was abundant at Stations 214 and 203.

The largest total catch occurred at Station 212 (Fishing Creek, 167.00 fish per collection) and was followed by Station 202 (117.50) (Table 3.1-1). The smallest catch was taken at Station 209 (11.00). Catches at the other stations ranged from 32.00 to 60.50 fish per collection.

The monthly catch per effort of the species taken by seine was compared with the historic data to determine if any changes occurred in their abundance since the program was terminated in 1979 (Table 3.1-2). The overall monthly catches and that of the common fishes were within the ranges previously observed.

3.2 Trawl Catches - Transects

A total of 16 species was collected at transect stations in October and November 1993 (Tables 3.2-1 and 3.2-2). Species number ranged from 0 at Station 371 to 11 at 341. Obviously, Station 371 had the lowest catch (0.00 fish per haul); the highest catch (186.00 fish per haul) occurred at Station 372 and was composed of three species with gizzard shad making up nearly 96% of the catch. Catches at the other stations ranged from 7.50 fish per haul at Station 322 to 121.50 at

Station 373.

The monthly number of species captured was identical (12) (Table 3.2-2). Most fish were taken in November (83.22 per haul) when gizzard shad comprised over 84% of the catch. The variations in catch with respect to month and station were primarily due to differences in the abundance of gizzard shad. In addition, common carp, channel catfish, bluegill, white crappie, and tessellated darter formed important components of the catch during the period.

Monthly catch per effort comparisons between 1993 and historic data are presented in Table 3.2-2. Large monthly fluctuations occurred in 1993 for gizzard shad, channel catfish, bluegill, and tessellated darter. The remaining species were uniformly low in numbers and within previously established ranges. Gizzard shad and tessellated darter catches in 1993 were higher than in other years for October and/or November. Though the monthly average catch per effort values were within the historic range for October, November's value was higher than historic values due primarily to gizzard shad abundance.

3.3 Trawl Catches - Zones

The total number of species taken in Trawl Zones 405 and 408 in October and November was 12 and 13, respectively (Tables 3.3-1 through 3.3-4). Number of species fluctuated between stations; the highest number (10) occurred at Station 482, while 4 were collected at Station 456. Total catch was highest in Zone 408 (197.75 fish per haul). In Zone 405 the total catch was 43.58 fish per haul. This large difference between zones was due to higher abundance of gizzard shad in Zone 408, particularly in November.

The gizzard shad was the most common species in both zones, comprising nearly 92% of the catch in Zone 408 and over 68% in Zone 405 (Tables 3.3-1 and 3.3-2). Bluegill and tessellated darter were the second most common species in Zones 408 and 405, respectively. White crappie and tessellated darter were relatively common in Zone 408, as were channel catfish, common carp, and bluegill in Zone 405. The catch per zone for the remaining species was less than one fish per

haul.

Monthly catch per effort comparisons of species taken in Zones 405 and 408 in 1993 with historical data (1966 through 1987) are presented in Tables 3.3-3 and 3.3-4. The overall catches of most species were within their historic range. However, substantial increases were noted for gizzard shad in October and/or November in Zones 408 and 405. Also, the catch of tessellated darter and common carp was higher than historically observed in Zone 405. The overall monthly average catch per effort values were within the historic variation for Zone 405. Zone 408 exceeded the historic range in November due to the large abundance of gizzard shad.

3.4 Trap Net Catches

A total of 10 species was caught during the October and November 1993 sampling (Tables 3.4-1 and 3.4-2). The number of species ranged from 10 in October to 7 in November and from 4 to 6 at all the stations. The common fishes in order of numerical abundance were the bluegill, white crappie, and rock bass. All other species comprised less than 1.00 fish per 24 hours. The white crappie ranked first in abundance in October, while bluegill ranked first in November. The white crappie was most abundant at Station 104 and least abundant at Station 110. Bluegill were common at Station 108, while rock bass were taken exclusively at Station 104. The catch per effort of the other fishes varied between stations and months.

Comparison of the monthly catch per effort data for 1993 and the 1966 through 1987 period was made to determine if changes in species abundance occurred (Table 3.4-2). The catches of the common fishes were within the range of variation observed in previous years. A comparison of the monthly total catch during the periods also showed that the catches of all fishes were within the range of previously observed variation for November, while the October value was slightly below its historic range.

3.5 Electrofishing Catches

The results of electrofishing in October and November 1993 are presented in Tables 3.5-1 and

3.5-2. A combined total of 22 species was collected. The number of species collected at the four stations was nearly identical ranging from 17 to 18. The common fishes in order of numerical abundance were gizzard shad, largemouth bass, bluegill, green sunfish, smallmouth bass, comely shiner, and white crappie. All other species comprised less than 5.00 fish per 30 minutes. The gizzard shad ranked first in abundance in November, while largemouth bass ranked first in October. The largemouth bass was most abundant at Station 161 (PBAPS thermal effluent) and least abundant at Station 165 (unaffected by the thermal effluent). Gizzard shad were common at all stations. Bluegill, green sunfish, and comely shiner were common at Station 190. Smallmouth bass and white crappie were most common at Stations 161 and 165, respectively.

The abundance of species varied between months (Table 3.5-2). The gizzard shad, comely shiner, and white crappie were more abundant in November than in October. Channel catfish and smallmouth bass were more common in October than in November. The abundance of green sunfish, bluegill, and largemouth bass showed little difference between months.

Monthly catch per effort comparisons of species collected in 1993 with the historic record (1983 through 1986) are presented in Table 3.5-2. No data were available from the historic record for November, and only a few samples were taken in October. Thus, monthly comparisons were limited to October. The relative abundance of white crappie was slightly lower than previously observed in October. However, the abundance of largemouth bass was substantially higher than the historic record. A comparison of the overall October catches showed the value for 1993 was just below the range of previously observed variation.

4.0 CONCLUSIONS

No obvious changes in the species abundance, except for gizzard shad in recent years, were observed between 1993 and the historic record. Changes in the abundance of a particular species has historically been associated with year class strength. Strong year classes are associated with increased abundance of a species.

Except for electrofishing, game fishes (i.e. smallmouth bass, largemouth bass, and walleye) comprised $<1.0\%$ of the total program catches. Game fishes were an integral component of the electrofishing catch. Nearly 94% of the game fish were collected from stations located in the thermal effluent of PBAPS. The thermal effluent during the electrofishing events ranged from 3.7 to 20.7 F above the ambient temperature. Thus, it appears that the increased catch of game fish in the thermal effluent may be related to their attraction to the warmer discharge water.

TABLES

TABLE 1.0-1

SURFACE WATER TEMPERATURE AT LOCATIONS INSIDE AND OUTSIDE THE INFLUENCE OF THE PBAPS THERMAL EFFLUENT, OCTOBER AND NOVEMBER 1993.

PROGRAM/ STATION	OCT AMBIENT	OCT PLUME	NOV AMBIENT	NOV PLUME
SEINE				
202	61.7		50.9	
203	64.4		50.9	
208	63.5		50.0	
209	60.8		50.0	
210	64.4		52.7	
212	54.5		45.4	
214		62.6		58.1
TRAWL TRANSECT				
321	61.0		50.2	
322	61.0		44.6	
323	61.2		44.6	
341	62.1		47.3	
342	63.2		47.0	
343	64.1		44.6	
371		61.9		59.0
372	61.4		44.6	
373	61.4		44.6	
TRAP NET				
104	60.6		49.3	
107	62.6		52.9	
108	64.8		54.4	
110		61.3		57.8

TABLE 1.0-1

CONTINUED.

PROGRAM/ STATION	OCT AMBIENT	OCT PLUME	NOV AMBIENT	NOV PLUME
TRAWL ZONE				
451		62.6		58.1
452		61.7		51.8
453	61.7		48.2	
454	62.6		50.0	
455	62.6		50.0	
456	62.6		47.3	
481	60.8		47.3	
482	61.7		47.3	
483	60.8		47.3	
484	60.8		46.4	
485	60.8		47.3	
486	60.8		47.3	
ELECTROFISHING				
161		65.5		63.5
164	56.3		42.8	
165	56.3		42.8	
190		60.0		46.8

TABLE 2.0-1

LOCATION OF SEINE STATIONS SAMPLED IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

Station	Description
202	Southeast shore of Sicily Island
203	West shore of Big Chestnut Island
208	Peach Bottom Peach
209	Broad Creek at the boat launch
210	Conowingo Creek at the boat launch
212	Fishing Creek at first road bridge upstream from mouth
214	Beach at mouth of Burkins Run

TABLE 2.0-2

LOCATION OF TRAWL TRANSECT STATIONS SAMPLED IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

Transect	Location
Transect 2	
321	Off Peach Bottom Atomic Power Station Unit 2
322	Mid-pond between Mt. Johnson Island and PBAPS
323	Below Mt. Johnson Island
Transect 4	
341	Broad Creek
342	Mid-pond off Broad Creek
343	Wildcat Tunnel
Transect 7	
371	Burkins Run (Stonewall Point)
372	Mid-pond between Burkins Run and I. A. Field Station
373	Ichthyological Associates Dock

TABLE 2.0-3

LOCATION OF STATIONS IN TRAWL ZONE 405 AND ZONE 408 SAMPLED IN CONOWINGO POND, OCTOBER - NOVEMBER 1993. TRAWLS MADE AT NEAR-SHORE STATIONS ARE INDICATED BY ODD NUMBERS AND OFF-SHORE STATIONS BY EVEN NUMBERS.

Station	Location
	Zone 405
451 452	From a point off Stonewall Point to a point at the terminus of the Peach Bottom Atomic Power Station Discharge Canal (as of 1970 construction). Sampling is done on river side of canal and not in the canal.
453 454	From a point approximately 30 yards upriver from the terminus of the Peach Bottom Atomic Power Station Canal (as of 1970 construction) to a point off Peach Bottom Atomic Power Station Unit 1
455 456	From a point off Peach Bottom Atomic Power Station Unit 1 to a point just above Peach Bottom Atomic Power Station Units 2 and 3
	Zone 408
481 482	From a point approximately 300 yards below Peach Bottom Beach to a point off Peach Bottom Beach
483 484	From a point off Peach Bottom Beach to a point off the Ichthyological Associates Dock
485 486	From a point off Ichthyological Associates Dock to a point off the mouth of Peters Creek

TABLE 2.0-4

LOCATION OF TRAP NET STATIONS SAMPLED IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

Station	Description
104	100 yards directly off-shore from Peach Bottom Atomic Power Station Unit 1.
107	At the mouth of Broad Creek.
108	50 yards above the mouth of Conowingo Creek.
110	Off Burkins Run (Stonewall Point).

TABLE 2.[illegible]

LOCATION OF ELECTROFISHING STATIONS SAMPLED NEAR PBAPS IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

Station	Description
161	PBAPS discharge structure to approximately 500 yd downstream
164	Southwest shoreline of Mt. Johnson Island
165	East shoreline, above Peters Creek
190	Mouth of Michaels Run to 500 yd downstream

TABLE 3.1-1

CATCH PER EFFORT (NO./COLLECTION) FOR FISHES COLLECTED BY A 10 X 4 FOOT SEINE AT STATIONS IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

STATION	202	203	208	209	210	212	214*	MEAN
NO. COLLECTIONS	2	2	2	2	2	2	2	14
NO. SPECIES	6	4	7	5	7	12	9	19
GIZZARD SHAD	-	-	0.50	-	1.00	-	2.50	0.57
COMMON CARP	-	0.50	-	-	-	-	1.00	0.21
GOLDEN SHINER	-	-	-	-	-	0.50	-	0.07
COMELY SHINER	-	-	0.50	-	-	-	4.00	0.64
COMMON SHINER	-	-	-	-	-	1.50	-	0.21
SPOTTAIL SHINER	3.50	4.00	0.50	0.50	0.50	0.50	4.50	2.00
SWALLOWTAIL SHINER	-	-	-	-	-	1.00	-	0.14
SPOTFIN SHINER	70.50	37.50	4.50	4.00	44.00	114.00	1.50	39.43
MIMIC SHINER	6.00	-	-	-	-	-	-	0.86
BLUNTNOSE MINNOW	36.50	9.50	45.50	1.00	5.00	42.50	9.50	21.36
NORTHERN HOG SUCKER	-	-	-	-	0.50	-	-	0.07
GREEN SUNFISH	-	-	-	-	-	0.50	1.50	0.28
PUMPKINSEED	-	-	-	-	3.50	1.00	1.50	0.86
BLUEGILL	-	-	0.50	4.50	6.00	1.50	6.00	2.64
SMALLMOUTH BASS	0.50	-	-	-	-	-	-	0.07
LARGEMOUTH BASS	0.50	-	0.50	1.00	-	-	-	0.28
TESSELLATED DARTER	-	-	-	-	-	1.50	-	0.21
BANDED DARTER	-	-	-	-	-	1.00	-	0.14
LOGPERCH	-	-	-	-	-	1.50	-	0.21
TOTAL	117.50	51.50	52.50	11.00	60.50	167.00	32.00	70.28

* LOCATED WITHIN THE INFLUENCE OF THE PBAPS THERMAL EFFLUENT.

TABLE 3.1-2

MONTHLY CATCH PER EFFORT (NO./COLLECTION) FOR FISHES COLLECTED BY A 10 X 4 FOOT SEINE AT STATIONS IN CONOWINGO POND, 1993 COMPARED TO HISTORIC DATA (1966 - 1979).

MONTH	OCT 1993	NOV 1993	OCT 1966-1979 (MIN)	OCT 1966-1979 (MAX)	NOV 1966-1979 (MIN)	NOV 1966-1979 (MAX)
NO. COLLECTIONS	7	7	213	213	195	195
NO. SPECIES	14	17	9	21	8	21
GIZZARD SHAD	0.57	0.57	1.00	15.00	1.00	3.00
COMMON CARP	0.43	-	0.04	1.00	1.00	1.00
GOLDEN SHINER	-	0.14	0.04	1.17	0.08	1.00
COMELY SHINER	1.28	-	0.11	7.20	0.12	6.67
COMMON SHINER	0.14	0.28	0.10	1.75	0.14	1.00
SPOTTAIL SHINER	1.71	2.28	0.39	20.45	0.06	10.00
SWALLOWTAIL SHINER	-	0.26	0.11	3.25	0.06	8.50
SPOTFIN SHINER	38.00	40.86	27.42	284.43	19.44	271.86
MIMIC SHINER	0.28	1.43	-	-	-	-
BLUNTNOSE MINNOW	11.28	31.43	0.36	14.33	1.00	70.50
NORTHERN HOG SUCKER	-	0.14	1.00	1.00	3.00	3.00
GREEN SUNFISH	0.43	0.14	0.12	0.12	1.50	1.50
PUMPKINSEED	0.71	1.00	0.44	3.50	0.06	9.00
BLUEGILL	2.00	3.28	0.72	35.14	1.32	20.00
SMALLMOUTH BASS	-	0.14	0.04	3.75	0.03	1.00
REDEMOUTH BASS	0.28	0.28	0.06	4.00	0.03	2.50
TESSELLATED DARTER	0.14	0.28	0.09	5.00	0.11	4.00
BANDED DARTER	-	0.28	0.09	1.00	1.00	3.00
LOGPERCH	0.28	0.14	0.62	0.62	1.00	1.00
TOTAL	57.57	83.00	25.86	296.43	29.64	282.14

TABLE 3.2-1

CATCH PER EFFORT (NO./10 MIN HAUL) FOR FISHES COLLECTED BY A 16 FOOT SEMI-BALLOON TRAWL IN TRANSECTS 2, 4, AND 7 IN CONOWINGO POND, OCT[illegible]NOVEMBER 1993.

STATION	321	322	323		342	343	371*	372	373	MEAN
NO. COLLECTIONS	2	2	2	2	2	2	2	2	2	18
NO. SPECIES	6	3	8	11	6	7	0	3	6	16
GIZZARD SHAD	2.50	1.50	14.50	2.00	3.50	-	-	178.00	117.00	35.44
COMMON CARP	1.00	0.50	-	2.00	3.50	2.00	-	-	-	1.00
SPOTTAIL SHINER	-	-	1.00	1.60	-	1.00	-	-	0.50	0.39
SWALLOWTAIL SHINER	-	-	0.50	0.50	1.00	-	-	-	-	0.22
BLUNTNOSE MINNOW	0.50	-	-	-	-	1.00	-	-	0.50	0.22
QUILLBACK	-	-	-	0.50	-	-	-	-	-	0.06
WHITE CATFISH	-	-	-	0.50	-	-	-	-	-	0.06
BROWN BULLHEAD	-	-	-	-	0.50	-	-	-	-	0.06
CHANNEL CATFISH	23.50	-	1.50	3.00	48.00	-	-	0.50	-	8.50
REDBREAST SUNFISH	0.50	-	-	-	-	-	-	-	-	0.06
PUMPKINSEED	-	-	-	-	-	4.00	-	-	-	0.44
BLUEGILL	-	-	1.50	2.00	-	38.50	-	-	1.00	4.78
SMALLMOUTH BASS	-	-	0.50	-	-	-	-	-	-	0.06
WHITE CRAPPIE	-	-	0.50	2.50	-	7.50	-	-	0.50	1.22
TESSELLATED DARTER	14.00	5.50	3.50	1.50	3.50	2.50	-	7.50	2.00	4.44
YELLOW PERCH	-	-	-	0.50	-	-	-	-	-	0.06
TOTAL	**42.00**	**7.50**	**23.50**	**16.00**	**60.00**	**56.50**	**0.00**	**186.00**	**121.50**	**57.00**

* LOCATED WITHIN THE INFLUENCE OF THE PBAPS THERMAL EFFLUENT.

TABLE 3.2-2

MONTHLY CATCH PER EFFORT (NO./10 MIN HAUL) FOR FISHES COLLECTED BY A 16 FOOT SEMI-BALLOON IN TRANSECTS 2, 4, AND 7 IN CONOWINGO POND, 1993 COMPARED TO HISTORIC DATA (1967 - 1979).

MONTH	OCT 1993	NOV 1993	OCT 1967-1979 (MIN)	OCT 1967-1979 (MAX)	NOV 1967-1979 (MIN)	NOV 1967-1979 (MAX)
NO. COLLECTIONS	9	9	271	271	226	226
NO. SPECIES	12	12	6	18	6	20
GIZZARD SHAD	0.89	70.00	0.08	1.85	0.09	2.27
COMMON CARP	1.44	0.56	0.08	1.77	0.09	0.82
SPOTTAIL SHINER	0.22	0.56	0.08	10.54	0.02	6.85
SWALLOWTAIL SHINER	0.44	-	0.07	0.07	-	-
BLUNTNOSE MINNOW	0.22	0.22	0.08	0.08	0.09	0.09
QUILLBACK	-	0.11	0.08	0.08	0.09	0.09
WHITE CATFISH	-	0.11	0.08	0.23	0.07	0.09
BROWN BULLHEAD	0.11	-	0.02	0.54	0.07	0.64
CHANNEL CATFISH	14.56	2.44	0.62	87.85	0.67	88.31
REDBREAST SUNFISH	-	0.11	-	-	-	-
PUMPKINSEED	0.89	-	0.15	5.69	0.14	1.09
BLUEGILL	8.56	1.00	0.08	35.54	0.09	32.00
SMALLMOUTH BASS	0.11	-	0.08	0.23	0.69	0.09
WHITE CRAPPIE	0.67	1.78	0.08	66.46	0.09	182.08
TESSELLATED DARTER	2.67	6.22	0.08	3.78	0.18	4.00
YELLOW PERCH	-	0.11	0.15	0.69	0.09	0.09
TOTAL	30.78	83.22	1.28	87.85	3.56	66.06

TABLE 3.3-1

CATCH PER EFFORT (NO./10 MIN HAUL) FOR FISHES COLLECTED BY A 16 FOOT SEMI-BALLOON TRAWL IN TRAWL ZONE 405 IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

STATION	451*	452*	453	454	455	456	MEAN
NO. COLLECTIONS	2	2	2	2	2	2	12
NO. SPECIES	5	5	8	5	5	4	12
GIZZARD SHAD	-	1.00	51.00	124.00	-	3.50	29.92
COMMON CARP	0.50	-	0.50	4.50	-	2.00	1.25
SPOTTAIL SHINER	-	0.50	-	-	-	-	0.08
SWALLOWTAIL SHINER	2.00	-	-	-	0.	-	0.42
BLUNTNOSE MINNOW	1.00	-	0.50	-	-	-	0.25
CHANNEL CATFISH	-	10.00	7.00	2.00	4.00	-	3.83
GREEN SUNFISH	-	-	0.50	-	-	-	0.08
PUMPKINSEED	-	-	1.50	-	-	0.50	0.33
BLUEGILL	-	3.50	1.00	0.50	1.00	-	1.00
SMALLMOUTH BASS	-	-	-	-	0.50	-	0.08
WHITE CRAPPIE	0.50	-	-	-	-	-	0.08
TESSELLATED DARTER	7.50	6.50	4.50	11.00	1.00	7.00	6.25
TOTAL	**11.50**	**21.50**	**66.50**	**142.00**	**7.00**	**13.00**	**43.58**

* LOCATED WITHIN THE INFLUENCE OF THE PBAPS THERMAL EFFLUENT.

TABLE 3.3-2

CATCH PER EFFORT (NO./10 MIN HAUL) FOR FISHES COLLECTED BY A 16 FOOT SEMI-BALLOON TRAWL IN TRAWL ZONE 408 IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

STATION	481	482	483	484	485	486	MEAN
NO. COLLECTIONS	2	2	2	2	2	2	12
NO. SPECIES	8	10	8	6	7	9	13
GIZZARD SHAD	6.50	0.50	219.00	4.00	811.00	48.00	181.50
COMMON CARP	-	1.00	0.50	-	-	0.50	0.33
GOLDEN SHINER	0.50	-	-	-	-	-	0.08
SPOTTAIL SHINER	-	0.50	-	-	0.50	-	0.17
SWALLOWTAIL SHINER	0.50	0.50	0.50	1.50	1.50	0.50	0.83
BLUNTNOSE MINNOW	0.50	1.00	0.50	0.50	0.50	1.50	0.75
WHITE SUCKER	-	-	-	-	-	0.50	0.08
CHANNEL CATFISH	-	-	-	-	-	0.50	0.08
PUMPKINSEED	0.50	2.00	0.50	-	-	-	0.50
BLUEGILL	19.50	23.00	5.50	7.50	-	6.50	10.33
LARGEMOUTH BASS	0.50	0.50	-	-	1.00	-	0.33
WHITE CRAPPIE	2.00	3.50	1.50	1.00	0.50	2.00	1.75
TESSELLATED DARTER	-	1.00	1.00	2.00	1.50	0.50	1.00
TOTAL	**30.50**	**33.50**	**229.00**	**16.50**	**816.50**	**60.50**	**197.75**

TABLE 3.3-3

MONTHLY CATCH PER EFFORT (NO./10 MIN HAUL) FOR FISHES COLLECTED BY A 16 FOOT SEMI-BALLOON IN TRAWL ZONE 405 IN CONOWINGO POND, 1993 COMPARED TO HISTORIC DATA (1966 - 1987).

MONTH	OCT 1993	NOV 1993	OCT 1966-1987 (MIN)	OCT 1966-1987 (MAX)	NOV 1966-1987 (MIN)	NOV 1966-1987 (MAX)
NO. COLLECTIONS	6	6	311	311	242	242
NO. SPECIES	11	7	6	20	7	17
GIZZARD SHAD	0.33	59.50	0.20	23.74	0.04	0.43
COMMON CARP	2.17	0.33	0.17	1.45	0.05	0.48
SPOTTAIL SHINER	-	0.17	0.06	19.00	0.04	5.13
SWALLOWTAIL SHINER	0.83	-	-	-	-	-
BLUNTNOSE MINNOW	0.33	0.17	0.03	0.20	0.05	0.05
CHANNEL CATFISH	7.33	0.33	4.49	933.80	0.29	46.72
GREEN SUNFISH	0.17	-	-	-	-	-
PUMPKINSEED	0.50	0.17	0.11	6.95	0.05	1.84
BLUEGILL	2.00	-	0.03	17.75	0.05	7.76
SMALLMOUTH BASS	0.17	-	0.03	0.04	0.05	0.05
WHITE CRAPPIE	0.17	-	0.09	418.40	0.05	156.50
TESSELLATED DARTER	6.50	6.00	0.60	4.43	0.04	5.00
TOTAL	20.50	66.67	2.00	1019.80	1.42	167.50

TABLE 3.3-4

MONTHLY CATCH PER EFFORT (NO./10 MIN HAUL) FOR FISHES COLLECTED BY A 16 FOOT SEMI-BALLOON IN TRAWL ZONE 408 IN CONOWINGO POND, 1993 COMPARED TO HISTORIC DATA (1966 - 1987).

MONTH	OCT 1993	NOV 1993	OCT 1966-1987 (MIN)	OCT 1966-1987 (MAX)	NOV 1966-1987 (MIN)	NOV 1966-1987 (MAX)
NO. COLLECTIONS	6	6	315	315	231	231
NO. SPECIES	13	6	9	20	5	17
GIZZARD SHAD	75.67	287.33	0.03	23.91	0.14	13.62
COMMON CARP	0.67	-	0.08	0.50	0.19	0.43
GOLDEN SHINER	0.17	-	0.04	0.33	0.03	0.19
SPOTTAIL SHINER	0.17	0.17	1.00	7.33	0.38	19.00
SWALLOWTAIL SHINER	1.67	-	-	-	-	-
BLUNTNOSE MINNOW	1.50	-	0.43	0.74	0.10	0.48
WHITE SUCKER	0.17	-	0.03	0.67	0.04	0.19
CHANNEL CATFISH	0.17	-	2.31	44.97	0.50	59.50
PUMPKINSEED	0.83	0.17	0.83	12.12	0.17	2.37
BLUEGILL	19.33	1.33	0.29	22.54	0.17	13.33
LARGEMOUTH BASS	0.67	-	0.03	2.50	0.04	0.14
WHITE CRAPPIE	2.50	1.00	1.50	95.54	1.05	160.62
TESSELLATED DARTER	0.83	1.17	0.33	3.83	0.17	3.25
TOTAL	104.33	291.17	8.08	164.75	0.92	187.66

TABLE 3.4-1

CATCH PER EFFORT (NO./24 HOURS) FOR FISHES COLLECTED AT THE TRAP NET STATIONS IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

STATION	104	107	108	110*	MEAN
NO. COLLECTIONS	4	4	4	4	16
NO. SPECIES	6	4	6	4	10
NO. HOURS	98.75	95.50	96.25	94.25	384.75
NO. TRAP DAYS	4.11	3.98	4.01	3.93	16.03
COMMON CARP	-	-	0.25	0.51	0.19
GOLDEN SHINER	-	-	-	0.25	0.06
YELLOW BULLHEAD	0.73	-	-	-	0.19
BROWN BULLHEAD	-	0.25	1.00	-	0.31
CHANNEL CATFISH	-	0.25	0.50	-	0.19
ROCK BASS	8.76	-	-	-	2.24
PUMPKINSEED	1.46	-	0.25	-	0.44
BLUEGILL	3.89	2.01	9.23	-	3.80
LARGEMOUTH BASS	0.73	-	-	0.25	0.25
WHITE CRAPPIE	4.14	2.76	1.74	0.51	2.31
TOTAL	19.71	5.28	12.97	1.53	9.98

* LOCATED WITH THE INFLUENCE OF THE PBAPS THERMAL EFFLUENT.

TABLE 3.4-2

MONTHLY CATCH PER EFFORT (NO./24 HOURS) FOR FISHES COLLECTED AT THE TRAP NET STATIONS IN CONOWINGO POND, OCTOBER - NOVEMBER 1993 COMPARED TO HISTORIC DATA (1966 - 1987).

MONTH	OCT 1993	NOV 1993	OCT 1966-1987 (MIN)	OCT 1966-1987 (MAX)	NOV 1966-1987 (MIN)	NOV 1966-1987 (MAX)
NO. COLLECTIONS	8	8	381	381	315	315
NO. SPECIES	10	7	8	22	7	21
NO. HOURS	204.50	180.25	9467.50	9467.50	7543.75	7543.75
NO. TRAP DAYS	8.52	7.51	394.48	394.48	314.32	314.32
COMMON CARP	0.23	0.13	0.07	7.92	0.06	12.99
GOLDEN SHINER	0.12	-	0.02	3.80	0.02	1.12
YELLOW BULLHEAD	0.35	-	0.11	7.65	0.03	4.52
BROWN BULLHEAD	0.23	0.40	0.33	5.95	0.43	5.90
CHANNEL CATFISH	0.12	0.27	0.92	46.27	1.20	38.13
ROCK BASS	1.53	3.06	0.03	4.17	0.08	5.67
PUMPKINSEED	0.35	0.53	1.14	10.34	0.29	8.55
BLUEGILL	2.35	5.46	0.50	20.41	0.34	13.20
LARGEMOUTH BASS	0.47	-	0.02	1.54	0.02	1.16
WHITE CRAPPIE	2.58	2.00	2.38	114.21	3.51	393.04
TOTAL	8.33	11.85	11.23	143.11	11.52	418.81

TABLE 3.5-1

CATCH PER EFFORT (NO./30 MIN) FOR FISHES COLLECTED BY DC ELECTROFISHER AT STATIONS IN CONOWINGO POND, OCTOBER - NOVEMBER 1993.

STATION	161*	164	165	190*	MEAN
NO. COLLECTIONS	2	2	2	2	8
NO. SPECIES	17	17	18	18	22
GIZZARD SHAD	87.50	148.50	164.50	139.50	135.00
COMMON CARP	4.00	1.00	1.00	7.50	3.38
COMELY SHINER	1.00	10.50	0.50	19.00	7.75
SPOTTAIL SHINER	-	3.50	6.00	4.50	3.50
SPOTFIN SHINER	1.00	1.50	2.50	0.50	1.38
BLUNTNOSE MINNOW	-	2.50	5.50	2.00	2.50
WHITE SUCKER	-	-	-	0.50	0.12
NORTHERN HOG SUCKER	1.00	-	-	-	0.25
YELLOW BULLHEAD	0.50	-	0.50	1.50	0.62
CHANNEL CATFISH	3.50	2.50	2.00	5.00	3.25
ROCK BASS	-	0.50	0.50	0.50	0.38
REDBREAST SUNFISH	0.50	0.50	3.50	1.50	1.50
GREEN SUNFISH	17.00	3.50	27.50	69.50	29.25
PUMPKINSEED	1.50	2.00	4.00	2.50	2.50
BLUEGILL	52.50	10.00	64.50	110.50	60.88
SMALLMOUTH BASS	23.50	2.00	3.50	8.00	9.25
LARGEMOUTH BASS	366.00	5.50	3.50	9.50	96.12
WHITE CRAPPIE	1.00	2.00	10.50	8.00	5.38
BLACK CRAPPIE	-	-	0.50	-	0.25
YELLOW PERCH	0.50	-	-	-	0.12
LOGPERCH	0.50	0.50	4.00	0.50	1.38
WALLEYE	9.00	1.50	-	-	2.62
TOTAL	571.00	204.00	304.50	390.50	367.50

* LOCATED WITHIN THE INFLUENCE OF THE PBAPS THERMAL EFFLUENT.

TABLE 3.5-2

MONTHLY CATCH PER EFFORT (NO./30 MIN) FOR FISHES COLLECTED BY DC ELECTROFISHER AT STATIONS IN CONOWINGO POND, 1993 COMPARED TO HISTORIC DATA (1983 - 1986). NO ELECTROFISHING SAMPLES WERE COLLECTED IN NOVEMBER 1983 - 1986.

MONTH	OCT 1993	NOV 1993	OCT 1983-1986 (MIN)	OCT 1983-1986 (MAX)
NO. COLLECTIONS	4	4	17	17
NO. SPECIES	20	18	22	28
GIZZARD SHAD	[illegible].00	247.00	8.75	31.75
COMMON CARP	3.00	3.75	9.75	12.21
COMELY SHINER	5.25	10.25	1.50	7.00
SPOTTAIL SHINER	2.25	4.75	3.00	12.25
SPOTFIN SHINER	0.25	2.50	1.50	12.25
BLUNTNOSE MINNOW	1.50	3.50	1.50	5.00
WHITE SUCKER	0.25	-	2.00	6.50
NORTHERN HOG SUCKER	0.50	-	-	-
YELLOW BULLHEAD	1.25	-	1.25	2.75
CHANNEL CATFISH	6.25	0.25	46.50	72.25
ROCK BASS	0.50	0.25	4.16	6.75
REDBREAST SUNFISH	1.50	1.50	7.60	31.25
GREEN SUNFISH	28.25	30.50	20.50	74.00
PUMPKINSEED	2.75	2.25	12.90	40.50
BLUEGILL	61.75	60.00	25.00	136.25
SMALLMOUTH BASS	16.00	2.50	14.25	64.75
LARGEMOUTH BASS	98.75	93.50	1.30	23.50
WHITE CRAPPIE	1.25	9.50	2.00	9.00
BLACK CRAPPIE	-	0.50	1.00	7.50
YELLOW PERCH	-	0.25	1.00	1.00
LOGPERCH	2.75	-	1.00	5.00
WALLEYE	4.00	1.25	1.00	12.50
TOTAL	[illegible].00	474.00	261.29	508.75

FIGURES

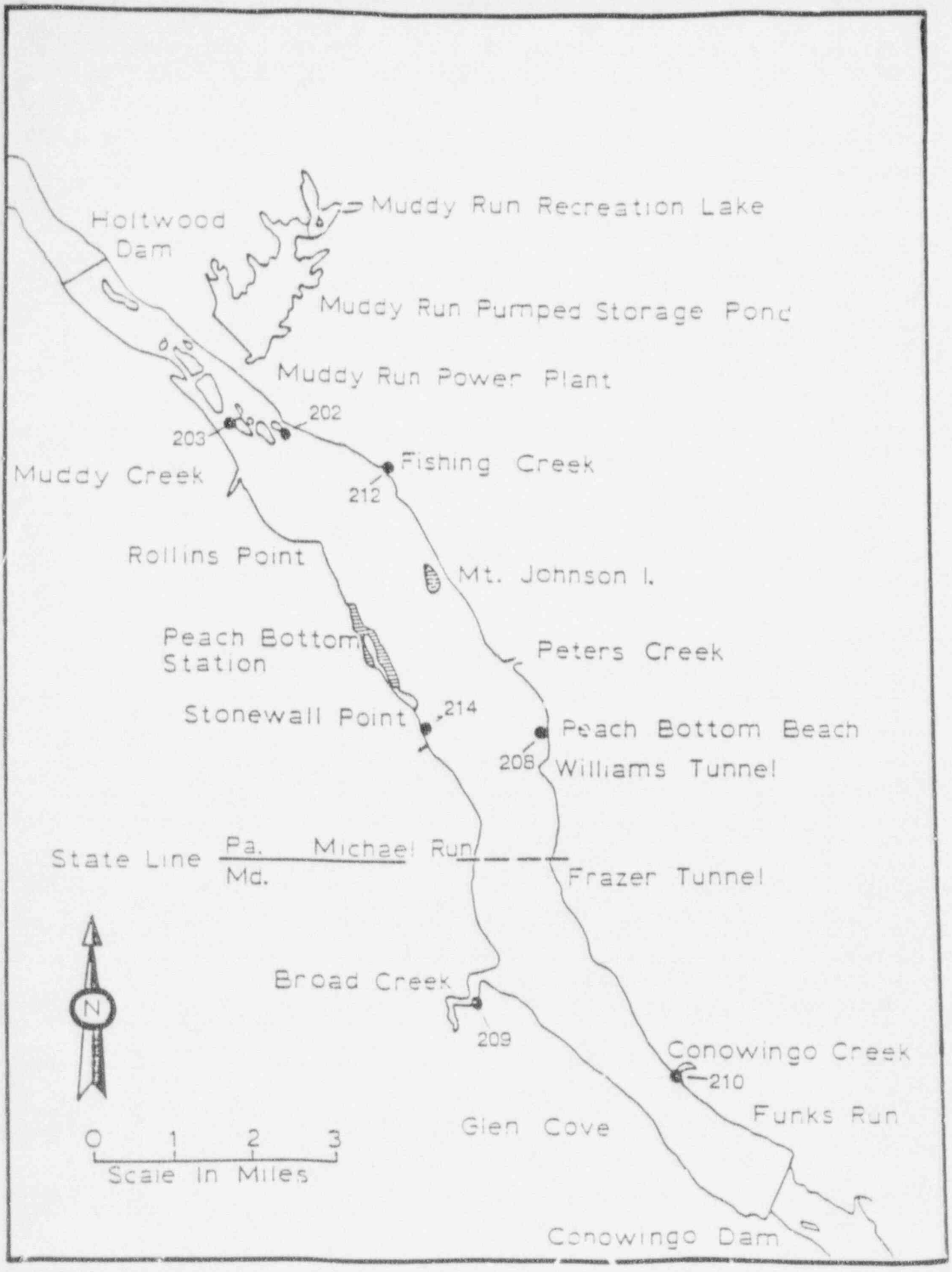

Figure 2.0-1 Map of Conowingo Pond showing distribution of seine stations.

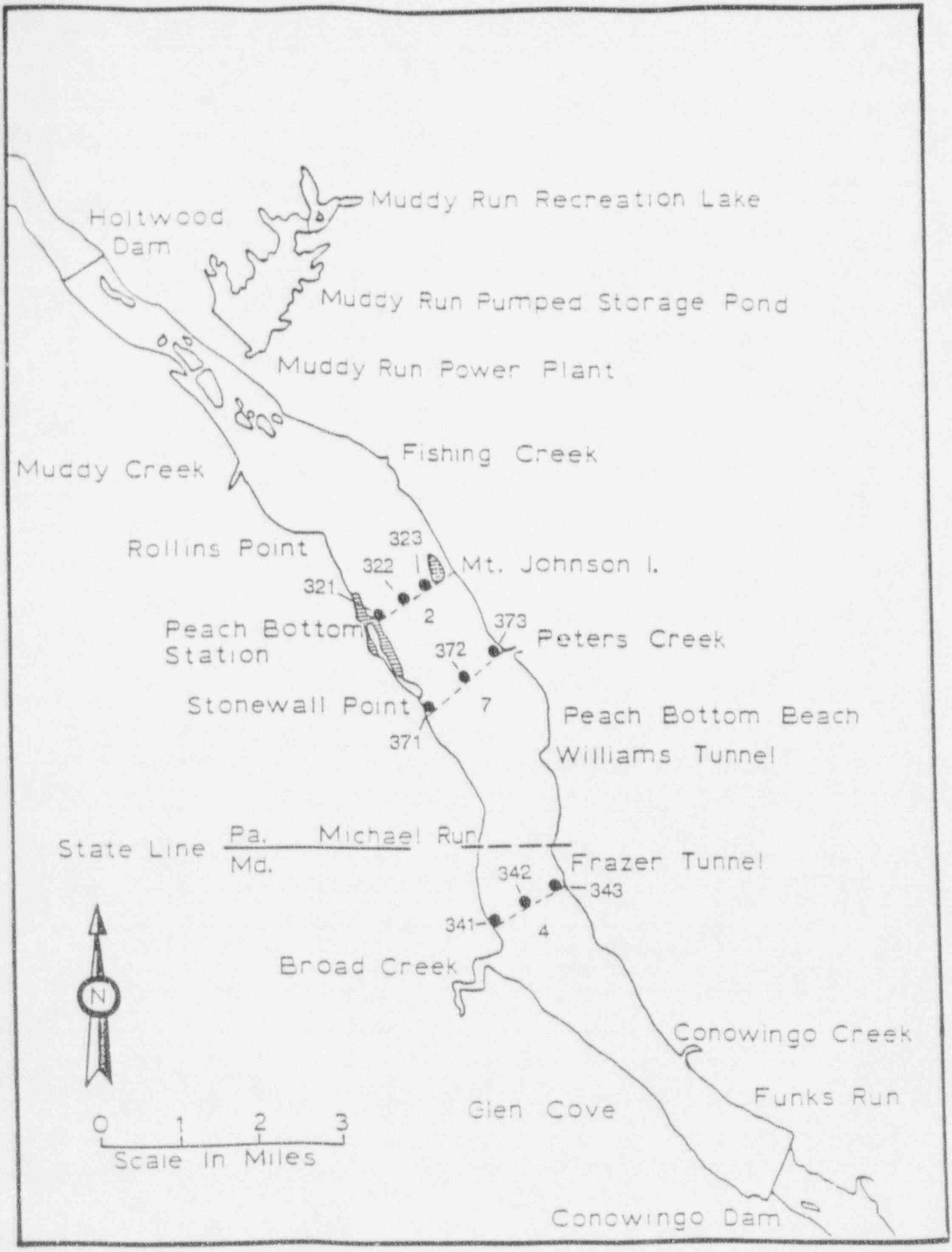

Figure 2.0-2 Map of Conowingo Pond showing distribution of stations in trawl transects 2, 4, and 7.

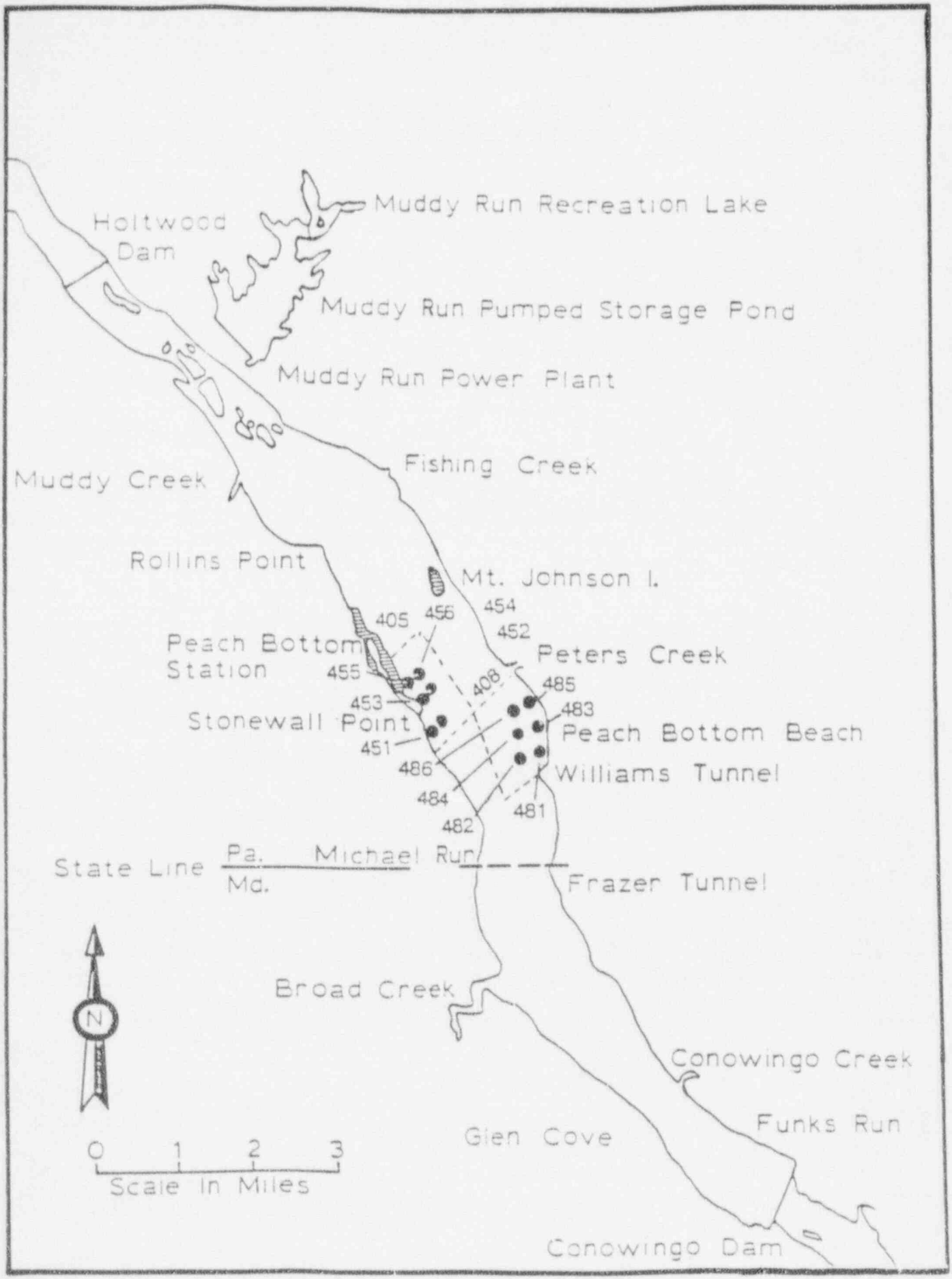

Figure 2.0-3 Map of Conowingo Pond showing distribution of stations in trawl zones 405 and 408.

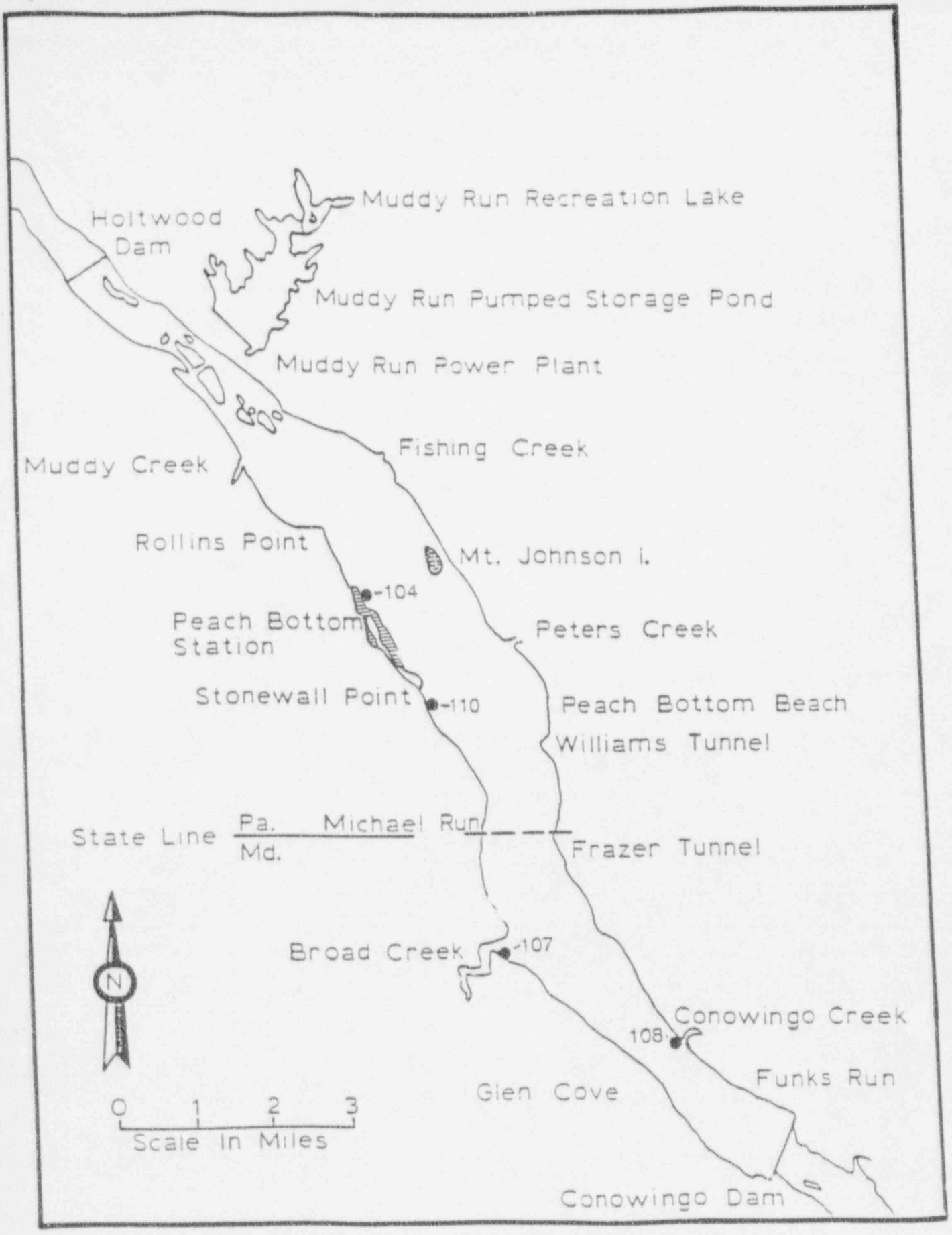

Figure 2.0-4 Map of Conowingo Pond showing distribution of trap net stations.

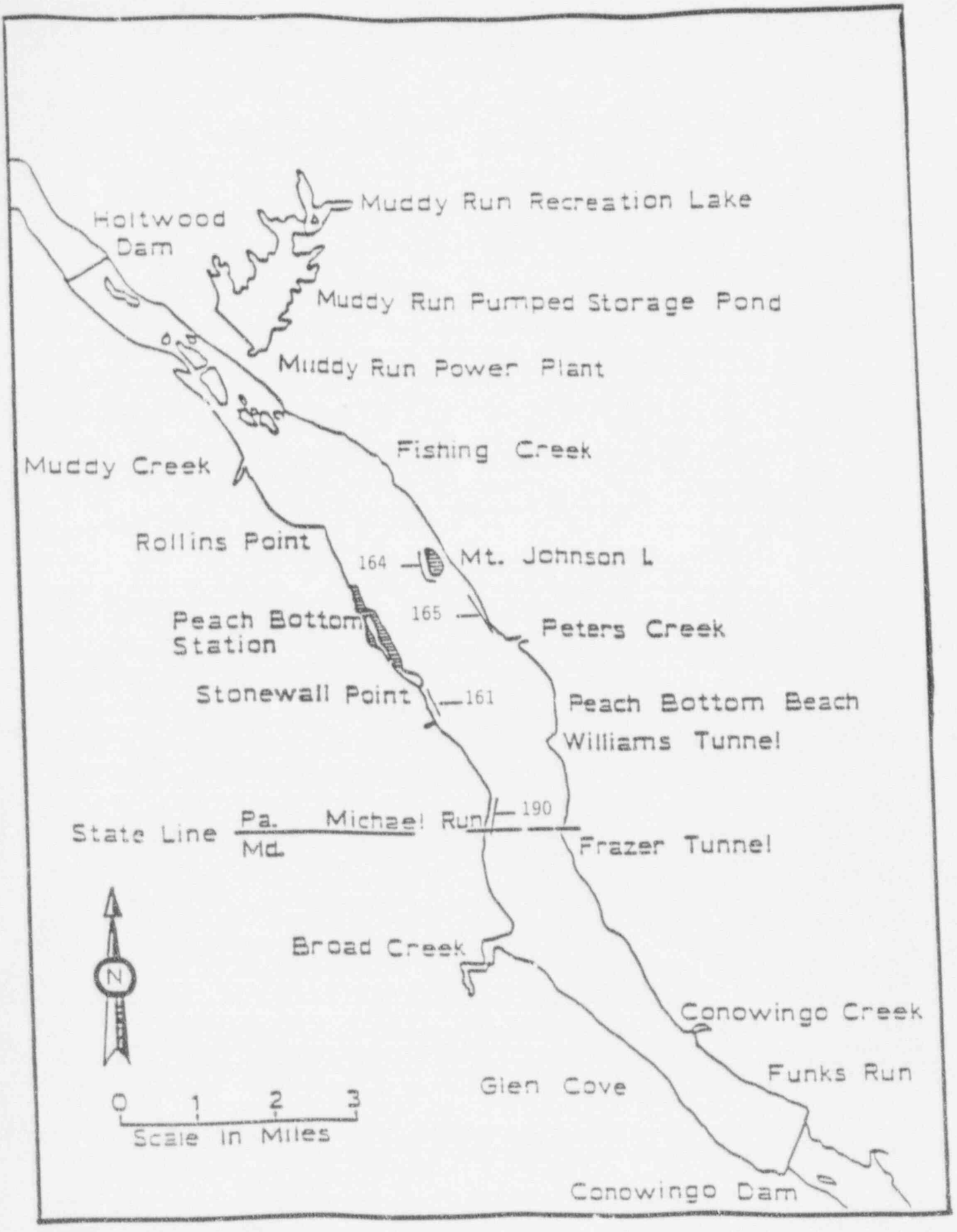

Figure 2.0-5 Map of Conowingo Pond showing distribution of electrofishing stations.