FORM 195

U.S. NUCLEAR REGULATORY COMMISSION

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DOCKET NUMBER: 50-313
FILE NUMBER: ENVIRO

TO: MR D L ZIEMAN

FROM: ARKANSAS POWER & LIGHT CO
LITTLE ROCK, ARK
W CAVANAUGH III

DATE OF DOCUMENT: 7-1-76
DATE RECEIVED: 7-2-76

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ENCLOSURE: DIEL CHANGES IN IMPINGEMENT LEVELS IN COMPLIANCE WITH ENVIRONMENTAL TECH SPEC...

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PLANT NAME: Arkansas #1

1 PG | 50 PG

FOR ACTION/INFORMATION — ENVIRO 7-2-76 RKB

SAFETY			ENVIRONMENTAL	
	ASSIGNED AD:			ASSIGNED AD:
✓	BRANCH CHIEF:	ZIEMANN	✓	BRANCH CHIEF: Youngblood
	PROJECT MANAGER:		✓	PROJECT MANAGER: MIRAGLIA
✓	LIC. ASST.:	Diggs	✓	LIC. ASST.: KREUTZER (17)

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	PROJECT MANAGEMENT		REACTOR SAFETY		OPERATING TECH.		STEPP
	BOYD		ROSS	X	EISENHUT		HULMAN
	P. COLLINS		NOVAK		SHAO		
	HOUSTON		ROSZTOCZY		BAER		SITE ANALYSIS
	PETERSON		CHECK		BUTLER	X	VOLLMER
	MELTZ			X	GRIMES		BUNCH
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Regulatory Docket File

HELPING BUILD ARKANS

ARKANSAS POWER & LIGHT COMPA

9TH & LOUISIANA STREETS • LITTLE ROCK, ARKANSA [illegible] (501) 372-4

July 1, 1976

Director of Nuclear Reactor Regulation
ATTN: Mr. Dennis L. Ziemann, Chief
Operating Reactor Branch #2
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Subject: Arkansas Power & Light Company
Arkansas Nuclear One-Unit 1
Docket No. 50-313
License No. DPR-51
Diel Changes in Impingement Levels

Gentlemen:

In compliance with Environmental Technical Specification 6.3 we hereby submit our interpretive report on the subject study. Based on the report's conclusions, further investigation in this direction is unwarranted. Therefore, we do not plan to pursue the matter further.

Very truly yours,

William Cavanaugh III
Assistant Director
Power Production

WC:ay

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INTRODUCTION

A. environmental concern of major utilities utilizing once through cooling ... fish impingement on the intake screens. Arkansas Nuclear One - Unit One, which became operational during the latter part of 1974, experienced a high rate of fish impingement during the subsequent fall and winter months. The impinged species were almost all Threadfin and Gizzard Shad. Of these the vast majority were Threadfin. During the fall and winter months the sample weight per 24-hour period varied from 30 pounds to over 27,000 pounds.

In view of such large quantities of fish being impinged Arkansas Power & Light Company intensified its search to define causal relationships in this observed phenomenon. Consultation with the Nuclear Regulatory Commission resulted in a decision to perform a diel study. The objective of this study was to ascertain if fluctuations in impingement levels correlate with time of day and if so whether altering plant operational status at certain times of day would affect impingement levels accordingly.

DESCRIPTION OF ARKANSAS NUCLEAR ONE, UNIT 1

Arkansas Nuclear One, Unit 1 is located in Pope County, Arkansas, 2 mi (3.2 km) southeast of the city of London on a peninsula formed by Dardanelle Reservoir. The site encompasses approximately 1164 acres (471.4 hectare).

Unit 1 is a pressurized water reactor (PWR) with a capacity of 836 Mw. Unit 1, which is designed for once-through cooling, began commercial operation in December 1974.

Cooling water is taken in through a 0.75-mi (1.2-km)-long intake canal to eight forebays.

At the confluence of the intake canal and the reservoir, the approach velocity of the intake water is $\leq$ 0.3 ft/sec (0.09 m/sec). Water velocity increases to 3.0 ft/sec (0.9 m/sec) at one point within the canal due to reduced canal depth and width where bedrock was not removed. Velocities then reduce to approximately 1.5 ft/sec (0.46 m/sec) along the remainder of the canal up to the intake forebays.

Each of the 8 forebays is protected from trash, fish, and other fouling materials by means of a 10-ft (3.1-m)-wide vertical traveling screen constructed of 3/8-in. (0.9-cm) wire mesh. There are no fixed screens in front of the traveling screens. The rate of speed of the traveling screens is fixed; however, the pressure on the wash system can be adjusted. The traveling screens are automatically cleaned by screen wash pumps which discharge into high-velocity spray nozzles, washing away debris as the screens travel past the nozzles. Collected trash is sluiced through a trough into one of two trash grinders located in front of screens 4 and 5; the ground

material, plus water, is then discharged in front of screen 2 where it then passes through the screen and into the Unit-1 condensers.

Unit 1's four circulating water pumps are designed with a total capacity of 762,960 gal./min. Cooling water passes through Unit-1 condensers and is returned to Dardanelle Reservoir via an effluent canal and 80-acre (32.4 hectare) discharge bay.

CHARACTERIZATION OF DARDANELLE RESERVOIR

Dardanelle Reservoir is part of the McClellan-Kerr Arkansas River navigation system which extends from the confluence of the Arkansas and Mississippi Rivers to Catoosa, Oklahoma, on the Verdigris River, a distance of 500 miles. The reservoir surface coverage varies from 34,300 to 36,600 surface acres, and the length of the shoreline is 315 miles at a pool elevation of 338 feet. It drains a 153,666-mi^2 area. The reservoir's maximum volume since being filled was 502,000 acre-feet on June 5, 1974 at a pool elevation of 338.45 feet above mean sea level; minimum volume since being filled to the bottom of the power pool was 415,000 acre-feet on October 13, 1969 at a pool elevation of 335.8 feet.

Over the thirty-four year period extending from 1923 to 1957, the Arkansas River at Dardanelle Reservoir produced an average daily discharge of 34,260 $feet^3/sec.$ or 24,820,000 acre-feet/year. During that period, the maximum daily discharge was 683,000 $feet^3/sec.$ on May 13-14, 1943 and the minimum daily discharge was 400 $feet^3/sec.$ in December, 1970.

Major tributaries contributing to Dardanelle Reservoir include Six Mile Creek, Horsehead Creek, Spadra Creek, Cane Creek, Big Shoal Creek, and Big Piney Creek as well as Delaware Creek and the Illinois Bayou.

Dardanelle Dam (Lock and Dam 10) is 259 miles upstream from the mouth of the Arkansas River and is the first of four dams with storage for hydropower. Construction of this dam was initiated in 1957 and commercial generation began in 1965.

The minimum and maximum pool elevations behind Dardanelle Dam are 336 feet and 338 feet, with a normal power generation storage capacity of two feet. Power generation is based on mean daily inflow equaling mean daily outflow within the 336 to 338 feet limits. The four hydroelectric generating units at Dardanelle Dam produce a total power output of 124,000 kw (124 mw).

Dardanelle Reservoir water temperatures, dissolved-oxygen levels, and other physiochemical parameters exhibit seasonal patterns typical of a southern (temperate) storage reservoir. Water temperatures range from near-freezing in winter to approximately 90°F (32°C) in summer. Dissolved oxygen levels follow a seasonal pattern inversely related to water temperatures. The reservoir currently possesses a relatively diverse warm-water fish community (53 species comprising 18 families) and supports a small commercial fishery as well as a growing sport fishery.

STUDY DESIGN

The diel study was originally planned to begin on October 1, 1975 and continue until April 1, 1976, but due to a delay in receiving the technical specification change and procedure development, a delay in implementation was requested and granted (letter from Mr. B. J. Youngblood to Mr. William Cavanaugh III, dated October 15, 1975). The revised study was scheduled for November 1, 1975 to May 1, 1976.

The study required subdividing a regular 24-hour impingement sample into three eight-hour samples. The following data were collected for each sample: The date and time of the sample, the species, the number or

estimated number impinged for each specie, the maximum length (in mm) for each specie, the modal length (in mm) for each specie, the modal weight (in grams) for each specie and the number of pumps operating during each sample collection. (See tables 1-30).

The program continued as planned through March, 1976. The plant went off line during the latter part of March and remained down during the last month of the study period. These two missing samples should statistically have no effect on the outcome of the study primarily because impingement had returned to the anticipated low level of late spring and summer.

RESULTS

Total sample weights ranged from a low of 0.6 pounds and 23 individuals occurring on November 4, 1975 in the 8:00 a.m. to 4:00 p.m. subdivision to a high of 1923.5 pounds and 84896 individuals which occurred January 28, 1976 in the midnight to 8:00 a.m. sample. Numerically, Threadfin dominated both samples, accounting for 65 percent and 99.9 percent of the sample respectively.

A two way analysis of variance (see appendix I) shows no statistical correlation of fish impingement with time of day. The results of the statistical analyses performed are given in tables thirty-one through thirty-six, and discussed below.

It was felt that the most significant test that could be performed on the data was a two-way analysis of variance. This test would indicate any significant differences relative to the time of day and/or the date of collection.

The test was performed using both the weight and the number of fish obtained from each sample. There were ten observations for each of the three time-of-day readings. In each results significant differences were shown between dates. Yet, variances relative to time of day were not statistically significant. The F-ratios for the variance between days were 19.5 for weight and 16.6 for number, significant at the 0.95 and 0.90 confidence level respecitively. The F-ratios for the variance between diel samples was 0.95 for weight and 1.03 for number which is not significant at the 0.75 confidence level.

The above test was also run using only two of the three readings for each day. Again, the F-ratios were significant for the variance between days but not within days.

CONCLUSIONS

The diel study shows no statistically significant fluctuations in impingement levels correlatable to time of day. This conclusion is consistent with the most probable explanation of the impingement problem at Arkansas Nuclear One. The explanation is as follows: Threadfin Shad exhibit a strong schooling tendency. They become stressed by cold water temperatures and passively drift with the water currents and become impinged on the intake screens independent of time of day.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 1

DIEL STUDY

SAMPLE TAKEN: 11-04-75 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 69 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 2
8 HOUR TOTAL SAMPLE COUNT: 26
8 HOUR TOTAL * SAMPLE WEIGHT: 0.6 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
LONGEAR SUNFISH	0.19	1.	145	120 TO 150	1	100%	90 TO 95	1	100%
BLUEGILL SUNFISH	0.09	2.	127	90 TO 120	1	50%	10 TO 15	1	50%
CHANNEL CATFISH	0.04	1.	136	120 TO 150	1	100%	15 TO 20	1	100%
BLUE CATFISH	0.01	1.	64	60 TO 90	1	100%	0 TO 5	1	100%
BROOK SILVERSIDE	0.01	1.	85	60 TO 90	1	100%	0 TO 5	1	100%
WHITE BASS	0.06	3.	115	90 TO 120	3	100%	5 TO 10	2	67%
THREADFIN SHAD	0.16	17.	115	30 TO 60	7	41%	0 TO 5	12	71%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 2

DIEL STUDY

SAMPLE TAKEN: 11-04-75 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 64 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 2 | 8 HOUR TOTAL SAMPLE COUNT: 94 | 8 HOUR TOTAL * SAMPLE WEIGHT: 1.5 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
WHITE CRAPPIE	0.13	2.	162	60 TO 90	1	50%	0 TO 5	1	50%
BLUEGILL SUNFISH	0.07	1.	128	120 TO 150	1	100%	30 TO 35	1	100%
CHANNEL CATFISH	0.31	4.	189	150 TO 180	2	50%	15 TO 20	1	25%
THREADFIN SHAD	0.63	71.	100	60 TO 90	14	78%	0 TO 5	14	78%
WHITE BASS	0.25	10.	150	90 TO 120	8	80%	5 TO 10	8	80%
GIZZARD SHAD	0.06	4.	135	60 TO 90	2	50%	0 TO 5	2	50%
FRESHWATER DRUM	0.01	1.	80	60 TO 90	1	100%	0 TO 5	1	100%
GREEN SUNFISH	0.04	1.	100	90 TO 120	1	100%	15 TO 20	1	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 3

DIEL STUDY

SAMPLE TAKEN: 11-15-75 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 64 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 2 | 8 HOUR TOTAL SAMPLE COUNT: 111 | 8 HOUR TOTAL * SAMPLE WEIGHT: 1.9 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
CHANNEL CATFISH	0.01	1.	60	30 TO 60	1	100%	0 TO 5	1	100%
THREADFIN SHAD	1.31	98.	114	90 TO 120	11	44%	0 TO 5	14	56%
WHITE BASS	0.14	5.	146	90 TO 120	4	80%	5 TO 10	2	40%
GIZZARD SHAD	0.44	6.	215	60 TO 90	1	17%	0 TO 5	1	17%
FRESHWATER DRUM	0.02	1.	104	90 TO 120	1	100%	5 TO 10	1	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 4

DIEL STUDY

SAMPLE TAKEN: 11-18-75 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 59 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 143
8 HOUR TOTAL * SAMPLE WEIGHT: 2.1 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	1.81	131.	110	60 TO 90	14	54%	0 TO 5	14	54%
GIZZARD SHAD	0.16	3.	190	60 TO 90	1	33%	0 TO 5	1	33%
WHITE BASS	0.04	2.	100	90 TO 120	2	100%	5 TO 10	2	100%
BLUE CATFISH	0.06	4.	111	90 TO 120	3	75%	5 TO 10	3	75%
CHANNEL CATFISH	0.02	1.	100	90 TO 120	1	100%	5 TO 10	1	100%
BROOK SILVERSIDE	0.01	2.	96	60 TO 90	1	50%	0 TO 5	2	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

Table 3

DIEL STUDY

SAMPLE TAKEN: 11-05-75 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 64 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 2
8 HOUR TOTAL SAMPLE COUNT: 111
8 HOUR TOTAL * SAMPLE WEIGHT: 1.9 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
CHANNEL CATFISH	0.01	1.	60	30 TO 60	1	100%	0 TO 5	1	100%
THREADFIN SHAD	1.31	98.	114	90 TO 120	11	44%	0 TO 5	14	56%
WHITE BASS	0.14	5.	146	90 TO 120	4	80%	5 TO 10	2	40%
GIZZARD SHAD	0.44	6.	215	60 TO 90	1	17%	0 TO 5	1	17%
FRESHWATER DRUM	0.02	1.	104	90 TO 120	1	100%	5 TO 10	1	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 4

DIEL STUDY

SAMPLE TAKEN: 11-18-75 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 59 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 143 | 8 HOUR TOTAL * SAMPLE WEIGHT: 2.1 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	1.81	131.	110	60 TO 90	14	54%	0 TO 5	14	54%
GIZZARD SHAD	0.16	3.	190	60 TO 90	1	33%	0 TO 5	1	33%
WHITE BASS	0.04	2.	100	90 TO 120	2	100%	5 TO 10	2	100%
BLUE CATFISH	0.06	4.	111	90 TO 120	3	75%	5 TO 10	3	75%
CHANNEL CATFISH	0.02	1.	100	90 TO 120	1	100%	5 TO 10	1	100%
BROOK SILVERSIDE	0.01	2.	96	60 TO 90	1	50%	0 TO 5	2	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 5

DIEL STUDY

SAMPLE TAKEN: 11-18-75 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 58 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 496 | 8 HOUR TOTAL SAMPLE WEIGHT: 8.5 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	7.44	461.	159	90 TO 120	14	48%	5 TO 10	12	41%
GIZZARD SHAD	0.26	14.	195	60 TO 90	10	71%	0 TO 5	9	64%
BLUEGILL SUNFISH	0.01	1.	43	30 TO 60	1	100%	0 TO 5	1	100%
GREEN SUNFISH	0.03	1.	89	60 TO 90	1	100%	10 TO 15	1	100%
CHANNEL CATFISH	0.03	2.	107	90 TO 120	2	100%	5 TO 10	2	100%
BLUE CATFISH	0.08	5.	118	90 TO 120	4	80%	5 TO 10	4	80%
WHITE BASS	0.25	9.	140	90 TO 120	5	56%	5 TO 10	4	44%
WHITE CRAPPIE	0.44	3.	217	90 TO 120	1	33%	5 TO 10	1	33%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBR. CUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 6

DIEL STUDY

SAMPLE TAKEN: 11-19-75 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 58 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 675 | 8 HOUR TOTAL * SAMPLE WEIGHT: 8.8 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GM)	#	%
THREADFIN SHAD	7.75	643.	154	60 TO 90	14	45%	0 TO 5	18	58%
WHITE CRAPPIE	0.08	1.	155	150 TO 180	1	100%	35 TO 40	1	100%
BROOK SILVERSIDE	0.01	1.	105	90 TO 120	1	100%	5 TO 10	1	100%
BLUEGILL SUNFISH	0.06	1.	124	120 TO 150	1	100%	25 TO 30	1	100%
WHITE BASS	0.09	2.	150	90 TO 120	1	50%	10 TO 15	1	50%
SKIPJACK HERRING	0.07	2.	129	120 TO 150	2	100%	10 TO 15	1	50%
BLUE CATFISH	0.14	6.	164	90 TO 120	4	67%	5 TO 10	4	67%
GIZZARD SHAD	0.59	19.	241	60 TO 90	14	74%	0 TO 5	12	63%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 7

DIEL STUDY

SAMPLE TAKEN: 12-02-75 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 47 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 2066 | 8 HOUR TOTAL * SAMPLE WEIGHT: 41.9 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	29.13	1980.	110	60 TO 90	26	59%	0 TO 5	21	48%
GIZZARD SHAD	1.75	42.	239	90 TO 120	15	58%	10 TO 15	9	35%
BLUEGILL SUNFISH	0.27	9.	144	30 TO 60	4	44%	0 TO 5	6	67%
STRIPED BASS	0.04	2.	105	90 TO 120	2	100%	5 TO 10	2	100%
GREEN SUNFISH	0.25	7.	119	90 TO 120	5	71%	20 TO 25	3	43%
FRESHWATER DRUM	0.01	1.	91	90 TO 120	1	100%	5 TO 10	1	100%
WHITE CRAPPIE	0.02	2.	87	60 TO 90	2	100%	0 TO 5	2	100%
SKIPJACK HERRING	0.06	1.	159	150 TO 180	1	100%	25 TO 30	1	100%
ORANGE SPOTTED SUNFISH	0.01	1.	55	30 TO 60	1	100%	0 TO 5	1	100%
BROOK SILVERSIDE	0.09	12.	108	90 TO 120	11	92%	0 TO 5	11	92%
WHITE BASS	0.25	9.	134	90 TO 120	6	67%	5 TO 10	4	44%

* TOTAL SAMPLE INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 8

DIEL STUDY

SAMPLE TAKEN: 12-02-75 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 46 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 3019
8 HOUR TOTAL SAMPLE WEIGHT: 44.1 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	35.94	2767.	156	60 TO 90	24	46%	0 TO 5	24	46%
GIZZARD SHAD	4.88	155.	252	60 TO 90	12	46%	0 TO 5	11	42%
BLUEGILL SUNFISH	0.05	7.	80	60 TO 90	4	57%	0 TO 5	6	86%
STRIPED BASS	0.24	4.	176	90 TO 120	2	50%	5 TO 10	1	25%
LARGEMOUTH BASS	0.04	1.	113	90 TO 120	1	100%	15 TO 20	1	100%
FLATHEAD CATFISH	0.02	2.	89	60 TO 90	2	100%	0 TO 5	2	100%
MISSISSIPPI SILVERSIDE	0.09	8.	116	90 TO 120	5	63%	0 TO 5	5	63%
GREEN SUNFISH	0.10	3.	118	90 TO 120	2	67%	0 TO 5	1	33%
FRESHWATER DRUM	0.94	22.	298	90 TO 120	16	73%	5 TO 10	13	59%
WHITE CRAPPIE	0.01	1.	75	60 TO 90	1	100%	0 TO 5	1	100%
SKIPJACK HERRING	0.77	14.	198	90 TO 120	4	29%	15 TO 20	4	29%
BLUE CATFISH	0.42	5.	235	150 TO 180	4	80%	25 TO 30	3	60%
CHANNEL CATFISH	0.56	23.	195	60 TO 90	14	61%	0 TO 5	15	65%
BROOK SILVERSIDE	0.04	5.	102	90 TO 120	5	100%	0 TO 5	5	100%
WHITE BASS	0.08	2.	140	90 TO 120	1	50%	5 TO 10	1	50%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 9

DIEL STUDY

SAMPLE TAKEN: 12-03-75 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 46 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 3412
8 HOUR TOTAL * SAMPLE WEIGHT: 43.1 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	36.19	3221.	144	60 TO 90	30	53%	0 TO 5	28	49%
GIZZARD SHAD	5.06	128.	231	60 TO 90	8	31%	0 TO 5	9	35%
BLUEGILL SUNFISH	0.01	2.	56	30 TO 60	2	100%	0 TO 5	2	100%
STRIPED BASS	0.02	8.	145	90 TO 120	4	50%	5 TO 10	3	38%
GOLDEN SHINER	0.01	1.	84	60 TO 90	1	100%	0 TO 5	1	100%
LONGEAR SUNFISH	0.09	1.	118	90 TO 120	1	100%	40 TO 45	1	100%
MISSISSIPPI SILVERSIDE	0.03	3.	113	90 TO 120	3	100%	0 TO 5	2	67%
FRESHWATER DRUM	0.08	5.	117	60 TO 90	3	60%	0 TO 5	2	40%
SKIPJACK HERRING	0.67	9.	242	150 TO 180	5	56%	15 TO 20	3	33%
WHITE CRAPPIE	0.01	1.	65	60 TO 90	1	100%	0 TO 5	1	100%
BLUE CATFISH	0.23	8.	173	90 TO 120	6	75%	5 TO 10	4	50%
CHANNEL CATFISH	0.24	16.	172	60 TO 90	11	69%	0 TO 5	12	75%
WHITE BASS	0.11	3.	130	120 TO 150	2	67%	15 TO 20	2	67%
GREEN SUNFISH	0.17	6.	101	90 TO 120	3	50%	10 TO 15	2	33%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 10

DIEL STUDY

SAMPLE TAKEN: 12-15-75 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 49 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 2310
8 HOUR TOTAL * SAMPLE WEIGHT: 57.6 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	56.25	2278.	144	90 TO 120	39	83%	10 TO 15	24	51%
MISSISSIPPI SILVERSIDE	0.01	1.	98	90 TO 120	1	100%	0 TO 5	1	100%
ORANGESPOTTED SUNFISH	0.01	1.	47	30 TO 60	1	100%	0 TO 5	1	100%
GREEN SUNFISH	0.16	2.	158	30 TO 60	1	50%	0 TO 5	1	50%
BLUEGILL SUNFISH	0.02	3.	66	60 TO 90	2	67%	0 TO 5	3	100%
WHITE BASS	0.05	2.	121	90 TO 120	1	50%	5 TO 10	1	50%
CHANNEL CATFISH	0.07	2.	140	120 TO 150	2	100%	10 TO 15	1	50%
GIZZARD SHAD	0.97	18.	229	90 TO 120	6	33%	0 TO 5	5	28%
STRIPED BASS	0.05	2.	125	90 TO 120	1	50%	5 TO 10	1	50%
BLUE CATFISH	0.02	1.	110	90 TO 120	1	100%	5 TO 10	1	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 11

DIEL STUDY

SAMPLE TAKEN: 12-16-75 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 48 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 3409
8 HOUR TOTAL SAMPLE WEIGHT: 81.1 LBS *

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
LONGEAR SUNFISH	0.05	1.	100	90 TO 120	1	100%	20 TO 25	1	100%
ORANGE SPOTTED SUNFISH	0.01	1.	61	60 TO 90	1	100%	0 TO 5	1	100%
THREADFIN SHAD	77.50	3333.	135	90 TO 120	42	72%	10 TO 15	25	43%
WHITE CRAPPIE	0.35	1.	249	240 TO 270	1	100%	155 TO 160	1	100%
BLUEGILL SUNFISH	0.02	4.	61	30 TO 60	3	75%	0 TO 5	4	100%
WHITE BASS	0.05	2.	126	90 TO 120	1	50%	5 TO 10	1	50%
CHANNEL CATFISH	0.13	7.	137	60 TO 90	3	43%	0 TO 5	3	43%
GIZZARD SHAD	2.50	44.	264	90 TO 120	10	38%	15 TO 20	6	23%
SKIPJACK HERRING	0.19	5.	183	120 TO 150	3	60%	10 TO 15	2	40%
STRIPED BASS	0.10	5.	122	90 TO 120	3	60%	5 TO 10	4	80%
BLUE CATFISH	0.20	6.	181	90 TO 120	4	67%	5 TO 10	4	67%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 12

DIEL STUDY

SAMPLE TAKEN: 12-17-75 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 48 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 1916 | 8 HOUR TOTAL SAMPLE WEIGHT: 45.6 LBS *

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	41.56	1860.	123	90 TO 120	32	74%	10 TO 15	21	49%
FRESHWATER DRUM	0.02	1.	105	90 TO 120	1	100%	5 TO 10	1	100%
GREEN SUNFISH	0.01	1.	50	30 TO 60	1	100%	0 TO 5	1	100%
WHITE BASS	0.04	1.	128	120 TO 150	1	100%	15 TO 20	1	100%
CHANNEL CATFISH	0.01	2.	79	30 TO 60	1	50%	0 TO 5	2	100%
GIZZARD SHAD	3.56	38.	310	60 TO 90	7	27%	0 TO 5	5	19%
SKIPJACK HERRING	0.18	4.	186	90 TO 120	2	50%	5 TO 10	1	25%
STRIPED BASS	0.13	4.	139	90 TO 120	3	75%	5 TO 10	2	50%
BLUE CATFISH	0.10	5.	157	90 TO 120	4	80%	5 TO 10	3	60%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 13

DIEL STUDY

SAMPLE TAKEN: 01-20-75 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 39 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 18956 | 8 HOUR TOTAL * SAMPLE WEIGHT: 464.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	446.41	18916.	166	90 TO 120	106	96%	5 TO 10	63	57%
GIZZARD SHAD	4.97	25.	249	210 TO 240	6	75%	95 TO 100	2	25%
SKIPJACK HERRING	6.96	3.	434	420 TO 450	1	100%	1015 TO 1020	1	100%
WHITE CRAPPIE	0.22	3.	147	120 TO 150	1	100%	30 TO 35	1	100%
MISSISSIPPI SILVERSIDE	0.04	6.	94	90 TO 120	2	100%	0 TO 5	2	100%
BLUE CATFISH	0.12	3.	147	120 TO 150	1	100%	15 TO 20	1	100%

* TOTAL SAMPLE WT. INCLUDES 5.3 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 14

DIEL STUDY

SAMPLE TAKEN: 01-20-76 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 39 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 23257
8 HOUR TOTAL * SAMPLE WEIGHT: 617.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	582.81	23100.	155	90 TO 120	98	93%	5 TO 10	49	47%
GIZZARD SHAD	1.34	53.	208	90 TO 120	8	62%	5 TO 10	6	46%
SKIPJACK HERRING	24.99	90.	445	120 TO 150	9	41%	10 TO 15	4	18%
GREEN SUNFISH	0.06	4.	76	60 TO 90	1	100%	5 TO 10	1	100%
CHANNEL CATFISH	0.02	4.	68	60 TO 90	1	100%	0 TO 5	1	100%
BLUEGILL SUNFISH	1.07	4.	179	150 TO 180	1	100%	115 TO 120	1	100%

* TOTAL SAMPLE WT. INCLUDES 6.7 LBS OF DEBRIS ACCUMULATION.

SAMPLE TAKEN: 01-21-76 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 38 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 20358 | 8 HOUR TOTAL * SAMPLE WEIGHT: 504.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	491.19	20247.	175	90 TO 120	96	88%	5 TO 10	70	64%
GIZZARD SHAD	2.44	37.	225	90 TO 120	6	55%	5 TO 10	5	45%
SKIPJACK HERRING	5.27	60.	350	120 TO 150	11	61%	15 TO 20	6	33%
GREEN SUNFISH	0.07	3.	85	60 TO 90	1	100%	5 TO 10	1	100%
STRIPED BASS	0.07	3.	101	90 TO 120	1	100%	5 TO 10	1	100%
WHITE CRAPPIE	0.76	3.	216	210 TO 240	1	100%	100 TO 105	1	100%
FRESHWATER DRUM	0.10	3.	120	90 TO 120	1	100%	10 TO 15	1	100%

* TOTAL SAMPLE WT. INCLUDES 4.1 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 16

DIEL STUDY

SAMPLE TAKEN: 01-27-76 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 43 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 40187 | 8 HOUR TOTAL * SAMPLE WEIGHT: 977.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	951.35	40064.	158	90 TO 120	106	95%	5 TO 10	61	55%
GIZZARD SHAD	6.84	65.	250	60 TO 90	3	30%	0 TO 5	4	40%
SKIPJACK HERRING	11.72	33.	402	180 TO 210	2	40%	25 TO 30	2	40%
MISSISSIPPI SILVERSIDE	0.12	20.	109	90 TO 120	2	67%	0 TO 5	3	100%
GREEN SUNFISH	0.16	7.	88	60 TO 90	1	100%	5 TO 10	1	100%

* TOTAL SAMPLE WT. INCLUDES 6.8 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 17

DIEL STUDY

SAMPLE TAKEN: 01-27-75 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 42 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 47217 | 8 HOUR TOTAL SAMPLE WEIGHT: 1111.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	1077.21	47121.	147	90 TO 120	104	92%	5 TO 10	64	57%
GIZZARD SHAD	5.93	44.	229	210 TO 240	3	50%	0 TO 5	2	33%
FRESHWATER DRUM	8.43	30.	359	90 TO 120	3	75%	10 TO 15	2	50%
GREEN SUNFISH	0.65	15.	129	60 TO 90	1	50%	5 TO 10	1	50%
WHITE CRAPPIE	1.99	7.	218	210 TO 240	1	100%	120 TO 125	1	100%

* TOTAL SAMPLE WT. INCLUDES 16.8 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
ANO SCREEN MONITORING

Table 18

DIEL STUDY

SAMPLE TAKEN: 01-28-76 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 41 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 84896 | 8 HOUR TOTAL * SAMPLE WEIGHT: 1928.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	1901.49	84858.	154	90 TO 120	107	92%	5 TO 10	68	59%
CHANNEL CATFISH	0.08	13.	70	60 TO 90	1	100%	0 TO 5	1	100%
SKIPJACK HERRING	0.28	13.	115	90 TO 120	1	100%	5 TO 10	1	100%
GIZZARD SHAD	1.67	13.	205	180 TO 210	1	100%	55 TO 60	1	100%

* TOTAL SAMPLE WT. INCLUDES 24.5 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
ANO SCREEN MONITORING

Table 19

DIEL STUDY

SAMPLE TAKEN: 02-10-76 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 44 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 7831
8 HOUR TOTAL * SAMPLE WEIGHT: 203.2 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	179.82	7797.	146	90 TO 120	100	93%	5 TO 10	69	64%
GIZZARD SHAD	0.74	20.	214	90 TO 120	7	47%	5 TO 10	5	33%
MISSISSIPPI SILVERSIDE	0.06	7.	98	90 TO 120	5	100%	0 TO 5	5	100%
BLUE CATFISH	0.02	1.	102	90 TO 120	1	100%	5 TO 10	1	100%
FRESHWATER DRUM	0.67	1.	280	270 TO 300	1	100%	225 TO 230	1	100%
CHANNEL CATFISH	0.01	1.	72	60 TO 90	1	100%	0 TO 5	1	100%
GOLDEN SHINER	0.01	1.	74	60 TO 90	1	100%	0 TO 5	1	100%
WHITE CRAPPIE	1.24	1.	290	270 TO 300	1	100%	410 TO 415	1	100%

* TOTAL SAMPLE WT. INCLUDES 20.6 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 20

DIEL STUDY

SAMPLE TAKEN: 02-10-76 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 44 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 11686
8 HOUR TOTAL * SAMPLE WEIGHT: 303.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	290.00	11661.	160	90 TO 120	98	92%	5 TO 10	52	49%
CHANNEL CATFISH	3.55	6.	465	30 TO 60	1	33%	0 TO 5	2	67%
MISSISSIPPI SILVERSIDE	0.04	4.	91	60 TO 90	1	50%	0 TO 5	2	100%
GIZZARD SHAD	1.39	14.	222	60 TO 90	2	29%	5 TO 10	2	29%

* TOTAL SAMPLE WT. INCLUDES 8.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
ANO SCREEN MONITORING

Table 21

DIEL STUDY

SAMPLE TAKEN: 02-11-76 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 44 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 8328 | 8 HOUR TOTAL * SAMPLE WEIGHT: 211.1 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	193.97	8289.	159	90 TO 120	96	89%	5 TO 10	63	58%
GIZZARD SHAD	0.77	17.	228	60 TO 90	7	58%	0 TO 5	7	58%
BLUE CATFISH	0.35	7.	204	90 TO 120	2	40%	5 TO 10	2	40%
SKIPJACK HERRING	0.23	3.	212	120 TO 150	1	50%	15 TO 20	1	50%
CHANNEL CATFISH	0.01	3.	68	60 TO 90	2	100%	0 TO 5	2	100%
MISSISSIPPI SILVERSIDE	0.10	8.	114	90 TO 120	6	100%	0 TO 5	3	50%
FRESHWATER DRUM	0.04	1.	113	90 TO 120	1	100%	10 TO 15	1	100%

* TOTAL SAMPLE WT. INCLUDES 15.7 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
ANO SCREEN MONITORING

Table 22

DIEL STUDY

SAMPLE TAKEN: 02-24-76 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 50 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 242 | 8 HOUR TOTAL * SAMPLE WEIGHT: 6.5 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
GIZZARD SHAD	0.59	20.	213	60 TO 90	11	55%	0 TO 5	9	45%
STRIPED BASS	0.03	2.	98	90 TO 120	2	100%	5 TO 10	2	100%
CHANNEL CATFISH	0.32	2.	289	60 TO 90	1	50%	0 TO 5	1	50%
BLUE CATFISH	0.06	5.	106	90 TO 120	4	80%	0 TO 5	3	60%
WHITE CRAPPIE	0.04	3.	95	90 TO 120	2	67%	5 TO 10	2	67%
FRESHWATER DRUM	0.09	4.	121	90 TO 120	2	50%	10 TO 15	2	50%
THREADFIN SHAD	5.38	206.	153	90 TO 120	23	85%	5 TO 10	16	59%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

AND SCREEN MONITO

DIEL STUDY

SAMPLE TAKEN: 02-24-76 4P.M. TO 12P.M. AIR CURTAIN
INCLUSIVE TIME
OF SAMPLES IN HRS. INLET WATERBOX TEMPERATURE: 50 F STATUS: OFF

NUMBER OF CIRCULATING PUMPS IN OPERATION: 4

8 HOUR TOTAL SAMPLE COUNT: 536

8 HOUR TOTAL * SAMPLE WEIGHT: 13.7 LBS

SPECIES	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
[illegible]	10.50	410.	144	[illegible]					
[illegible] SHAD	1.47	30.	244	60 TO 90	13	43%	0 TO 5	14	47%
STRIPED BASS	0.09	5.	104	90 TO 120	5	100%	5 TO 10	5	100%
CHANNEL CATFISH	0.12	11.	117	60 TO 90	7	64%	0 TO 5	8	73%
WHITE BASS	0.02	1.	102	90 TO 120	1	100%	10 TO 15	1	100%
BLACK CRAPPIE	0.19	1.	190	180 TO 210	1	100%	80 TO 85	1	100%
BLUE CATFISH	0.32	21.	153	90 TO 120	16	76%	5 TO 10	13	62%
GREEN SUNFISH	0.04	2.	85	60 TO 90	2	100%	5 TO 10	2	100%
ARKANSAS RIVERSHINER	0.09	6.	104	90 TO 120	6	100%	5 TO 10	6	100%
WHITE CRAPPIE	0.01	1.	82	60 TO 90	1	100%	0 TO 5	1	100%
BLACK BULLHEAD CATFISH	0.13	1.	175	150 TO 180	1	100%	55 TO 60	1	100%
BLUEGILL SUNFISH	0.29	8.	164	30 TO 60	4	50%	0 TO 5	5	63%
FRESHWATER DRUM	0.40	19.	118	90 TO 120	14	74%	5 TO 10	11	58%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

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Table 24

DIEL STUDY

SAMPLE TAKEN: 02-25-76 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 50 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 382
8 HOUR TOTAL SAMPLE WEIGHT: 8.9 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	5.13	223.	155	90 TO 120	22	81%	5 TO 10	15	56%
CHANNEL CATFISH	0.07	9.	103	60 TO 90	7	78%	0 TO 5	7	78%
CHESTNUT LAMPREY	0.03	2.	295	270 TO 300	2	100%	60 TO 65	1	50%
MISSISSIPPI SILVERSIDE	0.01	2.	94	60 TO 90	1	50%	0 TO 5	2	100%
BLUE CATFISH	1.25	82.	120	90 TO 120	17	65%	0 TO 5	16	62%
GREEN SUNFISH	0.01	1.	48	30 TO 60	1	100%	0 TO 5	1	100%
ARKANSAS RIVER SHINER	0.09	7.	101	90 TO 120	5	71%	5 TO 10	5	71%
WHITE CRAPPIE	0.11	2.	130	120 TO 150	2	100%	15 TO 20	1	50%
BLACK BULLHEAD CATFISH	0.12	1.	180	150 TO 180	1	100%	50 TO 55	1	100%
BLUEGILL SUNFISH	0.01	1.	58	30 TO 60	1	100%	0 TO 5	1	100%
GIZZARD SHAD	1.34	25.	245	60 TO 90	14	56%	0 TO 5	15	60%
FRESHWATER DRUM	0.50	27.	130	90 TO 120	15	56%	5 TO 10	14	52%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

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Table 25

DIEL STUDY

SAMPLE TAKEN: 03-10-76 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 54 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 411
8 HOUR TOTAL * SAMPLE WEIGHT: 194.9 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	4.71	239.	147	90 TO 120	46	88%	5 TO 10	37	71%
GIZZARD SHAD	16.08	147.	228	180 TO 210	18	35%	0 TO 5	7	13%
FRESHWATER DRUM	0.35	10.	155	90 TO 120	5	63%	10 TO 15	5	63%
GOLDEN SHINER	0.03	4.	85	60 TO 90	3	100%	0 TO 5	3	100%
STRIPED BASS	0.03	1.	102	90 TO 120	1	100%	5 TO 10	1	100%
SKIPJACK HERRING	0.91	1.	295	270 TO 300	1	100%	315 TO 320	1	100%
RIVER SHINER	0.09	6.	107	90 TO 120	3	60%	5 TO 10	3	60%
MISSISSIPPI SILVERSIDE	0.01	1.	108	90 TO 120	1	100%	0 TO 5	1	100%

* TOTAL SAMPLE WT. INCLUDES172.7 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 26

DIEL STUDY

SAMPLE TAKEN: 03-10-76 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 55 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 1362 | 8 HOUR TOTAL * SAMPLE WEIGHT: 49.0 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	21.13	1024.	125	90 TO 120	32	91%	5 TO 10	19	54%
FRESHWATER DRUM	0.90	27.	172	90 TO 120	18	67%	10 TO 15	11	41%
BLUE CATFISH	0.01	1.	97	90 TO 120	1	100%	5 TO 10	1	100%
WHITE CRAPPIE	0.02	1.	94	90 TO 120	1	100%	5 TO 10	1	100%
BLUEGILL SUNFISH	0.02	4.	67	30 TO 60	3	75%	0 TO 5	4	100%
GOLDEN SHINER	0.01	2.	75	60 TO 90	2	100%	0 TO 5	2	100%
RIVER SHINER	0.11	8.	107	60 TO 90	5	63%	0 TO 5	4	50%
GIZZARD SHAD	26.81	295.	232	120 TO 150	8	30%	15 TO 20	4	15%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
ANO SCREEN MONITORING

Table 27

DIEL STUDY

SAMPLE TAKEN: 03-11-76 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 55 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION: 4 | 8 HOUR TOTAL SAMPLE COUNT: 653 | 8 HOUR TOTAL * SAMPLE WEIGHT: 36.7 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	5.13	260.	119	90 TO 120	27	100%	5 TO 10	18	67%
FRESHWATER DRUM	0.63	26.	129	90 TO 120	18	69%	10 TO 15	12	46%
CHANNEL CATFISH	0.07	1.	166	150 TO 180	1	100%	30 TO 35	1	100%
BLUE CATFISH	0.03	2.	128	60 TO 90	1	50%	0 TO 5	1	50%
WHITE CRAPPIE	0.19	3.	184	60 TO 90	1	33%	0 TO 5	1	33%
BLUEGILL SUNFISH	0.01	1.	57	30 TO 60	1	100%	0 TO 5	1	100%
STRIPED BASS	0.05	1.	142	120 TO 150	1	100%	20 TO 25	1	100%
GOLDEN SHINER	0.01	1.	75	60 TO 90	1	100%	0 TO 5	1	100%
SKIPJACK HERRING	0.49	1.	294	270 TO 300	1	100%	215 TO 220	1	100%
GIZZARD SHAD	29.94	347.	229	180 TO 210	11	39%	70 TO 75	5	18%
RIVERSHINER	0.14	10.	105	90 TO 120	8	80%	5 TO 10	8	80%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 28

DIEL STUDY

SAMPLE TAKEN: 03-17-75 8A.M. TO 4P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 55 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 277
8 HOUR TOTAL * SAMPLE WEIGHT: 11.5 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	3.75	171.	156	90 TO 120	24	92%	5 TO 10	20	77%
CHESTNUT LAMPREY	0.16	1.	306	300 TO 330	1	100%	70 TO 75	1	100%
FRESHWATER DRUM	0.46	17.	134	90 TO 120	11	65%	5 TO 10	8	47%
GIZZARD SHAD	1.13	68.	215	90 TO 120	6	23%	0 TO 5	6	23%
CHANNEL CATFISH	0.52	5.	295	60 TO 90	4	80%	0 TO 5	4	80%
STRIPED BASS	0.13	4.	138	90 TO 120	3	75%	10 TO 15	2	50%
WHITE BASS	0.02	1.	102	90 TO 120	1	100%	10 TO 15	1	100%
WHITE CRAPPIE	0.02	2.	86	60 TO 90	2	100%	0 TO 5	2	100%
BLUE CATFISH	0.09	4.	145	90 TO 120	3	75%	5 TO 10	3	75%
GOLDEN SHINER	0.01	1.	77	60 TO 90	1	100%	0 TO 5	1	100%
BLUEGILL SUNFISH	0.13	2.	147	30 TO 60	1	50%	0 TO 5	1	50%
LONGEAR SUNFISH	0.06	1.	120	90 TO 120	1	100%	25 TO 30	1	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

ARKANSAS POWER & LIGHT COMPANY
AND SCREEN MONITORING

Table 29

DIEL STUDY

SAMPLE TAKEN: 03-17-76 4P.M. TO 12P.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS
INLET WATERBOX TEMPERATURE: 55 F
AIR CURTAIN STATUS: OFF
NUMBER OF CIRCULATING PUMPS IN OPERATION: 4
8 HOUR TOTAL SAMPLE COUNT: 1072
8 HOUR TOTAL SAMPLE WEIGHT: 33.8 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	15.56	645.	160	90 TO 120	29	94%	5 TO 10	18	58%
GIZZARD SHAD	10.75	146.	235	90 TO 120	8	31%	5 TO 10	7	27%
FRESHWATER DRUM	4.38	166.	185	90 TO 120	17	65%	5 TO 10	13	50%
BLUE CATFISH	0.88	53.	154	90 TO 120	21	81%	0 TO 5	14	54%
CHANNEL CATFISH	0.19	25.	102	60 TO 90	21	84%	0 TO 5	22	88%
SKIPJACK HERRING	0.05	1.	147	120 TO 150	1	100%	20 TO 25	1	100%
EUROPEAN CARP	1.25	1.	372	360 TO 390	1	100%	565 TO 570	1	100%
STRIPED BASS	0.14	6.	117	90 TO 120	6	100%	5 TO 10	3	50%
BLUEGILL SUNFISH	0.04	8.	65	30 TO 60	7	88%	0 TO 5	8	100%
RIVER SHINER	0.11	10.	98	60 TO 90	6	60%	0 TO 5	7	70%
WHITE BASS	0.09	1.	168	150 TO 180	1	100%	35 TO 40	1	100%
MISSISSIPPI SILVERSIDE	0.01	1.	98	90 TO 120	1	100%	0 TO 5	1	100%
GREEN SUNFISH	0.02	1.	93	60 TO 90	1	100%	5 TO 10	1	100%
CHESTNUT LAMPREY	0.27	2.	302	240 TO 270	1	50%	50 TO 55	1	50%
GOLDEN SHINER	0.01	2.	85	60 TO 90	2	100%	0 TO 5	2	100%
WHITE CRAPPIE	0.04	4.	85	60 TO 90	4	100%	0 TO 5	3	75%

SAMPLE TAKEN: 03-18-76 12P.M. TO 8A.M.
INCLUSIVE TIME OF SAMPLE: 8 HRS | INLET WATERBOX TEMPERATURE: 53 F | AIR CURTAIN STATUS: OFF | NUMBER OF CIRCULATING PUMPS IN OPERATION 4 | 8 HOUR TOTAL SAMPLE COUNT: 611 | 8 HOUR TOTAL * SAMPLE WEIGHT: 21.2 LBS

SPECIES NAME	SPECIES 8 HR TOTAL WEIGHT(LBS)	SPECIES 8 HR TOTAL COUNT	MAXIMUM LENGTH(MM)	MODAL LENGTH(MM)	#	%	MODAL WEIGHT(GR)	#	%
THREADFIN SHAD	6.38	276.	117	90 TO 120	27	100%	5 TO 10	18	67%
FRESHWATER DRUM	2.31	87.	208	90 TO 120	17	65%	5 TO 10	15	58%
GIZZARD SHAD	10.25	118.	230	90 TO 120	7	27%	5 TO 10	8	31%
BLUE CATFISH	1.63	91.	168	90 TO 120	18	69%	5 TO 10	16	62%
CHANNEL CATFISH	0.17	16.	107	60 TO 90	12	75%	0 TO 5	12	75%
WHITE CRAPPIE	0.17	4.	144	60 TO 90	2	50%	5 TO 10	2	50%
STRIPED BASS	0.04	1.	119	90 TO 120	1	100%	15 TO 20	1	100%
RIVERSHINER	0.14	9.	105	60 TO 90	5	56%	5 TO 10	5	56%
SKIPJACK HERRING	0.03	1.	131	120 TO 150	1	100%	10 TO 15	1	100%
YARMOUTH BASS	0.02	1.	85	60 TO 90	1	100%	10 TO 15	1	100%
GOLDEN SHINER	0.03	2.	105	60 TO 90	1	50%	0 TO 5	1	50%
BLUEGILL SUNFISH	0.03	5.	74	60 TO 90	3	60%	0 TO 5	5	100%

* TOTAL SAMPLE WT. INCLUDES 0.0 LBS OF DEBRIS ACCUMULATION.

TWO-WAY ANALYSIS OF VARIANCE (ONE OBS. PER CELL) (WEIGHT)

TABLE 31

TIME OF DAY	DATE OF SAMPLE									
	NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
	4	18	2	16	20	27	10	24	10	17
8AM - 4PM	.6	2.1	41.9	57.6	458.7	970.2	182.6	6.5	22.2	11.5
4PM - 12MN	1.5	8.5	44.1	81.1	610.3	1094.2	295.0	13.7	49.0	33.8
12MN - 8AM	1.9	8.8	43.1	45.6	499.9	1093.5	195.4	8.9	36.7	21.2

RESULTS OF ANALYSIS

SS_A = 5.12 (2)

SS_E = 4.84 (3)

B = 5.25 (3)

k-1 = 2.00

(k-1)(n-1)=18.00

C = 2.69 (2)

SS_B = 4.72 (4)

A = 2.56 (2)

SS_T = 5.26 (4)

n-1 = 9.00

nk-1 =29.00

FA = .95 - F-ratio for time of day. Not significant at the .95 confidence level

FB = 19.53 - F-ratio for different dates. Significant at the .95 confidence level

(Percentage points of the F-distribution given in Appendix II)

$(N) = 10^n$

TWO-WAY ANALYSIS OF VARIANCE (ONE OBS. PER CELL) (NUMBER OF FISH)

TABLE 32

TIME OF DAY	DATE OF SAMPLE									
	NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
	4	18	2	16	20	27	10	24	10	17
8AM - 4PM	26	143	2066	2310	18956	40187	7831	242	411	277
4PM - 12MN	94	496	3019	3409	23257	47217	11686	536	1362	1072
12MN - 8AM	111	675	3412	1916	20358	84896	8328	382	653	611

RESULTS OF ANALYSIS

$SS_A = 1.21$ (6) B = 8.41 (2)

n-1 = 9.00 nk-1 = 29.00

A = 6.05 (5) $SS_B = 8.73$ (16)

$SS_T = 9.96$ (16) (k-1)(n-1) = 13.00

k-1 = 2.00 C = 5.87 (5)

$SS_E = 1.06$

FA = 1.03 - F-ratio for time of day. Not significant at the .90 confidence level.

FB =16.62 - F-ratio for different dates. Significant at the .90 confidence level.

(Percentage points of the F-Distribution given in Appendix II)

$(N) = 10^n$

TWO-WAY ANALYSIS OF VARIANCE (ONE OBS. PER CELL) (WEIGHT)

TABLE 33

	DATE OF SAMPLE									
	NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
TIME OF DAY	4	18	2	16	20	27	10	24	10	17
8AM - 4PM	.6	2.1	41.9	57.6	458.7	970.2	182.6	6.5	22.2	11.5
4PM - 12MN	1.5	8.5	44.1	81.1	610.3	1	295.0	13.7	49.0	33.8

RESULTS OF ANALYSIS

SS_A = 1.89 (2) B = 8.41 (2)

n-1 = 9.00 nk-1 = 19.00

A == 1.89 (2) SS_B = 7.57 (3)

SS_T = 1.24 (4) (k-1)(n-1) = 9.00

k-1 = 1.00 C = 5.21 (2)

SS_E = 4.69 (3)

FA = 1.36

FB = 1.61

(Percentage points of the F-Distribution given in Appendix II)

$(N) = 10^n$

TWO-WAY ANALYSIS OF VARIANCE (ONE OBS. PER CELL) (WEIGHT)

TABLE 34

	DATE OF SAMPLE									
	NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
TIME OF DAY	4	18	2	16	20	27	10	24	10	17
8AM - 4PM	.6	2.1	41.9	57.6	458.7	970.2	182.6	∪.5	22.2	11.5
12MN - 8AM	1.9	8.8	43.1	45.6	499.9	1903.5	195.4	8.9	36.7	21.2

RESULTS OF ANALYSIS

SS_A = 5.11 (2) B = 4.05 (3)

n-1 = 9.00 SS_T = 4.09 (4)

A = 5.11 (2) SS_B = 3.65 (4)

C = 4.28 (2) (k-1)(n-1) = 9.00

k-1 = 1.00 nk-1 = 19.00

SS_E = 3.85 (3)

FA = 1.19

FB = 9.47

(Percentage points of the F-Distribution given in Appendix II)

$(N) = 10^n$

TWO-WAY ANALYSIS OF VARIANCE (ONE OBS. PER CELL) (WEIGHT)

TABLE 35

	DATE OF SAMPLE									
	NOVEMBER		DECEMBER		JANUARY		FEBRUARY		MARCH	
TIME OF DAY	4	18	2	16	20	27	10	24	10	17
4PM - 12MN	1.5	8.5	44.1	81.1	610.	1094.2	295.0	13.7	49.0	33.8
12MN - 8AM	1.9	8.8	43.1	45.6	499.9	1903.5	195.4	8.9	36.7	21.2

RESULTS OF ANALYSIS

SS_A = 1.42 (2) B = 4.44 (3)

n-1 = 9.00 nk-1 = 19.00

A = 1.42 (2) SS_B = 4.00 (4)

SS_T = 4.34 (4) (k-1)(n-1)= 9.00

k-1 = 1.00 C = 3.61 (2)

SS_E = 3.25 (3)

FA = .39

FB = 12.30

(Percentage points of the F-Distribution given in Appendix II)

(N) = 10^n

APPENDIX I

TWO-WAY ANALYSIS OF VARIANCE
(One Observation Per Cell)

THE ANALYSIS OF VARIANCE TABLE FOR THE OBSERVATIONS:

x_{ij} $\quad i = 1, 2, \ldots k \quad j = 1, 2, \ldots, r$

Where k = number of rows and n = number of columns is given below;

With $x_{i.} = \frac{1}{n} \sum_{j=1}^{n} x_{ij}$, $x_{.j} = \frac{1}{k} \sum_{i-1}^{k} x_{ij}$ and $x.. = \frac{1}{nk} \sum_{i} \sum_{j} x_{ij}$

SOURCE OF VARIATION	SUM OF SQUARES	DEGREES OF FREEDOM	MEAN SQUARE	F
BETWEEN ROWS (Time of Day)	$SS_A = n \sum_{i} (x_{i.} - x..)^2$	k-1	$A = \frac{SS_A}{k-1}$	$F_A = \frac{A}{C}$
BETWEEN COLUMNS (Different Dates)	$SS_B = k \sum_{j} (x_{.j} - x..)^2$	n-1	$B = \frac{SS_B}{n-1}$	$F_B = \frac{B}{C}$
ERROR	$SS_e = \sum\sum_{ij} (x_{ij} - x_{i.} - x_{.j} + x..)^2$	(k-1)(n-1)	$C = \frac{SS_e}{(k-1)(n-1)}$	
TOTAL	$SS_t = \sum\sum_{ij} (x_{ij} - x..)^2$	nk-1		

Table 4: Percentage Points of the *F*-Distribution ($\alpha = .05$)

ν_1 = numerator d. f.; ν_2 = denominator d. f.

ν_2 \ ν_1	1	2	3	4	5	6	7	8	9
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5
2	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38
3	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34
23	4.28	2.43	3.03	2.80	2.64	2.53	2.44	2.37	2.32
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28
26	4.23	3.37	2.98	2.74	2.59	2.47	2.39	2.32	2.27
27	4.21	3.35	2.96	2.73	2.57	2.46	2.37	2.31	2.25
28	4.20	3.34	2.95	2.71	2.56	2.45	2.36	2.29	2.24
29	4.18	3.33	2.93	2.70	2.55	2.43	2.35	2.28	2.22
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04
120	3.92	3.07	2.68	2.45	2.29	2.17	2.09	2.02	1.96
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88

10	12	15	20	24	30	40	60	120	∞	ν_2 \ ν_1
241.9	243.9	245.9	248.0	249.1	250.1	251.1	252.2	253.3	254.3	1
19.40	19.41	19.43	19.45	19.45	19.46	19.47	19.48	19.49	19.50	2
8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53	3
5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63	4
4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.[illegible]	5
4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.6[illegible]	6
3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23	7
3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93	8
3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71	9
2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54	10
2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40	11
2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30	12
2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21	13
2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13	14
2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07	15
2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01	16
2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96	17
2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92	18
2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88	19
2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84	20
2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81	21
2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78	22
2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.7[illegible]	23
2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.7[illegible]	24
2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71	25
2.22	2.15	2.07	1.99	1.95	1.90	1.85	1.80	1.75	1.69	26
2.20	2.13	2.06	1.97	1.93	1.88	1.84	1.79	1.73	1.67	27
2.19	2.12	2.04	1.96	1.91	1.87	1.82	1.77	1.7[illegible]	1.65	28
2.18	2.10	2.03	1.94	1.90	1.85	1.81	1.75	1.70	1.64	29
2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62	30
2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51	40
1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39	60
1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25	120
1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00	∞

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Table 3: Percentage Points of the *F*-Distribution ($\alpha = .10$)

F_1 = numerator d. f.; F_2 = denominator d. f.

F_2 \ F_1	1	2	3	4	5	6	7	8	9
1	39.86	49.50	53.59	55.83	57.24	58.20	58.91	59.44	59.86
2	8.53	9.00	9.16	9.24	9.29	9.33	9.35	9.37	9.38
3	5.54	5.46	5.39	5.34	5.31	5.28	5.27	5.25	5.24
4	4.54	4.32	4.19	4.11	4.05	4.01	3.98	3.95	3.94
5	4.06	3.78	3.62	3.52	3.45	3.40	3.37	3.34	3.32
6	3.78	3.46	3.29	3.18	3.11	3.05	3.01	2.98	2.96
7	3.59	3.26	3.07	2.96	2.88	2.83	2.78	2.75	2.72
8	3.46	3.11	2.92	2.81	2.73	2.67	2.62	2.59	2.56
9	3.36	3.01	2.81	2.69	2.61	2.55	2.51	2.47	2.44
10	3.29	2.92	2.73	2.61	2.52	2.46	2.41	2.38	2.35
11	3.23	2.86	2.66	2.54	2.45	2.39	2.34	2.30	2.27
12	3.18	2.81	2.61	2.48	2.39	2.33	2.28	2.24	2.21
13	3.14	2.76	2.56	2.43	2.35	2.28	2.23	2.20	2.16
14	3.10	2.73	2.52	2.39	2.31	2.24	2.19	2.15	2.12
15	3.07	2.70	2.49	2.36	2.27	2.21	2.16	2.12	2.09
16	3.05	2.67	2.46	2.33	2.24	2.18	2.13	2.09	2.06
17	3.03	2.64	2.44	2.31	2.22	2.15	2.10	2.06	2.03
18	3.01	2.62	2.42	2.29	2.20	2.13	2.08	2.04	2.00
19	2.99	2.61	2.40	2.27	2.18	2.11	2.06	2.02	1.98
20	2.97	2.59	2.38	2.25	2.16	2.09	2.04	2.00	1.96
21	2.96	2.57	2.36	2.23	2.14	2.08	2.02	1.98	1.95
22	2.95	2.56	2.35	2.22	2.13	2.06	2.01	1.97	1.93
23	2.94	2.55	2.34	2.21	2.11	2.05	1.99	1.95	1.92
24	2.93	2.54	2.33	2.19	2.10	2.04	1.98	1.94	1.91
25	2.92	2.53	2.32	2.18	2.09	2.02	1.97	1.93	1.89
26	2.91	2.52	2.31	2.17	2.08	2.01	1.96	1.92	1.88
27	2.90	2.51	2.30	2.17	2.07	2.00	1.95	1.91	1.87
28	2.89	2.50	2.29	2.16	2.06	2.00	1.94	1.90	1.87
29	2.89	2.50	2.28	2.15	2.06	1.99	1.93	1.89	1.86
30	2.88	2.49	2.28	2.14	2.05	1.98	1.93	1.88	1.85
40	2.84	2.44	2.23	2.09	2.00	1.93	1.87	1.83	1.79
60	2.79	2.39	2.18	2.04	1.95	1.87	1.82	1.77	1.74
120	2.75	2.35	2.13	1.99	1.90	1.82	1.77	1.72	1.68
∞	2.71	2.30	2.08	1.94	1.85	1.77	1.72	1.67	1.63

F_2 \ F_1	10	12	15	20	24	30	40	60	120	∞
1	60.19	60.71	61.22	61.74	62.00	62.26	62.53	62.79	63.06	63.33
2	9.39	9.41	9.42	9.44	9.45	9.46	9.47	9.47	9.48	9.49
3	5.23	5.22	5.20	5.18	5.18	5.17	5.16	5.15	5.14	5.13
4	3.92	3.90	3.87	3.84	3.83	3.82	3.80	3.79	3.78	3.76
5	3.30	3.27	3.24	3.21	3.19	3.17	3.16	3.14	3.12	3.10
6	2.94	2.90	2.87	2.84	2.82	2.80	2.78	2.76	2.74	2
7	2.70	2.67	2.63	2.59	2.58	2.56	2.54	2.51	2.49	2.47
8	2.54	2.50	2.46	2.42	2.40	2.38	2.36	2.34	2.32	2.29
9	2.42	2.38	2.34	2.30	2.28	2.25	2.23	2.21	2.18	2.16
10	2.32	2.28	2.24	2.20	2.18	2.16	2.13	2.11	2.08	2.06
11	2.25	2.21	2.17	2.12	2.10	2.08	2.05	2.30	2.00	1.97
12	2.19	2.15	2.10	2.06	2.04	2.01	1.99	1.96	1.93	1.90
13	2.14	2.10	2.05	2.01	1.98	1.96	1.93	1.90	1.88	1.85
14	2.10	2.05	2.01	1.96	1.94	1.91	1.89	1.86	1.83	1.80
15	2.06	2.02	1.97	1.92	1.90	1.87	1.85	1.82	1.79	1.76
16	2.03	1.99	1.94	1.89	1.87	1.84	1.81	1.78	1.75	1.72
17	2.00	1.96	1.91	1.86	1.84	1.81	1.78	1.75	1.72	1.69
18	1.98	1.93	1.89	1.84	1.81	1.78	1.75	1.72	1.69	1.66
19	1.96	1.91	1.86	1.81	1.79	1.76	1.73	1.70	1.67	1.63
20	1.94	1.89	1.84	1.79	1.77	1.74	1.71	1.68	1.64	1.61
21	1.92	1.87	1.83	1.78	1.75	1.72	1.69	1.66	1.62	1.59
22	1.90	1.86	1.81	1.76	1.73	1.70	1.67	1.64	1.60	1.57
23	1.89	1.84	1.80	1.74	1.72	1.69	1.66	1.62	1.59	1.55
24	1.88	1.83	1.78	1.73	1.70	1.67	1.64	1.61	1.57	1
25	1.87	1.82	1.77	1.72	1.69	1.66	1.63	1.59	1.56	1.52
26	1.86	1.81	1.76	1.71	1.68	1.65	1.61	1.58	1.54	1.50
27	1.85	1.80	1.75	1.70	1.67	1.64	1.60	1.57	1.53	1.49
28	1.84	1.79	1.74	1.69	1.66	1.63	1.59	1.56	1.52	1.48
29	1.83	1.78	1.73	1.68	1.65	1.62	1.58	1.55	1.51	1.47
30	1.82	1.77	1.72	1.67	1.64	1.61	1.57	1.54	1.50	1.46
40	1.76	1.71	1.66	1.61	1.57	1.54	1.51	1.47	1.42	1.38
60	1.71	1.66	1.60	1.54	1.51	1.48	1.44	1.40	1.35	1.29
120	1.65	1.60	1.55	1.48	1.45	1.41	1.37	1.32	1.26	1.19
∞	1.60	1.55	1.49	1.42	1.38	1.34	1.30	1.24	1.17	1.00

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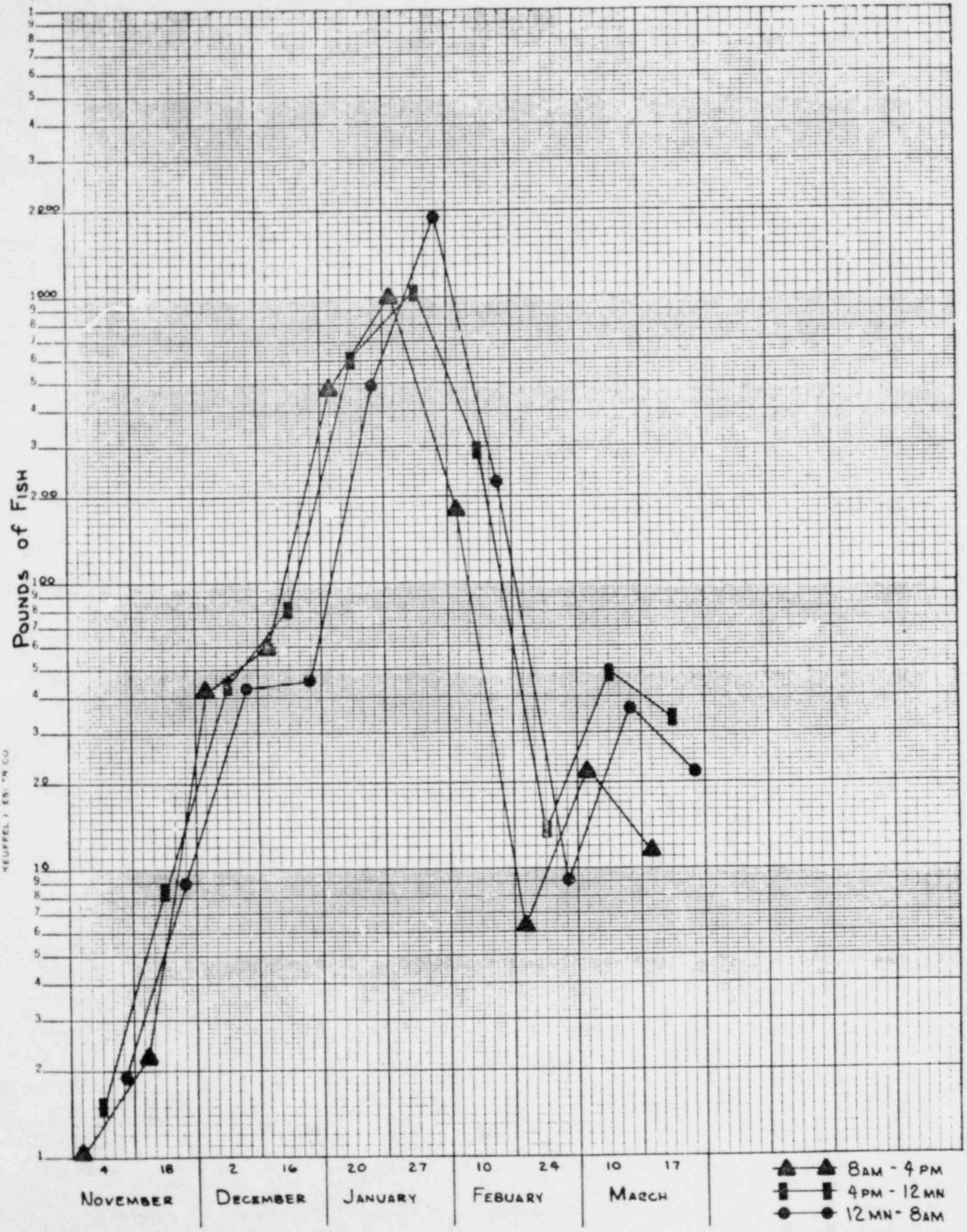
FIGURE 1

POUNDS of FISH PER SAMPLE PERIOD



K&E SEMI-LOGARITHMIC 46 6093
4 CYCLES X 64 DIVISIONS
KEUFFEL & ESSER CO.

FIGURE 2

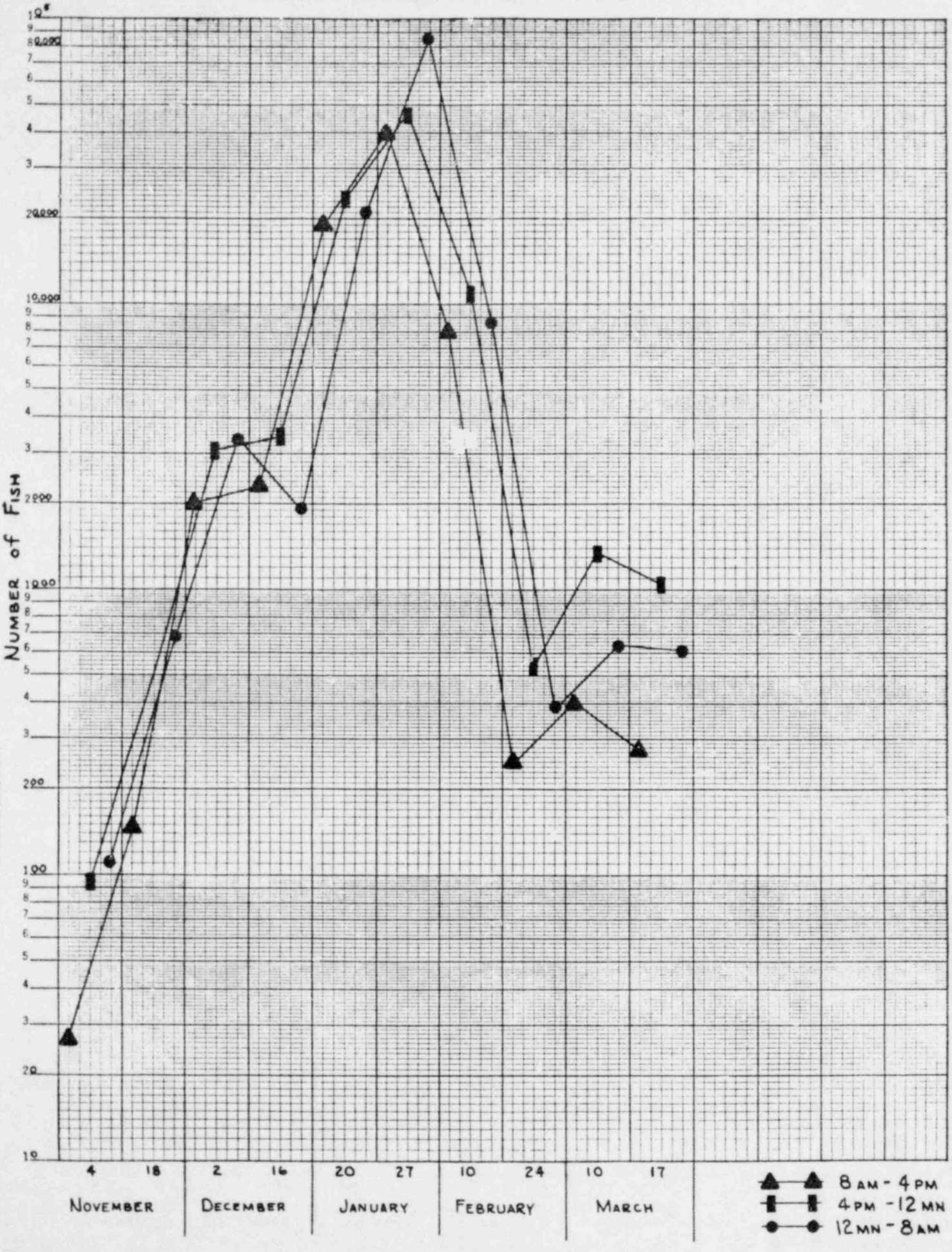
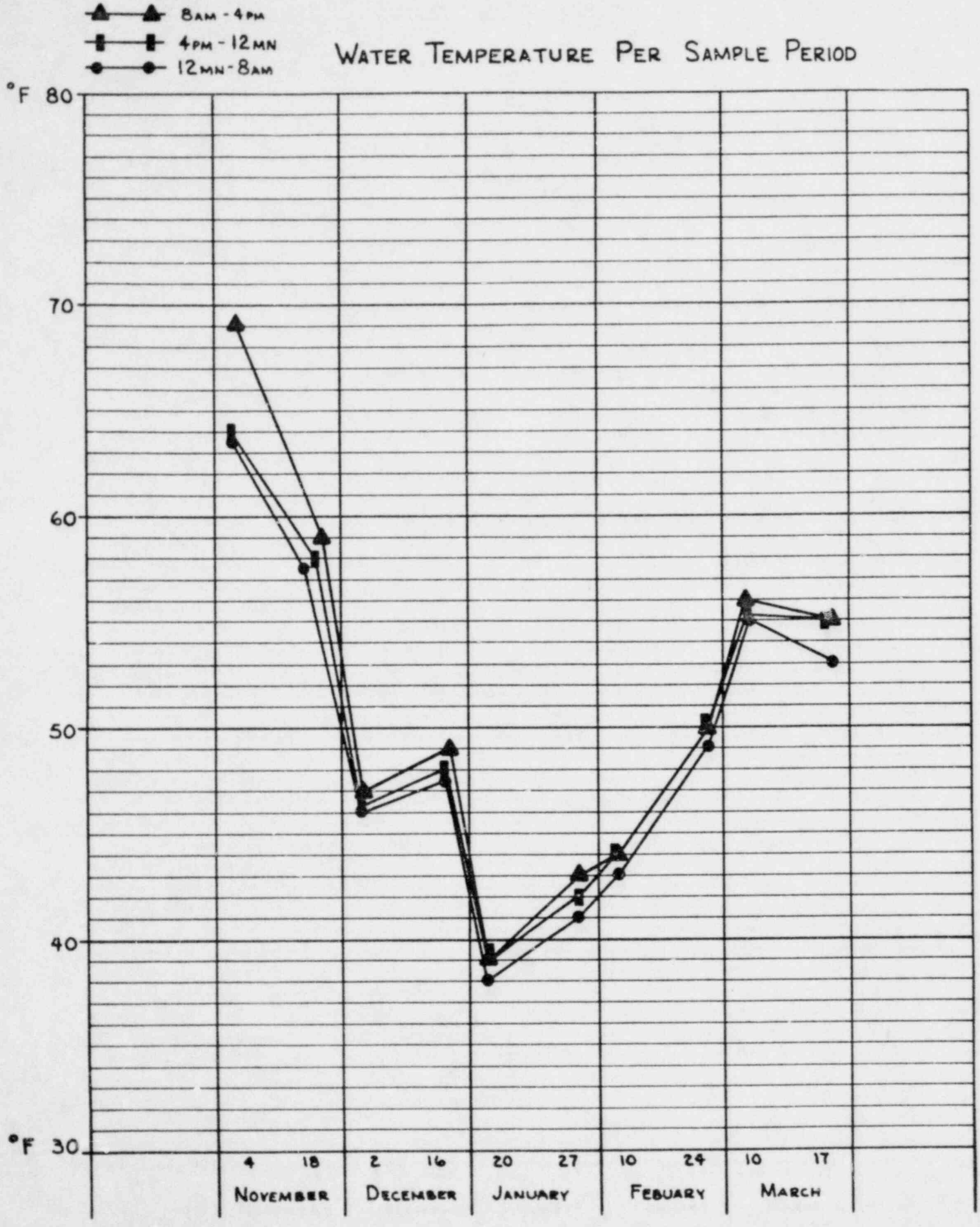

NUMBER of FISH PER SAMPLE PERIOD
NUMBER of FISH
10,000
2,000
1,000
200
100
20
10
4
18
2
16
20
27
10
24
10
17
NOVEMBER
DECEMBER
JANUARY
FEBRUARY
MARCH
8 AM - 4 PM
4 PM - 12 MN
12 MN - 8 AM

FIGURE 3


8AM - 4PM
4PM - 12MN
12MN - 8AM
WATER TEMPERATURE PER SAMPLE PERIOD
°F 80
70
60
50
40
°F 30
4
18
2
16
20
27
10
24
10
17
NOVEMBER
DECEMBER
JANUARY
FEBUARY
MARCH