JTI000006

VOGTLE ELECTRIC GENERATING PLANT
SAVANNAH RIVER LARVAL FISH STUDY, BURKE COUNTY, GEORGIA
FROM JANUARY THROUGH AUGUST, 1974
OPERATING LICENSE STAGE ENVIRONMENTAL REPORT
TECHNICAL DOCUMENT

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VEGP - OLSER

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INTRODUCTION

Construction of the Vogtle Electric Generating Plant (VEGP) began in June, 1974, and was discontinued in September, 1974, as a result of unfavorable economic conditions. Construction resumed in January, 1977, with excavation activities beginning in February. The plant site is approximately 3169 acres and located in Burke County, the southwest side of the Savannah River, the natural boundary between Georgia and South Carolina. The site is at river mile 150.9 across from the Savannah River Plant (SRP) operated by E. I. DuPont DeNemours and Company for the U.S. Department of Energy. The plant site is approximately 26 miles south-southeast of Augusta, Georgia. The site is located in the coastal plain, which is characterized by sandy or sandy loam soil with rolling hills and mixed pine-hardwood association. Since the onset of construction, approximately 1391 acres of the site have been cleared for plant construction.

The original plans proposed a generating plant consisting of four units, but construction of two units has been cancelled. The plant will employ two pressurized water reactors producing 1160 MW each. Unit 1 is scheduled to go into service in March, 1987, and Unit 2 in September, 1988. The exhaust steam will be cooled by a closed-cycle cooling system employing natural draft cooling towers using make-up water from the Savannah River. Low volume waste and blowdown from both cooling towers will ultimately be discharged back into the river.

The Savannah River below Augusta, Georgia, and above the VEGP site receives wastewater discharges from municipalities and industries that add organic wastes, nutrients, metals, and other trace contaminants. Stream classification near the VEGP is listed as "Fishing."[1] The river near the plant site is typical of large southeastern coastal plain rivers except that a dredged channel is maintained by the Corps of Engineers for barge traffic. The biological community of the river is similar to that of other large southeastern rivers but has been affected by man's influence on the river. The impoundment of the river above Augusta, Georgia, has reduced the transport of sediments and allochthonous particulate organic material, and the dredging of the channel has reduced the natural shallow areas and backwaters that would normally support a diverse flora and fauna. Studies on the Savannah River flora and fauna have been conducted periodically since 1951 and were detailed in Patrick, et al.,[2] Academy of Natural Sciences of Philadelphia,[3][4] and Matthews.[5]

Georgia Power Company was required by the Plant Vogtle Final Environmental Statement issued by the U.S. Atomic Energy Commission[6] to complete the requirement that fish eggs and larvae be sampled at suitable stations above and below the plant site in the Savannah River. A study began in January and ended in August, 1974.

METHODS

Three sampling transects were selected, each with two stations. Station 1 of each transect was on the Georgia side of the river, and Station 3 of each transect was on the South Carolina side (figure 1). Descriptions of each transect follows:

Transect 151.2: Located at river mile 151.2 and 0.3 miles upstream from the proposed site of the intake structure.

Transect 150.9: Located at river miles 150.9 and at the site of the intake structure.

Transect 150.6: Located at river mile 150.6 and 0.3 miles downstream from the proposed site of the intake structure.

Samples were taken from January through May and July and August, 1974. Survey frequency for the months sampled were as follows: January, 2 surveys; February, 3 surveys; March, 4 surveys; April, 3 surveys; May, 1 survey; July, 1 survey; and August, 1 survey. A total of 15 surveys consisting of 89 day samples and 88 night samples were collected. The data were grouped and presented as a monthly total. Densities were calculated by dividing the total number of eggs or larvae for a given month by the total volume of water filtered through the net. Sampling was done with a one-meter diameter, 760 μ mesh drift net. Sample duration time was 15 minutes. Specimens were preserved with ten percent formalin in the field and transported to the Georgia Power Company Environmental Affairs Center laboratory in Decatur to be identified, measured, and enumerated. Air and water temperature and dissolved oxygen concentration were measured at the time of sampling.

RESULTS AND DISCUSSION

The family, scientific, and common names of fish eggs and larvae collected in the Savannah River larval fish study are presented in table 1. A total of 2177 larvae and 1423 eggs were collected (table 2). At least 34 species of fish were represented. Table 3 showed that a greater number of individuals were collected at night, with the exception of the month of May. The larvae of the crappies (Pomoxis spp.) comprised 56.8 and 70.8 percent of the April and July samples, respectively. Larvae of the spotted sucker (Minytrema melanops) comprised 2.9, 18.7, and 37.5 percent of the March, April, and May samples, respectively. American shad (Alosa sapidissima) eggs first appeared in the March sample, comprising 5.0 percent. Peaks occurred in April (31.6 percent) and May (45.2 percent) with a sharp decrease in July (12.9 percent). For the 1974 study, the larvae of crappies and spotted sucker comprised the largest portion of the total number with 29.3 and 15.7 percent, respectively. American shad eggs comprised 23.6 percent of the total number collected (table 4). The densities of larvae and eggs for 1000 cubic meters (m^3) of water are presented in table 5 for each family for each

month sampled. The densities for the Clupeidae, Catostomidae, and Centrarchidae were the highest among the 12 familes represented. The density for the Clupeidae was highest in April and May, due primarily to the eggs of the American shad. Catostomid density was also highest in April and May and consisted mainly of spotted sucker larvae. Centrarchid density was highest in March, with a density of 45.6/1000 m^3. Crappies constituted the greater portion of the density of the Centrarchidae. Densities for the months sampled showed a gradual increase from January to April, peaking in May with a sharp decrease in July and August (table 6). Table 7 presents the monthly mean lengths and range (in millimeters) of total lengths for each species.

The air temperatures for the day and night surveys are given in figures 2 and 3. The water temperatures for the day and night surveys, presented in figures 4 and 5, showed that temperatures never exceeded 32.2 C (90.0 F); the limit set by the Georgia Department of Natural Resources.(1) Dissolved oxygen concentrations, figures 6 and 7, were also within the limit set by the Georgia Department of Natural Resources of a daily average of 5.0 mg/l, or no less than 4.0 mg/l at all times for warm water species of fish.

The study conducted at the SRP resulted in 1700 larval fish and 357 eggs collected, representing at least 22 species. The most common species were blueback herring (Alosa aestivalis), spotted sucker, and black crappie (Pomoxis nigromaculatus). Nearly half of all larvae collected were clupeids, primarily blueback herring. The eggs of the American shad comprised 96.4 percent of all eggs collected.(7)

The original design of the intake structure for VEGP called for six 1.4 m^3/sec (22,000 gpm) make-up pumps and two 0.94 m^3/sec (15,000 gpm) dilution pumps for the four units. The cancellation of two units has reduced the number of pumps to four 1.4 m^3/sec (22,000 gpm) pumps. The plant will use approximately 0.65 percent of the average daily river flow as compared to the original estimate of 1.3 percent. The SRP has eighteen 2.05 m^3/sec (32,500 gpm) and six 0.79 m^3/sec (12,500 gpm) pumps which presently removes seven percent of the daily average river flow.(7)

Studies conducted at SRP revealed that eggs were rarely found in canal plankton samples. It was believed that the eggs, which were dependent on the river current for suspension in the water column, settled to the bottom of the intake canal. The velocity decreased drastically in the canal in comparison to the main channel of the river. In general, fish eggs, which were carried by the flow of water, were present in the lower portion of the water column near the bottom. Those eggs which did enter the intake canal encountered a sharp decrease in velocity and had a tendency to settle to the bottom.

Some fish larvae, like the eggs, were carried by the current from the time of hatching to that period when direct movement was possible. The time span depended on the species and the biological and physical factors but usually required several days. The larvae were most susceptible to

entrainment during this time. As in the case of the eggs which entered the intake canal and settled to the bottom, so too would the larvae. This meant that not all eggs and larvae which entered the intake canal would necessarily be entrained. This was indicated by the persistence of sunfish, minnows, and larval and juvenile silversides in the SRP intake canals.[7] The sunfish were known to spawn in the intake canals, were the dominant species in the canals, and occurred there year round.

The bottom of the VEGP intake structure will be at the same elevation as the bottom of the river. This will allow eggs to enter the canal, encounter a sharp decrease in velocity, and result in the settling out of the eggs and larvae. The data indicated that the game and commercial species most susceptible to entrainment because of their abundance would be the eggs of the American shad and the larva of the crappies. Of the non-game and non-commercial species, the larva of the spotted sucker would be most susceptible to entrainment. The crappies construct nests and give parental care to the eggs and young. Upon leaving the nest, the larvae actively swim. Because of their swimming ability and the reduced velocity in the intake canal, the actual number of larvae entrained are expected to be minimal. The eggs of the American shad which do enter the canal would, most likely, settle to the bottom and possibly avoid being entrained.

Studies from SRP and VEGP indicate that entrainment of eggs and larvae will be minimal and not have a significant affect on the fish population in the river.

CONCLUSIONS

In our study, a total of 2177 fish larvae and 1423 eggs were collected with a minimum of 34 species represented. The most common taxa were crappies and spotted sucker, constituting 29.3 and 15.7 percent of the total number collected, respectively. The eggs of the American shad comprised 23.6 percent of the total. The difference in the percent composition of American shad eggs in the VEGP study and that of McFarlane, et al.,[7] was thought to be caused by annual spawning variations.

In terms of abundance, the eggs of the American shad and the larvae of the crappies and spotted sucker would be most likely affected by entrainment. Biological and physical factors, such as the reproductive behavior of the crappies and the low velocity in the intake canal, suggest that entrainment of eggs and larvae will be minimal and not have a significant effect on the fish population in the river.

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TABLE 1 (PAGE 1 OF 2)

FAMILY, SCIENTIFIC, AND COMMON NAMES OF FISHES COLLECTED IN THE SAVANNAH RIVER LARVAL FISH STUDY

Scientific Name	Common Name
Acipenseridae	
Acipenser spp.	Sturgeon
Clupeidae	
Alosa aestivalis	Blueback Herring
Alosa mediocris	Hickory Shad
Alosa sapidissima	American Shad
Dorosoma spp.	Shad
Esocidae	
Esox americanus	Redfin Pickerel
Esox niger	Chain Pickerel
Esox spp.	Pickerel
Cyprinidae	
Cyprinus carpio	Carp
Hybognathus regius	Eastern Silvery Minnow
Notemigonus crysoleucas	Golden Shiner
Notropis petersoni	Coastal Shiner
Catostomidae	
Carpiodes spp.	Carpsucker
Minytrema melanops	Spotted Sucker
Ictaluridae	
Ictalurus brunneus	Snail Bullhead
Ictalurus nebulosus	Brown Bullhead
Ictalurus platycephalus	Flat Bullhead
Ictalurus punctatus	Channel Catfish
Noturus gyrinus	Tadpole Madtom
Aphredoderidae	
Aphredoderus sayanus	Pirate Perch
Belonidae	
Strongylura marina	Atlantic Needlefish
Poeciliidae	
Gambusia affinis	Mosquitofish
Atherinidae	
Labidesthes sicculus	Brook Silverside
Centrarchidae	
Enneacanthus gloriosus	Bluespotted Sunfish
Lepomis auritus	Redbreast Sunfish
Lepomis gulosus	Warmouth
Lepomis macrochirus	Bluegill
Lepomis spp.	Sunfish
Pomoxis spp.	Crappie
Micropterus salmoides	Largemouth Bass
Micropterus spp.	Bass

TABLE 1 (PAGE 2 OF 2)

Scientific Name	Common Name
Percidae	
Etheostoma fricksium	Savannah Darter
Perca flavescens	Yellow Perch

TABLE 2 (PAGE 1 OF 2)

SPECIES AND NUMBER OF EGGS AND LARVAE COLLECTED PER MONTH
IN THE 1974 SAVANNAH RIVER LARVAL FISH STUDY

Species	Month Jan.	Feb.	Mar.	Apr.	May	July	Aug.	Total
Acipenser spp.			1	1				2
Alosa aestivalis			1					1
Alosa mediocris				1				1
Alosa sapidissima			1	7	2			10
Dorosoma spp.			1	18				19
Clupeidae larvae				7	2			9
Esox americanus			2					2
Esox niger			2					2
Esox spp.		3	5					8
Cyprinus carpio				4				4
Hybognathus regius					1			1
Notemigonus crysoleucas			1	4				5
Notropis petersoni			3	2	2			7
Cyprinidae larvae		16	32	62	9			119
Carpiodes spp.				2	6			8
Minytrema melanops			36	304	224			564
Catostomidae larvae				1				1
Ictalurus brunneus		1				5		6
Ictalurus nebulosus					4			4
Ictalurus platycephalus						7	1	8
Ictalurus punctatus							1	1
Noturus gyrinus						1		1
Aphredoderus sayanus		3	29	7				39
Strongylura marina					1			1
Gambusia affinis			1					1
Labidesthes sicculus					2			2
Enneacanthus gloriosus				1				1
Lepomis auritus	1							1
Lepomis gulosus				1				1
Lepomis macrochirus		1						1
Lepomis spp.			25	94	37	7	2	165
Pomoxis spp.		54	878	121		1		1054
Micropterus salmoides					1			1
Micropterus spp.			1	2				3
Centrarchidae larvae				4				4
Etheostoma fricksium					1			1
Perca flavescens		9	52	32	3		1	97
Percidae larvae			5	8	2			15
Unknown larvae		1		4	2			7
Alosa mediocris egg				114				114
Alosa sapidissima egg		2	62	513	270	4		851
Clupeidae egg			1					1

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TABLE 2 (PAGE 2 OF 2)

Species	Month Jan.	Feb.	Mar.	Apr.	May	July	Aug.	Total
Cyprinidae egg						1		1
Catostomidae egg			22	108				130
Percidae egg			14	23	1	2	1	41
Unknown egg		5	65	177	28	3	7	285
Totals	1	95	1240	1622	598	31	13	3600

TABLE 3 (PAGE 1 OF 3)

SPECIES, NUMBER OF INDIVIDUALS COLLECTED FOR THE DAY AND THE NIGHT SAMPLES, TOTALS FOR THE DAY, THE NIGHT AND THE MONTH AND PERCENT COMPOSITION OF EACH SPECIES FOR THE DAY, THE NIGHT AND THE MONTH

Month/Species	Day	(% Comp.)	Night	(% Comp.)	Total	(% Comp.)
1. January						
Lepomis auritus			1	(100.0)	1	(100.0)
Totals			1		1	
2. February						
Esox spp.	3	(7.5)			3	(3.2)
Cyprinidae	5	(12.5)	11	(20.0)	16	(16.8)
Ictalurus brunneus			1	(1.8)	1	(1.1)
Aphredoderus sayanus	1	(2.5)	2	(3.6)	3	(3.2)
Lepomis macrochirus			1	(1.8)	1	(1.1)
Pomoxis spp.	23	(57.5)	31	(56.4)	54	(56.8)
Perca flavescens	4	(10.0)	5	(9.1)	9	(9.5)
Unknown larvae	1	(2.5)			1	(1.1)
Alosa sapidissima egg	1	(2.5)	1	(1.8)	2	(2.1)
Unknown egg	2	(5.0)	3	(5.5)	5	(5.3)
Totals	40		55		95	
3. March						
Acipenser spp.	1	(0.3)			1	(0.1)
Alosa aestivalis	1	(0.3)			1	(0.1)
Alosa sapidissima			1	(0.1)	1	(0.1)
Dorosoma spp.			1	(0.1)	1	(0.1)
Esox americanus	2	(0.5)			2	(0.2)
Esox niger			2	(0.2)	2	(0.2)
Esox spp.	1	(0.3)	4	(0.5)	5	(0.4)
Notemigonus crysoleucas	1	(0.3)			1	(0.1)
Notropis petersoni	2	(0.5)	1	(0.1)	3	(0.2)
Cyprinidae larvae	18	(4.8)	14	(1.6)	32	(2.6)
Minytrema melanops	17	(4.5)	19	(2.2)	36	(2.9)
Aphredoderus sayanus	21	(5.6)	8	(0.9)	29	(2.3)
Gambusia affinis			1	(0.1)	1	(0.1)
Lepomis spp.	18	(4.8)	7	(0.8)	25	(2.0)
Pomoxis spp.	174	(46.5)	704	(81.3)	878	(70.8)
Micropterus spp.			1	(0.1)	1	(0.1)
Perca flavescens	30	(8.0)	22	(2.5)	52	(4.2)
Percidae larvae	3	(0.8)	2	(0.2)	5	(0.2)
Alosa sapidissima egg	44	(11.8)	18	(2.1)	62	(5.0)

TABLE 3 (PAGE 2 OF 3)

Month/Species	Day	(% Comp.)	Night	(% Comp.)	Total	(% Comp.)
Clupeidae egg	1	(0.3)			1	(0.1)
Catostomidae egg	6	(1.6)	16	(1.8)	22	(1.7)
Percidae egg	11	(2.9)	3	(0.3)	14	(1.1)
Unknown egg	23	(6.1)	42	(4.8)	65	(5.2)
Totals	374		866		1240	
4. April						
Acipenser spp.			1	(0.1)	1	(0.1)
Alosa mediocris	1	(0.1)			1	(0.1)
Alosa sapidissima	4	(0.6)	3	(0.3)	7	(0.4)
Dorosoma spp.	3	(0.4)	15	(1.6)	18	(1.1)
Clupeidae larvae	4	(0.6)	3	(0.3)	7	(0.4)
Cyprinus carpio	3	(0.4)	1	(0.1)	4	(0.2)
Notemigonus crysoleucas	2	(0.3)	2	(0.2)	4	(0.2)
Notropis petersoni			2	(0.2)	2	(0.1)
Cyprinidae larvae	32	(4.6)	30	(3.3)	62	(3.8)
Carpiodes spp.			2	(0.2)	2	(0.1)
Minytrema melanops	185	(26.3)	119	(12.9)	304	(18.7)
Catostomidae larvae			1	(0.1)	1	(0.1)
Aphredoderus sayanus			7	(0.8)	7	(0.4)
Enneacanthus gloriosus			1	(0.1)	1	(0.1)
Lepomis gulosus			1	(0.1)	1	(0.1)
Lepomis spp.	57	(8.1)	37	(4.0)	94	(5.8)
Pomoxis spp.	53	(7.5)	68	(7.4)	121	(7.5)
Micropterus spp.	2	(0.3)			2	(0.1)
Centrarchidae larvae	4	(0.6)			4	(0.2)
Perca flavescens	18	(2.6)	14	(1.5)	32	(2.0)
Percidae larvae	2	(0.3)	6	(0.7)	8	(0.5)
Unknown larvae	1	(0.1)	3	(0.3)	4	(0.2)
Alosa mediocris egg	32	(4.6)	83	(8.9)	114	(7.0)
Alosa sapidissima egg	183	(26.0)	330	(35.9)	513	(31.6)
Catostomidae egg	46	(6.5)	62	(6.7)	108	(6.7)
Percidae egg	12	(1.7)	11	(1.2)	23	(1.4)
Unknown egg	59	(8.4)	118	(12.8)	177	(10.9)
Totals	703		919		1622	
5. May						
Alosa sapiddissima	1	(0.3)	1	(0.4)	2	(0.3)
Clupeidae larvae	1	(0.3)	1	(0.4)	2	(0.3)
Hybognathus regius			1	(0.4)	1	(0.2)
Notropis petersoni			2	(0.7)	2	(0.3)
Cyprinidae larvae	6	(1.9)	3	(1.1)	9	(1.5)
Carpiodes spp.	3	(1.0)	3	(1.1)	6	(1.0)

TABLE 3 (PAGE 3 OF 3)

Month/Species	Day	(% Comp.)	Night	(% Comp.)	Total	(% Comp.)
5. May (Continued)						
Minytrema melanops	157	(49.8)	67	(23.7)	224	(37.5)
Ictalurus nebulosus			4	(1.4)	4	(0.7)
Strongylura marina	1	(0.3)			1	(0.2)
Labidesthes sicculus	2	(0.6)			2	(0.3)
Lepomis spp.	19	(6.0)	18	(6.4)	37	(6.2)
Micropterus salmoides			1	(0.4)	1	(0.2)
Etheostoma fricksium	1	(0.3)			1	(0.2)
Perca flavescens	3	(1.0)			3	(0.5)
Percidae larvae	1	(0.3)	1	(0.4)	2	(0.3)
Unknown larvae			2	(0.7)	2	(0.2)
Alosa sapidissima egg	107	(34.0)	163	(57.6)	270	(45.2)
Percidae egg			1	(0.4)	1	(0.2)
Unknown egg	13	(4.1)	15	(5.3)	28	(4.7)
Totals	315		283		598	
6. July						
Ictalurus brunneus			5	(26.3)	5	(16.1)
Ictalurus platycephalus	5	(41.7)	2	(10.5)	7	(22.6)
Noturus gyrinus			1	(5.3)	1	(3.2)
Lepomis spp.			7	(36.8)	7	(22.6)
Pomoxis spp.	1	(8.3)			1	(3.2)
Alosa sapidissima egg	2	(16.7)	2	(10.5)	4	(12.9)
Cyprinidae egg	1	(8.3)			1	(3.2)
Percidae egg	2	(16.7)			2	(6.5)
Unknown egg	1	(8.3)	2	(10.5)	3	(9.7)
Totals	12		19		31	
7. August						
Ictalurus platycephalus			1	(9.1)	1	(7.7)
Ictalurus punctatus			1	(9.1)	1	(7.7)
Lepomis spp.			2	(18.2)	2	(15.4)
Perca flavescens	1	(50.0)			1	(7.7)
Percidae egg			1	(9.1)	1	(7.7)
Unknown egg	1	(50.0)	6	(54.5)	7	(53.8)
Totals	2		11		13	

TABLE 4 (PAGE 1 OF 2)

SPECIES, TOTAL NUMBER, AND PERCENT COMPOSITION OF EACH FOR THE 1974 SAVANNAH RIVER LARVAL FISH STUDY

Species	Total Number	% Composition
Acipenser spp.	2	0.1
Alosa aestivalis	1	T[a]
Alosa mediocris	1	T
Alosa sapidissima	10	0.3
Dorosoma spp.	19	0.5
Clupeidae larvae	9	0.3
Esox americanus	2	0.1
Esox niger	2	0.1
Esox spp.	8	0.2
Cyprinus carpio	4	0.1
Hybognathus regius	1	T
Notemigonus crysoleucas	5	0.1
Notropis petersoni	7	0.2
Cyprinidae larvae	119	3.3
Carpiodes spp.	8	0.2
Minytrema melanops	564	15.7
Catostomidae larvae	1	T
Ictalurus brunneus	6	0.2
Ictalurus nebulosus	4	0.1
Ictalurus platycephalus	8	0.2
Ictalurus punctatus	1	T
Noturus gyrinus	1	T
Aphredoderus sayanus	39	1.1
Strongylura marina	1	T
Gambusia affinis	1	T
Labidesthes sicculus	2	0.1
Enneacanthus gloriosus	1	T
Lepomis auritus	1	T
Lepomis gulosus	1	T
Lepomis macrochirus	1	T
Lepomis spp.	165	4.6
Pomoxis spp.	1054	29.3
Micropterus salmoides	1	T
Micropterus spp.	3	0.1
Centrarchidae larvae	4	0.1
Etheostoma fricksium	1	T
Perca flavescens	97	2.7
Percidae larvae	15	0.4
Unknown larvae	7	0.2
Alosa mediocris egg	114	3.2
Alosa sapidissima egg	851	23.6

TABLE 4 (PAGE 2 OF 2)

Species	Total Number	% Composition
Clupeidae egg	1	T
Cyprinidae egg	1	T
Catostomidae egg	130	3.6
Percidae egg	41	1.1
Unknown egg	285	7.9
Totals	3600	99.7

a. Trace

TABLE 5

COMPARISON OF FAMILY DENSITIES PER
1000 CUBIC METERS OF WATER

Family	Month Jan.	Feb.	Mar.	Apr.	May	July	Aug.
Acipenseridae			0.05	0.06			
Clupeidae		0.10	3.30	37.00	58.10	0.90	
Esocidae		0.20	0.50				
Cyprinidae		1.00	1.90	4.00	2.50	0.20	
Catostomidae			2.90	23.20	48.80		
Ictaluridae		0.10			0.80	2.90	0.40
Aphredoderidae		0.20	1.50	0.40			
Belonidae					0.20		
Poeciliidae			0.05				
Atherinidae					0.40		
Centrarchidae	0.20	3.60	45.60	12.50	8.10	1.80	0.50
Percidae		0.60	3.60	3.50	1.40	0.50	0.40
Unknown eggs and larvae		0.40	3.30	10.10	6.30	0.70	1.70

TABLE 6 (PAGE 1 OF 3)

DENSITIES FOR EGGS AND LARVAE OF EACH TAXA PER
1000 CUBIC METERS OF WATER FOR THE DAY AND THE NIGHT

	Month/Species	Day	Night
1.	January, 1974		
	Lepomis auritus		0.4
2.	February		
	Esox spp.	0.4	
	Cyprinidae larvae	0.6	1.5
	Ictalurus brunneus		0.1
	Aphredoderus sayanus	0.1	0.3
	Lepomis macrochirus		0.1
	Pomoxis spp.	2.8	4.2
	Perca flavescens	0.5	0.7
	Unknown larvae	0.1	
	Alosa sapidissima egg	0.1	0.1
	Unknown egg	0.2	0.4
	Totals	4.8	7.4
3.	March		
	Acipenser spp.	0.1	
	Alosa aestivalis	0.1	
	Alosa sapidissima		0.1
	Dorosoma spp.		0.1
	Esox americanus	0.2	
	Esox niger		0.2
	Esox spp.	0.1	0.4
	Notemigonus crysoleucas	0.1	
	Notropis petersoni	0.2	0.1
	Cyprinidae larvae	1.8	1.4
	Minytrema melanops	1.7	1.9
	Aphredoderus sayanus	2.1	0.8
	Gambusia affinis		0.1
	Lepomis spp.	1.8	0.7
	Pomoxis spp.	17.5	70.9
	Micropterus spp.		0.1
	Perca flavescens	3.0	2.2
	Percidae larvae	0.3	0.2
	Alosa sapidissima egg	4.4	1.8
	Clupeidae egg	0.1	
	Catostomidae egg	0.6	1.6

TABLE 6 (PAGE 2 OF 3)

Month/Species	Day	Night
3. March (Continued)		
Percidae egg	1.1	0.3
Unknown egg	2.3	4.2
Totals	37.5	87.1
4. April		
Acipenser spp.		0.4
Alosa mediocris	0.1	
Alosa sapidissima	0.4	0.3
Dorosoma spp.	0.3	1.7
Clupeidae larvae	0.4	0.3
Cyprinus carpio	0.3	0.1
Notemigonus crysoleucas	0.2	0.2
Notropis petersoni		0.2
Cyprinidae larvae	3.5	3.5
Carpiodes spp.		0.2
Minytrema melanops	20.1	13.7
Catostomidae larvae		0.1
Aphredoderus sayanus		0.8
Enneacanthus gloriosus		0.1
Lepomis gulosus		0.1
Lepomis spp.	6.2	4.3
Pomoxis spp.	5.8	7.8
Micropterus spp.	0.2	
Centrarchidae larvae	0.4	
Perca flavescens	2.0	1.6
Percidae larvae	0.2	0.7
Alosa mediocris egg	3.5	9.5
Alosa sapidissima egg	19.9	38.1
Catostomidae egg	5.0	7.2
Percidae egg	1.3	1.3
Unknown egg	6.4	13.6
Totals	76.3	106.1
5. May		
Alosa sapidissima	0.5	0.4
Clupeidae larvae	0.5	0.4
Hybognathus regius		0.4
Notropis petersoni		0.8
Cyprinidae larvae	2.8	1.2
Minytrema melanops	73.0	26.2
Ictalurus nebulosus		1.6
Strongylura marina	0.5	

TABLE 6 (PAGE 3 OF 3)

Month/Species	Day	Night
5. May (Continued)		
Labidesthes sicculus	0.9	
Lepomis spp.	8.8	7.0
Micropterus salmoides		0.4
Etheostoma fricksium	0.5	
Perca flavescens	1.4	
Percidae larvae	0.5	0.4
Unknown larvae		0.8
Alosa sapidissima egg	49.8	63.6
Percidae egg		0.4
Unknown egg	6.0	5.9
Totals	146.6	110.7
6. July		
Ictalurus brunneus		2.3
Ictalurus platycephalus	2.2	0.9
Noturus gyrinus		0.5
Lepomis spp.		3.3
Pomoxis spp.	0.4	
Alosa sapidissima egg	0.9	0.9
Cyprinidae egg	0.4	
Percidae egg	0.9	0.9
Unknown egg	0.4	0.5
Totals	5.2	9.3
7. August		
Ictalurus platycephalus		0.4
Ictalurus punctatus		0.4
Lepomis spp.		0.9
Perca flavescens	0.5	
Percidae egg		0.4
Unknown egg	0.5	2.7
Totals	1.0	4.8

TABLE 7 (PAGE 1 OF 4)

MEAN LENGTHS IN MILLIMETERS WITH THE RANGE IN PARENTHESIS FOR THE LARVAL FISHES FROM THE SAVANNAH RIVER FOR EACH MONTH

Species	Month January	February	March	April	May	July	August
Acipenser spp.			17.0	9.8			
Alosa aestivalis			4.3				
Alosa mediocris				3.7			
Alosa sapidissima			11.4	9.6 (5.1-11.8)	10.3 (9.6-10.9)		
Dorosoma spp.			4.3	4.5 (2.7-5.0)			
Clupeidae larvae				6.7 (3.2-11.3)	10.8 (5.6-16.0)		
Esox americanus			25.0				
Esox niger			29.5 (20.0-39.0)				
Esox spp.		11.5 (9.0-15.0)	14.5 (6.4-25.0)				
Cyprinus carpio				6.2 (5.9-6.6)			
Hybognathus regius					21.0		

TABLE 7 (PAGE 2 OF 4)

Species	Month January	February	March	April	May	July	August
Notemigonus crysoleucas			6.1	5.9 (4.8-7.8)			
Notropis petersoni			61.7 (56.0-66.0)	42.0 (15.0-69.0)	36.5 (35.0-38.0)		
Cyprinidae larvae		6.5 (5.8-8.0)	7.1 (4.6-10.9)	6.3 (4.0-8.5)	6.4 (5.3-8.2)		
Carpiodes spp.				8.9 (8.0-9.8)	8.6 (8.0-8.8)		
Minytrema melanops			12.3 (10.1-15.5)	11.8 (7.7-17.0)	12.9 (11.2-14.6)		
Catostomidae larvae				11.2			
Ictalurus brunneus		145.0				17.0 (16.0-18.0)	
Ictalurus nebulosus					15.2 (13.6-16.0)		
Ictalurus platycephalus						16.4 (15.0-18.0)	17.0
Ictalurus punctatus							74.0
Noturus gyrinus						14.0	

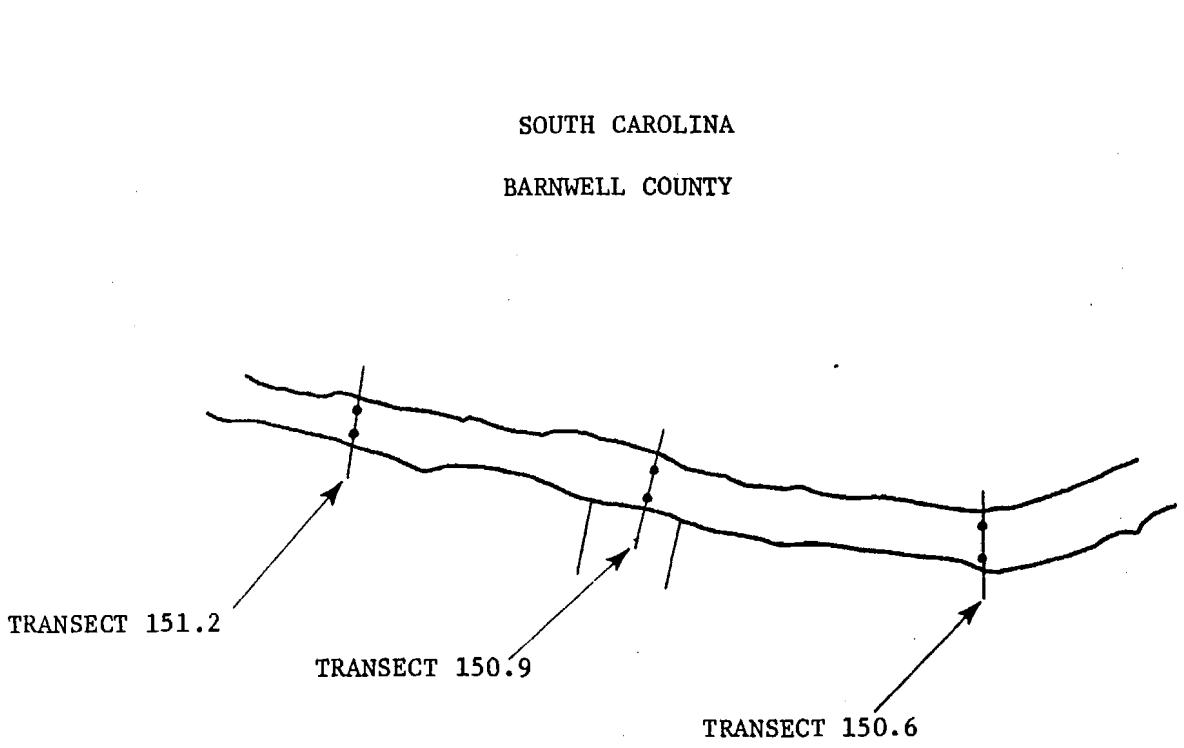
TABLE 7 (PAGE 3 OF 4)

Species	Month January	February	March	April	May	July	August
Aphredoderus sayanus		7.4 (4.0-8.0)	7.8 (4.0-13.0)	10.6 (3.2-29.0)			
Strongylura marina					15.2		
Gambusia affinis			34.0				
Labidesthes sicculus					5.3 (4.8-5.8)		
Enneacanthus gloriosus				57.0			
Lepomis auritus	50.0						
Lepomis gulosus				66.0			
Lepomis macrochirus		20.0					
Lepomis spp.			5.7 (4.8-7.2)	4.8 (3.0-7.2)	6.4 (4.8-7.5)	8.2 (6.7-9.0)	6.4
Pomoxis spp.		5.6 (4.0-8.2)	6.4 (4.0-11.2)	5.1 (3.2-11.2)		(a)	
Micropterus salmoides					30.0		
Micropterus spp.			5.6	5.1 (4.5-5.6)			

TABLE 7 (PAGE 4 OF 4)

Species	Month January	February	March	April	May	July	August
Centrarchidae larvae				6.2 (3.8-8.4)			
Etheostoma fricksium					18.1		
Perca flavescens		6.9 (5.6-8.0)	6.3 (5.3-10.1)	8.7 (4.5-71.0)	7.0 (6.6-7.5)		5.1
Percidae larvae			6.7 (5.4-7.7)	5.1 (4.2-8.0)	4.9 (4.5-5.3)		
Unknown larvae		5.6		(a)	(a)		

a. Damaged specimen



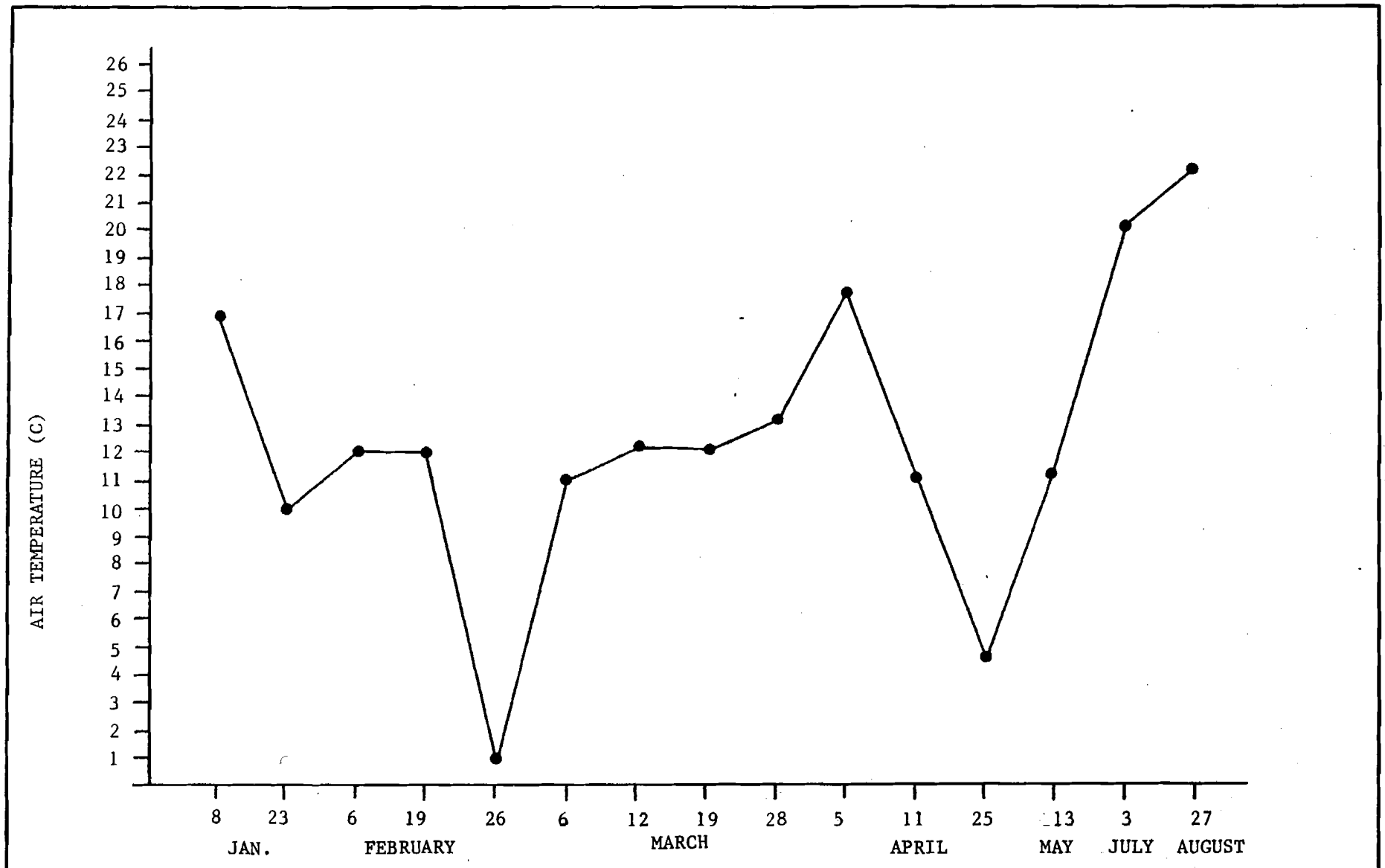
Georgia Power

VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

STATION LOCATION FOR THE SAVANNAH RIVER LARVAL FISH STUDY

FIGURE 1

433-9



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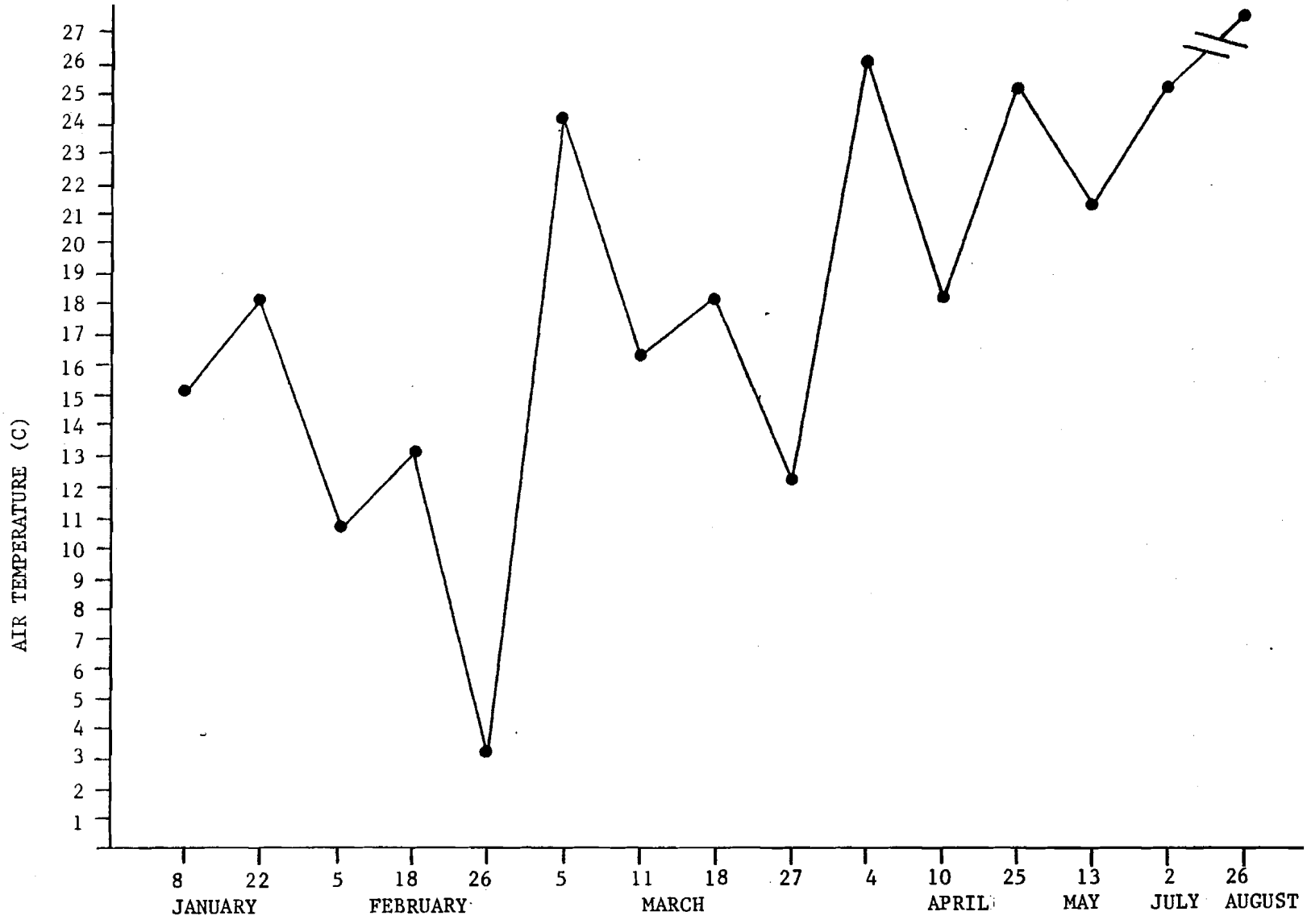
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

AIR TEMPERATURES FOR THE DAY
SURVEYS FOR 1974

FIGURE 2

433-9



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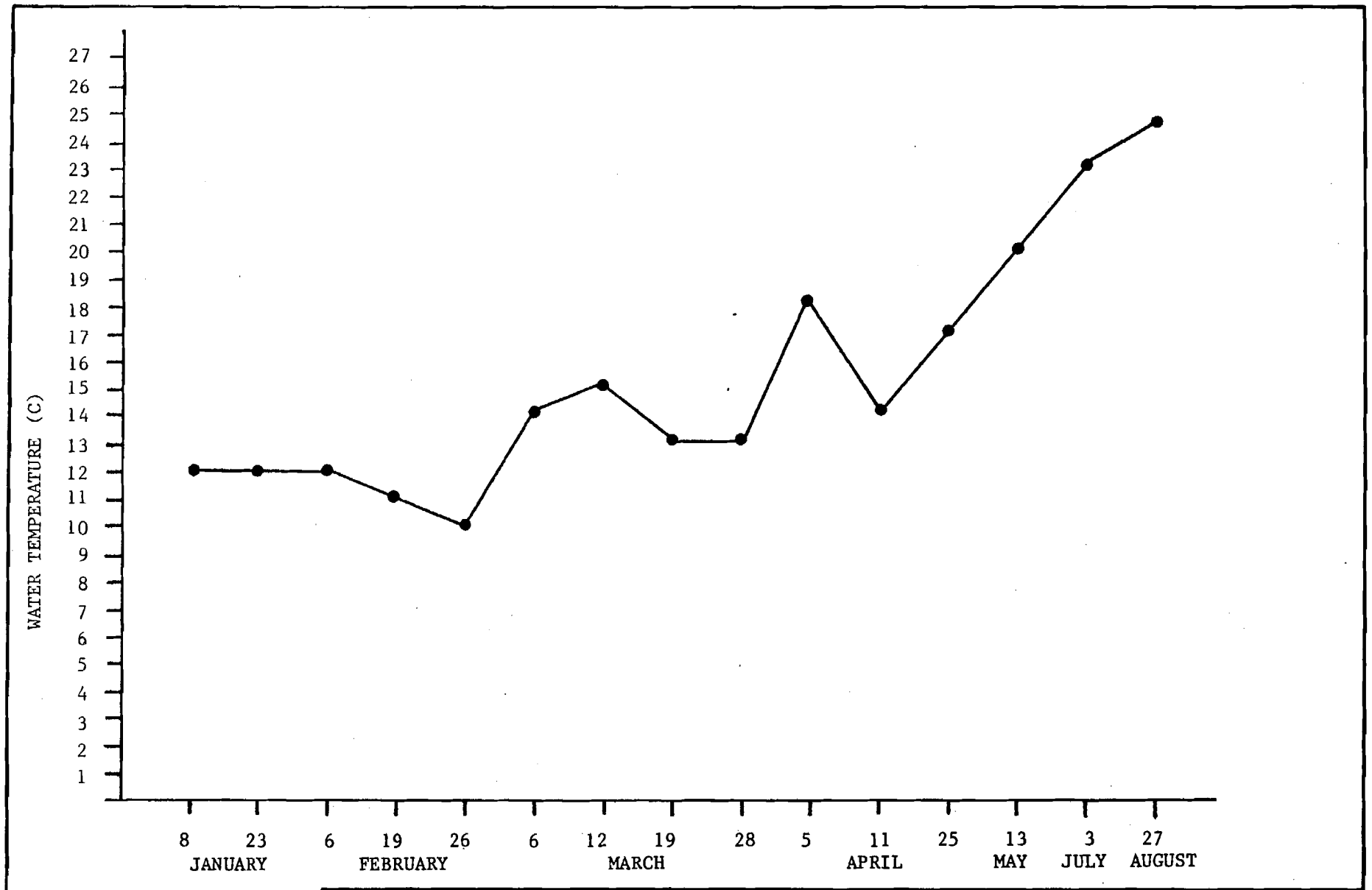
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

AIR TEMPERATURES FOR THE NIGHT SURVEYS FOR 1974

FIGURE 3

433-9



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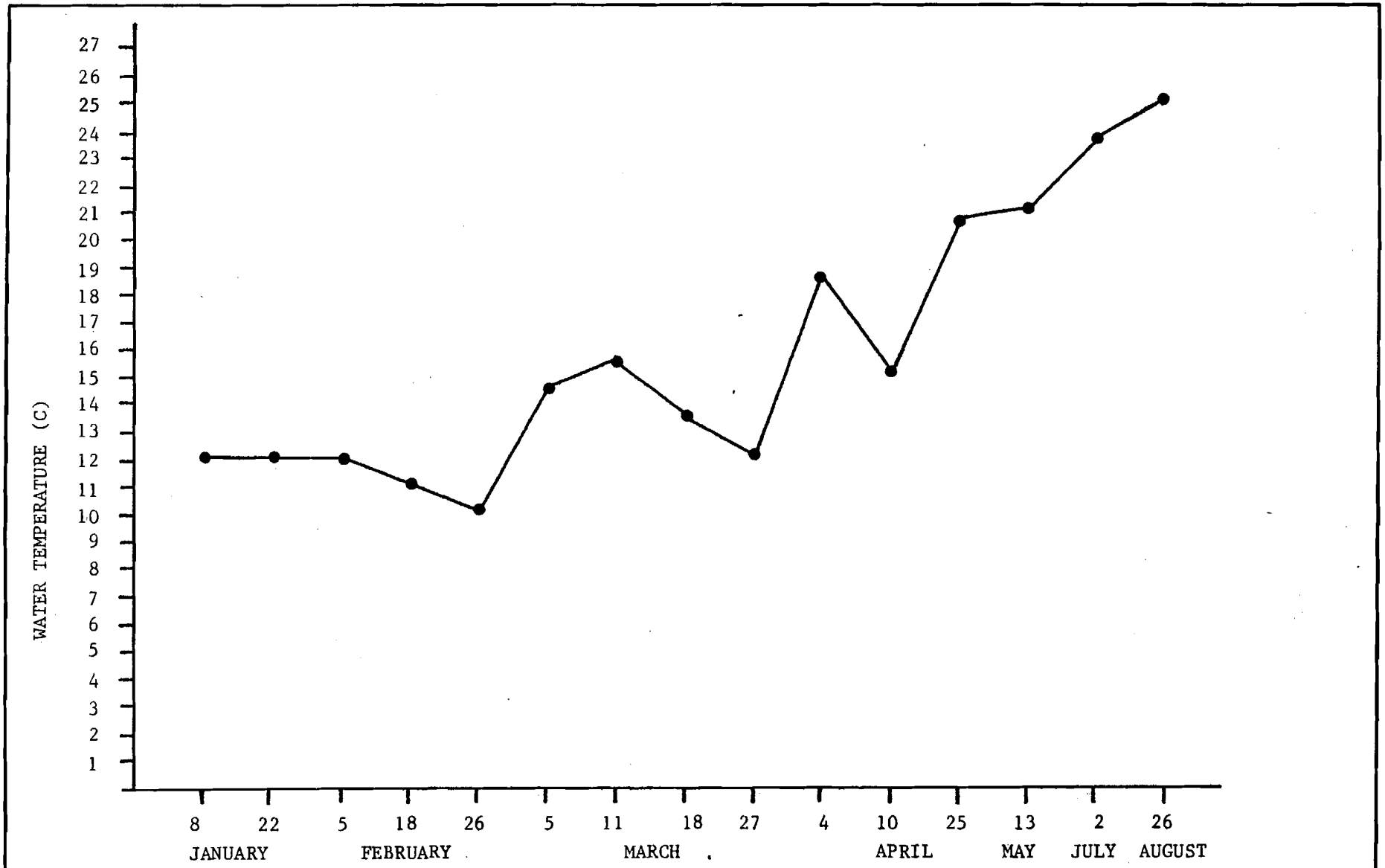
UNIT 1 AND UNIT 2

WATER TEMPERATURES FOR THE SAVANNAH RIVER DAY SURVEYS FOR 1974

FIGURE 4

433-9



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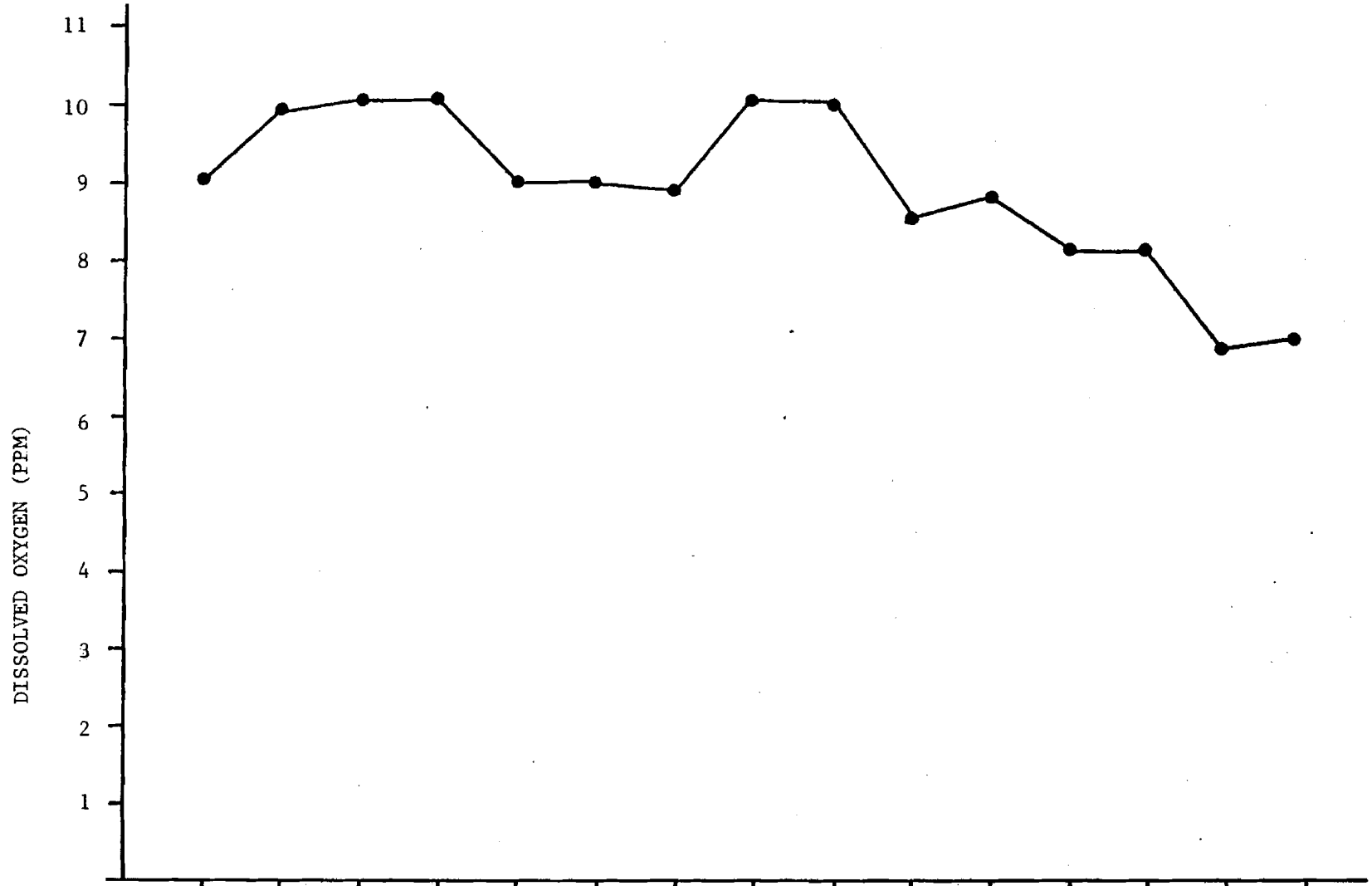
UNIT 1 AND UNIT 2

WATER TEMPERATURES FOR THE SAVANNAH RIVER NIGHT SURVEYS FOR 1974

FIGURE 5

433-9



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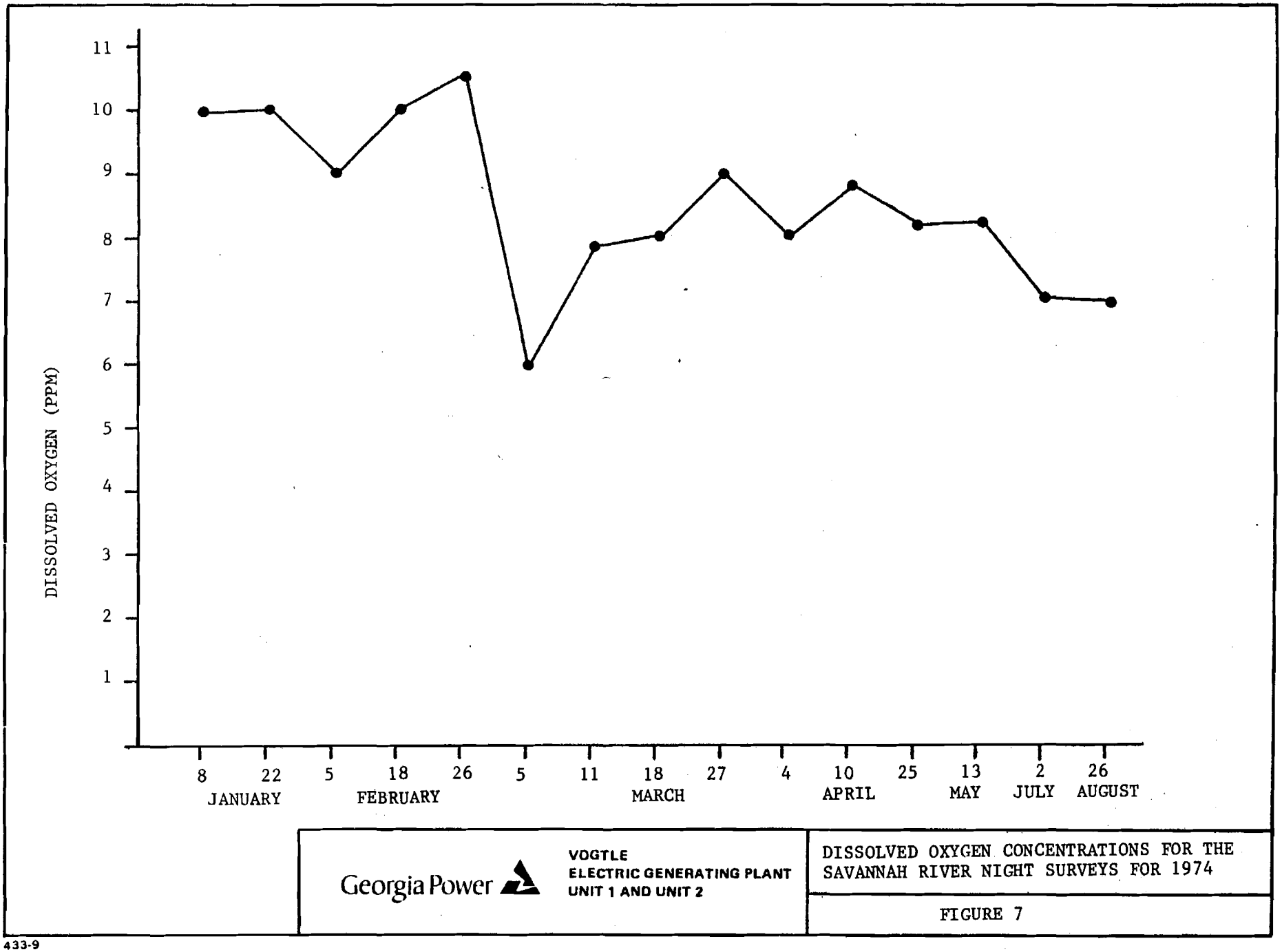
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

DISSOLVED OXYGEN CONCENTRATIONS FOR THE SAVANNAH RIVER DAY SURVEYS FOR 1974

FIGURE 6

433-9



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VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

DISSOLVED OXYGEN CONCENTRATIONS FOR THE SAVANNAH RIVER NIGHT SURVEYS FOR 1974

FIGURE 7

433-9