# VOGTLE ELECTRIC GENERATING PLANT
# BEAVERDAM CREEK ANADROMOUS FISH STUDY, BURKE COUNTY, GEORGIA FROM MARCH, 1977, THROUGH MAY, 1978
# OPERATING LICENSE STAGE ENVIRONMENTAL REPORT
# TECHNICAL DOCUMENT

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VEGP - OLSER

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VEGP - OLSER

## 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 located in Burke County on 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 materials, 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 United States Atomic Energy Commission,[6] to complete the requirement that the extent of use of Beaverdam Creek by anadromous fishes for spawning be established and that the effects of construction on spawning be determined. A study began in March, 1977, and ended in May, 1978.

The creek is approximately six miles in length and flows east-northeast to its confluence with the Savannah River at approximate river mile 148.4. Daniels Branch, a creek approximately five miles in length, flows southeast and High Head Creek, approximately one mile in length, flows northeast with both joining Beaverdam Creek in Telfair Pond (figure 1). Telfair Pond originated with the damming of Beaverdam Creek below the confluence of three creeks.

Game and commercially important anadromous fishes found in the Savannah River in Georgia include the Atlantic sturgeon (Acipenser oxyrhynchus), blueback herring (Alosa aestivalis), hickory shad (Alosa mediocris), American shad (Alosa sapidissima), and the striped bass (Morone saxatilis). The shortnose sturgeon (Acipenser brevirostrum) has been reported by the State of South Carolina[7] in the Savannah River. It is on the federal and State of Georgia[8] endangered and threatened species lists.

METHODS

One permanent station, Station 1.0 (figure 1), was sampled weekly beginning March 2 and ending May 3, 1977, and from March 7 to May 3, 1978. Because of flooding in 1977, surveys could not be conducted the weeks of April 4 to 8 or April 25 to 29. When river levels decreased so that sampling could be continued, the spawning in Beaverdam Creek by anadromous fishes was completed. The April 14, 1977, survey was conducted approximately 1 to 1½ miles upstream from the mouth of Beaverdam Creek due to the elevated river level. In contrast, river levels were low in 1978, allowing continuous weekly sampling.

Adult fish in 1977 were sampled using 2, 3, and 4-inch stretch mesh gill nets set at dusk and collected at dawn the following day. A hoop net with blockoff wings was used in the 1978 study, set for the same duration of time. Specimens which could be positively identified in the field and were not needed for the reference collection were released. Other specimens were preserved in a ten percent formalin solution and were taken to the Environmental Affairs Center in Decatur, Georgia.

Larval fish and eggs in 1977 were sampled with a ½ x ½ m net and a 1-m diameter drift net with a 760 micron mesh. Samples were collected at three locations across the creek. The net was placed on the bottom for a 15-minute duration. In 1978, two surveys were conducted using the ½ x ½ m net at two locations for 15 minutes each, but was later changed to one sample using a 1-m diameter drift net taken in the middle of the creek on the bottom for two hours. This proved to be more effective in procurring eggs and larvae. Samples were preserved in the field with ten percent formalin.

Physicochemical data collected in conjunction with the biological data included air and water temperatures, dissolved oxygen, pH, and light penetration. A YSI Model 54 oxygen meter was used to measure air and

water temperatures and dissolved oxygen. A Beckman Electromate pH meter was used in 1977 and an Orion Ionalyzer Model 399A in 1978. Light penetration was measured using a secchi disc.

RESULTS AND DISCUSSION

The family, scientific, and common names of all fishes including resident species collected during the anadromous fish study are given in table 1.

The Atlantic sturgeon, according to Breder and Rosen,[9] spawned at water temperatures of 13.3 C (56 F) and above, which agrees with Scott and Crossman,[10] who stated that the species spawned at temperatures of 13.3 to 17.8 C (54 to 64 F). The spawning site was "over a hard bottom of clay, rubble, gravel, or shell in shallow running water or water up to five fathoms deep; possibly in pools below waterfalls."[11] The Atlantic sturgeon spawned in water over a hard, clay bottom.[10][11] The shortnose sturgeon spawned in the middle reaches of large tidal rivers in the spring.[10][12] The striped bass spawned in tidal-fresh or slightly brackish water in large rivers with a high discharge in April and May.[9][13][14] Spawning sites and temperatures for the American shad, hickory shad, and blueback herring showed some differences according to the available literature. The American shad spawned at temperatures of 12 to 20 C in the mainstream of a river near the mouths of tributaries and creeks and rarely, if ever, in lakes.[11][13][10] Street[15] reported blueback herring spawned in swamps and lakes at temperatures of 15 to 20 C and not the main channel in the Altamaha River, Georgia, which contradicted the findings of Loesch and Lund[16] that they were highly selective and preferred fast-flowing water and associated hard substrate but not standing water. Hickory shad spawned in the Altamaha River at temperatures of 12 to 26 C in large tributaries and lakes and not in the mainstream of the river.[15]

Water temperatures during the study period ranged from 10 to 22 C for 1977 and from 8.9 to 21 C for 1978. The Atlantic sturgeon has not been collected in Beaverdam Creek, although larvae have been collected in drift samples from the Savannah River. Beaverdam Creek did not appear to be suitable for spawning for this species. The creek bottom consisted of drifting sand which did not concur with the spawning habitats for the Atlantic sturgeon.[10][11] Shortnose sturgeon, striped bass, and American shad, because of their preference in spawning sites, did not utilize Beaverdam Creek. Hickory shad and blueback herring were more likely to spawn in the creek. This was indicated by the numbers collected during the study (tables 2 and 3) and by the literature search. Blueback herring seemed best suited for spawning in the creek because the physical conditions of the creek were similar to those described by Loesch and Lund.[16] Water temperatures were optimum for spawning beginning in mid-March to early April, and the Alosa spp. eggs collected in the drift samples (tables 4 and 5) fit the description of blueback herring.

The low numbers of alosids collected may have indicated a low utilization of Beaverdam Creek and the adjacent Savannah River for spawning. "Upstream distribution is more likely a function of seeking desirable spawning sites," stated Loesch and Lund.[16] Davis and Cheek[17] noted that blueback herring have spawned as far as 134.8 miles upstream in the Cape Fear River, North Carolina. Beaverdam Creek is located approximately 150.0 miles from the mouth of the Savannah River. Loesch[18] also noted that different areas of a brook were used for spawning, depending on the rainfall and runoff intensities. Loesch and Lund[16] found that during periods of drought, spawning was not observed in tributaries with reduced flow. The low numbers of species and individuals collected, especially alosids in 1978, may have indicated the effects of low rainfall[19] thus low river elevations. Figure 2 presents the monthly precipitation for the Augusta area for January through May 1977 and 1978 and the record mean values for those months.

Secchi disc readings ranged from 15.4 to greater than 39.0 inches in 1977 and from 31.3 to greater than 39.0 inches in 1978. The creek was muddy only for short periods after heavy rainfall or when the creek flow was reversed because of the backflow of the river water as in 1977. Dissolved oxygen ranged from 6.6 to 10.0 ppm in 1977 and from 6.9 to 10.0 ppm in 1978; pH ranged from 5.5 to 7.7 and from 6.2 to 7.2, respectively for 1977 and 1978.

## CONCLUSION

Because of the low number of eggs and adults collected in the gill net, hoop net, and larval drift survey, the conclusion was Beaverdam Creek provided minor use for spawning for blueback herring. Physical characteristics notable creek bottom composition and flow made the creek unsuitable for spawning for the remaining anadromous species except the hickory shad. No reason can be given that would explain why hickory shad did not spawn in Beaverdam Creek.

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TABLE 1 (PAGE 1 OF 2)

FAMILY, SCIENTIFIC, AND COMMON NAMES OF FISHES COLLECTED
DURING THE 1977-1978 BEAVERDAM CREEK ANADROMOUS FISH STUDY

| Scientific Name | Common Name | 1977 | 1978 | Totals |
|---|---|---|---|---|
| GILL NET AND HOOP NET SURVEY | | | | |
| Lepisosteidae | | | | |
| *Lepisosteus osseus* | Longnose gar | 14 | 3 | 17 |
| *Lepisosteus platyrhincus* | Florida gar | 3 | | 3 |
| Amiidae | | | | |
| *Amia calva* | Bowfin | 9 | | 9 |
| Anguillidae | | | | |
| *Anguilla rostrata* | American eel | | 1 | 1 |
| Clupeidae | | | | |
| *Alosa aestivalis* | Blueback herring | 44 | 10 | 54 |
| *Alosa mediocris* | Hickory shad | 17 | | 17 |
| *Alosa sapidissima* | American shad | 7 | | 7 |
| *Dorosoma cepedianum* | Gizzard shad | 12 | 4 | 16 |
| Catostomidae | | | | |
| *Erimyzon oblongus* | Creek chubsucker | 1 | 2 | 3 |
| *Minytrema melanops* | Spotted sucker | 22 | 1 | 23 |
| *Moxostoma anisurum* | Silver redhorse | 1 | | 1 |
| Ictaluridae | | | | |
| *Ictalurus brunneus* | Snail bullhead | 4 | 31 | 35 |
| *Ictalurus catus* | White catfish | 2 | | 2 |
| *Ictalurus natalis* | Yellow bullhead | 4 | | 4 |
| *Ictalurus nebulosus* | Brown bullhead | 3 | | 3 |
| *Ictalurus platycephalus* | Flat bullhead | 10 | | 10 |
| *Ictalurus punctatus* | Channel catfish | 5 | 1 | 6 |
| Centrarchidae | | | | |
| *Centrarchus macropterus* | Flier | | 1 | 1 |
| *Lepomis auritus* | Redbreast sunfish | 1 | 7 | 8 |
| *Lepomis macrochirus* | Bluegill | 1 | 9 | 10 |
| *Lepomis microlophus* | Redear sunfish | | 2 | 2 |
| *Micropterus salmoides* | Largemouth bass | 3 | | 3 |
| *Pomoxis annularis* | White crappie | 1 | | 1 |
| *Pomoxis nigromaculatus* | Black crappie | 3 | 3 | 6 |
| Mugilidae | | | | |
| *Mugil cephalus* | Striped mullet | | 1 | 1 |
| DRIFT NET SURVEY | | | | |
| Clupeidae | | | | |
| *Alosa* spp. eggs | Shad | 2 | 58 | 60 |
| Cyprinidae | | | | |
| *Notropis cummingsae* | Dusky shiner | 1 | | 1 |
| *Notropis lutipinnis* | Yellowfin shiner | 1 | | 1 |
| *Notropis petersoni* | Coastal shiner | 7 | | 7 |
| *Opsopoeodus emiliae* | Pugnose minnow | 1 | | 1 |

TABLE 1 (PAGE 2 OF 2)

| Scientific Name | Common Name | 1977 | 1978 | Totals |
|---|---|---|---|---|
| Catostomidae | | | | |
| *Erimyzon* spp. *larvae* | Chubsucker | | 1 | 1 |
| Percidae | | | | |
| *Percidae eggs* | Darter | | 7 | 7 |
| *Percidae larvae* | Darter | 77 | 37 | 114 |

TABLE 2

SAMPLING DATES AND NUMBER OF INDIVIDUALS COLLECTED IN THE GILL NET SURVEYS FOR 1977

| Species | March 2 | March 9 | March 17 | March 22 | March 31 | April 14 | April 19 | May 3 | Number of Individuals |
|---|---|---|---|---|---|---|---|---|---|
| Amia calva | | 5 | | | | | | | 5 |
| Lepisosteus osseus | | | 1 | 1 | 1 | 2 | | 9 | 14 |
| Lepisosteus platyrhincus | | | | | | | | 3 | 3 |
| Alosa aestivalis | 2 | 4 | 19 | 17 | 2 | | | | 44 |
| Alosa mediocris | 7 | 5 | 1 | 4 | | | | | 17 |
| Alosa sapidissima | | 1 | 2 | 3 | | | 1 | | 7 |
| Dorosoma cepedianum | 2 | 1 | 4 | 3 | 1 | | | 1 | 12 |
| Erimyzon oblongus | | | | | | 1 | | | 1 |
| Minytrema melanops | 10 | | 5 | 2 | | 1 | 2 | 2 | 22 |
| Moxostoma anisurum | | | 1 | | | | | | 1 |
| Ictalurus catus | | | 1 | | 1 | | | | 2 |
| Ictalurus brunneus | | | 1 | 2 | 1 | | | | 4 |
| Ictalurus natalis | | | | | | 4 | | | 4 |
| Ictalurus nebulosus | | | 3 | | | | | | 3 |
| Ictalurus platycephalus | | | 1 | 1 | | 3 | 5 | | 10 |
| Ictalurus punctatus | | 1 | 2 | 2 | | | | | 5 |
| Lepomis auritus | | | | | | 1 | | | 1 |
| Lepomis macrochirus | 1 | | | | | | | | 1 |
| Micropterus salmoides | 2 | | | | | 1 | | | 3 |
| Pomoxis annularis | | | | | | 1 | | | 1 |
| Pomoxis nigromaculatus | | 2 | 1 | | | | | | 3 |
| Totals | 24 | 19 | 42 | 35 | 6 | 14 | 8 | 15 | 163 |

TABLE 3

SAMPLING DATES AND NUMBER OF INDIVIDUALS COLLECTED IN THE HOOP NET SURVEYS FOR 1978

| Species | March 7 | March 14 | March 21 | March 28 | April 4 | April 10 | April 17 | April 24 | May 3 | Number of Individuals |
|---|---|---|---|---|---|---|---|---|---|---|
| Lepisosteus osseus | | | | | 1 | 1 | | 1 | | 3 |
| Anguilla rostrata | | | | | | | | | 1 | 1 |
| Alosa aestivalis | | 1 | | | 9 | | | | | 10 |
| Dorosoma cepedianum | 1 | 2 | | | 1 | | | | | 4 |
| Erimyzon oblongus | | | 1 | 1 | | | | | | 2 |
| Minytrema melanops | 1 | | | | | | | | | 1 |
| Ictalurus brunneus | | 4 | 26 | 1 | | | | | | 31 |
| Ictalurus punctatus | | | | | | | | | 1 | 1 |
| Centrarchus macropterus | 1 | | | | | | | | | 1 |
| Lepomis auritus | 2 | | 4 | | 1 | | | | | 7 |
| Lepomis macrochirus | 2 | | 2 | | 3 | | 1 | | 1 | 9 |
| Lepomis microlophus | | | | | | | 1 | | 1 | 2 |
| Pomoxis nigromaculatus | | 1 | | 2 | | | | | | 3 |
| Mugil cephalus | | | | | | | | 1 | | 1 |
| Totals | 7 | 8 | 33 | 39 | 15 | 1 | 2 | 2 | 4 | 76 |

TABLE 4

TAXA COLLECTED DURING THE 1977 BEAVERDAM CREEK ANADROMOUS FISH STUDY (DRIFT SURVEY)

| Taxa | Sampling Dates: March 2 | March 8-9 | March 16-17 | March 22-23 | March 30-31 | April 4-8 | April 13-14 | April 19 | May 3 | Totals |
|---|---|---|---|---|---|---|---|---|---|---|
| *Alosa* spp. eggs | (a) | (a) | 2 | | (b) | (b) | | (b) | | 2 |
| Percidae larvae | | | | 1 | | | 68 | | 8 | 77 |
| *Notropis lutipinnis* Adult | | | | | | | 1 | | | 1 |
| *Notropis petersoni* Adult | | | | | | | 7 | | | 7 |
| *Opsopoeodus emiliae* Adult | | | 1 | | | | | | | 1 |
| Totals | | | 3 | 1 | | | 76 | | 8 | 88 |

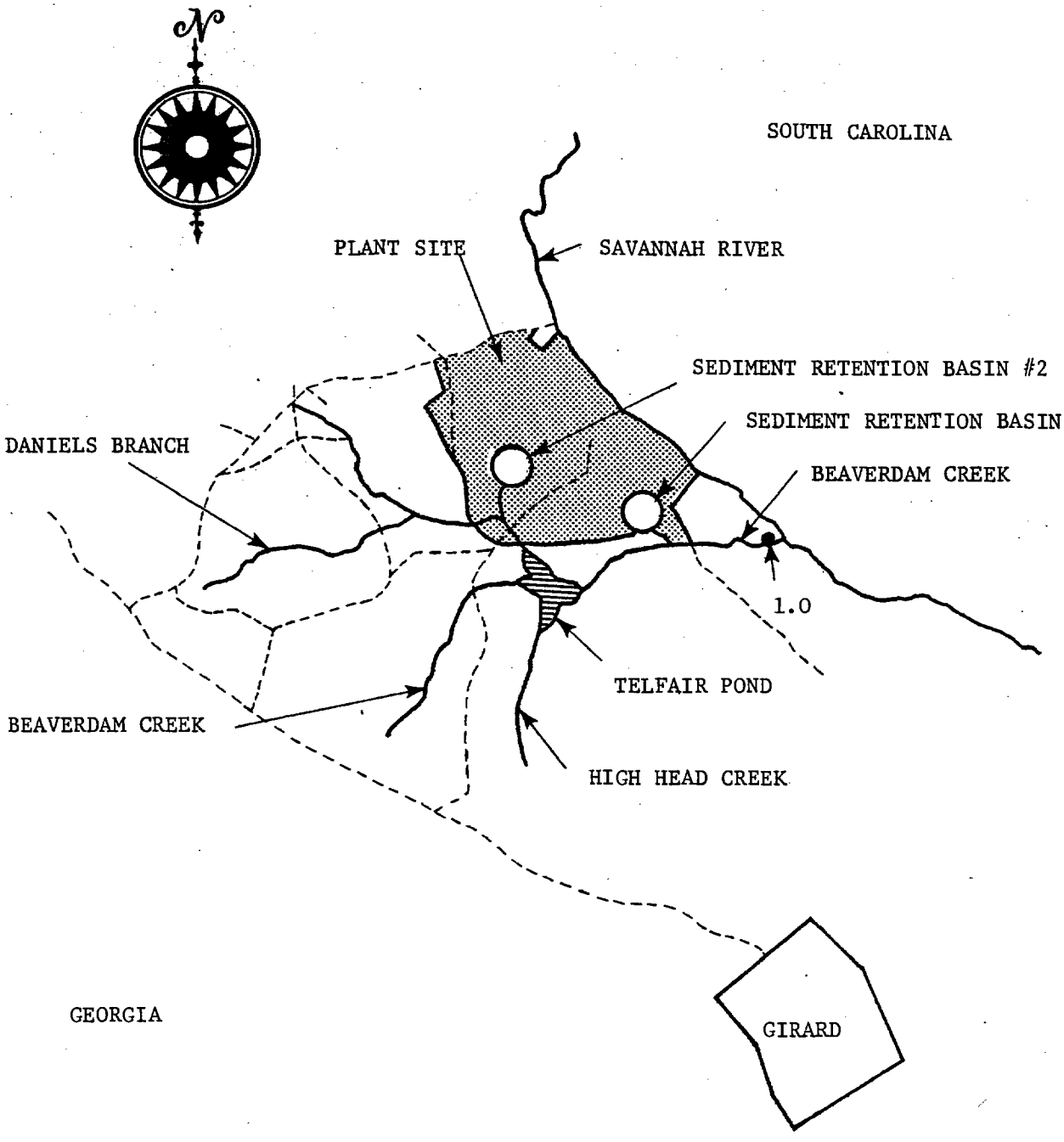
a. No species collected
b. No survey

TABLE 5

TAXA COLLECTED DURING THE 1978 BEAVERDAM CREEK ANADROMOUS FISH STUDY (DRIFT SURVEY)

| | Sampling Dates | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Taxa | March 7 | March 14 | March 21 | March 28 | April 4 | April 10 | April 17 | April 24 | May 3 | Totals |
| *Alosa* spp. eggs | (a) | (b) | (b) | | 57 | 1 | | | | 58 |
| Percidae eggs | | | | | | | 5 | 2 | | 7 |
| Percidae larvae | | | | | 13 | 8 | 6 | 9 | 1 | 37 |
| *Erimyzon* spp. larvae | | | | | | | | 1 | | 1 |
| *Notropis cummingsae* Adult | | | | | 1 | | | | | 1 |
| Totals | | | | | 71 | 9 | 11 | 12 | 1 | 104 |

a. No survey
b. No species collected

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VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

STATION LOCATION FOR THE BEAVERDAM CREEK ANADROMOUS FISH STUDY

FIGURE 1

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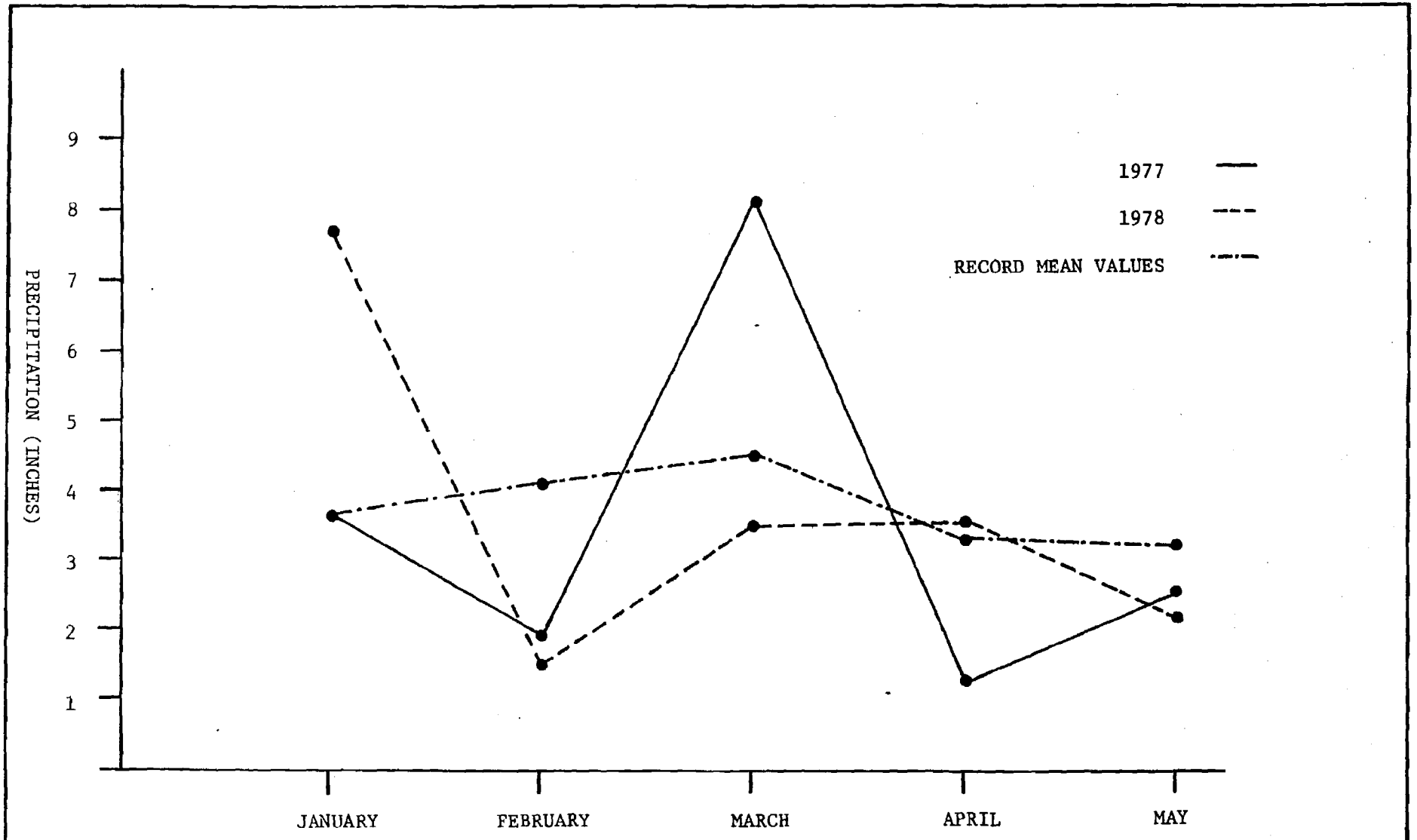


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VOGTLE
ELECTRIC GENERATING PLANT
UNIT 1 AND UNIT 2

COMPARISON OF MONTHLY PRECIPITATION FOR THE AUGUSTA AREA FOR JANUARY THROUGH MAY 1977 AND 1978

FIGURE 2

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