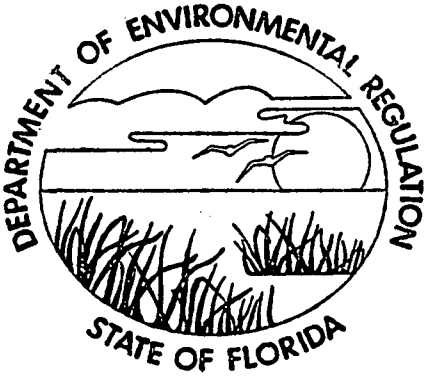

BIOASSAYS OF THE SCHOLTZ POWER PLANT

SNEADS, JACKSON COUNTY, FLORIDA

NPDES #FL0002283

DECEMBER 20, 1985

Biology Section
Division of Environmental Programs

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Biology Section
Bureau of Laboratories and
Special Programs
December 20, 1985

EXECUTIVE SUMMARY

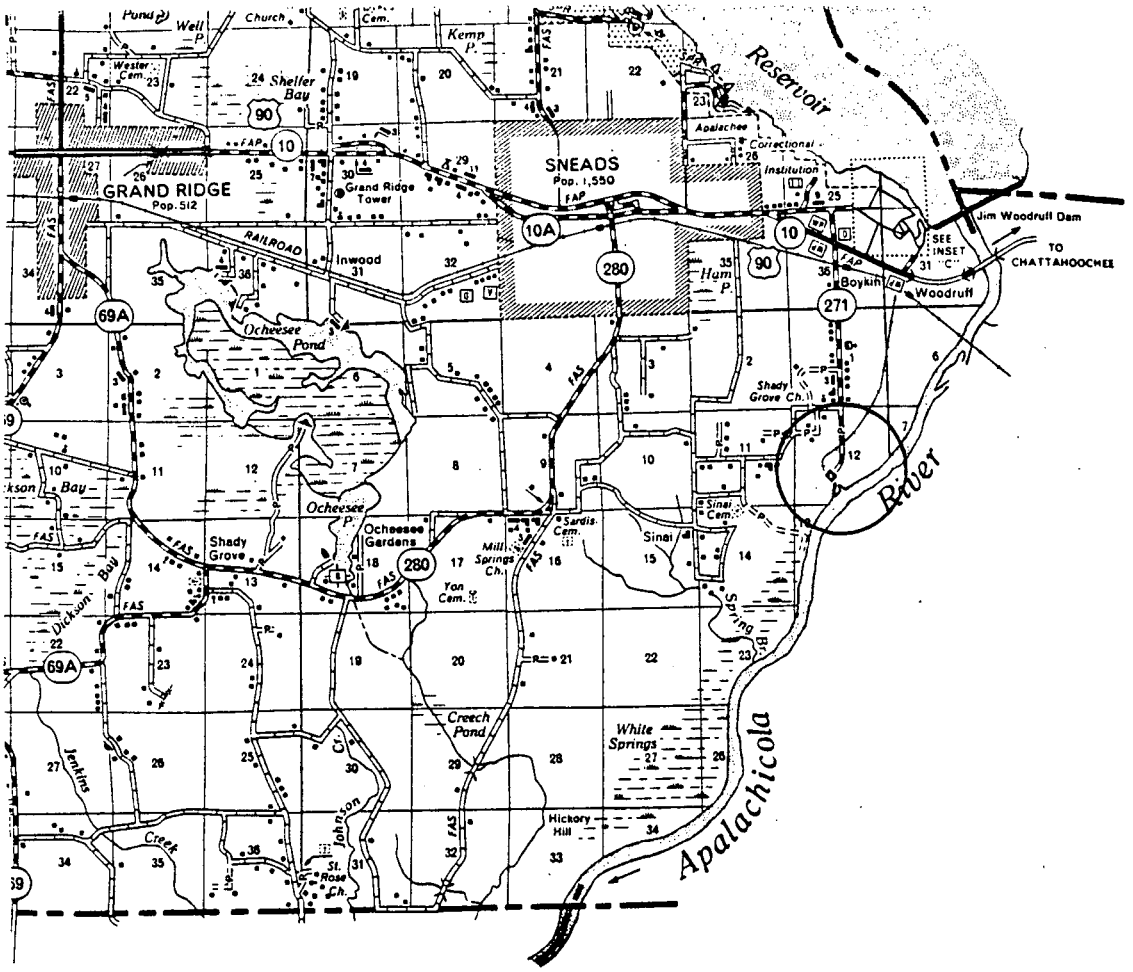
Scholtz Power Plant, Sneads, NPDES #FL0002283, on 13 to 15 November, 1985

The sample of effluent collected from the Scholtz Power Plant outfall #002 was not acutely toxic to the test organisms, Daphnia pulex and Notropis leedsi. No mortality occurred during the 48 hour tests. Chemical analyses were not performed since the sample was not toxic.

INTRODUCTION

The Scholtz Power Plant is a coal fired steam-electricity generating facility owned and operated by the Gulf Power Company. The faciltiy is located in Sneads, Jackson County, Florida (Fig. 1). Discharge from the Scholtz Power Plant may consist of non-contact cooling water (001), metal cleaning wastes and ash pond discharge (002), boiler blowdown (004), and construction runoff (006). Dishcarge is to the Apalachicola River.

The Biology Section performed static acute toxicity bioassays on a sample of effluent collected from the Scholtz Power Plant outfall #002, from 13 to 15 November, 1985. The results of these tests are presented in this report. Those involved in performing the tests and in preparation of this report were: R. B. Frydenborg, M. L. Moultrie and M. L. Roll.



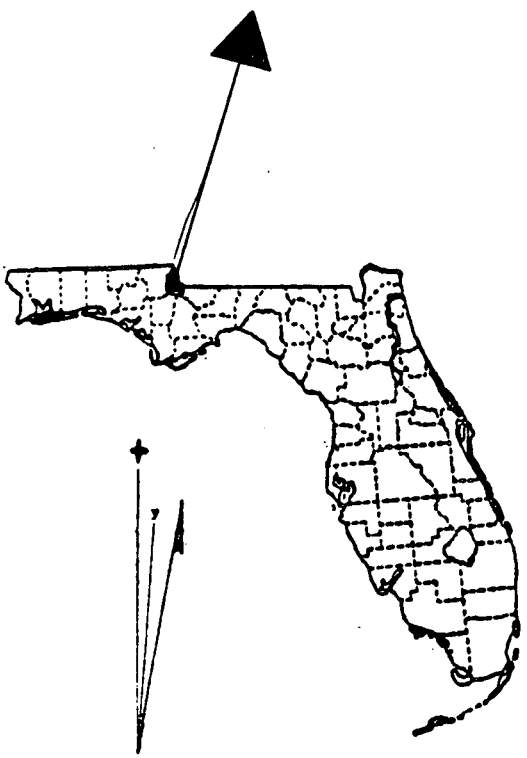


Figure 1. Portion of Jackson County, Florida, including location of the Scholtz Power Plant.

METHODS AND MATERIALS

Test methods used to conduct these static bioassays are extensively described by Peltier and Weber (1985) and the FDER Biology Section (1985). The organisms selected for this study include a species recommended by Peltier and Weber (1985), the U.S. EPA (1978), and the FDER Biology Section (1985). Additionally, the Biology Section maintains cultures of several species of organisms indigenous to the State of Florida. One of these indigenous species was also selected for testing. Life histories of these test organisms and maintenance procedures used to culture them are detailed below.

History and Maintenance of Bioassay Organisms

Daphnia pulex (water flea) - A breeding culture of Daphnia pulex was obtained from the EPA laboratory in Athens, Georgia, in March, 1979. This culture has been maintained since its arrival in 2 1/2 gallon all-glass aquaria, filled with unchlorinated DER well water, under a 16:8 hour light-dark cycle. Organisms are fed a liquified blend of Purina Trout Chow® and Cerophyl® twice daily, once daily on weekends, and are kept at a constant temperature of 22° ± 2°C. The aquaria are cleaned weekly by siphoning off half the water along with the detritus and excess organisms, and then refilling with fresh aerated well water. Additional measures are taken and/or new cultures started in the event of abnormal circumstances such as: declining populations, ephippia formation, or excessive fungal or bacterial growth.

Notropis leedsi (bannerfin shiner) - Approximately 40 adult bannerfin shiners were obtained from an indigenous population in the upper Suwannee River during October, 1981. The breeding stock is maintained in 30 and 125 gallon all-glass aquaria equipped with a flow-through water exchange system. Water for this system is unchlorinated and is pumped from the DER deep well. The bannerfin shiners are reared at 22° ± 2°C under a 16:8 hour light-dark cycle and are fed Tetra-Min® and frozen Artemia (brine shrimp) twice daily, and once daily on weekends. Breeding and egg hatching are encouraged at 25°C. The eggs are laid between stacked red ceramic tiles separated by a 3mm bead of silicone. Most of the eggs adhere to the tiles and are easily removed to heated, aerated hatching tanks. The narrow space between the tiles eliminates egg predation by adult fish. New hatching tanks are started regularly to segregate fry into even age groups. Newly hatched fry are fed a liquefied blend of Purina Trout Chow® and Cerophyl® twice daily. After one week, feeding is augmented with newly hatched Artemia nauplii and finely crushed Tetra Min®. The fish used in this test were three weeks old at the time of the test.

To ensure the uniform sensitivity of these test organisms to toxic substances, the Biology Section conducts monthly standard reference toxicant bioassays using sodium lauryl sulfate as the reference toxicant.

Test Methods

Methods used to perform acute toxicity bioassays are described by Peltier and Weber (1985) and the FDER Biology Section (1985). Some of the methods described below are more specific than those of Peltier and Weber. These will be noted in more detail.

Sampling Methods and Test Dates

Two 48 hour static acute toxicity screening bioassays were performed on a sample of effluent collected from the Scholtz Power Plant outfall #002. The tests were performed from 1430 hours on 13 November, to 1430 hours on 15 November, 1985.

The sample was collected by Mr. Stephen Baisden of DER's Northwest District office at 1455 hours on 12 November, 1985 using standard wastewater sampling procedures. Separate samples were obtained for chemical and biological testing. Samples for metal analyses were preserved with HNO_3. Samples for organic chemical analyses and for the bioassays were unpreserved. The samples were iced and transported to the DER laboratory in Tallahassee for analyses within 24 hours of collection.

Test Temperature

Upon arrival of the iced (4°C) bioassay samples in the Tallahassee laboratory, the containers were placed in warm water and the temperature of the samples allowed to rise to 20° $\pm$ 2°C. Although this temperature may be different than the temperature of the sample during collection, it is the temperature range to which the test organisms are acclimatized and is the range recommended in the above referenced bioassay protocols. This avoids stressful effects caused by exposure to unusually cold or warm samples.

Freshwater Tests

Freshwater for dilution of the effluent samples was obtained from the same DER deep well that is used to culture the test organisms. The concentration series selected for this study is presented in Table 1.

Two replicates, of each concentration and a control, were used to test with the water flea, Daphnia pulex. Flint glass jars of 250 ml capacity were used as test chambers, and 200 ml of the appropriate test concentration was placed in each chamber. Daphnia were siphoned into a large culture dish to isolate the proper size and age organisms (neonates). To accomplish this, the water fleas were siphoned through a stainless steel screen. The trapped adults were then discarded. These neonates were then transferred by glass pipette, examined for injury, and were loaded 10 per chamber, resulting in 20 per test concentration. Water fleas were fed during this test.

Two replicates, of each concentration and a control, were used for the Notropis leedsi (bannerfin shiner) bioassay. The fish were transferred individually or by twos, into wide mouth quart jars containing 500 ml each of the appropriate test concentration, and were loaded 5 per chamber, resulting in 10 per concentration. Fish were not fed during this test.

Test Parameters

Dissolved oxygen (YSI Model 57 oxygen meter), pH (Corning Model 7 pH meter with Orion Ross® combination electrode), temperature (NBS calibrated glass thermometer), and the number of live organisms were recorded for each test concentration at 0 hours, 24 hours, and 48 hours. Total alkalinity and total hardness (measured as $CaCO_3$ using HACH Chemical Company reagents) were recorded at the beginning of the test for the controls and the 100% effluent concentration. The specific conductance (YSI Model 33 S-C-T meter) of each test concentration was recorded at the beginning and end of the test. All instruments were calibrated daily according to manufacturer's recommendations. These values were recorded on the bioassay data forms and are presented in Tables 2 and 3.

Table 1. Concentration Series and Volumes Used for These Static Bioassays.

Daphnia pulex (water flea)-Screening test only

Concentration	Dilution Water	Effluent	Total Volume
Control	200.0 ml	--------	200 ml
50.0%	100.0 ml	100.0 ml	200 ml
100.0%	--------	200.0 ml	200 ml

Notropis leedsi (bannerfin shiner)

Concentration	Dilution Water	Effluent	Total Volume
Control	500 ml	--------	500 ml
50.0%	250 ml	250 ml	500 ml
100.0%	------	500 ml	500 ml

Table 2. Data recorded during 48 hour, Daphnia pulex, static acute toxicity bioassay of the Scholtz Power Plant, Sneads, Jackson County, Florida, NPDES #FL0002283, on 13 to 15 November, 1985.

Concentration or %	Number of Live Organisms			Dissolved Oxygen (mg/1)			pH			Temperature (°C)			Conductivity (umhos)	
	0	24	48	0	24	48	0	24	48	0	24	48	0	48
Control	10	10	10	8.3	7.7	8.5	7.6	7.8	7.9	22.0	20.5	21.1		
Control	10	10	10	8.3	7.7	8.5	7.6	7.8	7.9				210	242
50.0%	10	10	10	8.4	8.0	8.5	7.6	7.8	7.9	21.4	20.4	21.0		
50.0%	10	10	10	8.4	8.0	8.5	7.6	7.8	7.9				358	408
100.0%	10	10	10	8.8	8.0	8.5	7.7	7.7	7.7	21.0	20.4	20.9		
100.0%	10	10	10	8.8	8.0	8.5	7.7	7.7	7.7				580	599

Control Water

NH_3(as NH_3)(mg/1) _____

Total ammonia (as N)(mg/1) _____

Total Alkalinity 107 (mg/1 $CaCO_3$)

Total Hardness 115 (mg/1 $CaCO_3$)

100% Effluent

NH_3(as NH_3)(mg/1) _____

Total ammonia (as N)(mg/1) _____

Total Alkalinity 53 (mg/1 $CaCO_3$)

Total Hardness 185 (mg/1 $CaCO_3$)

Table 3. Data recorded during 48 hour, Notropis leedsi, static acute toxicity bioassay of the Scholtz Power Plant, Sneads, Jackson County, Florida NPDES #FL0002283 on 13 to 15 November, 1985.

Concentration or %	Number of Live Organisms			Dissolved Oxygen (mg/l)			pH			Temperature (°C)			Conductivity (umhos)		
	0	24	48	0	24	48	0	24	48	0	24	48	0	48	
Control	5	5	5	8.2	8.3	8.5	7.8	7.9	8.0	22.0	20.2	20.8			Control Water
Control	5	5	5	8.2	8.3	8.5	7.8	7.9	8.0				208	228	NH_3(as NH_3)(mg/l) ____ Total Alkalinity 107 (mg/l $CaCO_3$)
50.0%	5	5	5	8.5	8.4	8.5	7.8	7.8	7.9	21.4	20.1	20.7			
50.0%	5	5	5	8.5	8.4	8.5	7.8	7.8	7.9				370	395	
100.0%	5	5	5	8.8	8.3	8.5	7.8	7.7	7.8	21.0	20.1	20.7			Total ammonia (as N)(mg/l) ____ Total Hardness 115 (mg/l $CaCO_3$)
100.0%	5	5	5	8.8	8.3	8.7	7.8	7.7	7.8				580	600	
															100% Effluent
															NH_3(as NH_3)(mg/l) ____ Total Alkalinity 53 (mg/l $CaCO_3$)
															Total ammonia (as N)(mg/l) ____ Total Hardness 185 (mg/l $CaCO_3$)

RESULTS AND DISCUSSION

The sample of effluent collected from the Scholtz Power Plant outfall #002 was not acutely toxic to the test organisms, Daphnia pulex and Notropis leedsi. No mortality occurred during the 48 hour tests (Table 2 and 3). Chemical analyses were not performed since the sample was not toxic.

LITERATURE CITED

Florida Department of Environmental Regulation, Biology Section. 1985a. Quality Assurance Manual for Performing Acute Toxicity Tests. (Second Edition). FDER.

Peltier, W. and C. I. Weber. 1985. Methods for measuring the acute toxicity of effluents to aquatic organisms (Third Edition). Environmental Research Laboratory. Athens, Georgia. EPA-600/4-85-012. 217 pp.