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According to Section 404 of the Clean Water Act in the Federal Manual for Identifying and Delineating Jurisdictional Wetlands (1989), a wetland is defined as an area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions. The cypress-tupelo swamp in this three year study clearly fits this definition.

The study area is located in Township 12N, Range 3W, Section 25 northeast of Cord, Arkansas in Independence County. Rouse (1991) describes Section 25 as typical bottomland hardwood forest. Only a remnant of the swamp called Hattie's Brake remains due to heavy clearing for agricultural purposes. Hattie's Brake boarders area farmlands on three sides and is adjacent to the Black River on the other side. Rouse (1991) describes the remnant as having taken on a horseshoe or C-shape that covers 8.1 hectares whose ends are maintained by beaver dams at both extremes. Surface run off from the surrounding farmlands freely enters Hattie's Brake as do several small creeks and a slough that help to maintain the water level of the swamp. Periodically the swamp is flooded from the Black River. All of these inputs bring in nutrients from the outside to support the fauna and plant populaton of the swamp.

The data for six parameters were collected over a three year period from Hattie's Brake and then compared to data from a southern Illinois cypress-tupelo swamp as reported by Mitsch and Gosselink (1986) from studies done by Dorge, Mitsch and Weimhoff in 1984. The data presented in Table 1 from the swamp is very similar to that previously reported from the Black River at Jacksonport (Petersen 1988). The six parameters studied were conductivity (CND), pH, turbidity, dissolved oxygen (D.O.), nitrate and phosphate concentrations.

Hattie's Brake seems to consist primarily of the soil type labeled Amagon-Askew-Forestdale which is defined as deep, level to gently undulating, poorly to moderately well drained, loamy soil (Ferguson et al., 1982). These soils are found on bottomlands along the White and Black Rivers and are moderately suited to cultivated crops that have a short growing season (Ferguson et al., 1982).

Collection trips were made mostly on a weekly basis from May to September over the three year study except when flooding from the Black River occurred. All physical and chemical parameters were measured from the water samples collected in 1000 mL Wheaton collection bottles. The physical tests were performed in the field, and the chemical tests were done both in the field and in the Arkansas College water analysis lab. Franson (1985) provided the procedures used. Specific instruments/methods for these parameters are discussed as follows: pH–Hach One pH meter; Dissolved Oxygen–Hach Portable Dissolved Oxygen meter, membrane electrode method; Conductivity–Hach Conductivity/TDS meter; Turbidity–Hach Portable Turbidimeter; Nitrate concentration–cadmium reduction method using NitraVer6 and NitraVer3 nitrate reagent powder pillows; Phosphate concentration–ascorbic acid method using PhosVer3 phosphate reagent powder pillows. The Turner spectrophotometer Model 330 was used in the determination of the concentrations of the nitrates and phosphates present. Individual results for the physiochemical tests are given in Table 1. Table 2 includes a comparison of data that was collected from a southern Illinois cypress-tupelo swamp and the Independence County Arkansas cypress-tupelo swamp. All of the parameters except for turbidity and nitrate concentration from the Arkansas cypress-tupelo swamp are above those values for the southern Illinois cypress-tupelo swamp. However, more samples were taken for the Independence County Arkansas cypress-tupelo swamp than for the southern Illinois cypress-tupelo swamp.

The conductivity is consistently higher in the Arkansas cypress-tupelo swamp than for the southern Illinois cypress-tupelo swamp. Although there was no data taken for ion concentration over the entire three years, the Arkansas cypress-tupelo swamp would tend toward greater presence of conducting ions or electrolytes. This higher conductivity is also consistent with the data from the Black River because the conductivity for the Black River is lower than that for the Arkansas cypress-tupelo swamp. Welch (1952) has related this higher conductivity with greater biological productivity.

The dissolved oxygen averaged 3-4 mg/l. The data between May 29, 1991 to July 2, 1991 are probably skewed because of instrument malfunction. Therefore, the dissolved oxygen data of the Arkansas cypress-tupelo swamp during that year is not comparable to other studies. The data for 1990 and 1992 are comparable to the Illinois data (Table 2).

The pH of the Arkansas cypress-tupelo swamp was more

basic than the southern Illinois cypress-tupelo swamp. This implies that fewer hydrogen ions are present in the Arkansas cypress-tupelo swamp. This could also imply that the higher conductivity may be due mostly to salts rather than to inorganic acids and bases. The swamp was probably very high in calcium ions due to the presence of limestone ($CaCO_3$) in surrounding lands. This abundance of calcium mostly comes from the Black River.

The nitrogen concentration was lower in the Arkansas cypress-tupelo swamp than the southern Illinois cypress-tupelo swamp. Nitrate concentrations averaged 0.22 during the three years that data was collected. This value of 0.22 is reasonable because the nitrate concentration from the Black River in Table 2 has a mean value of 0.22. Nitrate generally occurs in trace quantities in surface water but may attain high levels in some groundwater (Franson 1985). Nitrate is also an essential nutrient for many photosynthetic autotrophs and in some cases has been identified as the growth-limiting nutrient. It is evident that the Arkansas cypress-tupelo swamp supports a large population of plants both along its banks and on it surface.

The phosphate concentration for the Arkansas cypress-tupelo swamp is higher than that for the southern Illinois cypress-tupelo swamp. This increase may be due to the ascorbic acid method used to test for the phosphate. Large amounts of turbidity could cause higher phosphate readings because the acid present in the powder pillow could dissolve some of the suspended particles and yield a higher reading. This seems unlikely because the turbidity recorded for the Arkansas cypress-tupelo swamp. The increase in the phosphate concentration is almost assuredly due to the run-off from the agricultural land that surrounds the swamp. The fertilizers used on the crops are carried with surface water with storm run-off and to a lesser extent with melting snow (Franson 1985). Phosphate is essential to the growth of organisms and can be the nutrient that limits the primary productivity of a body of water. The Arkansas cypress-tupelo swamp has been found to support a large fauna of aquatic invertebrates and other micro-and macroorganisms (Rouse et al., 1991).

Turbidity was one of the parameters that was measured to be lower in the Arkansas cypress-tupelo swamp than in the southern Illinois cypress-tupelo swamp. The fluctuation of the turbidity was attributed to changes in rainfall since murkiness increased after heavy rains. It can be concluded from the Arkansas cypress-tupelo swamp data that the Arkansas cypress-tupelo swamp has a fairly high sedimentation rate, yielding fairly clear water. The high tubidity can be used to explain the high phosphate concentration that was recorded.

The results obtained during the study were comparable with those obtained in Illinois, except for conductivity, turbidity, and pH (Table 2). Conductivity in the study area compared to that of the Cache River in Illinois, but was much higher than that reported for the Black River. Decomposing organic material in the swamp would account for the lower dissolved oxygen reading, while the stream load of the Black River would increase its turbidity.

Table 1. Ecological Data for Hattie's Brake.

Date 1990	CND (mS/m)	pH	Turbidity (NTU)	D.O. (Mg/L)	(NO_3)	(PO_4)
June 26	21	7.43	2.4	----	22	.64
July 3	23	7.20	14.0	4.2	.29	.12
July 10	27	7.27	15.0	2.8	.22	.10
July 16	24	7.04	4.1	2.3	.22	.31
July 24	22	7.77	6.0	4.4	.25	.24
Aug. 1	24	7.30	.39	3.2	.22	.20
Aug. 7	24	7.27	.75	2.4	.26	.19
Aug. 15	23	7.45	.30	2.5	.19	.05
Sept. 25	30.5	7.02	.53	2.45	.22	.40
Oct. 30	33	----	2.8	----	.27	.332
Nov. 16	27	7.65	6.6	2.7	.222	.60
Dec. 7	30	6.57	.67	3.4	.22	.10
Average	26	7.27	4.46	3.04	.234	.274

Date 1991	CND (mS/m)	pH	Turbidity (NTU)	D.O. (Mg/L)	(NO_3)	(PO_4)
May 29	31	7.45	.40	8.1	.30	.64
June 6	25	7.00	6.6	10	.37	.24
June 11	25	7.76	.38	11.5	.30	1.12
June 18	25	7.38	.37	8.8	.30	.38
June 27	31	7.38	4.7	8.4	.15	.44
July 2	28	7.30	8.2	6.8	.07	.84
July 11	30	7.35	4.1	----	.15	.04
July 17	26	6.97	29	----	.30	.14
July 22	26	7.19	.63	----	.22	.14
July 29	28	7.49	74	4.3	.52	.54
Aug. 5	25	6.92	7.9	----	.15	.14
Aug. 12	26	6.81	33.5	----	.34	.19
Aug. 19	31	7.51	62	----	.37	.34
Sept. 2	32	6.64	29	----	.30	.19
Sept. 16	25	6.52	.64	----	.15	.14
Oct. 4	27	7.35	.55	2.5	.74	.13
Oct. 18	38	7.67	.79	2.6	.18	.20
Average	28	7.22	15.46	7.0	.29	.34

Date 1991	CND (mS/m)	pH	Turbidity (NTU)	D.O. (Mg/L)	(NO_3)	(PO_4)
Jan. 21	44	8.25	6.3	4.2	.37	.28
April 10	34	6.63	53	6.3	.28	.10
May 14	33	7.60	7.5	4.6	.19	.48
May 20	24	7.78	.57	3.6	.15	.18
May 27	24	7.91	.27	4.8	.07	.22
June 10	22	7.19	.36	5.2	.07	.12
June 24	24	7.51	.67	2.1	0.0	.22
July 7	39	7.41	48	----	0.0	3.16
July 28	48	7.65	27	----	.07	.12
Aug. 4	51	7.50	1.7	----	.07	3.12
Aug.10	47	7.44	2.0	----	.12	.52
Aug. 13	62	-7	2.8	3.8	.15	.30
Aug. 17	58	----	.61	----	.37	.05
Sept. 11	62	-7	26	2.2	.04	.07
Sept. 30	76	-7	.34	2.2	.12	.04
Average	43	7.42	11.81	3.9	.14	.60

Table 2. Comparison of Selected Data from a southern Illinois cypress-tupelo swamp and its Cache River and an Arkansas cypress-tupelo swamp and its Black River.

	CND (mS/M)	pH	Turbidity (NTU)	D.O. (Mg/L)	(NO_3)	(PO_4)
Southern Illinois cypress-tupelo swamp	5.1-24 (9)*	5.8-6.5 (4)	23-690 (8)	0.9-4.0 (5)	0.6-4.7 (6)	0.06-0.28 (9)
Cache River in southern Illinois	35.2 (9)	7.3 (4)				
Independence County Arkansas cypress-tupelo swamp	33.33 21-76 (44)	7.3 6.52-8.25 (42)	10.58 0.27-74 (44)	4.65 2.1 (20)	0.22 0.0-.74 (44)	0.41 0.04-3.16 (44)
Black River in Arkansas	2.93 (56)	8.1 (93)	31 (30)	9.5 (92)	0.22 (39)	

*numbers in parenthesis indicate number of samples

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