WATERFOWL HABITAT IN LAKES OF THE ATCHAFALAYA BASIN, LOUISIANA

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ABSTRACT

Rooted vegetation in lakes of the Atchafalaya River Basin was adversely affected by increasing water turbidities from rising flood waters. Duck food plants decreased 80 percent from October 1972 to October 1973 as a result of severe flooding. Different sections of the basin were affected more than others by high water levels. Pest plants were a problem throughout most of the basin but presented no great problem in the study areas. Lakes in the lower section of the swamp region and the marsh region had the highest occurrence of vegetation during the study period. The middle and lower sections of the swamp region and the marsh region had higher duck usage than the upper section. Water turbidities were lowest in the upper section of the swamp region and water depths greatest.

INTRODUCTION

Louisiana is one of the outstanding waterfowl wintering areas in North America and peak wintering populations are approximately five million ducks and one million coots (Bateman and Summerall 1971). Waterfowl habitat in Louisiana takes in some 7,403,478 acres or about 23.8 percent of the total area of the state (St. Amant 1959). This large expanse of wetlands may be broken down into various habitat types. These are the coastal marshes, cypress-tupelo swamps, lakes and rivers and agricultural lands.

The coastal marshes of Louisiana are well recognized as the major waterfowl wintering area; however, this type of habitat is only attractive to a certain segment of the waterfowl population. The other habitat types are used by other segments, with each species selecting conditions suitable to its needs.

The maintenance of habitat diversity is an important phase of maintaining habitat quality; and, if waterfowl are to remain a viable part of our local fauna, a well-balanced habitat of all types must be preserved.

The largest swamp and bottom land area in Louisiana is the 1,300-square mile floodplain bordering the Atchafalaya River often referred to as the Atchafalaya Basin. The Atchafalaya Basin comprises the second largest swamp in the United States and has been described as "an irreplaceable wilderness area" (Bruce 1972), "one of the greatest natural lands in the world" (Wharton 1970) and "the greatest of all swamps" (Glasgow 1972). Increased siltation and channelization for flood control are causing the topography of the basin to change very rapidly and will likely affect the quality and quantity of waterfowl habitat in the area. Houck (1972) described flood control as "drying up the Atchafalaya Basin"; however, an accurate assessment of the impact of the changing environment on waterfowl cannot be made without information on the waterfowl resources of the area.

This study was an evaluation of lakes in the Atchafalaya River Basin as waterfowl habitat and their utilization by ducks and coots.

DESCRIPTION OF STUDY AREA

The study area included the Atchafalaya River floodplain south of Interstate Highway 10. It was divided into two major regions: the swamp region and the marsh region (Fig. 1), which were collectively identified as the Atchafalaya Basin. Floodway protection levees formed the east and west boundaries of the study area. The swamp region was sub-divided into three sections: upper section, middle section, and lower section and was separated from the marsh region by U. S. Highway 90.

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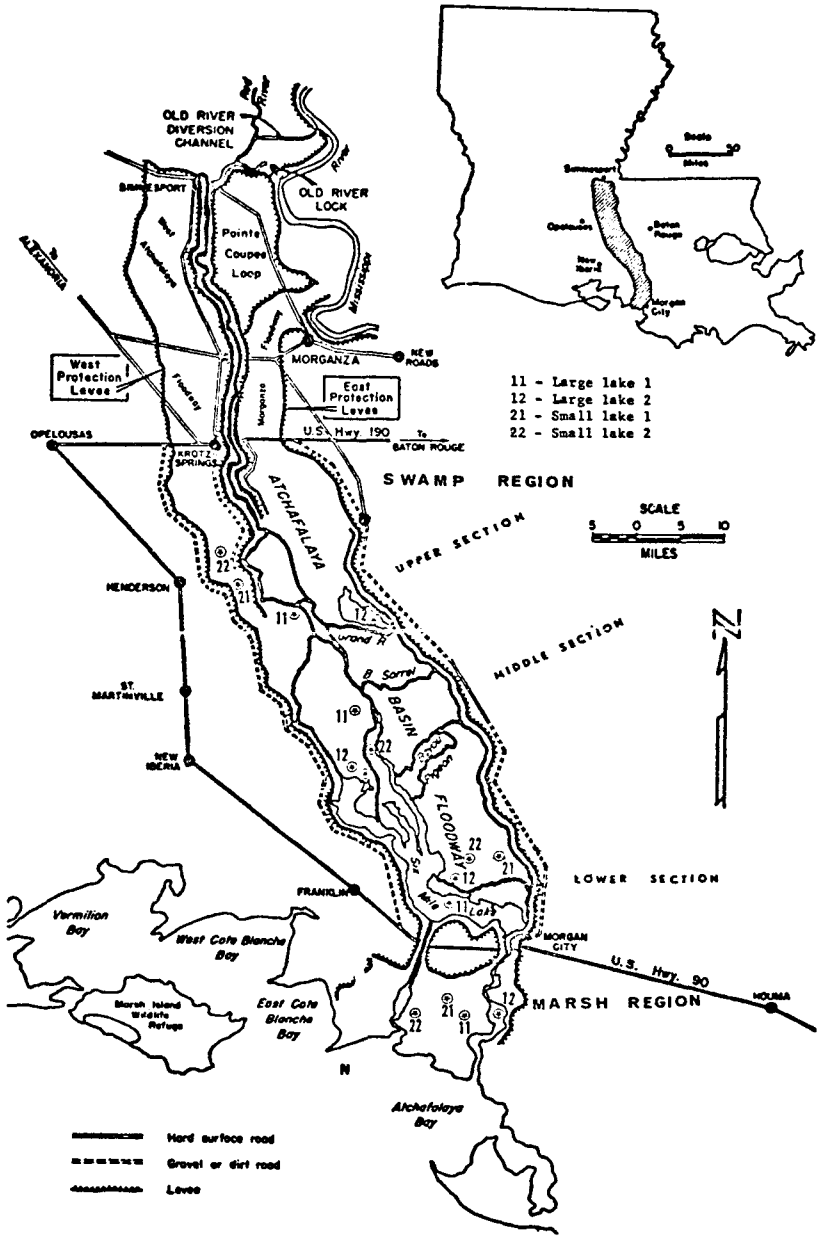

Figure 1. Location of study areas within the Atchafalaya River Basin.

The marsh region consisted of only one section and extended from U. S. Highway 90 southward to the Gulf of Mexico. Four lakes, two large lakes and two small lakes, were selected for study in each section of the swamp region and the marsh region.

The Atchafalaya River is a distributary of the Mississippi River and also carries the entire flow of the Red River and Black River. The Atchafalaya River floodplain is about 15 miles wide and contains a network of bayous, canals, and shallow lakes. The lakes vary in size from only a few acres to over 1,000 acres and are the major habitat for ducks and coots.

The Mississippi River and Atchafalaya River together drain 1,244,000 square miles in 31 states and two Canadian provinces (Outdoor Research Institute 1971). The Atchafalaya has so enlarged its channel that some 30 percent of the total annual flow is presently diverted from the Mississippi River (U. S. Fish and Wildlife Service 1959).

The basic hydrologic cycle of the Atchafalaya Basin should be mentioned because of its importance to the area. The cycle is one of water fluctuation, with low water stages generally occurring from September to November and high water periods lasting from February until June. During the annual high water period, approximately two-thirds of the Atchafalaya Basin is covered by water from over-bank flooding of the Atchafalaya River (Nichols 1973).

In the 1972-73 high water period, the Basin had abnormally high water levels due to heavy rains and high water in the Mississippi River and Red River watersheds. The entire Atchafalaya floodplain was under water from November to July.

Because of the excessively high water levels on the Mississippi River, the Morganza Spillway was used for the first time in April 1973 (Davis 1973). The spillway permitted additional amounts of Mississippi River water to flow through the Atchafalaya Basin, and within 24 hours after the spillway gates were opened, waters in the basin rose nine feet. The water then rose another three feet during the next 24 hours.

MATERIALS AND METHODS

Field studies were conducted from October 1972 to December 1973, and involved periodic aquatic vegetation sampling, duck and coot counts, and water depth and turbidity measurements. The data were tested statistically using correlations and analysis of variance (Snedecor 1956).

Vegetation sampling in lakes followed the method used by Chabreck and Hoffpauer (1962), and each lake was sampled six times during the 15-month study period. In sampling, four parallel lines were run across each study lake and equally spaced over the surface of the lake. Ten samples were taken per line on the small lakes and 20 samples per line on the large lakes. Sample stations were equally spaced along the lines. Sampling was done from a boat by dragging a rake on the bottom at each sampling station. The plant species present were recorded at each station.

Water depths were recorded on the first sampling station in a lake and every third station thereafter in order to establish a mean depth of the lake. Reference markers were established at each lake for determining the change in water levels. Information on water levels was also obtained from the U. S. Army Corps of Engineers. Water samples were collected each month during the study period to determine turbidity.

Duck and coot counts were made monthly in each study lake for the entire study period. Counts were made by boat except for one flight with a light airplane.

RESULTS AND DISCUSSION

Water Conditions in Study Ponds

Water levels

Water levels during October 1972 were very low over the entire basin, and ranged from 4 inches to 90 inches in the study lakes. Waters began to rise by November 1972 and continued to rise until May 1973 (Fig. 2).

From March 1973 through June 1973, water levels were extremely high and in essence covered the entire Atchafalaya River Basin. The peak month of high water occurred in May 1973 when all study lakes had the highest water level recorded during the study period. At that time, the Morganza Spillway was open and flood waters from the Mississippi River rushed through the area.

Water rises in November 1972 ranged from 40 to 149 inches over October levels of 1972. The water levels began to slowly recede in June 1973 and continued to recede through July and August 1973. In August 1973, the water levels dropped to an average of 89 inches over the study area. There was a small rise in September 1973 on 12 of the 16 lakes, but levels remained constant on most study lakes

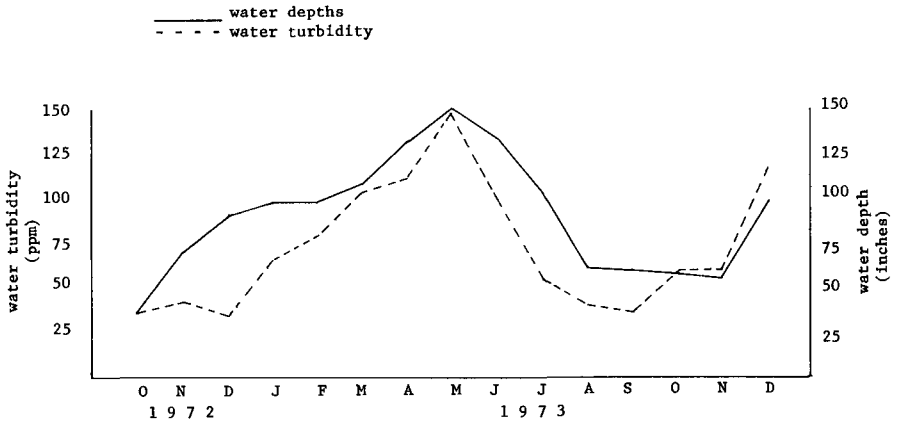

Figure 2. Mean water depth and turbidity in study lakes in the Atchafalaya Basin, 1972-1973.

during October and November 1973. A rise of 15 to 60 inches occurred in December 1973 on all study lakes.

Water levels of the marsh region were erratic when compared to the upper, middle and lower sections of the swamp region. In December 1972 and February 1973 the marsh region had a decline in water level while the upper, middle and lower sections had a rise in water levels. These falls in water levels in the marsh section were the result of tidal actions or prolonged north winds. The water levels of the upper section remained higher than water levels in the middle and lower sections after the drop of water levels from June through November 1973. The upper section had a mean decline of 77 inches from June through November 1973, compared to 104 inches in the middle section and 98 inches in the lower section.

Water turbidity

Water turbidity was low during October, November and December 1972 but increased with the rising waters from January 1973 through May 1973 (Fig. 2). Water turbidity ranged from less than 25 ppm to 185 ppm.

As the flood waters began to recede in June 1973, turbidities also declined in most study areas. Water turbidity dropped an average of 56 ppm during a 30-day period in May and June 1973. The turbidity remained low until December 1973 when another rise began in the river level.

Turbidity in the upper section of the swamp region remained much lower in comparison to the middle, lower and marsh sections. A total of 60 tests of water turbidity were made in each section of the study area and turbidity readings of 25 ppm or less occurred within the upper section 41 times during the study period, as compared to 10 times in the middle section, 22 times in the lower section, and 9 times in the marsh section. The marsh section tended to be the most turbid section during the study period. Turbidities over 100 ppm occurred 27 times in the marsh section which had a mean turbidity of 102 ppm, 12 times in the lower section (mean: 65 ppm), 19 times in the middle section (mean: 86 ppm), and only 2 times in the upper section (mean: 34 ppm).

Vegetation in Study Lakes

Food Plants

Food plants growing in study ponds were coontail (*Ceratophyllum demersum*), wild celery (*Vallisneria americana*), duckweed (*Lemna minor* and *Spirodela polyrhiza*), fanwort (*Cabomba caroliniana*), Eurasian water milfoil (*Myriophyllum spicatum*), pondweed (*Potamogeton* sp.), water stargrass (*Heteranthera dubia*), and frogbit (*Limnobium spongia*). A study of duck foods in the lower Mississippi Valley by Martin and Uhler (1951), based on stomach analysis, disclosed the presence and volumetric percentage of the following plants: coontail, 8.4 percent; duckweed, 7.0 percent; pondweed, 6.1 percent; and frogbit, 1.4 percent. The same study showed these plants occurred along

the Gulf Coast in ducks in following ratings: pondweed, 4.0 percent; wild celery, 1.1 percent; coontail, 0.3 percent; duckweed, 0.2 percent; fanwort, 0.03 percent; and water stargrass, 0.01 percent. Eurasian milfoil has only been in the basin in recent years, but a study by Florschutz (1972) found this plant to comprise 32.6 percent of the diet in waterfowl on the Atlantic Coast.

Considerable variation was found among seasons in the species composition of study ponds and the relative abundance of plants (Table 1). The relative abundance was expressed as the percentage frequency of stations at which a particular species occurred. In the fall sample (October 1972), coontail was the most abundant species, and occurred at 40 percent of the stations. Fanwort was second highest and was found at 12.9 percent of the stations. Two species which occurred in nearly equal abundance were pondweed at 10.5 percent and Eurasian milfoil at 10.1 percent. The lowest food plant in abundance was wild celery, which was found at 2.7 percent of the stations.

A severe flood in the basin during the spring and early summer 1973 caused a drastic reduction in aquatic plants. In the second fall sample (October 1973), pondweed replaced coontail as the major species and occurred at 5.0 percent of the stations. Coontail occurred at 2.0 percent and wild celery at 1.4 percent of the stations. Duckweed was the lowest in abundance at 1.2 percent of the stations and the other species remained absent.

The lower section of the swamp region had the greatest abundance of vegetation and duck food plants which occurred at 40.1 percent of the stations. The marsh section ranked second with 38.8 percent. Food plants were least abundant in the middle section and occurred at only 19.2 percent of the stations. Coontail, one of the most abundant plants, was most abundant in the upper section of the swamp region. The lowest amount of coontail was found in the middle section.

Pondweed, the second highest food plant in total abundance, was found in greatest concentration in the marsh region and occurred at 12.8 percent of the stations. The lowest occurrence of pondweed was found in the middle section and at 7.9 percent of the stations.

Eurasian milfoil, which was abundant in the fall and winter sampling of 1972, occurred in only the lower section of the swamp region and in the marsh region. Wild celery also only occurred in the lower section and the marsh region.

Pest Plants

The pest plants which occurred in the study lakes were water hyacinth *(Eichhornia crassipes)*, American lotus *(Nelumbo lutea)*, water lettuce *(Pistia stratiotes)*, and alligatorweed *(Alternanthera philoxeroides)*. Water hyacinth was the dominant pest plant and occurred on 8.7 percent of the stations in the fall sample (October 1972). American lotus was second highest with 5.6 percent occurrence.

During the winter sample (December 1972 and February 1973) only a trace of water hyacinth existed and American lotus has disappeared. In the summer sample (August 1973) American lotus was the most abundant pest plant in the study lakes, although it occurred at only 5.5 percent of the stations. Water hyacinth could be found at only 1.6 percent of the stations.

American lotus was the only pest plant occurring during the second fall sample (October 1973) and could be found at 5.2 percent of the stations. No pest plants occurred during the second winter sample (December 1973). Severe flooding during the spring and summer of 1973 apparently swept much of the water hyacinth from the study lakes.

Water hyacinth was a serious pest plant in most lakes, bayous, and canals of the Atchafalaya Basin but failed to show up on the study lakes in amounts often seen elsewhere in the basin. A continuous control program is administered by the Louisiana Wildlife and Fisheries Commission to remove the plant for the purpose of improving access and enhancing habitat quality for fish and wildlife.

Waterfowl Usage of Study Lakes

Duck usage

The major species of ducks on the study lakes were mallard *(Anas platyrhynocos)*, wood duck *(Aix sponsa)*, blue-winged teal *(Anas discors)*, lesser scaup *(Aythya affinis)*, and gadwall *(Anas sterapta)*. No geese were found within the study area. Ducks occur in Louisiana mostly during the fall and winter months, except for wood ducks and mottled ducks *(Anas fulvigula)* (St. Amant 1959). Species found on the study lakes were mostly migratory and greatest numbers were found from November through February (Table 2). The period from November 1972 through February 1973 accounted for 73 percent of the total 6,732 ducks seen for the entire study period. Numbers of ducks began to decline in March and remained low until October. The period from March 1973 through October 1973 only accounted for 6 percent of the total ducks seen.

Table 1. Percentage frequency of aquatic vegetation at sampling stations in lakes in different sections of the Atchafalaya Basin — October 1972, December 1972, February 1973, August 1973, October 1973 and December 1973.

	Upper Section				*Middle Section*				*Lower Section*				*Marsh Section*			
	Large		*Small*		*Large*		*Small*		*Large*		*Small*		*Large*		*Small*	
Species	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*	*1*	*2*
October 1972																
Ceratophyllum demersum	76.2		24.0	35.2		70.0	12.5	97.5	12.5	15.0	52.5	90.0	35.0	2.5	40.0	40.0
Vallisneria americana										25.0		12.5			2.5	
Lemna minor		1.2		5.0				22.5		3.7	10.0		2.5	5.0	2.5	
Cabomba caroliniana										35.0	52.5	100.0	37.5			12.5
Eichhornia crassipes						20.0	12.5		2.5	25.0	12.5	17.5	8.7	10.0	5.0	30.5
Nelumbo lutea									67.5							
Myriophyllum spicatum									1.2	7.5		73.7	5.0	65.0	12.5	
Potamogeton sp.	23.7	7.5	7.5	2.5				70.0	13.7	10.0	17.5		1.2	2.5	37.5	
Heterantha dubia						5.0			17.5	3.7	5.0		2.0	22.5	7.5	
Alternanthera philoxeroides														2.5		
December 1972																
Ceratophyllum dermersum	33.8	2.5	17.5	17.5		28.8	10.0	85.0	75.0	11.2	45.0	53.7	5.0	57.5	40.0	
Vallisneria americana										33.8						
Lemna minor		5.0	5.0	20.0												
Cabomba caroliniana										26.2	62.5	92.5	3.7			35.0
Eichhornia crassipes						2.5	5.0									
Myriophyllum spicatum													85.0	27.5	65.0	42.5
Potamogeton sp.	5.0	16.2	17.5	15.0		1.2	2.5	90.0	28.8		42.5	2.5	8.7	7.5	72.5	35.0
Heterantha dubia						3.7			45.0		12.5			3.7	7.5	12.5
Pistia stratiotes			5.0													
February 1973																
Ceratophyllum demersum	86.2	5.0	25.0	22.5		21.2	5.0	55.0	73.8	5.0	27.5	30.0	65.0	3.8	72.5	47.5
Potamogeton sp.	62.5	12.5				3.7		22.5	21.5		5.0		12.5	7.5	82.5	50.0
Cabomba caroliniana										23.8	50.0	70.0	7.5			30.0
Vallisneria americana										35.0		5.0		1.2		
Myriophyllum spicatum										2.5			63.8	18.8	52.5	37.5
Lemna minor			7.5	20.0												

Heterantha dubia						30.0	1.2	7.5	2.5	2.5	30.0	25.0	
Pistia stratiotes		2.5											
August 1973													
Ceratophyllum demersum	68.8												
Potamogeton sp.	17.5												
Eichhornia crassipes		17.5	20.0										
Lemna minor		20.0	17.5										
Heterantha dubia									1.2			25.0	
Vallisneria americana							10.0		10.0				
Nelumbo lutea						66.0							
October 1973													
Potamogeton sp.				13.8		27.5			8.8			47.5	
Ceratophyllum demersum	15.0		5.0	1.2	5.0				2.5				
Heteranthera dubia										5.0	17.5		
Vallisneria americana						2.5	13.8						
Lemna minor		2.5	2.5										
Nelumbo lutea						62.5							
December 1973													
Potamogeton sp.						2.5	33.8	13.8				50.0	5.0
Lemna minor		20.0	20.0		5.0								
Limnobium spongia			2.5										
Vallisneria americana							15.0			1.2	2.0		
Heteranthera dubia													20.0
Myriophyllum spicatum													5.0

Table 2. Number of ducks observed monthly in lakes in different sections of the Atchafalaya Basin.

Month	Upper Section				Middle Section				Lower Section				Marsh Section			
	Large		Small		Large		Small		Large		Small		Large		Small	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
1973																
Oct.	—	—	—	—	—	—	—	125	—	—	—	—	—	—	—	—
Nov.	3	3	—	1	30	—	—	1000	5	3	—	—	10	230	28	10
Dec.	30	7	—	—	—	300	—	50	200	60	—	—	150	150	80	80
1973																
Jan.	4	—	—	—	—	350	—	250	500	—	—	—	150	150	75	50
Feb.	3	—	—	—	—	75	1	25	500	30	—	—	25	175	—	147
Mar.	2	—	—	—	1	40	—	40	4	—	—	—	200	30	—	50
Apr.	6	—	—	—	—	1	—	15	—	—	—	—	2	2	—	—
May	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
June	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
July	—	—	—	—	—	—	—	—	—	—	—	—	—	4	—	—
Aug.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	5	—
Sept.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oct.	10	—	—	—	—	—	—	—	—	—	—	2	—	6	—	3
Nov.	—	—	—	1	—	—	—	—	2	—	—	—	—	100	10	3
Dec.	25	—	—	—	1	20	—	15	1000	35	10	5	—	8	7	2

Duck usage of study lakes was greater in October, November and December 1972 than for the same months in 1973 and accounted for 38 percent of the total ducks seen. The same period in 1973 accounted for 19 percent of the total ducks seen. The lower duck usage in 1973 probably resulted from the detrimental effects that the flood waters had on the study areas. Water levels were higher and aquatic food plants were less abundant in most areas in 1973.

The middle and lower sections of the swamp region each accounted for about 35 percent of the total duck usage. Only 1 percent of the ducks were seen in the upper section. The marsh region accounted for 29 percent of the total ducks. Numbers were lowest in the upper section because of greater water depths and lack of available food plants.

Coot usage

In addition to ducks, coots (*Fulica americana*) are also migratory and the greatest numbers were seen on the study lakes from November through March (Table 3). These 5 months accounted for 84 percent of the total 11,237 coots seen over the 15-month study period. The number of coots began to decline in April and remained low until November. The period between April and November accounted for only 10 coots.

The months of October, November and December 1972 accounted for 63 percent of all coots seen during the study. The same months in 1973 only accounted for 12 percent of the coots seen during the study. Extremely high water turbidity during flood in 1973 reduced the amount of aquatic vegetation occurring in many of the study lakes and probably caused the drastic decline in the number of coots from 1972 to 1973.

The lower section of the swamp region had the largest number of coots during the study period and contained 40 percent of all coots seen. The marsh region contained 25 percent of the coots seen, the upper section 18 percent and the middle section 17 percent. Coots occurred in greater numbers in the lower section of the swamp region and marsh region mainly because of more large open areas with available and abundant aquatic vegetation. The middle and upper sections of the swamp region contained large open water areas but lacked the abundant aquatic vegetation in most lakes.

Environmental Relationships

The correlation coefficients were determined for the relationships between water depths, water tubidity, ducks, coots, food plants and pest plants (Table 4). A positive correlation ($P<.05$) existed between water depth and water turbidity. The phrase "positive correlation" refers to one variable (turbidity) increasing as another variable (depth) increases. The probability statement indicates the percentage of the times you can expect something other than this to occur. For example, you can expect water turbidity to increase with an increase in water depth 95 out of 100 times. The increase in depth and turbidity was particularly noticeable during the extreme flooding which occurred during the spring and summer of 1973. The flood waters have a greater rate of flow than normal; consequently, a greater amount of suspended material can be carried. As depth increased in the study lakes, turbidity increased because of the influx of more and more silt-laden water mixing with the clearer water. There were several clear, deep lakes and shallow, turbid lakes before the flood. However, during the flood nearly all areas were highly turbid.

A negative difference approaching significance ($P<.054$) existed between turbidity and food plants. As turbidity increased, the quantity of food plants decreased. According to Reid (1961), the major effects of high turbidity are obstructing light penetration and inhibiting photosynthesis and growth of plants. No relationship ($P>.05$) was found between water depth and food plants or pest plants abundance during the dates sampled. However, the absence of aquatic plants in deeply flooded lakes was apparent, but we were unable to sample during the peak of the flood and this condition could not be included in the analysis.

A positive correlation ($P<.05$) occurred among ducks, coots, and food plants. Areas with abundant aquatic food plants usually contained abundant numbers of ducks and coots, which were attracted there by the food plants. Several areas had abundant food plants but little or no duck or coot usage. The lack of use mainly resulted from excessive disturbance caused by heavy boat traffic.

No relationship was found between pest plants and turbidity ($P>.05$). This was the result of water hyacinth and American lotus comprising the bulk of pest plants. The leaves of water hyacinth and American lotus usually extended above the water and were therefore not affected by turbidity. However, water covered the American lotus during the flood, killing the leaves of the plant, but when water levels receded, the American lotus re-sprouted and soon covered the lake.

No relationship was found between food plants and pest plants on the study lakes ($P>.05$). Pest plants and food plants were found on the same area, but one did not eliminate the other. Neverthe-

Table 3. Number of coots observed monthly in lakes in different sections of the Atchafalaya Basin.

Month	Upper Section				Middle Section				Lower Section				Marsh Section			
	Large		Small		Large		Small		Large		Small		Large		Small	
	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
1972																
Oct.	—	—	—	—	—	—	—	300	—	—	—	—	—	10	40	—
Nov.	50	—	—	—	—	—	—	800	1000	200	—	—	600	400	11	—
Dec.	200	—	—	—	—	—	—	800	2000	50	—	—	500	150	—	—
1973																
Jan.	350	—	—	—	—	—	—	—	10	—	—	—	300	—	20	—
Feb.	800	—	—	—	—	—	—	—	50	—	—	—	600	65	2	—
Mar.	500	—	—	—	—	—	—	—	—	—	—	—	30	10	—	—
Apr.	10	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
May	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
June	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
July	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Aug.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	
Sept.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Oct.	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
Nov.	30	—	—	—	—	—	—	1	1000	—	—	—	—	25	—	—
Dec.	100	—	—	—	—	—	—	—	200	3	—	—	—	20	—	—

Table 4. Correlation of coefficients for the relationships among ducks, coots, food plants, pest plants, water turbidity and water depth for study lakes in the Atchafalaya Basin, 1973-73.

	Coots	*Food plants*	*Pest plants*	*Turbidity*	*Depth*
Ducks	0.286847[a] (240)[d]	0.215837[b] (96)	−0.087470 (96)	0.032317 (240)	−0.050916 (240)
Coots		0.404583[a] (96)	−0.078278 (96)	−0.126769[b] (240)	−0.107418 (240)
Food plants			−0.054649 (96)	−0.194308[c] (96)	−0.188315 (96)
Pest plants				−0.147556 (96)	−0.164810 (96)
Turbidity					−0.150342[b] (240)

[a]Highly significant (P<.01).

[b]Significant (P<.05).

[c]Approaches significance (P>.05).

[d]Number of observations shown in parenthesis.

less, several lakes other than study lakes were seen which were completely covered by water hyacinth and all submerged aquatic plants were eliminated.

No relationship was found between pest plants and ducks or coots. Ducks and coots were found on areas with pest plants and areas without pest plants. Pest plants did not attract nor discourage ducks from using the study lakes. However, the greatest abundance of pest plants did not occur during months of highest duck and coot numbers. We were unable to measure the full impact of pest plants on ducks and coots because we intentionally avoided lakes covered with water hyacinth when selecting study areas. Even though duck and coot usage was not evaluated on lakes with dense water hyacinth cover, the relationship is well known (St. Amant 1959). Ducks and coots avoid lakes covered or mostly covered with water hyacinth. American lotus is not as serious a problem as water hyacinth because it dies back before the winter migrants arrive.

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EVALUATION OF HABITAT MANIPULATION FOR DUCKS IN AN ALABAMA BEAVER POND COMPLEX

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ABSTRACT

A three-year study was initiated in 1972 to evaluate habitat manipulation practices for ducks in a beaver pond complex located at Hardaway, Macon County, Alabama. Three methods for controlling water level were not effective. Seed yields were determined for four planted and one naturally occurring plant species. Japanese millet (*Echinochloa crusgalli* var. *frumentacea*) averaged 2342 kg/ha; jungle rice (*Echinochloa colonum*), 1847 kg/ha; chiwapa millet (*Echinochloa frumentacea*), 2064 kg/ha; sunflower (*Helianthus* sp.), 1625 kg/ha; and red-rooted sedge (*Cyperus erythrorhizos*), 834 kg/ha. During the hunting seasons of 1972-1975, 134 dabbling ducks were collected for food habit analysis. The five most important food items ranked by importance value for the combined period were: *Quercus nigra*, *Ludwigia leptocarpa*, *Sparganium chlorocarpum*, *Glycine max*, and *Polygonum hydropiperiodes*. The planting of several millet species for ducks was of little value on this study area.

INTRODUCTION

The value of beaver ponds as duck habitat has long been recognized. Wildlife biologists with both state and federal agencies are requested to provide technical assistance to landowners interested in manipulating the habitat to improve duck hunting on these ponds. Current recommendations for management of beaver ponds as waterfowl habitat in the southeast are based on the works of Arner (1963) and Arner et al. (1966).

Auburn University Agricultural Experiment Station biologists were asked to provide this type of assistance to the Glenncrest Hunting Club located on a 160-hectare beaver pond complex near Hardaway, Macon County, Alabama. This club is operated as a commercial duck hunting area and an average of 40 memberships are sold to interested sportsmen. In recent years, the duck harvest has declined from an average of 28 ducks per season per member in 1969 to 12 in 1971 (conversation on July 15, 1975 with Spencer Johnson, owner, Glenncrest Hunting Club, Hardaway, Alabama). A study was conducted to evaluate various methods which might be economically employed to reverse this trend by attracting greater numbers of ducks to the beaver pond complex during legal shooting hours. Experiments were designed to answer the following three questions: (1) Could a water regulation device be used to manipulate water levels so that non-native duck foods could be grown? (2) Could adequate yields of these sown crops be produced? (3) Would these foods be preferred by ducks and entice them to feed on the ponds during legal shooting hours?

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