

FISHERIES INVESTIGATIONS IN LAKES AND STREAMS

DISTRICT IV

JULY 1, 1998 THROUGH JUNE 30, 1999

1999

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stored in envelopes. The otoliths were sectioned following methods described by Secor *et al.* (1992). Sectioned otoliths were aged under a microscope and distances between annuli were measured using a Ken-A-Vision microprojector. Length at age was determined by back calculating using the Fraser-Lee method as developed by Morrow (1990).

[Sport fish creel survey]

A roving creel survey was conducted on Lake Monticello from June, 1997 through May, 1999. A seasonal temporal stratification and four daily time periods were used. Each of the four daily time periods was assigned a non-uniform probability (Table 1).

Five weekdays and four weekend days were sampled during the summer (June-August) for 3.5 hours each. During fall (September-November) seven weekdays and six weekend days were sampled and the first and last time periods (one and four) were adjusted as needed to accommodate daylight hours for creel clerk safety. In winter (December-February) four weekdays and four weekend days were sampled for 2.5 hours each. For spring (March-May) five weekdays and five weekend days were sampled for 3.5 hours each.

Sampling days for each month within a given season were selected randomly as were the time periods to be sampled within each day. At the start of each sample day, a coin toss was made to determine if the instantaneous counts or interviews would be conducted at the beginning or the end of the sample period. A coin toss was also used to determine if the counting or interview circuit would be made to the right or left as the clerk faced upstream. The creel clerk was able to make an entire circuit around the lake and complete an instantaneous count in about one hour. During late fall and winter, the instantaneous count and interviews were simultaneously conducted as the clerk proceeded around the lake. Estimates of seasonal effort,

Table 1. Lake Monticello creel survey sampling design.

Season	Season Starts	Sample Days		Time Period		Probabilities
		Weekday	Weekend	From	To	
Summer	6-1-1997	5	4	1. 6:00 am	9:30 am	.20
				2. 9:30 am	1:00 pm	.25
				3. 1:00 pm	4:30 pm	.25
				4. 4:30 pm	8:00 pm	.30
Fall	9-1-1997	7	6	* 1. 6:30 am	9:30 pm	.20
				**2. 9:30 am	1:00 pm	.25
				3. 1:00 pm	4:30 pm	.25
				4. 4:30 pm	8:00 pm	.30
Winter	12-1-1997	4	4	1. 7:00 am	9:30 am	.20
				2. 9:30 am	12:00 noon	.25
				3. 12:00 noon	2:30 pm	.25
				4. 2:30 pm	5:00 pm	.30
Spring	3-1-1998	5	5	1. 6:00 am	9:30 am	.20
				2. 9:30 am	1:00 pm	.25
				3. 1:00 pm	4:30 pm	.25
				4. 4:30 pm	8:00 pm	.30

*One half hour deleted as necessary mid September-October for time period 1 and 4

**One hour deleted as necessary in November for time period for time period 1 and 4

[Age and Growth]

Age and growth studies of largemouth bass in Lake Wateree continued during the study period. Otoliths from 285 bass were aged and measured. Mean lengths of age I, II and III year old bass were 198 mm, 284 mm, and 362 mm, respectively (Table 2). The oldest bass captured was eleven years old. Growth rates of largemouth bass in Lake Wateree compare favorably when compared to other State reservoirs (Table 3).

[Sport fish creel survey]

1997-1998 - From June, 1997, through May, 1998, interviews were conducted with 251 fishing parties on Lake Monticello. Anglers expended an estimated 115,973 hours (17.8 hours/acre) of fishing effort on Lake Monticello. Relative standard error over the study period was 12.6. Bank anglers expended an estimated 28,746 hours (25.6%), dock anglers expended 7,221 hours (6.1%), and boat anglers expended 80,006 hours (68.3%) of the total effort. Fishing pressure was highest in spring, 1998, when anglers expended a total of 41,531 hours of effort (6.1 hours/acre) and lowest during winter when only 12,788 hours of effort (1.8 hours/acre) were expended (Table 4).

Fifty-one percent of all fishing effort was directed at catfish species. Of this total, 5% was directed toward channel catfish and 5% was directed toward blue catfish. Black crappie and largemouth bass received 15% and 12% of the total effort, respectively (Table 5).

Fishing success (harvest + catch and release) was .88 fish/hour during the study period. Anglers caught and released .21 fish/hour during the period and harvested .67 fish weighing .49 pounds/hour. Fishing success varied seasonally throughout the study period, ranging from a high of 3 fish/hour in summer to .8 fish/hour caught in fall (Table 6).

Estimates of harvest indicated that 150,284 fish (22.7 fish/acre) were harvested weighing 71,956 pounds (10.8 pounds/acre). A total of 220,947 fish were caught during the year. Harvest was dominated numerically by blue catfish, channel catfish, and white perch (Table 7).

Table 4. Fishing effort from Lake Monticello, by season, expressed on a per angler-hour and on a per surface area basis. Relative standard errors (RSE) are included for angler-hour efforts.

Season	Year	Bank		Dock		Boat		Total		Effort/acre
		Hours	RSE	Hours	RSE	Hours	RSE	Hours	RSE	
Summer	1997	10,365	27	2,130	61	26,755	27	39,250	24	5.7
Fall	1997	4,848	29	1,976	29	15,579	23	22,403	21	3.3
Winter	1997-98	2,293	28	753	30	9,742	28	12,788	27	1.8
Spring	1998	11,239	19	2,361	50	27,930	26	41,531	22	6.1
Total		28,746	14	7,221	26	80,006	14	115,973	12	17.8

Table 5. Annual estimates of fishing effort by target species on Lake Monticello, June, 1997-May, 1998. Estimates are expressed in angler-hours and percent contribution to total effort for the entire lake.

Species Fish For	Hours	Percent
Any	14,489	13
Blue Catfish	5,186	5
Black crappie	15,961	15
Bluegill	7,308	7
Catfish	45,026	41
Channel catfish	5,421	5
Carp	39	1
Largemouth bass	12,507	12
White bass	1,816	2
White perch	999	1

Table 6. Fishing success in numbers of fish caught per hour by all anglers on Lake Monticello, Summer 1997-Spring 1998.

Season	Year	Success (No./hour)
Summer	1997	3.0
Fall	1997	0.8
Winter	1997-98	2.9
Spring	1998	1.0

Table 7. Number of fish harvested, by species, from Lake Monticello, Summer 1997-Spring 1998.

	Season				Total
	Summer	Fall	Winter	Spring	
Blue catfish	49,989	3,504	—	6,709	60,202
Black crappie	—	2,503	434	—	2,973
Bluegill	11,174	—	—	305	11,479
Channel catfish	15,879	1001	—	27,750	44,630
Largemouth bass	—	—	1,301	—	1,301
Redear sunfish	588	—	—	610	1,198
White catfish	5,293	—	—	305	5,598
White bass	—	—	3,470	—	3,470
White crappie	—	500	—	—	500
White perch	588	7,508	9,108	—	17,205
Yellow bullhead	1,764	—	—	—	1,764

Over the study period, an estimated 60,202 blue catfish; 44,630 channel catfish; 17,205 white perch and 11,479 bluegill were harvested from Lake Monticello. Only 1,301 largemouth bass were harvested over the study period. Anglers harvested more catfish during the spring and summer while largemouth bass, white bass, and white perch harvest was best during winter. Harvest by weight was dominated by blue catfish, channel catfish, and white bass (Table 8).

Monetary expenditures by anglers on Lake Monticello totaled \$338,989.00 over the study period (Table 9). Most money was spent on gasoline, followed by food and bait. Anglers were willing to spend an additional \$235,000 to fish Lake Monticello.

1998-1999 - From June, 1998, through May, 1999, interviews were conducted with 217 fishing parties on Lake Monticello. Anglers expended an estimated 119,757 hours (17.6 hours/acre) of fishing effort on Lake Monticello. Relative standard error over the study period was 17.4. Bank anglers expended an estimated 34,037 hours (25.6%), dock anglers expended 6,684 hours (6.1%), and boat anglers expended 79,036 hours (68.3%) of the total effort. Fishing pressure was highest in spring, 1999, when anglers expended a total of 51,736 hours of effort (7.6 hours/acre) and lowest during winter when only 11,828 hours of effort (1.7 hours/acre) were expended (Table 10).

Forty-two percent of all fishing effort was directed at catfish species. Black crappie and largemouth bass received 5% and 10% of the total effort, respectively (Table 11).

Fishing success (harvest + catch and release) was .84 fish/hour during the study period. Anglers caught and released .31 fish/hour during the period and harvested .53 fish weighing .45 pounds/hour. Fishing success varied seasonally throughout the study period, ranging from a high of 4.8 fish/hour in winter to .7 fish/hour caught in fall (Table 12).

Estimates of harvest indicated that 104,114 fish (15 fish/acre) were harvested weighing

Table 8. Weight (pounds) of fish harvested, by species, from Lake Monticello, Summer 1997-Spring 1998.

	Season				Total
	Summer	Fall	Winter	Spring	
Blue catfish	25,304	10,179	-	1,636	37,119
Black crappie	-	214	235	-	448
Bluegill	821	-	-	27	849
Channel catfish	5,979	428	-	17,841	24,248
Largemouth bass	-	-	1,348	-	1,348
Redear sunfish	92	-	-	322	414
White catfish	909	-	-	163	1,071
White bass	-	-	3,064	-	3,064
White crappie	-	29	-	-	29
White perch	48	342	1,883	-	2,273
Yellow bullhead	1,093	-	-	-	1,093

Table 9. Total annual angler expenditures in dollars for Lake Monticello for gas, bait, food, lodging and the total of these categories. Also given is the total willingness to pay.

Gas	Bait	Food	Lodging	Total	Willing
182,538	77,183	79,397	0	338,989	234,630

Table 10. Fishing effort from Lake Monticello, by season, expressed on a per angler-hour and on a per surface area basis. Relative standard errors (RSE) are included for angler-hour efforts.

Season	Year	Bank		Dock		Boat		Total		Effort/acre
		Hours	RSE	Hours	RSE	Hours	RSE	Hours	RSE	
Summer	1998	10,899	15	2,483	38	23,606	15	36,989	14	5.4
Fall	1998	4,617	19	968	37	13,619	20	1,204	16	2.8
Winter	1998-99	2,044	52	216	87	9,567	30	11,828	34	1.7
Spring	1999	16,476	19	3,016	37	32,244	33	51,736	38	7.6
Total		34,037	29	6,684	23	79,035	15	119,757	17	17.6

Table 11. Annual estimates of fishing effort by target species on Lake Monticello, June, 1998-May, 1999. Estimates are expressed in angler-hours and percent contribution to total effort for the entire lake.

Species Fish For	Hours	Percent
Any	19,486	16
Blue Catfish	13,717	12
Black crappie	5,645	5
Bluegill	24,919	21
Catfish	35,329	29
Channel catfish	580	1
Carp	7,439	6
Largemouth bass	11,790	10
White perch	231	1

Table 12. Fishing success in numbers of fish caught per hour by all anglers on Lake Monticello, Summer 1998-Spring 1999.

Season	Year	Success (No./hour)
Summer	1998	1.6
Fall	1998	0.7
Winter	1998-99	4.8
Spring	1999	1.1

76,765 pounds (11 pounds/acre). A total of 104,114 fish were caught during the year. Harvest was dominated numerically by blue catfish, channel catfish, and white perch (Table 13).

Over the study period, an estimated 21,250 blue catfish; 48,255 channel catfish; 7,812 white perch and 5,578 bluegill were harvested from Lake Monticello. Only 1,005 largemouth bass were harvested during the study period. Anglers harvested more catfish during the spring and summer while largemouth bass, white bass, and white perch harvest was highest during winter. Harvest by weight was dominated by channel catfish, blue catfish, and white catfish (Table 14).

Monetary expenditures by anglers on Lake Monticello totaled \$329,823 over the study period (Table 15). Most money was spent on gasoline, followed by food and bait. Anglers were willing to spend an additional \$240,000 to fish Lake Monticello.

The results of this two year roving creel survey on Lake Monticello reveal that fishing effort has increased substantially over a previous access point survey conducted in the late 1980s (Table 16). Also, fishing pressure on Lake Monticello is much lower than for other reservoirs in upstate South Carolina (Table 17).

[Meter netting]

Meter netting was conducted in Lake Monticello during the project year. Threadfin shad continued to dominate the forage base (Table 18). This trend is consistent with results from 1990, 1991 and 1992 (Christie and Stroud 1990, 1991 and 1992). Of the three stations sampled on Lake Wateree, the Wateree Dam site produced the highest percentage of gizzard shad. Threadfin shad densities were highest at the Taylor Creek and June Creek sampling locations (Table 19). Densities of age 0 threadfin shad were highest in the 10-19 mm size group (Figure 17), and no significant differences between the densities of shad captured in 1999 with densities in previous years sampled were detected ($p=.05$) (Figure 18).

Table 13. Number of fish harvested, by species, from Lake Monticello, Summer 1998-Spring 1999.

	Season				Total
	Summer	Fall	Winter	Spring	
Blue catfish	12,036	889	2,604	5,721	21,250
Black crappie	—	1,956	—	147	2,102
Bluegill	2,519	711	—	2,347	5,578
Channel catfish	15,395	2,134	9,896	20,831	48,255
Largemouth bass	—	711	—	293	1,005
Redear sunfish	280	—	—	—	280
Redbreast sunfish	—	1,423	—	—	1,423
White catfish	9,517	2,490	—	2,934	14,940
White bass	—	—	—	—	—
White crappie	—	—	—	—	—
White perch	—	—	7,812	—	7,812
Yellow bullhead	279	—	—	—	280
Yellow perch	—	—	1,042	147	1,188

Table 14. Weight (pounds) of fish harvested by species, from Lake Monticello, Summer 1998-Spring 1999.

	Season				Total
	Summer	Fall	Winter	Spring	
Blue catfish	15,739	4,673	4,673	6,636	32,390
Black crappie	-	816	816	89	905
Bluegill	112	29	29	181	323
Channel catfish	6,076	734	11,703	16,099	34,613
Largemouth bass	-	953	-	453	1,406
Redear sunfish	112	-	-	-	113
Redbreast sunfish	-	42	-	-	42
White catfish	2,061	1,403	-	1,111	4,575
White bass	-	-	-	-	-
White crappie	-	-	-	-	-
White perch	-	199	2,115	-	2,115
Yellow bullhead	16	-	-	-	16
Yellow perch	-	-	-	12	263

Table 15. Total annual angler expenditures in dollars for Lake Monticello for gas, bait, food, lodging and the total of these categories in 1998-99. Also given is the total willingness to pay.

Gas	Bait	Food	Lodging	Total	Willing
188,776	126,470	127,524	0	329,823	240,260

Table 16. Comparison of total fishing effort and effort per acre for a previous creel survey conducted on Lake Monticello from Winter 1987-Summer 1989 and the present survey Summer 1997-Spring 1998.

	1987-1988		1988-1989		1997-1998	
	Total Effort	Effort/acre	Total Effort	Effort/acre	Total Effort	Effort/acre
Summer	8,049	1.2	17,043	2.5	39,540	5.8
Fall	*				22,618	3.3
Winter		*		1,920 .3		12,102 1.8
Spring	11,196	1.6	10,609	1.6	43,259	6.4

*no interviews were conducted for Winter 1987-1988 and Fall 1988.

Table 17. A comparison of fishing effort on a per-acre basis of some of South Carolina's reservoirs.

Lake	Effort (h/a)	Year	Source
Murray	25	1988-89	Hayes & Penny 1991
	24	1989-90	" " Ann. Rpt.
	27	1990-91	" "
			(F-18-17)
Greenwood	50	1985-86	Hayes & Penny 1989
	43	1986-87	(F-18 Completion Rpt.)
	88	1988-89	
Thurmond	23	1990-91	Self 1991 (F-15-22)
Russell	26	1990-91	Self 1991 (F-11-22)
Moultrie	11	1988-89	White & Lamprecht 1989
Wateree	50	1990-91	Christie & Stroud 1993
	51	1991-92	" "
	41	1992-93	" "
Wylie	49	1993-94	Christie & Stroud, 1994
	37	1994-95	Christie & Stroud, 1995
Monticello	18	1997-98	Christie & Stroud, 1998
Monticello	18	1998-99	(Present study)

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