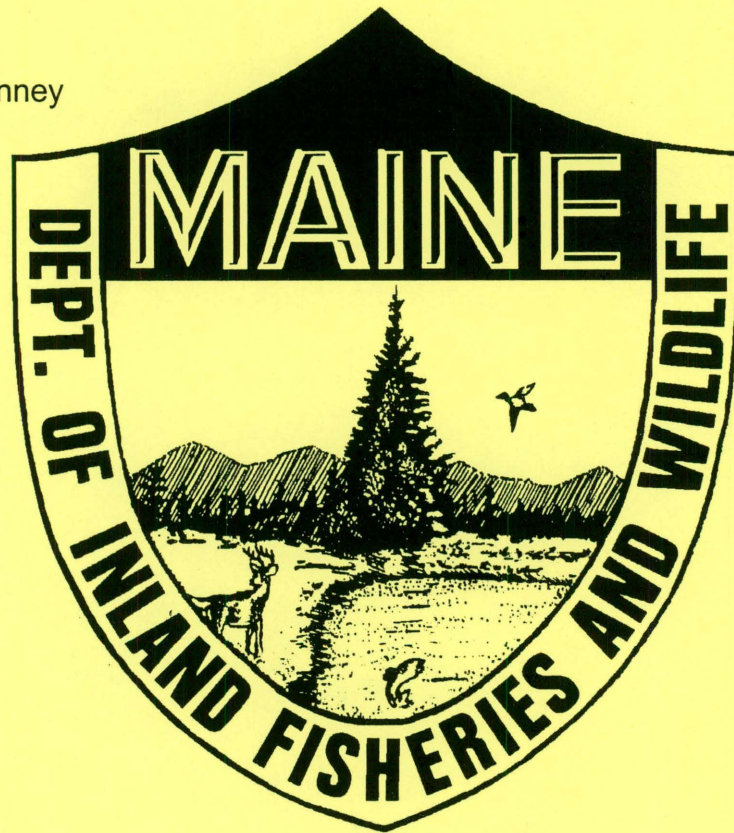


Mooselookmeguntic Lake Salmonid Management

By Forrest R. Bonney



Caring for Maine's Outdoor Future

March 2004

Maine Department of Inland Fisheries & Wildlife
Division of Fisheries & Hatcheries

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MOOSELOOKMEGUNTIC LAKE SALMONID MANAGEMENT

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JOB NO. F-104

PROGRESS REPORT NO. 6 (2000-2003)

SUMMARY

Mooselookmeguntic Lake is the largest of the Rangeley Chain of Lakes and supports sport fisheries for wild landlocked salmon and brook trout. These fisheries have been monitored by season-long creel surveys and aerial angler counts since 1981. Fishing pressure at Mooselookmeguntic Lake remained remarkably stable from 1981 to 1995 at about 10,000 angler trips per year, then declined to 6,000 angler trips in 1998 and 2002. This level of use is within the normal range for large Maine lakes.

The catch of legal-size salmon (14 inches and longer) has varied from 2,700 in 1981 to 8,800 in 1995. However, the actual number of salmon harvested (kept) was much less - varying from 3,161 in 1995 to 630 in 2002 - because anglers released a substantial proportion of their catch. They released 11% of their catch of legal salmon in 1981, 27% in 1986, and an average of 60% from 1995 to 2002. The average length of salmon harvested during the period has ranged from 16 to 18 inches; the average weight has ranged from 1.7 to 2 lb. Salmon caught in 1999 averaged among the largest at 18 inches in length and 2.0 lb in weight. The percent sublegal fish in the catch, an indirect measure of spawning success, ranged from 50% in 1986 to 71% in 1991, but exhibited no upward or downward trend.

Unlike that of salmon, the catch and harvest rates of legal-size brook trout varied considerably from 1981 to 2002. Harvest estimates ranged from about 900 trout in 1981 to about 1,800 in 1986. As with salmon, anglers released an increasing proportion of their legal catch of brook trout over time. In 1981, anglers released only 5% of legal trout. By 2002, about 41% of legal-size trout were released.

Salmon and brook trout growth declined significantly in 2002 and 2003. Anglers will be encouraged to keep more fish to increase their growth rates. If that strategy is unsuccessful, we will recommend further liberalization of the regulations.

MOOSELOOKMEGUNTIC LAKE SALMONID MANAGEMENT

JOB NO. F-104

PROGRESS REPORT NO. 6 (2002-2003)

ABSTRACT

Mooselookmeguntic Lake, a 16,300 ac (6,599 ha) water located in Franklin and Oxford Counties, supports fisheries for wild landlocked salmon and brook trout. Clerk creel survey and aerial angler count data collected in 2002 and 2003 were compared to data collected from similar surveys conducted from 1981 to 1995. Angler use remained stable from 1981 to 1995, averaging 0.6 ± 0.02 angler days/ac/yr (1.5 ± 0.2 days/ha/yr), but decreased to 0.4 ± 0.05 angler days/ac/yr (1.0 ± 0.1 days/ha/yr) in 1998 and 2002. The catch of legal-size salmon per angler increased steadily from 0.27 in 1981 to 0.92 in 1995, then declined to 0.35 in 2003. Release rates of legal-size salmon increased from 11% in 1981 to 64% in 2003. Average annual yield of salmon from 1981 to 1995 was 0.25 lb/ac/yr (0.28 kg/ha/yr); that for 2002 was only 0.07 lb/ac/yr (0.08 kg/ha/yr). The average weight of harvested fish decreased significantly ($p < 0.05$) from 904 ± 53 g in 1999 to 703 ± 58 g in 2003. Low harvest rates have resulted in the "stockpiling" of salmon and subsequent reduced growth rates. The number of legal-size brook trout caught per angler ranged from 0.09 in 1981 to 0.42 in 1998; the number harvested per angler ranged from 0.08 in 1981 to 0.20 in 1998. Brook trout catch rates for 2002-2003 were between these extremes. Anglers released 5% of legal trout in 1981, 35% in 1994 and 1995, 58% from 1998-2003. Annual yield averaged 0.02 lb/ac/yr (0.02 kg/ha/yr). Management efforts will concentrate on increasing the salmon harvest in order to reduce standing stock and improve size quality.

KEY WORDS: AGE AND GROWTH, BKT, LAKE, LENGTH-WEIGHT RELATION, LLS, LONGEVITY, REGULATIONS, SUMMER ANGLER SURVEY

INTRODUCTION

Mooselookmeguntic Lake is the largest of the Rangeley Chain of Lakes and supports important sport fisheries for brook trout and landlocked salmon. Brook trout are native to the drainage; salmon and smelts were introduced in 1875. Since that time, there has been a long history of stocking both species. Studies initiated in 1958 demonstrated that naturally reared fish supported the fishery and that stocked fish played only a minor role. As a result, stocking was gradually reduced and eventually eliminated. Neither trout nor salmon have been stocked since 1984. Since 1981, sport fisheries at Mooselookmeguntic Lake have been monitored by periodic season-long creel surveys and aerial angler counts. Abbreviated creel surveys (weekends from ice-out through July 4) are occasionally conducted between scheduled season-long surveys to supplement catch rate and fish growth information. Findings from previous surveys were reported by Bonney (1982, 1987, and 2000), DeSandre (1991), and Boucher (1996 and 1999). This report summarizes the results of season-long surveys (with aerial boat counts) conducted in 2002 and a partial-season clerk survey was conducted in 2003. Characteristics of fish populations and fisheries are compared to those of the earlier surveys. A list of fish species present in Mooselookmeguntic Lake is presented in Appendix A.

STUDY AREA

Mooselookmeguntic Lake lies between Rangeley Lake and the Richardson Lakes in Franklin and Oxford Counties. The lake has a surface area of 16,300 acres and mean and maximum depths of 60 ft and 139 ft, respectively. Summer water temperatures, dissolved oxygen concentrations, and other habitat characteristics are ideal for coldwater fishes. A dam was constructed at the lake's outlet in the early 1850's for log driving and was converted for water storage by 1878. Upper Dam, as it is known, was built to its current configuration and elevation by 1885, allowing a maximum drawdown of about 12 ft.

The Kennebago River is the principal salmon spawning tributary. Brook trout spawning occurs in the Kennebago River, the Cupsuptic River, Bemis Stream, and several other smaller tributaries. Rainbow smelts provide the major forage for lake salmonids and spawn in most of

the tributaries. Landlocked alewives were introduced in 1971 to provide supplemental forage for salmon, but are not currently abundant. A complete list of fish species known to be present in Mooselookmeguntic Lake is provided in Appendix A.

Mooselookmeguntic Lake is closed to ice fishing. Open water fishing regulations are currently general law for salmon except that only 1 may exceed 18 inches; more restrictive regulations are in effect for brook trout. The taking of smelts is also restricted (Table 1). Boat access to Mooselookmeguntic Lake is available at Haines Landing in Rangeley Township, near the mouth of the Cupsuptic River off Route 16, and near Toothaker Island at the southern end of this 13-mile-long lake.

METHODS

Aerial counts of boats were used to monitor fishing effort at Mooselookmeguntic Lake in 1981, 1986, 1991, 1995, 1998, and 2002. Counts were made on a systematic schedule throughout the fishing season, generally three days per week, including one weekend day (Table 2). Counts were made between the hours of 1000 and 1400. Angler counts for all years were expanded from use curves developed from clerk surveys. Angler interviews were conducted at the traditional access points listed above, including some years for which aerial counts were not made. Sampling at these sites provided catch and harvest data that were mostly from completed fishing trips.

Direct comparisons of age structure and growth rates for salmon and brook trout were made from data collected in 1991, 1994, 1995, 1998, 1999, 2000, 2001, 2002, and 2003. Because salmon and brook trout were sampled throughout the growing season at Mooselookmeguntic Lake, growth and condition were described by length-weight regressions using log 10 transformed data (F test for covariance, $P < 0.05$). The slopes of the regression lines describe the way weight changes as length increases while the intercepts of the regression lines are analogous to condition factors. Duncans multiple range tests were used to determine significant differences between means for years grouped using the above method. Significance levels were set at $P = 0.05$ for all tests and data were analyzed using the SAS package.

RESULTS AND DISCUSSION

Angler effort

There was little change in fishing effort at Mooselookmeguntic Lake from 1998 (6,081 angler days) to 2002 (6,304 angler days). These estimates represent a decline in angler use from previous years, however, when it averaged approximately 10,000 angler days per year from 1981 to 1995 (Table 3).

Landlocked salmon

The total number of salmon harvested during the season was 2,692 in 1981, 2,753 in 1986, and 3,161 in 1995. Since that time the salmon harvest has sharply declined to 630 in 2002. The decline in salmon harvest results not only from fewer anglers but from a higher voluntary release rate of legal-size fish. The percentage of legal-size salmon voluntarily released increased from 11 in 1981 to 27 in 1986 and 65 in 1995, similar to the 2003 figure of 64%. The release rate of legal salmon reported by volunteer record keepers showed a similar trend, increasing from 35% in 1991 to an average of 77% for the period 1995-99; in 2002 it was 85% and in 2003 it was 84% (Table 4).

The yield (pounds per acre) of harvested salmon changed little from 1981 to 1995. Pounds per acre harvested ranged from 0.18 in 1991 to 0.32 in 1995, and averaged 0.25 ± 0.03 for the period. There was a decline to 0.14 lb/ac in 1998, and a further substantial decline to 0.07 lb/ac in 2002. From 1991-95, salmon age VII+ and older accounted for 12 % of the sample; in 1998-1999 for 29%, and from 2000-2003 it accounted for 39% of the sample, indicating an aging population as fewer fish were harvested. These data confirm that the salmon population is increasing at a faster rate than it is being harvested as first stated in Progress Report No. 5. At that time, the voluntary data supported this conclusion but clerk data, which indicated reduced catch and harvest rates in 1999, did not.

The average length of the clerk-surveyed salmon boated has ranged from 17 to 18 inches since 1995; there was no decline in the size of the salmon sampled in 2003. Although the size of salmon harvested remained consistent through 2003 (presumably because anglers have been selecting larger fish for harvest), there has been a decline in the average length and weight by age

(Tables 5, 6 and 7; Figure 1). Comparison of age IV+ and age V+ salmon, which comprised the largest samples, indicated that the fish sampled in 2003 were the smallest sampled since 1991; those sampled in 2002 were the next smallest in size. Furthermore, salmon sampled in 2002 and 2003 were significantly ($P < 0.05$) smaller than those sampled in previous years. Age V+ salmon sampled in 2003 were also significantly less robust (weighed less at a given length) than those sampled in 1995. The increase in the proportion of sublegal salmon in the catch, from 51% in 1995 to 81% in 2003, corroborates the decrease in growth rates.

In summary, salmon abundance has increased and growth rates have decreased over the last several years. The increase in salmon abundance coincided with higher release rates of legal-size fish, resulting in a 'stockpiling' of salmon. Although growth rates and condition were maintained for a number of years despite the apparent buildup of salmon numbers, these parameters are now in decline. The increase in the proportion of older-age salmon is consistent with an increase in population. The maintenance of the average size of salmon harvested despite an overall decline in the average fish size suggests that anglers, while releasing many more legal fish, selected the largest ones to take home. While current harvest rates of no more than 0.07 lb/acre/year are sufficiently low to maintain suitable numbers of older salmon in the population, they are leading to the stockpiling of salmon and reduced growth.

Effective 2000, a regulation was promulgated stipulating that only one salmon longer than 18 inches may be kept. This regulation anticipated a need to increase the salmon harvest rate and was intended to encourage the harvest of salmon between the lengths of 14 and 18 inches, thereby reducing the number of salmon and the demand on smelts, the primary forage species. However, this regulation has not been successful in accomplishing the intended goal. Anglers will be aggressively encouraged to increase the harvest rate, possibly through further liberalization of the regulations. Growth rates and condition will be monitored closely over the next few years to evaluate trends in salmon abundance and growth rates.

Brook trout

New brook trout regulations, promulgated for the 1996 fishing season, included a two-fish daily bag limit (reduced from five) with a 10-inch minimum length limit; only one trout may exceed 12 inches. These regulations were designed to distribute the catch among more anglers,

direct harvest toward the more abundant age groups, and provide more protection to larger, older individuals that are of high aesthetic and genetic importance. The increase in the proportion of age IV+, V+, and even age VI+ trout in from 1998 through 2003 indicated that these regulations have contributed greater abundance of older-age fish in the population. The catch of legal-size brook trout (10 inches and longer) varied considerably from 1981 to 1995 (Boucher 1996) and from 1995 to 2003 (Table 3). Catch estimates ranged from 0.09 fish/angler in 1981 to 0.42 in 1998. The number of legal fish harvested/angler fluctuated from a low of 0.08 in 1981 to 0.20 in 1986. Annual yield in pounds harvested/acre averaged 0.07 ± 0.01 . Variable catch and harvest rates were probably the result of annual differences in natural recruitment success, common in wild brook trout populations. As with salmon, anglers released an increasing proportion of their catch of legal brook trout over the period. In 1981, anglers surveyed by clerks released only 5% of legal trout; by 1994-95 about 35% of legal trout were released; and in 2002 63% were released. The percent of legal-size trout reportedly released by voluntary anglers increased from 27% in 1991 to 63% in 2001 but has actually declined somewhat since then (Table 4).

Some, but not all brook trout growth rate indicators declined in 2002 and 2003 (Tables 8, 9, and 10; Figure 2). From 1999-2003, anglers harvested an average of only 35% of those brook trout they caught that were from 10-12 inches long but 66% of those that were over 12 inches in length. The percent of age IV+ and older fish has varied substantially from year to year but averaged about 17% of the harvest during the 1980's, compared to an average of 31% during the 1990's and 27% in 2002. The increase in the proportion of older-age brook trout in the harvest in recent years resulted from the imposition of more restrictive regulations. Unlike salmon, the overall robustness of age III+ brook trout (the most abundant age class) did not decline from 1996-99 to 2002-03 and a number of trophy-size fish were caught, with fish as large as 6 pounds and larger being reported. Continued good brook trout growth rates are attributed to the fact that this species is less dependent on smelt as a forage species.

Summary

Size quality of salmon and – to a lesser extent, brook trout - declined significantly in 2002 and 2003. Because the lake is not stocked, we must rely on regulations to control the salmonid population. To that end, a public relations program, involving written articles, oral presentations,

and signage, will be undertaken in an effort to convince anglers to harvest more salmon. We will continue to evaluate the fishery with particular reference to the effect of this new regulation and if growth rates do not improve, more liberal regulatory changes may be recommended.

RECOMMENDATIONS

1. A stratified random clerk creel survey and aerial angler counts will be conducted in 2004 and every third year thereafter.
2. A public relations program will be undertaken to encourage anglers to harvest more salmon in an effort to reduce their abundance, increase forage (smelt) abundance, and improve salmon and brook trout growth rates.
3. If growth salmonid growth rates do not improve as a result of this effort, we will recommend further liberalization of the salmon regulations.

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Table 1. Regulation history, Mooselookmeguntic Lake.

Years	Regulation
1990-95	Open to fishing April 1 to September 30. Closed to ice fishing. Landlocked salmon: Daily bag limit 2 fish; minimum length 14 inches. Brook trout: Daily bag limit 5 fish; minimum length 10 inches. Closed to the taking of smelts, except by hook and line. Tributaries closed to the taking of smelts. Use or possession of live fish as bait is prohibited.
1996-99	Same except brook trout: Daily bag limit 2 fish; minimum length limit: 10 inches, only 1 may exceed 12 inches.
2000-03	Same except landlocked salmon: Daily bag limit 2 fish; minimum length 14 inches; only 1 may exceed 18 inches.

Table 2. Creel survey methods, Mooselookmeguntic Lake.

Year	Date	No. days surveyed	No. days in season	Clerk	Vol.	Other
1998	Apr 19 - Sept 30	26	165	X		Aerial boat counts
1998	Apr 19 - Sept 30	81	165		X	
1999	May 3 - Sept 30	31	151	X		
1999	May 3 - Sept 30	88	151		X	
2000	May 13 - Sept 30	61	141		X	
2001	May 18 - Sept 30	33	136		X	
2002	May 6 - Sept 29	37	148	X		Aerial boat counts
2002	May 6 - Sept 30	41	148		X	
2003	May 15 - Jul 7	20	149	X		
2003	May 5 - Sept 30	49	149		X	

Table 3. Clerk creel survey summary, Mooselookmeguntic Lake, 1998 to 2003.

Statistics	Species	CENSUS YEAR				
		1995	1998	1999	2002	2003
No. anglers surveyed		399	350	502	495	355
No. angler hours		1,581	1,394	2,107	1,949	1,576
No. anglers (and %) successful in catching a legal fish	LLS	74 (19)	127 (36)	132 (26)	107 (22)	91 (26)
	BKT	.	97 (28)	77 (15)	66 (13)	58 (16)
No. legal fish kept	LLS	130	84	81	48	53
	14-18 in	.	.	.	28	36
	> 18 in	.	.	.	13	13
	BKT	58	71	53	38	40
	10-12 in	.	18	16	18	9
> 12 in	.	53	36	17	24	
No. (and %) legal fish released	LLS	239 (65)	113 (57)	111 (58)	71 (60)	71 (64)
	14-18 in	.	.	.	67 (94)	67 (94)
	> 18 in	.	.	.	4 (6)	4 (6)
	BKT	28 (33)	75 (51)	39 (42)	64 (63)	28 (41)
	10-12 in	.	33 (44)	21 (54)	58 (91)	22 (79)
> 12 in	.	42 (56)	18 (46)	6 (9)	6 (21)	
No. (and %) sublegal fish released	LLS	382 (51)	407 (67)	305 (61)	495 (81)	518 (81)
	BKT	17 (17)	62 (30)	55 (37)	57 (36)	22 (24)
No. legal fish per angler (only those kept)	LLS	0.92 (0.33)	0.56 (0.24)	0.38 (0.16)	0.24 (0.10)	0.35 (0.15)
	BKT	0.22 (0.15)	0.42 (0.20)	0.18 (0.11)	0.21 (0.08)	0.19 (0.11)
Hours to catch a legal fish (all legal fish caught)	LLS	4	7.1	11.0	16.4	12.7
	BKT	18	9.5	22.9	19.1	23.2

Table 3. Clerk creel survey summary, Mooselookmeguntic Lake, 1995 to 2003 (con't).

Statistics	Species	1995	1998	1999	2002	2003
Mean length in mm ± SE (and no.) fish sampled or reported	LLS	16.9±0.2 (87)	435±4 (81)	18.0±0.3 (72)	17.4±0.4 (41)	16.9±0.3 (48)
	BKT	13.2±0.3 (48)	12.9±0.2 (70)	13.8±0.4 (52)	12.2±0.2 (41)	13.9±0.5 (48)
Mean weight in g. ± SE (and no.) fish sampled or reported	LLS		1.6±0.06 (70)	2.0±0.12 (66)	1.9±0.15 (38)	1.5±0.13 (36)
	BKT		0.8±0.07 (62)	1.2±0.12 (46)	0.7±0.04 (38)	1.3±0.28 (24)
Estimated total fish harvested ± CI (@ 95%) during survey period	LLS	3,161 (2,601- 3,721)	1,459 (1,264- 1,654)	.	630 (524 - 736)	.
	BKT	1,437 (1,183- 1,691)	1,216 (1,068- 1,364)	.	504 (419 - 589)	.
Estimated total angler days ± CI (@ 95%) during survey period		9,580 (7,884 - 11,276)	6,081 (5,269- 6,893)	.	6,304 (5,247 - 7,361)	.

Remarks: LLS = landlocked salmon; BKT = brook trout; > = greater than.

Table 4. Voluntary creel survey summary, Mooselookmeguntic Lake, 1999-2003.

Statistics	Species	CENSUS YEAR				
		1999	2000	2001	2002	2003
No. anglers surveyed		229	150	75	89	101
No. angler hours		939	579	322	497	435
No. anglers (and %) successful in catching a legal fish	LLS	157 (69)	99 (66)	36 (48)	48 (54)	61 (60)
	BKT	73 (32)	39 (26)	27 (36)	26 (29)	17 (17)
No. (and %) legal fish kept	LLS	64	56 (31)	15 (35)	9 (15)	13
	BKT	43	25 (58)	11 (37)	15 (58)	11
No. (and %) legal fish released	LLS	224 (59)	126 (69)	28 (65)	51 (85)	71 (84)
	14-18 in	.	108	24	42	70
	> 18 in	.	18	4	9	1
	BKT	44 (57)	18 (42)	19 (63)	11 (42)	7 (37)
	GE 12 in	26	12	5	5	1
No. (and %) sublegal fish released	LLS	143 (33)	128 (44)	97 (69)	165 (73)	222 (73)
	BKT	8 (10)	5 (14)	5 (17)	8 (24)	6 (25)
No. legal fish per angler (only those kept)	LLS	1.26(0.28)	1.21(0.37)	0.57(0.20)	0.67(0.10)	0.83(0.13)
	BKT	0.38(0.19)	0.29(0.17)	0.40(0.15)	0.29(0.17)	0.18(0.11)
Hours to catch a legal fish (all legal fish caught)	LLS	3.3	3.2	7.5	8.3	4.3
	BKT	10.8	13.5	10.7	19.1	22.9
Mean length in mm ± SE (and no.) fish sampled or reported	LLS	16.2±0.1 (289)	16.7±0.2 (179)	16.8±0.4 (41)	16.4±0.3 (60)	16.0±0.2 (102)
	BKT	13.0±0.2 (87)	13.8±0.4 (45)	13.7±0.7 (29)	12.7±0.4 (24)	12.4±0.4 (19)

Table 5. Mean sizes and condition of wild landlocked salmon sampled from Mooselookmeguntic Lake, 1999-2003, by age.

Year	Size variable	IV+	V+	VI+	VII+	VIII+	IX+	X+	All
1999	Length	15.0±0.7 (3)	16.0±0.3 (21)	18.3±0.4 (15)	19.3±0.4 (26)	18.5±0.4 (2)	21.7±0.6 (3)	20.9 (1)	18.0±0.3 (72)
	Weight	1.0±0.06 (3)	1.2±0.05 (18)	2.1±0.19 (14)	2.4±0.20 (25)	2.2 (1)	3.0±0.39 (3)	4.0 (1)	2.0±0.12 (66)
	Cond.	0.804±0.064	0.862±0.016	0.912±0.024	0.874±0.022	1.222	0.821±0.046	1.222	0.879±0.013
2000	Length		16.3±0.6 (4)	18.5±0.8 (3)	21.2±0.6 (3)	21.9 (1)			18.7±0.7 (11)
	Weight		1.4±0.21 (3)	2.0±0.32 (3)	2.9±0.15 (3)	3.0 (1)			2.2±0.23 (10)
	Cond.		0.847±0.007	0.864±0.059	0.829±0.051	0.787			0.841
2001	Length		15.1±0.2 (10)	16.2±0.5 (10)	17.4±0.5 (8)	20.8±1.2 (4)	22.1±0.9 (4)		17.5±0.5 (37)
	Weight		1.0±0.03 (6)	1.3±0.20 (8)	1.7±0.17 (7)	2.4±0.50 (4)	3.8±0.17 (2)		1.8±0.18 (28)
	Cond.		0.829±0.022	0.859±0.029	0.895±0.015	0.712±0.033	0.842±0.115		0.837±0.016
2002	Length	14.0±0.2 (2)	15.6±0.3 (14)	18.0±0.5 (11)	18.8±0.6 (12)	22.7±0.2 (2)			16.7±0.4 (41)
	Weight	0.7±0.01 (2)	1.2±0.07 (13)	2.2±0.33 (10)	2.3±0.25 (11)	3.2±0.63 (2)			1.9±0.15 (38)
	Cond.	0.704±0.019	0.869±0.027	0.955±0.058	0.918±0.029	0.767±0.163			0.892±0.023
2003	Length	13.6 (1)	15.1±0.3 (10)	16.5±0.3 (17)	17.8±0.4 (14)	19.6 (3)	19.6 (1)	21.6 (1)	16.9±0.3 (48)
	Weight		1.1±0.08 (10)	1.5±0.09 (15)	1.9±0.36 (8)		2.5 (1)	4.1 (1)	1.5±0.13 (36)
	Cond.		0.839±0.029	0.866±0.018	0.906±0.048		0.912	1.071	0.877±0.016

Table 6. Comparisons of length-weight regressions, log 10 transformed data, Mooselookmeguntic Lake age V+ **salmon**, 1991-2001 vs. 2002-2003, legal size fish only. A bolded p value for slope indicates a significant difference in growth rates; for intercept it indicates a significant difference in robustness (weight at a specific length).

Years	df	Slope	(SE)	Intercept	(SE)	P	R ²
1991-2001	166	3.19	(0.11)	-5.73	(0.38)	<0.0001	0.85
2002-2003	85	3.25	(0.15)	-5.68	(0.12)	<0.0001	0.91
Both	252	3.41	(0.08)	-6.12	(0.20)	<0.0001	0.88

Comparison of Slope F test
 $F_{1,249}=0.11$ $p=0.74508$
 Comparison of Intercept F test
 $F_{1,165}=20.33$
 $p=0.00001$

Table 7. Duncans multiple range tests for differences in lengths and weights of Mooselookmeguntic **salmon**, 1991-2003. Current year bolded for emphasis.

Age	Duncan grouping	Mean length	Mean weight	Sample size	Year
IV+	A	15.2		16	1995
	A	15.2		18	1994
	A	15.1		15	1991
	B	13.1		22	2002
	B	12.8		21	2003
	A		1.15	13	1995
	A		1.13	12	1991
	A		1.12	12	1994
	B		0.61	22	2002
	B		0.60	18	2003
V+	A	16.3		28	1998
	A	16.2		54	1994
	A	16.1		35	1995
	A	16.0		21	1999
	A	15.9		24	1991
	A	15.8		29	2001
	B	14.6		58	2002
	B	14.4		29	2003
	A		1.46	47	1994
	A		1.40	32	1995
	A		1.34	23	1998
	A		1.30	25	2001
	A		1.26	22	1991
	A		1.23	18	1999
	B		0.93	57	2002
B		0.87	29	2003	

Table 8. Mean sizes and condition of wild **brook trout** sampled from Mooselookmeguntic Lake, 1999-2003, by age.

Year	Size variable	III+	IV+	V+	VI+	All
1999	Length	12.2±0.3 (24)	14.3±0.5 (17)	18.7±1.4 (3)		13.9±0.4 (52)
	Weight	0.7±0.06 (21)	1.2±0.14 (14)	2.9±0.46 (3)		1.2±0.12 (46)
	Cond.	0.981±0.025	1.067±0.041	1.229±0.088		1.053±0.021
2000	Length	11.1±0.7 (2)	13.7±0.6 (8)	17.4±0.4 (3)		15.0±0.8 (15)
	Weight	0.5±0.09 (2)	1.0±0.2 (7)	2.0±0.17 (3)		1.5±0.29 (14)
	Cond.	0.942±0.002	1.022±0.053	1.032±0.033		1.032±0.031
2001	Length	10.8±0.3 (10)	13.7±0.6 (7)	16.7±0.7 (12)	19.6±0.3 (4)	15.0±0.6 (35)
	Weight	0.5±0.06 (7)	1.0±0.17 (7)	2.2±0.25 (9)	3.4±0.07 (3)	1.7±0.23 (28)
	Cond.	0.926±0.031	1.012±0.039	1.197±0.033	1.210±0.032	1.084±0.028
2002	Length	11.9±0.2 (21)	12.7±0.2 (13)	13.2 (1)		12.2±0.2 (35)
	Weight	0.6±0.03 (19)	0.8±0.07 (9)	0.9 (1)		0.7±0.04 (29)
	Cond.	1.003±0.023	1.029±0.026	1.144		1.016±0.018
2003	Length	11.0±0.2 (8)	13.6±0.3 (20)	17.5±1.1 (4)	23.2 (1)	13.9±0.5 (34)
	Weight	0.5±0.05 (7)	1.0±0.11 (13)	2.9±0.7 (2)	6.2 (1)	1.3±0.28 (24)
	Cond.	0.979±0.042	1.062±0.043	1.286±0.112	1.363	1.083±0.036

Table 9. Comparisons of length-weight regressions, log 10 transformed data, Mooselookmeguntic Lake **brook trout**, by year group. Legal size fish only.

All ages							
Year	df	Slope	(SE)	Intercept	(SE)	P	R ²
1991-95	178	3.47	(0.06)	-6.18	(0.14)	0.0001	0.96
1998-99	107	3.54	(0.07)	-6.36	(0.17)	0.0001	0.96
Both	286	3.48	(0.04)	-6.21	(0.11)	0.0001	0.96
Comparison of Slope F test							
F _{1,283} =0.59 p=0.44126							
Comparison of Intercept F test							
F _{1,177} =10.76 p=0.01167							
Age III+							
Years	df	Slope	(SE)	Intercept	(SE)	P	R ²
1991-95	120	3.32	(0.09)	-5.80	(0.23)	0.0001	0.92
1998-99	65	3.28	(0.16)	-5.72	(0.40)	0.0001	0.87
Both	186	3.31	(0.08)	-5.78	(0.21)	0.0001	0.89
Comparison of Slope F test							
F _{1,183} =0.05 p=0.81534							
Comparison of Intercept F test							
F _{1,64} =13.19 p=0.00036							

Figure 1 Average size of age 5 salmon, 1986-2003.

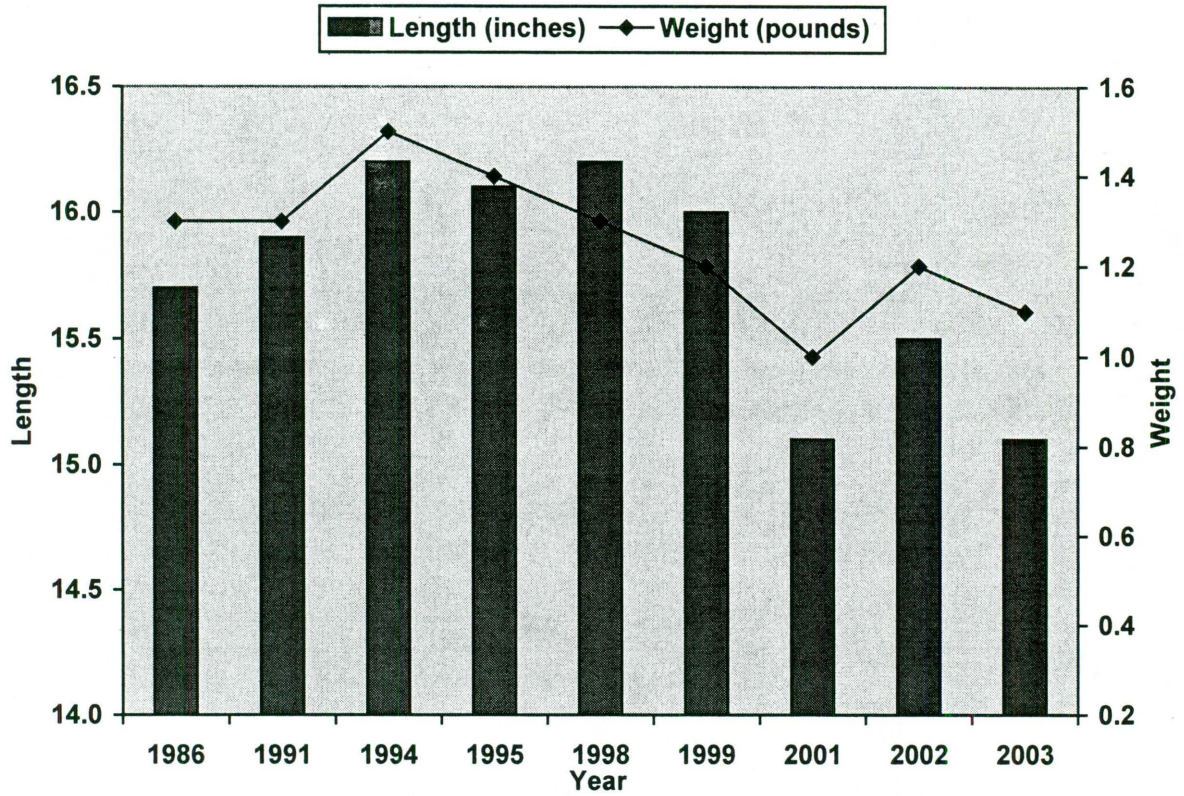


Figure 2. Average size of age III+ brook trout, 1986-2003.

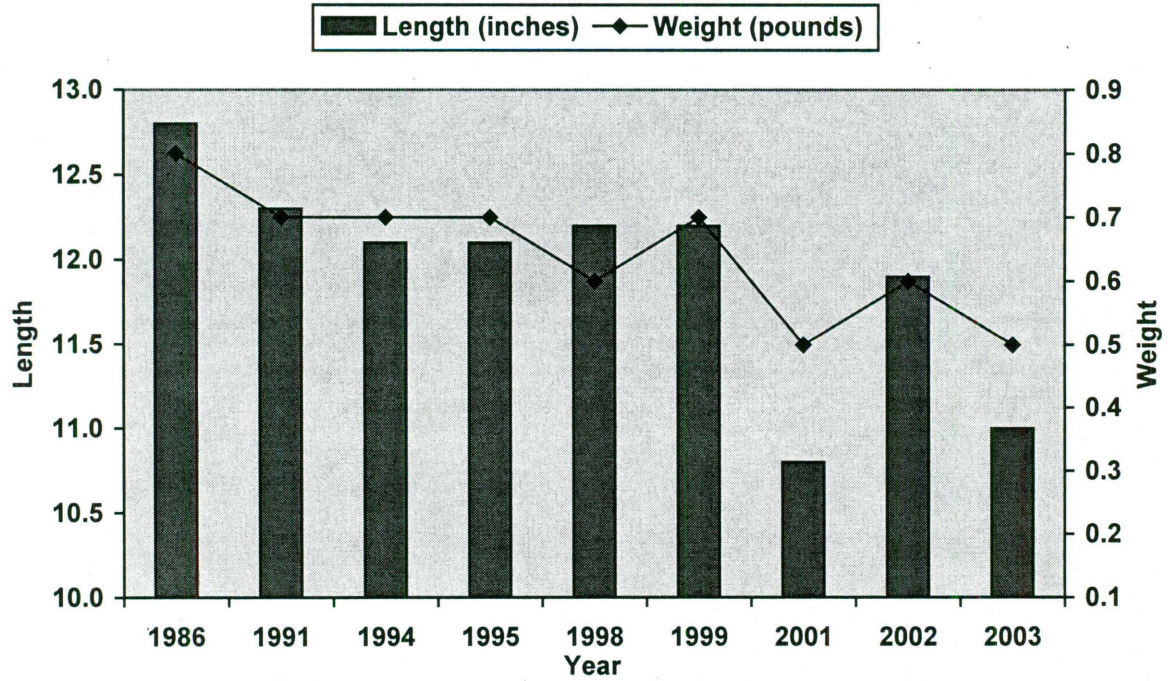


Table 10. Duncans multiple range tests for differences in lengths and weights of Mooselookmeguntic **brook trout**, 1991-2003. Current year bolded for emphasis

Age	Duncan grouping	Mean length	Mean weight	Sample size	Year
III+	A	12.4		43	1991
	A	12.2		24	1999
	A	12.2		49	1998
	A	12.1		76	1994
	A	12.1		19	1995
	A B	11.8		34	2002
	B	11.0		8	2003
	A		0.68	37	1991
	A B		0.67	66	1994
	A B		0.67	21	1999
	A B		0.65	18	1995
	A B		0.62	45	1998
	A B		0.57	32	2002
	A B		0.48	7	2003
IV+	A	14.6		17	1994
	A B	14.3		17	1999
	A B	14.0		17	1991
	A B	13.6		20	2003
	A B	13.5		12	1998
	A B	13.4		27	2002
	B	13.3		20	1995
	A		1.29	13	1994
	A B		1.23	10	1991
	A B		1.20	14	1999
	A B		0.98	13	2003
	A B		0.92	23	2002
	A B		0.88	15	1995

Table 11. Size distribution of legal-size brook trout harvested from Mooselookmeguntic Lake by voluntary anglers, 1999-2003.

Year	Inch class	Number caught	Number released	Number harvested	Percent harvested
1999	10-12	28	21	7	25
	GE 12	59	18	41	70
2000	10-12	13	8	5	38
	GE 12	30	10	20	67
2001	10-12	17	14	3	18
	GE 12	13	5	8	62
2002	10-12	11	4	7	64
	GE 12	20	7	13	65
2003	10-12	8	3	5	63
	GE 12	11	5	6	55
All	10-12	77	50	27	35
	GE 12	133	45	88	66

Appendix A. List of fish species present in Mooselookmeguntic Lake.

Common name	Scientific name
Landlocked Atlantic salmon	<i>Salmo salar</i>
Brook trout	<i>Salvelinius fontinalis</i>
Rainbow smelt	<i>Osmerus mordax</i>
Landlocked alewife	<i>Alosa psuedoharengus</i>
Yellow perch	<i>Perca flavescens</i>
White sucker	<i>Catostomus commersoni</i>
Longnose sucker	<i>Catostomus catostomus</i>
Brown bullhead	<i>Ameirus nebulosus</i>
Slimy sculpin	<i>Cottus cognatus</i>
Blacknose dace	<i>Rhinichthys atratulus</i>
Creek chub	<i>Semotilus atromaculatus</i>
Fallfish	<i>Semotilus corporalis</i>
Pearl dace	<i>Semotilus margarita</i>
Lake chub	<i>Couesius plumbeus</i>
Northern redbelly dace	<i>Chrosomus eos</i>
Golden shiner	<i>Notemigonus chrysoleucas</i>
Fathead minnow	<i>Pimephales promelas</i>
Common shiner	<i>Notropis cornutus</i>

COOPERATIVE
STATE  **FEDERAL**
PROJECT

This report has been funded in part by the Federal Aid in Sport Fish Restoration Program. This is a cooperative effort involving federal and state government agencies. The program is designed to increase sport fishing and boating opportunities through the wise investment of anglers' and boaters' tax dollars in state sport fishery projects. This program which was funded in 1950 was named the Dingell-Johnson Act in recognition of the congressmen who spearheaded this effort. In 1984 this act was amended through the Wallop-Breaux Amendment (also named for the congressional sponsors) and provided a threefold increase in Federal monies for sportfish restoration, aquatic education and motorboat access.

The Program is an outstanding example of a "user pays-user benefits", or "user fee" program. In this case, anglers and boaters are the users. Briefly, anglers and boaters are responsible for payment of fishing tackle excise taxes, motorboat fuel taxes, and import duties on tackle and boats. These monies are collected by the sport fishing industry, deposited in the Department of Treasury, and are allocated the year following collection to state fishery agencies for sport fisheries and boating access projects. Generally, each project must be evaluated and approved by the U.S. Fish and Wildlife Service (USFWS). The benefits provided by these projects to users complete the cycle between "user pays — user benefits".



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