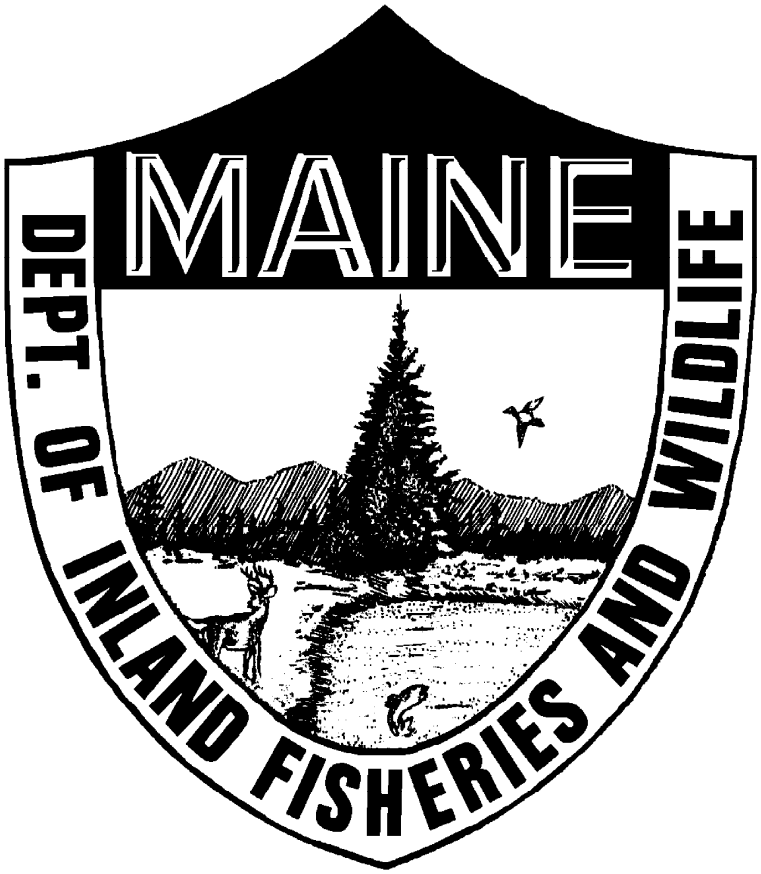
Fishery Progress Report Series No. 14-04

RICHARDSON LAKES FISHERY MANAGEMENT

By: David Howatt and Jason Seiders



December 2014

Maine Department of
Inland Fisheries & Wildlife
Fisheries and Hatcheries Division

JOB F-014

RICHARDSON LAKES FISHERY MANAGEMENT

Interim Summary Report No. 9 (2011-2014)

Summary

The Richardson Lakes support fisheries for landlocked salmon (*Salmo salar*), lake trout (*Salvelinus namaycush*), and brook trout (*Salvelinus fontinalis*). Angler surveys were conducted eight times from 1998 to 2014 to evaluate the status of the sport fishery. Estimates of total angler use and harvest were made in 2002, 2007, 2010 and 2014; all indicating an increase in angling activity over that of the late 1990's.

Salmon growth rates had been stable from 1986-1991, but declined in succeeding years, prompting a reduction in the salmon stocking rate to restore the abundance of rainbow smelt (*Osmerus mordax*), the primary forage species. Efforts to close Mill and Metallak Brooks to smelt dipping in 1996 were unsuccessful, but with continued poor salmon growth, they were closed effective 2007. Additionally, no salmon were stocked in 2006 in response to the sharp decline in salmon growth. Salmon stocking has since resumed, but at a lower rate to rebuild the forage base. Salmon growth rates and body condition remain relatively low even with reduced stocking rates and a more protected smelt population.

Lake trout and brook trout, which are not as dependent on smelt for forage, grew at acceptable rates over the survey period, and lake trout in particular provided an attractive fishery for large fish. Lake trout numbers are carefully managed by limiting recruitment through lake level manipulation. Wild brook trout are present in low numbers in the Richardson Lakes, and continue to be augmented by increasing numbers of hatchery fish. Brook trout catch rates have improved and provide an increasingly viable angling opportunity.

This report summarizes the clerk survey data, recent volunteer angler data, and other data collected by MDIFW during 2013. Summer angler surveys will continue on the Richardson Lakes on a three-year schedule; the next survey year will be 2017.

KEY WORDS: ANGLER EFFORT, ANGLER SURVEY, BKT, FORAGE, HARVEST, LAKE, LLS, LKT, MEAN SIZE, CLERK SURVEY

Introduction and Study Area

Upper and Lower Richardson Lakes, located in the Rangeley chain of lakes in Oxford County, are 7,100 acres in size and support fisheries for landlocked salmon, brook trout, and a remnant lake trout population. Water levels in the Richardson Lakes are controlled by Middle Dam, which is owned and operated by Brookfield Renewable Energy Partners.

General law regulations are in effect for salmon and lake trout; more restrictive brook trout regulations have been in effect since 1996. The lakes and their tributaries were closed to smelting in 2007 (Table 1). Previous to complete closure, smelt dipping at Upper Dam Pool was prohibited effective 1996 and the other smelt spawning tributaries, including Mill and Metallak Brooks, were closed to the taking of smelts from midnight until noon each day effective 2005.

The Richardsons are closed to ice fishing. There are public boat launch sites at the extreme ends of the Richardsons; at Mill Brook on the north end and at South Arm on the south end.

The salmon fishery is primarily dependent on annual stockings though there is some drop down of wild Mooselookmeguntic Lake salmon at Upper Dam. The salmon stocking rate was reduced from 3,500 in 1993 to approximately 2,500 or fewer fish in more recent years. Salmon stocking ceased in 2006 due to poor growth attributed to low smelt abundance. Continued poor salmon growth rates, despite reductions in the stocking rate, prompted the closure of the tributaries to recreational smelting in 2007. Since then, salmon growth rates have stayed steady and stocking has resumed at a rate of approximately 3,000 fish annually.

Lake trout were illegally introduced and efforts continue to reduce their numbers because they compete with salmon for limited forage. Landlocked alewives (*Alosa pseudoherangus*) were stocked in Rangeley Lake in the 1970's and have since become established in the Richardsons Lakes. Although they serve as forage for larger salmonids, they are utilized less than smelt (particularly by salmon) and likely compete with smelt for available plankton.

Currently, 5200 brook trout are annually stocked into the Richardson Lakes, supplementing the low population of wild trout. These fish grow well utilizing the alewives as forage. Also, unscheduled plantings of brook trout are occasionally added to the lakes, and provide varying rates of returns to anglers.

Methods

Season-long aerial angler counts and clerk creel surveys conducted in 2002, 2007, 2010 and 2013/2014 allowed estimation of total angler use as well as catch, harvest, and age composition of the

sport fishery. Clerk surveys conducted in 2003 and 2004 provided information on angler catch rates and fish growth rates, but not on total annual angler use and harvest. In addition, voluntary angler data are collected annually. These data complement and corroborate data collected via clerk surveys.

Supplementary information was gathered by trapnetting (1999, 2001, 2005, 2006, 2008, 2010, 2013), gillnetting (2003, 2007), and trawling (2005, 2006, 2009). Previous sampling efforts have been presented in Interim Summary Reports (1999, 2000, 2002, 2006, 2008, and 2011). Previously reported data are included in the summary tables in this report, and comparisons are made when appropriate.

Summary of Findings

Estimates of Angler Use and Harvest

Previous angler use estimates indicated a decline in the number of anglers fishing the Richardson Lakes in the late 1990's (Figure 1). Since the lowest total of 2,352 angler days in 1998, the number of anglers increased to a total of 8,455 in 2010. Angler use in 2013 dropped back to 5,336 angler days, a level similar to those of 2002 and 2007 (Table 2). The decrease in angler use observed may be attributed to the low salmon catch rates of the early 2000's.

In 1999, it took anglers approximately 49.7 hours to catch a legal salmon. By 2014, the number of hours required to catch a legal salmon had decreased to 5.2 (Table 2). This increase in angler success for salmon is a result of the larger fall-yearling sized fish stocked and recently increased stocking rates.

Lake trout numbers continued to fluctuate in the Richardson Lakes. Very few lake trout were reported during the 2010 and 2014 clerk surveys, illustrating some level of success in reducing lake trout numbers in the Richardson Lakes. Lake trout still provide an opportunity to catch larger, trophy fish, and are targeted by certain anglers; however, catches rates have averages only 0.04 fish per angler during the last two clerk surveys.

Brook trout contribute heavily to the sport fishery in the Richardson Lakes. MDIFW continues to augment the relatively low wild brook trout population with regular and occasional unscheduled Kennebago strain hatchery trout. As a result, angler success has increased from 0.08 legal fish per angler in 1999, to 0.63 legal fish per angler in 2014 (Table 2).

The Salmon Fishery

Salmon were stocked at a rate of 3,500 spring yearlings per year (0.49/acre) from 1981 through 1993. Growth rate concerns prompted a reduction in the stocking rate to 2,500 per year (0.35/acre/year) from 2003 through 2005. Due to a severe decline in growth rates, salmon stocking was suspended for a

year in 2006. Stocking resumed in 2007 and has now been increased to a rate of 3000 per year (0.42/acre).

Larger fall-yearling salmon have been stocked since 2009 and seem to be an improvement over the smaller spring-yearling fish that were previously used. We hypothesize that the lakes' insect production is low due to the lack of extensive littoral areas and from annual dewatering. This may negatively impact first year growth of spring-stocked salmon, which forage primarily on invertebrates. Larger fall-stocked salmon are less likely to rely on insects and could forage on smelts shortly after planting, thereby boosting growth rates and shortening the time required to recruit to attractive sizes. Trapnetting data suggested that fall-yearling salmon have comprised the majority of the salmon fishery since 2009 (Tables 5 & 7). Beginning in 2010, volunteer angler data shows an increased success rate for catching a legal size salmon (Table 3). The 2014 clerk survey data also indicate an excellent catch rate, up to 1.01 legal salmon per angler from just 0.18 in 2010 (Table 2).

All data sources show little improvement in the overall condition factor for salmon in the Richardson Lakes. In the 2013 trapnetting, hatchery salmon exhibited a similar average length (15.6") and condition (0.81) to previous samplings (Figure 2 & Table 5), but remained well below historical levels. This suggests that the lakes' forage base of smelt continues to be impaired.

Many factors contribute to the salmon forage problems in the Richardson Lakes. Competition for smelt from lake trout contributes to salmon growth problems, although lake trout numbers appear to be stable or in decline. Additional pressure on the smelt population comes from an unknown number of wild salmon that drop down from Mooselookmeguntic Lake. These salmon contribute to the fishery in the Richardson Lakes, but their numbers add an unknown variable to managing smelt predators. Landlocked alewives are not readily utilized by salmon. They remain dependent upon high smelt densities to achieve desirable growth and condition. Alewives compete with smelt for food and may be responsible for contributing to a decline in smelt abundance. The only variable within MDIFW's direct control is the salmon stocking rate, which will continue to be adjusted due to the variable balance between predatory species and the available forage. The performance of fall-yearling stocked salmon and smelt abundance will be monitored.

The Lake Trout Fishery

Lake trout were illegally introduced to the Richardson Lakes in the 1970's and were stocked intermittently from 1980 to 1995 until there was evidence that the forage base could not support an additional predator species. At the request of MDIFW, Florida Power & Light (FPL), the dam owners at the time, implemented a minimum winter drawdown of five feet below the October 1 lake elevation

on an annual basis beginning in 2000. This drawdown dewaters and kills lake trout eggs that were deposited in the fall when suitable spawning substrate was still covered with water. This effort appears to be successful, as evidenced by fewer sublegal fish reported and none captured in recent gillnet or trapnetting efforts. Age 5+ lake trout collected in 2007 originated from eggs laid after the draw down agreement went into effect in 2000, indicating that not all of the eggs were dewatered. However, no lake trout younger than age 5+ were sampled, suggesting that the effort is largely successful in limiting reproduction.

Lake trout in the Richardsons have grown to attractive sizes, and MDIFW recognizes that they have provided an attractive fishery for anglers seeking larger fish. Voluntary anglers reported catching a total of 20 legal-size lake trout from 2009 to 2013 (Table 3), the longest of which was 33 inches. However, due to their longevity, and because the lakes' smelt populations continues to be depressed, MDIFW desires to continue efforts to minimize the abundance of lake trout in the lakes through winter drawdowns.

Although MDIFW currently seeks to limit lake trout numbers in the Richardson Lakes, conditions may change in the future. If landlocked alewives become overabundant and the smelt population becomes relict, limited maintenance stockings of lake trout could help to reduce landlocked alewife numbers and ultimately benefit smelt and salmon.

The Brook Trout Fishery

The Richardson Lakes do not support a substantial wild brook trout population. This situation may result from a lack of spawning and nursery habitat in the tributaries, the relatively small littoral zone within the lake, the effect of the drawdown regime, or a combination of these factors. Brookfield Renewable Energy Partners conducts annual surveys to ensure unobstructed tributary access as part of their Federal Energy Regulatory Commission license. This eliminates a possible cause of reproductive failure, and may benefit other species such as smelt.

Regular stockings of spring-yearling brook trout are used to supplement the small wild population. Data from both clerk and voluntary angler surveys indicate that brook trout catch rates have improved in recent years. Growth rates were comparable to those observed in other large lakes in the chain. Also, the recruitment to older ages is clearly occurring with ages 1+ through 6+ being represented in the angler catch and in trapnet samples (Tables 11 and 12). These data are encouraging signs that brook trout stockings could provide significant benefits to the Richardson Lakes anglers.

Forage abundance

Inspections of annual smelt egg deposits suggested slightly improved spawning runs in two major tributaries (Mill Brook and Metallak Brook) in 2012 and 2013 (Table 13). Smelt spawning surveys are based on one or more qualitative observations where smelt egg deposition is visually assessed. The Department's hydroacoustic sampling has ceased due to obsolete equipment and a lack of funding to update and maintain the program.

Recommendations

- Continue salmon stockings with fall-yearlings at an annual rate of 2,000 to 3,000 (0.28 to 0.42/acre), with the specific rate depending on annual assessments of smelt spawning success and salmon growth rates and body condition.
- Continue brook trout stockings with Kennebago strain spring-yearlings at an annual rate of 5200 (0.73/acre), and monitoring their impact to the lakes' smelt and salmon populations.
- Continue to monitor smelt spawning runs with assistance from warden service.
- Continue water level manipulations through Brookfield to limit successful lake trout spawning.
- Conduct clerk creel surveys in 2017 (a frequency of one survey every third year) through Brookfield to evaluate changes in angler use, salmon growth rates, lake trout reproduction, and forage preference and abundance.

Prepared by: David Howatt and Jason Seiders
November, 2014

Acknowledgments

Funding to hire a clerk who checked anglers at the Richardson Lakes was provided by Brookfield Renewable Energy Partners. Voluntary anglers who keep fishing log books allow us to monitor the lakes' fishery on an annual basis, and we are grateful for the high quantity and quality of the records they maintain. Thanks to the following anglers: Fern Bosse, Honey Cronin, Lyn Hewey, and Maynard Webster. Elizabeth Thorndike assisted with data compilation and analysis. Gordon Kramer reviewed the report and added suggestions.

References

Bonney, Forrest R. 1999. Richardson Lakes Fishery Management. Interim Summary Report No. 3 (1998). Maine Department Inland Fisheries and Wildlife. 14 pp. Mimeo.

_____ 2000. Richardson Lakes Fishery Management. Interim Summary Report No. 4 (1998-1999). Maine Department Inland Fisheries and Wildlife. 17 pp. Mimeo.

_____ 2002. Richardson Lakes Fishery Management. Interim Summary Report No. 5 (2002). Maine Department Inland Fisheries and Wildlife. 20 pp. Mimeo.

_____ 2006. Richardson Lakes Fishery Management. Interim Summary Report No. 6 (2003-2005). Maine Department Inland Fisheries and Wildlife. 23 pp. Mimeo.

_____ 2008. Richardson Lakes Fishery Management. Interim Summary Report No. 7 (2006-2008). Maine Department Inland Fisheries and Wildlife. 20 pp. Mimeo.

_____ 2011. Richardson Lakes Fishery Management. Interim Summary Report No. 8 (2008-2010). Maine Department Inland Fisheries and Wildlife. 21 pp. Mimeo.

SAS [computer software]. Cary, North Carolina: SAS Institute, Inc., diskettes and manuals.

Table 1. Stocking and regulation history, Richardson Lakes, 2000-2014.

Year	Stocking History	Special Regulations
2000	2,500 SY LLS 25,760 FR BKT 10,000 FF BKT	No live fish as bait. BKT: 2 fish, min. length 10 in., only 1 may exceed 12 in. LLS and LKT: general law.
2001	2,500 SY LLS 5,000 FR BKT	Same as previous year.
2002	1,500 SY LLS	Same as previous year.
2003	2,500 SY LLS 6,500 FR BKT	Same as previous year.
2004	2,500 SY LLS 4,900 FR BKT	Same as previous year.
2005	2,500 SY LLS 12,850 FR BKT	Same as previous year except lake and tributaries closed to the taking of smelts from midnight until noon each day.
2006	3,956 SY BKT	Same as previous year.
2007	1,700 SY LLS 2,590 FR BKT 92 AD BKT	Same as previous year except lake and tributaries closed to the taking of smelts.
2008	1,700 SY LLS 3,800 FF BKT 198 FY BKT 127 AD BKT	Same as previous year.
2009	1,658 FY LLS	Same as previous year.
2010	1,892 FY LLS 2,750 SY BKT 2,000 FF BKT 175 FY BKT	Same as previous year.
2011	2076 FY LLS 2600 SY BKT	Same as previous year.
2012	3000 FY LLS 5200 SY BKT 19000 FR BKT	Same as previous year.
2013	3000 FY LLS 5200 SY LLS	Same as previous year.
2014	3000 FY LLS 5200 SY BKT	Same as previous year.

Note: LLS = landlocked salmon; BKT = brook trout; LKT = lake trout
FR = fry; FF = fall-fingerlings; FY = fall-yearling; SY = spring-yearlings; AD = adult

Table 2. Stratified random clerk surveys, 2002-2014.

		CENSUS YEAR					
Statistics	**Species**	**2002**	**2003**	**2004**	**2007**	**2010**	**2014**
No. anglers surveyed		110	123	61	122	105	150
No. angler hours		474	643	353	809	575	800
No.anglers (and %) successful in catching a legal fish	LLS	10 (9)	24 (20)	11 (18)	38 (31)	13 (12)	74 (49)
	LKT	9 (8)	3 (2)	0	13 (11)	2 (2)	6 (4)
	BKT	4 (4)	4 (3)	5 (8)	19 (16)	23 (22)	54 (36)
No. legal fish kept	LLS	5	7	3	16	4	32
	LKT	8	1	0	3	0	2
	BKT (all)	1	1	1	12	14	14
	10-12 in	1	0	1	6	12	13
	GE 12 in	0	1	0	6	2	1
No. (and %) legal fish released	LLS	20 (80)	39 (85)	26 (90)	100 (86)	15 (79)	120 (79)
	LKT	7 (47)	2 (67)	0	17 (86)	2 (100)	5 (71)
	BKT (all)	3 (75)	23 (96)	3 (75)	23 (66)	35 (71)	81 (85)
	10-12 in	3 (75)	16 (100)	0	20 (77)	33 (73)	56 (81)
	GE 12 in	0	7 (88)		3 (33)	2 (50)	25 (96)
No. (and %) sublegal fish released	LLS	80 (76)	149 (76)	85 (75)	73 (39)	53 (74)	51 (25)
	LKT	0	0	0	3 (13)	3 (60)	6 (46)
	BKT	2 (33)	15 (38)	7 (64)	24 (41)	17 (26)	29 (23)
No. legal fish per angler	LLS	0.22	0.37	0.48	0.95	0.18	1.01
	LKT	0.14	0.02	0	0.17	0.02	0.05
	BKT	0.04	0.20	0.07	0.29	0.47	0.63
Hours to catch a legal fish (<u>all</u> legal fish caught)	LLS	19.0	14.0	12.2	7.0	30.2	5.2
	LKT	31.6	214.3	-	40.5	287.3	114.3
	BKT	118.5	26.8	88.3	23.1	11.7	8.4
Mean length in inches ± SE (and no. of fish sampled)	LLS	16.0 ± 0.5 (5)	16.5 ± 0.4 (8)	16.9 (1)	17.5 ± 0.6 (14)	17.2 ± 0.8 (4)	15.9 ± 0.1 (31)
	LKT	26.7 ± 1.5 (8)	31.1 (1)	-	23.6 ± 2.3 (3)	- -	23.8 (1)
	BKT	10.8 (1)	14.0 (1)	10.6 (1)	13.7 ± 1.0 (12)	11.7 ± 0.5 (14)	14.3 ± 0.7 (12)
Mean weight in lbs ± SE (and no. of fish sampled)	LLS	1.4 ± 0.2 (5)	1.5 ± 0.1 (8)	1.5 (1)	1.9 ± 0.2 (13)	1.7 ± 0.2 (4)	1.4 ± 0.1 (22)
	LKT	6.7 ± 0.8 (7)	11.0 (1)	-	5.1 ± 1.5 (3)	-	4.8 (1)
	BKT	0.5 (1)	1.0 (1)	0.4 (1)	1.3 ± 0.4 (12)	0.6 ± 0.1 (14)	1.4 ± 0.3 (9)
Estimated total fish harvested ± CI (@95%) during survey period	LLS	344 ± 51	-	-	758 ± 155	151 ± 26	1,138 ± 299
	LKT	501 ± 73	-	-	117 ± 24	0	71 ± 19
	BKT	69 ± 10	-	-	583 ± 120	490 ± 84	498 ± 131
Estimated total angler days ± CI (@95%) during survey period		6,882 (5,863 – 7,901)	-	-	5,828 (4,637 – 7,019)	8,455 (7,159 – 9,751)	5,336* (3,936 – 6,736)

* 2013 aerial angler counts

Table 3. Voluntary angler surveys, 2009-2013.

		SURVEY YEAR				
Statistics	**Species**	**2009**	**2010**	**2011**	**2012**	**2013**
No. anglers surveyed		30	44	79	60	54
No. angler hours		151	165	326	280	241
No. anglers (and %) successful in catching a legal fish	LLS	7 (23)	28 (64)	35 (44)	40 (67)	32 (59)
	LKT	4 (13)	2 (5)	0	3 (5)	8 (15)
	BKT	16 (53)	25 (57)	44 (56)	43 (72)	45 (83)
No. legal fish kept	LLS	5	6	4	1	0
	LKT	4	1	0	1	0
	BKT	1	3	0	0	2
No. (and %) legal fish released	LLS	9 (64)	46 (88)	43 (93	55 (98)	62 (100)
	LKT	0	4 (80)	0	2 (67)	8 (100)
	BKT10-12"	43 (100)	18 (90)	33 (100)	30 (100)	66 (97)
	BKT >12"	22 (96)	13 (93)	33 (100)	48 (100)	37 (100)
No. (and %) sublegal fish released	LLS	15 (52)	40 (44)	76 (57)	26 (32)	25 (29)
	LKT	0	1 (17)	2 (100)	0	0
	BKT	18 (21)	10 (23)	42 (39)	12 (13)	20 (16)
No. legal fish per angler (only those kept)	LLS	0.47 (0.17)	1.18 (0.14)	0.72 (0.05)	0.93 (0.02)	1.15 (0)
	LKT	0.13 (0.13)	0.11 (0.02)	0	0.02 (0.02)	0.15 (0)
	BKT	2.20 (0.03)	0.77 (0.07)	0.84 (0)	1.30 (0)	1.94 (0.04)
Hours to catch a legal fish (<u>all</u> legal fish caught)	LLS	10.8	3.2	5.7	5.0	3.9
	LKT	37.8	33.0	-	280.0	30.1
	BKT	2.3	4.9	4.9	3.6	2.3
Mean length in inches ± SE (and no.) fish reported	LLS	16.6 ± 0.6 (12)	15.3 ± 0.2 (51)	15.4 ± 0.2 (49)	15.3 ± 0.1 (44)	15.1 ± 0.1 (55)
	LKT	32.1 ± 0.3 (4)	24.4 ± 2.1 (5)	-	24.3 ± 2.0 (3)	20.7 ± 2.7 (3)
	BKT	12.6 ± 0.2 (69)	12.8 ± 0.4 (29)	12.7 ± 0.2 (66)	12.7 ± 0.2 (64)	12.2 ± 0.2(105)

Table 4. Average size by age of **hatchery salmon** sampled by **clerks** at Richardson Lakes, of 1999-2014.

		Ages					
Year	**Variable**	**III+**	**IV+**	**V+**	**VI+**	**VII+**	**All**
1999	Length (in)	15.8 ± 0.4	17.2 ±0.1				16.1 ± 0.4
	Weight (lbs)	1.43 ± 0.11	1.66 ± 0.14				1.44 ± 0.12
	Condition	0.94 ± 0.01	0.95 ± 0.06				0.94 ± 0.01
	Number	7	2				9
	Mark	Ad	RV				All
2002	Length (in)		17.4	16.5			17.0 ± 0.5
	Weight (lbs)		2.24	1.46			1.78 ± 0.44
	Condition		1.16	0.89			1.03 ± 0.14
	Number		1	1			2
	Mark		BV	LV			All
2003	Length (in)	16.4 ± 0.1					16.4 ± 0.1
	Weight (lbs)	1.53 ± 0.40					1.53 ± 0.40
	Condition	0.89 ± 0.03					0.89 ± 0.03
	Number	2					2
	Mark	Ad					Ad
2004	Length (in)		16.9				16.9
	Weight (lbs)		1.57				1.57
	Condition		0.88				0.88
	Number		1				1
	Mark		Ad				Ad
2007	Length (in)	15.2	18.9 ± 0.1		20.2	17.2 ± 0.7	17.8 ± 0.8
	Weight (lbs)	1.23	2.40 ± 0.75		3.18	1.78 ± 0.33	2.13 ± 0.32
	Condition	0.94	0.97 ± 0.02		1.07	0.99 ± 0.05	0.99 ± 0.03
	Number	1	2		1	3	7
	Mark	Ad	LV		RV	Ad	All
2010	Length (in)		15.3		19.0		17.1 ± 1.9
	Weight (lbs)		1.22		1.98		1.60 ± 0.42
	Condition		0.94		0.80		0.87 ± 0.07
	Number		1		1		2
	Mark		BV		Ad		All
2014	Length (in)	15.8 ± 0.3	15.9 ± 0.3	16.4 ± 0.6			16.0 ± 0.2
	Weight (lbs)	1.41 ± 0.12	1.37 ± 0.0	1.50 ± 0.09			1.43 ± 0.08
	Condition	0.96 ± 0.04	0.98 ± 0.0	0.95 ± 0.04			0.95 ± 0.02
	Number	11	2	2			25
	Mark	RV	BV	LV			

Table 5. Average size by age of **hatchery salmon** sampled by **trapnetting** at Richardson Lakes, 1999-2013.

		Ages						
Year	**Variable**	**I+**	**II+**	**III+**	**IV+**	**V+**	**VI+**	**All**
1999	Length (in)	12.0 ± 0.4		16.7	19.4 ± 0.7	13.6		15.6 ± 1.3
	Weight (lbs)	0.44 ± 0.07		1.28	2.32 ± 0.27	0.64		1.29 ± 0.32
	Condition	0.68 ± 0.04		0.78	0.85 ± 0.05	0.68		0.76 ± 0.04
	Number	3		1	3	1		8
2001	Length (in)	10.4 ± 0.2	15.6 ± 1.9	15.4 ± 0.4	18.1 ± 0.4	21.7 ± 2.2	22.4	15.8 ± 0.5
	Weight (lbs)	0.35 ± 0.01	1.40 ± 0.56	1.13 ± 0.12	2.07 ± 0.18	3.56 ± 1.21	4.33	1.54 ± 0.16
	Condition	0.69 ± 0.02	0.81 ± 0.06	0.82 ± 0.03	0.93 ± 0.02	0.93 ± 0.05	1.05	0.84 ± 0.02
	Number	10	5	13	18	2	1	49
2005	Length (in)	11.1 ± 7.2	12.5 ± 0.6	13.9 ± 0.2	16.1 ± 1.3			12.8 ± 0.3
	Weight (lbs)	0.43 ± 0.01	0.62 ± 0.08	0.77 ± 0.05	1.39 ± 0.41			0.68 ± 0.06
	Condition	0.82 ± 0.04	0.79 ± 0.03	0.83 ± 0.01	0.84 ± 0.08			0.82 ± 0.02
	Number	14	7	14	4			39
2006	Length (in)		12.2	15.6 ± 0.8	16.7 ± 1.0		15.6	15.4 ± 0.6
	Weight (lbs)		0.35	1.21 ± 0.22	1.17 ± 1.0		1.10	1.08 ± 0.17
	Condition		0.54	0.83 ± 0.04	0.86 ± 0.0		0.81	0.79 ± 0.05
	Number		1	5	2		1	9
2008	Length (in)	11.0 ± 0.3	12.6 ± 0.3		19.1 ± 0.3	21.6	19.9	16.1 ± 0.6
	Weight (lbs)	0.37 ± 0.01	0.57 ± 0.03		2.30 ± 0.12	3.56	2.62	1.60 ± 0.17
	Condition	0.78 ± 0.03	0.79 ± 0.03		0.90 ± 0.17	0.98	0.92	0.86 ± 0.02
	Number	5	11		18	1	1	36
2010	Length (in)		14.1 ± 0.1	14.6 ± 0.2	17.2 ± 1.4		20.3 ± 0.5	14.5 ± 0.2
	Weight (lbs)		0.76 ± 0.02	0.94 ± 0.08	1.53 ± 0.11		2.64 ± 0.17	0.87 ± 0.01
	Condition		0.74 ± 0.02	0.83 ± 0.02	0.81 ± 0.02		0.86 ± 0.02	0.76 ± 0.04
	Number		86	17	2		4	109
2013	Length (in)		14.8 ± 0.1	16.1 ± 0.2	18.1 ± 0.3		17.4	15.6 ± 0.1
	Weight (lbs)		0.94 ± 0.04	1.28 ± 0.08	1.94 ± 0.14		1.91	1.17 ± 0.05
	Condition		0.79 ± 0.04	0.82 ± 0.03	0.90 ± 0.07		1.00	0.81 ± 0.02
	Number		105	56	22		1	184

Table 6. Average size by age of **wild salmon** sampled by **clerks** at Richardson Lakes, 1999-2014.

		Ages					
Year	**Variable**	**IV+**	**V+**	**VI+**	**VII+**	**VIII+**	**All**
1999	Length (in)	13.9	16.9	16.7 ± 0.3	18.0 ± 2.5	18.7 ± 0.2	17.2 ± 0.7
	Weight (lbs)	-	-	1.67 ±0.33	2.56 ± 1.43	2.02 ± 0.09	2.11 ± 0.40
	Condition	-	-	0.99 ± 0.13	1.10 ± 0.18	0.84 ± 0.02	0.98 ± 0.07
	Number	1	1	2	2	2	8
2002	Length (in)	14.6	15.7 ± 0.1				15.4 ± 0.4
	Weight (lbs)	0.89	1.22 ± 0.87				1.14 ± 0.12
	Condition	0.77	0.87				0.84 ± 0.04
	Number	1	2				3
2003	Length (in)		17.1	16.7 ± 1.2			16.8 ± 0.7
	Weight (lbs)		1.79	1.23 ± 0.14			1.38 ± 0.24
	Condition		0.97	0.71 ± 0.12			0.80 ± 0.11
	Number		1	2			3
2004	Length (in)			19.2			19.2
	Weight (lbs)			-			-
	Condition			-			-
	Number			1			1
2007	Length (in)	15.0		18.0 ± 1.5	16.9 ± 2.5	17.9 ± 0.4	17.2 ± 0.8
	Weight (lbs)	1.13		1.92 ± 0.45	2.47	1.50 ± 0.03	1.71 ± 0.18
	Condition	0.93		0.89	0.95	0.74	0.86 ± 0.04
	Number	1		2	2	2	7
2010	Length (in)			16.7	17.7		17.2
	Weight (lbs)			1.88	1.86		1.87
	Condition			1.04	0.88		0.96 ± 0.08
	Number			1	1		2
2014	Length (in)	15.7	14.9	16.1			15.6 ± 0.5
	Weight (lbs)	-	-	1.41			1.41
	Condition	-	-	0.93			0.93
	Number	1	1	1			3

Table 7. Average size by age of **wild salmon** sampled by **trapnetting** at Richardson Lakes, 1999-2013.

		Ages						
Year	**Variable**	**II+**	**III+**	**IV+**	**V+**	**VI+**	**VII+**	**All**
1999	Length (in)				16.1 ± 2.2	19.1		17.1 ± 1.6
	Weight (lbs)				1.23 ± 0.45	1.92		1.38 ± 0.41
	Condition				0.75 ± 0.02	0.75		0.75 ± 0.01
	Number				2	1		3
2001	Length (in)		11.3 ± 0.6	12.0 ± 0.3	14.0 ± 0.5	16.2 ± 1.2	18.7	13.3 ± 0.4
	Weight (lbs)		0.43 ± 0.04	0.39 ± 0.03	0.78 ± 0.13	1.31 ± 0.36	1.79	0.72 ± 0.08
	Condition		0.66 ± 0.03	0.67 ± 0.04	0.77 ± 0.04	0.77 ± 0.08	0.75	0.72 ± 0.02
	Number		4	12	11	4	1	32
2005	Length (in)		11.9	11.8	13.0 ± 0.3	13.7 ± 1.1		13.0 ± 0.4
	Weight (lbs)		0.52	0.44	0.63 ± 0.14	0.77 ± 0.19		0.62 ± 0.01
	Condition		0.76	0.71	0.72 ± 0.04	0.71 ± 0.06		0.72 ± 0.02
	Number		1	1	5	4		11
2006	Length (in)			13.4	13.8			13.6 ± 0.2
	Weight (lbs)			0.67	0.77			0.72 ±0.06
	Condition			0.76	0.82			0.96 ± 0.08
	Number			1	1			2
2008	Length (in)	9.1 ± 2.3	12.1 ± 0.1	13.5 ± 0.4	14.7 ± 0.4	16.9 ± 0.2	15.8	13.8 ± 0.5
	Weight (lbs)	0.24 ± 0.15	0.54 ± 0.02	0.71 ± 0.09	0.89 ± 0.12	1.38 ± 0.22	0.97	0.84 ± 0.08
	Condition	0.87 ± 0.22	0.70 ± 0.02	0.82 ± 0.02	0.77 ± 0.03	0.80 ± 0.08	0.73	0.78 ± 0.02
	Number	2	4	5	10	2	1	24
2010	Length (in)		10.8 ± 0.3	13.7 ± 0.9	13.5 ± 0.9	19.0		13.4 ± 0.7
	Weight (lbs)		0.33 ± 0.02	0.78 ± 0.16	0.79 ± 0.19	1.65		0.77 ± 0.14
	Condition		0.76 ± 0.08	0.81 ± 0.03	0.70 ± 0.04	0.67		0.74 ± 0.03
	Number		3	4	6	1		14
2013	Length (in)		9.7	14.4 ± 0.3	14.6 ± 0.7	15.8	21.1	14.8 ± 0.6
	Weight (lbs)		0.22	0.81 ± 0.09	0.84 ± 0.11	0.94	2.86	0.95 ± 0.15
	Condition		0.66	0.74 ± 0.05	0.73 ± 0.01	0.66	0.85	0.74 ± 0.03
	Number		1	7	5	1	1	16

Table 8. Average size and age of **hatchery-reared lake trout** sampled by **clerks** at Richardson Lakes, 1999-2010.

		Ages				
Year	**Variable**	**V+**	**VIII+**	**XII+**	**XV+**	**All**
1999	Length (in)	24.7 ± 0.4				24.7 ± 0.4
	Weight (lbs)	6.21 ± 0.44				6.21 ± 0.44
	Condition	1.13 ± 0.03				1.13 ± 0.03
	Number	10				10
	Mark	LP				LP
2002	Length (in)		28.9 ± 0.9		34.3	30.7 ± 1.9
	Weight (lbs)		8.87 ± 0.87		.	8.87 ± 0.87
	Condition		1.02 ± 0.01			1.02 ± 0.01
	Number		2		1	3
	Mark		LP		LV	All
2003	Length (in)			31.1		31.1
	Weight (lbs)			11.00		11.00
	Condition			1.02		1.02
	Number			1		1
	Mark			RV		RV

Table 9. Average size and age of **hatchery-reared lake trout** sampled by **trapnetting** at Richardson Lakes, 1999-2010.

		Ages							
Year	**Variable**	**V+**	**VII+**	**VIII+**	**XI+**	**XII+**	**XIV**	**XVI**	**All**
1999	Length (in)	24.7 ± 0.6		27.3		30.5 ± 0.7			26.5 ± 0.9
	Weight (lbs)	5.43 ± 0.45		9.50		9.45 ± 0.33			6.67 ± 0.67
	Condition	0.96 ± 0.04		1.29		0.99 ± 0.06			1.00 ± 0.04
	Number	7		1		3			11
2001	Length (in)		26.9 ± 0.5						26.9 ± 0.5
	Weight (lbs)		6.73 ± 0.63						6.73 ± 0.63
	Condition		0.95 ± 0.04						0.95 ± 0.04
	Number		5						5
2005	Length (in)				27.9				27.9
	Weight (lbs)				8.00				8.00
	Condition				1.02				1.02
	Number				1				1
2008	Length (in)						32.4		32.4
	Weight (lbs)						12.00		12.00
	Condition						0.97		0.97
	Number						1		1
2010	Length (in)							30.8	30.8
	Weight (lbs)							9.00	9.00
	Condition							0.86	0.86
	Number							1	1

Table 10. Average size and age of **wild lake trout** sampled at Richardson Lakes, summers of 1999-2014.

			Ages			
Year	**Method**	**Variable**	**V+**	**VII+**	**VIII+**	**All**
1999	Clerk survey	Length (in)		24.8		24.8
		Weight (lbs)		7.93		7.93
		Condition		1.44		1.44
		Number		1		1
2002*	Clerk survey	Length (in)				23.9 ± 2.1
		Weight (lbs)				6.43 ± 1.92
		Condition				1.26 ± 0.04
		Number				2
2004	Clerk survey	Length (in)		21.2		21.1
		Weight (lbs)		3.33		3.33
		Condition		0.97		0.97
		Number		1		1
2007	Clerk survey	Length (in)			17.5 ± 0.4	17.5 ± 0.4
		Weight (lbs)			1.50 ± 0.03	1.50 ± 0.03
		Condition			0.75 ± 0.06	0.75 ± 0.06
		Number			2	2
2007	Gillnet	Length (in)	18.9 ± 0.4			18.9 ± 0.4
		Weight (lbs)	2.23 ± 0.12			2.23 ± 0.12
		Condition	0.88 ± 0.03			0.88 ± 0.03
		Number	5			5
2008*	Trapnet	Length (in)				23.6
		Weight (lbs)				4.25
		Condition				0.88
		Number				1
2014*	Clerk survey	Length (in)				23.8
		Weight (lbs)				4.85
		Condition				0.99
		Number				1

*Note: Age unknown

Table 11. Average size and age of **brook trout** sampled at Richardson Lakes, summers of 1999-2014.

			Ages					
Year	**Method**	**Variable**	**I+**	**II+**	**III+**	**IV+**	**V+**	**All**
1999	Clerk survey	Length (in)			11.8 ± 0.7	13.2	18.9	14.5 ± 1.3
		Weight (lbs)			0.63 ± 0.12	0.89	2.41	1.64 ± 0.60
		Condition			1.04 ± 0.11	1.06	1.00	1.07 ± 0.07
		Number			4	1	1	6
2002	Clerk survey	Length (in)			10.8			10.8
		Weight (lbs)			0.50			0.50
		Condition			1.03			1.03
		Number			1			1
2003	Clerk survey	Length (in)				14.0		14.0
		Weight (lbs)				1.00		1.00
		Condition				1.01		1.01
		Number				1		1
2004	Clerk survey	Length (in)			10.6			10.6
		Weight (lbs)			0.42			0.42
		Condition			0.91			0.91
		Number			1			1
2007	Clerk survey	Length (in)		12.2 ± 0.6	11.6 ± 0.4	14.4 ± 2.1	17.7	13.0 ± 0.7
		Weight (lbs)		0.78 ± 0.16	0.64 ± 0.11	1.63 ± 0.59	2.44	1.03 ± 0.15
		Condition		1.08 ± 0.07	0.97 ± 0.04	1.17 ± 0.02	1.21	1.07 ± 0.04
		Number		4	4	2	1	11
2007	Gillnet	Length (in)		12.2 ± 2.2	11.4			11.9 ± 1.3
		Weight (lbs)		0.74 ± 0.45	0.53			0.68 ± 0.26
		Condition		0.88 ± 0.18	0.87			0.87 ± 0.10
		Number		2	1			3
2010	Clerk survey	Length (in)	11.2 ± 0.4	10.4	11.6 ± 0.6	11.3 ± 0.2	16.6	11.7 ± 0.5
		Weight (lbs)	0.52 ± 0.08	0.43	0.60 ± 0.12	0.55 ± 0.04	1.97	0.58 ± 0.11
		Condition	1.00 ± 0.02	0.91	0.98 ± 0.05	0.94 ± 0.02	1.20	0.99 ± 0.03
		Number	3	1	6	3	1	14
2014	Clerk survey	Length (in)		11.4 ± 0.5	13.7 ± 0.5	14.1 ± 0.3	18.1 ± 0.2	14.3 ± 0.7
		Weight (lbs)		0.54 ± 0.03	0.99 ± 0.22	1.15 ± 0.0	2.73 ± 0.35	1.46 ± 0.31
		Condition		0.88 ± 0.03	1.05 ± 0.12	1.07 ± 0.0	1.27 ± 0.12	1.09 ± 0.06
		Number		3	2	3	2	10

Table 12. Average size by age of **brook trout** sampled by **trapnetting** at Richardson Lakes, 1999-2013.

		Ages							
Year	**Variable**	**0+**	**I+**	**II+**	**III+**	**IV+**	**V+**	**VI**	**All**
1999	Length (in)			8.1 ± 0.2	14.6	15.0 ± 0.6			11.5 ± 1.3
	Weight (lbs)			0.24 ± 0.01	1.08	1.13 ± 0.16			0.64 ± 0.21
	Condition			0.91 ± 0.03	0.98	0.92 ± 0.04			0.92 ± 0.02
	Number			4	1	3			8
2001	Length (in)			8.7 ± 0.3	11.1 ± 0.3	17.1 ± 0.7			12.3 ± 1.3
	Weight (lbs)			0.23 ± 0.01	0.44 ± 0.04	1.81 ± 0.33			0.78 ± 0.31
	Condition			0.87 ± 0.09	0.78 ± 0.03	1.01 ± 0.09			0.89 ± 0.05
	Number			3	3	3			9
2005	Length (in)		6.1	9.2 ± 0.5	10.8 ± 0.6	6.5			9.3 ± 0.5
	Weight (lbs)		-	0.19 ± 0.02	0.45 ± 0.07	0.14			0.34 ± 0.09
	Condition		-	0.78 ± 0.09	0.91 ± 0.04	1.34			0.89 ± 0.06
	Number		2	6	7	1			16
2006	Length (in)		9.7 ± 0.2		11.0				10.1 ± 0.5
	Weight (lbs)		0.24 ± 0.04		0.28				0.25 ± 0.03
	Condition		0.68 ± 0.01		0.68				0.68 ± 0.01
	Number		2		1				3
2008	Length (in)	6.9		9.3 ± 0.3	13.0 ± 0.5	16.4	18.3		12.2 ± 0.6
	Weight (lbs)	0.08		0.20 ± 0.02	0.68 ± 0.08	1.27	2.41		0.73 ± 0.11
	Condition	1.01		0.82 ± 0.03	0.82 ± 0.03	0.80	1.08		0.84 ± 0.02
	Number	1		6	16	1	1		25
2010	Length (in)		10.8 ± 0.2	10.9 ± 0.5	11.2 ± 0.4	14.3	16.1 ± 0.6	22.4	11.6 ± 0.4
	Weight (lbs)		0.42 ± 0.02	0.43 ± 0.06	0.44 ± 0.04	0.78	1.33 ± 0.18	4.50	0.63 ± 0.08
	Condition		0.81 ± 0.03	0.77 ± 0.02	0.77 ± 0.02	0.75	0.84 ± 0.01	1.11	0.80 ± 0.02
	Number		20	13	4	1	3	1	42
2013	Length (in)		10.7 ± 0.2	11.4 ± 0.3	13.0 ± 0.4	15.8 ± 0.7	19.1 ± 0.7	18.5	12.3 ± 0.3
	Weight (lbs)		0.37 ± 0.02	0.43 ± 0.05	0.75 ± 0.08	1.44 ± 0.19	2.55 ± 0.49	2.16	0.69 ± 0.06
	Condition		0.80 ± 0.01	0.78 ± 0.04	0.89 ± 0.02	0.96 ± 0.03	1.00 ± 0.09	0.95	0.85 ± 0.01
	Number		37	9	20	9	2	1	79

Table 13. Smelt spawning observations, Richardson Lake tributaries, 1997-2014.

Date	Tributary	Abundance/comments
5/4/97	Metallak Brook	Good run
5/4/97	Mill Brook	Good run
4/15/98	Mill Brook	Run just beginning
4/27/98	Mill Brook	No eggs seen; poor run
5/3/99	Mill Brook	Light to moderate egg deposition
4/21/00	Mill Brook	Good run
5/2/00	Metallak Brook	Light to moderate egg deposition
5/3/00	Mill Brook	Moderate egg deposition
4/16/01	Upper Dam	Light egg deposition
4/28/01	Mill Brook	Heavy run
5/3/01	Mill Brook	Moderate egg deposition
5/8/01	Mill Brook	Water low; smelt spawning in lake
4/21/02	Mill Brook	Poor run
5/6/04	Mill Brook	No eggs
4/25/05	Mill Brook	Light run
4/25/05	Metallak Brook	Moderate run
5/5/05	Mill Brook	No eggs observed
5/16/05	Mill Brook	SCUBA survey: most eggs in 1.5-3' of water along east bank; some eggs 6-8' deep; most had hatched.
4/18-21/06	Metallak Brook	Poor run
4/18-22/06	Mill Brook	Poor run
4/26/07	Mill Brook	No SLT sign, high water
4/31/07	Mill Brook	Few SLT
5/16/07	Metallak Brook	Moderate egg deposition – high water
5/6/08	Mill Brook	No eggs or SLT
5/6/08	Metallak Brook	No eggs observed
4/28/09	Mill Brook	Good run
4/28/09	Metallak Brook	No eggs observed
4/13/10	Mill Brook	Good run
4/22/10	Metallak Brook	Light to Mod egg deposition, pockets of heavy
5/??/11	Mill Brook	Good run
	Metallak Brook	Poor run – high water
4/16/12	Mill Brook	Great run
5/2/13	Mill Brook	Heavy egg deposition
	Upper Dam Pool	Light to moderate egg deposition
5/5/14	Mill Brook	"Have spawned"
	Upper Dam Pool	"Have spawned"

Figure 1. Angler Use at the Richardson Lakes

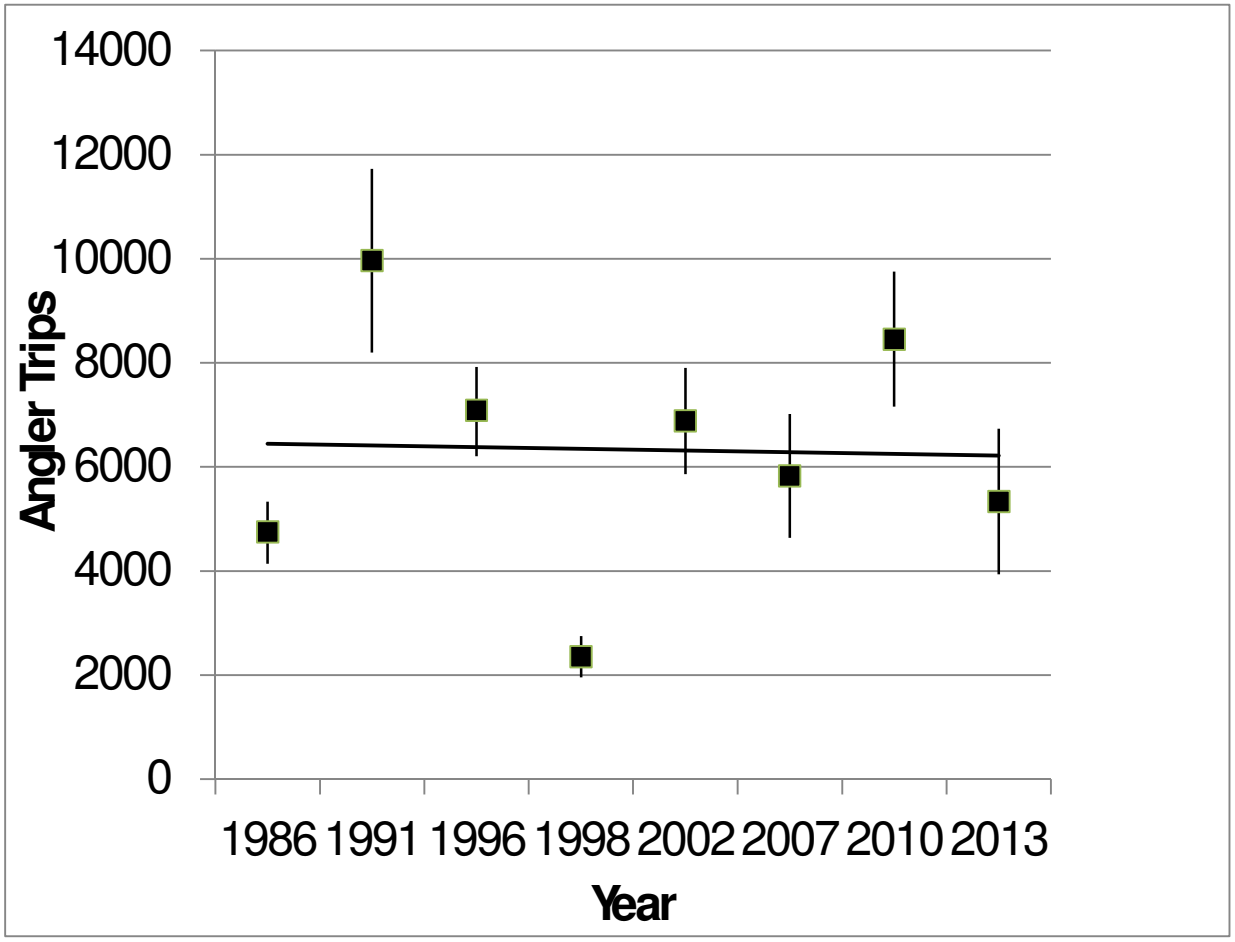
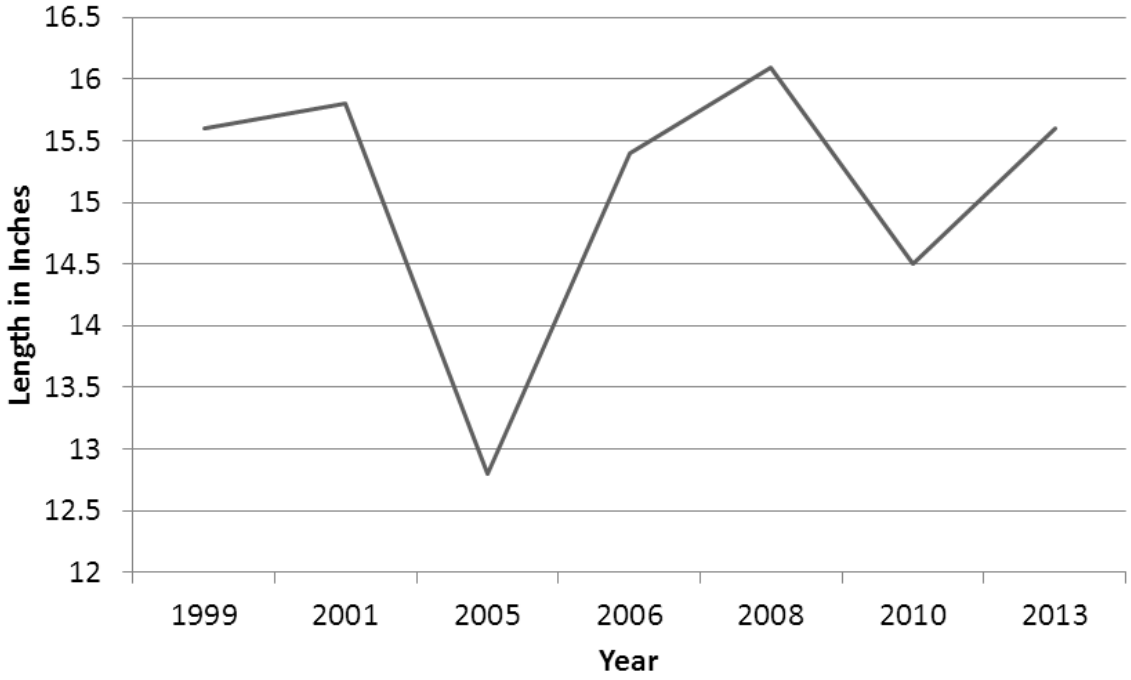


Figure 2. Average Lengths of Trapnetted Hatchery Salmon by Year



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 angler's and boater's tax dollars in state sport fishery projects. This program which was founded 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."

Maine Department of Inland Fisheries and Wildlife
284 State Street, 41 SHS, Augusta, ME 04333-0041