

STATE OF ALASKA

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DIVISION OF SPORT FISH

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MEMORANDUM

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FROM: *PH* Roger Harding; Fisheries Biologist, ADF&G,
ML Mark Laker; Fisheries Biologist, USFS Admiralty National Monument

DATE: February 5, 1996

SUBJECT: Results of 1995 Thayer Lake Cooperative Investigations

Introduction

Thayer Lake is located near the center of Admiralty Island and is approximately 1,133 HA surface area. A US Forest Service shelter (not a recreational cabin) and private lodge are located at the lake. Thayer Lake was originally barren (Region I Catalog and Inventory File) and was stocked on 7/17/36 with 20 cutthroat (7 to 12 inches) from Hasselborg Lake and apparently some Dolly Varden (Wilding 1939). Kokanee salmon from Distin Lake were transplanted into Thayer Lake to provide a forage fish for cutthroat and ultimately to increase the size of cutthroat trout; 714 kokanee were transplanted during 1965, 1,105 during 1966, and 1,813 during 1967 (Region 1, unpublished data).

During studies conducted at Thayer Lake during 1966 and 1967, a total of 138 cutthroat trout were captured, 77 in experimental gill nets (variable mesh) and 61 with hook-and-line. All fish captured were measured, weighed, and stomach contents examined for kokanee (Region 1, unpublished data). The average length of fish captured > 180 mm FL was 228 mm FL (only fish >180 mm FL were used to be comparable to 1995 data).

Between June 16 and June 27, 1995, a two person crew from the US Forest Service, Admiralty Island National Monument conducted an eight day cutthroat trout sampling trip to Thayer Lake. The objective of

this sampling was to estimate the length distribution of cutthroat trout in Thayer Lake. An additional task, conducted prior to the sampling trip, was to collect depth data to develop a bathymetric map (Figure 1).

Methods

Thayer Lake was divided into 26 equally sized sample areas and during the first two days 8 areas were randomly selected and two hoop nets were set in each area; during the remaining five days, 4 areas were randomly selected and 4 hoop nets were set in each area selected. Traps were baited with herring and salmon eggs and were randomly set at depths between 1 and 20 meters. All captured cutthroat were measured to the nearest mm FL, given a panjet blue die mark under the pelvic girdle, and returned to the lake; cutthroat ≥ 180 mm FL were given a caudal fin clip. Scale samples were collected from the first 70 fish measured. Other species captured during sampling were counted and returned to the lake. Bathymetric data was collected using a recording fathometer.

Results

Nine hundred and fifty-four (954) cutthroat trout were captured by the USFS at Thayer Lake between June 16 and June 27, 1995; 948 cutthroat were measured. A total of 540 cutthroat ≥ 180 FL (mm) were captured; 131 with hook and line gear and 409 with hoop nets (Table 1). The mean length of all cutthroat captured was 186 mm FL (SD=43) while those ≥ 180 mm FL averaged 218 mm FL (SD=24). The catch per unit effort (CPUE) for cutthroat captured in hoop nets was 0.14 cutthroat per hour and 4.4 for hook and line gear; the hook and line CPUE is among the highest recorded at lakes studied to date in southeast Alaska (Table 2).

The length distribution of cutthroat trout ≥ 180 mm FL at Thayer Lake was compared to several other lakes on Admiralty Island; length distribution of cutthroat captured at Thayer Lake during 1995 is significantly different than cutthroat captured at Young Lake during 1995 (Kolmogorov-Smirnov test results = $d_{max}=0.1261$, $P = 0.0001$). Length distributions of 1995 Thayer Lake cutthroat also differed significantly from all cutthroat captured at Florence Lake during the 1994 abundance experiment ($d_{max}=0.1290$, $P<0.0000$) and from cutthroat captured during marking event only, which was approximately the same time of year as the 1995 Thayer trip ($d_{max}=0.1029$, $P=0.0004$). The cumulative frequency distribution of cutthroat captured in Thayer Lake during 1995 is skewed slightly to the right (Figure 2) suggesting that larger cutthroat are more common in Thayer than in Florence or Young lake. However only one cutthroat trout captured at Thayer could have been legally harvested under the current minimum size limit of 14" (335mm FL= 14 total inches) and only 4 fish exceed the regionwide minimum size limit of 12 inches (287 mm FL= 12 total inches); i.e., $<0.5\%$ of the cutthroat in Thayer Lake could legally be harvested with a 12

or 14 inch minimum size limit. (Table3). The length frequency of cutthroat trout captured at Thayer Lake during 1995 is similar to Florence (1991 through 1994) and Young lakes but Hasselborg (a known trophy lake) has a higher frequency of larger fish (Figure 3).

Historic Data Review

Investigations in 1966 and 1967, aimed at evaluating the kokanee transplants, captured 138 cutthroat trout using experimental gill nets (variable mesh) and hook and line; no kokanee were captured. Forty-four cutthroat trout were captured in gill nets and 37 with hook and line during 1966, and 33 were captured in gill nets and 24 with hook and line during 1967; 12 cutthroat <180 mm FL were excluded from the analysis (i.e., only cutthroat ≥ 180 mm FL were used in the analysis). While some unknown bias may exist (i.e., size selectivity of gear) between the 1995 and 1966-67 samples, the length distribution of the two samples were compared as a means to evaluate the 1995 length distribution. The length distributions of cutthroat captured in 1966-67 was significantly different than the length distribution of fish captured during 1995 ($d_{max} = 0.1678$, $P=0.0055$) (Figure4). Analysis of the length data suggest that larger cutthroat were more frequent in Thayer Lake in 1966-67 than in 1995; however, there were only 1 > 14 inches (335 mm FL) and 10 >12 inches (287 mm FL) were captured 1966 and 1967 (Figure 4).

Future Projects

To estimate the cost and feasibility of conducting a mark/recapture abundance experiment at Thayer Lake we first "best guess" what the abundance is. The density of nearby Hasselborg Lake is approximately 8 cutthroat/HA (Jones et al 1992; Laker 1994) and the density of Florence Lake is approximately 27 cutthroat/HA (Harding 1995). The hoop trap CPUE in Thayer is about $\frac{1}{2}$ that of Florence; thus we might expect to see a density at Thayer somewhere between 12 and 14 cutthroat/HA or an abundance of approximately 13,500. to 15,800 cutthroat. Based on methods described by Robson and Regier (1964) and a "best guess" abundance estimate of 14,000, 924 cutthroat would need to be marked during the first event and 924 examined during the second event. However, results from previous experiments conducted to estimate the abundance of cutthroat trout in SE lakes, has shown that the methods of Robsin and Reiger (1964) has underestimated the sample size by approximately 65%. Thus, the sample size of 924 should be expanded by 65% (1,524). The sample size collected while estimating abundance at Thayer Lake would be more than adequate for estimating the length and age composition of cutthroat trout.

The estimate of mean hoop trap CPUE for fish ≥ 180 mm FL from the 1995 Thayer Lake study is 0.14 cutthroat/hour for the time period June 16 and June 27, 1995. Large traps have between a 30% and 50% higher CPUE than do hoop traps (Der Hovanisian and Marshall 1994, and Table 2). If large traps were

used instead of hoop traps we would expect to see the large trap CPUE range between 0.20 and 0.28, or an average of 0.24. Fishing 20 large traps, 21 hours per day (overnight sets), during each ten-day sample period (9 overnight sets), and assuming an average of 0.24 cutthroat/hour, each sample period should yield approximately 907 trout. Additionally, each crew member would fish a minimum of 1.5 hour/day with sport gear; with an average CPUE of 4.4 and two people fishing, a total of 80 additional fish could be captured during each 10 day sample trip. At the rate of approximately 987 cutthroat captured during each 10-day sampling trip it would require four 10-day sample trips (2 marking and 2 recapture) to meet the desired sample size.

Discussion

The data used in this analysis came from several different sources and the validity of making these comparisons should be discussed. The most obvious factor clouding this analysis were the different gear types and methods used, and the lack of a thorough description of methods used during 1966-67. Size selectivity between variable mesh gill nets, hook and line, and hoop traps may exist. Therefore, the difference between length distributions in Figure 4, which show that a higher percentage of larger fish existed in 1966-67, may be related to either gear selectivity, real differences in length distributions, or both.

A review of the Statewide Harvest Survey (SWHS) between 1977 and 1994 indicates that very little fishing effort occurred at Thayer Lake during this time. Only 5 people responding to the SWHS fished at Thayer Lake between 1977 and 1994 and none of the SWHS data was expanded into an estimate of catch, effort, or harvest. Based on available data, there is no indication that the number of cutthroat harvested in Thayer Lake would increase significantly under a 12 inch minimum size limit nor would this increase negatively impact the cutthroat population. Thayer Lake does not appear to be a "high use" lake and we recommend the Division of Sport Fish support a proposal to remove this designation, thus allowing Thayer Lake to fall under the regionwide trout regulations. Under the regionwide regulations the minimum size limit would be 12 inches. We also recommend that the Thayer Lake Lodge be contacted and a program established to sample the number and lengths of cutthroat harvested and caught and released, and that another sample trip be conducted in 1999 to reevaluate the length distribution.

Literature Cited

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cc: Bob Marshall, Mark Schwan, Rob Bentz, Steve Elliott, Rocky Holmes

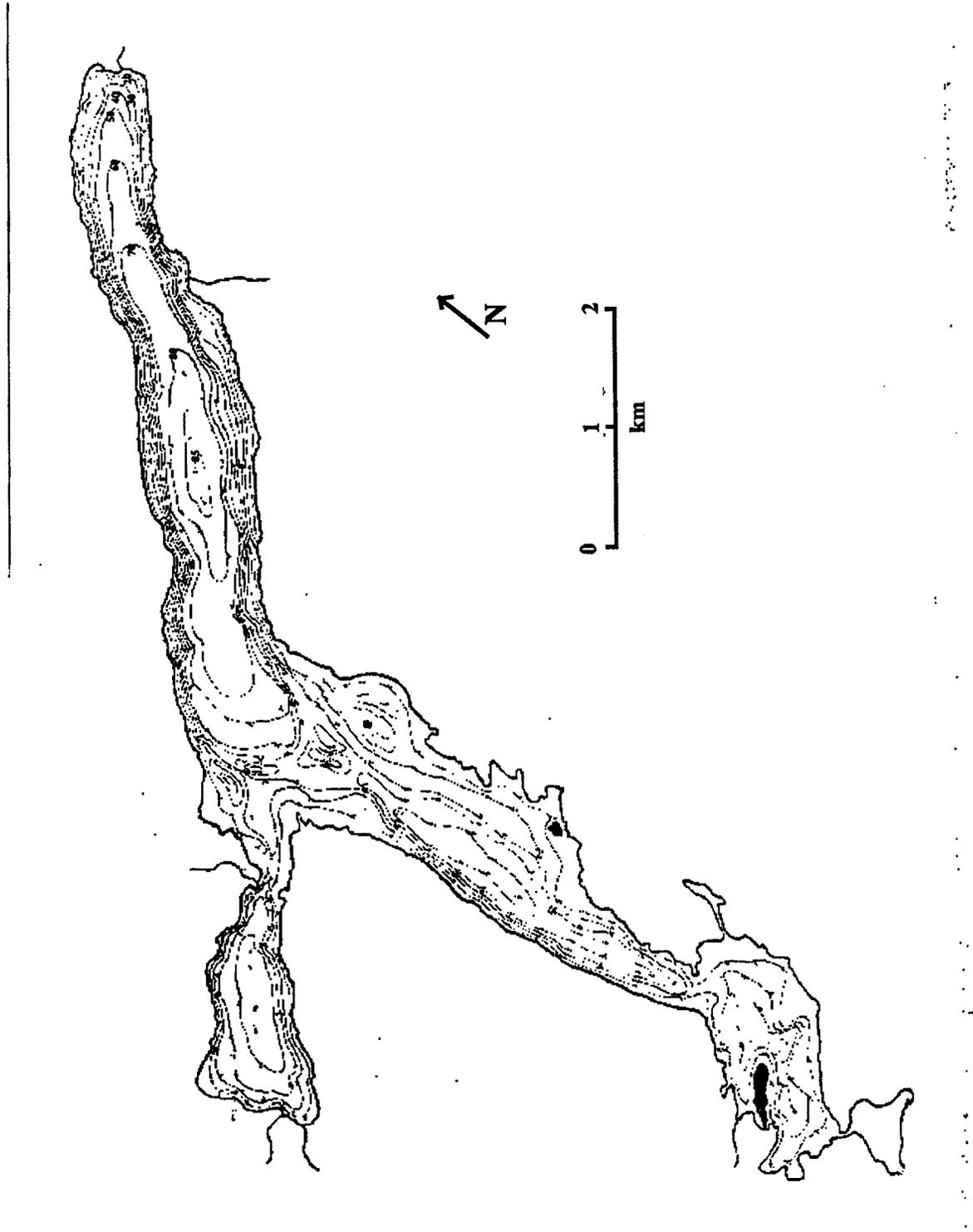


Figure 1. Thayer Lake bathymetric map, southeast Alaska.

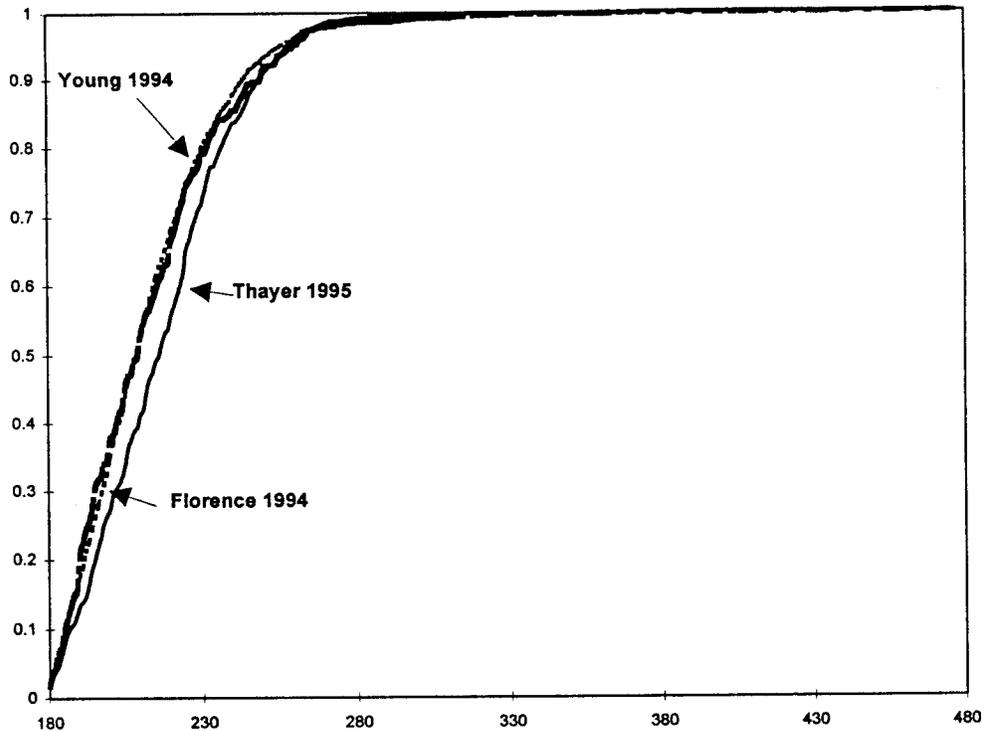


Figure 2. Cumulative histogram of lengths of cutthroat trout caught at Thayer Lake in 1995 versus lengths of cutthroat trout captured during abundance experiments at Young (1994) and Florence (1994) lakes.

Table 1. Sampling effort (hours), catch, and catch per unit effort (CPUE, fish per hour) by gear and species, Thayer Lake, 1995.

Date	Gear	Effort	Cutthroat Trout ≥180 mm		Cutthroat Trout <180 mm		Dolly Varden	
			Catch	CPUE	Catch	CPUE	Catch	CPUE
June 19 -	Hook and Line	30	131	4.4	51	1.7	3	0.10
June 27	Hoop Trap	2,837	409	0.14	363	0.13	673	0.24
Total								
	Large Trap		540		414		676	

Percent of fish captured

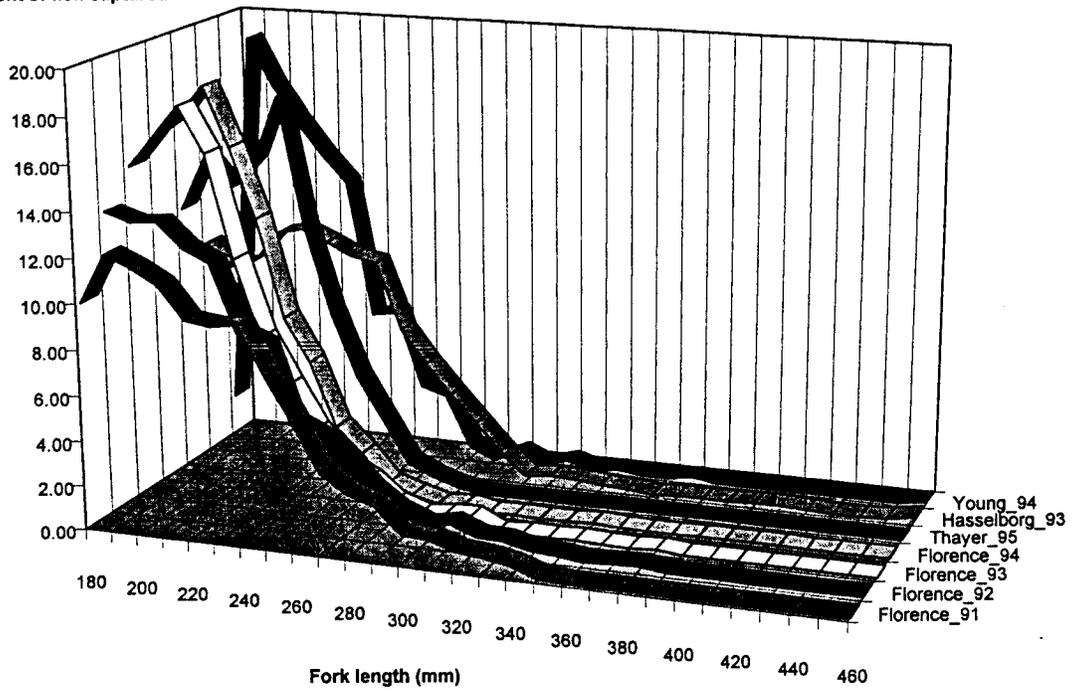


Figure 3. Length frequency in percent of cutthroat trout captured at Thayer lake in 1995 compared to lengths of cutthroat captured in various abundance experiments on Admiralty Island.

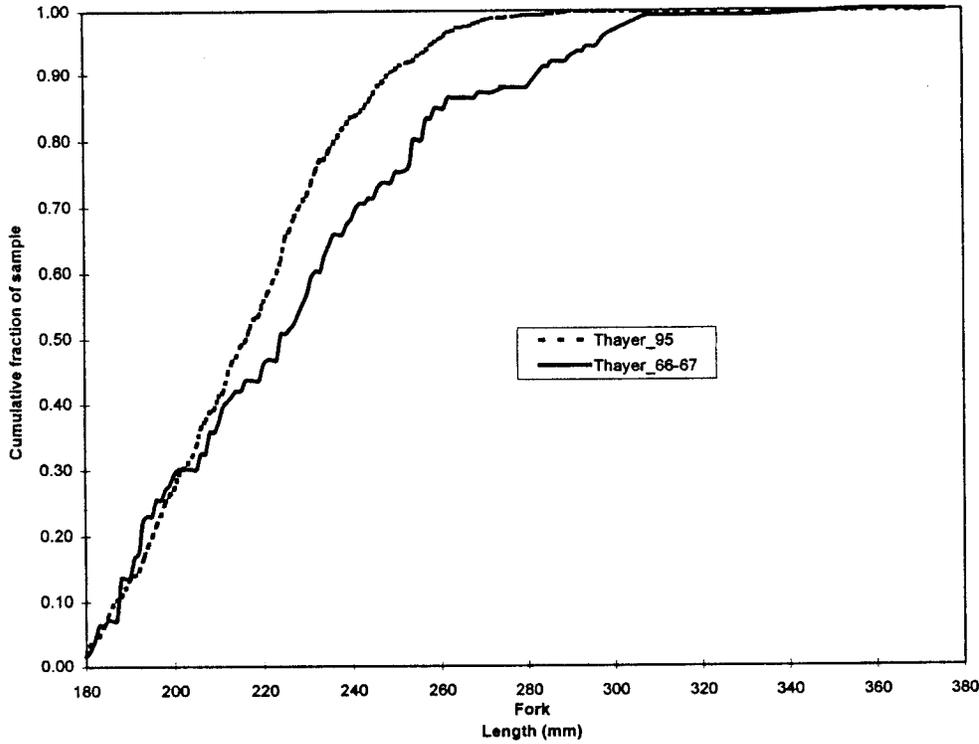


Figure 4. Cumulative histogram of lengths of cutthroat trout caught at Thayer Lake in 1960 and 1967 versus lengths of cutthroat trout captured at Thayer Lake during 1995.

Table 2. Comparison of cutthroat trout CPUE (catch per hour) by gear type, year and location.

Lake	Year	Gear ^a	Mean CPUE	CPUE Range	
				Low	High
Florence	1994	HL	2.80	0.18	5.12
		LT	0.33	0.27	0.39
Florence	1993	HL	2.75	0.00	3.50
		LT	0.35	0.21	0.52
Florence	1992	HL	4.11	4.04	5.24
		LT	0.40	0.21	0.62
Turner	1994	HL	2.51	3.59	2.28
		LT	0.06	0.03	0.08
		HT	0.03	0.02	0.03
Thayer	1995	HL	4.40	NA	NA
		HT	0.14	NA	NA
Wilson	1993	HL	3.64	2.64	4.57
		LT	0.09	0.04	0.18

^a HL= Hook and Line; LT= Large Trap; HT= Hoop Trap.

Table 3. Percent length frequency of cutthroat trout captured at Thayer Lake during 1995 and from fish captured during abundance experiments at Florence (1994), Hasselborg (1993), and Young Lake (1994).

Length FL (mm)	Florence_94		Thayer_95		Hasselborg_93		Young_94	
	% of catch	Cumm. %	% of catch	Cumm. %	% of catch	Cumm. %	% of catch	Cumm. %
180	15.77	15.77	11.92	11.92	9.81	9.81	1.77	1.77
190	16.61	32.38	14.34	26.26	8.77	18.58	18.94	20.71
200	18.10	50.48	13.04	39.29	9.16	27.74	16.81	37.52
210	15.49	65.96	14.34	53.63	10.58	38.32	15.22	52.74
220	12.38	78.34	17.32	70.95	10.84	49.16	13.81	66.55
230	7.97	86.31	11.55	82.50	10.32	59.48	12.57	79.12
240	6.07	92.38	7.64	90.13	9.74	69.23	6.37	85.49
250	3.25	95.63	4.84	94.97	9.55	78.77	6.55	92.04
260	2.15	97.78	2.98	97.95	6.52	85.29	3.19	95.22
270	0.85	98.62	1.12	99.07	5.03	90.32	2.83	98.05
280	0.49	99.12	0.56	99.63	3.74	94.06	0.53	98.58
290	0.18	99.29	0.19	99.81	2.52	96.58	0.00	98.58
300	0.25	99.54	0.00	99.81	1.29	97.87	0.53	99.12
310	0.04	99.58	0.00	99.81	0.26	98.13	0.00	99.12
320	0.07	99.65	0.00	99.81	0.39	98.52	0.35	99.47
330	0.04	99.68	0.00	99.81	0.32	98.84	0.00	99.47
340	0.04	99.72	0.00	99.81	0.19	99.03	0.18	99.65
350	0.11	99.82	0.00	99.81	0.13	99.16	0.00	99.65
360	0.04	99.86	0.00	99.81	0.00	99.16	0.00	99.65
370	0.00	99.86	0.19	100.00	0.06	99.23	0.18	99.82
380	0.00	99.86	0.00	100.00	0.06	99.29	0.00	99.82
390	0.04	99.89	0.00	100.00	0.06	99.35	0.00	99.82
400	0.04	99.93	0.00	100.00	0.13	99.48	0.00	99.82
410	0.04	99.96	0.00	100.00	0.13	99.61	0.00	99.82
420	0.04	100.00	0.00	100.00	0.06	99.68	0.00	99.82
430	0.00	100.00	0.00	100.00	0.00	99.68	0.00	99.82
440	0.00	100.00	0.00	100.00	0.00	99.68	0.00	99.82
450	0.00	100.00	0.00	100.00	0.06	99.74	0.00	99.82
460	0.00	100.00	0.00	100.00	0.26	100.00	0.18	100.00

Note: 12 inch total length = 287 mm FL and 14 inch total length = 335 mm FL.