Fishery Data Series No. 91-36

Escapements of Chinook Salmon in Southeast Alaska and Transboundary Rivers in 1990

by

Keith A. Pahlke

September 1991

Alaska Department of Fish and Game

Division of Sport Fish

FISHERY DATA SERIES NO. 91-36

ESCAPEMENTS OF CHINOOK SALMON IN SOUTHEAST ALASKA AND TRANSBOUNDARY RIVERS IN 1990[1]

by

Keith A. Pahlke

Alaska Department of Fish and Game
Division of Sport Fish
Anchorage, Alaska

September 1991

[1] This investigation was partially financed by the Federal Aid in Sport Fish Restoration Act (16 U.S.C. 777-777K) under Project F-10-6, Job No. S-1-6.

The Fishery Data Series was established in 1987 for the publication of technically oriented results for a single project or group of closely related projects. Fishery Data Series reports are intended for fishery and other technical professionals. Distribution is to state and local publication distribution centers, libraries and individuals and, on request, to other libraries, agencies, and individuals. This publication has undergone editorial and peer review.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF FIGURES (Continued)

LIST OF APPENDICES

ABSTRACT

The estimated total escapement of chinook salmon *Oncorhynchus tshawytscha* for all Southeast Alaska and transboundary rivers declined slightly from 54,200 fish in 1989 to 51,900 fish in 1990, the second decline in a row, following a trend of increasing escapements observed over the previous six years. The total escapement of chinook salmon in 1990 was 4 percent or 2,300 fish less than in 1989 and only 81 percent of the management escapement goal of 64,000 chinook salmon. The 1990 escapement represented an increase of approximately 88 percent or 24,300 chinook salmon over the 1975-1980 average of 27,500 chinook salmon, and an increase of 24 percent or 10,100 chinook salmon over the 1981-1985 average of 41,700.

Although total escapements of chinook salmon declined in 1990, increases were still observed in the Taku (38 percent), Situk (7 percent), and in Andrew Creek (25 percent). Chinook salmon escapements declined in 8 of the 11 index systems. The largest declines occurred in the Stikine River, where the 1990 escapement of 17,416 chinook salmon was 8 percent (1,444 fish) below the 1989 escapement of 18,860 fish, and in the Chilkat River, which declined 80 percent from 1,362 in 1989 to only 272 in 1990. Escapements of chinook salmon also declined in the Unuk (down 49 percent), Chickamin (down 40 percent), Keta (down 48 percent), Blossom (down 25 percent), and Alsek rivers (down 22 percent).

KEY WORDS: Chinook salmon, *Oncorhynchus tshawytscha*, escapement, Taku River, Stikine River, Alsek River, Chilkat River, Unuk River, Chickamin River, Blossom River, Keta River, Marten River, Wilson River, Chilkat River, King Salmon River, Situk River, Andrew Creek, Behm Canal, Southeast Alaska, U.S./Canada Treaty.

INTRODUCTION

Populations of chinook salmon *Oncorhynchus tshawytscha* are known to occur in some 34 river systems throughout Southeast Alaska, northwestern British Columbia, and the Yukon Territory, Canada. In the mid-1970's it became apparent that the majority of chinook salmon stocks in the Southeast Alaska region were depressed relative to historical levels of production. As a result, a fisheries management program was implemented to rebuild depressed stocks of chinook salmon in Southeast Alaska and transboundary rivers (rivers that originate in Canada and flow into Southeast Alaska coastal waters). Initially, this management program included regulatory closures of commercial and recreational fisheries in terminal and near-terminal areas. This program was formalized and expanded in 1981 to a 15-year (roughly 3 life-cycles) rebuilding program for the transboundary Taku, Stikine, Alsek, Unuk, Chickamin, and Chilkat rivers and the non-transboundary Blossom, Keta, Situk, and King Salmon rivers. The objective of this program, which included regionwide, all-gear catch ceilings for chinook salmon, was to rebuild spawning escapements to management goals by 1995. Then, in 1985, the Southeast Alaska rebuilding program was incorporated into a broader, coastwide, rebuilding program for natural stocks of chinook salmon under the auspices of the U.S./Canada Pacific Salmon Treaty (PST).

In accordance with the PST, escapement indices are used to ascertain progress towards meeting escapement goals for the chinook salmon stocks of Southeast Alaska and transboundary rivers. The Joint Chinook Technical Committee of the Pacific Salmon Commission combines the indices of escapements of the major, medium, and minor stocks and makes expansions to total estimates of escapements according to set formulas. These expansions are compared with similarly constructed historical estimates of escapement and appropriate fishery regulations are promulgated.

The overall goal of the Chinook Salmon Research Project is to collect information needed to manage commercial and recreational fisheries to ensure maximum sustained yield of chinook salmon populations of Southeast Alaska and transboundary rivers. Estimates of escapements by brood year will be used to investigate the relationship between spawners and subsequent recruitment. In 1990, the objective of this project was to estimate peak escapement of large (age 1.3, 1.4 and 1.5) chinook salmon to tributaries and mainstem areas of the Taku, Stikine, Alsek, Unuk, Chickamin, Chilkat, Blossom, Keta, Wilson, Marten, and King Salmon rivers.

METHODS

Of the 34 river systems with documented spawning populations of wild chinook salmon, three--the transboundary Taku, Stikine, and Alsek--are classified as major producers of chinook salmon, with total run sizes potentially exceeding 10,000 fish. Nine systems are considered medium producers, with run sizes between 1,500 and 10,000 fish. The remaining 22 rivers are placed in the minor production category, with run sizes less than 1,500 chinook salmon. Although chinook salmon have been observed in small numbers in other Southeast Alaska streams, successful spawning has not been documented.

Many index areas in the known chinook salmon spawning streams are surveyed annually to document escapements and to expand the database for Southeast Alaska. In addition, of the surveys conducted in the rivers and streams with documented runs of chinook salmon, results from three major, seven medium, and one minor

producing system are used to calculate an index of abundance for all Southeast Alaska chinook salmon spawning streams. Descriptions of the index areas and expansion methods are summarized in the following text and in Appendix A. A detailed description of survey areas and spawning distribution in index tributaries can also be found in Mecum and Kissner (1989).

Description of Study Areas

The Taku River originates in northern British Columbia and flows into the ocean 48 km east of Juneau, Alaska (Figure 1). The Taku River drainage covers over 16,000 km^2 and annual flows range from 787 to 2,489 m^3. Principal tributaries include the Sloko, Nakina, Sheslay, Inklin, and Nahlin rivers. The clearwater Nakina and Nahlin rivers contribute less than 25% of the total drainage discharge, with most of the remainder originating from glaciated areas on the eastern slope of the Coast Range of British Columbia. The drainage above the abandoned mining community of Tulsequah, British Columbia remains in pristine condition without any mining, logging, or other development activities. The upper Taku River area is extremely remote with no road access and few year-round residents. All of the important chinook salmon spawning areas in the Taku River are found in tributaries in the upper drainage in British Columbia. These include the Nakina, Nahlin, Dudidontu, Tatsamenie, Hackett, and Kowatua rivers and Tseta Creek.

The Stikine River originates in northern British Columbia and flows to the sea approximately 32 km south of Petersburg, Alaska (Figure 2). The Stikine River drainage encompasses approximately 52,000 km^2. The Stikine River's principal tributaries include the Tahltan, Chutine, Scud, Iskut, and Tuya rivers. Approximately 90% of the river system is inaccessible to anadromous fish due to natural barriers and velocity blocks, and the lower river and most tributaries are glacially occluded (e.g., Chutine, Scud, and Iskut rivers). Only 2% of the Stikine River drainage is in Alaska (Beak Consultants Limited 1981), and the majority of the chinook salmon spawning areas in the Stikine River are located in British Columbia, Canada in the mainstem Tahltan and Little Tahltan rivers (including Beatty Creek). However, Andrew Creek, in the lower Stikine River, also supports a significant spawning run of chinook salmon.

The Alsek River originates in the Yukon Territory, Canada and flows in a southerly direction until it empties into the Gulf of Alaska approximately 75 km Southeast of Yakutat, Alaska (Figure 3). The Dezadeash and Tatshenshini rivers are the largest tributaries of the Alsek River. Similar to the glacial Taku and Stikine rivers, velocity barriers and blockages prohibit migration of anadromous salmonids to most of the Alsek River drainage. The Alsek River is considered a major producer of chinook salmon; only the Taku and Stikine River support larger spawning populations in Southeast Alaska. Most of the significant chinook salmon spawning areas are found in tributaries of the Tatshenshini River, including the Klukshu, Blanchard, and Takhanne rivers and Village and Goat creeks.

The Unuk River originates in a heavily glaciated area of northern British Columbia and flows for 129 km to Burroughs Bay 85 km northeast of Ketchikan, Alaska; only the lower 39 km of the river are in Alaska (Figure 4). The Unuk River drainage encompasses an area of approximately 3,885 km^2. Most Unuk River chinook salmon spawn in tributaries in the lower 39 km of the U.S. portion of the river, including the Eulachon River and Cripple, Genes Lake, Clear, Lake, and Kerr creeks. Cripple Creek and Genes Lake Creek can not be surveyed from the air because of heavy vegetation and the escapements are counted by foot surveys.

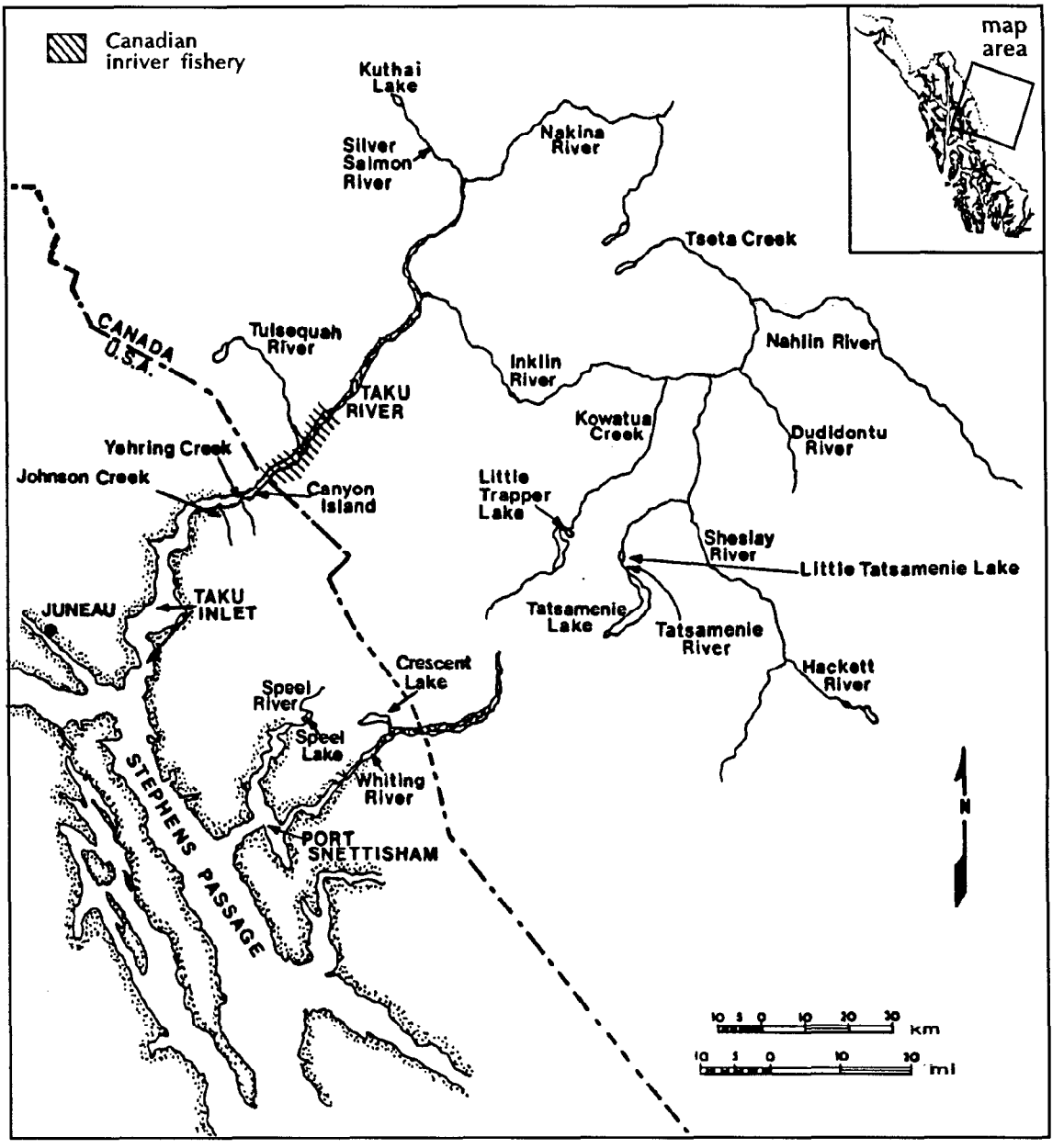

Figure 1. Taku River drainage, northwestern British Columbia and Southeast Alaska.

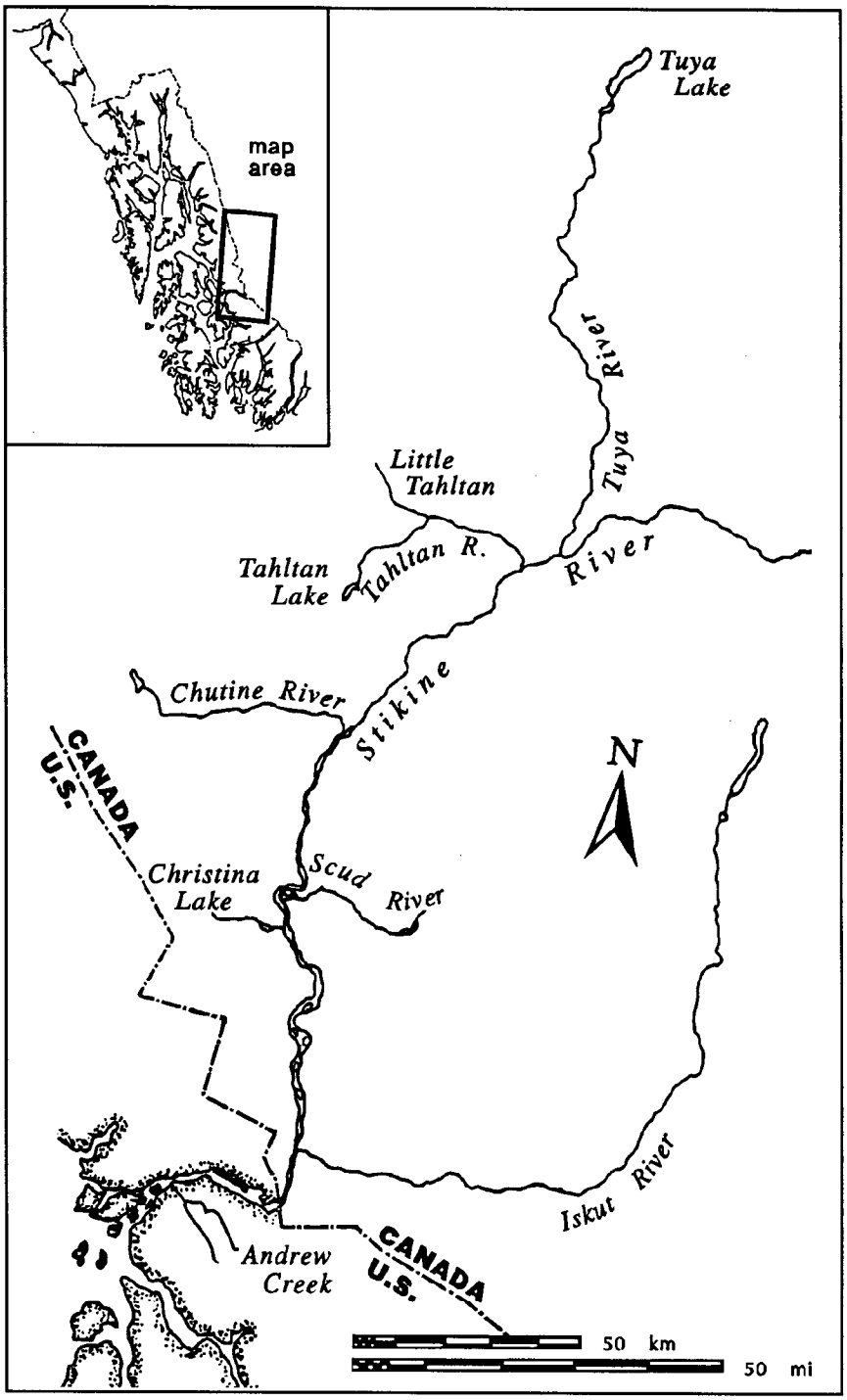

Figure 2. Stikine River drainage, northwestern British Columbia and Southeast Alaska.

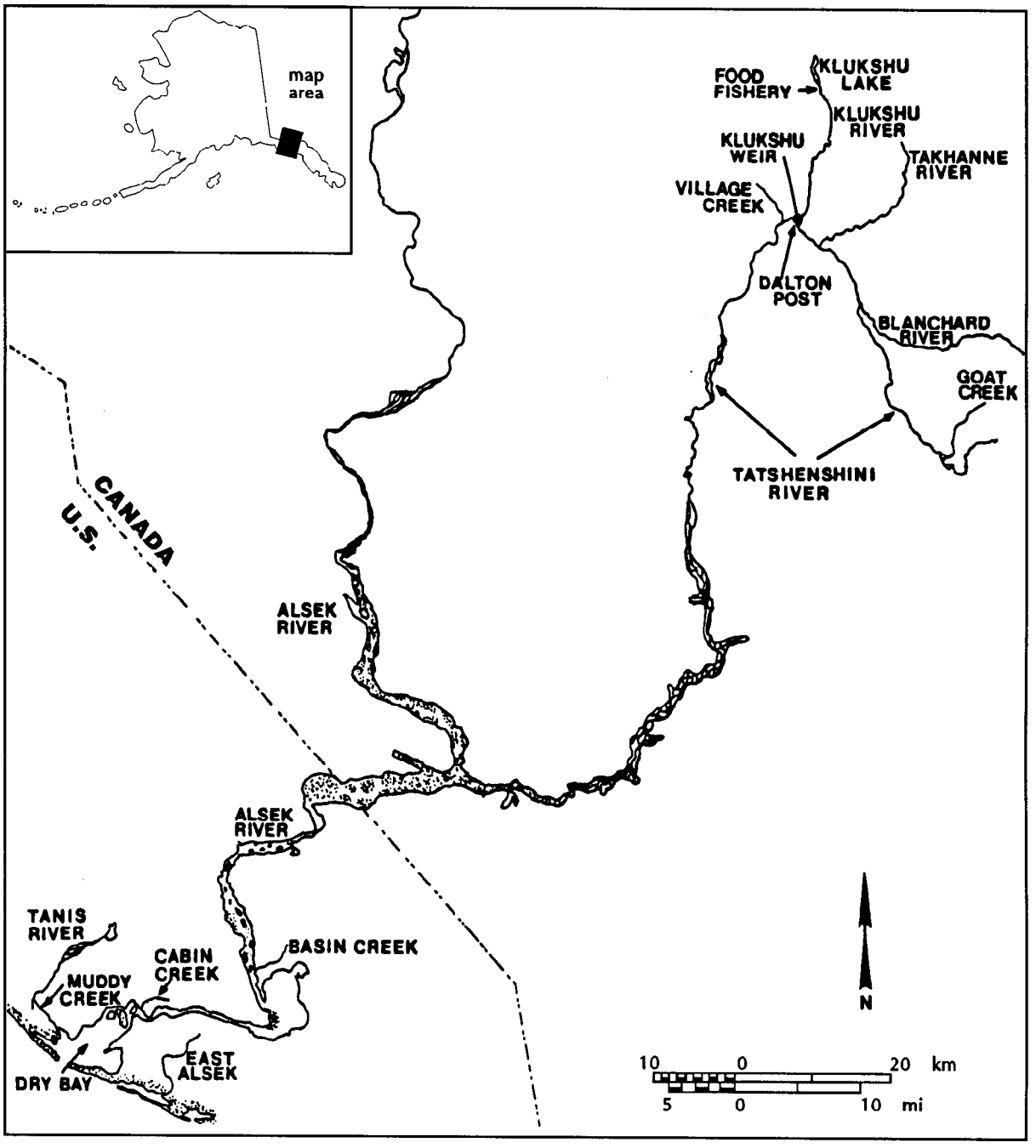

Figure 3. Alsek River drainage, northwestern British Columbia and northern Southeast Alaska.

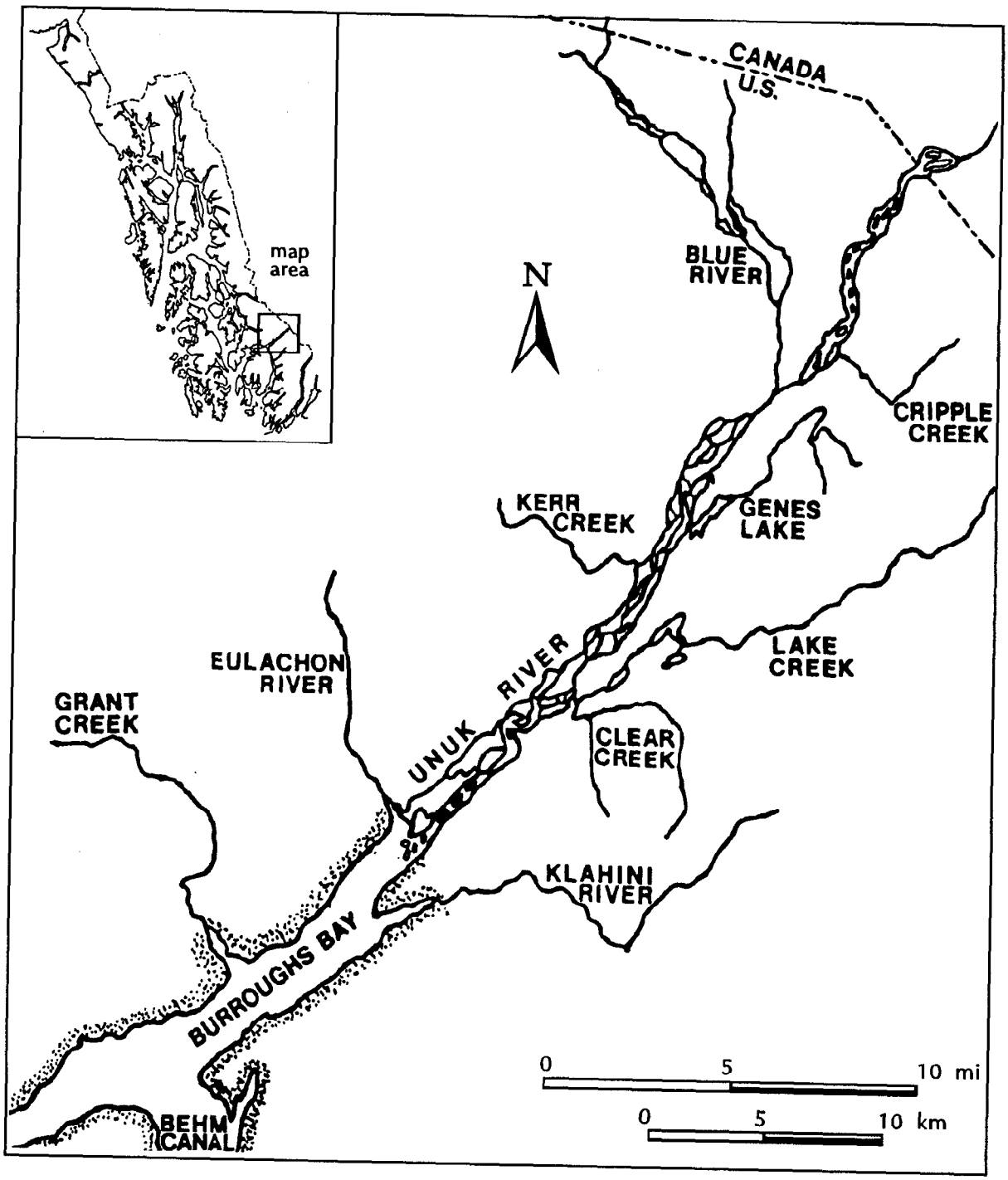

Figure 4. Unuk River drainage, northwestern British Columbia and southern Southeast Alaska.

The Chickamin River ranks fifth in chinook salmon production in Southeast Alaska behind the Taku, Stikine, Alsek, and Unuk rivers. This large, glacial river originates in northern British Columbia, flowing into Behm Canal approximately 32 km southeast of Burroughs Bay and 65 km northeast of Ketchikan (Figure 5). Important tributaries for spawning chinook salmon are the South Fork of the Chickamin and Barrier, Butler, Indian, Leduc, Humpy, King, and Clear Falls creeks.

The Chilkat River originates in the Yukon Territory and flows into Chilkat Inlet at the head of northern Lynn Canal near Haines, Alaska (Figure 6). Lynn Canal is bounded by the U.S.-Canadian border to the north and west and by the Takhinsha Mountains and the ice fields of Glacier Bay National Park to the south. This large, glacial river flows through a broad flood plain, forming numerous braided-stream channels, gravel bars, and islands covered with dense stands of willow and cottonwood (Mills et al. 1983).

The Blossom, Keta, Wilson, and Marten rivers are non-transboundary rivers that flow into Behm Canal approximately 45 km east of Ketchikan (Figure 7). These rivers lie within the boundaries of the Misty Fjords National Monument in southern Behm Canal that has received considerable attention in recent years due to potential development of a large-scale molybdenum mine (Quartz Hill) near the divide of the Blossom and Keta rivers. Chinook salmon escapements to the Wilson and Marten rivers have been monitored on an intermittent basis in recent years. The Marten River, the most southern of the four rivers, flows into Marten Arm near Boca de Quadra.

The King Salmon River drains an area of approximately 100 km^2 on Admiralty Island, flowing into King Salmon Bay in the eastern portion of Stephens Passage about 48 km south of Juneau (Figure 8). The King Salmon River is the only Southeast Alaska river system located on an island that supports a significant population of spawning chinook salmon. The only other island system with a documented run of chinook salmon is Wheeler Creek, also on Admiralty Island. An upstream weir has been operated by the Alaska Department of Fish and Game (ADFG), on the King Salmon River since 1983 to collect chinook salmon eggs for developing broodstock for the Snettisham Hatchery.

The Situk River is located about 16 km east of Yakutat, Alaska (Figure 9). The Situk River supports a large run of sockeye salmon *O. nerka* which are harvested in commercial and subsistence set gill net fisheries concentrated at the mouth of the Situk River. Situk River chinook salmon have been harvested incidentally in the set gillnet fishery and a recreational fishery in the lower river. A weir was operated on the Situk River at the upper limit of the intertidal area from 1928 to 1955 to enumerate all five species of Pacific salmon spawning in the river. From 1976 to 1988, a weir was operated further upstream near the 9-mile road bridge, primarily to enumerate chinook and sockeye salmon. This weir was moved downstream closer to the old weir location in 1988 and operated there from 1988 through 1990.

Enumeration of Adult Chinook Salmon

Escapements of chinook salmon in selected index areas of nine river systems in Southeast Alaska, northwest British Columbia, and the Yukon Territory, Canada are estimated annually as a part of the Southeast Alaska Chinook Salmon Research Project. Peak escapement surveys are conducted on foot or from a Bell 206 or Hughes 500D helicopter during periods of peak spawning. Peak spawning times, defined as the period when the largest number of adult chinook salmon actively

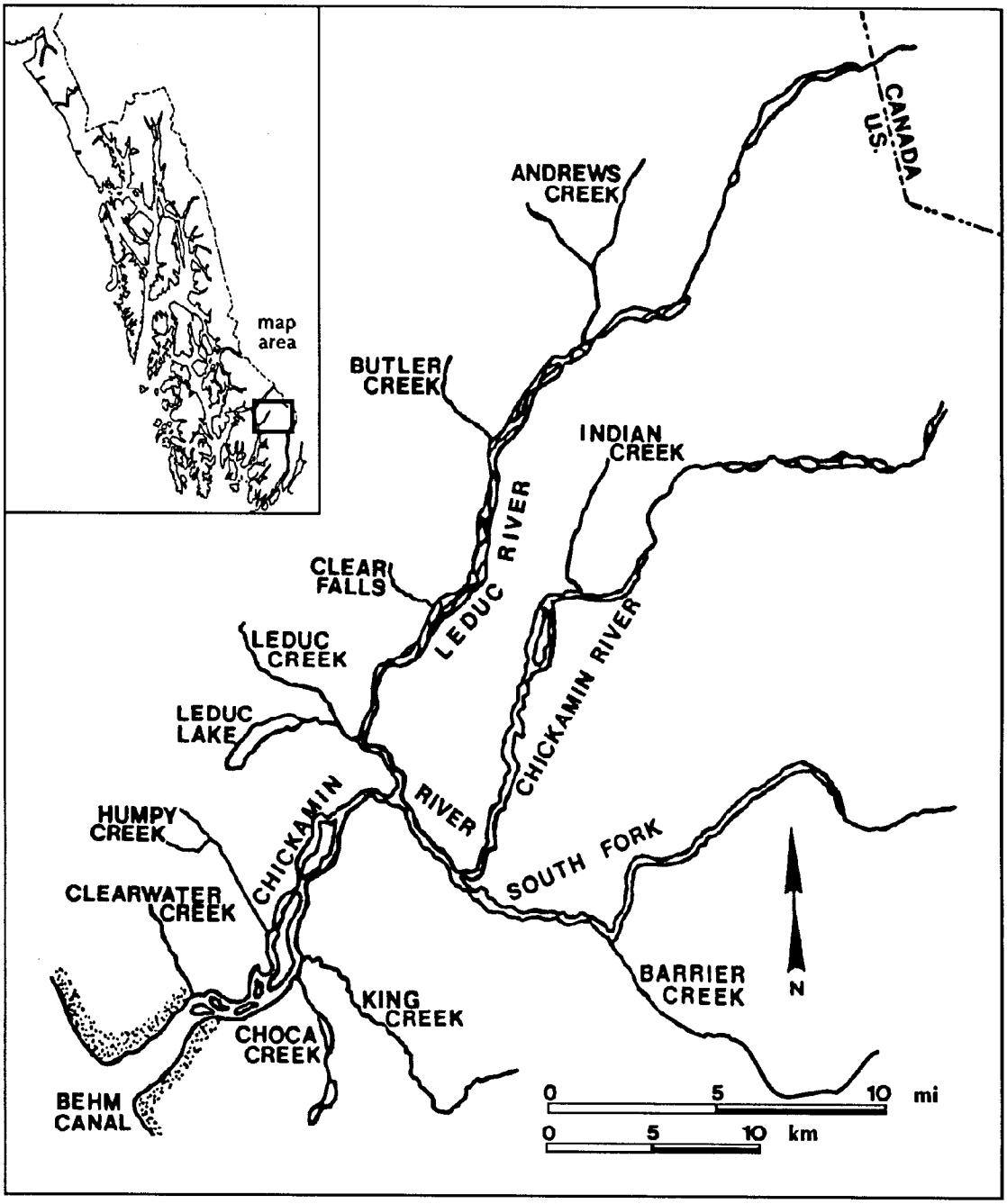

Figure 5. Chickamin River drainage, southern Southeast Alaska.

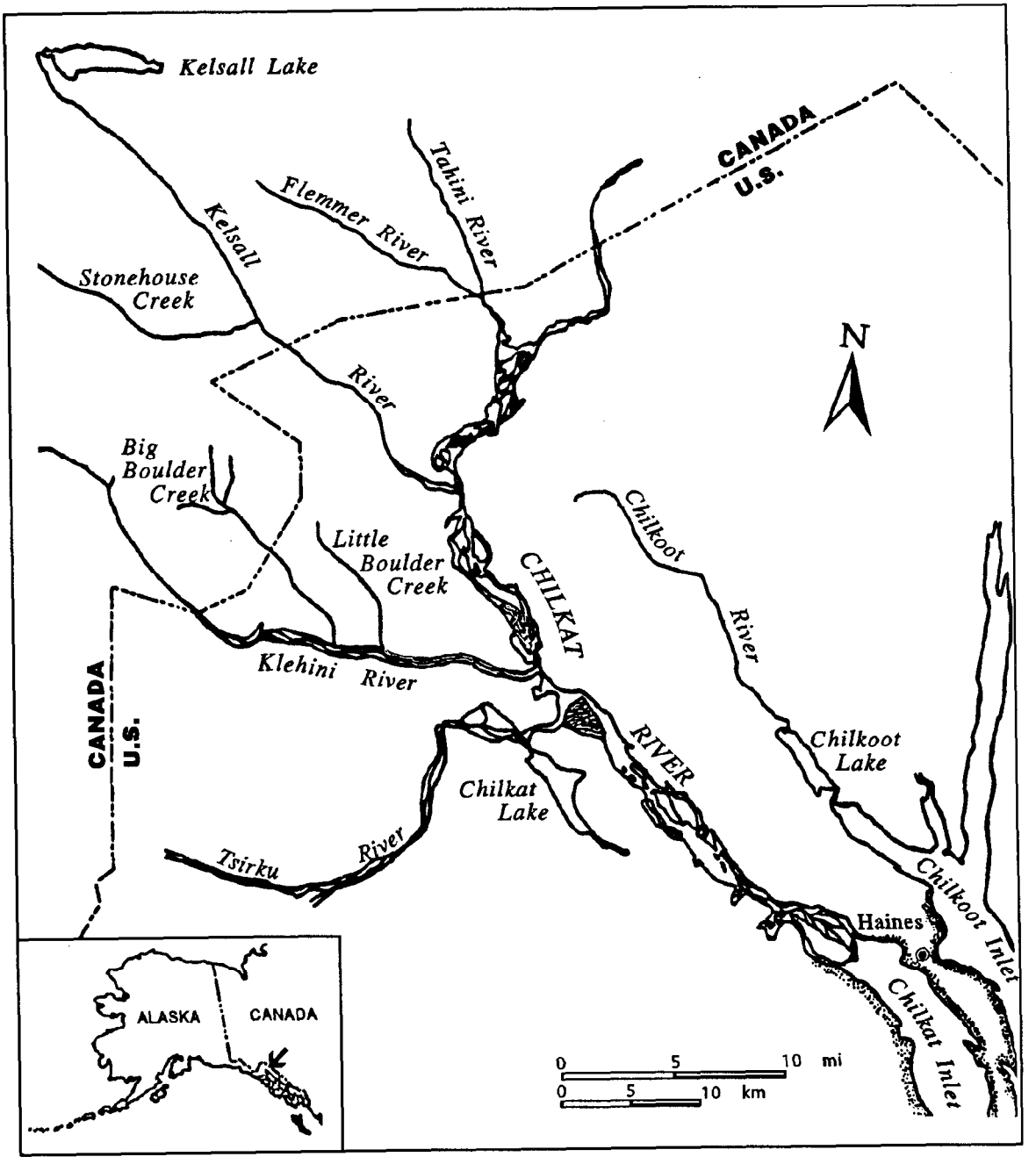

Figure 6. Chilkat River drainage, northwestern British Columbia and northern Southeast Alaska.

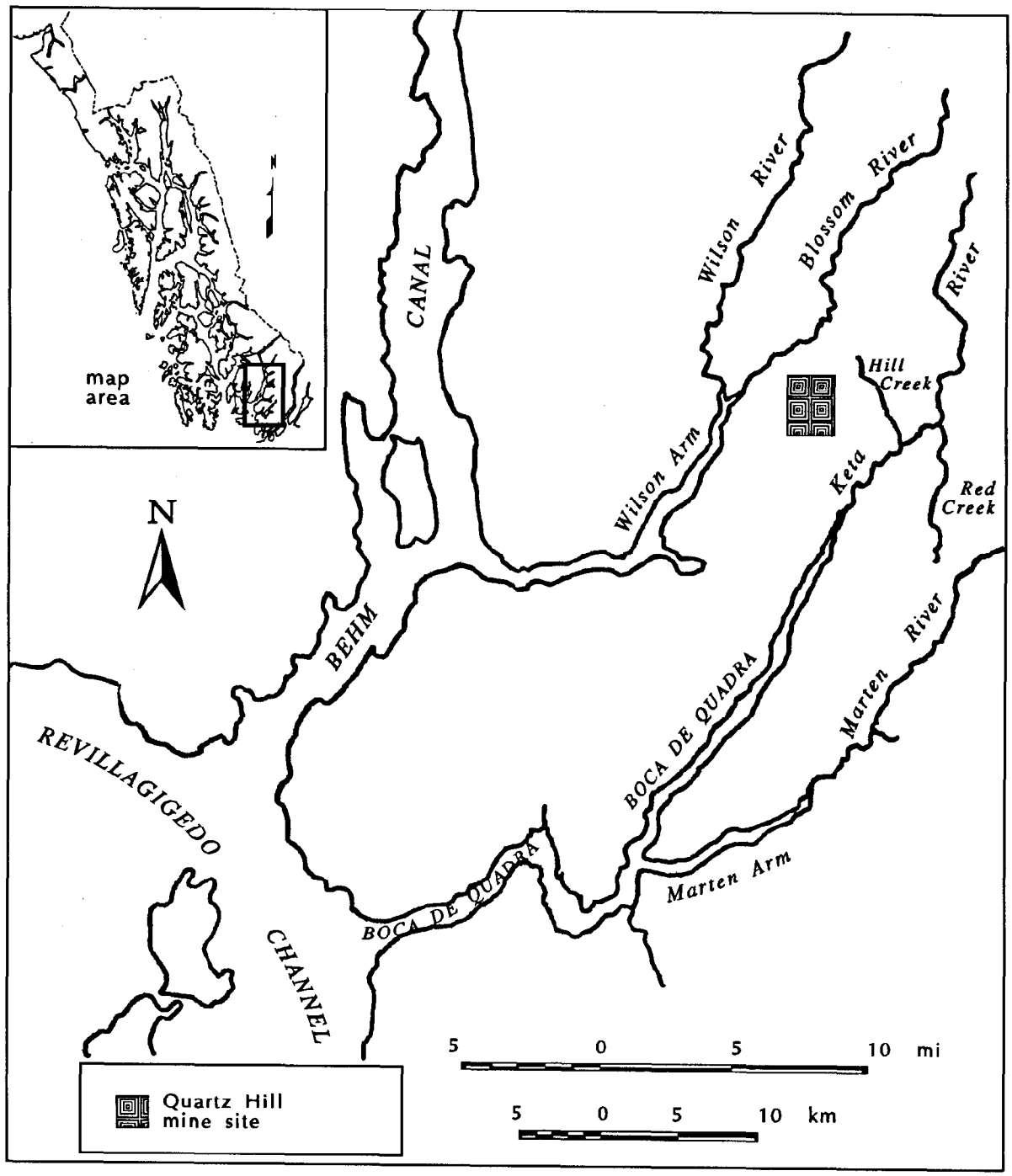

Figure 7. Blossom, Keta, Wilson, and Marten river drainages, southern Southeast Alaska.

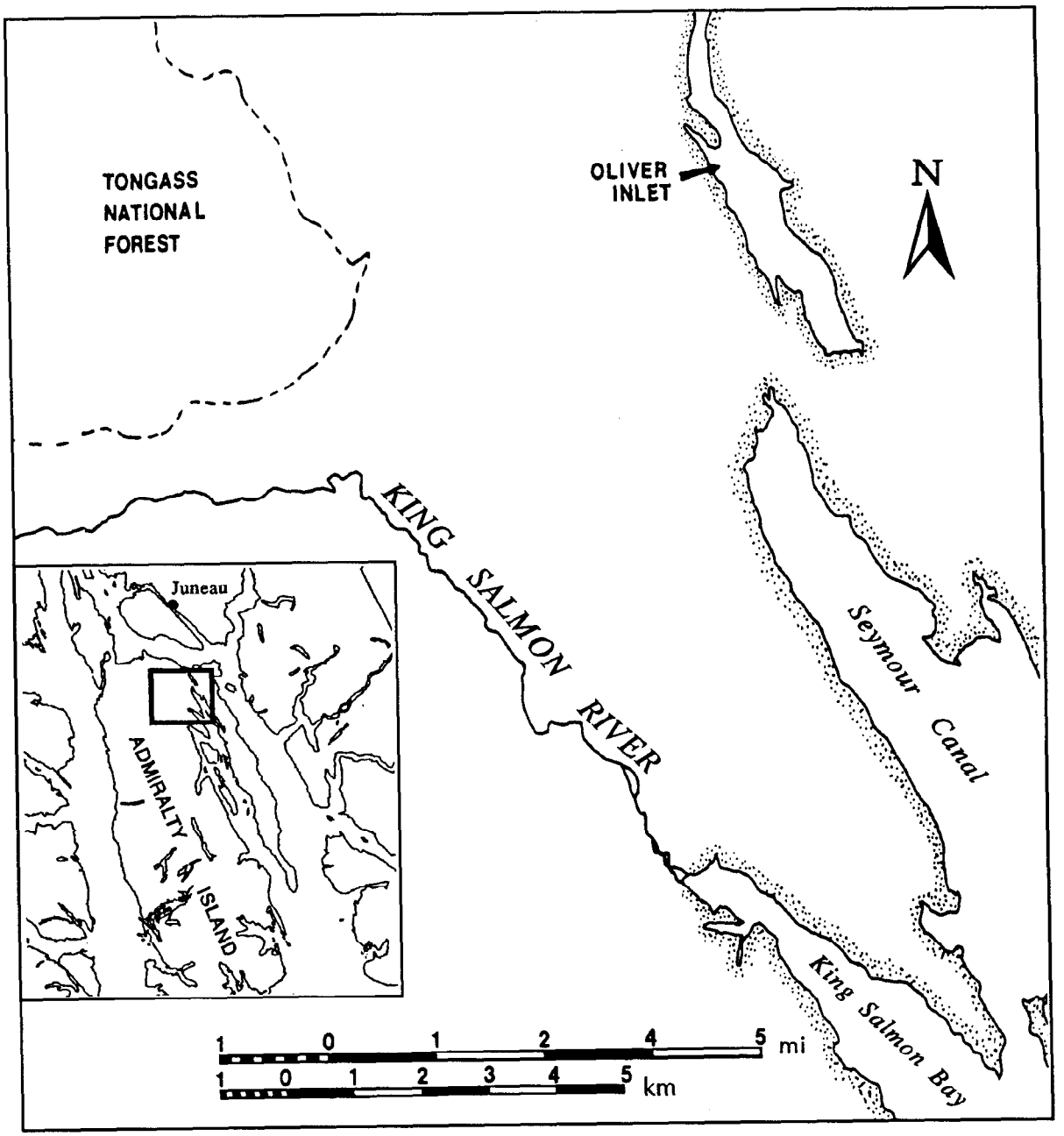

Figure 8. King Salmon River drainage, Admiralty Island, Southeast Alaska.

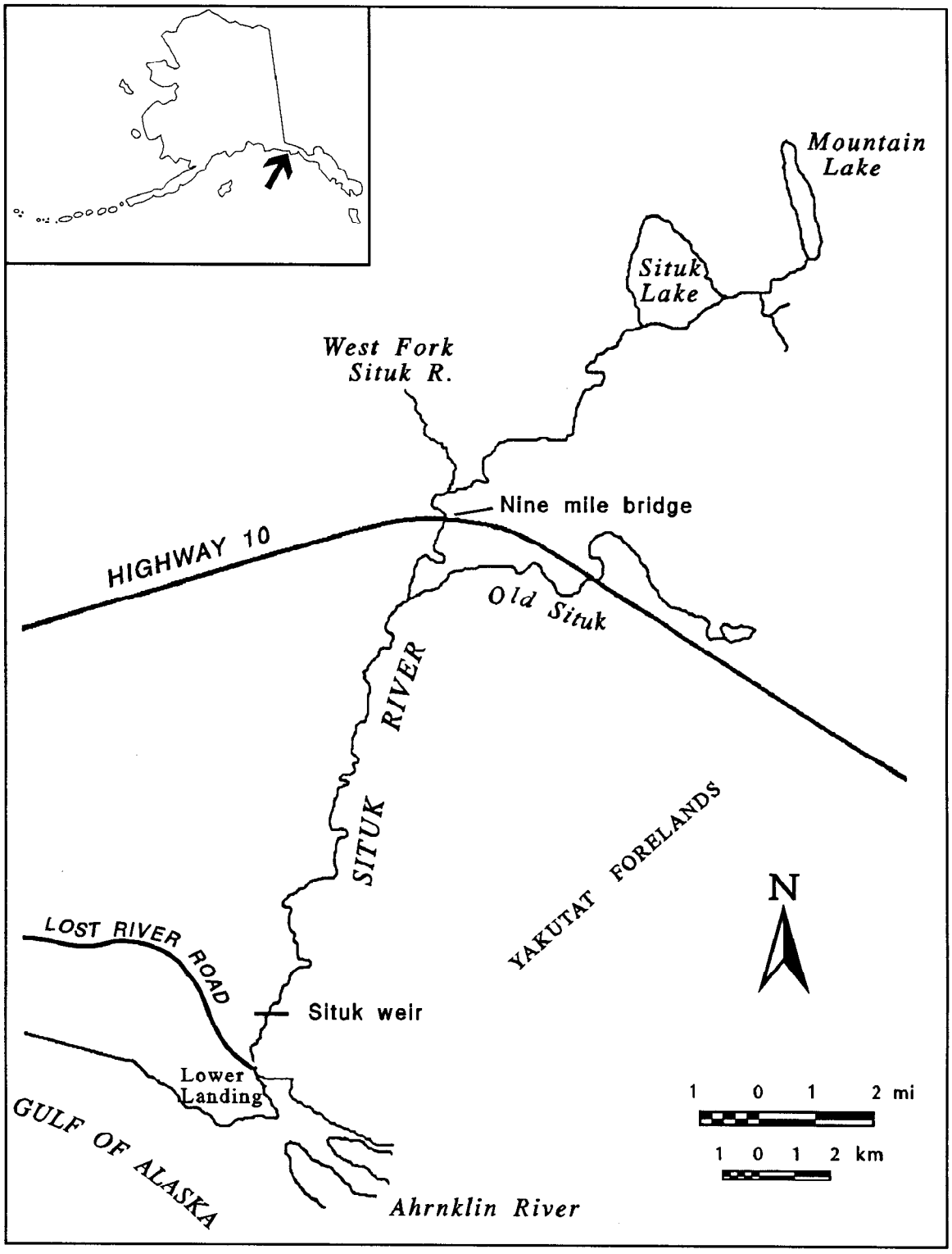

Figure 9. Situk River drainage, northern Southeast Alaska.

spawn in a particular stream or river, are well documented from previous surveys of the same index areas conducted over the past 15 years (Kissner 1982). These escapement counts have been used as comparable indices of escapements since 1975. A subset of these areas (Appendix A1) was used to form an index of abundance for Southeast Alaska. In accordance with the U.S./Canada Pacific Salmon Treaty, this abundance index was used to determine the progress of rebuilding for the chinook salmon stocks of Southeast Alaska and transboundary rivers.

An attempt was made to survey each of the index areas twice unless turbid water or unsafe flying conditions precluded the second survey. Pilots were directed to fly the helicopter from 6 to 15 meters above the river bed at a speed of 6-16 km/h. The helicopter door on the side of the observer was removed, and the helicopter was flown sideways while observations of spawning chinook salmon were made from the open space. Only large (age-.3, -.4 and -.5) chinook salmon >660 mm fork length (FL) or 28 in. total length (TL) were counted during aerial or foot surveys. No attempt was made to accurately count small (age-.1 and -.2) chinook salmon that are typically <660 mm FL (Mecum 1990). These small chinook salmon, also called jacks, are early maturing, precocious males that are considered to be surplus to spawning escapement needs. These small chinook salmon are easy to visually separate from their larger age counterparts under most conditions, due to their short, compact body configuration and lighter coloration.

Escapement counts of selected index spawning areas are expanded by a factor which represents the estimated percentage of the total season escapement observed during the peak spawning period. These expansion factors vary according to the difficulties encountered in observing spawning chinook salmon due to overhanging vegetation, turbid water conditions, presence of other salmon species (i.e., pink *O. gorbuscha* and chum *O. keta* salmon), or protraction of run timing. Survey expansion factors range from 1/0.80 for Big Boulder and Stonehouse creeks to 1/0.625 for most other systems (Appendix A1). Survey expansions are not necessary for those systems where upstream counting weirs are used to enumerate spawning chinook salmon. Peak aerial, foot, or weir counts were also expanded for the percentage of the total escapement to the entire drainage observed in index tributaries (i.e., not all tributaries or spawning areas were surveyed).

The expansion factors represent estimates whose validity is unknown for the majority of the index systems. In fact, comparison of aerial surveys with weir counts on some systems indicates the survey expansion factors for the larger systems may be too low. However, these expansion factors have been used since 1981 and have been adopted by the Joint Chinook Salmon Technical Committee (CTC) of the Pacific Salmon Commission. Therefore, a formal review of these index expansion methods by ADFG, the Canadian Department of Fisheries and Oceans (CDFO) and the CTC would be necessary before modifications could be made.

Chinook escapement counts are also obtained from fish-counting weirs operated by the CDFO on the Little Tahltan (Stikine), Tatsamenie (Taku), and Klukshu (Alsek) rivers, and by ADFG on the King Salmon River (Admiralty Island) and Situk River. Except for the Situk River, where aerial surveys were not practical because of overhanging vegetation, weir counts were compared with aerial or foot surveys to determine the relative accuracy of surveys of peak escapement in predicting total escapements.

RESULTS

Thirty-four index locations were surveyed in 1990 (Appendix A2). Surveys generally progressed as planned, and poor weather and water conditions only precluded aerial surveys of the Kowatua (Taku tributary) and Blanchard (Alsek tributary) rivers. Some parts of the Behm Canal systems (Unuk, Chickamin, Blossom, Keta, and Marten rivers) were only surveyed once because of poor weather. The Wilson River was not surveyed, due to time and funding constraints. None of the unsurveyed index areas were used to construct the abundance indices for the respective river systems.

Taku River

The observed peak escapement of 12,249 large chinook salmon into the six major spawning tributaries of the Taku River was the largest escapement observed since surveys began in 1951 (Table 1). Escapements were above recent year averages in all tributaries except Tseta Creek (Table 2). Expanding the Nakina (7,917) and Nahlin (1,658) river index escapement counts by the survey (1/0.75) and tributary (1/0.60) expansion factors resulted in a total escapement estimate for the Taku River of 21,278 large chinook salmon. Except for 1987, chinook salmon escapements to the Taku River have increased every year since 1983. Despite this increasing trend, 1990 is the first year since 1982 that chinook salmon escapements to the Taku River reached the rebuilding schedule (Figure 10), and the estimated escapement for 1990 is still 17% below the management escapement goal of 25,600 large chinook salmon.

Stikine River

Low-level helicopter surveys of the Little Tahltan River index area have been conducted every year since 1975. Since 1985, the CDFO has operated a fish counting weir at the mouth of the Little Tahltan River. Aerial surveys have been conducted during this time so that the relationship between peak aerial counts and actual total escapement could be quantified. From 1985 to 1990, the percentage of the total escapement of chinook salmon observed during peak aerial surveys has varied from 40.3% in 1990 to 56.6% in 1987 and averaged 49.2% (Table 3). The low percentage of total escapement observed in 1986 resulted from poor survey conditions, caused by a mudslide that occurred approximately 1.5 km above the weir site. The low count in 1990 resulted in part from the formation of a new river channel through a heavily wooded area which was difficult to survey. In 1985 and 1987-1989, the percentage of the total escapement observed during helicopter surveys ranged from 50.8% to 56.6% and averaged 53.3%.

The peak aerial count in the Little Tahltan River of 1,755 large chinook salmon was 31% lower than the count of 2,527 observed in 1989 (Table 4). A total of 4,354 chinook salmon was counted through the Little Tahltan weir in 1990, 8% lower than the weir count of 4,715 large chinook salmon observed in 1989. The observed escapement on the mainstem Tahltan River in 1990 of 2,134 fish was the third highest ever recorded on that glacially turbid river. The peak escapement count of 271 large chinook salmon in Beatty Creek was 25% lower than the count of 362 chinook salmon seen in 1989.

Expansion of the 1990 Little Tahltan weir count of 4,354 large chinook salmon by the tributary expansion factor (1/0.25) resulted in a total Stikine River escapement estimate of 17,416 large chinook salmon. This is 8% lower than the Stikine River escapement estimate of 18,860 in 1989 but still 30% higher than the

Table 1. Peak escapement counts of chinook salmon for tributaries of the Taku River, 1951-1990.[a,b]

Year	Nakina River	Kowatua River	Tatsamenie River	Dudidontu River	Tseta Creek	Nahlin River	Total
1951	5,000 (F)	-	-	400 (F)	100 (F)	1,000 (F)	6,500
1952	9,000 (F)	-	-	-	-	-	9,000
1953	7,500 (F)	-	-	-	-	-	7,500
1954	6,000 (F)	-	-	-	-	-	6,000
1955	3,000 (F)	-	-	-	-	-	3,000
1956	1,380 (F)	-	-	-	-	-	1,380
1957	1,500	-	-	-	-	-	1,500[c]
1958	2,500	-	-	4,500 (A)	-	2,500 (A)	9,500[c]
1959	4,000	-	-	-	-	-	4,000[c]
1962	-	-	-	25 (A)	81 (A)	216 (A)	322
1965	3,050 (H)	200 P(A)	50 P(A)	110 (A)	18 (A)	35 (A)	3,463
1966	3,700 P(A)	14 P(A)	100 P(A)	252 (A)	150 (A)	300 (A)	4,516
1967	700 (A)	250 P(A)	-	600 (A)	350 (A)	300 P(A)	2,200
1968	300 P(A)	1,100 (A)	800 E(A)	590 (A)	230 (A)	450 (A)	3,470
1969	3,500 (A)	3,300 (A)	800 E(A)	-	-	-	7,600
1970	-	1200 P(A)	530 E(A)	10 (A)	25 (A)	26 (A)	1,791
1971	500 (A)	1,400 E(A)	360 E(A)	165 (A)	- (A)	473 (A)	2,898
1972	1,000 (F)	170 (A)	132 (A)	102 (A)	80 P(A)	280 (A)	1,764
1973	2,000 N(H)	100 N(H)	200 E(H)	200 E(H)	4 (A)	300 E(H)	2,804
1974	1,800 E(H)	235 (A)	120 (A)	24 (A)	4 (A)	900 E(H)	3,083
1975	1,800 E(H)	-	-	15 N(H)	-	274 E(H)	2,089
1976	3,000 E(H)	341 P(A)	620 E(H)	40 (H)	-	725 E(H)	4,726
1977	3,850 E(H)	580 E(H)	573 E(H)	18 (H)	-	650 E(H)	5,671
1978	1,620 E(H)	490 N(H)	550 E(H)	- (H)	21 E(H)	624 E(H)	3,305
1979	2,110 E(A)	430 N(H)	750 E(H)	9 E(H)	-	857 E(H)	4,156
1980	4,500 E(H)	450 N(H)	905 E(H)	158 E(H)	-	1,531 E(H)	7,544
1981	5,110 E(H)	560 N(H)	839 E(H)	74 N(H)	258 N(H)	2,945 E(H)	9,786
1982	2,533 E(H)	289 N(H)	387 N(H)	130 N(H)	228 N(H)	1,246 E(H)	4,813
1983	968 E(H)	171 E(H)	236 E(H)	117 E(H)	179 N(H)	391 N(H)	2,062
1984	1,887 (H)	279 E(H)	616 E(H)	-	176 (H)	951 (H)	3,909[d]
1985	2,647 N(H)	699 E(H)	848 E(H)	475 (H)	303 E(H)	2,236 E(H)	7,208
1986	3,868 (H)	548 E(H)	886 E(H)	413 E(H)	193 E(H)	1,612 E(H)	7,520
1987	2,906 E(H)	570 E(H)	678 E(H)	287 E(H)	180 E(H)	1,122 E(H)	5,743
1988	4,500 E(H)	1,010 E(H)	1,272 E(H)	243 E(H)	66 E(H)	1,535 E(H)	8,626
1989	5,141 E(H)	601 (W)	1,228 E(H)	204 E(H)	494 E(H)	1,812 E(H)	9,480[e]
1990	7,917 E(H)	614 (W)	1,068 N(H)	820 E(H)	172 N(H)	1,658 E(H)	12,249[e]

[a] - = No Survey Conducted.
(F) = Foot Survey; (A) = Fixed-wing aircraft; (H) = Helicopter.
P = Survey conditions hampered by glacial or turbid waters.
N = Normal water flows and turbidities; average survey conditions.
E = Survey conditions excellent.

[b] Escapement counts before 1975 may not be comparable due to changes in survey dates and methods.

[c] Partial survey of Nakina River in 1957-59; comparisons made from carcass weir counts.

[d] Surveys in 1984 conducted by CDFO; partial survey of Tseta Creek and Nahlin.

[e] Carcass weir at Kowatua River used to partially enumerate escapement due to unfavorable water conditions.

Table 2. Percentages of escapement observed in tributaries of the Taku River during years when all index tributaries were surveyed.

Year	Nakina River	%	Kowatua River	%	Tatsamenie River	%	Dudidontu River	%	Tseta Creek	%	Nahlin River	%	Total
1981	5,110	52	560	6	839	9	74	1	258	3	2,945	30	9,786
1982	2,533	53	289	6	387	8	130	3	228	5	1,246	26	4,813
1983	968	47	171	8	236	11	117	6	179	9	391	19	2,062
1985	2,647	37	699	10	848	12	475	7	303	4	2,239	31	7,211
1986	3,868	51	548	7	886	12	413	5	193	3	1,612	21	7,520
1987	2,906	51	570	10	678	12	287	5	180	3	1,122	20	5,743
1988	4,500	52	1,010	12	1,272	15	243	3	66	1	1,535	18	8,626
1989	5,141	54	601	6	1,228	13	204	2	494	5	1,812	19	9,480
Average	3,459	50	556	8	797	12	243	4	238	3	1,613	23	6,905
1990	7,917	65	614	5	1,068	9	820	7	172	1	1,658	14	12,249

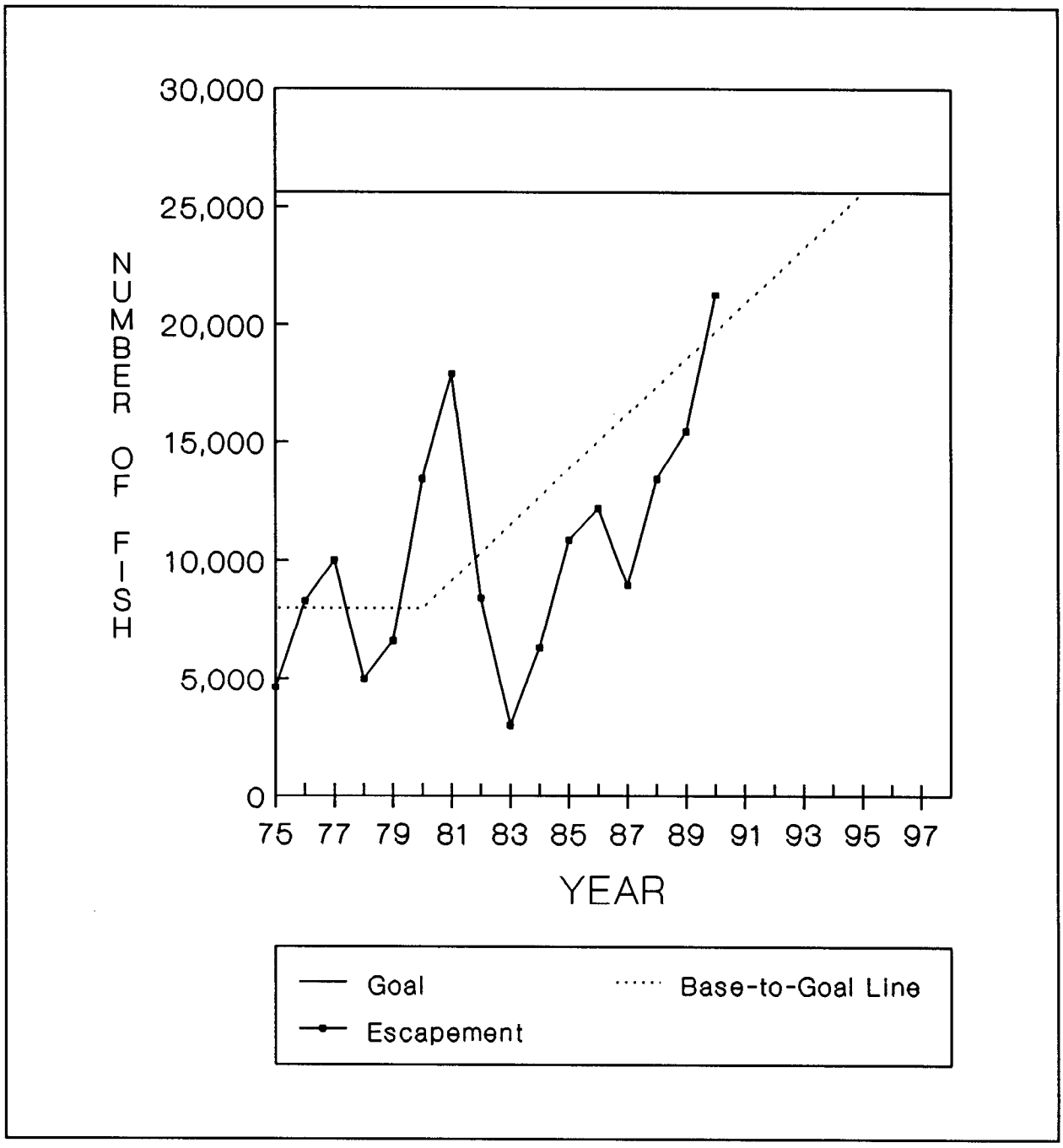

Figure 10. Estimated escapements of chinook salmon to the Taku River, 1975-1990. Base-to-goal line indicates linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 25,600 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

Table 3. Comparison of weir counts and aerial survey estimates of chinook salmon escapements to the Little Tahltan River, 1985-1990.

Date	Weir count	Low level helicopter count	Percent escapement observed from helicopter
8/02/85	2,379	1,262	53.1
8/06/85	2,864	1,598	55.8
Final	3,146	1,598	50.8
8/01/86	2,323	1,101	47.4
8/05/86	2,646	1,143	43.2
Final	2,893	1,201	41.5
7/31/87	3,903	2,446	62.7
8/03/87	4,456	2,706	60.7
Final	4,781	2,706	56.6
7/30/88	5,573	3,484	62.5
8/05/88	6,822	3,796	55.6
Final	7,292	3,796	52.1
7/29/89	3,772	2,515	66.7
8/04/89	4,394	2,527	57.5
Final	4,715	2,527	53.6
7/31/90	3,780	1,658	43.8
8/07/90	4,232	1,678	39.7
Final	4,354	1,755	40.3

Table 4. Peak escapement counts for Stikine River tributaries, 1956-1990.[a,b]

Year	Little Tahltan River		Mainstem Tahltan River	Beatty Creek	Andrew Creek	Total
	Peak count	Weir count				
1956	493 (F)	-	-	-	4,500 (A)	4,993
1957	199 (F)	-	-	-	3,000 (F/A)	3,199
1958	790 (F)	-	-	-	2,500 (F/A)	3,290
1959	198 (F)	-	-	-	150 (F/A)	348
1960	346 (F)	-	-	-	287 N(F)	633
1961	-	-	-	-	103 (F)	103
1962	-	-	-	-	300 (A)	300
1963	-	-	-	-	500 (A/H)	500
1964	-	-	-	-	400 (H)	400
1965	-	-	85	-	100 (A)	185 [c]
1966	-	-	318	-	75 (A)	393 [c]
1967	800 N(H)	-	-	-	30 (A)	830
1968	-	-	-	-	15	15
1969	-	-	-	-	12 (A)	12
1970	-	-	-	-	-	-
1971	-	-	-	-	305 (A)	305
1972	-	-	-	-	-	-
1973	-	-	-	-	40 (A)	40
1974	-	-	-	-	129 (A)	129
1975	700 E(H)	-	2,908 E(H)	-	260 (F)	3,868
1976	400 N(H)	-	120 (H)	-	468 (W)	988 [d]
1977	800 P(H)	-	25 (A)	-	534 (W)	1,359
1978	632 E(H)	-	756 P(H)	-	400 (W)	1,788
1979	1,166 E(H)	-	2,118 N(H)	-	382 (W)	3,666
1980	2,137 N(H)	-	960 P(H)	122 E(H)	362 (W)	3,581
1981	3,334 E(H)	-	1,852 P(H)	558 E(H)	629 (W)	6,373
1982	2,830 N(H)	-	1,690 N(F)	567 E(H)	910 (W)	5,997
1983	594 E(H)	-	453 N(H)	83 E(H)	444 (W)	1,574
1984	1,294 (H)	-	-	126 (H)	355 (W)	1,775 [e]
1985	1,598 E(H)	3,146	1,490 N(H)	147 N(H)	319 E(F)	5,102 [f]
1986	1,201 E(H)	2,893	1,400 P(H)	183 N(H)	707 N(F)	5,183
1987	2,706 E(H)	4,781	1,390 P(H)	312 E(H)	651 E(H)	7,134
1988	3,796 E(H)	7,292	4,384 N(H)	593 E(H)	470 E(F)	12,739
1989	2,527 E(H)	4,715	-	362 E(H)	530 E(F)	5,607
1990	1,755 E(H)	4,354	2,134 N(H)	271 E(H)	664 E(H)	7,423

[a] (F) = Survey conducted by walking.
(A) = Survey conducted by fixed-wing aircraft.
(H) = Survey conducted by helicopter.
(W) = Weir count.
(F/A)= Combined foot and aerial count.
N = Normal survey conditions.
P = Survey conditions hampered by glacial or turbid waters.
E = Excellent survey conditions.
- = No survey conducted or data not comparable.

[b] Escapement counts prior to 1975 may not be comparable because of differences in survey dates and counting methods.

[c] Chinook lifted over barrier on mainstem Tahltan.

[d] Late count on mainstem Tahltan, minimal estimate.

[e] Surveys by CDFO in 1984.

[f] Total = Little Tahltan weir count plus aerial or weir counts on other systems.

management escapement goal of 13,440 large chinook salmon. Escapements of chinook salmon to the Stikine River have been well above the management escapement goal and linear rebuilding trend since 1987 (Figure 11).

The escapement of chinook salmon to Andrew Creek increased from 530 in 1989 to 664 in 1990 (Table 4). Escapements to Andrew Creek have been above the linear rebuilding schedule since 1985 and above the escapement goal since 1986 (Figure 12).

Alsek River

Escapement data on Alsek River chinook salmon has been collected since 1962. Since 1976, the CDFO has operated a counting weir at the confluence of the Klukshu and Tatshenshini rivers to enumerate chinook, sockeye, and coho *O. kisutch* salmon into the Klukshu River drainage. Helicopter surveys of chinook salmon escapements to index tributaries of the Alsek River have been conducted by ADFG since 1981. Before 1976, chinook salmon escapement surveys were usually conducted from fixed-wing aircraft. Escapements of chinook salmon have not been estimated for Village and Mile 112 creeks since 1975. Turbid water conditions during the peak spawning period again precluded aerial surveys of the Blanchard River in 1990.

The count of 1,915 large chinook salmon through the Klukshu River weir in 1990 was 22% below the 1989 count of 2,456 fish (Table 5). The escapement to the Klukshu, estimated by subtracting the subsistence harvest from the weir count was 1,742, a decline of 547 fish from 1989. An aerial survey of the Klukshu River escapement was conducted in 1990. The aerial count of 1,381 large chinook salmon was approximately 72% of the weir count. The 1990 peak aerial count of 325 large chinook salmon in the Takhanne River was above the 1989 count but close to recent year averages. The aerial count of large chinook salmon escapement to Goat Creek in 1990 was 32 fish, close to the 1989 count of 34 fish. The total escapement for the Alsek River drainage, estimated by expanding the weir escapement count for the Klukshu River by 1/0.64 (tributary expansion factor), was 2,722 large chinook salmon. This was 24% below 1989 and 46% less than the management escapement goal of 5,000 large chinook salmon. Escapements of chinook salmon to the Alsek River have exceeded the management escapement goal only once since 1976, and average escapements during the first cycle of the rebuilding program (1981-1985) actually declined relative to the 1975-1980 base period (Figure 13).

Unuk River

Escapements of chinook salmon to the Unuk River have historically been the largest of any river system in Behm Canal, and only the Taku, Stikine, and Alsek rivers support larger runs of chinook salmon in Southeast Alaska. In 1990, only 591 large chinook salmon were observed in index areas of the Unuk River (Table 6). Escapements were below average in all index tributaries (Table 7).

Expansion of the peak aerial survey count by a survey expansion factor of 1/0.625 resulted in a total escapement estimate of 946 large chinook salmon. The 1990 estimated total escapement was 49% below the 1989 escapement of 1,838 chinook salmon and only 64% of the management escapement goal of 2,880 large chinook salmon. The 1990 estimated escapement of chinook salmon to the Unuk River was 53% below the average escapements observed during the first rebuilding cycle (1981-1985) and 46% below the 1975-1980 average of 1,469 chinook salmon.

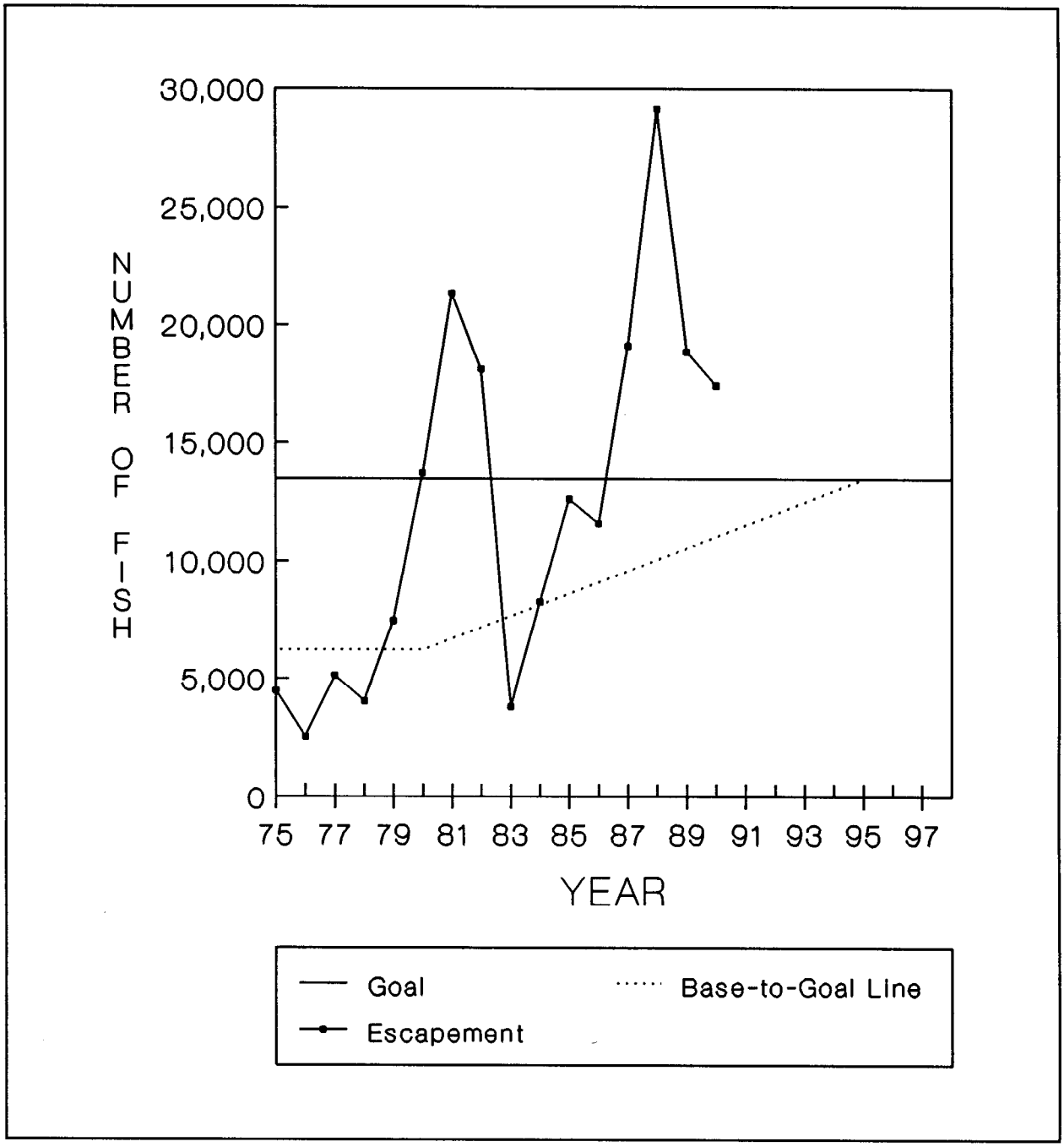

Figure 11. Estimated escapements of chinook salmon to the Stikine River, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 13,440 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

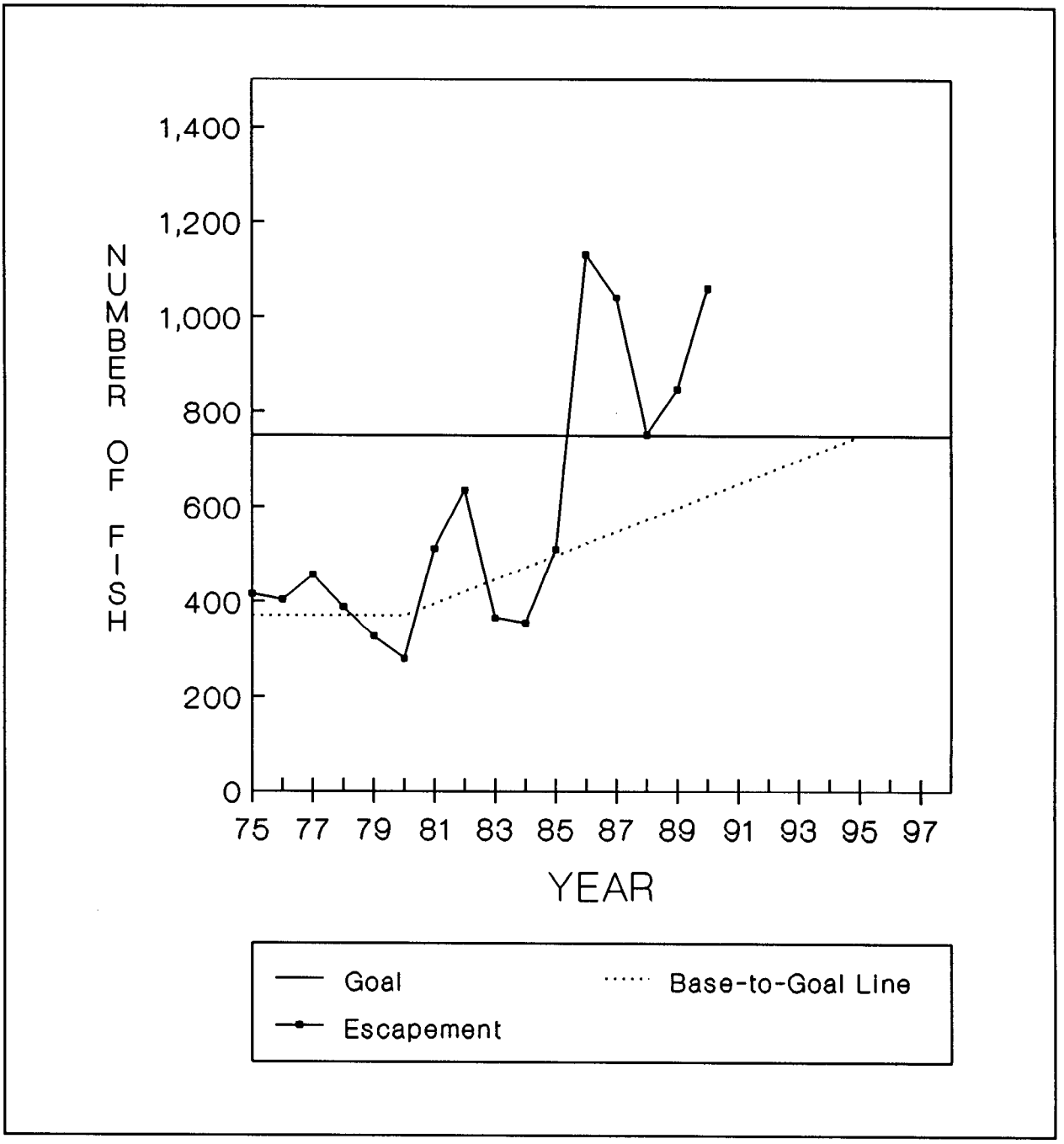

Figure 12. Estimated escapements of chinook salmon to Andrew Creek, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 750 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

Table 5. Peak escapement and weir counts of chinook salmon for tributaries of the Alsek River, 1960-1990.[a,b]

Year	Village System	Mile 112 Creek	Klukshu Weir Count	Klukshu Escapement[c]	Blanchard River	Takhanne River	Goat Creek	Total[d]
1962	-	-	86	86	-	-	-	86
1963	-	-	-	-	-	-	-	-
1964	-	-	20	20	-	-	-	20
1965	-	-	100	100	100	250	-	450
1966	-	-	1,000	1,000	100	200	-	1,300
1967	-	-	1,500	1,500	200	275	-	1,975
1968	-	-	1,700	1,700	425	225	-	2,350
1969	-	72	700	700	250	250	-	1,272
1970	100	-	500	500	100	100	-	800
1971	50	60	300	300	-	-	-	410
1972	-	32	1,100	1,100	12 (A)	250	-	1,394
1973	-	-	-	-	-	49 (A)	-	49
1974	14	183	62	62	52 (A)	132	-	443
1975	17	-	58	58	81 (A)	177 (A)	-	333
1976	-	-	1,244	1,153	-	-	-	1,153
1977	-	-	3,144	2,894	-	-	-	2,894
1978	-	-	2,976	2,676	-	-	-	2,676
1979	-	-	4,403	4,274	-	-	-	4,274
1980	-	-	2,637	2,487	-	-	-	2,487
1981	0	-	2,113	1,963	35 (H)	11 (H)	-	2,009
1982	-	-	2,369	1,969	59 (H)	241 (H)	13 (H)	2,282
1983	-	-	2,537	2,237	108 (H)	185 (H)	-	2,530
1984	-	-	1,672	1,572	304 (H)	158 (H)	28 (H)	2,062[e]
1985	-	-	1,458	1,283	232 (H)	184 (H)	-	1,699
1986	-	-	2,709	2,607	556 (H)	358 (H)	142 (H)	3,663
1987	-	-	2,615	2,491	624 (H)	395 (H)	85 (H)	3,595
1988	-	-	2,018	1,994	437 E(H)	169 E(H)	54 E(H)	2,654
1989	-	-	2,456	2,289	-	158 E(H)	34 E(H)	3,577
1990	-	-	1,915	1,742	-	325 E(H)	32 N(H)	2,099

[a] (F) = Escapement survey conducted by walking river.
(A) = Escapement Survey conducted from fixed-wing aircraft.
(H) = Escapement survey conducted from helicopter.
E = Excellent survey conditions.
- = No survey conducted or data not comparable.

[b] Escapement counts prior to 1975 may not be comparable due to differences in survey dates and counting methods.

[c] Klukshu River escapement = weir count minus subsistence fishery harvest.

[d] Total escapement = Klukshu escapement plus aerial counts of other systems.

[e] Surveys conducted by CDFO in 1984.

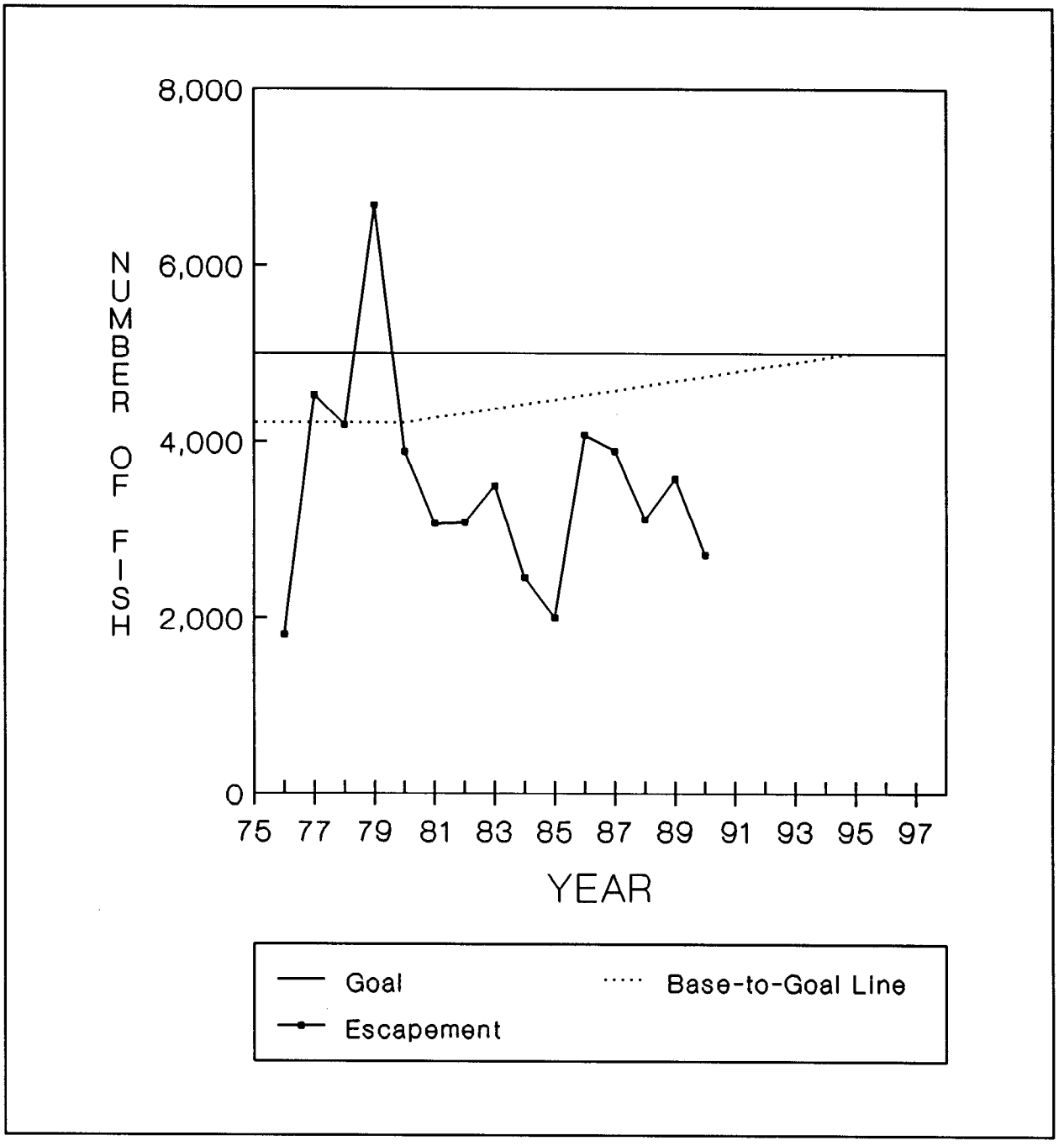

Figure 13. Estimated escapements of chinook salmon to the Alsek River, 1975-1990. Base-to-goal line indicates linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at the management escapement goal of 5,000 large chinook salmon in 1995 (final year of three-cycle rebuilding program).

Table 6. Peak escapement counts of chinook salmon to index tributaries of the Unuk River, 1960-1990. [a,b]

Year	Cripple Creek	Genes Lake Creek	Eulachon Creek	Clear Creek	Lake Creek	Kerr Creek	Total
1960	-	-	250 (A)	-	-	-	250
1961	3 (F)	200 (F)	270 (F)	65 (F)	-	53 (F)	591
1962	-	150 (A)	145 (A)	100 (A)	30 (A)	-	425
1963	100 (A)	750 (A)	150 (A)	25 (A)	-	-	1,025
1964	-	-	25 (A)	-	-	-	25
1965	-	-	-	-	-	-	-
1966	-	-	-	-	-	-	-
1967	-	-	60 (H)	-	-	-	60
1968	-	-	75 (H)	-	-	-	75
1969	-	-	150 (H)	-	-	-	150
1970	-	-	-	-	-	-	-
1971	-	-	30 (A)	-	-	-	30
1972	95 (A)	35 (A)	450 (A)	90 (A)	55 (A)	-	725
1973	-	-	64 (H)	-	-	-	64
1974	-	-	68 (H)	-	-	-	68
1975	-	-	17 (H)	-	-	-	17
1976	-	-	3 (A)	-	-	-	3
1977	529 (F)	339 (F)	57 (H)	34 (H)	-	15 (H)	974
1978	394 (F)	374 (F)	218 (H)	85 (H)	20 (H)	15 (H)	1,106
1979	363 (F)	101 (F)	48 (H)	14 (H)	30 (H)	20 (H)	576
1980	748 (F)	122 (F)	95 (H)	28 (H)	5 (H)	18 (H)	1,016
1981	324 (F)	112 (F)	196 (H)	54 (H)	20 (H)	25 (H)	731
1982	538 (F)	329 (F)	384 (H)	24 (H)	48 (H)	28 (H)	1,351
1983	459 (F)	338 (F)	288 (H)	24 (H)	12 (H)	4 (H)	1,125
1984	644 (F)	647 (F)	350 (H)	113 (H)	32 (H)	51 (H)	1,837
1985	284 (F)	553 (F)	275 (H)	37 (H)	22 (H)	13 (H)	1,184
1986	532 (F)	838 (F)	486 (H)	183 (F)	25 (H)	62 (H)	2,126
1987	860 (F)	398 (F)	520 (H)	107 (H)	37 (H)	51 (H)	1,973
1988	1,068 (F)	154 (F)	146 (F)	292 (H)	60 (H)	26 (H)	1,746
1989	351 (F)	302 (F)	298 (H)	128 (H)	27 (F)	43 (H)	1,149
1990	86 (F)	284 (F)	81 (H)	103 (F)	26 (F)	11 (H)	591

[a] (F) = Escapement survey conducted by walking river.
(A) = Escapement Survey conducted from fixed-wing aircraft.
(H) = Escapement survey conducted from helicopter.
- = No survey conducted or data not comparable.

[b] Escapement counts prior to 1975 may not be comparable due to differences in survey dates and counting methods.

Table 7. Percentages of total escapements of chinook salmon to index tributaries of the Unuk River for years when all index tributaries were surveyed.

Year	Cripple Creek	%	Genes Lake Creek	%	Eulachon Creek	%	Clear Creek	%	Lake Creek	%	Kerr Creek	%	Total
1978	394	36	374	34	218	20	85	8	20	2	15	1	1,106
1979	363	63	101	18	48	8	14	2	30	5	20	4	576
1980	748	74	122	12	95	9	28	3	5	1	18	2	1,016
1981	324	44	112	15	196	27	54	7	20	3	25	3	731
1982	538	39	329	24	384	28	24	2	48	4	28	2	1,351
1983	459	40	338	30	288	26	24	2	12	1	4	0	1,125
1984	644	35	647	35	350	19	113	6	32	2	51	3	1,837
1985	284	24	553	47	275	23	37	3	22	2	13	1	1,184
1986	532	25	838	39	486	23	183	9	25	1	62	3	2,126
1987	860	44	398	20	520	26	107	5	37	2	51	3	1,973
1988	1,068	61	154	9	146	8	292	17	60	3	26	2	1,746
1989	351	31	302	26	298	26	128	11	27	2	43	4	1,149
Average	547	41	356	27	275	21	91	7	28	2	30	2	1,327
1990	86	15	284	48	81	14	103	17	26	4	11	2	591

Escapements of chinook salmon to the Unuk River have declined every year since 1986, and fell below the linear rebuilding schedule in 1989 and 1990 (Figure 14).

Chickamin River

Chinook salmon have been counted by foot or helicopter surveys in index tributaries of the Chickamin River each year since 1977. The 1990 observed escapement to the eight index tributaries of the Chickamin River was 564 large chinook salmon, compared to 934 in 1989 (Table 8).

Expansion of the total observed peak escapement by the survey expansion factor of 1/0.625 gave an estimated total escapement to the Chickamin River drainage of 902 chinook salmon, 47% below the management escapement goal of 1,440 large chinook salmon. The 1990 total escapement was 40% lower than in 1989 and 33% lower than 1981-1985 average escapement of 1,169; however, it was 267% higher than the 1975-1980 average of 338 fish. Escapements in 1990 were below average in all of the Chickamin River tributaries except Humpy and Clear Falls creeks (Table 9). The 1990 escapement of chinook salmon to the Chickamin River falls below both the management escapement goal and the rebuilding schedule. Total escapements had been above the linear rebuilding schedule since 1980, and close to or above the management escapement goal since 1984 (Figure 15).

Chilkat River

Escapements of chinook salmon to the Chilkat River declined in 1985 and 1986, leading ADFG to implement a number of restrictions on the Haines marine recreational fishery (Mecum and Kissner 1989). In 1990, only 61 large chinook salmon were observed during the peak aerial surveys of the Big Boulder and Stonehouse creek index streams (Table 10). Expanding the combined peak aerial count of 61 chinook salmon for Big Boulder and Stonehouse creeks by the tributary (1/0.28) and survey (1/0.80) expansion factors resulted in an estimate of 272 large chinook salmon for the Chilkat River system. Escapement of chinook salmon to the Chilkat River in 1990 was again below the linear rebuilding schedule and is still well below the total escapement goal of 2,000 large chinook salmon (Figure 16).

Other Rivers

The observed peak escapement of 257 large chinook salmon to the Blossom River in 1990 was 25% less than the 1989 escapement of 344 and well below aerial counts recorded in recent years (Table 11). The expanded escapement estimate for the Blossom River of 411 fish was approximately 32% of the escapement goal of 1,280 fish. This escapement goal was exceeded in both 1986 and 1987. Since 1988, escapements of chinook salmon to the Blossom River have fallen below the linear rebuilding schedule (Figure 17).

Escapement to the Keta River in 1990 fell to 606 fish after a dramatic increase in 1989 of 1,155 large chinook salmon (Table 11). Expanding the peak aerial count by the survey expansion factor of 1/0.625 resulted in an estimate of 970 large chinook salmon, still above the escapement goal of 800 fish. Chinook salmon escapements to the Keta River have increased steadily since implementation of the rebuilding program in 1980, and have exceeded the management escapement goal every year since 1983 (Figure 18).

The Marten River is not used as a chinook salmon index stream and no escapement goals have been established. The escapements to this system have, however, been

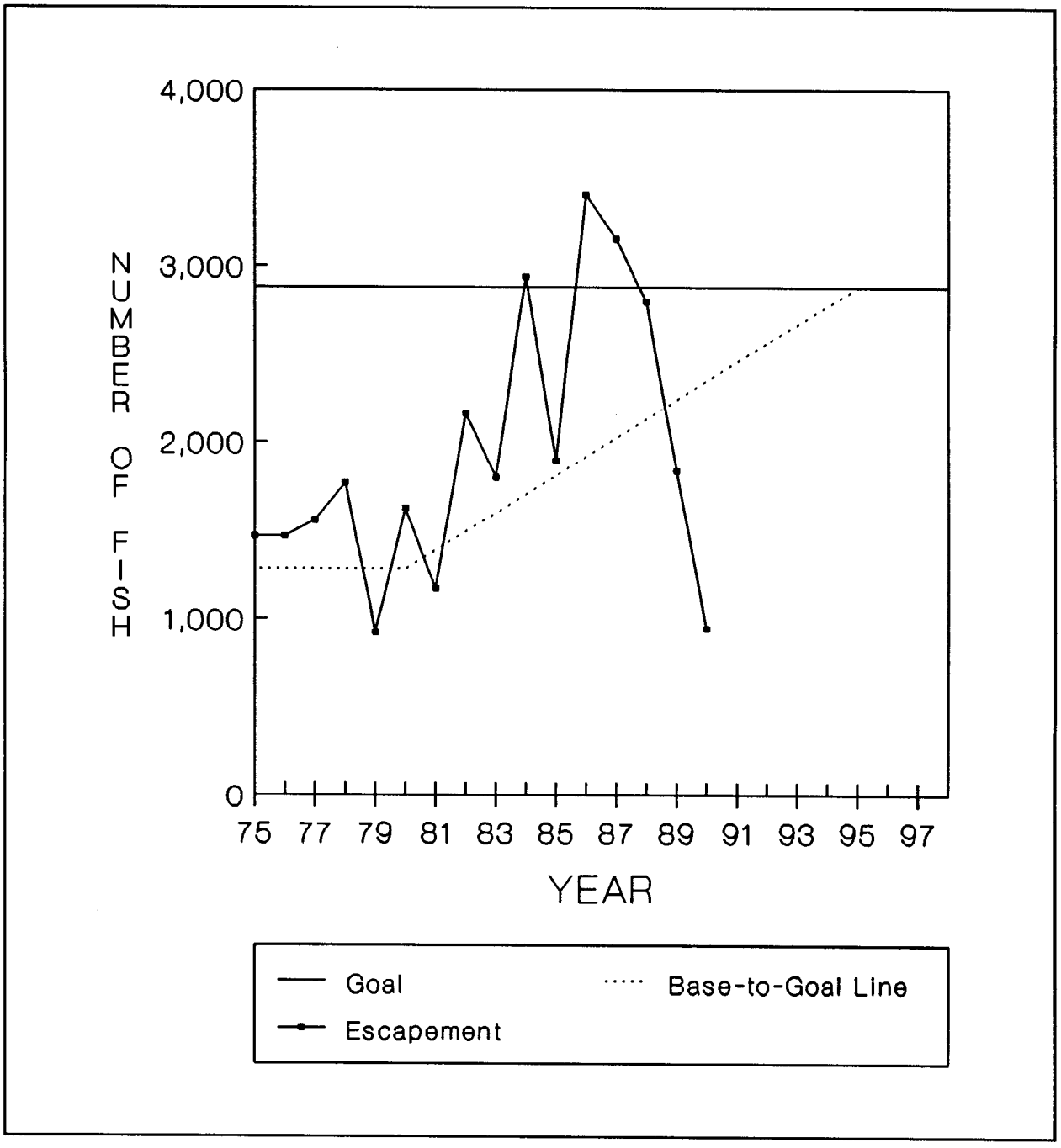

Figure 14. Estimated escapements of chinook salmon to the Unuk River, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 2,880 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

Table 8. Peak escapements of chinook salmon to tributaries of the Chickamin River, 1960-1990. [a,b]

Year	South Fork Creek	Barrier Creek	Butler Creek	Leduc Creek	Indian Creek	Humpy Creek	King Creek	Clear Falls Creek	Total
1960	-	-	-	-	-	3 (A)	-	-	3
1961	-	36 (A)	77 (A)	42 (A)	5 (A)	120 (A)	48 (A)	-	328
1962	400 (A)	35 (A)	-	-	-	150 (A)	-	-	585
1963	350 (A)	115 (A)	-	-	-	3 (A)	200 (A)	-	668
1964	-	-	-	-	-	-	-	-	-
1965	-	-	-	-	-	-	75 (A)	-	75
1966	-	-	-	-	-	50 (F)	-	-	50
1967	-	-	-	-	-	-	45 (H)	-	45
1968	-	-	-	-	-	30 (H)	20 (H)	-	50
1969	-	-	-	-	-	10 (H)	45 (H)	-	55
1970	-	-	-	-	-	-	-	-	-
1971	-	-	-	-	-	-	-	-	-
1972	350 (A)	25 (A)	-	85 (A)	-	65 (A)	510 (A)	-	1,035
1973	-	-	-	-	-	14 (A)	65 (A)	-	79
1974	144 (H)	-	-	-	-	-	11 (H)	-	155
1975	141 (H)	9 (H)	66 (H)	6 (H)	90 (H)	7 (H)	30 (H)	-	349
1976	46 (H)	10 (H)	15 (H)	12 (H)	9 (H)	-	-	-	92
1977	52 (H)	66 (H)	30 (H)	26 (H)	53 (H)	0 (H)	-	-	227
1978	21 (H)	94 (H)	4 (H)	42 (H)	20 (H)	-	-	-	181
1979	63 (H)	17 (H)	29 (H)	0 (H)	31 (H)	-	-	-	140
1980	56 (H)	62 (H)	104 (H)	17 (H)	22 (H)	-	-	-	261
1981	51 (H)	105 (H)	51 (H)	25 (H)	12 (H)	4 (F)	105 (F)	31 (H)	384
1982	84 (H)	149 (H)	37 (H)	36 (H)	30 (F)	37 (F)	165 (F)	33 (H)	571
1983	28 (H)	138 (H)	91 (H)	30 (H)	47 (H)	-	212 (F)	30 (H)	576
1984	185 (H)	171 (H)	124 (H)	15 (H)	103 (H)	88 (F)	388 (F)	28 (H)	1,102
1985	163 (H)	129 (H)	92 (H)	8 (H)	125 (H)	50 (H)	377 (H)	12 (H)	956
1986	562 (H)	168 (H)	203 (H)	20 (H)	120 (H)	-	564 (H)	40 (H)	1,677
1987	261 (H)	76 (H)	120 (H)	19 (H)	115 (H)	26 (H)	310 (H)	48 (H)	975
1988	280 (H/F)	82 (H/F)	159 (H)	25 (H/F)	32 (H)	19 (H/F)	164 (H)	25 (H/F)	786
1989	226 (H/F)	90 (H)	137 (H)	57 (H)	84 (H)	22 (H/F)	224 (H)	94 (H)	934
1990	135 (F)	107 (H)	27 (H)	20 (H)	24 (H)	35 (H)	163 (H)	53 (H)	564

[a] (F) = Escapement surveyed by walking stream.
(H) = Escapement surveyed by helicopter.
(A) = Escapement surveyed by fixed-wing aircraft.
(H/F) = Escapement surveyed by combination of walking and helicopter.
- = No survey conducted or data not comparable.

[b] Escapement counts conducted prior to 1975 may not be comparable due to differences in survey dates and counting methods.

Table 9. Percentages of total escapements of chinook salmon to index tributaries of the Chickamin River for years when all index tributaries were surveyed.

Year	South Fork Creek	%	Barrier Creek	%	Butler Creek	%	Leduc Creek	%	Indian Creek	%	Humpy Creek	%	King Creek	%	Clear Falls Creek	%	Total
1981	51	13	105	27	51	13	25	7	12	3	4	1	105	27	31	8	384
1982	84	15	149	26	37	7	36	6	30	5	37	7	165	29	33	6	571
1984	185	17	171	16	124	11	15	1	103	9	88	8	388	35	28	2	1,102
1985	136	14	156	16	93	10	8	1	125	13	50	5	377	39	12	1	957
1987	261	27	76	8	120	12	19	2	115	12	26	3	310	32	48	5	975
1988	280	36	82	10	159	20	25	3	32	4	19	2	164	21	25	3	786
1989	226	24	90	10	137	15	57	6	84	9	22	2	224	24	94	10	934
Average	175	21	118	15	103	13	26	3	72	9	35	4	248	30	39	5	816
1990	135	24	107	19	27	5	20	4	24	4	35	6	163	29	53	9	564

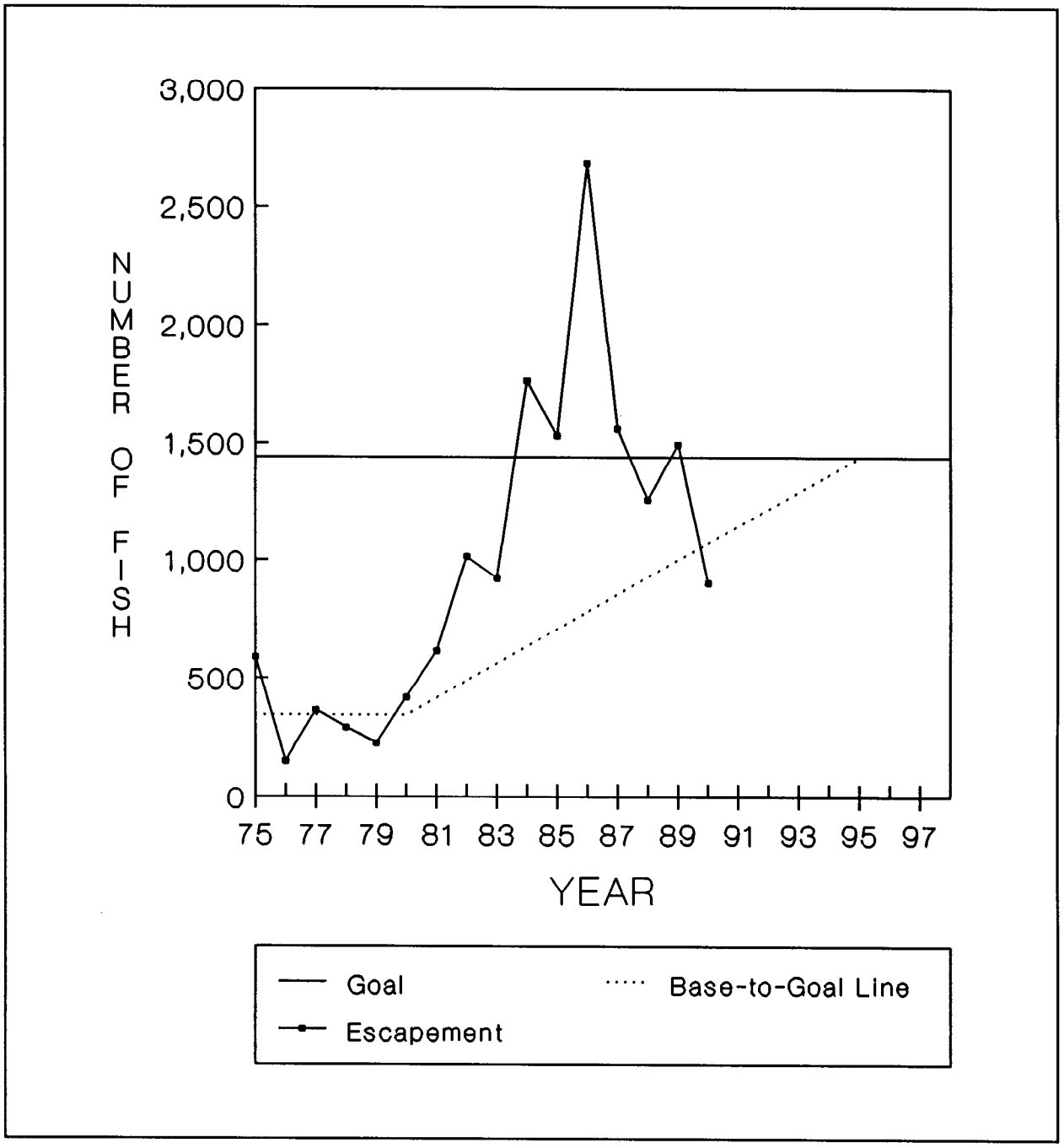

Figure 15. Estimated escapements of chinook salmon to the Chickamin River, 1975-1990. Base-to-goal line indicates linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 1,440 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

Table 10. Peak escapements of chinook salmon to index tributaries of the Chilkat River, 1960-1990.[a,b]

Year	Big Boulder Creek	Stonehouse Creek	Total
1960	316 (F)	-	316
1961	88 (F)	-	88
1962	-	-	-
1963	-	-	-
1964	-	-	-
1965	-	-	-
1966	330 (F)	-	330
1967	150 (F)	-	150
1968	259 (F)	-	259
1969	-	-	-
1970	176 (F)	-	176
1971	56 (F)	-	56
1972	-	-	-
1973	-	-	-
1974	0 (F)	-	0
1975	21 (F)	-	21
1976	25 (F)	-	25
1977	25 (F)	-	25
1978	-	-	-
1979	-	-	-
1980	-	-	-
1981	187 (H/F)	69 (H)	256
1982	56 (H/F)	123 (H)	179
1983	121 (H/F)	126 (H)	247
1984	229 (H/F)	104 (H)	333
1985	70 (H/F)	50 (H)	120
1986	20 (F)	9 (H)	29
1987	98 (F)	190 (H)	288
1988	86 (F)	89 (H)	175
1989	74 (H)	231 (H)	305
1990	19 (H)	42 (H)	61

[a] (F) = Escapement surveyed by walking stream.
(A) = Escapement surveyed from fixed-wing aircraft.
(H) = Escapement surveyed from helicopter.
(H/F) = Escapement surveyed from helicopter and by walking portions of stream.
- = No survey conducted or data not comparable.

[b] Escapement counts prior to 1975 may not be comparable because of differences in survey dates and counting methods.

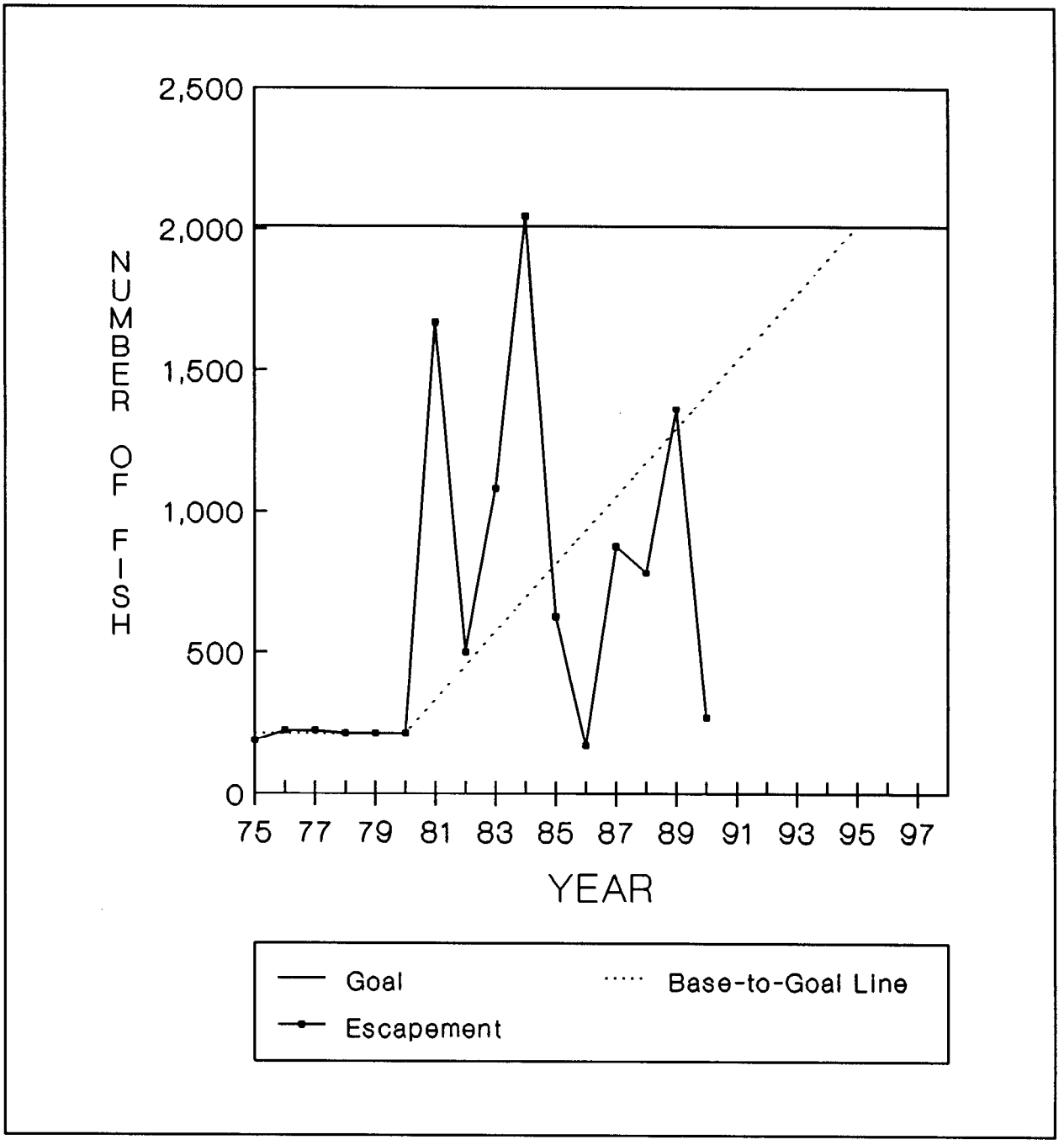

Figure 16. Estimated escapements of chinook salmon to the Chilkat River, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 2,000 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

Table 11. Peak escapement counts of chinook salmon for selected rivers in Behm Canal, 1948-1990. [a,b]

Year	Keta River	Blossom River	Wilson River	Marten River	Grant Creek	Klahini River	Total
1948	500 (F)	-	-	-	-	-	500
1949	-	-	-	-	-	-	-
1950	210 (F)	-	-	-	-	-	210
1951	120 (F)	-	-	-	-	-	120
1952	462 (F)	-	-	-	-	-	462
1953	156 (F)	-	-	-	-	-	156
1954	300 (A)	-	-	-	-	-	300
1955	1,000 (A)	-	-	-	-	-	1,000
1956	1,500 (A)	-	-	-	-	-	1,500
1957	500 (A)	-	-	-	-	-	500
1958	-	-	-	-	-	-	-
1959	-	-	-	-	-	-	-
1960	-	-	-	-	-	-	-
1961	44 (F)	68 (F)	-	22 (F)	40 (A)	-	174
1962	-	-	-	-	6 (A)	100 (A)	106
1963	-	450 (A)	375 (A)	-	15 (A)	-	840
1964	-	-	-	-	-	-	-
1965	-	-	50 (A)	43 (H)	-	-	93
1966	75 (A)	200 (A)	60 (A)	10 (A)	100 (A)	3 (A)	448
1967	86 (H)	-	8 (H)	7 (H)	15 (H)	-	116
1968	-	-	-	-	4 (H)	-	4
1969	200 (A)	-	10 (A)	10 (A)	69 (H)	3 (H)	292
1970	-	100 (H)	-	-	-	-	100
1971	-	-	-	-	-	-	-
1972	255 (A)	225 (A)	275 (A)	-	25 (A)	150 (A)	930
1973	-	-	30 (A)	-	38 (A)	7 (H)	75
1974	25 (H)	166 (H)	-	-	-	-	191
1975	203 (H)	146 (H)	7 (H)	15 (H)	-	-	371
1976	84 (H)	68 (H)	-	-	-	-	152
1977	230 (H)	112 (H)	-	-	-	-	342
1978	392 (H)	143 (H)	-	2 (A)	-	-	537
1979	426 (H)	54 (H)	36 (H)	-	-	-	516
1980	192 (H)	89 (H)	-	-	-	-	281
1981	329 (H)	159 (H)	76 (F)	-	25 (H)	42 (F)	631
1982	754 (H)	345 (H)	300 (B)	75 (F)	33 (F)	79 (F)	1,586
1983	822 (H)	589 (H)	178 (B)	138 (F)	8 (A)	10 (H)	1,745
1984	610 (H)	508 (H)	133 (F)	12 (B)	124 (F)	54 (F)	1,441
1985	624 (H)	709 (H)	420 (H)	69 (F)	55 (F)	20 (F)	1,897
1986	690 (H)	1,278 (H)	-	-	-	-	1,968
1987	768 (H)	1,349 (H)	-	270 (H)	33 (A)	-	2,420
1988	575 (H)	384 (H)	-	543 (H)	-	40 (H)	1,542
1989	1,155 (H)	344 (H)	-	133 (H)	-	-	1,632
1990	606 (H)	257 (H)	-	283 (H)	-	-	1,146

[a] (F) = Escapement surveyed by walking stream.
(A) = Escapement surveyed from fixed-wing aircraft.
(H) = Escapement surveyed from helicopter.
(B) = Escapement surveyed from boat.
- = No survey conducted or data not comparable.

[b] Escapement counts prior to 1975 may not be comparable due to differences in survey dates or methods.

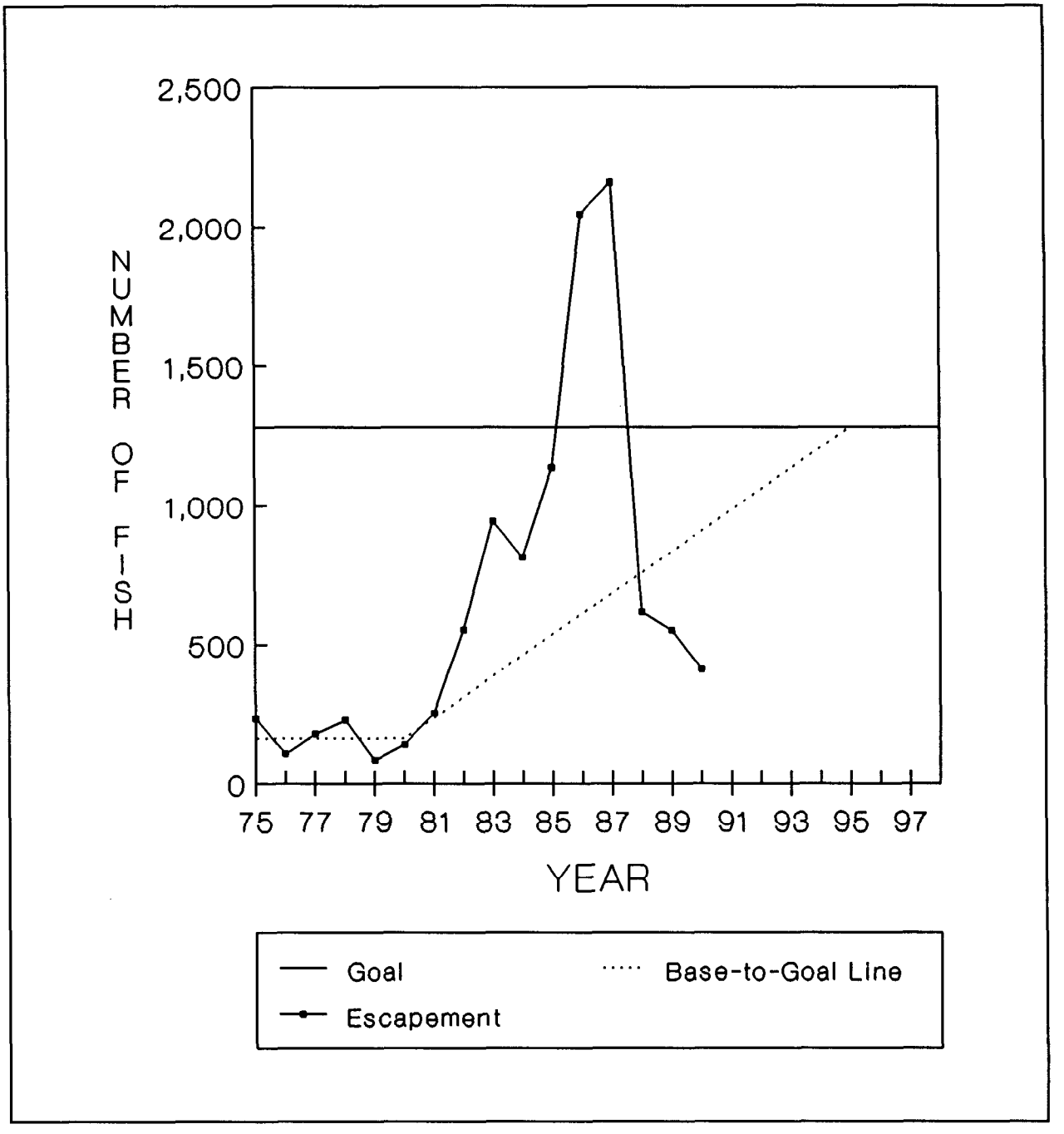

Figure 17. Estimated escapements of chinook salmon to the Blossom River, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 1,280 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

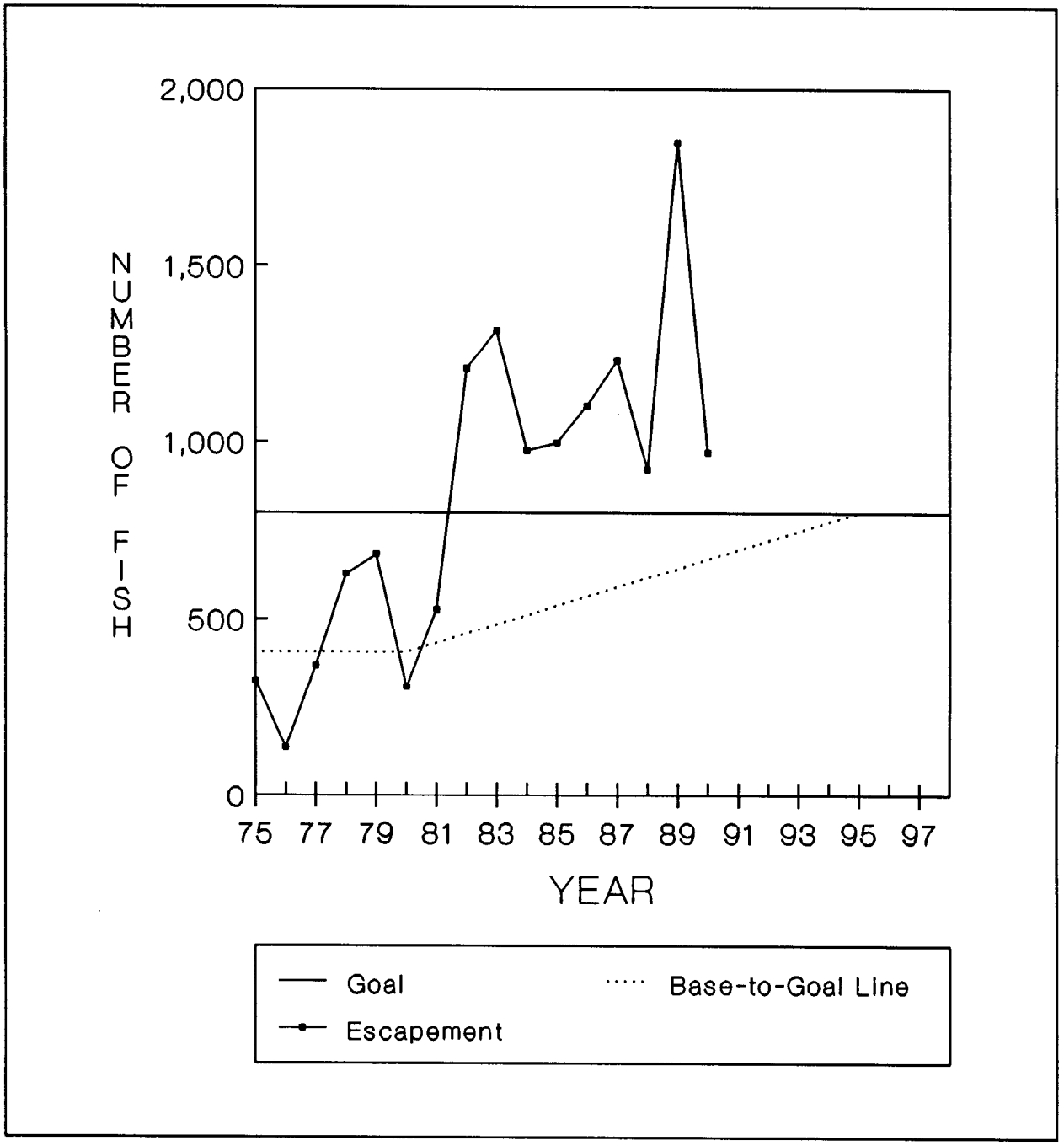

Figure 18. Estimated escapements of chinook salmon to the Keta River, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 800 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

regularly monitored since 1982. The 1990 peak escapement count for the Marten River of 283 large chinook salmon was 210% higher than the 1989 count of 133 fish. Chinook salmon escapements to the Wilson River were not estimated in 1990.

The 1990 weir count of 190 large chinook salmon to the King Salmon River was 76% above the 1989 escapement and below the 1983 to 1989 average escapement of 242 fish (Table 12). The addition of 8 adult chinook salmon observed spawning below the weir resulted in an estimated total return of 198 adult chinook salmon; 30 large chinook salmon were taken for brood stock production at the ADFG Snettisham hatchery, so 168 large chinook salmon spawned in the King Salmon River in 1990. Since 1983, chinook salmon escapements to the King Salmon River have been slightly below the management escapement goal of 250 large chinook salmon, but until 1990 were still ahead of the linear rebuilding schedule (Figure 19).

Escapements of chinook salmon to the Situk River in 1990 increased slightly to 700 large chinook salmon (Table 13). The 1990 escapement was 7% higher than the 1989 escapement of 652 and 30% and 46% lower than the 1981-1985 and 1975-1980 average escapements of 995 and 1,299 fish, respectively. Escapements of chinook salmon to the Situk River in 1988, 1989, and 1990 were <50% of the management escapement goal and well behind the linear rebuilding schedule (Figure 20).

DISCUSSION

The index expansion method relies on the assumption that escapements to the index tributaries are a constant proportion of the total escapement and are, therefore, "indicative" of the total escapement to all systems. There is reason to question the validity of this assumption for at least the Taku River. Mecum (1990) examined those years when all Taku River tributaries were surveyed and found that expansion of five or six index systems may give a more representative estimation of total escapement to the Taku River than the two systems now used. Surveying five or six index areas, however, is substantially more expensive than surveying just the Nakina and Nahlin areas, and some years it may not be possible to survey all systems. Any change in survey methods must also take into account the comparability of historical data with new data. Modification of the expansion method would have to be approved by the PSC chinook salmon technical committee before it could be implemented. Year to year consistency and repeatability of index counts may be more important than their absolute accuracy to agencies that compare escapement estimates between years.

The estimated total escapement of chinook salmon for all Southeast Alaska and transboundary rivers declined from 54,171 fish in 1989 to 51,879 fish in 1990. This was the second decline in a row after increasing escapements were observed over the previous six years. The total escapement of chinook salmon in 1990 was 4%, or 2,290 fish, less than in 1989 and only 81% of the management escapement goal of 64,000 chinook salmon. The 1990 escapement represents an increase of approximately 89%, or 24,300 chinook salmon, over the 1975-1980 base period average of 26,000 chinook salmon and an increase of 24%, or 10,200 chinook salmon, over the 1981-1985 average of 41,700 chinook salmon. Although the overall decline in escapements of chinook salmon in 1990 was small, declines were observed in 8 of the 11 index systems. The record high escapement observed in the Taku River offset the declines to other systems.

Total escapements of chinook salmon in Southeast Alaska have exhibited a strong trend towards rebuilding since 1984 (Figure 21). This is due primarily to the

Table 12. Peak escapements and weir counts of chinook salmon for the King Salmon River, 1957-1990.[a,b]

Year	Aerial count: Below weir	Aerial count: Above weir	Aerial count as percent of weir count[c]	Total Snettisham egg take	Total weir count (adults)[d]	Total weir count (jacks)[e]	Spawners below weir (foot count)	Total return[f]	Total natural spawning[g]
1957	-	200 (F)	-	-	-	-	-	200	200
1960	-	20 (F)[h]	-	-	-	-	-	20	20
1961	-	117 (F)	-	-	-	-	-	117	117
1971	-	94 (F)	-	-	-	-	-	94	94
1972	-	90 (F)	-	-	-	-	-	90	90
1973	-	211 (F)	-	-	-	-	-	211	211
1974	-	104 (F)	-	-	-	-	-	104	104
1975	-	42 (H)	-	-	-	-	-	42	42
1976	-	65 (H)	-	-	-	-	-	65	65
1977	-	134 (H)	-	-	-	-	-	134	134
1978	-	57 (H)	-	-	-	-	-	57	57
1979	-	88 (H)	-	17	-	-	-	88	71
1980	-	70 (H)	-	-	-	-	-	70	70
1981	-	101 (H)	-	11	-	-	-	101	90
1982	-	259 (F)	-	30	-	-	-	259	229
1983	25	183 (H)	0.85	37	252	20	30	282	245
1984	14	184 (H)	0.77	61	299	82	12	311	250
1985	12	105 (H)	0.65	33	194	45	10	204	171
1986	9	190 (H)	0.83	36	264	72	17	281	245
1987	19	128 (H)	0.74	34	207	62	20	227	193
1988	5	94 (H)	0.52[i]	37	231	54	12	243	206
1989	34	133 (H)	0.64	40[j]	249	71	29	278	238
1990	34	98 (H)	0.52	30	190	32	8	198	168

[a] (F) = Escapement surveyed by walking stream.
(H) = Escapement surveyed from helicopter.
- = No survey conducted or data not comparable.

[b] Escapement counts prior to 1975 may not be comparable due to differences in survey dates and counting methods.

[c] (total aerial count above weir)/(total weir count excluding jacks - egg take).

[d] Includes adult spawners used for egg take.

[e] Minimum count as jacks could pass through weir.

[f] Total return (adults) = weir count + spawning below weir.

[g] Natural spawning (adults) = (weir count - egg take & mortality) + spawners below weir (83-89).

[h] Accuracy of count questionable (minimal number of spawners).

[i] Four females and two males were held but not spawned for egg take.

[j] Includes holding mortality of 4 males and 6 females for egg take.

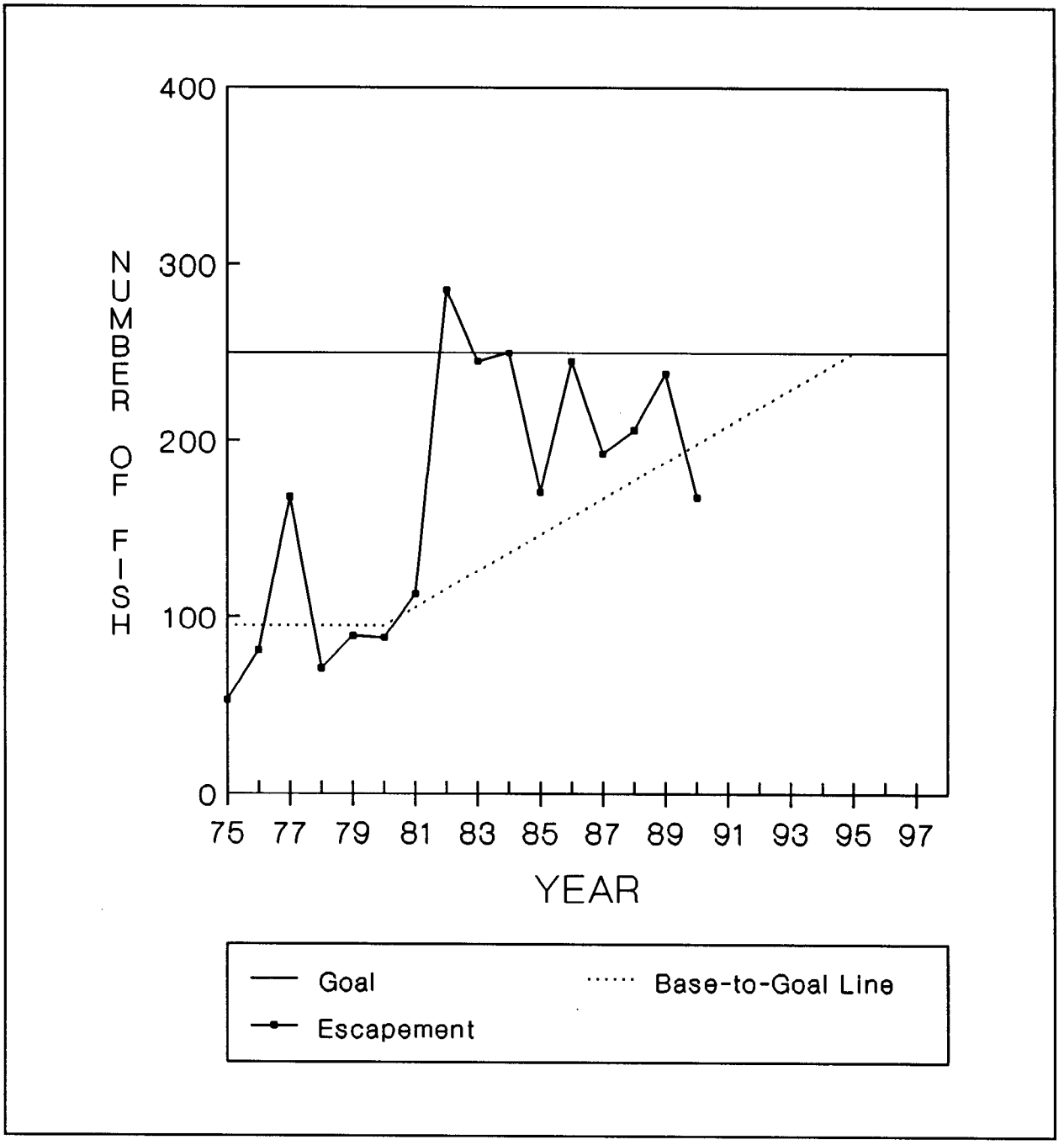

Figure 19. Estimated escapements of chinook salmon to the King Salmon River, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 250 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

Table 13. Harvest, escapement, and minimum total run of Situk River chinook salmon, 1915-1990.

Year	Commercial chinook harvests: Yakutat Bay	Situk River: Commercial	Situk River: Subsistence	Recreational: Large	Recreational: Small	Escapement: Large chinook	Escapement: Small chinook	Escapement: Total	Total run size[a]: Large only	Total run size[a]: All chinook
1915	-	836	-	-	-	-	-	-	-	836
1916	-	931	-	-	-	-	-	-	-	931
1917	-	2,499	-	-	-	-	-	-	-	2,499
1918	-	1,036	-	-	-	-	-	-	-	1,036
1919	-	316	-	-	-	-	-	-	-	316
1920	-	782	-	-	-	-	-	-	-	782
1921	-	1,952	-	-	-	-	-	-	-	1,952
1922	-	2,118	-	-	-	-	-	-	-	2,118
1923	-	1,761	-	-	-	-	-	-	-	1,761
1924	-	1,351	-	-	-	-	-	-	-	1,351
1925	-	1,087	-	-	-	-	-	-	-	1,087
1926	-	1,851	-	-	-	-	-	-	-	1,851
1927	-	1,687	-	-	-	-	-	-	-	1,687
1928	-	-	-	-	-	-	-	1,224	-	1,224
1929	-	-	-	-	-	-	-	3,559	-	3,559
1930	-	-	-	-	-	-	-	1,455	-	1,455
1931	-	-	-	-	-	-	-	2,967	-	2,967
1932	-	-	-	-	-	-	-	1,978	-	1,978
1933	-	267	-	-	-	-	-	-	-	267
1934	-	450	-	-	-	-	-	1,486	1,936	1,936
1935	-	558	-	-	-	-	-	638	1,196	1,196
1936	-	-	-	-	-	-	-	816	-	816
1937	-	-	-	-	-	-	-	1,290	-	1,290
1938	-	1,220	-	-	-	-	-	2,668	3,888	3,888
1939	-	495	-	-	-	-	-	2,117	2,612	2,612
1940	-	164	-	-	-	-	-	903	1,067	1,067
1941	-	390	-	-	-	-	-	2,594	2,984	2,984
1942	-	430	-	-	-	-	-	2,543	2,973	2,973
1943	-	947	-	-	-	-	-	3,546	4,493	4,493
1944	-	844	-	-	-	-	-	2,906	3,750	3,750
1945	-	692	-	-	-	-	-	1,458	2,150	2,150
1946	-	1,468	-	-	-	-	-	4,284	5,752	5,752
1947	-	885	-	-	-	-	-	5,077	5,962	5,962
1948	-	694	-	-	-	-	-	3,744	4,438	4,438
1949	-	410	-	-	-	-	-	1,978	2,388	2,388
1950	-	378	-	-	-	-	-	2,011	2,389	2,389
1951	-	948	-	-	-	-	-	2,780	3,728	3,728
1952	-	225	-	-	-	-	-	1,459	1,684	1,684
1953	-	378	-	-	-	-	-	1,040	1,418	1,418
1954	-	314	-	-	-	-	-	2,101	2,415	2,415
1955	-	740	-	-	-	-	-	1,571	2,311	2,311
1956	-	1,867	-	-	-	-	-	-	-	1,867
1957	-	1,796	-	-	-	-	-	1,500	-	3,296
1958	-	187	-	-	-	-	-	300	-	487
1959	-	426	-	-	-	-	-	-	-	426
1960	24	312	-	-	-	-	-	500	-	812
1961	28	367	-	-	-	-	-	400	-	767
1962	99	337	-	-	-	-	-	1,000	-	1,337
1963	141	466	-	-	-	-	-	-	-	466
1964	115	706	-	-	-	-	-	725	-	1,431
1965	86	442	-	-	-	-	-	1,500	-	1,942
1966	43	411	-	-	-	-	-	800	-	1,211
1967	241	203	-	-	-	-	-	200	-	403
1968	31	312	-	-	-	-	-	700	-	1,012
1969	29	1,089	-	-	-	-	-	2,500	-	3,589

-continued-

Table 13. (Page 2 of 2).

Year	Commercial chinook harvests: Yakutat Bay	Commercial chinook harvests: Situk River: Commercial	Commercial chinook harvests: Situk River: Subsistence	Recreational: Large	Recreational: Small	Escapement: Large chinook	Escapement: Small chinook	Escapement: Total	Total run size[a]: Large only	Total run size[a]: All chinook
1970	119	927	-	-	-	-	-	1,100	-	2,027
1971	106	473	-	-	-	-	-	964	-	1,437
1972	115	303	-	-	-	-	-	400	-	703
1973	79	752	-	-	-	-	-	510	-	1,262
1974	64	791	-	-	-	-	-	702	-	1,493
1975	41	562	27	-	-	-	-	1,180	-	1,769
1976	69	1,002	41	200	-	1,433	509	1,942	2,676	3,185
1977	53	833	24	244	-	1,732	148	1,880	2,833	2,981
1978	108	382	50	210	-	814	289	1,103	1,456	1,745
1979	51	1,028	25	282	-	1,400	367	1,767	2,735	3,102
1980	164	969	57	353	-	905	220	1,125	2,284	2,504
1981	151	858	62	130	-	702	105	807	1,752	1,857
1982	419	248	27	63	0	434	177	611	772	949
1983	371	349	50	42	10	592	257	849	1,033	1,300
1984	145	512	50	146	5	1,726	475	2,201	2,434	2,914
1985	240	484	81	294	217	1,521	461	1,982	2,380	3,058
1986	211	202	87	0	37	2,067	505	2,572	2,356	2,898
1987	329	891	22	76	319	1,884	494	1,884	2,873	3,192
1988	196	299	81	185	3	885	193	1,078	1,450	1,646
1989	297	1	29	0	0	652	1,217	1,869	682	1,899
1990	304	0[b]	na	0	0	700	631[c]	1,331	923	1,741

[a] Total run = chinook escapement + Situk commercial, sport, and subsistence harvests.

[b] Non-retention regulation in effect for commercial fisheries in 1989 and 1990; estimated harvest of 223 large chinook in 1990.

[c] Small chinook includes 486 medium fish (>450mm<660mm MEF).

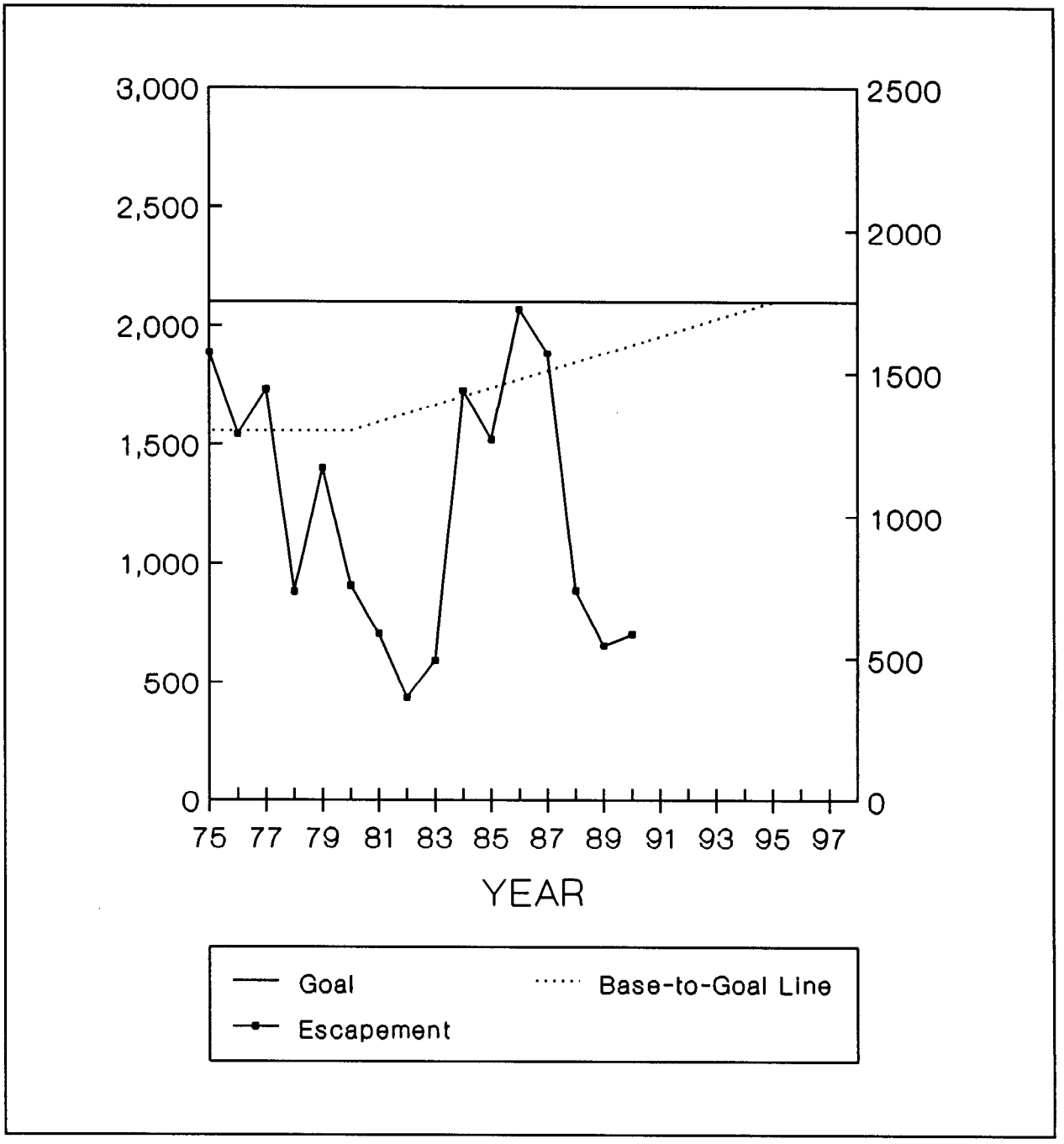

Figure 20. Estimated escapements of chinook salmon to the Situk River, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 2,100 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

Taku and Stikine rivers. These two rivers make up 61% of the total Southeast Alaska escapement goal and made up 74% of the total 1990 escapement. Five of the index systems (the Situk, Chilkat, Alsek, Taku, and Blossom rivers) have lagged behind the linear rebuilding schedule, and several others have slipped below the schedule in the last two years. Fluctuations in the annual escapement into an index area are expected. Water and weather conditions, pilot or observer experience and/or a change in the actual escapement can all affect the count. Multi-year trends are more significant than a given escapement count, and that is why the PSC concentrates on whether a stock's escapement trend is above or below the linear rebuilding trends as shown in Figures 10-21.

The observed decline in escapements to the Alsek and Situk rivers was not expected, particularly since harvests of these stocks in terminal net and recreational fisheries have been greatly reduced in recent years. Gmelch (1982) hypothesized that increased siltation and subsequent changes in channel morphology in the lower Alsek River estuary in Dry Bay may be contributing to the slow rebuilding progress of this stock. Other possible factors include: (1) the management escapement goals for the Alsek and Situk rivers are higher than they should be to achieve optimum sustained production; (2) Alsek and Situk river chinook salmon may be harvested to a greater extent in mixed stock domestic or high seas foreign gill net fisheries than previously believed; or (3) some combination of all of the factors listed above (Mecum and Kissner 1989). Recently initiated coded-wire tagging studies on the Alsek (Mecum 1989) and Situk rivers will provide information on migratory patterns and harvest rates and may provide insight into the primary reasons for the decline of these stocks.

Based on spawner-recruit analysis, ADFG in 1991 revised the management escapement goal for chinook salmon in the Situk River to 600 large fish, with a range of 450 to 900 (S. A. McPherson, Alaska Department of Fish and Game, Juneau, personal communication). This revised goal has not yet been adopted by the PSC; the historical goal of 2,100 was therefore used for assessment of rebuilding and comparison with previous years. The Alaska Board of Fisheries, however, approved a Situk River management plan in 1991 that incorporated the revised escapement goal through the Situk River weir of 600 large chinook salmon. With this plan in operation, it is unlikely that the old escapement goal of 2,100 fish will ever be reached.

Chinook salmon escapements to the Unuk, Chickamin, and Blossom rivers have declined substantially since 1987. Before 1987, the three stocks had been rebuilding and were above the linear rebuilding schedules for each river. The cause of the recent decline in these stocks is unknown. The three rivers, along with the Keta River, make up the major wild stocks of chinook salmon in southern Southeast Alaska. Brood stocks from the Unuk and Chickamin rivers are used in several large hatchery programs near Ketchikan. These hatcheries provide significant returns of adult salmon which rear and migrate in similar areas to wild donor stocks (Mecum and Kissner 1989). It is possible that increasing effort to harvest hatchery stocks has impacted the wild stocks. Coded-wire tag recoveries of wild and hatchery stocks will help evaluate this hypothesis (Pahlke *In press*).

Preliminary information from recoveries of coded-wire tagged chinook salmon fingerlings released in the Chilkat River in 1985 and 1986 indicate that this stock is harvested primarily in the Lynn Canal drift gill net fishery, the Haines and Juneau area marine recreational fisheries and in the commercial troll fishery in Icy Straits (Pahlke, Mecum, and Marshall 1990). It further appears that the loss of spawning and rearing habitat resulting from road construction activities

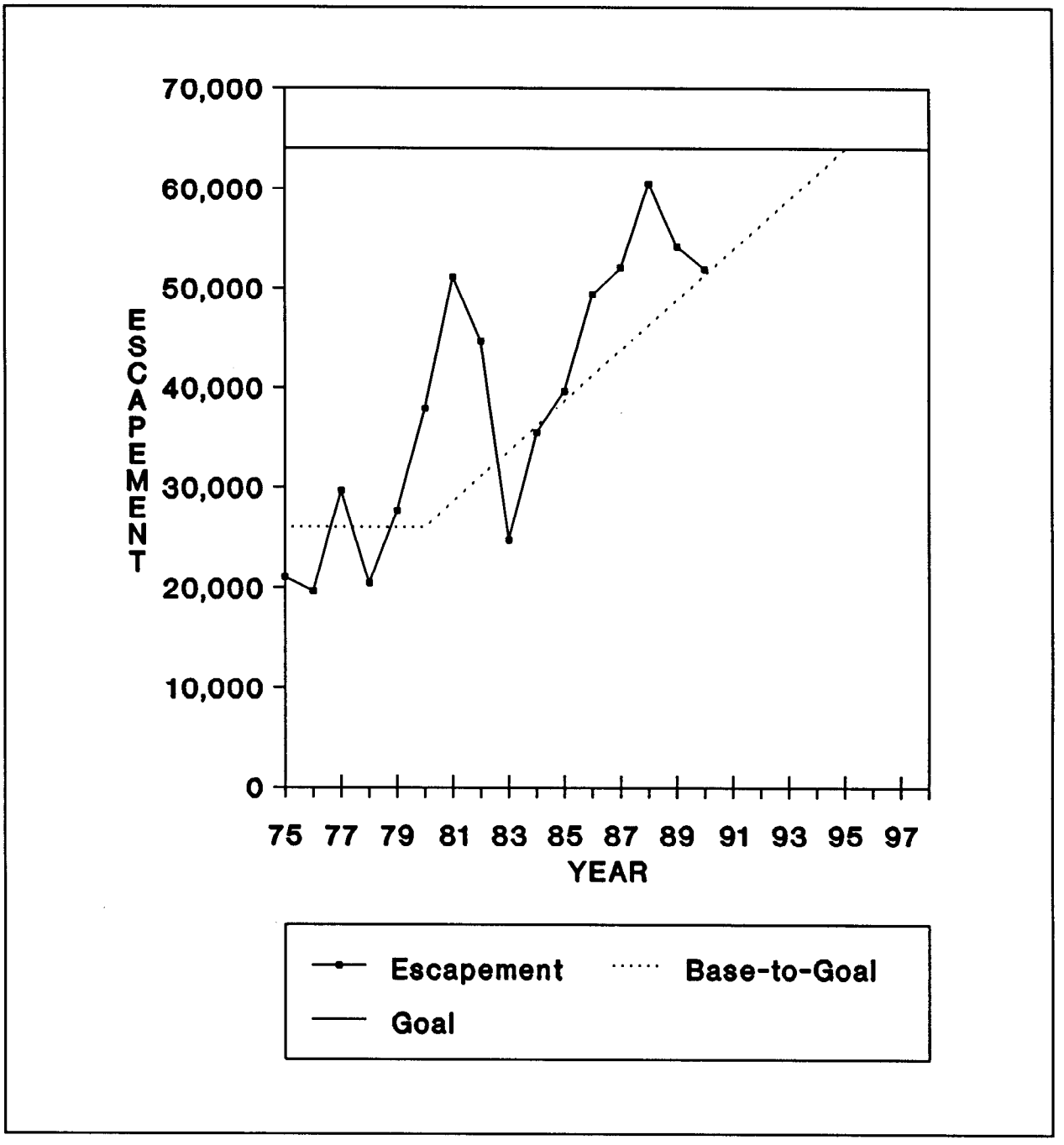

Figure 21. Estimated total escapement of chinook salmon to Southeast Alaska and transboundary river index systems, 1975-1990. Base-to-goal line shows linear rebuilding trend, starting in 1981 at average escapement level during first cycle of rebuilding (1975-1980) and ending at management escapement goal of 64,000 large chinook salmon in 1995 (final year of the three-cycle rebuilding program).

on Big Boulder Creek and the Kelsall River has also contributed to the decline of this stock (Mecum and Kissner 1989). Continued research and restriction of harvests of mature fish in the Haines marine recreational and commercial fisheries will be required to rebuild this important stock of chinook salmon.

ACKNOWLEDGMENTS

Several ADFG employees provided valuable assistance in this study. Doug Mecum and Paul Kissner trained the author in surveying technique; their experience and advice was essential in the completion of the project. David Magnus, Larry Derby, Rebecca Wilson, Randy Timothy, Randy Ericksen, and Robert Larsen conducted foot surveys on selected index systems; Kevin Brownlee provided the King Salmon River counts; Al Didier and Bob Marshall critically edited draft manuscripts; Iris Frank of the Commercial Fisheries Division contributed expert cartographic assistance. Pat Milligan and Pete Etherton of DFO provided weir counts from transboundary systems. Russ Kaufmann provided excellent flying skills and many years of surveying experience.

LITERATURE CITED

Beak Consultants, Limited. 1981. Preliminary analysis of the potential impact of hydroelectric development of the Stikine River system on biological resources of the Stikine River estuary. Report for the British Columbia Hydro and Power Authority. Richmond, British Columbia, Canada.

Gmelch, G. 1982. Resource use of Glacier Bay National Preserve. National Park Service, Alaska Region. Research/Resources Management Report, AR-6.

Kissner, P. D., Jr. 1982. A study of chinook salmon in Southeast Alaska. Alaska Department of Fish and Game. Annual report 1981-1982, Project F-9-14, 24 (AFS-41).

Mecum, R. D. 1989. Alsek River chinook salmon stock assessment. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report No. 1J89-42.

_____. 1990. Escapements of chinook salmon in Southeast Alaska and transboundary rivers in 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-52.

Mecum, R. D., and P. D. Kissner, Jr. 1989. A study of chinook salmon in Southeast Alaska. Alaska Department of Fish and Game, Fishery Data Series No. 117.

Mills, D., G. George, V. Sumida, and M. Kookesh. 1983. Salmon use by the residents of the Chilkat and Chilkoot river drainages. Alaska Department of Fish and Game, Technical Paper Series No. 95.

Pahlke, K. A. *In press*. Evaluation of juvenile code-wire tagging of chinook salmon on the Unuk and Chickamin rivers. Alaska Department of Fish and Game, Technical Fisheries Report Series.

Pahlke, K. A., R. D. Mecum, and R. P. Marshall. 1990. Migratory patterns and fishery distribution of Chilkat River chinook salmon. Alaska Department of Fish and Game, Fishery Data Series No. 90-50.

APPENDIX A

Appendix A1. Management escapement goals and survey and tributary expansion factors for Southeast Alaska and transboundary rivers. The escapement goal for each category equals the sum of the survey escapement goal times the survey and tributary expansion factors times the category expansion factor.

River system	Index tributaries surveyed	Survey escapement goal[a]	Survey expansion factor	Tributary expansion factor	System escapement goal	Category expansion factor	Category escapement goal
			Major Production Systems (Total = 3)				
Alsek	Klukshu	3,200 (W)	1/1	1/.64	5,000		
Taku	Nakina/Nahlin	11,500 (A)	1/0.75	1/.60	25,556		
Stikine	Little Tahltan	3,360 (W)	1/1	1/.25	13,440		
Major category subtotal		18,060			43,996	3/3	43,996
			Medium Production Systems (Total = 9)				
Situk	All	2,100 (W)	1/1	1/1	2,100		
Chilkat	Big Boulder/Stonehouse	450 (A)	1/0.80	1/0.28	2,009		
Andrew Cr.	All	470 (A)	1/0.625	1/1	750		
Unuk	All	1,800 (A)	1/0.625	1/1	2,880		
Chickamin	All	900 (A)	1/0.625	1/1	1,440		
Blossom	All	800 (A)	1/0.625	1/1	1,280		
Keta	All	500 (A)	1/0.625	1/1	800		
Medium category subtotal		7,020			11,259	9/7	14,476
			Minor Production Systems (Total = 22)				
King Salmon	All	250 (W)	1/1	1/1	250		
Minor category subtotal		250			250	22/1	5,500
All systems total		25,330			55,504		63,971

[a] (W) = weir count; (A) = aerial survey peak escapement estimate.

Appendix A2. Survey dates for indexing escapements by helicopter (h) or foot (f) during 1990. Dates are selected to encompass the historical dates of peak spawning.[a]

Location	Survey dates	Survey type
TAKU RIVER		
Nakina River	31 July and 5 August	h
Nahlin River	24 and 31 July	h
Dudidontu River	31 July and 5 August	h
Tseta Creek	31 July and 5 August	h
Kowatua River	17 and 24 August	h
Tatsamenie River	17 and 24 August	h
STIKINE RIVER		
Little Tahltan River	1 and 5 August	h
Tahltan River	5 August	h
Beatty Creek	1 and 5 August	h
Andrew Creek	12 August	f
ALSEK RIVER		
Klukshu River	2 August	h
Blanchard River	2 August	h
Takhanne River	2 August	h
Goat Creek	2 August	h
BLOSSOM RIVER	21, and 28 August	h
KING SALMON RIVER	20 and 27 July	h
CHILKAT RIVER		
Big Boulder Creek	3, 10, and 17 August	h
Stonehouse Creek	3, 10, and 17 August	h
KETA RIVER	21, and 28 August	h
UNUK RIVER		
Cripple Creek	5 and 10 August	f
Eulachon Creek	21 and 28 August	h & f
Genes Lake Creek	21 August	f
Clear Creek	7 and 14 August	h & f
Lake Creek	7 and 14 August	h & f
Kerr Creek	7 and 14 August	h
CHICKAMIN RIVER		
South Fork	7 and 14 August	h
Barrier Creek	7 and 14 August	h
Butler Creek	7 and 14 August	h
Indian Creek	7 and 14 August	h
Humpy Creek	21 and 28 August	h
King Creek	21 and 28 August	h
Leduc Creek	7 and 14 August	h
Clear Falls Creek	7 and 14 August	h

[a] Kissner (1982).