

YUKON RIVER SALMON ESCAPEMENT SURVEYS, 1990

By

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## INTRODUCTION

Annual documentation of spawning escapements is an essential element to responsible management of the Yukon River salmon resource. Such documentation provides for:

- determination of appropriate escapement levels or goals for selected spawning areas or management units.
- evaluation of escapement trends.
- evaluation of effectiveness of the management program, which in turn forms the basis for proposing regulatory changes and management strategies.
- evaluation of stock status for use in projecting subsequent returns.

The Yukon River drainage is too extensive (330,000 mi<sup>2</sup>) for complete comprehensive escapement coverage to all salmon spawning streams during any given season (Figure 1). Consequently, low-level aerial surveys from single-engine, fixed-wing aircraft form an integral component of the escapement enumeration program. Nevertheless, comprehensive enumeration studies such as intensified ground surveys, mark-and-recovery experiments, counting towers, weirs, and hydroacoustic projects are also conducted. Regardless of the method utilized, the overall objective of escapement enumeration in the Yukon Management Area is to determine abundance (or often indices of relative abundance), timing, and distribution of spawning salmon populations throughout the drainage. Specific objectives may vary by individual project.

There are both advantages and disadvantages related to each type of enumeration method. The more comprehensive studies tend to provide estimates of total salmon abundance and are often less dependent upon weather and water conditions. However, due to costs associated with manning and operating the more sophisticated enumeration projects, relatively few have been initiated over the years and have been restricted primarily to major spawning streams, e.g., the Anvik, Andreafsky, Sheenjek, Chandalar, Chena, Salcha, and Delta Rivers in Alaska and the Fishing Branch River and Whitehorse fishway in Canada. Only during the past decade (since 1985) has an attempt been made to estimate total salmon passage by species through the lower mainstem Yukon River. This project, located at rivermile 123 near Pilot Station, involves using hydroacoustic techniques to estimate the total number of fish passing upstream as well as a comprehensive test drift gillnet fishery to apportion sonar counts to species. A second study designed to estimate salmon abundance by species in the mainstem Yukon River has operated annually since 1982 (excluding 1984) near Dawson in Canada. That project involves a comprehensive mark-and-recovery study designed to estimate the abundance of chinook and chum salmon entering the Canadian portion of the mainstem river.

Perhaps the greatest advantage of aerial surveys, as they pertain to the Yukon River drainage, is the cost-effectiveness of obtaining escapement information throughout an extremely vast area, most of which is remote. Another advantage to aerial surveillance is that real or potential habitat-related problems arising from natural or man-induced causes can be readily identified. Among the disadvantages are that results may be highly variable if non-standardized procedures are used.

Variability in aerial survey accuracy is dependent upon a number of factors such as weather and water conditions (turbidity), timing of surveys with respect to peak spawning, aircraft type, survey altitude, experience of both pilot and observer, and species of salmon being enumerated. It is generally recognized that aerial estimates are lower than actual stream abundance due to these factors. Further, peak spawning abundance measured by aerial survey methods is significantly lower than total season abundance due to the die-off of early spawners and arrival of late fish. Also, aerial estimates in a given stream may demonstrate a wide range in the proportion of fish being enumerated from year to year. Peak aerial counts, however, can serve either as indices of relative abundance for examination of annual trends in escapement or estimation of total escapement from base year data and established expansion factors. Aerial survey results may also be useful in apportioning tributary spawning distribution to a mainstem total escapement estimate obtained from sonar, weir or tower counts.

Aerial escapement estimates are made of as many spawning streams as possible within the confines of fiscal, manpower, and weather constraints. However, selected (representative) spawning streams or "index areas" have been identified and receive highest priority. Index areas have been designated due to their importance as spawning areas and/or by their geographic location with respect to other unsurveyable salmon spawning streams in the general area.

Interim escapement objectives have been established for several Yukon River salmon spawning systems (Table 1). These objectives represent the approximate minimum number of desired spawners considered necessary to maintain the reproductive potential of each stock and are based upon historical performance, i.e., they are predicated upon some measure of historic averages. With exception of Anvik River chinook salmon, establishment of "optimum" escapement goals which are based upon analyses of maximum sustained yield (MSY) is not possible at this time due to the nature of the Yukon River mixed stock fisheries, lack of stock identification data, and consequential inability to reconstruct total in-river stock specific returns. Consequently, most interim escapement objectives are based upon aerial survey index estimates which do not represent total escapement but do reflect annual spawner abundance when using standard survey methods under acceptable survey conditions. This is particularly true for those objectives established for chinook and summer chum salmon. However, the interim objectives which have been established for selected fall chum salmon spawning stocks represent the desired minimum target for total spawning abundance; being based upon a somewhat more comprehensive escapement data base.

## METHODS

Among the comprehensive escapement enumeration studies conducted in 1990 to more completely estimate total abundance of spawners, hydroacoustic techniques were employed to monitor chum salmon escapements to the Anvik, South Fork Koyukuk, Chandalar, and Sheenjek Rivers.<sup>1</sup> While replicate ground surveys and stream life data were used to estimate abundance of chum salmon spawners in the Delta River, mark-and-recovery studies were conducted by the Sport Fish Division to generate population estimates for chinook salmon spawners in the Chena and Salcha Rivers. The Sport Fish Division also installed a weir in the Chatanika River in 1990. Although the main objective of the project was to monitor timing and strength of the upstream spring migration of whitefish species, passage of chinook and chum salmon was also monitored.

In addition to the site specific studies mentioned above, the Department also monitored salmon abundance by species in the mainstem Yukon River near Pilot Station by hydroacoustic methods for the sixth consecutive year. A similar, feasibility sonar project was initiated on the Tanana River in 1990 approximately 12 rivermiles downstream of Manley Hot Springs.

Projects conducted by the Canadian Department of Fisheries and Oceans (DFO) consisted of a mark-and-recovery project near Dawson to estimate the total number of chinook and chum salmon entering Yukon Territory as well as manning an enumeration window and passage gate at Whitehorse to monitor chinook salmon escapement upstream of Whitehorse.

Remaining escapement information throughout the Yukon River drainage in 1990 was obtained primarily by aerial surveillance and occasional ground surveys.

## RESULTS

In general, survey conditions were extremely poor in 1990 throughout much of the Alaskan portion of the drainage during the chinook and summer chum salmon survey season from mid July through August. This was particularly so in that portion of the drainage between the villages of Kaltag and Circle, including the lower Koyukuk and portions of the Tanana river drainages, where extremely dense smoke from numerous wildfires scattered throughout Interior Alaska severely restricted visibility during targeted survey dates.

By comparison, survey conditions for chinook and summer chum salmon were slightly improved in the lower (downstream from the village of Kaltag) Yukon River drainage, with the best conditions in 1990 prevailing in the Canadian portion of the drainage (Yukon Territory) where all chinook salmon aerial index streams were successfully surveyed.

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<sup>1</sup> The Koyukuk and Chandalar River projects were operated by USFWS.

Few difficulties with inclement weather or availability of survey aircraft were encountered in surveying most fall chum and coho salmon index areas.

Escapement estimates obtained in 1990 are shown in Table 2 while Figures 2 through 6 show selected major Yukon River tributary systems.

### *Chinook Salmon*

Tables 3 and 4 present historic chinook salmon escapement data for selected streams during the period 1961-1990. Interim chinook salmon escapement goals established by the Department for eight Alaskan streams are: East (1,600) and West Fork (1,000) Andreafsky, Anvik (500), North (500) and South Fork (500) Nulato, Gisasa (650), Chena (1,700), and Salcha (3,500) Rivers (see Table 1)<sup>2</sup>. The Salcha River objective was revised to 2,500 spawners prior to the 1990 fishing season. These escapement goals are based upon aerial survey index counts which do not represent total escapement.

Overall, chinook salmon spawning escapements throughout the entire Yukon River drainage were assessed as good; in most cases meeting established escapement objectives. The estimated sonar passage of chinook salmon at Pilot Station between June 5 and July 19 was the largest since the project was initiated (approximately 130,000). However, species apportionment was calculated differently in 1990 and additional analyses are being completed to allow comparison with other years.

Aerial surveys in the lower portion of the Yukon River drainage documented 2,503 chinook salmon in the East Fork and 1,545 in the West Fork Andreafsky River, and 1,595 in the Anvik River index area. Thus, escapement objectives were met in all of these rivers. Although the majority of aerial surveys flown of index streams throughout the middle Yukon River drainage were rated poor, observations still indicated good spawning escapements were realized. For example, a poor survey of the North and South Fork Nulato Rivers still resulted in counts of 568 and 430 chinook salmon, respectively. The interim goal for each of these rivers is 500 spawners. Similarly, a poor survey of the Gisasa River revealed at least 536 chinook salmon were present. The interim objective for that stream is 650. Chinook salmon escapements in the upper Koyukuk River drainage were also judged good as evidenced by the 369 observed in Henshaw Creek and 288 in the South Fork Koyukuk and Jim Rivers. A count of 185 chinook salmon on a poor survey of the Kateel River was the highest ever recorded in that stream. A fair survey of the Tozitna River resulted in a chinook salmon count of 149 fish.

The number of chinook salmon observed spawning in the Chena and Salcha Rivers is used to assess escapement to the Tanana River drainage. Whereas, only 1,402 chinook salmon were observed in the Chena River between Moose Creek Dam and

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<sup>2</sup> Although no escapement objectives have been established for individual Canadian streams, an interim escapement objective of 33,000-43,000 chinook salmon spawners for the mainstem upper Yukon River drainage (Yukon Territory) was established by the United States/Canada Yukon River Technical Committee (JTC) in March 1987.

Middle Fork Chena River (index area), observer conditions in the lower section of this area were rated as poor due to water turbidity problems. Although the count is approximately 300 fish shy of the objective (1,700), the Sport Fish Division estimated the total spawning population to be approximately 5,600 chinook salmon. In the Salcha River aerial index area (Transalaska Pipeline crossing upstream to Caribou Creek), 3,429 chinook salmon were observed under good survey conditions on July 27. The mark-and-recovery population estimate made for chinook salmon spawners in the Salcha River in 1990 by Sport Fish Division was approximately 10,700 fish. Although considered a "secondary" index stream, a survey of the Goodpaster River in 1990 documented 510 chinook salmon present, the highest on record for that stream.

The preliminary DFO mark-and-recovery population estimate of chinook salmon entering the Canadian portion of the mainstem Yukon in 1990 was approximately 57,500, the highest on record since tagging studies have been conducted (1982). Subtracting the preliminary estimated Canadian commercial and non-commercial harvest (18,800 excluding Old Crow) from this population estimate results in a total spawning escapement estimate to Yukon Territory (excluding the Porcupine River drainage) of approximately 38,700 chinook salmon; falling within the interim spawning escapement objective range of 33,000-43,000 fish.

Aerial surveillance of Yukon Territory chinook salmon spawning streams in 1990 was quite limited and primarily conducted by the Department due to severe budget reductions in DFO funding. However, all major chinook salmon aerial index areas were successfully surveyed and results were to compliment subsequent results of the DFO tagging study. The general finding was that spawning escapements were very good, often rivaling years of some of the highest escapements on record (particularly 1981). Chinook salmon escapement to the Big Salmon River rivaled that observed in 1981, the largest on record for that stream. Likewise, escapement to the Little Salmon River paralleled the observed 1981 level in that stream, being exceeded only in 1989.

Although chinook salmon escapement to the Teslin River drainage as typified by counts in the Nisutlin and Wolf Rivers was good, comparatively it was somewhat lower than that observed in the Big and Little Salmon Rivers. Escapements were very similar to that observed in 1989, the highest observed since 1984. However, the combined observations to these streams in 1990 represented roughly 44% of the 1981 record escapement levels.

Although data on chinook salmon escapement are limited for the Ross River, observations suggested a fairly good escapement was realized in 1990. A total of 300 spawners was documented on August 17 but under poor survey conditions. The highest escapement on record was recorded in 1981 (822 fish). However, 157 spawners were observed in the outlet of Lewis Lake in 1990, whereas only 105 were documented in 1981, further suggesting good chinook salmon escapements were realized to the Ross River drainage in 1990. By contrast, a survey of the Hoole River revealed "average numbers" of chinook spawners present that stream.

The number of chinook salmon which returned to the Whitehorse fishway in 1990 totaled 1,407, rivaling the largest return on record of 1,539 in 1981. However, at least 21% of the fish which returned were estimated as having been from previous hatchery releases. From the total chinook salmon returning to the

fishway in 1990, only 1,236 were passed upstream; the remainder being taken for hatchery brood stock.

### *Summer Chum Salmon*

Table 5 presents historic summer chum salmon escapement data for selected streams during the period 1973-1990. Interim escapement goals for six major summer chum spawning streams in the lower Yukon River drainage are: East (109,000) and West Fork (116,000) Andreafsky, Anvik (487,000), North Fork Nulato (53,000), and the Hogatza (17,000 - Clear Creek at 8,000 and Caribou Creek at 9,000) Rivers. An additional escapement objective of 3,500 summer chum salmon exists for the Salcha River in the Tanana River drainage. With exception of the Anvik River objective which is an "optimum" goal based upon spawner/return relationships, all other objectives are based upon aerial survey observations during periods of peak spawning. The corresponding aerial objective for the Anvik using this latter technique is 356,000 chum salmon between Goblet Creek and McDonald Creek.

Unfortunately, the very poor survey conditions encountered in 1990 severely limited aerial assessment of summer chum salmon spawning escapements. This was especially disappointing considering the run appeared below average in magnitude based upon inseason performance of commercial and test fisheries. However, the limited observations made regarding summer chum escapement tended to corroborate this. The Yukon River sonar project at Pilot Station estimated a passage of approximately 936,000 summer chum salmon from June 5 through July 19. Although this number was greater than the poor return experienced in 1987 (sonar passage 687,000), it was well below the sonar passage in years which exceeded 1.6 million fish (1985, 1986, 1988, and 1989). Further, the preliminary Anvik River sonar estimate of approximately 400,000 chum salmon through July 29 was nearly 18% below the optimum objective of 487,000 fish and the lowest observed since 1983.

The East Fork Andreafsky River tower project has not operated since 1988 due to budget constraints and aerial survey effort was hampered by inclement weather in 1990. The only observations available are from an aerial survey flown on July 21. Approximately 175,000 salmon were estimated present. However, the observer could not differentiate between chum and pink salmon. Similarly, approximately 93,000 salmon were estimated on a survey of the West Fork Andreafsky River with no species apportionment made. Thus, no reliable chum salmon escapement estimates are available for these important spawning areas.

Access to most major summer chum salmon spawning streams in the middle Yukon and lower Koyukuk River drainages were hindered during periods of peak spawning from inclement weather or severe smoke conditions from wildfires; most observations being made after peak spawning. These surveys indicated below average numbers of summer chum salmon.

The only summer chum salmon index stream successfully surveyed in the Tanana River drainage in 1990 was the Salcha River; a good survey on July 27 resulted in a count of only 450 chum salmon. Although the survey was flown about 3 days prior to the targeted survey dates for that stream, it is unlikely good escapement was realized.

### *Fall Chum Salmon*

Table 6 presents historic fall chum salmon escapement data for selected streams since the early 1970's. Total Yukon River fall chum salmon escapements are evaluated based upon escapement observations to four major spawning streams: Delta, Toklat, Sheenjek, and Fishing Branch Rivers. Interim escapement objectives for these four streams in 1990 were 11,000, 33,000, 62,000, and 50,000-120,000 fall chum salmon, respectively.<sup>3</sup> These interim objectives are of total abundance which were based upon expansion of inseason point estimates. Using the low number (50,000) in the objective range for the Fishing Branch River, the total 4-area index escapement objective is considered as 156,000 fall chum salmon. The entire Yukon River objective is taken as twice the 4-area index objective, or 312,000 fall chum salmon. This figure allows for inclusion of spawning populations in the upper mainstem Yukon River (Yukon Territory), Chandalar River, upper Tanana River, and other areas where spawning occurs but is not monitored.

The overall projected return of fall chum salmon to the Yukon River in 1990 was 784,000 fish; slightly below the 1974-1989 estimated average of approximately 811,000. Distribution and strength of various spawning stocks throughout the Yukon River drainage was anticipated to be quite variable, based upon an analysis of brood year escapements. For example, a poor return of fall chum salmon to the Tanana River drainage was expected while near to slightly above average returns were projected for the Sheenjek and upper mainstem Yukon Rivers. In brief, the 4-area escapement index in 1990 totaled approximately 135,385 fall chum salmon, falling approximately 24,200 fish short of the 4-area objective of 156,000.

Lower Yukon River inseason assessment of the 1990 fall chum salmon return was below average in strength and late in run timing. Only an approximate 68,000 fish were commercially harvested in the lower 3 fishing districts, being nearly 39% below the most recent 5-year average harvest in those districts (112,000). A preliminary sonar estimate of 485,083 fall chum salmon (90% C.I. = 451,569-518,597) passing Pilot Station was made for the period July 19 to September 4, the lowest since initiation of the project.

Similarly, the preliminary population estimate of fall chum salmon entering the Canadian portion of the upper Yukon River made by DFO was approximately 81,700 fish. Subtracting the preliminary estimated Canadian commercial and non-commercial harvest (31,800 excluding Old Crow) from this population estimate results in a total escapement estimate to Yukon Territory (excluding the Porcupine River drainage) of approximately 49,900 spawners. This estimate is

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<sup>3</sup> The interim fall chum salmon escapement objectives for Alaskan streams (Toklat, Delta, and Sheenjek) were established by the Department in 1983. The interim objective for the Fishing Branch River (Canadian stream) was established by the JTC in March 1987. Another fall chum salmon interim escapement objective established by the JTC in October 1987 was 90,000-135,000 spawners (border passage less harvest) for the mainstem Canadian Yukon River (Yukon Territory). However, in April 1990 chief negotiators for both the U.S. and Canada asked the JTC to examine all current data and develop proposals for re-establishing an escapement objective for this area.

nearly 18% below the most recent 5-year average of 60,700. An aerial estimate of spawners in the Kluane River was approximately 4,400, while 3,500 were estimated in the mainstem Yukon River spawning between Fort Selkirk and Tatchun Creek.

Fall chum salmon escapement to the Porcupine River system was evaluated by observations made in the Sheenjek and Fishing Branch Rivers. The preliminary sonar-estimated escapement to the Sheenjek River in 1990 was approximately 65,700 chum salmon. Although this is a minimal estimate, since fish were known present prior to sonar operations as well as being passed at a rate of nearly 1,000 per day upon project termination, the escapement objective (62,000) was achieved. By comparison, it is not believed that the Fishing Branch interim objective of 50,000 fish was reached in 1990 based upon limited observations. Due to budget constraints, DFO did not operate a weir on this river in 1990, but rather conducted a single aerial survey on October 26 to estimate of the number of spawners present. Although only 7,541 chum salmon were estimated present, a population estimate of approximately 27,000 chum salmon was made through the date of the survey, based upon an historic average aerial-to-weir expansion of 28%. Actual population of spawners in 1990 was reported by DFO to likely have been between 30,000-40,000 in view of the late timing of the survey with respect to spawning.

Comprehensive escapement enumeration of fall chum salmon in the Chandalar River was undertaken for the fifth consecutive year in 1990 by the USFWS. Although no interim escapement objective exists for this stream, the sonar-estimated escapement of 78,631 fish was the highest observed since hydroacoustic operations were initiated in 1986.

By comparison to the upper Yukon River region, test wheel results in the Tanana River indicated 1990 fall chum salmon run strength to be stronger than anticipated to that drainage; even exceeding performance of the test wheels in 1989 when a strong fall chum salmon run was realized. Once judged reasonably certain that escapement objectives and subsistence needs would be met in the Tanana River, additional fishing time was allowed in that district (District 6) which resulted in a record commercial harvest of approximately 50,000 fall chum salmon. Escapement success varied.

Escapement to the Toklat River in 1990 was estimated at approximately 33,700 fall chum salmon, the highest observed since 1979 and the first year the escapement objective (33,000) has been achieved during the past decade. By comparison, the Delta River escapement estimate of approximately 9,000 spawners fell 2,000 fish shy of the objective for that river. Although no escapement objectives exist for other fall chum salmon spawning areas in the upper Tanana River, observations to prominent spawning areas in the Big Delta region (e.g., Bluff Cabin and Clearwater Lake Outlet Sloughs) indicated less than expected numbers of spawners based upon inseason fishery performance.

Finally, the USFWS initiated a hydroacoustic enumeration project in 1990 on the South Fork Koyukuk River near the confluence of Fish Creek and estimated 20,081 chum salmon passing between July 25 and September 30. This represents the first major effort to thoroughly monitor fall chum escapement in this drainage.

Summation of the 1990 preliminary estimated fall chum salmon inriver commercial and subsistence harvests (340,552) together with estimated spawning escapement (270,770) reveals total run size to have been on the order of magnitude of 611,400 fish. The 1990 fall chum salmon pre-season projection was 784,000.

### *Coho Salmon*

Coho salmon escapement assessment is very limited in the Yukon River drainage due to funding limitations and survey conditions at that time of year. Most information on spawning escapements that has been collected is from the Tanana River drainage although coho salmon passage at Pilot Station in the mainstem Yukon River has been partially monitored since the mid-1980's. The preliminary sonar-estimated passage of coho salmon at Pilot Station through September 4, 1990 was 231,714.

Spawning escapements in the Tanana River drainage as reflected by observations made of selected index areas in the lower Nenana (Lost Slough) and upper Tanana Rivers (Delta Clearwater River and Clearwater Lake outlet stream) were judged to be at least average in magnitude (Table 7).

A previously undocumented coho salmon spawning area was identified in the mainstem Nenana River on October 10. An estimated 1,308 coho salmon spawners and numerous redds were observed in an approximate 8-mile stretch of the mainstem Nenana River, immediately upstream of the Teklanika River mouth. Water was extremely clear and the area appeared to be springfed. This spawning area was subsequently nominated for inclusion in the State's *Catalog of Waters Important for Spawning, Rearing, and Migration of Anadromous Fish*.

Table 1. Yukon River 1990 fishing season interim escapement objectives for selected salmon species and index streams.<sup>a</sup>

Stream	Species	Interim Escapement Objectives	Species	Interim Escapement Objectives	Species	Interim Escapement Objectives <sup>b</sup>
Andreafsky River						
East Fork	Chinook	1,600 <sup>c,r</sup>	Summer Chum	109,000 <sup>d,r</sup>	--	
West Fork	Chinook	1,000 <sup>c,r</sup>	Summer Chum	116,000 <sup>d,r</sup>	--	
Anvik River						
Mainstem						
Yellow River to McDonald Cr	Chinook	500 <sup>c,r</sup>	--		--	
Goblet Cr to McDonald Cr	--		Summer Chum	356,000 <sup>d,r</sup>	--	
Sonar b	--		Summer Chum	487,000 <sup>b,e</sup>	--	
Nulato River						
North Fork	Chinook	500 <sup>d</sup>	Summer Chum	53,000 <sup>d,r</sup>	--	
South Fork	Chinook	500 <sup>d</sup>	--		--	
Hogatza River						
Clear Creek	--		Summer Chum	8,000 <sup>d,r</sup>	--	
Caribou Creek	--		Summer Chum	9,000 <sup>d,r</sup>	--	
Gisasa River	Chinook	650 <sup>d</sup>	--		--	
Chena River						
Mainstem from Flood Control Dam to Middle Fork	Chinook	1,700 <sup>d,r</sup>	--		--	
Ylcha River	Chinook	2,500 <sup>j</sup>	Summer Chum	3,500 <sup>d</sup>	--	
Shaanjek River	--		--		Fall Chum	62,000 <sup>f</sup>
Fishing Branch River (YT) <sup>d</sup>	--		--		Fall Chum	50,000-120,000 <sup>g</sup>
Toklat River	--		--		Fall Chum	33,000 <sup>f</sup>
Delta River	--		--		Fall Chum	11,000 <sup>g</sup>
Upper Yukon River (Border E.O.)	Chinook	33,000-43,000 <sup>b,h</sup>	--		Fall Chum	-- <sup>i</sup>

<sup>a</sup>Index streams have been designated due to their importance as spawning areas and/or by their geographic location with respect to other unsurveyable salmon spawning streams in the general area. Interim escapement objectives represent the approximate number of desired spawners considered necessary to maintain the reproductive potential of each stock and are based upon historical performance, i.e., they are predicated upon some measure of historic averages. Unless otherwise indicated, escapement objectives are based upon aerial survey index estimates which do not represent total escapement but do reflect annual spawner abundance when using standard survey methods under acceptable survey conditions.

<sup>b</sup>Interim escapement objectives of total spawning abundance based upon sonar, weir, mark-and-recapture, or expansions from inseason point estimates.

<sup>c</sup>Interim escapement objectives developed by ADF&G in 1983; (r) indicates objectives were originally established in the form of a range. They first appear as a single objective in April 1987 (Table 1) and November 1988 (Table 8, footnote a) JTC reports.

<sup>d</sup>Interim escapement objectives developed by ADF&G in 1983; (r) indicates objectives were originally established in the form of a range. They first appear as a single objective in November 1988 JTC report (Table 9, footnote a).

<sup>e</sup>Optimum escapement objective calculated from escapement-return relationships.

<sup>f</sup>Interim escapement objectives developed by ADP&G in November 1987 (B.O.F.). These appear in November 1988 JTC report (Table 10, footnote a).

<sup>g</sup>Interim escapement objective developed by JTC in October 1987. (Page 42 October 6-8, 1987 JTC report).

<sup>h</sup>Interim spawning escapement objective developed by JTC in March 1987. (Page 6 and Table 1 of April 1987 JTC report).

<sup>i</sup>Interim spawning escapement objectives were originally developed by JTC in March 1978 in the form of a range (90,000-135,000) (Page 8 and Table 1 of April 1987 JTC report). However, in April 1990 chief negotiators for both the U.S. and Canada asked the JTC to examine all current data and develop proposals for interim objectives for this area.

Interim escapement objective established by ADP&G in March 1990; original objectives were developed in 1983 in the form of a range (1,500-3,500).

Table 2. Salmon spawning escapement estimates obtained by aerial surveys in the Yukon River drainage, 1990.<sup>a</sup>

Stream (drainage)	Date	Survey Rating	Chinook	Summer Chums	Fall Chums	Coho
<b>Andreafsky River</b>						
East Fork (Aerial)	7/21, 7/12	Fr, Pr	2,503	11,519 <sup>a</sup>	--	--
West Fork (Aerial)	7/12	Fr	1,545	20,426 <sup>a</sup>	--	--
	<b>Subtotal</b>		<b>4,048</b>	<b>31,945<sup>a</sup></b>	<b>--</b>	<b>--</b>
<b>Yukon River (Pilot Station)</b>						
Main River Sonar <sup>b, c</sup>	6/5-9/4		(129,880)	(935,884)	(485,083)	(231,714)
<b>Atchuelinguk River</b>						
	7/28	Gd	815	1,449	--	--
<b>Anvik River</b>						
<b>Aerial Counts</b>						
Mainstem River	7/20	Gd	2,087	--	--	--
Yellow Ri-McDonald Cr	7/20	Gd	(1,595)	--	--	--
Beaver Creek	7/20	Gd	180	--	--	--
Canyon Creek	7/20	Gd	6	--	--	--
Otter Creek	7/20	Gd	30	--	--	--
Swift River	7/20	Gd	29	--	--	--
McDonald Creek	7/20	Gd	15	--	--	--
Sonar Count <sup>d</sup>	6/21-7/29		--	400,000 <sup>a</sup>	--	--
	<b>Subtotal</b>		<b>2,947</b>	<b>400,000<sup>c</sup></b>	<b>--</b>	<b>--</b>
<b>Simon Creek</b>						
	7/25	Fly-over	--	279	--	--
<b>Blackburn Creek</b>						
	7/25	Fly-over	--	34	--	--
River	7/25	Pr	69	1,941	--	--
<b>Mulato River</b>						
South Fork	7/25	Pr	430	3,196	--	--
North Fork	7/25	Pr	568	1,419	--	--
	<b>Subtotal</b>		<b>998</b>	<b>4,615</b>	<b>--</b>	<b>--</b>
<b>Koyukuk River Drainage</b>						
Gisasa River	7/25	Pr	596	450	--	--
Kateel River	7/25	Pr	185	338	--	--
<b>Hogatza River</b>						
Clear Creek	7/26	Pr	--	1,006	--	--
Caribou Creek	7/26	Ex	--	1,171	--	--
	<b>Subtotal</b>		<b>--</b>	<b>2,177</b>	<b>--</b>	<b>--</b>
<b>Indian River</b>						
	7/26	Pr	--	781	--	--
<b>Henshaw Creek</b>						
	8/1	Gd-Pr	369	1,237	--	--
<b>South Fork Koyukuk River<sup>d, e</sup></b>						
South Fork Koyukuk River	7/25-9/30		--	--	20,081 <sup>c</sup>	--
South Fork Koyukuk River	8/1	Pr	142	--	--	--
Jim River	8/1	Pr	146	233	--	--
	<b>Subtotal</b>		<b>288</b>	<b>233</b>	<b>20,081</b>	<b>--</b>
<b>Total Koyukuk River</b>			<b>1,978</b>	<b>5,216</b>	<b>20,081</b>	<b>--</b>
<b>Melozi Hot Springs</b>						
	7/26	Pr	--	349	--	--
<b>Tazitna River</b>						
	7/26	Pr	149	36	--	--
<b>Total Lower Yukon River</b>			<b>9,804</b>	<b>445,864</b>	<b>20,081</b>	<b>--</b>

(Continued)

Page 2 continued.

Tanana River Drainage						
Kantishna River Drainage						
Takiat River						
Barton Creek	7/25	Fr	123	--	--	--
Floodplain via Rdbase <sup>f</sup>	10/15-21	Gd	--	--	17,081	216
Geiger Creek <sup>f</sup>	10/15-21	Gd	--	--	2,414	211
Sushana River <sup>f</sup>	10/15-21	Gd	--	--	7,052	95
Population Estimate <sup>g</sup>			--	--	(33,672)	--
Subtotal			123	--	26,547	522
Clear Creek	7/25	Fr	12	--	--	--
Bearpaw River	7/30	Gd	180	--	--	--
Nenana River Drainage						
Mainstem upstream Teklanika R	10/10	Gd	--	--	--	1,308
Teklanika River eastern spring adjacent to Comma Lake	10/10	Gd	--	--	--	210
Seventeen Mile Slough	7/25,30,10/25	Fr,Gd,Pr	77	200	--	15
Loat Slough	10/10	Gd	--	--	--	688
Subtotal			77	200	--	2,221
Chatanika River (aerial)	7/30	Fr-Pr	61	--	--	--
Weir <sup>i</sup>	7/8-11,20-28		(56)	262	--	--
Chena River (mainstem aerial)	7/27	Fr-Pr	1,436	100	--	--
MCD to Middle Fk (index aerial)	7/27	Fr-Pr	(1,402)	--	--	--
Population Estimate <sup>h,i</sup>			(5,603)	--	--	--
Subtotal			1,436	100	--	--
Uloha River (mainstem aerial)	7/27	Gd	3,744	450	--	--
IAPS to Caribou Cr (index aerial)	7/27	Gd	(3,429)	--	--	--
Population Estimate <sup>h,i</sup>			(10,728)	--	--	--
Subtotal			3,744	450	--	--
Total Lower Tanana River			5,633	1,012	26,547	2,743
Upper Tanana River Drainage						
Open water via upper Salchaket Sl	10/25	Gd	--	--	47	--
Open water via Flag Hill	10/25	Gd	--	--	92	--
Open water via of Little Delta R mo	10/25	Gd	--	--	472	--
Open water via Canyon Cr Camp	10/25	Gd	--	--	70	--
Open water via Delta Cr	10/25	Gd	--	--	20	--
Richardson Clearwater River	10/25	Gd	--	--	389	--
Tanana mainstem Shaw Cr to Timber	10/25,26	Gd	--	--	3,695	--
South Bank Tanana	10/25	Fr	--	--	475	--
Delta River						
Foot Survey (peak count)	11/19,11/2	Gd	--	--	5,373	10
Whitestone Cr	11/2	Gd	--	--	--	71
Population Estimate <sup>g</sup>			--	--	(8,992)	--
Goodpaster River	7/27	Fr	510	--	--	--
Bluff Cabin Slough						
Aerial	10/25	Gd	--	--	(670)	0
Foot Survey	11/2	Gd	--	--	1,632	--
Bluff Cabin Spring	10/25	Gd	--	--	100	105
Clearwater Lake Outlet Slough	10/25	Gd	--	--	176 <sup>k</sup>	5
Clearwater Lake and Outlet	10/25,10/26 <sup>l</sup>	Gd	--	--	104	2,375 <sup>i,j</sup>
Delta Clearwater River <sup>i,j</sup>	10/26	Gd	--	--	--	8,325
Onemile Slough	10/25	Fr	--	--	5	--
Total Upper Tanana River			510	0	12,650	10,891
Total Tanana River			6,143	1,012	39,197	13,634

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Adalar River (Aerial)	9/25	Gd	--	--	(11,890)	--
Sonar Estimate <sup>d,e</sup>	8/10-9/27		--	--	78,631 <sup>c</sup>	--
<b>Porcupine River Drainage</b>						
Sheenjek River (Aerial)	8/31	Fr-Incom.	--	--	(421)	--
Sonar Estimate <sup>d</sup>	8/24-9/25		--	--	65,721 <sup>o</sup>	--
Fishing Branch River (Aerial) <sup>o,k</sup>	10/26	Gd	--	--	7,541	--
<b>Total Porcupine River</b>			--	--	<b>73,262</b>	--
<b>Total Alaskan Portion of Drainage</b>			<b>15,947</b>	<b>446,876</b>	<b>203,630<sup>m</sup></b>	<b>13,634</b>
<b>Yukon Territory Streams</b>						
Fortymila River	8/8 <sup>j,w</sup>		20	--	--	--
<b>White River</b>						
Donjek River						
Kluane River <sup>k</sup>	10/19	Fr-Fr	--	--	4,393	--
Tincup Creek	8/18	Fr	83	--	--	--
Koidern River <sup>k</sup>	10/19	Gd	--	--	1	--
<b>Subtotal</b>			<b>83</b>	<b>--</b>	<b>4,394</b>	<b>--</b>
<b>Pelly River</b>						
Ross River	8/17	Fr	300	--	--	--
Lewis Lake Outlet	8/17	Fr	157	--	--	--
Hoolie River	8/17	Gd	57	--	--	--
<b>Subtotal</b>			<b>514</b>	<b>--</b>	<b>--</b>	<b>--</b>
<b>Tatchum Creek<sup>f,k</sup></b>						
Little Salmon River	8/17	Gd	643	--	--	--
Little Salmon River	8/16	Fr	665	--	--	--
<b>Big Salmon River</b>						
Big Salmon Lake to Sourvy Cr	8/15	Gd	568	--	--	--
Sourvy Cr to Moose Cr	8/15	Gd	494	--	--	--
Moose Cr to DFO weir	8/15	Gd	516	--	--	--
DFO weir to Bat Cr	8/15	Gd	58	--	--	--
Bat Cr to Souch Cr	8/15	Gd	170	--	--	--
Souch Cr to South Big Salmon	8/15	Flyover	441	--	--	--
South to North Big Salmon	8/15	Gd	194	--	--	--
North Big Salmon mouth to Northern Lk outlet	8/15	Flyover	95	--	--	--
Northern Lk Outlet	8/15	Flyover	50	--	--	--
<b>Subtotal</b>			<b>2,586</b>	<b>--</b>	<b>--</b>	<b>--</b>
<b>Teslin River Drainage</b>						
Mainstem Teslin River <sup>k</sup>	11/1	Gd	--	--	720	--
Nisutlin River	8/15-17	Gd-Fr	1,017	--	--	--
Wolf River	8/16	Fr	380	--	--	--
<b>Subtotal</b>			<b>1,397</b>	<b>--</b>	<b>720</b>	<b>--</b>
<b>Whitehorse Fishway Counts<sup>k</sup></b>						
	7/25-8/30		1,407 <sup>n</sup>	--	--	--
<b>Mainstem Yukon River</b>						
Tatchum Creek to Ft. Selkirk <sup>k</sup>	10/18	Fr	--	--	3,547	--
Population Estimate <sup>b,k</sup>			(57,502) <sup>c,p</sup>	--	(81,656) <sup>o,p</sup>	--
<b>Subtotal</b>			<b>--</b>	<b>--</b>	<b>3,547</b>	<b>--</b>
<b>Total Yukon Territory (observed)</b>			<b>7,315</b>	<b>--</b>	<b>16,202<sup>m</sup></b>	<b>--</b>
<b>Total Yukon Territory (estimated)<sup>q</sup></b>			<b>(98,678)<sup>r</sup></b>	<b>--</b>	<b>(49,849)<sup>r</sup></b>	<b>--</b>
<b>Yukon River Drainage Totals</b>			<b>23,262</b>	<b>446,876</b>	<b>219,832</b>	<b>13,634</b>

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<sup>a</sup>Only peak estimates listed; carcass counts included. Data in parentheses not included in totals or subtotals.

<sup>b</sup>Bio-sonar estimate.

<sup>c</sup>Preliminary.

<sup>d</sup>Bendix side scan sonar estimate.

<sup>e</sup>U.S. Fish and Wildlife Service estimate.

<sup>f</sup>Foot Survey.

<sup>g</sup>Population estimate based upon replicate foot surveys and streamlife data.

<sup>h</sup>Population estimate based upon mark and recapture study.

<sup>i</sup>Sport Fish Division estimate.

<sup>j</sup>Boat survey.

<sup>k</sup>Canadian Department of Fisheries and Oceans (DFO) estimate.

<sup>m</sup>Total for Alaskan portion of drainage does not include Fishing Branch River. Total for Yukon Territory includes Fishing Branch River.

<sup>n</sup>Only 1,236 of the chinook salmon which returned to the Fishway were passed; 95 females and 76 males were taken for hatchery brood stock; 71 of these females were artificially spawned (average fecundity was 5,792 eggs). The number of clipped chinook salmon which returned to the fishway totaled 292.

<sup>p</sup>Canadian estimates for Yukon Territory streams excluding the Fishing Branch River. Commercial and subsistence catches have not been removed from these estimates. These are "border" escapement estimates.

<sup>q</sup>Estimated spawning escapement from DFO tagging study (border population estimate minus harvest).

<sup>u</sup>This is an aerial estimate of "salmon" present. The count includes both pink and chum salmon; no estimate of species composition was made by the observer.

<sup>w</sup>Habitat Division observations.

Table 3. Chinook salmon escapement counts for selected U.S. spawning stocks in the Yukon River drainage, 1961-1990.<sup>a</sup>

Year	Andreafsky River		Anvik River <sup>b</sup>		Nulato River	Gisasa River	Chena River		Salcha River	
	East Fork	West Fork	Aerial	Tower			River	Index	River	Index
1961	1,003	-	1,226	-	543 <sup>c</sup>	266 <sup>c</sup>	-	-	2,878	-
1962	675 <sup>c</sup>	762 <sup>c</sup>	-	-	-	-	61 <sup>a,d</sup>	-	937	-
1963	-	-	-	-	-	-	137 <sup>c</sup>	-	-	-
1964	867	705	-	-	-	-	-	-	450	-
1965	-	344 <sup>c</sup>	650 <sup>c</sup>	-	-	-	-	-	408	-
1966	361	303	638	-	-	-	-	-	800	-
1967	-	276 <sup>c</sup>	336 <sup>d</sup>	-	-	-	-	-	-	-
1968	380	383	310 <sup>c</sup>	-	-	-	-	-	739	-
1969	274 <sup>c</sup>	231 <sup>d</sup>	296 <sup>c</sup>	-	-	-	-	-	461 <sup>c</sup>	-
1970	665	574 <sup>c</sup>	368	-	-	-	6 <sup>c</sup>	-	1,882	-
1971	1,904	1,682	-	-	-	-	193 <sup>a,d</sup>	-	158 <sup>c</sup>	-
1972	798	582 <sup>c</sup>	-	1,198	-	-	138 <sup>a,d</sup>	-	1,193	1,034
1973	825	788	-	613	-	-	21 <sup>c</sup>	-	391	-
1974	-	285	-	471 <sup>d</sup>	78 <sup>c</sup>	161	1,016 <sup>d</sup>	959	1,857	1,620
1975	993	301	-	730	204	385	316 <sup>d</sup>	262 <sup>d</sup>	1,055	-
1976	818	643	-	1,153	648	332	531	496	1,641	1,473
1977	2,008	1,499	-	1,371	487 <sup>c</sup>	255	563	-	1,202	1,052
1978	2,487	1,062	-	1,324	920	45 <sup>c</sup>	1,726	-	3,499	3,258
1979	1,180	1,134	-	1,484	1,507	484	1,159 <sup>c</sup>	-	4,789	-
1980	958 <sup>c</sup>	1,500	1,192	-	1,323 <sup>d</sup>	951	2,541	-	6,757	6,126
1981	2,146 <sup>c</sup>	231 <sup>d</sup>	577 <sup>d</sup>	-	791 <sup>c</sup>	-	600 <sup>c</sup>	-	1,237 <sup>c</sup>	1,121 <sup>c</sup>
1982	1,274	851	-	-	-	421	2,073	-	2,334	2,346
1983	-	-	376 <sup>d</sup>	-	1,006	572	2,553	2,336	1,961	1,803
1984	1,573 <sup>c</sup>	1,993	574 <sup>d</sup>	-	-	-	501	494	1,031	906
1985	1,617	2,248	720	-	2,780	795	2,553	2,262	2,035	1,860
1986	1,954	3,158	918	-	2,974	1,346	2,031	1,935	3,368	-
1987	1,608	3,281	879	-	1,638	731	1,312	1,209 <sup>c</sup>	1,898	1,671
1988	1,020	1,448	1,449	-	1,775	797	1,966	1,760	2,761	2,553
1989	1,399	1,089	212 <sup>c</sup>	-	-	-	1,280	1,185	2,333	2,136
1990	2,303	1,545	1,595	-	998	884 <sup>c</sup>	1,436	1,402 <sup>c</sup>	3,744	3,429
E.O. <sup>e</sup>	1,600	1,000	500 <sup>f</sup>	-	1,000	650	-	1,700 <sup>g</sup>	-	2,500 <sup>h</sup>

<sup>a</sup> Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.

<sup>b</sup> From 1961-1970, aerial survey count data are from various segments of the mainstem Anvik River. From 1971-1979, mainstem aerial survey counts below the tower were added to tower counts. From 1980-present, aerial survey counts are from the mainstem Anvik River between the Yellow River and McDonald Creek.

<sup>c</sup> Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.

<sup>d</sup> Boat Survey.

<sup>e</sup> Interim escapement objective.

<sup>f</sup> Interim escapement objective for the mainstem Anvik River between the Yellow River and McDonald Creek.

<sup>g</sup> Interim escapement objective for the mainstem Chena River between Moose Creek Dam and the Middle Fork River.

<sup>h</sup> Interim escapement objective for the mainstem Salcha River between TAPS crossing and Caribou Creek.

Table 4. Chinook salmon escapement counts for selected Canadian spawning stocks in the Yukon River drainage, 1961-1990.<sup>a</sup>

Year	Tincup Creek	Tatchun River <sup>b</sup>	Little Salmon River	Big Salmon River <sup>d</sup>	Nisutlin River <sup>e</sup>	Wolf River <sup>f</sup>	Whitehorse Fishway <sup>g</sup>	Mainstem Tagging Estimate <sup>h</sup>
1961	-	-	-	-	-	-	1,068	-
1962	-	-	-	-	-	-	1,500	-
1963	-	-	-	-	-	-	483	-
1964	-	-	-	-	-	-	595	-
1965	-	-	-	-	-	-	903	-
1966	-	7 <sup>c</sup>	-	-	-	-	563	-
1967	-	-	-	-	-	-	533	-
1968	-	-	173 <sup>c</sup>	857 <sup>d</sup>	407 <sup>d</sup>	-	414	-
1969	-	-	120	286	105	-	334	-
1970	-	100	-	670	615	71 <sup>c</sup>	625	-
1971	-	130	275	275	650	750	856	-
1972	-	80	126	415	237	13	391	-
1973	100	99	27 <sup>c</sup>	75 <sup>c</sup>	56 <sup>d</sup>	-	224	-
1974	-	192	-	70 <sup>c</sup>	48 <sup>c</sup>	-	273	-
1975	-	175	-	153 <sup>d</sup>	249	40 <sup>c</sup>	313	-
1976	-	52	-	86 <sup>c</sup>	102	-	121	-
1977	-	150	408	316 <sup>d</sup>	77	-	277	-
1978	-	200	330	324	375	-	725	-
1979	-	150	489 <sup>c</sup>	632	713	183 <sup>c</sup>	1,184	-
1980	-	222	286 <sup>c</sup>	1,436	975	377	1,383	-
1981	-	133	670	2,411	1,626	395	1,555	-
1982	-	73	403	758	578	104	473	19,790
1983	100	264	101 <sup>d</sup>	540	701	95	905	28,989
1984	150	161	434	1,044	832	124	1,042	27,616 <sup>i</sup>
1985	210	190	255	801	409	110	508	10,730
1986	228	155	54 <sup>c</sup>	745	459 <sup>c</sup>	109	557	16,415
1987	100	159	468	891	183	35	327	13,210
1988	204	130	368	765	267	66	405	23,118
1989	88	100	862	1,662	695	146	549	25,201
1990	83	643	665	1,806	652	188	1,407	38,678 <sup>j</sup>
E.O. <sup>k</sup>	-	-	-	-	-	-	-	33,000-43,000

a Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.

b All foot surveys except 1978 (boat survey) and 1986 (aerial survey).

c Incomplete and/or poor survey conditions resulting in minimal or inaccurate counts.

d For 1968, 1970, and 1971 counts are from mainstem Big Salmon River. For all other years counts are from the mainstem Big Salmon River between Big Salmon Lake and the vicinity of Souch Creek.

e One Hundred Mile Creek to Sidney Creek.

f Wolf Lake to Red River.

g Includes 50, 90, and 292 fin-clipped hatchery-origin salmon in 1988, 1989, and 1990, respectively.

h Estimated total spawning escapement excluding Forcupine River (estimated border escapement minus the Canadian catch).

i Estimate derived by dividing the 1984 5-area (Whitehorse Fishway, Big Salmon, Nisutlin, Wolf, Tatchun) by the average proportion of the 5-area index count to the estimated spawning escapements from the DFO tagging study for years 1982, 1983, and 1985-1989.

j Preliminary

k Interim escapement objective.

Table 5. Summer chum salmon escapement counts for selected spawning areas in the Yukon River drainage, 1973-1990.<sup>a</sup>

Year	Andreafsky River			Anvik River		Nulato River	Gisasa River	Hogatza River	Chena River	Salcha River
	East Fork	West Fork	Anvik River							
	Aerial	Sonar or Tower	Tower & Aerial	Sonar						
1973	10,149 <sup>b</sup>	-	51,835	89,665 <sup>b</sup>	-	-	-	-	-	-
1974	3,215 <sup>b</sup>	-	33,578	201,277	-	51,160	-	-	-	3,510
1975	223,485	-	235,954	845,485	-	138,495	-	22,355	-	7,573
1976	105,347	-	118,420	406,166	-	40,001 <sup>b</sup>	-	20,744	-	6,474
1977	112,722	-	63,120	262,854	-	69,660	-	10,734	-	677 <sup>b</sup>
1978	127,050	-	57,321	251,339	-	54,480	9,280 <sup>b</sup>	5,102	1,609	5,405
1979	66,471	-	43,391	-	280,597	37,104	10,962	14,221	1,025 <sup>b</sup>	3,060
1980	36,823 <sup>b</sup>	-	115,457	-	492,676	14,946 <sup>b</sup>	10,388	19,786	338	4,140
1981	81,555	147,312 <sup>c</sup>	-	-	1,479,582	14,348 <sup>b</sup>	-	-	3,500	8,500
1982	7,501 <sup>b</sup>	181,352 <sup>c</sup>	7,267 <sup>b</sup>	-	444,581	-	334 <sup>b</sup>	4,984 <sup>b</sup>	1,509	3,756
1983	-	110,608 <sup>c</sup>	-	-	362,912	21,012 <sup>b</sup>	2,356 <sup>b</sup>	28,141	1,097	716 <sup>b</sup>
1984	95,200 <sup>b</sup>	70,125 <sup>d</sup>	238,565	-	891,028	-	-	-	1,861	9,810
1985	66,146	-	52,750	-	1,080,243	29,838	13,232	22,566	1,005	3,178
1986	83,931	167,614 <sup>d</sup>	99,373	-	1,189,602	64,265	12,114	-	1,509	8,028
1987	6,687 <sup>b</sup>	45,221 <sup>d</sup>	35,333	-	455,876	11,257	2,123	5,669 <sup>b</sup>	333	3,657
1988	43,056	68,937 <sup>d</sup>	45,432	-	1,125,449	42,083	9,284	6,890	432	2,889 <sup>b</sup>
1989	21,460 <sup>b</sup>	-	-	-	636,906	-	-	-	714 <sup>b</sup>	1,574 <sup>b</sup>
1990	11,519 <sup>b</sup>	-	20,428 <sup>b</sup>	-	400,000 <sup>e</sup>	4,615 <sup>b</sup>	450 <sup>b</sup>	2,177 <sup>b</sup>	-	450
E.O. <sup>f</sup>	109,000	-	116,000	-	487,000 <sup>g</sup>	-	-	17,000 <sup>h</sup>	-	3,500

<sup>a</sup>Data obtained by aerial survey unless otherwise noted. Only peak counts are listed.

<sup>b</sup>Incomplete survey and/or poor survey timing or conditions resulted in minimal or inaccurate count.

<sup>c</sup>Sonar count.

<sup>d</sup>Tower count.

<sup>e</sup>Preliminary

<sup>f</sup>Interim escapement objective.

<sup>g</sup>Optimum escapement objective calculated from escapement-return relationships.

<sup>h</sup>Interim escapement objective includes Clear Creek (8,000) and Caribou Creek (9,000).

Table 6. Fall chin salmon escapement counts for selected spawning areas in the Yukon River drainage, 1974-1990.

Year	Delta River <sup>a</sup>	Toklat River <sup>b</sup>	Chandalar River <sup>c</sup>	Sheenjek River <sup>d</sup>	Fishing Branch River <sup>e</sup>	Canada Mainstem Tagging Estimate <sup>f</sup>
1974	5,915	43,484	-	89,966	32,525 <sup>g</sup>	-
1975	3,734 <sup>h</sup>	90,984	-	173,371	353,282 <sup>g</sup>	-
1976	6,312 <sup>h</sup>	53,882	-	26,354	36,584	-
1977	16,876 <sup>h</sup>	36,462	-	45,544	88,400	-
1978	11,136	37,057	-	32,449	40,800	-
1979	8,355	179,627	-	91,372	119,898	-
1980	5,137	26,373	-	28,933	55,268	-
1981	23,508	15,775	-	74,560 <sup>c</sup>	37,386 <sup>l</sup>	-
1982	4,235	3,601	-	31,421 <sup>c</sup>	15,901	21,958
1983	7,705	20,807	-	49,392 <sup>c</sup>	27,200	90,875
1984	12,411	16,511	-	27,130 <sup>c</sup>	15,150	56,633 <sup>j</sup>
1985	17,276 <sup>h</sup>	22,805	-	152,768 <sup>c</sup>	56,100 <sup>g</sup>	62,010
1986	6,703 <sup>h</sup>	18,903	39,313	83,197 <sup>c</sup>	31,173 <sup>g</sup>	87,990
1987	21,180	22,141	32,416	140,086 <sup>c</sup>	48,956 <sup>g</sup>	80,776
1988	18,024	13,324	33,619	41,078 <sup>c</sup>	23,597 <sup>g</sup>	36,786
1989	21,342 <sup>h</sup>	30,447	69,161	101,748 <sup>c,p</sup>	43,834 <sup>g</sup>	35,750
1990 <sup>k</sup>	8,992 <sup>h</sup>	33,672	78,631	65,721 <sup>c</sup>	27,000 <sup>m</sup>	49,849
E.O. <sup>n</sup>	11,000	33,000	-	62,000	50,000-120,000	-

<sup>a</sup>Total escapement estimates made from migratory time density curve (see Barton 1986), unless otherwise indicated.

<sup>b</sup>Total escapement estimates using Delta River migratory time density curve and percentage of live salmon present by survey date in the upper Toklat River area.

<sup>c</sup>Sonar estimate.

<sup>d</sup>Total escapement estimates using sonar to aerial survey expansion factor of 2.221, unless otherwise indicated.

<sup>e</sup>Total escapement estimates using weir to aerial survey expansion factor of 2.72, unless otherwise indicated.

<sup>f</sup>Estimated total spawning estimates excluding Porcupine-Fishing Branch Rivers (estimated border escapement minus Canadian removal).

<sup>g</sup>Weir estimate.

<sup>h</sup>Population estimate from replicate foot surveys and stream life data.

<sup>i</sup>Initial aerial survey count was doubled before applying the weir/aerial expansion factor of 2.72 since only half of the spawning area was surveyed.

<sup>j</sup>Escapement estimate based on mark-recapture program unavailable. Estimate based on assumed average exploitation rate.

<sup>k</sup>Preliminary

<sup>m</sup>Weir was not operated. Total escapement estimate using weir to aerial survey expansion factor of 3.57. Survey was conducted approximately 2 weeks late. Therefore, a more reasonable escapement estimate would be between 30,000 and 40,000 salmon.

<sup>n</sup>Interim escapement objective.

<sup>p</sup>Includes an estimated 20,000 fish already in the river prior to sonar operations. Sonar count was 81,748 fish.

Table 7. Coho salmon escapement counts for selected spawning areas in the Yukon River drainage, 1972-1990.<sup>a</sup>

Year	Hemana River Drainage				Delta Clearwater River <sup>c,d</sup>	Clearwater Lake and Outlet	Richardson Clearwater River
	Lost Slough	Clear Creek	Wood Creek <sup>b</sup>	17 Mile Slough			
1972	-	-	-	-	632	417	454 <sup>e</sup>
1973	-	-	-	-	3,322	551 <sup>c</sup>	375 <sup>c</sup>
1974	1,388	-	-	27	3,954	560	652 <sup>c</sup>
1975	943	-	-	956	5,100	1,575 <sup>a,d</sup>	4 <sup>e</sup>
1976	118	13	-	281	1,920	1,500 <sup>c,d</sup>	80 <sup>e</sup>
1977	524	-	310 <sup>f</sup>	1,167	4,793	730 <sup>c,d</sup>	327
1978	350	-	300 <sup>f</sup>	466	4,798	570 <sup>c,d</sup>	-
1979	227	-	-	1,987	8,970	1,015 <sup>a,d</sup>	372
1980	499	-	1,603 <sup>f</sup>	592	3,946	1,545 <sup>c,d</sup>	611
1981	274	-	849 <sup>g</sup>	1,005	8,563 <sup>b</sup>	459 <sup>e</sup>	550
1982	-	-	1,436 <sup>g</sup>	-	8,365 <sup>b</sup>	-	-
1983	766	-	1,044 <sup>g</sup>	103	8,019 <sup>b</sup>	253	88
1984	2,677	2,600 <sup>b,d</sup>	8,805 <sup>g</sup>	-	11,061	1,368	428
1985	1,584	-	3,775 <sup>g</sup>	2,081	5,358	750	-
1986	794	605 <sup>b,d</sup>	1,664 <sup>g</sup>	218 <sup>b,d</sup>	10,857	3,577	146 <sup>e</sup>
1987	2,511	-	2,450 <sup>g</sup>	3,802	22,300	4,225 <sup>c,d</sup>	-
1988	348	-	2,046 <sup>g</sup>	-	21,600	825 <sup>c,d</sup>	-
1989	-	-	412 <sup>g</sup>	824 <sup>a</sup>	11,000	1,600 <sup>c,d</sup>	483
1990 <sup>i</sup>	688	-	-	15 <sup>a</sup>	8,325	2,375 <sup>c,d</sup>	-

<sup>a</sup>Only peak counts presented. Survey rating is fair to good, unless otherwise noted.

<sup>b</sup>Surveyed by F.R.E.D.

<sup>c</sup>Surveyed by Sport Fish Division.

<sup>d</sup>Boat survey.

<sup>e</sup>Poor survey.

<sup>f</sup>Foot survey.

<sup>g</sup>Weir count.

<sup>h</sup>Population estimate.

<sup>i</sup>Preliminary.

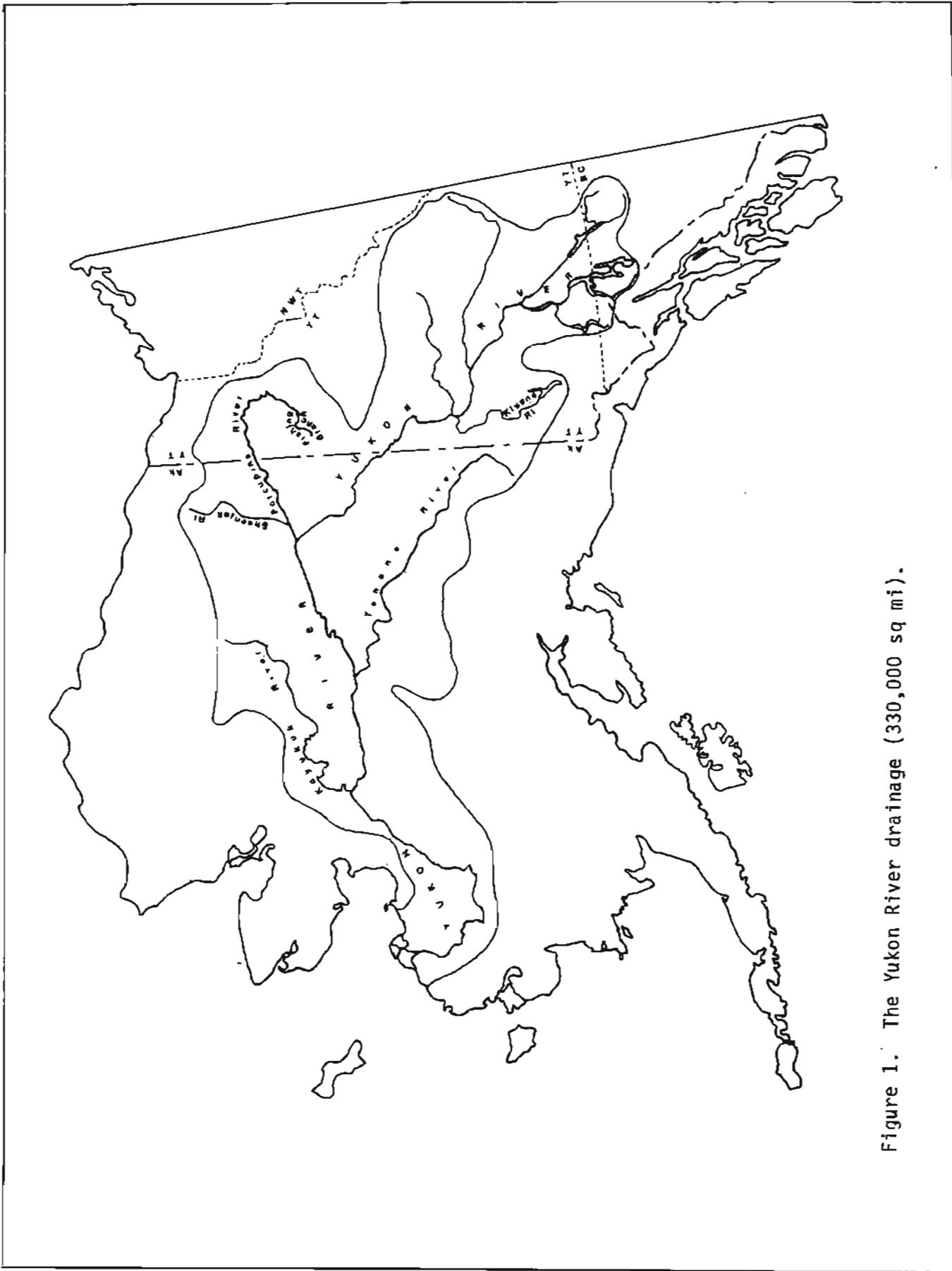


Figure 1. The Yukon River drainage (330,000 sq mi).







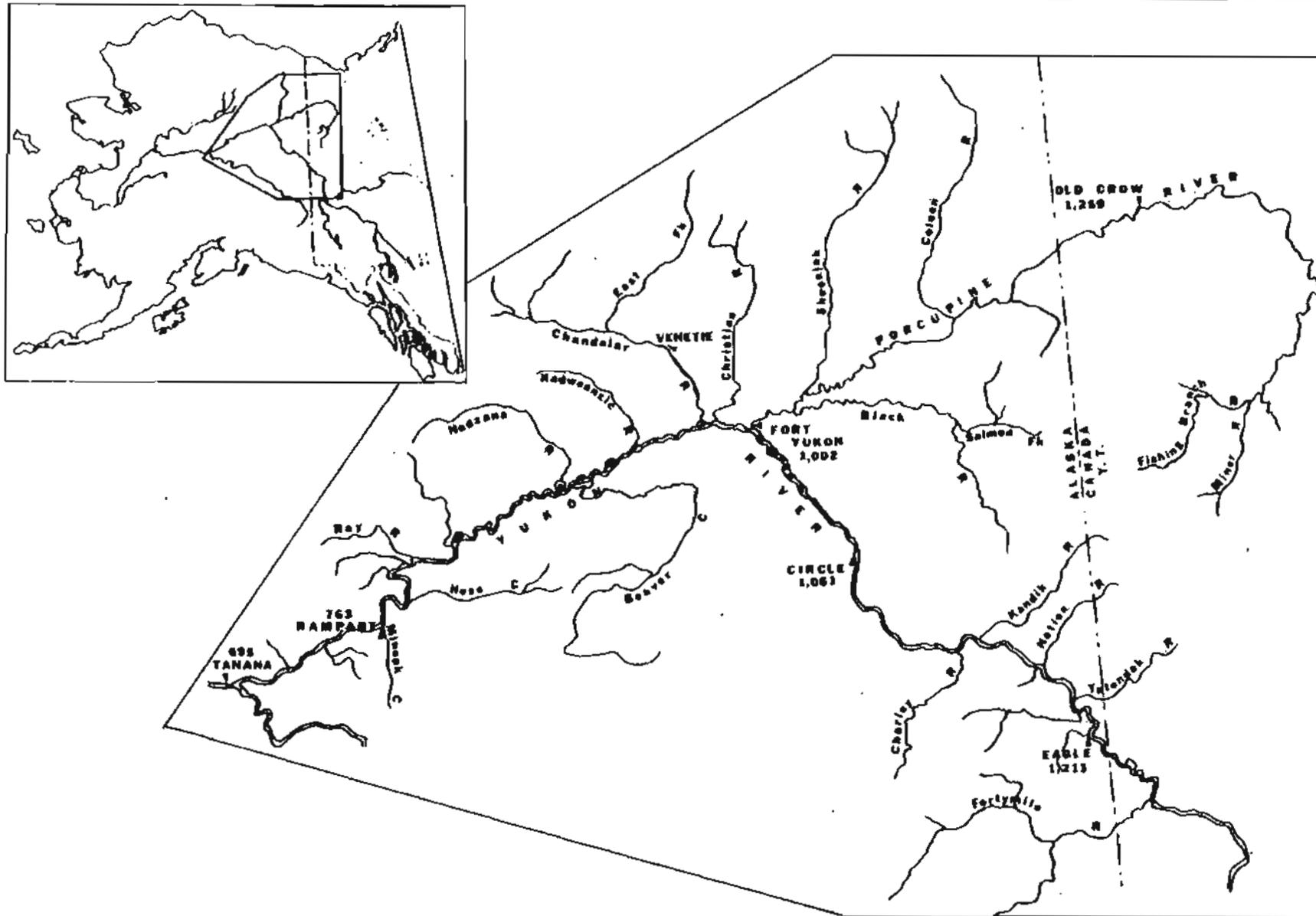


Figure 5. The middle Yukon River and Porcupine River drainage.

