

NULATO RIVER SALMON ESCAPEMENT PROJECT, 1998



By

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and

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ABSTRACT

Summer chum salmon migrating into the Nulato River were counted using counting towers to estimate the spawning abundance in 1998. Before 1994, salmon escapements to the Nulato River were previously indexed only by aerial surveys. Beginning in 1994, a cooperative tower counting project was formed by the Tanana Chiefs Council, Nulato Tribal Council and the Alaska Department of Fish and Game. The Nulato Tribal Council and Alaska Department of Fish and Game estimated the daily passage of summer chum salmon *Oncorhynchus keta* and chinook salmon *O. tshawytscha* using visual observations from towers during the period June 22 to July 26, 1998. Counting was interrupted at 1200 on June 22 until 2400 on June 23, and from 0200 on July 2 to 1600 on July 6 because high and turbid water caused poor counting conditions. Missed counting periods were interpolated for chum salmon but not enough data was collected to interpolate missed periods for chinook salmon. High water conditions caused an interruption in tower counting at 2100 on July 23. Counts were interpolated for the remainder of July 23 for both chinook and summer chum salmon but not for the missed days July 24-26. Total estimated escapements into the Nulato River were 1,504 chinook salmon and 52,041 summer chum salmon. Observations of commercial harvests, aerial survey data, and other escapement projects indicate that chinook salmon runs to the Yukon River were well below average. However, conservative management steps were taken and escapement goals were generally achieved in the Alaska portion of the drainage but border passage estimates indicate escapements into Canadian spawning tributaries were not achieved. Overall, summer chum salmon escapements into Yukon River spawning grounds were below average.

INTRODUCTION

The goal of the Nulato River Tower project is to provide area managers an inseason escapement index for the upper portion of the Yukon River District 4 management area. This project also assesses the age and sex composition of the summer chum salmon escapement into the Nulato River.

Historical aerial survey indices indicate summer chum salmon returning to the Nulato River (river kilometer [rkm] 777) may be the largest producer of summer chum salmon above the Anvik River (rkm 512) (Sandone 1995). Spawning chinook salmon also utilize the Nulato River. Some pink and coho salmon have been reported to spawn in the Nulato River but do not spawn in significant numbers. Management of subsistence and commercially targeted salmon species requires reliable run strength and run timing information from harvests and escapement information as salmon migrate through Yukon River districts. Ground-based escapement projects throughout the Yukon River drainage are typically operated on tributaries that are easily accessible or are considered to be an important spawning tributary. These escapement projects provide researchers and managers quality escapement information and age, sex and size information that can be used for management of Yukon River salmon resources.

Nulato River escapements were previously indexed using aerial survey methodology. Aerial survey methods are inexpensive compared to ground-based projects but sacrifice quality information. Aerial survey indices are susceptible to a host of factors, which influence the quality of the data, therefore do not provide accurate escapement estimates of chinook or summer chum migrating into the Nulato River. There is a lack of quality historical escapement information for Nulato River chinook and summer chum salmon. Without this information, it is difficult to determine if escapement objectives are being met in this portion of the Yukon River. Likewise, without a historical database, the escapement objectives are difficult to determine. Pilot Station Sonar, test fishing indices, age and sex composition information and commercial and subsistence harvests provide run strength and run timing information of salmon migrating up the Yukon River mainstem. However, these assessment projects and their indices do not provide quality escapement information for specific tributaries being used to index salmon runs in various districts of the Yukon River.

The Yukon River drainage supports major stocks of chinook salmon *Oncorhynchus tshawytscha*, summer and fall run chum salmon *O. keta*, and coho salmon *O. kisutch*. These species contribute to commercial and subsistence fisheries throughout the Yukon River drainage. Pink salmon *O. gorbuscha* and Sockeye salmon *O. nerka* are also indigenous to the Yukon River. Pink salmon return to lower drainage tributaries and typically have stronger runs in even numbered years. Sockeye salmon are documented less frequently. Neither of the two later species are harvested commercially or targeted for subsistence use to any extent. Summer chum salmon are distinguished from fall chum salmon by their earlier entry timing (early June to mid-July) into the Yukon River. Summer chum salmon are smaller in size with spawning distributions into lower and middle Yukon River drainages. Fall chum salmon enter the Yukon River from mid-July to the first of September, are larger, and spawn primarily in middle to upper portions of the Yukon River drainage.

Before 1994, there were relatively few projects that provided spawning escapement information for the various Yukon River salmon stocks. Lower river test fishing catch rates, inseason passage estimates from Pilot Station Sonar (rkm 198) and the Anvik River sonar project provided most of the available information used to make management decisions concerning commercial and subsistence harvests of summer chum salmon in District 4 (Figure 1).

Salmon returning to the Nulato River are most likely harvested in commercial and subsistence fisheries in coastal areas near the Yukon River delta and throughout the mainstem Yukon River. These areas include the Coastal District, Districts 1, 2, and 3 and most of District 4 (Figure 1). There was not an inseason salmon escapement, monitoring project within the upper portion of District 4 to serve as an index for run size and quality (sex composition) of spawning escapements in that portion of the river prior to the Nulato River Tower project. Federal agencies and private organizations have increased their involvement and participation by developing and implementing additional spawning escapement and assessment projects. These projects provide managers inseason information necessary to manage for escapements. Operation of an inseason escapement, monitoring project for summer chum salmon within the upper portion of District 4 would serve as an index for the middle Yukon River area and provide fishery managers additional information concerning the size and quality of spawning escapement in this area. Additional stock identification studies for mixed stock fisheries could provide information to develop stream specific biological escapement goals.

A thorough review of the Nulato River and probable contribution of salmon production from this stream to the Yukon River is presented in the report *Nulato River Salmon Escapement Project, 1994* (Sandone 1995), which was the first year of operation. The 1995 field project data was reported only as a brief summary by Paul Headlee, Water Resource Specialist, TCC (Headlee 1996). Paulus (1997) reported results from the 1996 season and Paulus *et. al.* (2001) reported results from the 1997 season. This report presents information gathered during the 1998 field season.

Nulato River Escapement Assessment

The Nulato River is one of the department's primary aerial survey index areas for assessment of the relative magnitude of chinook and summer chum salmon spawning escapement. All escapement goals pertaining to the Nulato River were, and presently are, based on aerial survey counts of salmon.

Nulato River escapement goals for chinook and summer chum salmon were first established in 1981 (Buklis 1993). For summer chum salmon, an escapement goal range of 33,700 to 78,400 aerial survey counts was initially proposed for the entire Nulato River drainage. This aerial survey goal was modified several times until 1990 when a minimum summer chum salmon goal of 53,000 was established in 1990 (Bergstrom, et al. 1992). No escapement goal was established for the South Fork Nulato River (Geiger et al. 1984). The various aerial survey-based escapement goals have been met only once since initially established (1986). However, survey conditions have not been acceptable in some years.

A chinook salmon aerial survey-based escapement goal range of 400 to 1,100 was proposed in 1981 for the entire Nulato River (Buklis 1993). Similar to summer chum salmon aerial survey goals, this goal went through several changes (Sandone 1995). Chinook salmon escapement goals for the Yukon River were reevaluated in the spring of 1991 and were made effective for the 1992 season (Buklis 1993). At that time, minimum interim escapement goals for chinook salmon, based on aerial survey counts, were established for both forks: 800 for the North Fork and 500 for the South Fork.

Since data gathered from ground-based sources (e.g., tower and weir counts, mark-recapture estimates) are considered more reliable than aerial survey data, ground-based escapement goals will first be evaluated using such sources having at least 5 years of information. Aerial survey data will be secondarily used when ground-based sources are limited or unavailable. Information from the tower counting project may be used to re-evaluate the current escapement objectives for the Nulato River.

Study Area

The Nulato River is a narrow river with a substrate consisting mainly of gravel and cobble. The river is formed from two main branches, the North Fork and South Fork, which converge approximately 9 kilometer (km) above its mouth. Both forks of the Nulato River originate at an elevation of approximately 600 meter (m). From its source, the South Fork flows in a northeasterly and easterly direction about 98 km to the confluence with the North Fork. From its source, the North Fork, for the most part, also flows in a northeasterly and easterly direction and is approximately 114 km long. The North Fork drainage includes the Kalasik Creek drainage, approximately 54 km in length. The mainstem Nulato River joins the Yukon River at rkm 777 at an approximate elevation of 33 m (Sandone 1995).

The Nulato River tower site is located approximately 5 km upstream of the confluence of the Nulato and Yukon Rivers (Figure 2). The water is typically clear with some brown (tannic) staining from peat and organic material along the watershed. Most of the chum salmon spawning area is upstream of the tower site.

Objectives

The objectives of this study were to:

1. Estimate the total escapement of summer chum and chinook salmon into the Nulato River using tower-counting methodology;
2. Estimate the age and sex composition of the summer chum spawning population;
3. Monitor climatological and hydrological conditions at the tower site.

METHODS

Site Selection and Preparation

The current site was selected in 1994 (Figure 2) after completing a reconnaissance of the mainstem Nulato River. The criteria used for selection included: 1) Location below most, if not all, chum salmon spawning areas; 2) A single, relatively narrow channel; and 3) Relatively shallow river depth to facilitate observation of migrating salmon from the towers. The south side (right bank) of the river is a wide gravel bar with gradual decline and the north side (left bank) is characterized as a cut bank with a rapid decline.

On the north side of the river, a single section of 3 m high steel scaffold tower was erected. On the south side of the river, two sections of scaffold were combined to make a 6 m high tower. The south bank tower was placed in the river to reduce the width of the counting area. A 15 m long weir of wire fencing and T-stakes extended from the south bank to the tower to divert fish into the counting area. Light-colored empty sandbags were attached to a bank-to-bank cable weighted with sandbags. This light-colored background improved the ability of the crew to see and count fish. Because of the current, it was difficult to keep the reflective panels and cable on the stream bottom near the north bank. On the first day of operation fish were observed passing under the cable. Additional sandbags were placed on the cable, which solved the problem. Observers wore polarized glasses to reduce glare. During the darkest hours, several lights suspended on a line across the river illuminated the counting area.

Escapement Estimation Sampling

Tower counting operations were conducted 7 days a week, 24 hours a day, for a 15-minute period each hour on each bank. The north bank counting period began at the top of the hour and the south bank began at the bottom of the hour. The observer counted fish passage by species and noted the direction of movement (upstream or downstream). Hand-held tally counters were used to record the observed tower counts. These counts were then transferred to data forms immediately after completion of a shift (Appendix A). Each count was expanded for each hour and each bank by dividing the count by the proportion of the hour counted. Missed counts were estimated by averaging the counts for the hours before and after the missed hourly count. When salmon were not counted for a portion of a day, the expanded total daily count for that day was estimated by dividing the expanded partial daily count by the mean proportion of the count, for the corresponding hours for the day before and day after having full 24-hour counts. When counting was not conducted for a full day, the salmon passage estimate for that day was calculated as the mean salmon passage for the day before and after. When counting was not conducted for more than one full day, the passage for those days were estimated by interpolating between the last full day and first full day of counts after counting resumed.

The daily passage for each bank was calculated by summing the expanded hourly counts for each species, for each bank. The total daily passage estimate for each species was the sum of the expanded count for each bank.

Age-Sex-Size Sampling

When the Nulato River tower project was initiated in 1994, dates needed to be established to define sampling strata for collecting age-sex-length (ASL) information. Run timing information did not exist for the Nulato River. Aerial survey information seemed to indicate, however, that the timing of peak abundance for summer chum salmon in the Nulato River was historically similar to that of the Anvik River for which sonar daily passage estimates were available dating back to 1979. Strata periods were initially selected for the Nulato River based on those used on the Anvik River, and were described as: early, June 20 to July 3; early-middle, July 4-8; late-middle, July 9-13 and late, July 14-26 (Sandone 1995).

The sample goal for each species was based on 95% precision with 10% accuracy for each time stratum. The season ASL sample goal was set at 640 chum salmon and all chinook salmon, with 160 chum salmon sampled in each of the strata described above. Beyond the required ASL sample, beach seining continues until an additional 200 chum salmon per stratum were caught and observed for male-female ratio. The additional 200 fish per strata, combined with the 160 summer chum salmon per strata, yielded a total sex ratio sample goal of 1,480 fish for the season on the Nulato River to define the quality of the escapement. For chinook salmon escapement, a sample size of 198 fish per stratum was the season goal based on the number of age classes that were expected in the run (Bromaghin 1993). While beach seine catches were expected to yield the desired total chum salmon sample, it was unlikely that the chinook salmon sample would be achieved because of the difficulty of catching chinook salmon by beach seine.

A beach seine 31 m long, 66 meshes deep of 6.35 centimeter (cm) mesh, was used to catch salmon for ASL samples. Data such as date, time of seine, number and sex of fish were recorded (Appendix A) Captured salmon were identified by species and sex, measured to the nearest 5 millimeter (mm) (mid-eye to fork-of-tail), sampled for scales and adipose fin-clipped to prevent re-sampling. Scales were taken from an area posterior to the base of the dorsal fin and above the lateral line on the left side of the fish (Clutter and Whitesel 1956). One scale was taken from chum salmon and three scales were taken from chinook salmon. Scales were wiped clean to remove slime and tissue and affixed to a gum-surfaced scale card with numbers that corresponded to recording form. The scales were processed and aged post-season, and ASL data compiled and summarized.

Hydrological and Climatological Sampling

Climatological and hydrological data were collected at approximately 1800 hours each day at the campsite. Relative stream depth was monitored on a staff gauge marked in 0.1-foot increments

with measurements subsequently converted to centimeters. Water temperature was measured in Celsius (°C) near shore at a depth of about 0.5 m. Daily maximum and minimum air temperatures were recorded in °C using a “high-low” thermometer. Subjective notes describing wind speed and direction, cloud cover and precipitation were recorded by the crew (Appendix A).

RESULTS AND DISCUSSION

Escapement Estimation

Counting towers were operated on each bank of the Nulato River from June 22 to July 26 in 1998 (Table 1). Counting was interrupted at 1200 on June 22 until 2400 on June 23 and from 0200 on July 2 to 1600 on July 6 because high and turbid water caused poor counting conditions. Because of the time period of the missed counts, using proportions of the day before and the day after could not be used. No estimations were calculated to expand chinook salmon counts for days when no tower counts were possible because of the lack of data before and after missed counting periods. Estimates were calculated for chum salmon by interpolating between the last full day and first full day of counts after counting resumed, as described under the Methods section, for counting periods and days when tower counts were not complete because of high and turbid water conditions. Expanded hourly counts by day and by bank for chinook and summer chum salmon are presented in Appendix B.

The water level and turbidity at the counting site varied throughout the 1998 field season. Three flood events were noted, one at the onset of the project, another approximately two weeks later during the peak of the run, and the third at the very end of the field season. There were very few days when the flash panel was visible for the width of the river. These high water events did not hamper beach seining.

Spatial distribution of summer chum salmon is normally close to the riverbank, which brings them close to the towers where they are easier to observe and count. Therefore, over the course of the season, counts of summer chum salmon are thought to be a good estimate of the total escapement passage. In 1994, Sandone (1995) observed that chinook salmon typically travel in the deepest part of the channel or near the middle of the river, where many were probably not seen and counted. Therefore the escapement estimate of chinook salmon is to be considered a conservative estimate and below the actual escapement.

Chinook Salmon

The chinook salmon escapement estimate into the Nulato River was 806 for the South Bank and 698 for the North Bank for a total 1,504 chinook salmon (Table 1). No chinook salmon were observed until the fourth day of tower operations. Figure 3 illustrates the relative passage rate estimate by day for each bank. No obvious bank orientation was observed in 1998 with 54% of

the estimated total passage observed on the right bank and 46% observed on the left bank. The first quartile day of passage occurred on July 10 (Table 2), two days later than the 4-year average (1994-1997) of July 8 (Table 3, Figure 4). The median day occurred on July 14, two days later than the 4-year average (1994-1997) of July 12, and the last quartile occurred on July 17 one day later than the 4-year average (1994-1997) of July 16. The total chinook salmon estimated escapement was 32% below the four-year average. Chinook salmon exhibited a diurnal migratory behavior in 1998. Chinook salmon generally migrated upriver with the highest passage typically occurring between 1300 and 2200 hours and the lowest passage occurring between 2300 and 0900 hours (Table 5, Figure 5).

In 1998, the aerial survey escapement goal for chinook salmon was 500 for the South Fork and 800 for the North Fork. No aerial survey was flown in 1998 because of poor weather conditions.

Summer Chum Salmon

The estimated summer chum salmon escapement from June 22 through July 25 was 33,928 on the South Bank and 18,113 on the North Bank for a total of 52,041 chum salmon. Expanded data for each bank are presented in Table 1 and Figure 3. This was the lowest escapement estimate during the five years of counting tower operation (Table 5, Figure 4). The run timing of Nulato River chum salmon was also the latest observed since the initiation of the project. The first quartile day of passage occurred on July 7 (Table 2), seven days later than the 4-year average (1994-1997) of June 30 (Table 5). The median day occurred on July 12, six days later than the 4-year average (1994-1997) of July 6, and the last quartile occurred on July 15 five days later than the 4-year average (1994-1997) of July 10.

Passage of summer chum salmon in the Nulato River in 1998 demonstrated a distinct spatial and diurnal pattern. These patterns have also been previously noted in this system and on the Anvik River (Sandone 1995). Table 1 and Figure 3 illustrates the spatial pattern with 65% of the run counted on the south bank, the side of the river with the wide gravel bar and gradual decline, and the remaining fish passing the North bank which is characterized with a steep decline. Table 4 and Figure 5 illustrates the diurnal pattern with hourly counts increasing steadily in the afternoon on both banks, typically peaking between 2100 and 0100 hours, then decreasing to the lowest passage rate period occurring between 0300 and 1300 hours.

The distribution of 1998 counts by day verifies observations by the crew that the preponderance of the run passed the tower site during counting operations, and counts increased during the first few days and tapered off during the last week (Table 2, Figure 3). During the weak run observed in 1998, daily passage estimates of summer chum salmon surpassed 4,000 fish only three times. Fifty-six percent of the run occurred during the nine days between the 1st and 3rd quartile out of the 29-day counting period. The data illustrate that the Nulato River migration timing past the counting towers in 1998 was the latest on record for this project.

Sandone (1995) evaluated run timing information using test fishing catch rates, Yukon River sonar, and escapements to the Anvik, Kaltag, and Nulato Rivers to determine run timing relationships for summer chum salmon migrating into the Nulato River. Comparisons between

historical relative abundance data from aerial surveys and the 1994 Nulato River tower data suggested that run timing into the three spawning escapement tributaries was similar. Sandone (1995) cites swimming speed analyses using lower Yukon River test fishing data and Anvik river sonar data, summer chum salmon have an estimated average travel speed of 42 km per day. This statistic indicated that fish spawning farther upriver passed by the Yukon River sonar site earlier than those spawning in tributaries lower in the river near the downstream, which entered the river later. No aerial survey was conducted because of poor weather. Therefore, no comparisons could be made between tower escapement estimates with aerial survey estimates in 1998.

Age-Sex-Size

Nulato escapement ASL sampling in 1998 was completed on 580 summer chum salmon captured by beach seine. Sampling was done at a site approximately 100 m upstream from the north (left) bank tower during the early portion of the season. For the pooled sample weighted by escapement, 68.2 % were age-0.3 fish and 30.9% were age-0.4 fish, with the remaining 0.9% being age 0.5-fish (Table 6). The weighted sex ratio was 64.0% females and 36.0% males. Mean lengths ranged from 544 mm to 561 mm for females and 567 mm to 602 mm for males. For females, mean length increase corresponded with the age of the fish. However, for males of the three age groups, the mean length for age-0.4 fish was the greatest. Age-0.3 fish predominated in all 4 strata followed by age-0.4 fish and age-0.5 fish. Females were predominant across all age classes and strata (Figure 6, Appendix C).

Too few chinook salmon were caught in the beach seines to make an analysis of age and sex composition of the chinook run. No carcass sampling project was conducted on the Nulato River, therefore no escapement age and sex for chinook salmon information is available.

Hydrology and Climate

For most tributaries of the Yukon River, the water is usually highest during or shortly after breakup, and generally continues to drop during the summer as the snow pack decreases. Storage capacity of the Nulato River watershed, similar to the Anvik, appears to be minimal with limited retention of rainfall in the upper areas of the drainage. The Nulato River, similar to the Anvik River, has rapid changes in water depth when substantial rainfall occurs. These flood conditions make counting difficult or impossible because of the suspended solids, detritus, tannic staining and increased water depth.

Light rainfall for the Nulato River drainage, was observed 28 out of 35 recorded weather days with only seven days recording no rainfall (Table 7). The highest water level was recorded on July 3 and the lowest water level was recorded on July 22 (Table 7, Figure 7). Water temperatures ranged from 7.7°C to 13.2°C, a range of 5.5 °C during the season. The range for the low air temperature was from 6.0°C to 14.5°C (a range of 8.5 °C) and for the high temperature, 14.0°C to 28.0°C, a range of 14.0°C.

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TABLES AND FIGURES

Table 1. Nulato River tower daily expanded counts for chinook and summer chum salmon by bank and total by day, 1998.

| Date | Chinook salmon expanded counts | | | Chum salmon expanded counts | | |
|---------------------|--------------------------------|------------|-------|-----------------------------|------------|--------|
| | South Bank | North Bank | Total | South Bank | North Bank | Total |
| 22-Jun | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-Jun | 0 | 0 | 0 | 4 | 0 | 4 |
| 24-Jun | 4 | 4 | 8 | 24 | 12 | 36 |
| 25-Jun | 4 | 0 | 4 | 24 | 32 | 56 |
| 26-Jun | 0 | 4 | 4 | 56 | 124 | 180 |
| 27-Jun | 0 | 28 | 28 | 336 | 252 | 588 |
| 28-Jun | 12 | 76 | 88 | 490 | 280 | 770 |
| 29-Jun | 8 | 12 | 20 | 322 | 400 | 722 |
| 30-Jun | 12 | 0 | 12 | 380 | 336 | 716 |
| 1-Jul | 0 | 0 | 0 | 152 | 556 | 708 |
| 2-Jul ^a | 16 | 4 | 20 | 347 | 150 | 496 |
| 3-Jul ^a | 0 | 0 | 0 | 580 | 513 | 1,092 |
| 4-Jul ^a | 0 | 0 | 0 | 813 | 876 | 1,688 |
| 5-Jul ^a | 0 | 0 | 0 | 1,046 | 1,239 | 2,284 |
| 6-Jul ^a | 24 | 12 | 36 | 1,278 | 1,602 | 2,880 |
| 7-Jul | 4 | 0 | 4 | 792 | 792 | 1,584 |
| 8-Jul | 44 | 40 | 84 | 2,052 | 700 | 2,752 |
| 9-Jul | 28 | 32 | 60 | 1,676 | 516 | 2,192 |
| 10-Jul | 40 | 44 | 84 | 3,868 | 900 | 4,768 |
| 11-Jul | 32 | 12 | 44 | 1,886 | 826 | 2,712 |
| 12-Jul | 52 | 40 | 92 | 1,224 | 1,068 | 2,292 |
| 13-Jul | 54 | 48 | 102 | 3,032 | 1,352 | 4,384 |
| 14-Jul | 120 | 64 | 184 | 3,460 | 1,400 | 4,860 |
| 15-Jul | 72 | 84 | 156 | 2,680 | 1,124 | 3,804 |
| 16-Jul | 48 | 28 | 76 | 2,100 | 680 | 2,780 |
| 17-Jul | 16 | 4 | 20 | 856 | 432 | 1,288 |
| 18-Jul | 52 | 24 | 76 | 1,280 | 576 | 1,856 |
| 19-Jul | 56 | 22 | 78 | 660 | 74 | 734 |
| 20-Jul | 52 | 20 | 72 | 940 | 400 | 1,340 |
| 21-Jul | 28 | 32 | 60 | 756 | 388 | 1,144 |
| 22-Jul | 28 | 44 | 72 | 484 | 332 | 816 |
| 23-Jul | 0 | 20 | 20 | 331 | 182 | 513 |
| 24-Jul ^b | 0 | 0 | 0 | 0 | 0 | 0 |
| 25-Jul ^b | 0 | 0 | 0 | 0 | 0 | 0 |
| 26-Jul ^b | 0 | 0 | 0 | 0 | 0 | 0 |
| Totals | 806 | 698 | 1,504 | 33,928 | 18,113 | 52,041 |

^a Missed counting periods due to high water were interpolated for summer chum salmon. Because of a lack of hourly and daily counts, no interpolations were calculated for chinook salmon.

^b Because of a lack of hourly and daily counts, no interpolations were calculated.

Table 2. Nulato River tower daily and cumulative counts and proportions for chinook and summer chum salmon, 1998.

| Date | Chinook Salmon | | | | Summer Chum Salmon | | | |
|---------------------|----------------|-------|-------------|-------|--------------------|--------|-------------|-------|
| | Counts | | Proportions | | Counts | | Proportions | |
| | Daily | Cum. | Daily | Cum. | Daily | Cum. | Daily | Cum. |
| 22-Jun ^a | 0 | 0 | 0.000 | 0.000 | 0 | 0 | 0.000 | 0.000 |
| 23-Jun | 0 | 0 | 0.000 | 0.000 | 4 | 4 | 0.000 | 0.000 |
| 24-Jun | 8 | 8 | 0.005 | 0.005 | 36 | 40 | 0.001 | 0.001 |
| 25-Jun | 4 | 12 | 0.003 | 0.008 | 56 | 96 | 0.001 | 0.002 |
| 26-Jun | 4 | 16 | 0.003 | 0.011 | 180 | 276 | 0.003 | 0.005 |
| 27-Jun | 28 | 44 | 0.019 | 0.029 | 588 | 864 | 0.011 | 0.017 |
| 28-Jun | 88 | 132 | 0.059 | 0.088 | 770 | 1,634 | 0.015 | 0.031 |
| 29-Jun | 20 | 152 | 0.013 | 0.101 | 722 | 2,356 | 0.014 | 0.045 |
| 30-Jun | 12 | 164 | 0.008 | 0.109 | 716 | 3,072 | 0.014 | 0.059 |
| 1-Jul | 0 | 164 | 0.000 | 0.109 | 708 | 3,780 | 0.014 | 0.073 |
| 2-Jul ^a | 20 | 184 | 0.013 | 0.122 | 496 | 4,276 | 0.010 | 0.082 |
| 3-Jul ^a | 0 | 184 | 0.000 | 0.122 | 1,092 | 5,369 | 0.021 | 0.103 |
| 4-Jul ^a | 0 | 184 | 0.000 | 0.122 | 1,688 | 7,057 | 0.032 | 0.136 |
| 5-Jul ^a | 0 | 184 | 0.000 | 0.122 | 2,284 | 9,342 | 0.044 | 0.180 |
| 6-Jul ^a | 36 | 220 | 0.024 | 0.146 | 2,880 | 12,222 | 0.055 | 0.235 |
| 7-Jul | 4 | 224 | 0.003 | 0.149 | 1,584 | 13,806 | 0.030 | 0.265 |
| 8-Jul | 84 | 308 | 0.056 | 0.205 | 2,752 | 16,558 | 0.053 | 0.318 |
| 9-Jul | 60 | 368 | 0.040 | 0.245 | 2,192 | 18,750 | 0.042 | 0.360 |
| 10-Jul | 84 | 452 | 0.056 | 0.301 | 4,768 | 23,518 | 0.092 | 0.452 |
| 11-Jul | 44 | 496 | 0.029 | 0.330 | 2,712 | 26,230 | 0.052 | 0.504 |
| 12-Jul | 92 | 588 | 0.061 | 0.391 | 2,292 | 28,522 | 0.044 | 0.548 |
| 13-Jul | 102 | 690 | 0.068 | 0.459 | 4,384 | 32,906 | 0.084 | 0.632 |
| 14-Jul | 184 | 874 | 0.122 | 0.581 | 4,860 | 37,766 | 0.093 | 0.726 |
| 15-Jul | 156 | 1,030 | 0.104 | 0.685 | 3,804 | 41,570 | 0.073 | 0.799 |
| 16-Jul | 76 | 1,106 | 0.051 | 0.735 | 2,780 | 44,350 | 0.053 | 0.852 |
| 17-Jul | 20 | 1,126 | 0.013 | 0.749 | 1,288 | 45,638 | 0.025 | 0.877 |
| 18-Jul | 76 | 1,202 | 0.051 | 0.799 | 1,856 | 47,494 | 0.036 | 0.913 |
| 19-Jul | 78 | 1,280 | 0.052 | 0.851 | 734 | 48,228 | 0.014 | 0.927 |
| 20-Jul | 72 | 1,352 | 0.048 | 0.899 | 1,340 | 49,568 | 0.026 | 0.952 |
| 21-Jul | 60 | 1,412 | 0.040 | 0.939 | 1,144 | 50,712 | 0.022 | 0.974 |
| 22-Jul | 72 | 1,484 | 0.048 | 0.987 | 816 | 51,528 | 0.016 | 0.990 |
| 23-Jul | 20 | 1,504 | 0.013 | 1.000 | 513 | 52,041 | 0.010 | 1.000 |
| 24-Jul ^b | 0 | 1,504 | 0.000 | 1.000 | 0 | 52,041 | 0.000 | 1.000 |
| 25-Jul ^b | 0 | 1,504 | 0.000 | 1.000 | 0 | 52,041 | 0.000 | 1.000 |
| 26-Jul ^b | 0 | 1,504 | 0.000 | 1.000 | 0 | 52,041 | 0.000 | 1.000 |

^a Missed counting periods due to high water were interpolated for summer chum salmon. Because of a lack of hourly and daily counts, no interpolations were calculated for chinook salmon.

^b Because of a lack of hourly and daily counts, no interpolations were calculated.

Table 3. Historic daily and cumulative Nulato River chinook salmon escapement passage estimates, 1994-1998.

| Date | 1994 | | | 1995 | | | 1996 | | | 1997 | | | 1998* | | |
|--------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|
| | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion |
| 15-Jun | | | | | | | | | | | | | | | |
| 16-Jun | | | | | | | | | | | | | | | |
| 17-Jun | | | | | | | | | | | | | | | |
| 18-Jun | | | | | | | | | | | | | | | |
| 19-Jun | | | | | | | | | | | | | | | |
| 20-Jun | | | | | | | | | | 0 | 0 | 0.00 | | | |
| 21-Jun | | | | | | | | | | 0 | 0 | 0.00 | | | |
| 22-Jun | | | | | | | | | | 0 | 0 | 0.00 | 0 | 0 | 0.00 |
| 23-Jun | | | | | | | | | | 20 | 20 | 0.00 | 0 | 0 | 0.00 |
| 24-Jun | | | | | | | | | | 16 | 36 | 0.01 | 8 | 8 | 0.01 |
| 25-Jun | | | | | | | | | | 16 | 52 | 0.01 | 4 | 12 | 0.01 |
| 26-Jun | | | | 4 | 4 | 0.00 | 12 | 12 | 0.02 | 32 | 84 | 0.02 | 4 | 16 | 0.01 |
| 27-Jun | | | | 4 | 8 | 0.01 | 12 | 24 | 0.03 | 52 | 136 | 0.03 | 28 | 44 | 0.03 |
| 28-Jun | | | | 0 | 8 | 0.01 | 8 | 32 | 0.04 | 84 | 220 | 0.05 | 88 | 132 | 0.09 |
| 29-Jun | | | | 0 | 8 | 0.01 | 4 | 36 | 0.05 | 136 | 356 | 0.07 | 20 | 152 | 0.10 |
| 30-Jun | | | | 0 | 8 | 0.01 | 8 | 44 | 0.06 | 144 | 500 | 0.10 | 12 | 164 | 0.11 |
| 1-Jul | | | | 8 | 16 | 0.01 | 12 | 56 | 0.07 | 144 | 644 | 0.13 | 0 | 164 | 0.11 |
| 2-Jul | | | | 0 | 16 | 0.01 | 8 | 64 | 0.08 | 172 | 816 | 0.17 | 20 | 184 | 0.12 |
| 3-Jul | | | | 12 | 28 | 0.02 | 13 | 77 | 0.10 | 184 | 1,000 | 0.21 | 0 | 184 | 0.12 |
| 4-Jul | 0 | 0 | 0.00 | 24 | 52 | 0.04 | 19 | 96 | 0.13 | 344 | 1,344 | 0.28 | 0 | 184 | 0.12 |
| 5-Jul | 3 | 3 | 0.00 | 64 | 116 | 0.08 | 24 | 120 | 0.16 | 336 | 1,680 | 0.35 | 0 | 184 | 0.12 |
| 6-Jul | 6 | 9 | 0.01 | 44 | 160 | 0.11 | 48 | 168 | 0.22 | 352 | 2,032 | 0.42 | 36 | 220 | 0.15 |
| 7-Jul | 72 | 81 | 0.05 | 36 | 196 | 0.14 | 40 | 208 | 0.28 | 308 | 2,340 | 0.49 | 4 | 224 | 0.15 |
| 8-Jul | 72 | 153 | 0.09 | 8 | 204 | 0.14 | 8 | 216 | 0.29 | 368 | 2,708 | 0.56 | 84 | 308 | 0.20 |
| 9-Jul | 60 | 213 | 0.12 | 16 | 220 | 0.16 | 12 | 228 | 0.30 | 212 | 2,920 | 0.61 | 60 | 368 | 0.24 |
| 10-Jul | 216 | 429 | 0.24 | 52 | 272 | 0.19 | 108 | 336 | 0.44 | 344 | 3,264 | 0.68 | 84 | 452 | 0.30 |
| 11-Jul | 208 | 637 | 0.35 | 100 | 372 | 0.26 | 36 | 372 | 0.49 | 128 | 3,392 | 0.71 | 44 | 496 | 0.33 |
| 12-Jul | 120 | 757 | 0.42 | 52 | 424 | 0.30 | 80 | 452 | 0.60 | 152 | 3,544 | 0.74 | 92 | 588 | 0.39 |
| 13-Jul | 84 | 841 | 0.47 | 112 | 536 | 0.38 | 52 | 504 | 0.67 | 290 | 3,834 | 0.80 | 102 | 690 | 0.46 |
| 14-Jul | 92 | 933 | 0.52 | 84 | 620 | 0.44 | 48 | 552 | 0.73 | 108 | 3,942 | 0.82 | 184 | 874 | 0.58 |
| 15-Jul | 100 | 1,033 | 0.58 | 56 | 676 | 0.48 | 16 | 568 | 0.75 | 252 | 4,194 | 0.87 | 156 | 1,030 | 0.68 |
| 16-Jul | 112 | 1,145 | 0.64 | 60 | 736 | 0.52 | 36 | 604 | 0.80 | 184 | 4,378 | 0.91 | 76 | 1,106 | 0.74 |
| 17-Jul | 92 | 1,237 | 0.69 | 164 | 900 | 0.64 | 64 | 668 | 0.88 | 108 | 4,486 | 0.93 | 20 | 1,126 | 0.75 |
| 18-Jul | 96 | 1,333 | 0.74 | 56 | 956 | 0.68 | 16 | 684 | 0.90 | 52 | 4,538 | 0.94 | 76 | 1,202 | 0.80 |
| 19-Jul | 100 | 1,433 | 0.80 | 56 | 1,012 | 0.72 | 16 | 700 | 0.93 | 68 | 4,606 | 0.96 | 78 | 1,280 | 0.85 |
| 20-Jul | 104 | 1,537 | 0.86 | 76 | 1,088 | 0.77 | 24 | 724 | 0.96 | 116 | 4,722 | 0.98 | 72 | 1,352 | 0.90 |
| 21-Jul | 44 | 1,581 | 0.88 | 92 | 1,180 | 0.84 | 24 | 748 | 0.99 | 44 | 4,766 | 0.99 | 60 | 1,412 | 0.94 |
| 22-Jul | 51 | 1,632 | 0.91 | 56 | 1,236 | 0.88 | 8 | 756 | 1.00 | 45 | 4,811 | 1.00 | 72 | 1,484 | 0.99 |
| 23-Jul | 40 | 1,672 | 0.93 | 28 | 1,264 | 0.90 | 0 | 756 | 1.00 | | | | 20 | 1,504 | 1.00 |
| 24-Jul | 43 | 1,715 | 0.96 | 72 | 1,336 | 0.95 | 0 | 756 | 1.00 | | | | | | |
| 25-Jul | 28 | 1,743 | 0.97 | 48 | 1,384 | 0.98 | | | | | | | | | |
| 26-Jul | 12 | 1,755 | 0.98 | 28 | 1,412 | 1.00 | | | | | | | | | |
| 27-Jul | 8 | 1,763 | 0.98 | | | | | | | | | | | | |
| 28-Jul | 32 | 1,795 | 1.00 | | | | | | | | | | | | |
| 29-Jul | | | | | | | | | | | | | | | |
| 30-Jul | | | | | | | | | | | | | | | |
| 31-Jul | | | | | | | | | | | | | | | |
| | 1,795 | | | 1,412 | | | 756 | | | 4,811 | | | 1,504 | | |

* No interpolations were calculated for missed counting period due to a lack of data.

Table 4. Season total counts and proportions by hour for Nulato River chinook and summer chum salmon, 1998.

| Hour Ending | Chinook Salmon | | Summer Chum Salmon | |
|----------------|----------------|-------------|--------------------|-------------|
| | Counts | Proportions | Counts | Proportions |
| 1:00 | 56 | 0.037 | 4,218 | 0.081 |
| 2:00 | 20 | 0.013 | 2,107 | 0.040 |
| 3:00 | 4 | 0.003 | 1,919 | 0.037 |
| 4:00 | 12 | 0.008 | 1,325 | 0.025 |
| 5:00 | 26 | 0.017 | 1,255 | 0.024 |
| 6:00 | 30 | 0.020 | 1,458 | 0.028 |
| 7:00 | 32 | 0.021 | 1,639 | 0.032 |
| 8:00 | 36 | 0.024 | 1,539 | 0.030 |
| 9:00 | 78 | 0.052 | 1,100 | 0.021 |
| 10:00 | 48 | 0.032 | 939 | 0.018 |
| 11:00 | 48 | 0.032 | 1,196 | 0.023 |
| 12:00 | 64 | 0.043 | 1,223 | 0.023 |
| 13:00 | 144 | 0.096 | 1,167 | 0.022 |
| 14:00 | 60 | 0.040 | 1,617 | 0.031 |
| 15:00 | 116 | 0.077 | 1,585 | 0.030 |
| 16:00 | 80 | 0.053 | 1,878 | 0.036 |
| 17:00 | 70 | 0.047 | 2,059 | 0.040 |
| 18:00 | 88 | 0.059 | 2,031 | 0.039 |
| 19:00 | 56 | 0.037 | 2,773 | 0.053 |
| 20:00 | 132 | 0.088 | 3,495 | 0.067 |
| 21:00 | 132 | 0.088 | 3,836 | 0.074 |
| 22:00 | 60 | 0.040 | 4,498 | 0.086 |
| 23:00 | 44 | 0.029 | 3,281 | 0.063 |
| 24:00 | 68 | 0.045 | 3,903 | 0.075 |

Table 5. Historic daily and cumulative Nulato River summer chum salmon escapement passage estimates, 1994-1998.

| Date | 1994 | | | 1995 | | | 1996 | | | 1997 | | | 1998 | | |
|--------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|--------------|-------------------|-----------------------|
| | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion | Daily Counts | Cumulative Counts | Cumulative Proportion |
| 15-Jun | | | | | | | | | | | | | | | |
| 16-Jun | | | | | | | | | | | | | | | |
| 17-Jun | | | | | | | | | | | | | | | |
| 18-Jun | | | | | | | | | | | | | | | |
| 19-Jun | | | | | | | | | | | | | | | |
| 20-Jun | | | | | | | | | | 64 | 64 | 0.00 | | | |
| 21-Jun | | | | 452 | 452 | 0.00 | 700 | 700 | 0.01 | 168 | 232 | 0.00 | | | |
| 22-Jun | | | | 692 | 1,144 | 0.00 | 3,684 | 4,384 | 0.03 | 524 | 756 | 0.00 | 0 | 0 | 0.00 |
| 23-Jun | | | | 1,056 | 2,200 | 0.01 | 6,612 | 10,996 | 0.08 | 2,344 | 3,100 | 0.02 | 4 | 4 | 0.00 |
| 24-Jun | | | | 1,880 | 4,080 | 0.02 | 6,680 | 17,676 | 0.14 | 3,816 | 6,916 | 0.04 | 36 | 40 | 0.00 |
| 25-Jun | | | | 1,612 | 5,692 | 0.02 | 7,196 | 24,872 | 0.19 | 4,856 | 11,772 | 0.07 | 56 | 96 | 0.00 |
| 26-Jun | | | | 2,044 | 7,736 | 0.03 | 6,792 | 31,664 | 0.24 | 4,592 | 16,364 | 0.10 | 180 | 276 | 0.01 |
| 27-Jun | | | | 10,884 | 18,620 | 0.08 | 2,082 | 33,746 | 0.26 | 3,868 | 20,232 | 0.13 | 588 | 864 | 0.02 |
| 28-Jun | | | | 5,196 | 23,816 | 0.10 | 3,812 | 37,558 | 0.29 | 4,816 | 25,048 | 0.16 | 770 | 1,634 | 0.03 |
| 29-Jun | 2,001 | 2,001 | 0.01 | 9,184 | 33,000 | 0.14 | 5,542 | 43,100 | 0.33 | 6,972 | 32,020 | 0.20 | 722 | 2,356 | 0.05 |
| 30-Jun | 8,355 | 10,356 | 0.07 | 7,188 | 40,188 | 0.17 | 7,271 | 50,371 | 0.39 | 7,916 | 39,936 | 0.25 | 716 | 3,072 | 0.06 |
| 1-Jul | 7,898 | 18,254 | 0.12 | 9,716 | 49,904 | 0.21 | 7,104 | 57,475 | 0.44 | 7,656 | 47,592 | 0.30 | 708 | 3,780 | 0.07 |
| 2-Jul | 9,604 | 27,858 | 0.19 | 15,110 | 65,014 | 0.27 | 6,076 | 63,551 | 0.49 | 8,900 | 56,492 | 0.36 | 496 | 4,276 | 0.08 |
| 3-Jul | 7,601 | 35,459 | 0.24 | 9,068 | 74,082 | 0.31 | 3,624 | 67,175 | 0.52 | 8,596 | 65,088 | 0.41 | 1,092 | 5,369 | 0.10 |
| 4-Jul | 6,708 | 42,167 | 0.28 | 11,064 | 85,146 | 0.36 | 5,484 | 72,659 | 0.56 | 12,432 | 77,520 | 0.49 | 1,688 | 7,057 | 0.14 |
| 5-Jul | 10,188 | 52,355 | 0.35 | 12,700 | 97,846 | 0.41 | 8,320 | 80,979 | 0.62 | 11,432 | 88,952 | 0.56 | 2,284 | 9,342 | 0.18 |
| 6-Jul | 8,092 | 60,447 | 0.41 | 18,504 | 116,350 | 0.49 | 4,968 | 85,947 | 0.66 | 10,748 | 99,700 | 0.63 | 2,880 | 12,222 | 0.23 |
| 7-Jul | 7,008 | 67,455 | 0.45 | 10,704 | 127,054 | 0.54 | 7,460 | 93,407 | 0.72 | 11,368 | 111,068 | 0.70 | 1,584 | 13,806 | 0.27 |
| 8-Jul | 4,704 | 72,159 | 0.49 | 11,960 | 139,014 | 0.59 | 5,728 | 99,135 | 0.76 | 9,944 | 121,012 | 0.77 | 2,752 | 16,558 | 0.32 |
| 9-Jul | 9,232 | 81,391 | 0.55 | 14,008 | 153,022 | 0.65 | 3,664 | 102,799 | 0.79 | 4,664 | 125,676 | 0.79 | 2,192 | 18,750 | 0.36 |
| 10-Jul | 10,744 | 92,135 | 0.62 | 14,004 | 167,026 | 0.71 | 7,104 | 109,903 | 0.85 | 7,388 | 133,064 | 0.84 | 4,768 | 23,518 | 0.45 |
| 11-Jul | 8,776 | 100,911 | 0.68 | 13,684 | 180,710 | 0.76 | 4,144 | 114,047 | 0.88 | 3,756 | 136,820 | 0.87 | 2,712 | 26,230 | 0.50 |
| 12-Jul | 7,327 | 108,238 | 0.73 | 11,356 | 192,066 | 0.81 | 4,224 | 118,271 | 0.91 | 4,153 | 140,973 | 0.89 | 2,292 | 28,522 | 0.55 |
| 13-Jul | 6,931 | 115,169 | 0.77 | 8,660 | 200,726 | 0.85 | 3,888 | 122,159 | 0.94 | 3,558 | 144,531 | 0.91 | 4,384 | 32,906 | 0.63 |
| 14-Jul | 6,535 | 121,704 | 0.82 | 5,172 | 205,898 | 0.87 | 3,132 | 125,291 | 0.97 | 2,256 | 146,787 | 0.93 | 4,860 | 37,766 | 0.73 |
| 15-Jul | 6,140 | 127,844 | 0.86 | 4,232 | 210,130 | 0.89 | 1,920 | 127,211 | 0.98 | 3,016 | 149,803 | 0.95 | 3,804 | 41,570 | 0.80 |
| 16-Jul | 4,440 | 132,284 | 0.89 | 6,728 | 216,858 | 0.92 | 916 | 128,127 | 0.99 | 3,016 | 152,819 | 0.97 | 2,780 | 44,350 | 0.85 |
| 17-Jul | 3,211 | 135,495 | 0.91 | 6,464 | 223,322 | 0.94 | 676 | 128,803 | 0.99 | 2,392 | 155,211 | 0.98 | 1,288 | 45,638 | 0.88 |
| 18-Jul | 3,332 | 138,827 | 0.93 | 3,716 | 227,038 | 0.96 | 520 | 129,323 | 1.00 | 924 | 156,135 | 0.99 | 1,856 | 47,494 | 0.91 |
| 19-Jul | 2,215 | 141,042 | 0.95 | 4,400 | 231,438 | 0.98 | 371 | 129,694 | 1.00 | 1,080 | 157,215 | 0.99 | 734 | 48,228 | 0.93 |
| 20-Jul | 1,712 | 142,754 | 0.96 | 3,368 | 234,806 | 0.99 | | | | 760 | 157,975 | 1.00 | 1,340 | 49,568 | 0.95 |
| 21-Jul | 1,208 | 143,962 | 0.97 | 2,084 | 236,890 | 1.00 | | | | 196 | 158,171 | 1.00 | 1,144 | 50,712 | 0.97 |
| 22-Jul | 2,808 | 146,770 | 0.99 | | | | | | | | | | 816 | 51,528 | 0.99 |
| 23-Jul | 1,992 | 148,762 | 1.00 | | | | | | | | | | 513 | 52,041 | 1.00 |
| 24-Jul | | | | | | | | | | | | | | | |
| 25-Jul | | | | | | | | | | | | | | | |
| 26-Jul | | | | | | | | | | | | | | | |
| 27-Jul | | | | | | | | | | | | | | | |
| 28-Jul | | | | | | | | | | | | | | | |
| 29-Jul | | | | | | | | | | | | | | | |
| 30-Jul | | | | | | | | | | | | | | | |
| 31-Jul | | | | | | | | | | | | | | | |
| Total | 148,762 | | | 236,890 | | | 129,694 | | | 158,171 | | | 52,041 | | |

Table 6. Nulato River summer chum salmon weighted age and sex composition and mean length, 1998.

| | | Brood Year and Age Group | | | Total |
|--------|-------------------|--------------------------|-------------|-------------|--------|
| | | 1993 0.3 | 1992 0.4 | 1991 0.5 | |
| Female | No. in Escapement | 23,418 | 9,784 | 208 | 33,410 |
| | Percent of Sample | 45.0 | 18.8 | 0.4 | 64.0 |
| | Mean Length (mm) | 544 | 561 | 560 | |
| | Std. Deviation | 1 | 2 | 35 | |
| Male | No. in Escapement | 12,074 | 6,297 | 260 | 18,631 |
| | Percent of Sample | 23.2 | 12.1 | 0.5 | 36.0 |
| | Mean Length (mm) | 567 | 592 | 602 | |
| | Std. Deviation | 2 | 4 | 9 | |
| Total | No. in Escapement | 35,492 | 16,081 | 468 | 52,041 |
| | Percent of Sample | 68.2 | 30.9 | 0.9 | 100.0 |

Table 7. Nulato River tower project climatological and hydrological observations, 1998.

| Date | Time | Precipitation (code\amt) | Wind (Direction and) Velocity | Sky (code) | Temperature (°C) | | | Water Guage (cm) | Water Color (code) |
|--------|------|-----------------------------|-------------------------------------|---------------|------------------|---------|-------|---------------------|--------------------------|
| | | | | | Air Min | Air Max | Water | | |
| 22-Jun | 2200 | None | | 2 | | | 8.3 | 91.4 | Tr |
| 23-Jun | 2200 | I | Calm | 3 | 7.0 | | 8.5 | 78.6 | Tr |
| 24-Jun | 1800 | I | W-5 | 4 | 7.0 | 14.0 | 7.7 | 75.3 | Dk |
| 25-Jun | 1800 | I | Lt. & Var. | 3 | 7.0 | 15.5 | 8.3 | 70.4 | Green |
| 26-Jun | 1800 | I | Calm | 4 | 8.0 | 15.0 | 8.1 | 66.4 | Green |
| 27-Jun | 1800 | I | S-5 | 3 | 9.0 | 22.5 | 9.0 | 62.5 | Green |
| 28-Jun | 1800 | None | SW-10 | 2 | 11.0 | 25.0 | 11.9 | 59.7 | Green |
| 29-Jun | 1600 | None | S-5 | 3 | 9.5 | 24.5 | 10.8 | 57.0 | Green |
| 30-Jun | 1930 | None | NW-5 | 3 | 12.0 | 28.0 | 11.7 | 54.6 | Green |
| 01-Jul | 1930 | I | Lt. & Var. | 3 | 14.0 | 27.0 | 11.9 | 51.8 | Green |
| 02-Jul | 1930 | I | S-5 | 4 | 11.0 | 20.0 | 8.6 | 100.6 | Tr |
| 03-Jul | 1930 | I | Calm | 3 | 8.0 | 21.0 | 8.4 | 143.3 | Tr |
| 04-Jul | 1930 | I | S-5 | 2 | 12.5 | 24.0 | 10.4 | 94.5 | Tr |
| 05-Jul | 1930 | None | Calm | 3 | 11.0 | 23.0 | 9.9 | 78.6 | Tr |
| 06-Jul | 1930 | I | N-5 | 3 | 14.5 | 27.0 | 10.3 | 71.6 | Dk |
| 07-Jul | 1930 | I | Calm | 4 | 13.5 | 24.0 | 10.4 | 66.4 | Green |
| 08-Jul | 1930 | I | Lt. & Var. | 4 | 12.0 | 19.0 | 9.5 | 64.9 | Green |
| 09-Jul | 1930 | I | S-5 | 3 | 6.5 | 20.0 | 9.6 | 61.3 | Green |
| 10-Jul | 1800 | I | Calm | 3 | 6.0 | 24.5 | 11.5 | 57.9 | Green |
| 11-Jul | 1800 | None | Calm | 3 | 9.0 | 23.0 | 11.0 | 54.6 | Lt |
| 12-Jul | 1800 | I | NW-5 | 3 | 13.0 | 22.0 | 10.4 | 52.1 | Lt |
| 13-Jul | 2000 | I | Lt. & Var. | 3 | 12.0 | 22.0 | 11.4 | 48.8 | Lt |
| 14-Jul | 1800 | I | SW-10 | 3 | 10.0 | 21.0 | 11.4 | 46.3 | Lt |
| 15-Jul | 2330 | I | Lt. & Var. | 3 | 8.0 | 22.5 | 11.2 | 45.4 | Lt |
| 16-Jul | 1800 | I | N-5 | 3 | 12.5 | 21.2 | 10.9 | 45.1 | Lt |
| 17-Jul | 1800 | I | Calm | 4 | 13.5 | 20.0 | 9.5 | 45.1 | Lt |
| 18-Jul | 1800 | I | Calm | 3 | 10.5 | 20.0 | 10.6 | 45.7 | Lt |
| 19-Jul | 1800 | I | SE-5 | 3 | 7.0 | 21.0 | 11.5 | 44.8 | Tr |
| 20-Jul | 1800 | None | E-5 | 3 | 10.0 | 23.5 | 12.5 | 42.1 | Green |
| 21-Jul | 1800 | I | NW-5 | 2 | 11.5 | 27.0 | 13.2 | 41.5 | Green |
| 22-Jul | 2330 | I | Calm | 5 | 13.0 | 27.0 | 11.7 | 39.3 | Green |
| 23-Jul | 1800 | I | NE-5 | 4 | 13.0 | 26.5 | 10.8 | 47.5 | Dk |
| 24-Jul | 1630 | I | Calm | 5 | 13.0 | 19.0 | 9.8 | 57.6 | Tr |
| 25-Jul | 1800 | I | Calm | 3 | 11.5 | 16.0 | 8.8 | 102.1 | Tr |
| 26-Jul | 1800 | I | SW-5 | 3 | 9.0 | 18.5 | 9.2 | 104.5 | Tr |

Codes

| SKY | PRECIPITATION | WATER COLOR |
|---------------------------------------|-----------------------|-----------------------------|
| 0 No observation made | I Intermittent rain | Clr Clear |
| 1 Clear sky, not over 10% cloud cover | R Continuous rain | Dk grn Dark green |
| 2 Cloud cover not over 50% | S Snow | Lt grn Light green |
| 3 Cloud cover over 50% of sky | S&R Mixed snow & rain | Br Brown |
| 4 Completely overcast | H Hail | Dk Dark Brown |
| 5 Fog or thick haze or smoke | T Thunder showers | Tr Turbid: murky or glacial |

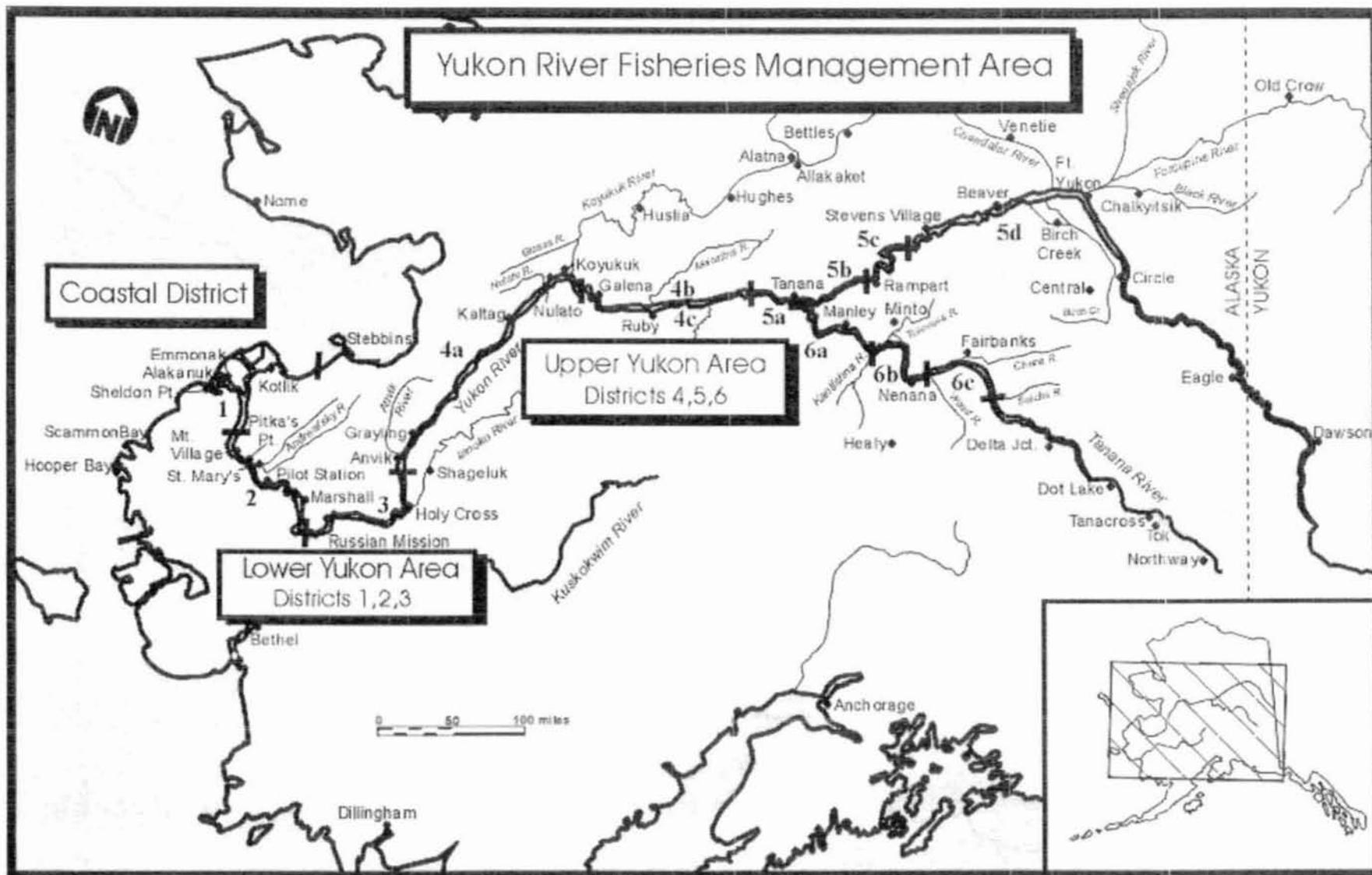


Figure 1. Alaskan portion of the Yukon River showing villages and fishing district boundaries.

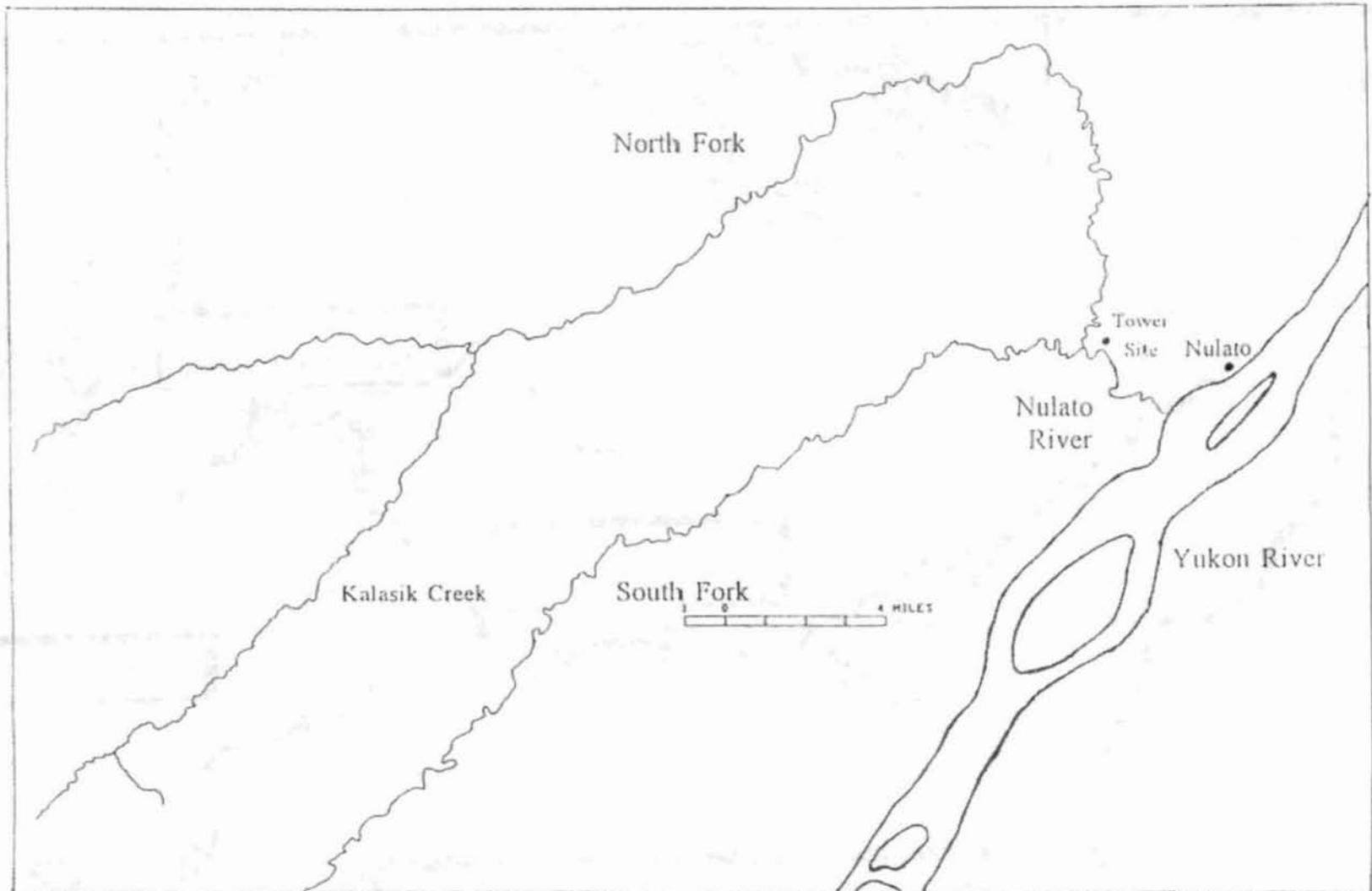


Figure 2. The Nulato River drainage showing the counting tower site.

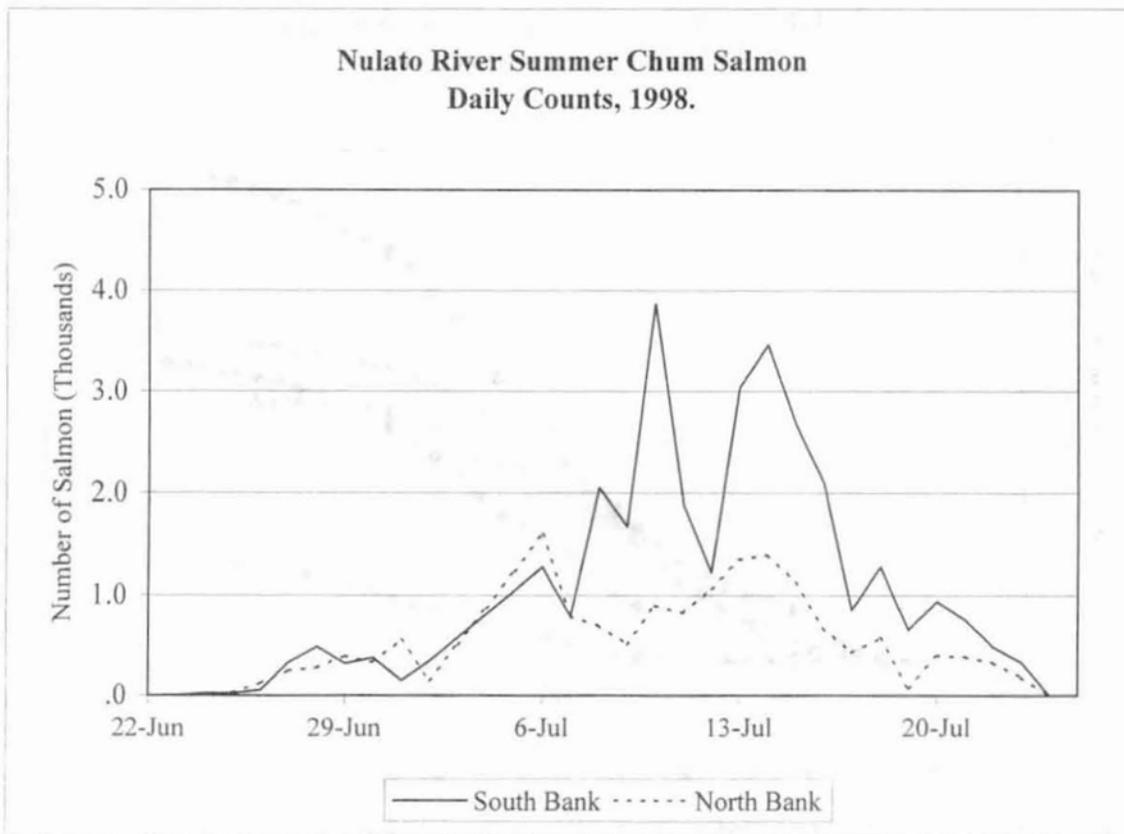
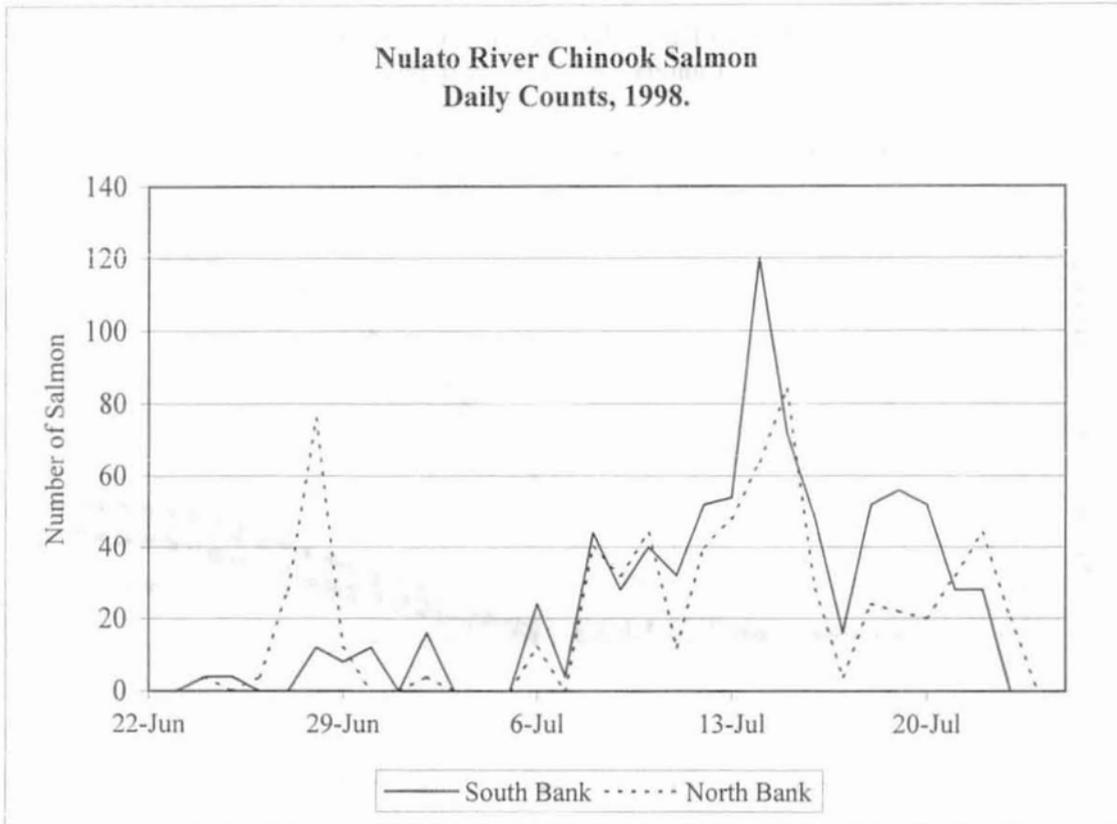


Figure 3. Nulato River chinook and summer chum salmon estimated daily counts by bank, 1998.

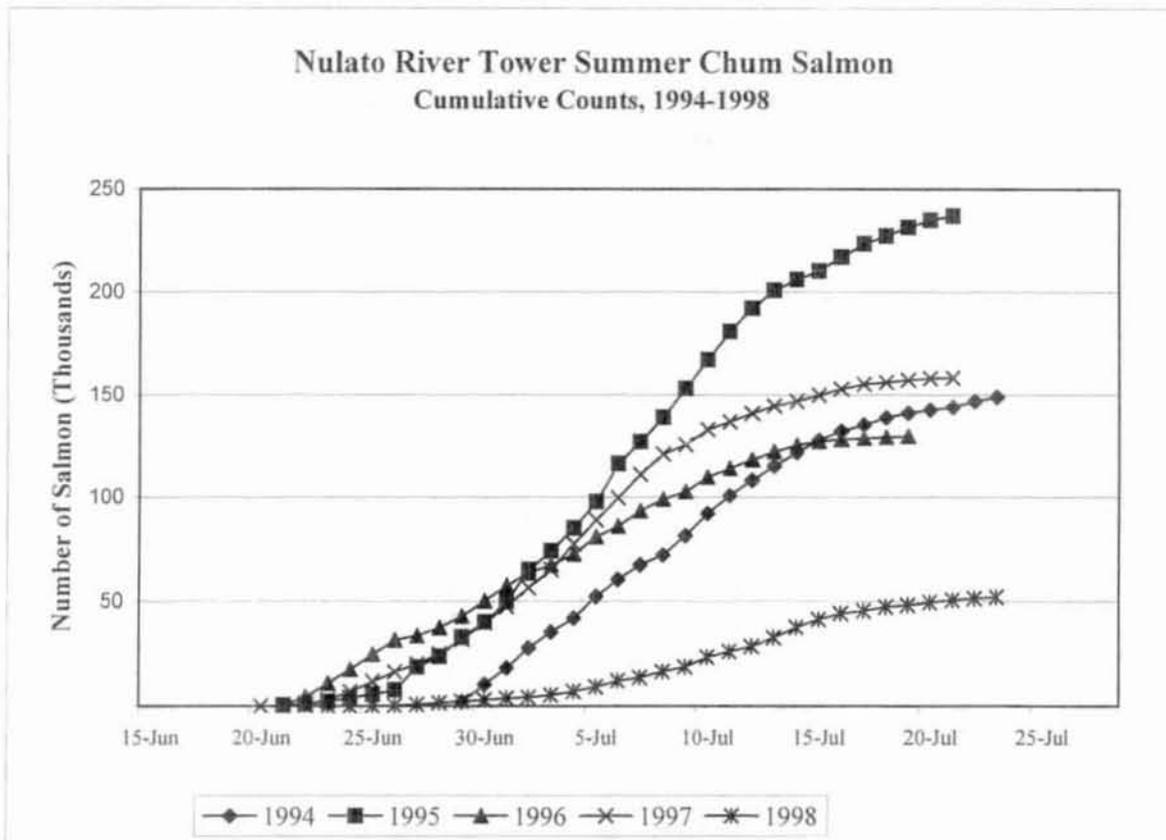
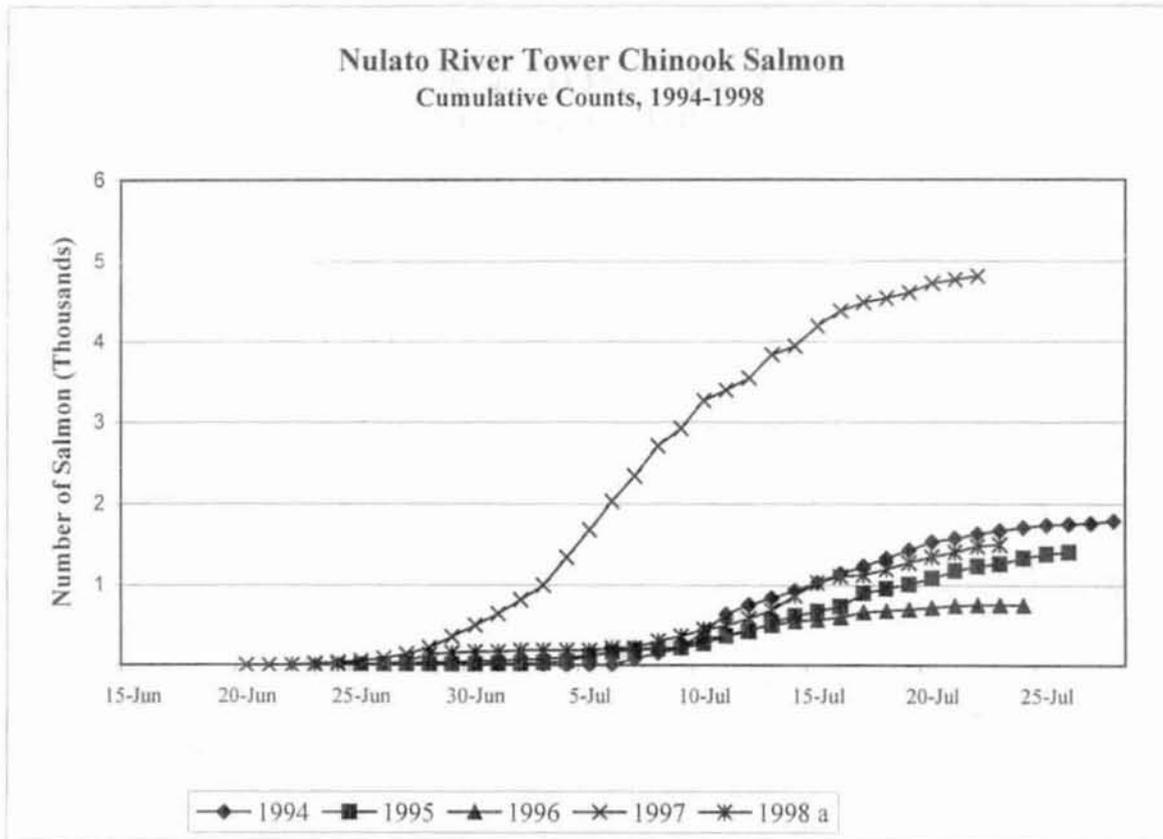


Figure 4 Nulato River chinook and summer chum salmon cumulative counts, 1994-1998.

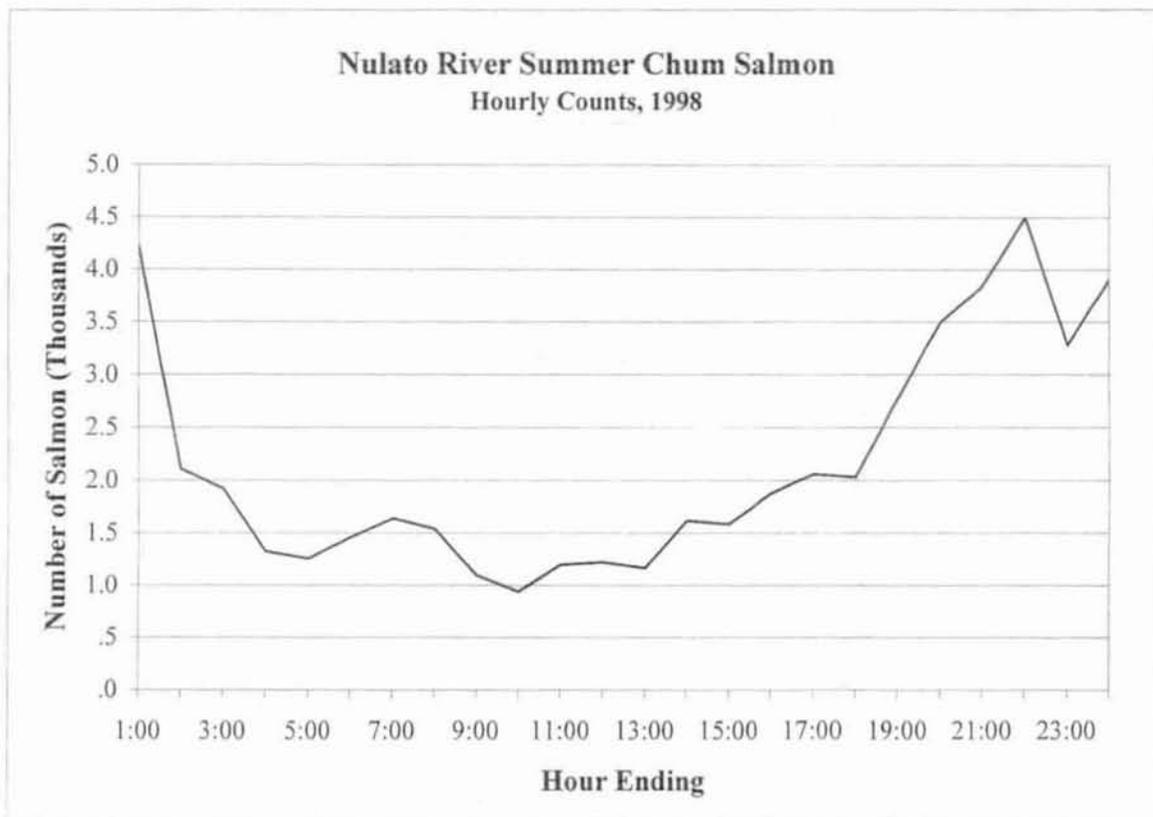
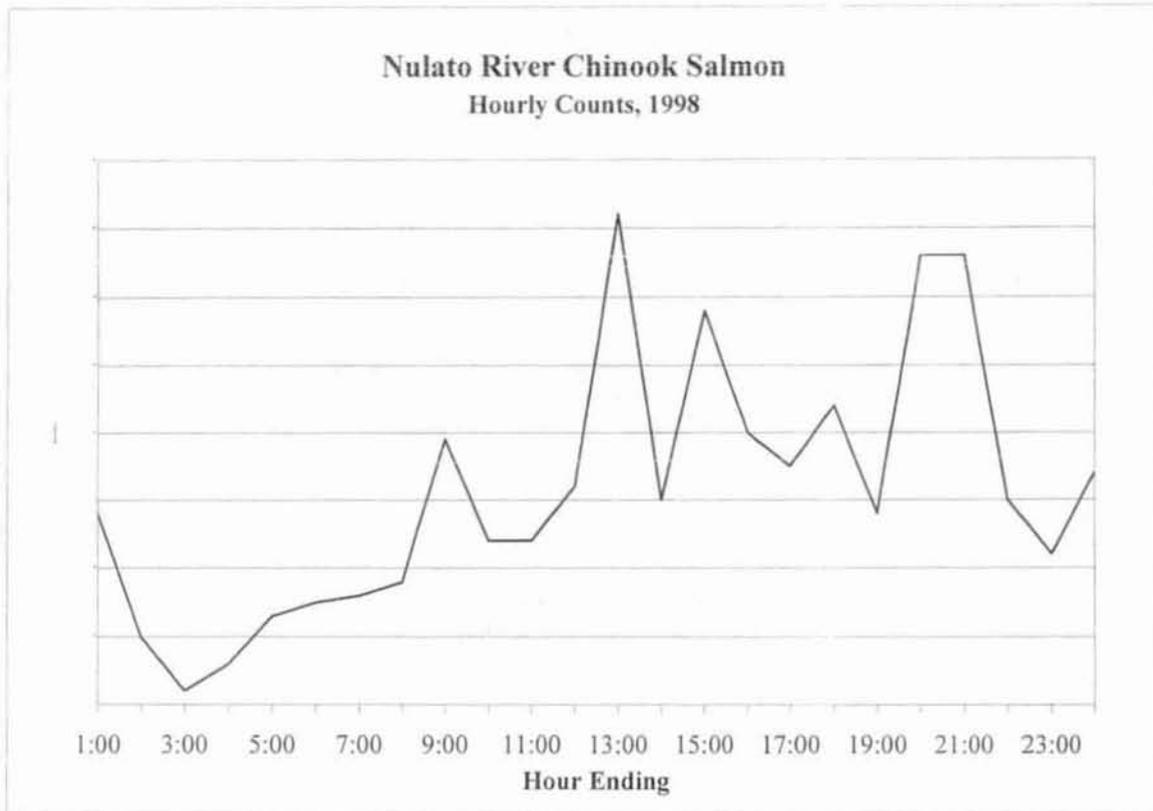


Figure 5. Nulato River chinook and summer chum salmon estimated daily counts by hour, 1998.

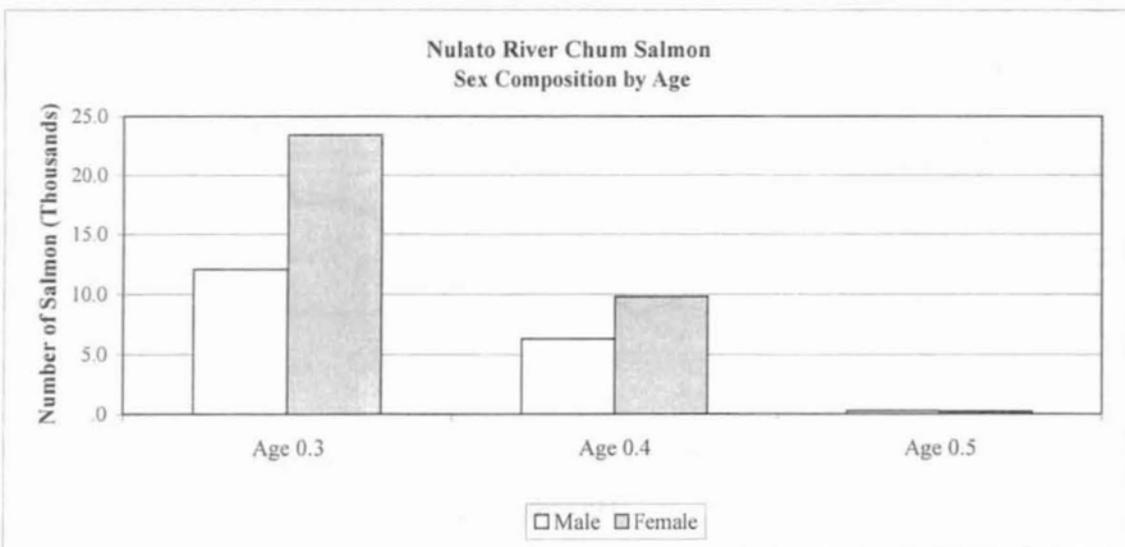
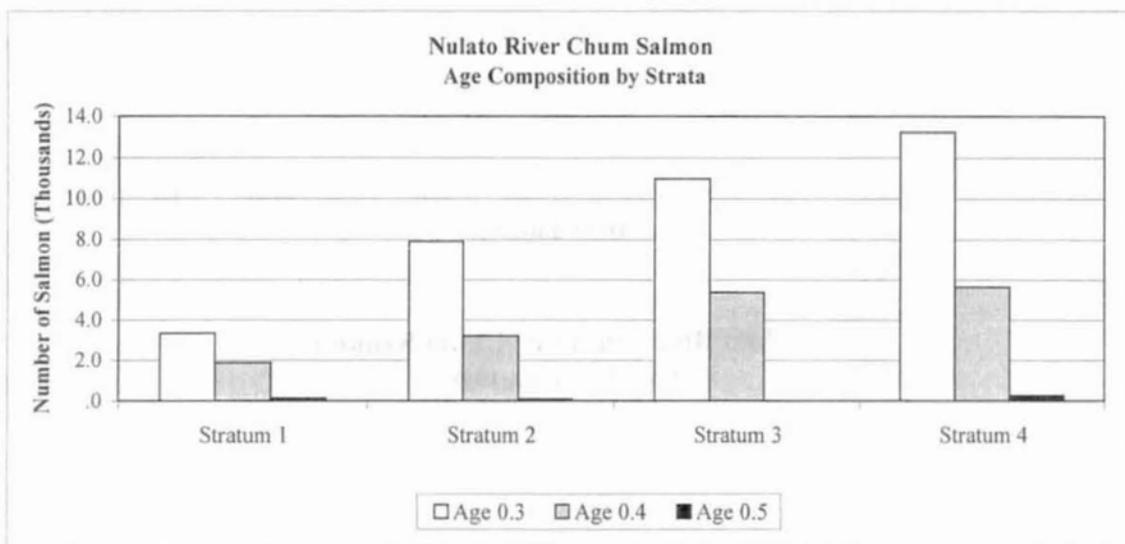
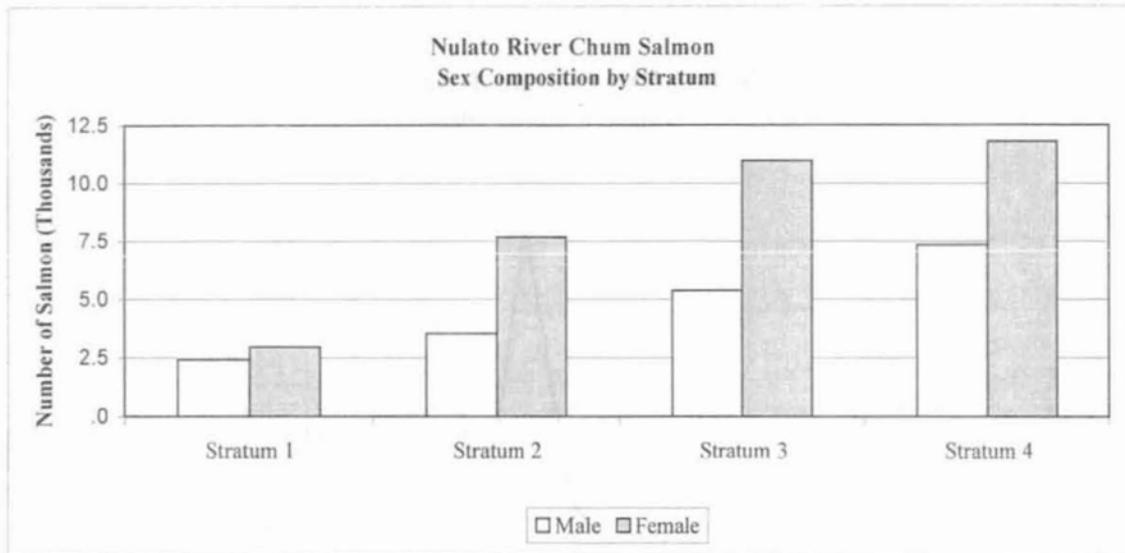


Figure 6. Nulato River summer chum salmon age and sex composition by stratum, and sex composition by age group, 1998.

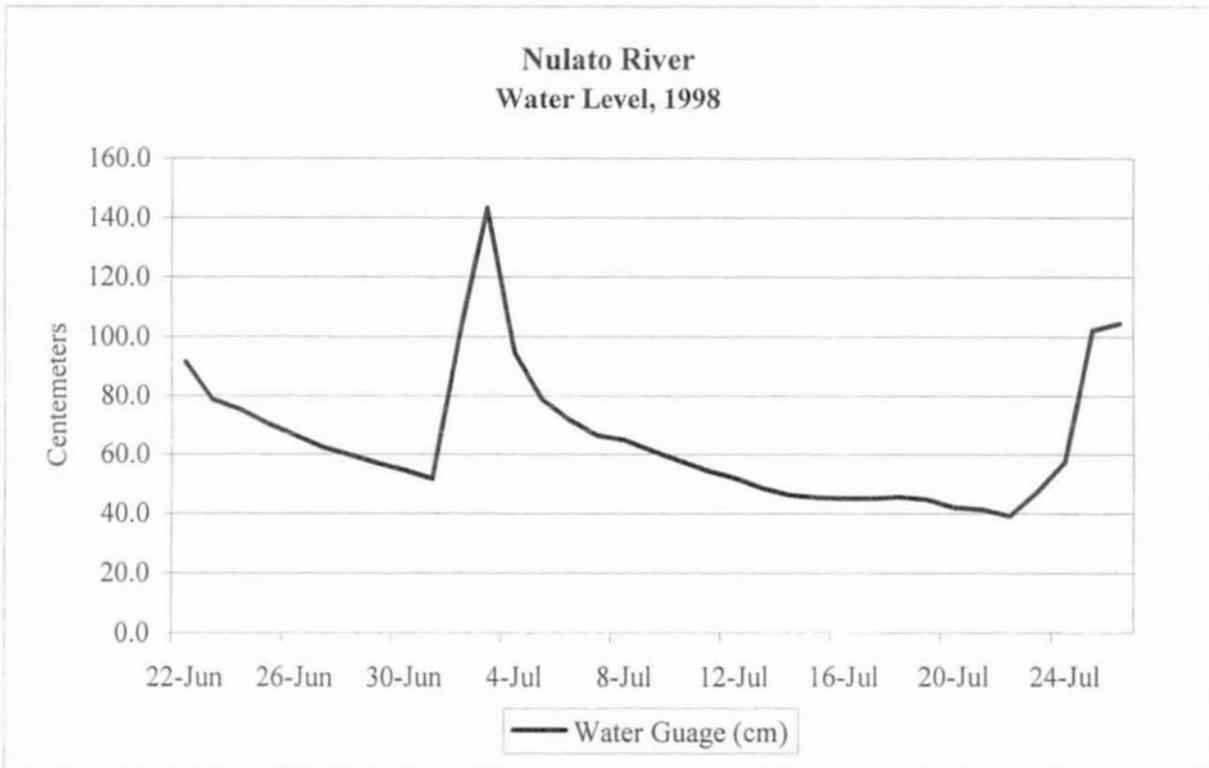
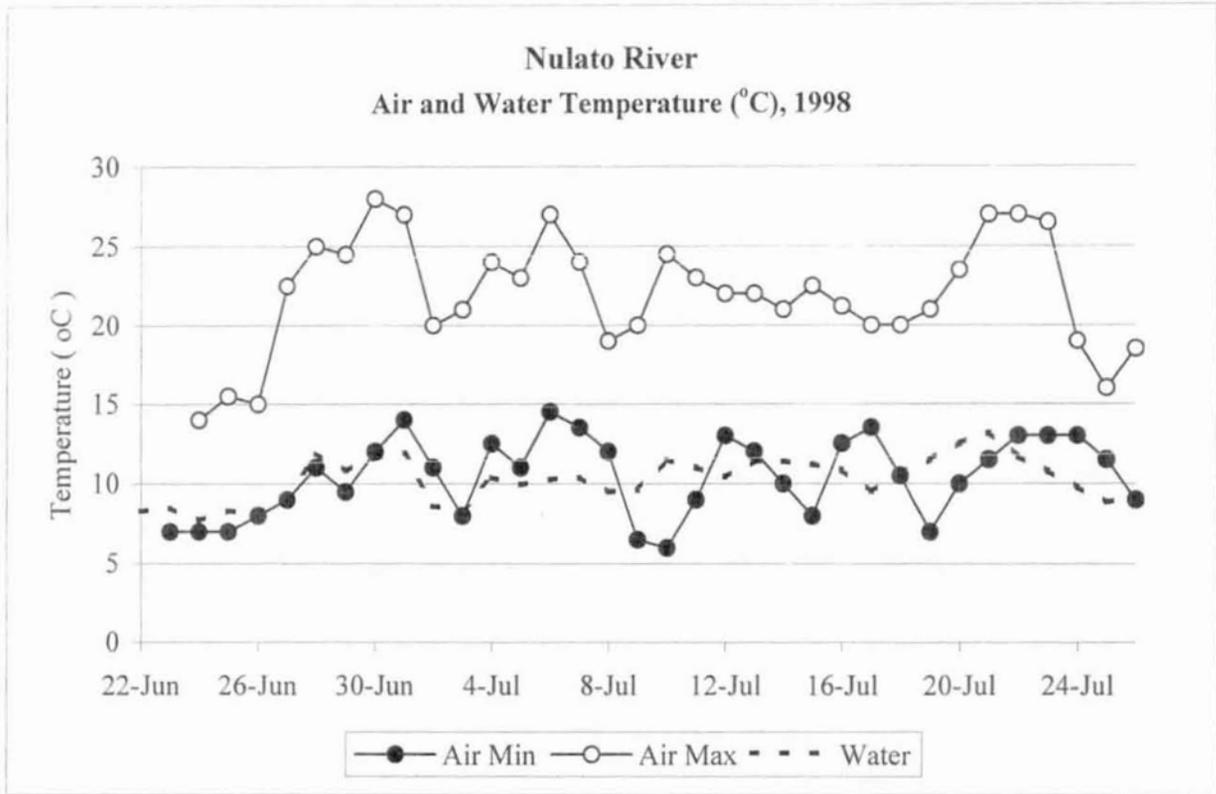


Figure 7. Nulato River tower escapement project climatological and hydrological observations, 1998.

APPENDICES

Appendix Table A.3. Nulato River tower project hourly salmon counts.

Nulato River Tower Project Hourly Salmon Counts, Date____, Year____.

| Hour Ending | Right Bank (gravel-bar side) | | | | Left Bank (cut-bank side) | | | | Total Both Banks | |
|--------------|------------------------------|-------------------------------|---------------|-----------------|---------------------------|-----------------|---------------|-----------------|----------------------|-------------------------|
| | Minutes Counted | Expansion Factor ^a | Actual Counts | Expanded Counts | Actual Counts | Expanded Counts | Actual Counts | Expanded Counts | Chum Expanded Counts | Chinook Expanded Counts |
| 0100 | | | | | | | | | | |
| 0200 | | | | | | | | | | |
| 0300 | | | | | | | | | | |
| 0400 | | | | | | | | | | |
| 0500 | | | | | | | | | | |
| 0600 | | | | | | | | | | |
| 0700 | | | | | | | | | | |
| 0800 | | | | | | | | | | |
| 0900 | | | | | | | | | | |
| 1000 | | | | | | | | | | |
| 1100 | | | | | | | | | | |
| 1200 | | | | | | | | | | |
| 1300 | | | | | | | | | | |
| 1400 | | | | | | | | | | |
| 1500 | | | | | | | | | | |
| 1600 | | | | | | | | | | |
| 1700 | | | | | | | | | | |
| 1800 | | | | | | | | | | |
| 1900 | | | | | | | | | | |
| 2000 | | | | | | | | | | |
| 2100 | | | | | | | | | | |
| 2200 | | | | | | | | | | |
| 2300 | | | | | | | | | | |
| 2400 | | | | | | | | | | |
| Total | | | | | | | | | 100.0% | 100.0% |

^a Hourly expansion factor = [60/(number of minutes counted)]

Appendix Table B.1. South (right) Bank Nulato River expanded chinook salmon tower counts by hour and date, 1998.

| Date | Hourly Counts (hour ending) | | | | | | | | | | | | | | | | | | | | | | | | Total | |
|--------|-----------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 | 24:00 | | |
| 22-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-Jun | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| 24-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 25-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 26-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 27-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 28-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 12 |
| 29-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 8 |
| 30-Jun | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 12 | |
| 1-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 2-Jul | 16 | 0 | | | | | | | | | | | | | | | | | | | | | | | | 16 |
| 3-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 4-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 5-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | 0 |
| 6-Jul | | | | | | | | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 16 | 4 | 4 | 24 | |
| 7-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 8-Jul | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 8 | 8 | 4 | 0 | 0 | 4 | 0 | 0 | 8 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 44 |
| 9-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 4 | 0 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 28 |
| 10-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 8 | 0 | 0 | 4 | 8 | 4 | 40 | |
| 11-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 12 | 0 | 4 | 4 | 0 | 0 | 4 | 4 | 4 | 32 | |
| 12-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 4 | 8 | 0 | 4 | 8 | 0 | 0 | 4 | 4 | 8 | 0 | 4 | 4 | 52 | |
| 13-Jul | 4 | 0 | 0 | 4 | 2 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 8 | 4 | 0 | 4 | 0 | 16 | 4 | 0 | 0 | 0 | 0 | 54 | |
| 14-Jul | 4 | 0 | 0 | 4 | 0 | 0 | 4 | 4 | 8 | 0 | 0 | 0 | 4 | 0 | 16 | 4 | 8 | 4 | 8 | 8 | 36 | 4 | 4 | 0 | 120 | |
| 15-Jul | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 4 | 4 | 0 | 0 | 4 | 24 | 24 | 0 | 0 | 0 | 0 | 72 | |
| 16-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 0 | 8 | 0 | 12 | 8 | 0 | 0 | 8 | 0 | 0 | 0 | 48 | |
| 17-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 16 | |
| 18-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 0 | 0 | 8 | 8 | 12 | 8 | 0 | 4 | 0 | 0 | 52 | |
| 19-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 8 | 8 | 0 | 4 | 8 | 8 | 0 | 12 | 4 | 0 | 0 | 0 | 56 | |
| 20-Jul | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 4 | 8 | 0 | 4 | 0 | 0 | 0 | 4 | 4 | 4 | 8 | 0 | 4 | 4 | 4 | 52 | |
| 21-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 4 | 4 | 0 | 0 | 8 | 0 | 0 | 0 | 28 | |
| 22-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 28 | |
| 23-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 24-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 24 | 4 | 0 | 8 | 14 | 4 | 12 | 16 | 40 | 20 | 24 | 16 | 56 | 20 | 68 | 36 | 52 | 68 | 36 | 100 | 104 | 32 | 24 | 28 | 806 | |

Appendix Table B.2. North (left) Bank Nulato River expanded chinook salmon tower counts by hour and date, 1998.

| Date | Hourly Counts (hour ending) | | | | | | | | | | | | | | | | | | | | | | | | Total | |
|--------|-----------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|---|
| | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 | 24:00 | | |
| 22-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | | | | | | | | | | | | | | 0 | |
| 23-Jun | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| 24-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | |
| 25-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 26-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | |
| 27-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 8 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 28 | |
| 28-Jun | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 12 | 8 | 4 | 8 | 0 | 4 | 4 | 0 | 8 | 0 | 8 | 12 | 76 | |
| 29-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 12 | |
| 30-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 1-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2-Jul | 0 | 4 | | | | | | | | | | | | | | | | | | | | | | | 4 | |
| 3-Jul | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 4-Jul | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 5-Jul | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 6-Jul | | | | | | | | | | | | | | | | | 0 | 4 | 4 | 0 | 0 | 4 | 0 | 0 | 12 | |
| 7-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 8-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 8 | 4 | 12 | 4 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 40 | |
| 9-Jul | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 32 | |
| 10-Jul | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 4 | 0 | 12 | 0 | 4 | 0 | 4 | 0 | 0 | 4 | 8 | 0 | 0 | 0 | 44 | |
| 11-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | 12 | |
| 12-Jul | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 12 | 8 | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 40 | |
| 13-Jul | 4 | 0 | 0 | 4 | 0 | 0 | 8 | 0 | 8 | 4 | 0 | 4 | 4 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 48 | |
| 14-Jul | 0 | 0 | 0 | 0 | 8 | 0 | 8 | 4 | 8 | 4 | 4 | 4 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 4 | 4 | 4 | 64 | |
| 15-Jul | 8 | 8 | 0 | 0 | 0 | 4 | 0 | 8 | 4 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 8 | 4 | 4 | 4 | 0 | 16 | 0 | 4 | 84 | |
| 16-Jul | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 8 | 4 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | |
| 17-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | |
| 18-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 8 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | |
| 19-Jul | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 0 | 4 | 4 | 0 | 4 | 4 | -2 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 22 | |
| 20-Jul | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 4 | 4 | -4 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 20 | |
| 21-Jul | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 8 | 0 | 8 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 32 | |
| 22-Jul | 4 | 0 | 0 | 0 | 0 | 8 | 0 | 4 | 0 | 4 | 0 | 8 | 4 | 0 | 0 | 4 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 44 | |
| 23-Jul | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | | | | 20 | |
| 24-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 32 | 16 | 4 | 4 | 12 | 26 | 20 | 20 | 38 | 28 | 24 | 48 | 88 | 40 | 48 | 44 | 18 | 20 | 20 | 32 | 28 | 28 | 20 | 40 | 698 | |

Appendix Table B.3. South (right) and North (left) Bank Nulato River combined expanded chinook salmon tower counts by hour and date, 1998.

| Date | Hourly Counts (hour ending) | | | | | | | | | | | | | | | | | | | | | | | | Total | |
|--------|-----------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|----|
| | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 | 24:00 | | |
| 22-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-Jun | | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 |
| 24-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 |
| 25-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 26-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 27-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 8 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 28 |
| 28-Jun | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 12 | 8 | 8 | 8 | 0 | 4 | 4 | 0 | 12 | 0 | 8 | 12 | 88 | |
| 29-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 4 | 0 | 0 | 4 | 0 | 0 | 4 | 4 | 20 | |
| 30-Jun | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 12 | |
| 1-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 2-Jul | 16 | 4 | | | | | | | | | | | | | | | | | | | | | | | 20 | |
| 3-Jul | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 4-Jul | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 5-Jul | | | | | | | | | | | | | | | | | | | | | | | | | 0 | |
| 6-Jul | | | | | | | | | | | | | | | | | 0 | 4 | 4 | 0 | 0 | 20 | 4 | 4 | 36 | |
| 7-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | |
| 8-Jul | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 8 | 8 | 4 | 0 | 8 | 8 | 12 | 4 | 12 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 84 | |
| 9-Jul | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 12 | 0 | 8 | 0 | 0 | 12 | 0 | 4 | 4 | 0 | 0 | 4 | 60 | |
| 10-Jul | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 8 | 8 | 0 | 12 | 0 | 4 | 4 | 4 | 8 | 0 | 12 | 8 | 0 | 4 | 8 | 84 | |
| 11-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 12 | 0 | 8 | 4 | 0 | 0 | 4 | 8 | 44 | | |
| 12-Jul | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 8 | 20 | 8 | 8 | 8 | 0 | 0 | 0 | 8 | 4 | 12 | 0 | 4 | 92 | |
| 13-Jul | 8 | 0 | 0 | 8 | 2 | 0 | 8 | 0 | 16 | 4 | 0 | 4 | 4 | 0 | 8 | 8 | 0 | 4 | 0 | 16 | 4 | 0 | 4 | 4 | 102 | |
| 14-Jul | 4 | 0 | 0 | 4 | 8 | 0 | 12 | 8 | 16 | 4 | 4 | 4 | 8 | 0 | 16 | 4 | 12 | 4 | 8 | 12 | 36 | 8 | 8 | 4 | 184 | |
| 15-Jul | 8 | 8 | 0 | 0 | 4 | 4 | 0 | 8 | 4 | 0 | 8 | 0 | 4 | 8 | 4 | 4 | 8 | 4 | 8 | 28 | 24 | 16 | 0 | 4 | 156 | |
| 16-Jul | 4 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 12 | 4 | 8 | 4 | 0 | 8 | 0 | 12 | 8 | 0 | 0 | 8 | 0 | 0 | 0 | 76 | |
| 17-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 0 | 0 | 0 | 20 | |
| 18-Jul | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 4 | 16 | 0 | 4 | 4 | 8 | 8 | 12 | 8 | 0 | 4 | 0 | 0 | 76 | |
| 19-Jul | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 6 | 0 | 0 | 4 | 12 | 8 | 4 | 8 | 6 | 8 | 0 | 16 | 4 | 0 | 0 | 0 | 78 | |
| 20-Jul | 0 | 0 | 0 | 0 | 8 | 4 | 0 | 0 | 0 | 4 | 8 | 4 | 4 | 0 | 4 | 4 | -4 | 4 | 4 | 8 | 8 | 0 | 8 | 4 | 72 | |
| 21-Jul | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 12 | 0 | 12 | 4 | 0 | 4 | 12 | 0 | 0 | 0 | 60 | |
| 22-Jul | 4 | 0 | 0 | 0 | 0 | 8 | 4 | 4 | 0 | 8 | 0 | 8 | 8 | 0 | 4 | 4 | 0 | 8 | 4 | 4 | 4 | 0 | 0 | 0 | 72 | |
| 23-Jul | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | |
| 24-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 56 | 20 | 4 | 12 | 26 | 30 | 32 | 36 | 78 | 48 | 48 | 64 | 144 | 60 | 116 | 80 | 70 | 88 | 56 | 132 | 132 | 60 | 44 | 68 | 1,504 | |

Appendix Table B.4. South (right) Bank Nulato River expanded summer chum salmon tower counts by hour and date, 1998.

| Date | Hourly Counts (hour ending) | | | | | | | | | | | | | | | | | | | | | | | | Total | |
|--------|-----------------------------|-------|-------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|---|
| | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 | 24:00 | | |
| 22-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-Jun | | | | | | | | | | | | | | | | | | | | | | | | | 4 | 4 |
| 24-Jun | 0 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 24 | |
| 25-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 4 | 0 | 24 | |
| 26-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 8 | 16 | 0 | 4 | 0 | 0 | 16 | 4 | 56 | |
| 27-Jun | 0 | 8 | 0 | 12 | 0 | 4 | 0 | 0 | 4 | 4 | 0 | 0 | 4 | 0 | 0 | 12 | 0 | 8 | 20 | 0 | 136 | 60 | 64 | 336 | | |
| 28-Jun | 52 | 44 | 56 | 112 | 0 | 52 | 4 | 0 | 4 | 0 | 8 | 0 | 2 | 4 | 0 | 0 | 16 | 8 | 0 | 36 | 32 | 8 | 32 | 20 | 490 | |
| 29-Jun | 28 | 56 | 32 | 36 | -16 | 24 | 0 | 0 | 0 | 0 | 0 | 8 | 4 | 20 | 0 | 8 | 24 | 16 | 26 | 36 | 12 | 0 | 8 | 0 | 322 | |
| 30-Jun | 36 | 20 | 44 | 20 | 52 | 0 | 60 | -4 | -4 | 0 | 0 | 0 | 0 | 0 | 8 | 20 | 12 | 8 | 0 | 4 | 8 | 48 | 0 | 48 | 380 | |
| 1-Jul | 36 | 0 | 0 | 0 | 0 | 0 | 4 | 8 | 4 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 4 | 12 | 16 | 8 | 16 | 28 | 12 | 152 | |
| 2-Jul | 16 | 10 | 9 | 7 | 6 | 7 | 10 | 11 | 7 | 4 | 5 | 6 | 9 | 8 | 9 | 10 | 0 | 7 | 15 | 31 | 38 | 47 | 30 | 44 | 347 | |
| 3-Jul | 34 | 21 | 19 | 13 | 13 | 14 | 16 | 14 | 11 | 8 | 10 | 12 | 13 | 16 | 17 | 20 | 0 | 10 | 18 | 46 | 69 | 78 | 31 | 76 | 580 | |
| 4-Jul | 52 | 31 | 28 | 20 | 19 | 21 | 21 | 18 | 14 | 12 | 15 | 18 | 18 | 23 | 26 | 31 | 0 | 14 | 22 | 62 | 99 | 110 | 33 | 108 | 813 | |
| 5-Jul | 70 | 41 | 37 | 26 | 25 | 28 | 27 | 21 | 17 | 16 | 21 | 23 | 23 | 31 | 35 | 41 | 0 | 17 | 25 | 77 | 130 | 141 | 34 | 140 | 1,046 | |
| 6-Jul | 89 | 52 | 47 | 33 | 31 | 35 | 33 | 24 | 20 | 20 | 26 | 29 | 28 | 39 | 43 | 51 | 0 | 20 | 28 | 92 | 160 | 172 | 36 | 172 | 1,278 | |
| 7-Jul | 92 | 56 | 28 | 48 | 12 | 4 | 20 | 4 | 20 | 24 | 12 | 8 | 8 | 4 | 32 | 0 | 16 | 20 | 12 | 60 | 20 | 28 | 76 | 188 | 792 | |
| 8-Jul | 120 | 56 | 88 | 0 | 28 | 52 | 80 | 44 | 60 | 72 | 40 | 112 | 72 | 52 | 64 | 96 | 120 | 100 | 84 | 88 | 148 | 216 | 68 | 192 | 2,052 | |
| 9-Jul | 108 | 72 | 40 | 40 | 76 | 56 | 56 | 28 | 16 | 28 | 44 | 48 | 64 | 52 | 80 | 68 | 60 | 88 | 48 | 120 | 100 | 112 | 80 | 192 | 1,676 | |
| 10-Jul | 216 | 188 | 248 | 68 | 100 | 64 | 72 | 56 | 16 | 40 | 44 | 24 | 32 | 108 | 76 | 60 | 76 | 224 | 200 | 512 | 440 | 320 | 316 | 368 | 3,868 | |
| 11-Jul | 184 | 116 | 104 | 52 | 38 | 24 | 8 | 0 | 16 | 20 | 76 | 60 | 32 | 68 | 76 | 96 | 116 | 92 | 108 | 100 | 160 | 140 | 116 | 84 | 1,886 | |
| 12-Jul | 132 | 40 | 20 | 48 | 36 | 60 | 28 | 44 | 52 | 32 | 28 | 24 | 20 | 36 | 56 | 76 | 48 | 44 | 56 | 40 | 80 | 36 | 52 | 136 | 1,224 | |
| 13-Jul | 164 | 124 | 72 | 20 | 44 | 68 | 68 | 56 | 60 | 40 | 64 | 24 | 84 | 72 | 72 | 140 | 84 | 108 | 124 | 280 | 376 | 484 | 220 | 184 | 3,032 | |
| 14-Jul | 340 | 156 | 112 | 100 | 72 | 80 | 72 | 100 | 84 | 12 | 64 | 36 | 28 | 140 | 136 | 108 | 164 | 164 | 208 | 244 | 312 | 444 | 172 | 112 | 3,460 | |
| 15-Jul | 160 | 76 | 84 | 64 | 100 | 60 | 52 | 32 | 8 | 12 | 0 | 28 | 48 | 40 | 76 | 80 | 100 | 156 | 296 | 316 | 196 | 300 | 216 | 180 | 2,680 | |
| 16-Jul | 188 | 96 | 72 | 48 | 84 | 88 | 124 | 64 | 28 | 48 | 52 | 120 | 76 | 64 | 68 | 100 | 88 | 76 | 176 | 52 | 124 | 132 | 92 | 40 | 2,100 | |
| 17-Jul | 76 | 12 | 16 | 8 | 20 | 24 | 28 | 20 | 12 | 32 | 28 | 8 | 36 | 40 | 64 | 80 | 72 | 52 | 36 | 28 | 52 | 20 | 56 | 36 | 856 | |
| 18-Jul | 20 | 20 | 16 | 24 | 16 | 56 | 12 | 28 | 12 | 12 | 40 | 60 | 32 | 76 | 64 | 84 | 108 | 76 | 112 | 84 | 76 | 120 | 88 | 44 | 1,280 | |
| 19-Jul | 4 | 20 | 24 | 8 | 12 | 36 | 16 | 16 | 8 | 16 | 4 | 20 | 4 | 24 | 12 | 44 | 20 | 76 | 44 | 88 | 36 | 64 | 24 | 40 | 660 | |
| 20-Jul | 40 | 20 | 8 | 16 | 20 | 8 | 20 | 24 | 32 | 28 | 40 | 52 | 32 | 60 | 52 | 48 | 32 | 16 | 124 | 88 | 60 | 16 | 44 | 60 | 940 | |
| 21-Jul | 20 | 8 | 8 | 24 | 12 | 20 | 20 | 24 | 16 | 12 | 32 | 8 | 28 | 28 | 32 | 48 | 56 | 40 | 84 | 76 | 52 | 48 | 40 | 20 | 756 | |
| 22-Jul | 28 | 8 | 4 | 8 | 16 | 28 | 12 | 8 | 24 | 20 | 16 | 36 | 20 | 12 | 20 | 20 | 28 | 20 | 32 | 32 | 28 | 20 | 24 | 20 | 484 | |
| 23-Jul | 16 | 12 | 8 | 8 | 12 | 28 | 16 | 20 | 4 | 8 | 8 | 16 | 4 | 24 | 16 | 28 | 4 | 24 | 12 | 0 | 19 | 14 | 16 | 14 | 331 | |
| 24-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 2,321 | 1,371 | 1,228 | 862 | 828 | 941 | 878 | 660 | 545 | 523 | 677 | 780 | 733 | 1,041 | 1,141 | 1,357 | 1,264 | 1,500 | 1,910 | 2,648 | 2,835 | 3,270 | 2,012 | 2,602 | 33,928 | |

Appendix Table B.5. North (left) Bank Nulato River expanded summer chum salmon tower counts by hour and date, 1998.

| Date | Hourly Counts (hour ending) | | | | | | | | | | | | | | | | | | | | | | | | Total | |
|--------|-----------------------------|------|------|------|------|------|------|------|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|--------|
| | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 | 24:00 | | |
| 22-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-Jun | | | | | | | | | | | | | | | | | | | | | | | | 0 | 0 | 0 |
| 24-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 4 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 12 |
| 25-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 8 | 0 | 0 | 4 | 0 | 8 | 4 | 0 | 0 | 4 | 0 | 32 |
| 26-Jun | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 4 | 0 | 8 | 12 | 24 | 0 | 16 | 20 | 20 | 12 | 124 | 124 | |
| 27-Jun | 0 | 0 | 8 | 0 | 4 | 4 | 4 | 24 | 12 | 12 | 4 | 0 | 0 | 4 | 24 | 4 | 4 | 24 | 16 | 24 | 4 | 28 | 4 | 44 | 252 | 252 |
| 28-Jun | 4 | 8 | 4 | 0 | 8 | 0 | 4 | 0 | 24 | 4 | 4 | 8 | 4 | 0 | 0 | 20 | 4 | 4 | 12 | 56 | 28 | 20 | 36 | 28 | 280 | 280 |
| 29-Jun | 12 | 0 | 12 | 16 | 20 | 32 | 4 | 20 | 4 | 0 | 12 | 0 | 20 | 20 | 20 | 28 | 8 | 20 | 40 | 68 | 4 | 28 | 0 | 12 | 400 | 400 |
| 30-Jun | 4 | 4 | 20 | 0 | 8 | 20 | 12 | 4 | 4 | 0 | 4 | 4 | 4 | 4 | 4 | 16 | 4 | 8 | 64 | 16 | 48 | 12 | 36 | 36 | 336 | 336 |
| 1-Jul | 36 | 44 | 24 | 16 | 44 | 12 | 48 | 16 | 12 | 16 | 12 | 28 | 12 | 0 | 0 | 0 | 20 | 8 | 0 | 84 | 40 | 48 | 16 | 20 | 556 | 556 |
| 2-Jul | 16 | 12 | 3 | 2 | 5 | 1 | 8 | 9 | 4 | 3 | 5 | 4 | 1 | 4 | 3 | 1 | 7 | 4 | 2 | 11 | 7 | 12 | 18 | 8 | 150 | 150 |
| 3-Jul | 86 | 15 | 4 | 1 | 4 | 1 | 21 | 39 | 13 | 8 | 22 | 7 | 1 | 19 | 14 | 7 | 15 | 10 | 31 | 29 | 23 | 42 | 39 | 60 | 513 | 513 |
| 4-Jul | 157 | 18 | 6 | 1 | 3 | 1 | 33 | 69 | 22 | 14 | 39 | 10 | 1 | 34 | 26 | 13 | 37 | 23 | 32 | 33 | 34 | 69 | 126 | 78 | 876 | 876 |
| 5-Jul | 168 | 14 | 83 | 45 | 2 | 16 | 48 | 79 | 27 | 23 | 37 | 27 | 13 | 46 | 20 | 32 | 48 | 46 | 75 | 26 | 77 | 79 | 118 | 89 | 1,239 | 1,239 |
| 6-Jul | 279 | 41 | 12 | 3 | 8 | 2 | 62 | 124 | 40 | 26 | 70 | 20 | 2 | 60 | 45 | 23 | 44 | 32 | 104 | 88 | 72 | 132 | 116 | 196 | 1,602 | 1,602 |
| 7-Jul | 148 | 12 | 4 | 0 | 0 | 0 | 28 | 64 | 20 | 12 | 36 | 8 | 0 | 32 | 24 | 12 | 40 | 24 | 16 | 20 | 28 | 60 | 148 | 56 | 792 | 792 |
| 8-Jul | 56 | 0 | 100 | 56 | 0 | 20 | 28 | 32 | 12 | 16 | 8 | 24 | 16 | 24 | 0 | 28 | 24 | 36 | 64 | 0 | 64 | 32 | 24 | 36 | 700 | 700 |
| 9-Jul | 100 | 24 | 16 | 24 | 32 | 24 | 0 | 8 | 4 | 4 | 20 | 12 | 28 | 20 | 8 | 16 | 24 | 12 | 16 | 28 | 12 | 36 | 20 | 28 | 516 | 516 |
| 10-Jul | 180 | 52 | 40 | 32 | 28 | 24 | 32 | 44 | 24 | 8 | 20 | 24 | 12 | 16 | 0 | 8 | 16 | 24 | 28 | 60 | 80 | 72 | 40 | 36 | 900 | 900 |
| 11-Jul | 144 | 44 | 28 | 36 | 24 | 34 | 44 | 20 | 16 | 4 | 0 | 4 | 8 | 12 | 0 | 24 | 84 | 44 | 36 | 20 | 44 | 76 | 32 | 48 | 826 | 826 |
| 12-Jul | 28 | 44 | 20 | 16 | 12 | 36 | 52 | 12 | 80 | 44 | 56 | 20 | 40 | 48 | 48 | 80 | 40 | 28 | 44 | 24 | 40 | 76 | 76 | 104 | 1,068 | 1,068 |
| 13-Jul | 80 | 72 | 36 | 12 | 16 | 48 | 68 | 44 | 36 | 24 | 20 | 44 | 44 | 56 | 28 | 44 | 64 | 24 | 40 | 24 | 96 | 128 | 136 | 168 | 1,352 | 1,352 |
| 14-Jul | 84 | 112 | 100 | 84 | 48 | 88 | 104 | 52 | 60 | 44 | 32 | 36 | 48 | 32 | 24 | 4 | 84 | 28 | 28 | 24 | 52 | 112 | 56 | 64 | 1,400 | 1,400 |
| 15-Jul | 100 | 104 | 36 | 24 | 32 | 56 | 40 | 20 | 28 | 40 | 44 | 24 | 32 | 36 | 20 | 24 | 76 | -4 | 68 | 64 | 96 | 44 | 84 | 36 | 1,124 | 1,124 |
| 16-Jul | 44 | 36 | 48 | 16 | 48 | 24 | 16 | 36 | 36 | 16 | 12 | 32 | 28 | 32 | 12 | 16 | 36 | -4 | 44 | 12 | 44 | 24 | 44 | 28 | 680 | 680 |
| 17-Jul | 92 | 20 | 16 | 24 | 8 | 20 | 28 | 40 | 0 | 20 | 4 | 20 | 16 | 16 | 12 | 0 | 8 | 16 | 4 | 24 | 8 | 8 | 28 | 0 | 432 | 432 |
| 18-Jul | 20 | 20 | 20 | 16 | 20 | 8 | 16 | 28 | 16 | 16 | 0 | 24 | 28 | 12 | 24 | 28 | 64 | 52 | 20 | 48 | 32 | 12 | 12 | 40 | 576 | 576 |
| 19-Jul | 2 | 2 | 3 | 3 | 2 | 1 | 2 | 4 | 2 | 2 | 2 | 2 | 4 | 2 | 4 | 5 | 5 | -4 | 4 | 8 | 12 | 0 | 4 | 4 | 74 | 74 |
| 20-Jul | 12 | 4 | 24 | 20 | 0 | 4 | 12 | 20 | 8 | 12 | 24 | 8 | 20 | 12 | 24 | 36 | 4 | 20 | 24 | 12 | 8 | 32 | 8 | 52 | 400 | 400 |
| 21-Jul | 20 | 12 | 16 | 4 | 16 | 8 | 28 | 32 | 16 | 20 | 8 | 8 | 16 | 12 | 16 | 24 | 8 | 32 | 16 | 24 | 8 | 20 | 16 | 8 | 388 | 388 |
| 22-Jul | 16 | 8 | 4 | 4 | 20 | 28 | 16 | 28 | 16 | 20 | 20 | 28 | 16 | 12 | 8 | 20 | 16 | 4 | 12 | 8 | 12 | 4 | 8 | 4 | 332 | 332 |
| 23-Jul | 4 | 12 | 4 | 8 | 16 | 4 | 4 | 12 | 20 | 8 | 4 | 12 | 16 | 8 | 28 | 4 | 4 | 0 | 0 | 0 | 6 | 2 | 4 | 2 | 182 | 182 |
| 24-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 1,897 | 735 | 692 | 463 | 427 | 516 | 761 | 880 | 555 | 416 | 519 | 443 | 434 | 576 | 443 | 521 | 795 | 531 | 863 | 847 | 1,001 | 1,228 | 1,269 | 1,301 | 18,113 | 18,113 |

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Appendix Table B.6. South (right) and North (left) Bank Nulato River combined expanded summer chum salmon tower counts by hour and date, 1998.

| Date | Hourly Counts (hour ending) | | | | | | | | | | | | | | | | | | | | | | | | Total | |
|--------|-----------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|--------|----|
| | 1:00 | 2:00 | 3:00 | 4:00 | 5:00 | 6:00 | 7:00 | 8:00 | 9:00 | 10:00 | 11:00 | 12:00 | 13:00 | 14:00 | 15:00 | 16:00 | 17:00 | 18:00 | 19:00 | 20:00 | 21:00 | 22:00 | 23:00 | 24:00 | | |
| 22-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 23-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| 24-Jun | 0 | 8 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 8 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 36 |
| 25-Jun | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 16 | 0 | 0 | 4 | 0 | 20 | 4 | 0 | 4 | 0 | 4 | 56 |
| 26-Jun | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 4 | 0 | 0 | 16 | 28 | 24 | 4 | 16 | 20 | 36 | 16 | 180 | |
| 27-Jun | 0 | 8 | 8 | 12 | 4 | 8 | 4 | 24 | 16 | 16 | 4 | 0 | 4 | 4 | 24 | 4 | 16 | 24 | 24 | 44 | 4 | 164 | 64 | 108 | 588 | |
| 28-Jun | 56 | 52 | 60 | 112 | 8 | 52 | 8 | 0 | 28 | 4 | 12 | 8 | 6 | 4 | 0 | 20 | 20 | 12 | 12 | 92 | 60 | 28 | 68 | 48 | 770 | |
| 29-Jun | 40 | 56 | 44 | 52 | 4 | 56 | 4 | 20 | 4 | 0 | 12 | 8 | 24 | 40 | 20 | 36 | 32 | 36 | 66 | 104 | 16 | 28 | 8 | 12 | 722 | |
| 30-Jun | 40 | 24 | 64 | 20 | 60 | 20 | 72 | 0 | 0 | 0 | 4 | 4 | 4 | 4 | 12 | 36 | 16 | 16 | 64 | 20 | 56 | 60 | 36 | 84 | 716 | |
| 1-Jul | 72 | 44 | 24 | 16 | 44 | 12 | 52 | 24 | 16 | 16 | 12 | 28 | 16 | 0 | 0 | 0 | 20 | 12 | 12 | 100 | 48 | 64 | 44 | 32 | 708 | |
| 2-Jul | 32 | 22 | 12 | 8 | 11 | 8 | 18 | 20 | 11 | 7 | 10 | 10 | 10 | 11 | 11 | 12 | 7 | 11 | 17 | 43 | 46 | 59 | 48 | 52 | 496 | |
| 3-Jul | 121 | 36 | 23 | 14 | 16 | 15 | 36 | 53 | 23 | 16 | 32 | 19 | 14 | 34 | 31 | 27 | 15 | 21 | 49 | 76 | 92 | 121 | 70 | 136 | 1,092 | |
| 4-Jul | 210 | 50 | 34 | 21 | 21 | 22 | 54 | 87 | 36 | 25 | 54 | 28 | 19 | 57 | 51 | 43 | 37 | 37 | 53 | 95 | 134 | 178 | 158 | 186 | 1,688 | |
| 5-Jul | 238 | 56 | 120 | 71 | 27 | 44 | 75 | 100 | 44 | 39 | 57 | 50 | 36 | 77 | 55 | 73 | 48 | 63 | 100 | 103 | 207 | 220 | 152 | 229 | 2,284 | |
| 6-Jul | 368 | 93 | 59 | 36 | 40 | 37 | 95 | 148 | 60 | 45 | 96 | 50 | 30 | 99 | 88 | 74 | 44 | 52 | 132 | 180 | 232 | 304 | 152 | 368 | 2,880 | |
| 7-Jul | 240 | 68 | 32 | 48 | 12 | 4 | 48 | 68 | 40 | 36 | 48 | 16 | 8 | 36 | 56 | 12 | 56 | 44 | 28 | 80 | 48 | 88 | 224 | 244 | 1,584 | |
| 8-Jul | 176 | 56 | 188 | 56 | 28 | 72 | 108 | 76 | 72 | 88 | 48 | 136 | 88 | 76 | 64 | 124 | 144 | 136 | 148 | 88 | 212 | 248 | 92 | 228 | 2,752 | |
| 9-Jul | 208 | 96 | 56 | 64 | 108 | 80 | 56 | 36 | 20 | 32 | 64 | 60 | 92 | 72 | 88 | 84 | 84 | 100 | 64 | 148 | 112 | 148 | 100 | 220 | 2,192 | |
| 10-Jul | 396 | 240 | 288 | 100 | 128 | 88 | 104 | 100 | 40 | 48 | 64 | 48 | 44 | 124 | 76 | 68 | 92 | 248 | 228 | 572 | 520 | 392 | 356 | 404 | 4,768 | |
| 11-Jul | 328 | 160 | 132 | 88 | 62 | 58 | 52 | 20 | 32 | 24 | 76 | 64 | 40 | 80 | 76 | 120 | 200 | 136 | 144 | 120 | 204 | 216 | 148 | 132 | 2,712 | |
| 12-Jul | 160 | 84 | 40 | 64 | 48 | 96 | 80 | 56 | 132 | 76 | 84 | 44 | 60 | 84 | 104 | 156 | 88 | 72 | 100 | 64 | 120 | 112 | 128 | 240 | 2,292 | |
| 13-Jul | 244 | 196 | 108 | 32 | 60 | 116 | 136 | 100 | 96 | 64 | 84 | 68 | 128 | 128 | 100 | 184 | 148 | 132 | 164 | 304 | 472 | 612 | 356 | 352 | 4,384 | |
| 14-Jul | 424 | 268 | 212 | 184 | 120 | 168 | 176 | 152 | 144 | 56 | 96 | 72 | 76 | 172 | 160 | 112 | 248 | 192 | 236 | 268 | 364 | 556 | 228 | 176 | 4,860 | |
| 15-Jul | 260 | 180 | 120 | 88 | 132 | 116 | 92 | 52 | 36 | 52 | 44 | 52 | 80 | 76 | 96 | 104 | 176 | 152 | 364 | 380 | 292 | 344 | 300 | 216 | 3,804 | |
| 16-Jul | 232 | 132 | 120 | 64 | 132 | 112 | 140 | 100 | 64 | 64 | 64 | 152 | 104 | 96 | 80 | 116 | 124 | 72 | 220 | 64 | 168 | 156 | 136 | 68 | 2,780 | |
| 17-Jul | 168 | 32 | 32 | 32 | 28 | 44 | 56 | 60 | 12 | 52 | 32 | 28 | 52 | 56 | 76 | 80 | 80 | 68 | 40 | 52 | 60 | 28 | 84 | 36 | 1,288 | |
| 18-Jul | 40 | 40 | 36 | 40 | 36 | 64 | 28 | 56 | 28 | 28 | 40 | 84 | 60 | 88 | 88 | 112 | 172 | 128 | 132 | 132 | 108 | 132 | 100 | 84 | 1,856 | |
| 19-Jul | 6 | 22 | 27 | 11 | 14 | 37 | 18 | 20 | 10 | 18 | 6 | 22 | 8 | 26 | 16 | 49 | 25 | 72 | 48 | 96 | 48 | 64 | 28 | 44 | 734 | |
| 20-Jul | 52 | 24 | 32 | 36 | 20 | 12 | 32 | 44 | 40 | 40 | 64 | 60 | 52 | 72 | 76 | 84 | 36 | 36 | 148 | 100 | 68 | 48 | 52 | 112 | 1,340 | |
| 21-Jul | 40 | 20 | 24 | 28 | 28 | 28 | 48 | 56 | 32 | 32 | 40 | 16 | 44 | 40 | 48 | 72 | 64 | 72 | 100 | 100 | 60 | 68 | 56 | 28 | 1,144 | |
| 22-Jul | 44 | 16 | 8 | 12 | 36 | 56 | 28 | 36 | 40 | 40 | 36 | 64 | 36 | 24 | 28 | 40 | 44 | 24 | 44 | 40 | 40 | 24 | 32 | 24 | 816 | |
| 23-Jul | 20 | 24 | 12 | 16 | 28 | 32 | 20 | 32 | 24 | 16 | 12 | 28 | 20 | 32 | 44 | 32 | 8 | 24 | 12 | 0 | 25 | 16 | 20 | 16 | 513 | |
| 24-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 25-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 26-Jul | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Total | 4,218 | 2,107 | 1,919 | 1,325 | 1,255 | 1,458 | 1,639 | 1,539 | 1,100 | 939 | 1,196 | 1,223 | 1,167 | 1,617 | 1,585 | 1,878 | 2,059 | 2,031 | 2,773 | 3,495 | 3,836 | 4,498 | 3,281 | 3,903 | 52,041 | |

Appendix Table C. Nulato River summer chum salmon age and sex composition by stratum and weighted season total, 1998.

| Strata Dates | Sample Size | | | Brood Year and (Age Group) | | | Total |
|------------------|-------------|----------|-------------------|----------------------------|---------------|---------------|--------|
| | | | | 1994 (0.3) | 1993 (0.4) | 1992 (0.5) | |
| June 20 - July 3 | 151 | Males | No. in Escapement | 1,280 | 996 | 142 | 2,418 |
| | | | Percent of Sample | 23.8 | 18.5 | 2.6 | 45.0 |
| | | Females | No. in Escapement | 2,062 | 889 | 0 | 2,951 |
| | | | Percent of Sample | 38.4 | 16.6 | 0.0 | 55.0 |
| | | Subtotal | No. in Escapement | 3,342 | 1,885 | 142 | 5,369 |
| | | | Percent of Sample | 62.3 | 35.1 | 2.6 | 100.0 |
| July 4-8 | 143 | Males | No. in Escapement | 2,660 | 861 | 0 | 3,521 |
| | | | Percent of Sample | 23.8 | 7.7 | 0.0 | 31.5 |
| | | Females | No. in Escapement | 5,243 | 2,347 | 78 | 7,668 |
| | | | Percent of Sample | 46.9 | 21.0 | 0.7 | 68.5 |
| | | Subtotal | No. in Escapement | 7,903 | 3,208 | 78 | 11,189 |
| | | | Percent of Sample | 70.6 | 28.7 | 0.7 | 100.0 |
| July 9-13 | 140 | Males | No. in Escapement | 3,270 | 2,102 | 0 | 5,372 |
| | | | Percent of Sample | 20.0 | 12.9 | 0.0 | 32.9 |
| | | Females | No. in Escapement | 7,706 | 3,270 | 0 | 10,976 |
| | | | Percent of Sample | 47.1 | 20.0 | 0.0 | 67.1 |
| | | Subtotal | No. in Escapement | 10,976 | 5,372 | 0 | 16,348 |
| | | | Percent of Sample | 67.1 | 32.9 | 0.0 | 100.0 |
| July 14-26 | 146 | Males | No. in Escapement | 4,849 | 2,359 | 131 | 7,339 |
| | | | Percent of Sample | 25.3 | 12.3 | 0.7 | 38.4 |
| | | Females | No. in Escapement | 8,388 | 3,277 | 131 | 11,796 |
| | | | Percent of Sample | 43.8 | 17.1 | 0.7 | 61.6 |
| | | Subtotal | No. in Escapement | 13,237 | 5,636 | 262 | 19,135 |
| | | | Percent of Sample | 101.0 | 43.0 | 2.0 | 146 |
| Seasonal | 580 | Males | No. in Escapement | 12,059 | 6,318 | 273 | 18,650 |
| | | | Percent of Sample | 23.2 | 12.1 | 0.5 | 35.8 |
| | | Females | No. in Escapement | 23,399 | 9,783 | 209 | 33,391 |
| | | | Percent of Sample | 45.0 | 18.8 | 0.4 | 64.2 |
| | | Total | No. in Escapement | 35,458 | 16,101 | 482 | 52,041 |
| | | | Percent of Sample | 68.1 | 30.9 | 0.9 | 100.0 |