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# Abundance and Run Timing of Adult Salmon in the Gisasa River, Koyukuk National Wildlife Refuge, Alaska, 2014

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Jeremy G. Carlson

## Abstract

A resistance board weir was operated by the U.S. Fish and Wildlife Service, Fairbanks Fish and Wildlife Field Office to collect information on abundance, run timing, and biology of returning adult Chinook Salmon *Oncorhynchus tshawytscha* and summer Chum Salmon *O. keta* in the Gisasa River. The weir has been operated at this location since 1994 and this is the first year video technology has been incorporated into the project. In 2014, the weir was operated from July 2 through July 13. High water impeded weir operations for most of the 2014 season. During weir operation an estimated 1,589 Chinook Salmon and 32,523 summer Chum Salmon passed through the weir. The most abundant other species was Pink Salmon *Oncorhynchus gorbuscha* ( $N = 256$ ), followed by Northern Pike *Esox lucius* ( $N = 14$ ), Arctic Grayling *Thymallus arcticus* ( $N = 8$ ), Longnose Sucker *Catostomus catostomus* ( $N = 5$ ), and Whitefish (subfamily Coregoninae;  $N = 2$ ). During the first 5 days of weir operation, the estimated weekly sex composition for Chinook Salmon was 19% females. This estimate dropped to 18% for the next 7 days of operation for an 18% average for the duration of weir operations. Three primary age classes of Chinook Salmon were identified, 1.2, 1.3, and 1.4, with the predominant age class being 1.3 (66%). Length-at-age of female Chinook Salmon was larger than males. During the 5 days of weir operation, the estimated weekly sex composition for summer Chum Salmon was 50% females. This estimate was 52% for the next 7 days of operation for a 51% average for the duration of weir operations. There were two primary age classes identified for summer Chum Salmon, 0.3 and 0.4, with the predominant age class being 0.3 (48%). Length-at-age of male summer Chum Salmon was larger than females.

## Introduction

The Gisasa River, located within the Koyukuk National Wildlife Refuge in northcentral Interior Alaska, is a tributary of the Koyukuk River and provides spawning and rearing habitat for Chinook Salmon *Oncorhynchus tshawytscha* and Chum Salmon *Oncorhynchus keta*. These salmon species in the Gisasa River contribute to mixed stock subsistence and commercial fisheries in the Yukon River (USFWS 1993). The U.S. Fish and Wildlife Service (USFWS), through Section 302 of the Alaska National Interest Lands Conservation Act, has a responsibility to ensure that salmon populations within federal conservation units are conserved in their natural diversity, international treaty agreements are met, and subsistence opportunities are maintained.

Yukon River salmon returns declined in the late 1990s (Kruse 1998). These declines led to harvest restrictions, complete fishery closures, and spawning escapements below management goals (Vania et al. 2002). Since the late 1990s, Chum Salmon returns have shown considerable variability with no pattern of declining numbers (JTC 2014). However, Chinook returns rebounded and continued to improve from 2001 to 2006, and then declined again from 2007 to the present (JTC 2015). Management of individual stocks does not occur and accurate escapement data are limited throughout the Yukon River drainage. In-season management of the salmon fisheries is conducted using

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preseason projections based on parent stock returns, Pilot Station sonar counts, Eagle sonar counts, information provided by test fisheries, data from escapement projects, and harvest data from subsistence and commercial fisheries.

Historically, escapement information on individual salmon stocks from the Koyukuk River has been collected by aerial surveys. The Alaska Department of Fish and Game (ADF&G) has conducted these surveys on several index tributaries within the Koyukuk River drainage intermittently since 1960 (Barton 1984). Aerial surveys, however, are highly variable and provide only a point in time index of relative run strength. Counts produced using weirs or counting towers provide a better estimation of escapement, and weirs provide a platform for collecting other biological data. Weirs or counting towers have historically been operated on five different Koyukuk River tributaries since 1994. Weirs are currently operated on the Gisasa River and at Henshaw Creek (Figure 1).

The USFWS, Fairbanks Fish and Wildlife Field Office (FFWFO), has operated a resistance board weir on the Gisasa River since 1994 (Melegari and Wiswar 1995). Historical Chinook Salmon escapement estimates from weir counts on the Gisasa River through 2013 range from 1,126 to 4,023 fish per year. Summer Chum Salmon escapement estimates for the same period range from 10,155 to 261,305 fish per year. The Gisasa River weir study objectives for 2014 were to: (1) determine daily fish passage, estimate seasonal escapement, and describe run timing of adult Chinook Salmon and summer Chum Salmon, (2) determine age, sex, and length composition of adult Chinook Salmon and summer Chum Salmon, and (3) document observations of resident fish.

## **Study Area**

The Gisasa River headwaters originate in the Nulato Hills, and the river flows northeast as it passes through the Koyukuk National Wildlife Refuge. Approximately 112 km from its source, the Gisasa River enters the Koyukuk River at roughly 65° 15.206' N, 157° 42.529' W (USGS 1:63,360 series, Kateel River B-4 quadrangle), 90 km upriver from the mouth of the Koyukuk River (Figure 1). Climate in the region is continental subarctic with dramatic seasonal temperature variations and low precipitation. Mean annual air temperature at the village of Galena, 64 km southeast of the Gisasa River, is 3.8°C with extremes ranging from 32°C during summer to -57°C during winter (USFWS 1993). The hydrology of this area is dynamic throughout the year, with lower flows generally occurring in late summer. Peak flows usually occur during spring snow melt/breakup or occasionally during summer high precipitation events. Rivers in the area generally begin to freeze during October and breakup during May.

The weir site is located approximately 4 km upriver from the mouth of the Gisasa River. This section of the river is straight with generally laminar flow. The river channel cross section slopes gradually from both stream banks to the thalweg. The river width is approximately 45 m. The water depth was unusually high during the 2014 season due to flooding and was over the top of the depth gauge for most of the season. During the 12 days of weir operation, the depth at the trap near the thalweg, ranged from 62 to 96 cm (Appendix 2). Predominant substrate at the weir site consists of medium-size gravel 35-70 mm diameter.

## **Methods**

### *Weir Operation*

A resistance board weir was used to enumerate and collect biological data from adult salmon as they migrated up the Gisasa River to spawn. The Gisasa River weir has been installed at the same site

since the project was initiated in 1994, following the construction and installation methods described by Tobin (1994). More detailed information on deployment of the Gisasa River weir can be found in Melegari and Wiswar (1995). A live trap was installed approximately mid-channel, near the thalweg, allowing fish to be recorded as they passed through the weir and, when necessary, the trap was closed to collect fish for sampling. The weir was visually inspected for integrity and cleaned of debris daily. Cleaning consisted of raking debris from the upstream surface of the weir or walking across each panel to submerge it enough to allow the current to wash debris downstream. In 2014, a video camera system was installed on the upstream side of the trap box to capture video footage of migrating salmon which was used to enumerate fish passage by species. This video camera box funneled fish into a narrow passage providing motion capture footage to identify species, and determine sex for Chinook Salmon and Chum Salmon, without handling fish. The motion capture video files, which were saved to a hard drive, were reviewed and recorded on an electronic data sheet. Manual counts were conducted simultaneously and compared to the video counts from the live video feed and motion capture files to verify that the video motion capture was working properly and counts remained accurate. The video box was equipped with halogen lights so that fish could be observed 24 hours per day. This was the first year using this system and adjustments were made when necessary to optimize performance. Water depth (cm) was recorded once daily at the trap at approximately 0800 hours. In addition, temperature, conductivity, dissolved oxygen, and pH were collected with a YSI Professional Plus Multiprobe (Yellow Springs, Ohio) twice daily at approximately 0800 hours and 2000 hours upstream of the weir in a section of river where water was well mixed.

### *Biological Data*

The target start date of June 18 was based on previous years' salmon run timing data, but due to high water in the Gisasa River, and above average rain, the weir was not installed and operational until July 2. The end date of the project is determined in-season, normally when the daily count of both Chinook Salmon and summer Chum Salmon drops to less than 1% of the seasonal passage to date for three consecutive days, or when logistical constraints require stopping before this point is reached. In 2014, extreme high water resulted in failure of the weir causing many of the weir components to be washed downstream. The crew was unable to retrieve the weir components until the water subsided to a safe level which occurred on July 29. The weir was in operation from July 2 through July 13. All fish passing through the weir were identified to species and enumerated, with the exception of Whitefish *Coregonus* and *Prosopium* spp. Non-salmon species were usually not handled, making Whitefish species identification difficult. Therefore, all Whitefish species were grouped under the subfamily Coregoninae. With the installation of the video weir, we should be able identify Whitefish to species and will evaluate the ability to distinguish Whitefish species moving forward.

The daily counting schedule was implemented and fish were counted 24 hours per day. The manual counts were compared to video counts to ensure video counts and manual counts were within 3%. This allowed verification of the counts from the new video weir with motion activated technology. Sampling schedules and methods remained unchanged. Counts and sex ratios from the previous day were reported daily to the FFWFO using a satellite telephone.

A stratified random sampling scheme (Cochran 1977), with weeks as the strata, was used to collect age, sex, and length data from adult Chinook Salmon and summer Chum Salmon. Sampling was conducted throughout the week, targeting 160 salmon per species per week. Lengths were measured to the nearest 1 mm from mid eye to fork of the caudal fin (METF) and sex was visually determined by external morphological characteristics. Scales were collected for aging and ages were reported using the European method (Foerster 1968). Three scales were collected from Chinook Salmon and one scale from summer Chum Salmon. Scales were collected from the left side of the fish, two rows

above the lateral line on a diagonal from the posterior insertion of the dorsal fin to the anterior insertion of the anal fin. Scales from both adult salmon species were sent to ADF&G for processing. Previous studies have shown that nearly all age 1.1 and 1.2 Chinook Salmon are males (Brady 1983; Bales 2007; Karpovich and DuBois 2007). Therefore, all age 1.1 and 1.2 Chinook Salmon were assumed to be males regardless of the field determination.

### Data Analysis

For days with partial counts, i.e., high water or other events where fish could pass uncounted, adjustments to the counts were made. Days with counts greater than 6 hours but less than 24 hours were adjusted for a 24-hour period using:

$$E_d = (24/T_d) \bullet C_d,$$

where  $E_d$  = estimated daily count for day  $d$ ,  $T_d$  = number of hours sampled during day  $d$ , and  $C_d$  = number of fish counted during the time sampled in day  $d$ . Counts from days with less than 6 hours of the day counted were disregarded and were treated as completely missed days.

Age and sex data were collected and analyzed using a stratified random sampling design (Cochran 1977) with statistical weeks as the strata. Because the weir was only operated from July 2 through July 13, the 12 days of operation were divided into two statistical weeks for Chinook Salmon and Chum Salmon. Within a week, the proportion of the samples composed of a given sex or age,  $\hat{p}_{ij}$ , were calculated as:

$$\hat{p}_{ij} = \frac{n_{ij}}{n_j},$$

where  $n_{ij}$  is the number of fish by sex  $i$  or age  $i$  sampled in week  $j$ , and  $n_j$  is the total number of fish sampled in week  $j$ . The variance of  $\hat{p}_{ij}$  was calculated as:

$$\hat{v}(\hat{p}_{ij}) = \frac{\hat{p}_{ij}(1 - \hat{p}_{ij})}{n_j - 1}.$$

Sex and age compositions for the total run of Chinook Salmon and Chum Salmon of a given sex or age,  $\hat{p}_i$  were calculated as:

$$\hat{p}_i = \sum_{j=1} \hat{W}_j \hat{p}_{ij},$$

where  $\hat{W}_j$  = the stratum weight and was calculated as:

$$\hat{W}_j = \frac{N_j}{N},$$

and  $N_j$  equals the total number of fish of a given species passing through the weir during week  $j$ , and  $N$  is the total number of fish of a given species passing through the weir during the run. Variance,  $\hat{v}(\hat{p}_i)$  of sex and age compositions for the run was calculated as:

$$\hat{v}(\hat{p}_i) = \sum_{j=1} \hat{W}_j^2 \hat{v}(\hat{p}_{ij}).$$

## Results and Discussion

### *Weir Operation*

The weir was not fully operational until 1800 hours on July 2, with 12 Chinook Salmon and 792 summer Chum Salmon counted on that day. The escapement counts were not expanded on the first day to avoid over estimation of the beginning of the run so the first day is a conservative estimate. The 2014 season brought above average rainfall to most of the interior and this, in turn, caused high water conditions throughout the Koyukuk River sub-basin. Counting continued until 1840 hours on July 13 when conditions deteriorated and safety became an issue. This is also when counting ended for the season.

The picket spacing (3.5 cm space between pickets) within the trap and weir panels was narrow enough to prevent adult Chinook Salmon and summer Chum Salmon from passing through the weir. However, some individuals of the smaller fish species, such as Arctic Grayling *Thymallus arcticus* and Whitefish, likely passed through the weir undetected. We will evaluate the ability to distinguish Whitefish species with the video equipment. The video motion capture worked for most of the weir operations. It was down for less than an hour on July 5 for unknown reasons. Extremely poor visibility beginning on July 12 led to the video equipment missing an estimated 50% of passing salmon. Manual counts were also extremely difficult as turbidity increased and water levels rose.

The average river stage height and water temperatures were not calculated in 2014 due to the high water conditions. The lowest water gauge reading for the season was 62 cm, but for most of the season it was either unsafe to obtain readings or the gauge was completely underwater. Water temperature during the season ranged from 6.8°C to 16.7°C (Figure 2, Appendix 2). Water quality data was also collected and is provided in Appendix 7.

### *Biological Data*

An estimated 1,589 Chinook Salmon and 32,523 summer Chum Salmon (Table 1) passed through the weir during the period of operation. The next most abundant species was Pink Salmon *Onchorynchus gorbuscha* ( $N = 256$ ), followed by Northern Pike *Esox lucius* ( $N = 14$ ), Arctic Grayling ( $N = 8$ ), Longnose Sucker *Catostomus catostomus* ( $N = 5$ ), and Whitefish spp. (subfamily Corigininae;  $N = 2$ ).

*Chinook Salmon* — The fish passage during weir operation was estimated to be 1,589 Chinook Salmon. Due to the short duration of weir operation, the 2014 estimate was not included in the historical average but was the fifth lowest weir count to date (Figure 3, Appendix 1). Because the weir operated for only 12 days due to extremely high water for most of the 2014 season, it is likely fish passed the weir before and after the period in which the weir was operational. Overall, Chinook Salmon counts on the Gisasa River were similar to most runs throughout the Yukon River drainage (and throughout Alaska) in 2014 which were poor (JTC 2015). On July 2, the first day that the weir was operational, 12 Chinook Salmon were counted through the weir. During the final day of weir operation (July 13), 77 Chinook Salmon were counted through the weir. Run timing was not estimated due to the limited duration of weir operations. However, there was a peak in the run on July 6 and 7 followed by a decrease in passage and then another peak on July 11 (Table 1; Figure 4).

Due to logistical constraints during the two statistical weeks of weir operation, sample size objectives for age, sex, and length data were not attained. The first weekly statistical stratum was July 2 through

July 6 (Table 2). The second and final statistical week was July 7 through July 13 (Table 2). Scale samples were collected from 141 Chinook Salmon during the season, with age not determined for 11 (8%) of those samples, primarily due to scale regeneration. There were three primary age classes; 1.2, 1.3, and 1.4 from brood years 2010, 2009, and 2008, respectively. Age class 1.3 was predominant overall, accounting for 66% of the season total (Table 2). Age class 1.2 accounted for 18% of the total during weir operation and age class 1.4 accounted for 14%. Also included were age classes 1.1 and 1.5, which combined accounted for 2% of the total. The age distributions differed between males and females. Males were predominantly age 1.3 (72%) followed by age 1.2 (22%), whereas females were predominantly age 1.4 (52%) followed by age 1.3 (40%). The estimated sex ratio for the two statistical weeks of weir operation was 18% female. Female Chinook salmon ranged from 662 to 892 mm METF with an average for all age classes of 801 mm. Males ranged from 415 to 800 mm METF for all age classes with an average of 645 mm (Table 3). The mean length-at-age of females for all age classes was larger than males.

*Chum Salmon* — Fish passage during weir operation was estimated to be 32,523 summer Chum Salmon. Due to the short duration of weir operation, the 2014 estimate was not included in the historical average or median, but the 2014 estimate was the eighth lowest weir count to date (Figure 5, Appendix 1). On July 2, the first day the weir was operational, 792 summer Chum Salmon were counted. During the final day of counting (July 13), 1,349 summer Chum Salmon passed through the weir. Run timing was not estimated in 2014 due to the limited weir operations. However, on July 5, there was a “peak” in fish passage with 5,095 fish counted on that day. This peak was only one day earlier than the 1995-2013 average peak fish passage date of July 6 (Table 1, Figure 6).

Sample size objectives for age, sex, and length data were not attained due to logistical constraints during the 12 days of weir operations. Age, sex, and length data were collected from 285 summer Chum Salmon, with age unable to be determined for 36 (13%) of the scale samples. The predominant age class was 0.3, accounting for 48% of the total. The estimate for the first statistical week was 47% and the estimate for the second and final statistical week was 48%. Age class 0.4 was the next most abundant, and accounted for 47% of the total, with both statistical weekly estimates at 47% (Table 4). Also observed were age classes 0.2 and 0.5, which accounted for 2% and 3% of the total, respectively. There was a higher percentage of age 0.3 females (51%) than males (44%) and a higher percentage of age 0.4 males (51%) than females (44%). Age 0.2 fish were only female (4%) and age 0.5 fish were comprised of 2% females and 5% males. The estimated sex ratio for the entire run was 51% female (Table 4). Female summer Chum Salmon lengths ranged from 470 to 613 mm METF with an average for all age classes of 546 mm. Males ranged from 476 to 675 mm METF with an average for all age classes of 578 mm (Table 5). For length-at-age measurements, mean lengths of male fish were larger than females.

The information collected at the Gisasa River weir is vital to managing the complex mixed-stock subsistence and commercial salmon fisheries in the Yukon River. In-season management and post-season evaluations of management actions are greatly enhanced by the data from this and other stock assessment projects. Additionally, this project has produced 21 years of data enabling analyses of trends in population status, size, length, age, and gender composition of the run, developing future run projections, and setting and evaluating harvest and escapement goals and allocations. Furthermore, these time series data will become increasingly valuable as stressors such as climate change, disease, selective harvest, and overall demand on the resources of the dynamic Yukon River system continue to increase.

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**Table 1.** — Daily and cumulative (Cum) estimates of Chinook Salmon and summer Chum Salmon passage, and daily counts of other species, at the Gisasa River weir, Alaska, 2014. The weir was only operated for 12 days due to high water events.

| Date   | Chinook Salmon   |                 | Chum Salmon        |                  | Pink salmon    | Northern pike | Arctic grayling | Longnose Sucker | Whitefish spp. |
|--------|------------------|-----------------|--------------------|------------------|----------------|---------------|-----------------|-----------------|----------------|
|        | Daily            | Cum             | Daily              | Cum              | Daily          | Daily         | Daily           | Daily           | Daily          |
| Jun-20 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-21 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-22 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-23 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-24 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-25 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-26 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-27 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-28 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-29 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jun-30 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-01 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-02 | 12 <sup>a</sup>  | 12 <sup>a</sup> | 792 <sup>a</sup>   | 792 <sup>a</sup> | 4 <sup>a</sup> | 0             | 1 <sup>a</sup>  | 0               | 0              |
| Jul-03 | 46               | 58              | 2,616              | 3,408            | 16             | 2             | 0               | 1               | 0              |
| Jul-04 | 46               | 104             | 3,280              | 6,688            | 26             | 0             | 1               | 1               | 0              |
| Jul-05 | 116 <sup>b</sup> | 220             | 5,095 <sup>b</sup> | 11,783           | 31             | 0             | 2               | 0               | 0              |
| Jul-06 | 229              | 449             | 3,599              | 15,382           | 29             | 4             | 1               | 0               | 0              |
| Jul-07 | 268              | 717             | 4,356              | 19,738           | 30             | 0             | 2               | 1               | 0              |
| Jul-08 | 100              | 817             | 2,244              | 21,982           | 28             | 1             | 0               | 0               | 0              |
| Jul-09 | 138              | 955             | 2,776              | 24,758           | 27             | 1             | 0               | 0               | 0              |
| Jul-10 | 146              | 1,101           | 2,064              | 26,822           | 26             | 4             | 0               | 1               | 1              |
| Jul-11 | 324              | 1,425           | 2,975              | 29,797           | 22             | 2             | 0               | 1               | 0              |
| Jul-12 | 87               | 1,512           | 1,377              | 31,174           | 9              | 0             | 0               | 0               | 1              |
| Jul-13 | 77 <sup>b</sup>  | 1,589           | 1,349 <sup>b</sup> | 32,523           | 8              | 0             | 1               | 0               | 0              |
| Jul-14 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-15 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-16 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-17 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-18 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-19 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-20 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-21 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-22 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-23 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-24 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-25 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-26 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-27 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-28 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-29 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-30 |                  |                 |                    |                  |                |               |                 |                 |                |
| Jul-31 |                  |                 |                    |                  |                |               |                 |                 |                |
| Total  | 1,589            | 1,589           | 32,523             | 32,523           | 256            | 14            | 8               | 5               | 2              |

<sup>a</sup> Partial daily count, counting started at 1800 hours

<sup>b</sup> Partial daily count, count expanded to 24 hours

**Table 2.** — Age and sex ratio estimates, by stratum, of Chinook Salmon at Gisasa River weir, Alaska, 2014. Standard errors are in parentheses. Season totals are calculated from weighted strata totals. Unknown age indicates the number of fish that could not be aged from the scales sampled and were not included in age calculations.

| Strata dates | Run size (N) | Sample size (n) | % Female   | Unknown age | Brood year and age |            |             |         |             |           |           |           |      |  |
|--------------|--------------|-----------------|------------|-------------|--------------------|------------|-------------|---------|-------------|-----------|-----------|-----------|------|--|
|              |              |                 |            |             | 2011               |            | 2010        |         | 2009        |           | 2008      |           | 2007 |  |
|              |              |                 |            |             | 1.1                | 1.2        | 1.3         | 2.2     | 1.4         | 2.3       | 1.5       | 2.4       |      |  |
| 7/2 - 6      | 449          | 36              | 19.4 (6.7) | 4           | 0.0%(0.0)          | 18.7%(7.0) | 68.7%(8.3)  | 0%(0.0) | 12.5%(5.9)  | 0.0%(0.0) | 0.0%(0.0) | 0.0%(0.0) |      |  |
| 7/7 - 13     | 1140         | 105             | 18.1 (3.8) | 7           | 1.0%(1.0)          | 17.3%(3.8) | 65.3%(4.8)  | 0%(0.0) | 14.3%(3.6)  | 0.0%(0.0) | 2.0%(1.4) | 0.0%(0.0) |      |  |
| Total        | 1,589        | 141             | 18.5 (3.3) | 11          | 0.7%(0.7)          | 17.7%(3.4) | 66.3%(4.2)  | 0%(0.0) | 13.8%(3.1)  | 0.0%(0.0) | 1.5%(1.0) | 0.0%(0.0) |      |  |
| Female       | 294          | 26              |            | 1           | 0.0%(0.0)          | 0.0%(0.0)  | 40.4%(10.0) | 0%(0.0) | 51.8%(10.4) | 0.0%(0.0) | 7.8%(5.4) | 0.0%(0.0) |      |  |
| Male         | 1,295        | 115             |            | 10          | 0.9%(0.9)          | 22.0%(4.1) | 72.4%(4.4)  | 0%(0.0) | 4.7%(2.1)   | 0.0%(0.0) | 0.0%(0.0) | 0.0%(0.0) |      |  |

**Table 3.** — Length-at-age of female and male Chinook Salmon sampled at Gisasa River weir, Alaska, 2014.

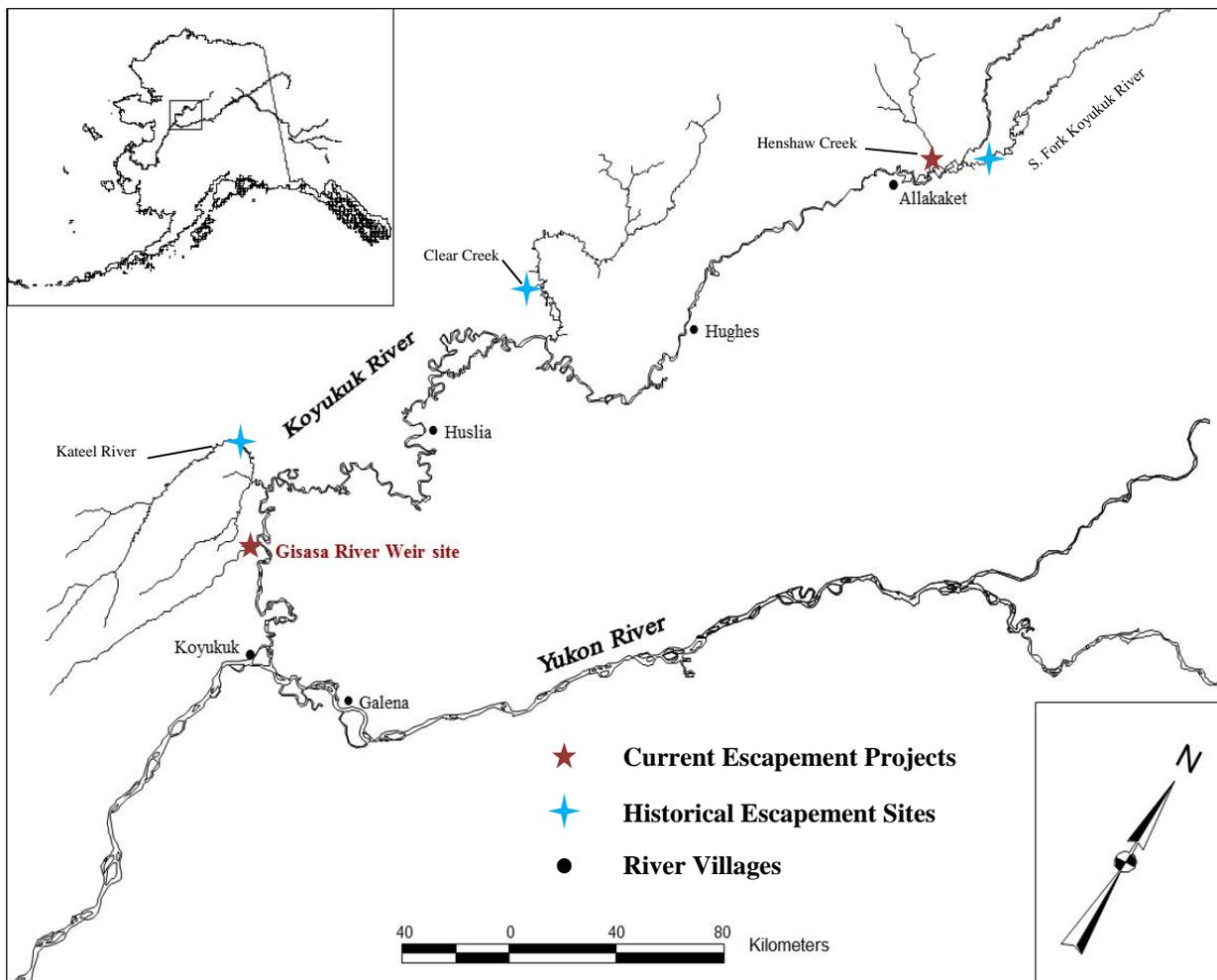
| Age   | Female |                             |      |        |           | Male |                             |      |        |           |
|-------|--------|-----------------------------|------|--------|-----------|------|-----------------------------|------|--------|-----------|
|       | N      | Mid eye to fork length (mm) |      |        |           | N    | Mid eye to fork length (mm) |      |        |           |
|       |        | Mean                        | SE   | Median | Range     |      | Mean                        | SE   | Median | Range     |
| 1.1   | 0      | -                           | -    | -      | -         | 1    | 415                         | -    | -      | -         |
| 1.2   | 0      | -                           | -    | -      | -         | 23   | 536                         | 10.1 | 540    | 420 - 620 |
| 2.1   | 0      | -                           | -    | -      | -         | 0    | -                           | -    | -      | -         |
| 1.3   | 10     | 760                         | 19.4 | 775    | 662 - 832 | 76   | 675                         | 5.0  | 673    | 561 - 782 |
| 2.2   | 0      | -                           | -    | -      | -         | 0    | -                           | -    | -      | -         |
| 1.4   | 13     | 821                         | 14.4 | 826    | 731 - 889 | 5    | 770                         | 8.4  | 768    | 750 - 800 |
| 2.3   | 0      | -                           | -    | -      | -         | 0    | -                           | -    | -      | -         |
| 1.5   | 2      | 825                         | 67.0 | 825    | 758 - 892 | 0    | -                           | -    | -      | -         |
| 2.4   | 0      | -                           | -    | -      | -         | 0    | -                           | -    | -      | -         |
| Total | 25     | 801                         |      |        |           | 105  | 645                         |      |        |           |

**Table 4.** — Age and sex ratio estimates, by stratum, of summer Chum Salmon at Gisasa River weir, Alaska, 2014. Standard errors are shown in parentheses. Season totals are calculated from weighted strata totals. Unknown age data indicate numbers of fish that could not be aged from the scales sampled and were not included in age calculations.

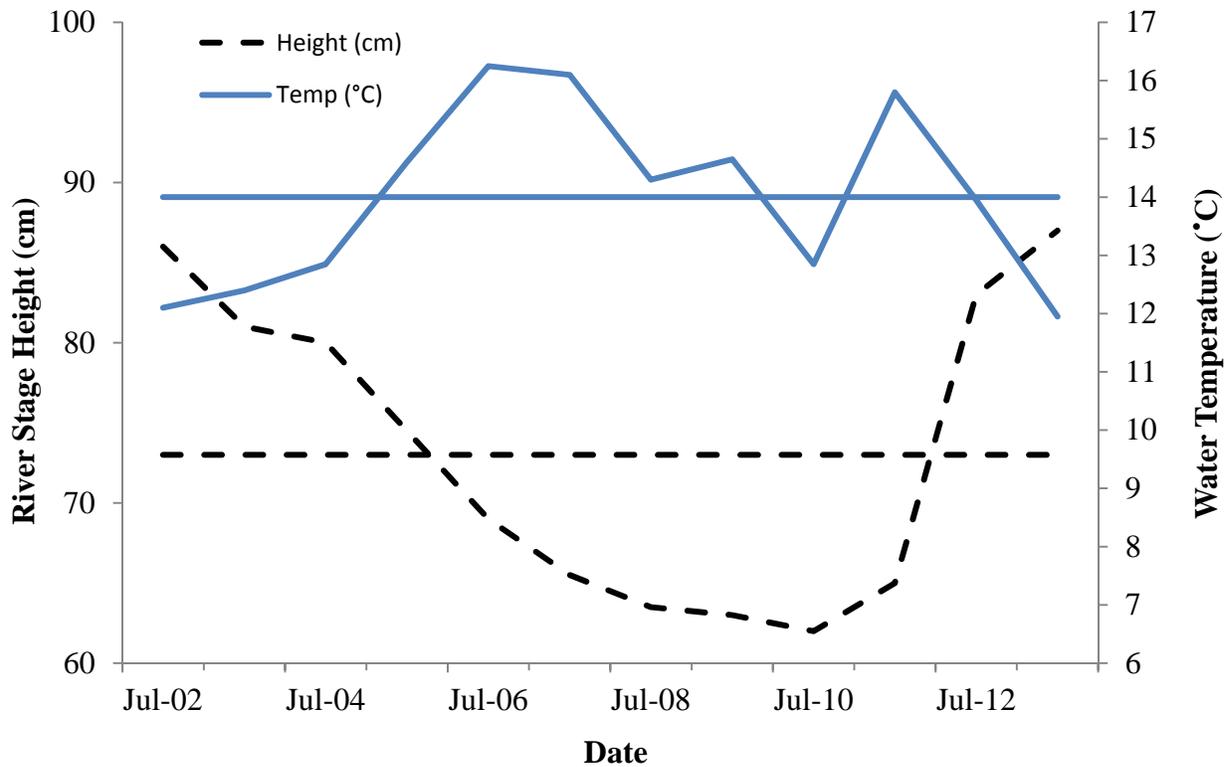
| Strata dates | Run size (N) | Sample size (n) | % Female   | Unknown age | Brood year and age |             |             |            |
|--------------|--------------|-----------------|------------|-------------|--------------------|-------------|-------------|------------|
|              |              |                 |            |             | 2011               | 2010        | 2009        | 2008       |
|              |              |                 |            |             | 0.2                | 0.3         | 0.4         | 0.5        |
| 7/2 - 6      | 15,382       | 155             | 49.7 (4.0) | 18          | 0.7% (0.7)         | 47.4% (4.3) | 46.7% (4.3) | 5.1% (1.9) |
| 7/7 - 13     | 17,141       | 130             | 51.5 (4.4) | 18          | 2.7% (1.5)         | 48.2% (4.7) | 47.3% (4.7) | 1.8% (1.3) |
| Total        | 32,523       | 285             | 50.7 (3.0) | 36          | 1.8% (0.9)         | 47.9% (3.2) | 47.0% (3.2) | 3.3% (1.1) |
| Female       | 16,476       | 144             |            | 19          | 3.5% (0.7)         | 51.3% (4.6) | 43.6% (4.5) | 1.6% (1.2) |
| Male         | 16,047       | 141             |            | 17          | 0.0% (0.0)         | 44.3% (4.5) | 50.6% (4.6) | 5.1% (1.9) |

**Table 5.** — Length-at-age of female and male summer Chum Salmon sampled at Gisasa River weir, Alaska, 2014.

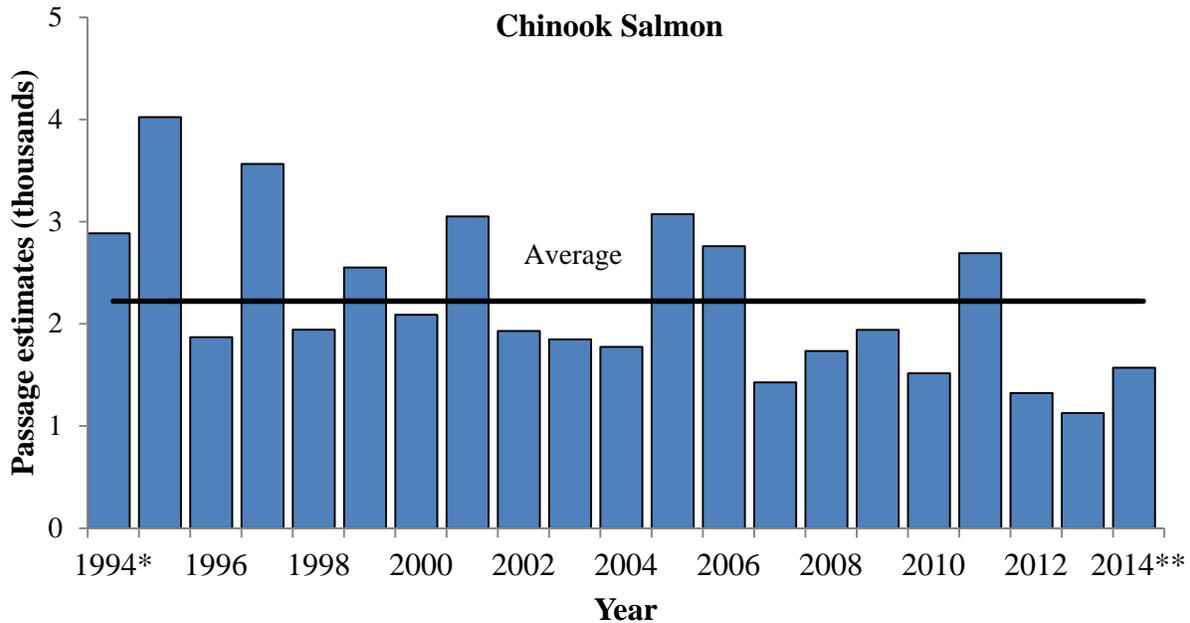
| Age   | Female |                             |     |        |           | Male |                            |      |        |           |
|-------|--------|-----------------------------|-----|--------|-----------|------|----------------------------|------|--------|-----------|
|       | N      | Mid eye to fork length (mm) |     |        |           | N    | Mideye to fork length (mm) |      |        |           |
|       |        | Mean                        | SE  | Median | Range     |      | Mean                       | SE   | Median | Range     |
| 0.2   | 4      | 529                         | 8.3 | 528    | 511 - 551 | 0    | -                          | -    | -      | -         |
| 0.3   | 65     | 530                         | 3.4 | 525    | 470 - 596 | 54   | 553                        | 4.4  | 551    | 493 - 658 |
| 0.4   | 54     | 559                         | 4.2 | 564    | 495 - 613 | 63   | 598                        | 4.5  | 602    | 476 - 667 |
| 0.5   | 2      | 564                         | 6.5 | 564    | 557 - 570 | 7    | 602                        | 16.2 | 590    | 559 - 675 |
| Total | 125    | 546                         |     |        |           | 124  | 578                        |      |        |           |



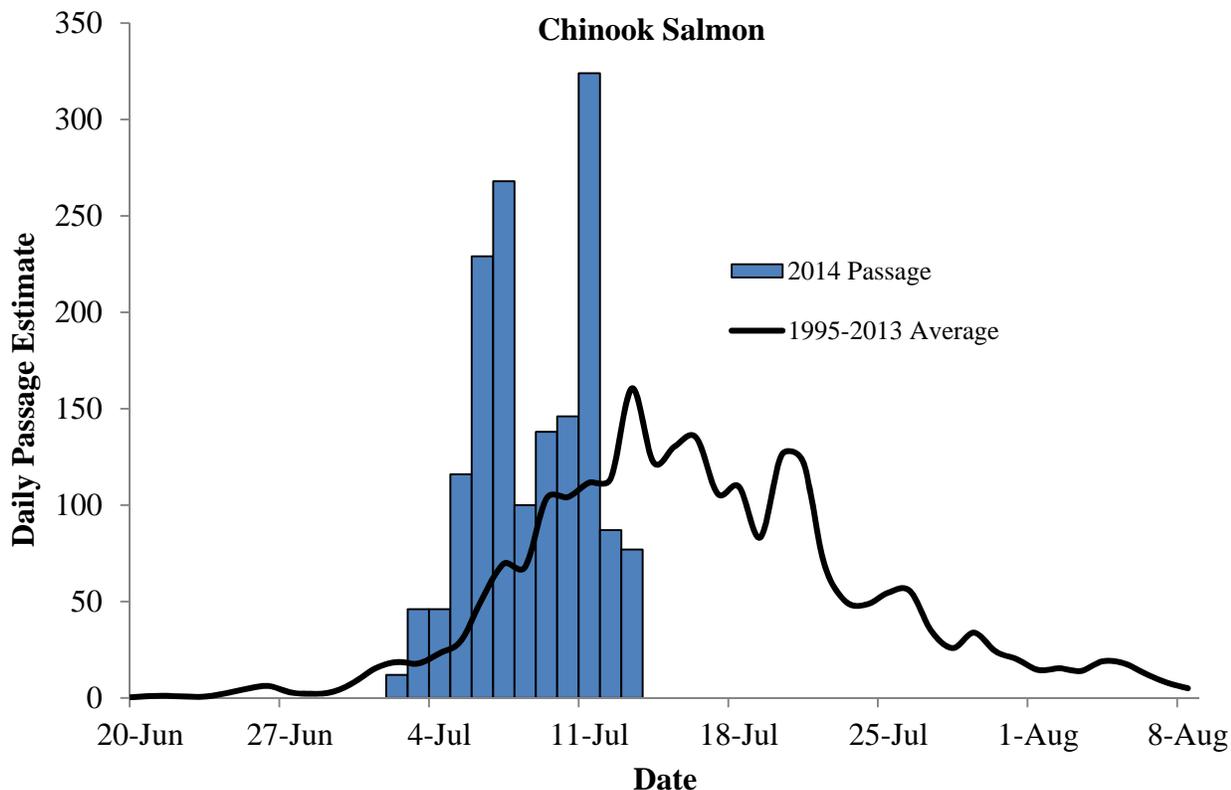
**Figure 1.** — Location of the Gisasa River weir and other active and historical tributary escapement project sites in the Koyukuk River drainage, Alaska.



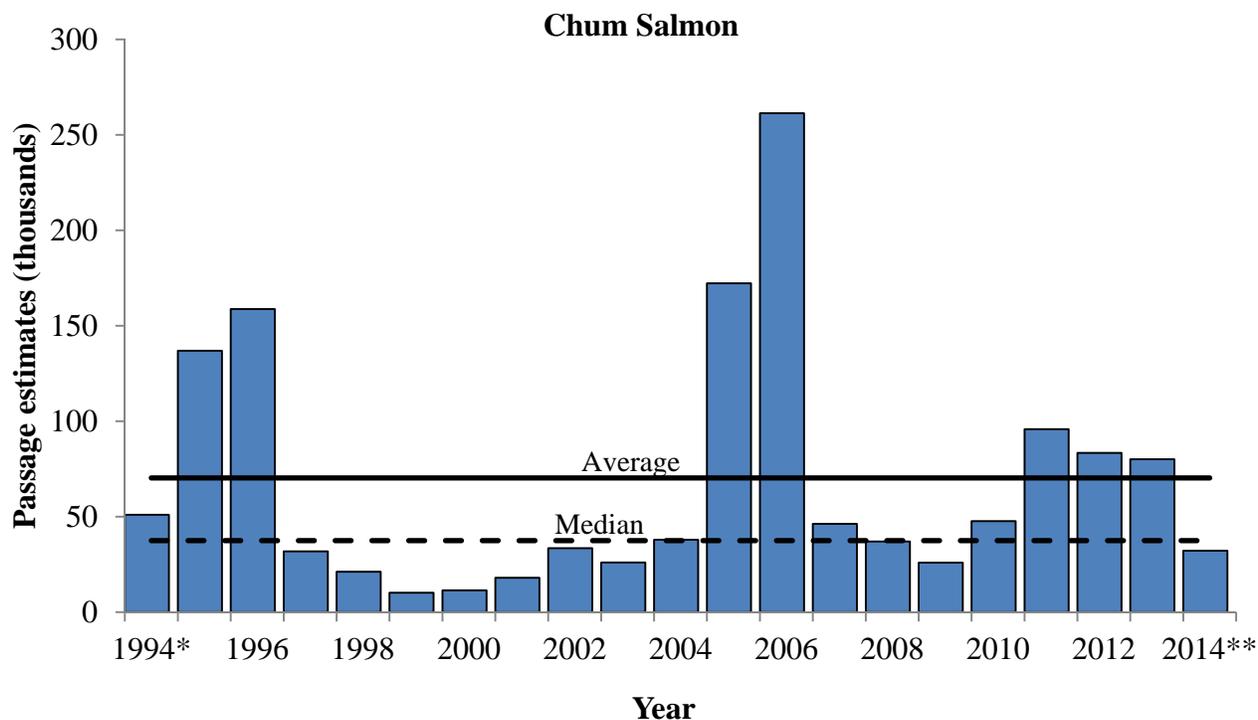
**Figure 2.** — Average daily river stage height and water temperature at the Gisasa River weir, Alaska, 2014. Horizontal lines represent the 2014 average for river stage height (dashed) and water temperature (solid) during the 12 days of weir operation. Average daily water temperature and river stage height were calculated using the average of the morning and evening values.



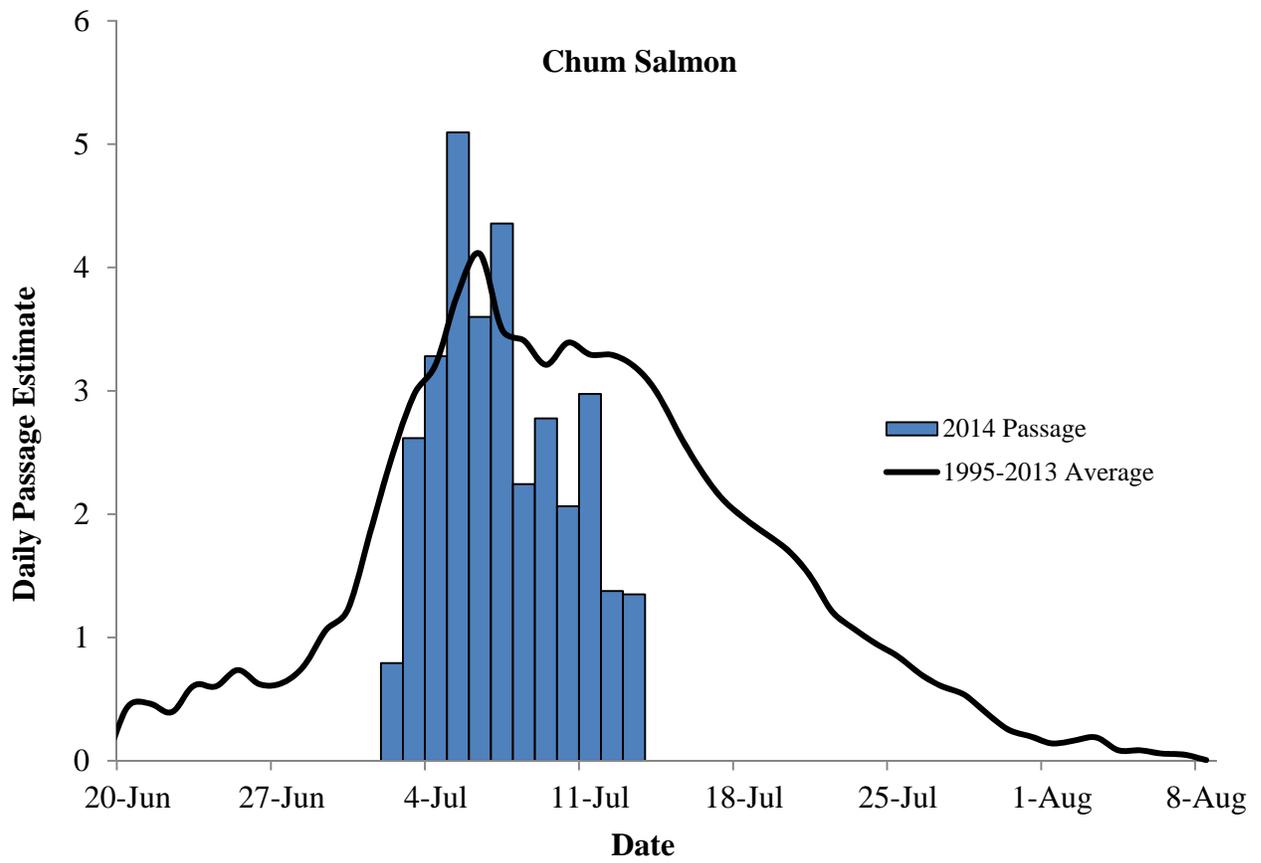
**Figure 3.** — Chinook Salmon escapement estimates at the Gisasa River weir 1994-2014. \*Data from the first year of operation (1994) is only a partial count; counting did not begin until July 10, after the run was underway and this data is not included in averages. \*\*Data from 2014 is a partial count due to extremely high water and is also not included in the average. Horizontal line represents the 1995-2013 average.



**Figure 4.** — Daily 2014 and average daily 1995-2013 Chinook Salmon passage estimates through Gisasa River weir, Alaska.



**Figure 5.** — Chum Salmon escapement estimates at the Gisasa River weir 1994-2014. \*Data from the first year of operation (1994) is only a partial count; counting did not begin until July 10, after the run was underway and 1994 data is not included in averages. \*\*Data from 2014 is only a partial count due to high water events and is not included in the averages. Horizontal lines represent the 1995-2013 average (solid) and median (dashed).



**Figure 6.** — Daily 2014 and average daily 1995-2013 Chum Salmon passage estimates through Gisasa River weir, Alaska.

**Appendix 1.** — Historical Chinook Salmon and summer Chum Salmon counts in the Gisasa River, Alaska 1960-2014. Aerial index data is from Barton (1984) and Alaska Department of Fish and Game from JTC (2015).

| Year | Aerial index estimates |             |                   | Weir escapement estimates |                     |
|------|------------------------|-------------|-------------------|---------------------------|---------------------|
|      | Chinook Salmon         | Chum Salmon | Survey rating     | Chinook Salmon            | Chum Salmon         |
| 1960 | 300                    | 400         | Good              |                           |                     |
| 1961 | 266                    | 0           | Good              |                           |                     |
| 1974 | 161                    | 22,022      | Good              |                           |                     |
| 1975 | 385                    | 56,904      | Good              |                           |                     |
| 1976 | 332                    | 21,342      | Good              |                           |                     |
| 1977 | 255                    | 2,204       | Good              |                           |                     |
| 1978 | 45                     | 9,280       | Good              |                           |                     |
| 1979 | 484                    | 10,962      | Good              |                           |                     |
| 1980 | 951                    | 10,388      | Good              |                           |                     |
| 1982 | 421                    | 334         | Good              |                           |                     |
| 1983 | 572                    | 2,356       | Good              |                           |                     |
| 1985 | 735                    | 13,232      | Good              |                           |                     |
| 1986 | 1,346                  | 12,114      | Good              |                           |                     |
| 1987 | 731                    | 2,123       | Good              |                           |                     |
| 1988 | 797                    | 9,284       | Good              |                           |                     |
| 1990 | 884                    | 450         | Good              |                           |                     |
| 1991 | 1,690                  | 7,003       | Good              |                           |                     |
| 1992 | 910                    | 9,300       | Good              |                           |                     |
| 1993 | 1,573                  | 1,581       | Good              |                           |                     |
| 1994 | 2,775                  | 6,827       | Good              | 2,888 <sup>a</sup>        | 51,116 <sup>a</sup> |
| 1995 | 410                    | 6,458       | Good              | 4,023                     | 136,886             |
| 1996 |                        |             |                   | 1,991                     | 158,752             |
| 1997 | 144                    | 686         | Good              | 3,764                     | 31,800              |
| 1998 | 889                    |             | Poor              | 2,414                     | 21,142              |
| 1999 |                        |             |                   | 2,644                     | 10,155              |
| 2000 |                        |             |                   | 2,089                     | 11,410              |
| 2001 | 1298                   |             | Good              | 3,052                     | 17,946              |
| 2002 | 506                    |             | Good              | 2,025                     | 33,481              |
| 2003 |                        |             |                   | 1,901                     | 25,999              |
| 2004 | 731                    |             | Good              | 1,774                     | 37,851              |
| 2005 | 958                    |             | Good              | 3,111                     | 172,259             |
| 2006 | 843                    | 1,000       | Fair              | 3,030                     | 261,305             |
| 2007 | 593                    |             | Fair              | 1,427                     | 46,257              |
| 2008 | 487                    | 20470       | Fair              | 1,738                     | 36,938              |
| 2009 | 515                    | 1,060       | Good              | 1,955                     | 25,904              |
| 2010 | 264                    | 1,096       | Fair              | 1,516                     | 47,669              |
| 2011 | 906                    | 13,228      | Good              | 2,692                     | 95,796              |
| 2012 |                        |             |                   | 1,323                     | 83,423              |
| 2013 | 201                    | 9,300       | Surveyed too late | 1,126                     | 80,055              |
| 2014 |                        |             |                   | 1,589 <sup>a</sup>        | 32,523 <sup>a</sup> |

<sup>a</sup> Partial weir count.

**Appendix 2.** — Water depth, water temperature, and air temperature data collected at the Gisasa River weir, 2014. Water depth is the water level at the trap.

| Date   | Water depth (m) |      | Water temperature (°C) |      | Air temperature (°C) |      |
|--------|-----------------|------|------------------------|------|----------------------|------|
|        | AM              | PM   | AM                     | PM   | AM                   | PM   |
| Jun-23 | -               | -    | -                      | 10.7 | -                    | -    |
| Jun-24 | -               | -    | -                      | -    | -                    | -    |
| Jun-25 | -               | -    | 10.5                   | 12.9 | 12.0                 | -    |
| Jun-26 | -               | -    | 10.8                   | 13.6 | 11.0                 | -    |
| Jun-27 | -               | -    | 11.2                   | 14.3 | 11.0                 | 20.0 |
| Jun-28 | -               | -    | 12.3                   | 12.9 | 10.0                 | 15.0 |
| Jun-29 | -               | -    | 11.5                   | 12.8 | 11.0                 | 16.0 |
| Jun-30 | -               | -    | 11.5                   | 13.0 | -                    | -    |
| Jul-1  | -               | -    | 11.5                   | 12.9 | 14.0                 | 14.0 |
| Jul-2  | -               | 0.86 | 11.8                   | 12.4 | 15.0                 | 16.0 |
| Jul-3  | 0.82            | 0.80 | 11.3                   | 13.5 | 11.0                 | 16.0 |
| Jul-4  | 0.80            | 0.80 | 11.1                   | 14.6 | 12.0                 | 17.0 |
| Jul-5  | 0.75            | 0.74 | 12.6                   | 16.6 | 12.0                 | 26.0 |
| Jul-6  | 0.70            | 0.68 | 14.4                   | 18.1 | 16.0                 | 29.0 |
| Jul-7  | 0.67            | 0.64 | 15.5                   | 16.7 | 15.0                 | 18.0 |
| Jul-8  | 0.63            | 0.64 | 13.6                   | 15.0 | 13.0                 | 18.0 |
| Jul-9  | 0.64            | 0.62 | 13.1                   | 16.2 | -                    | 19.0 |
| Jul-10 | 0.62            | 0.62 | 11.1                   | 14.6 | 13.0                 | 17.0 |
| Jul-11 | -               | 0.65 | -                      | 15.8 | -                    | 21.0 |
| Jul-12 | 0.76            | 0.90 | 13.5                   | 14.4 | 12.0                 | 18.0 |
| Jul-13 | 0.84            | 0.90 | 12.1                   | 11.8 | 13.0                 | 13.0 |
| Jul-14 | 0.90            | >1   | 10.9                   | -    | 12.0                 | -    |
| Jul-15 | >1              | >1   | 7.2                    | -    | 12.0                 | -    |
| Jul-16 | >1              | >1   | -                      | 8.2  | -                    | 12.0 |
| Jul-17 | >1              | >1   | 8.0                    | -    | 10.0                 | -    |
| Jul-18 | >1              | >1   | -                      | -    | -                    | -    |
| Jul-19 | >1              | >1   | 6.6                    | -    | 4.0                  | -    |
| Jul-20 | >1              | >1   | -                      | 7.5  | -                    | -    |
| Jul-21 | >1              | >1   | 7.1                    | -    | 9.0                  | -    |
| Jul-22 | >1              | >1   | -                      | 7.3  | -                    | 10.0 |
| Jul-23 | >1              | >1   | -                      | 7.1  | -                    | 11.0 |
| Jul-24 | >1-             | >1   | -                      | 6.9  | -                    | 10.0 |
| Jul-25 | >1              | >1   | 6.8                    | -    | 9.0                  | -    |
| Jul-26 | >1              | >1   | 7.1                    | -    | 11.0                 | -    |
| Jul-27 | >1              | >1   | 7.4                    | -    | 11.0                 | -    |
| Jul-28 | >1              | >1   | 7.8                    | -    | 11.0                 | -    |
| Jul-29 | >1              | >1   | 8.5                    | -    | 18.0                 | -    |

**Appendix 3.** — Historical daily and cumulative Chinook Salmon counts from Gisasa River weir, 1994-2014. Boxes indicate first quarter, mid, and third quarter points of the run.

| Date   | 1994 <sup>a</sup> | 1995  |       | 1996            |       | 1997  |       | 1998            |       | 1999            |       | 2000  |       | 2001  |       |
|--------|-------------------|-------|-------|-----------------|-------|-------|-------|-----------------|-------|-----------------|-------|-------|-------|-------|-------|
|        | Daily             | Daily | Cum   | Daily           | Cum   | Daily | Cum   | Daily           | Cum   | Daily           | Cum   | Daily | Cum   | Daily | Cum   |
| Jun-15 |                   |       |       |                 |       |       |       |                 |       |                 |       |       |       |       |       |
| Jun-16 |                   |       |       |                 |       |       |       |                 |       |                 |       |       |       |       |       |
| Jun-17 |                   |       |       |                 |       |       |       |                 |       |                 |       |       |       |       |       |
| Jun-18 |                   |       |       |                 |       |       |       |                 |       |                 |       |       |       |       |       |
| Jun-19 |                   |       |       | 0               | 0     | 0     | 0     |                 |       |                 |       |       |       |       |       |
| Jun-20 |                   |       |       | 4               | 4     | 0     | 0     |                 |       |                 |       |       |       |       |       |
| Jun-21 |                   | 0     | 0     | 9               | 13    | 0     | 0     | 0               | 0     |                 |       |       |       |       |       |
| Jun-22 |                   | 1     | 1     | 6               | 19    | 0     | 0     | 0               | 0     |                 |       |       |       |       |       |
| Jun-23 |                   | 0     | 1     | 8               | 27    | 0     | 0     | 0               | 0     | 0               | 0     |       |       |       |       |
| Jun-24 |                   | 2     | 3     | 32              | 59    | 0     | 0     | 0               | 0     | 0               | 0     |       |       |       |       |
| Jun-25 |                   | 4     | 7     | 63              | 122   | 0     | 0     | 0               | 0     | 0               | 0     |       |       |       |       |
| Jun-26 |                   | 1     | 8     | 69              | 191   | 0     | 0     | 0               | 0     | 0               | 0     |       |       |       |       |
| Jun-27 |                   | 5     | 13    | 16              | 207   | 1     | 1     | 2               | 2     | 0               | 0     |       |       |       |       |
| Jun-28 |                   | 19    | 32    | 46 <sup>c</sup> | 253   | 3     | 4     | 0               | 2     | 1               | 1     | 0     | 0     |       |       |
| Jun-29 |                   | 23    | 55    | 76 <sup>b</sup> | 329   | 9     | 13    | 1               | 3     | 0               | 1     | 0     | 0     |       |       |
| Jun-30 |                   | 46    | 101   | 30              | 359   | 2     | 15    | 2               | 5     | 0               | 1     | 0     | 0     |       |       |
| Jul-1  |                   | 82    | 183   | 57              | 416   | 33    | 48    | 5               | 10    | 0               | 1     | 0     | 0     |       |       |
| Jul-2  |                   | 46    | 229   | 72              | 488   | 11    | 59    | 13 <sup>b</sup> | 23    | 0               | 1     | 0     | 0     |       |       |
| Jul-3  |                   | 35    | 264   | 28              | 516   | 6     | 65    | 18 <sup>c</sup> | 41    | 0               | 1     | 0     | 0     |       |       |
| Jul-4  |                   | 57    | 321   | 35              | 551   | 78    | 143   | 22 <sup>c</sup> | 63    | 0               | 1     | 0     | 0     |       |       |
| Jul-5  |                   | 39    | 360   | 41              | 592   | 120   | 263   | 26 <sup>c</sup> | 89    | 1               | 2     | 0     | 0     |       |       |
| Jul-6  |                   | 92    | 452   | 78              | 670   | 64    | 327   | 30 <sup>b</sup> | 119   | 2               | 4     | 13    | 13    |       |       |
| Jul-7  | 258               | 710   | 234   | 904             | 70    | 397   | 37    | 156             | 1     | 5               | 8     | 21    | 18    | 18    |       |
| Jul-8  | 175               | 885   | 51    | 955             | 138   | 535   | 71    | 227             | 5     | 10              | 70    | 91    | 41    | 59    |       |
| Jul-9  | 184               | 1,069 | 63    | 1,018           | 310   | 845   | 71    | 298             | 45    | 55              | 40    | 131   | 43    | 102   |       |
| Jul-10 | 300               | 1,369 | 81    | 1,099           | 320   | 1,165 | 107   | 405             | 60    | 115             | 21    | 152   | 26    | 128   |       |
| Jul-11 | 385               | 1,754 | 70    | 1,169           | 144   | 1,309 | 116   | 521             | 80    | 195             | 28    | 180   | 100   | 228   |       |
| Jul-12 | 212               | 281   | 2,035 | 51              | 1,220 | 424   | 1,733 | 142             | 663   | 19              | 214   | 40    | 220   | 63    | 291   |
| Jul-13 | 259               | 468   | 2,503 | 215             | 1,435 | 137   | 1,870 | 163             | 826   | 83              | 297   | 82    | 302   | 63    | 354   |
| Jul-14 | 189               | 205   | 2,708 | 158             | 1,593 | 38    | 1,908 | 225             | 1,051 | 49              | 346   | 103   | 405   | 117   | 471   |
| Jul-15 | 239               | 104   | 2,812 | 40              | 1,633 | 112   | 2,020 | 102             | 1,153 | 50              | 396   | 345   | 750   | 306   | 777   |
| Jul-16 | 355               | 211   | 3,023 | 26              | 1,659 | 146   | 2,166 | 155             | 1,308 | 89              | 485   | 223   | 973   | 196   | 973   |
| Jul-17 | 248               | 126   | 3,149 | 14              | 1,673 | 632   | 2,798 | 115             | 1,423 | 37              | 522   | 59    | 1,032 | 299   | 1,272 |
| Jul-18 | 219               | 72    | 3,221 | 38              | 1,711 | 92    | 2,890 | 147             | 1,570 | 154             | 676   | 177   | 1,209 | 238   | 1,510 |
| Jul-19 | 302               | 155   | 3,376 | 54              | 1,765 | 257   | 3,147 | 74              | 1,644 | 30              | 706   | 66    | 1,275 | 258   | 1,768 |
| Jul-20 | 248               | 62    | 3,438 | 93              | 1,858 | 88    | 3,235 | 62              | 1,706 | 397             | 1,103 | 41    | 1,316 | 388   | 2,156 |
| Jul-21 | 70                | 87    | 3,525 | 15              | 1,873 | 91    | 3,326 | 50              | 1,756 | 363             | 1,466 | 66    | 1,382 | 254   | 2,410 |
| Jul-22 | 42                | 79    | 3,604 | 17              | 1,890 | 142   | 3,468 | 75              | 1,831 | 27              | 1,493 | 188   | 1,570 | 74    | 2,484 |
| Jul-23 | 100               | 68    | 3,672 | 18              | 1,908 | 98    | 3,566 | 54              | 1,885 | 26              | 1,519 | 53    | 1,623 | 44    | 2,528 |
| Jul-24 | 99                | 87    | 3,759 | 45              | 1,953 | 38    | 3,604 | 90              | 1,975 | 70              | 1,589 | 89    | 1,712 | 25    | 2,553 |
| Jul-25 | 65                | 42    | 3,801 | 4               | 1,957 | 120   | 3,724 | 84 <sup>c</sup> | 2,059 | 307             | 1,896 | 42    | 1,754 | 36    | 2,589 |
| Jul-26 | 48                | 21    | 3,822 | 21              | 1,978 | 25    | 3,749 | 78 <sup>c</sup> | 2,137 | 276             | 2,172 | 13    | 1,767 | 37    | 2,626 |
| Jul-27 | 39                | 45    | 3,867 | 13              | 1,991 | 15    | 3,764 | 73 <sup>c</sup> | 2,210 | 103             | 2,275 | 23    | 1,790 | 14    | 2,640 |
| Jul-28 | 33                | 35    | 3,902 |                 |       |       |       | 67 <sup>c</sup> | 2,277 | 106             | 2,381 | 18    | 1,808 | 27    | 2,667 |
| Jul-29 | 32                | 11    | 3,913 |                 |       |       |       | 61 <sup>b</sup> | 2,338 | 68              | 2,449 | 79    | 1,887 | 149   | 2,816 |
| Jul-30 | 24                | 42    | 3,955 |                 |       |       |       | 33              | 2,371 | 40              | 2,489 | 52    | 1,939 | 20    | 2,836 |
| Jul-31 | 9                 | 29    | 3,984 |                 |       |       |       | 17              | 2,388 | 33 <sup>c</sup> | 2,522 | 27    | 1,966 | 88    | 2,924 |
| Aug-1  | 21                | 14    | 3,998 |                 |       |       |       | 14              | 2,402 | 27 <sup>c</sup> | 2,549 | 27    | 1,993 | 18    | 2,942 |
| Aug-2  | 12                | 8     | 4,006 |                 |       |       |       | 12              | 2,414 | 20 <sup>c</sup> | 2,569 | 34    | 2,027 | 23    | 2,965 |
| Aug-3  | 5                 | 17    | 4,023 |                 |       |       |       |                 |       | 13 <sup>b</sup> | 2,582 | 24    | 2,051 | 9     | 2,974 |
| Aug-4  | 2                 |       |       |                 |       |       |       |                 |       | 13              | 2,595 | 16    | 2,067 | 28    | 3,002 |
| Aug-5  | 3                 |       |       |                 |       |       |       |                 |       | 15              | 2,610 | 10    | 2,077 | 29    | 3,031 |
| Aug-6  | 5                 |       |       |                 |       |       |       |                 |       | 23              | 2,633 | 3     | 2,080 | 12    | 3,043 |
| Aug-7  | 6                 |       |       |                 |       |       |       |                 |       | 11              | 2,644 | 9     | 2,089 | 4     | 3,047 |
| Aug-8  | 1                 |       |       |                 |       |       |       |                 |       |                 |       |       |       | 5     | 3,052 |

continued

Appendix 3. — Continued

| Date   | 2002            |       | 2003            |       | 2004  |       | 2005            |       | 2006             |       | 2007  |       | 2008           |       |
|--------|-----------------|-------|-----------------|-------|-------|-------|-----------------|-------|------------------|-------|-------|-------|----------------|-------|
|        | Daily           | Cum   | Daily           | Cum   | Daily | Cum   | Daily           | Cum   | Daily            | Cum   | Daily | Cum   | Daily          | Cum   |
| Jun-15 |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-16 |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-17 |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-18 |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-19 |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-20 |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-21 |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-22 | 0               | 0     |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Jun-23 | 0               | 0     |                 |       |       |       |                 |       |                  |       | 0     | 0     |                |       |
| Jun-24 | 0               | 0     |                 |       | 0     | 0     |                 |       |                  |       | 0     | 0     | 0              | 0     |
| Jun-25 | 0               | 0     |                 |       | 0     | 0     |                 |       |                  |       | 0     | 0     | 0              | 0     |
| Jun-26 | 1               | 1     |                 |       | 14    | 14    |                 |       |                  |       | 0     | 0     | 1              | 1     |
| Jun-27 | 0               | 1     |                 |       | 14    | 28    |                 |       |                  |       | 0     | 0     | 1              | 2     |
| Jun-28 | 3               | 4     | 2               | 2     | 6     | 34    |                 |       | 0                | 0     | 0     | 0     | 1              | 3     |
| Jun-29 | 0               | 4     | 8               | 10    | 9     | 43    | 37 <sup>b</sup> | 37    | 1                | 1     | 0     | 0     | 1              | 4     |
| Jun-30 | 4               | 8     | 8               | 18    | 14    | 57    | 21              | 58    | 3 <sup>b</sup>   | 4     | 2     | 2     | 2              | 6     |
| Jul-1  | 5               | 13    | 25              | 43    | 14    | 71    | 25              | 83    | 46 <sup>c</sup>  | 50    | 6     | 8     | 4              | 10    |
| Jul-2  | 5               | 18    | 32              | 75    | 18    | 89    | 45              | 128   | 89 <sup>c</sup>  | 139   | 10    | 18    | 10             | 20    |
| Jul-3  | 9               | 27    | 25 <sup>c</sup> | 100   | 35    | 124   | 29              | 157   | 132 <sup>b</sup> | 271   | 41    | 59    | 8              | 28    |
| Jul-4  | 0               | 27    | 18 <sup>c</sup> | 118   | 10    | 134   | 39              | 196   | 82               | 353   | 29    | 88    | 25             | 53    |
| Jul-5  | 15              | 42    | 11 <sup>b</sup> | 129   | 36    | 170   | 42              | 238   | 72               | 425   | 19    | 107   | 32             | 85    |
| Jul-6  | 41              | 83    | 23              | 152   | 38    | 208   | 229             | 467   | 58               | 483   | 24    | 131   | 35             | 120   |
| Jul-7  | 134             | 217   | 36              | 188   | 39    | 247   | 256             | 723   | 52               | 535   | 13    | 144   | 44             | 164   |
| Jul-8  | 103             | 320   | 73              | 261   | 34    | 281   | 145             | 868   | 77               | 612   | 32    | 176   | 38             | 202   |
| Jul-9  | 135             | 455   | 186             | 447   | 283   | 564   | 158             | 1,026 | 134              | 746   | 31    | 207   | 55             | 257   |
| Jul-10 | 134             | 589   | 222             | 669   | 127   | 691   | 93              | 1,119 | 159              | 905   | 41    | 248   | 84             | 341   |
| Jul-11 | 100             | 689   | 109             | 778   | 147   | 838   | 93              | 1,212 | 211              | 1,116 | 43    | 291   | 84             | 425   |
| Jul-12 | 259             | 948   | 88              | 866   | 17    | 855   | 329             | 1,541 | 255              | 1,371 | 56    | 347   | 31             | 456   |
| Jul-13 | 359             | 1,307 | 120             | 986   | 142   | 997   | 255             | 1,796 | 216              | 1,587 | 59    | 406   | 36             | 492   |
| Jul-14 | 66              | 1,373 | 26              | 1,012 | 55    | 1,052 | 197             | 1,993 | 227              | 1,814 | 99    | 505   | 68             | 560   |
| Jul-15 | 78              | 1,451 | 79              | 1,091 | 265   | 1,317 | 125             | 2,118 | 239              | 2,053 | 64    | 569   | 62             | 622   |
| Jul-16 | 37              | 1,488 | 41              | 1,132 | 40    | 1,357 | 208             | 2,326 | 141              | 2,194 | 48    | 617   | 143            | 765   |
| Jul-17 | 48              | 1,536 | 94              | 1,226 | 170   | 1,527 | 86              | 2,412 | 224              | 2,418 | 47    | 664   | 323            | 1,088 |
| Jul-18 | 23              | 1,559 | 217             | 1,443 | 47    | 1,574 | 179             | 2,591 | 157              | 2,575 | 94    | 758   | 55             | 1,143 |
| Jul-19 | 37              | 1,596 | 102             | 1,545 | 11    | 1,585 | 58              | 2,649 | 101              | 2,676 | 106   | 864   | 29             | 1,172 |
| Jul-20 | 63              | 1,659 | 94              | 1,639 | 19    | 1,604 | 47              | 2,696 | 59               | 2,735 | 43    | 907   | 35             | 1,207 |
| Jul-21 | 22              | 1,681 | 50              | 1,689 | 18    | 1,622 | 130             | 2,826 | 69               | 2,804 | 30    | 937   | 157            | 1,364 |
| Jul-22 | 27              | 1,708 | 57              | 1,746 | 20    | 1,642 | 80              | 2,906 | 48               | 2,852 | 136   | 1,073 | 41             | 1,405 |
| Jul-23 | 16              | 1,724 | 11              | 1,757 | 28    | 1,670 | 58              | 2,964 | 32               | 2,884 | 39    | 1,112 | 53             | 1,458 |
| Jul-24 | 18              | 1,742 | 53              | 1,810 | 20    | 1,690 | 21              | 2,985 | 32               | 2,916 | 44    | 1,156 | 70             | 1,528 |
| Jul-25 | 15              | 1,757 | 8               | 1,818 | 15    | 1,705 | 24              | 3,009 | 26               | 2,942 | 70    | 1,226 | 50             | 1,578 |
| Jul-26 | 73              | 1,830 | 22              | 1,840 | 13    | 1,718 | 30              | 3,039 | 38               | 2,980 | 138   | 1,364 | 18             | 1,596 |
| Jul-27 | 91              | 1,921 | 8               | 1,848 | 12    | 1,730 | 16              | 3,055 | 14               | 2,994 | 37    | 1,401 | 59             | 1,655 |
| Jul-28 | 61 <sup>c</sup> | 1,982 | 9               | 1,857 | 8     | 1,738 | 23              | 3,078 | 19               | 3,013 | 26    | 1,427 | 39             | 1,694 |
| Jul-29 | 32 <sup>c</sup> | 2,014 | 16              | 1,873 | 15    | 1,753 | 8               | 3,086 | 18               | 3,031 |       |       | 40             | 1,734 |
| Jul-30 | 2 <sup>b</sup>  | 2,016 | 6               | 1,879 | 13    | 1,766 | 12              | 3,098 |                  |       |       |       | 4 <sup>b</sup> | 1,738 |
| Jul-31 | 9               | 2,025 | 3               | 1,882 | 7     | 1,773 | 13              | 3,111 |                  |       |       |       |                |       |
| Aug-1  |                 |       | 13              | 1,895 | 1     | 1,774 |                 |       |                  |       |       |       |                |       |
| Aug-2  |                 |       | 0               | 1,895 |       |       |                 |       |                  |       |       |       |                |       |
| Aug-3  |                 |       | 6               | 1,901 |       |       |                 |       |                  |       |       |       |                |       |
| Aug-4  |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Aug-5  |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Aug-6  |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Aug-7  |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |
| Aug-8  |                 |       |                 |       |       |       |                 |       |                  |       |       |       |                |       |

continued

Appendix 3. — Continued

| Date   | 2009            |       | 2010  |       | 2011  |       | 2012  |       | 2013  |       | 2014             |                 |
|--------|-----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|------------------|-----------------|
|        | Daily           | Cum   | Daily | Cum   | Daily | Cum   | Daily | Cum   | Daily | Cum   | Daily            | Cum             |
| Jun-15 |                 |       |       |       |       |       |       |       |       |       |                  |                 |
| Jun-16 |                 |       |       |       |       |       |       |       |       |       |                  |                 |
| Jun-17 |                 |       | 0     | 0     |       |       |       |       |       |       |                  |                 |
| Jun-18 |                 |       | 0     | 0     | 0     | 0     |       |       |       |       |                  |                 |
| Jun-19 |                 |       | 0     | 0     | 0     | 0     |       |       |       |       |                  |                 |
| Jun-20 |                 |       | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-21 |                 |       | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-22 |                 |       | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-23 | 0               | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-24 | 0               | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-25 | 0               | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-26 | 0               | 0     | 0     | 0     | 1     | 1     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-27 | 0               | 0     | 0     | 0     | 3     | 4     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-28 | 0               | 0     | 0     | 0     | 3     | 7     | 0     | 0     | 0     | 0     |                  |                 |
| Jun-29 | 0               | 0     | 0     | 0     | 7     | 14    | 0     | 0     | 0     | 0     |                  |                 |
| Jun-30 | 0               | 0     | 2     | 2     | 8     | 22    | 0     | 0     | 0     | 0     |                  |                 |
| Jul-1  | 5               | 5     | 3     | 5     | 30    | 52    | 0     | 0     | 0     | 0     |                  |                 |
| Jul-2  | 0               | 5     | 22    | 27    | 32    | 84    | 2     | 2     | 1     | 1     | 12 <sup>d</sup>  | 12 <sup>d</sup> |
| Jul-3  | 6               | 11    | 30    | 57    | 33    | 117   | 4     | 6     | 1     | 2     | 46               | 58              |
| Jul-4  | 3               | 14    | 9     | 66    | 74    | 191   | 2     | 8     | 4     | 6     | 46               | 104             |
| Jul-5  | 7               | 21    | 21    | 87    | 94    | 285   | 9     | 17    | 14    | 20    | 116 <sup>b</sup> | 220             |
| Jul-6  | 12              | 33    | 79    | 166   | 115   | 400   | 11    | 28    | 19    | 39    | 229              | 449             |
| Jul-7  | 12              | 45    | 32    | 198   | 96    | 496   | 17    | 45    | 30    | 69    | 268              | 717             |
| Jul-8  | 44              | 89    | 22    | 220   | 153   | 649   | 28    | 73    | 51    | 120   | 100              | 817             |
| Jul-9  | 36              | 125   | 22    | 242   | 212   | 861   | 71    | 144   | 77    | 197   | 138              | 955             |
| Jul-10 | 23              | 148   | 69    | 311   | 135   | 996   | 190   | 334   | 43    | 240   | 146              | 1,101           |
| Jul-11 | 254             | 402   | 33    | 344   | 109   | 1,105 | 51    | 385   | 39    | 279   | 324              | 1,425           |
| Jul-12 | 40              | 442   | 54    | 398   | 138   | 1,243 | 124   | 509   | 35    | 314   | 87               | 1,512           |
| Jul-13 | 288             | 730   | 38    | 436   | 95    | 1,338 | 40    | 549   | 19    | 333   | 77 <sup>b</sup>  | 1,589           |
| Jul-14 | 40              | 770   | 67    | 503   | 167   | 1,505 | 72    | 621   | 61    | 394   |                  |                 |
| Jul-15 | 189             | 959   | 10    | 513   | 131   | 1,636 | 28    | 649   | 118   | 512   |                  |                 |
| Jul-16 | 201             | 1,160 | 54    | 567   | 157   | 1,793 | 17    | 666   | 155   | 667   |                  |                 |
| Jul-17 | 90              | 1,250 | 33    | 600   | 65    | 1,858 | 18    | 684   | 28    | 695   |                  |                 |
| Jul-18 | 200             | 1,450 | 31    | 631   | 140   | 1,998 | 25    | 709   | 50    | 745   |                  |                 |
| Jul-19 | 20              | 1,470 | 99    | 730   | 86    | 2,084 | 57    | 766   | 127   | 872   |                  |                 |
| Jul-20 | 27              | 1,497 | 400   | 1,130 | 204   | 2,288 | 146   | 912   | 69    | 941   |                  |                 |
| Jul-21 | 86              | 1,583 | 69    | 1,199 | 125   | 2,413 | 73    | 985   | 34    | 975   |                  |                 |
| Jul-22 | 105             | 1,688 | 77    | 1,276 | 100   | 2,513 | 31    | 1,016 | 37    | 1,012 |                  |                 |
| Jul-23 | 20              | 1,708 | 30    | 1,306 | 61    | 2,574 | 43    | 1,059 | 38    | 1,050 |                  |                 |
| Jul-24 | 39              | 1,747 | 35    | 1,341 | 29    | 2,603 | 48    | 1,107 | 20    | 1,070 |                  |                 |
| Jul-25 | 140             | 1,887 | 49    | 1,390 | 15    | 2,618 | 40    | 1,147 | 10    | 1,080 |                  |                 |
| Jul-26 | 13              | 1,900 | 17    | 1,407 | 29    | 2,647 | 86    | 1,233 | 11    | 1,091 |                  |                 |
| Jul-27 | 12              | 1,912 | 32    | 1,439 | 20    | 2,667 | 17    | 1,250 | 11    | 1,102 |                  |                 |
| Jul-28 | 9               | 1,921 | 23    | 1,462 | 11    | 2,678 | 31    | 1,281 | 4     | 1,106 |                  |                 |
| Jul-29 | 20              | 1,941 | 14    | 1,476 | 6     | 2,684 | 19    | 1,300 | 11    | 1,117 |                  |                 |
| Jul-30 | 14 <sup>b</sup> | 1,955 | 36    | 1,512 | 8     | 2,692 | 23    | 1,323 | 5     | 1,122 |                  |                 |
| Jul-31 |                 |       | 4     | 1,516 |       |       |       |       | 4     | 1,126 |                  |                 |
| Aug-1  |                 |       |       |       |       |       |       |       |       |       |                  |                 |
| Aug-2  |                 |       |       |       |       |       |       |       |       |       |                  |                 |
| Aug-3  |                 |       |       |       |       |       |       |       |       |       |                  |                 |
| Aug-4  |                 |       |       |       |       |       |       |       |       |       |                  |                 |
| Aug-5  |                 |       |       |       |       |       |       |       |       |       |                  |                 |
| Aug-6  |                 |       |       |       |       |       |       |       |       |       |                  |                 |

<sup>a</sup> Incomplete count, counting did not begin until after the run had started.

<sup>b</sup> Partial daily count, count expanded to 24 hours.

<sup>c</sup> Weir not operated due to high water, counts interpolated.

<sup>d</sup> Partial daily count, counting started at 1800 hours.

**Appendix 4.** — Historical daily and cumulative summer Chum Salmon counts from Gisasa River weir, 1994-2014. Boxes indicate first quarter, mid, and third quarter points of the run.

| Date   | 1994 <sup>a</sup> | 1995   |         | 1996               |         | 1997  |        | 1998               |        | 1999             |        | 2000  |        |
|--------|-------------------|--------|---------|--------------------|---------|-------|--------|--------------------|--------|------------------|--------|-------|--------|
|        | Daily             | Daily  | Cum     | Daily              | Cum     | Daily | Cum    | Daily              | Cum    | Daily            | Cum    | Daily | Cum    |
| Jun-15 |                   |        |         |                    |         | 0     | 0      |                    |        |                  |        |       |        |
| Jun-16 |                   |        |         |                    |         | 8     | 8      |                    |        |                  |        |       |        |
| Jun-17 |                   |        |         |                    |         | 0     | 8      |                    |        |                  |        |       |        |
| Jun-18 |                   |        |         |                    |         | 1     | 9      |                    |        |                  |        |       |        |
| Jun-19 |                   |        |         | 160                | 160     | 8     | 17     |                    |        |                  |        |       |        |
| Jun-20 |                   |        |         | 2,620              | 2,780   | 11    | 28     |                    |        |                  |        |       |        |
| Jun-21 |                   | 3      | 3       | 3,679              | 6,459   | 10    | 38     | 8                  | 8      |                  |        |       |        |
| Jun-22 |                   | 131    | 134     | 3,234              | 9,693   | 30    | 68     | 20                 | 28     |                  |        |       |        |
| Jun-23 |                   | 254    | 388     | 6,736              | 16,429  | 28    | 96     | 69                 | 97     | 0                | 0      |       |        |
| Jun-24 |                   | 382    | 770     | 7,461              | 23,890  | 60    | 156    | 114                | 211    | 0                | 0      |       |        |
| Jun-25 |                   | 653    | 1,423   | 7,855              | 31,745  | 535   | 691    | 279                | 490    | 0                | 0      |       |        |
| Jun-26 |                   | 955    | 2,378   | 5,744              | 37,489  | 247   | 938    | 147                | 637    | 0                | 0      |       |        |
| Jun-27 |                   | 1,123  | 3,501   | 4,422              | 41,911  | 696   | 1,634  | 202                | 839    | 0                | 0      |       |        |
| Jun-28 |                   | 2,117  | 5,618   | 4,982 <sup>c</sup> | 46,893  | 1,074 | 2,708  | 253                | 1,092  | 0                | 0      | 27    | 27     |
| Jun-29 |                   | 1,950  | 7,568   | 5,542 <sup>b</sup> | 52,435  | 696   | 3,404  | 291                | 1,383  | 0                | 0      | 146   | 173    |
| Jun-30 |                   | 2,678  | 10,246  | 4,939              | 57,374  | 373   | 3,777  | 297                | 1,680  | 1                | 1      | 35    | 208    |
| Jul-1  |                   | 2,747  | 12,993  | 5,849              | 63,223  | 769   | 4,546  | 359                | 2,039  | 0                | 1      | 6     | 214    |
| Jul-2  |                   | 2,911  | 15,904  | 7,692              | 70,915  | 681   | 5,227  | 390 <sup>b</sup>   | 2,429  | 0                | 1      | 11    | 225    |
| Jul-3  |                   | 3,253  | 19,157  | 5,703              | 76,618  | 852   | 6,079  | 838 <sup>c</sup>   | 3,267  | 1                | 2      | 33    | 258    |
| Jul-4  |                   | 2,967  | 22,124  | 7,250              | 83,868  | 1,431 | 7,510  | 1,286 <sup>c</sup> | 4,553  | 113              | 115    | 140   | 398    |
| Jul-5  |                   | 3,908  | 26,032  | 10,615             | 94,483  | 1,895 | 9,405  | 1,734 <sup>c</sup> | 6,287  | 115              | 230    | 462   | 860    |
| Jul-6  |                   | 5,663  | 31,695  | 10,640             | 105,123 | 1,678 | 11,083 | 2,182 <sup>b</sup> | 8,469  | 50               | 280    | 410   | 1,270  |
| Jul-7  |                   | 6,765  | 38,460  | 7,103              | 112,226 | 1,466 | 12,549 | 1,075              | 9,544  | 257              | 537    | 386   | 1,656  |
| Jul-8  |                   | 7,439  | 45,899  | 6,241              | 118,467 | 1,162 | 13,711 | 1,017              | 10,561 | 376              | 913    | 493   | 2,149  |
| Jul-9  |                   | 8,347  | 54,246  | 4,698              | 123,165 | 925   | 14,636 | 1,041              | 11,602 | 517              | 1,430  | 366   | 2,515  |
| Jul-10 |                   | 10,664 | 64,910  | 4,612              | 127,777 | 1,096 | 15,732 | 911                | 12,513 | 467              | 1,897  | 352   | 2,867  |
| Jul-11 |                   | 11,207 | 76,117  | 4,571              | 132,348 | 1,052 | 16,784 | 740                | 13,253 | 423              | 2,320  | 414   | 3,281  |
| Jul-12 | 6,178             | 9,710  | 85,827  | 4,511              | 136,859 | 1,394 | 18,178 | 658                | 13,911 | 281              | 2,601  | 500   | 3,781  |
| Jul-13 | 4,528             | 9,699  | 95,526  | 4,045              | 140,904 | 1,081 | 19,259 | 623                | 14,534 | 299              | 2,900  | 559   | 4,340  |
| Jul-14 | 5,195             | 6,519  | 102,045 | 4,868              | 145,772 | 1,113 | 20,372 | 735                | 15,269 | 497              | 3,397  | 500   | 4,840  |
| Jul-15 | 5,449             | 4,396  | 106,441 | 3,691              | 149,463 | 1,140 | 21,512 | 534                | 15,803 | 423              | 3,820  | 678   | 5,518  |
| Jul-16 | 3,347             | 4,690  | 111,131 | 2,160              | 151,623 | 1,339 | 22,851 | 687                | 16,490 | 426              | 4,246  | 778   | 6,296  |
| Jul-17 | 3,450             | 3,344  | 114,475 | 1,750              | 153,373 | 1,248 | 24,099 | 644                | 17,134 | 277              | 4,523  | 579   | 6,875  |
| Jul-18 | 2,193             | 2,761  | 117,236 | 1,282              | 154,655 | 693   | 24,792 | 487                | 17,621 | 372              | 4,895  | 931   | 7,806  |
| Jul-19 | 2,089             | 2,706  | 119,942 | 1,081              | 155,736 | 795   | 25,587 | 385                | 18,006 | 372              | 5,267  | 512   | 8,318  |
| Jul-20 | 2,007             | 2,944  | 122,886 | 456                | 156,192 | 721   | 26,308 | 253                | 18,259 | 388              | 5,655  | 390   | 8,708  |
| Jul-21 | 1,416             | 2,461  | 125,347 | 465                | 156,657 | 724   | 27,032 | 310                | 18,569 | 300              | 5,955  | 298   | 9,006  |
| Jul-22 | 1,864             | 1,709  | 127,056 | 265                | 156,922 | 1,233 | 28,265 | 262                | 18,831 | 202              | 6,157  | 370   | 9,376  |
| Jul-23 | 2,138             | 1,524  | 128,580 | 334                | 157,256 | 1,081 | 29,346 | 267                | 19,098 | 267              | 6,424  | 291   | 9,667  |
| Jul-24 | 1,676             | 1,343  | 129,923 | 320                | 157,576 | 564   | 29,910 | 292                | 19,390 | 354              | 6,778  | 173   | 9,840  |
| Jul-25 | 2,120             | 1,280  | 131,203 | 348                | 157,924 | 918   | 30,828 | 294 <sup>c</sup>   | 19,684 | 644              | 7,422  | 154   | 9,994  |
| Jul-26 | 1,994             | 1,073  | 132,276 | 492                | 158,416 | 367   | 31,195 | 296 <sup>c</sup>   | 19,980 | 433              | 7,855  | 100   | 10,094 |
| Jul-27 | 1,325             | 1,158  | 133,434 | 336                | 158,752 | 605   | 31,800 | 297 <sup>c</sup>   | 20,277 | 252              | 8,107  | 141   | 10,235 |
| Jul-28 | 994               | 896    | 134,330 |                    |         |       |        | 299 <sup>c</sup>   | 20,576 | 239              | 8,346  | 112   | 10,347 |
| Jul-29 | 671               | 656    | 134,986 |                    |         |       |        | 301 <sup>b</sup>   | 20,877 | 315              | 8,661  | 215   | 10,562 |
| Jul-30 | 360               | 500    | 135,486 |                    |         |       |        | 91                 | 20,968 | 165              | 8,826  | 206   | 10,768 |
| Jul-31 | 321               | 439    | 135,925 |                    |         |       |        | 69                 | 21,037 | 184 <sup>c</sup> | 9,010  | 171   | 10,939 |
| Aug-1  | 247               | 299    | 136,224 |                    |         |       |        | 58                 | 21,095 | 203 <sup>c</sup> | 9,213  | 90    | 11,029 |
| Aug-2  | 205               | 330    | 136,554 |                    |         |       |        | 47                 | 21,142 | 221 <sup>c</sup> | 9,434  | 116   | 11,145 |
| Aug-3  | 225               | 332    | 136,886 |                    |         |       |        |                    |        | 240 <sup>b</sup> | 9,674  | 88    | 11,233 |
| Aug-4  | 238               |        |         |                    |         |       |        |                    |        | 135              | 9,809  | 72    | 11,305 |
| Aug-5  | 259               |        |         |                    |         |       |        |                    |        | 168              | 9,977  | 44    | 11,349 |
| Aug-6  | 194               |        |         |                    |         |       |        |                    |        | 109              | 10,086 | 25    | 11,374 |
| Aug-7  | 169               |        |         |                    |         |       |        |                    |        | 69               | 10,155 | 36    | 11,410 |
| Aug-8  | 130               |        |         |                    |         |       |        |                    |        |                  |        |       |        |

continued

Appendix 4. — Continued

| Date   | 2001  |        | 2002             |        | 2003             |        | 2004  |        | 2005               |         | 2006                |         |
|--------|-------|--------|------------------|--------|------------------|--------|-------|--------|--------------------|---------|---------------------|---------|
|        | Daily | Cum    | Daily            | Cum    | Daily            | Cum    | Daily | Cum    | Daily              | Cum     | Daily               | Cum     |
| Jun-15 |       |        |                  |        |                  |        |       |        |                    |         |                     |         |
| Jun-16 |       |        |                  |        |                  |        |       |        |                    |         |                     |         |
| Jun-17 |       |        |                  |        |                  |        |       |        |                    |         |                     |         |
| Jun-18 |       |        |                  |        |                  |        |       |        |                    |         |                     |         |
| Jun-19 |       |        |                  |        |                  |        |       |        |                    |         |                     |         |
| Jun-20 |       |        |                  |        |                  |        |       |        |                    |         |                     |         |
| Jun-21 |       |        |                  |        |                  |        |       |        |                    |         |                     |         |
| Jun-22 |       |        | 19               | 19     |                  |        |       |        |                    |         |                     |         |
| Jun-23 |       |        | 3                | 22     |                  |        |       |        |                    |         |                     |         |
| Jun-24 |       |        | 68               | 90     |                  |        | 36    | 36     |                    |         |                     |         |
| Jun-25 |       |        | 150              | 240    |                  |        | 459   | 495    |                    |         |                     |         |
| Jun-26 |       |        | 128              | 368    |                  |        | 1,005 | 1,500  |                    |         |                     |         |
| Jun-27 |       |        | 228              | 596    |                  |        | 1,527 | 3,027  |                    |         |                     |         |
| Jun-28 |       |        | 356              | 952    | 248              | 248    | 1,499 | 4,526  |                    |         | 1,560               | 1,560   |
| Jun-29 |       |        | 570              | 1,522  | 230              | 478    | 1,732 | 6,258  | 3,357 <sup>b</sup> | 3,357   | 2,788               | 4,348   |
| Jun-30 |       |        | 1,331            | 2,853  | 561              | 1,039  | 1,007 | 7,265  | 1,850              | 5,207   | 3,996 <sup>b</sup>  | 8,344   |
| Jul-1  |       |        | 1,116            | 3,969  | 890              | 1,929  | 853   | 8,118  | 2,226              | 7,433   | 10,192 <sup>c</sup> | 18,536  |
| Jul-2  |       |        | 803              | 4,772  | 655              | 2,584  | 900   | 9,018  | 2,092              | 9,525   | 16,387 <sup>c</sup> | 34,923  |
| Jul-3  |       |        | 833              | 5,605  | 680 <sup>c</sup> | 3,264  | 858   | 9,876  | 2,884              | 12,409  | 22,583 <sup>b</sup> | 57,506  |
| Jul-4  |       |        | 430              | 6,035  | 706 <sup>c</sup> | 3,970  | 709   | 10,585 | 3,702              | 16,111  | 21,897              | 79,403  |
| Jul-5  |       |        | 1,059            | 7,094  | 731 <sup>b</sup> | 4,701  | 1,201 | 11,786 | 6,330              | 22,441  | 19,597              | 99,000  |
| Jul-6  |       |        | 1,765            | 8,859  | 609              | 5,310  | 1,855 | 13,641 | 8,352              | 30,793  | 19,538              | 118,538 |
| Jul-7  | 229   | 229    | 2,293            | 11,152 | 1,181            | 6,491  | 1,093 | 14,734 | 8,404              | 39,197  | 12,310              | 130,848 |
| Jul-8  | 705   | 934    | 2,122            | 13,274 | 957              | 7,448  | 1,836 | 16,570 | 6,564              | 45,761  | 14,500              | 145,348 |
| Jul-9  | 758   | 1,692  | 1,879            | 15,153 | 1,222            | 8,670  | 1,939 | 18,509 | 5,980              | 51,741  | 16,121              | 161,469 |
| Jul-10 | 1,176 | 2,868  | 2,446            | 17,599 | 1,004            | 9,674  | 1,655 | 20,164 | 4,621              | 56,362  | 14,216              | 175,685 |
| Jul-11 | 1,305 | 4,173  | 1,493            | 19,092 | 1,455            | 11,129 | 1,596 | 21,760 | 4,807              | 61,169  | 13,101              | 188,786 |
| Jul-12 | 1,522 | 5,695  | 1,731            | 20,823 | 1,303            | 12,432 | 1,568 | 23,328 | 10,256             | 71,425  | 11,011              | 199,797 |
| Jul-13 | 1,781 | 7,476  | 1,898            | 22,721 | 1,361            | 13,793 | 1,824 | 25,152 | 12,057             | 83,482  | 8,398               | 208,195 |
| Jul-14 | 2,032 | 9,508  | 1,608            | 24,329 | 909              | 14,702 | 1,632 | 26,784 | 11,537             | 95,019  | 6,795               | 214,990 |
| Jul-15 | 1,741 | 11,249 | 1,017            | 25,346 | 1,287            | 15,989 | 1,289 | 28,073 | 9,813              | 104,832 | 6,286               | 221,276 |
| Jul-16 | 998   | 12,247 | 1,225            | 26,571 | 529              | 16,518 | 1,503 | 29,576 | 9,981              | 114,813 | 5,477               | 226,753 |
| Jul-17 | 727   | 12,974 | 1,186            | 27,757 | 1,321            | 17,839 | 1,240 | 30,816 | 8,076              | 122,889 | 6,257               | 233,010 |
| Jul-18 | 575   | 13,549 | 1,086            | 28,843 | 1,924            | 19,763 | 917   | 31,733 | 9,758              | 132,647 | 4,847               | 237,857 |
| Jul-19 | 708   | 14,257 | 774              | 29,617 | 1,439            | 21,202 | 951   | 32,684 | 7,031              | 139,678 | 4,734               | 242,591 |
| Jul-20 | 616   | 14,873 | 728              | 30,345 | 823              | 22,025 | 685   | 33,369 | 5,716              | 145,394 | 3,991               | 246,582 |
| Jul-21 | 549   | 15,422 | 669              | 31,014 | 626              | 22,651 | 846   | 34,215 | 5,324              | 150,718 | 3,082               | 249,664 |
| Jul-22 | 492   | 15,914 | 544              | 31,558 | 432              | 23,083 | 572   | 34,787 | 4,490              | 155,208 | 2,498               | 252,162 |
| Jul-23 | 432   | 16,346 | 377              | 31,935 | 264              | 23,347 | 478   | 35,265 | 4,285              | 159,493 | 1,922               | 254,084 |
| Jul-24 | 266   | 16,612 | 272              | 32,207 | 411              | 23,758 | 600   | 35,865 | 3,776              | 163,269 | 1,929               | 256,013 |
| Jul-25 | 250   | 16,862 | 268              | 32,475 | 209              | 23,967 | 577   | 36,442 | 2,571              | 165,840 | 1,689               | 257,702 |
| Jul-26 | 142   | 17,004 | 315              | 32,790 | 168              | 24,135 | 357   | 36,799 | 2,112              | 167,952 | 1,360               | 259,062 |
| Jul-27 | 114   | 17,118 | 226              | 33,016 | 212              | 24,347 | 333   | 37,132 | 1,460              | 169,412 | 847                 | 259,909 |
| Jul-28 | 149   | 17,267 | 178 <sup>c</sup> | 33,194 | 310              | 24,657 | 207   | 37,339 | 1,141              | 170,553 | 681                 | 260,590 |
| Jul-29 | 146   | 17,413 | 130 <sup>c</sup> | 33,324 | 316              | 24,973 | 186   | 37,525 | 779                | 171,332 | 716                 | 261,306 |
| Jul-30 | 87    | 17,500 | 82 <sup>b</sup>  | 33,406 | 264              | 25,237 | 131   | 37,656 | 575                | 171,907 |                     |         |
| Jul-31 | 76    | 17,576 | 75               | 33,481 | 120              | 25,357 | 132   | 37,788 | 352                | 172,259 |                     |         |
| Aug-1  | 67    | 17,643 |                  |        | 204              | 25,561 | 63    | 37,851 |                    |         |                     |         |
| Aug-2  | 63    | 17,706 |                  |        | 207              | 25,768 |       |        |                    |         |                     |         |
| Aug-3  | 56    | 17,762 |                  |        | 231              | 25,999 |       |        |                    |         |                     |         |
| Aug-4  | 50    | 17,812 |                  |        |                  |        |       |        |                    |         |                     |         |
| Aug-5  | 43    | 17,855 |                  |        |                  |        |       |        |                    |         |                     |         |
| Aug-6  | 41    | 17,896 |                  |        |                  |        |       |        |                    |         |                     |         |
| Aug-7  | 44    | 17,940 |                  |        |                  |        |       |        |                    |         |                     |         |
| Aug-8  | 6     | 17,946 |                  |        |                  |        |       |        |                    |         |                     |         |

continued

Appendix 4. — Continued

| Date   | 2007  |        | 2008            |        | 2009           |        | 2010  |        | 2011  |        |
|--------|-------|--------|-----------------|--------|----------------|--------|-------|--------|-------|--------|
|        | Daily | Cum    | Daily           | Cum    | Daily          | Cum    | Daily | Cum    | Daily | Cum    |
| Jun-15 |       |        |                 |        |                |        |       |        |       |        |
| Jun-16 |       |        |                 |        |                |        |       |        |       |        |
| Jun-17 |       |        |                 |        |                |        | 0     | 0      |       |        |
| Jun-18 |       |        |                 |        |                |        | 0     | 0      | 0     | 0      |
| Jun-19 |       |        |                 |        |                |        | 0     | 0      | 0     | 0      |
| Jun-20 |       |        |                 |        |                |        | 0     | 0      | 4     | 4      |
| Jun-21 |       |        |                 |        |                |        | 0     | 0      | 13    | 17     |
| Jun-22 |       |        |                 |        |                |        | 0     | 0      | 117   | 134    |
| Jun-23 | 0     | 0      |                 |        | 2 <sup>b</sup> | 2      | 1     | 1      | 228   | 362    |
| Jun-24 | 5     | 5      | 2 <sup>b</sup>  | 2      | 3              | 5      | 0     | 1      | 312   | 674    |
| Jun-25 | 9     | 14     | 29 <sup>c</sup> | 31     | 3              | 8      | 0     | 1      | 331   | 1,005  |
| Jun-26 | 5     | 19     | 56 <sup>c</sup> | 87     | 27             | 35     | 0     | 1      | 365   | 1,370  |
| Jun-27 | 12    | 31     | 82              | 169    | 26             | 61     | 2     | 3      | 494   | 1,864  |
| Jun-28 | 31    | 62     | 187             | 356    | 70             | 131    | 11    | 14     | 652   | 2,516  |
| Jun-29 | 214   | 276    | 195             | 551    | 126            | 257    | 8     | 22     | 1,213 | 3,729  |
| Jun-30 | 1,513 | 1,789  | 185             | 736    | 550            | 807    | 361   | 383    | 2,345 | 6,074  |
| Jul-1  | 1,925 | 3,714  | 633             | 1,369  | 817            | 1,624  | 741   | 1,124  | 2,606 | 8,680  |
| Jul-2  | 2,870 | 6,584  | 834             | 2,203  | 515            | 2,139  | 2,734 | 3,858  | 3,053 | 11,733 |
| Jul-3  | 2,926 | 9,510  | 1,285           | 3,488  | 667            | 2,806  | 2,620 | 6,478  | 3,841 | 15,574 |
| Jul-4  | 2,666 | 12,176 | 1,434           | 4,922  | 828            | 3,634  | 2,722 | 9,200  | 4,311 | 19,885 |
| Jul-5  | 2,322 | 14,498 | 1,371           | 6,293  | 838            | 4,472  | 3,056 | 12,256 | 4,460 | 24,345 |
| Jul-6  | 2,196 | 16,694 | 1,117           | 7,410  | 1,451          | 5,923  | 2,734 | 14,990 | 5,013 | 29,358 |
| Jul-7  | 2,028 | 18,722 | 1,216           | 8,626  | 947            | 6,870  | 2,739 | 17,729 | 5,622 | 34,980 |
| Jul-8  | 2,207 | 20,929 | 1,325           | 9,951  | 1,197          | 8,067  | 2,977 | 20,706 | 4,774 | 39,754 |
| Jul-9  | 1,817 | 22,746 | 1,110           | 11,061 | 1,062          | 9,129  | 3,182 | 23,888 | 4,072 | 43,826 |
| Jul-10 | 1,620 | 24,366 | 1,146           | 12,207 | 1,002          | 10,131 | 3,478 | 27,366 | 2,894 | 46,720 |
| Jul-11 | 1,446 | 25,812 | 1,230           | 13,437 | 1,961          | 12,092 | 3,439 | 30,805 | 1,718 | 48,438 |
| Jul-12 | 1,155 | 26,967 | 1,429           | 14,866 | 1,578          | 13,670 | 2,501 | 33,306 | 1,456 | 49,894 |
| Jul-13 | 1,000 | 27,967 | 2,300           | 17,166 | 2,060          | 15,730 | 1,732 | 35,038 | 1,121 | 51,015 |
| Jul-14 | 1,368 | 29,335 | 1,955           | 19,121 | 1,484          | 17,214 | 1,491 | 36,529 | 2,759 | 53,774 |
| Jul-15 | 1,184 | 30,519 | 1,949           | 21,070 | 1,180          | 18,394 | 1,366 | 37,895 | 3,729 | 57,503 |
| Jul-16 | 908   | 31,427 | 1,518           | 22,588 | 863            | 19,257 | 1,176 | 39,071 | 4,656 | 62,159 |
| Jul-17 | 1,134 | 32,561 | 1,363           | 23,951 | 957            | 20,214 | 955   | 40,026 | 5,152 | 67,311 |
| Jul-18 | 1,152 | 33,713 | 940             | 24,891 | 736            | 20,950 | 674   | 40,700 | 4,292 | 71,603 |
| Jul-19 | 918   | 34,631 | 971             | 25,862 | 628            | 21,578 | 714   | 41,414 | 5,106 | 76,709 |
| Jul-20 | 1,177 | 35,808 | 836             | 26,698 | 969            | 22,547 | 857   | 42,271 | 5,457 | 82,166 |
| Jul-21 | 909   | 36,717 | 969             | 27,667 | 680            | 23,227 | 754   | 43,025 | 4,533 | 86,699 |
| Jul-22 | 903   | 37,620 | 951             | 28,618 | 606            | 23,833 | 711   | 43,736 | 2,501 | 89,200 |
| Jul-23 | 1,151 | 38,771 | 1,203           | 29,821 | 519            | 24,352 | 447   | 44,183 | 1,551 | 90,751 |
| Jul-24 | 1,257 | 40,028 | 1,581           | 31,402 | 312            | 24,664 | 554   | 44,737 | 1,413 | 92,164 |
| Jul-25 | 1,740 | 41,768 | 1,691           | 33,093 | 349            | 25,013 | 425   | 45,162 | 939   | 93,103 |
| Jul-26 | 1,703 | 43,471 | 1,112           | 34,205 | 224            | 25,237 | 476   | 45,638 | 859   | 93,962 |
| Jul-27 | 1,532 | 45,003 | 1,005           | 35,210 | 150            | 25,387 | 492   | 46,130 | 743   | 94,705 |
| Jul-28 | 1,254 | 46,257 | 883             | 36,093 | 143            | 25,530 | 407   | 46,537 | 495   | 95,200 |
| Jul-29 |       |        | 625             | 36,718 | 210            | 25,740 | 341   | 46,878 | 334   | 95,534 |
| Jul-30 |       |        | 220             | 36,938 | 164            | 25,904 | 359   | 47,237 | 262   | 95,796 |
| Jul-31 |       |        |                 |        |                |        | 432   | 47,669 |       |        |
| Aug-1  |       |        |                 |        |                |        |       |        |       |        |
| Aug-2  |       |        |                 |        |                |        |       |        |       |        |
| Aug-3  |       |        |                 |        |                |        |       |        |       |        |
| Aug-4  |       |        |                 |        |                |        |       |        |       |        |
| Aug-5  |       |        |                 |        |                |        |       |        |       |        |
| Aug-6  |       |        |                 |        |                |        |       |        |       |        |
| Aug-7  |       |        |                 |        |                |        |       |        |       |        |
| Aug-8  |       |        |                 |        |                |        |       |        |       |        |

continued

**Appendix 4.** — Continued

| Date   | 2012  |       | 2013  |        | 2014               |                  |
|--------|-------|-------|-------|--------|--------------------|------------------|
|        | Daily | Cum   | Daily | Cum    | Daily              | Cum              |
| Jun-15 |       |       |       |        |                    |                  |
| Jun-16 |       |       |       |        |                    |                  |
| Jun-17 |       |       |       |        |                    |                  |
| Jun-18 |       |       |       |        |                    |                  |
| Jun-19 |       |       |       |        |                    |                  |
| Jun-20 | 0     | 0     | 0     | 0      |                    |                  |
| Jun-21 | 0     | 0     | 0     | 0      |                    |                  |
| Jun-22 | 0     | 0     | 0     | 0      |                    |                  |
| Jun-23 | 0     | 0     | 0     | 0      |                    |                  |
| Jun-24 | 0     | 0     | 0     | 0      |                    |                  |
| Jun-25 | 0     | 0     | 0     | 0      |                    |                  |
| Jun-26 | 0     | 0     | 0     | 0      |                    |                  |
| Jun-27 | 0     | 0     | 2     | 2      |                    |                  |
| Jun-28 | 1     | 1     | 0     | 2      |                    |                  |
| Jun-29 | 7     | 8     | 0     | 2      |                    |                  |
| Jun-30 | 74    | 82    | 2     | 4      |                    |                  |
| Jul-1  | 1426  | 1508  | 1     | 5      |                    |                  |
| Jul-2  | 1563  | 3071  | 288   | 293    | 792 <sup>d</sup>   | 792 <sup>d</sup> |
| Jul-3  | 2094  | 5165  | 1444  | 1,737  | 2,616              | 3,408            |
| Jul-4  | 2830  | 7995  | 2519  | 4,256  | 3,280              | 6,688            |
| Jul-5  | 3027  | 11022 | 5534  | 9,790  | 5,095 <sup>b</sup> | 11,783           |
| Jul-6  | 4073  | 15095 | 4661  | 14,451 | 3,599              | 15,382           |
| Jul-7  | 4023  | 19118 | 7316  | 21,767 | 4,356              | 19,738           |
| Jul-8  | 3008  | 22126 | 5834  | 27,601 | 2,244              | 21,982           |
| Jul-9  | 2408  | 24534 | 3562  | 31,163 | 2,776              | 24,758           |
| Jul-10 | 4898  | 29432 | 6163  | 37,326 | 2,064              | 26,822           |
| Jul-11 | 4548  | 33980 | 6081  | 43,407 | 2,975              | 29,797           |
| Jul-12 | 5000  | 38980 | 4963  | 48,370 | 1,377              | 31,174           |
| Jul-13 | 4451  | 43431 | 4502  | 52,872 | 1,349 <sup>b</sup> | 32,523           |
| Jul-14 | 3398  | 46829 | 5745  | 58,617 |                    |                  |
| Jul-15 | 4150  | 50979 | 4814  | 63,431 |                    |                  |
| Jul-16 | 3415  | 54394 | 2617  | 66,048 |                    |                  |
| Jul-17 | 2823  | 57217 | 1363  | 67,411 |                    |                  |
| Jul-18 | 2279  | 59496 | 1697  | 69,108 |                    |                  |
| Jul-19 | 2905  | 62401 | 2196  | 71,304 |                    |                  |
| Jul-20 | 3599  | 66000 | 1803  | 73,107 |                    |                  |
| Jul-21 | 3740  | 69740 | 1247  | 74,354 |                    |                  |
| Jul-22 | 2505  | 72245 | 1756  | 76,110 |                    |                  |
| Jul-23 | 2687  | 74932 | 1237  | 77,347 |                    |                  |
| Jul-24 | 1883  | 76815 | 717   | 78,064 |                    |                  |
| Jul-25 | 1311  | 78126 | 408   | 78,472 |                    |                  |
| Jul-26 | 1328  | 79454 | 476   | 78,948 |                    |                  |
| Jul-27 | 1163  | 80617 | 393   | 79,341 |                    |                  |
| Jul-28 | 1484  | 82101 | 250   | 79,591 |                    |                  |
| Jul-29 | 800   | 82901 | 158   | 79,749 |                    |                  |
| Jul-30 | 522   | 83423 | 170   | 79,919 |                    |                  |
| Jul-31 |       |       | 136   | 80,055 |                    |                  |
| Aug-1  |       |       |       |        |                    |                  |
| Aug-2  |       |       |       |        |                    |                  |
| Aug-3  |       |       |       |        |                    |                  |
| Aug-4  |       |       |       |        |                    |                  |
| Aug-5  |       |       |       |        |                    |                  |
| Aug-6  |       |       |       |        |                    |                  |

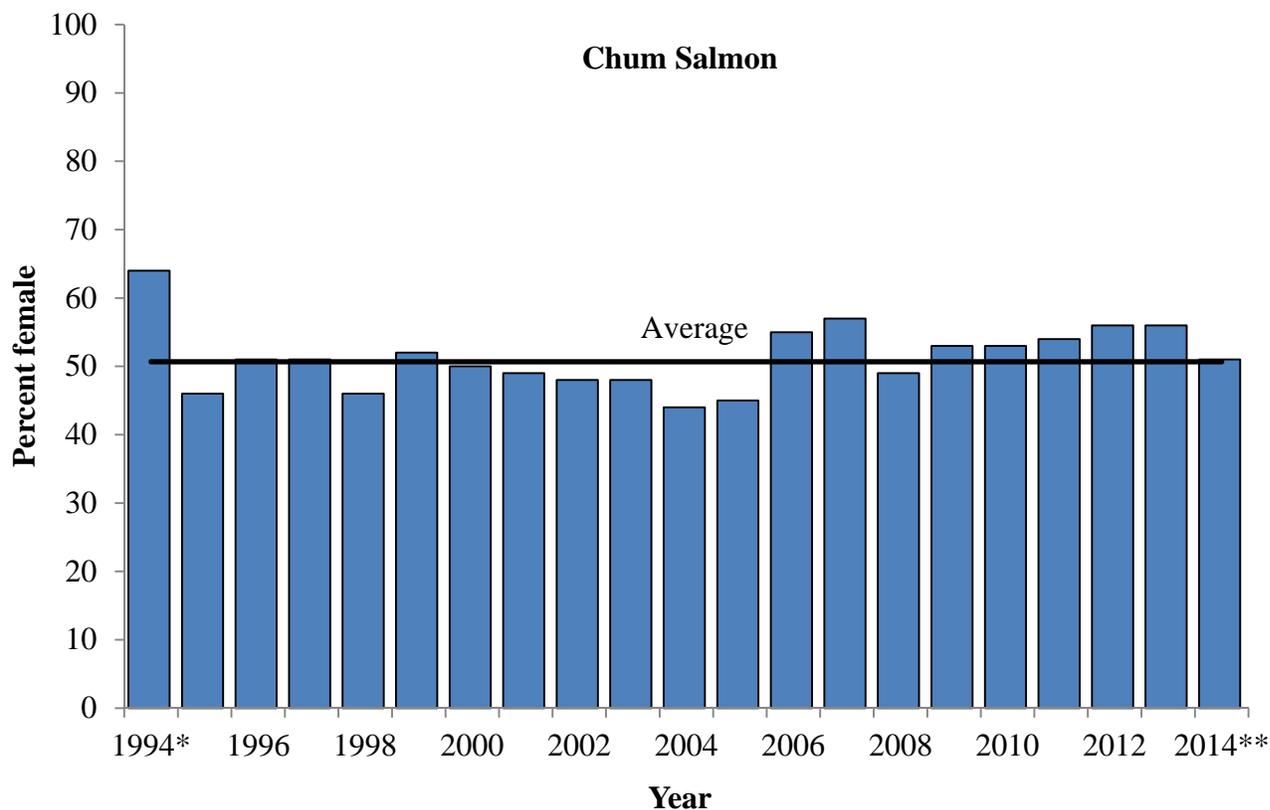
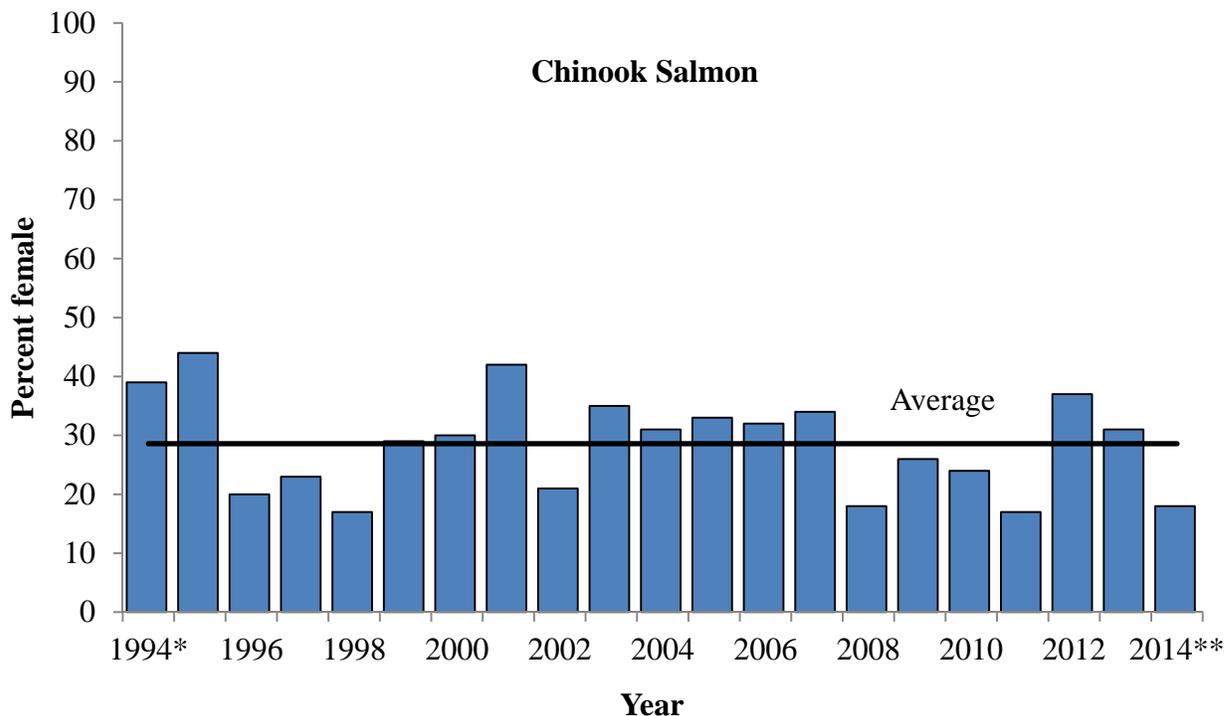
<sup>a</sup> Incomplete count, counting did not begin until after the run had started.

<sup>b</sup> Partial daily count, count expanded to 24 hours.

<sup>c</sup> Weir not operated due to high water, counts interpolated.

<sup>d</sup> Partial daily count, counting started at 1800 hours.

**Appendix 5.** — Historical percentages of female Chinook Salmon and summer Chum Salmon for the Gisasa River weir 1994-2014. \*Data from the first year of operation (1994) is only a partial count; counting did not begin until July 10, after the run was underway and this data is not included in averages. \*\*Data from 2014 is a partial count due to extremely high water and is also not included in the average. Horizontal line represents the 1995-2013 average.



**Appendix 6.** — Historical percentages of female Chinook salmon and summer Chum Salmon sampled at Gisasa River weir, Alaska. \*Asterisk indicates incomplete data from the first year of operation (1994); data collection did not begin until July 10. \*\*Asterisks indicate incomplete data from 2014 when high water events impeded weir operation for all but 12 days.

| Year   | Chinook<br>Salmon<br>% | Chum<br>Salmon<br>% |
|--------|------------------------|---------------------|
| 1994*  | 39                     | 64                  |
| 1995   | 44                     | 46                  |
| 1996   | 20                     | 51                  |
| 1997   | 23                     | 51                  |
| 1998   | 17                     | 46                  |
| 1999   | 29                     | 52                  |
| 2000   | 30                     | 50                  |
| 2001   | 42                     | 49                  |
| 2002   | 21                     | 48                  |
| 2003   | 35                     | 48                  |
| 2004   | 31                     | 44                  |
| 2005   | 33                     | 45                  |
| 2006   | 32                     | 55                  |
| 2007   | 34                     | 57                  |
| 2008   | 18                     | 49                  |
| 2009   | 26                     | 53                  |
| 2010   | 24                     | 53                  |
| 2011   | 17                     | 54                  |
| 2012   | 37                     | 56                  |
| 2013   | 31                     | 56                  |
| 2014** | 18                     | 51                  |

**Appendix 7.** — Water quality parameters collected during the 2014 project at the Gisasa River weir, Alaska.

| Date   | Conductivity ( $\mu\text{s}/\text{cm}$ ) |       | Dissolved Oxygen (mg/L) |       | pH   |      |
|--------|--|-------|-------------------------|-------|------|------|
|        | AM                                       | PM    | AM                      | PM    | AM   | PM   |
| Jun-23 | -  | 222.4 | -                       | 11.39 | -    | 8.50 |
| Jun-24 | -  | -     | -                       | -     | -    | -    |
| Jun-25 | 221.3                                    | 214.3 | 10.12                   | 11.06 | 8.23 | 8.79 |
| Jun-26 | 212.6                                    | 232.7 | 10.45                   | 10.13 | 8.03 | 8.07 |
| Jun-27 | 225.5                                    | 249.7 | 10.47                   | 9.90  | 8.10 | 8.09 |
| Jun-28 | 241.9                                    | 250.7 | 9.93                    | 10.29 | 8.14 | 8.08 |
| Jun-29 | 244.2                                    | 255.6 | 10.13                   | 10.28 | 8.10 | 8.12 |
| Jun-30 | 250.0                                    | 259.2 | 10.39                   | 11.22 | 8.12 | 8.10 |
| Jul-1  | 253.2                                    | 265.2 | 10.46                   | 10.44 | 8.11 | 8.13 |
| Jul-2  | 254.4                                    | 264.5 | 10.34                   | 10.55 | 8.11 | 8.15 |
| Jul-3  | 256.8                                    | 271.2 | 10.89                   | 10.29 | 8.43 | 8.18 |
| Jul-4  | 352.8                                    | 282.8 | 10.51                   | 9.82  | 8.24 | 8.18 |
| Jul-5  | 357.6                                    | 301.2 | 10.16                   | 9.67  | 8.38 | 8.14 |
| Jul-6  | 363.8                                    | 318.5 | 10.30                   | 10.03 | 8.79 | 8.19 |
| Jul-7  | 368.2                                    | 310.3 | 9.56                    | 9.92  | 8.06 | 8.25 |
| Jul-8  | 370.4                                    | 299.8 | 10.04                   | 10.48 | 8.51 | 8.25 |
| Jul-9  | 371.9                                    | 309.4 | 10.39                   | 10.51 | 8.37 | 8.30 |
| Jul-10 | 360.1                                    | 300.6 | 10.49                   | 10.28 | 8.24 | 8.30 |
| Jul-11 | -  | 307.9 | -                       | 10.25 | -    | 8.27 |
| Jul-12 | 380.9                                    | 279.9 | 10.31                   | 10.35 | 8.46 | 8.26 |
| Jul-13 | 382.1                                    | 243.0 | 10.29                   | 10.53 | 8.47 | 8.20 |
| Jul-14 | 240.1                                    | -     | 10.47                   | -     | 8.21 | -    |
| Jul-15 | 145.4                                    | -     | 12.38                   | -     | 8.15 | -    |
| Jul-16 | -  | 169.0 | -                       | 11.76 | -    | 8.06 |
| Jul-17 | 175.0                                    | -     | 12.05                   | -     | 8.16 | -    |
| Jul-18 | -  | -     | -                       | -     | -    | -    |
| Jul-19 | 165.2                                    | -     | 12.45                   | -     | 8.13 | -    |
| Jul-20 | -  | 170.6 | -                       | 12.47 | -    | 8.23 |
| Jul-21 | 179.9                                    | -     | 12.19                   | -     | 8.19 | -    |
| Jul-22 | -  | 188.4 | -                       | 12.09 | -    | -    |
| Jul-23 | -  | 165.2 | -                       | 12.12 | -    | 8.01 |
| Jul-24 | -  | 178.8 | -                       | 12.26 | -    | 8.09 |
| Jul-25 | 195.7                                    | -     | 12.18                   | -     | 8.14 | -    |
| Jul-26 | 211.2                                    | -     | 12.36                   | -     | 8.16 | -    |
| Jul-27 | 221.8                                    | -     | 12.20                   | -     | 8.22 | -    |
| Jul-28 | 228.7                                    | -     | 11.92                   | -     | 8.18 | -    |
| Jul-29 | 237.2                                    | -     | 11.87                   | -     | 8.28 | -    |