

**Fishery Data Series No. 24-22**

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**Monitoring the Chinook Salmon Sport Fishery on the  
Nushagak River Drainage, 2024**

by

**Greta Hayden-Pless**

and

**Lee K. Borden**

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December 2024

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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<b>Weights and measures (metric)</b>		<b>General</b>		<b>Mathematics, statistics</b>	
centimeter	cm	Alaska Administrative Code	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	$H_A$
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	$e$
hectare	ha	at	@	catch per unit effort	CPUE
kilogram	kg	compass directions:		coefficient of variation	CV
kilometer	km	east	E	common test statistics	(F, t, $\chi^2$ , etc.)
liter	L	north	N	confidence interval	CI
meter	m	south	S	correlation coefficient	
milliliter	mL	west	W	(multiple)	R
millimeter	mm	copyright	©	correlation coefficient	
		corporate suffixes:		(simple)	r
<b>Weights and measures (English)</b>		Company	Co.	covariance	cov
cubic feet per second	ft <sup>3</sup> /s	Corporation	Corp.	degree (angular)	°
foot	ft	Incorporated	Inc.	degrees of freedom	df
gallon	gal	Limited	Ltd.	expected value	$E$
inch	in	District of Columbia	D.C.	greater than	>
mile	mi	et alii (and others)	et al.	greater than or equal to	≥
nautical mile	nmi	et cetera (and so forth)	etc.	harvest per unit effort	HPUE
ounce	oz	exempli gratia	e.g.	less than	<
pound	lb	(for example)		less than or equal to	≤
quart	qt	Federal Information Code	FIC	logarithm (natural)	ln
yard	yd	id est (that is)	i.e.	logarithm (base 10)	log
		latitude or longitude	lat or long	logarithm (specify base)	log <sub>2</sub> , etc.
<b>Time and temperature</b>		monetary symbols		minute (angular)	'
day	d	(U.S.)	\$, ¢	not significant	NS
degrees Celsius	°C	months (tables and figures): first three letters	Jan, ..., Dec	null hypothesis	$H_0$
degrees Fahrenheit	°F	registered trademark	®	percent	%
degrees kelvin	K	trademark	™	probability	P
hour	h	United States (adjective)	U.S.	probability of a type I error	
minute	min	United States of America (noun)	USA	(rejection of the null hypothesis when true)	$\alpha$
second	s	U.S.C.	United States Code	probability of a type II error	
		U.S. state	use two-letter abbreviations (e.g., AK, WA)	(acceptance of the null hypothesis when false)	$\beta$
<b>Physics and chemistry</b>				second (angular)	"
all atomic symbols				standard deviation	SD
alternating current	AC			standard error	SE
ampere	A			variance	
calorie	cal			population	Var
direct current	DC			sample	var
hertz	Hz				
horsepower	hp				
hydrogen ion activity	pH				
(negative log of)					
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

***FISHERY DATA SERIES NO. 24-22***

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NUSHAGAK RIVER DRAINAGE, 2024**

by

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## ABSTRACT

The Chinook salmon (*Oncorhynchus tshawytscha*) sport fishery on the Nushagak River was examined from 14 June to 13 July 2024 by creel survey and angler interviews. Index counts of anglers fishing the survey area ranged from 0 on 13 July to 174 on 27 June, with an average for the study period of 74 per day. Information was collected on angler-days of effort by type of angler (guided vs. unguided), gear (bait or no bait), and catch and harvest rates of Chinook salmon. Samples of harvested fish were used to determine age, sex, length, and weight characteristics of Chinook salmon in the sport harvest. These data provided information about sport fishing success as well as the composition of the harvest in the sport fishery during the months of June and July. Data collected from this onsite survey will also provide documented use patterns enabling regulations to be designed that accommodate the sport fishery and maintain angling opportunity. Results will also guide review of current regulations and will be used to assess the effectiveness of current regulations.

Keywords: Chinook salmon, *Oncorhynchus tshawytscha*, creel survey, Nushagak River, Bristol Bay Management Area, angler effort, harvest, age, sex, length, sport fishery, Southwest Alaska

## INTRODUCTION

This project was initiated to allow managers to track inseason sport effort, catch, and harvest rates of Chinook salmon (*Oncorhynchus tshawytscha*) in the Nushagak River and to collect biological data from Chinook salmon harvested in the Nushagak River sport fishery.

The Nushagak River is located in Southwestern Alaska and flows approximately 390 km from its headwaters into Bristol Bay (Figure 1). The Nushagak River drainage supports the largest sport fisheries for Chinook salmon in the Bristol Bay Management Area (BBMA). Under the *Nushagak and Mulchatna King Salmon Management Plan* (5 AAC 06.361; adopted January 1992 and amended 6 times), Chinook salmon are managed to attain an inriver goal of 95,000 fish, with an sustainable escapement goal range of 55,000 to 120,000 spawning fish per year, a reasonable opportunity to harvest Chinook salmon in the inriver subsistence fishery, and a guideline harvest level in the sport fishery of 5,000 fish. Except for 2018, runs have failed to meet this 95,000-fish inriver goal every year since 2017, and since 2021, the runs have failed to meet the 55,000-fish lower end of the escapement goal range (Table 1; Borden and Adickes 2022). As a result of these runs, the *Nushagak King Salmon Stock of Concern Action Plan* was created in the spring of 2023 to provide guidance to managers in achieving the established escapement goal.

Historically (2000 to 2016), the total harvest by commercial, subsistence, and sport fisheries averaged 54,791 Chinook salmon annually (Table 1). Based on this average, the majority (66%) of the harvest was taken by the commercial fishery, 22% was taken by the subsistence fishery, and 12% by sport anglers (calculated from Table 1). Sport harvest of Chinook salmon averaged 6,500 fish from 2000 through 2016 (calculated from Table 1).

In recent years (2017–2023), the total harvest by commercial, subsistence, and sport fisheries averaged 29,260 Chinook salmon (Table 1). The majority (57%) of the total harvest was taken by the commercial fishery, 26% was taken by the subsistence fishery, and 16% by sport anglers. Sport harvest of Chinook salmon averaged 4,667 fish from 2017 through 2021 (calculated from Table 1). Numbers of Chinook salmon in the Nushagak–Mulchatna Rivers drainage have also declined in recent years. Historically, the total run of Nushagak and Mulchatna Rivers Chinook salmon averaged 179,624 fish from 2000 through 2016, ranging from 94,245 to 356,240 fish, but from 2017 to 2021, the average annual run totaled 80,919 Chinook salmon, ranging from 147,742 fish in 2018 to 50,763 in 2023 (Table 1).

As a result of the newly created *Nushagak King Salmon Stock of Concern Action Plan*, entering into the 2024 Chinook season, sport fishery regulations stipulated, in part, an annual bag limit of 4 Chinook salmon 20 inches or longer, only 1 of which may be over 28 inches, and a daily bag limit of 2 Chinook salmon 20 inches or longer, only 1 of which may be longer than 28 inches total length in the Nushagak River drainage. Due to concerns over catch-and-release mortality, the Alaska Board of Fisheries (BOF) adopted regulations in 2012 requiring anglers to use single hooks and, after harvesting a bag limit of fish over 20 inches in length, to use only unbaited, single-hook, artificial lures for the remainder of that day<sup>1</sup>.

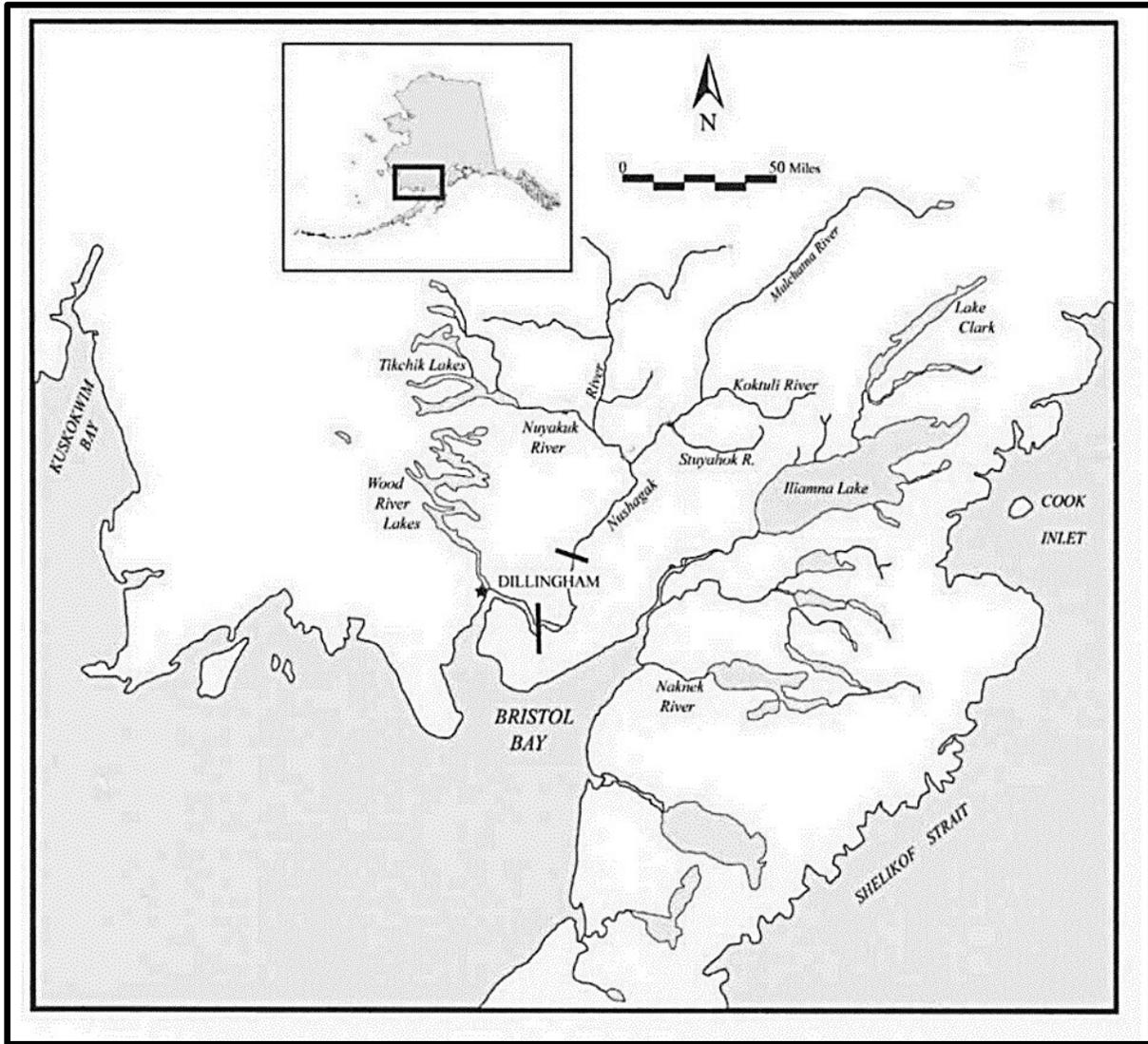


Figure 1.–Nushagak River Chinook salmon study site.

<sup>1</sup> Southwest Alaska sport fishing regulations summary, 2024 (effective until the 2025 summary is issued) Alaska Department of Fish and Game, Division of Sport Fish, Anchorage

Table 1.—Chinook salmon commercial, subsistence, and sport harvests, and escapement for the Nushagak River drainage, 2000–2023.

Year	Total run <sup>a</sup>	Harvests below sonar			Inriver sonar estimate	Harvests above sonar		Spawning escapement <sup>g</sup>	Total harvest
		Commercial <sup>b</sup>	Subsistence <sup>c</sup>	Sport <sup>d</sup>		Subsistence <sup>e</sup>	Sport <sup>f</sup>		
2000	138,044	12,120	7,247	1,389	117,288	1,979	4,628	110,682	27,362
2001	213,306	11,746	7,972	1,600	191,988	3,372	4,299	184,317	28,989
2002	229,485	40,039	6,946	1,193	181,307	4,103	2,500	174,704	54,781
2003	225,594	43,485	13,399	2,203	166,507	4,448	3,752	158,307	67,287
2004	356,240	100,846	10,644	2,567	242,183	4,422	4,339	233,422	122,818
2005	307,701	62,764	7,951	2,863	234,123	4,471	5,702	223,950	83,751
2006	218,861	84,881	6,131	3,166	124,683	3,012	4,307	117,364	101,497
2007	125,435	51,831	9,564	3,581	60,459	3,411	6,088	50,960	74,475
2008	128,752	18,968	9,149	3,305	97,330	2,571	3,395	91,364	37,388
2009	117,936	24,693	9,312	2,451	81,480	2,796	3,903	74,781	43,155
2010	94,245	26,056	6,345	1,659	60,185	1,845	2,248	56,092	38,153
2011	145,232	26,927	8,485	1,542	108,278	2,981	3,302	101,995	43,237
2012	195,106	11,952	7,236	1,833	174,085	2,398	4,098	167,589	27,517
2013	132,782	10,213	6,889	1,971	113,709	4,201	4,714	104,794	27,988
2014	96,639	11,868	11,942	2,369	70,460	3,890	3,891	62,679	33,960
2015	160,713	50,675	9,505	2,514	98,019	2,209	4,720	91,090	69,623
2016	167,540	24,937	14,182	3,053	125,368	1,933	5,358	118,077	49,463
2017	102,083	33,376	8,912	2,834	56,961	1,827	3,161	51,973	50,110
2018	147,742	36,626	10,427	3,450	97,239	1,408	4,742	91,089	56,653
2019	80,250	22,725	7,162	3,600	46,763	2,967	2,706	41,090	39,160
2020	57,968	7,452	5,988	1,496	43,032	2,265	454	40,313	17,655
2021	65,539	4,820	3,922	1,575	55,222	1,297	2,472	51,453	14,086
2022	62,086	5,431	3,723	1,279	44,434	1,721	2,142	40,571	14,296
2023	50,763	6,847	1,816	1,155	31,499	1,444	1,601	28,454	12,863
Average [% avg. total harvest]									
2000–2016	179,624 [NA]	36,118 [66%]	8,994 [16%]	2,309 [4%]	132,203 [NA]	3,179 [6%]	4,191 [8%]	124,833[NA]	54,791
2017–2023	80,919 [NA]	16,754 [57%]	5,993 [20%]	2,198 [8%]	53,593 [NA]	1,847 [6%]	2,468 [8%]	49,278 [NA]	29,260

-continued-

*Source:* **Commercial (total Nushagak District)** 2000: Jones et al. (2014: Appendix A19); 2001–2022: Elison et al. (2023: Appendix A17); 2023: Data provided by by Tim Sands, Division of Commercial Fisheries, Region II, Anchorage. **Subsistence (above and below sonar)** 2000–2021: Data provided by Jordan Head, Division of Commercial Fisheries, Region II, Anchorage; 2022–2023: Data provided by Terri Barnett, Research Analyst III Division of Subsistence. **Sport harvests (above and below sonar)** Alaska Sport Fishing Survey database [Intranet]. 1996–present. Anchorage, AK: Alaska Department of Fish and Game, Division of Sport Fish (cited July 10, 2024) <http://www.adfg.alaska.gov/sf/sportfishingsurvey/>. **Sonar estimates** 2000: Morstad et al. (2012: Table 10); 2001–2021: Elison et al. (2022: Appendix A17); 2022: Bristol Bay Salmon Season Summary <https://www.adfg.alaska.gov/static/applications/dcfnewsrelease/1438246231>.

- <sup>a</sup> Total run refers to the aggregation of salmon of all ages returning from ocean feeding grounds to spawn in any given year and is determined from escapement plus harvest.
- <sup>b</sup> Total Nushagak District commercial harvest from 2001 to present includes personal use reported from commercial harvest.
- <sup>c</sup> Includes Nushagak River bound Chinook salmon harvests from below the sonar site.
- <sup>d</sup> Sport harvest total for 2000–2022 is the Nushagak River sport harvest from Black Point to sonar.
- <sup>e</sup> Includes Ekwok area, Iowithla River, Klutuk River, Koliganek area, New Stuyahok area, Portage Creek area, Kokwok area, Mulchatna River, and an unknown Nushagak River watershed site.
- <sup>f</sup> Sport harvest total for 2000 to 2001 is 50% of the Nushagak River harvest plus harvest from Black Point to Iowithla River, Nushagak River upstream of Iowithla River, Mulchatna River system, Tikchik–Nuyakuk Rivers, and the Kaktuli River harvests. Sport harvest totals for 2002–2021 are Nushagak River drainage excluding Black Point to sonar.
- <sup>g</sup> Spawning escapement for 2000–2021 are sonar estimates minus subsistence and sport harvest above sonar.

## **OBJECTIVES**

The objectives for the 2024 survey of the Chinook salmon sport fishery on the Nushagak River near Portage Creek are as follows:

- 1) Index angler-days of guided, unguided, and total angler effort in the lower Nushagak River from June 15 to July 31.
- 2) Index catch and harvest rates of Chinook salmon and composition of angler-days by gear (bait vs. no bait) and angler type (guided vs. unguided and Alaska resident vs. nonresident) in the lower Nushagak River from June 15 to July 31.
- 3) Estimate the age, sex, length, and weight compositions of Chinook salmon in the sport harvest, separately and in total, for both guided and unguided anglers in the lower Nushagak River from June 15 to July 31 such that the estimates are within 10 percentage points of the true values 90% of the time.

## **METHODS**

### **STUDY SITE**

The 2024 Nushagak River creek survey focused on the area between Black Point and the lower Ekwook land boundary (LELB) at latitude 59°10'25"N, longitude 157°42'35"W and was broken into 3 sublocations: (1) Black Point to the sonar site near Portage Creek, (2) the sonar site to LELB in the west channel, and (3) in the east channel from the Keefer cutoff just downstream of Portage Creek upstream to the channel convergence (Figure 2).

### **ANGLER EFFORT**

One angler count was conducted during each sample day (Objective 1) resulting in 6 sample days per week. Sample days were randomly generated before beginning the project (Appendix A1). All counts were conducted at 10:00 AM, representing what is thought to be the peak time of angling activity, and took 1.5–2.5 hours to complete. Two boats were used to conduct counts, with one boat stationed at the start of Sublocation 1 and the other stationed at the start of Sublocation 2 (Figure 2). These counts were run simultaneously. Once the Sublocation 2 count was completed, the Sublocation 3 count was begun. The boats maintained a safe constant cruising speed while maneuvering the river and counting active anglers; no stops were made until the count was completed. These counts provided an instantaneous representation of active angler effort, broken into guided and unguided anglers. Guided and unguided anglers were identified by the presence or absence of the green guide vessel decals with current year registration stickers as required for any vessel that provides commercial guiding services.

### **CATCH AND HARVEST RATES AND ANGLER-DAY COMPOSITIONS**

Individual angler interviews were conducted every sample day. Roving surveys were utilized to locate completed day anglers, along with a randomized selection of the guided lodges present in the fishery. Each interviewed angler was asked a series of questions to collect the following data: length of time fished, duration of trip, number and species of fish caught and harvested, bait usage, and whether the services of a guide were utilized, along with demographic data. Field technicians also collected biological data (outlined below) from all sport harvested fish that were encountered

during the interviews. This provided data on catch and harvest rates and composition (proportion) of angler-days by gear (bait usage) and angler type (guided vs. unguided; Objective 2).

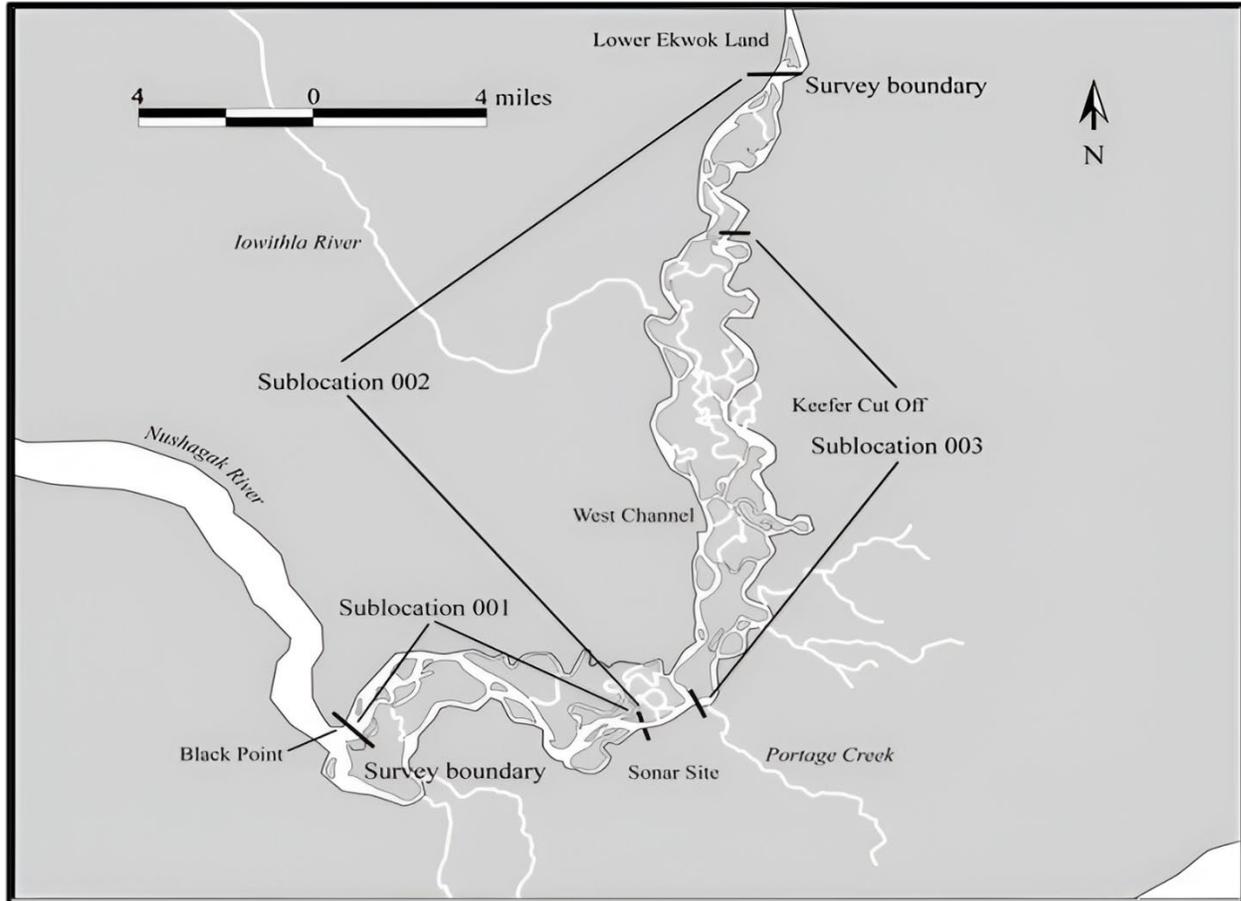


Figure 2.—Nushagak River Chinook salmon study area and sublocations.

## BIOLOGICAL COMPOSITION OF HARVESTED FISH

Samples of harvested Chinook salmon obtained the following data: length (mid eye to tail fork [METF]; nearest 0.1 mm), weight (nearest 0.1 kilograms), age (from scales), and sex determined from external characteristics (developing kype on males, ovipositor on females). Ages were obtained by removing 3 scales from the preferred area<sup>2</sup> and mounting them on an adhesive-coated card. Standard age determination procedures were used (see Jearld 1983 for a general description of the principles used). The European system of age designation was used, where the number of freshwater winter annuli precedes the decimal, and the number of marine winter annuli follows. Total age from the brood year is the sum of the 2 numerals plus 1.

<sup>2</sup> The left side of the fish approximately 2 rows above the lateral line and on the diagonal row downward from the posterior insertion of the dorsal fin, as used on sockeye salmon by Clutter and Whitesel (1956).

## DATA ANALYSIS

### Angler Effort

The single angler count conducted each day represents an index of angler effort. Only a summary of the daily counts by study area, sublocation, and angler type (guided vs. unguided) was performed.

### Angler Interviews

#### *Catch and Harvest Rate*

Daily and weekly estimates of catch per unit of effort (CPUE) were calculated as described below. A unit of effort was defined as an individual angler-day. Daily CPUE on the  $i$ th day during the  $h$ th week was calculated as follows:

$$cpue_{hi} = \frac{c_{hi}}{n_{hi}} \quad (1)$$

where  $c_{hi}$  equals the number of fish caught (both kept and released) on the  $i$ th day during the  $h$ th week of the survey, and  $n_{hi}$  is the number of complete-day anglers interviewed on the  $i$ th day.

Variance of daily CPUE was estimated as follows:

$$\text{var}(cpue_{hi}) = \frac{\sum_{a=1}^{n_{hi}} (c_{hia} - cpue_{hi})^2}{n_{hi}(n_{hi} - 1)} \quad (2)$$

where  $c_{hia}$  is catch of angler  $a$  interviewed on day  $i$  of week  $h$ .

Then the weekly estimate of CPUE was calculated as follows using pooled weekly catch data:

$$cpue_h = \frac{\sum_{i=1}^{m_h} c_{hi}}{\sum_{i=1}^{m_h} n_{hi}} \quad (3)$$

where  $m_h$  equals the number of days sampled in the lower study area during week  $h$  of the survey.

Variance of weekly CPUE was estimated by

$$\text{var}(cpue_h) = \frac{\sum_{i=1}^{m_h} \sum_{a=1}^{n_{hi}} (c_{hia} - cpue_h)^2}{(\sum_{i=1}^{m_h} n_{hi})(\sum_{i=1}^{m_h} n_{hi} - 1)} \quad (4)$$

The standard error (SE) was estimated as the square root of the variance estimate. Harvest per unit of effort (HPUE) was estimated similarly, replacing harvest (only fish kept) for catch.

### *Angler Compositions*

The proportion of anglers by type (guided vs. unguided), terminal gear type (bait use)  $z$ , or angler demographic (Alaska resident vs. nonresident),  $z$  was estimated as follows:

$$\hat{p}_z = \frac{m_z}{m} \quad (5)$$

where  $m_z$  equals the number of the interviewed anglers whose trips were categorized as  $z$ , and  $m$  equals the total number of classifiable anglers interviewed.

No estimates of the sampling variance were calculated because these proportions were merely descriptive in nature and cannot be used to make inferences about the fishery.

### **Biological Composition of Harvested Fish**

The proportion of harvested Chinook salmon of category (age, sex, length, or weight class)  $u$  was estimated as follows:

$$\hat{p}_u = \frac{n_u}{n} \quad (6)$$

where  $n_u$  equals the number of sampled Chinook salmon in category  $u$ , and  $n$  equals the total number of Chinook salmon sampled.

Variance of each proportion was estimated without the finite population correction factor because we do not have harvest estimates:

$$\text{var}(\hat{p}_u) = \frac{\hat{p}_u(1 - \hat{p}_u)}{n - 1} \quad (7)$$

Mean length- and weight-at-age of harvested Chinook salmon were estimated following standard procedures (Sokal and Rohlf 1981: Boxes 4.2 and 7.1, pages 56 and 139). The standard error was calculated as the square root of the variance estimate.

## **RESULTS**

### **ANGLER EFFORT**

During the 2024 sampling period (June 14–July 13), creel technicians performed 25 angler counts, completed 291 angler interviews, and observed 1,790.3 rod-hours of effort (Table 2). Index counts of anglers fishing in the survey area reached a peak of 174 on 27 June (Figure 3), with an average for the study period of 74 anglers per sample day. Interviewed anglers were composed of 10.0% Alaska resident anglers (and of these, 0.3% were local Alaska residents of Dillingham, Ekwok, or New Stuyahok) and 89.7% nonresident anglers. Guided service was utilized by 94.5% of interviewed anglers, and 5.5% were unguided (Table 3). One angler count was missed on 12 July due to unsafe operating conditions caused by severe weather. The field crew ended the project July 13 because effort dropped below 1% of the maximum observed effort in conjunction with an emergency order effective July 3 that moved Chinook salmon sport fishing on the Nushagak River to catch-and-release only.

Table 2.—Summary of weekly angler and harvest data obtained on the Nushagak River during the June 14 to July 13 sampling period in 2024.

Week date range	Anglers counted	Inter-viewed anglers	Resident anglers	Catch		Angler-hours (rod-hours)	CPUE <sup>a</sup>	CPUE SE	HPUE <sup>b</sup>	HPUE SE
				Released	Harvest					
6/14–6/16	82	24	3	0	4	154.0	0.2	0.1	0.2	0.1
6/17–6/23	532	66	7	133	100	305.3	3.5	0.4	1.5	0.2
6/24–6/30	822	87	2	514	147	484.0	7.6	0.9	1.7	0.2
7/1–7/7	374	100	11	150	16	772.5	1.7	0.3	0.2	0.0
7/8–7/13	32	14	7	11	0	74.5	0.8	0.2	0.0	0.0
Weekly average	–	–	–	–	–	–	2.7	–	0.7	–
Grand total	1,842	291	30	808	267	1,790	–	–	–	–

<sup>a</sup> Catch per unit effort (CPUE) is the number of fish caught per angler-day.

<sup>b</sup> Harvest per unit effort (HPUE) is number of fish harvested per angler-day.

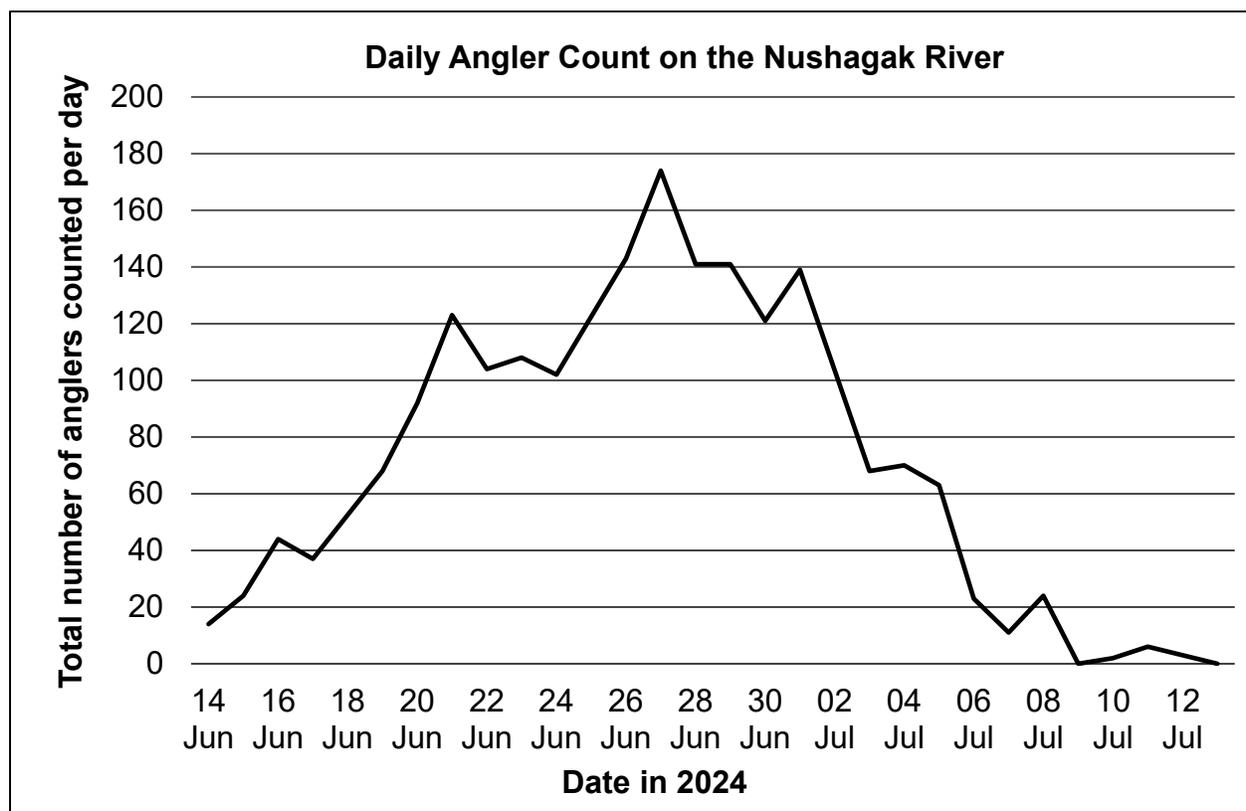


Figure 3.—Total number of anglers counted per day over all sublocations throughout the duration of the project.

Table 3.—Summary of angler composition on the Nushagak River during the June 14 to July 13 sampling period in 2024.

Category	Angler type	Counts	Proportion
Residency	Nonresident	261	89.7%
	Alaska resident	29	10.0%
	Local resident <sup>a</sup>	1	0.3%
Use of guide services	Guided	275	94.5%
	Unguided	16	5.5%
Gear	Baited	168	57.7%
	Unbaited	123	42.3%

<sup>a</sup> Resident of Dillingham, Ekwok, New Stuyahok.

## HARVEST

A total of 291 individual interviews were conducted throughout all sublocations, with biological data collected from 202 sport harvested Chinook salmon. The average weekly catch per unit effort (CPUE) during the study, where effort was defined as an angler-day, was 2.7 fish per angler-day, and the average weekly harvest per unit effort (HPUE) was 0.7 fish per angler day (Table 2).

## BIOLOGICAL COMPOSITION OF HARVESTED FISH

Age was determined from scales collected from all 202 sampled Chinook salmon. Ten fish samples could not be aged and were removed from age analysis. The average length of Chinook salmon in the sport harvest was 541.6 mm (SE 10.2 mm) from mid eye to tail fork (METF), with an average weight of 3.1 kg (SE 0.2; Table 4). The largest of 202 sampled Chinook salmon was 905 mm METF and weighed 12.7 kg. METF length is measured from the mid eye, whereas the regulatory size (28 inches) applies to total length, meaning a METF length equivalent to 28 inches (711 mm) would be greater than 28 inches total length. There were 28 fish whose METF length was greater than 711 mm, placing these fish in the regulatory size of “greater than 28 inches.” One fish was less than 711 mm, although it may have reached or exceeded 28 inches if total length had been measured. Of the 202 fish measured, 38 were female (18.8% of the total sample, SE 2.8%). When separated by sex, males in the sport harvest had an average METF length of 498.8 mm and an average weight of 2.4 kg. Females were larger, with an average METF length of 726.6 mm and average weight of 6.2 kg. Sampled age categories include 1.1, 1.2, 1.3, and 1.4. The age category with the most samples was 1.1 with 77 fish, followed by 1.2 with 73 fish (Figure 4).

Table 4.–Composition of sport harvested Chinook salmon sampled on the Nushagak River during the June 14 to July 13 sampling period in 2024.

Parameter	Age <sup>a</sup>	Average length (mm)	Average weight (kg)	Count	Proportion	SE
Male						
	1.1	386.2	0.9	77	–	–
	1.2	578.6	3.1	62	–	–
	1.3	686.4	5.8	18	–	–
	1.4	–	–	0	–	–
	All male	498.8	2.4	164	81.2%	2.8%
Female						
	1.1	–	–	0	–	–
	1.2	650.5	4.5	11	–	–
	1.3	758.0	6.9	20	–	–
	1.4	803.8	8.3	4	–	–
	All female	726.6	6.2	38	18.8%	2.8%
All <sup>a</sup>						
	1.1	386.2	0.9	77	40.1%	3.5%
	1.2	589.5	3.3	73	38.0%	3.5%
	1.3	724.1	6.3	38	19.8%	2.9%
	1.4	803.8	8.3	4	2.1%	1.0%
	Overall	541.6	3.1	202	–	–

Note: Counts may not sum because not all fish have an assigned age. An en dash indicates data not available or applicable.

<sup>a</sup> Of the 202 salmon sampled from the sport harvest, 10 could not be aged and were removed from the calculations in this table.

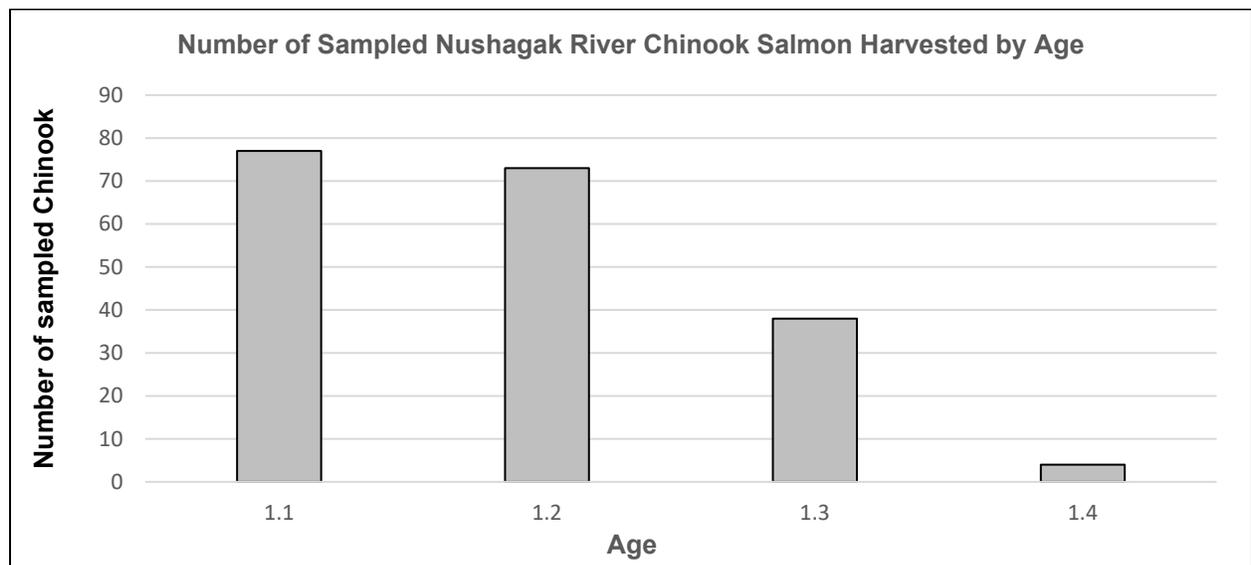


Figure 4.–Number of sampled sport harvested Chinook salmon by age.

## DISCUSSION

Understanding levels of daily angler effort and the composition of Chinook salmon in the sport harvest on the Nushagak River is crucial for management and conservation of the stock. In November of 2022, the Alaska Board of Fisheries listed the Nushagak River Chinook salmon as a stock of concern. In May of 2023, the *Nushagak King Salmon Stock of Concern Action Plan* was created and resulted in the implementation of several regulation changes to guide managers on how to best rebuild the stock. These included a reduction in the annual number per angler of sport harvested Chinook salmon over 28 inches total length from 4 to 1 in hopes of increasing the number of large females (with a higher fecundity) on the spawning grounds (Malick et al. 2023).

Fish with METF lengths greater than 711 mm place them in the >28-inch regulatory category. In the sport harvest samples for 2024, 28 out of 202 (13.9%) sampled fish were over 711 mm METF length, and 21 of those fish were female (10% of total). This is a 13-percentage-point reduction in the proportion of fish in the >28-inch category from the sampled sport harvest in 2023 (Hayden-Pless and Borden 2024) when 49 out of 179 (27.4%) sampled fish were greater than 711 mm METF, and 33 of those fish were female (18% of total). A similar creel survey on the Nushagak River in 2007 (Dye 2012), when the annual bag limit was 4 over 20 inches and the daily limit was 2 over 20 inches, with only 1 over 28 inches, recorded the female portion of the total sampled harvest as 14 percentage points higher (36%) than the total portion found in the first year of this study (22%; Hayden-Pless and Borden 2024) and nearly double the total portion from the 2024 study period (19%), although it is possible this is due to differences in run composition rather than harvest regulations.

This multiyear project, initiated in June 2023, is focused on providing an inseason and in-depth representation of the sport fishery and harvest of Chinook salmon on the Nushagak River, with a glimpse into the size and age composition of the run. This project provides reference data on inriver Chinook salmon numbers that can be used alongside the Portage Creek sonar data (Elison et al. 2022) to help area managers track Chinook salmon abundance and composition. An internal review of telemetry data collected from 2011 to 2014 by the ADF&G Division of Commercial Fisheries found that an annual average of 57% of the Chinook salmon run migrated outside the sonar beam at Portage Creek, with an annual range of 47–65% uncounted (Maxwell et al. 2020). Inseason monitoring allows the Chinook salmon stock to be assessed in real time and allows for necessary adjustments via emergency order to be made to best conserve this stock of concern. For example, in 2024, inseason data reported by the sonar and creel survey enabled managers to restrict the fishery to a catch and release only for Chinook salmon.

Based on the composition of the sampled fish, the largest portion (40.1%) of Chinook salmon harvested in the Nushagak River sport fishery in 2024 were 3 years old (age 1.1; Figure 4, Table 4). The overall average length in 2024 was 541.6 mm (SE 10.2), which is less than the average length in 2023 (597.0 mm; Hayden-Pless, Borden, 2024) and far less than the average in 2007 (752 mm; Dye 2012). The decrease could be due to a number of reasons, including a general change in the composition of the run or the new regulations placed on the Nushagak River Chinook salmon anglers allowing only 1 fish over 28 inches to be harvested. It should be noted that the fish returning to the Nushagak River drainage in 2024 included members of the 2019 brood stock, which experienced a hot summer, with water temperature reaching 21.5°C, with high pre-spawn salmon mortality observed bay-wide (Hayden-Pless, Fishery Biologist, ADF&G, Dillingham, unpublished data).

Total effort hit a peak midseason on June 27, which is reflected in the daily and weekly CPUE of 16.4 and 7.6 fish per angler-day, respectively, which were maximums during the project (Appendix B1; Table 2). When observed effort was broken into sublocations, sublocation 001 had the greatest effort during the study period, with 990 total anglers, followed by sublocation 003 with 528 total anglers (Appendix C1). It was noted by project staff that the overall effort on the river appeared less than the previous year, but the per-angler rod hours increased. There was a maximum count of 174 anglers on June 27 (Figure 3), with an average of 71 anglers per day, and a total angler count for the sampling period of 1,842 (Table 2). These numbers were less than those found by the 2023 study (Hayden-Pless and Borden 2024), which averaged 96.7 anglers per day, and counted a total of 2,128 anglers for the sampling period. Although the number of anglers decreased by 286 anglers compared to the 2023 season, the total rod hours increased by 183 rod hours of effort in 2024.

The project concluded July 13 after the angler counts had decreased to below 1% of the maximum observed effort. Biological sampling could no longer be conducted because an emergency order was issued effective July 3 restricting the Chinook salmon fishery to catch-and-release only to conserve returning Chinook salmon.

## **ACKNOWLEDGMENTS**

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## **APPENDIX A: SAMPLING SCHEDULE**

Appendix A1.–Angler count schedule.

Date	Scheduled sample days	Days sampled
14 Jun		X
15 Jun	X	X
16 Jun	X	X
17 Jun	X	X
18 Jun	X	X
19 Jun	X	X
20 Jun		
21 Jun	X	X
22 Jun	X	X
23 Jun	X	X
24 Jun	X	X
25 Jun	X	X
26 Jun	X	X
27 Jun		
28 Jun	X	X
29 Jun	X	X
30 Jun	X	X
1 Jul	X	X
2 Jul	X	X
3 Jul	X	X
4 Jul		
5 Jul	X	X
6 Jul	X	X
7 Jul	X	X
8 Jul	X	X
9 Jul	X	X
10 Jul	X	X
11 Jul		
12 Jul	X	–
13 Jul	X	X
14 Jul	X	–
15 Jul	X	–
16 Jul	X	–
17 Jul	X	–
18 Jul		
19 Jul	X	–
20 Jul	X	–
21 Jul	X	–
22 Jul	X	–
23 Jul	X	–
24 Jul	X	–
25 Jul		
26 Jul	X	–
27 Jul	X	–
28 Jul	X	–
29 Jul	X	–
30 Jul	X	–

Note: “X” indicates a survey was either planned or conducted; an en dash indicates a planned survey was not conducted.

**APPENDIX B: DAILY EFFORT DATA OF SAMPLED  
SPORT HARVESTED CHINOOK SALMON**

Appendix B1.–Daily effort data of sampled sport harvested Chinook salmon.

Date	Week	Daily				
		Interviews conducted	CPUE	CPUE SE	HPUE	HPUE SE
14 Jun	1	5	0.6	0.4	0.6	0.4
15 Jun	1	7	0.0	0.0	0.0	0.0
16 Jun	1	12	0.1	0.1	0.1	0.1
17 Jun	2	5	0.0	0.0	0.0	0.0
19 Jun	2	28	2.6	0.4	1.8	0.4
20 Jun	2	10	5.7	0.6	1.5	0.4
21 Jun	2	6	8.7	1.1	2.8	1.2
22 Jun	2	9	4.4	0.7	1.2	0.3
23 Jun	2	8	1.5	0.6	0.8	0.3
24 Jun	3	17	1.9	0.4	0.8	0.2
26 Jun	3	15	8.7	1.3	2.5	0.7
27 Jun	3	9	16.4	2.6	1.2	0.1
28 Jun	3	11	5.5	1.1	2.1	0.3
29 Jun	3	18	14.8	2.8	2.6	0.4
30 Jun	3	17	1.4	0.5	0.9	0.2
1 Jul	4	11	6.9	1.1	1.5	0.2
3 Jul	4	26	0.3	0.1	0.0	0.0
4 Jul	4	33	0.6	0.2	0.0	0.0
5 Jul	4	14	3.6	0.4	0.0	0.0
6 Jul	4	8	0.4	0.3	0.0	0.0
7 Jul	4	8	1.1	0.5	0.0	0.0
8 Jul	5	4	2.0	0.0	0.0	0.0
10 Jul	5	5	0.0	0.0	0.0	0.0
11 Jul	5	5	0.6	0.2	0.0	0.0

**APPENDIX C: DAILY OBSERVED EFFORT BY  
SUBLOCATION ON THE NUSHAGAK RIVER**

Appendix C1.–Daily observed effort data by sublocation on the Nushagak River, 14 June–13 July 2024.

Date	Number of anglers		
	Sublocation 001	Sublocation 002	Sublocation 003
14 Jun	7	4	3
15 Jun	17	0	7
16 Jun	14	16	14
17 Jun	24	0	13
19 Jun	48	3	17
20 Jun	61	14	17
21 Jun	70	24	29
22 Jun	72	2	30
23 Jun	42	28	38
24 Jun	53	25	24
26 Jun	91	24	28
27 Jun	110	31	33
28 Jun	53	28	60
29 Jun	68	8	65
30 Jun	62	18	41
1 Jul	70	34	35
3 Jul	43	16	9
4 Jul	30	11	29
5 Jul	31	17	15
6 Jul	7	9	7
7 Jul	7	0	4
8 Jul	8	6	10
10 Jul	2	0	0
11 Jul	2	0	4
13 Jul	0	0	0
Total anglers	990	318	528