Regional Operational Plan ROP.SF.2A.2015.14

Operational Plan: Ninilchik Chinook Salmon Stock Assessment and Supplementation, 2015

by

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and

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February 2016

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN ROP.SF.2A.2015.14

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by

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This document should be cited as:
Booz, M. D., and C. M. Kerkvliet. 2015. Operational Plan: Ninilchik River Chinook salmon stock assessment and supplementation, 2015. Alaska Department of Fish and Game, Division of Sport Fish, Regional Operational Plan ROP.SF.2A.2015.14, Anchorage.

SIGNATURE PAGE

Project Title:	Ninilchik River Chinook Salmon Stock Assessment and Supplementation 2015.
Project leader(s):	*Michael Booz, Fisheries Biologist I and Carol Kerkvliet, Fisheries Biologist II*
Division, Region, and Area	*Sport Fish, Region II, Homer*
Project Nomenclature:	*F-10-29; S-2-15 and F-10-30; S-2-15*
Period Covered	FY15 and FY16
Field Dates:	May 14, 2015 to August 1, 2015
Plan Type:	Category II

Approval

Title	Name	Signature	Date
Project leader	Mike Booz	[signature]	5/12/15
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ABSTRACT

This project is designed to monitor wild Chinook salmon escapement to ensure sustainability of the stock and to conduct egg takes to provide additional fishing opportunities within the Ninilchik River and terminal salt water fisheries in Kachemak Bay. Chinook salmon escapement will be indexed from 3 to 31 July at a broodstock weir located approximately 7.7 river kilometers (RKM) upstream of the mouth of the Ninilchik River. The index will be compared to a sustainable escapement goal (SEG) range of 550–1300 wild Chinook salmon.

Key words: Ninilchik River, escapement, egg takes, Chinook salmon, *Oncorhynchus tshawytscha.*

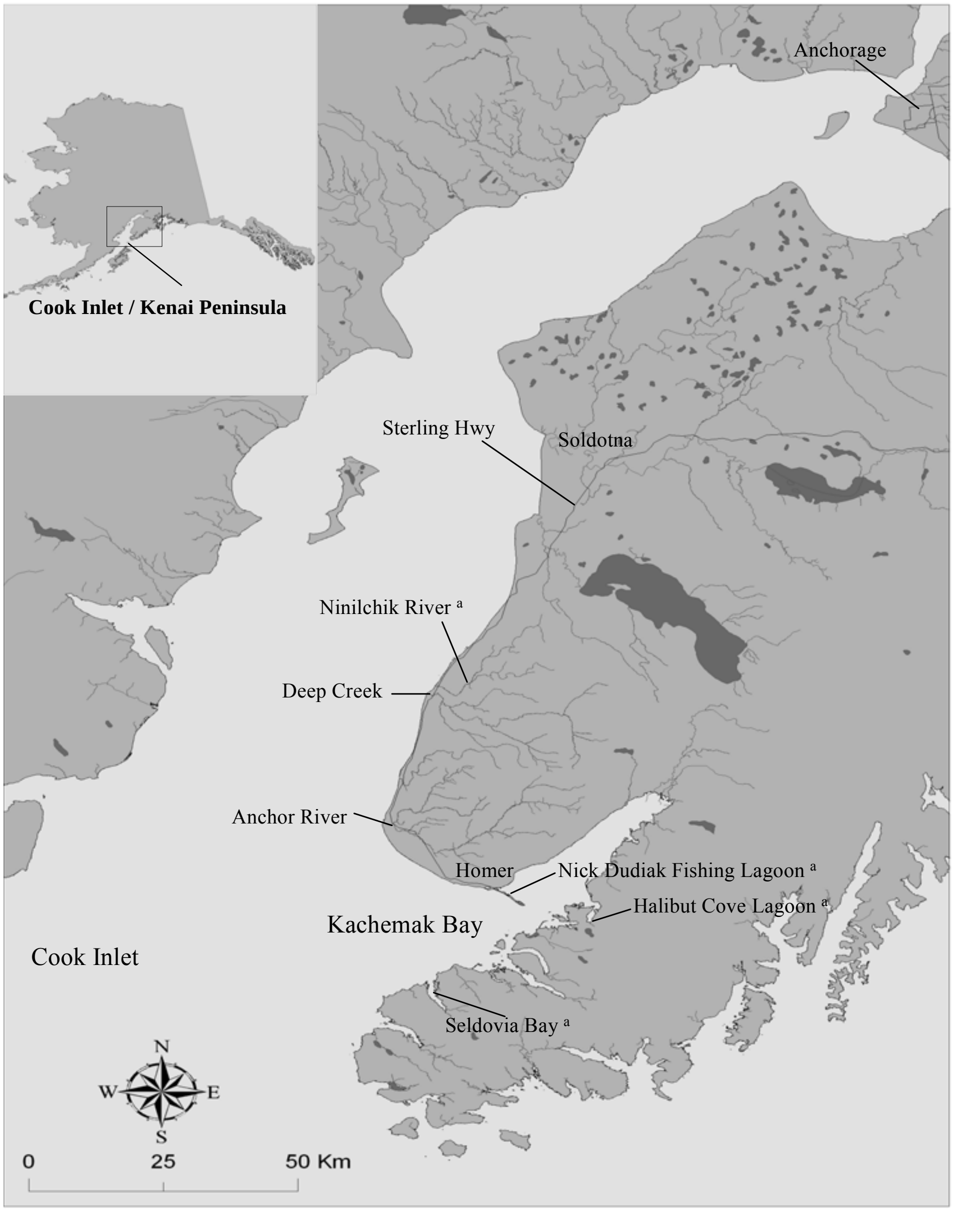
INTRODUCTION

Ninilchik River is located on the Kenai Peninsula in the Lower Cook Inlet management area (LCIMA) (Figure 1). It is a small (anadromous stream length 81 river kilometers [RKM]), non-glacial, anadromous stream with extensive wetlands (122 km^2) and no large tributary lakes. There are only 3 road accessible streams in the LCIMA that support Chinook salmon (*Onchorhynchus tshawytscha*) sport fisheries: Ninilchik River, Anchor River, and Deep Creek. Angler effort is focused on Ninilchik River earlier in the season because water conditions are generally less turbid than those at the Anchor River or at Deep Creek.

Sport anglers are capable of harvesting a significant portion of the Ninilchik River Chinook salmon run because the stream size is small and fishing conditions are typically favorable to good fishing success. In the mid-1980s, the Alaska Department of Fish and Game (ADF&G) Division of Sport Fish (SF) recognized that the Ninilchik River Chinook salmon stock was vulnerable to overharvest from the growing Kenai Peninsula sport fishery. In 1987, SF initiated a supplementation program for the Ninilchik River as a way to create sustainable fishing opportunities through stocking hatchery-reared Chinook salmon smolt. As a result of the supplementation program, 2 groups of Chinook salmon (wild and hatchery-reared) now return to the Ninilchik River, which has added an additional level of complexity to the management of escapement and harvest of Ninilchik River Chinook salmon. Since 1994, Ninilchik River Chinook salmon smolt have also been used in supplementation programs in other areas of the Lower Cook Inlet peninsula (see below).

From 1999 through 2008, the average annual harvest estimate of Ninilchik River Chinook salmon was 1,156 fish. To put this figure in context, an average of 2,197 wild and hatchery fish arrived at the weir from 1999 through 2005, when the weir operated for the duration of the run. It should also be noted that a substantial proportion, thought to be about 35% of the escapement, spawns below the weir. From 2009 through 2013, the average annual harvest estimate of Ninilchik River Chinook salmon declined to 184 fish. During this period it is estimated that the average run to the weir of was about 1,000 hatchery and wild fish.

The following sections summarize the supplementation program and escapement monitoring, the tools used to evaluate the sport harvest of hatchery-reared fish, and management strategies.



[a] Stocking locations for Ninilchik River Chinook Salmon broodstock

Figure 1.–Map of Kenai Peninsula highway system, Ninilchik River, and Kachemak Bay Chinook salmon stocking locations, 2015.

SUPPLEMENTATION

The annual supplementation of Chinook salmon for the Ninilchik River has remained essentially unchanged since 1995, when stocking levels were reduced to 50,000 smolt (from ~200,000 smolt) with 100% of the smolt adipose-clipped and coded-wire-tagged (CWT).

Since 1988, broodstock collection and egg takes have been conducted at a broodstock weir located at Brody Road bridge (7.7 RKM; Figure 2) during the month of July and early August. Only the progeny from wild Chinook salmon broodstock are used for Ninilchik River stockings. From 1988 through 2002, Chinook salmon smolt were stocked as age-0 fish. From 2003 through 2011, due to limited hatchery rearing facilities, all stocked Chinook salmon have been overwintered in the hatchery as parr and released in the spring as age-1 smolt. Starting in 2012, all Ninilchik River hatchery-reared Chinook salmon are reared in the new William Jack Hernandez Hatchery (WJHH) in Anchorage and stocked as age-0 smolt.

Starting in 1994, additional broodstock from the Ninilchik River was collected to support stocking at the terminal saltwater fisheries in Kachemak Bay at Nick Dudiak Fishing Lagoon (NDFL) on Homer Spit, Halibut Cove Lagoon (HCL), and Seldovia Bay (Figure 1). A combination of both wild and hatchery-reared Chinook salmon is used as broodstock for the terminal saltwater fisheries.

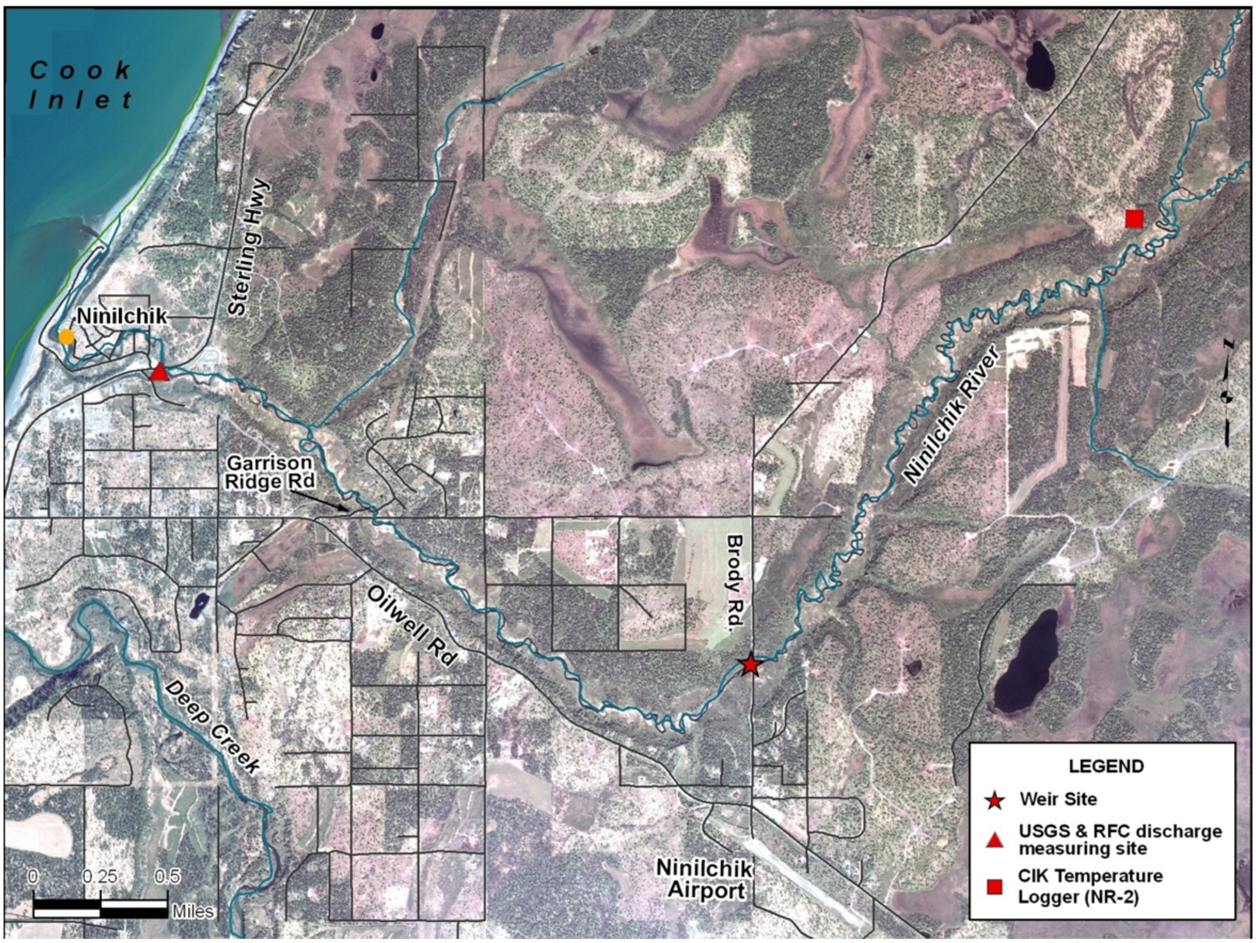


Figure 2.–Map of Ninilchik River sampling locations, 2015..

ESCAPEMENT MONITORING

ADF&G has monitored Chinook salmon escapement in Ninilchik River since 1962. Starting in 1999, all hatchery-reared Chinook salmon returning to the Ninilchik River have been adipose finclipped and tagged with a CWT. Since then, all weir counts of wild and hatchery-reared Chinook salmon have been differentiated by examining all Chinook salmon at the weir for the presence or absence of an adipose fin. Currently, escapement is monitored at the broodstock weir during an index monitoring period and not over the entire run (Table 1). The Chinook salmon escapement is calculated by removing the holding and egg-take mortalities from the Chinook salmon weir count. On average (1999–2005), 65% of the total wild Chinook salmon weir escapement is believed to be counted during the index monitoring period. This index fails to account for spawning below the weir which may consist of approximately 35% of the total spawning escapement based on aerial survey data; it is noted that the composition (wild vs. hatchery-reared) of the spawning population below the weir is unknown (Marsh *unpublished*[1]).

Escapement Goal

The sustainable escapement goal (SEG) range for wild Ninilchik River Chinook salmon is 550–1,300 fish during the index monitoring period (3–31 July). This SEG was calculated using the percentile method (Bue and Hasbrouck *unpublished)*[2]*,* and is based on the wild escapement above the weir during the index monitoring period from 1999 through 2007 (Otis and Szarzi 2007).

SPORT HARVEST

Monitoring the Chinook salmon sport harvest at Ninilchik River has become more complicated since the inception of the supplementation program. The Alaska Statewide Harvest Survey (SWHS) estimates, by area and by fishery, the participation, harvest (fish kept), and catch (fish harvested plus fish released) of sport-caught species. The SWHS does not provide the stock composition (wild vs. hatchery-reared) of the harvest, or the harvest by time period.

From 1991 through 2006, periodic assessment of the hatchery-reared contribution to the sport harvest, has been conducted with creel and sport harvest surveys. During runs from high stocking years (1990–1998), these surveys found over 50% of the harvest was hatchery-reared fish (Balland and Begich 2077; Balland et al. 1994; Begich 2006-2007; Boyle and Alexandersdottir 1992; Boyle et al. 1993; Marsh 1995; Marsh, memorandum). In 2006, the hatchery-reared percentage of the Chinook salmon harvest during the 3 regulatory 3-day weekend fishery was 39% (Booz and Kerkvliet 2011a).

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1 L. E. Marsh, 1997 memorandum to B. Clark, ADF&G, on preliminary evaluation of the stocking program at the Ninilchik River. Subsequently referred to as the *Marsh, memorandum*.

2 Bue, B. G., and J. J. Hasbrouck. Unpublished. Escapement goal review of salmon stocks of Upper Cook Inlet. Alaska Department of Fish and Game, Report to the Alaska Board of Fisheries, November 2001 (and February 2002), Anchorage. Subsequently referred to as *Bue and Hasbrouck, unpublished*.

Table 1.–Number and escapement of wild and hatchery-reared Chinook salmon counted at the Ninilchik River weir during SEG index monitoring period, 1999–2014.

	Wild Chinook salmon					Hatchery Chinook salmon				
	Total run		SEG period		SEG escapement percentage of total	Total run		SEG period		SEG escapement percentage of total
Year	Weir counts	Escapement counts	Weir counts	Escapement counts		Weir counts	Escapement counts	Weir counts	Escapement counts	
1999	1,644	1,576	1,351	1,283	81	641	573	515	453	79.1
2000	1,634	1,553	1,346	1,265	82	853	685	786	626	91.4
2001	1,414	1,239	1,072	897	72	673	543	601	483	89.0
2002	1,516	1,340	1,073	897	67	559	395	403	266	67.3
2003	1,258	1,127	648	517	46	425	336	293	217	64.6
2004	1,525	1,393	811	679	49	536	469	409	373	79.5
2005	2,241	2,076	1,424	1,259	61	462	409	339	295	72.1
2006	ND	ND	1,114	1,013	–	ND	ND	260	192	–
2007	ND	ND	672	543	–	ND	ND	83	63	–
2008	ND	ND	721	586	–	ND	ND	83	63	–
2009	ND	ND	551	528	–	ND	ND	97	65	–
2010	ND	ND	605	605	–	ND	ND	34	34	–
2011	ND	ND	761	668	–	ND	ND	52	25	–
2012	ND	ND	561	555	–	ND	ND	65	52	–
2013	ND	ND	591	571	–	ND	ND	210	9	–
2014 [a]	ND	ND	983	891	–	ND	ND	1,116	90	–

Note: ND means no data; "–" means cannot be estimated.

[a] Preliminary.

MANAGEMENT

The sport fishery regulations for Ninilchik River Chinook salmon are designed to conservatively manage for the sustainability of the wild stock. The regulations restrict harvest opportunity by limiting the area open to fishing to the lower 3.2 RKM of the river (to protect the main Chinook salmon spawning area), and by limiting fishing openings to 3 consecutive 3-day weekends (Saturday through Monday) beginning on Memorial Day weekend. Starting in 2008, the regulatory sport Chinook salmon fishery in the Ninilchik River includes opportunity to harvest only hatchery-reared Chinook salmon in the lower 3.2 RKM of the river from 1 July through 31 December.

Management of Chinook salmon in the Ninilchik River has been refined since the inception of the supplementation program with a more directed focus towards maximizing the harvest of hatchery-reared fish. From 1991 through 2001, SF has periodically issued Emergency Orders (EOs) to increase th`e number of fishing days for both wild and hatchery-reared Chinook salmon. Starting in 2002, EOs increased fishing days for hatchery-reared fish only.

In 2004, the Alaska Board of Fisheries (BOF) adopted a regulation that increased the daily bag limit for Ninilchik River Chinook salmon from 1 to 2 of which no more than 1 fish could be a wild Chinook salmon. The intent of this regulation was to increase the harvest of hatchery-reared Chinook salmon. The daily bag limit was returned to 1 fish by BOF starting in 2014 fishery.

Despite the Chinook salmon supplementation in the Ninilchik River, the Chinook salmon sport fishery has been restricted through EO from 2010 through 2014 to reduce harvest to ensure adequate wild Chinook salmon escapement. The contribution of hatchery-reared Chinook salmon to the harvest in the sport fishery has likely been well below the historical contribution. If only 40% of the sport harvest is of hatchery origin (most recent estimate) then an average of about 80 hatchery fish have been provided annually to anglers from 2009 to 2013. After ongoing discussion of the costs and benefits of continuing the Ninilchik River supplementation program, the stocking level is scheduled to increase to 150,000 smolt to provide a more significant hatchery return that will supplement the harvest and broodstock collection at the weir.

This project is designed to monitor wild Chinook salmon escapement to ensure sustainability of the stock and conduct egg takes to provide additional fishing opportunities within the Ninilchik River and terminal salt water fisheries. This operational plan will serve to outline the annual objectives and tasks and to describe how they will be met.

OBJECTIVES

PRIMARY OBJECTIVES

1) Census the Ninilchik River wild and hatchery-reared Chinook salmon run and escapement[3] at 7.7 RKM from 3 July through 31 July.
2) Census the sex composition of the Ninilchik River wild and hatchery-reared Chinook salmon run at 7.7 RKM from 3 July through 31 July.

[3] Run and escapement differ by the number of fish sacrificed for broodstock.

3) Estimate the sex and age compositions of the Ninilchik River wild Chinook salmon run at 7.7 RKM from 3 July through 31 July such that the estimates of each group are within 10% of the true values 95% of the time[1].
4) Estimate the sex and age compositions of the Ninilchik River hatchery Chinook salmon run at 7.7 RKM from 3 July through 31 July such that the estimates of each group are within 10% of the true values 95% of the time.
5) Estimate the wild and hatchery-reared compositions of the Chinook salmon run below the weir in late June, prior to the July sport fishery, such that the estimates of each group are within 10% of the true values 90% of the time.

SECONDARY OBJECTIVES

1) Collect, hold, and artificially spawn 131 male and 131 female Chinook salmon during July from the Ninilchik River (minimum of 60 wild males and 60 wild females to ensure genetic variation) for future hatchery releases to the Ninilchik River, HCL, Seldovia, and the NDFL on Homer Spit. Only wild fish will be used for stocking the Ninilchik River.
2) Release approximately 150,000 Chinook salmon smolt in the Ninilchik River, 105,000 smolt in HCL, 105,000 smolt in Seldovia, and 210,000 smolt in NDFL from May through June.
3) Estimate length at age by sex for the Ninilchik River hatchery-reared and wild Chinook salmon run at 7.7 RKM.
4) Estimate within-reader variability of age estimates from scale readings.
5) Census the number of the Ninilchik River wild and hatchery-reared Chinook salmon less than or equal to 525 mm mid eye to tail fork (METF) length in the Chinook salmon run at 7.7 RKM from 3 July through 31 July.
6) Collect kidney samples from all sacrificed female Chinook salmon from egg takes to test for bacterial kidney disease (BKD).
7) Measure daily water temperature and depth at the weir.
8) Quantify *Chaetoceros* spp. concentrations around stockings at NDFL and HCL.

METHODS

STUDY AND SAMPLING DESIGN

There are 3 main components to this project: 1) escapement monitoring and biological sampling; 2) egg takes; and 3) smolt releases. From 3 July through 31 July, escapement will be monitored and sampled with a fixed picket weir. The weir will be installed approximately 7.7 RKM from the mouth and 15 m downstream of the Brody Road Bridge (Figure 2). Egg takes will be conducted at the weir site. Hatchery personnel in cooperation with Homer ADF&G staff will stock smolt into net pens at the terminal saltwater fisheries in Kachemak Bay. Homer ADF&G staff will feed, assess mortality, and release held smolt.

[1] Within d% of the true value A% of the time implies $P\left(\left[p_i - \frac{d}{100}\right] \le \hat{p}_i \le \left[p_i + \frac{d}{100}\right]\right) = A/100$ for all i where p_i denotes population age proportion for age class i.

Escapement

Escapement Monitoring

The weir will be operated with a live box for capturing fish. The weir will be visually inspected on a daily basis to ensure no fish can migrate upstream undetected. The gate to the live box will be opened daily at approximately 8:00 AM and closed around 11:00 PM. Technicians will periodically check the live box and process all fish as quickly as possible to prevent impeding the migration.

All fish captured in the live box will be identified to species and tallied for the daily escapement counts. All Chinook salmon will be examined for caudal and adipose finclips, sexed based on external characteristics, and sampled for scales in the fish is determined to be greater than 525mm METF. Fish less than or equal to 525 mm are almost certainly ocean age 1 and scales need not be taken. It is noted that ocean age-1 fish can be greater than 525mm METF as well. Chinook salmon with intact adipose fins will be recorded as wild, and those with missing adipose fins will be recorded as hatchery-reared. Chinook salmon will be given an upper caudal finclip to prevent double sampling in the event of a weir failure.

Biological Sampling

During the 3–31 July escapement monitoring, Chinook salmon will be processed through the weir following the flow chart in Appendix A1 and sampled for age-sex-length (ASL) data using the following methods:

1) Age—Chinook salmon less than or equal to 525 mm will be assumed to be ocean age 1 (jacks) and no scales will be collected. Between 2005 and 2010, less than 0.5% of ocean age-2 wild fish were less than or equal to 525 mm METF. For each sampled Chinook salmon greater than 525 mm METF, 3 scales will be removed following the methods of Welander (1940) and as described in Appendix A2.

    a. If regenerated scales are present on the fish's left side in the preferred area, then the right side preferred area will be used alternatively. Scale samples will be temporarily stored in prenumbered containers. At the end of the day, scale samples will be mounted on gum cards, with the first 3 scales (first sample) placed in the first column on the right side of the gum card in cell numbers 1, 11, and 21. All additional 3-scale samples will be placed in appropriate columns until the gum card is filled. Prior to mounting, scales will be inspected to ensure they are clean and oriented correctly before drying. Common problems encountered with inexperienced scale collectors are listed in Appendix A3. Scale cards will be labeled with species, date, location, card number, and name of sampler before collection. To prevent confusion, the same scale card will be used for both wild and hatchery-reared Chinook salmon. The cards will be numbered sequentially from 1 through 99.

    b. Gum cards will be impressed into cellulose acetate using a Carver press at 99°C and 22,500 psi for approximately 2.5 min in the Homer ADF&G office. Scales will be read using a microfiche reader and aged with methods described by Mosher(1969). Before scales are aged, the reader will review a test set of 100 Chinook salmon scale samples that have been previously aged by readers and contain at least 50 samples of a known age (Appendix A4). The reader's ages will be compared to the previous age estimates and known ages. Ages that do not match will be reviewed and reread. Once the reader ages are resolved and equal to the test set ages, then the reader will begin with the collected samples from this season. Age estimates will be produced without knowledge of size, sex, and other age estimates. Scale samples will be aged twice to estimate within-reader precision. All scale samples that had conflicting ages for the 2 estimates will be re-aged to produce a resolved age, which will be used for composition and abundance estimates.

2) Sex—determined by external physical characteristics, such as kype development, or a protruding ovipositor.

3) Length—measurements will be from mid eye to tail fork (METF) to the nearest 5 millimeters.

Sample Sizes

The sample sizes giving the desired precision of estimates of the proportion by age category for the wild run were calculated by combining a finite population correction factor (Cochran 1977) with the sample size determined under the assumption of multinomial sampling (Thompson 1987):

$$n = \frac{n_o}{1 + \frac{n_o - 1}{N}}(1 - R)^{-1} \tag{1}$$

where

n_o = 127 Chinook salmon (Thompson 1987) of target population,

N = total number of Chinook salmon in the target population, and

R = proportion of unreadable scales.

For the period of 3–31 July, the latest 3-year average (2012–2014) run of wild Chinook salmon to the weir is 711. Assuming the run in 2015 is similar to this average, and assuming age cannot be estimated on 20% of the scale samples, sampling 136 wild Chinook salmon will allow us to meet the criteria stated in Objective 3.

Because the age and sex composition of the wild Chinook salmon run may change over time, age and length sampling will be conducted every other day by applying a sampling rate to the cumulative wild Chinook salmon weir count since the last sampling event. To determine the wild Chinook salmon sampling rate, we anticipate the wild salmon run to be the average of the last 3 years (711) and therefore anticipate that our required sampling rate will be at least 0.19 (136/711). Using the run size data from the 2012–2014 period will improve our chances of meeting our sampling goal. For each sampling event, the number of wild Chinook salmon that arrived at the weir on the previous day will be multiplied by the sampling rate (0.20) and rounded up to the nearest whole number. Sampling will start immediately in the morning when the live box is opened and wild Chinook salmon will be sampled continuously until the sample size is met. When sampling wild Chinook salmon for age and length, fish less than or equal to 525 mm METF will be assumed to be ocean age 1 (jacks) and will be measured but no scales will be collected. Wild jack Chinook salmon will count towards meeting the overall and every other day sample size goals.

The hatchery-reared Chinook salmon run sizes have caused us to change the age and length sampling methodology in recent years. Historically, the hatchery-reared component of the run has been sampled in a similar fashion as outlined above for wild Chinook salmon. From 2007 through 2012, the hatchery-reared Chinook salmon annual weir counts were less than 100 fish. These runs were well below average and attributed to below average stocking size coupled with poor marine survival. Every hatchery-reared Chinook salmon was sampled for age and length data during these years due to the small run sizes. In 2013, the hatchery-reared Chinook salmon cumulative weir count during the SEG index monitoring period was 210 fish. Of those, 172 were jacks (≤525 mm METF) that were the first return out of the WJHSF hatchery and the largest run of jacks observed at the weir for years with runs comprised of the 50,000 smolt stocking level. In 2014, age and length sampling was adjusted to compensate for this significant increase in jacks. No scales were collected from hatchery-reared Chinook salmon that were less than or equal to 525 mm METF, observed at the weir, and assumed to be ocean age-1 fish. All hatchery-reared Chinook salmon greater than 525 mm were sampled for age and length. The hatchery-reared jack Chinook salmon were subsampled for lengths. The 2014 hatchery-reared Chinook salmon run size for jacks was 821 fish and there were roughly 300 fish greater than 525 mm METF.

In 2015, we anticipate that the hatchery-reared Chinook salmon run will continue to increase in numbers due to having a nearly full complement of age classes (except ocean age 4) of fish reared at WJHSF hatchery. Based on the 2014 run of hatchery-reared Chinook salmon greater than 525 mm METF, age and length sampling will need to be subsampled; based on the age composition of the return in 2014, we assume that there will be at least 350 hatchery-reared Chinook salmon greater than 525 mm METF in 2015. With the same assumptions of the wild Chinook salmon sampling, the target sample size goal is 118 hatchery-reared Chinook salmon greater than 525 mm METF to meet the criteria in Objective 4. The sampling rate will be 0.34 (118/350) applied to the hatchery-reared run in the same fashion as the wild run. For jacks (assumed ocean age 1) we anticipate the same run size as 2014 and by measuring every sixth fish less than or equal to 525 mm METF we will obtain 136 lengths. Given the mean and standard deviation of lengths of ocean age-1 fish is about 440 mm and 70 mm, respectively (2005–2010 data), we should estimate length-at-age for age-1fish less than 525 mm METF with a coefficient of variation of 1.4%, at most (CV = $\sqrt{70^2 \div 136}/440 \times 100$). While we do not have an established precision criteria for length-at-age estimates, the sample size of 136 will ensure an acceptably precise estimate of mean length of ocean age-1 fish when ocean age-1 samples from the 2 sampling protocols are combined.

Water Temperature and Discharge

Water temperature and discharge data will be analyzed postseason. Cook Inletkeeper (CIK), a citizen-based nonprofit group, will collect water temperature (°C) every 15 minutes using a temperature logger at their NR-2 site (described in Mauger 2005). The NR-2 site is located approximately 6.0 RKM above the weir site (Figure 2). Discharge data will be collected by the National Weather Service, Alaska Pacific River Forecast Center (RFC) near the Sterling Highway Bridge (RKM 0.9; Figure 2). RFC will contract a local citizen to collect a daily stage (ft) reading at approximately the same time each day (~1900 hours) using a wire weight gauge. Collected stage readings will be converted to discharge in cubic feet per second (cfs) using a rating curve of previous discharge and stage measurements from the same Ninilchik River site.

River temperature (°C) and depth (nearest cm) will be measured twice daily at the weir site at approximately 1000 h and 1900 h. The measurements will be collected at a staff gauge installed downstream of the weir. A hand-held thermometer will be used to measure water temperature. Temperature data collected at the weir will be used to monitor the environment of fish being held for broodstock collection. River stage measurements at the weir will allow for assessment of the river conditions and their potential influence on daily weir operation. Because more rigorous water temperature and stage data will be collected by other agencies, the water data collected at the weir will not be analyzed or reported further.

Egg Take

During 3–31 July escapement monitoring, an inriver holding area will be established using a weir upstream of the escapement weir to hold broodstock for gamete collection (Figure 3). It is likely that the 2015 wild Chinook salmon run will be below average and similar to the annual run sizes observed since 2009. To ensure meeting the SEG, the holding of wild Chinook salmon will be delayed until there is assurance of meeting the SEG. If the SEG is not met, no wild broodstock will be collected. Alternatively, all hatchery-reared Chinook salmon (except jacks) will be held for broodstock collection.

All hatchery-reared Chinook salmon greater than 525 mm will be held for gamete collection. When we begin holding wild Chinook salmon, those fish showing signs of attaining more immediate sexual maturity will be placed in the holding area. The holding area will contain no more than 200 Chinook salmon at any given time and a 1:1 sex ratio will be maintained. Ripeness will be assessed on held females as often as necessary to ensure that they are spawned when ready. The daily number of wild and hatchery-reared mortalities from the holding area will be recorded.

Three net pens approximately 3.57 m^3 (1.8 × 2.1 × 0.9 m) will be placed in the holding area. The net pens will be used to hold males and females in separate pens. Holding fish in the net pens will eliminate the need to capture fish prior to assessing maturity. As space allows, females will be further sorted based on maturity to aid in the tasks of sorting the fish and conducting egg takes more efficiently. Holding females in net pens will also prevent females from spawning before gametes can be collected. Males will be kept outside of the net pens within the holding area if the number of held females requires the space in all 3 net pens.

Egg takes will be conducted when mature fish are available. Prior to 2012, egg takes were conducted when sufficient numbers (at least 10 pairs) of Chinook salmon were ready to be spawned. In 2012, the low Chinook salmon run size resulted in a change in methods; 7 egg takes were required to collect gametes from 27 pairs. Egg takes were conducted multiple times in 2013 and 2014 as well. If the Chinook salmon run size in 2015 is similar to other recent years, mature Chinook salmon will be spawned as soon as they are ready. Ideally, every female hatchery-reared Chinook salmon will be spawned and as few as 1 pair of fish may be spawned in an egg take.

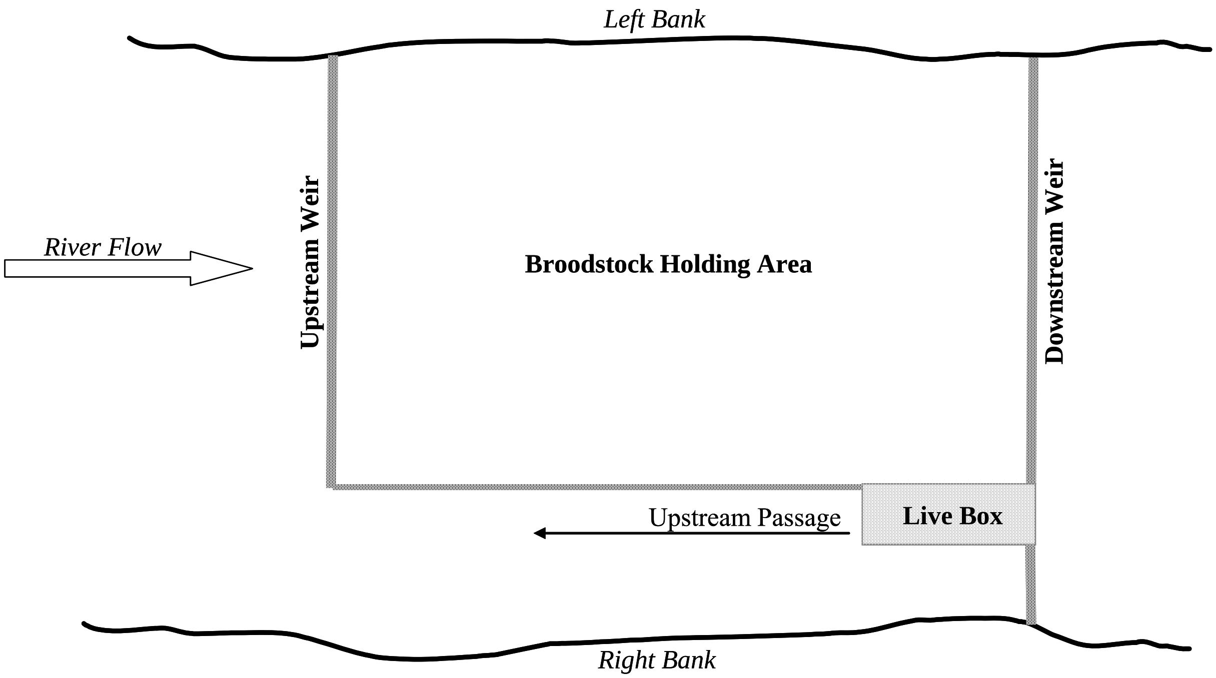

Figure 3.–The configuration of the Ninilchik River egg-take weir, 2015.

For each egg take, gametes will be collected at the weir site, but fertilization will be delayed until gametes reach the William Jack Hernandez Sport Fish Hatchery (WJHH) in Anchorage. At the weir site, held fish will be captured with a seine and dip nets. Males and unripe females will be sorted into net pens. Ripe females will be sacrificed, placed on their back on an angled rack with their heads upward. After a female is placed on the rack, she will be bled (bled out) by cutting the lower dorsal artery and vein on the ventral side of the caudal peduncle to prevent blood from being mixed with the eggs. To collect the eggs, each bled-out female will be held above a container holding a sealable egg bag and then her abdomen will be cut open from the vent to the gill plate. Loose eggs will then be collected in the bag. Males will be randomly selected from the net pens. Immature males will be released upstream of the weir and mature males will be live spawned before they are released upstream of the weir. Each mature male will be live spawned into a sealable bag. Finally, the gametes will be packaged in a container chilled by ice packs and transported to WJHH by hatchery staff or will be shipped from Homer to Anchorage with an air courier.

Kidney samples will be collected from all sacrificed female Chinook salmon to test for BKD. A small spoon will be used to remove 2 small (1 × 1 cm) pieces of kidney from the anterior and posterior ends of the kidney. The combined kidney samples per individual should weigh 1–2 g and will be placed in a Whirlpak bag and labeled with the sample location, date, and species. The spoon will be wiped clean of all tissue and disinfected with 3% iodophor solution (Betadine) between sampling each fish. All samples will be placed on ice and transported by hatchery staff to the pathology laboratory in Juneau.

Only wild Chinook salmon will be used to supplement the Ninilchik River. A combination of wild and hatchery-reared Chinook salmon will be used to stock the Kachemak Bay release sites.

Reducing Hatchery-reared Chinook salmon Escapement

Due to the increased production of hatchery-reared Chinook salmon from the WJHSF hatchery and the well-below average annual sport fishing effort in recent years, we anticipate needing to remove hatchery-reared Chinook salmon from the escapement. Based on conversations with ADF&G genetics lab staff, the hatchery-reared Chinook salmon contribution to the escapement should be 10% or less to minimize the effects of hatchery influence. From 1999 through 2005 (when the weir was operated over the entire run and all hatchery fish were adipose finclipped), the hatchery-reared contribution to the escapement above the weir averaged roughly 29% annually. The sport fishery was liberalized over these years to help reduce the numbers of hatchery-reared Chinook salmon in the escapement. Since 2006, the hatchery-reared contribution to the escapement above the weir has averaged 8% annually during the SEG index monitoring period. This reduction has been accomplished through a combination of factors including poor hatchery returns due to stocking poor quality smolt coupled with poor marine survival, the additional sport fishing opportunities for hatchery-reared Chinook salmon, and maximizing the use of hatchery fish in the broodstock collection. The first attempt to remove hatchery-reared Chinook salmon at the weir occurred in 2013, when the highest number of jacks (<525 mm METF) was observed. With the increased production from the WJHSF hatchery, there has also been a significant increase in the number of jack Chinook salmon returning to the weir. In the last few days of weir operation in 2013, 143 of hatchery-reared jack Chinook salmon were removed. In 2014, the weir count of hatchery-reared Chinook salmon jacks was 821 and required removing them from the escapement throughout the weir operation and during maturation sorting for egg takes (roughly 800 were removed in total). Additionally, 129 males greater than 525 mm METF were removed at the end of weir operation to further reduce the hatchery-reared contribution of the escapement to less than 10%. After egg takes were completed in 2014, all 5 remaining hatchery-reared females were allowed to escape upstream of the weir.

In 2015, we anticipate a similar number of jacks and an increase in the number of fish greater than 525 mm in the hatchery-reared Chinook salmon run to the weir and that there will be sufficient numbers of males greater than 525 mm to meet our egg-take goal. With these anticipations, all hatchery-reared jacks will be removed from the escapement as they are processed through the livebox. All other hatchery-reared Chinook salmon will be held for egg takes and additional fish will be removed from the escapement to ensure that the hatchery-reared contribution to the escapement above the weir is less than 10%.

Smolt Releases

Stocking of Chinook salmon smolt at the 3 terminal fishery locations in Kachemak Bay will be coordinated by Homer staff, hatchery staff, a barge operator, the Seldovia City Manager, and Kachemak Bay State Park volunteers. Hatchery staff, Homer staff, and (CIRI) personnel will coordinate the direct release of approximately 150,000 Ninilchik River Chinook salmon smolt at about 25.8 RKM on CIRI land. The Brody Road Bridge will be used as a secondary stocking location if the upstream location is inaccessible. In NDFL, approximately 210,000 Chinook salmon smolt will be stocked in 2 separate stockings of roughly 105,000 smolt each. Approximately 105,000 Chinook salmon smolt will be stocked in HCL and Seldovia in June.

Smolt will be transported from WJHSF hatchery to the Homer Area with a tanker truck with either 5 or 6 separate tanks. Hatchery staff will ensure dissolved oxygen (DO), CO_2, and water temperatures are at appropriate levels for smolt. The tanker truck loaded with fish will be barged by a private contractor to HCL and Seldovia.

Stocking

Release methods will vary by stocking location. Chinook salmon smolt will be released directly into the Ninilchik River at the bridge located 6.4 miles down Michael and Zoyas Road, located at approximately milepost 3.75 Oilwell Road, and allowed to emigrate freely. The bridge crosses the south fork of the Ninilchik River at about 25.8 RKM. Access to the bridge and Michael and Zoyas Road must be coordinated with CIRI. In Seldovia, Chinook salmon smolt will be directly released at the northern end of Fish Creek Slough and allowed to freely emigrate to the harbor. The Seldovia stocking location is approximately 2 km from the bridge over the slough near the harbor. The slough has several small freshwater inputs and always has enough water to allow smolt to emigrate to the harbor, even at low tide. For stocking at NDFL and HCL, smolt will be held in net pens and fed for five days prior to release, but only if *Chaetoceros* spp. concentrations are below 10,000 cells/L (see methods below in Plankton Sampling section). If *Chaetoceros* spp. concentrations are above 10,000 cells/L prior to stocking, smolt will be temporarily stocked into the net pens and released at dark at both locations.

We assume that a 5-day holding period is beneficial for Chinook salmon smolt to imprint to their stocking location. NDFL has no freshwater inputs and HCL has a small second order stream approximately 0.2 km west of the stocking location. After the holding period, smolt will be released near high tide, which is particularly important at NDFL, where access to saltwater is restricted below a tide height of 3.96 m.

The floating net pens will be deployed in the deepest water available in the southwest corner of NDFL (Figure 4) and at the public dock in HCL. The floating net pens at NDFL will consist of aluminum floats (8.5 m long, 0.6 m wide, and 0.3 m tall) braced together with 2 × 6 inch boards and plywood walkways. The floating net pens at HCL will consist of aluminum floats (7.3 m long, 0.6 m wide, and 0.45 m tall) braced together with plywood walkways and have attachments for the nets to hang. At NDFL, 2 nets (8.53 m long, 4.27 m wide, and 3.66 m deep) will each provide approximately 133.3 m^3 of volume to hold smolt and 1 other net (6.71 m long, 3.35 m wide, and 6.01 m deep) will provide approximately 135.1 m^3 of volume to hold smolt. At HCL, 2 nets (6.71 m long, 3.35 m wide, and 3.66 m deep) will each provide approximately 82.3 m^3 of volume to hold smolt. The nets will be attached to the inside of the braced floats. After smolt are stocked into the floating net pens, each net pen will be covered with netting to reduce bird predation.

The NDFL float net pens will be anchored offshore on the ends of each float with large anchors in 3 corners and smaller anchors at the other locations. A running line will be placed at the nonanchored corner to allow Homer staff to access the floating net pens using a skiff. Between stockings, the nets will be removed and washed to improve water flow. A hose will be used to move the smolt from the stocking truck to the pens. An additional float will be used to support the hose across the open water between the pens and shore.

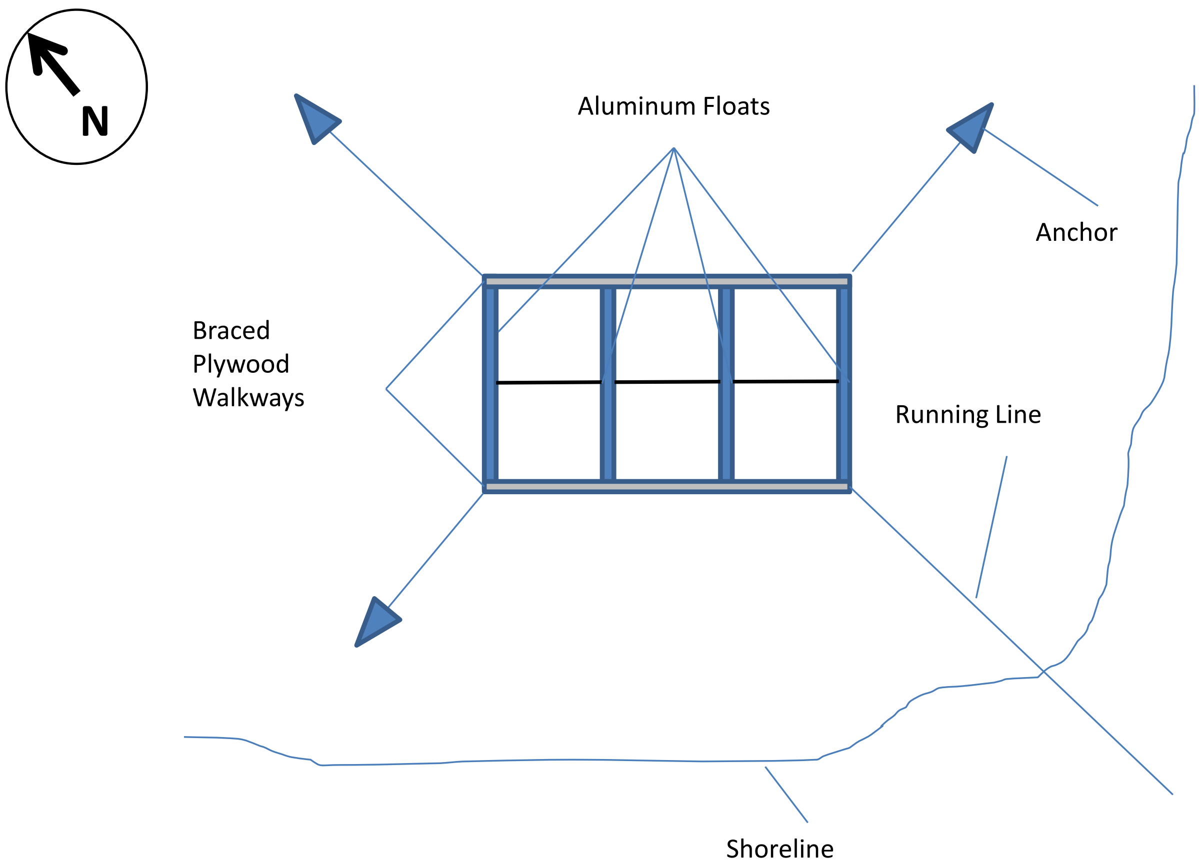

Figure 4.–The configuration of the floating net pen stocking assembly at the Nick Dudiak Fishing Lagoon, 2015.

The HCL floating net pens will be tied to the southeast corner at the public dock to the Kachemak Bay State Park Ranger Station. This will provide direct access to the floating net pens for State Park volunteer staff. During stocking, the barge will be tied to the dock and the stocking truck will remain on the barge. A hose will run from the stocking truck to the floating net pens.

At both NDFL and HCL, smolt will be stocked at a density of no more than 6 kg of fish per cubic meter. The estimated average weight per smolt will be used to calculate the appropriate number of smolt per pen and fish from each tank of the stocking truck will be divided equally among the floating net pens. For each stocking, if the density of Chinook salmon smolt in the stocking truck is calculated to be greater than the maximum density (6 kg of fish per cubic meter) needed for each pen, the excess smolt in the stocking truck will be directly released into open water. The approximate number of smolt released into each floating net pen will be recorded.

Holding Mortality Assessment

The daily number of mortalities will be enumerated for each floating net pen each morning prior to feeding at NDFL and HCL. Mortality assessment will be conducted by Homer staff at NDFL and by State Park Volunteer Staff at HCL. Dead smolt generally sink to the bottom of the net pen and will be counted by removing the net covers and pulling 1 side of each net pen to the surface. This action will typically bring the dead smolt up to the surface where they can be captured using a long-handle dip net. Once the majority of the dead smolt are captured, the net pen will be released as quickly as possible to allow smolt to disperse throughout the entire floating net pen.

We expect that mortality will be the highest for the first day due to the stressors associated with transport to the stocking location. Although smolt are scheduled to be held for 5 days, they will be released early under the following conditions: 1) the daily mortality rate is greater than or equal to 0.5%, or 2) the cumulative mortality rate is greater than or equal to 1.0% from any given net pen, or 3) *Chaetoceros* spp. concentrations are unacceptable (see below).

Feeding

Smolt held at the NDFL and HCL will be fed twice daily with Biomark smolt pellet food. At NDFL, the smolt will be fed in the morning (~9:00 AM) by Homer staff after assessment of daily mortalities and by volunteers in the evening (~6:00 PM). State Park volunteers will follow the same schedule at HCL. Feeding can be done with the covers over the pens.

Smolt will be fed 1–2% of their biomass per day and with a feed chart provided by hatchery staff. The feed chart recommendations are based on the size of the smolt and water temperature. The number of Chinook salmon smolt and their average weight will be used to estimate the total biomass per net pen. If the smolt are released prior to the entire 5-day holding period, we will continue to feed smolt in the same fashion from the net pens for up to 2 weeks after stocking. A premeasured graduated container will be used to measure the feed.

The food will be dispersed by hand to each floating net pen for each feeding and the amount of feed dispersed will be recorded at each feeding. The food will be slowly and evenly spread across the entire floating net pen to allow all fish to have access to the food and to prevent the occurrence of uneaten food settling on the bottom of the net and being wasted. Food will be dispersed among all of the floating net pens during a feeding instead of feeding 1 pen at a time to speed up the process. If the smolt are not actively eating all of the food, then less food will be fed to reduce the amount of waste.

Plankton Sampling

Since 2009, holding salmon smolt at NDFL and HCL has been complicated by harmful algal blooms, specifically the diatom *Chaetoceros* spp. These diatoms are found as either individual cells or long chains of individuals linked together. Each individual has long spines that can lacerate the gill filaments of fish. Chinook salmon smolt held in pens are more susceptible to the harmful effects of *Chaetoceros* spp. because held fish are unable to avoid the blooms. *Chaetoceros* spp. concentrations as low as 5,000 cells/L can be lethal to salmon held in net pens (Yank and Albright 1994). Plankton blooms are hard to predict, but generally, blooms are influenced by amount of sunlight and inputs of inorganic nutrients such as nitrate and phosphate[2]. *Chaetoceros* spp. concentrations can increase quickly to levels unsafe to hold fish (>10,000 cells/L) and then to bloom-like levels (≥1,000,000 cells/L).

In 2012, the risk of subjecting held smolt to lethal concentrations of *Chaetoceros* spp. necessitated assessment of daily concentrations throughout the stocking season. The goal was

[2]NOAA. 2010. Harmful algal blooms and biotoxins: Phytoplankton- Algal Bloom Dynamics. http://www.nwfsc.noaa.gov/hab/habs_toxins/phytoplankton/algal_dynamics.cfm. (Accessed June 2015).

to identify changes in concentration levels of *Chaetoceros* spp. that would influence our ability to safely hold smolt in net pens. The assessment started prior to stocking on 17 April initial *Chaetoceros* spp. concentrations were well below 10,000 cells/L, but on 28 April (one day after stocking a small test group of Chinook salmon smolt), *Chaetoceros* spp. concentrations increased to bloom levels. *Chaetoceros* spp. concentrations remained higher than 10,000 cells/L throughout the monitoring period and into early August, when sampling was terminated. The exception to this pattern was a 5-day period from 13 through 17 July, but after this period, *Chaetoceros* spp. concentrations averaged 377,000 cells/L through 5 August. Additionally, spatial variation in *Chaetoceros* spp. concentrations was also assessed at NDFL. *Chaetoceros* spp. concentrations were estimated at 3 different surface locations and also from near the bottom within NDFL and were compared to the standardized sampling location. *Chaetoceros* spp. concentrations were similar at all locations. In 2013, counts were compared on 14 July at 5 surface locations throughout the lagoon. Counts ranged from 1,060,000 to 1,440,000 cells/L. The daily *Chaetoceros* spp. concentrations observed throughout the season were also compared to samples collected by Kachemak Bay Research Reserve and NOAA field station in Kasitsna Bay. Results were generally similar, suggesting that *Chaetoceros* spp. was the predominant plankton species throughout Kachemak Bay and when blooms occurred within NDFL, they also occurred at other locations in the bay. In 2014, a sample collected on 13 May indicated *Chaetoceros* spp. concentrations were less than 10,000 cells/L, but the remainder of the samples, collected weekly from April through June, showed concentrations remained at greater than 100,000 cells/L, well above the lethal 10,000 cells/L level. Although there may be some spatial variation, our methods (i.e., limited non-spatial sampling) should be able to detect critical levels of *Chaetoceros* spp. with relative certainty.

In 2015, the daily *Chaetoceros* spp. concentration will be estimated either the day prior to stocking or the day of stocking or both for any stocking at NDFL and HCL. Data collected during 2012–2014 indicates that *Chaetoceros* spp. is consistently above the 10,000 cells/L level at the saltwater stocking locations in Kachemak Bay from April through June (stocking season). By sampling just prior to the stocking event, we will shorten the time between plankton sampling and the actual stocking, lessening the time in which *Chaetoceros* spp. concentration could change from the sampled quantity.

To estimate the *Chaetoceros* spp. concentrations, 1 surface water sample will be collected from the floating net pens (outside of the nets) in the southwest corner of the lagoon during residual depth (<12 ft tide height). The primary water sample will be 1 L of unfiltered surface water. If the estimated *Chaetoceros* spp. concentration from the unfiltered sample is less than 30,000 cells/L, than a filtered method will be used to concentrate a volume of surface water such that a detectable number of cells occurs on the counting slide. An unfiltered 1 L water sample will be collected at every sampling event, and the need for a filtered sample will be determined based on previous sampling or the processing of the current unfiltered sample. For filtered samples, we will use the smallest amount of water needed to prevent filtration from crushing cells.

The filtered water sample (up to 400 L) will be collected by either using a bucket or a hand-held electric bilge pump. The water sample will be filtered through a 20-micron plankton net. After the water sample has been filtered through the net, the net will be rinsed into a 150 ml sample bottle attached to the bottom of the net to ensure all plankton from the sample are in the 150 ml bottle. The 150 ml sample bottle will be labeled with the date and taken to the ADF&G Homer office for processing.

Water samples taken to the Homer office will be stored in a cooler until they have been processed. Prior to subsampling, the water sample will be homogenized by slowly rotating it (not shaken) for 30 seconds. After the water sample has been homogenized, a pipette will be used to collect a subsample from the middle of the sampling bottle. The subsample will be placed on a counting slide, and a cover slip will be gently placed over the subsample to keep it within the counting slide.

Several methods may be used to count the number of cells of *Chaetoceros* spp. Based on relative precision criteria for plankton sampling, roughly 100 cells of *Chaetoceros* spp. need to be counted for each slide (Karlson et al. 2010). The primary counting method will be to count every *Chaetoceros* spp. cell present on an entire gridded Sedgewick-Rafter counting slide. The Sedgewick-Rafter counting slide holds exactly 1.0 ml of water and has 20 rows with 40 grids each. If the anticipated number of cells is greater than 100 cells of *Chaetoceros* spp., then subsampling of the slide rows may occur during the counting process. Different methods of subsampling the rows of the Sedgwick-Rafter counting slide will be explored, but they will always involve counting all grids within a row. When concentrations of *Chaetoceros* spp. in the lagoon are considered at bloom levels (greater than 1,000,000 cells/L, approximately; unfiltered samples only), a Palmer counting slide will be used. The Palmer counting cell holds exactly 0.1 ml of water and is not gridded, so the entire slide should ideally be counted. If concentrations are too large to count every cell within the Palmer counting slide, then expansions based on area of field of view will be explored. Alternatively, expansions based on counting a small portion of a Sedgewick-Rafter counting slide may also be considered.

In 2012, 3 replicate counts were made every day from the same water sample. The average daily 95% relative precision was 20% and increased (less precise estimate) when *Chaetoceros* spp. concentrations were below bloom levels. As time allows in 2015, replicate counts will be done for each water sample. Ideally, a minimum of 3 counts will be produced for each sample. The concentration of *Chaetoceros* spp. for each water sample will be calculated with appropriate expansions based on dilution, filtering, counted slide volume, or a combination.

Composition of Chinook Salmon in July Sport Fishery

Prior to the opening of the July hatchery-reared Chinook salmon sport fishery, a beach seine survey will be conducted in the lower 2 miles of the Ninilchik River to assess the composition of the Chinook salmon run. In recent years, the below average runs have complicated our ability to meet our escapement and egg-take goals. The July sport fishery may be closed if we find a high proportion of wild fish in the river before the fishery. The closure would reduce catch-and-release mortality of wild Chinook salmon and would provide additional opportunity to meet wild and hatchery-reared egg-take goals.

One survey will be conducted during the last week of June and will start at Garrison Ridge Road and end just prior to the harbor (Figure 2). The beach seine will be deployed from shore or a small raft just upstream of where Chinook salmon are thought to be holding. Methods will be identical to the beach seine surveys conducted in 2008 (Booz and Kerkvliet 2011c). Hatchery-reared Chinook salmon are easily identified by the absence of the adipose fin. During the survey, the number of wild and hatchery Chinook salmon will be recorded each time the beach seine is deployed. We assume that during this survey, most of the Chinook salmon run will be inriver and holding in this section of the river and we anticipate the presence of up to roughly 700 Chinook salmon during this time. Based on the desired precision criteria for Objective 5, the minimum sample size will be 68 Chinook salmon (Cochran 1977). Based on beach seine surveys conducted in 2007 and 2011–2014, this sample size is easily obtainable. In the 6 beach seine surveys conducted over these years, the number of Chinook salmon caught has ranged from a low of 71 (2012) to 354 (2014).

DATA COLLECTION

Escapement and biological data collected at the weir will be recorded onto datasheets (Appendix B1) and then entered in a field-specific Microsoft Access database (e.g., 2015 Ninilchik Field Database.mdb; Appendix C1). Daily and cumulative fish counts and biological sample data will be automatically generated using queries and reports from this database (Appendix C2). Postseason, all data will be proofed before analysis begins.

NDFL and HCL smolt stocking data will be recorded onto datasheets (Appendix B2) and entered into Microsoft Excel spreadsheets at the Homer office. Plankton data will be directly entered into an Excel spreadsheet. Water quality data will be downloaded into Excel spreadsheets at the Kachemak Bay Research Reserve laboratory.

A backup copy of all data files will be saved on a jump drive at the end of each day. The data on the jump drive will be taken to the Homer office as often as possible during the field season. Scale cards will be examined for completeness, accuracy, and scale placement. All data files and forms will be reviewed for completeness and accuracy by the biologist leading the fieldwork.

Inseason Reporting and Summaries

Field notes are an extremely important means to communicate activities and conditions between crewmember and supervisor. Furthermore, field notes can be extremely valuable postseason in evaluating data. The crew will write field notes that will include the following: date, day of week, first and last name, and general weather and water conditions. Notes will also include details on the following: weir maintenance, broodstock collection, holding mortalities, egg takes, observations or changes that would affect data, and daily activities. The daily activity notes should include "who, what, when, and why" information. An electronic daily log will be kept and saved as C:\Ninilchik River 2015\AR_LogMMDDYY.doc (Appendix D1). Each day the log will be e-mailed to Carol Kerkvliet, Mike Booz and Holly Smith between 0900 and noon.

DATA MAP

All data will be appended to tables within an Access database (*NinilchikRiver_master.mdb*) for final editing and will be stored on the local network O-drive in the Homer office. All data will also be copied onto a DVD and archived in the Homer office. Additionally, all pertinent data files will be submitted to Research and Technical Services (RTS) along with the final FDS report. These data files will be archived as RTS Publication archives and will be associated with the published report (as per MacClellan et al. 2012: page 20).

DATA ANALYSIS

Escapement

Annual escapement for 2015 for each of the wild and hatchery components will be calculated by removing the fish mortality associated with egg takes from the weir count.

Age, Sex and Length Data

Prior to 2010, the age-sex compositions were estimated for wild and hatchery-reared Chinook salmon without regard to the information present in the census of the sex composition. In some years, such as 2007, the sampling estimated more males than the census counted and biased age-sex estimates (Booz and Kerkvliet 2011b*)*. The reason why males were over-selected when sampling is unknown. The selectivity could be a result of the method used to process fish in the live box, or because of differential behavior between males and females that influenced how they arrived at the weir, or the order in which they are processed in the live box.

To reduce bias associated with possible sex-selective sampling for wild and hatchery-reared fish, the age-sex composition estimates will be calculated by incorporating the known sex composition.

Due to small run sizes from 2009 through 2014, all hatchery-reared Chinook salmon were sampled for age and length. Starting in 2015, the hatchery-reared component of the Chinook salmon run will be subsampled due to an anticipated increase in run size. Therefore, the age, sex, and length compositions will be calculated in the same fashion for both components of the Chinook salmon run.

For the wild component of the Chinook salmon run, the proportion by sex to the weir is known and will be calculated as follows:

$$p_i = \frac{N_i}{N} \tag{2}$$

where

N_i = number of wild fish of sex class *i* in *N*,

N = run of wild fish to the weir.

The proportion of wild fish greater than 525 mm METF population *l* of age *j* given sex *i* will be estimated as follows:

$$\hat{p}_{(l)j|i} = \frac{x_{(l)ij}}{n_{(l)i}} \tag{3}$$

where

$x_{(l)ij}$ = number of wild fish of age class *j* in $n_{(l)i}$,

$n_{(l)i}$ = number of fish of sex class *i* in wild fish greater than 525 mm METF population *l* sampled for age

with variance

$$\text{var}(\hat{p}_{(l)j|i}) = \frac{N_{(l)i} - n_{(l)i}}{N_{(l)i}} \frac{\hat{p}_{(l)j|i}(1 - \hat{p}_{(l)j|i})}{n_{(l)i} - 1} \tag{4}$$

where $N_{(l)i}$ is the number of wild fish greater than 525 mm METF in sex class *i*.

Abundance of wild fish greater than 525 mm METF of age *j* given sex *i* will be estimated as follows:

$$\hat{N}_{(l)j|i} = \hat{p}_{(l)j|i} N_{(l)i} \tag{5}$$

with variance estimated as

$$\text{var}(\hat{N}_{(l)j|i}) = N_{(l)i}^2 \ \text{var}(\hat{p}_{(l)j|i}) \ . \tag{6}$$

For *j* = ocean age-1 fish, the total abundance of wild fish in sex class *i* will be estimated as follows:

$$\hat{N}_{j|i} = \hat{N}_{(l)j|i} + N_{(s)j|i} \tag{7}$$

where $N_{(s)j|i}$ is the number of wild fish of less than or equal to 525mm METF population *s* in sex class *i*.

All wild fish of ocean age greater than 1 are defined as follows:

$$\hat{N}_{j|i} = \hat{N}_{(l)j|i} \tag{8}$$

and therefore for all *j* and *i*

$$\text{var}(\hat{N}_{j|i}) = \text{var}(\hat{N}_{(l)j|i}) \ . \tag{9}$$

The proportion of wild fish in age class *j* and sex class *i* in the wild weir run will be estimated as follows:

$$\hat{p}_{ji} = \frac{\hat{N}_{j|i}}{N} \tag{10}$$

with variance estimated as

$$\text{var}(\hat{p}_{ji}) = \frac{1}{N^2} \text{var}(\hat{N}_{j|i}) \ . \tag{11}$$

The abundance of wild fish in age class *j* in the run will be estimated by summing over sex *i*:

$$\hat{N}_j = \sum_{i=1}^{2} \hat{N}_{j|i} \tag{12}$$

with variance estimated as

$$\mathrm{var}(\hat{N}_j) = \sum_{i=1}^{2} \mathrm{var}(\hat{N}_{j|i}) . \quad (13)$$

The proportion of wild fish in age class j in the run will be estimated as follows:

$$\hat{p}_j = \frac{\hat{N}_j}{N} \quad (14)$$

with variance estimated as

$$\mathrm{var}(\hat{p}_j) = \frac{\mathrm{var}(\hat{N}_j)}{N^2} . \quad (15)$$

The mean length at age j by sex i for wild fish greater than 525 mm METF population l will be estimated as follows:

$$\bar{l}_{(l)j|i} = \frac{\sum_{k=1}^{n_{(l)j|i}} l_{(l)j|i,k}}{n_{(l)j|i}} \quad (16)$$

where

$l_{(l)j|i}$ = length of the kth wild fish greater than 525 mm METF sampled for length of age class j and sex i,

$n_{(l)j|i}$ = number of wild fish greater than 525 mm METF of age class j and sex i sampled for length

with variance estimated as

$$\mathrm{var}\left(\bar{l}_{(l)j|i}\right) = \frac{\left(\hat{N}_{(l)j|i} - n_{(l)j|i}\right)}{\hat{N}_{(l)j|i}} \frac{\sum_{k=1}^{n_{(l)j|i}} \left(l_{(l)j|i,k} - \bar{l}_{(l)j|i}\right)^2}{n_{(l)j|i}(n_{(l)j|i} - 1)} . \quad (17)$$

The mean length by sex i for wild fish less than or equal to 525 mm METF ($\bar{l}_{(s)j|i}$), assuming all fish are ocean age 1 will be estimated using equations (16–17) with appropriate substitutions.

All wild fish of ocean age j greater than 1 of sex i are defined as follows:

$$\bar{l}_{j|i} = \bar{l}_{(l)j|i} \quad (18)$$

with

$$\mathrm{var}(\bar{l}_{j|i}) = \mathrm{var}(\bar{l}_{(l)j|i}) . \quad (19)$$

For j = ocean age-1 fish,

$$\bar{l}_{j|i} = \frac{\hat{N}_{(l)j|i}}{\hat{N}_{j|i}} \bar{l}_{(l)j|i} + \frac{N_{(s)j|i}}{\hat{N}_{j|i}} \bar{l}_{(s)j|i} \tag{20}$$

with its variance approximated using a Taylor's series expansion (Mood et al. 1974):

$$\text{var}\left(\bar{l}_{j|i}\right) \approx \frac{\hat{N}^2_{(l)j|i}}{\hat{N}^2_{j|i}} \text{var}\left(\bar{l}_{(l)j|i}\right) + \frac{N^2_{(s)j|i}}{\hat{N}^2_{j|i}} \text{var}\left(\bar{l}_{(s)j|i}\right) + \frac{\left(\hat{N}_{j|i}\bar{l}_{(l)j|i} - \hat{N}_{j|i}\bar{l}_{j|i}\right)^2}{\hat{N}^4_{j|i}} \text{var}\left(\hat{N}_{(l)j|i}\right). \tag{21}$$

Estimates of sex and age composition and mean length by sex and age for hatchery-reared fish will be made using equations (2–21) with appropriate substitutions.

Age, Sex and Length Data

The within-reader variability of scale age estimates will be calculated using a coefficient of variation (CV) expressed as the ratio of the standard deviation over the mean age (Campana 2001):

$$CV_j = 100\% x \frac{\sqrt{\sum_{i=1}^{R} \frac{(X_{ij} - X_j)^2}{R-1}}}{X_j} \tag{22}$$

where

X_{ij} = the *i*th age estimate of the *j*th fish,

X_j = the mean age estimate of the *j*th fish,

R = the number of times each fish is aged.

For each sex, age, wild, and hatchery-reared group, the CV_j's will be averaged across all fish (*j*) in the group to produce a mean CV.

Plankton Concentration

Plankton concentration (*k*) for a given day in NDFL in cells per liter will be estimated daily as follows:

$$\hat{k} = \frac{\sum_{i=1}^{D} c_i \rho}{D} \tag{23}$$

where

D = total samples per day, up to three,

c_i = count of *Chaetoceros* spp. from counting cell for *i*th daily sample,

ρ = Expansion factor accounting for counting slide subsampling (1.0 if all cells are counted) and volume-based adjustments (e.g., slide volume, filtering).

Variance of $\hat{k}$ will be estimated as follows:

$$\text{var}(\hat{k}) = \rho^2 \frac{s^2}{D} \tag{24}$$

where s^2 is the sample variance of the c_i. It is noted that the variance in Equation 15 pertains to within-sample variability and does not reflect variability across the lagoon, which is assumed relatively small based on spatial sampling results from 2012.

Composition of Chinook Salmon in July Sport Fishery

The percentage of wild Chinook salmon in the river below the weir at the time of sampling will be estimated as a binomial proportion (Cochran 1977):

$$\hat{p}_w = \frac{n_w}{n} \tag{25}$$

where n_w is the number of wild Chinook salmon observed and n is the total number of Chinook salmon sampled. The variance will be estimated as

$$\text{var}(\hat{p}_w) = \frac{\hat{p}_w(1-\hat{p}_w)}{n-1}\,. \tag{26}$$

SCHEDULES AND DELIVERABLES

Crew schedules from late June through 3 August are outlined in Appendix E2.

Date	Activities
1 April	Begin arrangements for saltwater smolt releases
1–14 May	Begin equipment preparation for saltwater smolt releases
20–30 June	Ninilchik weir preparation and install weir
23–27 June	Beach seine downstream of Garrison Bridge
30 June–8 August	Ninilchik weir operation
14 May–30 June	Fresh and saltwater smolt releases
21–31 July	Ninilchik River egg takes
1–15 August	Breakdown and store Ninilchik weir and camp materials
15 September–15 October	Read scales and preparation of FDS Report
15 October–15 February	FDS Reporting
1 October–15 May	Correction of Federal Aid report and operational planning

Results of this study will be reported as an Alaska Department of Fish and Game, Division of Sport Fish, Data Series report.

RESPONSIBILITIES

Carol Kerkvliet, Fishery Biologist II, Project Leader

Duties: Oversees project by supervising operational planning, analysis, and reporting. Tracks implementation of operational plan and reporting and maintains daily contact with the field project leader. Prepares and tracks budget, hiring and supervising of crewmembers. Maintains contact with the field crew, providing assistance and direction when needed, oversees daily reporting and summarization of data. Processes required land leases. Responsible for annual Federal reporting requirements.

Michael Booz, Fishery Biologist I, Field Project Leader

Duties: Drafts operational plan and annual report with oversight from project leader. Leads field crews. Provides necessary level of training, assistance, and direction to the crew when needed. Completes routine administrative duties such as reviewing time sheets and approving leave. Maintains daily contact with the field crew. Routinely visits with the crew to observe activities, provides assistance, and discusses weir and stocking operation and sampling. Responsible for leading crew with the installation, maintenance, and dismantling of the weir and stocking equipment. Responsible for summarizing season data, aging scales, and inseason escapement counts. Coordinates stocking with hatchery personnel and barge operators and egg takes with hatchery staff and volunteers. Conduct egg takes.

Holly Smith, Fishery Technician III

Duties: Leads the installation, maintenance, and dismantling of floating net pens for stocking and leads the transporting, feeding, and release of smolt. Assesses daily mortalities of held smolt, collects and counts plankton samples, and communicates status of stocking with project leader, field project leader, and hatchery staff. Leads the installation and dismantling of the fish weir and holding area. Responsible for supporting weir crew with daily weir operations, ASL sampling as outlined in operational plan and maintaining daily and seasonal Chinook salmon weir counts. Assesses maturity and conducts egg takes.

Rose Robinson, Fishery Technician II

Duties: Installs, maintains, operates, and dismantles floating net pens for stocking. Transports, feeds, releases, and assesses mortality of smolt. Collects and counts plankton samples. Installs, maintains, and dismantles fish weir. Responsible for the daily operation of the weir. Collects ASL samples as outlined in the operational plan. Counts and summarizes daily and seasonal Chinook salmon weir counts. Assesses maturity and conducts egg takes.

Vacant, Fishery Technician II

Duties: Installs, maintains, and dismantles fish weir. Responsible for daily operation of the weir. Collects ASL samples as outlined in operational plan. Counts and summarizes daily and seasonal Chinook salmon weir counts. Assesses maturity and conducts egg takes.

David Evans, Biometrician III

Duties: Provides technical assistance with statistical procedures and sampling designs. Reviews and recommends procedures for data analysis. Edits Technical Data Report.

Daniel Reed, Biometrician III

Duties: Provides technical assistance with statistical procedures and sampling designs. Reviews and recommends procedures for data analysis. Edits operational plan.

BUDGET

Projected FY2016:

Line Item	Category	Budget ($K)
100	Personal Services	98.0
200	Travel	0.0
300	Contractual Services	14.1
400	Commodities	4.7
500	Equipment	0
Total		116.8

Budget Manager: Carol Kerkvliet

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APPENDIX A: CHINOOK SALMON PROCESSING AND SAMPLING PROCEDURES

Appendix A1.–Chinook processing flow chart at the Ninilchik River weir, 2015.

Caudal Clip

Present	Absent
Record as recapture Pass upstream	Clip upper lobe

Adipose Fin

Present	Absent
Record as Wild	Record as Hatchery

Sex

Assess every fish based on external charactristics
Record as Male or Female

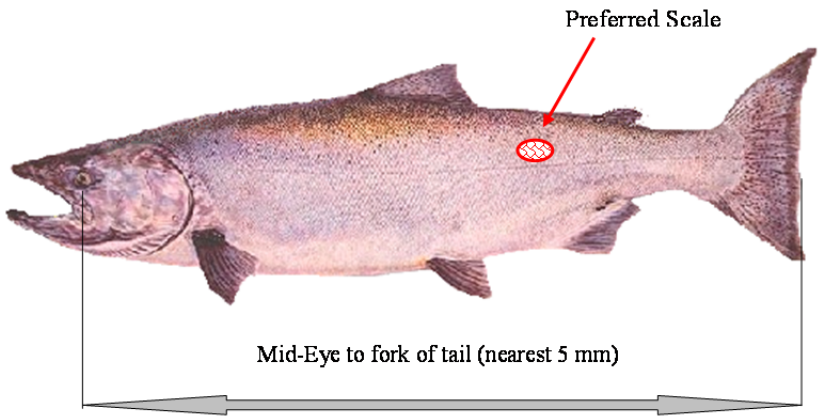
Jack

≤ 525 MEF	> 525 MEF
Record as Yes	Record as No

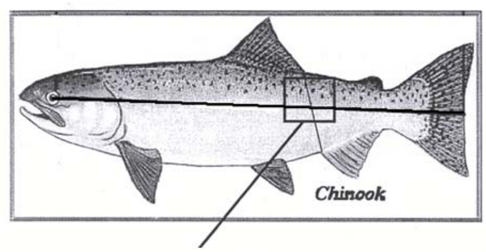
Wild	**Hatchery**	**Wild**	**Hatchery**
Measure MEFT every other day with sampling rate of 0.20	Measure every 6th	collect 3 scales & Measure MEFT every other day with sampling rate of 0.20	collect 3 scales & Measure MEFT every other day with sampling rate of 0.34
Release upstream	*remove from escapement*	SEG count <550 → *Release upstream* SEG count >550 → *Hold as directed*	*Place in holding area*

Minimize handling stress by

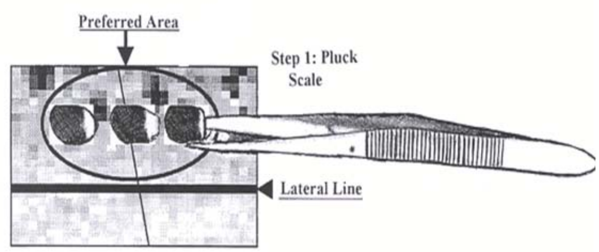
1) preventing a large number of fish from entering the live box at one time
2) not removing fish from water unless necessary
3) using a net and sampling cradle to control fish
4) processing each fish as quickly as possible
5) provide a recovery area for fish released upstream



Preferred scales are located on the left side of the fish, 2 rows above the lateral line along a diagonal line from back (posterior) of the dorsal fin to the front (anterior) of the anal fin.



Pull the "preferred scale" from the fish using forceps. Pliers may be necessary to remove scales if the fish has been in freshwater for an extended period.



A good scale has a well-rounded shape. Hold scale up to light and examine for overall size, shape, regeneration, deformities, etc.

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Remove all slime, grit, and skin from scale by rubbing between thumb and forefinger. Place scales in the prenumbered container. One set of 3 scales per fish per collection.

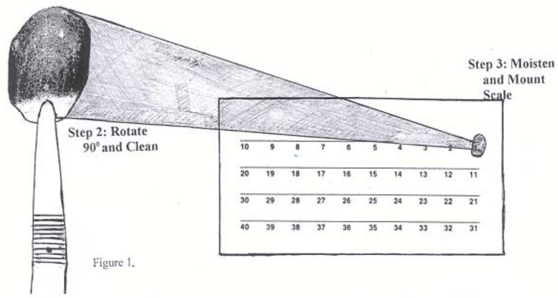
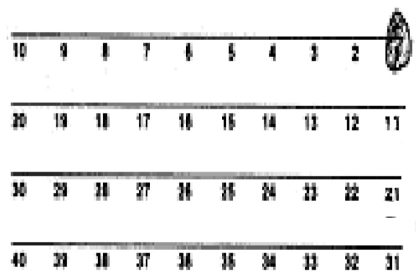


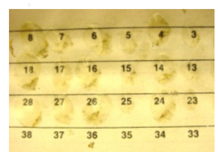
Figure 1.

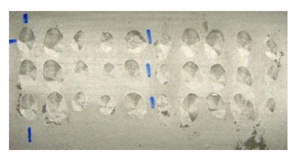
At the end of the day, mount the scales from each collection onto the gum cards. When mounting, be careful not to invert the scale and try to mount the insertion point up.



Gum cards are numbered from right to left. One fish per column and 10 fish per gum card.

After mounting every collection of scales for the day, attach a piece of wax paper over the gum card with a paperclip. Store gum cards in a Ziploc bag and send them to the Homer office as soon as possible. At the Homer office, the gum cards will be pressed onto an acetate sheet.





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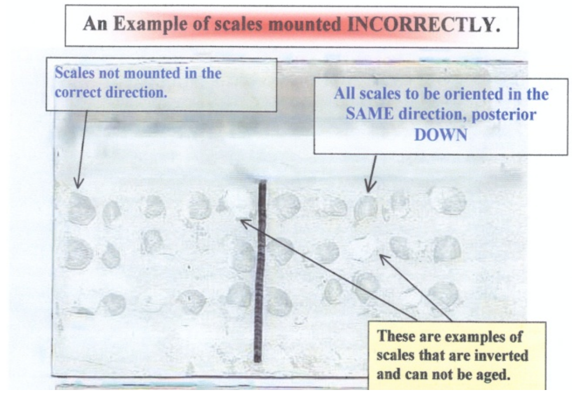
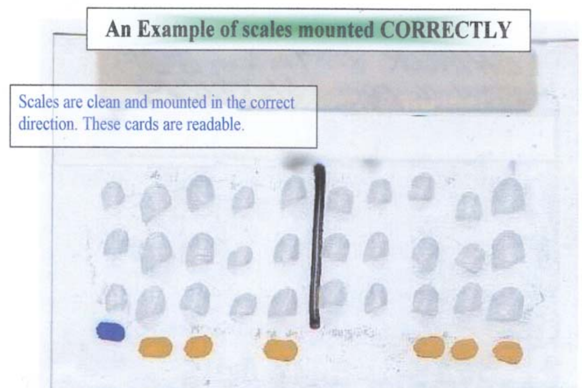
Incorrect scale mounting.



Correct scale mounting.



Appendix A3.–Age sampling problems.

Common problems encountered with inexperienced scale collectors are torn edges, inadequate scale cleaning, selecting regenerated or distorted scales, inverted scale mounting, and dirty gum cards. Common data recording errors include recording the wrong origin (wild vs. hatchery), scale number for sample, incorrect number of scale samples collected than recorded in the data, and more than 1 fish with the same collection number. Experienced staff must take extra measures to ensure that less experienced staff become fully proficient at sampling before the first sampling event. Before the first sampling event, the experienced staff will take one fish and slowly walk through the sampling routine with less experienced crew. This routine should specifically demonstrate how to do the following:

1) Locate the lateral line and preferred scale sampling area.
2) Identify irregular scale patterns that are the result of regenerated scales.
3) Remove the scales in a manner that reduces torn edges.
4) Properly clean and mount scale samples.
5) Identify inversely mounted scales.

Minimize the handling of gum cards and keep them as dry as possible. Wet gum cards should be dried out slowly. Excessive heat when drying may cause the scale to become unglued from the gum card. After the gum cards are dry, they should be stored with wax paper between each gum card. Check the numbering between the Microsoft Access[1] database and the gum card.

A final step to improve quality is to identify sampling problems promptly so that corrections can be implemented inseason. To achieve this, gum cards should be sent to the Homer office as quickly and as often as possible throughout the season. The person actually collecting the scales needs to be identified on each gum card so feedback can be effectively directed to the source.

[1] Product names used in this publication are included for completeness but do not constitute product endorsement.

Appendix A4.–Scale interpretation training and refresher procedure.

Reader Verification

Readers will review a test set of 100 scale samples from both wild and hatchery-reared Chinook salmon collected from 1999 through 2007 at the weir. At least 50 scale samples within the test set will be of a known age and the test set will include samples of all ages. Readers' test set ages will be compared to previous age estimates and known ages. Ages that do not match will be reviewed and reread. Once the reader ages are resolved, then the reader will begin with the collected samples from this season.

Scale Interpretation and Criteria

To estimate scale age, at least 1 scale per sample must have all of the following characteristics:

1) a clean focus
2) little or no regeneration in the freshwater growth area
3) minimal tearing on the edge
4) clearly identified annuli through winter growth periods and crossing over of rings

If none of the scales in a sample contains all of these characteristics, then the age will be recorded as "NR" (not readable). If differing scale age estimates are obtained within a scale sample, the age for that fish will be recorded as "NR".

APPENDIX B: DATA ENTRY FORMS

AppendixB1.–Weir escapement data entry form, 2015.

Ninilchik River weir Fish Data Entry Form

Date: Crew: Page: of

Chinook salmon Data

#	Hour	Adfin (W/H)	# of fish	Sex (M/F/U)	Jack (Y/N)	Fate Up/Held/mort	Caudal (U/L/N)	Recap (Y/N)	Sampling data: Length MEFT (mm	Scales Card	Scales Col	CWT	Comments
1													
2													
3													
4													
5													
6													
7													
8													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
19													
20													

Page Totals:	**WILD**	Male	Jack	Female	Total Wild		**Hatchery**	Male	Jack	Female	Total H		**Eggtake Summary**		
	Up						Held							M	F
	Held						Culled						W		
	H Mort						Hold Mort						H		

Other Species Tally

Pink salmon	dolly varden	coho salmon	chum salmon	Sockeye salmon	Steelhead

AppendixB2.–Stocking data entry form, 2015.

Stocking Data Entry Form

Location ________________ Stocking Date ____________________________ Page________ of________

Species Number of smolt Avg. Weight

Pen Number

Number of smolt_________________ Release Date _____________ Max food per feeding_________________

0.5% Est. 1.0% Est.

Amount of Food

Day	Morts	Morning	Evening	Comments
1				
2				
3				
4				
5				

Pen Number

Number of smolt_________________ Release Date _____________ Max food per feeding_________________

0.5% Est. 1.0% Est.

Amount of Food

Day	Morts	Morning	Evening	Comments
1				
2				
3				
4				
5				

Pen Number

Number of smolt_________________ Release Date _____________ Max food per feeding_________________

0.5% Est. 1.0% Est.

Amount of Food

Day	Morts	Morning	Evening	Comments
1				
2				
3				
4				
5				

Pen Number

Number of smolt_________________ Release Date _____________ Max food per feeding_________________

0.5% Est. 1.0% Est.

Amount of Food

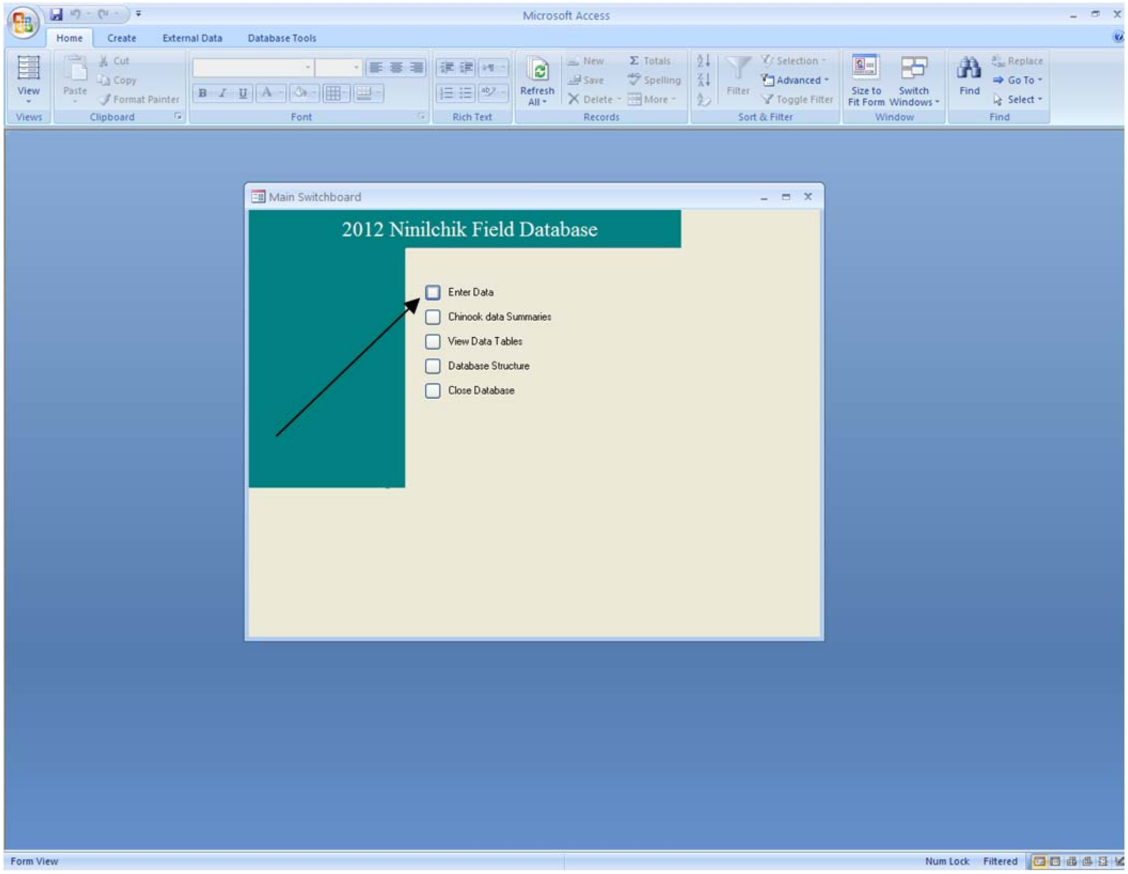
Day	Morts	Morning	Evening	Comments
1				
2				
3				
4				
5				

APPENDIX C: DATA PROCESSING OF WEIR DATA

Appendix C1.–Steps used to enter weir data from the data form to a Microsoft Access database.

Step1: open database.

The title of the database will be *“2015 Ninilchik Field Database”*.



When the database is opened, the switchboard automatically opens. To enter data, click on the “enter data” button.

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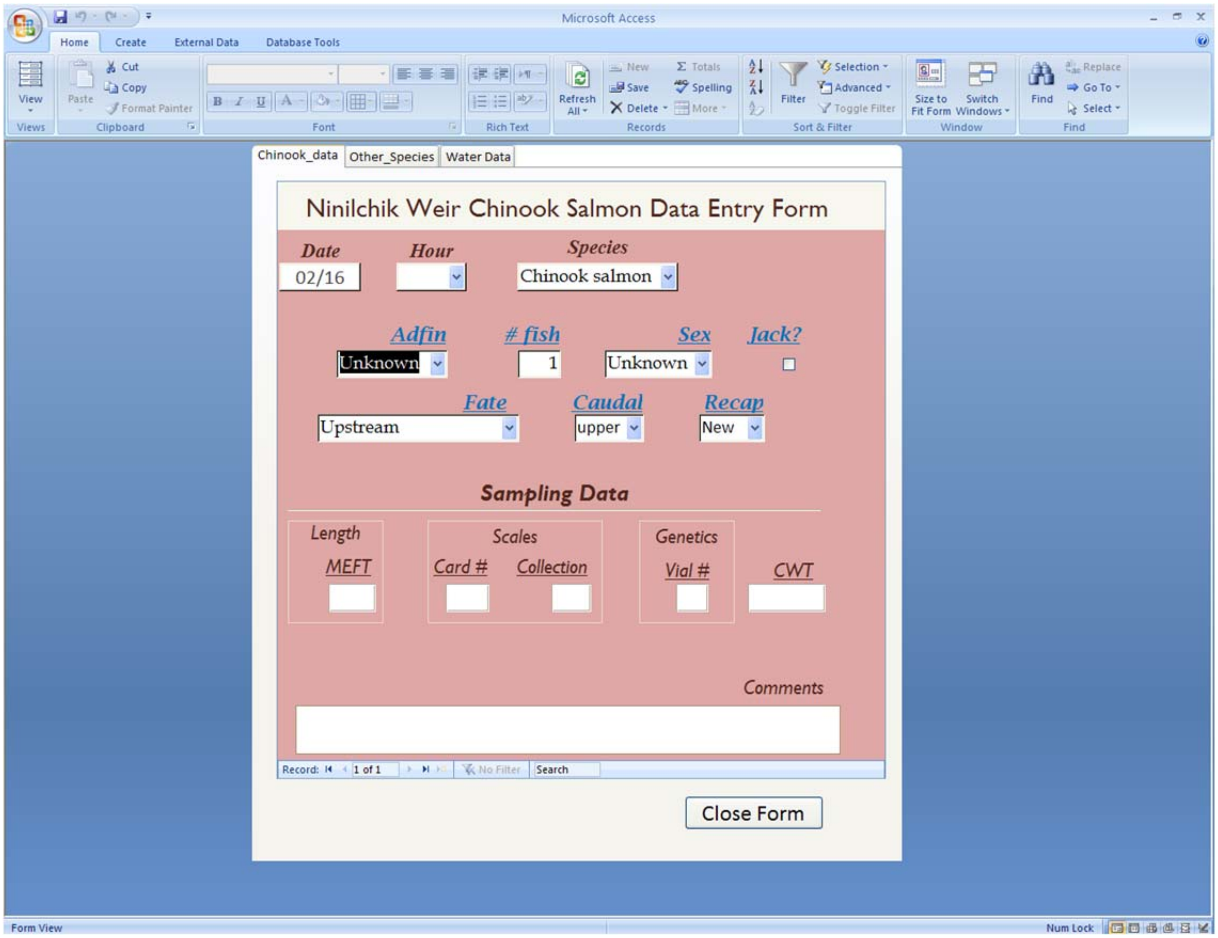
The data entry form will open. There are 3 tabs at the top of the form: 1) Chinook_data, 2) Other_Species, and 3) Water_Data. The Chinook_data form will be the default entry form and is visible first. To switch to other tabs just click them at the top of the form.



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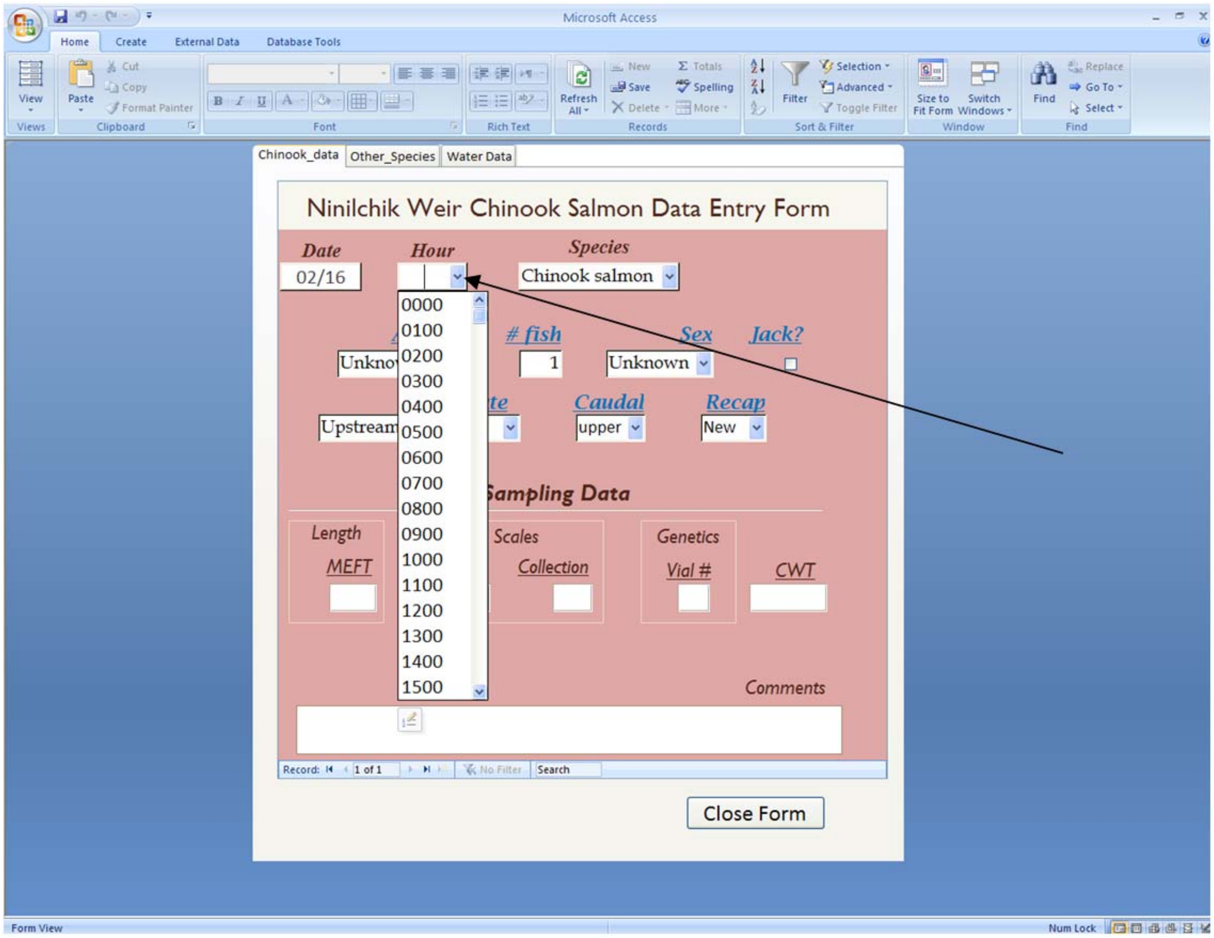
Step2: enter Chinook salmon data.

Fill in the form sequentially.



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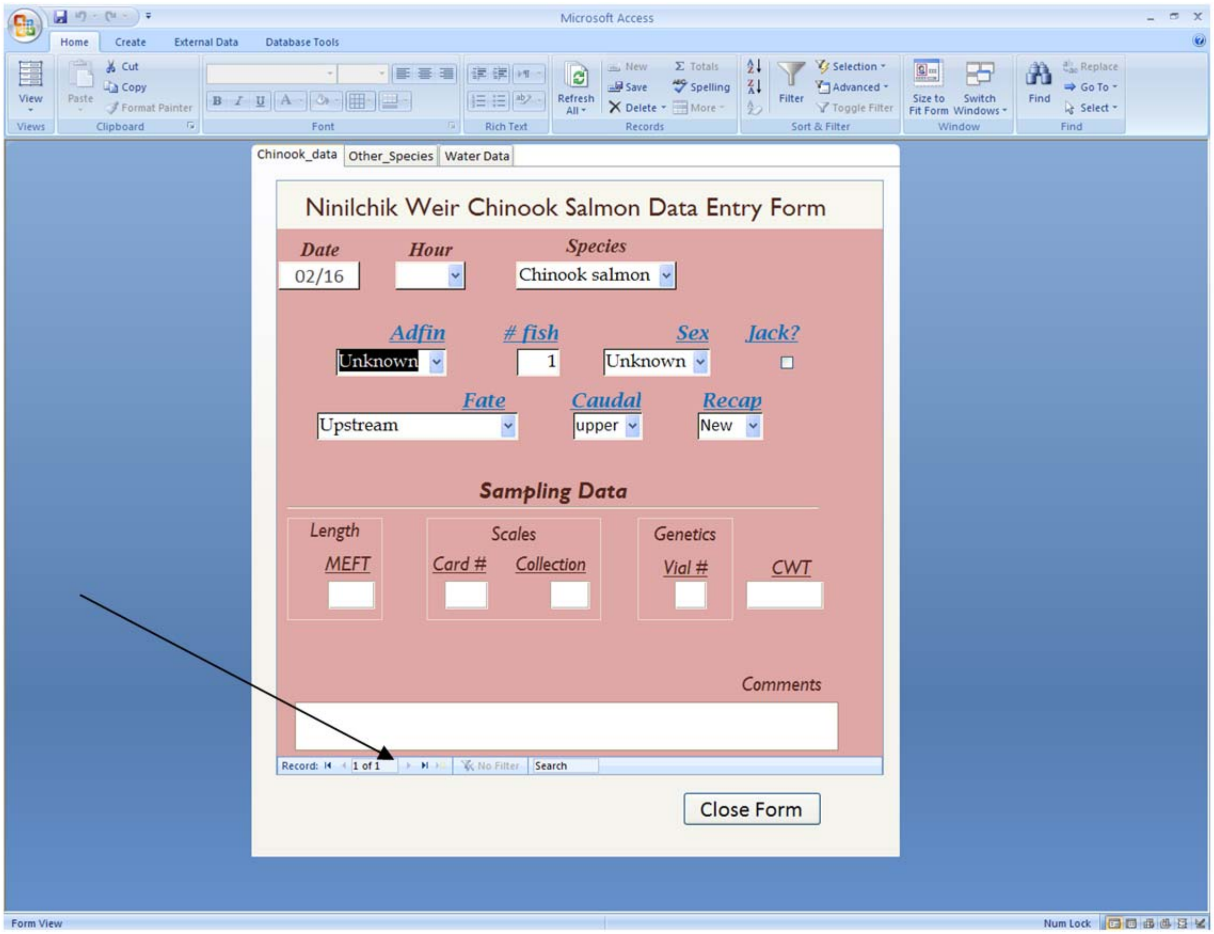
After you have entered all of the data for a record, you need to advance to the next record by pressing the *"next record"* button at the bottom of the form.



After all Chinook salmon data records have been entered, you can either press the *"close form"* button or move to the "Other_Species" or "Water_Data" tabs. If you do enter data in other tabs before closing the form, make sure you press the *"close form"* button before closing the database. There are several update functions that occur when you use the button.

The next time that you open the form there will be no data in the form. So prior to closing the form you can proof the data for each record by viewing them from the record selector.

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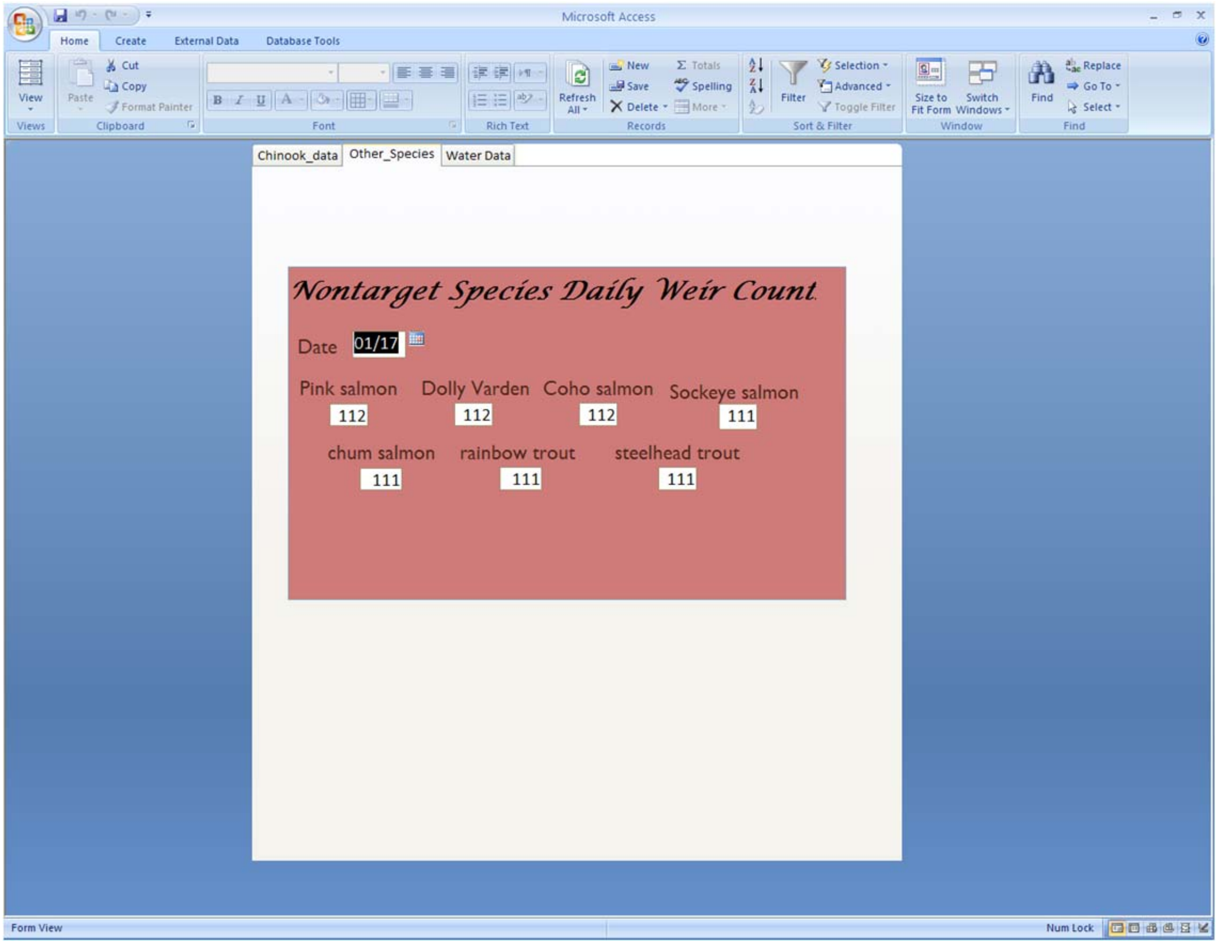
Step 3: enter other species data.

Click on the "Other_Species" tab. You will need to summarize the total number of each species for the day prior to entering the data.



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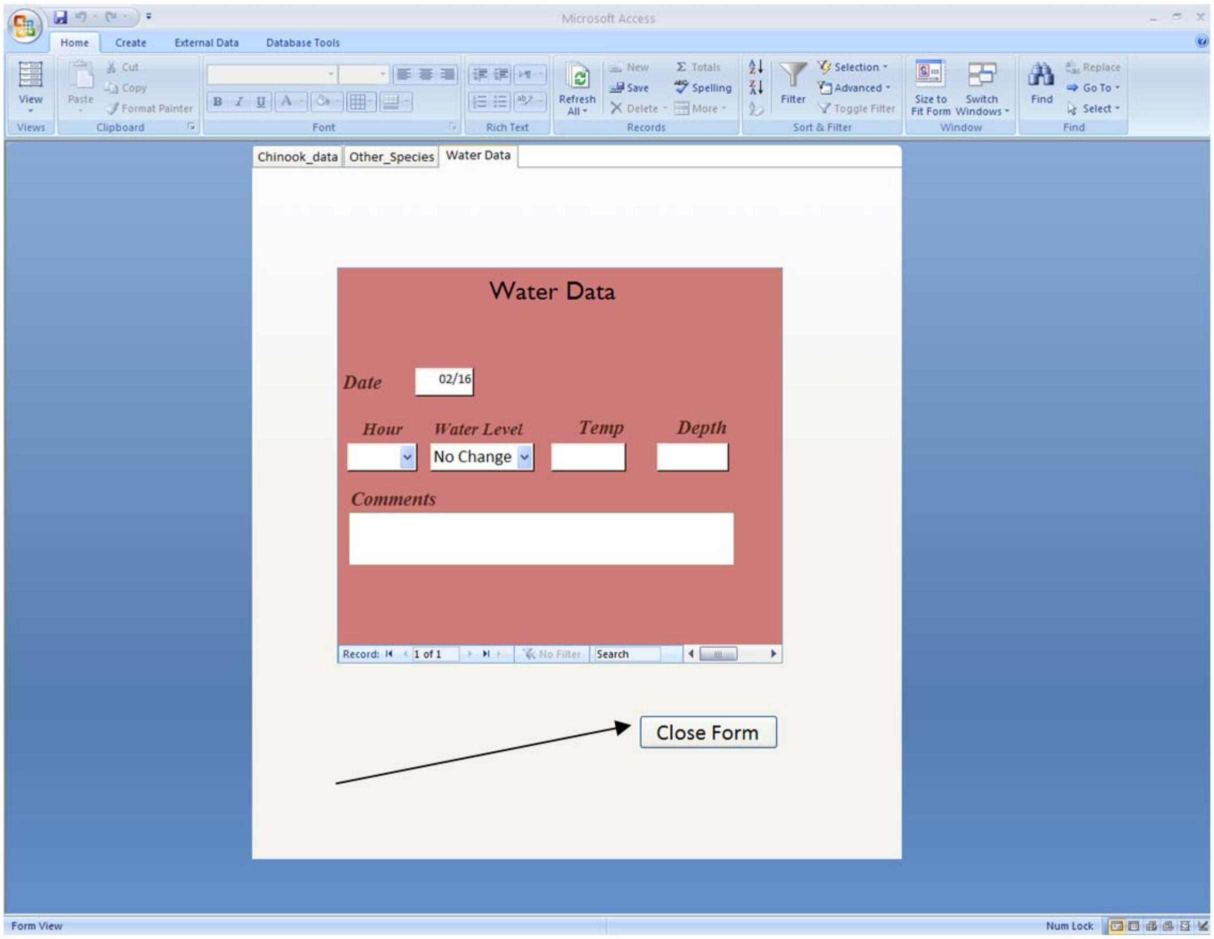
Step 4: enter water data.

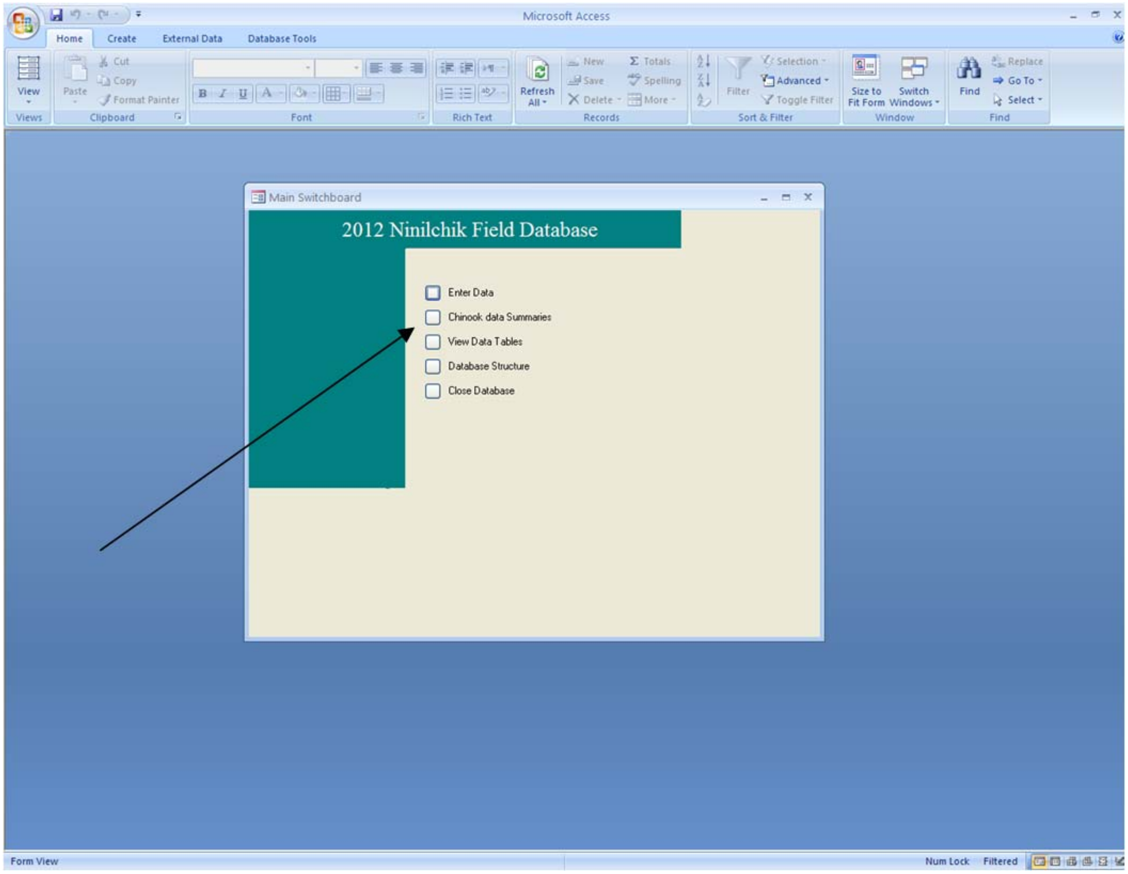
Click on the "Water Data" tab. You will be able to enter both morning and evening water data by using the record selector at the bottom of the form.



Make sure you click on the *"Close Form"* button prior to closing the database.

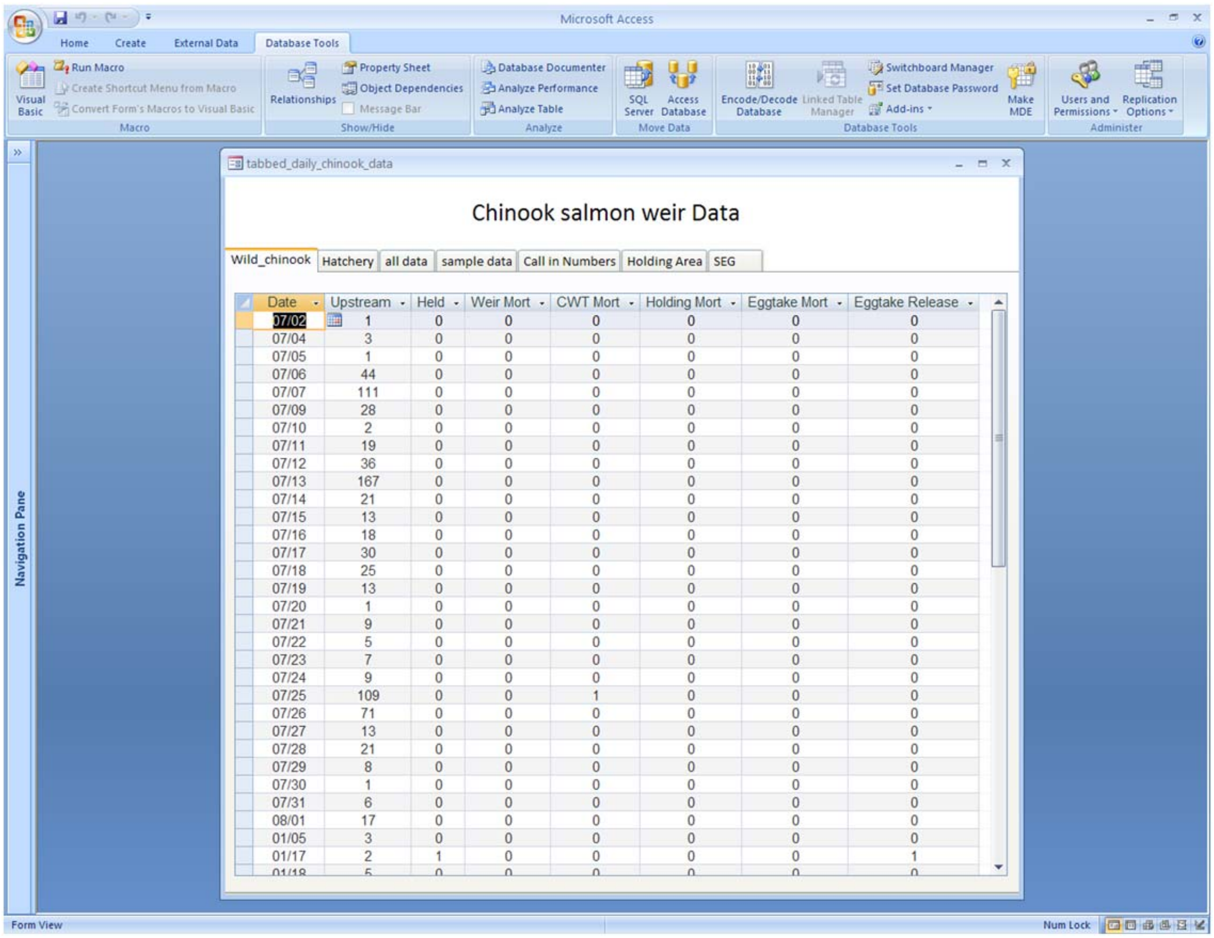
Appendix C2.–Microsoft Access–generated daily weir operation summaries.

The database will automatically produce data summaries after the data has been entered. With the database opened to the main switchboard, click on the *"Chinook data summaries"* button.



-continued-

No changes can be made to the data in this view. Using these summaries is a good way to proof the data input. If there is a discrepancy between the database and your datasheet, notify the project field leader.

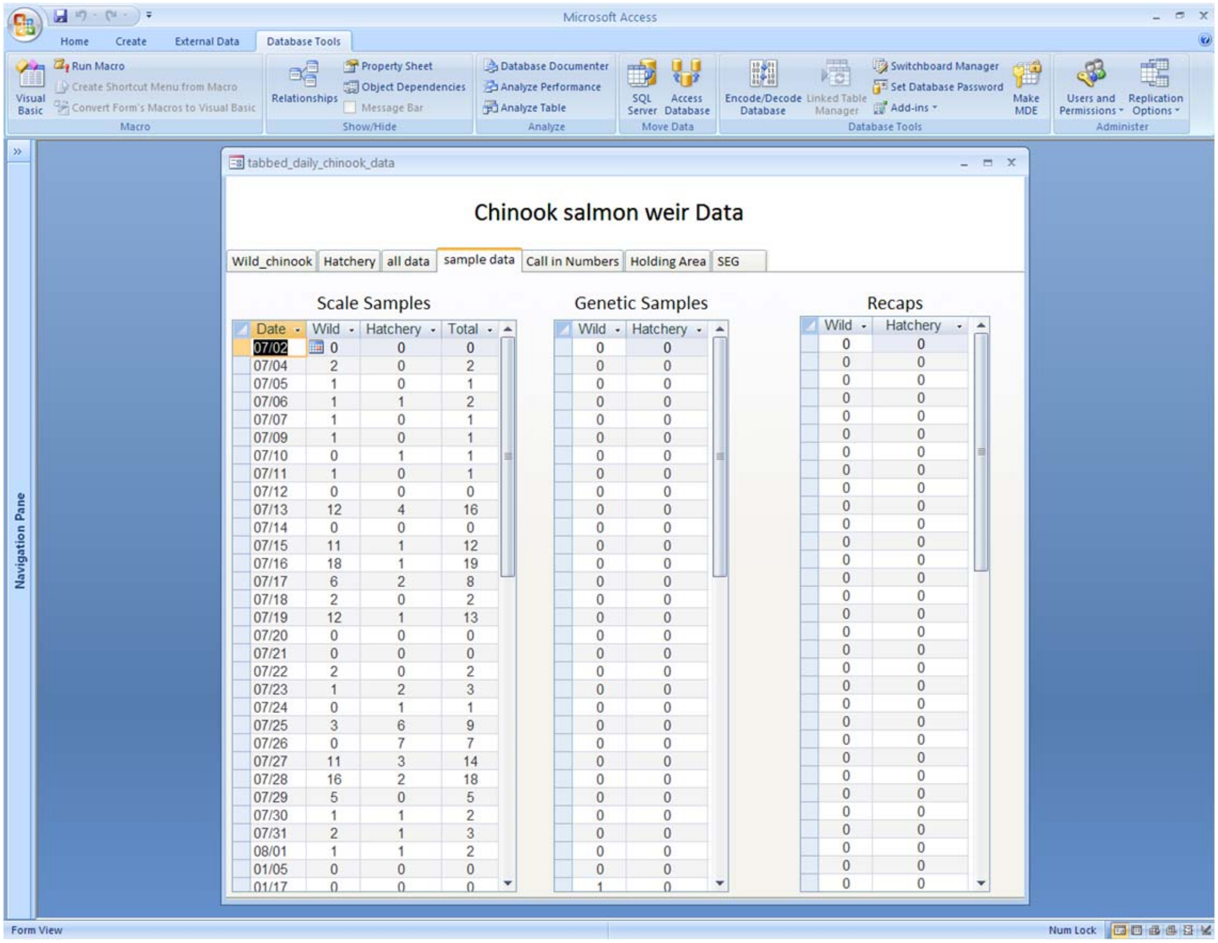


Date	Upstream	Held	Weir Mort	CWT Mort	Holding Mort	Eggtake Mort	Eggtake Release
07/02	1	0	0	0	0	0	0
07/04	3	0	0	0	0	0	0
07/05	1	0	0	0	0	0	0
07/06	44	0	0	0	0	0	0
07/07	111	0	0	0	0	0	0
07/09	28	0	0	0	0	0	0
07/10	2	0	0	0	0	0	0
07/11	19	0	0	0	0	0	0
07/12	36	0	0	0	0	0	0
07/13	167	0	0	0	0	0	0
07/14	21	0	0	0	0	0	0
07/15	13	0	0	0	0	0	0
07/16	18	0	0	0	0	0	0
07/17	30	0	0	0	0	0	0
07/18	25	0	0	0	0	0	0
07/19	13	0	0	0	0	0	0
07/20	1	0	0	0	0	0	0
07/21	9	0	0	0	0	0	0
07/22	5	0	0	0	0	0	0
07/23	7	0	0	0	0	0	0
07/24	9	0	0	0	0	0	0
07/25	109	0	0	1	0	0	0
07/26	71	0	0	0	0	0	0
07/27	13	0	0	0	0	0	0
07/28	21	0	0	0	0	0	0
07/29	8	0	0	0	0	0	0
07/30	1	0	0	0	0	0	0
07/31	6	0	0	0	0	0	0
08/01	17	0	0	0	0	0	0
01/05	3	0	0	0	0	0	0
01/17	2	1	0	0	0	0	1
01/18	5	0	0	0	0	0	0

The first and second tabs contain the wild (default view) and hatchery Chinook salmon data, respectively.

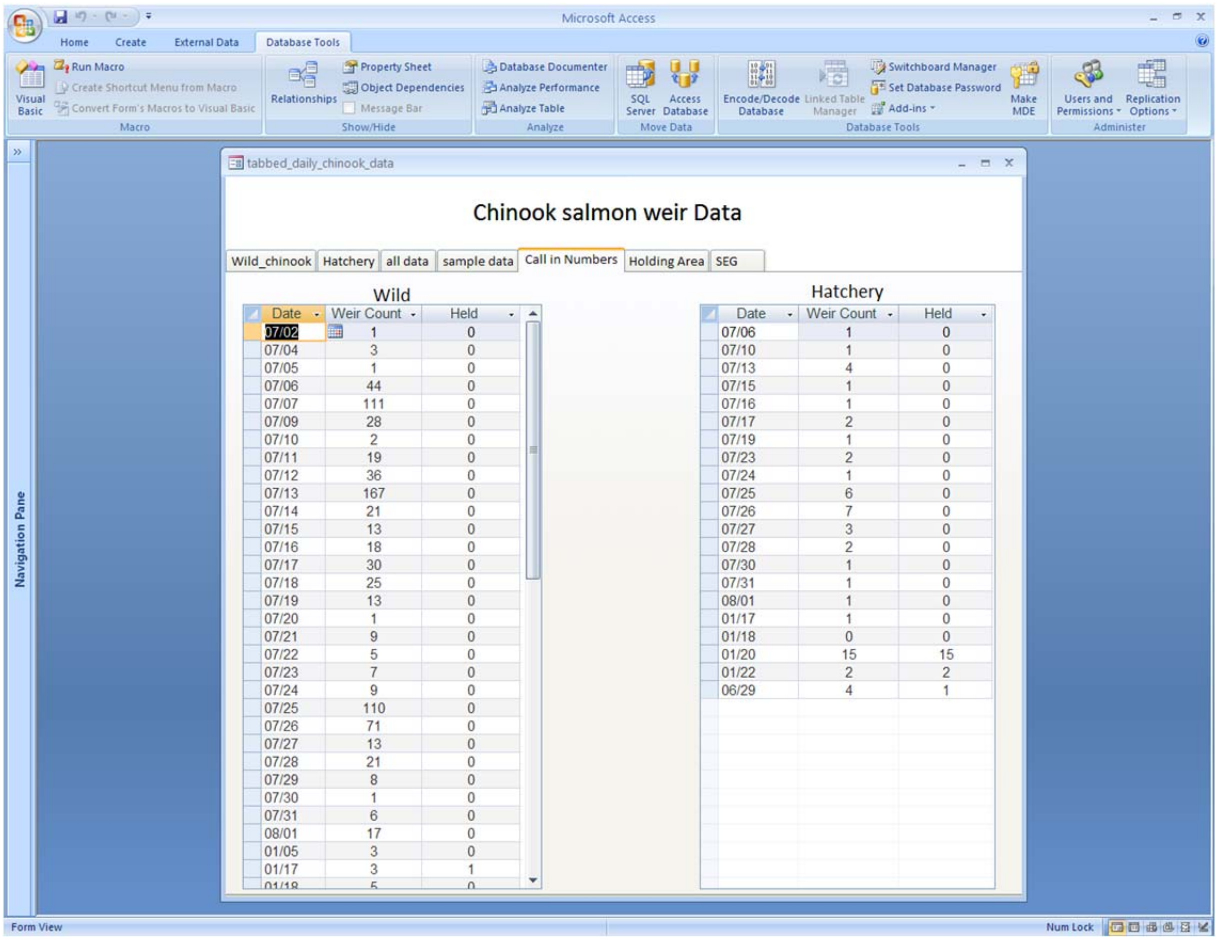
-continued-

The *"Sample data"* tab has all of the data from the grayed section of the datasheet. This tab will help you figure out how many scale samples have been collected.



-continued-

The Call in Numbers tab is probably the most useful. At the end of the day when you need to call in the numbers to the project supervisor, just read the numbers as they are in this form (Date, wild and hatchery weir counts, and numbers held).



Wild

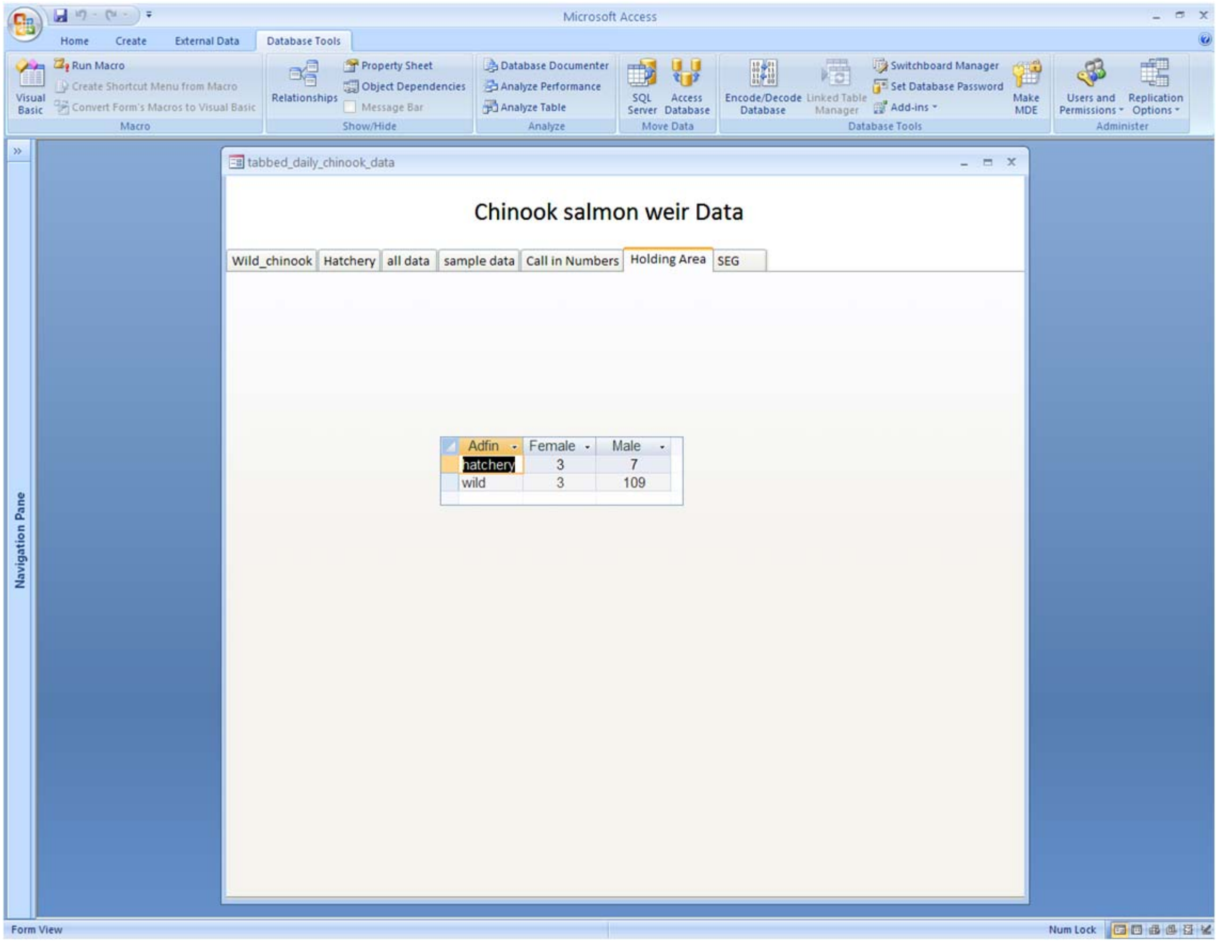
Date	Weir Count	Held
07/02	1	0
07/04	3	0
07/05	1	0
07/06	44	0
07/07	111	0
07/09	28	0
07/10	2	0
07/11	19	0
07/12	36	0
07/13	167	0
07/14	21	0
07/15	13	0
07/16	18	0
07/17	30	0
07/18	25	0
07/19	13	0
07/20	1	0
07/21	9	0
07/22	5	0
07/23	7	0
07/24	9	0
07/25	110	0
07/26	71	0
07/27	13	0
07/28	21	0
07/29	8	0
07/30	1	0
07/31	6	0
08/01	17	0
01/05	3	0
01/17	3	1

Hatchery

Date	Weir Count	Held
07/06	1	0
07/10	1	0
07/13	4	0
07/15	1	0
07/16	1	0
07/17	2	0
07/19	1	0
07/23	2	0
07/24	1	0
07/25	6	0
07/26	7	0
07/27	3	0
07/28	2	0
07/30	1	0
07/31	1	0
08/01	1	0
01/17	1	0
01/18	0	0
01/20	15	15
01/22	2	2
06/29	4	1

-continued-

The *"Holding Area"* tab will allow us to keep track of the number of fish in the holding area.



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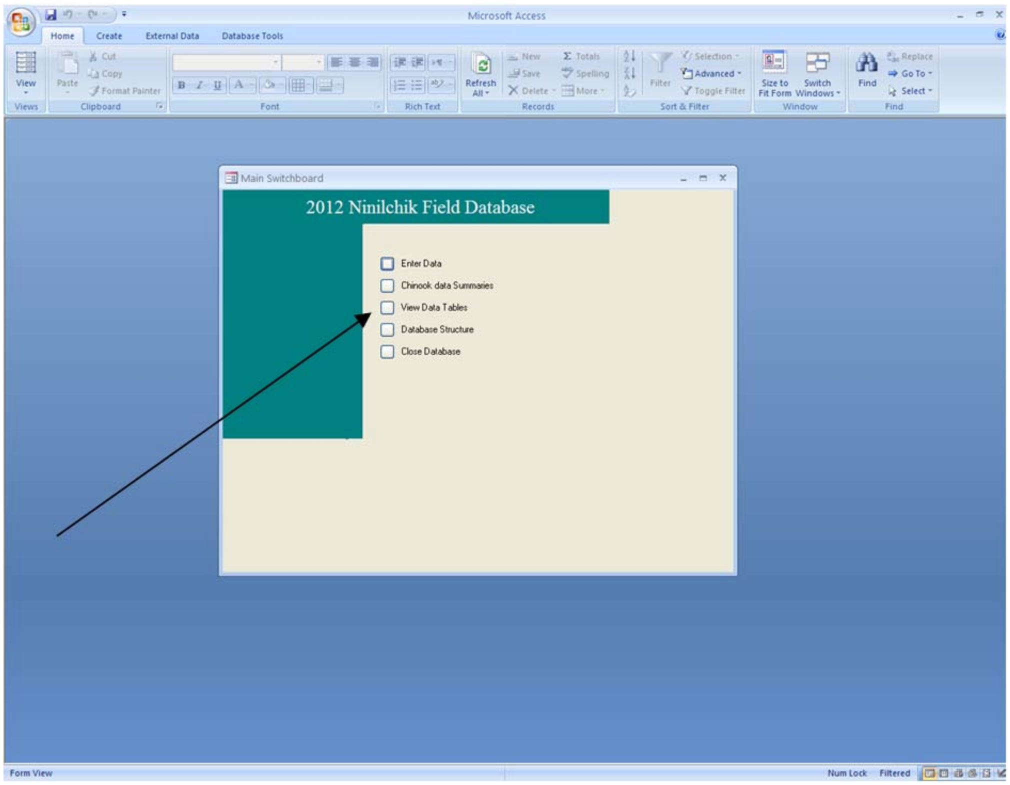
Other species data and water data can be found by pressing *"view Data Tables"* button on the main switchboard. Click on the tab for the data that you wish to view. These are in view-only table formats.



Appendix C3.–Ninilchik database fish table fields.

Fish Table			
Field Name	**Column #**	**Data Type**	**Description**
ID	F1	AutoNumber	Primary Key
Date	F16	Number	Date
Hour	F17	Number	Hour
Species	F2	Number	410=Chinook salmon 420=Sockeye salmon 430=Coho salmon 440=Pink salmon 450=Chum salmon 530=Dolly Varden 540=Steelhead trout 541=Rainbow trout 600=Pacific lamprey 900=Unknown or other (if "900" is entered, an explanation should be included in the comments.
# Fish	F3	Number	Number of fish
Adfin	F4	Number	0=Wild (adipose fin present) 1=Hatchery (adipose fin absent) 3=Unknown
Jack	F5	Number	0=Not a jack -1=Jack
Sex	F6	Number	1=Male 2=Female 0=Unknown
Fate	F8	Number	1=Up 2=Held 3=CWT 4=Weir Mort 5=Hold Mort 6=Eggtake Removal (mort) 7=Holding Release 8=Livebox Removal 9=Hatchery Male Holding Pen Removal

-continued-

Appendix C1.–Page 2 of 2.

MEFT	F7	Number	Mid-eye to fork length in mm
Card	F9	Number	Scale card number
Column	F10	Number	Column on scale card
Recap	F11	Number	0=New 1=Recap
Caudal	F12	Number	1=Upper 2=Lower 3=None
Comments	F14	Memo	Comments
Genetic Vial	F18	Number	Genetic vial sample #
Time	F15	Number	Time (used with Allegro)
CWT	F13	Number	CWT number
HID	F1	Number	HID (used with Allegro)

APPENDIX D: IMPORTING TO THE MASTER DATABASE POSTSEASON.

Appendix D1.–Procedure for importing data from the Ninilchik field database into the Ninilchik Master database.

Export the data in the *Fish table* in the Ninilchik Field database to a Microsoft Excel spreadsheet. This table contains only Chinook salmon data. Add filters to all the columns so you can proof the data. Proof for daily weir counts by wild and hatchery, sex, jack, number of fish, and fate. Proof total wild and hatchery weir counts and SEG. Be sure to proof all eggtake data and numbers as well. Check that all fish with a scale card number also have a column number, etc.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	FishNo	Date	Release_Tim	Species	No	AdFin	Fate	Sex	Jack	MEF	Card	Col	Recap	Mark
2947		7/3/2014	8:00	410	1	0	1	1	0	0	0	0	0	
2948		7/3/2014	8:00	410	1	0	1	2	0	0	0	0	0	
2949		7/3/2014	8:00	410	1	0	1	2	0	0	0	0	0	
2950		7/3/2014	8:00	410	1	0	1	1	0	0	0	0	0	
2951		7/3/2014	8:00	410	1	0	1	2	0	0	0	0	0	
2952		7/3/2014	8:00	410	1	0	1	1	0	0	0	0	0	
2953		7/3/2014	8:00	410	1	0	1	1	0	0	0	0	0	
2954		7/3/2014	8:00	410	1	0	1	1	0	0	0	0	0	
2955		7/3/2014	8:00	410	1	0	1	1	0	0	0	0	0	
2956		7/3/2014	8:00	410	1	0	1	1	0	0	0	0	0	
2958		7/3/2014	9:00	410	1	0	1	1	-1	0	0	0	0	
2959		7/3/2014	9:00	410	1	0	1	1	0	0	0	0	0	
2962		7/3/2014	14:00	410	1	0	1	1	0	0	0	0	0	
2963		7/3/2014	14:00	410	1	0	1	1	0	0	0	0	0	
2964		7/3/2014	14:00	410	1	0	1	1	0	0	0	0	0	
2965		7/3/2014	14:00	410	1	0	1	1	0	0	0	0	0	
2966		7/3/2014	14:00	410	1	0	1	1	0	0	0	0	0	
2968		7/3/2014	19:00	410	1	0	1	1	0	0	0	0	0	
2969		7/3/2014	19:00	410	1	0	1	2	0	0	0	0	0	
2970		7/3/2014	19:00	410	1	0	1	1	0	0	0	0	0	
2971		7/3/2014	19:00	410	1	0	1	2	0	0	0	0	0	
2972		7/3/2014	19:00	410	1	0	1	1	-1	0	0	0	0	
2973		7/3/2014	19:00	410	1	0	1	1	0	0	0	0	0	
2974		7/3/2014	19:00	410	1	0	1	1	0	0	0	0	0	
2976		7/3/2014	20:00	410	1	0	1	1	0	0	0	0	0	
2977		7/3/2014	20:00	410	1	0	1	1	0	0	0	0	0	
2978		7/3/2014	20:00	410	1	0	1	1	0	0	0	0	0	
2979		7/3/2014	20:00	410	1	0	1	1	0	0	0	0	0	
2980		7/3/2014	20:00	410	1	0	1	1	0	0	0	0	0	
2981		7/3/2014	20:00	410	1	0	1	1	0	0	0	0	0	
2982		7/3/2014	20:00	410	1	0	1	1	0	0	0	0	0	

In the Excel workbook, order and name the columns so they exactly match the fields in the *FishDataTbl* in the master database. Make sure all data types match (for example, the jack column should be numbers, not a Y/N). Add all the columns the *FishDataTbl* has to the Excel spreadsheet and add data where appropriate. For example, add 2015 to the year column. If there are scale ages available, add those and the ager to the appropriate columns.

All fish with fate code 7 "holding release" do not need to be entered into the master database. Fate code 7 is only used to keep track of the holding area summary inseason, and is not needed postseason because that fish was also entered under fate code 2 "held". Select all fish with fate code 7 and delete them from the Excel spreadsheet.

-continued-

Export the *non-target_species table* from the Ninilchik Field database to an Excel spreadsheet. This table contains all of the data from fish species other than Chinook salmon. In order to incorporate the *non-target_species* data into the same Excel spreadsheet as the Chinook salmon data from the *Fish table*, create an entry for each date and species present. It should look like this:

Date	Hour	Species	No
7/3/2014		530	6
7/4/2014		530	6
7/5/2014		530	2
7/6/2014		530	3
7/7/2014		530	1
7/9/2014		530	3
7/10/2014		530	5
7/11/2014		420	2
7/11/2014		530	10
7/13/2014		450	1
7/14/2014		530	5
7/15/2014		530	35
7/16/2014		450	1
7/16/2014		530	10
7/17/2014		440	1
7/17/2014		530	8
7/18/2014		530	14

The nontarget species will only have data to fill 3 columns of the exported *Fish table* in Excel: date, species, and number.

-continued-

After the Chinook salmon data and the nontarget species data are incorporated into the same Excel spreadsheet in the format that matches the *FishDataTbl* in the Ninilchik Master database, you're ready to import.

Make a copy of the Ninilchik Master database first. Then import the data by selecting the data in the Excel spreadsheet and copying and pasting it into the FishDataTbl in the Ninilchik Master database. Check each field to make sure the data is displayed in the correct format. Now go through and proof the data again in order to make sure everything imported correctly.

FishDataTbl

FishNo	Date	Hour	Species	No	AdFin	Fate	Sex	Jack	MEF	Card	Col	Recap	Mark	CW
20602	7/31/2014	2:00:00 PM	410	1	1	6	1	0	0	0	0	0	1	
20610	7/31/2014	2:00:00 PM	410	1	0	6	2	0	850	0	0	0	1	
20611	7/31/2014	2:00:00 PM	410	1	0	6	2	0	670	0	0	0	1	
20612	7/31/2014	2:00:00 PM	410	1	0	6	2	0	760	0	0	0	1	
20613	7/31/2014	2:00:00 PM	410	1	0	6	2	0	870	0	0	0	1	
20587	7/31/2014	9:00:00 AM	410	1	1	5	2	0	0	0	0	0	1	
20615	7/31/2014	2:00:00 PM	410	5	0	5	2	0	0	0	0	0	1	
20607	7/31/2014	2:00:00 PM	410	1	1	6	1	0	0	0	0	0	1	
20617	7/31/2014	7:00:00 PM	410	1	1	2	2	0	0	0	0	0	1	
20618	7/31/2014	8:00:00 PM	410	18	0	1	2	0	0	0	0	0	1	
20619	7/31/2014	8:00:00 PM	410	11	0	1	1	0	0	0	0	0	1	
20620	7/31/2014	9:00:00 PM	410	13	1	8	1	0	0	0	0	0	3	
20621	7/31/2014	10:00:00 PM	410	30	1	8	1	-1	0	0	0	0	3	
20622	7/31/2014	10:00:00 PM	410	2	0	1	1	0	0	0	0	0	1	
20623	7/31/2014	11:00:00 PM	410	22	1	8	1	-1	0	0	0	0	3	
20614	7/31/2014	2:00:00 PM	410	1	0	6	2	0	800	0	0	0	1	
20595	7/31/2014	2:00:00 PM	410	1	1	6	2	0	810	0	0	0	1	
20588	7/31/2014	2:00:00 PM	410	1	1	6	2	0	770	0	0	0	1	
20589	7/31/2014	2:00:00 PM	410	1	0	6	2	0	730	0	0	0	1	
20590	7/31/2014	2:00:00 PM	410	1	0	6	2	0	720	0	0	0	1	
20591	7/31/2014	2:00:00 PM	410	1	0	6	2	0	875	0	0	0	1	
20592	7/31/2014	2:00:00 PM	410	1	0	6	2	0	765	0	0	0	1	
20609	7/31/2014	2:00:00 PM	410	1	1	6	1	0	0	0	0	0	1	
20594	7/31/2014	2:00:00 PM	410	1	0	6	2	0	770	0	0	0	1	
20606	7/31/2014	2:00:00 PM	410	1	0	6	2	0	730	0	0	0	1	
20596	7/31/2014	2:00:00 PM	410	1	0	6	2	0	660	0	0	0	1	
20597	7/31/2014	2:00:00 PM	410	1	1	6	2	0	840	0	0	0	1	
20598	7/31/2014	2:00:00 PM	410	1	0	6	2	0	810	0	0	0	1	
20599	7/31/2014	2:00:00 PM	410	1	0	6	2	0	770	0	0	0	1	
20600	7/31/2014	2:00:00 PM	410	1	0	6	2	0	810	0	0	0	1	
20601	7/31/2014	2:00:00 PM	410	1	1	6	2	0	820	0	0	0	1	
20603	7/31/2014	2:00:00 PM	410	1	0	6	2	0	780	0	0	0	1	
20605	7/31/2014	2:00:00 PM	410	1	1	6	1	0	0	0	0	0	1	
20593	7/31/2014	2:00:00 PM	410	1	1	6	2	0	725	0	0	0	1	
20624	7/31/2014		530	20										

Record: 1 of 11200 No Filter Search

APPENDIX E: NINILCHIK RIVER WEIR REPORTING AND SCHEDULE

Appendix E1.–Ninilchik River Daily Log, 2015.

Date and Day:

Name: First and Last:

Query of Counts:

- Number of wild and hatchery-reared counted through live box,
- Number of wild and hatchery-reared held by sex,
- Total number of wild and hatchery-reared in holding area by sex,
- Total mortality by wild and hatchery-reared by sex and jacks,
- Escapement of wild and hatchery reared.

Stream Conditions for North and South Fork:

- Turbidity
- Depth

Weather:

- Air Temperature:
- Water Temperatures

Weir Maintenance:

Generator Maintenance:

Computer Trouble:

Camp Maintenance:

Visitors:

Fishery Notes:

Questions:

Problems:

Other observations:

Appendix E2.–Weir crew work schedule.

Day	Date	Activity	Crew
Monday	29-Jun	Weir Intallation/Operation	All/Vacant
Tuesday	30-Jun	Holding Area Install/Weir Operation	All/Vacant
Wednesda	1-Jul	Weir Operation	Vacant
Thursday	2-Jul	Weir Operation	Vacant/Robinson
Friday	3-Jul	Weir Operation	Robinson
Saturday	4-Jul	Weir Operation	Robinson
Sunday	5-Jul	Weir Operation	Robinson
Monday	6-Jul	Weir Operation	Vacant
Tuesday	7-Jul	Weir Operation	Vacant
Wednesda	8-Jul	Weir Operation	Vacant
Thursday	9-Jul	Weir Operation	Vacant/Robinson
Friday	10-Jul	Weir Operation	Robinson
Saturday	11-Jul	Weir Operation	Robinson
Sunday	12-Jul	Weir Operation	Robinson
Monday	13-Jul	Weir Operation	Vacant
Tuesday	14-Jul	Weir Operation	Vacant
Wednesda	15-Jul	Weir Operation	Vacant
Thursday	16-Jul	Weir Operation	Vacant/Robinson
Friday	17-Jul	Weir Operation	Robinson
Saturday	18-Jul	Weir Operation	Robinson
Sunday	19-Jul	Weir Operation	Robinson
Monday	20-Jul	Weir Operation	Vacant
Tuesday	21-Jul	Weir Operation	Vacant
Wednesda	22-Jul	Weir Operation	Vacant
Thursday	23-Jul	Weir Operation	Vacant/Robinson
Friday	24-Jul	Weir Operation	Robinson
Saturday	25-Jul	Weir Operation	Robinson
Sunday	26-Jul	Weir Operation	Robinson
Monday	27-Jul	Weir Operation	Vacant
Tuesday	28-Jul	Weir Operation	Vacant
Wednesda	29-Jul	Weir Operation	Robinson
Thursday	30-Jul	Weir Operation	Robinson
Friday	31-Jul	Weir Operation	Robinson
Saturday	1-Aug	Weir Removal	All