

**Amendment: Crooked Creek Chinook Salmon
Enhancement Project, 2016-2018**

by

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May 2017

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code	AAC	all standard mathematical signs, symbols and abbreviations	
deciliter	dL	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H _A
gram	g	all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.	base of natural logarithm	e
hectare	ha			catch per unit effort	CPUE
kilogram	kg	at	@	coefficient of variation	CV
kilometer	km			common test statistics	(F, t, χ^2 , etc.)
liter	L	compass directions:		confidence interval	CI
meter	m	east	E	correlation coefficient (multiple)	R
milliliter	mL	north	N	correlation coefficient (simple)	r
millimeter	mm	south	S	covariance	cov
Weights and measures (English)		west	W	degree (angular)	°
		copyright	©	degrees of freedom	df
		corporate suffixes:		expected value	E
		Company	Co.	greater than	>
		Corporation	Corp.	greater than or equal to	≥
		Incorporated	Inc.	harvest per unit effort	HPUE
		Limited	Ltd.	less than	<
		District of Columbia	D.C.	less than or equal to	≤
		et alii (and others)	et al.	logarithm (natural)	ln
		et cetera (and so forth)	etc.	logarithm (base 10)	log
Time and temperature		exempli gratia		logarithm (specify base)	log ₂ , etc.
day	d	(for example)	e.g.	minute (angular)	'
degrees Celsius	°C	Federal Information Code	FIC	not significant	NS
degrees Fahrenheit	°F	id est (that is)	i.e.	null hypothesis	H ₀
degrees kelvin	K	latitude or longitude	lat or long	percent	%
hour	h	monetary symbols		probability	P
minute	min	(U.S.)	\$, ¢	probability of a type I error	
second	s	months (tables and figures): first three		(rejection of the null hypothesis when true)	α
Physics and chemistry		letters	Jan,...,Dec	probability of a type II error	
all atomic symbols		registered trademark	®	(acceptance of the null hypothesis when false)	β
alternating current	AC	trademark	™	second (angular)	"
ampere	A	United States		standard deviation	SD
calorie	cal	(adjective)	U.S.	standard error	SE
direct current	DC	United States of America (noun)	USA	variance	
hertz	Hz	U.S.C.	United States Code	population	Var
horsepower	hp			sample	var
hydrogen ion activity (negative log of)	pH	U.S. state	use two-letter abbreviations (e.g., AK, WA)		
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

REGIONAL OPERATIONAL PLAN SF.2A.2017.13

**CROOKED CREEK CHINOOK SALMON ENHANCEMENT PROJECT,
2016-2018**

by
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May 2017

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SIGNATURE PAGE

Project Title: Crooked Creek Chinook Salmon Enhancement Project

Project leader(s): *Jenny L. Gates, Fishery Biologist I*

Division, Region and Area: Sport Fish, Region II, Soldotna

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Period Covered: 2016-2018

Field Dates: May 24 – August 15

Plan Type: Amendment

Approval

Title	Name	Signature	Date
Project leader	Jenny L. Gates		05-12-17
Research Coordinator	Tim McKinley		5/12/17

TABLE OF CONTENTS

	Page
LIST OF FIGURES	ii
PURPOSE.....	1
REASON FOR CHANGE.....	1
DESCRIPTION OF CHANGE.....	1

LIST OF FIGURES

Figure	Page
1. Diagram of the layout of Crooked Creek Facility, weir and digital video system and passage chute.....	3

PURPOSE

The Crooked Creek Chinook Salmon Enhancement Project is designed to monitor both naturally- and hatchery-produced Chinook salmon escapement as well as collect brood stock and conduct egg takes to provide additional sport fishing opportunities within the Kasilof River and other terminal fisheries on the Kenai Peninsula. This project imprints Chinook salmon smolt for seven to ten days at the beginning of June. Additionally, age, sex, length and genetic samples will be collected from returning naturally- and hatchery-produced Chinook salmon. The sustainable escapement goal for Crooked Creek is 650-1,700 naturally-produced Chinook salmon.

The overall goal of this research program is to reconstruct naturally- and hatchery-produced returns of Chinook salmon to Crooked Creek such that a biological escapement goal (BEG) can be established.

REASON FOR CHANGE

This amendment is to document programmatic changes that will occur at the Crooked Creek Facility in 2017 and in future years. No changes to primary objectives will be made.

Substantial renovations of the Crooked Creek Facility occurred during the fall of 2016 to address life safety concerns of the failing facility. These renovations will change how the facility is operated in 2017 and in the subsequent future. Other programmatic changes include eliminating a secondary objective to collect axillary process tissue samples from age-1.2 naturally- and hatchery-produced Chinook salmon. This is due to the cost associated with processing samples and the project cost to sample the entire run of Chinook salmon at Crooked Creek for future analysis. Lastly, a minor modification will be made in how the daily biological samples sizes are determined. This is due to the amount of time it takes to review the previous day's digital video and determine the daily count of Chinook salmon before sampling occurs.

DESCRIPTION OF CHANGE

The DVR system will be installed and operational at the time of smolt imprinting. Smolt imprinting will occur the first part of June. In 2017, smolt are scheduled to be delivered on June 6th. Raceways 2, 3 and 4 will be used for holding and imprinting smolt. Specialized smolt panels constructed of perforated plate will be installed at the upper and lower ends of the raceways to prevent smolt from out-migrating. Panels will be removed from the lower end of the raceways at the time of release. Smolt will exit the facility using the tail raceway which was modified and improved as part of the renovation. Release will occur over a two day period. After this time, the facility drain pipe (replaced as part of the renovation) will be opened to allow remaining smolt to exit the facility during cleaning and disinfecting in preparation of brood stock collection. The remaining smolt panels will be removed and replaced with expanded aluminum jump screens for holding brood stock (Figure 1).

Fish will be allowed unobstructed passage into the Crooked Creek Facility via the fish steep pass located at the downstream end of the tail raceway. After entering the facility, all fish will be diverted into raceway 1 by a panel placed in the tailrace directly located at a gate at the bottom end of raceway 1. Fish will swim freely through a fish passage chute and will be digitally recorded using an underwater camera located in a submerged camera box. The fish passage chute will be modified and connected to a live box fitted with a finger system to prevent downstream movement, back through the fish passage chute. Fish will then either be trapped in

the live box for biological sampling, trapped and sorted for brood stock or swim freely upstream to the head raceway and out of the facility. During sampling days and/or brood stock collection days, fish of acceptable sexual maturity will be moved via a chute system to raceways 2, 3 or 4 and held for an egg take. Fish that are not used for brood stock will be placed upstream of the live box in raceway 1 and allowed passage upstream to Crooked Creek via the head raceway (Figure 1).

The total number of adults that return to the weir will be the sum of the daily counts (counts derived from reviewing digital video) and mortalities that occurred in the tail raceway before the DVR system. Escapement counts will be the DVR daily count minus brood stock collection and any mortalities that occur upstream of the DRV system. It will also include brood stock that are manually passed upstream and not used for egg takes.

Biological samples will be collected in proportion to passage through the weir. Early and late season (when fish passage is low) the gate to the DVR passage chute will be closed overnight no less than twice weekly, tentatively scheduled for Mondays and Thursdays, to collect fish for biological sampling the following day (Tuesdays and Fridays). A conservative sampling rate for each group (1:10 for naturally-produced fish and 1:5 for hatchery-produced fish) will be applied to the weir passage for each group since the last sampling day to set the daily sampling goal. If digital video counts are not completed in time for sampling, the first six hours of fish passage recorded on the DVR will be used to estimate the previous days total fish passage and determine sample size. If the sampling goal is not reached during a sampling period then extra fish will be sampled the following sampling day to make up the deficit. During the middle of the run (when fish passage is high) the same procedure will be employed although the gate to the DVR passage chute will be closed everyday (or every weekday) to allow a large number of broodstock to be collected. After a fish is sampled it will either be placed into raceway 1 for holding as broodstock or into the tail race (via the sampling chute) for upstream passage through the DVR. Fish that were not sampled will be sorted into raceway 1 for holding as broodstock or into the tail race for upstream passage depending on broodstock collection needs. All fish will be given an anal fin punch to mark it so that duplicate sampling doesn't occur on days when the tail raceway gate is opened for unobstructed fish passage. Some fish do not immediately leave the facility and hold in the tail raceway. The sampling equipment prevents selective sampling of fish within the sampling chute. All fish are crowded into the sampling chute prior to sampling, the net is the width of the sampling chute and the water is opaque so that fish cannot be observed prior to netting. The water flow at the main water intake gate will be reduced during sampling (Figure 1). The same method will be used to generate samples sizes in 2017 and 2018 after adjusting the sampling rate to account for recent escapements.

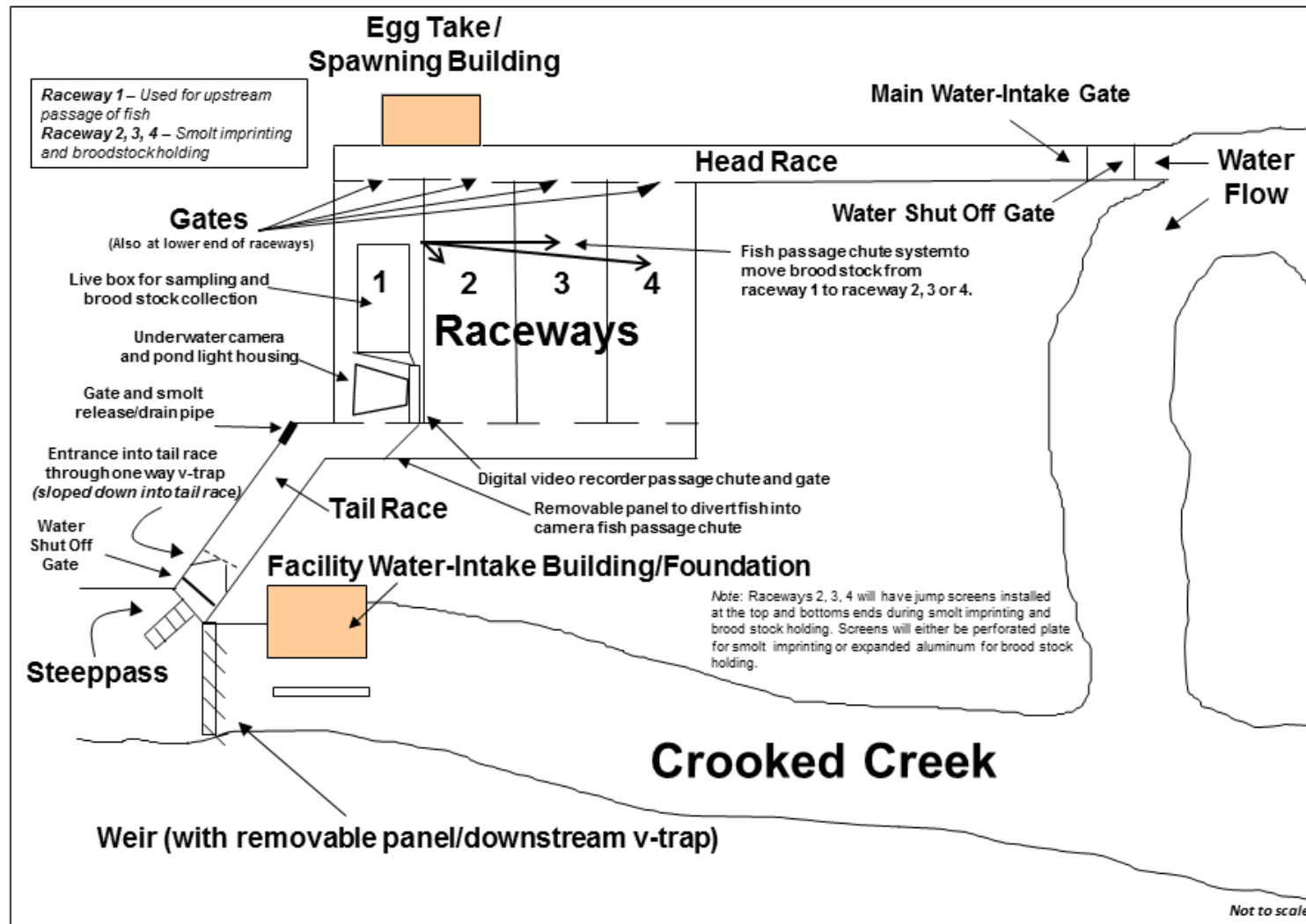


Figure 1.–Diagram of the layout of Crooked Creek Facility, weir and digital video system and passage chute.