Regional Operational Plan SF.2A.2014.14

Beaver Dam and Related Pond Inventory on Anadromous Streams within the Susitna River Drainage, 2014

by

Samantha Oslund

February 2015

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

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BEAVER DAM AND RELATED POND INVENTORY ON ANADROMOUS STREAMS WITHIN THE SUSITNA RIVER DRAINAGE, 2014

by

Samantha Oslund

Alaska Department of Fish and Game, Sport Fish, Palmer

Alaska Department of Fish and Game
Sport Fish

January 2015

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SIGNATURE PAGE

Project Title:	Beaver Dam Inventory on anadromous streams within the Susitna River drainage, 2014.
Project leader(s):	*Samantha Oslund, Assistant Area Management Biologist* *Sam Ivey, Area Management Biologist*
Division, Region, and Area	Sport Fish, Region II, Palmer
Project Nomenclature:	
Period Covered	July 2014
Field Dates:	July 15-October 4
Plan Type:	Category II

Approval

Title	Name	Signature	Date
Project leader	Samantha Oslund		07/14/2014
Biometrician	Sarah Power		8/4/2014
Research Coordinator	Timothy R. McCarty		7/19/14

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ABSTRACT

This document provides a detailed summary of beaver dams observed in the Susitna drainage that may potentially impair adult Chinook or coho passage up-stream. Included is a description of the Susitna drainage, how the survey will be conducted, study objectives, methods, and data collection.

Key words: Beaver dams, Susitna River, impair fish passage, helicopter surveys.

PURPOSE

Currently within the Matanuska–Susitna basin there is only ad-hoc documentation of beaver structures. This project will provide a beaver dam and pond inventory on at least 33 anadromous systems within the Susitna River drainage. The end product will be baseline data that may be used in any future assessments related to beaver dams and ponds.

BACKGROUND

The Susitna River drainage encompasses about 30,000 square miles. The Susitna River drainage originates in the Alaska Range and Talkeetna Mountain and flows south to Cook Inlet (Figure 1). Tributaries flowing into the Susitna from the west generally originate in the Alaska Range and have relatively low gradient and velocity, and are generally accessible only by boat or airplane. Tributaries flowing into the Susitna from the east mostly drain from the Talkeetna Mountains and generally have a relatively high gradient and velocity, and are easily accessible from the Parks Highway. As a whole these tributary streams produce all 5 species of Pacific salmon, and are harvested in sport, commercial, and subsistence fisheries.

To index the spawning escapement of king salmon, the department has conducted single aerial surveys on the same 24 streams in northern Cook Inlet since 1979. These surveys are conducted from rotary-wing aircraft (i.e., helicopter) at slower speeds than traditional fixed-wing aircraft surveys, and provide a suitable means for inventorying beaver structures concurrently. In addition, foot surveys to index spawning coho salmon escapement are conducted on four streams in the Susitna River drainage.

Beaver dams in a natural stream improve habitat for rearing salmonids (Pollock et al. 2004; Kemp et al. 2012) and can be easily navigated by migratory fish at higher water or via overflow channels. A prudent approach should be used to assure that only beaver dams that block upstream migration of juvenile and adult salmon are considered for alteration or removal. Sites known to have nearby beaver activity can be reviewed using existing data and photographs to identify sites where beaver activity may be blocking the upstream movement of spawning or juvenile fish.

Currently, little information exists that describes the extent of beaver dams that may potentially impair adult fish passage and/or provide rearing habitat for juvenile production in the Susitna River drainage. This project will document beaver dams and related ponds concurrently and as an addition to long-standing surveys of Chinook salmon escapement via helicopter, and foot surveys of coho salmon escapement in the fall. This effort will survey anadromous streams using aerial photographs, GIS, helicopter and on-the-ground surveys to identify all beaver dams, particularly those that potentially block or significantly impair fish passage.

These data should be considered an inventory of dam and related pond locations; further work would be necessary to assess the potential benefit or detriment to salmon production on a case by case basis and is beyond the scope of this project

OBJECTIVES

The primary objective of this study is to:

1. Photograph, enumerate, and map the number of beaver dams and related ponds that exist in at least 25 selected Susitna River drainage streams between 15 July and October 4.

METHODS

STUDY DESIGN

The surveys will be conducted once during peak spawning periods, as determined from past escapement surveys (Chinook) or inspection of easily accessible streams (coho) when water and viewing conditions are acceptable. Acceptable counting conditions can vary from stream to stream. The inventory will be conducted so that dams and ponds are documented regardless of whether they potentially impair adult fish passage. Dams will also be categorized as either newly built or multigenerational, by observations and photographs. GPS location will be automatically recorded for each dam by the camera. RTS staff will develop a database for data storage and create a map of beaver dams and ponds.

Salmon streams

Helicopter surveys indexing the escapement of Chinook salmon in 21 selected NCI streams occurs on an annual basis through a separate project. This beaver dam inventory project will be conducted in tandem with index surveys (Lafferty 1997). The 24 streams surveyed annually are the east and middle fork Chulitna, Chuitna, Talachulitna, Indian, Deshka, North Fork Kashwitna, and Alexander, Clear, Goose, Lake, Willow, Little Willow, Moose, Peters, Portage, Prairie, Sheep, Montana, Red (Johnson Creek) and Cache creek drainages. The surveys will be conducted during the peak spawning period, between 15 July to 7 August (as determined through past escapement surveys), and when water and viewing conditions are permissible.

All streams will be surveyed from the air using a helicopter with one observer. The chosen air speed and height above the ground will vary with light condition and terrain but generally the aircraft will fly approximately 50 to 75 feet over the water. Generally, the streams are surveyed from their confluence with tidewater or a glacial river, upstream to the upper-most reach to which Chinook salmon can ascend. All major clear water secondary tributaries of each stream are also surveyed. If time is an issue, the counting of salmon would take precedence. A second survey may be flown if initial surveys do not provide adequate time to assess beaver dams in the same day.

Beaver dams may also be inventoried by foot during the period in which coho salmon are indexed annually through a separate project. Currently four streams are indexed annually in the Susitna Drainage (Lafferty 1997).

DATA COLLECTION

The observer will note beaver dams observed during surveys with a Garmin Montana 650t GPS. The following data will be recorded during each survey (Appendix A3):

1. Stream name and the respective reach or tributary area surveyed.
2. Date.

3. GPS location of dam and related pond.
4. Weather condition (clear, overcast, or turbulent).
5. Stream level (low, normal, or high).
6. Water visibility (clear or turbid).
7. Photograph
8. Potentially impairing fish passage (Yes or No).
9. Multigenerational or newly built.
10. Adult salmon sighted upriver (Yes or No).

DATA REDUCTION AND ANALYSIS

Data forms will be entered into an Arc/GIS database or excel spreadsheet by a Fish and Wildlife Technician II following completion of the surveys. The notebooks and original fish survey forms will be filed in the Palmer office.

SCHEDULE AND DELIVERABLES

Date	*Activity*
July 15 - October 4	Data collection
August 15	Data analysis: Chinook streams
October 30	Data analysis: Coho streams

RESPONSIBILITIES

List of Personnel and Duties:

Fishery Biologist II Oversees project by writing operational plan, coordinates and conducts the surveys, tracking implementation of operational plan, oversees daily reporting and data entry by technician. Provides data to appropriate personnel.

Fishery Biologist III Assists with index surveys.

Fishery Biologist I Conducts index surveys. Oversees daily reporting and summarization of data.

Fish and Wildlife Technician II/III Perform index surveys. Train crew members in how to conduct surveys and record data. Report all data to Palmer office staff daily. Compile data for appropriate personnel.

Fish and Wildlife Technician II/III Data entry.

RTS: Create map of beaver dams inventoried.

BUDGET SUMMARY FY15

Line Item	Category	Budget ($K)
100	Personal Services	5.0
200	Travel	0.0
300	Contractual	66.0
400	Commodities	4.0
500	Equipment	0.0
	Total	75.0

Budget Manager: Sam Ivey

REFERENCE CITED

Kemp, P.S., T.A. Worthington, T.E.L. Langford, A.R.J. Tree, M.J. Gaywood 2012. Qualitative and quanitative effects of reintroduced beavers on stream fish. Fish and Fisheries Vol.13, Issue 2, 158-181.

Lafferty, R. 1997. Summary of escapement index counts of Chinook salmon in the Northern Cook Inlet management area, 1958-1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-8, Anchorage.

Pollock, M.M., G.R. Pess, T.J. Beechie, and D.R. Montgomery 2004. The importance of Beaver Ponds to Coho Salmon Production in the Stillaguamish River Basin, Washington, USA. North American Journal of Fisheries Management 24: 749-760, 2004.

Hughes, D. 2013. A Comprehensive Inventory of Impaired Anadromous Fish Habitats in the Matanuska-Susitna Basin, with Recommendations for Restoration, 2013. Alaska Department of Fish and Game, Anchorage.

FIGURES

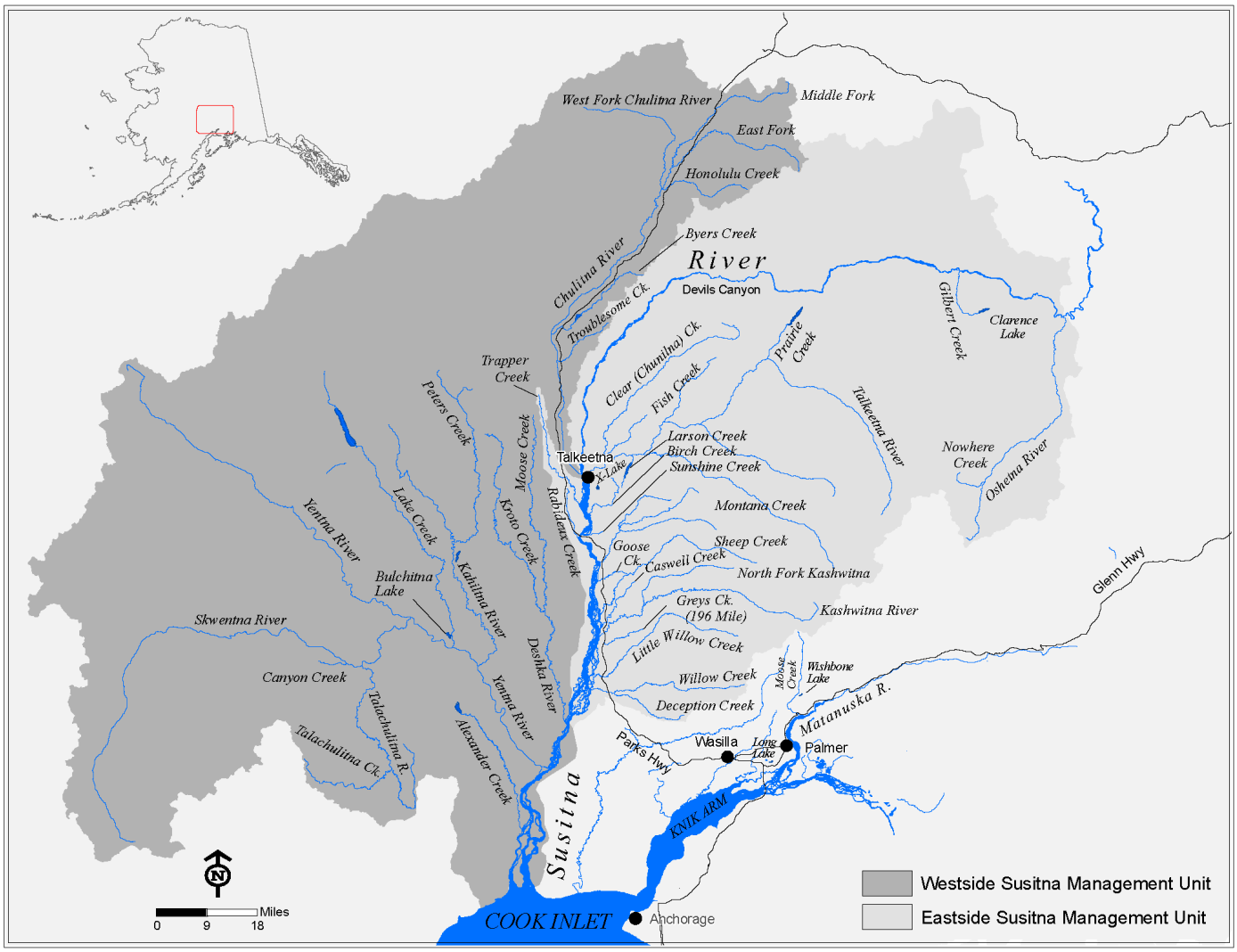

Figure 1.–Map depicting the Susitna River drainage.

APPENDIX A: NORTHERN COOK INLET CHINOOK AND COHO SALMON SURVEY STREAMS.

Appendix A1.–List of streams selected for Chinook salmon surveys in NCI.

End points are indicated with Latitude and Longitude coordinates or obvious physical markers.

CHUITNA RIVER (West Cook Inlet drainage)

1. Mainstem from tidewater to the confluence of Lone Creek.
2. Mainstem from the confluence of Lone Creek to the confluence of Chuit Creek.
3. Mainstem from the confluence of Chuit Creek to the confluence of Wolverine Creek.
4. Mainstem from the confluence of Wolverine Creek to the headwaters-N61.23229, W151.70207.
5. Tributaries:

   Lone Creek-N61.17699, W151.29751; Wolverine Creek-N61.25268, W151.67369; and Chuit Creek-N61.21277, W151.70207.

ALEXANDER CREEK

1. Mainstem from the confluence with the Susitna River upstream to the confluence of Trail Creek.
2. Mainstem from the confluence of Trail Creek to the confluence of Sucker Creek.
3. Mainstem from the confluence of Sucker Creek to Alexander Lake.
4. Tributaries:

   Sucker Creek to Sucker Lake, Wolverine Creek to headwaters-N61.51137, W150.82497

DESHKA RIVER

1. Mainstem from the confluence with the Susitna River upstream to Loebb's Homestead.
2. Mainstem from Loebb's Homestead upstream to the confluence of Trapper Creek.
3. Mainstem from the confluence of Trapper Creek upstream to Neil Lake.
4. Mainstem from Neil Lake upstream to the confluence of Moose and Kroto Creeks.
5. Tributaries:

   Trapper and Chijuk Creeks

   Moose Creek:

   1. From the confluence of Moose and Kroto Creeks upstream to Petersville Road bridge.
   2. From the Petersville Road bridge upstream to the headwaters of East Fork-N62.39734, W105.41153 and West Fork-N62.33533, W150.46620.

   Kroto Creek:

   1. From the confluence of Kroto and Moose Creeks upstream to Petersville Road bridge.
   2. From the Petersville Road bridge upstream to the headwaters-N62.41068, W150.57660.

LAKE CREEK

1. Mainstem from the confluence with the Yentna River upstream to Chelatna Lake.
2. Tributaries from their confluence until no more fish sited:

Yenlo (N62.07968 W151.01730); Home (N62.25320 W151.16231); No Name; Camp (N62.30724 W151.23127); and Sunflower Creeks (N62.36458 W151.29890).

TALACHULITNA RIVER

1. Mainstem from the confluence with the Skwentna River upstream to the lodges near Hiline Lake.
2. Mainstem from Hiline Lake area upstream to the confluence of Talachulitna Creek.
3. Mainstem from the confluence of Talachulitna Creek upstream to the headwaters.
4. Tributaries from their confluence until no more fish sited:

   Friday; Saturday; and Talachulitna Creeks.

RED CREEK

1. Confluence with Johnson Creek to headwaters-N62.02861, W151.95656.

CACHE CREEK

1. From its confluence with the Kahiltna River to the headwaters of both forks-N62.50896, W150.91794.

PETERS CREEK

1. Mainstem from the confluence with the Kahiltna River upstream to the confluence of Martin Creek.
2. Mainstem from the confluence with Martin Creek upstream to the headwaters-N62.53196, W150.81394.
3. Tributary:

   Martin Creek-N62.45515, W150.78267.

PORTAGE CREEK

1. Mainstem from the confluence with the Susitna River upstream to the headwaters of west fork-N62.98241, W149.10471 and east fork-N62.97684, W148.96189.

INDIAN RIVER

1. Mainstem from the confluence with the Susitna River upstream to the headwaters-N62.93153, W149.39155.

CHULITNA RIVER

1. The east fork from its confluence with the west fork and the Chulitna River to the headwaters-N63.18740, W149.23045.
2. The middle fork from its confluence with the east fork to the headwaters-N63.27765, W149.07295.

CLEAR CREEK

1. Mainstem from the confluence with the Talkeetna River upstream to the headwaters-N62.64376, W149.4770

PRAIRIE CREEK

1. Mainstem from the confluence with the Talkeetna River upstream to Stephan Lake.

Tributary: Grizzly Creek to falls

MONTANA CREEK

1. Mainstem from the confluence with the Susitna River upstream to the Yoder Road Bridge.
2. North fork, middle fork and east fork upstream to falls.

GOOSE CREEK

1. Mainstem from the confluence with the Susitna River upstream to the confluence of Sheep Creek.

SHEEP CREEK

1. Mainstem from the confluence with the Susitna River upstream to the headwaters-N62.14196, W149.70148.

N. FORK KASHWITNA RIVER

1. From its confluence with the Kashwitna River to the headwaters-N62.06201, W149.67786.

LITTLE WILLOW CREEK

1. Mainstem from the confluence with the Susitna River upstream to the headwaters-N61.91220, W149.52529.

WILLOW CREEK

1. Mainstem from the confluence with the Susitna River upstream to a four meter high falls in the canyon.
2. Tributaries:

   Deception Creek from confluence with Willow Creek upstream to weir.

Appendix A2.–List of areas selected for coho salmon surveys in NCI.

RABIDEUX CREEK

1. Sawmill Creek downstream to Rabideux Creek.
2. Confluence of Sawmill and Rabideux Creek downstream to the Glenn Highway culvert on Rabideux Creek.

BIRCH CREEK

1. Talkeetna Spur Road downstream to the ARR Bridge.
2. ARR Bridge downstream to the mouth.

QUESTION CREEK

1. Talkeetna Spur Road downstream to the marsh N62.22383, W150.09478.

ANSWER CREEK

1. Talkeetna Spur Road downstream to the marsh N62.2030, W150.07680.
2. Talkeetna Spur Road upstream to old beaver dam N62.201833, W150.0638.

Appendix A3. Page 1 of 1.

Beaver Dam Inventory

Water: _____

Location: _____

					Beaver Dam					
		Conditions 2/								
Date	Dist. Survey Miles 1/	Weather	Stream level	Visibility	GPS/photo	Potentially impairing fish passage?			Multigenerational Y/N	Observer

Remarks

1/ A=aerial, B=Boat/Float, F=Foot

2/ Weather: C=Clear, O=Overcast, T=Turbulent

Stream: L=Low, N=Normal, H=High, C+Clear, T=Turbid