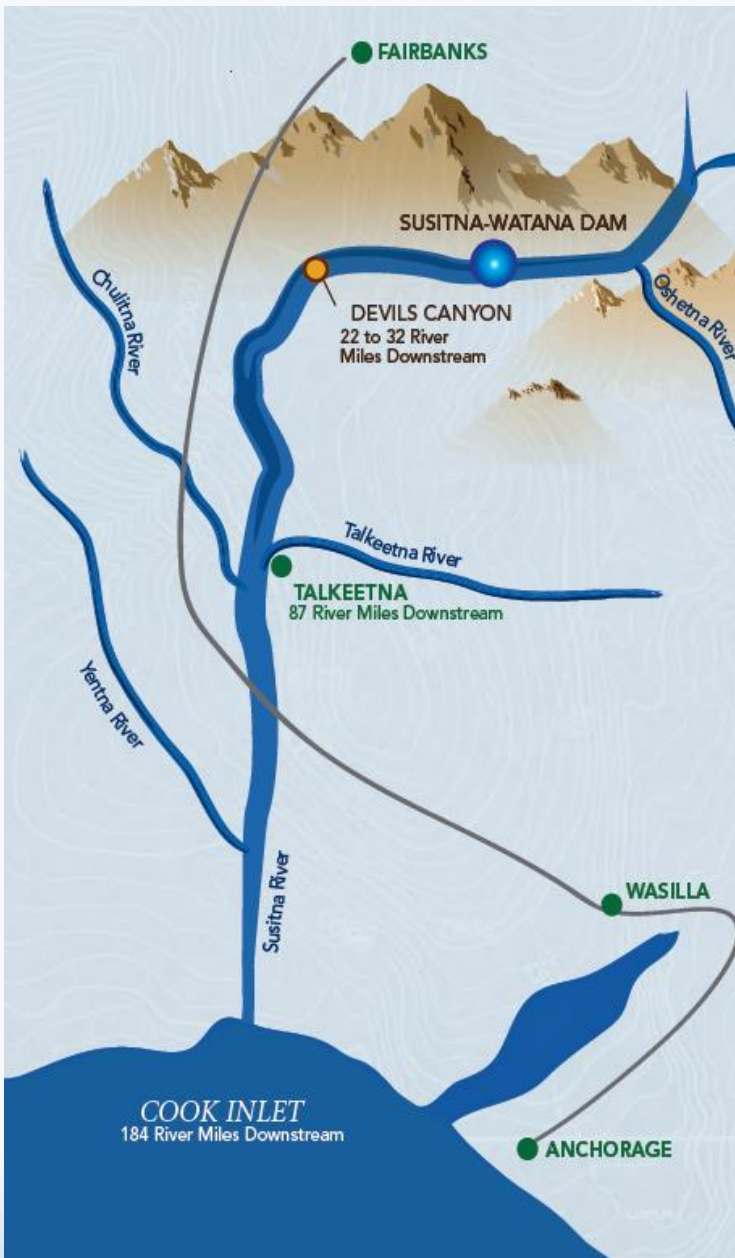


Initial Study Report Meeting

Study 9.7 Salmon Escapement

March 22, 2016

Prepared by
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LGL Alaska Research Associates
Alaska Department of Fish & Game*



Study 9.7 Status

- ISR Documents (ISR Part D Overview):
 - Initial Study Report (June 3, 2014)
 - 2014 Implementation and Preliminary Results Technical Memorandum (September 30, 2014); superseded by SCR
 - Study Completion Report (November 6, 2015)
- ✓ Field work, data collection, data analysis, and reporting complete
- ✓ All objectives in the FERC-approved Study Plan successfully met
- ✓ None of the variances affected successful completion
- ✓ AEA has completed this study

Study 9.7 Objectives

- 1) Capture, radio-tag, and track adults of five species of Pacific salmon in the Middle and Upper Susitna River in proportion to their species-specific abundance. Capture and tag Chinook, coho, and pink salmon in the Lower Susitna River
- 2) Characterize the migration behavior and spawning locations of radio-tagged salmon in the Lower, Middle, and Upper Susitna River
- 3) Characterize adult salmon migration behavior and timing within and above Devils Canyon
- 4) If shown to be an effective sampling method, and where feasible, use sonar to aid in documenting salmon spawning locations in turbid water in 2013 and 2014
- 5) Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon
- 6) Generate counts of adult Chinook salmon spawning in the Susitna River and its tributaries to estimate the proportions of fish with tags for populations in the watershed
- 7) Collect tissue samples to support the Fish Genetic Baseline Study (Study 9.14)
- 8) Estimate the system-wide Chinook salmon escapement to the entire Susitna River, the coho salmon escapement to the Susitna River above the confluence with the Yentna River, and the distribution of Chinook, coho, and pink salmon among tributaries of the Susitna River (upstream of Yentna River confluence) in 2013 and 2014

Study 9.7 Components

- 1) Capture, radio-tag, and track adults of five species of Pacific salmon in the Middle and Upper Susitna River in proportion to their abundance. Capture and tag Chinook, coho, and pink salmon in the Lower Susitna and Yentna rivers **(ISR Part A, Section 4.1; pg 3)**
- 2) Determine the migration behavior and spawning locations of radio-tagged fish in the Lower, Middle, and Upper Susitna River **(ISR Part A, Section 4.2; pg 12)**
- 3) Characterize adult salmon migration behavior and timing within and above Devils Canyon **(ISR Part A, Section 4.3; pg 16)**
- 4) Use available technology to document salmon spawning locations in turbid water **(ISR Part A, Section 4.4; pg 18)**
- 5) Compare historical and current data on run timing, distribution, relative abundance, and specific locations of spawning and holding salmon **(ISR Part A, Section 4.5; pg 20)**
- 6) Generate counts of adult Chinook salmon spawning in the Susitna River and its tributaries **(ISR Part A, Section 4.6; pg 21)**
- 7) Collect tissue samples to support the Fish Genetics Study **(ISR Part A, Section 4.7; pg 22)**
- 8) Estimate the system-wide Chinook and coho salmon escapement to the Susitna River above Yentna River and the distribution of those fish among tributaries of the Susitna River **(ISR Part A, Section 4.8; pg 22)**

Study 9.7 Variances

- Due to land access limitations, AEA did not operate a fishwheel in Devils Canyon (see **ISR Part A, Section 4.1.8.1**). Instead, AEA increased the tagging goal, added a third fish wheel and increased fishing effort at the Curry fishwheels (**SCR Section 4.1.6**).
- AEA operated a weir and underwater video system on the Indian River in 2013 to sample adult salmon for mark rates and size instead of collecting these data from spawning ground surveys (**ISR Part A, Section 4.6.1**).
- In 2014 the Indian River weir was rendered inoperable by a flood. After that, the best available option was to increase the number of aerial spawner surveys and aerial telemetry surveys in the Indian River and use area-under-the-curve methods to generate an escapement estimate (**SCR Section 4.6.1**).
- Due to land access limitations, five of the fixed-station receiver sites listed in the Study Plan (**RSP Section 9.7.4.2.1**) were not installed in 2013. Instead, AEA added six new fixed-station receiver sites (see **ISR Part A, Section 4.2.4**) and increased the frequency of helicopter telemetry surveys through Devils Canyon (see **ISR Part A, Section 4.3.5**).
- Due to high stream discharges, it was not safe or feasible to operate weirs on Willow and Lake Creeks, or the Talachulitna and Middle Fork Chulitna rivers. In place of Willow Creek, a weir site on Montana Creek was selected in 2013; and sonar was operated on the Talachulitna and Middle Fork Chulitna rivers. (**ISR Part A, Section 4.8.1**).

Study 9.7 Variances (2014)

- Gillnets were used to capture Coho Salmon in September 2014 and proved effective (SCR Section 4.1.6). This replaced the use of fish wheels and beach seining.
- Chinook Salmon captured at the Yentna River tag site in 2014 were marked with uniquely numbered dart tags (SCR Section 4.1.6).
- The effects of holding time and density on the behavior of tagged fish was not conducted. Due to stipulations in the Fish Resource Permit, all fish were tagged soon after capture, thereby reducing holding times and densities to levels that made comparisons of post-release survival and migration behavior unnecessary. (ISR Part A, Section 4.1.8.3)
- AEA did not use sex and age to evaluate fishwheel selectivity. Instead, the study team relied on other length-frequency comparisons and results from previous study years to provide insights into capture probabilities based on size at the Middle River tag site (SCR Section 4.1.6).
- ISR Part C, Section 7.1.2.2 indicated that the study team would modify the Study Plan to include eleven fixed-station receiver sites in the Middle and Upper rivers in 2014: however, only 10 sites were implemented related to no weir on the Indian River (SCR Section 4.2.4).

Study 9.7 Variances (2014)

- In 2014, the study team increased the frequency of telemetry surveys in the Middle River to every 1-2 days between Portage Creek and Devils Island from June 28 to August 6, and every third day between the Chulitna River and Devils Island from August 9 to October 28 (SCR Section 4.3.5).
- No spaghetti tags were applied in 2014. Instead, fixed-site sonar was used at Site 1, to compare bank of capture and length frequencies in order to evaluate capture probabilities at the Middle River tag site (SCR Section 4.1.4.2).
- To study team added seven ADCP transects to sonar operation at the proposed dam site in 2014. Bathymetric and velocity data were collected at these transects (SCR Section 4.3.5).
- The use of sonar to confirm spawning was limited by habitat conditions; so in 2014, sonar was only used to characterize suspected Chinook Salmon spawning (SCR Section 4.4.3).
- Both ARIS in 2013 (ISR Part A, Section 4.4.3) and DIDSON in 2014 were used for turbid water surveys (SCR Section 4.3.5).

Objective 1: Tagging

Salmon	Tag Location	2012	2013	2014	Total
Chinook	Lower Susitna	442	689	656	1,787
	Yentna River	--	693	295	989
	Middle Susitna	352	603	622	1,577
	Total	794	1,985	1,573	4,352
Chum	Lower Susitna	400	0	0	400
	Middle Susitna	279	201	200	680
	Total	679	201	200	1,080
Coho	Lower Susitna	399	596	640	1,635
	Middle Susitna	184	242	230	656
	Total	583	838	870	2,291
Pink	Lower Susitna	401	200	199	800
	Middle Susitna	230	200	201	631
	Total	631	400	400	1,431
Sockeye	Lower Susitna	100	0	0	100
	Middle Susitna	70	137	200	407
	Total	170	137	200	507

Summary of Results (Study 9.7 SCR Errata)

Number of Salmon Tagged by Location and Year

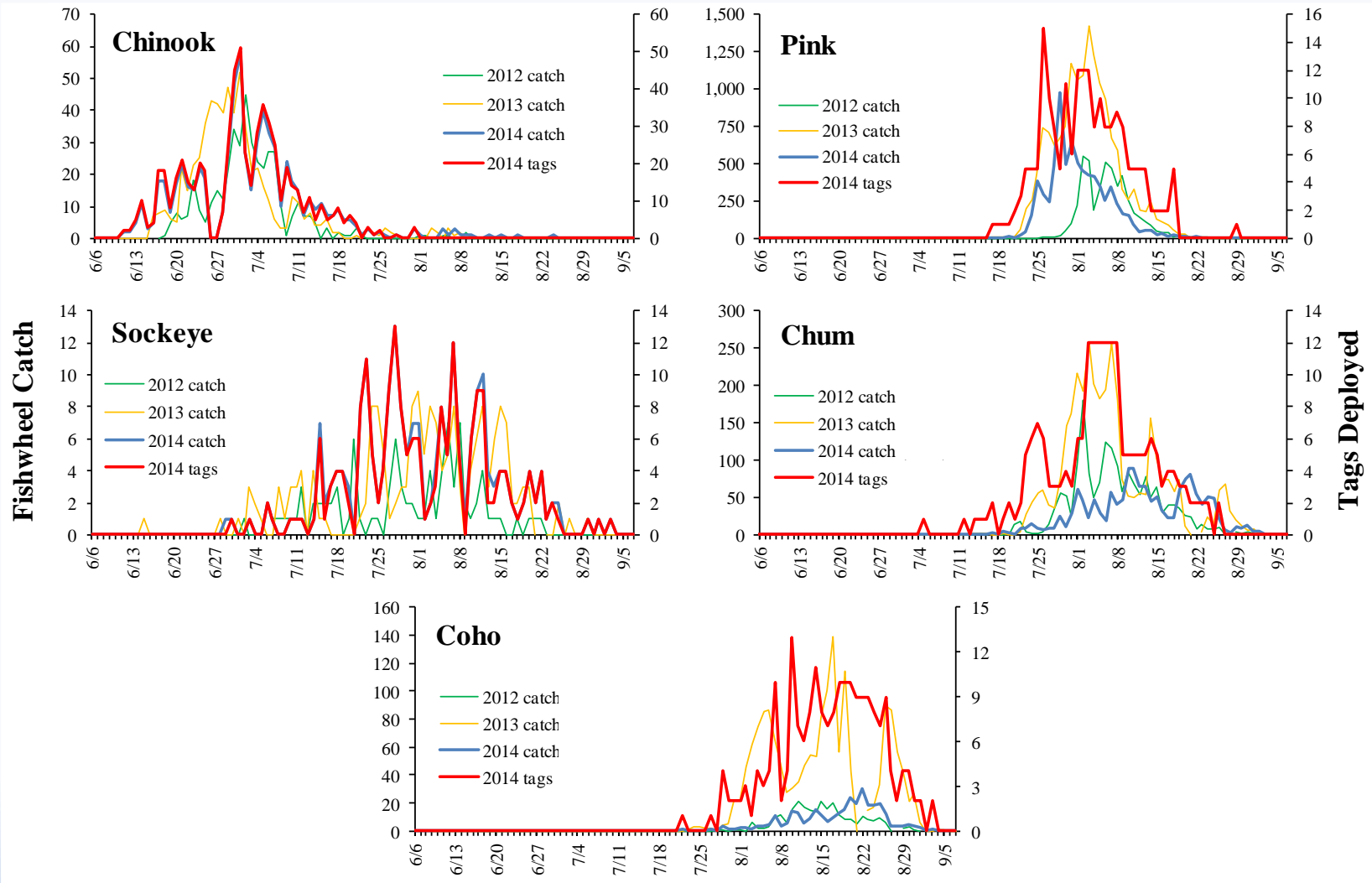
- N = 9,661 salmon
- Tagging exceeded 90% of goal for 24 out of 28 instances

Summary of Results

(September 2014 Technical Memo)

Temporal Distribution of Tagging versus Catch in the Middle River

Objective 1: Tagging

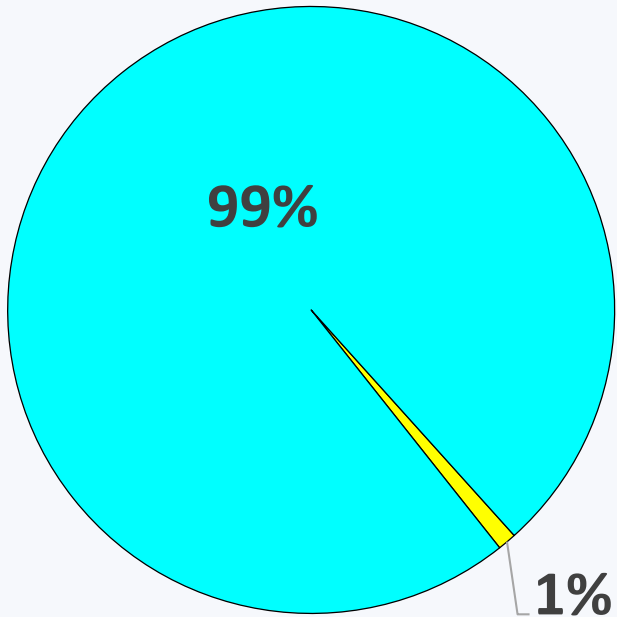


Summary of Results

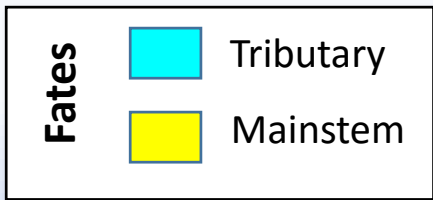
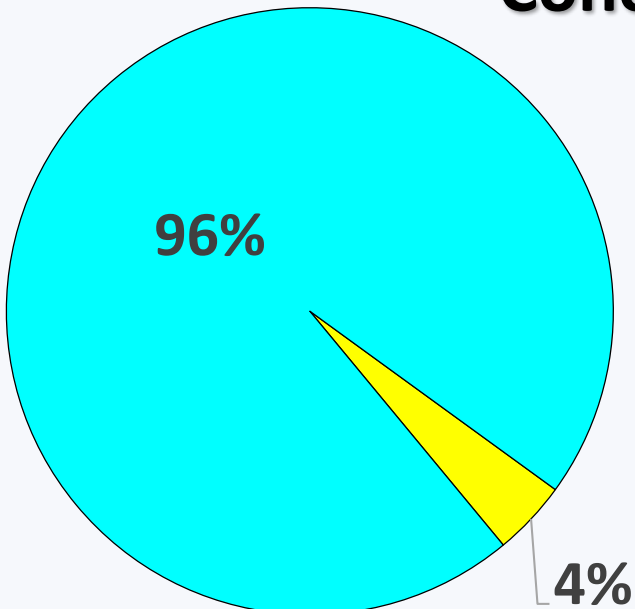
(SCR – Section 6 & Appendix D)

Tagged in Lower River

Chinook



Coho



* 2013 – 2014 data

Summary of Results

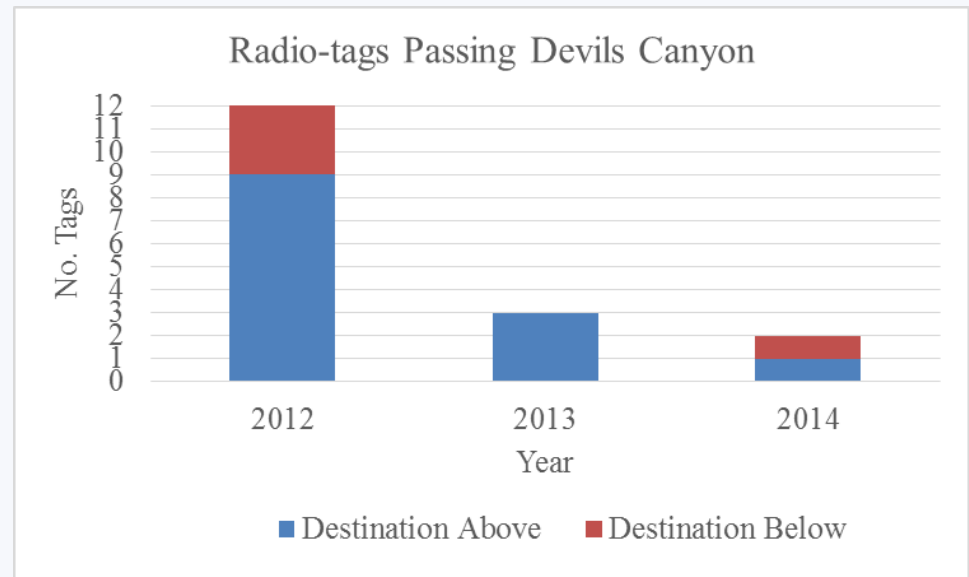
(SCR– Sections 5.2 & 5.3)

Only Chinook tracked upstream of Devils Canyon

- 17 tagged Chinook passed upstream of Devils Canyon in 3 years
- 10 had final destinations in upstream tributaries: Kosina (7), Devil (2), Tsusena (1)
- 7 returned downstream of Canyon

3 tagged Sockeye Salmon moved upstream of Impediment 1

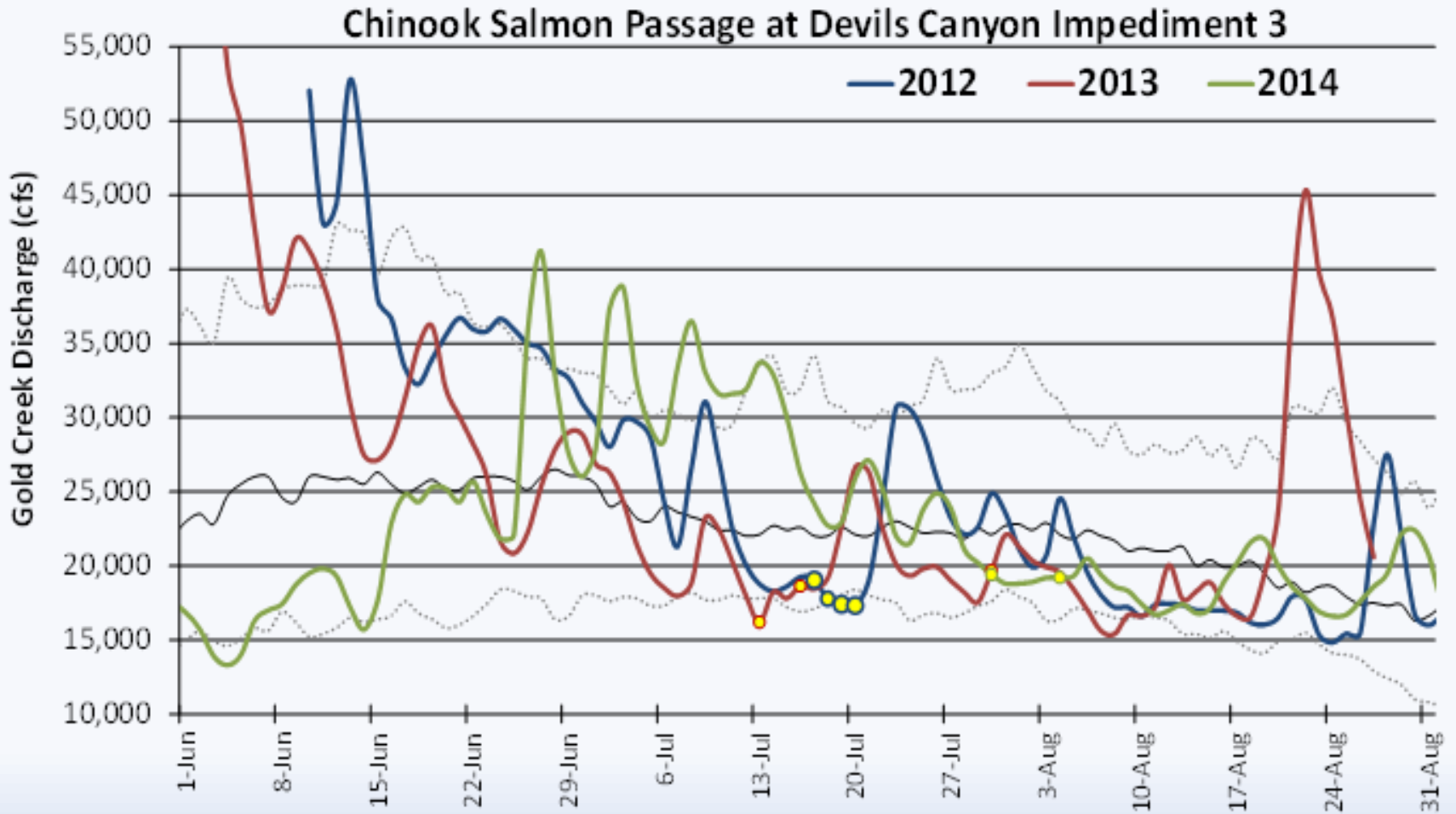
- All in 2014
- all moved downstream within 2 days



Source: Study 9.7 September 2014 Technical Memo

Summary of Results

(SCR – Sections 5.2 & 5.3)

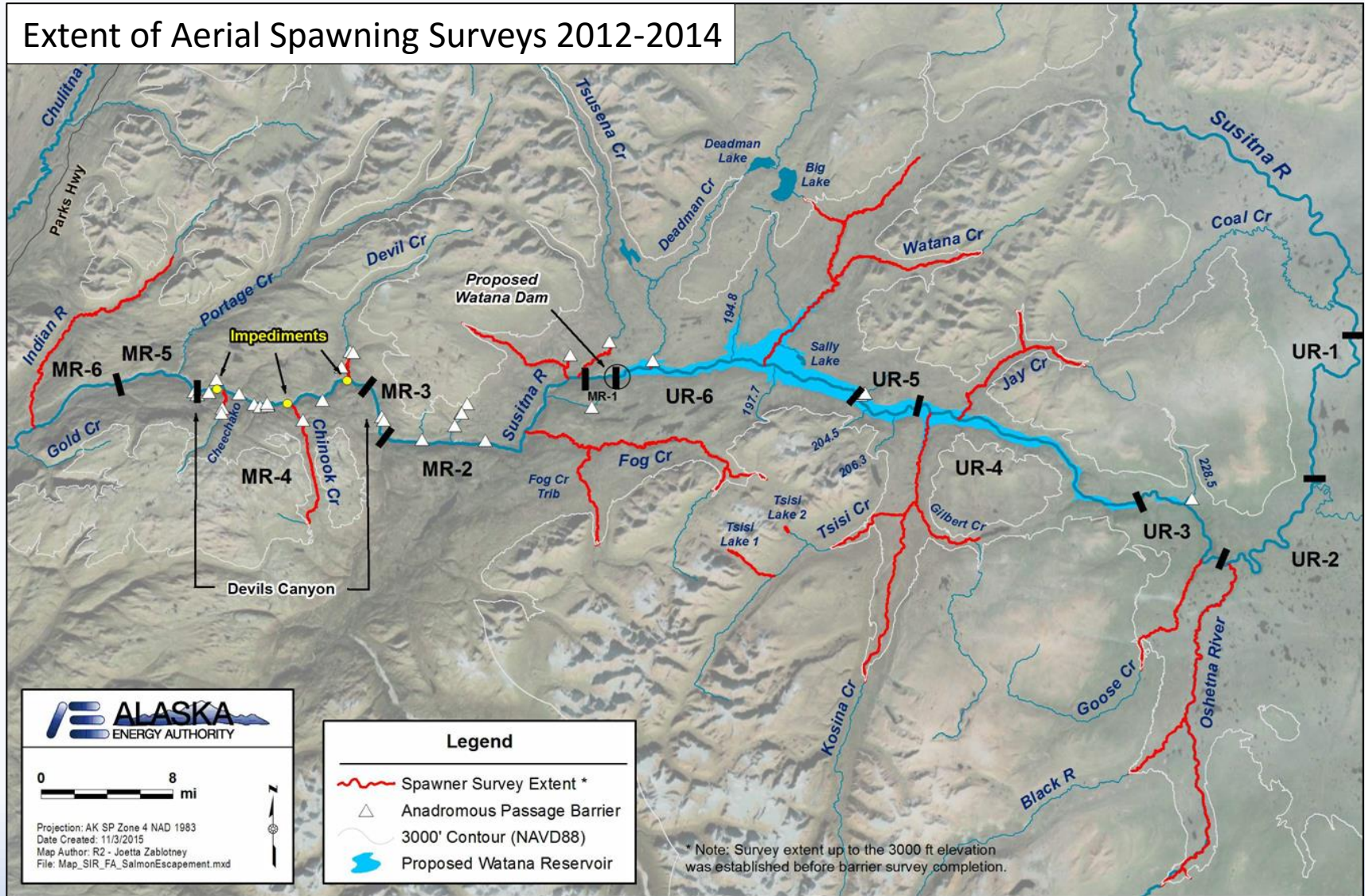


Summary of Results

(SCR – Section 4.3)

Objective 3: Devils Canyon & Above

Extent of Aerial Spawning Surveys 2012-2014



Summary of Results

(SCR – Section 5.3)

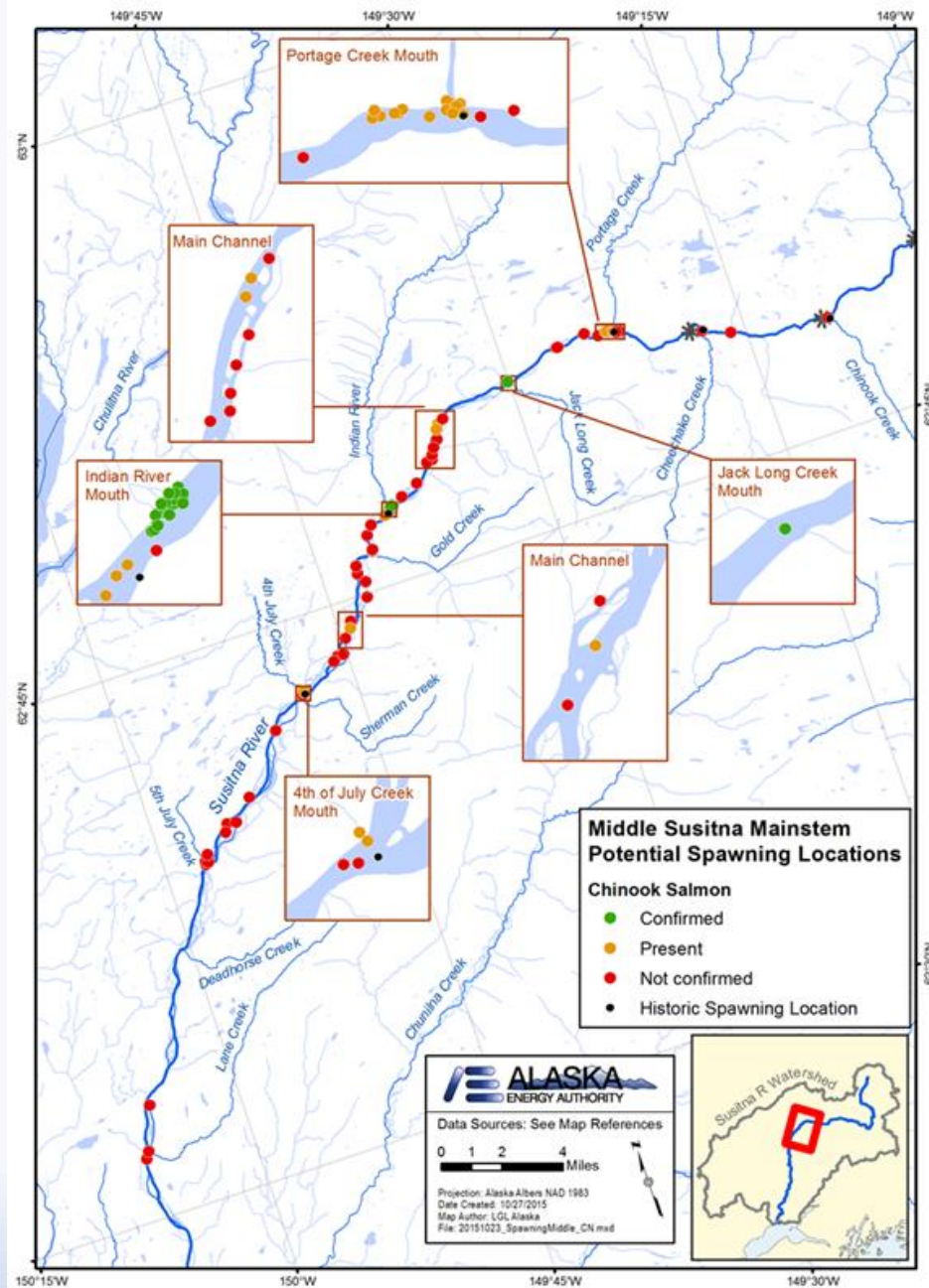
The utility of using sonar to document spawning behaviors in turbid waters was limited, given the current state of sonar technology, by bed topography and shallow depths at which Susitna River Chinook Salmon spawned

Summary of Results

(SCR – Section 6, Appendix D)

Species comparisons
2012-2014 & historic data:

- ✓ Migration timing
- ✓ Spawning timing
- ✓ Distribution in mainstem & tributaries
- ✓ Mainstem habitat & tributary use
- ✓ Abundance

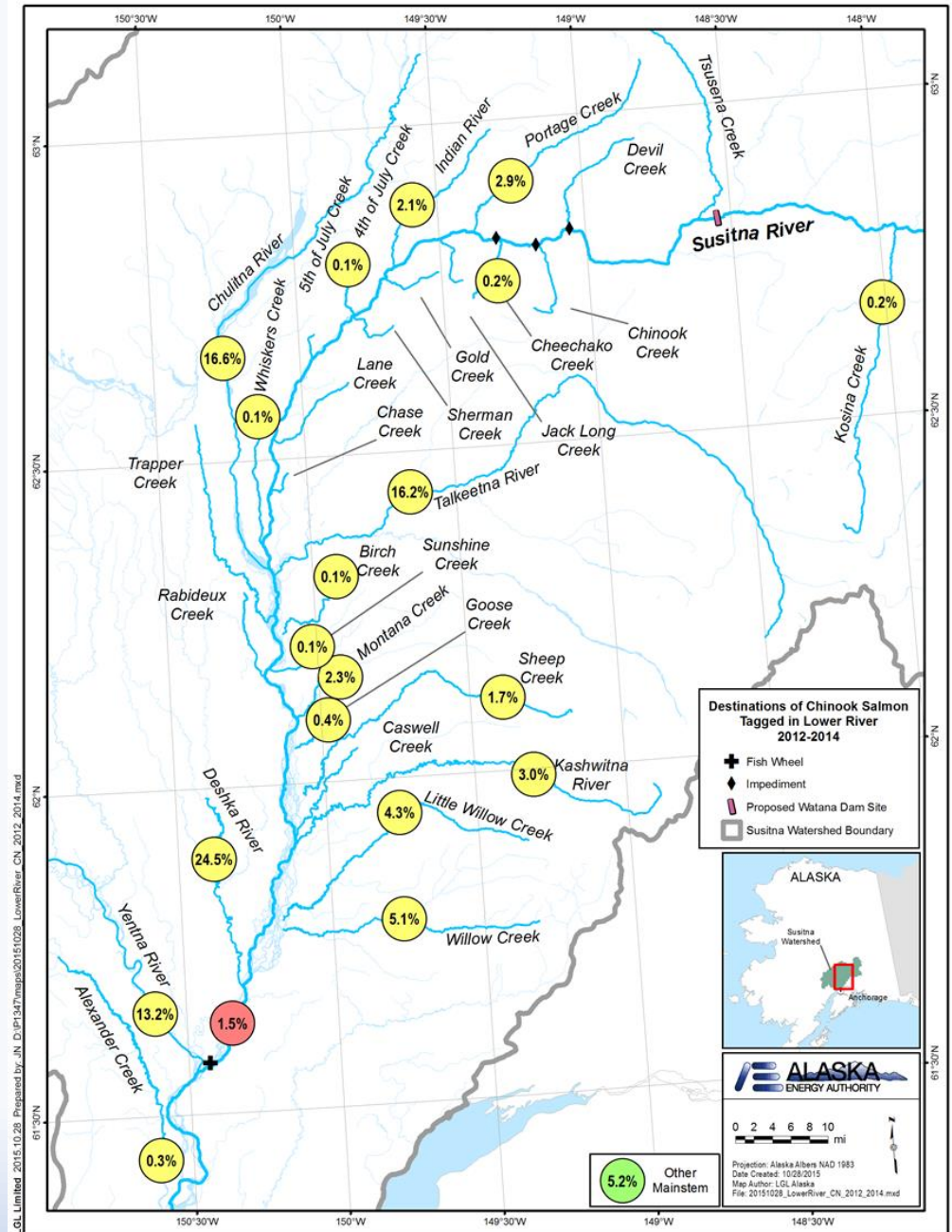


Summary of Results

(SCR – Section 6 & Appendix D)

Objective 6: Chinook Counts

- Majority of tagged fish returned to tributaries
- Major tributaries = Yentna, Deshka, Chulitna, Talkeetna, Indian rivers and Portage Creek.



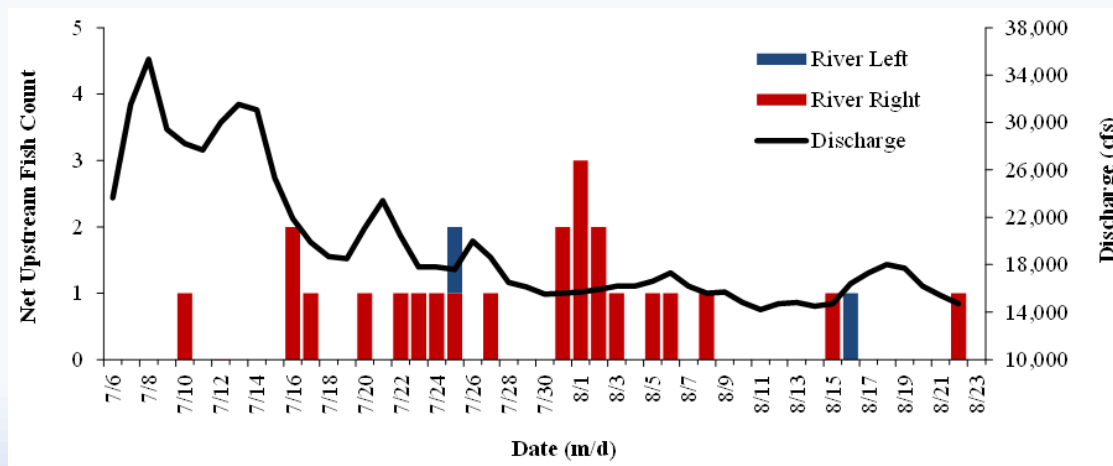
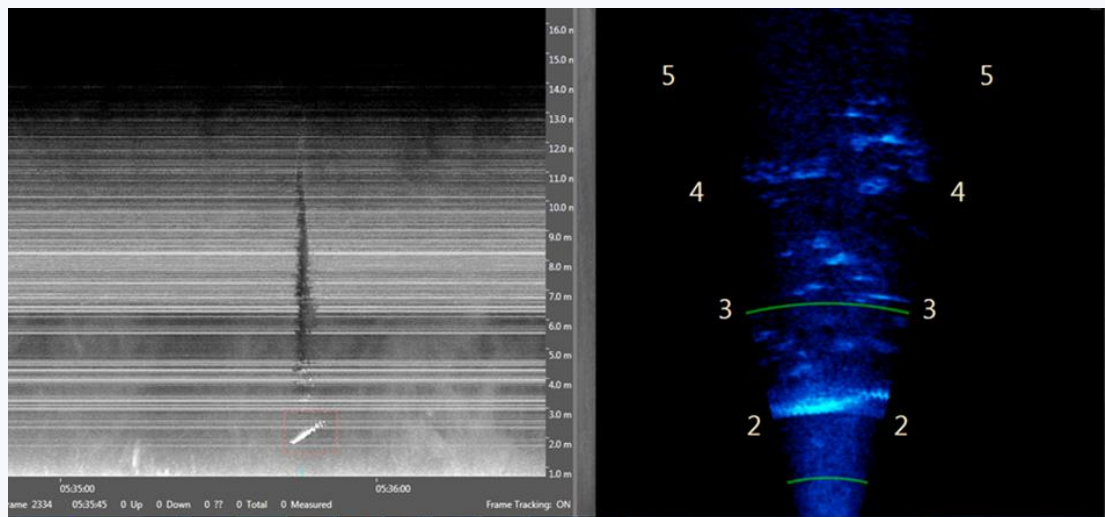
Summary of Results

(SCR – Section 5.3.1.7, Appendix G)

Objective 6: Chinook Counts

Sonar counts at proposed dam site used ARIS and DIDSON:

- **24 Chinook counted moving upstream**
- Daily passage was low, 0 to 3 fish per day
- No diel passage patterns were evident
- Passage highly skewed towards the right bank
- Passage was shore-oriented



Summary of Results

(SCR – Section 5.3)

Peak counts of Chinook Salmon observed in aerial surveys

Stream	1982	1983	1984	1985	2012	2013	2014
<u>Within Devils Canyon</u>							
Cheechako Creek	16	25	29	18	5	40	16
Chinook Creek	5	8	15	1	5	2	5
<u>Upstream of Devils Canyon</u>							
Devil Creek	0	1	0	0	7	25	10
Fog Creek	--	--	2	0	1	2	3
Tsusena Creek	--	--	0	0	0	4	0
<u>Upstream of dam site</u>							
Kosina Creek	--	--	--	--	16	3	0

Summary of Results

(SCR – Section 5.6)

2012-2014 samples sent to ADF&G genetics lab:

- 12 fish species
- 4,016 Chinook Salmon
- 201 Chum Salmon
- 1,016 Coho Salmon
- 399 Pink Salmon
- 138 Sockeye Salmon

Summary of Results

(SCR – Section 5.7)

Objective 8: Escapement

Species	2013	2014	Includes
Chinook	89,463 (SE 9,523)	68,225 (SE 10,615)	Susitna River upstream of Yentna River
	--	22,267 (SE 2,871)	Yentna River upstream of Mile 6
Coho	130,026 (SE 24,342)	84,879 (SE 9,550)	Susitna River upstream of Mile 34

Licensing Participants Proposed Modifications to Study 9.7?

- Agencies
- CIRWG members & Ahtna
- Public