

Initial Study Report Meeting

Study 9.5 Fish Distribution and Abundance in the Upper Susitna River

October 15, 2014

Prepared by
R2 Resource Consultants, Inc.



Study 9.5 Objectives

1. Describe the **seasonal distribution, relative abundance** (as determined by catch per unit effort [CPUE], fish density, and counts), and **fish-habitat associations**
2. Describe **seasonal movements** of juvenile salmonids and selected fish species within the hydrologic zone of influence upstream of the Project
 - a. Document the timing of downstream movement and catch using rotary screw traps
 - b. Describe seasonal movements using biotelemetry (passive integrated transponders [PIT] and radio-tags)
 - c. Describe juvenile Chinook salmon movements
3. Describe **early life history** of anadromous salmonids. Determine movement patterns and timing of juvenile salmonids from spawning to rearing habitats. (*Note that this objective was not part of the Study Plan; it was added during implementation.*)
4. Characterize the **seasonal age class structure, growth, and condition** of juvenile anadromous and resident fish by habitat type
5. Determine whether Dolly Varden and humpback whitefish residing in the Upper River exhibit anadromous or resident **life histories**
6. Determine **baseline metal concentrations** in fish tissues for resident fish species in the mainstem Susitna River (see RSP Section 5.5 Water Quality and Section 5.7, Mercury Assessment and Potential for Bioaccumulation Study)
7. Document the seasonal distribution, relative abundance, and habitat associations of invasive species (**northern pike**)
8. Collect **tissue samples** to support the Genetic Baseline Study for Selected Fish Species (RSP Section 9.14)

Study 9.5 Components

- Fish Distribution, Relative Abundance, and Habitat Associations (ISR Part A, Section 4.4; pg 12)
- Seasonal Movements (ISR Part A, Section 4.5; pg 16)
- Early Life History (ISR Part A, Section 4.6; pg 19)
- Characterize the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type (ISR Part A, Section 4.7; pg 20)
- Determine whether Dolly Varden and humpback whitefish residing in the Upper River exhibit anadromous or resident life histories (ISR Part A, Section 4.8; pg 21)
- Determine baseline metal and mercury concentrations in fish tissues for resident fish species in the mainstem Susitna River (ISR Part A, Section 4.9; pg 22)
- Document the seasonal distribution, relative abundance, and habitat associations of invasive species (northern pike) (ISR Part A, Section 4.10; pg 22)
- Collect tissue samples from juvenile salmon and resident and non-salmon anadromous fish (ISR Part A, Section 4.11; pg 22)

Study 9.5 Variances

- **Addition of an early life history study objective (Objective 3 above; ISR Part A, Section 4.6.2)**
- **Adjustments to rotary screw trap, PIT array, radio telemetry fixed receiver, and fish distribution and abundance sampling locations (ISR Part A, Section 4.1.6)**
- Adjustments to the number of fixed receiver locations (ISR Part A, Section 4.1.6.4)
- Adjustments to the timing of fish distribution and sampling efforts (ISR Part A, Section 4.2.1)
- **Adjustments to sample unit lengths** (ISR Part A, Section 4.1.6.1.1)
- Adjustments to gear type applications (e.g., numbers of passes, soak times, minnow trap densities; ISR Part A, Section 4.4.4.1)
- Refinements to estimating the detection efficiency of PIT tag interrogation systems (ISR Part A, Section 4.5.4.1)
- Adjustments to the **timing of radio-tagging** and aerial survey methods for tracking resident fish (ISR Part A, Sections 4.5.4.2 and 4.5.4.3)
- Using size instead of age to evaluate habitat associations of juvenile anadromous and resident fish (ISR Part A, Section 4.7.1)
- Adjustments to the timing of fish tissue sample collection for metals and mercury analysis (ISR Part A, Section 4.9.1)

Study 9.5 Summary of Results in ISR (ISR Study 9.5, Part A – Section 5)

- 12,700 observations: 9 species
- > 7,000 fish caught/observed during FDA
- 458 fish collected during ELH, 6 Chinook salmon in Black River
- 1,154 fish caught in rotary screw traps, 12 Chinook salmon
- 1,224 fish PIT tagged, 42 relocated
- 92 fish radio tagged, 4 species
- Otoliths, tissue samples for metals/mercury, and genetic samples collected to support coordinated studies (5.5, 5.7 & 9.14)

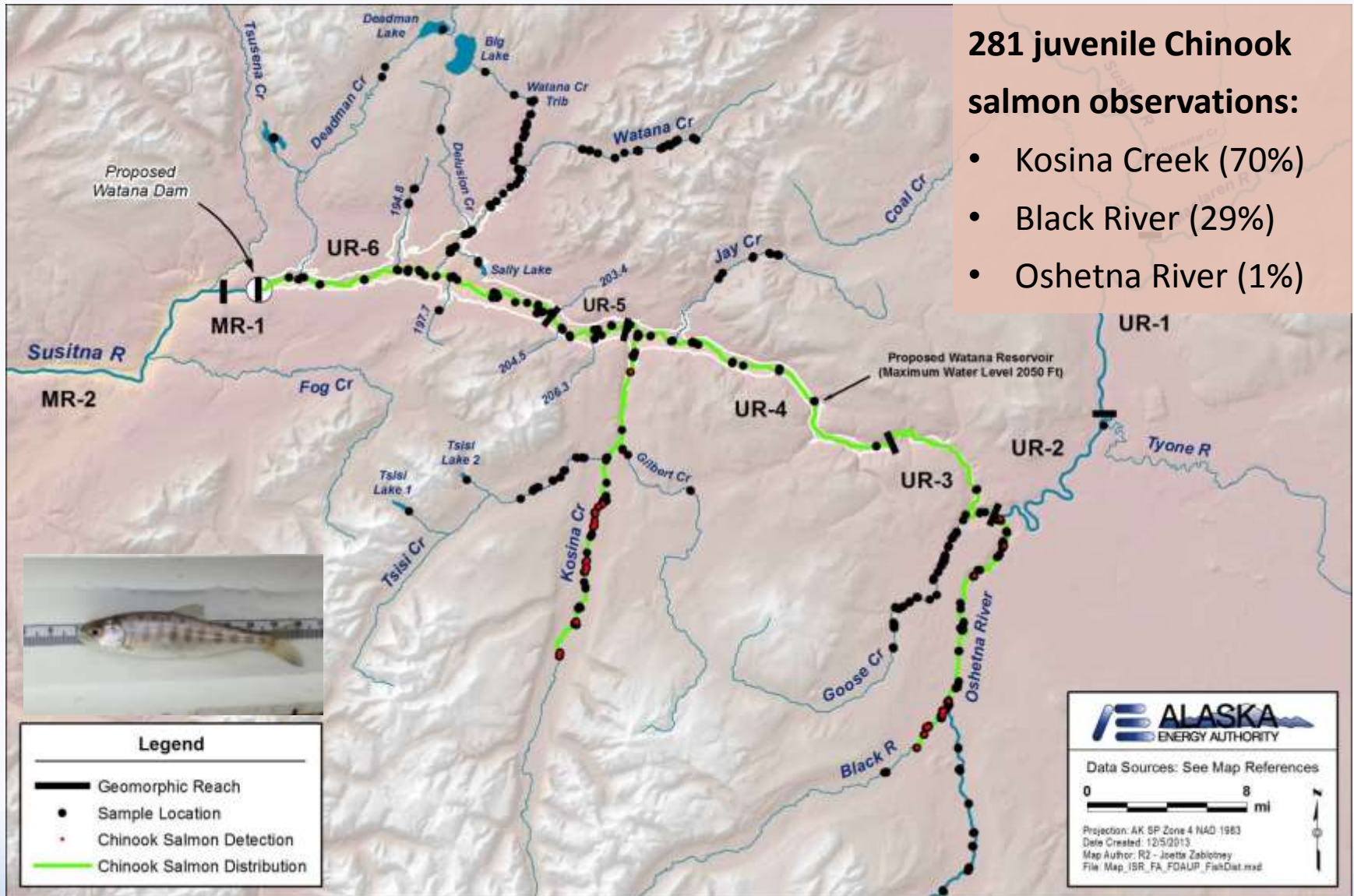
Location	Project River Mile	Drainage Basin Size (km ²)	Chinook salmon (juvenile)	Arctic grayling	Burbot	Dolly Varden	Lake trout	Longnose sucker	Sculpin	Whitefish, humpback	Whitefish, round	Whitefish, unspecified
Devils Canyon to Watana Dam	166.1-187.1		X	X	X	X		X	X		X	X
Watana Dam Location	187.1	---	---	---	---	---	---	---	---	---	---	---
Susitna River UR-6	187.1-203.4		X	X	X			X	X	X	X	X
Susitna River UR-5	203.4-208.1			X	X			X	X		X	X
Susitna River UR-4	208.1-224.9			X	X			X	X		X	X
Susitna River UR-3	224.9-234.5			X	X			X	X		X	X
Watana Reservoir at Full Pool	232.5	---	---	---	---	---	---	---	---	---	---	---
Susitna River above Oshetna	>234.5			X								
AeriaDam site to Oshetna	N/A			X				X				
Deadman Creek	189.4	453.5		X	-	-	-	-	X			
Unnamed Tributary 194.8	194.8	321.2		X		X		X				
Watana Creek	196.9	452.7		X, O	-	X, O		X, -	X, O		X, O	
Watana Creek Tributary: Unnamed L1	N/A			X					X			
Watana Creek Tributary: Unnamed L3	N/A								X			
Watana Creek Tributary: Unnamed R3	N/A			X					X			
Watana Creek Tributary: Unnamed R5	N/A			X			X		X		X	
Unnamed Tributary 197.7	197.7	<80.3		X					X			
Unnamed Tributary 198.4	198.4					X						
Unnamed Tributary 203.4	203.4			X					X			
Unnamed Tributary 206.3	206.3	<80.3							X			
Kosina Creek	209.1	1036.5	X, O	X	X, -	X, O		X, -	X, O	X, O	X	X
Kosina Creek Tributary: T sisi Creek	N/A			X					X		X	X
Kosina Creek Tributary: Gilbert Creek	N/A			X					X, O			
Kosina Creek Tributary: Unnamed	N/A								X			
Jay Creek	211	106.1		X, O	X, -	X, -		-	X		-	
Goose Creek	232.8	269.1		X, O	-			X	X, O		X	
Oshetna River	235.1	1424.5	X, O	X, O	X			X	X	X	X	X
Oshetna River Tributary: Black River	N/A		X	X	X, -	O		X, O	X, O		X, O	
Tyone River	247.3							X				
Clearwater Creek	266.6			X								
Deadman Basin Lake: Deadman Lake	N/A			-	-	-	X, -					
Deadman Basin Lake: Unnamed Lake	N/A						X					
Watana Basin Lake: Sally Lake	196.9			X, -			X, -		X, -			
Kosina Basin Lake: T sisi Lake	N/A			X								

X: Fish Distribution and Abundance 2012-2013

-: ADF&G 1981, 1983a, 1984

O: Buckwalter 2011

Study 9.5 Summary of Results in ISR



AEA Proposed Modifications to Study 9.5 in ISR (ISR Study 9.5, Part C – Section 7.1.2)

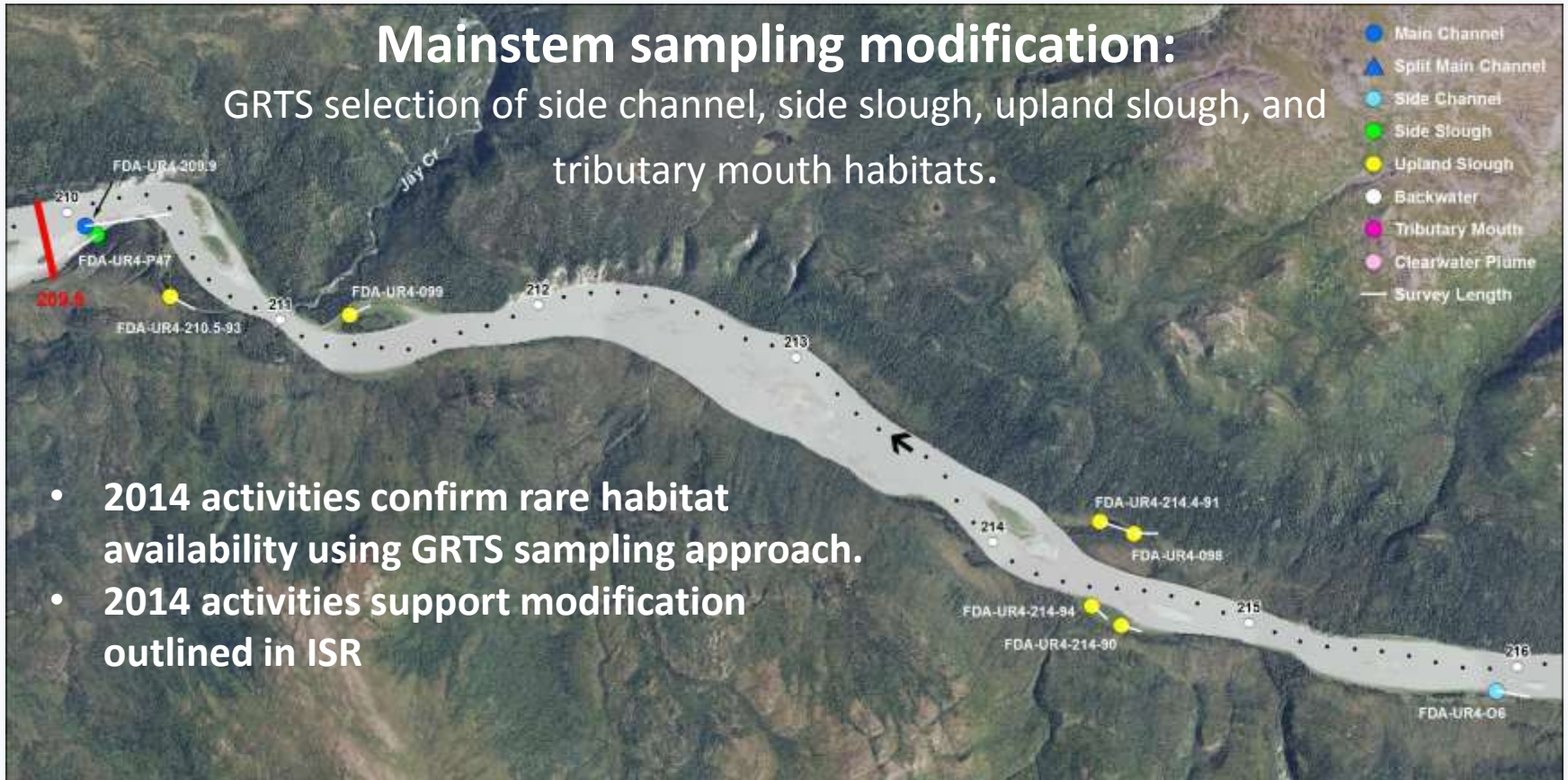
- **Continue Salmon Early Life History sampling** in select Upper Susitna River tributaries (Section 7.1.2.1)
- **Reduce the number of mainstem transects** between UR-3 and UR-6 from 20 to 10 (Section 7.1.2.5)
- Use remote line mapping and a **GRTS approach** to select six replicates of side channels, side sloughs, upland sloughs and tributary mouths for sampling in UR-3 to UR-6 (Section 7.1.2.5.1)
- **Increase targets for total length of sampled area in Upper River tributaries** (Section 7.1.2.4)
- **Adjust the location of select rotary screw trap and PIT interrogation antenna sites** to improve catch (Sections 7.1.2.2 & 7.1.2.3.2)
- **Reduce the sample unit length** from 500 to 200 meters for main channel and side channel sites when using techniques other than boat electrofishing or drift gillnetting (Section 7.1.2.5)
- **Abandon multiple-pass sampling** efforts for relative abundance in favor of consistent and rigorous single-pass sampling to generate meaningful CPUE estimates (Section 7.1.2.6)

Study 9.5 Summary of Results since ISR

Mainstem sampling modification:

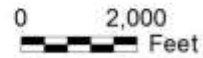
GRTS selection of side channel, side slough, upland slough, and tributary mouth habitats.

- 2014 activities confirm rare habitat availability using GRTS sampling approach.
- 2014 activities support modification outlined in ISR



Legend

- ← Flow Arrow
- Project River Mile (Small Black Dots = PRM Tenths)
- Fish Sampling Transect



Projection: AK SP Zone 4 NAD 1983
Date Created: 8/28/2014
Map Author: R2 - Joetta Zablotsney
File: Map_TM_FA_FDAUP_MS.mxd



Orthophoto Source: 2013 ABR

Study 9.5 Summary of Results since ISR

Tributary sampling modification:

Increased length targets for tributary sampling were applied to the Black River.

	Drainage Basin Area (km ²)	Chinook salmon presence	GRTS Sampling Unit Size (m)	Number of 2013 Sample Sites	Number of mesohabitats sampled 2013	Meters Sampled 2013	Number of mesohabitats sampled 2014	Meters sampled 2014	Average Wetted width (m)	Channel Widths Sampled 2013	Kirsch et al. 2014 target (CW)	Kirsch et al. 2014 target (m)	Proposed Change (m)
GRTS Sampled Tributaries													
Oshetna River (PRM 235.1)	1424.5	yes	800	13	28	2,604	--	--	36	73	140	5,026	2,422
Black River	NA	no	400	6	11	1,050	28	3619	23	46	140	3,178	2,128
Goose Creek (PRM 232.8)	269.1	no	200	20	38	3,107	--	--	14	219	120	1,704	-1,403
Kosina Creek (PRM 209.1)	1036.5	yes	800	6	10	1,000	--	--	32	31	120	4,522	3,522
Tsisi Creek	NA	no	400	6	10	980	--	--	14	69	140	1,988	1,008
Watana Creek (PRM 196.9)	452.7	yes	400	15	30	2,561	--	--	11	231	140	1,554	--
Watana Creek Tributary	NA	no	200	13	18	1,459	--	--	10	154	140	1,330	--
Unnamed Tributary (PRM 194.8)	321.2	no	400	2	4	300	--	--	3	88	140	476	176
GRTS Total	--	--	--	81	149	13,061	--	--	--	--		19,778	7,853
Direct sample Tributaries													
Jay Creek (PRM 211)	160.1	no	NA	NA	8	324			14	--	--	--	--
Unnamed Tributary (PRM 206.3)	<80.3	no	NA	NA	--	--	3	263	6.9	--	--	--	Direct
Unnamed Tributary (PRM 204.5)	<80.3	no	NA	NA	--	--	2	330	4.5	--	--	--	Direct
Unnamed Tributary (PRM 197.7)	<80.3	no	NA	NA	--	--	5	358	7.1	--	--	--	Direct
Deadman Creek (PRM 189.4)	453.5	no	NA	NA	--	--	5	357	28.4	--	--	--	--
Direct Sample Total	--	--	--	--	8	324	15	1,308	--	--	--	--	--

- In 2013, the 100-meter sub-sampling approach in six GRTS panels resulted in sampling 11 mesohabitat units within 1,050 meters of sample unit length
- In 2014, the total sample length of 3,619 meters included 28 mesohabitat units.
- 2014 activities support the sampling modification described in the ISR

Study 9.5 Summary of Results since ISR

Downstream Migrant Trapping Modifications



Kosina Creek Downstream Migrant Trapping (May-June)

2013 Rotary Screw Trap: 0.06 fish/night, No Chinook salmon

2014 Fyke Netting: 1.06 fish/net/night, 9 Chinook salmon



Rotary Screw Trap at PRM 200.3:

May-June 2014

- 9.76 fish/night
- 12 Chinook salmon



Study 9.5 Summary of Results since ISR

Winter Movement Upper River: (Winter Studies TM, September 2014)

- Up to 30 tags per species
- Arctic grayling moved between tributaries and mainstem
 - 3 overwintering reaches: downstream Watana Dam site, between Deadman and Kosina creeks, and between Oshetna and the Tyone rivers
- Burbot: most in mainstem near release location, one fish moved far upriver from Deadman to Goose Creek
- Longnose sucker used mainstem Susitna between Watana and Kosina creeks near release location
- Round whitefish moved from release sites, overwintered in mainstem between Fog and Kosina creeks, also some moved downstream of the Watana Dam site in December, and were detected there through April.

Species	Total Tags Applied	Jun-13	Jul-13	Aug-13	Sep-13	Oct-13	Nov-13	Dec-13	Jan-14	Feb-14	Mar-14	Apr-14	May-14	Jun-14	Jul-14	Aug-14	Sep-14
Arctic Grayling	110	0	0	24	19	40	36	27	35	23	22	21	18	15	57	47	47
Burbot	40	0	0	0	0	6	5	5	4	4	4	4	3	2	15	12	31
Dolly Varden	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Longnose Sucker	39	0	0	3	1	5	5	2	2	1	1	1	1	1	17	15	32
Northern Pike	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lake Trout	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12
Rainbow Trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Humpback Whitefish	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Round Whitefish	41	0	0	0	0	18	15	12	9	6	5	5	4	3	10	9	25



New Modifications to Study 9.5 since ISR

- 2013 ELH not as effective or informative as downstream trapping because of low catch and no timing data
- 2014 data demonstrated the effectiveness of downstream migrant traps in documenting out migration of Chinook salmon.
- AEA proposes no ELH sampling in the Upper River in 2015 and focus on early deployment and maintenance of downstream traps for a 3rd year.

Current Status and Steps to Complete Study 9.5



Activity	2013				2014				2015				2016
	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q	2 Q	3 Q	4 Q	1 Q
Salmon Early Life History		—											
FDA- Rotary Screw Trap Operation		—	—	—		—	—	—			—	—	—
FDA- PIT Antenna Operations		—	—	—							—	—	—
FDA- Radio Tagging and Tracking		—	—	—	—	—	—	—	—	—	—	—	—
FDA- Fish Sampling			—	—								—	—
FDA- Fish Sampling CIRWG Sites							—	—				—	—
FDA- Fish Sampling Mainstem Hybrid							—	—				—	—

Steps to Complete Study 9.5

(ISR Study 9.5, Part C – Section 7.1)

To complete this study, AEA will implement the methodologies in the Study Plan except as described in Section 7.1.2. These activities include:

- Fish distribution and abundance sampling activities in the mainstem Sustina River and select tributaries in the Study Area to support AEA's efforts to:
 - describe the seasonal distribution, relative abundance (as determined by catch per unit effort [CPUE], fish density, and counts), and fish-habitat associations of resident fishes, juvenile anadromous salmonids, and the freshwater life stages of non-salmon anadromous species (Study Objective 1)
 - describe seasonal movements of juvenile salmonids and selected fish species such as rainbow trout, Dolly Varden, humpback whitefish, round whitefish, northern pike, Arctic lamprey, Arctic grayling and burbot within the hydrologic zone of influence upstream of the Project (Study Objective 2)
 - characterize the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type (Study Objective 3)
 - collect tissue samples to support the Genetic Baseline Study for Selected Fish Species (ISR Study 9.14) (Study Objective 7)
- AEA will operate two rotary screw traps in the Upper River Study Area as well as fyke nets in Kosina Creek to support describing seasonal movements of juvenile salmonids and selected fish species within the hydrologic zone of influence upstream of the Project (Study Objective 2)

Steps to Complete Study 9.5 (ISR Study 9.5, Part C – Section 7.1)

- Biotelemetry including PIT and radio-tagging, PIT interrogation antenna sites, fixed radio telemetry sites, and aerial surveys will continue to support AEA efforts to:
 - describe seasonal movements of juvenile salmonids and selected fish species within the hydrologic zone of influence upstream of the Project (Study Objective 2)
 - document the seasonal distribution and habitat associations of invasive species (northern pike) (Study Objective 6)
- Fish tissue collection will continue to support AEA's efforts to:
 - determine whether Dolly Varden and humpback whitefish residing in the Upper River exhibit anadromous or resident life histories (Study Objective 5)
 - determine baseline metal concentrations in fish tissues for resident fish species in the mainstem Susitna River (see Study 5.7, Mercury Assessment and Potential for Bioaccumulation Study)
 - collect tissue samples to support the Genetic Baseline Study for Selected Fish Species (see Study 9.14)

Licensing Participants Proposed Modifications to Study 9.5?

- Agencies
- CIRWG members and Ahtna
- Public