

Initial Study Report Meeting

Study 9.5 Fish Distribution and Abundance in the Upper Susitna River

March 22, 2016

Prepared by
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Study 9.5 Status

- **ISR Documents (ISR Part D Overview)**
 - Initial Study Report (Jun 3, 2014)
 - Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum (Sept 17, 2014)
 - Appendix 3. Protocol for Site-Specific Gear Type Selection; Version 5 (Nov 14, 2014)
 - Draft Chinook and Coho Salmon Identification Protocol (Nov 14, 2014)
 - Evaluation of 2014 Study Modifications in the Black River Technical Memorandum (Dec 17, 2014)
 - Study Implementation Report (Nov 6, 2015)

Study 9.5 Status

- The following fieldwork activities occurred since the June 2014 ISR:
 - **2nd study year of downstream migrant trapping**
 - **2nd study year of radio tagging & tracking**
 - **Sampled sites not accessible in 2013**
 - Evaluated new tributary target sample lengths in Black River filed *Evaluation of 2014 Study Modifications in the Black River TM*
 - **Completed transect and GRTS hybrid sampling approach for mainstem**
- A second study year is needed for some tasks to complete all objectives for Study 9.5

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
- Seasonal Movements
- Early Life History
- Characterize the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type
- Determine whether Dolly Varden and humpback whitefish residing in the Upper River exhibit anadromous or resident life histories
- Determine baseline metal and mercury concentrations in fish tissues for resident fish species in the mainstem Susitna River
- Document the seasonal distribution, relative abundance, and habitat associations of invasive species (Northern Pike)
- Collect tissue samples from juvenile salmon and resident and non-salmon anadromous fish

Variances

(ISR Part D - Sections 6.1 and 6.2)

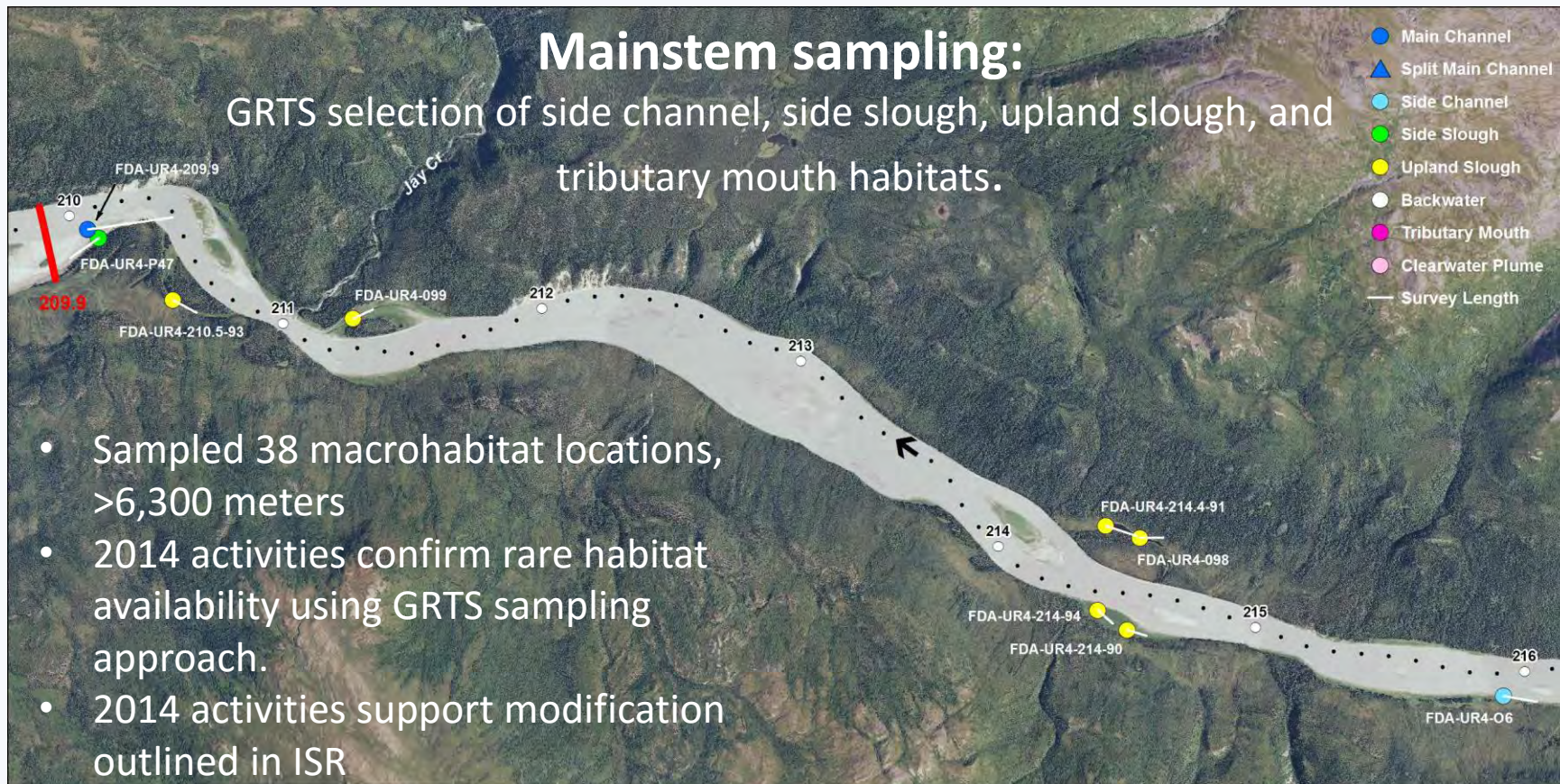
- Addition of an early life history study objective (ISR Part A, Section 4.6.2)
- Adjustments to radio telemetry fixed receiver, and fish distribution and abundance sampling locations (ISR Part A, Section 4.1.6; SIR, Section 4.1.4)
- Adjustments to the number of fixed receiver locations (ISR Part A, Section 4.1.6.4)
- Adjustments to the timing of fish distribution and sampling efforts (ISR Part A, Section 4.2.1; SIR, Section 4.2)
- Adjustments to mainstem sample unit lengths (ISR Part A, Section 4.1.6.1.1; SIR, Section 4.1.1)
- Adjustments to gear type applications (ISR Part A, Section 4.4.4.1; SIR, Section 4.3.3.1)
- Refinements to estimating the detection efficiency of PIT tag interrogation systems (ISR Part A, Section 4.5.4.1)
- Measured and weighed first 25 individuals per species/life stage (ISR Part A, Section 4.7.1.1; SIR, Section 4.5.1)
- 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; SIR, Section 4.4.4)
- Used size instead of age to evaluate habitat associations of juvenile anadromous and resident fish (ISR Part A, Section 4.7.1; SIR, Section 4.5.1)
- Adjustments to the timing of fish tissue sample collection for metals and mercury analysis (ISR Part A, Section 4.9.1)

Variances

(ISR Part D - Section 6.2)

- Increased sample length in select Upper River tributaries (ISR Part C, Section 7.1.2.4; SIR, Section 4.4.3)
- Adjustments to downstream migrant trapping locations and methods (ISR Part C, Section 7.1.2.2; SIR Section 4.1.4)
- PIT tags were distributed throughout the Upper River (ISR Part C, 7.1.2.3; SIR, Section 4.4.4)
- Opportunistic sampling in an unnamed lake in the Tsis Creek drainage (SIR, Section 4.1.4)
- Direct sampling of unnamed tributaries 197.7, 204.5, and 206.3 instead of GRTS (SIR, Section 4.1.4)
- Oshetna River RST not operated on schedule during July flow event (SIR, Section 4.2.1)
- One tributary mouth was inadvertently not sampled in fall (SIR, Section 4.2.1)
- Radio tagging targets not met for all species because of low abundance (SIR, Section 4.4.4)

Summary of Results (SIR November 2015)



- Main Channel
- ▲ Split Main Channel
- Side Channel
- Side Slough
- Upland Slough
- Backwater
- Tributary Mouth
- Clearwater Plume
- Survey Length

Legend

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

Orthophoto Source: 2013 ABR

ALASKA ENERGY AUTHORITY

0 2,000 Feet

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

Map Key

0 10 mi

■ = Spatial Extent

Summary of Results

Increased tributary sampling lengths applied in the Black River (Sampling Considerations TM {Mar 20, 2014}; ISR Part C, Section 7.1.2.4; Proposed Modifications TM {Sept 17, 2014})

- In 2013, sub-sampling approach resulted in 11 mesohabitat units within 1,050 meters
- In 2014, additional effort resulted in 28 mesohabitat units sampled in 3,217 meters of tributary and 402 meters of off-channel habitat
- 2014 activities support the sampling modification described in ISR (Part C, Section 7.1.2.4)

GRTS Sampled Tributaries	Drainage Basin Area (km ²)	Chinook Salmon presence	GRTS Sampling Unit Size (m)	Number of GRTS Population Sample Units	Number of 2013 Sample Sites	Number of mesohabitats sampled 2013	Meters Sampled 2013	% 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)	Kirsch et al. 2014 target (%)	Proposed Change (m)
Oshetna River (PRM 235.1)	1424.5	yes	800	52	13	28	2,604	6%	--	--	36	73	140	5,026	12%	2,422
Black River	NA	no	400	24	6	11	1,050	11%	28	3217*	23	46	140	3,178	33%	2,128
Goose Creek (PRM 232.8)	269.1	no	200	81	20	38	3,107	19%	--	--	14	219	120	1,704	11%	-1,403
Kosina Creek (PRM 209.1)	1036.5	yes	800	24	6	10	1,000	5%	--	--	32	31	120	4,522	24%	3,522
Tsisi Creek	NA	no	400	23	6	10	980	11%	--	--	14	69	140	1,988	22%	1,008
Watana Creek (PRM 196.9)	452.7	yes	400	60	15	30	2,561	11%	--	--	11	231	140	1,554	6%	--
Watana Creek Tributary	NA	no	200	67	13	18	1,459	11%	--	--	10	154	140	1,330	10%	--
Unnamed Tributary (PRM 194.8)	321.2	no	400	32	2	4	300	2%	--	--	3	88	140	476	4%	176
GRTS Total	--	--	--	454	81	149	13,061	8%	28	3217	--	--	--	19,778	12%	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	--	--	--	--	--	--

*Tributary main channel sample length, an additional 402 m of tributary off-channel habitat was sampled totaling 3,619 m

Summary of Results

Downstream Migrant Trapping Modifications



Kosina Creek Downstream Migrant Trapping

- 2013: 1,154 fish; 12 Chinook Salmon (ISR Section 5.2.1)
- 2014: 1,639 fish; 29 Chinook Salmon (SIR Section 5.2.1)
- Oshetna similar in '13 and '14, Kosina catch increased by ~50% in '14, mainstem trap moderate catch '14
- Support modifications (ISR Part C, Section 7.1.2.2; ISR Part D, Section 7.2)



Rotary Screw Trap at PRM 200.3:



Summary of Results

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

- Arctic grayling overwintered: downstream Watana Dam site, between Deadman and Kosina creeks , and between Oshetna and the Tyone rivers
- Burbot overwintered in mainstem near release locations,
- Longnose sucker used mainstem Susitna between Watana and Kosina creeks
- Round whitefish overwintered in mainstem between Fog and Kosina creeks; in Middle River above Devils Canyon

Radio-tracking Upper River: Tags-at-large (SIR Section, 4.4.2)

Target Species	# Tagged	Jun '13	Jul '13	Aug '13	Sept '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	Oct '14	Nov '14	Dec '14	Jan '15	Feb '15	Mar '15	Apr '15	May '15	Jun '15
Arctic Grayling	111	0	29	24	44	40	35	29	25	23	22	21	17	68	50	43	40	35	31	28	27	23	23	22	20	17
Burbot	40	0	0	0	6	6	6	6	5	5	5	4	4	16	14	13	29	25	23	20	20	20	19	19	19	17
Dolly Varden	0																									
Longnose Sucker	44	0	5	3	6	5	4	3	3	3	3	3	3	19	17	15	27	25	22	17	15	15	14	14	13	13
Rainbow Trout	0																									
Humpback Whitefish	0																									
Round Whitefish	41	0	0	0	18	18	16	11	7	6	5	5	4	11	11	10	25	23	19	18	18	17	16	16	16	16
Lake Trout	12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12	12	12	11	11	11	11	11	11	11
Northern Pike	0																									

Summary of Results

Task	2014 June ISR Section 5	2014-2015 SIR Section 5	Total
All Tasks	~9,200 fish observations; 9 spp	~9,400 fish observations, 9 spp	18,600 fish observations; 9 spp
FDA Sampling	>7,000 fish; 186 Chinook Salmon	>7,000 fish; 8 Chinook Salmon	>14,000 fish; 194 Chinook Salmon
ELH Sampling	458 fish*; 6 Chinook Salmon	No ELH surveys	458 fish; 6 Chinook Salmon
Downstream Migrant Traps	1,154 fish; 12 Chinook Salmon	1,639; 29 Chinook Salmon	2,796 fish; 41 Chinook Salmon
Radio tagging	92 fish; 4 spp	156 fish; 5 spp	248 fish; 5 spp
PIT tagging	1,204; 8 spp	1,466, 7 spp	2,670 fish, 8 spp
PIT Recaptures	41 fish; 5 spp	40 fish; 3 spp	81 fish; 6 spp
Opportunistic Sampling [^]	>500 fish, 79 Chinook Salmon	>600 fish, 6 Chinook Salmon	1,100 fish; 85 Chinook Salmon

*1,298 total fish observed, 458 caught and reported in ISR Table 5.3-1; ^includes sampling for Chinook Salmon, genetics, metals/mercury and radio tagging

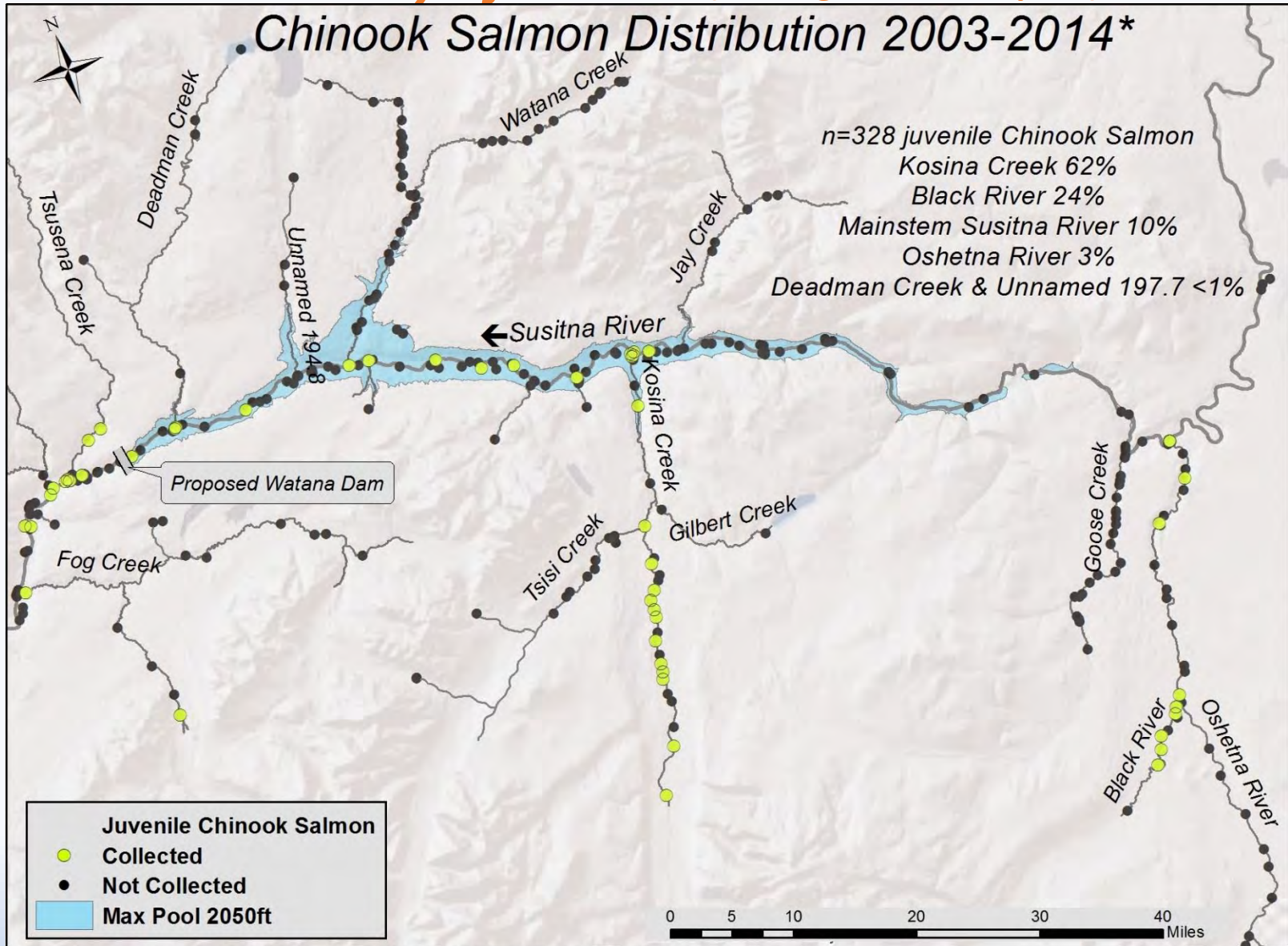
Summary of Results (SIR, Table 5-2)

Supports sampling modifications for mainstem and direct tributaries (ISR Part D, Section 7.2)

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
Susitna River Devils Canyon to Watana Dam 2013	166.1-187.1		X	X	X	X		X	X		X	X
Proposed Watana Dam Location PRM 187.1												
Susitna River UR-6	187.1-203.4		X	X	X	◊	◊	X	X	X	X	◊
Susitna River UR-5	203.4-208.1		◊	X	X			X	X	◊	X	◊
Susitna River UR-4	208.1-224.9		◊	X	X			X	X	◊	X	◊
Susitna River UR-3	224.9-234.5			X	X			X	X		X	
Watana Reservoir at Full Pool PRM 232.5												
Susitna River above Oshetna	>234.5			X								
Aerial Mainstem - Dam 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, ◊	□	X, ◊	◊	X, □	X, ◊		X, ◊	
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 204.5						◊						
Unnamed Tributary 206.3	206.3	<80.3							X			
Kosina Creek	209.1	1036.5	X, ◊	X	X, □	X, ◊		X, □	X, ◊	X, ◊	X	X
Kosina Creek Tributary: Tsisi Creek	N/A			X					X		X	X
Kosina Creek Tributary: Gilbert Creek	N/A			X					X, ◊			
Kosina Creek Tributary: Unnamed	N/A								X			
Jay Creek	211	106.1		X, ◊	X, □	X, □		□	X		□	
Goose Creek	232.8	269.1		X, ◊	□			X	X, ◊		X	
Oshetna River	235.1	1424.5	X, ◊	X, ◊	X			X	X	X	X	X
Oshetna River Tributary: Black River	N/A		X	X	X, □	◊		X, ◊	X, ◊		X, ◊	
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: Tsisi Lake	N/A			X			◊					

□: ADF&G 1981, 1983a, 1984; ◊: Buckwalter 2011; X: Fish Distribution and Abundance 2012-2013; ◊: Fish Distribution and Abundance 2014

Summary of Results (SIR, Figure 6-1 adapted)



* data sources include: AEA 2015; Buckwalter 2011; Kirsch et al. 2014

Summary of Results – Species ID

Genetics Results (SIR, Appendix B)

- Species determined for 1,226 samples of juvenile salmon
- 100% of Upper River (n=228) juvenile salmon samples correctly identified in the field as Chinook Salmon
- Developed *Fish Distribution and Abundance in the Upper and Middle/Lower Susitna River (Studies 9.5 and 9.6): Draft Chinook and Coho Identification Protocol* to improve future ID accuracy below Devils Canyon

AEA Proposed Modifications

(ISR Part D - Section 7.1)

- ELH sampling will take place biweekly (every two weeks) from ice breakup through the end of June (ISR Part C, Section 7.1.2.1).
- At each site, 25 fish/per species/life stage will be weighed and measured for length and PIT tagged if appropriate (ISR Part C, Section 7.1.2.7).
- Relocate PIT antennas to smaller waterbodies to have better stream channel coverage (ISR Part C, Section 7.1.2.3.2).
- Continue to use a single-pass sampling approach (ISR Part C, Section 7.1.2.6).

AEA Proposed Modifications

(ISR Part D - Section 7.2)

- Modifications to tributary sampling lengths and distance targets for future sampling (ISR Part C, Section 7.1.2.4; detailed in *Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum, September 2014*; SIR, Section 7.1).
- Implementation of the hybrid approach to Upper River mainstem sampling. Reduce the number of target mainstem transects from 20 to 10 and increase sampling in off-channel habitat types (n=6) (ISR Part C, Section 7.1.2.5; detailed in *Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum, September 2014*; SIR, Section 7.1).
- Rotary screw trap operation at the mouth of the Oshetna River, at PRM 200 mainstem locations and fyke netting in the Kosina Creek mouth and clear water plume (ISR Part C, Section 7.1.2.3.1).
- Direct sampling for unnamed tributaries 197.7, 204.5, and 206.3 (described in the *Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum, September 2014*; SIR, Section 7.1).
- Follow the gear specifications and descriptions of field application outlined in IP Appendix 3 Protocol for Site-Specific Gear Type Selection; Version 5 (R2 Resource Consultants 2014b).

Steps to Complete Study

(ISR Part D -Section 8)

Objective 1:

- Seasonal sampling for **fish distribution and abundance in eight GRTS and five direct sample tributary streams** with modified target sample lengths (ISR Part A, Section 4.1.2.1, Table 4.1-2).
- Seasonal sampling for **fish distribution and abundance in the mainstem Susitna River** along 10 transects and at 6 replicate GRTS samples of rare habitat types.

Objective 2:

- **Rotary screw trapping** at the mouth of the Oshetna River and the PRM 200 mainstem locations as well as **fyke netting** in the mouth and clear water plume of Kosina Creek during the open-water period.
- **PIT tagging of target species** will continue. PIT antenna arrays will be placed in modified locations with channel configuration that better suit the limitations of the technology.

Steps to Complete Study

(ISR Part D – Section 8)

Objective 3:

- Sampling directed at salmon **early life history (ELH)** life stages will take place biweekly (every two weeks) from ice breakup through the end of June.

Objective 4:

- At each sampling location, **fish will be measured for length and weight** (25 per species/life stage) and categorized into life stages based on length.

Objective 5:

- AEA will continue to collect and sacrifice Dolly Varden and Humpback Whitefish of appropriate sizes for **evaluation of anadromous life history** type.

Objective 7:

- AEA will continue to identify fish when sampling and document the seasonal distribution, relative abundance, and habitat associations of **invasive species** (Northern Pike) if documented.

Objective 8:

- AEA will continue to **collect samples to support the Genetic Baseline Study** for Selected Fish Species (RSP Section 9.14) and to follow the methodology proposed **to support fish identification** in the *Draft Chinook and Coho Salmon Identification Protocol*.

Licensing Participants Proposed Modifications to Study 9.5?

- Agencies
- CIRWG members and Ahtna
- Public