Susitna-Watana Hydroelectric Project
(FERC No. 14241)

Initial Study Report Meetings
October 15, 2014
Part B – Agenda and Presentations

Millennium Hotel
4800 Spenard Road
Anchorage, Alaska 99517

Filed November 15, 2014

SUSITNA-WATANA HYDRO

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Agenda and Schedule
Initial Study Report (ISR) Meetings
Fish and Aquatics (Studies 9.05 – 9.17)
October 15th, 2014

LOCATION: **Millennium Hotel**
4800 Spenard Road
Anchorage AK, 99517

TIME: **8:30 am – 5:00 pm AKST**

SUBJECT: **ISR Meetings**

GoTo MEETING: **https://www4.gotomeeting.com/register/264384991**
1-888-585-9008 CODE: 810-056-852

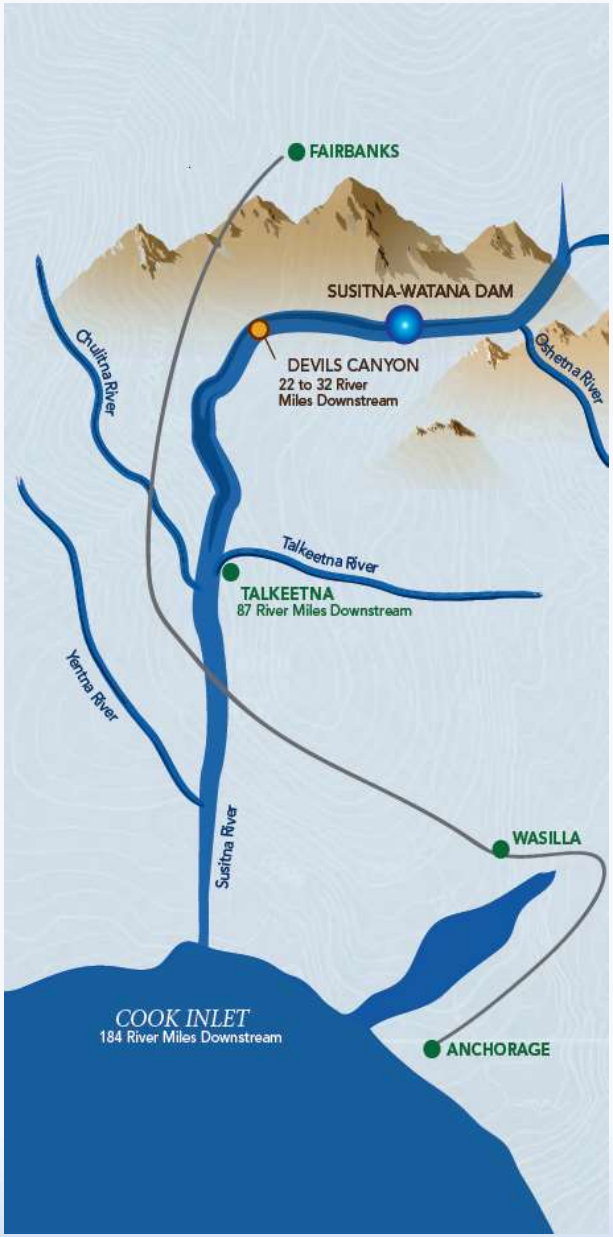
Goal: **To review the ISR for Fish and Aquatic studies and 2015 activities**

Agenda Items

8:30 – 8:45	**Introduction**
8:45 – 9:00	**The Future Watana Reservoir Fish Community and Risk of Entrainment Study (Study 9.10), Aquatic Resources Study within the Access Alignment, Transmission Alignment, and Construction Area (Study 9.13), Analysis of Fish Harvest in and Downstream of the Susitna-Watana Hydroelectric Project Area (Study 9.15) (MaryLouise Keefe)**
9:00 – 9:45	**Study of Fish Distribution and Abundance in the Upper Susitna River (Study 9.5) (MaryLouise Keefe)**
9:45 – 10:45	**Study of Fish Distribution and Abundance in the Middle and Lower Susitna River (Study 9.6) (Jerry George)**
10:45 – 11:00	**Break**
11:00 – 12:00	**Salmon Escapement Study (Study 9.7) (Bryan Nass)**
12:00 – 1:00	**Lunch**
1:00 – 1:45	**River Productivity Study (Study 9.8) (Tim Nightengale)**
1:45 – 2:15	**Characterization and Mapping of Aquatic Habitats (Study 9.9) (Laurie Marczak)**
2:15 – 2:45	**Study of Fish Passage Feasibility at Watana Dam (Study 9.11) (Dana Postlewait)**
2:45 – 3:15	**Study of Fish Barriers in the Middle and Upper Susitna River and Susitna Tributaries (Study 9.12) (Kevin Petrone)**
3:15 – 3:30	**Break**
3:30 – 4:00	**Genetic Baseline Study for Selected Fish Species (Study 9.14) (Chris Habicht)**

4:00 – 4:30 **Eulachon Run Timing, Distribution, and Spawning in the Susitna River (Study 9.16) (Bryan Nass)**

4:30 – 5:00 **Cook Inlet Beluga Whale Study (Study 9.17) (Darren Ireland)**



Initial Study Report Meeting

Study 9.10

Future Watana Reservoir Fish Community and Risk of Entrainment

October 15, 2014

Prepared by
R2 Resource Consultants, Inc.

Study 9.10 Objectives

- Develop scenarios for anticipated changes in reservoir habitat based on predicted reservoir operations, size, temperatures, and water quality and depth profiles.
- Develop scenarios for future reservoir fish communities based on current fish species composition upstream of the proposed dam site and enhancement potential for select salmon species.
- Characterize potential management options including recreational, commercial, and subsistence uses of the reservoir fishery.
- Conduct a qualitative desktop analysis on the potential for entrainment of fish species inhabiting the proposed reservoir upstream of Watana Dam.

Study 9.10 Components

- Development of scenarios for anticipated changes in reservoir habitat characteristics, based on alternate Project operation scenarios.
- Development of alternatives of potential future fish communities.
- Development of alternative fisheries management scenarios.
- A desktop analysis on potential for fish entrainment.

Study 9.10 Variances

- This study was not implemented in 2013 (RSP Section 9.10.10). As noted in the Study Plan, this study is largely a desktop analysis that is to be completed as information from other studies becomes available. These other studies are continuing, and AEA will meet study objectives by completing this study as described in the Study Plan.

Steps to Complete Study 9.10 (ISR Study 9.10, Part C – Section 7.1)

AEA will implement the methods in the Study Plan, with no modifications. To summarize , AEA will:

1. Develop scenarios of anticipated changes in reservoir habitat corresponding to alternative Project operating scenarios. Tasks include coordination with modeling teams for evaluations of the lacustrine zone, water temperature and turbidity. (RSP Section 9.10.4.1).

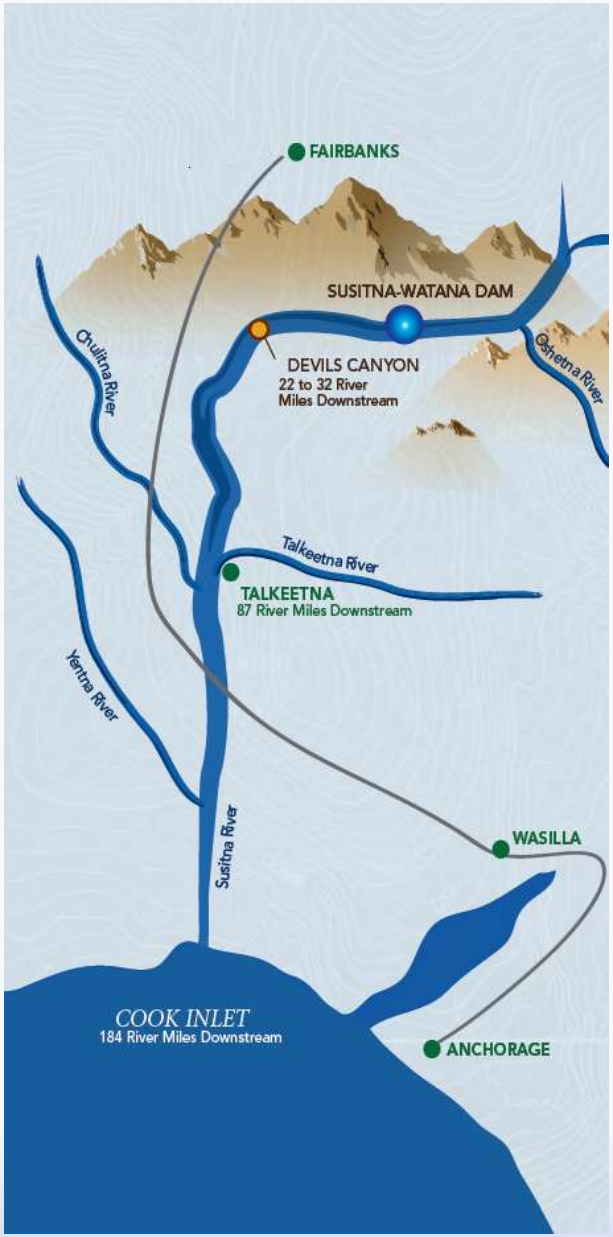
2. Develop scenarios for future reservoir fish communities based on current fish species composition upstream of the proposed dam site, anticipated reservoir habitat, and management practices acceptable to ADF&G. Tasks include 1) defining the existing fish community, 2) identifying potential use of lacustrine habitat, 3) identifying potential invasive species and 4) identifying the potential for an anadromous versus land-locked salmon-based community. (RSP Section 9.10.4.2).

3. Characterize potential management options for a future reservoir fishery (RSP Section 9.10.4.3) based on information on plans for public access, recreational goals, fish passage.

4. Conduct a desktop analysis on the potential for entrainment and impingement of fish species inhabiting the proposed reservoir. Tasks are 1) develop an understanding of alternative Project designs and operating scenarios, 2) conduct a literature review on entrainment at deep water intakes and cold water reservoirs, and synthesizing the information to analyze the potential vulnerability of target species. (RSP Section 9.10.4.4).

Licensing Participants Proposed Modifications to Study 9.10?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.13

Aquatic Resources Study within the Access Alignment, Transmission Alignment, and Construction Area

October 15, 2014

Prepared by

R2 Resource Consultants, Inc.

Study 9.13 Objectives

- Characterize the aquatic habitats and fish assemblages at potential stream crossings within a 200-meter (650-foot) buffer zone along proposed access road and transmission line alignments

- Describe aquatic habitats and species present within the construction area for the dam and related hydropower facilities

Study 9.13 Components

- Synthesis of Existing Information (ISR Part A, Section 4.1; pg 2)
- Field Data Collection (ISR Part A, Section 4.2; pg 2)

Study 9.13 Variances

AEA has **rescheduled the implementation** of the field study components to 2015. The rescheduling of this study component is not anticipated to impair AEA's ability to meet study objectives. Undertaking the field data collection and completing this study in 2015 will allow the study to benefit from additional information coming from other study efforts as additional results become available.

Study 9.13 Summary of Results in ISR (ISR Study 9.13, Part A – Section 5)

Review of 1980s studies, the Anadromous Waters Catalog, and the Alaska Freshwater Fish Inventory database:

1. **Denali Corridor (West Option)**
   - 38 possible stream crossings in Susitna and Nenana watersheds.
   - Resident fishes present (Dolly Varden, Arctic grayling, slimy sculpin).
   - No anadromous species documented.
2. **Chulitna Corridor (Note - AEA Proposal to Eliminate Chulitna Corridor from Further Study (September 17, 2014))**
   - 23 possible stream crossings in Susitna watershed.
   - Resident fishes
   - Anadromous salmon documented in 3 larger streams, e.g. Indian River, Portage and Thoroughfare creeks.
3. **Gold Creek Corridor**
   - 17 possible stream crossings in the Susitna watershed.
   - Resident fishes documented downstream of crossings include Dolly Varden, Arctic grayling, rainbow trout, and slimy sculpin.
   - Anadromous salmon documented in Fog, Chinook, Cheechako, Unnamed Tributary, and Gold creeks.

AEA Proposed Modifications to Study 9.13 in ISR (ISR Study 9.13, Part C – Section 7.1.2)

The study area has changed from the RSP (Section 9.13.3). **AEA has added the Denali East Option road and transmission line corridor to the study area** to provide an alternative to crossing higher elevation BLM lands just south of the Denali Highway. **The corridor addition includes a 200 meter buffer** along the alignments which matches the 200 meter buffers used on the other potential road and transmission line corridors included in the study area.

The FERC-approved Study Plan anticipated two years of field work, with the second year designed primarily to accommodate resampling sites with data gaps or potential refinements in the corridor alignment. With the **field work now being conducted in the 2015 field season, the proposed modification incorporates two sampling events during the open water period.** With two events the ability to fill in data gaps and to address realignment needs related to aquatic resources will be maintained. Thus these field events will be sufficient to allow AEA to collect all of the data in one year to meet study plan objectives.

AEA Proposal to Eliminate Chulitna Corridor from Further Study (September 17, 2014))

AEA is proposing to eliminate the Chulitna Corridor from further detailed study.

- This AEA proposal is based primarily on a desire by AEA to avoid the need to cross Indian River and Portage Creek subwatersheds.

- In addition, the Chulitna corridor would require the road and transmission line routes to be located at higher elevations along more avalanche prone slopes than the other corridors and thus would not provide as reliable access and transmission operations as the other corridors.

Steps to Complete Study 9.13 (ISR Study 9.13, Part C – Section 7.1)

To complete this study, AEA will implement the methods in the Study Plan, except as described in Section 7.1.2. These activities consist of field data collection at proposed crossing sites in streams along the potential access and transmission corridors and within the vicinity of construction areas and potential airport locations. Specific methods include:

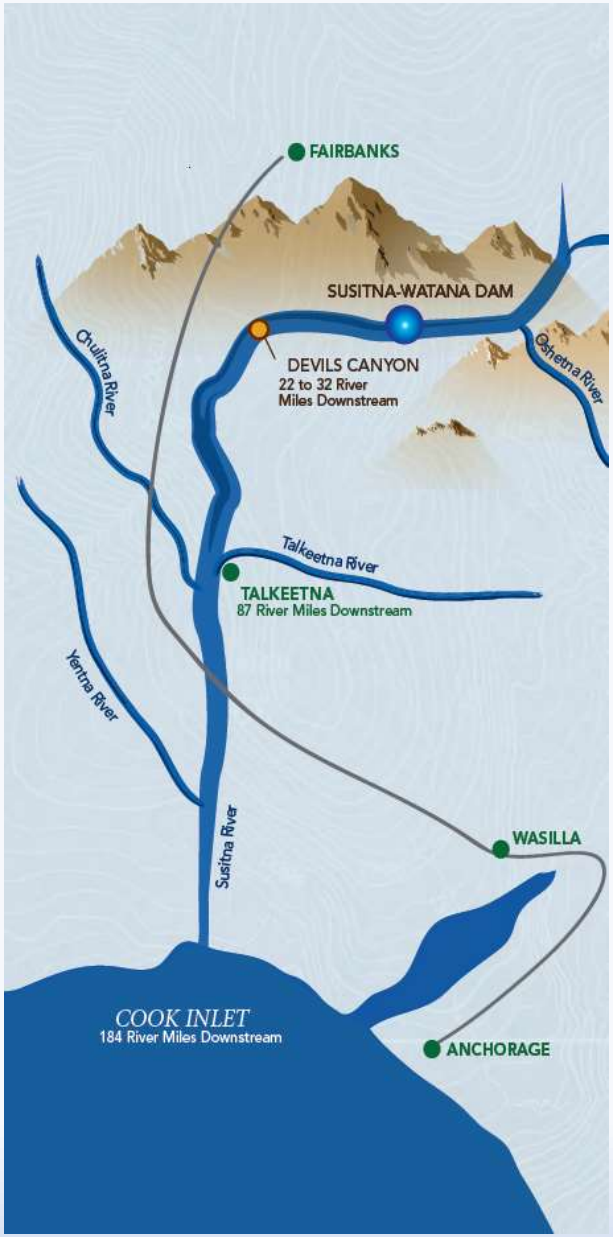
1. Characterize aquatic habitat and fish assemblages in the vicinity of each potential crossing site (RSP Section 9.13.4.2.1 and 9.13.4.2.2).

2. Two habitat and fish sampling events in 2015.
   a) Event 1 will occur early in the field season (June to July) and surveys will be attempted at each potential crossing site.
   b) Event 2 will occur if during Event 1: 1) unsurveyable conditions were found (dry, or excessive flow), 2) data gaps occurred, or 3) no fish were detected at a crossing site. Event 2 will be conducted late in the open-water period (September to October).

3. Data analysis and reporting in USR, including incorporating data into the Project's geospatial database (RSP Section 9.13.4.2.3)

Licensing Participants Proposed Modifications to Study 9.13?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.15

Analysis of Fish Harvest in and Downstream of the Susitna-Watana Hydroelectric Project Area

October 15, 2014

Prepared by

R2 Resource Consultants, Inc.

Study 9.15 Objectives

- Describe baseline harvest levels and harvest locations for commercial, sport, personal use, and subsistence fisheries for Susitna-River-origin resident and anadromous fish.

- Describe the potential for the Project to alter harvest levels and opportunities on Susitna-River-origin resident and anadromous fish based on potential Project-induced changes in fish abundance and distribution from flow- and habitat-related changes as estimated from other Project studies

Study 9.15 Components

- Compilation and Apportionment of ADF&G Commercial Harvest Records,

- Compilation of Harvest and Effort from Sport Fisheries,

- Compilation of Harvest and Effort from Personal Use Fisheries,

- Compilation of Subsistence Harvest Data, and

- Evaluation of Potential Project Effects.

Study 9.15 Variances

This study was not implemented in 2013 (RSP Section 9.15.10). All 5 study components are scheduled for 2015. AEA will meet the study objectives by completing the entire study in one study season.

Steps to Complete Study 9.15 (ISR Study 9.15, Part C – Section 7.1)

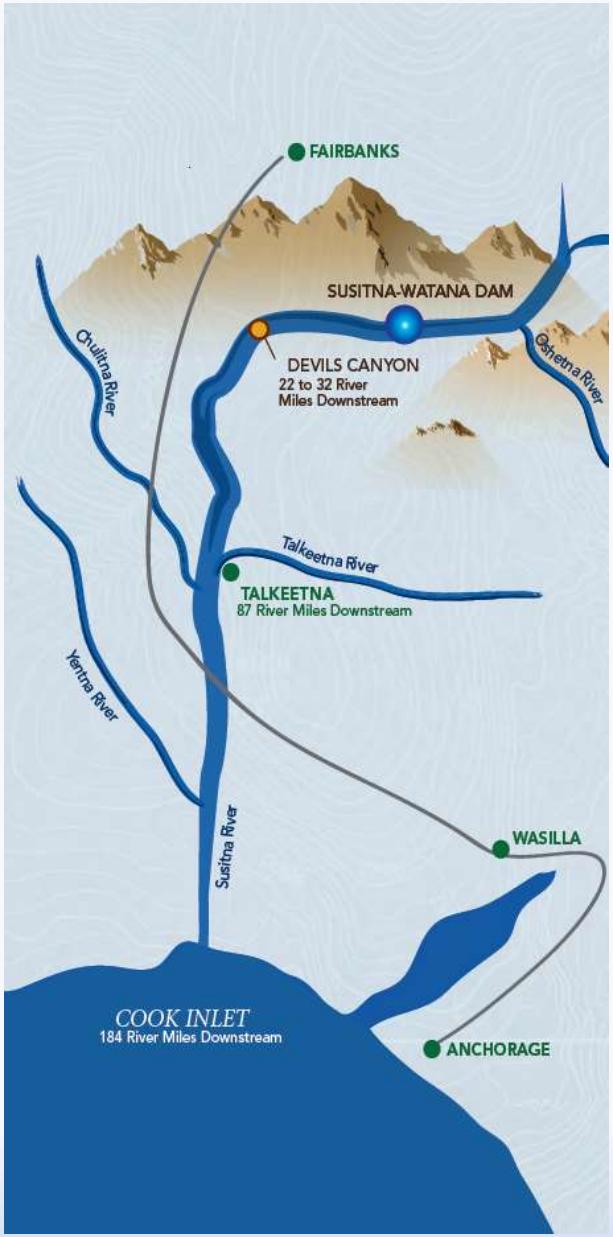
To complete this study, AEA will implement the methods in the Study Plan with no modifications. These activities include:

1. Compilation of ADF&G harvest records;
2. Apportionment of Susitna commercial harvest;
3. Compilation of relevant data from 8 Susitna studies that are ongoing (RSP 9.15.4.5);
4. Evaluation of potential effects to marine, eulachon and sport fisheries.

All remaining data collection necessary to complete the analyses for this study will be completed during the 2015 study season and reported in the USR.

Licensing Participants Proposed Modifications to Study 9.15?

- Agencies
- CIRWG members and Ahtna
- Public



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)

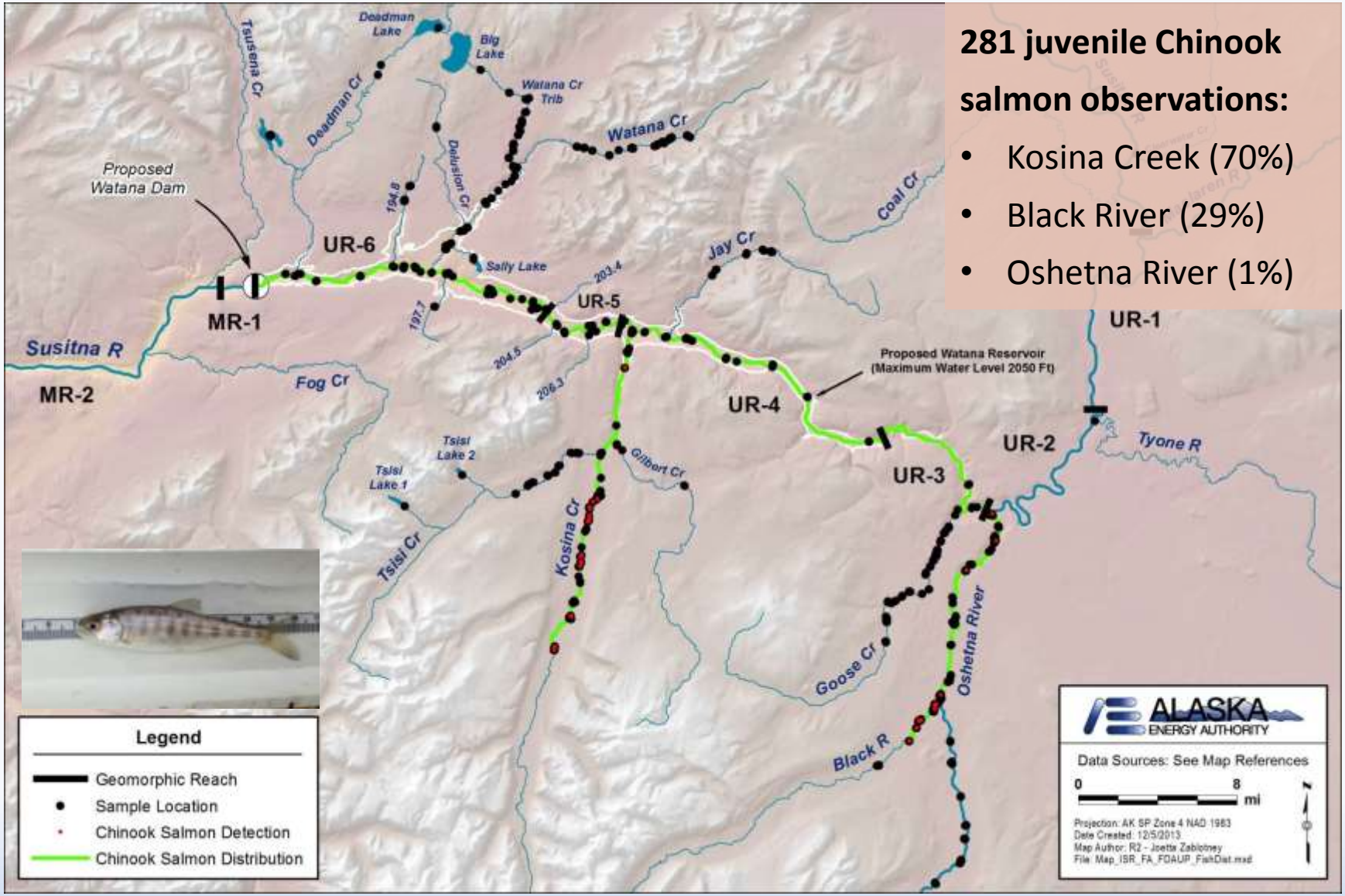
Location	Poject River Mile	Drainage Basin Size (km^2)	Chinook salmon (juvenile)	Arctic grayling	Burbot	Dolly Varden	Lake trout	Longnose sucker	Sculpin	Whitefish, humpback	Whitefish, round	Whitefish, unspecified
Devils Canyon to Watana Dam	166.1-187.1		X	X	X	X		X	X		X	X
Watana Dam Location	187.1	---	---	---	---	---	---	---	---	---	---	---
Susitna River UR-6	187.1-203.4		X	X	X			X	X	X	X	
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	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: Tsisi 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: Tsisi Lake	N/A			X								

X: Fish Distribution and Abudance 2012-2013

¨: ADF&G 1981, 1983a, 1984

O: Buckwalter 2011

Study 9.5 Summary of Results in ISR



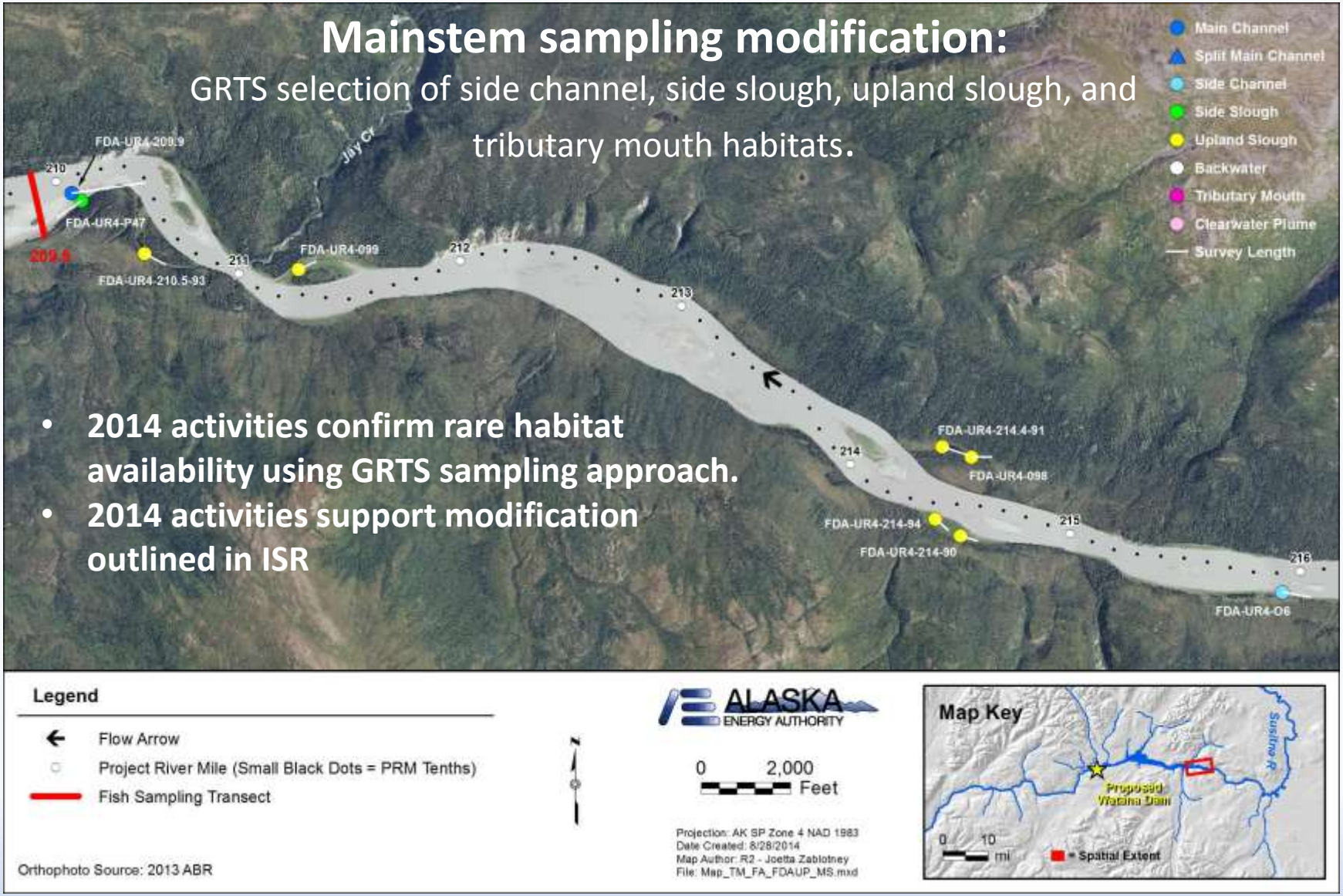
281 juvenile Chinook salmon observations:

- Kosina Creek (70%)
- Black River (29%)
- Oshetna River (1%)

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



Study 9.5 Summary of Results since ISR

Tributary sampling modification:

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

GRTS Sampled Tributaries	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)
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:

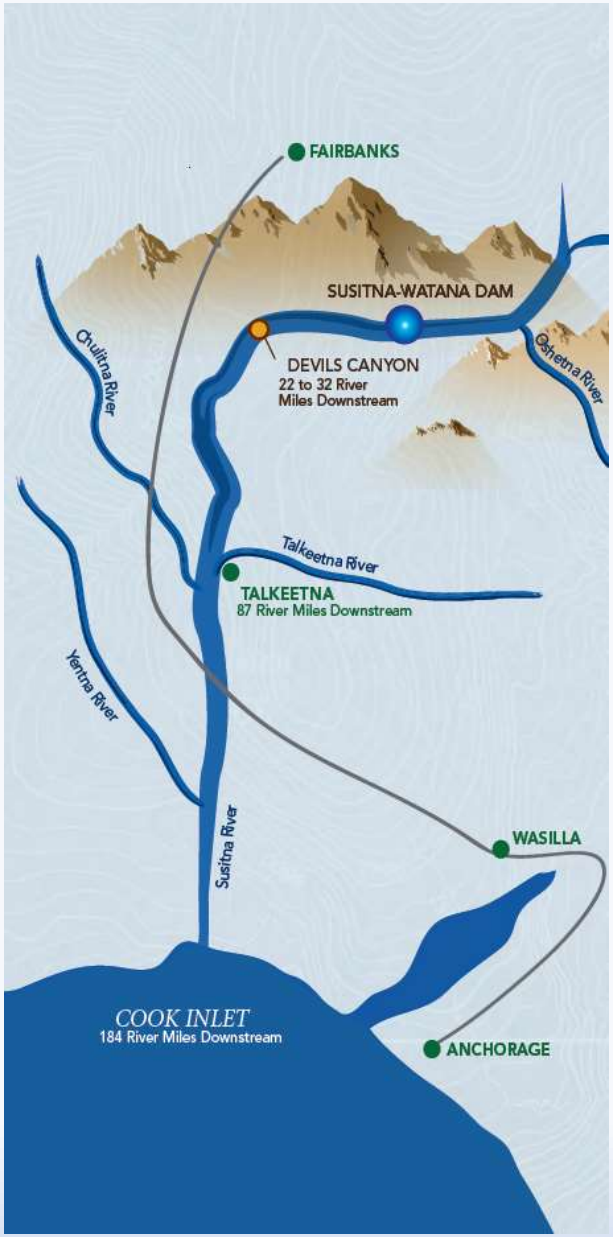
- Fish distribution and abundance sampling activities in the mainstem Sustina River and select tributaries in the Study Area to support AEA's efforts to:
  - describe the seasonal distribution, relative abundance (as determined by catch per unit effort [CPUE], fish density, and counts), and fish-habitat 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



Initial Study Report Meeting

Study 9.6 Fish Distribution and Abundance in the Middle and Lower Susitna River

October 15, 2014

Prepared by
R2 Resource Consultants

Study 9.6 Objectives

1. Describe the seasonal distribution, relative abundance (by CPUE, fish density, and counts) and fish habitat associations
2. Describe seasonal movements of selected fish species with emphasis on identifying foraging, spawning and overwintering habitats within the mainstem of the Susitna River
    a) Document the timing of downstream movement and catch using out-migrant traps
    b) Describe seasonal movements using biotelemetry (passive integrated transponder [PIT] and radio-tags)
3. Describe early life history, timing, and movements of anadromous salmonids
    a) Describe emergence timing of salmonids
    b) Determine movement patterns of juveniles from spawning to rearing habitats
    c) Determine juvenile salmonid diurnal behavior
    d) Collect baseline data to support the Stranding and Trapping Study
4. Document winter movements and timing and location of spawning for burbot, humpback whitefish, and round whitefish
5. Document the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type
6. Document the seasonal distribution, relative abundance, and habitat associations of northern pike
7. Collect tissue samples to support the Fish Genetic Baseline Study (Study 9.14)

Study 9.6 Components

- Fish Distribution, Relative Abundance, and Habitat Associations (ISR Part A, Section 4.4; pg 15)
- Seasonal Movements (ISR Part A, Section 4.5; pg 20)
- Early Life History (ISR Part A, Section 4.6; pg 23)
- Document Winter Movements and Timing and Location of Spawning for Burbot, Humpback Whitefish, and Round Whitefish (ISR Part A, Section 4.7; pg 24)
- Document the Seasonal Size/Life stage Structure, Growth, and Condition of Juvenile Anadromous and Resident Fish by Habitat Type (ISR Part A, Section 4.8; pg 24)
- Document the Seasonal Distribution, Relative Abundance, and Habitat Associations of Northern Pike (ISR Part A, Section 4.9; pg 26)
- Collect Tissue Samples from Juvenile Salmon and All Resident and Non-Salmon Anadromous Fish (ISR Part A, Section 4.10; pg 26)

Study 9.6 Variances

- Adjustments to fish sampling, trap and telemetry locations (ISR Part A, Section 4.1.7)
- Adjustments to fish sampling due to grouping main channel habitat classifications (ISR Part A, Sections 4.1.7.2 and 4.4.4.3)
- Adjustments to Early Life history and downstream migrant trapping sampling timing (ISR Part A, Section 4.2.1)
- Adjustments to sample unit lengths (ISR Part A, Section 4.4.4.1)
- Adjustments to gear type applications (e.g., numbers of passes, soak times; ISR Part A, Section 4.4.4.2)
- Refinements to estimating the detection efficiency of PIT tag interrogation systems (ISR Part A, Section 4.5.3.1)
- Adjustments to the timing of radio-tag implementation and aerial survey methods for tracking resident fish (ISR Part A, Sections 4.5.3.2 and 4.5.3.3)
- Utilizing size instead of age to evaluate habitat associations of juvenile anadromous and resident fish (ISR Part A, Section 4.8.1)

Study 9.6 Temporal Scale

- All sites visited
- Most sites visited 3 times (FDA MR 177 sites LR 44 sites)
- Some sites visited 8-18 times during Winter (~50), ELH (36), and FDA
- Additional temporal sampling RST, PIT, Radio Telemetry, HSC

Location	Feb-13	Mar-13	Apr-13	May-13	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	Oct-14
Upper River RSTs					•	•	•	•	•							•	•	•	•	•	•
Upper River PIT					•	•	•	•	•												
Upper River Tribs					••	•		•	•									•		•	•
Upper River Mainstem						•		•	•									•		•	•
MR-1 non FA						•		•	•												
MR-1 FA						•		•	•												
MR-2 non FA						•		•	•												
MR-2 FA						•		•	•												
MR-5 non FA						•		•	•												
MR-5 FA					••	•		•	•							•	••				
MR-6 RSTs					•	•	•	•	•												
MR-6 PIT					•	•	•	•	•	•	•		•	•	•						
MR-6 non FA						•		•	•												
MR-6 FA			•	•	••	•		•	•	•			•	•	•	•	••				
MR-7 non FA						•		•	•												
MR-7 FA				•	••	•		•	•							•	••				
MR-8 RST					•	•	•	•	•												
MR-8 PIT					•	•	•	•	•	•	•		•	•	•						
MR-8 non FA						•		•	•												
MR-8 FA	•	•	•	•	••	•		•	•	•			•	•	•	•	••				
Lower River RST					•	•	•	•	•												
Lower River PIT					•	•	•	•	•	•	•		•	•	•						
Lower River Mainstem					••	•		•	•												
Radio Telemetry					••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••	••

Study 9.6 Summary of Results in ISR (ISR Study 9.6, Part A – Section 5)

Location[a]	PRM	Chinook salmon	Chum salmon	Coho salmon	Pink salmon	Sockeye salmon	Salmon, undifferentiated	Arctic Grayling	Burbot	Dolly Varden	Lake Trout	Lamprey	Longnose sucker	Northern Pike	Rainbow trout	Sculpin	Stickleback, ninespine	Stickleback, threespine	Whitefish, Bering cisco	Whitefish, humpback	Whitefish, round	Whitefish, undifferentiated
Upper River Study Area	187.1-234.5	X						X	X	X	X		X			X				X	X	X
Proposed Watana Dam (PRM 187.1)																						
MR-1[a]	184.6-187.1							X	X	X			X			X					X	X
MR-2[b]	169.6-184.6	X						X	X	X			X			X					X	X
Upper extent Devils Canyon (PRM 166.1)																						
MR-3[c]	166.1-169.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MR-4[d]	153.9-166.1									X						X						
Lower extent Devils Canyon (PRM 153.9)																						
MR-5[a]	148.4-153.9	X	X	X	X	X	X	X	X	X			X		X	X				X	X	X
MR-6[a]	122.7-148.4	X	X	X	X	X	X	X	X	X			X		X	X		X		X	X	X
MR-7[a]	107.8-122.7	X	X	X	X	X	X	X	X	X		X	X		X	X		X		X	X	X
MR-8[a]	102.4-107.8	X	X	X	X	X	X	X	X	X		X	X		X	X		X		X	X	X
LR-1[a]	87.9-102.4	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X			X	X
LR-2[a]	65.6-87.9	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X	X		X	X
LR-3[a]	44.6-65.6	X	X	X	X	X	X	X	X	X		X	X		X	X	X	X			X	X
LR-4[a]	32.3-44.6	X	X	X	X	X	X	X	X			X	X	X	X	X	X	X	X	X	X	X

- 18 species collected
- Fish observations
  - Middle River: 45,899
  - Lower River: 8,649
- Early Life History
  - > 2,000 juvenile salmon
- Rotary screw traps
  - Indian River (142): 4,551
  - Curry Station (124): 1,457
  - Talkeetna Station (107): 2,696
  - Montana Creek (81): 2,861
- PIT tagging
  - Over 5,000 fish tagged
  - 141 in hand recaptures (3%)
  - 649 detected at antennas (12%)
- Radio tagging
  - 158 fish tagged
  - 8 target species
- Fish collection for interrelated studies (8.5, 9.8, 9.14).

Study 9.6 Summary of Results in ISR (ISR Study 9.6, Part A – Section 5)

Tagging Macrohabitat			Detection/Recapture Macrohabitat: Main Channel: Main Channel	Main Channel: Split Main Channel	Main Channel: Total	Off-Channel: Side Slough	Off-Channel: SS Beaver Complex	Off-Channel: US Beaver Complex	Off-Channel: Total	Tributary: Single Channel	Tributary: Split Channel	Tributary: Tributary Mouth	Tributary: Total
Main Channel		Main Channel	3		3	34			34				
		Side Channel				7			7				
		Split Main Channel		3	3	61		5	66				
		Total	3	3	6	102		5	107				
Off-Channel		Side Slough				11			11				
		SS Beaver Complex				8	1		9				
		Upland Slough				1			1				
		UG Beaver Complex				18		31	49				
		Total				38	1	31	70				
Tributary		Complex Channel				3			3		3		3
		Single Channel				31			31	20	8		28
		Split Channel									1		1
		Tributary Mouth	3	3	6	30		3	33		69	8	77
		Total	3	3	6	64		3	67	20	81	8	109

Movements- Juvenile Coho Salmon

- 67% of all Coho Salmon re-sighted in off-channel habitat
- For Coho Salmon tagged in tributaries:
  - 60% re-sighted in tagging tributary
  - 37% moved to off-channel habitat

Tagging Macrohabitat			Detection/Recapture Macrohabitat: Main Channel: Main Channel	Main Channel: Side Channel	Main Channel: Split Main Channel	Main Channel: Total	Off-Channel: Side Slough	Off-Channel: SS Beaver Complex	Off-Channel: US Beaver Complex	Off-Channel: Total	Tributary: Not Reported	Tributary: Single Channel	Tributary: Split Channel	Tributary: Tributary Mouth	Tributary: Total
Main Channel		Main Channel	1	1		2	8			8		2			2
		Side Channel		1		1	23			23					
		Split Main Channel	1			1									
		Total	2	2		4	31			31		2			2
Off-Channel		Side Slough					26			26					
		SS Beaver Complex					3	1		4					
		US Beaver Complex					6		9	15					
		Total					36	2	7	45					
Tributary		Not Reported										7			7
		Single Channel					44			44	1	57			58
		Split Channel											2		2
		Tributary Mouth	1		2	3	4			4			18	10	28
		Total	1		2	3	48			48	1	64	20	10	95

Movements- Juvenile Chinook Salmon

- 84% tagged in main channel moved into side sloughs
- 100% tagged in off-channel re-sighted there
- For Chinook salmon tagged in tributaries:
  - 65% re-sighted in tagging tributary
  - 33% moved to off-channel habitat

Study 9.6 Fish Identification

Coho Salmon?

Study 9.6 Fish Identification

Chinook Salmon?

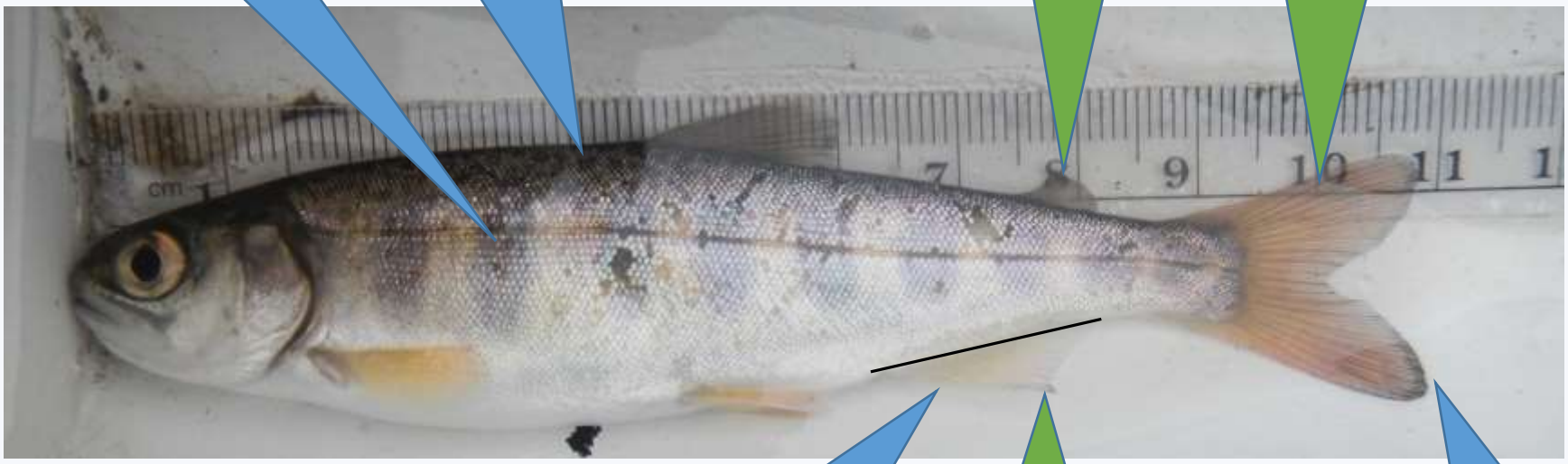
Study 9.6 Fish Identification

Large parr marks wider than interspaces

Large black spots on back above lateral line

Adipose fin pigmented, no clear "window"

Pale orange caudal and anal fin coloration



Chinook or Coho Salmon?

Anal fin not sickle-shaped, leading edge shorter than base

Remnant black edge on anal fin?

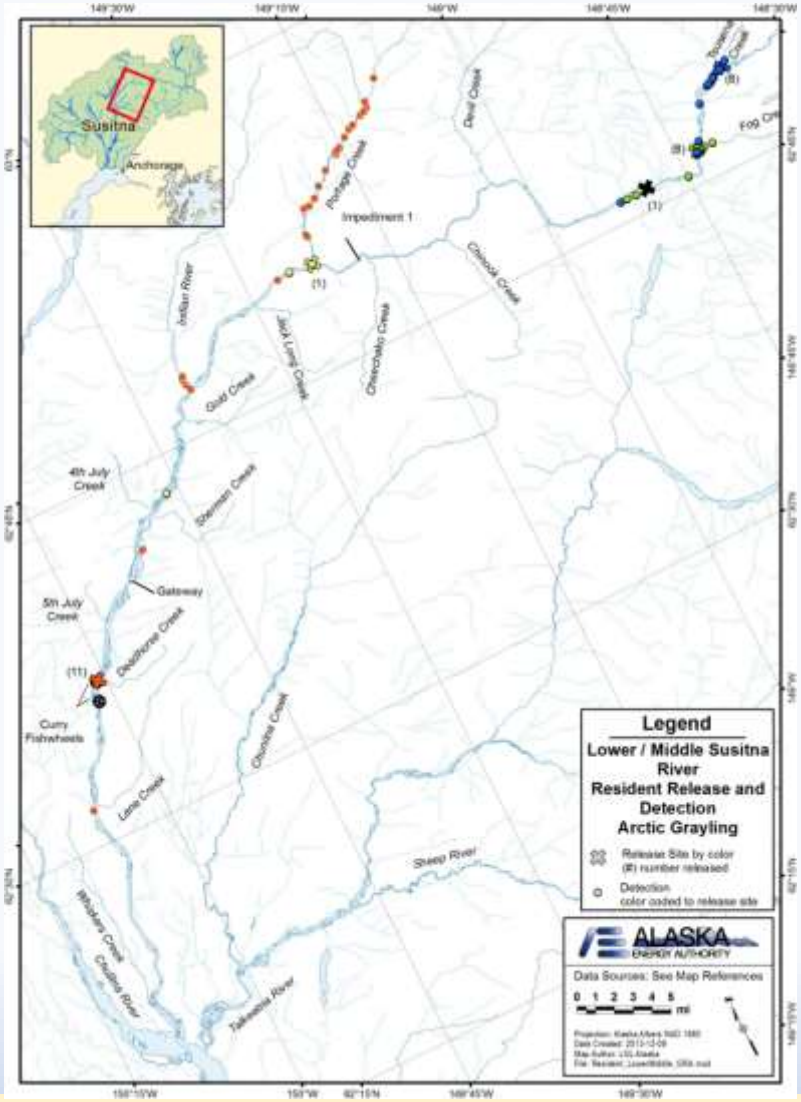
Caudal fin tipped in black

Study 9.6 Photo Review

- 4 independent blind reviewers of 41 unidentified juvenile salmonid photos
- 68% in agreement
- 8 instances when reviewers disagreed between Chinook and coho salmon
- 3 instances when reviewers disagreed between sockeye and chum salmon
- Reclassification of 436 SAM records

Reviewer 1	Reviewer 2	Reviewer 3	Initial Call	Frequency
25+ YOE	15 YOE	12 YOE	5 YOE	
Sockeye	Sockeye	Chum	Pac Sam Undif	2
Unk Sp	Salmonid	Chinook	Pac Sam Undif	2
Chinook	Pac Sam Undif	Chinook	Pac Sam Undif	2
Chinook	Chinook	Chinook	Pac Sam Undif	1
Coho	Coho	Chinook	Pac Sam Undif	3
Coho	Pac Sam Undif	Coho	Pac Sam Undif	10
Rainbow Trout	Pac Sam Undif	Coho	Pac Sam Undif	1
Chinook	Chinook	Coho	Pac Sam Undif	2
Coho	Coho	Coho	Pac Sam Undif	11
Chum	Chum	Sockeye	Chum	1
Coho	Coho	Rainbow Trout	Chinook	1
Chinook?	Chinook	Chinook	Coho	1
Coho	Coho	Chinook	Coho	1
Unk Sp	Pac Sam Undif	Coho	Sockeye	1
Unk Sp	Salmonid	GRA	Unk Sp	2

Study 9.6 Summary of Results in ISR (ISR Study 9.6, Part A – Section 5)



Radio Tagging: June-August 2013

- Arctic grayling moved from mainstem to tributaries/ tributary mouths
- Burbot little movement in mainstem
- Dolly Varden limited movement in large tributary streams
- Longnose sucker mainstem movement varied by fish
- Northern pike remained near tagging locations (PRM 34)
- Rainbow trout moved into tributaries for the summer
- Humpback whitefish moved downstream after tagging
- Round whitefish movement varied in mainstem and tributaries, upstream and downstream, some >35 RM

Study 9.6 Summary of Results since ISR (Winter Studies TM, September 2014)

2013-2014 Interdisciplinary Winter Studies

- 4 sampling events: November, February, March, & April
- 59 sites around 3 FAs (104, 128, and 138) repeat, opportunistic, and oversamples
- Fish Collection: minnow trap, Fyke net, electrofishing, trotline
- Fish Observation: underwater video and sonar
- Fish Tracking: radio and PIT telemetry

Study 9.6 Summary of Results since ISR

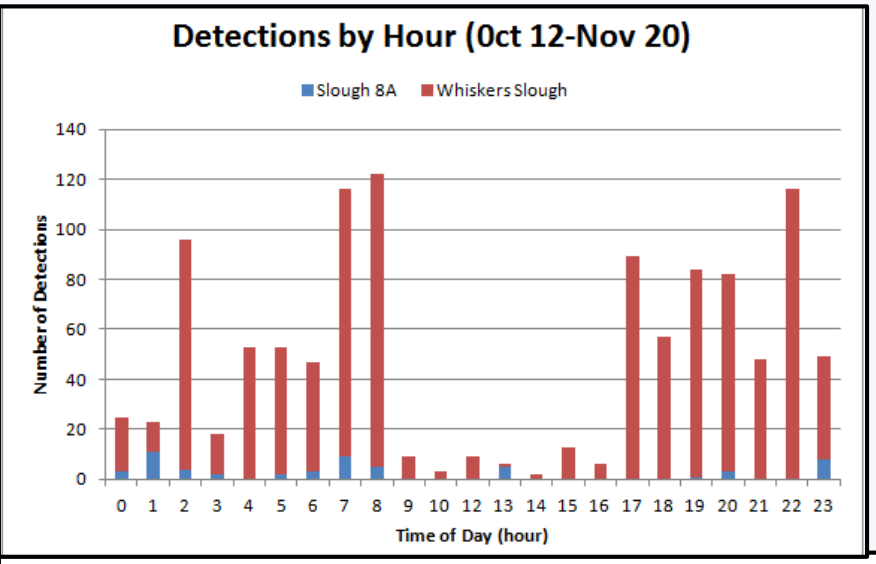
Underwater Video

Study 9.6 Summary of Results since ISR (Winter Studies TM, September 2014)

- 13 species
- Juvenile salmon species composition varied by location:
  - FA-104 (Whiskers Slough) primarily coho and Chinook salmon
  - FA-128 (Slough 8A) primarily sockeye, coho and chum salmon
  - FA-138 (Gold Creek) primarily coho followed by sockeye and chum salmon
- Fry emergence (Chinook, chum, coho and sockeye salmon) began mid-March

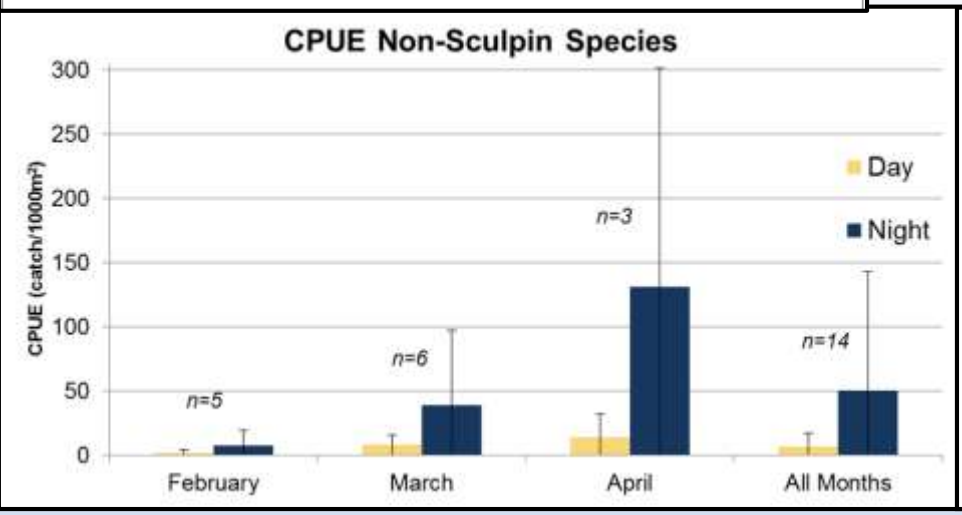
Gear type	Salmon, Chinook	Salmon, chum	Salmon, coho	Salmon, sockeye	Salmon, undifferentiated	Arctic grayling	Burbot	Dolly Varden	Lamprey, Arctic	Lamprey, undifferentiated	Longnose sucker	Salmonid	Sculpin	Stickleback, threespine	Stickleback, undifferentiated	Trout, rainbow	Unknown species	Whitefish, round	Whitefish, undifferentiated	Grand Total
Fyke net	65	65	214	131	10		7	1	2	23		2	78			2		4		604
Minnow trap	73		817	5	5		4						66	19		1				990
Electrofish	38	81	230	241	5	1	1			34	9	1	733			5				1,379
Trotline							3													3
Video[1]	11		131		861		1			1	3	84	44		7		583		2	1,728
Grand Total[2]	**187**	**146**	**1,392**	**377**	**881**	**1**	**16**	**1**	**2**	**58**	**12**	**87**	**921**	**19**	**7**	**8**	**583**	**4**	**2**	**4,704**

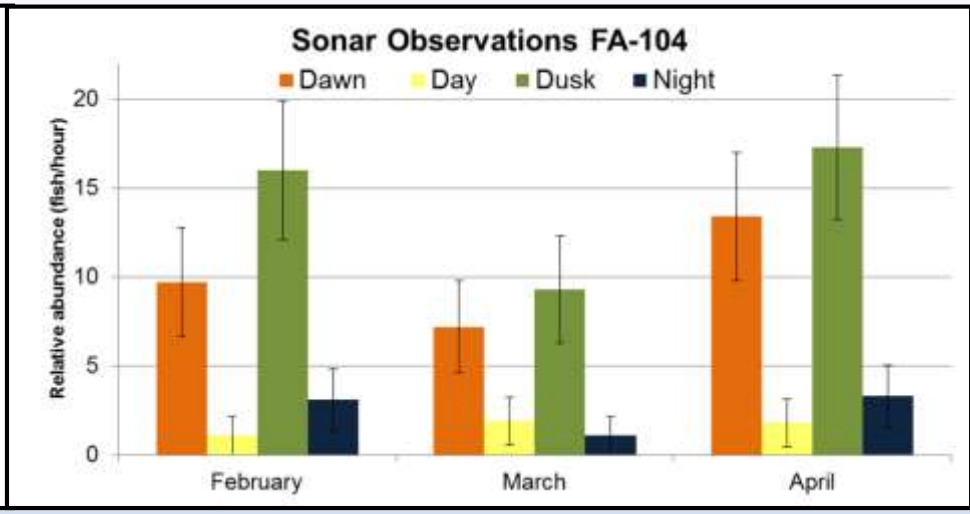
Study 9.6 Summary of Results since ISR (Winter Studies TM, September 2014)



Diel activity

- PIT detections highest dawn and night
- Paired electrofishing: 290 juvenile salmon at night vs 35 in day
- More sonar observations at dusk and dawn
- Juvenile salmon more active in dawn, dusk, night
- Pattern consistent across winter study period





Study 9.6 Summary of Results since ISR (Winter Studies TM, September 2014)

Winter Movement

- > 50% of juvenile coho salmon re-sighted in tagging Focus Area and macrohabitat
- Coho movements seen were mostly out of tributaries and to sloughs to overwinter

ISR Figure C.A1-17. Newly emerged pink salmon

			Winter Detection Location															
	FA/PRM		80.8	103.5	104					128				138		141	
		Macrohabitat	Tributary Array	Upland Slough	Side Channel	Side Slough	Side Slough Array	Upland Slough	Whiskers Cr.	Backwater	Side Channel	Side Slough	Side Slough Array	Side Slough	Upland Slough	Upland Slough	Indian River
Tagging Location	80.8	Tributary DMT															
	103.5	Upland Slough		6													
	104	Side Channel			1		1										
		Side Slough				3											
		Upland Slough			5	1	3	11									
		Whiskers Cr.					7		2								
	106.9	MC DMT					1	1									
	115	Upland Slough					3										
		Tributary			1												
	128	Backwater															
		Side Channel															
		Side Slough										2					
	138	Side Slough												11			
		Upland Slough													3		
	141	Upland Slough															
		Indian River													2		
		Tributary DMT					1	5							2		

Study 9.6 Summary of Results since ISR (Winter Studies TM, September 2014)

Winter Movement Middle/Lower River

- Arctic grayling utilized the mainstem Susitna River
  - Below Devils Canyon, fish from Indian River and Portage Creek overwintered in the mainstem between Indian River and Montana Creek.
  - Above Devils Canyon, fish overwintered in the Susitna River between Devils Island and the Watana Dam site.
- Burbot utilized the mainstem primarily between Montana Creek and Lane Creek , some winter movement documented.
- Longnose sucker had high winter mortality; located throughout the mainstem between Talkeetna and Slough 21
- Rainbow trout had minimal winter movements winter.
  - Fish tagged in Lower River primarily overwintered in the Susitna River between the Kashwitna River and Lane Creek.
  - Fish tagged in Middle River primarily overwintered in the Susitna River between Talkeetna and Slough 11.
- Northern pike exhibited little movement from release areas in Yentna or Deshka Rivers.
- Round whitefish limited movement in mainstem primarily overwintered from Sunshine to Slough 11.

Study 9.6 Summary of Results since ISR (Radio Tagging/Tracking)

Tags at Large

- Goal - up to 30 tags per species
- Monthly tags-at-large range from 0 (lake trout) to 25 (rainbow trout)
- Tracking continued in the Middle and Lower River over the winter and during fall and spring spawning seasons
- No tagging in Middle/Lower River in 2014 (except Arctic grayling above Devils Canyon in July)
- Most seasonal tagging events occur outside of spawning season

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	51	0	11	24	17	18	13	12	8	8	8	8	8	6	13	10	10
Burbot	14	0	2	2	4	4	3	3	2	2	2	1	1	1	1	1	6
Dolly Varden	9	0	1	5	6	4	4	3	3	3	3	3	3	3	2	1	1
Longnose Sucker	28	0	8	9	7	5	4	4	1	0	0	0	0	0	0	0	0
Northern Pike	5	0	0	0	3	3	3	3	3	3	3	3	3	2	2	2	2
Lake Trout	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Rainbow Trout	44	0	11	25	14	21	21	20	20	20	20	20	17	16	16	15	15
Humpback Whitefish	7	0	1	4	0	0	0	0	0	0	0	0	0	0	0	0	0
Round Whitefish	21	0	10	13	11	13	11	11	9	9	7	7	5	3	3	2	2

Study 9.6 Summary of Results since ISR (FDA Middle/Lower Update)

CIRWG and ARRC Sample Locations

- Locations on private lands not accessed in 2013 were sampled in 2014
  - Middle River Geomorphic Reach 7:
    - 3 tributary sites (2 FA) and backwater (FA)
  - Middle River Geomorphic Reach 6:
    - 2 tributary sites (1 FA), 1 clearwater plume, 1 upland slough
  - Middle River Geomorphic Reach 5:
    - 1 main channel (FA), 1 tributary (FA), 2 tributary mouths (1 FA), 1 clearwater plume (FA; partial sample in 2013)
  - Middle River Geomorphic Reach 2:
    - 1 main channel, 4 tributary sites (1 FA), 1 tributary mouth, 6 upland sloughs (3 FA)
- Direct Sample Tributaries: 2 days of effort each
  - Cheechako Creek
  - Chinook Creek- partial sample 2013
  - Devil Creek
  - Unnamed Tributary PRM 184
  - Tsusena Creek- partial sample 2013

AEA Proposed Modifications to Study 9.6 in ISR (ISR Study 9.6, Part C – Section 7.1.2)

- Combine main channel, split main channel, and multi-split main channel into one strata for the purposes of GRTS site selection in the Middle River (Section 7.1.2.2)
- 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 7.1.2.6.1)
- Abandon multiple-pass sampling efforts for relative abundance in favor of consistent and rigorous single pass sampling for generating meaningful CPUE estimates (Section 7.1.6.2)
- Operate three rotary screw traps in the Middle River and one trap in the Lower River. The location of select rotary screw traps will be adjusted to improve catch (Section 7.1.2.3)
- PIT tagging of target species will continue to occur during FDA sampling within Focus Areas, at rotary screw traps, and during all sampling activities in close proximity to PIT interrogation antennas. AEA plans to continue to PIT tag fish at capture locations until 4,000 tags (1,000 tags x four PIT antennas) have been allocated per target species in the entire Middle/Lower River segments. The location of PIT interrogation antenna sites will be adjusted to improve channel coverage/detections (Sections 7.1.2.3 & 7.1.2.4.2)
- Biotelemetry studies will continue and fish will be radio tagged during non-spawning periods and prior to important spawning, overwintering, or foraging periods so that tags are active during these times (Section 7.1)

Current Status and Steps to Complete Study 9.6

Completed Activities:

- Winter Fish Studies Pilot Season (2012-2013)
- Salmon Early Life History (2013, 2014)

Activities with One Year Completed and Future Work Planned:

- FDA – Rotary Screw Trap Operation (2013)
- FDA- PIT Antenna Operation (2013)
- FDA- Radio Tagging and Tracking (2013)
- FDA- Fish Sampling (2013)
- Winter Fish Studies (2013-2014)
- FDA – Sampling CIRWG and ARRC Sites (2014)

Steps to Complete Study 9.6 (ISR Study 9.6, 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:

- **Salmon early life history field sampling efforts were completed in 2013 and 2014. 2015 efforts include data analysis and integration** with other studies (8.5 Objective 8: Juvenile Fish Stranding and Trapping)

Steps to Complete Study 9.6 (ISR Study 9.6, Part C – Section 7.1)

- **Fish distribution and abundance sampling** activities in the mainstem Susitna River and select tributaries in the Study Area to support AEA's efforts to:
  - Describe the **seasonal distribution, relative abundance** (as determined by 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 with emphasis on identifying foraging, spawning, and overwintering habitats within the mainstem of the Susitna River (Study Objective 2)
  - Characterize the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type (Study Objective 5)
  - Document the seasonal distribution, relative abundance, and habitat associations of **invasive species** (lake trout and northern pike) (Study Objective 6)
  - **Tissue samples** collection to support the Fish Genetic Baseline Study (Study Objective 7; Study 9.14)

Steps to Complete Study 9.6 (ISR Study 9.6, 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's efforts to:
    - 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 with emphasis on identifying foraging, spawning, and overwintering habitats within the mainstem of the Susitna River (Study Objective 2)
    - Document the winter movements and timing and location of spawning for burbot, humpback whitefish, and round whitefish (Study Objective 4)
    - Document the seasonal distribution, relative abundance, and habitat associations of **invasive species** (lake trout and northern pike) (Study Objective 6)
- AEA will continue to operate four **rotary screw traps** in the Middle/Lower River Study Area to support describing seasonal movements of juvenile salmonids and selected fish species (Study Objective 2) and early life history (Study Objective 3).

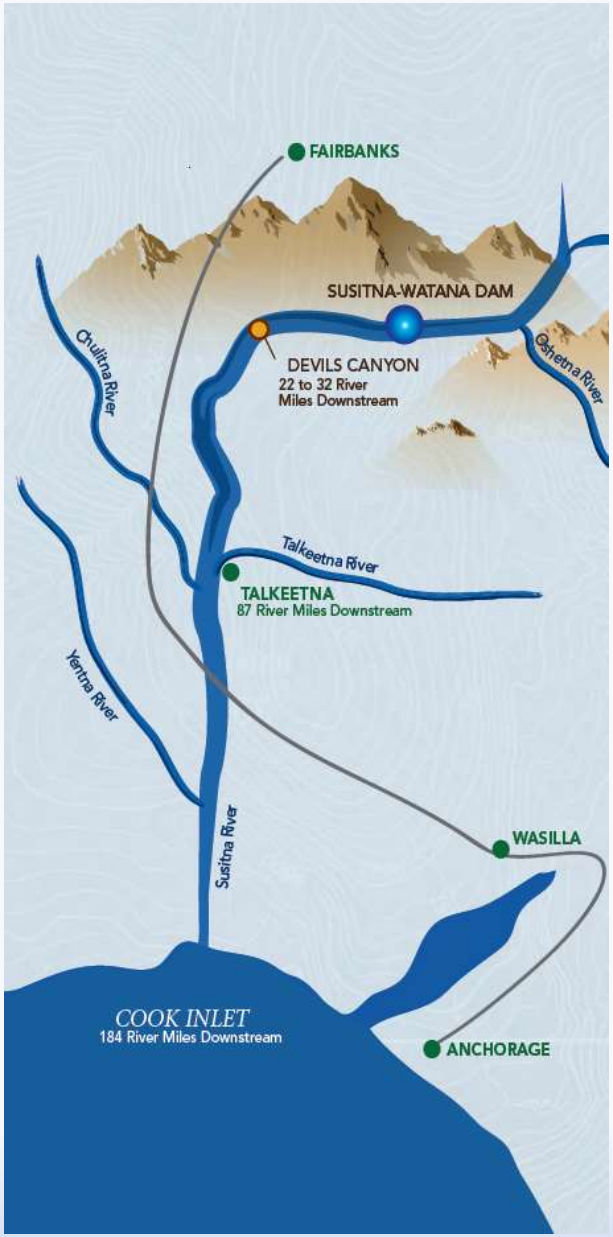
Steps to Complete Study 9.6
(Winter Studies TM, September 2014)

Winter Fish Studies will continue to support AEA's efforts to:

- Describe overwintering habitat associations of juvenile anadromous salmonids, non-salmonid anadromous fishes and resident fishes.
- Use biotelemetry to describe winter movements of juvenile salmonids and selected fish species such as Arctic grayling, burbot, Dolly Varden, lamprey, northern pike, rainbow trout, humpback whitefish, and round whitefish within select Focus Areas (Study Objectives 2 & 4).
- Describe early life history, diurnal behavior, timing, and movements of anadromous salmonids (Study Objective 3).
- Document the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type (Study Objective 5).
- Collect tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish (Study Objective 7) to support the Fish Genetic Baseline Study (ISR Study 9.14).

Licensing Participants Proposed Modifications to Study 9.6?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.7 Salmon Escapement

October 15, 2014

Prepared by
LGL Alaska and ADF&G

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

- 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)
- 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)
- Characterize adult salmon migration behavior and timing within and above Devils Canyon (ISR Part A, Section 4.3; pg 16)
- Use available technology to document salmon spawning locations in turbid water (ISR Part A, Section 4.4; pg 18)
- 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)
- Generate counts of adult Chinook salmon spawning in the Susitna River and its tributaries (ISR Part A, Section 4.6; pg 21)
- Collect tissue samples to support the Fish Genetics Study (ISR Part A, Section 4.7; pg 22)
- 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 (2013)

- Due to CIRWG land access limitations, AEA did not operate a fishwheel in Devils Canyon to supplement the Middle River fishing effort for Chinook salmon (see Section 4.1.8.1). Instead, **AEA increased the tagging goal (from 400 to 560) and fishing effort at the Curry fishwheels. (RSP Section 9.7.4.1)**
- AEA operated a floating picket weir and underwater video system on the Indian River in 2013 to sample adult salmon for mark rates and size distributions (to test capture probabilities at the tag and recovery locations; see Section 4.1.8.3). The Study Plan (RSP Section 9.7.4.1.5) indicated these samples would be collected on selected spawning grounds
- Due to CIRWG 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. Because of this, AEA added six new fixed-station receiver sites (see Section 4.2.4). In addition, to compensate for the absence of fixed stations within Devils Canyon (RSP Section 9.7.4.3), **helicopter surveys for tagged fish were flown through Devils Canyon daily** starting in late June, and twice daily during the period of Chinook salmon passage (see Section 4.3.5)
- Due to high stream discharges, it was not safe or feasible to operate weirs as recapture sites on Willow and Lake Creeks, or the Talachulitna and Middle Fork Chulitna rivers. Instead of Willow Creek, **Montana Creek was selected as a weir site in 2013; and sonar was operated on the Talachulitna and Middle Fork Chulitna rivers.** (RSP Section 9.7.4.8; see Section 4.8.1 for more detail)

Study 9.7 Summary of Results in ISR (ISR Study 9.7, Part A – Section 5)

Basin wide, 2013

- **Tagging goals for Chinook salmon were achieved** in the Middle Susitna, Lower Susitna, and Yentna rivers. AEA tagged 603 Chinook salmon (536 large, 67 small) in the Middle Susitna River, and ADF&G tagged 698 large Chinook salmon in the Lower Susitna River and 692 large Chinook salmon in the Yentna River.

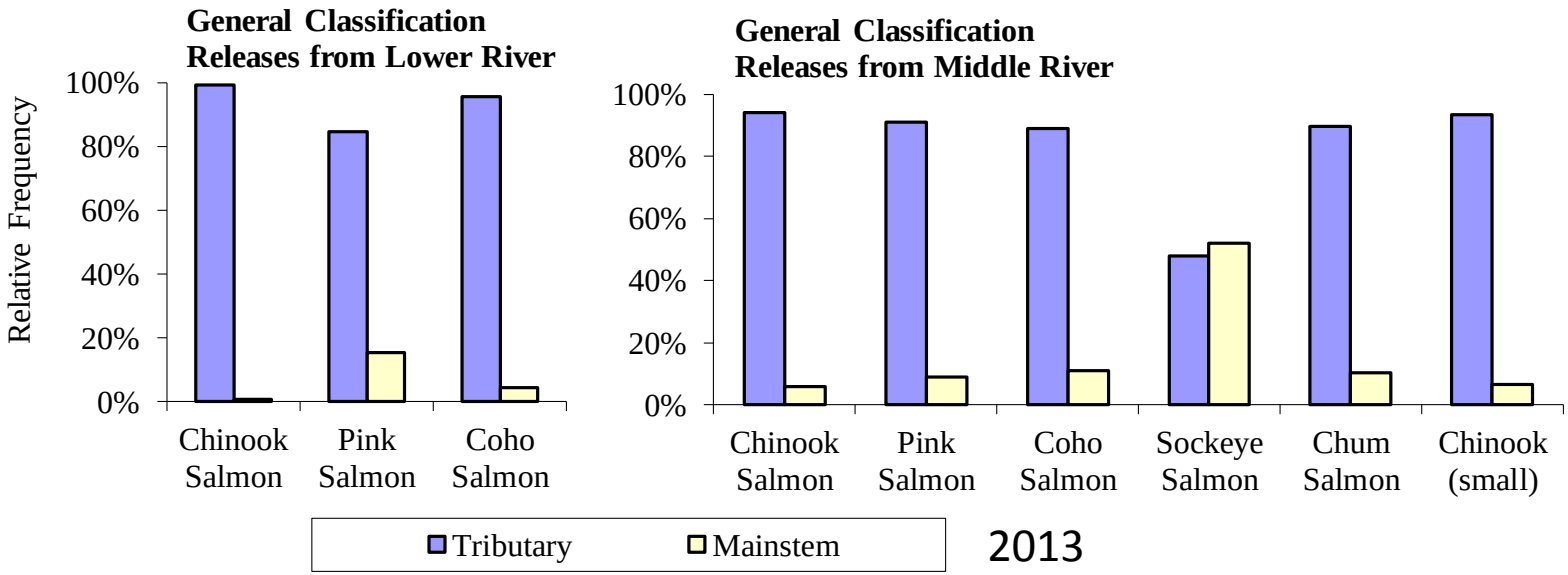
- **Chinook salmon continued to be the only salmon species tracked above Devils Canyon.** In 2013, 3 Chinook salmon radio-tagged in the Middle Susitna passed upstream of Devils Canyon, and did so at water discharges of 14,400, 16,700, and 18,800 cfs.

- Of the **3 radio-tagged Chinook salmon passing Devils Canyon**, one tag moved into Devil Creek, one into Tsusena Creek, and the other moved back downstream of Devils Canyon into Portage Creek.

- The estimated escapement of Chinook salmon to the Susitna River above the Yentna River confluence was 89,463 (SE = 9,523).

- The estimated escapement of coho salmon to the Susitna River above the Yentna River confluence was 130,026 (SE = 24,342).

Study 9.7 Summary of Results in ISR (ISR Study 9.7, Part A – Section 5)



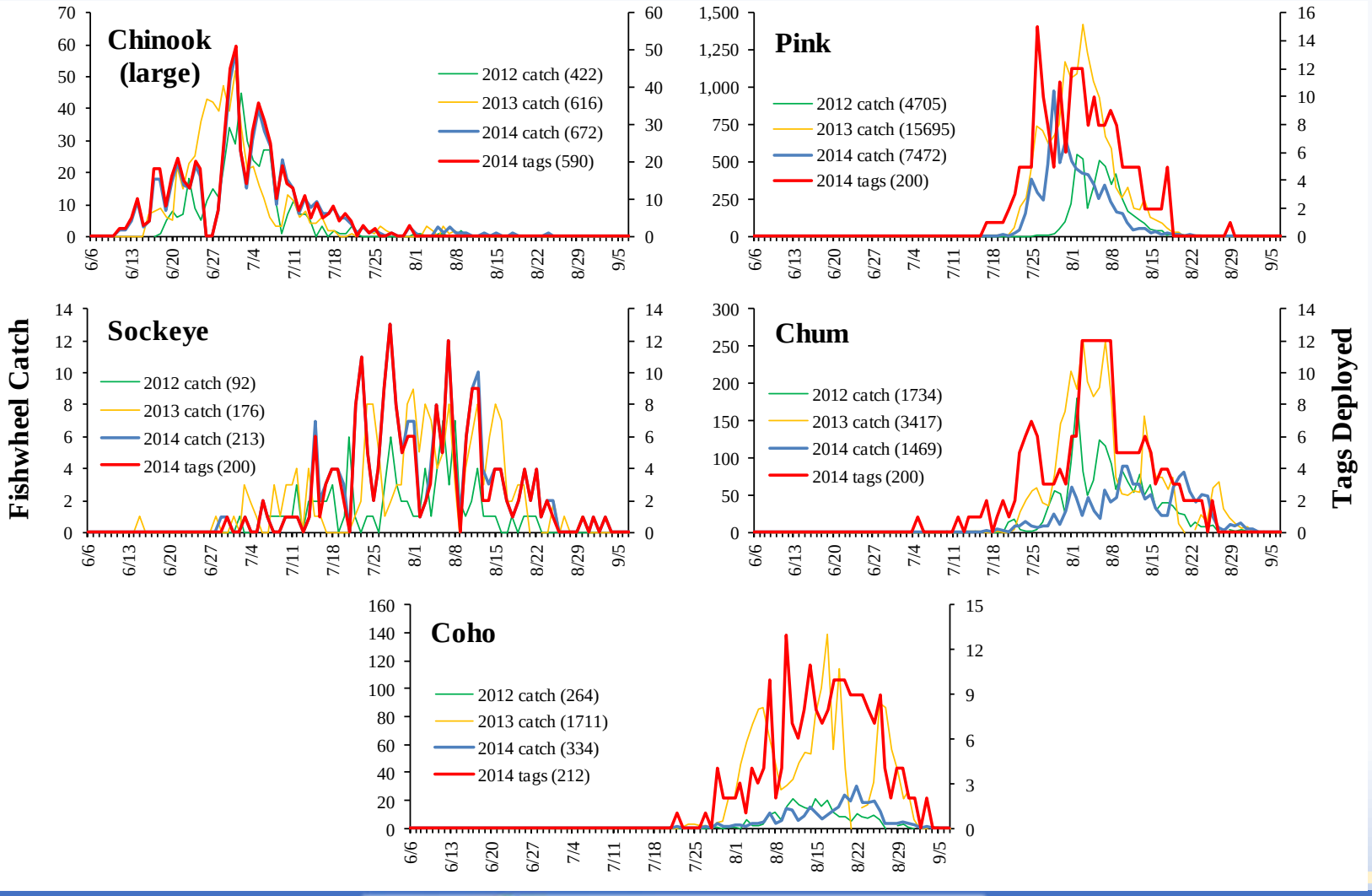
AEA Proposed Modifications to Study 9.7 in ISR (ISR Study 9.7, Part C – Section 7.1.2)

- On the Yentna River, **use fishwheels at a new site for recapture**, instead of weirs, and deploy fewer Chinook salmon radio tags (RSP Section 9.7.4.1 and 9.7.4.8).
- Use beach seining in September near Curry, instead of fishwheels, to capture and radio-tag salmon (RSP Section 9.7.4.1.1 and FERC SPD).
- **Operate three fishwheels near Curry**, instead of two, and not operate a fishwheel at Devils Canyon (RSP Section 9.7.4.1.1).
- **Radio tag 650 Chinook salmon at Curry** (550 large, 100 small) (RSP Section 9.7.4.1).
- Operate a picket weir and underwater video system on the Indian River to enumerate tagged and untagged Chinook salmon (RSP Sections 9.7.4.1.3 and 9.7.4.1.5).
- Tag fish at the Curry fishwheels as soon as they are caught, thus precluding the need to examine any effects of holding times and density (RSP Section 9.7.4.1.6).
- Not use sex and age composition of radio-tagged fish to assess fishwheel selectivity (RSP Section 9.7.4.1.7).
- **Increase the frequency of aerial telemetry surveys** in the Middle River between Curry and Impediment 1 to every three days (RSP Section 9.7.4.2.2).
- Change some of the fixed-station receiver sites that were proposed in the Study Plan (RSP Section 9.7.4.2.1).
- Use ARIS sonar only to confirm Chinook salmon spawning activity in turbid waters (RSP Section 9.7.4.4.2).

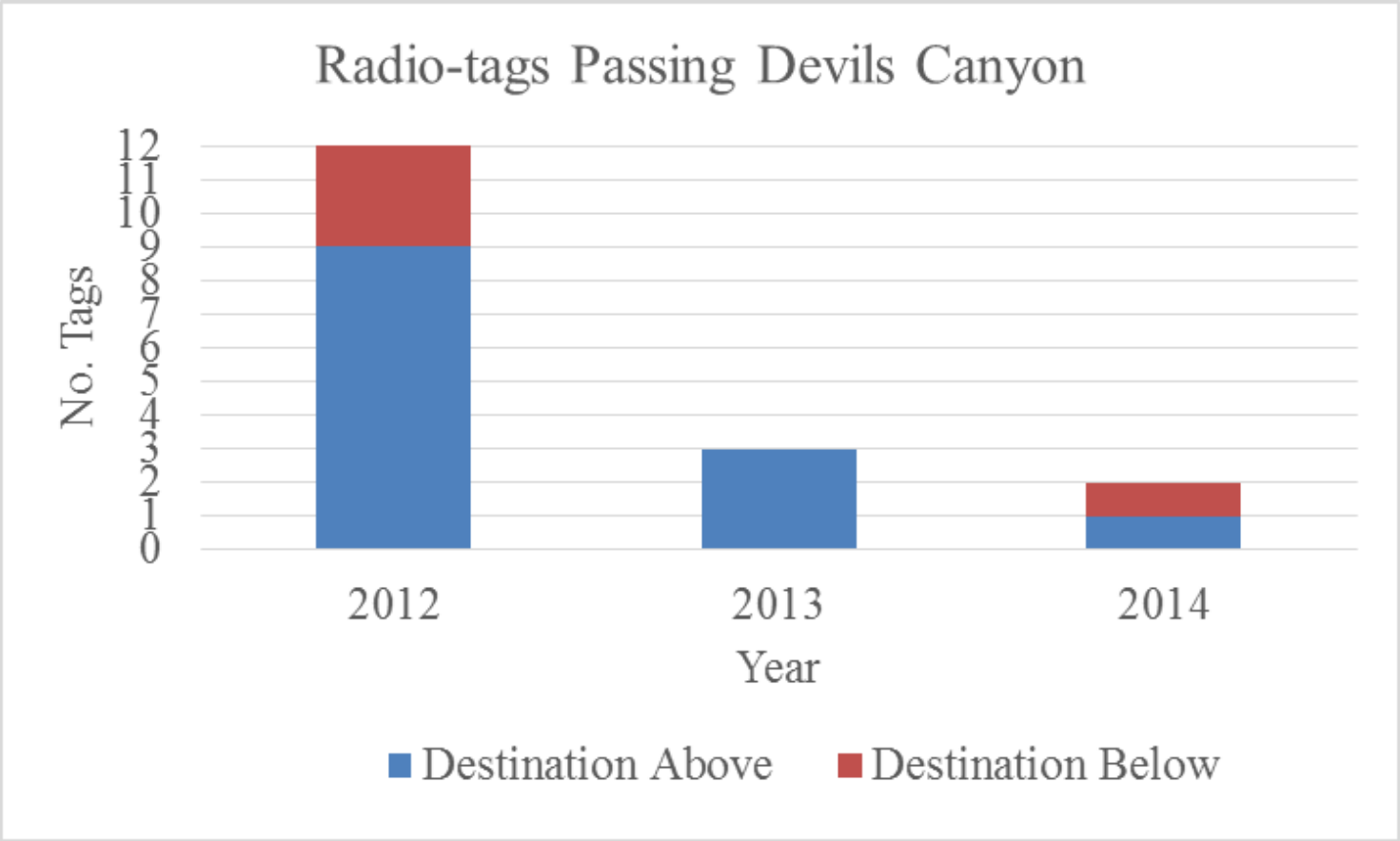
Study 9.7 Summary of Results since ISR

(Salmon Escapement Study 9.7 – September 2014 Technical Memo)

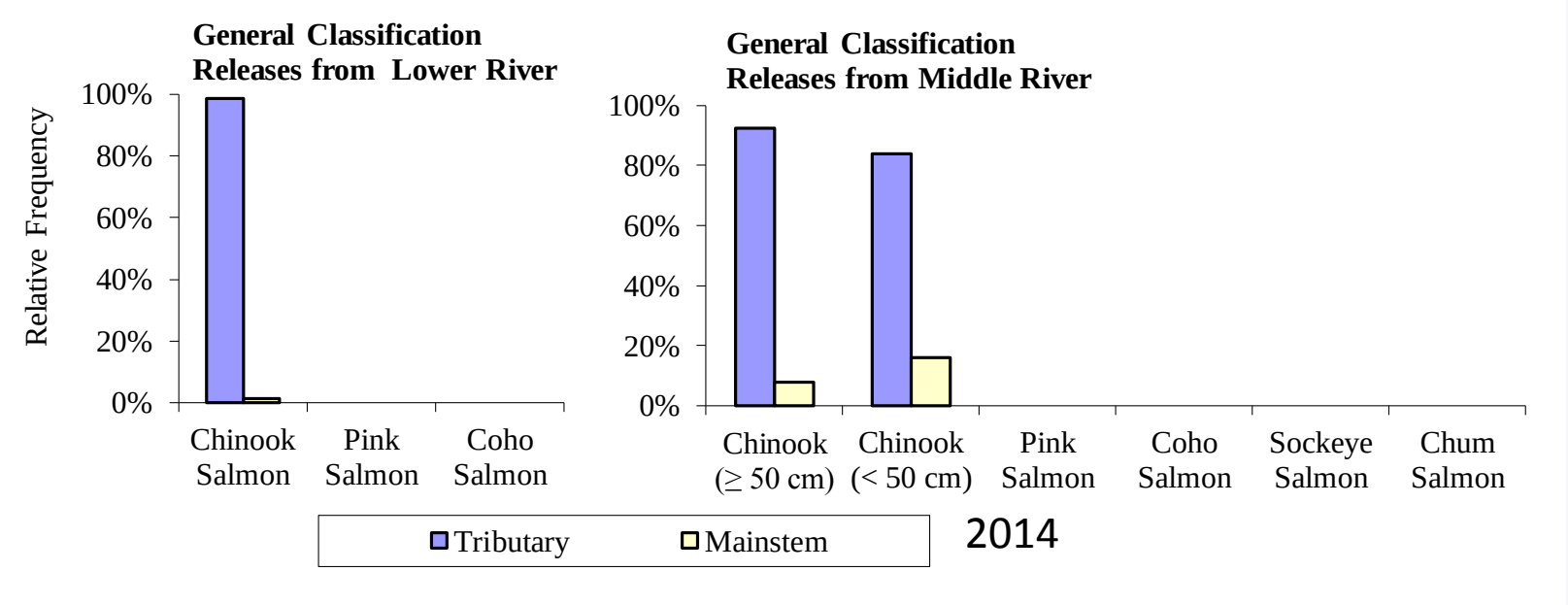
Middle River released



Study 9.7 Summary of Results since ISR
(Salmon Escapement Study 9.7 – September 2014 Technical Memo)



Study 9.7 Summary of Results since ISR
(Salmon Escapement Study 9.7 – September 2014 Technical Memo)



Data for pink, coho, sockeye and chum salmon are being processed

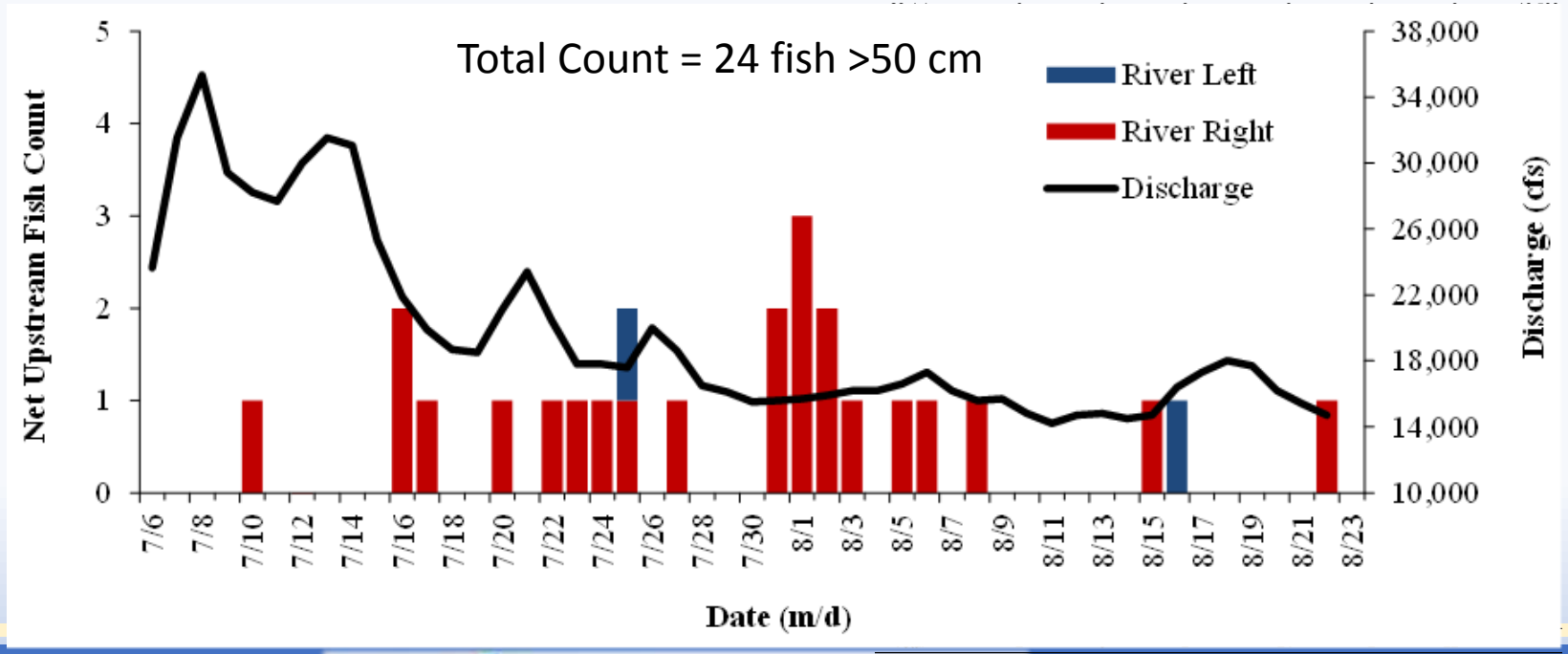
Decision Points from Study Plan
(Salmon Escapement Study 9.7 – September 2014 Technical Memo)

FERC SPD request

Decision Points from Study Plan (Salmon Escapement Study 9.7 – September 2014 Technical Memo)

Sonar at dam site demonstrated as feasible in 2013; 2 stations installed on July 6, 2014.

	River Left			River Right			
	Fish Count			Fish Count			
Date	Upstream	Down-stream	Net Upstream	Upstream	Down-stream	Net Upstream	Mean Discharge (cfs)
6-Jul	0	0	0				23,648
7-Jul	0	0	0	0	0	0	31,521
8-Jul	0	0	0	0	0	0	35,331
9-Jul	0	0	0	0	0	0	29,431
10-Jul	0	0	0	1	0	1	28,232
11-Jul	0	0	0	0	0	0	27,668
12-Jul	0	0	0	0	1	-1	30,000
13-Jul	0	0	0	0	0	0	31,527
14-Jul	0	0	0	0	0	0	31,069
15-Jul	0	0	0	0	0	0	25,300
16-Jul	0	0	0	2	0	2	21,900
17-Jul	0	0	0	1	0	1	19,900
18-Jul	0	0	0	0	0	0	18,700
19-Jul	0	0	0	1	1	0	18,500
20-Jul	0	0	0	1	0	1	21,100
21-Jul	0	0	0	0	0	0	23,400
22-Jul	0	0	0	1	0	1	20,400
23-Jul	0	0	0	1	0	1	17,800
24-Jul	0	0	0	1	0	1	17,800
25-Jul	1	0	1	1	0	1	17,600
26-Jul	0	0	0	0	0	0	20,000
27-Jul	0	0	0	1	0	1	18,600

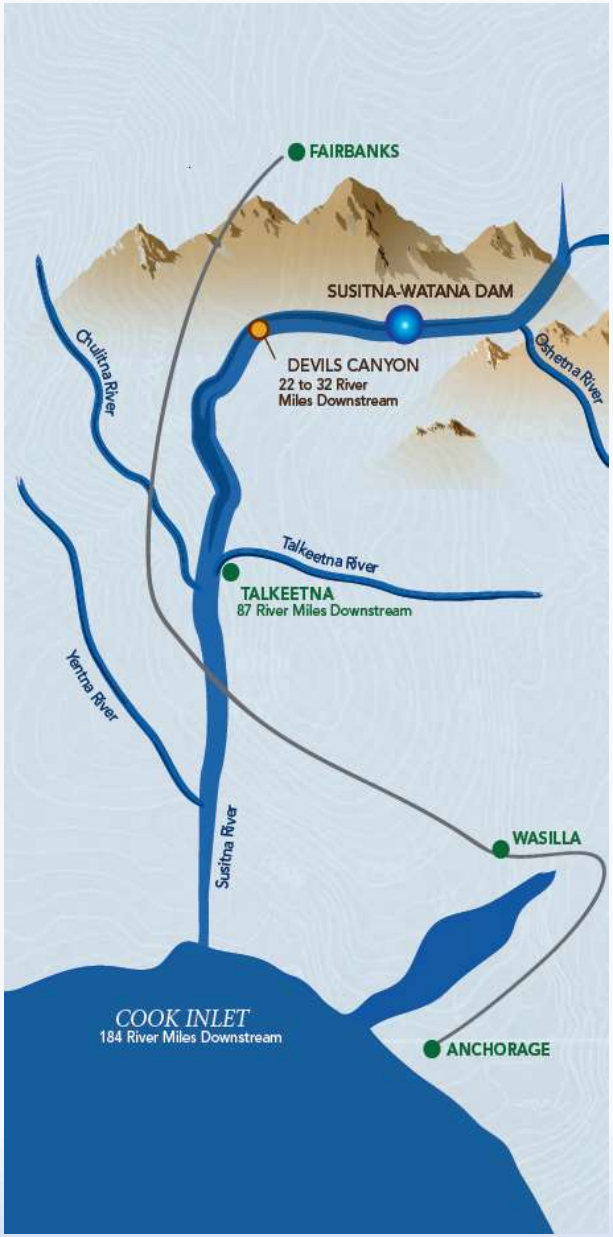


Current Status and Steps to Complete Study 9.7

- All data collection for Chinook salmon is complete.
- Data collection for pink, chum, sockeye and coho salmon will be completed during fourth quarter 2014.
- Analyses of and reporting on for Chinook salmon is complete except for a basin wide population estimate (Objective 8).
- Analysis and reporting for pink, chum, sockeye and coho salmon will be completed during fourth quarter 2014, except for a basin wide population estimate of coho (Objective 8).
- USR - Comprehensive assembly of data and results from study activities in 2012, 2013, and 2014 will be complete by March.

Licensing Participants Proposed Modifications to Study 9.7?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.8 River Productivity

October 15, 2014

Prepared by

R2 Resource Consultants, Inc.

Alaska Cooperative Fish and Wildlife Research Unit, University of Alaska Fairbanks

Study 9.8 Objectives

- Synthesize existing literature on the impacts of hydropower development and operations on benthic communities
- **Characterize the pre-Project benthic macroinvertebrate and algal communities with regard to species composition and abundance in the Middle and Lower Susitna River**
- **Estimate drift of benthic macroinvertebrates in selected habitats within the Middle and Lower Susitna River to assess food availability to juvenile and resident fishes**
- Conduct a feasibility study in 2013 to evaluate the suitability of using reference sites on the Talkeetna River to monitor long-term Project-related change in benthic productivity
- **Conduct a trophic analysis to describe the food web relationships within the current riverine community within the Middle and Lower Susitna River**
- Develop habitat suitability criteria for Susitna benthic macroinvertebrate and algal habitats to predict potential change in these habitats downstream of the proposed dam site
- **Characterize the invertebrate compositions in the diets of representative fish species in relationship to their source (benthic or drift component)**
- Characterize organic matter resources (e.g., available for macroinvertebrate consumers) including coarse particulate organic matter, fine particulate organic matter, and suspended organic matter in the Middle and Lower Susitna River
- **Estimate benthic macroinvertebrate colonization rates in the Middle Susitna Segment under pre-Project baseline conditions to assist in evaluating future post-Project changes to productivity in the Middle Susitna River**

Study 9.8 Components

- Synthesize existing information on the impact of hydropower development and operations (ISR Part A, Section 4.3; pg 8)
- Characterize the pre-Project benthic macroinvertebrate and algal communities in the Middle and Lower Susitna River (ISR Part A, Section 4.4; pg 9)
- Estimate drift in selected habitats within the Middle and Lower Susitna River (ISR Part A, Section 4.5; pg 15)
- Conduct a feasibility study in 2013 to evaluate the suitability of using reference sites on the Talkeetna River (ISR Part A, Section 4.6; pg 17)
- Conduct a trophic analysis to describe the food web relationships within the Middle and Lower Susitna River (ISR Part A, Section 4.7; pg 18)

Study 9.8 Components

- Generate habitat suitability criteria for Susitna benthic macroinvertebrate and algal (ISR Part A, Section 4.8; pg 23)
- Characterize the invertebrate compositions in the diets of representative fish species (ISR Part A, Section 4.9; pg 23)
- Characterize organic matter in the Middle and Lower Susitna River (ISR Part A, Section 4.10; pg 25)
- Estimate benthic macroinvertebrate colonization rates in the Middle River under pre-Project baseline conditions (ISR Part A, Section 4.11; pg 26)

Study 9.8 Variances

- Lower River site was moved from Trapper Creek to Montana Creek (IP Section 2.1.3). See ISR Section 4.2.4.1.
- Sampling at the FA-173 (Stephan Lake Complex) upland slough replaced by small unnamed tributary mouth (FERC SPD, B-181). See ISR Section 4.2.4.2.
- Storm event sampling at side slough at FA-173 (Stephan Lake Complex) instead of FA-144 (Slough 21); upper and lower end sites not established (RSP Section 9.8.4.3; IP Section 2.1.2). See ISR Sections 4.2.4.3 and 4.4.3.2.
- Frequent and rapid river stage changes limited sampling sites available with 30-day periods of continuous inundation (RSP Section 9.8.4.3; IP Section 2.2.1). See ISR Section 4.4.3.1.
- Number of depth and velocity measures intended to evaluate shoreline bathymetry reduced for each Hess sample (RSP Section 9.8.4.3; IP Section 2.2.1). See ISR Section 4.4.3.1.
- Algae samples were taken from stones and woody debris as opposed to fine sediment in grab samples (FERC SPD, B-187). See ISR Section 4.4.3.3.
- Plankton tows were conducted at 5 still water sites instead the potential total of 11 recommended by FERC (FERC SPD, B-188). See ISR Section 4.5.1.1.

Study 9.8 Variances

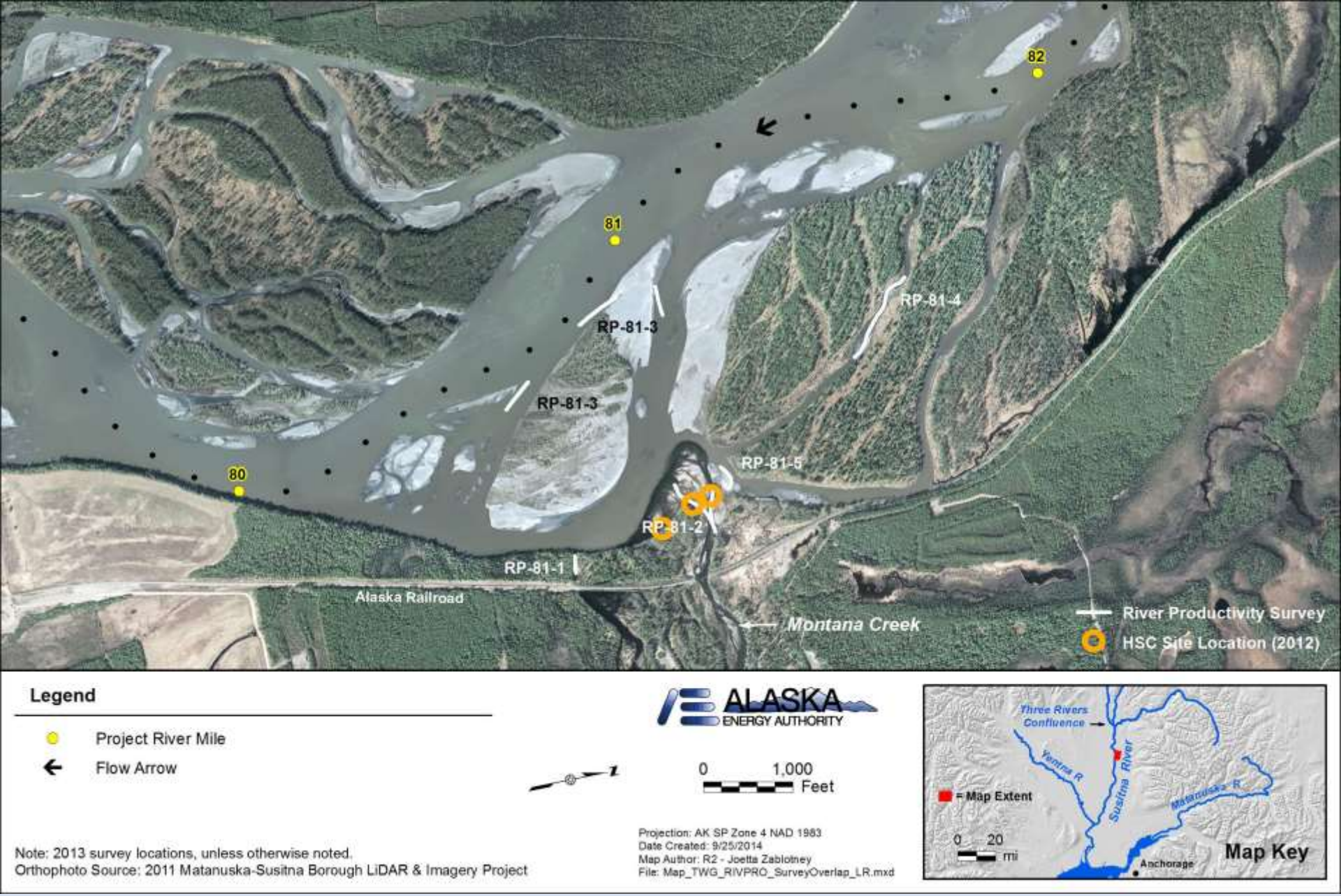
- Dry weights for macroinvertebrate taxa will be estimated using length-weight relationship data from UAF (RSP Section 9.8.4.3; IP Section 2.2.2.). (ISR Part A, Section 4.4.3.4)
- The Talkeetna reference station features a side channel, side slough, and upland slough, and does not include a main channel macrohabitat type (IP Section 2.1.4). (ISR Part A, Section 4.6.1)
- Stable isotope site selection was increased from the original two stations (3 sites each) to four stations, sampling 16 sites total (IP Section 2.11.1; FERC SPD, B-201). (ISR Part A, Section 4.7.3.1)
- Macrohabitat-specific subcutaneous dye marking was not used to track movements of juvenile chinook, coho or rainbow trout less than 60 mm long (FERC SPD, B-199). (ISR Part A, Section 4.7.3.2)
- Fish stomach content samples were not assessed in the field as to whether the stomach was empty or not (IP Section 2.8.1.). (ISR Part A, Section 4.9.1.1)
- Dry weights for prey items in stomach contents will be estimated using length-weight relationship data from UAF (IP Section 2.8.2.). (ISR Part A, Section 4.9.1.2)
- Hester-Dendy Samplers were not pre-conditioned before deployment (IP Section 2.9.1). (ISR Part A Section 4.11.1)

Study 9.8 Summary of Results in ISR (ISR Study 9.8, Part A – Section 5)

- Benthic samples collected from 20 study sites on the Lower and Middle Susitna River, plus 3 Talkeetna River sites, during three 2013 seasonal events and processed by taxonomic laboratory:
  - 940 benthic samples (Hess, algae, LWD, and petite Ponar samples)
  - 221 seston samples (drift samples and plankton tows)
  - 45 adult emergence traps
  - 105 Hester-Dendy samples for colonization study

- For benthic algae, chlorophyll-a and AFDM (biomass) levels were lower in mainstem macrohabitats than off-channel habitats. Some side channels with lower flow also had increased algal levels

- Trophic Analysis efforts collected a total of 1,242 sample components, in support of trophic modeling and stable isotope analyses
  - 261 juvenile Chinook and coho salmon, juvenile and adult rainbow trout collected for fish stomach content, scale aging analyses, and stable isotopes from fin clips
  - Benthic macroinvertebrates, benthic algae, benthic organic matter
  - Invertebrates and organic matter in drift samples
  - Salmon carcasses


82
81
80
RP-81-4
RP-81-3
RP-81-3
RP-81-5
RP-81-2
RP-81-1
Alaska Railroad
Montana Creek
River Productivity Survey
HSC Site Location (2012)
Legend
Project River Mile
Flow Arrow
ALASKA ENERGY AUTHORITY
0 1,000 Feet
Three Rivers Confluence
Yentna R
Susitna River
Matanuska R
Map Extent
0 20 mi
Anchorage
Map Key
Note: 2013 survey locations, unless otherwise noted.
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project
Projection: AK SP Zone 4 NAD 1983
Date Created: 9/25/2014
Map Author: R2 - Joetta Zablotney
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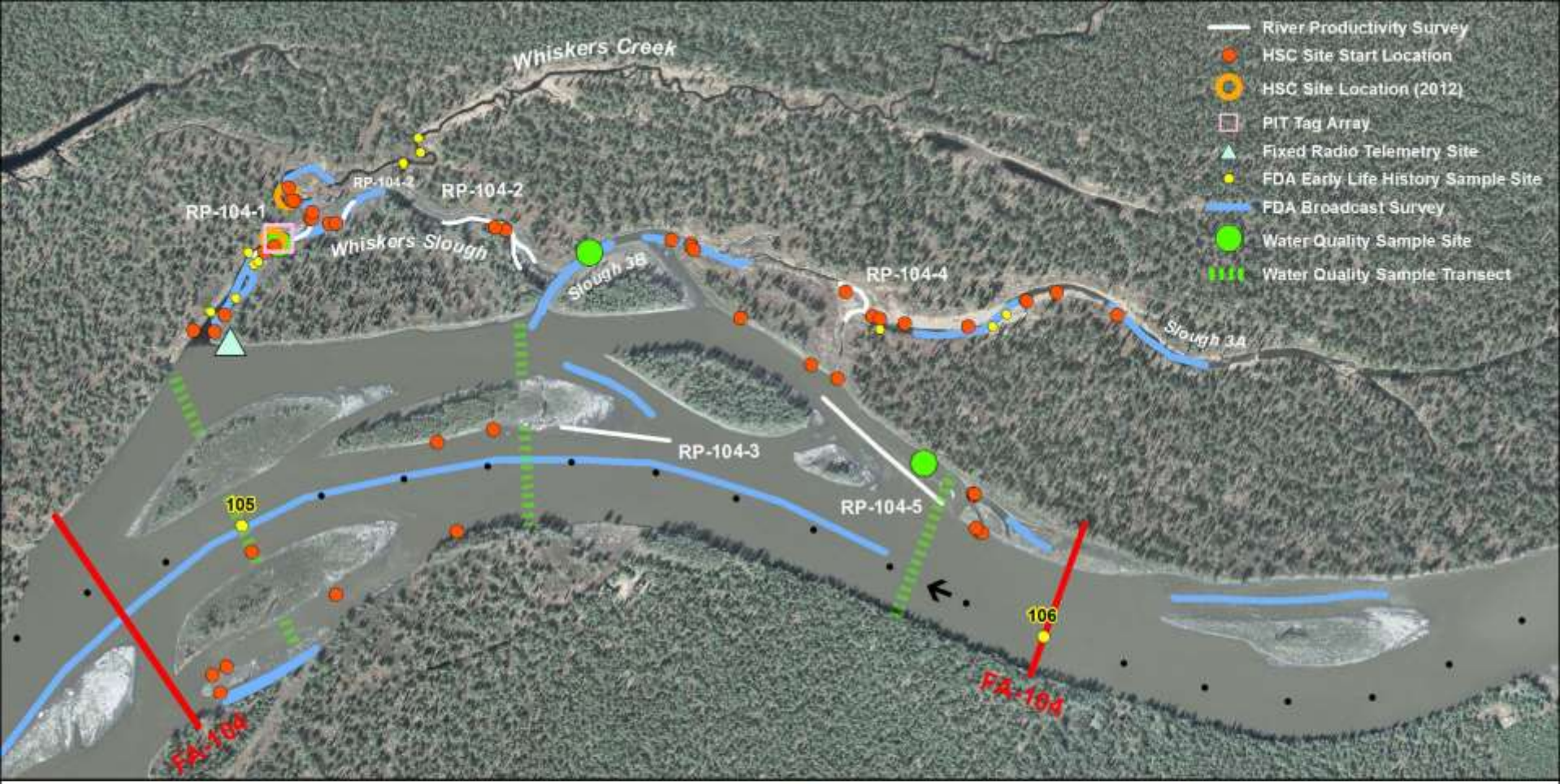


Legend

- Instream Flow Focus Area (Upper and Lower Extent)
- Project River Mile
- Flow Arrow

Note: 2013 survey locations, unless otherwise noted.
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project

ALASKA ENERGY AUTHORITY

0 1,000 Feet

Projection: AK SP Zone 4 NAD 1983
Date Created: 9/25/2014
Map Author: R2 - Joetta Zablotney
File: Map_TWG_RIVPRO_SurveyOverlap.mxd

Legend

- Instream Flow Focus Area (Upper and Lower Extent)
- Project River Mile
- Flow Arrow

Note: 2013 survey locations, unless otherwise noted.
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project

ALASKA ENERGY AUTHORITY

0 1,000 Feet

Projection: AK SP Zone 4 NAD 1983
Date Created: 9/25/2014
Map Author: R2 - Joetta Zablotney
File: Map_TWG_RIVPRO_SurveyOverlap.mxd

Legend

- Instream Flow Focus Area (Upper and Lower Extent)
- Project River Mile
- Flow Arrow

Note: 2013 survey locations, unless otherwise noted.
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project

ALASKA ENERGY AUTHORITY

0 1,000 Feet

Projection: AK SP Zone 4 NAD 1983
Date Created: 9/25/2014
Map Author: R2 - Joetta Zablotney
File: Map_TWG_RIVPRO_SurveyOverlap.mxd

Legend

- Instream Flow Focus Area (Upper and Lower Extent)
- Project River Mile
- Flow Arrow

Note: 2013 survey locations, unless otherwise noted.
Orthophoto Source: 2011 Matanuska-Susitna Borough LiDAR & Imagery Project

ALASKA ENERGY AUTHORITY

0 1,000 Feet

Projection: AK SP Zone 4 NAD 1983
Date Created: 9/25/2014
Map Author: R2 - Joetta Zablotney
File: Map_TWG_RIVPRO_SurveyOverlap.mxd

Study 9.8 Summary of Results since ISR
September 2014 Technical Memo

- Suite of metrics generated for benthic and seston (drift) data analysis
  - Density, taxa richness, community compositions, feeding habits

- 2013 benthic macroinvertebrate density and taxa richness measures appeared lower in mainstem macrohabitats than off-channel habitats

- 2013 drift net samples showed higher drift density and taxa richness in tributary mouths, lower in off-channel habitats
  - Drift density averaged 0.14 individuals/ft^3 (0.007 – 1.25 individuals/ft^3)

- Plankton tows showed high densities per ft^3
  - Plankton tows averaged 3.13 individuals/ft^3 (0.03 – 18.48 individuals/ft^3)
  - Higher zooplankton densities
  - Low taxa richness

- Sampling with Hester-Dendy multiplates suggests that a period of 6 weeks is sufficient for colonization.
  - Higher densities and taxa richness under clear and warm conditions.

Study 9.8 Summary of Results since ISR
September 2014 Technical Memo

Fish Diet Analysis

- 196 non-empty fish stomachs analyzed
- 4,375 diet items identified and measured
- Stable Isotope Analysis: 3 fish species ate substantial amounts of marine-derived food, in addition to freshwater and terrestrial invertebrates
- Stomach contents: strong reliance on fish (including newly emerged salmon fry) during June and on salmon eggs during August-October

Trophic Modeling

- 2013 growth patterns of age-0 Chinook salmon; age-0 and 1 coho salmon similar to 1980s
- More age-2 Chinook salmon present in age samples than during 1980s
- From bioenergetics model: feeding rate was the primary factor limiting the growth of while temperature and food quality were secondary
- Salmon that fed heavily on eggs had higher growth efficiency (consumed less energy per unit of growth)

AEA Proposed Modifications to Study 9.8 in ISR (ISR Study 9.8, Part C – Section 7.1.2)

7.1.2.1. Characterizing Pre-Project Benthic Macroinvertebrate and Algal Communities (RSP Sections 9.8.4.2, 9.8.4.3, 9.8.4.4.)

- Moving the Lower River site from Trapper Creek to Montana Creek, which has no effect on any of the study objectives, as it establishes one study station within the Lower River Segment (ISR Section 4.2.4.1)
- Replacing the upland slough sites at FA-173 (Stephan Lake Complex) with a small unnamed tributary mouth (ISR Section 4.2.4.2), which has no effect on accomplishing the study objectives
- Conducting storm event sampling at side slough at FA-173 (Stephan Lake Complex) instead of FA-144 (Slough 21), which made it possible to accomplish the required sampling for the purpose of evaluating the effects of the storm event in 2013, and benefits the study by providing a second post-flood event sampling during the Fall Index period, which may give further information on recovery times (Section 4.2.4.3)
- Sampling at sites that could have potentially been inundated for less than the 30-day periods of continuous inundation, due to frequent and rapid river stage changes, which allows for sample collection during all seasonal events as opposed to postponements or cancellations (ISR Section 4.4.3.1)
- The reduction in the number of depth and velocity measures intended to evaluate shoreline bathymetry, which enables the completion of each seasonal event within a 14-day period, allowing for better comparability among sites sampled within each seasonal event, and sample-specific depth and velocity measurements were able to be made to satisfy the requirements for both the trophic modeling effort (ISR Section 4.7), and the HSC/HSI development effort (ISR Section 4.8). (ISR Section 4.4.3.1)

AEA Proposed Modifications to Study 9.8 in ISR (ISR Study 9.8, Part C – Section 7.1.2)

- Taking algae samples from stones and woody debris as opposed to fine sediment in grab samples, which allows for algae samples to be consistently collected in slow-water habitats, as required for the study objective (ISR Section 4.4.3.3)
- Estimating dry weights for macroinvertebrate taxa using length-weight relationship data from UAF as opposed to direct oven-dried biomass weights
- **Emergence trap modifications include:**
  - **Increased floatation to prevent sinking and/or capsizing**
  - **Improved anchoring and deployment**

7.1.2.2. Estimating Drift of Invertebrates (RSP Section 9.8.4.5.)

- Collecting plankton tows at 5 still water sites instead the potential total of 11 recommended by FERC, which provides a standardized approach for sampling the water column for invertebrates, depending upon the velocity, allowing the study team to achieve the study objective (ISR Section 4.5.1.1)
- Estimating dry weights for macroinvertebrate taxa using length-weight relationship data from UAF as opposed to direct oven-dried biomass weights, which increases accuracy, reduces sampling bias, and provides a standard methodology for estimating biomass and energy density while achieving the study objective (ISR Section 4.5.1.2)

7.1.2.3. Feasibility of Talkeetna River Reference Sites

- Main channel macrohabitat type would be replaced with an upland slough site within the Talkeetna reference station (would add second off-channel habitat type to compare to the Middle River Segment sites)

AEA Proposed Modifications to Study 9.8 in ISR (ISR Study 9.8, Part C – Section 7.1.2)

7.1.2.4. Trophic Modeling and Stable Isotope Analysis (RSP Section 9.8.4.7.)

- **Increasing stable isotope site selection from the original two stations (3 sites each) to four stations, sampling 16 sites total, which will better address the study objective of quantifying the relative importance of riverine, terrestrial, and marine energy sources to juvenile salmon and the broader river food web (ISR Section 4.7.3.1)**
- Not utilizing macrohabitat-specific subcutaneous dye marking to track movements of juvenile chinook salmon, coho salmon or rainbow trout less than 60 mm long, which would be much less useful for GRP model validation than the PIT tag data, and therefore allow study resources to be focused on using a robust PIT tag study to most effectively document the movements and growth of individual fish, test the GRP models, and accomplish the objectives of the study (ISR Section 4.7.3.2)
- **Addition of Arctic grayling as a target species**

7.1.2.5. Fish Diet Analysis (RSP Section 9.8.4.11.)

- Elimination of field determinations of fish stomach emptiness to reduce uncertainties in sample collection by standardizing the sampling effort and decision process, thus allowing the study crew to achieve the study objective (ISR Section 4.9.1.1)
- Estimating dry weights for prey items in stomach contents using length-weight relationship data from UAF, as opposed to direct oven-dried biomass weights, which increased accuracy, reduces sampling bias, and provides a standard methodology for estimating biomass while achieving the study objective (ISR Section 4.9.1.2)
- **Addition Arctic grayling juveniles and adults as target species/lifestages**

AEA Proposed Modifications to Study 9.8 in ISR (ISR Study 9.8, Part C – Section 7.1.2)

7.1.2.6. Benthic Macroinvertebrate Colonization Rates (RSP Section 9.8.4.13.)

- The deployment of Hester-Dendy sampler sets from sites with different turbidity/temperature conditions, to deployment in each of the macrohabitat-type sites within a River Productivity station
- Investigate the overall differences in colonization rates and compositions among the five macrohabitat types within River Productivity sites
  - Main channel site, side channel site, side slough site, upland slough site, tributary mouth/clearwater plume site
  - Adds one upland slough site to sampling efforts
- Add an extra collection of six Hester-Dendy sampler sets at a main channel site at increasing depth increments

7.1.2.7. River Productivity in Susitna River Tributaries and Lakes above Devils Canyon

- Additional effort will be added to the River Productivity Study, with the stated objective to characterize the pre-Project benthic macroinvertebrate communities, with regard to species composition and abundance, and algal production in selected Susitna River tributaries and lake systems located above Devils Canyon

Current Status Study 9.8 (ISR Study 9.8, Part C – Section 7.1)

- 2014 focus was field collections to support Trophic Modeling and Stable Isotope Analysis (SIA)
  - Fish diet and tissue sampling at 21 sites
    - Dedicated fish collection efforts for target fish species
    - Addition of adult and juvenile arctic grayling
    - Spring: collected 129 target fish species/lifestage
  - Drift sampling/plankton tows at 21 sites.
  - SIA components collected at 16 study sites.

- Continuing analysis of 2013 data received from taxonomic laboratories.

2014 Productivity in Tributaries and Lakes Above Devils Canyon

- River Productivity surveys in selected Susitna River tributaries and lakes above Devils Canyon. (July 14 - 24).

- Sampling from nine tributaries located above Devils Canyon in the Middle and Upper Susitna River basin.

Devil Creek	Fog Creek	Deadman Creek
Watana Creek	Kosina Creek	Jay Creek
Oshetna River	Tyone River	Butte Creek

- Sampling from Lake Louise, Susitna Lake, and Tyone Lake in the Upper Susitna River basin.

- Samples of benthic macroinvertebrates, algae, drift, plankton, water quality, and water nutrients

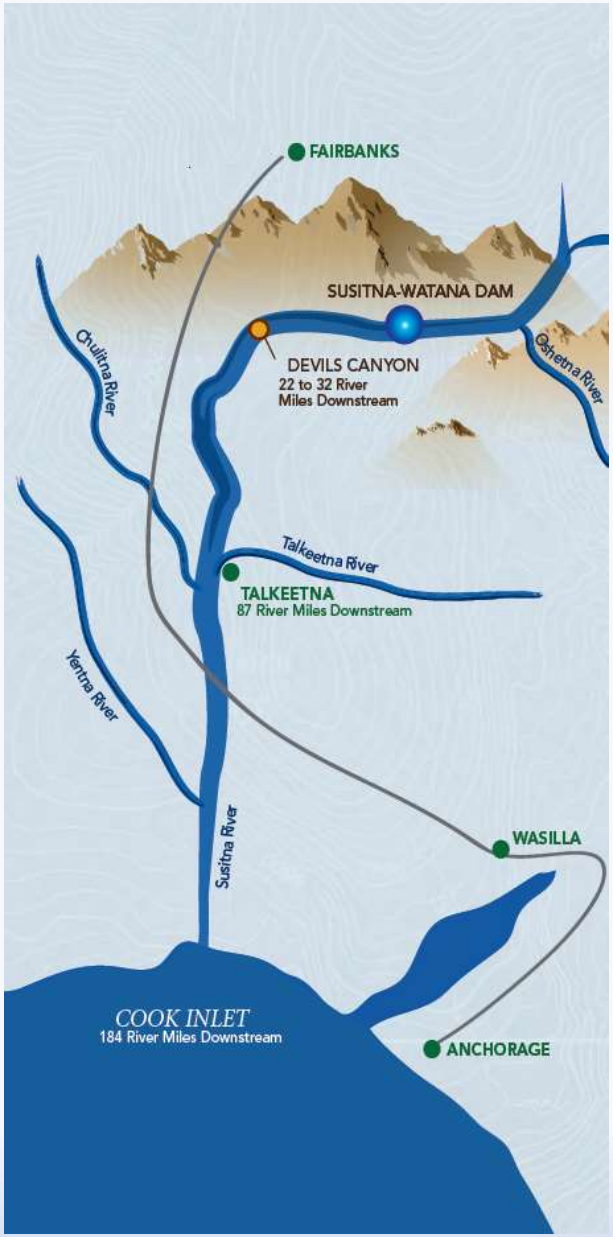
Steps to Complete Study 9.8 (ISR Study 9.8, Part C – Section 7.1)

In 2015, AEA plans to complete all remaining data collection and analysis for this study, which include the following activities:

- Collection of benthic macroinvertebrates, algae, drift, and organic matter from the 21 sites established in 2013, with modifications as detailed in the ISR.
- Evaluate the feasibility of Talkeetna River reference sites with continued sampling efforts pursuant to a decision point based on 2013 results as described in the ISR.
- Develop habitat suitability criteria for Susitna benthic macroinvertebrate and algal habitats as detailed in the Study Plan.
- Deploy Hester-Dendy samplers in each macrohabitat site within FA-104, with the addition of a one set that contains a collection of six sampler sets along a main channel depth transect. Supports the study of the effect of fluctuating shorelines on mainstem colonization.

Licensing Participants Proposed Modifications to Study 9.8?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.9 Characterization and Mapping of Aquatic Habitats

October 15, 2014

Prepared by

R2 Resource Consultants, Inc.

Study 9.9 Objectives

Upper River Habitats:

- Characterize and map Upper River tributary and lake habitats for the purpose of evaluating the potential loss or gain in available fluvial and lacustrine habitat that may result from dam construction and inundation by the reservoir
- Characterize and map Upper River tributary and lake habitats for the purposes of informing other studies including Fish Distribution and Abundance in the Upper Susitna River (Study 9.5) and River Productivity (Study 9.8)
- Characterize and map the Upper River mainstem (understood hereafter to encompass both main channel and off-channel habitats) upstream from the Watana dam site to the confluence with the Oshetna River:
    - To provide baseline data for the purpose of evaluating the potential loss or gain in accessible available fluvial and lacustrine habitat that may result from dam construction and inundation by the reservoir
    - To inform other studies including Fish Distribution and Abundance in the Upper Susitna River (Study 9.5), River Productivity (Study 9.8), and Future Watana Reservoir Fish Community and Risk of Entrainment (Study 9.10)

Study 9.9 Objectives

Middle River Habitats:

- Characterize and map the Middle River mainstem from the Chulitna River confluence to the proposed Watana Dam site, including tributaries within the zone of hydrologic influence (ZHI) and the Focus Areas:
  - To provide baseline data for the purpose of evaluating the potential loss or gain in accessible available fluvial habitat that may result from flow regulation below the proposed Watana Dam
  - To inform other studies including Fish Distribution and Abundance in the Middle and Lower Susitna River (Study 9.6), River Productivity (Study 9.8), and Instream Flow (Study 8.5)

Lower River Habitats:

- Characterize and map the Lower River mainstem from the upper extent of tidal influence upstream to the Three Rivers Confluence:
  - To provide baseline data for the purpose of evaluating the potential loss or gain in available fluvial habitat that may result from flow regulation below the proposed Watana Dam
  - To inform other studies including Fish Distribution and Abundance in the Middle and Lower Susitna River (Study 9.6), River Productivity (Study 9.8), and Instream Flow (Study 8.5)

Study 9.9 Components

- **Upper River Habitat Mapping**
  (ISR Part A, Section 4.2; pg 12)

- **Middle River Habitat Mapping**
  (ISR Part A, Section 4.3; pg 17)

- **Lower River Habitat Mapping**
  (ISR Part A, Section 4.4; pg 21)

Study 9.9 Variances

- Physical access limitations and safety concerns restricted the scope of random sampling (RSP Sections 9.9.5.3.2 and 9.9.5.4) to habitat units (ISR Part A, Sections 4.2.4.1 and 4.3.3.1).
- **Special habitat features were expanded from the Study Plan** (SPD B-210) to include backwaters, beaver complexes and clearwater plumes (ISR Part A, Sections 4.2.4.2 and 4.3.3.2).
- **Ground survey flow conditions were more variable than anticipated** (RSP Section 9.9.5.3.2) due to unexpected late summer high flows, this affected a small number of habitat units that were surveyed at flows higher than those under which the reference imagery was obtained (ISR Part A, Sections 4.2.4.3 and 4.3.3.3). Careful preplanning largely limited these habitats to those where habitat calls were least likely to be altered by variation in flow conditions. An assessment of any resulting discrepancies between remote mapped and ground-truthed habitat classifications will be presented in the Updated Study Report.

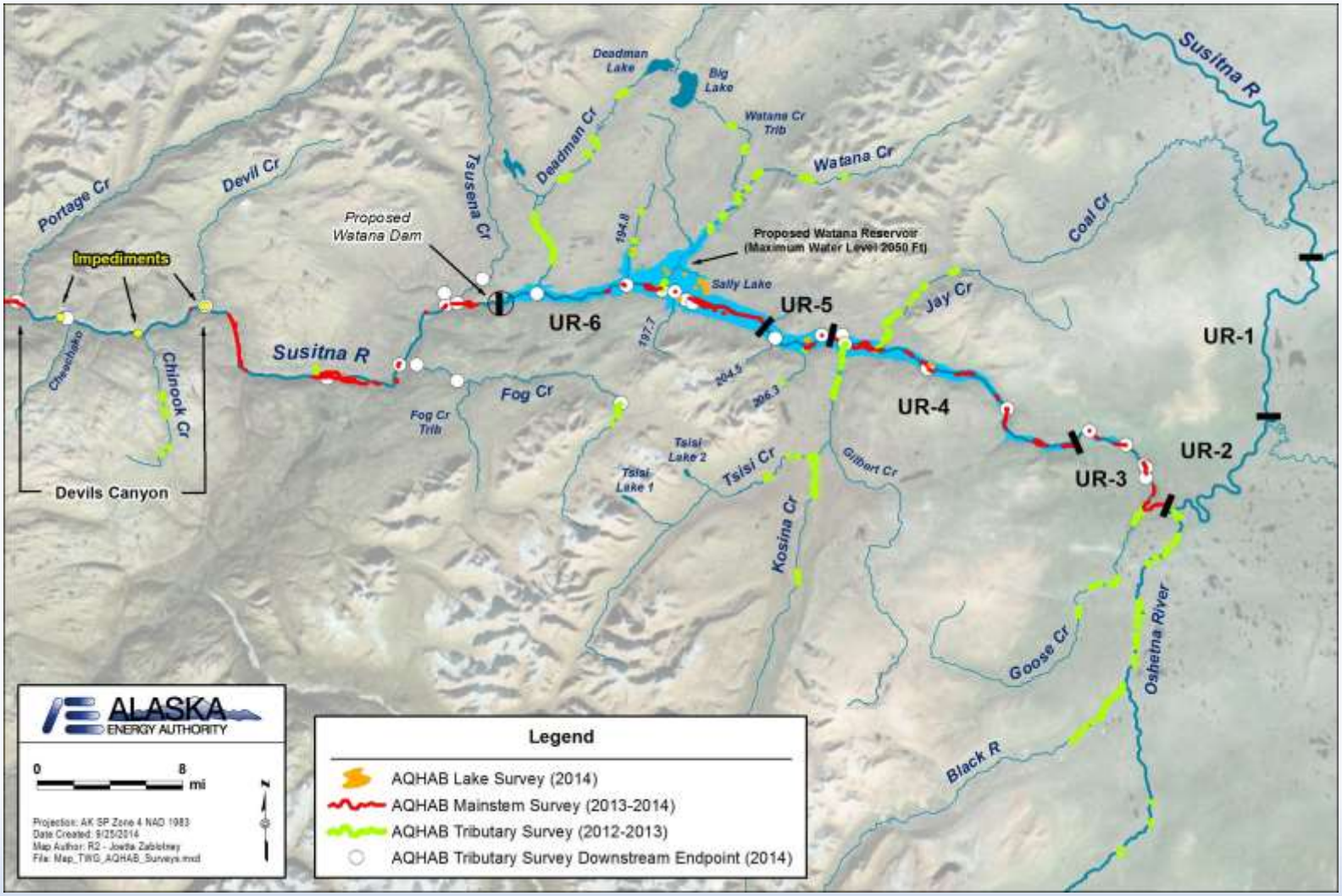
Study 9.9 Summary of Results in ISR (ISR Study 9.9, Part A – Section 5)

- The ISR presents a subset of summary data from 2013.
- Habitat frequency and characteristics will be presented in the USR .
- Data collection was not completed in 2013 and was continued in 2014.

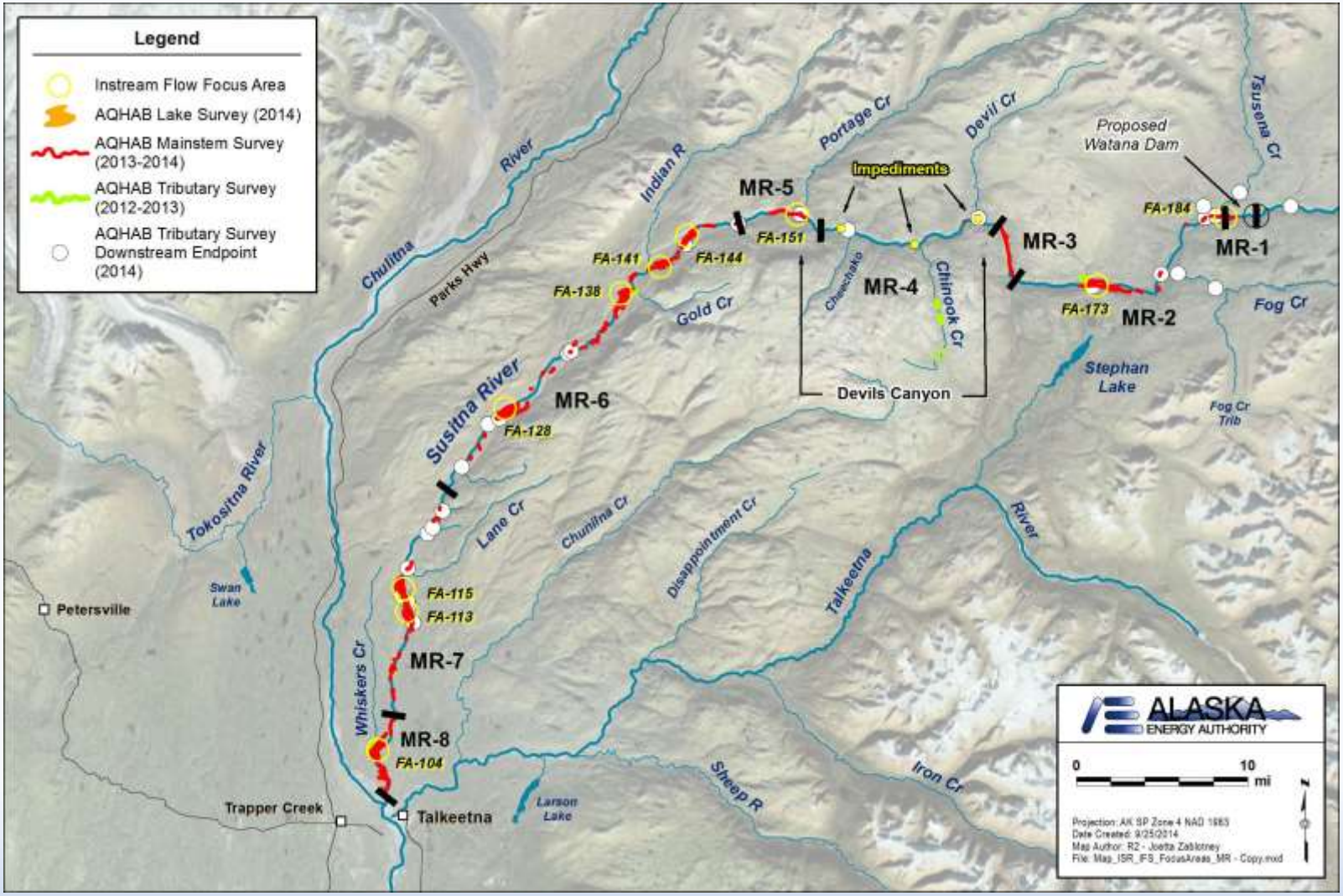
Study 9.9 Summary of Results since ISR (September 2014 TM)

- Tributary and mainstem targeted surveys completed in the Upper River (UR).
- Targeted surveys completed in 12 UR lakes within inundation zone surveyed (depth profiles, other limnology).
- Tributary and mainstem targeted surveys completed in the Middle River (MR).
- Complete ground-truthing concluded for Focus Areas in the MR.

Study 9.9 Summary of Results since ISR (September 2014 TM)



Study 9.9 Summary of Results since ISR (September 2014 TM)



Study 9.9 Summary of Results since ISR (September 2014 TM)

- Interim assessment (2013 groundtruthing vs remote line mapping) identified 23 out of 175 habitat units where field calls differed from remote macrohabitat.

- Only 4 of these were judged valid and these were due to more favorable flows during some field surveys.

- Remaining 19 variations were explained by higher field flows, spatial inaccuracies, overlapping surveys or documentation of new features.

AEA Proposed Modifications to Study 9.9 in ISR (ISR Study 9.9, Part C – Section 7.1.2)

The special habitat features will be expanded from the Study Plan (SPD B-210) to include backwaters, beaver complexes and clearwater plumes as in 2013 (ISR Sections 4.2.4.2 and 4.3.3.2).

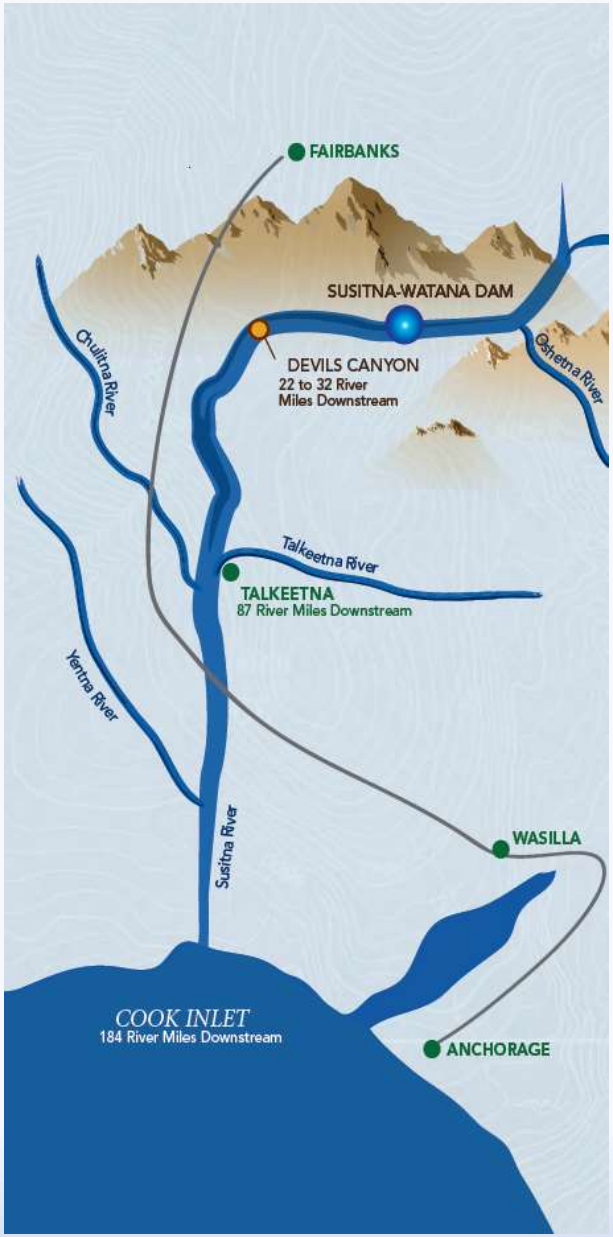
- This change is in response to a FERC recommendation (April 1 SPD) that these habitats receive "special consideration."
- Implementation of this change is largely procedural – by identifying these habitats as special, in addition to their common mesohabitat (Level 4) status, they can be more logically grouped and highlighted for analyses to be presented in the USR.
- This modification will allow AEA to more specifically meet the objective of providing special consideration to these habitats of particular interest.

Steps to Complete Study 9.9 (ISR Study 9.9, Part C – Section 7.1)

- Update and complete ground-truthing by combining 2013 and 2014 field data and comparing to remote mapping GIS
- Characterize macro- and mesohabitats using measured habitat metrics from tributary and mainstem surveys
- Characterize lake habitats from limnological data collected 2014
- Produce final photographic base maps for all mapped locations

Licensing Participants Proposed Modifications to Study 9.9?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.11

Fish Passage Feasibility at Watana Dam

October 15, 2014

Prepared by
R2 Resource Consultants, Inc.

Study 9.11 Objectives

- The goal of this study is to develop, to the feasibility level, a fish passage strategy in support of the License Application for the proposed Project. The methods section of this report outlines the process that was used during 2013 to achieve this objective. A variety of engineering, biological, sociological, and economic factors will be considered during this process as it continues through 2014. The study will explore various alternatives in support of three basic strategies related to fish passage:
  - Proposed Project without fish passage
  - Integration of upstream and downstream passage features into the current Project design
  - The retrofit of upstream and downstream fish passage features to a Project designed without passage
- In the context of this study "retrofit" means that fish passage features would be either geographically or temporally independent from the dam design. A retrofitted passage facility may be constructed some distance upstream or downstream from the dam or later in the future after the construction of the dam, and thus is independent of the dam design process. Option 3, the retrofit option, avoids constraints with having the only option of fish passage being part of the dam structure. Thus, the feasibility evaluation can examine a wider spectrum of passage alternatives

Study 9.11 Components

- Task 1: Establish the Fish Passage Technical Workgroup to Provide Input on the Feasibility Assessment (ISR Part A, Section 4.1; pg 3)
- Task 2: Prepare for Feasibility Study (ISR Part A, Section 4.2; pg 3)
- Task 3: Conduct Site Reconnaissance (ISR Part A, Section 4.3; pg 5)
- Task 4: Develop Concepts (ISR Part A, Section 4.4; pg 5)
- Task 5: Evaluate Feasibility of Conceptual Alternatives (ISR Part A, Section 4.5; pg 5)
- Task 6: Develop Refined Passage Strategy(ies) (ISR Part A, Section 4.6; pg 5)

Study 9.11 Variances

- Variances from the Study Plan in 2013 were limited to schedule modifications for Tasks 3 and 4 (ISR Section 9.11.4.7)
  - Task 3 – Site Recon moved to Sept. 2013 for low flow access
  - Task 4 – Delayed to allow integration of other studies: kickoff with brainstorm workshop Sept. 9-11, 2014

Study 9.11 Summary of Results in ISR (ISR Study 9.11, Part A – Section 5)

- Completed Tasks 1 -3.
- Site Visit conducted September 18, 2013

Study 9.11 Summary of Results since ISR

Initiated Task 4:

- Collated and delivered updates of biological, physical and operational information based on Technical Team input.
- Conducted Brainstorm Workshop (September 9-11, 2014) to develop initial concepts.
- Development of Biological Performance Tool (ISR 9.11, Appendix B, Information Item B11).
- Presented examples of evaluation matrix (September 18, 2013 and September 11, 2014).

AEA Proposed Modifications to Study 9.11 in ISR (ISR Study 9.11, Part C – Section 7.1.2)

Although the schedule has been modified, no modifications to the Study Plan are needed to complete the study and meet Study Plan objectives.

Steps to Complete Study 9.11 (ISR Study 9.11, Part C – Section 7.1)

To complete this study, AEA will implement the methods in the Study Plan, without modification.

Task 4 (RSP Section 9.11.4):

- Organize and clarify brainstorm concepts, text and sketches
- Develop and update draft evaluation criteria
- Update and perform runs with the Biological Performance Tool (BPT)
- Conduct review meeting with FPTT
- Begin compilation and development of alternatives

Steps to Complete Study 9.11 (ISR Study 9.11, Part C – Section 7.1)

Task 5: Evaluate Feasibility of Conceptual Alternatives (RSP Section 9.11.4)

- Update drawings and descriptions
- Update BPT
- Update criteria, and prepare evaluation matrix
- Submit Draft Report
- Conduct Workshop #4 – alternative selection

Task 6: Develop Refined Passage Strategy(ies) (RSP Section 9.11.4)

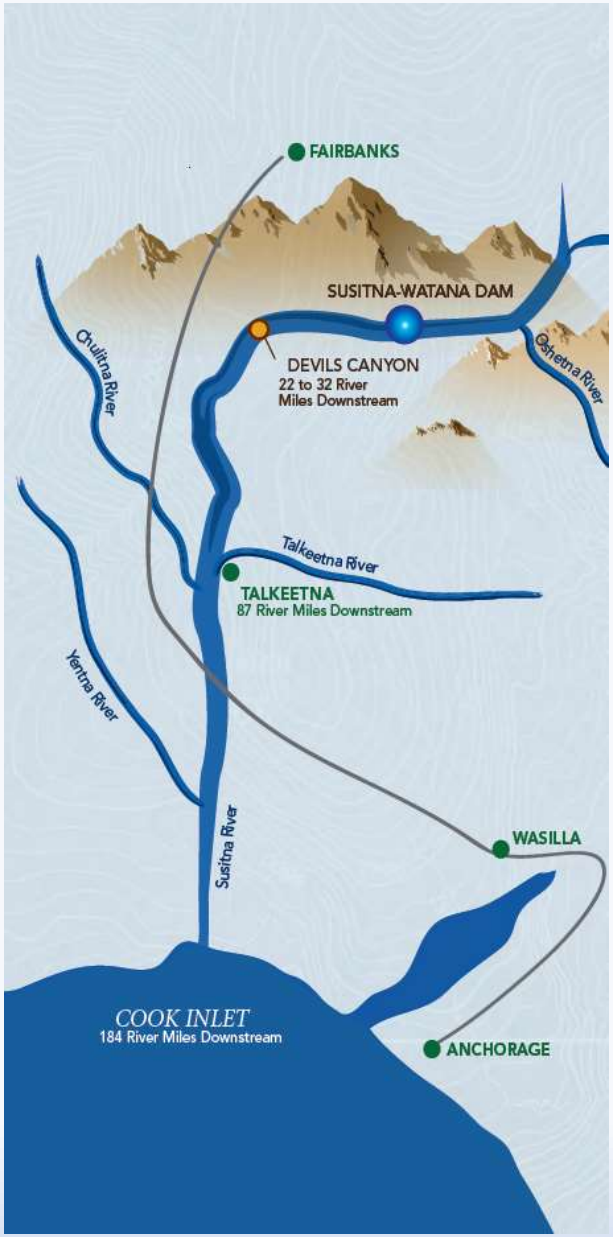
- Refine alternatives (text and drawings)
- Prepare opinions of probable costs
- Conduct FPTT meeting
- Submit draft Fish Passage Technical Report
- Final FPTT meeting to review report

Steps to Complete Study 9.11 (ISR Study 9.11, Part C – Section 7.1)

- AEA expects to complete development of passage strategies in both the 2014 and 2015 study seasons, which will be reported in the USR.

Licensing Participants Proposed Modifications to Study 9.11?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.12

Fish Passage Barriers in the Middle and Upper Susitna River and Susitna Tributaries

October 15, 2014

Prepared by

R2 Resource Consultants, Inc.

Study 9.12 Objectives

- Locate and categorize all existing fish passage barriers located in selected tributaries in the Middle and Upper Susitna River

- Locate, identify the type (permanent, temporary, seasonal, partial), and characterize the physical nature of existing fish barriers within the Project's Zone of Hydrologic Influence (ZHI)

- Evaluate potential changes to existing fish barriers within the Project's ZHI

- Evaluate the potential creation of fish passage barriers within existing habitats (tributaries, sloughs, side channels, off-channel habitats) related to future flow conditions, water surface elevations, and sediment transport

Study 9.12 Components

- Fish Species Identification (ISR Part A, Section 4.1; 4)
- Passage Criteria for Identified Fish Species (ISR Part A, Section 4.2; 6)
- Site Selection (ISR Part A, Section 4.3; 6)
- Field Methods (ISR Part A, Section 4.4; 8)
- Modeling Methods (ISR Part A, Section 4.5; 11)

Study 9.12 Variances

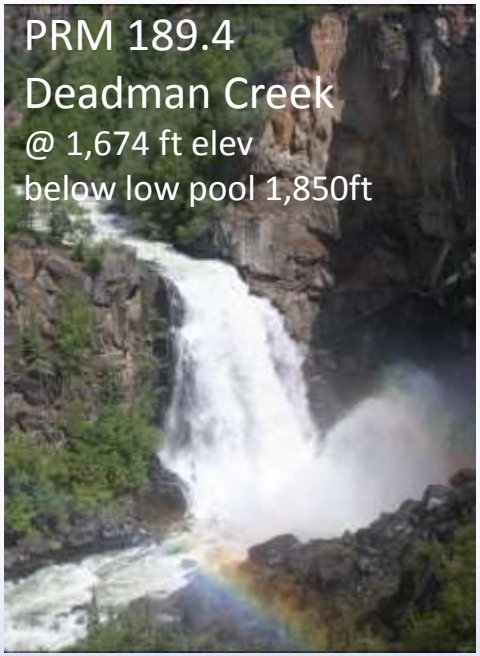
- Delay in field surveys of existing barriers on Cook Inlet Regional Working Group (CIRWG) and Alaska Railroad Corporation (ARRC) lands (ISR Part A, Section 4.3.5)

- Change from field measurements of beaver dam attributes to model-based evaluation (IP Section 4.4.5)

Study 9.12 Summary of Results in ISR (ISR Study 9.12, Part A – Section 5)

Middle and Upper River Vertical Barriers surveyed in 2012

- 72 potential barriers surveyed in 2012
- 38 confirmed as barriers to fish passage due to height, greater than 12 ft
- 3 tributaries with barriers that will be inundated, below max pool elevation 2,050 ft



Study 9.12 Summary of Results in ISR (ISR Study 9.12, Part A – Section 5)

Upper River Vertical Barriers surveyed in 2013

- 4 potential barriers surveyed in 2012; 2 confirmed as barriers to fish passage
- Barriers at Unnamed Tributary 204.3 - ground survey in Oct 2014 to confirm as barrier

Barrier in Unnamed Tributary 189.7

Barrier in Unnamed Tributary 197.7

Barrier A in Unnamed Tributary 204.3

Barrier B in Unnamed Tributary 204.3

Study 9.12 Summary of Results in ISR (ISR Study 9.12, Part A – Section 5)

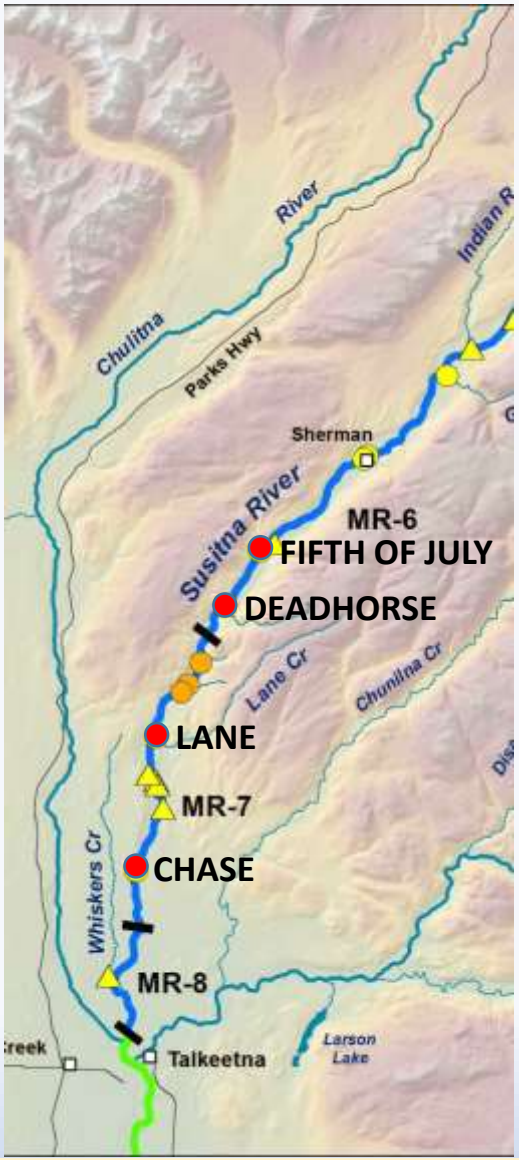
- Within the Middle River in 2013 , seven tributary mouths were surveyed to document current depth and velocity conditions for fish passage and to collect data for an evaluation of the Project's potential effects.

CHASE CREEK PRM 110.5

DEADHORSE CREEK PRM 124.4

LANE CREEK PRM 117.2

FIFTH OF JULY CREEK PRM 127.3



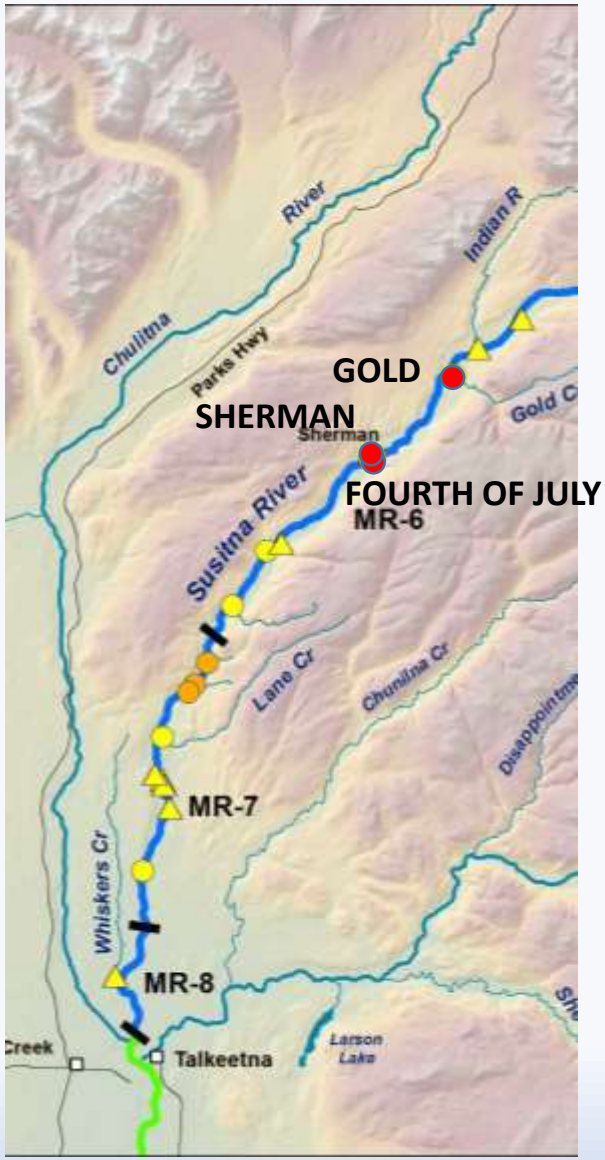
Study 9.12 Summary of Results in ISR (ISR Study 9.12, Part A – Section 5)

- Middle River tributary mouths surveyed (cont.)

FOURTH OF JULY CREEK PRM 134.3

GOLD CREEK PRM 140.1

SHERMAN CREEK PRM 134.1



Study 9.12 Summary of Results in ISR (ISR Study 9.12, Part A – Section 5)

- Characterization of existing barriers and evaluation of potential changes to barriers is ongoing and is being coordinated with the Geomorphology Study (Study 6.5), the Ice Processes Study (Study 7.6), and the Flow Routing Study (Study 8.5.4).

Study 9.12 Summary of Results since ISR

AEA proposed species list, additional species suggested by licensing participants, and preliminary species list following consultation during fisheries technical meeting on March 19, 2014.

AEA Proposed Species List	Additional Species Suggested by Licensing Participants	Final Species List
Chinook salmon	Arctic lamprey	Chinook salmon
Chum salmon	Bering cisco[1]	Chum salmon
Coho salmon	Eulachon[1]	Coho salmon
Pink salmon	Northern pike[1]	Pink salmon
Sockeye salmon	Humpback whitefish	Sockeye salmon
Arctic grayling		Arctic grayling
Burbot		Arctic lamprey
Dolly Varden		Burbot
Rainbow trout		Dolly Varden
		Humpback whitefish
		Rainbow trout
[1] Species not added to final list due to absence from study area		

Study 9.12 Summary of Results since ISR

as presented in March 19, 2014 Fisheries Technical Meeting

(http://www.susitna-watanahydro.org/wp-content/uploads/2014/04/2014-03-19TT_Fish_Notes.pdf)

Upstream ***Velocity*** Criteria

- Refined prolonged and burst speed swimming performance from literature (presented at March Barrier meeting) + criteria for Humpback Whitefish and Arctic Grayling

Leaping and ***Gradient*** Criteria for Adult Upstream Migration

- Final leaping criteria (Chinook, Coho, Chum, Pink, Sockeye Salmon)
- Gradient criteria - FSH 2090.21 - Aquatic Habitat Management Handbook

Depth Criteria for Upstream Adult Migration and Downstream juvenile/resident spp

- Final depth criteria – water depth required to fully submerge the fish species

Final Criteria Application - Interactions of Velocity, Leaping/Gradient , Depth and Distance

- Ongoing development of criteria application for Focus Areas and Tributary Mouths
- Final approach dependent on model outputs from Fluvial Geomorphology Modelling (6.6)

AEA Proposed Modifications to Study 9.12 in ISR (ISR Study 9.12, Part C – Section 7.1.2)

No modifications to the Study Plan are proposed to complete the study and meet Study Plan objectives

Decision Points from Study Plan (ISR Study 9.12, Part C – Section 7.1.1)

- Results from the 1-D Bed Evolution Model to be presented in a forthcoming Technical Memorandum (Q4 2014) will be used to examine the potential for depth barriers under pre-Project and post-Project conditions in main channels, side channels and tributary mouths in the Lower River upstream of PRM 29.9.
- The modeling results will inform the decision point for extending the Fish Passage Barrier Study into the Lower River.

Current Status and Steps to Complete Study 9.12

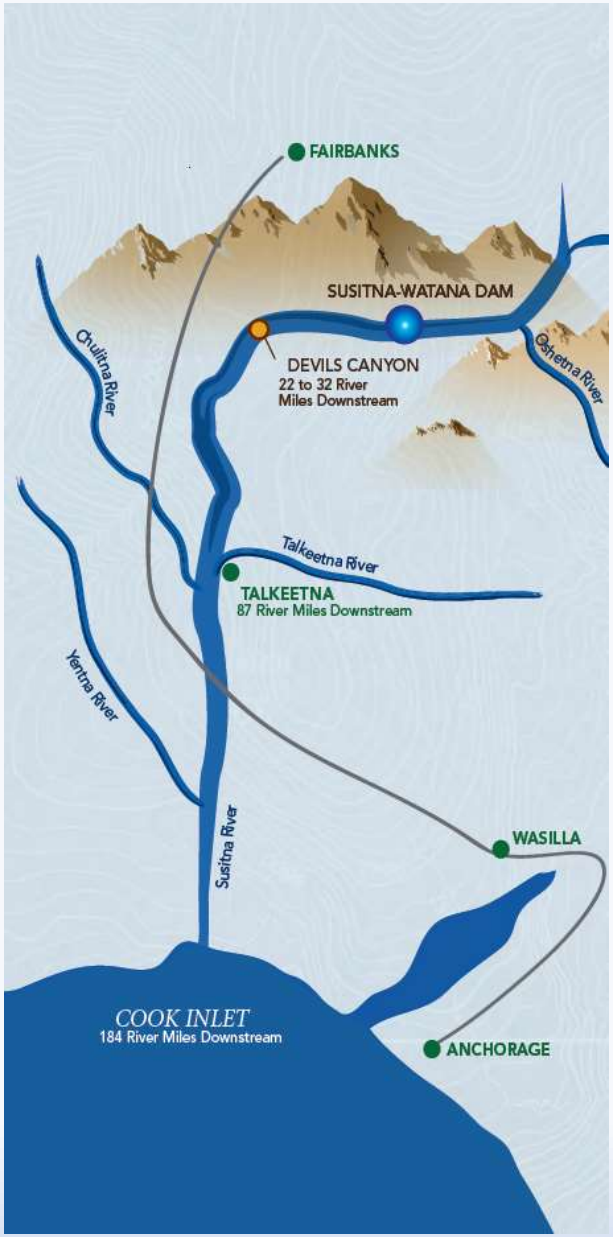
- Barriers identified from aerial and ground surveys in 2012, 2013 and 2014 will be combined into a comprehensive barrier dataset and GIS layer
- Determine approach for integrating passage criteria for fish species into modelling framework in coordination with IFS 8.5, GEO 6.5 and FGM 6.6
- Complete modelling analysis of current barrier conditions and potential changes related to future flow conditions, water surface elevations, and sediment transport

Steps to Complete Study 9.12 (ISR Study 9.12, Part C – Section 7.1)

- Finalized passage criteria will be applied to potential barriers in accordance with IP Section 7.1.2.
- Beaver dams within Focus Areas will be evaluated based on passage criteria and modeling results from ISR Study 6.6.
- Remaining barriers in tributaries and tributary mouths on CIRWG and ARRC lands will be surveyed in 2014 in accordance with IP Section 7.4.
- Current and future Middle River depth barriers within Focus Areas will be evaluated during ice-free and ice-cover periods incorporating 2-D model outputs in accordance with IP Sections 7.3.2 and 7.3.3, respectively.
- AEA expects to complete all remaining data collection during the 2014 study season. Analysis for this study will extend into 2015, which will be reported in the USR.

Licensing Participants Proposed Modifications to Study 9.12?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.14

Genetic Baseline Study for Selected Fish Species

October 15, 2014

Prepared by
Chris Habicht and Andy Barclay
Gene Conservation Lab
Alaska Department of Fish and Game

Study 9.14 Objectives

- **Develop a repository of genetic samples** for target **resident fish** species captured within the Lower, Middle, and Upper Susitna River drainage
- **Contribute to the development of genetic baselines** for chum, coho, pink, and sockeye **salmon** spawning in the Middle and Upper Susitna River drainage
- **Characterize the genetic population structure of Chinook salmon** from Upper Cook Inlet, with emphasis on spawning aggregates in the Middle and Upper Susitna River
- **Examine the genetic variation among Chinook salmon populations** from the Susitna River drainage, with emphasis on Middle and Upper River populations, **for mixed-stock analyses** (MSA)
- If sufficient genetic variation is found for MSA, **estimate the annual percent of juvenile Chinook salmon in selected Lower River habitats** that originated in the Middle and Upper Susitna River in 2013 and 2014 (Figure 2-1)

Study 9.14 Components

- Sample Collection (ISR Part A, Section 4.1; pg 3)
- Tissue Storage (ISR Part A, Section 4.2; pg 7)
- Laboratory Analysis (ISR Part A, Section 4.3; pg 8)
- Data Retrieval and Quality Control (ISR Part A, Section 4.4; pg 8)

Study 9.14 Variances

- There were no variances from the collection, storage and analysis methods described in the Study Plan; however, full access to all of the sampling sites was not available in 2013.
  - Access was not available to collect Chinook salmon samples in tributaries flowing through Cook Inlet Regional Working Group (CIRWG) lands above or near Devils Canyon (Cheechako, Devil, Fog, Tsusena and Watana creeks) in 2013.
  - Lack of land access prevented sampling of coho salmon from Portage and Prairie creeks, and reduced sampling effort for sockeye salmon in Prairie Creek (Genetics IP Section 4.2; see ISR Section 4.5).

Study 9.14 Summary of Results in ISR (ISR Study 9.14, Part A – Section 5)

- Sample Collections (through Sept. 15, 2013)
  - Adult Chinook salmon collections
    - Sites: 50 surveyed, 27 sampled: 1,131 fish (2 above Devils Canyon)
  - Other adult salmon collections
    - Sites: 85 surveyed, 26 sampled: 295 sockeye, 641 chum, 68 coho, and 1,041 pink salmon sampled
  - Juvenile Chinook salmon collections
    - Above Devils Canyon: 103 fish
    - Lower River collections: 8 fish – one habitat type
  - Other species collections (opportunistic)
    - 20 species from 6 strata listed
    - 1,255 fish collected, 9 species/strata complete
  - Pacific salmon coordination with other studies
    - Salmon Escapement Study (9.7)
      - Indian River weir 25 fish
      - Radio-tagged fish: 609 Chinook, 771 other Pacific salmon
    - ADF&G fish wheels: no fish delivered

Study 9.14 Summary of Results in ISR (ISR Study 9.14, Part A – Section 5)

Continued…

- Collection trip documentation: GCL database
- Tissue Storage: GCL archive
- Laboratory Analysis: ongoing
- Data Retrieval and Quality Control: ongoing

Study 9.14 Summary of Results in ISR
(ISR Study 9.14, Part B, 2014 Implementation Plan)

- Met with FWS and NMFS March 12, 2014
  - Refine statistical analyses after distribution and size of samples is known.
  - Increase number of markers screened for Chinook salmon from 96 SNPs to 190 SNPs and 12 uSATs.
  - Exclude related juveniles from statistical analysis.

- Revised draft to Final 2014 Implementation Plan (filed with ISR 9.14, Part B, Attachment 1)
  - Reviewed and addressed written comments by USFWS and NMFS (summarized in Table 8 of IP).

Study 9.14 Summary of Results in ISR
(ISR Study 9.14, Part B, 2014 Implementation Plan)

- 2014 focus on Chinook salmon in Middle and Upper Susitna River
  - **Priority is genetic population structure of Chinook salmon and examining the genetic variation among Chinook salmon populations for mixed-stock analysis.**
  - **Opportunistic sampling for a genetic repository of** target **resident fish species and collection of data for genetic baselines for** chum, coho, pink, and sockeye **salmon** spawning in the Middle and Upper Susitna River drainage
  - If sufficient genetic variation exists for MSA, **estimate the annual percent of juvenile Chinook salmon in selected *Middle* River habitats** that originated in the *Middle and Upper* Susitna River in 2013 and 2014
- 2015 similar to 2013

Study 9.14 Summary of Results since ISR

- Increased representation of Chinook salmon sampled within and above Devils Canyon (DV) from 12 to 102 adults and 138 to 264 juveniles:
  - Adults:
    - 2014 ISR: Kosina Creek 12 fish
    - Post-ISR (additional 2014): Fog 12; Devil 1; Chinook 7; Cheechako 57 fish
    - From radio tagging project (2013 and 2014): Kosina 1; Tsusena 1; Devil 1; Chinook 1; Cheechako 9 fish
  - Juveniles:
    - 2014 ISR: Oshetna River 32; Kosina Creek 106 fish
    - Post-ISR (additional 2013 and 2014): Oshetna River 28; Kosina Creek 68; Mainstem above Devils Canyon 17; Chinook Creek 6; Cheechako 7 fish
- Increased representation of Chinook salmon sampled from Upper Cook Inlet from 20 to 28 sites:
  - 2014 ISR: 1,131 fish collected in 2013 from 27 sites
    - 20 sites >100 fish (including archived)
  - Post ISR: 826 fish collected in 2014 from 24 sites,
    - 28 sites >100 fish (including archived)

Study 9.14 Summary of Results since ISR

Number of Chinook salmon samples collected to date.

Collection Area	Reported in ISR		Post-ISR *		Total
	Adults	Juveniles	Adults	Juveniles	
Susitna Upper River	12	138	1	109	260
Susitna Middle River-Devils Canyon to Upper	0	0	89	17	106
Susitna Middle River downstream of Devils Canyon	237	0**	159	153	549
Other Upper Cook Inlet Sites	4,483	8	704	0	5,195

*1 adult and approximately 122 additional juvenile samples pending delivery to ADF&G from FDA team.

**FDA ISR reported that 48 juveniles were delivered to ADF&G but they arrived after September 15, 2013, so they are counted in the Post-ISR numbers.

AEA Proposed Modifications to Study 9.14 in ISR (ISR Study 9.14, Part C – Section 7.1.2)

- AEA is not planning any modifications to the approved Study Plan. However, specific details regarding the sampling and analytical methods have been updated in the 2014 Implementation Plan based on the 2013 study season and consultation with NMFS and USFWS.

Current Status of Study 9.14

1. Sample Collections (through Sept. 15, 2014)
    a) Adult Chinook salmon
        - Exceeded expected sample sizes at 13 of 29 strata
        - Progress on 4 additional strata
        - 28 sites ready for baseline (>100 fish)
        - Exceeded expected sample sizes within/above Devils Canyon
    b) Other adult salmon (opportunistic in 2014)
        - Met or exceeded targets at 4 of 15 species/drainage strata
        - At least one full collection completed in 10 strata
    c) Juvenile Chinook salmon
        - Exceeded expected sample sizes within/above Devils Canyon
        - Did not capture Lower River fish in multiple habitat types (opportunistic in 2014)
    d) Other species collections (opportunistic)
        - Exceeded goals for 13 of the 120 species/strata
        - Progress made for 10 of the 20 species

Current Status of Study 9.14

Continued…

2. Collection trip documentation: GCL database
3. Tissue Storage: GCL archive ongoing and on schedule
4. Laboratory Analysis: ongoing and on schedule
5. Data Retrieval and Quality Control: ongoing and on schedule
6. Statistical analyses:
   a) Baseline for MSA: Waiting for laboratory analysis
   b) Testing among hypotheses for Chinook salmon spawning above Devils Canyon: Wait to fine-tune statistical analyses in collaboration with USFWS and NMFS.

Steps to Complete Study 9.14 (ISR Study 9.14, Part C – Section 7.1)

AEA is planning the following activities for 2014:

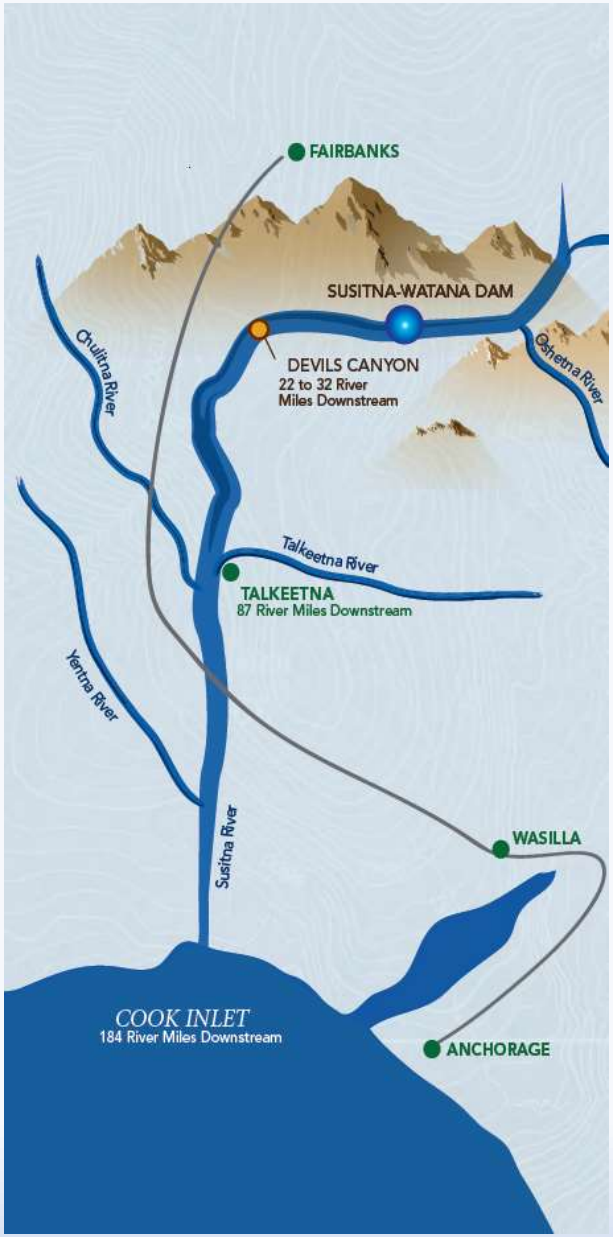
- Collect juvenile and adult Chinook salmon from above Devils Canyon
- Collect adult Chinook salmon from upper Cook Inlet tributaries
- Opportunistically collect other salmon and resident species from the Susitna River
- Genotype Chinook salmon for Single Nucleotide Polymorphisms (SNPs) and microsatellites (µSATs)

AEA is planning the following activities for 2015:

- Statistically analyze genetic structure of Chinook salmon
- Examine potential for mixed-stock analysis of Chinook salmon within Susitna River

Licensing Participants Proposed Modifications to Study 9.14?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.16 Eulachon Run Timing, Distribution, and Spawning in the Susitna River

October 15, 2014

Prepared by
LGL Alaska and R2 Resources

Study 9.16 Objectives

1) Determine eulachon run timing and duration in the Susitna River in 2013 and 2014

2) Identify and map eulachon spawning sites in the Susitna River

3) Characterize eulachon spawning habitats

4) Describe population characteristics of eulachon returning in 2013 and 2014

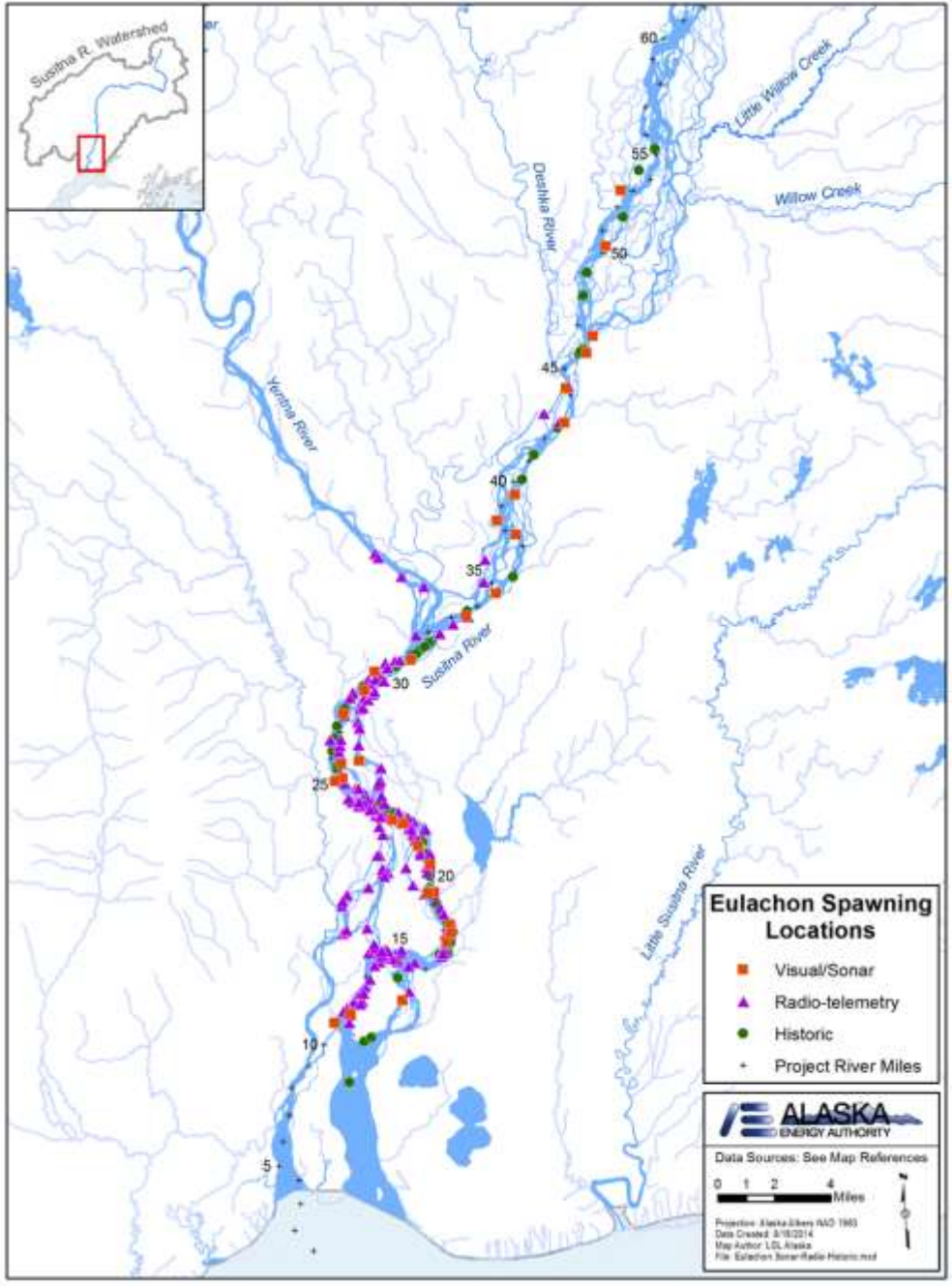
Study 9.16 Components

- Determine Eulachon Run Timing and Duration in the Susitna River (ISR Part A, Section 4.1; pg 2)
- Identification and Mapping of Potential Eulachon Spawning Sites (ISR Part A, Section 4.2; pg 7)
- Eulachon Spawning Habitat Characteristics (ISR Part A, Section 4.3; pg 12)
- Eulachon Population Characteristics (ISR Part A, Section 4.4; pg 14)

Study 9.16 Variances

- RSP Section 9.16.4.1.1: The blocking weir was removed due to flood conditions and because turbulence from the weir impeded sonar data collection
- RSP Section 9.16.4.1.3: Water velocity data were not collected at the sonar station because the data were not needed to estimate eulachon run timing
- RSP Section 9.16.4.1.2: **Fish sampling was conducted at other locations along the river**, in addition to the sonar site, to more effectively estimate catch per unit effort (CPUE) and run timing
- RSP Section 9.16.4.1.1: Sonar data collection ended on June 15 when fewer than 2 fish per minute were observed
- RSP Section 9.16.4.2.2: **Visual surveys were also used to identify spawning sites**
- RSP Section 9.16.4.3.2: Visual surveys were the primary method to characterize substrate
- RSP Section 9.16.4.3.3: A grid sampling design was not used to collect water quality information; instead, a randomized approach was used

Study 9.16 Summary of Results in ISR (ISR Study 9.16, Part A – Section 5)



AEA Proposed Modifications to Study 9.16 in ISR (ISR Study 9.16, Part C – Section 7.1.2)

- No blocking weir will be used around the sonar transducer, instead of using a blocking weir (RSP Section 9.16.4.1.1)
- **Sonar data will be collected until at least June 10** and until less than 2 fish per minute are observed, instead of monitoring until no eulachon were observed for 5 consecutive days after June 10 (RSP Section 9.16.4.1.1)
- Run timing and **population characteristics data will be collected at up to five sites**, instead of near and downstream of the fixed sonar site (RSP Section 9.16.4.1.2)
- No water velocity data will be collected at the sonar site because it is not needed to determine run timing (RSP Section 9.16.4.1.3)
- **Visual observation will be used again to collect data on substrate composition**, instead of supplementing using side scan sonar (RSP Section 9.16.4.3.2)
- Three randomized locations at each site will be measured for water velocity because grid collection is not suitable for conditions (RSP Section 9.16.4.3.3)

Study 9.16 Summary of Results Since ISR

No field activities or analyses were conducted in 2014.

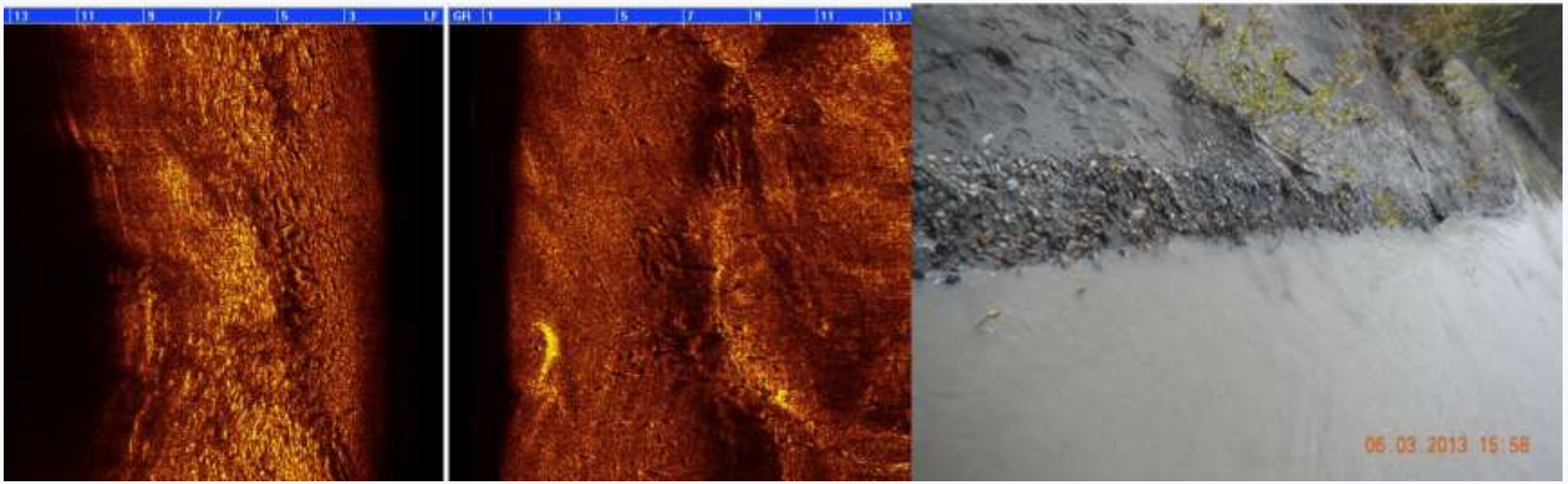
New Modifications to Study 9.16 since ISR

To inform the pre- and post-Project assessments on eulachon, and indirectly CIBW:

- Eliminate radio-telemetry as it does not provide additional information beyond that already known.
- Expand visual and sonar surveys downstream of PRM 10.5 to identify the downstream extent of spawning relative to tidal fluctuation.
- Add a flow-habitat assessment using Wetted-Perimeter modeling method (9.17 CIBW Study Implementation TM, filed September 26, 2014).

Decision Points from Study Plan

RSP indicated the study would determine the feasibility of using side-scan sonar to identify substrate composition at eulachon spawning sites.



Current Status and Steps to Complete Study 9.16 (ISR Study 9.16, Part C – Section 7.1)

- Year 1 data collection is complete.
- Year 2 of data collection in 2015 as per the RSP with modifications.

1) Sonar and active sampling will be used to evaluate eulachon run timing and identify potential eulachon spawning sites.

2) Visual surveys will be used to characterize eulachon spawning habitat.

3) Active sampling will be used to describe eulachon population characteristics including length, weight, age and sex ratios.

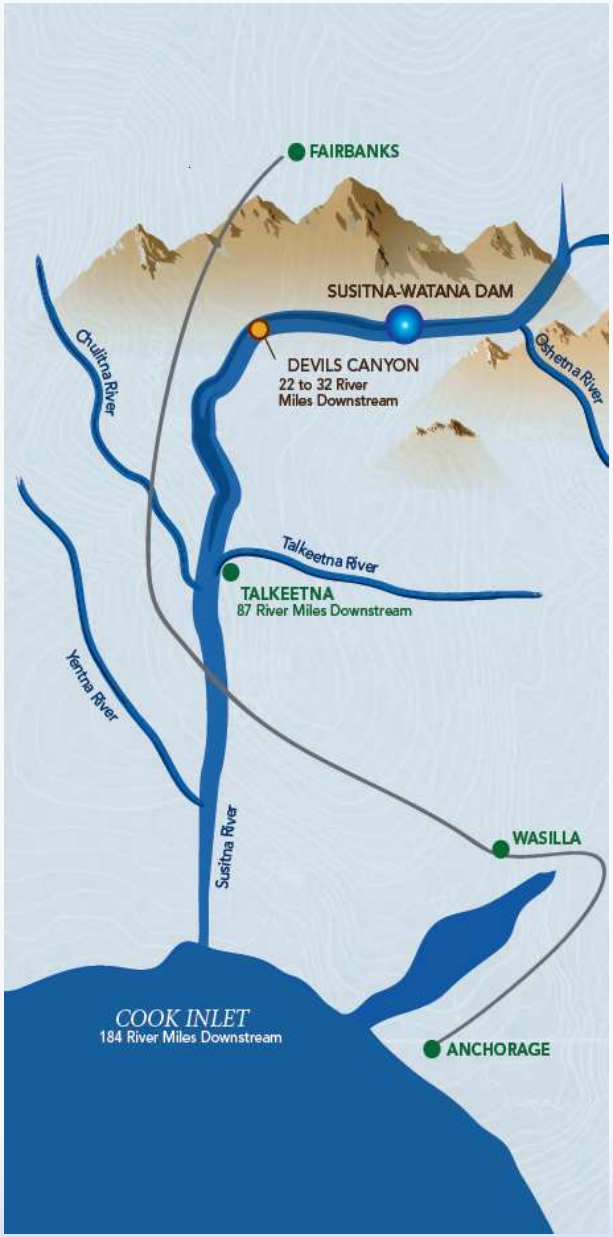
Current Status and Steps to Complete Study 9.16 (ISR Study 9.16, Part C – Section 7.1)

4. Spawning Habitat Flow Model will expand on 1980's model to quantify relationship between flow, stage and eulachon spawning habitat.

   - Establish 4 transects at known spawning locations
   - Collect data on wetted perimeter transect lengths, depths discharge, surficial substrate
   - Data collect over a range of flows (high, medium, low)
   - Develop wetted perimeter-discharge relationship
   - Extrapolate flow routing results to transect location
     - Pressure transducers
     - Stage data from Susitna Station – USGS 15294350

Licensing Participants Proposed Modifications to Study 9.16?

- Agencies
- CIRWG members and Ahtna
- Public



Initial Study Report Meeting

Study 9.17

Cook Inlet Beluga Whale

October 15, 2014

Prepared by

LGL Alaska

Study 9.17 Objectives

- Document CIBWs and other marine mammals in the Susitna River delta, focusing on CIBW distribution and upstream extent

- Document CIBW group size, group composition, and behavior within the Susitna River delta

- Develop a model to describe the relationships between river flows, water surface elevation, and CIBW foraging habitats in the Susitna River

Study 9.17 Components

- **Document CIBW and Other Marine Mammal Presence within the Susitna River Delta** (ISR Part A, Section 4.1; pg 2)

- Document CIBW Group Size, Group Composition and Behavior in the Susitna River (ISR Part A, Section 4.2; pg 4)

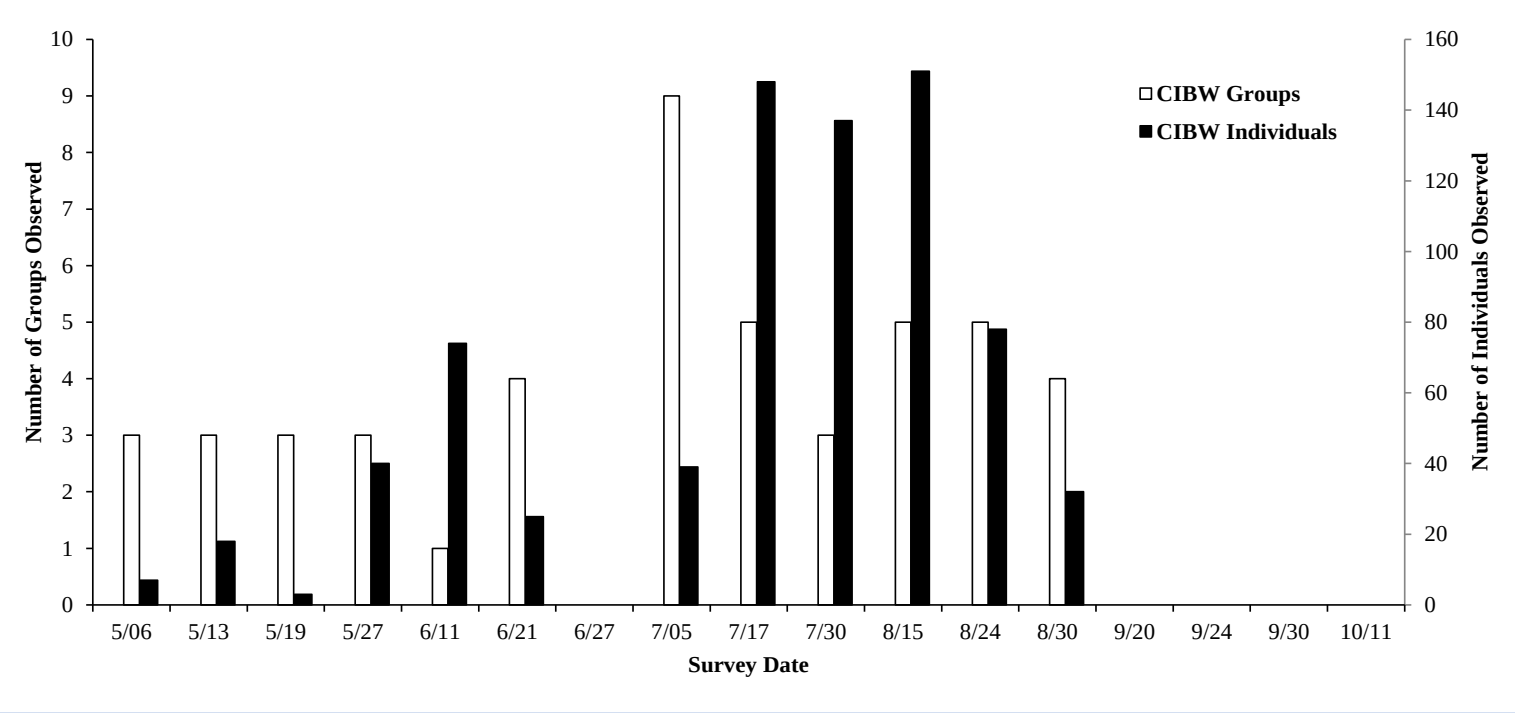
- Develop a model to describe the relationships between river flows, water surface elevation, and CIBW foraging habitats in the Susitna River delta (ISR Part A, Section 4.3; pg 7)

Study 9.17 Variances

- Section 9.17.4.2.1 - **Observers did not document the angle of aerial survey sightings** as it was deemed unnecessary. Angles to sightings can be used to estimate density. Estimating density was not an objective of this study.
- Section 9.17.4.2.1 – Rather than using the median of CIBW group counts, each observer independently counted the number of animals in each group during multiple passes (up to five). **Observers then agreed upon a "best" count for each CIBW group.**
- Section 9.17.4.2.2 – Video cameras at PRM 6 were installed at the west camera station on June 24 and the east camera station on July 12; however, the **live-feed function of the cameras was not operational until September 25, 2013**. From September 13 through September 24, video from the cameras fixed at a wide-angle view of the river was recorded onto hardrives for later review. Additionally, two still cameras were installed at each video camera station on September 3 and they collected an image every 5 seconds through October 17.
- Section 9.17.4.3 – **Water surface elevation modeling was deferred until the next year of study.**

Study 9.17 Summary of Results in ISR (ISR Study 9.17, Part A – Section 5)

- Aerial surveys (ISR, Section 5.1; pg 8)
  - CIBWs sighted on 12 of 17 aerial surveys
  - Most sightings were within two miles of the shoreline
  - Sighting rates increased from May to July;
    - highest in July and August.

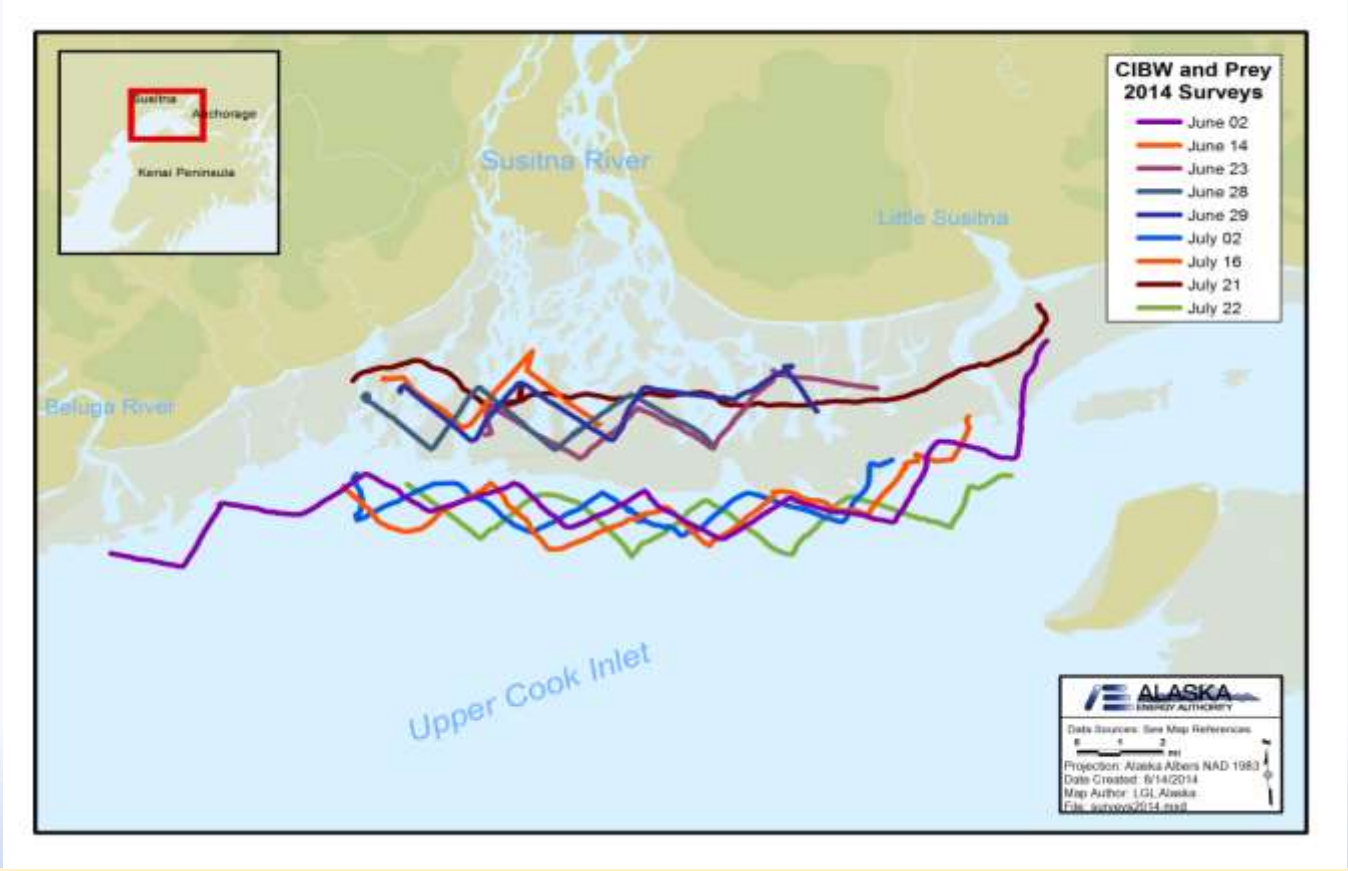


Study 9.17 Summary of Results in ISR (ISR Study 9.17, Part A – Section 5)

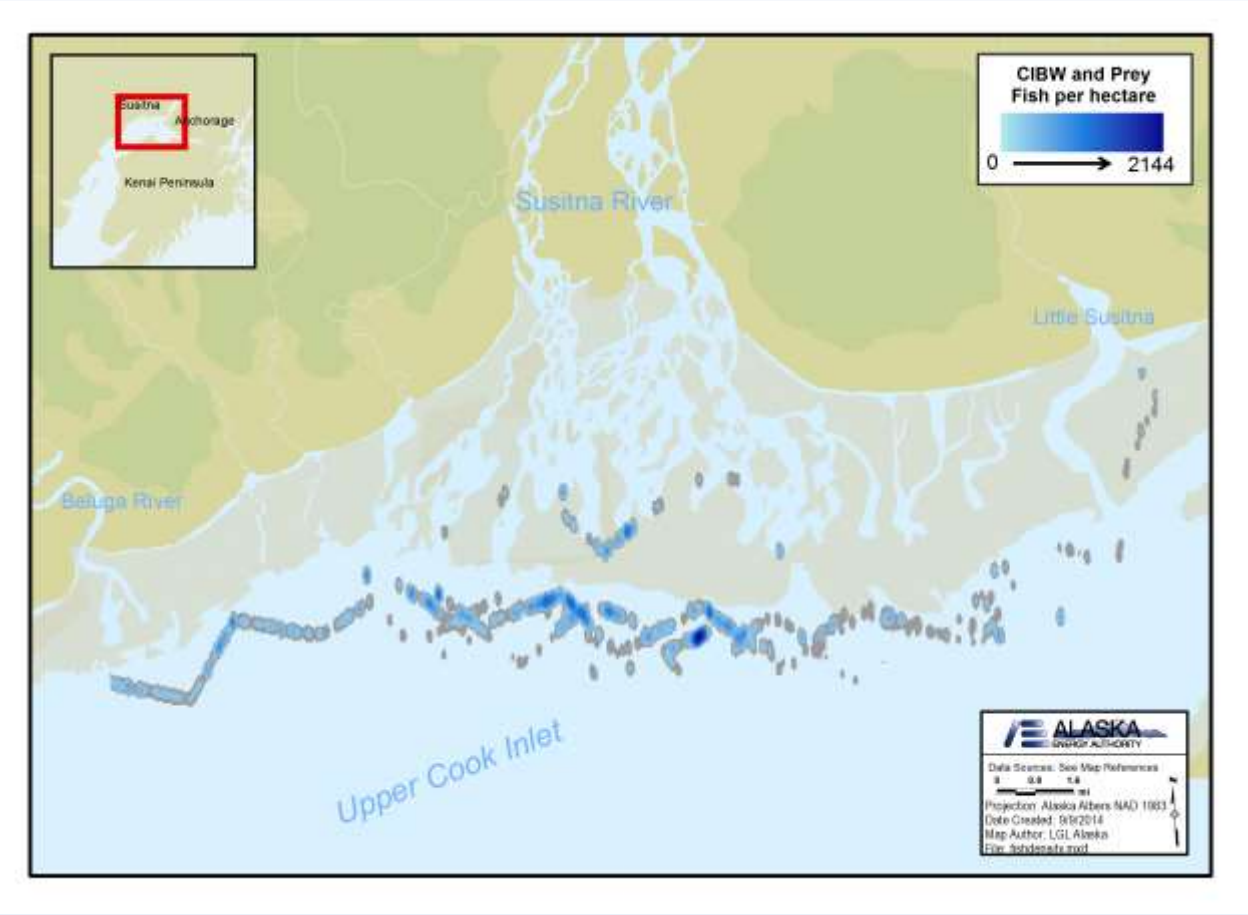
- Video and still cameras (ISR Section 5.2; pg 10)
  - Video was recorded Sep 3 – 24 at PRM 6
    - 7 sightings (likely the same group) on Sep. 20
    - 2 sightings on Sep. 22
  - Live-feed video was monitored Sep. 25 – Oct. 17
    - No sightings
  - 1 group (2 CIBWs) was photographed on Sep. 4 at PRM 6
  - No beluga whales were photographed by still cameras positioned from PRM 11 through PRM 16

Study 9.17 Summary of Results since ISR
(2014 Study Implementation Technical Memo, September 2014)

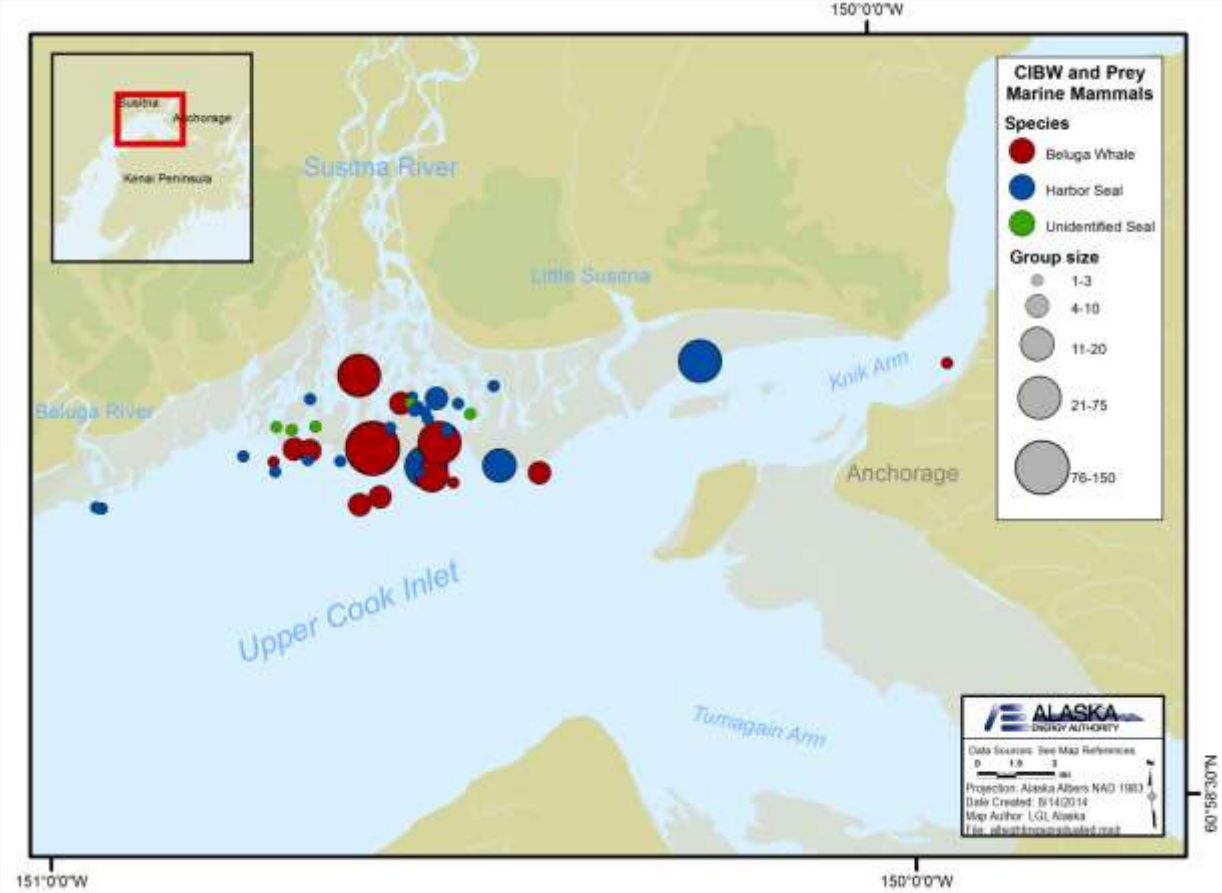
- Vessel-based surveys for beluga prey species
  - June and July 2014.



Study 9.17 Summary of Results since ISR
(2014 Study Implementation Technical Memo, September 2014)



Study 9.17 Summary of Results since ISR
(2014 Study Implementation Technical Memo, September 2014)



AEA Proposed Modifications to Study 9.17 in ISR (ISR Study 9.17, Part C – Section 7.1.2)

- Modified Revised Study Plan (MRSP) has been provided as Attachment 1 to the ISR.
- This MRSP applies to study plan activities that would occur in 2014 and 2015.

AEA Proposed Modifications to Study 9.17 in ISR (ISR Study 9.17, Part C – Section 7.1.2)

7.1.2.1. General Description of the Proposed Study

- **The Modified Revised Study Plan (MRSP) does not modify the study objectives**

7.1.2.3. Study Area and Timing

- **The MRSP does not change the study area or timing for activities in 2015**

7.1.2.4. Study Methods

- This section describes the phased approach for completing study activities in 2014 and 2015
- **The Implementation Plan (IP) describes revised methods for 2015 including:**
  - Aerial surveys will be replaced by incidental observations from vessels conducting activities for the Eulachon Study (9.16)
  - Camera stations will be replaced by manned observation stations
  - Water surface elevation modeling will be replaced by:
    - Stage height measurements and modeling performed by the Instream Flow Study (Study 8.5)
    - Wetted perimeter analysis performed for the Eulachon Study (9.16)

7.1.2.6. Schedule

- **AEA has updated this section to reflect activities planned in 2014 and 2015**

New Modifications to Study 9.17 since ISR
(2015 Implementation Plan, September 2014)

2015 Implementation Plan Modifies:

- Methods described in the MRSP Section 9.17.4
- Schedule described in the MRSP

2015 Implementation Plan Does Not Alter:

- General Description of Study including study objectives
- Existing Information
- Study Area and Timing

New Modifications to Study 9.17 since ISR (2015 Implementation Plan, September 2014)

Camera Stations will be replaced by land-based observations (IP Section 4.1)

- Two stations (near PRM 6 and between PRM 15-20).
- Intensive sampling during peak CIBW use.

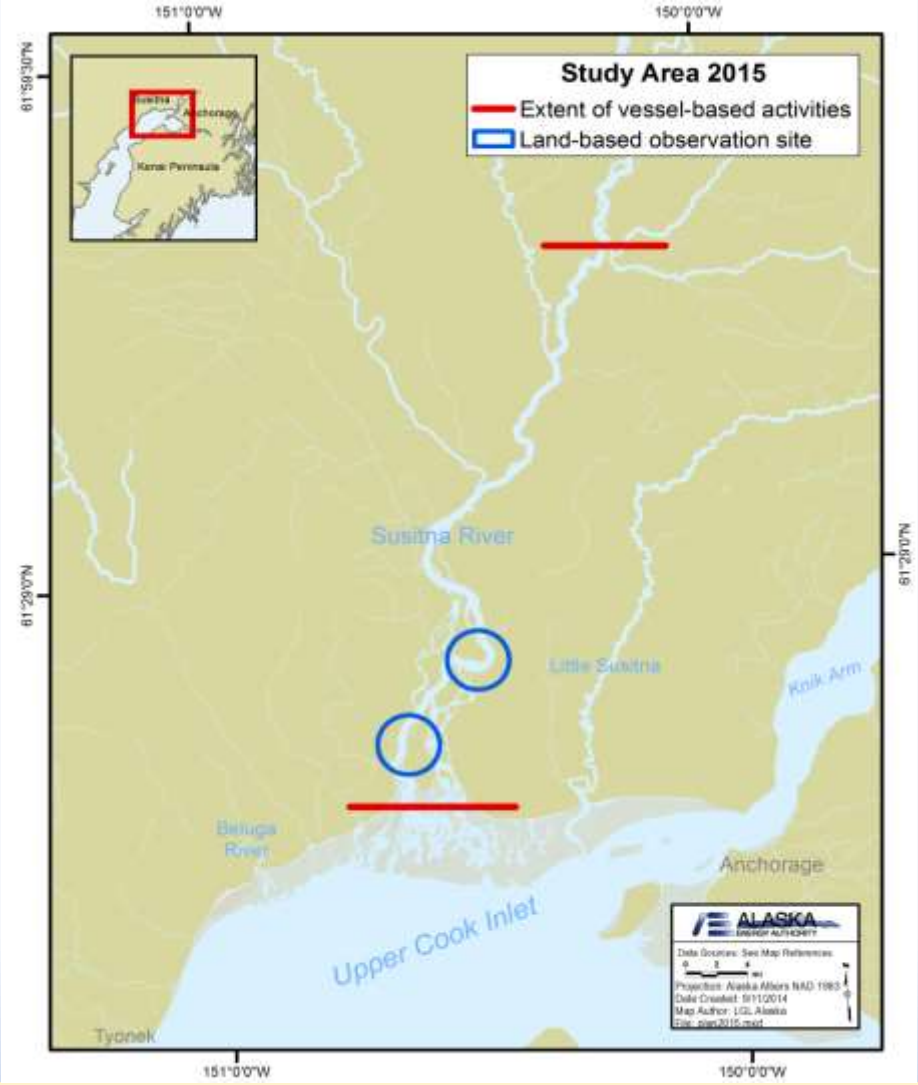
Aerial surveys will be replaced by Vessel-based incidental observations (IP Section 4.2)

- Eulachon Study (Study 9.16) biologists will look for belugas during transits.
- Record observation effort and CIBW sightings.

Habitat Modeling

- Extend stage height model into Lower River (Study 8.5)
- Wetted perimeter analysis (Study 9.16)

New Modifications to Study 9.17 since ISR (2015 Implementation Plan, September 2014)



Current Status and Steps to Complete Study 9.17

- Aerial surveys in 2013 and non-ILP studies have adequately documented CIBW distribution and timing in the Susitna River Delta.
- Methods tested in 2014 are not adequate to fully address study objectives in 2015.
- Land-based observations and vessel-based incidental observations will be conducted in 2015 to document CIBW use of the Lower Susitna River.
- Data from 2015 will be analyzed and results will be combined with those from 2013 and 2014 to fulfill study objectives.

Licensing Participants Proposed Modifications to Study 9.17?

- Agencies
- CIRWG meeting and Ahtna
- Public