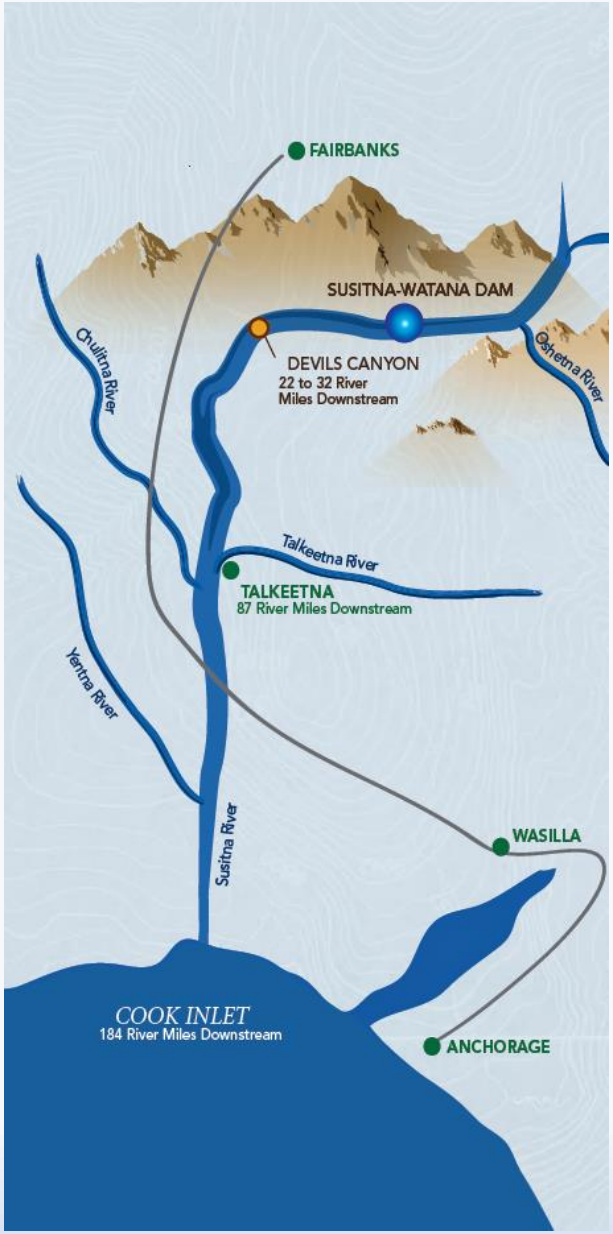

Initial Study Report Meeting

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

March 22, 2016

Prepared by
R2 Resource Consultants

Study 9.6 Status

ISR Documents (ISR Part D Overview)

- Initial Study Report (Jun 3, 2014)
- ISR Appendix C: Winter Sampling Report (Jun 3, 2014)
- 2013-2014 Winter Fish Study Technical Memorandum (Sept 14, 2014)
- Appendix 3. Protocol for Site-Specific Gear Type Selection; Version 5 (Nov 14, 2014)
- Draft Chinook and Coho Salmon Identification Protocol (Nov 14, 2014)
- Study Implementation Report (Nov 6, 2015)

Study 9.6 Status

The following activities have taken place since the June 2014 ISR:

- **2nd study year of Salmon Early Life History**
- **2nd year of radio tracking**
- **Sampled sites that were not sampled or partially sampled in 2013 because of land access**
- Reported 2013-2014 Genetics Results Juvenile Chinook and Coho Salmon Identification Accuracy

A second study year for some tasks is necessary to complete 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)

Components

(ISR Study 9.6, Part D- Section 2.2)

- Seasonal sampling in Middle and Lower Susitna River during the open water period to provide data on distributions, abundance, and habitat associations of all fish species encountered and document any Northern Pike observed or collected.
- Strategic sampling of locations targeting the early life history stages of juvenile Pacific salmon between ice-out and start of seasonal surveys.
- Downstream migrant trapping in Indiana River (PRM 142.1) and Montana Creek (PRM 80.1), and in the mainstem Susitna River at Curry Station (PRM 124) and Talkeetna Station (PRM 106.9).
- Winter studies on overwintering habitat associations of juvenile anadromous salmonids, non-salmonid anadromous, and resident fishes.
- Use of radio-telemetry to describe seasonal movements of selected fishes.
- Use of PIT tagging to track movements of freshwater stages of selected fish species, and estimate individual growth rates.
- Collect fish tissue samples in target species in support of metals analysis and genetic baseline characterizations.

Variances

(ISR Part D - Sections 6.1)

- 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)
- Adjustments to Lower River field habitat classification and site selection (ISR Part A, Section 4.4.4.3)
- Adjustments to the number of fixed receiver locations (ISR Part A, Section 4.1.7.4)
- Use of single antennae configuration at PIT arrays to maximize channel coverages (ISR Part A, Section 4.5.3.1)
- Addition of early life history sampling objective in the Middle River outside of Focus Areas and the Lower River (ISR Part A, Section 4.6.5)

Variances

(ISR Part D - Sections 6.1 and 6.2)

- Adjustments to fish sampling, trap and telemetry locations (ISR Part A, Section 4.1.7; SIR, Section 4.4.2; SIR, Section 4.1.5.3)
- Adjustments to fish sampling due to grouping main channel habitat classifications (ISR Part A, Sections 4.1.7.2 and 4.4.4.3; SIR, Section 4.1.5.1)
- Adjustments to Early Life history and downstream migrant trapping sampling timing (ISR Part A, Section 4.2.1; SIR, Section 4.2.1)
- Adjustments to sample unit lengths (ISR Part A, Section 4.4.4.1; SIR, Section 4.3.3)
- Adjustments to gear type applications (e.g., numbers of passes, soak times) (ISR Part A, Section 4.4.4.2; SIR, Section 4.3.3)
- Refinements to estimating the detection efficiency of PIT tag interrogation systems (ISR Part A, Section 4.5.3.1; SIR, Section 4.4.2)
- Measured and weighed first 25 individuals per species/life stage (ISR Part A, Section 4.7.1.1; SIR, Section 4.7.1)
- 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; SIR, Section 4.4.2)
- Utilizing size instead of age to evaluate habitat associations of juvenile anadromous and resident fish (ISR Part A, Section 4.8.1; SIR, Section 4.7.1)

Variances

(ISR Part D - Section 6.2)

- Fish were not identified to the species level when large numbers of Chum and Sockeye salmon fry were collected during early life history sampling (SIR, Section 4.5.5)

- In addition to tissue samples collected in support of the Genetic Baseline Study for Selected Fish Species (Study 9.14) genetics samples of Coho Salmon and Chinook Salmon were collected in the Middle River for fish identification purposes (SIR, Section 4.9.1)

- Adjustments to the timing of Winter Fish Studies sampling efforts (SIR, Section 4.10.1)

Summary of Results (Radio Tagging/Tracking)

Tags at Large (SIR, Section 4.4.1)

- Goal - up to 30 tags per species
- Monthly tags-at-large ranged from 0 (Lake Trout) to 28 (Rainbow Trout)
- Tracking continued in the Middle and Lower River through June 2015
- Tagging in 2014 limited to Arctic Grayling (16) and Burbot (5) above Devils Canyon
- Most seasonal tagging events occur outside of spawning season

Species	# Tagged	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	Nov '14	Dec '14	Jan '15	Feb '15	Mar '15	Apr '15	May '15	Jun '15
Arctic Grayling	51	11	25	18	19	18	15	12	9	9	9	9	8	14	10	9	9	8	8	7	7	7	7	7	7	6
Burbot	14	0	2	2	4	4	3	3	2	2	2	1	1	1	1	1	6	6	6	5	4	4	4	4	4	3
Dolly Varden	9	1	7	8	6	5	5	3	2	2	2	2	2	2	1	0	0	0	0	0	0	0	0	0	0	0
Longnose Sucker	28	12	14	13	7	6	6	5	4	3	3	3	2	1	1	0	0	0	0	0	0	0	0	0	0	0
Rainbow Trout	44	11	28	23	28	24	23	22	21	21	21	21	18	17	16	13	11	10	10	10	10	10	10	9	9	7
Humpback Whitefish	7	3	4	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Round Whitefish	21	10	13	11	15	11	11	10	9	9	8	7	5	3	3	1	1	1	1	1	1	1	1	1	1	0
Lake Trout	0																									
Northern Pike	5	0	0	5	5	5	5	5	4	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	1	0

Summary of Results

Task	2014 June ISR Section 5	2014-2015 SIR Section 5	Total
All Tasks	~50,000 fish observations; 18 spp	~27,000 fish observations; 17 spp	87,000 fish observations; 18 spp
FDA Sampling	>36,000 fish; 18 species	>7,000 fish; 11 species	>43,000 fish; 18 species
ELH Sampling	3,959 fish; 2,141 juvenile salmon	20,218 fish; 18,754 juvenile salmon	24,177 fish; 20,895 juvenile salmon
Downstream Migrant Traps	11,535 fish; 7,553 juvenile salmon	No trapping	11,535 fish; 7,553 juvenile salmon
Radio tagging	158 fish; 8 species	21 fish; 2 spp	179 fish; 8 spp
PIT tagging	5,248; 10 spp	2,004; 9 spp	7,252 fish; 10 spp
PIT Recaptures	765 fish; 9 spp	236 fish; 7 spp	1,001 fish; 9 spp
Opportunistic Sampling	Additional fish sampling includes River Productivity (9.8), Genetics (9.14), Winter Fish Studies (9.6), resident fish catch in Middle River Fishwheels and Indian River Weir (9.7), Habitat Suitability Criteria (8.5), and Radio Tagging (9.6)		

Summary of Results – Species Presence

(SIR, Table 5.1-1)

Location[a]	PRM	Chinook Salmon	Chum Salmon	Coho Salmon	Pink Salmon	Sockeye Salmon	Salmon, Unspecified	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, Unspecified
Upper River Study Area	187.1-234.5	X						X	X	X	X		X			X				X	X	X
Watana Dam (PRM 187.1)																						
MR-1	184.6-187.1	◊						X	X	X			X			X					X	X
Tsusena Creek	184.6	X						X		X			◊			X					X	
MR-2	169.6-184.6	X						X	X	X			X			X					X	X
Unnamed Tributary	184	◊						◊	◊	◊						◊						
Fog Creek	173.9	○								X						X						
MR-3[b]	166.1-169.6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Devil Creek	164.8	◊								◊					◊	◊						
Impediment 3 Devils Canyon (PRM 164.7)																						
Chinook Creek	160.5	◊								X						X						
Cheechako Creek	155.9	◊						◊		◊						◊						
MR-4[b]	153.9-166.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Impediment 1 Devils Canyon (PRM 155.1)																						
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
Middle / Lower River (PRM 102.4)																						
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

X species observed in 2013, ◊ **new** species observed in 2014; ○ Species observed in 1980s (Delaney et al 1981) or 2003-2012 ADF&G Inventory (Kirsch et al. 2014)

[a] Geomorphic reaches MR-1, MR-5, MR-6, MR-7, MR-8, LR-1, LR-2, LR-3, and LR-4 include sites located in the mainstem Susitna River and its associated off-channel and tributary habitats within the Zone of Hydrologic Influence (ZHI). Directed sampling efforts outside of the ZHI did not occur in these

[b] The mainstem Sustina River in geomorphic reaches MR-3 and MR-4 were not sampled during on-the-ground surveys in 2013 or 2014.

Summary of Results – Species ID

Genetics Results (SIR, Appendix B)

- Species determined for 1,226 samples from juvenile salmon, 2013-2014
- 100% of samples (n=172) from the Middle River upstream of Impediment 1 were correctly identified as Chinook Salmon
- Overall 2013 Chinook and Coho salmon field identification accuracy of 86%
  - Chinook Salmon 96% (nearly all Chinook Salmon correctly called Chinook)
  - Coho Salmon 57% (many Coho Salmon were called Chinook Salmon)

Actions for Improvement

- Increased training and photo QAQC in 2014
  - Species-specific accuracy improved for Coho Salmon
    - **95% Chinook Salmon**
    - **96% Coho Salmon**
- Developed *Fish Distribution and Abundance in the Upper and Middle/Lower Susitna River (Studies 9.5 and 9.6): Draft Chinook and Coho Identification Protocol* to improve future ID accuracy

Implications

- Juvenile Chinook and Coho salmon ecological similarities (size, diet, habitat)
- Results consistent with literature:
  - 84% accuracy fish id overall (Kirsch et al. 2014)
  - Combined Coho and Chinook juveniles for analysis (Bradley et al. 2015)

AEA Proposed Modifications

(ISR Part D - Section 7.1)

- Salmon ELH sampling will take place biweekly (every two weeks) from ice breakup through the end of June for a third year in six Focus Areas and for a second year outside of Focus Areas in the Middle River upstream of Impediment 1 (PRM 155.1) and the Lower River **(ISR Part C, Section 7.1.2.2).**
- Continue to sampling with adjustments made to Fish Distribution and Abundance sampling sites, including the addition of FA-113 and main channel habitat placed into a single stratum **(ISR Part C, Section 7.1.2.2).**
- Relocate the rotary screw trap located on the mainstem Susitna at Curry Station to the mainstem Susitna below Portage Creek between PRM 151.3-152.3 **(ISR Part C, Section 7.1.2.3).**
- Relocate the Montana Creek rotary screw trap to a suitable location in the mainstem Lower Susitna River in the vicinity of Montana Creek **(ISR Part C, Section 7.1.2.3).**
- Relocate the Indian River and Montana Creek PIT antenna locations antennas near the modified mainstem screw trap locations or to another location in proximity to a source of PIT tagged fish **(ISR Part C, Section 7.1.2.3).**

AEA Proposed Modifications

(ISR Part D - Section 7.1)

- Adjustments made to fixed radio receiver station locations in 2014 will be continued in the next year of study. These include: Powerline station in place of Slough 21 and the elimination of Slough 11 and Fog Creek stations **(ISR Part C, Section 7.1.2.4.1).**
- 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 **(ISR Part C, Section 7.1.2.4.2).**
- Continue implementation of Winter Fish Studies as described in ISR Appendix C **(ISR Part C, Section 7.1.2.5).**
- Continue with modified sample reach lengths for main channel habitat types. Sample lengths will be 500 m (0.3 mi) for boat electrofishing and drift gillnetting and 200 meters for other techniques **(ISR Part C, Section 7.1.2.6.1).**
- Continue to use single-pass sampling **(ISR Part C, Section 7.1.2.6.2).**
- 25 fish, per species, per life stage, per gear will be weighed, measured for length and PIT tagged if appropriate **(ISR Part C, Section 7.1.2.6.3).**

AEA Proposed Modifications

(ISR Part D - Section 7.2)

- Continue to survey the same study sites used for 2013-2014 winter PIT tag arrays for future winter efforts **(SIR, Section 4.4.2).**

- Collect additional tissue samples for genetic analysis and increase photo documentation of juvenile Chinook and Coho salmon to inform the accuracy and improvement of species identification in the field **(SIR, Section 4.9.1).**

- Follow the gear specifications and descriptions of field application outlined in IP Appendix 3 Protocol for Site-Specific Gear Type Selection; Version 5 **(R2 Resource Consultants 2014b).**

Steps to Complete Study

(ISR Part D – Section 8)

Objective 1:

- **Seasonal sampling** for fish distribution and abundance in seven select **tributaries** upstream of impediment 1 (PRM 155.1) will take place during early summer (July), late summer (late August- early September), and fall (late September- Early October) (See ISR Part A, Section 4.1.2.1, Table 4.1-2).
- **Seasonal sampling** for fish distribution and abundance in the **mainstem Middle Susitna River** will be repeated during early summer (July), late summer (late August- early September), and fall (late September- Early October) and target 177 GRTS sample locations (See ISR Part A, Section 4.1.2.2, Table 4.1-3).
- **Seasonal sampling** for fish distribution and abundance in **Lower Susitna River** will be repeated along 10 transects.
- **Winter fish studies** will take place at FA-104 (Whiskers Slough), FA-128 (Slough 8A), and FA-138 (Gold Creek) with monthly sampling events February through April.

Steps to Complete Study

(ISR Part D – Section 8)

Objective 2:

- **Rotary screw traps will be operated** at the mouth of the Indian River, and in the mainstem downstream of confluence of Portage Creek, at Talkeetna Station, and at a location in the Lower River.

- **PIT tagging of target species will continue**. PIT antenna arrays will be placed at four locations including the 2013 sites at Whiskers Slough and Slough 8A. The Indian River and Montana Creek PIT antenna locations may be relocated to another location in proximity to a source of PIT tagged fish.

- **Radio tagging and tracking of targets species will continue**.

- **Fixed radio receivers will be operated during the open water period** at the following locations in Middle and Lower River as described in the Study Plan (IP Section 5.8.2.1): Lane Creek Station (RM 113.0), Gateway (RM 125.5), Fourth of July Creek (RM 131.1), Indian River (RM 138.5), Slough 21 (RM 141.1), Portage Creek (RM 148.8), Cheechako Station (RM 152.4), the Chinook Creek confluence (RM 157.0), Devils Station (RM 164.0).

Steps to Complete Study

(ISR Part D –Section 8)

Objective 3 :

- Sampling directed at **salmon ELH** will take place biweekly from ice breakup through June in six Middle River Focus Areas, upstream of Impediment 1 (PRM 155.1), and in the Lower River.

Objective 4:

- Tagging of Burbot and whitefishes will continue during the open water season.
- Aerial surveys during the winter will take place approximately every 16-20 days

Objective 5:

- At each site, 25 fish per species/life stage will be measured for length and weight
- PIT tagging will continue and recaptures used for growth.

Objective 6:

- AEA will continue to look for document Northern Pike and if found document its seasonal distribution, relative abundance, and habitat associations.

Objective 7:

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

Licensing Participants Proposed Modifications to Study 9.6?

- Agencies
- CIRWG members and Ahtna
- Public