

**Susitna-Watana Hydroelectric Project
(FERC No. 14241)**

**River Productivity Study
(Study 9.8)**

**2014 Field Season River Productivity Progress Report
Technical Memorandum**

Prepared for

Alaska Energy Authority



SUSITNA-WATANA HYDRO

Clean, reliable energy for the next 100 years.

Prepared by

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LIST OF ACRONYMS AND SCIENTIFIC LABELS

Abbreviation	Definition
AEA	Alaska Energy Authority
CIRWG	Cook Inlet Region Working Group
FA	Focus Area
FERC	Federal Energy Regulatory Commission
ft	feet
ISR	Initial Study Report
PAR	photosynthetic active radiation
PRM	Project River Mile
Project	Susitna-Watana Hydroelectric Project (FERC No.14241)
RP	River Productivity
RSP	Revised Study Plan
TM	Technical Memorandum

1. BACKGROUND

The Initial Study Report (ISR) for Study 9.8, River Productivity, outlined activities required to complete the Study Plan (ISR Part C, Section 7.1; AEA 2014). This Technical Memorandum (TM) presents an update on activities conducted during the Spring field sampling event in June 2014, which was focused on data collection to support the needs of the trophic modeling and stable isotope analysis objectives of the study. Thus, this TM includes three of the four activities which AEA indicated would be completed in 2014 (Section 7.2):

- Estimating Drift of Invertebrates (RSP Section 9.8.4.5; AEA 2012), as modified in ISR Part C Section 7.1.2.2 (AEA 2014).
- Trophic Modeling and Stable Isotope Analysis (RSP Section 9.8.4.7; AEA 2012) as modified in ISR Part C Section 7.1.2.4 (AEA 2014).
- Fish Diet Analysis (RSP Section 9.8.4.11; AEA 2012) as modified in ISR Part C Section 7.1.2.5 (AEA 2014).

Notable modifications adopted for these activities included a) continuing stable isotope analysis sampling at the 16 sites established in 2013 (ISR Part C, Section 7.1.2.4; AEA 2014), and b) the addition of Arctic grayling juveniles and adults as target species/lifestages to the Study Plan. The purposes of these modification are to aid in the development of bioenergetics models by providing new fish growth and foraging information for the models, and stable isotope analysis efforts that lacked adequate samples in 2013 (ISR Part C, Sections 7.1.2.4 and 7.1.2.5; AEA 2014). In addition, the ISR for Study 9.8, River Productivity, suggested that an increased fish collection effort would be necessary in subsequent sampling seasons (ISR Part A, Section 6; AEA 2014). Specifically, the ISR suggested that “coordination efforts and fish collection timing and locations requirements will be reviewed and refined for efforts in the next year of the study” and that “River Productivity Study and Fish Distribution study efforts will coordinate schedules pre-field season to maximize both site and scheduling overlaps and facilitate collection of useable target fish.” Following this review, the two study programs decided to include a dedicated fish crew as part of the River Productivity seasonal sampling event efforts, in order to increase sampling efforts and total targeted fish species collections.

2. 2014 SPRING EVENT SUMMARY

2.1. Methods

The River Productivity Spring Event sampling was conducted over a 10-day period from June 10–19, 2014 (Table 2.1-1), with a focus on collecting data associated with the trophic modeling objectives of the study plan. The field team collected the following types of samples from target fish species (Chinook salmon, coho salmon, rainbow trout and Arctic grayling): tissue samples (fin clips) for stable isotope analysis, scale samples for growth modeling, and fish stomach samples for diet analysis. In addition, samples for stable isotope analysis were collected from benthic macroinvertebrates, benthic algae, benthic organic matter, drifting invertebrates and seston, and emerging adult insects. Drift nets were set to quantify drifting invertebrates and

organic matter. At each site, basic habitat and water quality parameters were collected including temperature, turbidity, photosynthetic active radiation (PAR), substrate composition, depth and velocity. Additionally, GPS coordinates were recorded for all sampling locations. Finally, at each of the 21 sites an OnSet Tidbit temperature logger was deployed in the water and set to record surface water temperatures until removal during the Fall Event, scheduled for September 2014.

2.2. Results of Data Collection Efforts

During the Spring sampling event for the River Productivity study, a total of 129 diet, tissue, and scale samples from four target fish species were collected for stable isotope analysis along with samples of benthic and drift components (Table 2.2-1). The stable isotope analysis will be conducted by the Wipfli Laboratory at the University of Alaska Fairbanks. Target species collected during this sampling trip included 39 juvenile coho salmon, 52 juvenile Chinook salmon, eight adult rainbow trout, 24 juvenile Arctic grayling, and six adult Arctic grayling (Table 2.2-2). Sampling methods used to collect target species included fyke nets, beach seines, backpack electrofishing, minnow traps, and angling.

At Montana Creek (RP-81), AEA collected samples from 19 juvenile coho, 12 juvenile Chinook, and two juvenile Arctic grayling. At Whiskers Slough (FA-104), samples were collected from 24 juvenile coho, 10 juvenile Chinook, and two juvenile Arctic grayling. At Indian River (FA-141), AEA collected samples from nine juvenile coho, 13 juvenile Chinook, eight adult rainbow trout, five juvenile Arctic grayling, and one adult Arctic grayling. At FA-173, efforts yielded one juvenile Chinook, and seven juvenile and four adult Arctic grayling. No targeted fish species were captured within sites RP-173-4 or RP-173-5, two sites which required access via CIRWG lands. At FA-184, AEA collected samples from three juvenile Chinook, and eight juvenile and one adult Arctic grayling. Genetics samples were collected from all juvenile Chinook salmon caught above Devils Canyon.

An additional 5,881 non-target fish were also collected with these methods during this sampling trip. Non-target fish captured at sites below Devils Canyon included juvenile chum salmon, juvenile sockeye salmon, juvenile pink salmon, lamprey, longnose sucker, round whitefish, threespine stickleback, and sculpin; non-target fish captured at sites above Devils Canyon included longnose sucker, round whitefish, and sculpin.

Along with these target fish species collection efforts, 40 drift samples and 30 plankton tows were collected within the 21 sites (Table 2.2-3). These samples were prepared and shipped to a taxonomic laboratory for processing. Results of the invertebrate analysis will be provided for use in the trophic models.

3. DISCUSSION

Efforts during the 2014 Spring sampling event were focused on collecting the sample components necessary for both the stable isotope analyses and the fish growth and bioenergetics models currently in development for the River Productivity Study. Numbers of fish collected in 2013 were lower than expected due to limited access to private land and distributions of target species upstream of Devils Canyon, including sampling at FA-173 (Stephan Lake Complex) and FA-184 (Watana Dam), which resulted in no catch of the targeted species/lifestages. The total

collection for 2013 sampling was 231 target species fish, of which 63 target species fish (27 percent of the 2013 total) were collected during the Spring event (Table 2.2-1). In contrast, the Spring 2014 dedicated fish collection effort that occurred in concert with macroinvertebrate sampling captured 129 fish from target species/lifestage, just over 50 percent of the 2013 total. With the addition of Arctic grayling as a target species, AEA was successful at collecting target fish at sites both above and below Devils Canyon. A total of 24 target species fish were captured at sites above Devils Canyon during the Spring event efforts (Table 2.2-2), compared to 0 target species fish in 2013.

AEA also took the opportunity during the 2014 field season to reevaluate the design of the emergence traps, which was a study modification proposed in the ISR for Study 9.8, River Productivity (ISR Part C, Section 7.1.2.1; AEA 2014). Emergence traps were used as part of the 2014 Spring sampling, specifically to collect specimens for stable isotope analysis. These floating traps were identical to those used in 2013, with no additional modifications. Emergence traps were left out for 24–48 hour periods and collected an adequate number of emerging adult insects for the needs of stable isotope analysis during that time period, without any loss or damage to traps. This method of shorter, more frequent sampling periods may be more advantageous than the longer deployment times of more than two weeks used in 2013. This method will be monitored carefully in 2014 as a possible modification to 2015 efforts.

The sampling effort detailed in this TM was repeated in full in August 2014 (Summer Event) and is scheduled again in September 2014 (Fall Event). Details of the 2014 field activities will be provided in the USR. In 2015, AEA plans to complete all remaining data collection and analysis for the River Productivity Study 9.8.

4. LITERATURE CITED

Alaska Energy Authority (AEA). 2012. Revised Study Plan: Susitna-Watana Hydroelectric Project FERC Project No. 14241. December 2012. Prepared for the Federal Energy Regulatory Commission by the Alaska Energy Authority, Anchorage, Alaska. <http://www.susitna-watanahydro.org/study-plan>.

AEA. 2014. Initial Study Report: Susitna-Watana Hydroelectric Project FERC Project No. 14241. June 2014. Prepared for the Federal Energy Regulatory Commission by the Alaska Energy Authority, Anchorage, Alaska. <http://www.susitna-watanahydro.org/type/documents>.

5. TABLES

Table 2.1-1. Sampling Stations and Seasonal Sampling Event dates of collection for the River Productivity study in the Lower and Middle River Segments of the Susitna River.

Station	Seasonal Sampling Event
	Spring 2014
FA-184 (Watana Dam)	6/17
FA-173 (Stephan Lake Complex)	6/18 – 6/19
FA-141 (Indian River)	6/15 – 6/16
FA-104(Whiskers Slough)	6/10 – 6/12
RP-81 (Montana Creek)	6/13 – 6/14

Notes:

FA = Focus Area

RP = River Productivity

Table 2.2-1. Itemized listing of Stable Isotope Analysis sample components and number of samples collected from the four sampling stations (16 sites total) in the Middle and Lower River Segments of the Susitna River for the River Productivity Study in both Spring 2014 compared to Spring 2013, along with the total number of samples collected and analyzed in 2013.

Category	Component	Spring 2014	Spring 2013	Total Number Analyzed (2013)
Endmembers	Benthic Algae	48	44	134
	Organic Matter - benthic	48	44	140
	Organic Matter - drift	32	30	94
	Salmon carcass	0	0	21
	Subtotal	128	118	389
Invertebrates	Benthic- grazers	- *	25	77
	Benthic- collectors	- *	37	127
	Benthic- shredders	- *	19	71
	Benthic- predators	- *	36	105
	Terrestrial Drift	- *	23	80
	Emergents	- *	32	75
	Subtotal		172	535
Fish	Chinook salmon - juveniles	39	30	88
	Coho salmon - juveniles	52	24	108
	Rainbow trout - juveniles	0	8	18
	Rainbow trout - adults	8	1	17
	Arctic Grayling – juveniles	24	-	-
	Arctic Grayling – adults	6	-	-
	Subtotal	129	63	231
	Totals	257	353	1,155

Notes:

* Invertebrate sample components were collected with the organic matter components, and will be sorted and identified in the laboratory.

Table 2.2-2. Number of fish collected for fish gut content, scales, and stable isotope tissue samples for the River Productivity Study during the 2014 Spring Index Event for each target species / age class from each sampling site in the Middle and Lower River Segments of the Susitna River.

Station	Sampling site	Habitat Type	Juvenile Chinook	Juvenile Coho	Juvenile Rainbow	Adult Rainbow	Juvenile Arctic Grayling	Adult Arctic Grayling
			2014 Spring Totals					
FA-184 (Watana Dam)	RP-184-1	Tributary Mouth	0	0	0	0	0	1
	RP-184-2	Side Channel	3	0	0	0	7	0
	RP-184-3	Main Channel	0	0	0	0	1	0
FA-173 (Stephan Lake Complex)	RP-173-1	Tributary Mouth	0	0	0	0	1	3
	RP-173-2	Main Channel	1	0	0	0	6	1
	RP-173-3	Side Channel	0	0	0	0	0	0
	RP-173-4	Side Slough	-	-	-	-	-	-
	RP-173-5	Upland Slough	-	-	-	-	-	-
FA-141 (Indian River)	RP-141-1	Tributary Mouth	0	8	0	6	0	1
	RP-141-2	Side Channel	4	1	0	0	0	0
	RP-141-3	Mult Split Main Channel	8	0	0	0	5	0
	RP-141-4	Upland Slough	1	0	0	2	0	0
FA-104 (Whiskers Slough)	RP-104-1	Side Slough	8	8	0	0	0	0
	RP-104-2	Side Slough	0	6	0	0	0	0
	RP-104-3	Main Channel	2	0	0	0	2	0
	RP-104-4	Upland Slough	0	8	0	0	0	0
	RP-104-5	Side Channel	0	2	0	0	0	0
RP-81 (Montana Creek)	RP-81-1	Upland Slough	1	8	0	0	0	0
	RP-81-2	Tributary Mouth	0	6	0	0	0	0
	RP-81-3	Split Main Channel	7	3	0	0	0	0
	RP-81-4	Side Channel	4	2	0	0	2	0
2014 Spring Totals			39	52	0	8	24	6

Notes:
RP River Productivity

Table 2.2-3. Benthic drift and plankton tow sample totals for 2014 sampling during the Spring index event for sampling sites in the Middle and Lower River Segments of the Susitna River.

Site	Macrohabitat Type	Drift Samples	Plankton Tow Samples
		Spring	Spring
RP-184-1	Tributary Mouth	2	
RP-184-2	Side Channel	2	
RP-184-3	Main Channel	2	
RP-184-4*	Main Channel	2	
RP-173-1	Tributary Mouth	2	
RP-173-2	Main Channel	2	
RP-173-3	Side Channel	2	
RP-173-4	Side Slough**		5
RP-173-5	Upland Slough**	2	
RP-141-1	Tributary Mouth	2	
RP-141-2	Side Channel	2	
RP-141-3	Mult Split Main Channel	2	
RP-141-4	Upland Slough		5
RP-141-5*	Main Channel	2	
RP-104-1	Tributary Mouth	2	
RP-104-2	Side Slough		10
RP-104-3	Main Channel	2	
RP-104-4	Upland Slough	2	5
RP-104-5	Side Channel	2	
RP-81-1	Upland Slough		5
RP-81-2	Tributary Mouth	2	
RP-81-3	Split Main Channel	2	
RP-81-4	Side Channel	2	
RP-81-5*	Side Channel	2	
	Totals	40	30

Notes:

* Site established for additional drift sampling upstream of tributary mouth.

** CIRWG

RP River Productivity