Susitna-Watana Hydroelectric Project Document
ARLIS Uniform Cover Page

Title: Study of fish distribution and abundance in the middle and lower Susitna River (Study 9.6), 2013-2014 winter fish study, technical memorandum	SuWa 232
Author(s) – Personal:	
Author(s) – Corporate: R2 Resource Consultants, Inc. & LGL Alaska Research Associates, Inc.	
AEA-identified category, if specified: September 17, 2014 technical memorandum filings	
AEA-identified series, if specified:	
Series (ARLIS-assigned report number): Susitna-Watana Hydroelectric Project document number 232	Existing numbers on document:
Published by: [Anchorage, Alaska : Alaska Energy Authority, 2014]	Date published: September 2014
Published for: Prepared for Alaska Energy Authority	Date or date range of report:
Volume and/or Part numbers: Attachment D	Final or Draft status, as indicated:
Document type: Technical memorandum	Pagination: 100 p.
Related work(s): Cover letter to this report: Susitna-Watana Hydroelectric Project, FERC Project no. 14241-000; Initial filing of September 2014 technical memoranda. (SuWa 228) Attachments A-C and E-J (SuWa 229-231 and 233-238)	Pages added/changed by ARLIS: Added cover letter
Notes:	

September 17, 2014

Ms. Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, N.E.
Washington, D.C. 20426

Re: Susitna-Watana Hydroelectric Project, Project No. 14241-000

Initial Filing of September 2014 Technical Memoranda

Dear Secretary Bose:

By letter dated January 28, 2014, the Federal Energy Regulatory Commission (Commission or FERC) extended the procedural schedule for the preparation and review of the Initial Study Report (ISR) for the proposed Susitna-Watana Hydroelectric Project, FERC Project No. 14241 (Project).[1] In particular, the Commission's January 28 letter established a deadline of June 3, 2014 for the Alaska Energy Authority (AEA) to file the ISR, and provided a 120-day period for licensing participants to review the ISR prior to the ISR meetings, which are scheduled to begin the week of October 13.[2] The purpose of this filing is to provide several technical memoranda to Commission Staff and licensing participants prior to the ISR meetings.

As required by the Commission's January 28 letter, AEA filed the ISR with the Commission on June 3. Among other things, the ISR detailed AEA's planned work during the 2014 field season.[3] As AEA was preparing this 2014 work plan, it recognized that data gathered during the 2014 field season, together with other study work conducted prior to the October 2014 ISR meetings, could assist Commission Staff, AEA, and other licensing participants in developing the Project's licensing study program for 2015. For this reason, the ISR provided for AEA to prepare certain technical memoranda and other information based on 2014 work.

AEA recognizes that Commission Staff and licensing participants need a reasonable amount of time prior to the ISR meetings to review this additional information. AEA and licensing participants consulted with Commission Staff on this

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1 Letter from Jeff Wright, Federal Energy Regulatory Commission, to Wayne Dyok, Alaska Energy Authority, Project No. 14241-000 (issued Jan. 28, 2014) [hereinafter, "January 28 letter"].

2 The full schedule for the ISR meetings appears in Section 1.5 of the ISR, as well as on AEA's licensing website, http://www.susitna-watanahydro.org/meetings/.

3 *E.g.*, Initial Study Report § 1.3 & Table 3, Project No. 14241-000 (filed June 3, 2014) [hereinafter, "ISR"].

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matter, and Staff directed that any additional information should be filed with the Commission and made available to licensing participants no later than 15 days prior to the ISR meetings, consistent with the typically applicable deadline under the Commission's Integrated Licensing Process regulations.[4]

With this letter, AEA is filing and distributing the first set of technical memoranda and other information generated during the 2014 study season, as described below. As part of its continued implementation of the study plan, AEA expects to file certain additional technical memoranda prior to October 1, 2014, in accordance with Commission Staff direction.

This first set of technical memoranda and other information consists of the following:

- Attachment A: *Proposal to Eliminate the Chulitna Corridor from Further Study*. As explained in the ISR, throughout the licensing process AEA has continually evaluated its proposal for Project development based on environmental review, technical feasibility, practical considerations, and other factors. As part of this iterative process, AEA notified the Commission and licensing participants in the ISR that it was evaluating whether to continue study of the Chulitna Corridor.[5] Attachment A details AEA's conclusion that development of the Chulitna Corridor is not a reasonable alternative, and therefore AEA proposes to eliminate the corridor from further study. AEA seeks any comments or information on this proposal from federal and state resource agencies and other participants in the licensing process.

- Attachment B: *Ice Processes in the Susitna River Study (Study 7.6), Detailed Ice Observations October 2013 – May 2014 Technical Memorandum.* The ISR indicated that AEA would provide a summary of the 2014 break-up observations.[6] This technical memorandum describes all field activities and observations between October 16, 2013 and May 15, 2014 for the Ice Processes in the Susitna River Study (Study 7.6).

- Attachment C: *Study of Fish Distribution and Abundance in the Upper Susitna River (Study 9.5), Proposed 2015 Modifications to Fish Distribution and Abundance Study Plan Implementation Technical Memorandum.* Based on AEA's experience in implementing the study plan for the Study of Fish Distribution and Abundance in the Upper Susitna River (Study 9.5) during 2014, this technical memorandum proposes to continue certain modifications to the implementation of this study during 2015.

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4 *See* 18 C.F.R. § 5.15(c)(2).

5 *See* ISR, ISR Overview § 1.4.

6 *See id.*, Ice Processes in the Susitna River Study, Study Plan 7.6, Part C § 7.2.

- Attachment D: *Study of Fish Distribution and Abundance in the Middle and Lower Susitna River Study (Study 9.6), 2013-2014 Winter Fish Study Technical Memorandum.* At the time the ISR was filed, AEA was still in the process of conducting data entry, quality control, and analysis of winter sampling for this study. AEA reported in the ISR that it would develop plans for completing this study in a technical memorandum to be filed with the Commission.[7] This technical memorandum fulfills this commitment and sets forth AEA's proposal for winter efforts, including proposed methodologies and modifications.

- Attachment E: *Characterization and Mapping of Aquatic Habitats (Study 9.9), 2013 and 2014 Aquatic Habitat Mapping Field Season Completion Progress Technical Memorandum.* In the ISR, AEA reported that its 2014 activities for the Characterization and Mapping of Aquatic Habitats Study (Study 9.9) would consist of various ground-truthing surveys and collection of habitat information for the 12 lakes within the potential reservoir inundation zone.[8] This technical memorandum reports on these activities.

- Attachment F: *Eulachon Run Timing, Distribution, and Spawning in the Susitna River (Study 9.16), 2015 Proposed Eulachon Spawning Habitat Study Modifications Technical Memorandum.* After reviewing the 2013 and 2014 results from the Cook Inlet Beluga Whale Study (Study 9.17) and discussing the results with the National Marine Fisheries Service, AEA has determined that additional data are needed regarding eulachon spawning habitats. This technical memorandum describes a proposed modification to the Study of Eulachon Run Timing, Distribution and Spawning in the Susitna River (Study 9.16) to include an assessment of eulachon spawning habitats.

- Attachment G: *Fish and Aquatics Instream Flow Study (Study 8.5), Evaluation of Relationships between Fish Abundance and Specific Microhabitat Variables Technical Memorandum*. Consistent with the Commission's study plan determination,[9] this technical memorandum provides a detailed evaluation of the comparison of fish abundance measures with specific microhabitat variable measurements where sampling overlaps. This memorandum is used to determine whether a relationship between a specific microhabitat variable and fish abundance is evident.

- Attachment H: *Fish and Aquatics Instream Flow Study (Study 8.5), 2013-2014 Instream Flow Winter Studies Technical Memorandum*. In the ISR, AEA reported that it would distribute its finding concerning the 2013-2014

[7] *See id.*, Study of Fish Distribution and Abundance in the Middle and Lower Susitna River Study, Study Plan 9.6, Part C § 7.1.2.5.

[8] *See id.*, Characterization and Mapping of Aquatic Habitats, Study Plan 9.9, Part C § 7.1.

[9] *See* Study Plan Determination on 14 Remaining Studies for the Susitna-Watana Hydroelectric Project, Appendix B at B-84 to B-86, Project No. 14241-000 (issued Apr. 1, 2013).

winter activities in 2014.[10] This technical memorandum describes the methods applied, and data and information collected, as part of the Instream Flow Study 2013-2014 winter studies.

- Attachment I: *Geomorphology Study (Study 6.5), Susitna River Historical Cross Section Comparison (1980s to Current) Technical Memorandum*. As specified in Revised Study Plan Section 6.5.4.1.2.3, this technical memorandum describes changes within the main and side channels of the Susitna River by comparing historical survey data from the 1980s with survey data from the current Project.

- Attachment J: *Geomorphology Study (Study 6.5), 2014 Update of Sediment-Transport Relationships and a Revised Sediment Balance for the Middle and Lower Susitna River Segments Technical Memorandum*. The purpose of this technical memorandum is to update the sediment load rating curves and preliminary estimates of the overall sediment balance in the Middle and Lower River segments under pre-Project conditions that were initially provided in "Development of Sediment-Transport Relationships and an Initial Sediment Balance for the Middle and Lower Susitna River Segments," (Tetra Tech, Inc. 2013a). This update is based on additional data collected by the U.S. Geological Survey in 2012 and 2013.

AEA appreciates the opportunity to provide this additional information to the Commission and licensing participants, which it believes will be helpful in determining the appropriate development of the 2015 study plan as set forth in the ISR. If you have questions concerning this submission please contact me at wdyok@aidea.org or (907) 771-3955.

Sincerely,

Wayne Dyok
Project Manager
Alaska Energy Authority

Attachments

cc: Distribution List (w/o Attachments)

10 *See* ISR, Fish and Aquatics Instream Flow Study, Study Plan 8.5, Part C § 7.5.2.

Susitna-Watana Hydroelectric Project
(FERC No. 14241)

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

2013-2014 Winter Fish Study
Technical Memorandum

Prepared for

Alaska Energy Authority

SUSITNA-WATANA HYDRO
Clean, reliable energy for the next 100 years.

Prepared by

R2 Resource Consultants Inc. &

LGL Alaska Research Associates, Inc.

September 2014

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LIST OF ACRONYMS AND SCIENTIFIC LABELS

Abbreviation	Definition
ADF&G	Alaska Department of Fish and Game
adt	adult
AEA	Alaska Energy Authority
ARIS	Adaptive Resolution Imaging Sonar
ATS	Advanced Telemetry Systems, Inc.
CPUE	catch per unit effort
DIDSON	Dual Frequency Identification Sonar
DO	dissolved oxygen
FA	Focus Area(s)
ft	foot, feet
GPS	global positioning system
GRTS	Generalized Random Tessellation Stratified sampling
HDX	half-duplex
in	inch
IP	Implementation Plan
joa	juvenile or adult
juv	juvenile
m	meter(s)
mm	millimeter(s)
NMFS	National Marine Fisheries Service
PIT	Passive Integrated Transponder
PRM	Project River Mile(s)

1. INTRODUCTION

As presented in Section 9.6.4.5 of the Revised Study Plan (AEA 2012) and in the Initial Study Reports in Study 9.6 Appendix C and Study 8.5 Appendix I (AEA 2014), an interdisciplinary winter pilot study was conducted in 2012-2013 to assess the safety, feasibility, and utility of collecting: (a) intergravel temperature, dissolved oxygen (DO), and water level; (b) winter fish observations using sonar and underwater video; and (c) fish during winter conditions on the Susitna River. Based on pilot efforts and feedback from the FERC and other licensing participants, AEA developed recommendations for winter studies. AEA implemented the first complete study year of the Winter Fish Study between November 2013 and April 2014.

2. STUDY OBJECTIVES

The goal of the Winter Fish Study is to improve knowledge of the winter ecology of fish species in the Middle and Lower Susitna River. Specific fish winter sampling objectives include the following:

1) Describe overwintering habitat associations of juvenile anadromous salmonids, non-salmonid anadromous fishes and resident fishes.
2) 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 (see Section 3).
3) Describe early life history, diurnal behavior, timing, and movements of anadromous salmonids.
4) Document the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type.
5) Collect tissue samples from juvenile salmon and opportunistically from all resident and non-salmon anadromous fish to support the Fish Genetic Baseline Study (ISR Study 9.14).

When ice conditions allowed, 40 meter (m) (131 ft) sampling units were sampled with a minimum of one technique and a target of two techniques including:

1) Setting four to eight baited minnow traps overnight;
2) Selecting an additional technique based on site conditions including electrofishing, small mesh fyke netting, hoop trapping, trotlining, setlining, angling, or underwater video; and
3) Repeated sampling of a subset of sites using electrofishing and sonar to characterize diurnal fish presence and behavior.

3. STUDY AREA

Given the limited number of daylight hours and potential for extreme weather, the ground efforts for the Winter Fish Study area were limited to the reach of the Middle and Lower Susitna River easily accessible from Talkeetna by snow machine, snowshoe, or railroad. The study area includes lower Montana Creek (PRM 80.8) and the Susitna River between PRM 104.4 and PRM 142.4. Three Focus Areas, FA-104 (Whiskers Slough), FA-128 (Slough 8A), and FA-138 (Gold Creek), served as activity centers for intensive sampling (Figures 3-1, 3-2 and 3-3). Additional sampling took place at select satellite locations including: the Cut (an upland slough between the Susitna and Chulitna Rivers), Slough 14, Gold Creek, Indian River, and Slough 17 (Figure 3-4). Aerial tracking of radio-tagged fishes extended into the Lower River down to the mouth of the Susitna River and into the Upper River above Clearwater Creek (PRM 321)

4. METHODS

4.1. Study Site Selection

4.1.1. Fish Habitat Associations and Abundance

4.1.1.1. Generalized Random Tessellation Stratified (GRTS) Sampling

To the extent practical based on ice conditions, sampling took place at the same stratified macrohabitat locations randomly selected using the GRTS method for the fish distribution and abundance sampling conducted July through October 2013. Each sampling event included sampling in three replicate sites of each off-channel macrohabitat type within each of the three Focus Areas.

Specific fish sampling sites for winter studies could not be preselected because ice conditions are dynamic and unpredictable. During the winter it is common for the water column to freeze all the way to the substrate, especially in off-channel locations. Instead, each 200 m (656 ft) GRTS site was evaluated, beginning at the downstream end, to determine if a 40 m (131 ft) segment had conditions appropriate for sampling. In ice-covered areas, a 2-in diameter ice auger was used to drill pilot holes every 25 m (82 ft) along GRTS units to determine suitability based on the presence of flowing water and minimum water depths under the ice. When GRTS units did not have appropriate conditions for sampling, spatially random oversample sites were evaluated and sampled.

4.1.1.2. Opportunistic Sampling

Opportunistic (non-random) sampling took place at additional locations of interest within and nearby Focus Areas and included: main channel locations, tributary confluences, areas of upwelling, and additional slough habitats downstream of known spawning areas. A limited number of main channel locations were sampled opportunistically as they required careful evaluation of ice thickness and stability for safe access. Opportunistic sample locations ranged in size from a small point sample (video, trotline or fyke net) up to 300 m-long units for electrofishing (Figures 3-1 to 3-4).

4.1.2. Sonar

Sonar sampling took place in off-channel habitats in FA-104 (Whiskers Slough) and FA-138 (Gold Creek). Site selection was based on suitable water depth and channel configuration for good coverage of the habitat feature. Sites generally overlapped or were in close proximity to winter fish sampling sites.

FA-104 (Whiskers Slough) contained a diverse array of off-channel habitats including side sloughs, side channels, tributaries and upland sloughs known to support juvenile and adult fish use. Three sites representing different habitat types were targeted in FA-104 (Whiskers Slough): a side slough, tributary, and upland slough.

FA-138 (Gold Creek) also contained a range of habitats including side sloughs, side channels, upland sloughs and a complex of beaver dams. Habitats targeted in FA-138 (Gold Creek) were side slough, side channel and a beaver pond complex within a side slough.

Sonar sites and sampling locations in FA-104 (Whiskers Slough) and FA-138 (Gold Creek) are shown in Figures 3-1 and 3-3, respectively. One of the objectives of the study was to examine patterns of habitat use. However, low water conditions occurred after the first sonar event and two new sample sites were required. In FA-104 (Whiskers Slough), the Whiskers Creek site was moved upstream from the original location for the March and April sample periods. In FA-138 (Gold Creek), the side slough site was moved upstream of the beaver dam for the April sample period where depths were adequate for sonar operations.

4.1.3. PIT Tag Arrays

PIT tag antenna arrays were operated during the winter season at three locations that were monitored during the open water period. Sites were selected within Focus Areas in off-channel habitats accessible from the mainstem Susitna River during typical winter conditions with suitable channel configuration. Sites included Montana Creek at RM 2.2, Whiskers Slough in FA-104 (Figure 3-1) and Slough 8A in FA-128 (Figure 3-2). These were the same monitoring locations used during the 2013 open water period.

4.2. Sampling Frequency

Fish data collection occurred during four trips in the winter of 2013-2014, starting in November 2013 and followed by monthly trips from February to April, 2014. The March and April sampling trips included sampling below known salmon spawning areas to determine if fry emergence was occurring. Sonar sampling occurred in off-channel habitats from February to April. PIT tag arrays were operated throughout the fall and winter months as conditions allowed prior to their removal for ice breakup in May. Aerial surveys to relocate radio tagged fish took place approximately once every two to three weeks in each segment of the river (Lower, Middle, and Upper).

4.3. Fish Sampling Techniques

Multiple fish sampling techniques were utilized to sample multiple fish species, life stages, habitat types, and various ice conditions. Sampling methods included minnow traps, backpack electrofishing, fyke nets, trotlines/setlines, sonar and underwater video. Two techniques were typically used at each site to sample a diversity of species and life stages. Table 4.3-1 provides a list of sampling locations and techniques.

Because sampling efforts occurred in both open-water leads and ice-covered sites, methods varied depending on conditions (ice coverage, ice thickness, depth, velocity, and conductivity). In ice-covered sites, sampling methods included setlines, trotlines, minnow traps, and underwater video. In open-water sites, methods included baited minnow traps, trotlines, electrofishing, and fyke nets.

To characterize diel behavior, in addition to overnight minnow trapping and fyke netting, a select subset of sites sampled during the day (three to four per Focus Area) were revisited during the night and sampled by electrofishing. Night sampling sites were selected based on safe ice conditions and proximity to winter spike camps.

4.3.1. Electrofishing

Single-pass backpack electrofishing surveys were conducted in open-water leads (i.e., sloughs and side channels). Electrofishing was selected as a primary sampling gear for open-water habitats during the 2013-2014 sampling efforts. The location of each electrofishing transect was mapped using a handheld GPS unit and the sampled area was estimated. The electrofishing, settings (voltage, frequency, and duty cycle), start and stop times, and water conductivity were recorded. To the extent possible, electrofishing reaches were standardized and the methods were repeated during subsequent sampling events at each sample site. Electrofishing followed NMFS (2000) protocol.

4.3.2. Minnow Traps

Minnow traps were set at a density of 1-2 traps per 10 meters of sampleable unit length. Minnow traps were deployed in ice-covered areas through 10-inch diameter auger holes or in open water leads set overnight for 18 to 24 h, allowing the gear to fish during both day and night. Wired two-piece minnow traps were 16.5 in long, with a 9-in diameter, and a 1-in diameter opening, were baited with commercially processed salmon roe. As per ADF&G Fish Resource Permit stipulations, all salmon eggs used as bait were either commercially sterilized or disinfected with a 10-minute soak in a 1/100 Betadine solution. Approximately one tablespoon of roe was placed in a 1-oz plastic Whirl-Pak bag (Fort Atkinson, WI, USA). Filled plastic bags were perforated using a utility knife before bait was placed inside the trap. Traps were placed on the stream bottom, parallel to stream current, along banks, in deep pools, or near structure such as large woody debris. To prevent the loss of traps, each trap was anchored to the ice surface or bank by a tether line connected to the minnow trap and flagged with the fish resource permit number.

4.3.3. Trotlines/Set Lines

Trotline construction and deployment followed the techniques used during the 1980s studies as described in ADF&G (1981). Trotlines consisted of 30 to 36 ft of dropline made of cord attached to heavy monofilament with swivels spaced every meter to which six 0.5 m-long leaders with hooks were snapped. The line was then lowered to the river bottom and positioned using 8 to 24 oz sinkers. Trotlines were set up with a range of hook sizes from 10 to 4/0 to target various species. For larger hook sizes, both traditional J hooks and circle hooks were used. Hooks were baited with salmon eggs, herring, eulachon, or whitefish depending on the hook size. As per ADF&G Fish Resource Permit stipulations, all salmon eggs used as bait were sterilized either commercially or with a 10-minute soak in a 1/100 Betadine solution prior to use.

To deploy trotlines in ice-covered areas, holes were augured and lines were lowered to the bottom. Underwater video was often used when deploying lines to ensure correct placement. Slack was then retrieved from the drop line and wrapped around a wooden rod that was laid over the hole and marked with flagging. In open water areas, trotlines were tied to trees, rocks, or ice anchors. Trotlines were soaked for 24 to 48 hours and checked and rebaited at least once daily. Setlines are similar to trotlines but have only 1 or 2 hooks baited with salmon roe or whitefish that were attached to a main line weighted with a 16 oz sinker. Small hooks (sizes 4 to 10) were generally used with setlines.

Trotlines were set in backwaters, slough mouths, and main channel habitats. Each trotline was flagged and identified with the fish resource permit holder’s name, contact information, and the date and time of the set. All captured fish were identified to species, measured for fork length (FL), and gonads were examined to evaluate spawning status. Sampling mortalities were returned to the stream.

4.3.4. Underwater Video

Several underwater video camera models were used to observe fish presence and behavior in ice-covered and open water habitats (Figure4.3-1).

Video cameras were used to record or observe short duration “spot checks” of fish presence and habitat and record long duration deployments of fish presence, behavior and counts. Spot checks had multiple applications to: 1) make quick determinations of fish presence; 2) observe habitat and ice features; and 3) observe gear (trot line and minnow trap) placement. Spot checks required a camera type where imagery could be viewed real-time on a view screen and smaller, lightweight, mobile camera models were best suited for this application. Spot checks were done through an auger hole or near the edge of an iced-over area. During a spot check, the camera was either mounted to stationary mount or attached to a rod and panned around in order to observe conditions and fish presence under the ice in different views of field.

Long duration video-recording was sometimes stratified by day/night, covering day, night, and crepuscular periods, by positioning the camera on a stationary mount and letting the camera record for extended periods of time (up to 16 hours). Long duration video was gathered for later playback and did not require real-time viewing capabilities. Depending on the camera model, long duration deployment were done through an auger hole and covered with an ice fishing tent housing a 12-volt battery to run a computer and lighting system overnight. Both white and infrared lighting were used during night observations.

4.3.5. Sonar

4.3.5.1. Field Methods

Data was collected using Adaptive Resolution Imaging Sonar (ARIS) during three monthly sampling trips (February to April 2014) to FA-104 (Whiskers Slough) and FA-138 (Gold Creek). At each site within each Focus Area, 24 hours of continuous ARIS data was acquired. To describe the mesohabitat type at each sample site, the following physical parameters were measured: ice thickness, water depth, water velocity, habitat width, presence and type of cover, and dominant substrate type.

When sites were covered in ice, sample holes were made using a chainsaw with an 18-inch bar, a 12-inch ice auger, and or an ice saw. At each site, an ARIS was fastened to an aluminum pole mount and lowered down into the sample hole (Figure 4.3-2). The sonar heads were positioned just off the bottom and typically near the bank and aimed towards the opposite bank. The sonar heads were tilted down to allow the sampling beams to spread across the substrate throughout the majority of the sampling window (Figure 4.3-3).

Two different models of ARIS units were used: the 1200, which has operating frequencies of 0.7 and 1.2 MHz, and the 1800, which has operating frequencies of 1.1 and 1.8 MHz. Each ARIS system consisted of the sonar head, data transmission cable, switch box, Ethernet cable, laptop computer and an external hard drive. All topside electronic components were housed inside a portable shelter near the sample location (Figure 4.3-4) to provide protection from winter weather conditions. The sonar systems were powered using Honda generators (model EU2000i) and auxiliary fuel tanks. Generators and fuel tanks were placed inside portable fuel containment barriers.

4.3.5.2. Analytical Methods

For each sample date, a 24-hour period of data was processed by manually reviewing files using ARISFish playback software (version 1.0, SoundMetrics Corp., Bellevue, WA). A background subtraction algorithm was applied to the data to remove static imagery, allowing for moving targets to be more easily detected. Data playback rate was typically three times the collection rate. The review process involved noting the presence of fish targets, their size, and direction of travel.

To classify fish targets as juvenile salmonids or other species, a number of assumptions were made based on observations and direct capture data collected during the 2013 pilot study:

1) Juvenile salmon were defined as targets < 14 cm, often moving in aggregations or schools. Initially, the maximum estimated size for juvenile salmon was defined as 12 cm based on data collected in 2013. The definition was broadened to 14 cm after a number of observations in the 2014 data indicated there were sometimes a few slightly longer fish within schools of fish ranging in size from 10 to 12 cm.
2) Whitefish were defined as targets > 14 cm, with broader general body shape as compared to juvenile salmon targets. Although whitefish were not captured in 2013, they were observed visually through the clear ice near the FA-104 (Whiskers Slough) side slough site.
3) Burbot were defined as targets that exhibited anguilliform (serpentine) swimming behavior. Burbot were occasionally captured at FA-104 (Whiskers Slough) in 2013.
4) Sculpin were defined as targets that exhibited lurching swimming behavior, with a bulbous-shaped head.
5) A designation of “other” was given for fish targets that did not exhibit the above characteristics and could not be classified as either juvenile salmon, whitefish, burbot or sculpin.

The data were post-processed by summing all juvenile salmon counts by hour separately for upstream and downstream moving targets (fish targets other than juvenile salmon were just noted as present). In cases where less than a full hour of data was collected, counts were expanded based on the ratio of sampled time vs. non-sampled time. Each hour was classified as dawn, day, dusk and night for each monthly sample as summarized in Table 4.3-2.

4.3.6. PIT Tag Arrays

Based on performance and maintenance required during the 2013 open water period, winter 2013 pilot testing, power supply, logistics, and accessibility, it was proposed that three PIT tag arrays at the most accessible sites be operated and maintained throughout the fall winter months. The locations included Montana Creek (Lower River) near RM 2.2, Whiskers Slough below the confluence of Whiskers Creek (FA-104), and Slough 8A (FA-128).

AEA attempted to operate these three sites to collect data on direction of movement, but success was limited by channel conditions, equipment constraints, and power supply. During the 2013 open water period, it was determined that the power requirements for the Whiskers Slough and Montana Creek stations exceeded the power capacity of a single multiplexer due to the antenna length required to cover the wetted widths. Dual antennas would require independent readers, which would double the necessary power supply. In contrast, the channel configuration at Slough 8A was narrow enough that a multiplexer reader could power two antennas for that site. An alternative approach to reducing power demand was to program the dataloggers to operate on a set schedule each day when fish were the most active and shut down during periods when fewer fish were detected (Figure 4.3-4). During the early winter evaluation period, the number of tags detected in each hour of the day was plotted to determine the optimal window for datalogger operation. Following the evaluation period, antennas were operated on a 12 hours on/12 hours off cycle beginning at 16:00 to capture evening crepuscular activity and to cover the majority of fish activity (Figure 4.3-4). The 16:00 to 04:00 interval included more than 60 percent of unique fish detections during the evaluation period.

As a part of the active fish sampling during the winter, PIT tagging continued to occur in proximity to arrays to the extent practical under winter conditions. Post-tagging recovery time and swimming ability were closely monitored and tagging efforts were suspended if harmful effects were observed. Tagged fish were released in the reach where they were collected. PIT tagged fish were detected both by in-hand recaptures during winter fish sampling and by dataloggers at antenna arrays.

4.3.7. Radio Telemetry

The primary function of the telemetry component was to track tagged fish spatially and temporally with a combination of fixed station receivers and mobile tracking. Time/date stamped, coded radio signals from tags implanted in fish were recorded by fixed station or mobile positioning. All telemetry gear (tags and receivers) was manufactured by ATS, Inc. (Advanced Telemetry Systems, www.atstrack.com).

The types of behavior to be characterized include the following:

- Arrival and departure timing at specific locations/positions
- Direction of travel
- Residence time at specific locations/positions

- Travel time between locations/positions
- Migratory, holding, and spawning time and locations/positions
- Movement patterns in and between habitats in relation to seasonal conditions

Relocation data from the radio telemetry component of this study was used to characterize the timing of use and degree of movements among macrohabitats and over periods during which the radio tags remain active (potentially two or three years for large fish). This objective is being achieved by the use of long-life tags (e.g., greater than one year) and shorter life tags (e.g., three-month tags) applied to appropriate-sized fish over time.

During the 2013 open-water period, tags were surgically implanted in fish of sufficient body size, distributed temporally and spatially in the Middle/Lower and Upper River with a goal of 30 per-species per study area (Study 9.5 Upper River and Study 9.6 Lower and Middle River). These fish were captured during sampling events targeting adult fish and with directed effort using a variety of methods. Larger tags accommodated the greatest battery life and therefore were used when fish were large enough, but smaller, shorter life tags were used across the range of adult body sizes. Four different-sized radio tags were used with expected operational lives ranging from 180 to 901 days. The ATS model 1810C, 1815C, 1820C, and 1830C tags have minimum tagging weights of 200, 233, 267, and 367 g, respectively. The tags used for this study were programmed to operate in “slow pulse” mode with approximately 12 pulses-per-minute in order to extend the operational life of the tags as much as possible. All tags were equipped with a motion sensitive sensor to alert biologists when a tag has remained motionless for 24 consecutive hours. Due to the number of tags planned for release seven radio frequencies were needed for this study.

4.4. Methods to Accomplish Objective 1

Objective 1: Describe overwintering habitat associations of juvenile anadromous salmonids, non-salmonid anadromous fishes and resident fishes.

For Winter Studies GRTS sampling, catch per unit effort (CPUE) estimates for backpack electrofishing (fish catch per 1,000m^2 sample area), minnow trapping (fish catch/trap/overnight set), and fyke netting (fish catch/net/overnight set) were derived for each macrohabitat unit and then averaged among macrohabitat units within each Focus Area. Estimates were derived specific to the each of the sampling events (i.e., November, February, March, April). CPUE was used to describe habitat associations for species with a minimum of 20 observations during winter GRTS sampling, which included: Chinook salmon, chum salmon, coho salmon, sockeye salmon, lamprey and sculpin.

CPUE estimates were derived in a similar manner for opportunistic sampling; however, unlike the GRTS sampling design, opportunistic sampling sites were not randomly selected with a Focus Area, and therefore, the relevance of the averaged CPUE estimates to the unsampled portions is unknown. For this reason, opportunistic sampling was not used to make inferences at the Focus Area level.

Gear-specific CPUE estimates were derived for each species. The three gear types used to determine CPUE included: backpack electrofishing, minnow trapping, and fyke netting. For backpack electrofishing, CPUE was estimated as the number of fish captured per 1,000 m^2 sampled. Minnow trapping and fyke netting CPUE estimates were standardized as the number of fish captured per net or trap per overnight set. Trotline catch was low and limited to very few replicate sites in main and side channel habitats, therefore it was dropped from analysis. For sites with paired day and night fish collections, the sampling times that departed from the standard sampling protocol were omitted from analysis of habitat associations including both night electrofishing collections and daytime trapping and netting catches.

4.5. Methods to Accomplish Objective 2

Objective 2: 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.

The primary method for evaluating winter movements of resident fishes was radio telemetry. However, incidental recapture of PIT tagged individuals also provided movement information.

4.5.1. Radio Telemetry

Fish monitored through the use of radio telemetry were captured and tagged from June through September 2013. No fish were radiotagged during the November 2013 through April 2014 time period. During the time period from November 2013 through April 2014, radio-tagged Arctic grayling, burbot, Dolly Varden, humpback whitefish, longnose sucker, northern pike, rainbow trout, and round whitefish movements were tracked through the use of fixed telemetry stations and regular aerial surveys through the Middle, Lower and Upper River. Sixteen Arctic grayling, 3 burbot, 4 Dolly Varden, 5 longnose sucker, 3 northern pike, 21 rainbow trout, and 11 round whitefish tagged in the Middle and Lower River were tracked over the study period (Tables 4.5-1 to 4.5-7). At the end of the period, 7 Arctic grayling, 1 burbot, 3 Dolly Varden, 0 longnose sucker, 3 northern pike, 20 rainbow trout, and 6 round whitefish were being tracked. Thirty-one Arctic grayling, 5 burbot, 4 longnose sucker, and 18 round whitefish tagged in the Upper River were tracked over the study period (Tables 4.5-8 to 4.5-11). At the end of the period, 20 Arctic grayling, 2 burbot, 0 longnose sucker, and 5 round whitefish were being tracked in the Upper River. The target number for total radio-tags applied is 30 fish per species per study area; tagging efforts are ongoing.

4.5.1.1. Fixed Radio Telemetry Sites

Fixed radio telemetry stations were installed at three locations in the Middle River during the time period of the winter study (November 2013 – April 2014). The primary objective of the Devils Island station (PRM 167; upstream of Devils Creek) was to track movement of radio-tagged resident fish in the mainstem of the Susitna River. The Indian River station (PRM 142) provided coverage of the mainstem Susitna River as well as movement into and out of Indian River. The Whiskers Creek station (PRM 105) provided coverage of Whiskers Creek and slough as well as limited coverage of the mainstem Susitna River.

Due to the thermal limitations of the telemetry receivers, these three fixed stations were only operational for a portion of the November 2013 through April 2014 time frame (Table 4.5-12). The Devils Island fixed station was operational until November 13, and the Indian River and

Whiskers Creek stations were operational until December 3. Each station was shut down due to air temperatures dropping below the operational range of the telemetry receivers.

4.5.1.2. Aerial Telemetry Surveys

Aerial telemetry surveys of the mainstem Susitna were conducted from downstream of the mouth of the Yentna River (PRM 31) to the Watana Dam site (PRM 187) in support of the Study 9.6 Fish Distribution and Abundance in the Middle and Lower River (Table 4.5-13). The Susitna River was also surveyed from the Tyone River (PRM 247) downstream to the Watana Dam site to support the Upper River FDA study as well as track fish tagged in the Middle River that may have migrated into the Upper River. Surveys were completed on 27 days from November 2013 through April 2014.

Surveys were scheduled to cover each segment of the river (Lower, Middle, and Upper) approximately once every two to three weeks. Helicopter surveys were conducted at lower elevations and at slower speeds than possible with fixed-wing aircraft, and therefore allowed more time for signal acquisition, higher spatial resolution, and fish habitat observations. The spatial resolution of helicopter surveys was approximately 300 m (1,000 ft). Higher precision was achievable in reaches where conditions were most favorable and observers could determine whether the fish was in off-channel or mainstem habitat. Geographic coordinates were recorded for each signal detected using an integrated communication link between the telemetry receiver and a global positioning system (GPS) unit. The position of the fish was determined by the position of the aircraft at the time of the highest signal power. Aerial surveys completed during the summer and fall of 2013 confirmed detection ranges for typical flying heights, and receiver gains, and provided experience to refine the methods for achieving highest spatial resolution. The mainstem aerial telemetry surveys covered over 200 river miles (Yentna River mouth to the Oshetna River and occasionally beyond), and multiples of that total when side channels and braids of the Lower River, as well as tributaries, were included.

The habitat type (mainstem, side channel, slough, or tributary) and relative water turbidity (if water was visible) was classified for each tag detected (time stamp, frequency, code, and power level). Tag identification and GPS coordinates were archived and systematically processed after each survey. A data-handling script was used to extract unique tag records with the highest power level from the receiver files generated during the survey. These records were imported into a custom database software application (Telemetry Manager) and incorporated into a GIS-based mapping database.

4.5.1.2.1. Lower River Surveys

Helicopter surveys of the Lower River covered mainstem areas from below the mouth of the Yentna River (PRM 31) to the confluence of the Chulitna River (PRM 102.4). This reach was highly braided with side channels and sloughs, so complete coverage required considerable effort and in-flight route tracking. Notable tributaries in this reach include the Yentna, Deshka, Talkeetna, and Chulitna rivers as well as Willow and Montana creeks.

4.5.1.2.2. Middle River Surveys

Helicopter surveys of the Middle River covered mainstem areas from the confluence of the Chulitna River (PRM 102) through Devils Canyon to the proposed Watana Dam site (PRM 187).

Notable tributaries in this reach include Indian River and 4th of July, Portage, Fog, and Tsusena creeks.

4.5.1.2.3. Upper River Surveys

Upper River telemetry surveys covered the mainstem areas from the proposed Watana Dam site (PRM 187) to the Oshetna River (PRM 235) and at times the Tyone River (PRM 247). This reach included approximately 48 relatively confined river miles. Notable tributaries in this reach include the Oshetna and Tyone rivers as well as Watana and Kosina creeks. Radio-tagged fish above Devils Canyon were located at a spatial resolution in habitat types similar to the Middle and Lower river surveys.

4.5.2. PIT Tags

The movements of PIT-tagged juvenile Pacific salmon are reported in Section 4.6.2. The locations of PIT-tagged individuals of other species were documented during winter fish sampling and by the PIT tag interrogation arrays described in Section 4.3.6. Recapture locations were classified by Focus Area or Project River Mile (PRM) and macrohabitat type. PIT-tagging of Arctic lamprey was attempted on a few fish and was unsuccessful due to small body sizes, difficulty with anesthesia, and sensitivity to surgical procedures (excessive bleeding).

4.6. Methods to Accomplish Objective 3

Objective 3: Describe early life history, timing, and movements of anadromous salmonids.

4.6.1. Emergence Timing of Pacific Salmon

Observations of Pacific salmon less than 40 mm were used to evaluate emergence timing during the winter months. These observations will support coordinated intergravel monitoring conducted as part of the Fish and Aquatic Instream Flow Study (Study 8.5).

4.6.2. Movement of Juvenile Anadromous Salmonids

Juvenile salmon greater than 60 mm FL were PIT tagged in the winter when conditions allowed and were recaptured during subsequent sampling events or detected by antenna arrays providing information on daily and seasonal movements. A total of 815 juvenile salmon were PIT tagged during winter studies and 79 in-hand recaptures were acquired (Table 4.6-1).

PIT tag antenna arrays were operated with some success during the winter fish study. In addition to power supply challenges, multiple freeze-thaw events during the relatively warm 2013-2014 winter resulted in unstable ice conditions; ice jamming events; break-up and ice-jam flooding; and ice scour (Figure 4.6.2-1). These events caused antennas to be pulled from the substrate and data logger boxes to flood causing multiple outages and periods of downtime while antennas were re-assembled and conditions were favorable for reinstallation.

4.6.3. Juvenile Salmonid Diurnal Behavior by Season

At a subset of sites in February (n=5), March (n=6), and April (n=3); electrofishing was conducted during both daylight and nighttime hours to compare diurnal fish presence and relative abundance. Applied effort (electroshock on time and sampled area) was held as consistent as possible between paired events. Day and night fish counts by species and average CPUE for 1) all fish species combined, and 2) all fish species except for sculpin were estimated to describe diurnal behavior.

Similarly, sonar observations of juvenile salmonids were summarized at an hourly time scale and classified as either dawn, day, dusk or night to facilitate evaluation of diel patterns of activity and movement.

4.7. Methods to Accomplish Objective 4

Objective 4: Document the seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type.

4.7.1. Seasonal Size Class

Captured fish were identified to species and classified to life stage when possible. A summary of fish length-at-maturation for the region was used as a basis for assigning life stages (Table 4.7-1). Each time a gear was used for sampling, a random sample of 25 individuals per species, lifestage, and site were measured for fork length (FL) in mm and weighed in grams. For species without a forked tail (e.g., sculpin and burbot), total length was measured laterally along the mid-line from the anterior edge of the snout to the posterior edge of the tail. Total sample sizes of fish measured for length and weight by month are presented in Table 4.7-2.

4.7.2. Growth

Recaptured PIT-tagged fish provided growth information. The number of fish PIT-tagged and recaptured during the winter study period is presented in Table 4.6-1. Fish recaptures less than seven days in duration were eliminated from the growth analysis. The tally of fish measurements with seven days or more between recapture events included 10 juvenile Chinook salmon, 55 juvenile coho salmon, and 3 juvenile sockeye salmon. Growth rates for juvenile coho salmon were compared across sites.

4.7.3. Condition

Species with more than 50 captures during winter studies were included in the condition factor analysis. Prior to analysis of fish condition by habitat type, outliers which might skew comparisons were identified and removed. This was done by first fitting a log-log regression on length vs. weight for all measured fish within a species. The Grubbs test (Grubbs, 1950, Lukasz, 2011) was then used for sequentially identifying outliers in the residuals from these regressions. The experiment-wise error for the outlier removal for each species was maintained at 0.05 by using alpha of 0.05 divided by the total number of outliers for each sequential test. The resulting condition factors were also evaluated to ensure there were no obvious trends with size of fish. Fish condition was estimated using Fulton's condition factor where the coefficient of condition, K-FL was derived from the formula: $K\text{-}FL = W \times 10^5/L^3$, where K-FL = condition factor by fork length, W = weight of fish in grams, and L = fork length of fish (mm).

Condition factors for each species were then compared across Geomorphic Reach, sampling period, and macrohabitat types using graphics and linear models depending upon sample sizes. Data summaries are provided for each distinct group.

4.8. Methods for Tissue Collection to Support the Fish Genetic Baseline Study (ISR Study 9.14).

In support of the Genetic Baseline Study for Selected Fish Species (Study 9.14), fish tissues were collected opportunistically in conjunction with winter fish sampling events. Tissue samples included caudal fin clips or slime swab samples from fish greater than 60 mm (2.4 in), and whole fish less than 60 mm (2.4 in). A summary of tissues collected for genetic baseline development as part of this study is presented in Table 4.8-1.

5. RESULTS

Nearly 3,000 fish were collected during 2013-2014 winter fish studies using fyke nets, minnow traps, electrofishing, and trotlines. A total of thirteen species were collected; sculpin were the most abundant fish sampled followed by coho salmon, sockeye salmon, Chinook salmon, chum salmon, and lamprey (Table 5-1). Among gear types, electrofishing resulted in the highest overall catch; collected ten species; and was particularly effective with sculpin, juvenile salmon and lamprey. Fyke netting collected ten species and was effective collecting juvenile salmon, lamprey, burbot and whitefish. Minnow trapping collected seven species and was most effective for coho and Chinook salmon and was the only gear type to collect threespine stickleback. Baited trotlines were the only gear type to collect adult burbot, however catch was low (3). An additional 1,728 observations of fish were made by underwater video (Table 5-1). Underwater video was effective with a wide variety of species and was one of two methods for gathering information on longnose sucker, stickleback, and whitefish presence. Many video observations could not determine fish species (example juvenile Pacific salmon, undifferentiated whitefish).

The three Focus Areas, FA-104 (Whiskers Slough), FA-128 (Slough 8A), and FA-138 (Gold Creek), with intensive sampling effort had similar overall catch numbers ranging from 740 to 1,128 (Table 5-2). Collections were lowest in February (383) and highest in April (1,359), attributable to the emergence of salmon fry. FA-104 (Whiskers Slough) was the most diverse area for fish collections and catches included lamprey, whitefish, and longnose sucker, species that were absent or rare at other sampling locations. All intensively studied Focus Areas had juvenile salmon present; however, the species composition varied by location. Juvenile salmon in FA-104 (Whiskers Slough) were primarily coho and Chinook salmon; in FA-128 (Slough 8A) were primarily sockeye, coho and chum salmon; and in FA-138 (Gold Creek) were primarily coho followed by sockeye and chum salmon (Table 5-2).

5.1. Objective 1: Overwintering habitat associations of juvenile anadromous salmonids, non-salmonid anadromous fishes and resident fishes.

5.1.1. Chinook Salmon

A total of 133 juvenile Chinook salmon were collected at GRTS-selected locations during 2013-2014 winter fish studies. Chinook salmon were caught in low numbers in each Focus Area sampled with GRTS sampling.

At FA-104 (Whiskers Slough) Chinook salmon were most strongly associated with tributary habitats where average monthly CPUE ranged from 0.83-20 Chinook salmon/net^{-1}/night^{-1} for fyke netting, 0 to 0.22 Chinook salmon/trap^{-1}/night^{-1} for minnow trapping, and 0.13 to 22.45 Chinook salmon/1000m^2 of electrofishing effort (Table 5.1-1). Relative abundance in tributary habitat increased in April with the emergence of age-0 fry. Chinook salmon were found in lower abundances at FA-104 (Whiskers Slough) in side channels, side sloughs and upland sloughs.

At FA-128 (Slough 8A) juvenile Chinook salmon were found in very low abundance in all habitats sampled: side channel, side slough and upland slough. Average monthly CPUE ranged from 0 to 0.3 Chinook salmon/trap^{-1}/night^{-1} for minnow trapping and 0 to 3.03 Chinook salmon/1000m^2 of electrofishing effort (Table 5.1-2). Chinook were only collected in November and February at FA-128 (Slough 8A).

At FA-138 (Gold Creek) juvenile Chinook salmon were also found in low abundance as compared to FA-104 (Whiskers Slough) and were associated with side slough habitat but not side channel or upland slough. Average monthly CPUE ranged from 0 to 0.29 Chinook salmon/trap^{-1}/night^{-1} for minnow trapping and 0-3 Chinook salmon/net^{-1}/night^{-1} for fyke netting (Table 5.1-3). Chinook were collected in November, February and April but not March.

5.1.2. Chum Salmon

A total of 23 juvenile chum salmon were collected at GRTS selected locations during 2013-2014 winter fish studies. Chum salmon were captured at FA-128 (Slough 8A) and FA-138 (Gold Creek) only during the month of April. Chum salmon were found in side channel and side slough habitats close to known spawning areas. Average monthly CPUE for fyke netting ranged from 0 to 7 chum salmon/net^{-1}/night^{-1} at FA-128 (Slough 8A) and 0 to 10 chum salmon/net^{-1}/night^{-1} at FA-138 (Gold Creek) (Tables 5.1-5 & 5.1-6).

5.1.3. Coho Salmon

A total of 768 juvenile coho salmon were collected at GRTS selected locations during 2013-2014 winter fish studies. Coho salmon were captured at all three Focus Areas sampled.

At FA-104 (Whiskers Slough) coho salmon were collected in all habitats sampled: side channels, side slough, upland sloughs, and tributaries during each monthly event. Coho salmon were most consistently associated with tributary and upland slough habitat at FA-104 (Whiskers Slough). In upland sloughs, average monthly minnow trapping CPUE ranged from 0.96 to 3.63 fish/trap^{-1}/night^{-1}. In tributary habitats, average monthly fyke netting CPUE ranged from 1.17 to 42.5 coho salmon/net^{-1}/night^{-1} with abundance increasing in April with newly emerged fish. Minnow trapping CPUE was lower in tributary habitat than upland sloughs with an average monthly range from 0 to 1.11 coho salmon/trap^{-1}/night^{1}. In side channel habitat, average monthly CPUE ranged from 0 to 3.33 coho salmon/1000m^2 of electrofishing effort and 0 to 2 coho salmon/trap^{-1}/night^{-1}for minnow trapping. In side slough habitats, coho salmon were not collected during fyke netting and minnow trapping CPUE ranged from 0-0.42 fish/trap^{-1}/night^{-1} (Table 5.1-7).

At FA-128 (Slough 8A), coho salmon were in each GRTS macrohabitat sampled during the winter and most strongly associated with side slough habitat. Coho salmon were captured in all months in side slough habitats; average monthly CPUE ranged from 0.4 to 1.1 fish/trap^{-1}/night^{-1} for minnow trapping, 0 to 18 fish/net^{-1}/night^{-1}for fyke netting and was 0 for electrofishing. Fish were only collected with minnow trapping in side channel habitat in November where CPUE ranged from 0-0.11 fish/trap^{-1}/night^{-1}. Similarly coho salmon were only collected from upland slough habitats in February where CPUE ranged from 0-0.07 fish/trap^{-1}/night^{-1} for minnow trapping and was 3.03 fish/1000m^2 at the one site that was electrofished (Table 5.1-8).

At FA-138 (Gold Creek), coho salmon were present in all GRTS sampled habitat types (side channels, side sloughs, and upland sloughs) in all months with the exception of the single upland slough sampled in November. Monthly average CPUE was higher in side channel and side slough habitats than in upland sloughs. For minnow trapping, the most widely used method, average monthly CPUE ranged from 0-4.15, 0.42-2.17, and 0-0.31 fish/trap^{-1}/night^{-1} for side channels, side slough, and upland sloughs, respectively with generally higher catches in November declining towards April (Table 5.1-9).

5.1.4. Sockeye Salmon

A total of 109 juvenile sockeye salmon were collected at GRTS selected locations during 2013-2014 winter fish studies. Sockeye were collected once at FA-104 (Whiskers Slough) in very low abundance. This collection occurred in minnow trapping in upland slough habitat in April where monthly average CPUE for sockeye salmon ranged from 0 to 0.04 fish/trap^{-1}/night^{-1} (Table 5.1-10). Sockeye salmon CPUE was 0 for all other gear types and months at FA-104 (Whiskers Slough).

At FA-128 (Slough 8A), sockeye salmon were associated with side slough and to a lesser degree side channel habitats and were not collected from upland slough habitats. Sockeye were collected during the February and April sampling events. CPUE was highest in April with the emergence of fry. Average CPUE for side channel habitat in April was 1 fish/net^{-1}/night^{-1}for a single fyke net sample and 0.35 fish/1000m^2 area sampled by electrofishing. April CPUE in side slough habitat was 42.5 fish/net^{-1}/night^{-1}for fyke netting and 0 for other gear types. A single individual was collected in side slough habitat February, CPUE ranged from 0 to 0.04 fish/trap^{-1}/night^{-1} for minnow trapping and was 0 for all other gears and habitats. No individuals were collected in November and March, CPUE was 0 (Table 5.1-11).

At FA-138 (Gold Creek) sockeye salmon were present in all months and were associated with side slough habitats and not collected in side channel or upland slough sites. Average monthly sockeye salmon CPUE in side slough habitats ranged from 0-0.7 fish/trap^{-1}/night^{-1} and 0-0.47 fish/1000m^2 sample area for minnow trapping and electrofishing and was 15 fish/net^{-1}/night^{-1}for a single fyke net sample in April (Table 5.1-12). CPUE was highest for minnow trapping in November and electrofishing in March.

5.1.5. Lamprey

A total of 57 undifferentiated lamprey and two Arctic lamprey were collected at GRTS selection locations during 2013-2014 winter fish studies. All lamprey were captured at FA-104 (Whiskers Slough) and were found to be overwintering in tributary habitats but not sloughs or side channels (Tables 5.1-13 through 5.1-15). In tributary habitat, lamprey were captured in fyke nets and electrofishing and average monthly CPUEs ranged from 1.5 to 2.75 lamprey/net^{-1}/night^{-1} and 7 to 21 lamprey/1000m^2 respectively. Catches were consistent across sampling events.

5.1.6. Sculpin

Sculpin were the most widely distributed fish collected in the GRTS sample sites; a total of 563 were collected and they were collected during each monthly sampling event. At FA-104 (Whiskers Slough) sculpin were collected in every habitat type. Average monthly fyke net CPUE ranged from 0-3 sculpin/net^{-1}/night^{-1} with highest higher CPUE associated with tributary habitat in February and March (Table 5.1-16). Average minnow trapping CPUE range from 0-0.84 sculpin/trap^{-1}/night^{-1} and was highest for upland slough habitats in November. Average electrofishing CPUE ranged from 5.85-71.55 sculpin/1000m^2 sample area; abundance was highest in tributary habitats in March and April.

At FA-128 (Slough 8A) sculpin were associated with side channel and side slough habitats but not upland sloughs. Average monthly CPUE for fyke netting ranged from 0 to 11.5 sculpin/net^{-1}/night^{-1} and was highest for side slough habitat in April (Table 5.1-17). Average CPUE for minnow trapping ranged from 0 to 0.17 sculpin/trap^{-1}/night^{-1} and was highest for side slough habitat in November. Average CPUE for electrofishing ranged from 0 to 26.15 sculpin/1000m^2 sample area and was highest for side slough habitat in February.

At FA-138 (Gold Creek) sculpin were present in all macrohabitats, however abundance was very low in upland sloughs. March fyke netting CPUE ranged from 2 to 13 sculpin/net^{-1}/night^{-1} and was highest in side slough habitats (Table 5.1-18). Average monthly minnow trapping CPUE ranged from 0 to 0.3 sculpin/trap^{-1}/night^{-1} and similar to FA-128 (Slough 8A), was highest for side slough habitat in November. Electrofishing CPUE ranged from 0 to 57.78 sculpin/1000m^2 sample area and was consistently higher in side slough habitats than side channels.

5.2. Objective 2: 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 as Determined by Biotelemetry.

5.2.1. Arctic Grayling

5.2.1.1. Radiotelemetry

5.2.1.1.1. Middle River

At the beginning of November, six Arctic grayling that had been tagged and released below Devils Canyon and ten tagged and released between Devils Canyon and the Watana Dam site had active tags (Table 4.5-1). Below Devils Canyon, fish moved out of Indian River and Portage Creek in November, and spent December between Indian River and Lane Creek. From January through April, fish stayed in the mainstem between Montana Creek and the Gateway telemetry station. Above Devils Canyon, Arctic grayling stayed in the Susitna between Devils Island and the Watana Dam site from November through April.

5.2.1.1.2. Upper River

During the winter there were 31 Arctic grayling with active tags in the Upper River (Table 4.5-8). These fish showed considerable movement from release sites; 14 out of the 17 tagged Arctic grayling that had been released in Upper River tributaries and were relocated were found overwintering in the mainstem river. Primary overwintering stretches of the Susitna were from the Devils Island telemetry station to the Watana Dam site, from Deadman Creek to Kosina Creek, and from the Oshetna River to the Tyone River. To a lesser extent, overwintering in the mainstem also occurred between the Watana Dam site and Deadman Creek, between Kosina and Jay creeks, and at the mouth of the Oshetna River. The only tributary with notable overwintering was the Tyone River, although no Arctic grayling were tagged in or near it (i.e., they migrated to it). Arctic grayling that overwintered in the Tyone River or the stretch of the Susitna River between the Oshetna and Tyone rivers included fish originally tagged in Clearwater Creek, the Oshetna River, and the mainstem of the Susitna River between Jay and Goose creeks, as well as between Watana and Kosina creeks. In general, fish that were tagged and released from Kosina Creek downstream overwintered there, including downstream of the Watana Dam site; while fish tagged upstream of Kosina Creek were more likely to remain upstream to overwinter.

5.2.2. Burbot

5.2.2.1. Radio Telemetry

5.2.2.1.1. Middle River

Three of the five burbot tagged and released in the Middle River had active tags during winter (Table 4.5-2). These three fish were tagged and released in the Susitna River. Two were tagged between the Kashwitna River and Montana Creek, and the third was tagged between Talkeetna and Lane Creek. One burbot released between the Kashwitna River and Montana Creek remained in that stretch of river until it was detected as mortality in January. The other fish released in that area spent November and December in the Susitna River between Montana Creek and Sunshine before moving upstream to the stretch of the Susitna River between Sunshine and Talkeetna in January. It remained there until April when it returned downstream to the section of river between Montana Creek and Sunshine. The third active burbot had been released between Talkeetna and Lane Creek and had moved downstream between Sunshine and Lane Creek by November where it was observed through January. In February this fish was located upstream of Lane Creek, and then returned to the stretch of river where it was tagged by early March.

5.2.2.1.2. Upper River

Although seven burbot were tagged and released in the Upper River, at the beginning of November, only five burbot in the Upper River had active tags (Table 4.5-9). Two of these burbot remained in the same mainstem area where they were released throughout the winter, while the other three exhibited movement from their release in Watana Creek into the mainstem Susitna River. One of the burbot, tagged and released in Watana Creek, displayed more movement throughout the winter and was found between Watana and Kosina creeks in February, between Kosina and Jay creeks during March, and between Jay and Goose creeks in April.

5.2.2.2. PIT Tag Recaptures

Nine PIT-tagged burbot were detected by the fixed arrays during the winter study period (Table 5.2-1). Eight tagged burbot were detected at the array in a side slough in FA-104 (Whiskers Slough); five had been tagged in side sloughs in FA-104 (Whiskers Slough) in June and August 2013, two had been tagged in Whiskers Creek in September and February 2013, and one had been tagged upstream in a side channel near PRM 113 in June 2013. One PIT-tagged burbot was detected by the fixed array in a side slough in FA-128 (Slough 8A). This burbot had been tagged on June 15, 2013 in a side slough in the same Focus Area.

5.2.3. Dolly Varden

5.2.3.1. Radio Telemetry

5.2.3.1.1. Middle River

Of the nine Dolly Varden released in the Middle River, four had active tags during the winter (Table 4.5-3). Dolly Varden tagged in the Talkeetna River stayed primarily in the Talkeetna River with few observations in the mainstem of the Susitna River. In late November, one of these Talkeetna River fish moved into the Susitna River between Talkeetna and Sunshine before returning to the Talkeetna River in January. In April, one Dolly Varden moved out of the Talkeetna River and into the Susitna River between Montana Creek and Sunshine. A Dolly Varden tagged between Lane Creek and the Gateway telemetry station remained in the Susitna River between Sunshine and Talkeetna into December before being detected as a mortality.

5.2.4. Lamprey

No lamprey were radio-tagged or successfully PIT-tagged during the winter study period.

5.2.5. Longnose Sucker

5.2.5.1. Radio Telemetry

5.2.5.1.1. Middle River

During the winter, 5 out of 28 longnose suckers previously tagged and released had active tags (Table 4.5-4). One was detected in Whiskers Creek in November before dying, while two others were in the Susitna River between Indian River and Slough 21 before they died in November and December. The Susitna River between Talkeetna and Lane Creek had a single tagged longnose sucker from November into January before its tag went into mortality mode. The final tagged longnose sucker was located between Slough 11 and Indian River in November, and slowly moved downstream to where it was last detected alive between Lane Creek and the Gateway telemetry station before its tag went into mortality mode in February.

5.2.5.1.2. Upper River

At the beginning of November, 4 of the 10 longnose sucker tagged and released in the Upper River had active tags, although winter mortality was high and none were active in March (Table 4.5-10). Two of the four tagged fish showed movement out of the mainstem river area into which they were released. The primary area where longnose sucker were observed during the winter was in the mainstem Susitna between Watana and Kosina creeks in the vicinity of where they were tagged.

5.2.6. Northern Pike

5.2.6.1. Radio Telemetry

5.2.6.1.1. Lower River

Three of five northern pike tagged and released in the Lower River had active tags through the winter (Table 4.5-5). These fish exhibited little movement. All three tags consistently were found in the Susitna River in the area where they were released between the Yentna and Deshka rivers.

5.2.7. Rainbow Trout

5.2.7.1. Radio Telemetry

5.2.7.1.1. Middle/Lower River

During the winter, 21 of the 43 rainbow trout tagged and released in the Middle and Lower River had active tags (Table 4.5-6). Most fish showed minimal movements between tracking zones throughout the winter. Rainbow trout tagged in the Lower River primarily overwintered in the Susitna River between the Kashwitna River and Lane Creek. A single rainbow trout was detected in the Susitna River downstream of the Kashwitna River during December. The Talkeetna and Chulitna rivers were the only tributaries utilized by rainbow trout over the winter, and neither had more than a single tagged fish present during any detection period. Rainbow trout tagged in the Middle River primarily overwintered in the mainstem of the Susitna River between Talkeetna and Slough 11. Lesser used overwintering areas included the mainstem Susitna River between Slough 11 and Indian River, and between Slough 21 and Portage Creek.

5.2.7.2. PIT Tag Recaptures

Twelve PIT-tagged rainbow trout were detected by the fixed arrays during the winter study period; all were detected at the array in a side slough in FA-104 (Whiskers Slough) (Table 5.2-2). All had been tagged during sampling on August 28 and September 21, 2013. Nine had been tagged within the same Focus Area; three in side slough habitats and six in Whiskers Creek. The other three tagged rainbow trout had been tagged upstream, two at downstream migrant traps. One was tagged at the downstream migrant trap at Talkeetna Station (PRM 106.9) in early October, another was tagged in a split main channel habitat at PRM 120.7 in late September, and the third was tagged at the downstream migrant trap in Indian River (PRM 142.1) in August.

5.2.8. Humpback Whitefish

No active humpback whitefish tags were detected during the winter study period.

5.2.9. Round Whitefish

5.2.9.1. Radiotelemetry

5.2.9.1.1. Middle River

During the winter, there were 11 round whitefish with active tags, all of which were tagged and released in the Middle River (Table 4.5-7). The number of tags within various reaches of the river fluctuated throughout the winter indicating some movement within the mainstem Susitna River. This movement was limited and fish tended to stay in the reach they were initially detected in November for most of the winter. The primary overwintering section of the Susitna River was between Sunshine and Slough 11. To a lesser extent, overwintering was observed in the Susitna River between the Deshka and Kashwitna rivers and between Montana Creek and Sunshine. A single fish was detected in 4th of July Creek in April which was the only winter detection in a tributary.

5.2.9.1.2. Upper River

At the beginning of November, 18 round whitefish had active tags, although mortality over the winter was high and only 5 tags were active through April (Table 4.5-11). All of the active tags were in fish originally released between Deadman and Kosina creeks and most (10 out of 14) of the resightings in early winter indicated movement from the release area. Overwintering areas for all tagged fish were in the Susitna River between Fog and Kosina creeks. Some tagged fish moved downstream of the Watana Dam site in the latter half of December, and remained there from that time through the end of April.

5.2.10. Juvenile Salmonids

The movements of Juvenile salmonids are reported below in Section 5.3.2

5.3. Objective 3: Early life history, timing, and movements of anadromous salmonids.

5.3.1. Emergence Timing of Pacific Salmon

Juvenile salmon fry (fork length <50mm) were present in every Focus Area during the winter sampling. Only Chinook salmon and coho salmon fry were observed during the November sampling (Figure 5.3.1-1). In February, a few sockeye were observed. In March and April, four species of salmon fry (Chinook, chum, coho, and sockeye) were captured. Juvenile pink salmon were not observed during winter sampling. Coho salmon fry were the most abundant species captured followed by chum, sockeye and Chinook salmon fry. Although the number of sites sampled and gear types varied among sampling events, the abundance of salmon fry generally increased across sampling events, with the most fry documented during April (425). Seven fry were captured in November, six fry were captured in February, and 43 fry were captured in March.

Although AEA was not able to document precise emergence timing, winter sampling provided evidence about emergence timing for the four species of Pacific salmon observed. A few chum alevin were documented in mid-February; all four species were observed in early March and April. Fork lengths in the 20-40mm range indicate that these fish had recently emerged (Figure 5.3.1-2). Although not conclusive, Chinook and coho salmon fork lengths between 40-50mm during November sampling are indicative of later spring or summer emergence coupled with poor growing conditions.

5.3.2. Movement of Juvenile Anadromous Salmonids

5.3.2.1. Chinook salmon

Twenty-two individual juvenile Chinook salmon were relocated as detections at PIT antenna arrays or recaptured during winter fish studies (Table 5.3.2-1). Twenty of the twenty-two (91%) relocated Chinook salmon exhibited very little winter movement and were relocated in the same Focus Area or tributary where tagging took place. Two individuals showed longer movements, from tagging locations in FA-141 (Indian River DMT) and PRM 106.9 (Talkeetna Station DMT) to FA-104 (Whiskers Slough). All movements were in a downstream direction. Half of the Chinook salmon relocated were both tagged and dectected or recaptured in FA-104 (Whiskers Slough). Four of these individuals were found in the same macrohabitat where they were tagged.

5.3.2.2. Chum salmon

Chum salmon generally emigrated from the Susitna River as small age-0 fish in late spring/early summer 2013 (ISR Study 9.6, Figure 5.2-7; AEA 2014) before reaching the minimum length for PIT tagging (60mm). Few juvenile chum salmon were PIT tagged during 2013 Fish Distribution and Abundance Studies (ISR Study 9.6, Table 4.5-1; AEA 2014) and none were recaptured during 2013-2014 winter studies.

5.3.2.3. Coho salmon

Of the 72 juvenile coho salmon relocated during winter studies, more than half showed little movement and were found in the same Focus Area and macrohabitat type where tagging took place (Table 5.3.2-2). Of those fish that moved between habitat types, 19 of 33 were tagged in tributaries or the main channel and moved into side slough or upland slough habitats where they are later relocated. Of the coho salmon that exhibited movement, 23 of 33 were localized movements from the Talkeetna Station rotary screw trap (PRM 106.9) to FA-104 (Whiskers Slough), between macrohabitat types within FA-104 (Whiskers Slough), or from Indian River (PRM 142.0) to a nearby upland slough (PRM 139.4). The few fish that exhibited longer movements were either tagged at Indian River (FA-141) or Slough 6A (FA-115) and were later relocated in FA-104 (Whiskers Slough) at the side slough PIT antenna or upland slough (Table 5.3.2-2). All movements were in a downstream direction.

5.3.2.4. Pink Salmon

Pink salmon emigrated from the Susitna River as small age-0 fish in late spring/early summer 2013 before reaching the minimum length for PIT tagging (60mm) and recapture during winter studies (ISR Study 9.6, Table 4.5-1 and Figure 5.2-7; AEA 2014).

5.3.2.5. Sockeye salmon

No PIT tagged sockeye salmon were documented to have moved during the winter study period. All three resighted sockeye salmon juveniles were PIT tagged in March and recaptured in April at the same sites. Two were tagged and recaptured in side sloughs; one in FA-128 (Slough 8A) and one in FA-138 (Gold Creek). The third individual was tagged and recaptured in a backwater habitat in FA-128 (Slough 8A).

5.3.3. Juvenile Salmonid Diurnal Behavior by Season.

5.3.3.1. Paired Electrofishing Sampling

In total, 722 fish were captured during paired day/night electrofishing surveys. In general, fish were much more active during the night period. The total number of fish caught during the night period was more than double the catch during the day period (Table 5.3.3-1). Sculpin were the most abundant fish sampled, however their overall catch was similar between day (198) and night (186) periods. Juvenile Pacific salmon, on the other hand, were much more active at night than during the day with a total catch of 290 and 35, respectively. Average CPUE for all fish and months combined was lower during the day, 19.2 fish/1000 m^2 (range 1-58 fish/1000m2), than at night, 64.4 fish/1000m2 (range 7-363 fish/1000 m^2, Figure 5.3.3-1,). No seasonal trend in diurnal behavior was observed during the Feb-April sampling period; in all months sampled, average CPUE was higher during the night period than during the day for all species combined and for all non-sculpin species (Figures 5.3.3-1 and 5.3.3-2). Catches and average CPUE increased from February through April. Increased catch is likely due to emergence of age-0 salmon.

5.3.3.2. Sonar Observations

Among periods of the day across all monthly sonar samples, juvenile salmon abundance peaked during the dusk and dawn periods at both Focus Areas (Table 5.3.3-2). These observations are consistent with the diel distribution of PIT tag detections in early winter when fish were especially active at dusk and dawn (Figure 4.3.1-1). This same general pattern was evident during each monthly sonar sample event at FA-104 (Whiskers Slough; Figure 5.3.3-3), and during March and April at FA-138 (Gold Creek; Figure 5.3.3-4). Sonar observations were highest in April at FA-138, consistent with juvenile salmon catch during day/night paired electrofishing efforts (Table 5.3.3-1). Typically, relative abundance was lowest during the daylight period.

Trends in crepuscular migrations (upstream migration at dusk and downstream migration at dawn) at sites with the highest level of fish activity indicate fish are most active during low light conditions. A net upstream-oriented migration at dusk followed by a lull in activity, and a net downstream-oriented migration at dawn suggests that fish are moving to different areas for rearing or feeding during the lowest light and darkest hours. Previous research indicates that juvenile salmon often exhibit increased feeding activity during hours of low light and further suggest that this behavior is linked to season, habitat type and a trade-off between predator avoidance and energetic gain (Metcalfe et al. 1999; Bradford and Higgins 2001).

5.4. Objective 4: Seasonal age class structure, growth, and condition of juvenile anadromous and resident fish by habitat type.

5.4.1. Seasonal Size Class

Length frequency plots for juvenile Pacific salmon show the appearance of small age-0 fish beginning in the March sampling event and increasing considerably in the April sampling event (Figure 5.3.1-1). Relatively low sample sizes and variable growth rates prevent identification of any clear age classes beyond age-0. This was also true for the other species captured including burbot, lamprey, sculpin, and threespine stickleback (Figure 5.4.1-1).

5.4.2. Growth

Of the 55 juvenile coho salmon measurements that qualified for the growth assessment, 53 were recaptured in the mainstem Susitna River. Seven were recaptured in the main channel in side channel habitats whereas 46 were recaptured in off-channel habitats including upland sloughs (28) and side sloughs (18). Two juvenile coho were recaptured in Whiskers Creek where they were tagged.

Of the ten juvenile Chinook salmon measurements that qualified for the growth assessment, eight were recaptured in the mainstem Susitna River. Four were recaptured in the main channel in backwater habitats whereas four were recaptured in off-channel habitats including upland sloughs and side sloughs. Two juvenile Chinook were recaptured in Whiskers Creek where they were tagged.

Of the three juvenile sockeye salmon measurements that qualified for the growth assessment, all three were recaptured in the mainstem Susitna River. One was recaptured in the main channel in a backwater habitat and the other two were recaptured in off-channel side slough habitats.

Only Chinook salmon and coho salmon were recaptured in numbers sufficient to evaluate growth rate by habitat type. However, relatively small sample sizes and high levels of individual variation made any differences among habitat types difficult to discern (Figure 5.4.2-1).

Juvenile Chinook and coho salmon growth rates were highly correlated with the tagging date (Figure 5.4.2-2). Summer growth rates were considerably higher as reflected in higher specific growth rates for fish tagged in June and July. Fish tagged in October, November and February exhibited very low growth rates. The growth rates of fish tagged in March were notably higher than fish tagged in August through January, and were nearly as high as fish tagged in July 2013 (Figure 5.4.2-1).

5.4.3. Condition

5.4.3.1. Chinook Salmon

Seven outliers were identified and removed using the Grubbs Test (Figure 5.4.3-1). Figure 5.4.3-2 shows that the condition factors are lower for smaller Chinook salmon less than 60 mm (2.4 in) in length. Chinook salmon less than 60 mm (2.4 in) have been excluded from the condition factor summaries.

Figure 5.4.3-3 shows distributions of condition factors by Geomorphic Reach, sampling period, and habitat type. In side channels, there was only one fish captured in MR-6, so reaches could not be compared. With combined reaches, there was no significant difference between the November and the February through March sampling period (p=0.83).

In side slough habitats, there were low sample sizes but they were dispersed among reaches and sampling periods. There were no significant differences among reaches (p=0.33) or sampling periods (p=0.41).

In upland slough habitats, there were only 2 captures in MR-6. When reaches were combined, there were no significant differences between the November and the February through April sampling period (p=0.96).

There were no Chinook salmon captures in main channel habitats, and all of the tributary and tributary mouth captures were in MR-8, with most of these in the February through March sampling period (no comparisons were made among groups for tributary and tributary mouth habitats due to small sample size).

The condition factor data are summarized for Chinook salmon in Table 5.4.3-1. There were no significant differences among habitat types when data were combined across reaches and sampling periods.

5.4.3.2. Chum Salmon

All chum salmon caught during winter studies were less than 41mm in length, so condition factors were not summarized.

5.4.3.3. Coho Salmon

Ten outliers were identified and removed using the Grubbs Test (Figure 5.4.3-4). Figure 5.4.3-5 shows that the condition factors are relatively stable when fish length is greater than 60 mm (2.4 in), but increasing for smaller fish.

Figure 5.4.3-6 shows distributions of condition factors by Geomorphic Reach, sampling period, and habitat type. Sample sizes were imbalanced among the factors, so comparisons were done within each macrohabitat type to determine if all groups should be combined. For side channels, February and March were combined with April, and a linear model was fit with condition factor as a function of reach and sampling period. The interaction between reach and sampling period was significant (p=0.00005); coho salmon condition was higher in MR-6 side channels, but this is due mainly to captures in November. In the remainder of the winter, the condition was similar between MR-6 and MR-8. The condition factor data are summarized for side channels in Table 5.4.3-2.

For side and upland sloughs, linear models showed differences among the three sampling periods displayed in Figure 5.4.3-6 (side slough p=0.000009; upland slough p=0.0058), as well as between the two Geomorphic Reaches (side slough p=0.00000002; upland slough p=0.0008).

No comparisons were possible for main channel habitats due to low sample size. There were no differences among sampling periods for the tributary and tributary mouth category (p=0.81), which were all located in MR-8.

Statistical comparisons among habitat types were not conducted because of the variability among reaches and sampling periods. The summaries are displayed by group in Table 5.4.3-3.

5.4.3.4. Sockeye Salmon

There were no outliers identified using the Grubbs Test. Figure 5.4.3-7 shows that the condition factors are relatively stable, but they are highly variable for smaller fish. Because there is a clear break in the size distribution, we have excluded fish less than 48 mm (1.9 in) from the condition factor summaries.

Figure 5.4.3-8 shows distributions of condition factors by Geomorphic Reach, sampling period, and habitat type. All sockeye salmon (>48 mm) were captured in side sloughs in MR-6 except for one fish in an upland slough in MR-8. There were only two captures in November, and there were no significant differences (p=0.98) in sockeye salmon condition factors between the February and March sampling period and the April sampling period. The condition factor data are summarized for sockeye salmon in Table 5.4.3-4.

5.4.3.5. Lamprey

One outlier was identified and removed using the Grubbs Test (Figure 5.4.3-9). Figure 5.4.3-10 shows that the condition factors may be lower and more variable for smaller lamprey, but there are too few samples overall to define a cutoff and exclude some samples. Therefore, all samples have been included in the condition factor summaries.

Figure 5.4.3-11 shows distributions of condition factors by Geomorphic Reach, sampling period, and habitat type. All lamprey were captured in the tributaries and tributary mouths in MR-8. There was no significant difference in mean lamprey condition factor between the February and March sampling period and the April sampling period (p=0.63). The condition factor data are summarized for lamprey in Table 5.4.3-4.

5.4.3.6. Sculpin

Six outliers were identified and removed using the Grubbs Test (Figure 5.4.3-12). Figure 5.4.3-13 shows that the condition factors are relatively stable, but they are highly variable for juveniles (i.e., <51 mm [2 in]). Therefore, juveniles have been excluded from the condition factor summaries.

Figure 5.4.3-13 shows distributions of condition factors by Geomorphic Reach, sampling period, and habitat type. Sample sizes are smaller and more unbalanced than for coho salmon. For side sloughs, there were only two fish in MR-8, both captured in April. Thus, no comparisons were possible between the two reaches. The observations were highly unbalanced among sampling periods as well, with only 13 observations in April. A linear model showed no significant differences (p=0.46) in sculpin condition factors among sampling periods in side sloughs. The condition factor data are summarized for side sloughs in Table 5.4.3-5.

For main channel sculpin, there were too few fish to compare among sampling periods and reaches simultaneously, but there were no significant differences in mean sculpin condition factor among sampling periods when reaches were combined (p=0.87), and no differences among reaches when sampling periods were combined (p=0.502).

For side channels, almost all fish were captured in the February through March sampling period, so sampling periods could not be compared. When sampling periods were combined, there were no significant differences in mean sculpin condition factor among reaches (p=0.15).

For upland sloughs, almost all fish were captured in MR-8, so reaches could not be compared. When reaches were combined, there were no significant differences between the November versus the February through April sampling periods (p=0.36).

For the tributary and tributary mouth habitat group, all fish were captured in MR-8 in the February through March and April sampling periods. There were no significant differences between sculpin condition factors in these two time periods (p=0.29).

Because there were no observed differences among sampling periods and reaches in the sculpin condition factors, we also compared condition factors among the habitat groups. Mean condition factor in the tributary and tributary mouth habitats were significantly greater than the mean in side channels (p=0.045, pairwise t-tests with pooled SD, with Holm p-value adjustment).

The summaries of sculpin condition factor are displayed by group in Table 5.4.3-5.

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7. TABLES

Table 4.3-1. Winter sampling locations and techniques, 2013-2014

Site ID	Focus Area	Macrohabitat	Gear Type	Nov	Feb	Mar	Apr
WFS-104.5-OP1	NFA	Upland Slough	Minnow Trap		X	X	X
WFS-104-154	FA-104	Side Channel	Electrofish	X	X	X	X
			Minnow Trap	X	X	X	
			Video	X	X	X	
WFS-104-156	FA-104	Side Slough	Fyke Net			X	X
			Minnow Trap	X	X	X	X
WFS-104-157	FA-104	Side Slough	Minnow Trap	X	X	X	X
			Video		X	X	X
			Sonar		X	X	X
WFS-104-159T2	FA-104	Tributary	Electrofish			X	
			Fyke Net		X	X	X
			Minnow Trap		X		X
WFS-104-159T3	FA-104	Tributary	Minnow Trap		X		
WFS-104-159T4	FA-104	Tributary	Electrofish			X	X
WFS-104-159	FA-104	Tributary	Fyke Net	X	X	X	X
			Minnow Trap	X	X	X	X
			Video		X	X	X
			Sonar		X	X	X
WFS-104-160	FA-104	Upland Slough	Minnow Trap	X	X	X	X
			Video	X		X	X
WFS-104-161	FA-104	Upland Slough	Minnow Trap	X		X	X
			Video		X	X	X
			Sonar		X	X	X
WFS-104-162	FA-104	Upland Slough	Minnow Trap	X	X	X	X
			Video	X	X	X	X
WFS-104-OP1	FA-104	Upland Slough	Electrofish			X	X
WFS-104-OP2	FA-104	Side Channel	Electrofish		X	X	X
WFS-104-OP3	FA-104	Side Slough	Minnow Trap			X	X
			Video			X	
WFS-128-115	FA-128	Side Channel	Minnow Trap	X			
			Video	X			
WFS-128-156	FA-128	Upland Slough	Minnow Trap		X	X	X
			Video		X	X	X
WFS-128-157	FA-128	Upland Slough	Electrofish		X	X	X
			Minnow Trap		X	X	X
			Video		X		

Table 4.3-1. Winter sampling locations and techniques, 2013-2014 (continued).

Site ID	Focus Area	Macrohabitat	Gear Type	Nov	Feb	Mar	Apr
WFS-128-158	FA-128	Upland Slough	Minnow Trap		X	X	X
			Video				X
WFS-128-63OP2	FA-128	Side Channel	Minnow Trap	X			
WFS-128-63	FA-128	Side Channel	Minnow Trap	X			
WFS-128-64	FA-128	Side Channel	Electrofish				X
			Fyke Net			X	
			Minnow Trap		X	X	X
WFS-128-69	FA-128	Side Slough	Electrofish			X	X
			Minnow Trap		X	X	X
WFS-128-71	FA-128	Side Slough	Electrofish		X		
			Fyke Net			X	X
			Minnow Trap	X	X	X	X
			Video	X		X	X
WFS-128-73	FA-128	Trib Mouth	Video		X		
WFS-128-O70	FA-128	Side Slough	Electrofish		X	X	
			Minnow Trap	X	X	X	
WFS-128-OP1	FA-128	Main Channel Backwater	Fyke Net		X	X	X
			Trotline		X	X	
			Video		X	X	
WFS-128-OP2	FA-128	Side Slough	Electrofish			X	X
WFS-128-OP3	FA-128	Upland Slough	Electrofish		X	X	X
			Video		X		
WFS-128-WO109	FA-128	Side Slough	Electrofish		X	X	
			Video			X	
WFS-128-WO112	FA-128	Side Channel	Trotline			X	
WFS-128-WO118	FA-128	Side Channel	Trotline		X	X	
			Video		X		
WFS-128-WO119	FA-128	Side Channel	Electrofish		X		
WFS-128-WO120	FA-128	Side Channel	Electrofish				X
			Fyke Net				X
WFS-128-WO121	FA-128	Side Channel	Minnow Trap	X			
			Video	X			
WFS-128-WO150	FA-128	Side Slough	Fyke Net				X
			Minnow Trap	X			X
WFS-138-102	FA-138	Side Channel	Minnow Trap		X	X	X
			Trotline				X
WFS-138-108	FA-138	Side Channel	Electrofish	X	X		

Table 4.3-1. Winter sampling locations and techniques, 2013-2014 (continued).

Site ID	Focus Area	Macrohabitat	Gear Type	Nov	Feb	Mar	Apr
			Minnow Trap	X	X	X	X
			Video	X		X	X
WFS-138-11	FA-138	Side Channel	Electrofish		X		
			Trotline		X		
			Video		X	X	X
			Sonar		X	X	X
WFS-138-134	FA-138	Side Slough	Electrofish	X	X		
			Fyke Net				X
			Minnow Trap	X	X	X	X
WFS-138-134UP	FA-138	Side Slough	Electrofish		X	X	X
WFS-138-161	FA-138	Upland Slough	Minnow Trap		X	X	X
			Video				X
WFS-138-65	FA-138	Side Channel	Electrofish				
			Minnow Trap	X		X	X
WFS-138-66	FA-138	Side Slough	Minnow Trap	X	X	X	X
			Video		X		X
WFS-138-67	FA-138	Side Slough	Minnow Trap	X	X	X	X
			Video	X	X	X	X
WFS-138-76	FA-138	Upland Slough	Minnow Trap		X	X	X
WFS-138-O77	FA-138	Upland Slough	Minnow Trap	X			
			Video	X			
WFS-138-OP1	FA-138	Side Slough	Video		X	X	X
			Sonar		X	X	X
WFS-138-OP2	FA-138	Side Channel	Electrofish		X		
			Minnow Trap		X		
WFS-138-OP3	FA-138	Side Slough	Minnow Trap		X		
			Video		X	X	X
			Sonar		X	X	X
WFS-138-OP4	FA-138	Main Channel, Single	Trotline			X	
WFS-138-OP5	FA-138	Upland Slough	Minnow Trap			X	X
			Video			X	X
WFS-138-OP6	FA-138	Main Channel, Multi Split	Electrofish		X		
			Minnow Trap		X		
WFS-138-WO127	FA-138	Side Channel	Electrofish			X	X
			Fyke Net				X
			Minnow Trap			X	X
WFS-140-OP1	NFA	Main Channel, Clearwater Plume	Fyke Net				X
			Minnow Trap		X	X	X

Table 4.3-1. Winter sampling locations and techniques, 2013-2014 (continued).

Site ID	Focus Area	Macrohabitat	Gear Type	Nov	Feb	Mar	Apr
			Trotline		X	X	
			Video		X		
WFS-141-58	FA-141	Main Channel, Backwater	Fyke Net			X	
			Minnow Trap			X	X
			Video		X		
WFS-141-75	FA-141	Tributary Mouth	Fyke Net				X
			Minnow Trap		X	X	X
			Trotline		X	X	
			Video		X	X	X
WFS-141-81	FA-141	Upland Slough	Minnow Trap			X	X
			Video			X	X
WFS-141-OP1	FA-141	Main Channel	Electrofish				X
			Video				X
WFS-141-OP2	FA-141	Tributary	Electrofish		X		

Table 4.3-2. Hours used to define daily periods for analyzing sonar data from winter 2014.

	Dawn	Day	Dusk	Night
February	06-09	10-16	17-20	21-05
March	05-08	09-17	18-21	22-04
April	04-07	08-18	19-22	23-03

Table 4.5-1. Radio-tagged Arctic grayling detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Arctic Grayling	PRM		Released in Lane - Gateway area														Released in Gateway - 4th of July area														Released in Slough11 - Indian area														Released in abv Powerline - Portage area														Released in Devil Stn - Fog area														Released in Tsusena Creek area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																																																																					
ADFG Deshka River	44.6	-																																																																																					
ADFG Deshka Weir	-	-																																																																																						
MOB - Deshka River	44.9	-																																																																																					
MOB - Willow and Little Willow Cr	52.2	55.6																																																																																				
MOB - Kashwitna River	64.7	-																																																																																				
MOB - Deshka - Kashwitna	45	64.7																																																																																				
MOB - Caswell Creek	67.4	-																																																																																					
MOB - Sheep Creek	70.1	-																																																																																				
MOB - Goose Creek (LR)	76.9	-																																																																																				
MOB - Kashwitna - Montana	64.7	80.7																																																																																				
Montana	-	-																																																																																					
MOB - Montana Creek	80.9	-																																																																																					
ADFG Montana Weir	-	-																																																																																						
MOB - Montana - Sunshine	80.7	88.5										1	1	2	2	2																																																																				
MOB - Sunshine Creek	88.1	-																																																																																				
MOB - Rabideux Creek	87.4	-																																																																																				
ADFG Sunshine	87.7	-																																																																																					
MOB - Birch Creek	93.5	-																																																																																				
ADFG Talkeetna	-	-																																																																																						
MOB - Talkeetna River	101	-																																																																																				
ADFG Chulitna	-	-																																																																																							
MOB - Chulitna River	102	-																																																																																				
ADFG Chulitna Weir	-	-																																																																																							
MOB - Sunshine - Talkeetna	88.5	102							2	2	1	1																																																																								
Middle River (PRM 102.4)																																																																																								
MOB - Talkeetna - Lane	102	117							1	1	1	1	1	1	1	1																																																																				
Whiskers	105	-																1																																																																			
MOB - Whiskers Creek	105	-																																																																																					
MOB - Trib off zone 95	111	-																																																																																					
Lane Creek	117	-																																																																																					
MOB - Lane - Gateway	117	130	11				2	3	2																							1	1	1	1	1	1	1	1	1	1	1	1																																												
MOB - Lane Creek	117	-																																																																																					
MOB - 5th of July Creek	127	-																																																																																				
MOB - Slough 8A	129	130																																																																																				
Gateway	130	-																																																																																					
MOB - Gateway - 4th of July	130	134															2	1	1																									1																																																
MOB - Slough 9	131	134																																																																																					
MOB - Sherman Creek	134	-																																																																																					
Fourth of July	134	-																																																																																						
MOB - 4th of July Creek	134	-																																																																																					
MOB - 4th of July - Slough 11	134	140			1	1	1																																																																															
MOB - Slough 11	139	-																																																																																					
MOB - Gold Creek	140	-																																																																																					
MOB - Slough11 - Indian	140	142																													1																																																									
Indian River	142	-		2	2	1																																																																																
Indian River trib	-	-																																																																																							
MOB - Indian trib	142	-																																																																																					
MOB - Indian - Slough 21	142	146																																																																																				
MOB - Slough 21	145	146																																																																																					
Powerline	146	-																																																																																					
MOB - above Powerline	146	146																																																																																					
MOB - abv Powerline - Portage	146	152																																											1																																											
MOB - Jack Long Creek	148	-																																																																																					
Portage Creek Mouth	152	-																																																																																						
MOB - Portage trib	152	-		1																																																																																		
Lower Extent Devils Canyon (PRM 153.9)																																																																																								
MOB - Portage - Impediment1	152	155																																																																																					
MOB - Impediment1 - Cheechako	155	157																																																																																					
MOB - Cheechako Creek	156	-																																																																																					
Cheechako Station	157	-																																																																																					
MOB - Cheechako - Impediment2	157	160																																																																																					
MOB - Impediment2 - Chinook	160	161																																																																																					
MOB - Chinook Creek	160	-																																																																																					
Chinook Creek Mouth	160	-																																																																																					
MOB - Chinook - Impediment3	161	165																																																																																					
MOB - Devil Creek	165	-																																																																																						
MOB - Impediment3 - Devil Stn	165	167																																																																																					
Upper Extent Devils Canyon (PRM 166.1)																																																																																								
Devils Island	167	-																																																												1	1														2												
MOB - Devil Stn - Fog	167	179																																																										11	4	2	2	3	4	2	2	2	2	2	2	2	2														
MOB - Fog Creek	179	-																																																																																					
MOB - Fog - Dam Site	179	187																																																											4	4	3	4	2	1	1	1	1	1	1	1	1														
MOB - Tsusena Creek	185	-																																																																									8													
Watana Dam Site (PRM 187)																																																																																							
Total Tags Tracked			11	3	3	2	3	3	3	3	3	3	3	3	3	3	2	2	1	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	11	8	7	6	7	6	3	3	3	3	3	3	3	3	8	2	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				7	7	7	7	7	7	7	7	7	7	7	7	7		0	0	0	0	1	1	1	1	1	1	1	1	1		0	0	0	0	0	0	0	0	0	0	0	0	0		1	1	1	1	1	1	1	1	1	1	1	1	1		2	3	3	4	5	8	8	8	8	8	8	8	8		6	8	8	8	8	8	8	8	8	8	8	8	8
Vanished tags / Dead Batteries				1	1	2	1	1	1	1	1	1	1	1	1	1		0	1	2	2	1	1	1	1	1	1	1	1	1		0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0		1	1	2	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-2. Radio-tagged burbot detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Burbot	PRM		Released in Confluence - Yentna area														Released in Yentna - Deshka area														Released in Kashwitna - Montana area														Released in Talkeetna - Lane area														Released in Lane - Gateway area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45															3																																																									
ADFG Deshka River	44.6	-																																																																						
ADFG Deshka Weir	-	-																																																																						
MOB - Deshka River	44.9	-																																																																						
MOB - Willow and Little Willow Cr	52.2	55.6																																																																						
MOB - Kashwitna River	64.7	-																																																																						
MOB - Deshka - Kashwitna	45	64.7																																																																						
MOB - Caswell Creek	67.4	-																																																																						
MOB - Sheep Creek	70.1	-																																																																						
MOB - Goose Creek (LR)	76.9	-																																																																						
MOB - Kashwitna - Montana	64.7	80.7																													2	1	1			1																																					
Montana	-	-																																																																							
MOB - Montana Creek	80.9	-																																																																						
ADFG Montana Weir	-	-																																																																						
MOB - Montana - Sunshine	80.7	88.5																														1	1			1							1	1																												
MOB - Sunshine Creek	88.1	-																																																																						
MOB - Rabideux Creek	87.4	-																																																																						
ADFG Sunshine	87.7	-																																																																						
MOB - Birch Creek	93.5	-																																																																						
ADFG Talkeetna	-	-																																																																						
MOB - Talkeetna River	101	-																																																																						
ADFG Chulitna	-	-																																																																						
MOB - Chulitna River	102	-																																																																						
ADFG Chulitna Weir	-	-																																																																						
MOB - Sunshine - Talkeetna	88.5	102																																			1	1	1	1	1	1				1	1	1	1																									
Middle River (PRM 102.4)																																																																										
MOB - Talkeetna - Lane	102	117																																											2					1	1			1	1	1	1															
Whiskers	105	-																																																																						
MOB - Whiskers Creek	105	-																																																																						
MOB - Trib off zone 95	111	-																																																																						
Lane Creek	117	-																																																																						
MOB - Lane - Gateway	117	130																																																		1	1						1													
MOB - Lane Creek	117	-																																																																						
MOB - 5th of July Creek	127	-																																																																						
MOB - Slough 8A	129	130																																																																						
Gateway	130	-																																																																						
MOB - Gateway - 4th of July	130	134																																																																						
MOB - Slough 9	131	134																																																																						
MOB - Sherman Creek	134	-																																																																						
Fourth of July	134	-																																																																						
MOB - 4th of July Creek	134	-																																																																						
MOB - 4th of July - Slough 11	134	140																																																																						
MOB - Slough 11	139	-																																																																						
MOB - Gold Creek	140	-																																																																						
MOB - Slough11 - Indian	140	142																																																																						
Indian River	142	-																																																																						
Indian River trib	-	-																																																																						
MOB - Indian trib	142	-																																																																						
MOB - Indian - Slough 21	142	146																																																																						
MOB - Slough 21	145	146																																																																						
Powerline	146	-																																																																						
MOB - above Powerline	146	146																																																																						
MOB - abv Powerline - Portage	146	152																																																																						
MOB - Jack Long Creek	148	-																																																																						
Portage Creek Mouth	152	-																																																																						
MOB - Portage trib	152	-																																																																						
Lower Extent Devils Canyon (PRM 153.9)																																																																										
MOB - Portage - Impediment1	152	155																																																																						
MOB - Impediment1 - Cheechako	155	157																																																																						
MOB - Cheechako Creek	156	-																																																																						
Cheechako Station	157	-																																																																						
MOB - Cheechako - Impediment2	157	160																																																																						
MOB - Impediment2 - Chinook	160	161																																																																						
MOB - Chinook Creek	160	-																																																																						
Chinook Creek Mouth	160	-																																																																						
MOB - Chinook - Impediment3	161	165																																																																						
MOB - Devil Creek	165	-																																																																						
MOB - Impediment3 - Devil Stn	165	167																																																																						
Upper Extent Devils Canyon (PRM 166.1)																																																																										
Devils Island	167	-																																																																						
MOB - Devil Stn - Fog	167	179																																																																						
MOB - Fog Creek	179	-																																																																						
MOB - Fog - Dam Site	179	187																																																																						
MOB - Tsusena Creek	185	-																																																																						
Watana Dam Site (PRM 187)																																																																										
Total Tags Tracked			1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	2	0	0	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				1	1	1	1	1	1	1	1	1	1	1	1	1		3	3	3	3	3	3	3	3	3	3	3	3	3		0	0	0	0	0	1	1	1	1	1	1	1	1		0	1	1	1	1	1	1	1	1	1	1	1	1		1	1	1	1	1	1	1	1	1	1	1	1	1
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0		0	0	2	2	0	0	0	0	0	0	0	0	0		1	0	0	0	0	0	0	0	0	0	0	0	1		0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-3. Radio-tagged Dolly Varden detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Dolly Varden	PRM		Released in Talkeetna River area														Released in Lane - Gateway area														Released in Slough11 - Indian area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																										
ADFG Deshka River	44.6	-																																										
ADFG Deshka Weir	-	-																																										
MOB - Deshka River	44.9	-																																										
MOB - Willow and Little Willow Cr	52.2	55.6																																										
MOB - Kashwitna River	64.7	-																																										
MOB - Deshka - Kashwitna	45	64.7																																										
MOB - Caswell Creek	67.4	-																																										
MOB - Sheep Creek	70.1	-																																										
MOB - Goose Creek (LR)	76.9	-																																										
MOB - Kashwitna - Montana	64.7	80.7																																										
Montana	-	-																																										
MOB - Montana Creek	80.9	-																																										
ADFG Montana Weir	-	-																																										
MOB - Montana - Sunshine	80.7	88.5											1	1	1																													
MOB - Sunshine Creek	88.1	-																																										
MOB - Rabideux Creek	87.4	-																																										
ADFG Sunshine	87.7	-																																										
MOB - Birch Creek	93.5	-																																										
ADFG Talkeetna	-	-																																										
MOB - Talkeetna River	101	-	6	1				2	2	3	3			2	2	2																												
ADFG Chulitna	-	-																																										
MOB - Chulitna River	102	-																																										
ADFG Chulitna Weir	-	-																																										
MOB - Sunshine - Talkeetna	88.5	102			1	1	1												1	1																								
Middle River (PRM 102.4)																																												
MOB - Talkeetna - Lane	102	117																																										
Whiskers	105	-																																										
MOB - Whiskers Creek	105	-																																										
MOB - Trib off zone 95	111	-																																										
Lane Creek	117	-																																										
MOB - Lane - Gateway	117	130															2																											
MOB - Lane Creek	117	-																																										
MOB - 5th of July Creek	127	-																																										
MOB - Slough 8A	129	130																																										
Gateway	130	-																																										
MOB - Gateway - 4th of July	130	134																																										
MOB - Slough 9	131	134																																										
MOB - Sherman Creek	134	-																																										
Fourth of July	134	-																																										
MOB - 4th of July Creek	134	-																																										
MOB - 4th of July - Slough 11	134	140																																										
MOB - Slough 11	139	-																																										
MOB - Gold Creek	140	-																																										
MOB - Slough11 - Indian	140	142																													1													
Indian River	142	-																																										
Indian River trib	-	-																																										
MOB - Indian trib	142	-																																										
MOB - Indian - Slough 21	142	146																																										
MOB - Slough 21	145	146																																										
Powerline	146	-																																										
MOB - above Powerline	146	146																																										
MOB - abv Powerline - Portage	146	152																																										
MOB - Jack Long Creek	148	-																																										
Portage Creek Mouth	152	-																																										
MOB - Portage trib	152	-																																										
Lower Extent Devils Canyon (PRM 153.9)																																											
MOB - Portage - Impediment1	152	155																																										
MOB - Impediment1 - Cheechako	155	157																																										
MOB - Cheechako Creek	156	-																																										
Cheechako Station	157	-																																										
MOB - Cheechako - Impediment2	157	160																																										
MOB - Impediment2 - Chinook	160	161																																										
MOB - Chinook Creek	160	-																																										
Chinook Creek Mouth	160	-																																										
MOB - Chinook - Impediment3	161	165																																										
MOB - Devil Creek	165	-																																										
Upper Extent Devils Canyon (PRM 166.1)																																											
MOB - Impediment3 - Devil Stn	165	167																																										
Devils Island	167	-																																										
MOB - Devil Stn - Fog	167	179																																										
MOB - Fog Creek	179	-																																										
MOB - Fog - Dam Site	179	187																																										
MOB - Tsusena Creek	185	-																																										
Watana Dam Site (PRM 187)																																											
Total Tags Tracked			6	1	1	1	1	2	2	3	3	0	0	3	3	3	2	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				2	2	2	2	2	2	2	2	2	2	2	2	2		0	0	0	1	2	2	2	2	2	2	2	2	2		1	1	1	1	1	1	1	1	1	1	1	1	1
Vanished tags / Dead Batteries				3	3	3	3	2	2	1	1	4	4	1	1	1		2	1	1	1	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-4. Radio-tagged longnose sucker detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Longnose Sucker — Released in Talkeetna River area

Zone Name	PRM From	PRM To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45														
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-	3													
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117														
Whiskers	105	-														
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130														
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134														
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140														
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142														
Indian River	142	-														
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146														
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152														
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			3	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				3	3	3	3	3	3	3	3	3	3	3	3	3
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0

Longnose Sucker — Released in Talkeetna - Lane area

Zone Name	PRM From	PRM To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45														
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-														
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117	11	1	1		1	1								
Whiskers	105	-														
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130														
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134														
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140														
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142														
Indian River	142	-														
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146														
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152														
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			11	1	1	0	1	1	0	0	0	0	0	0	0	0
Mortalities				9	9	9	9	9	10	10	10	10	10	10	10	10
Vanished tags / Dead Batteries				1	1	2	1	1	1	1	1	1	1	1	1	1

Longnose Sucker — Released in Lane - Gateway area

Zone Name	PRM From	PRM To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45														
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-														
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117														
Whiskers	105	-		1												
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130	6				1	1								
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134														
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140														
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142														
Indian River	142	-				1										
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146		1	1											
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152														
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			6	2	1	1	1	1	0	0	0	0	0	0	0	0
Mortalities				4	5	5	5	5	6	6	6	6	6	6	6	6
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0

Longnose Sucker — Released in Slough11 - Indian area

Zone Name	PRM From	PRM To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45														
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-														
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117														
Whiskers	105	-														
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130								1	1					
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134						1	1							
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140					1									
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142	3													
Indian River	142	-				1										
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146		1	1		1									
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152														
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			3	1	1	1	2	1	1	1	1	0	0	0	0	0
Mortalities				1	1	1	1	2	2	2	2	3	3	3	3	3
Vanished tags / Dead Batteries				1	1	1	0	0	0	0	0	0	0	0	0	0

Longnose Sucker — Released in Indian - Slough 21 area

Zone Name	PRM From	PRM To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45														
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-														
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117														
Whiskers	105	-														
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130														
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134														
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140														
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142														
Indian River	142	-														
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146	4													
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152														
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			4	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				4	4	4	4	4	4	4	4	4	4	4	4	4
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0

Longnose Sucker — Released in abv Powerline - Portage area

Zone Name	PRM From	PRM To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45														
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-														
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117														
Whiskers	105	-														
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130														
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134														
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140														
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142														
Indian River	142	-														
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146														
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152	1													
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				1	1	1	1	1	1	1	1	1	1	1	1	1
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-5. Radio-tagged northern pike detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Northern Pike	PRM		Released in Yentna - Deshka area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45	5			3	3	3	3	3	3	3	3	3	3	
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-														
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117														
Whiskers	105	-														
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130														
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134														
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140														
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142														
Indian River	142	-														
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146														
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152														
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			5	0	0	3	3	3	3	3	3	3	3	3	3	3
Mortalities				0	0	0	0	0	0	0	0	0	0	0	0	0
Vanished tags / Dead Batteries				5	5	2	2	2	2	2	2	2	2	2	2	2

Table 4.5-6. Radio-tagged rainbow trout detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Rainbow Trout	PRM		Released in Kashwitna - Montana area														Released in Montana Creek area														Released in Talkeetna River area														Released in Lane - Gateway area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																																								
ADFG Deshka River	44.6	-																																																								
ADFG Deshka Weir	-	-																																																								
MOB - Deshka River	44.9	-																																																								
MOB - Willow and Little Willow Cr	52.2	55.6																																																								
MOB - Kashwitna River	64.7	-																																																								
MOB - Deshka - Kashwitna	45	64.7					1																																																			
MOB - Caswell Creek	67.4	-																																																								
MOB - Sheep Creek	70.1	-																																																								
MOB - Goose Creek (LR)	76.9	-																																																								
MOB - Kashwitna - Montana	64.7	80.7	7	3	3	1	1	3	3	3	3	2	2	3	3	3																																										
Montana	-	-																																																								
MOB - Montana Creek	80.9	-															6																																									
ADFG Montana Weir	-	-																																																								
MOB - Montana - Sunshine	80.7	88.5		2	2	3	3	3	1	2	2	1	1	3	3	3		1	1	1	1	1	1	1	1	1	1	1	1	1																												
MOB - Sunshine Creek	88.1	-																																																								
MOB - Rabideux Creek	87.4	-																																																								
ADFG Sunshine	87.7	-																																																								
MOB - Birch Creek	93.5	-																																																								
ADFG Talkeetna	-	-																																																								
MOB - Talkeetna River	101	-																													8																											
ADFG Chulitna	-	-																																																								
MOB - Chulitna River	102	-																																				1	1	1	1	1	1	1														
ADFG Chulitna Weir	-	-																																																								
MOB - Sunshine - Talkeetna	88.5	102		1	1				2	1	1	1	1																			1																										
Middle River (PRM 102.4)																																																										
MOB - Talkeetna - Lane	102	117					1	1	1	1	1	1	1	1	1	1																			1	1	1	1	1	1	1	1	1	1		2			1	1	2	2	2	2	2	2	2	2
Whiskers	105	-																																													1	1										
MOB - Whiskers Creek	105	-																																																								
MOB - Trib off zone 95	111	-																																																								
Lane Creek	117	-																																																								
MOB - Lane - Gateway	117	130																																											9		2	2	3	3	2	2	1			2	2	2
MOB - Lane Creek	117	-																																																								
MOB - 5th of July Creek	127	-																																																								
MOB - Slough 8A	129	130																																																								
Gateway	130	-																																																								
MOB - Gateway - 4th of July	130	134																																												1												
MOB - Slough 9	131	134																																																								
MOB - Sherman Creek	134	-																																																								
Fourth of July	134	-																																																								
MOB - 4th of July Creek	134	-																																																								
MOB - 4th of July - Slough 11	134	140																																												1												
MOB - Slough 11	139	-																																																								
MOB - Gold Creek	140	-																																																								
MOB - Slough11 - Indian	140	142																																																								
Indian River	142	-																																																								
Indian River trib	-	-																																																								
MOB - Indian trib	142	-																																																								
MOB - Indian - Slough 21	142	146																																																								
MOB - Slough 21	145	146																																																								
Powerline	146	-																																																								
MOB - above Powerline	146	146																																																								
MOB - abv Powerline - Portage	146	152																																																								
MOB - Jack Long Creek	148	-																																																								
Portage Creek Mouth	152	-																																																								
MOB - Portage trib	152	-																																																								
Lower Extent Devils Canyon (PRM 153.9)																																																										
MOB - Portage - Impediment1	152	155																																																								
MOB - Impediment1 - Cheechako	155	157																																																								
MOB - Cheechako Creek	156	-																																																								
Cheechako Station	157	-																																																								
MOB - Cheechako - Impediment2	157	160																																																								
MOB - Impediment2 - Chinook	160	161																																																								
MOB - Chinook Creek	160	-																																																								
Chinook Creek Mouth	160	-																																																								
MOB - Chinook - Impediment3	161	165																																																								
MOB - Devil Creek	165	-																																																								
MOB - Impediment3 - Devil Stn	165	167																																																								
Upper Extent Devils Canyon (PRM 166.1)																																																										
Devils Island	167	-																																																								
MOB - Devil Stn - Fog	167	179																																																								
MOB - Fog Creek	179	-																																																								
MOB - Fog - Dam Site	179	187																																																								
MOB - Tsusena Creek	185	-																																																								
Watana Dam Site (PRM 187)																																																										
Total Tags Tracked			7	6	6	4	6	7	7	7	7	5	5	7	7	7	6	1	1	1	1	1	1	1	1	1	1	1	1	1	8	1	0	0	1	1	1	2	2	2	2	2	2	2	9	4	3	3	4	4	4	4	3	2	2	4	4	4
Mortalities				0	0	0	0	0	0	0	0	0	0	0	0	0		3	3	3	3	3	3	4	4	4	4	4	4	4		4	4	4	4	5	5	5	5	5	5	5	5	5		5	5	5	5	5	5	5	5	5	5	5	5	5
Vanished tags / Dead Batteries				1	1	3	1	0	0	0	0	2	2	0	0	0		2	2	2	2	2	2	1	1	1	1	1	1	1		3	4	4	3	2	2	1	1	1	1	1	1	1		0	1	1	0	0	0	0	1	2	2	0	0	0

Table 4.5-6 (continued) Radio-tagged rainbow trout detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Rainbow Trout	PRM		Released in Gateway - 4th of July area														Released in Slough11 - Indian area														Released in Indian - Slough 21 area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																										
ADFG Deshka River	44.6	-																																										
ADFG Deshka Weir	-	-																																										
MOB - Deshka River	44.9	-																																										
MOB - Willow and Little Willow Cr	52.2	55.6																																										
MOB - Kashwitna River	64.7	-																																										
MOB - Deshka - Kashwitna	45	64.7																																										
MOB - Caswell Creek	67.4	-																																										
MOB - Sheep Creek	70.1	-																																										
MOB - Goose Creek (LR)	76.9	-																																										
MOB - Kashwitna - Montana	64.7	80.7																																										
Montana	-	-																																										
MOB - Montana Creek	80.9	-																																										
ADFG Montana Weir	-	-																																										
MOB - Montana - Sunshine	80.7	88.5																																										
MOB - Sunshine Creek	88.1	-																																										
MOB - Rabideux Creek	87.4	-																																										
ADFG Sunshine	87.7	-																																										
MOB - Birch Creek	93.5	-																																										
ADFG Talkeetna	-	-																																										
MOB - Talkeetna River	101	-																																										
ADFG Chulitna	-	-																																										
MOB - Chulitna River	101.7	-																																										
ADFG Chulitna Weir	-	-																																										
MOB - Sunshine - Talkeetna	88.5	102.3																																										
Middle River (PRM 102.4)																																												
MOB - Talkeetna - Lane	102.3	116.8																																										
Whiskers	105	-																																										
MOB - Whiskers Creek	104.8	-																																										
MOB - Trib off zone 95	110.5	-																																										
Lane Creek	116.8	-																																										
MOB - Lane - Gateway	116.8	130.1							1	1	1	1	1	1	1	1																												
MOB - Lane Creek	117.1	-																																										
MOB - 5th of July Creek	127.3	-																																										
MOB - Slough 8A	129.2	129.8																																										
Gateway	130.1	-																																										
MOB - Gateway - 4th of July	130.1	134.3	6	2	1	1	2	2		1	1	1	1	1	1	1										1	1	1	1															
MOB - Slough 9	131.4	133.5																																										
MOB - Sherman Creek	134.1	-																																										
Fourth of July	134.3	-																																										
MOB - 4th of July Creek	134.3	-																																										
MOB - 4th of July - Slough 11	134.3	140.2		1	1	1	1	1	2	1	1	1	1	1	1	1		1	2	1	2	3	3	3	3	1	1	2	2	3														
MOB - Slough 11	138.6	-																																										
MOB - Gold Creek	140.1	-																																										
MOB - Slough11 - Indian	140.1	142.1															7		1	1																								
Indian River	142.1	-																2																										
Indian River trib	-	-																																										
MOB - Indian trib	141.8	-																																										
MOB - Indian - Slough 21	142.1	145.7																													1													
MOB - Slough 21	145.1	145.6																																										
Powerline	145.7	-																																										
MOB - above Powerline	145.7	146																																										
MOB - abv Powerline - Portage	146	152.3																														1												
MOB - Jack Long Creek	148.2	-																																										
Portage Creek Mouth	152.3	-																																										
MOB - Portage trib	152.3	-																																										
Lower Extent Devils Canyon (PRM 153.9)																																												
MOB - Portage - Impediment1	152.3	155.2																																										
MOB - Impediment1 - Cheechako	155.2	157.4																																										
MOB - Cheechako Creek	155.9	-																																										
Cheechako Station	157.4	-																																										
MOB - Cheechako - Impediment2	157.4	160.2																																										
MOB - Impediment2 - Chinook	160.2	160.5																																										
MOB - Chinook Creek	160.4	-																																										
Chinook Creek Mouth	160.4	-																																										
MOB - Chinook - Impediment3	160.5	164.8																																										
MOB - Devil Creek	164.8	-																																										
MOB - Impediment3 - Devil Stn	164.8	166.9																																										
Upper Extent Devils Canyon (PRM 166.1)																																												
Devils Island	166.9	-																																										
MOB - Devil Stn - Fog	166.9	179.4																																										
MOB - Fog Creek	179.3	-																																										
MOB - Fog - Dam Site	179.4	186.8																																										
MOB - Tsusena Creek	184.5	-																																										
Watana Dam Site (PRM 187)																																												
Total Tags Tracked			6	3	2	2	3	3	3	3	3	3	3	3	3	3	7	3	3	2	2	3	3	3	3	2	2	3	3	3	1	1	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				3	3	3	3	3	3	3	3	3	3	3	3	3		4	4	4	4	4	4	4	4	4	4	4	4	4		0	1	1	1	1	1	1	1	1	1	1	1	1
Vanished tags / Dead Batteries				0	1	1	0	0	0	0	0	0	0	0	0	0		0	0	1	1	0	0	0	0	1	1	0	0	0		0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-7. Radio-tagged round whitefish detected in the Lower and Middle River segments during the winter study period (November 2013-April 2014) grouped by release location. No fish tagged in the Lower or Middle River segements were detected downstream of the Yentna River or upstream of the Watana Dam site (PRM 187.1).

Round Whitefish	PRM		Released in Talkeetna River area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45														
ADFG Deshka River	44.6	-														
ADFG Deshka Weir	-	-														
MOB - Deshka River	44.9	-														
MOB - Willow and Little Willow Cr	52.2	55.6														
MOB - Kashwitna River	64.7	-														
MOB - Deshka - Kashwitna	45	64.7														
MOB - Caswell Creek	67.4	-														
MOB - Sheep Creek	70.1	-														
MOB - Goose Creek (LR)	76.9	-														
MOB - Kashwitna - Montana	64.7	80.7														
Montana	-	-														
MOB - Montana Creek	80.9	-														
ADFG Montana Weir	-	-														
MOB - Montana - Sunshine	80.7	88.5														
MOB - Sunshine Creek	88.1	-														
MOB - Rabideux Creek	87.4	-														
ADFG Sunshine	87.7	-														
MOB - Birch Creek	93.5	-														
ADFG Talkeetna	-	-														
MOB - Talkeetna River	101	-	1													
ADFG Chulitna	-	-														
MOB - Chulitna River	102	-														
ADFG Chulitna Weir	-	-														
MOB - Sunshine - Talkeetna	88.5	102														
Middle River (PRM 102.4)																
MOB - Talkeetna - Lane	102	117														
Whiskers	105	-														
MOB - Whiskers Creek	105	-														
MOB - Trib off zone 95	111	-														
Lane Creek	117	-														
MOB - Lane - Gateway	117	130														
MOB - Lane Creek	117	-														
MOB - 5th of July Creek	127	-														
MOB - Slough 8A	129	130														
Gateway	130	-														
MOB - Gateway - 4th of July	130	134														
MOB - Slough 9	131	134														
MOB - Sherman Creek	134	-														
Fourth of July	134	-														
MOB - 4th of July Creek	134	-														
MOB - 4th of July - Slough 11	134	140														
MOB - Slough 11	139	-														
MOB - Gold Creek	140	-														
MOB - Slough11 - Indian	140	142														
Indian River	142	-														
Indian River trib	-	-														
MOB - Indian trib	142	-														
MOB - Indian - Slough 21	142	146														
MOB - Slough 21	145	146														
Powerline	146	-														
MOB - above Powerline	146	146														
MOB - abv Powerline - Portage	146	152														
MOB - Jack Long Creek	148	-														
Portage Creek Mouth	152	-														
MOB - Portage trib	152	-														
Lower Extent Devils Canyon (PRM 153.9)																
MOB - Portage - Impediment1	152	155														
MOB - Impediment1 - Cheechako	155	157														
MOB - Cheechako Creek	156	-														
Cheechako Station	157	-														
MOB - Cheechako - Impediment2	157	160														
MOB - Impediment2 - Chinook	160	161														
MOB - Chinook Creek	160	-														
Chinook Creek Mouth	160	-														
MOB - Chinook - Impediment3	161	165														
MOB - Devil Creek	165	-														
MOB - Impediment3 - Devil Stn	165	167														
Upper Extent Devils Canyon (PRM 166.1)																
Devils Island	167	-														
MOB - Devil Stn - Fog	167	179														
MOB - Fog Creek	179	-														
MOB - Fog - Dam Site	179	187														
MOB - Tsusena Creek	185	-														
Watana Dam Site (PRM 187)																
Total Tags Tracked			1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				1	1	1	1	1	1	1	1	1	1	1	1	1
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0

Round Whitefish	Released in Lane - Gateway area													
Zone Name	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka														
ADFG Deshka River														
ADFG Deshka Weir														
MOB - Deshka River														
MOB - Willow and Little Willow Cr														
MOB - Kashwitna River														
MOB - Deshka - Kashwitna		1	1	1	1									
MOB - Caswell Creek														
MOB - Sheep Creek														
MOB - Goose Creek (LR)														
MOB - Kashwitna - Montana														
Montana														
MOB - Montana Creek														
ADFG Montana Weir														
MOB - Montana - Sunshine														
MOB - Sunshine Creek														
MOB - Rabideux Creek														
ADFG Sunshine														
MOB - Birch Creek														
ADFG Talkeetna														
MOB - Talkeetna River														
ADFG Chulitna														
MOB - Chulitna River														
ADFG Chulitna Weir														
MOB - Sunshine - Talkeetna						1	1	1	1	1	1	1	1	
Middle River (PRM 102.4)														
MOB - Talkeetna - Lane					1	1								
Whiskers														
MOB - Whiskers Creek														
MOB - Trib off zone 95														
Lane Creek														
MOB - Lane - Gateway	12	1	2	1			2	2	2	2	2	1	1	1
MOB - Lane Creek														
MOB - 5th of July Creek														
MOB - Slough 8A														
Gateway														
MOB - Gateway - 4th of July		1	1	1	2	1								
MOB - Slough 9														
MOB - Sherman Creek														
Fourth of July														
MOB - 4th of July Creek														
MOB - 4th of July - Slough 11		1												
MOB - Slough 11														
MOB - Gold Creek														
MOB - Slough11 - Indian														
Indian River														
Indian River trib														
MOB - Indian trib														
MOB - Indian - Slough 21														
MOB - Slough 21														
Powerline														
MOB - above Powerline														
MOB - abv Powerline - Portage														
MOB - Jack Long Creek														
Portage Creek Mouth														
MOB - Portage trib														
Lower Extent Devils Canyon (PRM 153.9)														
MOB - Portage - Impediment1														
MOB - Impediment1 - Cheechako														
MOB - Cheechako Creek														
Cheechako Station														
MOB - Cheechako - Impediment2														
MOB - Impediment2 - Chinook														
MOB - Chinook Creek														
Chinook Creek Mouth														
MOB - Chinook - Impediment3														
MOB - Devil Creek														
MOB - Impediment3 - Devil Stn														
Upper Extent Devils Canyon (PRM 166.1)														
Devils Island														
MOB - Devil Stn - Fog														
MOB - Fog Creek														
MOB - Fog - Dam Site														
MOB - Tsusena Creek														
Watana Dam Site (PRM 187)														
Total Tags Tracked	12	4	4	3	4	3	3	3	3	3	3	2	2	1
Mortalities		7	7	7	7	8	8	8	8	8	8	8	8	8
Vanished tags / Dead Batteries		1	1	2	1	1	1	1	1	1	1	2	2	3

Round Whitefish	Released in Gateway - 4th of July area													
Zone Name	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka														
ADFG Deshka River														
ADFG Deshka Weir														
MOB - Deshka River														
MOB - Willow and Little Willow Cr														
MOB - Kashwitna River														
MOB - Deshka - Kashwitna														
MOB - Caswell Creek														
MOB - Sheep Creek														
MOB - Goose Creek (LR)														
MOB - Kashwitna - Montana														
Montana														
MOB - Montana Creek														
ADFG Montana Weir														
MOB - Montana - Sunshine										1	1			
MOB - Sunshine Creek														
MOB - Rabideux Creek														
ADFG Sunshine														
MOB - Birch Creek														
ADFG Talkeetna														
MOB - Talkeetna River														
ADFG Chulitna														
MOB - Chulitna River														
ADFG Chulitna Weir														
MOB - Sunshine - Talkeetna		1	1		1							1	1	1
Middle River (PRM 102.4)														
MOB - Talkeetna - Lane			1	1	1	3	2	2	1	2	2	2	1	1
Whiskers														
MOB - Whiskers Creek														
MOB - Trib off zone 95														
Lane Creek														
MOB - Lane - Gateway					1		2	2	2	1	1		1	1
MOB - Lane Creek														
MOB - 5th of July Creek														
MOB - Slough 8A														
Gateway														
MOB - Gateway - 4th of July	6	2	2	2	1	3	2	1	1	1	1	1		
MOB - Slough 9														
MOB - Sherman Creek														
Fourth of July														
MOB - 4th of July Creek													1	
MOB - 4th of July - Slough 11		1	1	1	1									1
MOB - Slough 11														
MOB - Gold Creek														
MOB - Slough11 - Indian														
Indian River		2	1											
Indian River trib														
MOB - Indian trib														
MOB - Indian - Slough 21														
MOB - Slough 21														
Powerline														
MOB - above Powerline														
MOB - abv Powerline - Portage														
MOB - Jack Long Creek														
Portage Creek Mouth														
MOB - Portage trib														
Lower Extent Devils Canyon (PRM 153.9)														
MOB - Portage - Impediment1														
MOB - Impediment1 - Cheechako														
MOB - Cheechako Creek														
Cheechako Station														
MOB - Cheechako - Impediment2														
MOB - Impediment2 - Chinook														
MOB - Chinook Creek														
Chinook Creek Mouth														
MOB - Chinook - Impediment3														
MOB - Devil Creek														
MOB - Impediment3 - Devil Stn														
Upper Extent Devils Canyon (PRM 166.1)														
Devils Island														
MOB - Devil Stn - Fog														
MOB - Fog Creek														
MOB - Fog - Dam Site														
MOB - Tsusena Creek														
Watana Dam Site (PRM 187)														
Total Tags Tracked	6	6	6	4	5	6	6	5	4	5	5	4	4	4
Mortalities		0	0	0	0	0	0	0	0	0	0	0	1	1
Vanished tags / Dead Batteries		0	0	2	1	0	0	1	2	1	1	2	1	1

Round Whitefish	Released in Slough11 - Indian area													
Zone Name	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka														
ADFG Deshka River														
ADFG Deshka Weir														
MOB - Deshka River														
MOB - Willow and Little Willow Cr														
MOB - Kashwitna River														
MOB - Deshka - Kashwitna														
MOB - Caswell Creek														
MOB - Sheep Creek														
MOB - Goose Creek (LR)														
MOB - Kashwitna - Montana														
Montana														
MOB - Montana Creek														
ADFG Montana Weir														
MOB - Montana - Sunshine														
MOB - Sunshine Creek														
MOB - Rabideux Creek														
ADFG Sunshine														
MOB - Birch Creek														
ADFG Talkeetna														
MOB - Talkeetna River														
ADFG Chulitna														
MOB - Chulitna River														
ADFG Chulitna Weir														
MOB - Sunshine - Talkeetna														
Middle River (PRM 102.4)														
MOB - Talkeetna - Lane														
Whiskers														
MOB - Whiskers Creek														
MOB - Trib off zone 95														
Lane Creek														
MOB - Lane - Gateway														
MOB - Lane Creek														
MOB - 5th of July Creek														
MOB - Slough 8A														
Gateway														
MOB - Gateway - 4th of July														
MOB - Slough 9														
MOB - Sherman Creek														
Fourth of July														
MOB - 4th of July Creek														
MOB - 4th of July - Slough 11		1	1	1	1	1	1	1	1	1	1	1	1	
MOB - Slough 11														
MOB - Gold Creek														
MOB - Slough11 - Indian	1													1
Indian River														
Indian River trib														
MOB - Indian trib														
MOB - Indian - Slough 21														
MOB - Slough 21														
Powerline														
MOB - above Powerline														
MOB - abv Powerline - Portage														
MOB - Jack Long Creek														
Portage Creek Mouth														
MOB - Portage trib														
Lower Extent Devils Canyon (PRM 153.9)														
MOB - Portage - Impediment1														
MOB - Impediment1 - Cheechako														
MOB - Cheechako Creek														
Cheechako Station														
MOB - Cheechako - Impediment2														
MOB - Impediment2 - Chinook														
MOB - Chinook Creek														
Chinook Creek Mouth														
MOB - Chinook - Impediment3														
MOB - Devil Creek														
MOB - Impediment3 - Devil Stn														
Upper Extent Devils Canyon (PRM 166.1)														
Devils Island														
MOB - Devil Stn - Fog														
MOB - Fog Creek														
MOB - Fog - Dam Site														
MOB - Tsusena Creek														
Watana Dam Site (PRM 187)														
Total Tags Tracked	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Mortalities		0	0	0	0	0	0	0	0	0	0	0	0	0
Vanished tags / Dead Batteries		0	0	0	0	0	0	0	0	0	0	0	0	0

Round Whitefish	Released in Indian - Slough 21 area													
Zone Name	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka														
ADFG Deshka River														
ADFG Deshka Weir														
MOB - Deshka River														
MOB - Willow and Little Willow Cr														
MOB - Kashwitna River														
MOB - Deshka - Kashwitna														
MOB - Caswell Creek														
MOB - Sheep Creek														
MOB - Goose Creek (LR)														
MOB - Kashwitna - Montana														
Montana														
MOB - Montana Creek														
ADFG Montana Weir														
MOB - Montana - Sunshine														
MOB - Sunshine Creek														
MOB - Rabideux Creek														
ADFG Sunshine														
MOB - Birch Creek														
ADFG Talkeetna														
MOB - Talkeetna River														
ADFG Chulitna														
MOB - Chulitna River														
ADFG Chulitna Weir														
MOB - Sunshine - Talkeetna														
Middle River (PRM 102.4)														
MOB - Talkeetna - Lane														
Whiskers														
MOB - Whiskers Creek														
MOB - Trib off zone 95														
Lane Creek														
MOB - Lane - Gateway														
MOB - Lane Creek														
MOB - 5th of July Creek														
MOB - Slough 8A														
Gateway														
MOB - Gateway - 4th of July														
MOB - Slough 9														
MOB - Sherman Creek														
Fourth of July														
MOB - 4th of July Creek														
MOB - 4th of July - Slough 11														
MOB - Slough 11														
MOB - Gold Creek														
MOB - Slough11 - Indian														
Indian River														
Indian River trib														
MOB - Indian trib														
MOB - Indian - Slough 21	1													
MOB - Slough 21														
Powerline														
MOB - above Powerline														
MOB - abv Powerline - Portage														
MOB - Jack Long Creek														
Portage Creek Mouth														
MOB - Portage trib														
Lower Extent Devils Canyon (PRM 153.9)														
MOB - Portage - Impediment1														
MOB - Impediment1 - Cheechako														
MOB - Cheechako Creek														
Cheechako Station														
MOB - Cheechako - Impediment2														
MOB - Impediment2 - Chinook														
MOB - Chinook Creek														
Chinook Creek Mouth														
MOB - Chinook - Impediment3														
MOB - Devil Creek														
MOB - Impediment3 - Devil Stn														
Upper Extent Devils Canyon (PRM 166.1)														
Devils Island														
MOB - Devil Stn - Fog														
MOB - Fog Creek														
MOB - Fog - Dam Site														
MOB - Tsusena Creek														
Watana Dam Site (PRM 187)														
Total Tags Tracked	1	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities		1	1	1	1	1	1	1	1	1	1	1	1	1
Vanished tags / Dead Batteries		0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-8. Radio-tagged Arctic grayling detected in the Upper River segments during the winter study period (November 2013-April 2014) grouped by release location.

Arctic Grayling	PRM		Released in Dam Site - Deadman area														Released in Deadman - Watana area														Released in Watana Creek area														Released in Watana - Kosina area														Released in Kosina Creek area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																																																								
ADFG Deshka River	44.6	-																																																																								
ADFG Deshka Weir	-	-																																																																								
MOB - Deshka River	44.9	-																																																																								
MOB - Willow and Little Willow Cr	52.2	55.6																																																																								
MOB - Kashwitna River	64.7	-																																																																								
MOB - Deshka - Kashwitna	45	64.7																																																																								
MOB - Caswell Creek	67.4	-																																																																								
MOB - Sheep Creek	70.1	-																																																																								
MOB - Goose Creek (LR)	76.9	-																																																																								
MOB - Kashwitna - Montana	64.7	80.7																																																																								
Montana	-	-																																																																								
MOB - Montana Creek	80.9	-																																																																								
ADFG Montana Weir	-	-																																																																								
MOB - Montana - Sunshine	80.7	88.5																																																																								
MOB - Sunshine Creek	88.1	-																																																																								
MOB - Rabideux Creek	87.4	-																																																																								
ADFG Sunshine	87.7	-																																																																								
MOB - Birch Creek	93.5	-																																																																								
ADFG Talkeetna	-	-																																																																								
MOB - Talkeetna River	101	-																																																																								
ADFG Chulitna	-	-																																																																								
MOB - Chulitna River	102	-																																																																								
ADFG Chulitna Weir	-	-																																																																								
MOB - Sunshine - Talkeetna	88.5	102																																																																								
Middle River (PRM 102.4)																																																																										
MOB - Talkeetna - Lane	102	117																																																																								
Whiskers	105	-																																																																								
MOB - Whiskers Creek	105	-																																																																								
MOB - Trib off zone 95	111	-																																																																								
Lane Creek	117	-																																																																								
MOB - Lane - Gateway	117	130																																																								1	1	1										
MOB - Lane Creek	117	-																																																																								
MOB - 5th of July Creek	127	-																																																																								
MOB - Slough 8A	129	130																																																																								
Gateway	130	-																																																																								
MOB - Gateway - 4th of July	130	134																																												1	1																										
MOB - Slough 9	131	134																																																																								
MOB - Sherman Creek	134	-																																																																								
Fourth of July	134	-																																																																								
MOB - 4th of July Creek	134	-																																																																								
MOB - 4th of July - Slough 11	134	140																																																																								
MOB - Slough 11	139	-																																																																								
MOB - Gold Creek	140	-																																																																								
MOB - Slough11 - Indian	140	142																																																																								
Indian River	142	-																																											1																												
MOB - Indian trib	142	-																																																																								
MOB - Indian - Slough 21	142	146																																																																								
MOB - Slough 21	145	146																																																																								
Powerline	146	-																																																																								
MOB - above Powerline	146	146																																																																								
MOB - abv Powerline - Portage	146	152																																																																								
MOB - Jack Long Creek	148	-																																																																								
Portage Creek Mouth	152	-																																																																								
MOB - Portage trib	152	-																																																																								
Lower Extent Devils Canyon (PRM 153.9)																																																																										
MOB - Portage - Impediment1	152	155																																																																								
MOB - Impediment1 - Cheechako	155	157																																																																								
MOB - Cheechako Creek	156	-																																																																								
Cheechako Station	157	-																																																																								
MOB - Cheechako - Impediment2	157	160																																																																								
MOB - Impediment2 - Chinook	160	161																																																																								
MOB - Chinook Creek	160	-																																																																								
Chinook Creek Mouth	160	-																																																																								
MOB - Chinook - Impediment3	161	165																																																																								
MOB - Devil Creek	165	-																																																																								
MOB - Impediment3 - Devil Stn	165	167																																																																								
Upper Extent Devils Canyon (PRM 166.1)																																																																										
Devils Island	167	-																																																																								
MOB - Devil Stn - Fog	167	179																	1	1	1	1	1	1	1	1	1	1	1	1																				1	1	1	1	1	1	1	1	1														
MOB - Fog Creek	179	-																1																																																						
MOB - Fog - Dam Site	179	187		1	1	1															1	2	2	2	2	1	1	1							1			1	1	1	1	1	1	1					1																1	1	1	1	1	1	1		
MOB - Tsusena Creek	185	-																																																																								
Watana Dam Site (PRM 187)																																																																										
Total Tags Tracked			1	1	1	1	0	0	0	0	0	0	0	0	0	0	9	5	4	3	4	5	5	5	5	4	4	4	4	4	14	11	10	9	10	9	8	7	7	7	7	7	7	7	6	6	6	5	3	3	3	3	3	4	4	3	3	3	8	2	2	2	1	1	1	1	1	1	1	1	1	1
Mortalities				0	0	0	1	1	1	1	1	1	1	1	1	1		4	4	4	4	4	4	4	4	5	5	5	5	5		2	3	3	4	5	6	7	7	7	7	7	7	7		0	0	0	1	1	1	2	2	2	2	2	3	3		5	6	6	7	7	7	7	7	7	7	7	7	7
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0		0	1	2	1	0	0	0	0	0	0	0	0	0		1	1	2	0	0	0	0	0	0	0	0	0	0		0	0	1	2	2	2	1	1	0	0	1	0	0		1	0	0	0	0	0	0	0	0	0	0	0	0

Table 4.5-8 (continued). Radio-tagged Arctic grayling detected in the Upper River segments during the winter study period (November 2013-April 2014) grouped by release location.

Arctic Grayling	PRM		Released in Jay - Goose area														Released in Goose Creek (UR) area														Released in Oshetna River area														Released in Clearwater Creek area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																																								
ADFG Deshka River	44.6	-																																																								
ADFG Deshka Weir	-	-																																																								
MOB - Deshka River	44.9	-																																																								
MOB - Willow and Little Willow Cr	52.2	55.6																																																								
MOB - Kashwitna River	64.7	-																																																								
MOB - Deshka - Kashwitna	45	64.7																																																								
MOB - Caswell Creek	67.4	-																																																								
MOB - Sheep Creek	70.1	-																																																								
MOB - Goose Creek (LR)	76.9	-																																																								
MOB - Kashwitna - Montana	64.7	80.7																																																								
Montana	-	-																																																								
MOB - Montana Creek	80.9	-																																																								
ADFG Montana Weir	-	-																																																							
MOB - Montana - Sunshine	80.7	88.5																																																								
MOB - Sunshine Creek	88.1	-																																																								
MOB - Rabideux Creek	87.4	-																																																								
ADFG Sunshine	87.7	-																																																								
MOB - Birch Creek	93.5	-																																																								
ADFG Talkeetna	-	-																																																							
MOB - Talkeetna River	101	-																																																								
ADFG Chulitna	-	-																																																								
MOB - Chulitna River	102	-																																																								
ADFG Chulitna Weir	-	-																																																								
MOB - Sunshine - Talkeetna	88.5	102																																																								
Middle River (PRM 102.4)																																																										
MOB - Talkeetna - Lane	102	117																																																								
Whiskers	105	-																																																								
MOB - Whiskers Creek	105	-																																																								
MOB - Trib off zone 95	111	-																																																							
Lane Creek	117	-																																																								
MOB - Lane - Gateway	117	130																																																								
MOB - Lane Creek	117	-																																																								
MOB - 5th of July Creek	127	-																																																								
MOB - Slough 8A	129	130																																																							
Gateway	130	-																																																								
MOB - Gateway - 4th of July	130	134																																																								
MOB - Slough 9	131	134																																																								
MOB - Sherman Creek	134	-																																																								
Fourth of July	134	-																																																								
MOB - 4th of July Creek	134	-																																																								
MOB - 4th of July - Slough 11	134	140																																																								
MOB - Slough 11	139	-																																																								
MOB - Gold Creek	140	-																																																								
MOB - Slough11 - Indian	140	142																																																								
Indian River	142	-																																																								
MOB - Indian trib	142	-																																																								
MOB - Indian - Slough 21	142	146																																																								
MOB - Slough 21	145	146																																																								
Powerline	146	-																																																								
MOB - above Powerline	146	146																																																								
MOB - abv Powerline - Portage	146	152																																																								
MOB - Jack Long Creek	148	-																																																								
Portage Creek Mouth	152	-																																																								
MOB - Portage trib	152	-																																																								
Lower Extent Devils Canyon (PRM 153.9)																																																										
MOB - Portage - Impediment1	152	155																																																								
MOB - Impediment1 - Cheechako	155	157																																																								
MOB - Cheechako Creek	156	-																																																								
Cheechako Station	157	-																																																								
MOB - Cheechako - Impediment2	157	160																																																								
MOB - Impediment2 - Chinook	160	161																																																								
MOB - Chinook Creek	160	-																																																								
Chinook Creek Mouth	160	-																																																								
MOB - Chinook - Impediment3	161	165																																																								
MOB - Devil Creek	165	-																																																								
MOB - Impediment3 - Devil Stn	165	167																																																								
Upper Extent Devils Canyon (PRM 166.1)																																																									
Devils Island	167	-																																																								
MOB - Devil Stn - Fog	167	179																																																								
MOB - Fog Creek	179	-																																																								
MOB - Fog - Dam Site	179	187																																																								
MOB - Tsusena Creek	185	-																																																								
Watana Dam Site (PRM 187)																																																										
Total Tags Tracked			6	5	5	5	2	3	3	3	3	3	3	3	3	3	2	0	0	0	0	0	0	0	0	0	0	0	0	0	8	2	2	2	0	0	0	3	3	3	3	2	2	2	2	0	1	1	0	0	0	0	0	0	0	0	0	0
Mortalities				1	1	1	1	1	1	1	1	2	2	2	2	2		2	2	2	2	2	2	2	2	2	2	2	2	2		1	3	3	3	3	3	3	3	3	3	4	4	4		0	0	0	0	0	0	1	1	1	1	1	1	1
Vanished tags / Dead Batteries				0	0	0	3	2	2	2	2	1	1	1	1	1		0	0	0	0	0	0	0	0	0	0	0	0	0		5	3	3	5	5	5	2	2	2	2	2	2	2		2	1	1	2	2	2	1	1	1	1	1	1	1

Table 4.5-9. Radio-tagged burbot detected in the Upper River segments during the winter study period (November 2013-April 2014) grouped by release location.

Burbot	PRM		Released in Deadman - Watana area														Released in Watana Creek area														Released in Watana - Kosina area														Released in Jay - Goose area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																																							
ADFG Deshka River	44.6	-																																																							
ADFG Deshka Weir	-	-																																																							
MOB - Deshka River	44.9	-																																																							
MOB - Willow and Little Willow Cr	52.2	55.6																																																							
MOB - Kashwitna River	64.7	-																																																							
MOB - Deshka - Kashwitna	45	64.7																																																							
MOB - Caswell Creek	67.4	-																																																							
MOB - Sheep Creek	70.1	-																																																							
MOB - Goose Creek (LR)	76.9	-																																																							
MOB - Kashwitna - Montana	64.7	80.7																																																							
Montana	-	-																																																							
MOB - Montana Creek	80.9	-																																																							
ADFG Montana Weir	-	-																																																							
MOB - Montana - Sunshine	80.7	88.5																																																							
MOB - Sunshine Creek	88.1	-																																																							
MOB - Rabideux Creek	87.4	-																																																							
ADFG Sunshine	87.7	-																																																							
MOB - Birch Creek	93.5	-																																																							
ADFG Talkeetna	-	-																																																							
MOB - Talkeetna River	101	-																																																							
ADFG Chulitna	-	-																																																							
MOB - Chulitna River	102	-																																																							
ADFG Chulitna Weir	-	-																																																							
MOB - Sunshine - Talkeetna	88.5	102																																																							
Middle River (PRM 102.4)																																																								
MOB - Talkeetna - Lane	102	117																																																							
Whiskers	105	-																																																							
MOB - Whiskers Creek	105	-																																																							
MOB - Trib off zone 95	111	-																																																							
Lane Creek	117	-																																																							
MOB - Lane - Gateway	117	130																																																							
MOB - Lane Creek	117	-																																																							
MOB - 5th of July Creek	127	-																																																							
MOB - Slough 8A	129	130																																																							
Gateway	130	-																																																							
MOB - Gateway - 4th of July	130	134																																																							
MOB - Slough 9	131	134																																																							
MOB - Sherman Creek	134	-																																																							
Fourth of July	134	-																																																							
MOB - 4th of July Creek	134	-																																																							
MOB - 4th of July - Slough 11	134	140																																																							
MOB - Slough 11	139	-																																																							
MOB - Gold Creek	140	-																																																							
MOB - Slough11 - Indian	140	142																																																							
Indian River	142	-																																																							
Indian River trib	-	-																																																							
MOB - Indian trib	142	-																																																							
MOB - Indian - Slough 21	142	146																																																							
MOB - Slough 21	145	146																																																							
Powerline	146	-																																																							
MOB - above Powerline	146	146																																																							
MOB - abv Powerline - Portage	146	152																																																							
MOB - Jack Long Creek	148	-																																																							
Portage Creek Mouth	152	-																																																							
MOB - Portage trib	152	-																																																							
Lower Extent Devils Canyon (PRM 153.9)																																																								
MOB - Portage - Impediment1	152	155																																																							
MOB - Impediment1 - Cheechako	155	157																																																							
MOB - Cheechako Creek	156	-																																																							
Cheechako Station	157	-																																																							
MOB - Cheechako - Impediment2	157	160																																																							
MOB - Impediment2 - Chinook	160	161																																																							
MOB - Chinook Creek	160	-																																																							
Chinook Creek Mouth	160	-																																																							
MOB - Chinook - Impediment3	161	165																																																							
MOB - Devil Creek	165	-																																																							
Upper Extent Devils Canyon (PRM 166.1)																																																								
MOB - Impediment3 - Devil Stn	165	167																																																							
Devils Island	167	-																																																							
MOB - Devil Stn - Fog	167	179																																																							
MOB - Fog Creek	179	-																																																							
MOB - Fog - Dam Site	179	187																																																							
MOB - Tsusena Creek	185	-																																																							
Watana Dam Site (PRM 187)																																																								
Total Tags Tracked			1	0	0	0	0	0	0	0	0	0	0	0	0	0	3	3	2	1	1	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	0	1	0	1	1	1	1	0	1	1	1	1	1	1	1	1	1
Mortalities				1	1	1	1	1	1	1	1	1	1	1	1	1		0	0	0	0	1	2	2	2	2	2	2	2	2		1	1	1	1	1	1	1	1	1	1	1	1	2		0	0	0	0	0	0	0	0	0	0	0	0	0
Vanished tags / Dead Batteries				0	0	0	0	0	0	0	0	0	0	0	0	0		0	1	2	2	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	0	0	0	0	1	0	0		0	0	0	1	0	0	0	0	0	0	0	0	0

Table 4.5-10. Radio-tagged longnose sucker detected in the Upper River segments during the winter study period (November 2013-April 2014) grouped by release location.

Longnose Sucker	PRM		Released in Watana - Kosina area														Released in Tyone River area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																												
ADFG Deshka River	44.6	-																												
ADFG Deshka Weir	-	-																												
MOB - Deshka River	44.9	-																												
MOB - Willow and Little Willow Cr	52.2	55.6																												
MOB - Kashwitna River	64.7	-																												
MOB - Deshka - Kashwitna	45	64.7																												
MOB - Caswell Creek	67.4	-																												
MOB - Sheep Creek	70.1	-																												
MOB - Goose Creek (LR)	76.9	-																												
MOB - Kashwitna - Montana	64.7	80.7																												
Montana	-	-																												
MOB - Montana Creek	80.9	-																												
ADFG Montana Weir	-	-																												
MOB - Montana - Sunshine	80.7	88.5																												
MOB - Sunshine Creek	88.1	-																												
MOB - Rabideux Creek	87.4	-																												
ADFG Sunshine	87.7	-																												
MOB - Birch Creek	93.5	-																												
ADFG Talkeetna	-	-																												
MOB - Talkeetna River	101	-																												
ADFG Chulitna	-	-																												
MOB - Chulitna River	102	-																												
ADFG Chulitna Weir	-	-																												
MOB - Sunshine - Talkeetna	88.5	102																												
Middle River (PRM 102.4)																														
MOB - Talkeetna - Lane	102	117																												
Whiskers	105	-																												
MOB - Whiskers Creek	105	-																												
MOB - Trib off zone 95	111	-																												
Lane Creek	117	-																												
MOB - Lane - Gateway	117	130																												
MOB - Lane Creek	117	-																												
MOB - 5th of July Creek	127	-																												
MOB - Slough 8A	129	130																												
Gateway	130	-																												
MOB - Gateway - 4th of July	130	134																												
MOB - Slough 9	131	134																												
MOB - Sherman Creek	134	-																												
Fourth of July	134	-																												
MOB - 4th of July Creek	134	-																												
MOB - 4th of July - Slough 11	134	140																												
MOB - Slough 11	139	-																												
MOB - Gold Creek	140	-																												
MOB - Slough11 - Indian	140	142																												
Indian River	142	-																												
Indian River trib	-	-																												
MOB - Indian trib	142	-																												
MOB - Indian - Slough 21	142	146																												
MOB - Slough 21	145	146																												
Powerline	146	-																												
MOB - above Powerline	146	146																												
MOB - abv Powerline - Portage	146	152																												
MOB - Jack Long Creek	148	-																												
Portage Creek Mouth	152	-																												
MOB - Portage trib	152	-																												
Lower Extent Devils Canyon (PRM 153.9)																														
MOB - Portage - Impediment1	152	155																												
MOB - Impediment1 - Cheechako	155	157																												
MOB - Cheechako Creek	156	-																												
Cheechako Station	157	-																												
MOB - Cheechako - Impediment2	157	160																												
MOB - Impediment2 - Chinook	160	161																												
MOB - Chinook Creek	160	-																												
Chinook Creek Mouth	160	-																												
MOB - Chinook - Impediment3	161	165																												
MOB - Devil Creek	165	-																												
MOB - Impediment3 - Devil Stn	165	167																												
Upper Extent Devils Canyon (PRM 166.1)																														
Devils Island	167	-																												
MOB - Devil Stn - Fog	167	179																												
MOB - Fog Creek	179	-																												
MOB - Fog - Dam Site	179	187																												
MOB - Tsusena Creek	185	-																												
Watana Dam Site (PRM 187)																														
Total Tags Tracked			5	4	4	4	1	1	1	1	1	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0
Mortalities				1	1	1	2	4	4	4	4	5	5	5	5	5		3	4	4	4	4	4	4	4	4	4	4	4	4
Vanished tags / Dead Batteries				0	0	0	2	0	0	0	0	0	0	0	0	0		2	1	1	1	1	1	1	1	1	1	1	1	1

Table 4.5-11. Radio-tagged round whitefish detected in the Upper River segments during the winter study period (November 2013-April 2014) grouped by release location..

Round Whitefish	PRM		Released in Deadman - Watana area														Released in Watana Creek area														Released in Watana - Kosina area														Released in Jay - Goose area													
Zone Name	From	To	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr	Rls	1 Nov	15 Nov	1 Dec	15 Dec	1 Jan	15 Jan	1 Feb	15 Feb	1 Mar	15 Mar	1 Apr	15 Apr	30 Apr
MOB - Yentna - Deshka	32.4	45																																																								
ADFG Deshka River	44.6	-																																																								
ADFG Deshka Weir	-	-																																																								
MOB - Deshka River	44.9	-																																																								
MOB - Willow and Little Willow Cr	52.2	55.6																																																								
MOB - Kashwitna River	64.7	-																																																								
MOB - Deshka - Kashwitna	45	64.7																																																								
MOB - Caswell Creek	67.4	-																																																								
MOB - Sheep Creek	70.1	-																																																								
MOB - Goose Creek (LR)	76.9	-																																																								
MOB - Kashwitna - Montana	64.7	80.7																																																								
Montana	-	-																																																								
MOB - Montana Creek	80.9	-																																																								
ADFG Montana Weir	-	-																																																								
MOB - Montana - Sunshine	80.7	88.5																																																								
MOB - Sunshine Creek	88.1	-																																																								
MOB - Rabideux Creek	87.4	-																																																								
ADFG Sunshine	87.7	-																																																								
MOB - Birch Creek	93.5	-																																																								
ADFG Talkeetna	-	-																																																								
MOB - Talkeetna River	101	-																																																								
ADFG Chulitna	-	-																																																								
MOB - Chulitna River	102	-																																																								
ADFG Chulitna Weir	-	-																																																								
MOB - Sunshine - Talkeetna	88.5	102																																																								
Middle River (PRM 102.4)																																																										
MOB - Talkeetna - Lane	102	117																																																								
Whiskers	105	-																																																								
MOB - Whiskers Creek	105	-																																																								
MOB - Trib off zone 95	111	-																																																								
Lane Creek	117	-																																																								
MOB - Lane - Gateway	117	130																																																								
MOB - Lane Creek	117	-																																																								
MOB - 5th of July Creek	127	-																																																								
MOB - Slough 8A	129	130																																																								
Gateway	130	-																																																								
MOB - Gateway - 4th of July	130	134																																																								
MOB - Slough 9	131	134																																																								
MOB - Sherman Creek	134	-																																																								
Fourth of July	134	-																																																								
MOB - 4th of July Creek	134	-																																																								
MOB - 4th of July - Slough 11	134	140																																																								
MOB - Slough 11	139	-																																																								
MOB - Gold Creek	140	-																																																								
MOB - Slough11 - Indian	140	142																																																								
Indian River	142	-																																																								
Indian River trib	-	-																																																								
MOB - Indian trib	142	-																																																								
MOB - Indian - Slough 21	142	146																																																								
MOB - Slough 21	145	146																																																								
Powerline	146	-																																																								
MOB - above Powerline	146	146																																																								
MOB - abv Powerline - Portage	146	152																																																								
MOB - Jack Long Creek	148	-																																																								
Portage Creek Mouth	152	-																																																								
MOB - Portage trib	152	-																																																								
Lower Extent Devils Canyon (PRM 153.9)																																																										
MOB - Portage - Impediment1	152	155																																																								
MOB - Impediment1 - Cheechako	155	157																																																								
MOB - Cheechako Creek	156	-																																																								
Cheechako Station	157	-																																																								
MOB - Cheechako - Impediment2	157	160																																																								
MOB - Impediment2 - Chinook	160	161																																																								
MOB - Chinook Creek	160	-																																																								
Chinook Creek Mouth	160	-																																																								
MOB - Chinook - Impediment3	161	165																																																								
MOB - Devil Creek	165	-																																																								
MOB - Impediment3 - Devil Stn	165	167																																																								
Upper Extent Devils Canyon (PRM 166.1)																																																										
Devils Island	167	-																																																								
MOB - Devil Stn - Fog	167	179																																							1																
MOB - Fog Creek	179	-																																																								
MOB - Fog - Dam Site	179	187																																	3	3	3	3	3	2	2	1	2	2														
MOB - Tsusena Creek	185	-																																																								
Watana Dam Site (PRM 187)																																																										
Total Tags Tracked			1	1	1	1	0	0	0	0	0	0	0	0	0	0	3	3	2	1	2	1	0	0	0	0	0	0	0	0	13	13	12	10	8	10	9	7	7	5	5	5	5	5	1	1	1	0	0	0	0	0	0	0	0	0	0	0
Mortalities				0	0	0	0	1	1	1	1	1	1	1	1	1		0	0	0	0	1	2	2	2	2	2	2	2	2		0	1	1	2	2	3	5	5	6	6	7	7	7		0	0	0	1	1	1	1	1	1	1	1	1	1
Vanished tags / Dead Batteries				0	0	0	1	0	0	0	0	0	0	0	0	0		0	1	2	1	1	1	1	1	1	1	1	1	1		0	0	2	3	1	1	1	1	2	2	1	1	1		0	0	1	0	0	0	0	0	0	0	0	0	0

Table 4.5-12. Monitoring efficiency (percent operational) of fixed-station receivers, by week. Percentages were calculated as the number of hours of recorded receiver activity divided by the number of hours for which it was deployed, summed by week; "nd" = 'not deployed'.

Week	Whiskers (PRM 105)	Indian River (PRM 142)	Devils Station (PRM 167)
10/28 - 11/3	100	100	100
11/4 - 11/10	100	100	100
11/11 - 11/17	100	100	100
11/18 - 11/24	100	100	nd
11/25 - 12/1	100	100	nd
12/2 - 12/8	100	100	nd
12/9 - 12/15	nd	nd	nd
12/16 - 12/22	nd	nd	nd
12/23 - 12/29	nd	nd	nd
12/30 - 1/5	nd	nd	nd
1/6 - 1/12	nd	nd	nd
1/13 - 1/19	nd	nd	nd
1/20 - 1/26	nd	nd	nd
1/27 - 2/2	nd	nd	nd
2/3 - 2/9	nd	nd	nd
2/10 - 2/16	nd	nd	nd
2/17 - 2/23	nd	nd	nd
2/24 - 3/2	nd	nd	nd
3/3 - 3/9	nd	nd	nd
3/10 - 3/16	nd	nd	nd
3/17 - 3/23	nd	nd	nd
3/24 - 3/30	nd	nd	nd
3/31 - 4/6	nd	nd	nd

Table 4.5-13. Aerial survey schedule in the Mainstem Susitna River during the winter study period (2013-2014). (co

Zone Name	From (PRM)	To (PRM)	Zone Number	11-11	11-12	11-13	11-15	11-16	12-02	12-03	12-04	12-09	12-16	12-18	12-19	12-21	1-06	1-07	1-28	1-29	1-30	2-17	2-18	2-19	3-18	3-19	3-20	4-8	4-9	4-30
MOB - Little Susitna River	-	-	3																											
MOB - Beyond Confluence	-	-	4												H															
MOB - Confluence - Yentna	3.5	32.4	5					H				H			H						H							H		
MOB - Yentna River	32.4	-	22					H				H			H			H			H			H			H	H		
MOB - Yentna - Deshka	32.4	45	35					H				H			H			H			H			H			H	H		
MOB - Deshka River	44.9	-	42					H				H			H						H						H	H		
MOB - Willow and Little Willow Cr	52.2	55.6	53					H				H															H			
MOB - Kashwitna River	64.7	-	54								H															H				
MOB - Deshka - Kashwitna	45	64.7	55					H			H				H			H			H			H		H	H	H		
MOB - Caswell Creek	67.4	-	62																											
MOB - Sheep Creek	70.1	-	63																											
MOB - Goose Creek	76.9	-	64																											
MOB - Kashwitna - Montana	64.7	80.7	65					H			H				H	H		H		H	H			H		H		H		
MOB - Montana Creek	80.9	-	71					H			H									H			H			H				
MOB - Montana - Sunshine	80.7	88.5	75					H			H					H		H		H			H	H		H		H		
MOB - Sunshine Creek	88.1	-	76				H				H									H										
MOB - Rabideux Creek	87.4	-	77								H									H										
MOB - Birch Creek	93.5	-	79																											
MOB - Talkeetna River	101	-	81				H				H			H						H	H					H		H	H	
MOB - Chulitna River	101.7	-	83				H				H			H				H		H	H		H			H		H		
MOB - Sunshine - Talkeetna	88.5	102.3	85				H				H		H	H		H		H		H			H			H		H		
Middle River (PRM 102.4)																														
MOB - Talkeetna - Lane	102.3	116.8	95				H				H		H	H				H	H				H			H		H		H
MOB - Whiskers Creek	104.8	-	97				H			H									H				H			H		H		H
MOB - Trib off zone 95	110.5	-	98							H			H																	
MOB - Lane - Gateway	116.8	130.1	105				H			H			H					H	H				H			H		H		H
MOB - Lane Creek	117.1	-	106				H			H													H			H		H		H
MOB - 5th of July Creek	127.3	-	108							H																				
MOB - Slough 8A	129.2	129.8	109				H			H			H					H	H				H			H			H	H
MOB - Gateway - 4th of July	130.1	134.3	111				H			H			H					H	H				H			H			H	H
MOB - Slough 9	131.4	133.5	112				H			H			H						H										H	H
MOB - Sherman Creek	134.1	-	114																											
MOB - 4th of July Creek	134.3	-	116				H			H													H			H			H	H
MOB - 4th of July - Slough 11	134.3	140.2	117				H			H			H					H	H				H			H			H	H
MOB - Slough 11	138.6	-	118				H			H			H						H				H			H			H	H
MOB - Gold Creek	140.1	-	119				H			H															H					
MOB - Slough11 - Indian	140.1	142.1	125				H			H			H	H			H	H	H				H		H				H	H

Table 4.5-13. Aerial survey schedule in the Mainstem Susitna River during the winter study period (2013-2014). (continued)

Zone Name	From (PRM)	To (PRM)	Zone Number	11-11	11-12	11-13	11-15	11-16	12-02	12-03	12-04	12-09	12-16	12-18	12-19	12-21	1-06	1-07	1-28	1-29	1-30	2-17	2-18	2-19	3-18	3-19	3-20	4-8	4-9	4-30
MOB - Indian trib	141.8	-	132				H			H									H				H		H				H	H
MOB - Indian - Slough 21	142.1	145.7	135				H			H				H			H		H			H			H				H	H
MOB - Slough 21	145.1	145.6	136				H			H				H								H								
MOB - above Powerline	145.7	146	138				H			H				H								H			H				H	H
MOB - abv Powerline - Portage	146	152.3	145				H			H				H			H		H			H			H				H	H
MOB - Jack Long Creek	148.2	-	146							H																				
MOB - Portage trib	152.3	-	152				H			H									H			H			H				H	H
Lower Extent Devils Canyon (PRM 153.9)																														
MOB - Portage – Impediment 1	152.3	155.2	153			H				H				H			H		H			H			H				H	H
MOB - Impediment1 - Cheechako	155.2	157.4	157			H				H				H			H		H			H			H				H	H
MOB - Cheechako Creek	155.9	-	158							H															H					
MOB - Cheechako - Impediment2	157.4	160.2	163			H				H				H			H		H			H			H				H	H
MOB - Impediment2 - Chinook	160.2	160.5	167							H				H			H		H			H			H				H	H
MOB - Chinook Creek	160.4	-	168			H				H																				
MOB - Chinook – Impediment 3	160.5	164.8	173							H				H			H		H			H			H				H	H
MOB - Devil Creek	164.8	-	176			H				H												H			H					
MOB – Impediment 3 - Devil Stn	164.8	166.9	177			H			H					H			H		H			H			H				H	H
Upper Extent Devils Canyon (PRM 166.1)																														
MOB - Devil Stn - Fog	166.9	179.4	185			H			H					H			H		H			H			H				H	H
MOB - Fog Creek	179.3	-	192			H			H								H					H			H				H	H
MOB - Fog - Dam Site	179.4	186.8	195			H			H					H			H		H			H			H				H	H
MOB - Tsusena Creek	184.5	-	197			H			H										H			H			H				H	H
Watana Dam Site (PRM 187)																														
MOB - Dam Site - Deadman	187.1	189.4	201						H					H			H		H			H			H				H	H
MOB - Deadman Creek	189.4	-	203			H			H										H						H					
MOB - Deadman - Watana	189.4	196.9	205		H				H					H			H		H			H			H				H	H
MOB - 'Creek 192'	194.8	-	207		H				H																					
MOB - Watana Creek	196.9	-	212		H				H								H		H			H			H				H	H
MOB - Wantana - Kosina	196.9	209.1	215		H				H					H			H		H			H			H				H	H
MOB - Kosina Creek	209.1	-	222	H					H								H		H			H			H				H	H
MOB - Kosina - Jay Creek	209.1	211	223						H					H			H		H			H			H				H	H
MOB - Jay Creek	211	-	224						H					H								H			H				H	
MOB - Jay - Goose	211	232.9	225	H													H		H	H		H			H				H	H
MOB - Goose Creek (Upper River)	232.9	-	228	H																		H			H				H	H
MOB - Goose - Oshetna	232.9	235.1	229	H																H		H			H				H	H
MOB - Oshetna River	235.1	-	232	H																		H			H				H	H
MOB - Oshetna - Tyone	235.1	247.3	233	H																H		H			H				H	H
MOB - Tyone River	247.3	-	236	H																H		H			H				H	H

Table 4.6-1. Fish species PIT tagged, the range in length, and the number of recaptures during Winter Fish Studies, 2014.

Species	# Fish PIT tagged	Length range (mm)	# Tags Detected at Arrays	# Recaptured tags	# Recapture Events	# Recapture Events >7 days apart
Salmon, Chinook	98	57-129	12	10	11	10
Salmon, coho	676	60-154	16	61	65	55
Salmon, sockeye	36	60-96	0	3	3	3
Salmon, undifferentiated	5	71-122	0	0	0	0
Arctic grayling	1	68	0	0	0	
Burbot	15	103-520	9	0	0	
Dolly Varden	1	114	0	0	0	
Trout, rainbow	2	136-245	12	0	0	
Whitefish, round	2	81-130	1	0	0	
TOTAL	**836**	**60-520**	**50**	**74**	**79**	**68**

Table 4.7-1. A summary of fish length-at-maturation (mm) for the region used as a basis for assigning life stages.

Species	Life stage by Length (mm)			Source
	Juvenile	Juvenile-or-adult	Adult	
Alaska blackfish	<42	42–113	>113	Buckwalter et al. (2012)
Arctic grayling	<190	190–328	>328	Buckwalter et al. (2012)
Arctic lamprey	<125	125-219	>219	Heard 1966; Docker 2009; Vladykov and Kott 1978
Bering cisco	<220		≥220	Delaney et al. (1981)
burbot	<280	280–498	>498	Buckwalter et al. (2012)
Dolly Varden	<83	≥83	-	Buckwalter et al. (2012)
eulachon	<165		≥165	HDR and LGL (2014)
humpback whitefish	<280	280–363	>363	Buckwalter et al. (2012)
lake trout	<300	300-430	430	Burr 1993
longnose sucker	<188	188–348	>348	Buckwalter et al. (2012)
northern pike	<330	330–448	>448	Buckwalter et al. (2012)
rainbow trout	<200	200-325	>325	Russell 1977, Adams 1999
round whitefish	<199	199–318	>318	Buckwalter et al. (2012)
sculpin (slimy)	<51	51–68	>68	Buckwalter et al. (2012)
threespine stickleback	<40	40-70	>70	ADFG 1981
Whitefish, undifferentiated	<199	199-363	>363	
Chinook salmon	alevin, fry, parr, smolt index		>350	
chum salmon	alevin, fry, parr, smolt index		>350	
coho salmon	alevin, fry, parr, smolt index		>350	
pink salmon	alevin, fry, parr, smolt index		>350	
sockeye salmon	alevin, fry, parr, smolt index		>350	

Table 4.7-2. Summary of fish numbers with length and weight measurements collected during winter sampling 2013-2014.

Species	November	February	March	April	Total
Chinook salmon	28	46	27	72	173
Chum salmon	0	0	20	126	146
Coho salmon	245	126	272	388	1,031
Sockeye salmon	2	10	35	134	181
Pacific salmon, undifferentiated	4	0	2	13	19
Arctic grayling	0	0	1	0	1
Burbot		4	5	6	15
Dolly Varden	0	0	1	0	1
Lamprey, Arctic	0	0	2	0	2
Lamprey, undifferentiated	2	10	37	8	57
Longnose sucker	1	6	1	1	9
Salmonid, undifferentiated	0	0	0	2	2
Sculpin	72	173	242	245	732
Stickleback, threespine	3	1	3	12	19
Rainbow trout	0	1	5	2	8
Whitefish, Round	0	0	4	0	4

Table 4.8-1. Genetics samples collected during 2013-2014 winter fish studies.

Focus Area	MacroHabitat	Species	Fork Length (mm)	Genetics Sample Type
FA-104 (Whiskers Slough)	Side Channel	Salmon, Chinook	79	Swab
FA-104 (Whiskers Slough)	Side Slough	Salmon, Chinook	96	Swab
FA-104 (Whiskers Slough)	Side Slough	Salmon, Chinook	100	Swab
FA-104 (Whiskers Slough)	Side Slough	Salmon, coho	105	Swab
FA-104 (Whiskers Slough)	Side Slough	Salmon, Chinook	103	Swab
FA-104 (Whiskers Slough)	Side Slough	Salmon, Chinook	115	Swab
FA-104 (Whiskers Slough)	Side Slough	Salmon, Chinook	90	Swab
FA-104 (Whiskers Slough)	Tributary	Salmon, Chinook	78	Swab
FA-104 (Whiskers Slough)	Tributary	Salmon, Chinook	75	Swab
FA-104 (Whiskers Slough)	Tributary	Salmon, Chinook	64	Swab
FA-104 (Whiskers Slough)	Tributary	Salmon, Chinook	68	Swab
FA-104 (Whiskers Slough)	Upland Slough	Salmon, Chinook	74	Swab
FA-104 (Whiskers Slough)	Upland Slough	Salmon, Chinook	70	Swab
FA-128 (Slough 8A)	Side Slough	Salmon, Chinook	84	Swab
FA-128 (Slough 8A)	Side Slough	Salmon, Chinook	86	Swab
FA-128 (Slough 8A)	Side Slough	Salmon, Chinook	94	Swab
FA-128 (Slough 8A)	Side Slough	Salmon, Chinook	81	Swab
FA-128 (Slough 8A)	Side Slough	Salmon, Chinook	97	Swab
FA-138 (Gold Creek)	Side Slough	Salmon, Chinook	67	Swab
FA-138 (Gold Creek)	Side Slough	Salmon, Chinook	68	Swab
FA-138 (Gold Creek)	Side Slough	Salmon, Chinook	75	Swab
FA-138 (Gold Creek)	Side Slough	Salmon, Chinook	94	Swab

Table 5-1. Winter fish collection by species and gear type, 2013-2014.

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
Electrofisher	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**

[1]video observation counts may include repeat observations of individual(s) during a video recording event when the same fish entered the field of view on multiple occasions.

[2]fish collection counts may include multuple counts of individuls by various gear types within an event and recaptures across events.

Table 5-2. Winter fish catch by location (Focus Area) and month 2013-2014.

Focus Area	Month	Salmon, Chinook	Salmon, chum	Salmon, coho	Salmon, sockeye	Salmon, undifferentiated	Arctic Grayling	Burbot	Dolly Varden	Lamprey, Arctic	Lamprey, undifferentiated	Longnose sucker	Salmonid, undifferentiated	Sculpin	Stickleback, threespine	Trout, rainbow	Whitefish, Round	Grand Total
FA-104	Nov	19		174		5					2	1		28	3			232
	Feb	21		72				2			10	5		38		1		149
	Mar	21		141			1	2		2	37	1	1	145	1	1		353
	Apr	64		208	1	9		3			8	1	1	91	6	2		394
FA-104 Total		**125**		**595**	**1**	**14**	**1**	**7**		**2**	**57**	**8**	**2**	**302**	**10**	**4**		**1128**
FA-128	Nov	1		35										10				46
	Feb	6		6	1			2				1		38				54
	Mar	2	20	7	7	2			1					73		2	4	118
	Apr	7	69	103	250	4		2					1	86				522
FA-128 Total		**16**	**89**	**151**	**258**	**6**		**4**	**1**			**1**	**1**	**207**		**2**	**4**	**740**
FA-138	Nov	6		148	2									64				220
	Feb	6		35	9									101				151
	Mar	1		43	34			2						91		2		173
	Apr	4	56	59	73									100				292
FA-138 Total		**17**	**56**	**285**	**118**			**2**						**356**		**2**		**836**
FA-141	Feb																	0
	Mar	2		15				1						1				19
	Apr	1	1	38				1						10				51
FA-141 Total		**3**	**1**	**53**				**2**						**11**				**70**
Non Focus Area	Feb	14		13										1	1			29
	Mar	1		70											2			73
	Apr			94											6			100
Non Focus Area Total		**15**		**177**										**1**	**9**			**202**
Grand Total		**176**	**146**	**1261**	**377**	**20**	**1**	**15**	**1**	**2**	**57**	**9**	**3**	**877**	**19**	**8**	**4**	**2,976**

Table 5.1-1. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for Chinook salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-104 (Whiskers Slough).

Salmon, Chinook FA-104		November			February			March			April		
Macrohabitat	Site ID	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	154		0.60	0.00		0.00	0.00		0.13	0.00			0.00
Side Channel Average CPUE			0.60	0.00		0.00	0.00		0.13	0.00			0.00
Side Slough	156		0.00			0.00		0.00	0.00		0.00	0.00	
Side Slough	157		0.44			0.17			0.00			0.00	
Side Slough Average CPUE			0.22			0.08		0.00	0.00		0.00	0.00	
Tributary	159	1.00	0.22		1.00	0.00		2.00	0.13		31.00	0.00	
Tributary	159T2				0.67	0.43		3.00		4.76	9.00	0.00	
Tributary	159T3					0.00							
Tributary	159T4									6.00			22.45
Tributary Average CPUE		1.00	0.22		0.83	0.14		2.50	0.13	5.38	20.00	0.00	22.45
Upland Slough	160		0.11			0.00			0.13			0.00	
Upland Slough	161		0.56						0.00			0.00	
Upland Slough	162		0.00			0.75			0.13			0.00	
Upland Slough Average CPUE			0.22			0.38			0.08			0.00	

Table 5.1-2. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for Chinook salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-128 (Slough 8A).

Salmon, Chinook FA-128		November	February		March			April		
Macrohabitat	Site ID	Minnow trap	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	115	0.10								
Side Channel	63	0.00								
Side Channel	64		0.00		0.00	0.00			0.00	0.00
Side Channel	WO119			0.00						
Side Channel	WO120							0.00		0.00
Side Channel	WO121	0.00								
Side Channel Average CPUE		0.03	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Side Slough	69		0.38			0.00	0.00		0.00	0.00
Side Slough	71	0.00	0.00	1.79	0.00	0.00		0.00	0.00	
Side Slough	O70	0.00	0.00	0.00		0.00	0.00			
Side Slough	WO109			0.00			0.00			
Side Slough	WO150	0.00						0.00	0.00	
Side Slough Average CPUE		0.00	0.13	0.60	0.00	0.00	0.00	0.00	0.00	0.00
Upland Slough	156		0.00			0.00			0.00	
Upland Slough	157		0.00	3.03		0.00	0.00		0.00	0.00
Upland Slough	158		0.00			0.00			0.00	
Upland Slough Average CPUE			0.00	3.03		0.00	0.00		0.00	0.00

Table 5.1-3. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for Chinook salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-138 (Gold Creek).

Salmon, Chinook FA-138		November		February		March		April		
Macrohabitat	Site ID	Minnow trap	Electrofish	Minnow trap	Electrofish	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	102			0.00		0.00			0.00	
Side Channel	108	0.00	0.00	0.00	0.00	0.00			0.00	
Side Channel	11				0.00					
Side Channel	65	0.00				0.00			0.00	
Side Channel	WO127					0.00	0.00	0.00	0.00	
Side Channel Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Side Slough	134	0.00	0.00	0.20	0.00	0.00		3.00	0.00	
Side Slough	134UP				0.00		0.00			0.00
Side Slough	66	0.67		0.67		0.00			0.20	
Side Slough	67	0.00		0.00		0.00			0.00	
Side Slough Average CPUE		0.22		0.29	0.00	0.00	0.00	3.00	0.07	0.00
Upland Slough	161			0.00		0.00			0.00	
Upland Slough	76			0.00		0.00			0.00	
Upland Slough	O77	0.00								
Upland Slough Average CPUE		0.00		0.00		0.00			0.00	

Table 5.1-4. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for chum salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-104 (Whiskers Slough).

Salmon, chum FA-104		November			February			March			April		
Macrohabitat	Site ID	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	154		0.00	0.00		0.00	0.00		0.00	0.00			0.00
Side Channel Average CPUE			0.00	0.00		0.00	0.00		0.00	0.00			0.00
Side Slough	156		0.00			0.00		0.00	0.00		0.00	0.00	
Side Slough	157		0.00			0.00			0.00			0.00	
Side Slough Average CPUE			0.00			0.00		0.00	0.00		0.00	0.00	
Tributary	159	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Tributary	159T2				0.00	0.00		0.00		0.00	0.00	0.00	
Tributary	159T3					0.00							
Tributary	159T4									0.00			0.00
Tributary Average CPUE		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Upland Slough	160		0.00			0.00			0.00			0.00	
Upland Slough	161		0.00						0.00			0.00	
Upland Slough	162		0.00			0.00			0.00			0.00	
Upland Slough Average CPUE			0.00			0.00			0.00			0.00	

Table 5.1-5. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for chum salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-128 (Slough 8A).

Salmon, chum FA-128		November	February		March			April		
Macrohabitat	Site ID	Minnow trap	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	115	0.00								
Side Channel	63	0.00								
Side Channel	64		0.00		0.00	0.00			0.00	0.00
Side Channel	WO119			0.00						
Side Channel	WO120							7.00		0.00
Side Channel	WO121	0.00								
Side Channel Average CPUE		0.00	0.00	0.00	0.00	0.00		7.00	0.00	0.00
Side Slough	69		0.00			0.00	0.00		0.00	0.00
Side Slough	71	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Side Slough	O70	0.00	0.00	0.00		0.00	0.00			
Side Slough	WO109			0.00			0.00			
Side Slough	WO150	0.00						6.00	0.00	
Side Slough Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	3.00	0.00	0.00
Upland Slough	156		0.00			0.00			0.00	
Upland Slough	157		0.00	0.00		0.00	0.00		0.00	0.00
Upland Slough	158		0.00			0.00			0.00	
Upland Slough Average CPUE			0.00	0.00	0.00	0.00	0.00		0.00	0.00

Table 5.1-6. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for chum salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-138 (Gold Creek).

Salmon, chum FA-138		November		February		March		April		
Macrohabitat	Site ID	Minnow trap	Electrofish	Minnow trap	Electrofish	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	102			0.00		0.00			0.00	
Side Channel	108	0.00	0.00	0.00	0.00	0.00			0.00	
Side Channel	11				0.00					
Side Channel	65	0.00				0.00			0.00	
Side Channel	WO127					0.00	0.00	10.00	0.00	
Side Channel Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	10.00	0.00	
Side Slough	134	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Side Slough	134UP				0.00		0.00			0.00
Side Slough	66	0.00		0.00		0.00			0.00	
Side Slough	67	0.00		0.00		0.00			0.00	
Side Slough Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upland Slough	161			0.00		0.00			0.00	
Upland Slough	76			0.00		0.00			0.00	
Upland Slough	O77	0.00								
Upland Slough Average CPUE		0.00		0.00		0.00			0.00	

Table 5.1-7. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for coho salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-104 (Whiskers Slough).

Salmon, coho FA-104		November			February			March			April		
Macrohabitat	Site ID	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	154		8.30	0.00		2.00	3.23		0.00	1.17			3.33
Side Channel Average CPUE			8.30	0.00		2.00	3.23		0.00	1.17			3.33
Side Slough	156		0.40			0.00		0.00	0.00		0.00	0.00	
Side Slough	157		0.44			0.00			0.00			0.00	
Side Slough Average CPUE			0.42			0.00		0.00	0.00		0.00	0.00	
Tributary	159	11.00	1.11		2.00	0.25		8.00	0.00		38.00	0.00	
Tributary	159T2				0.33	1.57		1.50		0.00	47.00	0.00	
Tributary	159T3					0.17							
Tributary	159T4									3.60			22.45
Tributary Average CPUE		11.00	1.11		1.17	0.66		4.75	0.00	1.80	42.50	0.00	22.45
Upland Slough	160		4.56			2.38			3.38			0.13	
Upland Slough	161		2.22						0.13			0.50	
Upland Slough	162		0.30			1.25			1.75			2.25	
Upland Slough Average CPUE			2.36			3.63			1.75			0.96	

Table 5.1-8. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for coho salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-128 (Slough 8A).

Salmon, coho FA-128		November	February		March			April		
Macrohabitat	Site ID	Minnow trap	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	115	0.10								
Side Channel	63	0.00								
Side Channel	64		0.00		0.00	0.00			0.00	0.00
Side Channel	WO119			0.00						
Side Channel	WO120							0.00		0.00
Side Channel	WO121	0.11								
Side Channel Average CPUE		0.07	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Side Slough	69		0.13			0.00	0.00		0.13	0.00
Side Slough	71	1.80	0.13	0.00	0.00	0.00		0.00	0.00	
Side Slough	O70	1.10	0.13	0.00		0.25	0.00			
Side Slough	WO109			0.00			0.00			
Side Slough	WO150	0.40						36.00	0.00	
Side Slough Average CPUE		1.10	0.13	0.00	0.00	0.08	0.00	18.00	0.04	0.00
Upland Slough	156		0.00			0.00			0.00	
Upland Slough	157		0.17	3.03		0.00	0.00		0.00	0.00
Upland Slough	158		0.00			0.00			0.00	
Upland Slough Average CPUE			0.06	3.03		0.00	0.00		0.00	0.00

Table 5.1-9. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for coho salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-138 (Gold Creek).

Salmon, coho FA-138		November		February		March		April		
Macrohabitat	Site ID	Minnow trap	Electrofish	Minnow trap	Electrofish	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	102			0.13		0.75			0.00	
Side Channel	108	8.30	0.00	0.50	0.00	0.50			0.00	
Side Channel	11				0.00					
Side Channel	65	0.00				0.00			0.00	
Side Channel	WO127					0.38	1.67	1.00	0.00	
Side Channel Average CPUE		4.15	0.00	0.31	0.00	0.41	1.67	1.00	0.00	
Side Slough	134	4.80	0.00	2.00	0.00	0.50		9.00	0.25	
Side Slough	134UP				0.00		0.00			0.86
Side Slough	66	0.00		0.00		0.25			0.00	
Side Slough	67	1.70		0.88		1.00			1.00	
Side Slough Average CPUE		2.17	0.00	0.96	0.00	0.58	0.00	9.00	0.42	0.86
Upland Slough	161			0.13		0.25			0.20	
Upland Slough	76			0.50		0.00			0.00	
Upland Slough	O77	0.00								
Upland Slough Average CPUE		0.00		0.31		0.13			0.10	

Table 5.1-10. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for sockeye salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-104 (Whiskers Slough).

Salmon, sockeye FA-104		November			February			March			April		
Macrohabitat	Site ID	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	154		0.00	0.00		0.00	0.00		0.00	0.00			0.00
Side Channel Average CPUE			0.00	0.00		0.00	0.00		0.00	0.00			0.00
Side Slough	156		0.00			0.00		0.00	0.00		0.00	0.00	
Side Slough	157		0.00			0.00			0.00			0.00	
Side Slough Average CPUE			0.00			0.00		0.00	0.00		0.00	0.00	
Tributary	159	0.00	0.00		0.00	0.00		0.00	0.00		0.00	0.00	
Tributary	159T2				0.00	0.00		0.00		0.00	0.00	0.00	
Tributary	159T3					0.00							
Tributary	159T4									0.00			0.00
Tributary Average CPUE		0.00	0.00		0.00	0.00		0.00	0.00	0.00	0.00	0.00	0.00
Upland Slough	160		0.00			0.00			0.00			0.13	
Upland Slough	161		0.00						0.00			0.00	
Upland Slough	162		0.00			0.00			0.00			0.00	
Upland Slough Average CPUE			0.00		0.00	0.00		0.00	0.00			0.04	

Table 5.1-11. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for Sockeye salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-128 (Slough 8A).

Salmon, sockeye FA-128		November	February		March			April		
Macrohabitat	Site ID	Minnow trap	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	115	0.00								
Side Channel	63	0.00								
Side Channel	64		0.00		0.00	0.00			0.00	0.00
Side Channel	WO119			0.00						
Side Channel	WO120							1.00		0.71
Side Channel	WO121	0.00								
Side Channel Average CPUE		0.00	0.00	0.00	0.00	0.00		1.00	0.00	0.35
Side Slough	69		0.13			0.00	0.00		0.00	0.00
Side Slough	71	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Side Slough	O70	0.00	0.00	0.00		0.00	0.00			
Side Slough	WO109			0.00			0.00			
Side Slough	WO150	0.00						85.00	0.00	
Side Slough Average CPUE		0.00	0.04	0.00	0.00	0.00	0.00	42.50	0.00	0.00
Upland Slough	156		0.00			0.00			0.00	
Upland Slough	157		0.00	0.00		0.00	0.00		0.00	0.00
Upland Slough	158		0.00			0.00			0.00	
Upland Slough Average CPUE			0.00	0.00		0.00	0.00		0.00	0.00

Table 5.1-12. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for sockeye salmon at GRTS selected sites during winter fish studies, 2013-2014 at FA-138 (Gold Creek).

Salmon, sockeye FA-138		November		February		March		April		
Macrohabitat	Site ID	Minnow trap	Electrofish	Minnow trap	Electrofish	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	102			0.00		0.00			0.00	
Side Channel	108	0.00	0.00	0.00	0.00	0.00			0.00	
Side Channel	11				0.00					
Side Channel	65	0.00				0.00			0.00	
Side Channel	WO127					0.00	0.00	0.00	0.00	
Side Channel Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Side Slough	134	0.00	0.00	0.00	0.00	0.00		15.00	0.00	
Side Slough	134UP				0.51		0.47			0.00
Side Slough	66	0.00		0.00		0.00			0.00	
Side Slough	67	0.20		0.13		0.00			0.00	
Side Slough Average CPUE		0.07	0.00	0.04	0.25	0.00	0.47	15.00	0.00	0.00
Upland Slough	161			0.00		0.00			0.00	
Upland Slough	76			0.00		0.00			0.00	
Upland Slough	O77	0.00								
Upland Slough Average CPUE		0.00		0.00		0.00			0.00	

Table 5.1-13. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for lamprey at GRTS selected sites during winter fish studies, 2013-2014 at FA-104 (Whiskers Slough).

Lamprey FA-104		November			February			March			April		
Macrohabitat	Site ID	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	154		0.00	0.00		0.00	0.00		0.00	0.00			0.00
Side Channel Average CPUE			0.00	0.00		0.00	0.00		0.00	0.00			0.00
Side Slough	156		0.00			0.00		0.00	0.00		0.00	0.00	
Side Slough	157		0.00			0.00			0.00			0.00	
Side Slough Average CPUE													
Tributary	159	2.00	0.00		3.00	0.00		3.00	0.00		2.00	0.00	
Tributary	159T2				2.33	0.00		2.50		30.16	1.00	0.00	
Tributary	159T3					0.00							
Tributary	159T4									12.00			7.01
Tributary Average CPUE		2.00	0.00		2.67			2.75		21.08	1.50		7.01
Upland Slough	160		0.00			0.00			0.00			0.00	
Upland Slough	161		0.00						0.00			0.00	
Upland Slough	162		0.00			0.00			0.00			0.00	
Upland Slough Average CPUE			0.00			0.00			0.00			0.00	

Table 5.1-14. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for lamprey at GRTS selected sites during winter fish studies, 2013-2014 at FA-128 (Slough 8A).

Lamprey FA-128		November	February		March			April		
Macrohabitat	Site ID	Minnow trap	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	115	0.00								
Side Channel	63	0.00								
Side Channel	64		0.00		0.00	0.00			0.00	0.00
Side Channel	WO119			0.00						
Side Channel	WO120							0.00		0.00
Side Channel	WO121	0.00								
Side Channel Average CPUE		0.00	0.00	0.00	0.00	0.00		0.00	0.00	0.00
Side Slough	69		0.00			0.00	0.00		0.00	0.00
Side Slough	71	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Side Slough	O70	0.00	0.00	0.00		0.00	0.00			
Side Slough	WO109			0.00			0.00			
Side Slough	WO150	0.00						0.00	0.00	
Side Slough Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upland Slough	156		0.00			0.00			0.00	
Upland Slough	157		0.00	0.00		0.00	0.00		0.00	0.00
Upland Slough	158		0.00			0.00			0.00	
Upland Slough Average CPUE			0.00	0.00		0.00	0.00		0.00	0.00

Table 5.1-15. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for lamprey at GRTS selected sites during winter fish studies, 2013-2014 at FA-138 (Gold Creek).

Lamprey FA-138		November		February		March		April		
Macrohabitat	Site ID	Minnow trap	Electrofish	Minnow trap	Electrofish	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	102			0.00		0.00			0.00	
Side Channel	108	0.00	0.00	0.00	0.00	0.00			0.00	
Side Channel	11				0.00					
Side Channel	65	0.00				0.00			0.00	
Side Channel	WO127					0.00	0.00	0.00	0.00	
Side Channel Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Side Slough	134	0.00	0.00	0.00	0.00	0.00		0.00	0.00	
Side Slough	134UP				0.00		0.00			0.00
Side Slough	66	0.00		0.00		0.00			0.00	
Side Slough	67	0.00		0.00		0.00			0.00	
Side Slough Average CPUE		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Upland Slough	161			0.00		0.00			0.00	
Upland Slough	76			0.00		0.00			0.00	
Upland Slough	O77	0.00								
Upland Slough Average CPUE		0.00		0.00		0.00			0.00	

Table 5.1-16. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for sculpin at GRTS selected sites during winter fish studies, 2013-2014 at FA-104 (Whiskers Slough).

Sculpin FA-104		November			February			March			April		
Macrohabitat	Site ID	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	154		0.00	15.00		0.25	15.05		0.00	5.85			15.83
Side Channel Average CPUE			0.00	15.00		0.25	15.05		0.00	5.85			15.83
Side Slough	156		0.00			0.00		0.00	0.00		0.00	0.13	
Side Slough	157		0.11			0.00			0.00			0.00	
Side Slough Average CPUE			0.06			0.00		0.00	0.00		0.00	0.06	
Tributary	159	1.00	0.00		5.00	0.00		4.00	0.13		4.00	0.00	
Tributary	159T2				1.00	0.00		1.50		30.16	0.00	0.13	
Tributary	159T3					0.00							
Tributary	159T4									105.64			71.55
Tributary Average CPUE		1.00	0.00		3.00	0.00		2.75	0.13	67.90	2.00	0.06	71.55
Upland Slough	160		0.11			0.00			0.00			0.00	
Upland Slough	161		2.11						0.13			0.25	
Upland Slough	162		0.30			0.00			0.00			0.13	
Upland Slough Average CPUE			0.84			0			0.04			0.13	

Table 5.1-17. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for sculpin at GRTS selected sites during winter fish studies, 2013-2014 at FA-128 (Slough 8A).

Sculpin FA-128		November	February		March			April		
Macrohabitat	Site ID	Minnow trap	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	115	0.20								
Side Channel	63	0.00								
Side Channel	64		0.00		0.00	0.00			0.00	0.00
Side Channel	WO119			0.00						
Side Channel	WO120							0.00		1.42
Side Channel	WO121	0.22								
Side Channel Average CPUE		0.14	0.00	0.00	0.00	0.00		0.00	0.00	0.71
Side Slough	69		0.00			0.00	5.56		0.00	3.47
Side Slough	71	0.30	0.00	51.79	0.00	0.13		0.00	0.13	
Side Slough	O70	0.20	0.00	23.33		0.00	9.78			
Side Slough	WO109			3.33			0.00			
Side Slough	WO150	0.00						23.00	0.13	
Side Slough Average CPUE		0.17	0.00	26.15	0.00	0.04	5.11	11.50	0.08	3.47
Upland Slough	156		0.00			0.00			0.00	
Upland Slough	157		0.00	0.00		0.00	0.00		0.00	0.00
Upland Slough	158		0.00			0.00			0.00	
Upland Slough Average CPUE		0.00	0.00	0.00		0.00	0.00	0.00	0.00	0.00

Table 5.1-18. Monthly average minnow trapping, fyke netting, and backpack electrofishing CPUE for sculpin at GRTS selected sites during winter fish studies, 2013-2014 at FA-138 (Gold Creek).

Sculpin FA-138		November		February		March		April		
Macrohabitat	Site ID	Minnow trap	Electrofish	Minnow trap	Electrofish	Minnow trap	Electrofish	Fyke	Minnow trap	Electrofish
Side Channel	102			0.00		0.00			0.00	
Side Channel	108	0.00	12.40	0.00	0.00	0.00			0.00	
Side Channel	11				5.68					
Side Channel	65	0.00				0.00			0.00	
Side Channel	WO127					0.00	0.00	2.00	0.00	
Side Channel Average CPUE		0.00	12.40	0.00	2.84	0.00	0.00	2.00	0.00	
Side Slough	134	0.70	57.78	0.00	40.82	0.25		13.00	0.00	
Side Slough	134UP				8.59		16.55			20.97
Side Slough	66	0.11		0.00		0.00			0.00	
Side Slough	67	0.10		0.50		0.13			0.25	
Side Slough Average CPUE		0.30	57.78	0.17	24.70	0.13	16.55	13.00	0.08	20.97
Upland Slough	161			0.13		0.00			0.00	
Upland Slough	76			0.00		0.00			0.00	
Upland Slough	O77	0.00								
Upland Slough Average CPUE		0.00		0.06		0.00			0.00	

Table 5.2 -1. PIT-tagged burbot detected during the winter study period (2013-2014). Light shading indicates a shared Focus Area, darker shading indicates a shared macrohabitat within a Focus Area.

			Winter Detection Location									
	FA/PRM		80.8	104					128			
		Macro	Tributary Array	Side Channel	Side Slough	Side Slough Array	Upland Slough	Whiskers Cr.	Backwater	Side Channel	Side Slough	Side Slough Array
Tagging location	80.8	Tributary DMT										
	103.5	Upland Slough										
	104	Side Channel										
		Side Slough				5						
		Upland Slough										
		Whiskers Cr.				2						
	106.9	MC DMT										
	113	Side Channel				1						
	115	Upland Slough										
		Tributary										
	120.7	Split Main Channel										
	128	Backwater										
		Side Channel										
		Side Slough										1
	138	Side Slough										
		Upland Slough										
	141	Upland Slough										
		Indian River										
		Tributary DMT										

Table 5.2-2. PIT-tagged rainbow trout detected during the winter study period (2013-2014). Light shading indicates a shared Focus Area, darker shading indicates a shared macrohabitat within a Focus Area.

			Winter Detection Location									
	FA/PRM		80.8	104					128			
		Macro	Tributary Array	Side Channel	Side Slough	Side Slough Array	Upland Slough	Whiskers Cr.	Backwater	Side Channel	Side Slough	Side Slough Array
Tagging location	80.8	Tributary DMT										
	103.5	Upland Slough										
	104	Side Channel										
		Side Slough				3						
		Upland Slough										
		Whiskers Cr.				6						
	106.9	MC DMT				1						
	113	Side Channel										
	115	Upland Slough										
		Tributary										
	120.7	Split Main Channel				1						
	128	Backwater										
		Side Channel										
		Side Slough										
	138	Side Slough										
		Upland Slough										
	141	Upland Slough										
		Indian River										
		Tributary DMT				1						

Table 5.3.2-1. Movement among habitats by PIT-tagged juvenile Chinook salmon detected or recaptured during the winter study. Light shading indicates a shared Focus Area, darker shading indicates a shared macrohabitat within a Focus Area.

			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	1														
	103.5	Upland Slough															
	104	Side Channel					3	1									
		Side Slough					2										
		Upland Slough					3										
		Whiskers Cr.							2								
	106.9	MC DMT					2										
	128	Backwater								1							
		Side Channel								2							
		Side Slough								1							
	138	Side Slough												3			
		Upland Slough															
	141	Upland Slough														1	
		Indian River															
		Tributary DMT					1										

Table 5.3.2-2. Movement among habitats by PIT-tagged juvenile coho salmon detected or recaptured during the winter study. Light shading indicates a shared Focus Area, darker shading indicates a shared macrohabitat within a Focus Area.

			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		

Table 5.3.3-1. Fish counts by species for paired day/night electrofishing efforts, 2014.

			Day								Night									
Month	**Focus Area**	**Site ID**	**Salmon, Chinook**	**Salmon, chum**	**Salmon, coho**	**Salmon, sockeye**	**Longnose sucker**	**Sculpin**	**Trout, Rainbow**	**Day Total**	**Salmon, Chinook**	**Salmon, chum**	**Salmon, coho**	**Salmon, sockeye**	**Salmon, undifferentiated**	**Arctic grayling**	**Longnose sucker**	**Sculpin**	**Trout, rainbow**	**Night Total**
February	**FA- 104**	**154-SC**			3		3	14		**20**	6		15				2	10		**33**
February	**FA-138**	**134-SS**						24		**24**				1				19		**20**
February	**FA-138**	**134UP-SS**				1		17		**18**			2	6				29		**37**
February	**FA-138**	**OP2-SC**	1							**1**										**0**
February	**FA-138**	**OP6-MC**						1		**1**								4		**4**
March	**FA-104**	**154-SC**			1		1	5		**7**			22			1		18		**41**
March	**FA-104**	**OP1-US**			4			1		**5**			28					1		**29**
March	**FA-128**	**WOP2-SS**		10				30		**40**		4		2				14		**20**
March	**FA-128**	**OP3-US**		2	2			1		**5**		1	2		2			2	2	**9**
March	**FA-138**	**134UP-SS**				1		35		**36**	1		14	33				51		**99**
March	**FA-138**	**WO127-SC**			1				2	**3**			3					2		**5**
April	**FA-104**	**154-SC**			4		1	19		**24**	1		31					3		**35**
April	**FA-104**	**OP1-US**			3			2		**5**	2		25					3	1	**31**
April	**FA-138**	**134UP-SS**			2			49		**51**			31	58				30		**119**
Grand Total			**1**	**12**	**20**	**2**	**5**	**198**	**2**	**240**	**10**	**5**	**173**	**100**	**2**	**1**	**2**	**186**	**3**	**482**

Table 5.3.3-2. Relative abundance (fish per hour) of juvenile salmon targets observed for each Focus Area in winter using ARIS, 2014. Relative abundance is shown overall, monthly, overall among periods of the day and monthly during periods of the day. Numbers shown in parentheses indicate +/- 95 percent confidence limits.

		FA-104	FA-138
	Overall	5.4 (4.6)	9.0 (5.9)
Monthly	Feb	5.8 (4.7)	0.8 (1.8)
	Mar	3.8 (3.8)	1.9 (2.7)
	Apr	6.6 (5.1)	24.3 (9.7)
Overall	Dawn	10.1 (6.2)	22.8 (9.4)
	Day	1.7 (2.5)	0.8 (1.7)
	Dusk	14.2 (7.4)	25.3 (9.9)
	Night	2.5 (3.1)	2.4 (3.0)
Feb	Dawn	9.7 (6.1)	0.7 (1.6)
	Day	1.1 (2.1)	0.6 (1.5)
	Dusk	16.0 (7.8)	1.5 (2.4)
	Night	3.1 (3.5)	0.7 (1.6)
Mar	Dawn	7.2 (5.2)	1.8 (2.7)
	Day	1.9 (2.7)	0.5 (1.4)
	Dusk	9.3 (6.0)	6.2 (4.9)
	Night	1.1 (2.1)	1.2 (2.2)
Apr	Dawn	13.4 (7.2)	65.8 (15.9)
	Day	1.8 (2.7)	1.1 (2.1)
	Dusk	17.3 (8.1)	68.3 (16.2)
	Night	3.3 (3.5)	7.1 (5.2)

Table 5.4-1. Chinook Salmon Condition Factor summaries

MacroHabitat	Group	Sample Size	Mean	Standard Deviation	Standard error
Side Channels	Combined	14	0.972	0.108	0.0289
Side Sloughs	Combined	38	0.981	0.152	0.0247
Upland Sloughs	Combined	33	0.998	0.089	0.0155
Trib/TM	Combined	20	1.01	0.191	0.0427

Table 5.4-2. Coho Salmon Condition Factor summaries

MacroHabitat	Group	Sample Size	Mean	Standard Deviation	Standard error
Side Channels	MR-8 November	25	0.939	0.092	0.0184
	MR-6 November	15	1.14	0.103	0.0266
	MR-8 Feb/Mar/Apr	38	1.02	0.124	0.0201
	MR-6 Feb/Mar/Apr	21	0.989	0.134	0.0292
	Combined	99	1.01	0.131	0.0132
Side Sloughs	MR-8 November	5	0.976	0.084	0.0375
	MR-6 November	71	1.09	0.104	0.0123
	MR-8 Feb/Mar	26	0.923	0.088	0.0172
	MR-6 Feb/Mar	43	1.00	0.107	0.0163
	MR-8 Apr	43	0.968	0.100	0.0153
	MR-6 Apr	22	0.981	0.159	0.0340
	Combined	210	1.01	0.123	0.0085
Upland Sloughs	MR-8 November	48	1.06	0.095	0.0137
	MR-6 November	NA	NA	NA	NA
	MR-8 Feb/Mar	111	1.00	0.134	0.0127
	MR-6 Feb/Mar	66	0.98	0.103	0.0126
	MR-8 Apr	49	0.997	0.112	0.0160
	MR-6 Apr	43	0.944	0.107	0.0164
	Combined	317	0.999	0.119	0.0067
Main Channel	Combined	2	0.941	0.143	0.1011
Trib/TM	Combined	29	0.978	0.131	0.0243

Table 5.4-3. Sockeye Salmon Condition Factor summary

MacroHabitat	Group	Sample Size	Mean	Standard Deviation	Standard error
Sloughs Combined	Combined	90	0.906	0.164	0.0173

Table 5.4-4. Lamprey Condition Factor summary

MacroHabitat	Group	Sample Size	Mean	Standard Deviation	Standard error
Trib/TM	Combined	54	0.150	0.0390	0.0053

Table 5.4-5. Sculpin Condition Factor summaries

MacroHabitat	Group	Sample Size	Mean	Standard Deviation	Standard error
Side Channels	Combined	35	1.03	0.171	0.0289
Side Sloughs	Combined	270	1.08	0.180	0.0110
Upland Sloughs	Combined	24	1.13	0.180	0.0367
Main Channel	Combined	19	1.11	0.191	0.0438
Trib/TM	Combined	46	1.14	0.200	0.0295

8. FIGURES

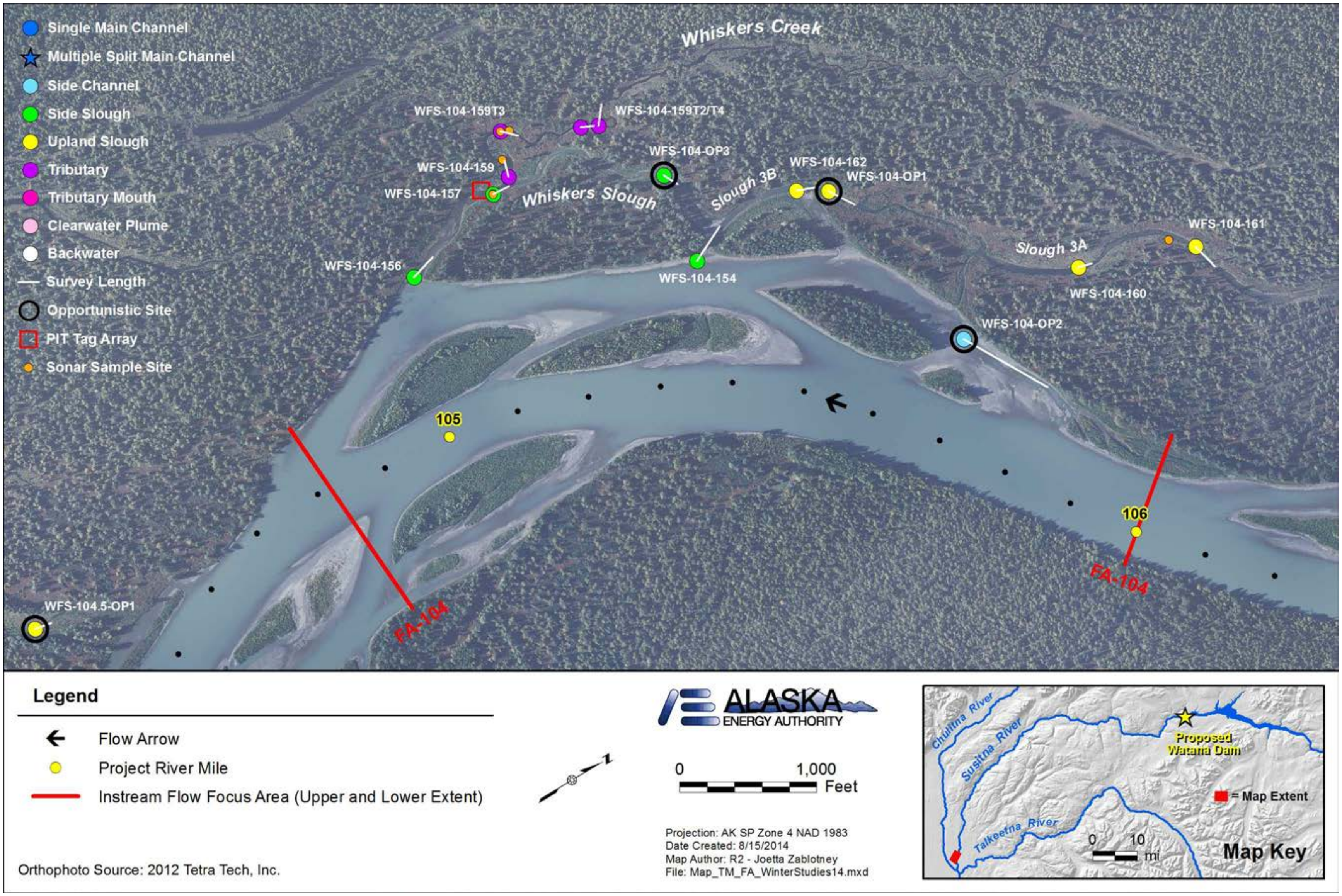

Figure 3-1. Winter fish studies sampling locations by macrohabitat type within and near FA-104 (Whiskers Slough) including GRTS selected off-channel habitat units, opportunistic (non-random) sample sites, sonar locations and PIT tag antenna arrays.

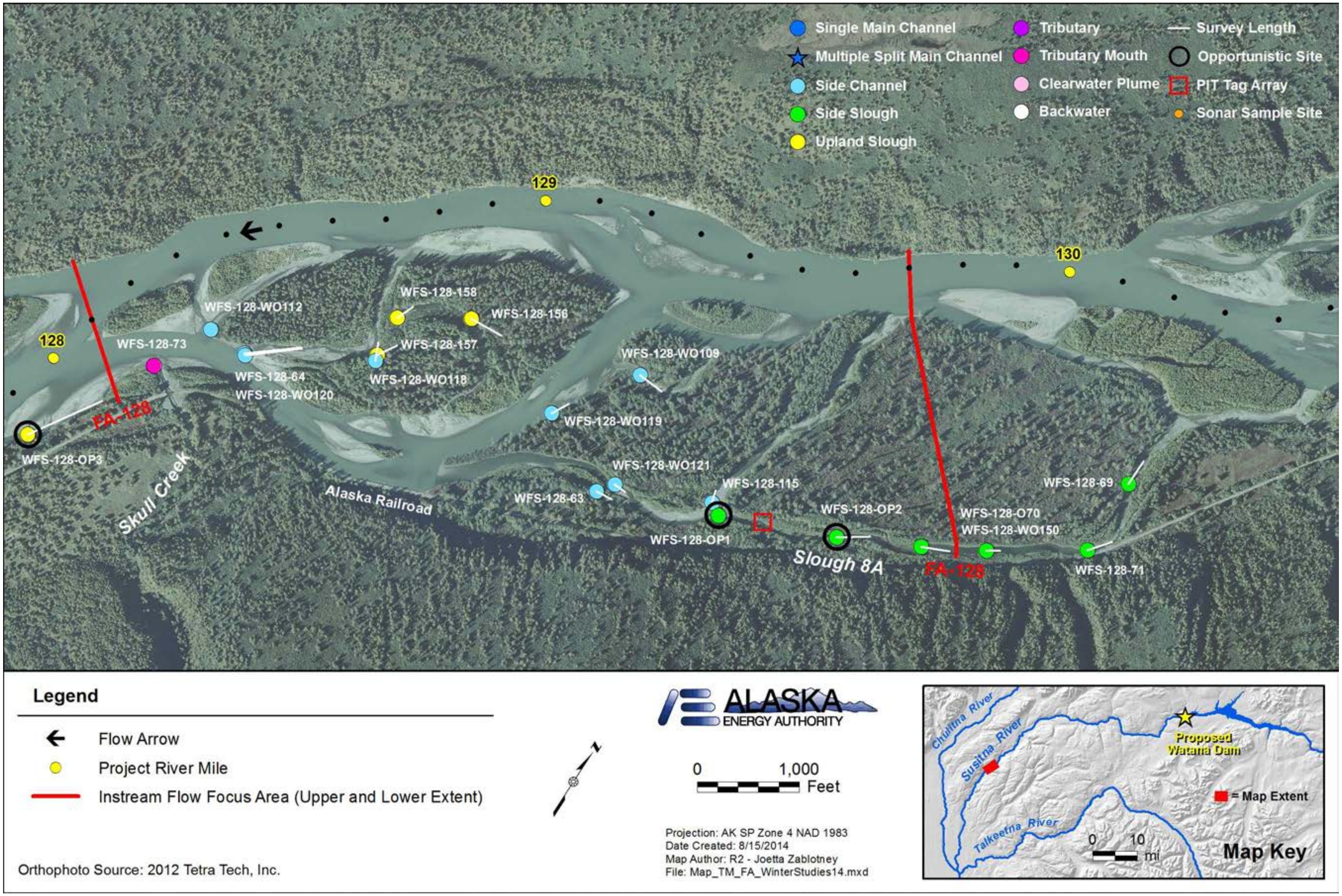

Figure 3-2. Winter fish studies sampling locations by macrohabitat type within and near FA-128 (Slough 8A) including GRTS selected off-channel habitat units, opportunistic (non-random) sample sites, and PIT tag antenna arrays.

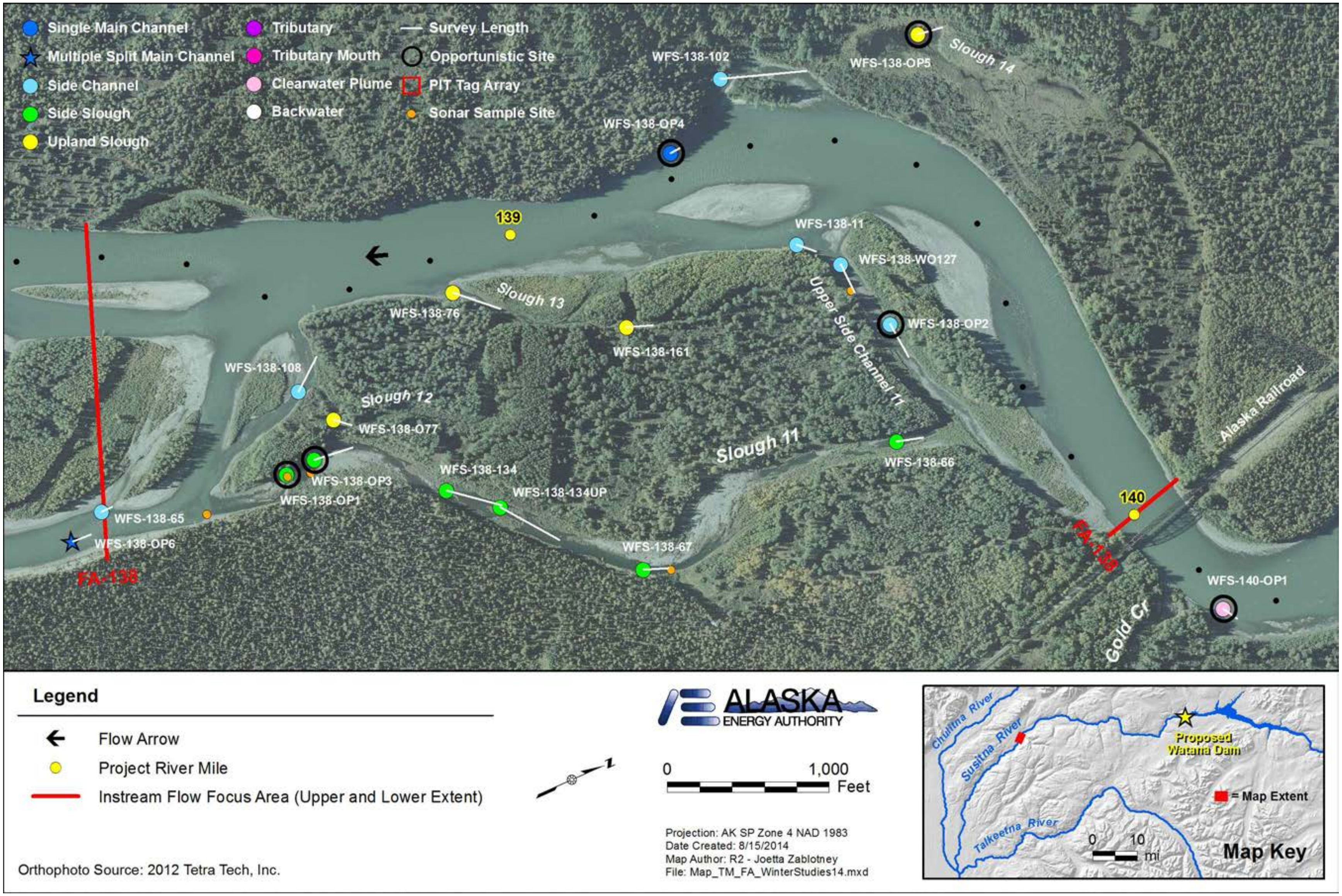

Figure 3-3. Winter fish studies sampling locations by macrohabitat type within and near FA-138 (Gold Creek) including GRTS selected off-channel habitat units, opportunistic (non-random) sample sites, and sonar locations.

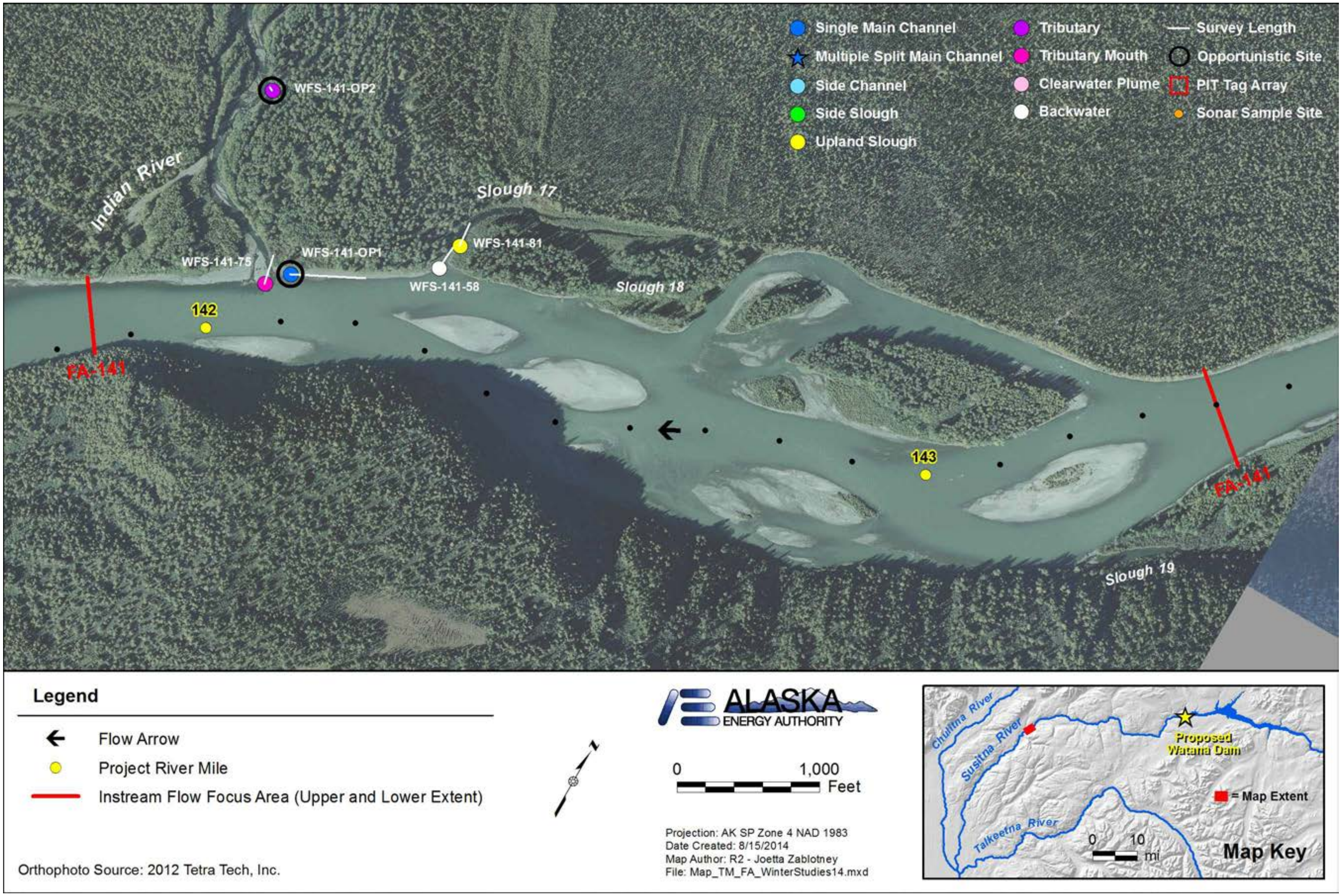

Figure 3-4. Winter fish studies sampling locations by macrohabitat type within and near FA-141 (Indian River) including GRTS selected off-channel habitat units and opportunistic (non-random) sample sites.

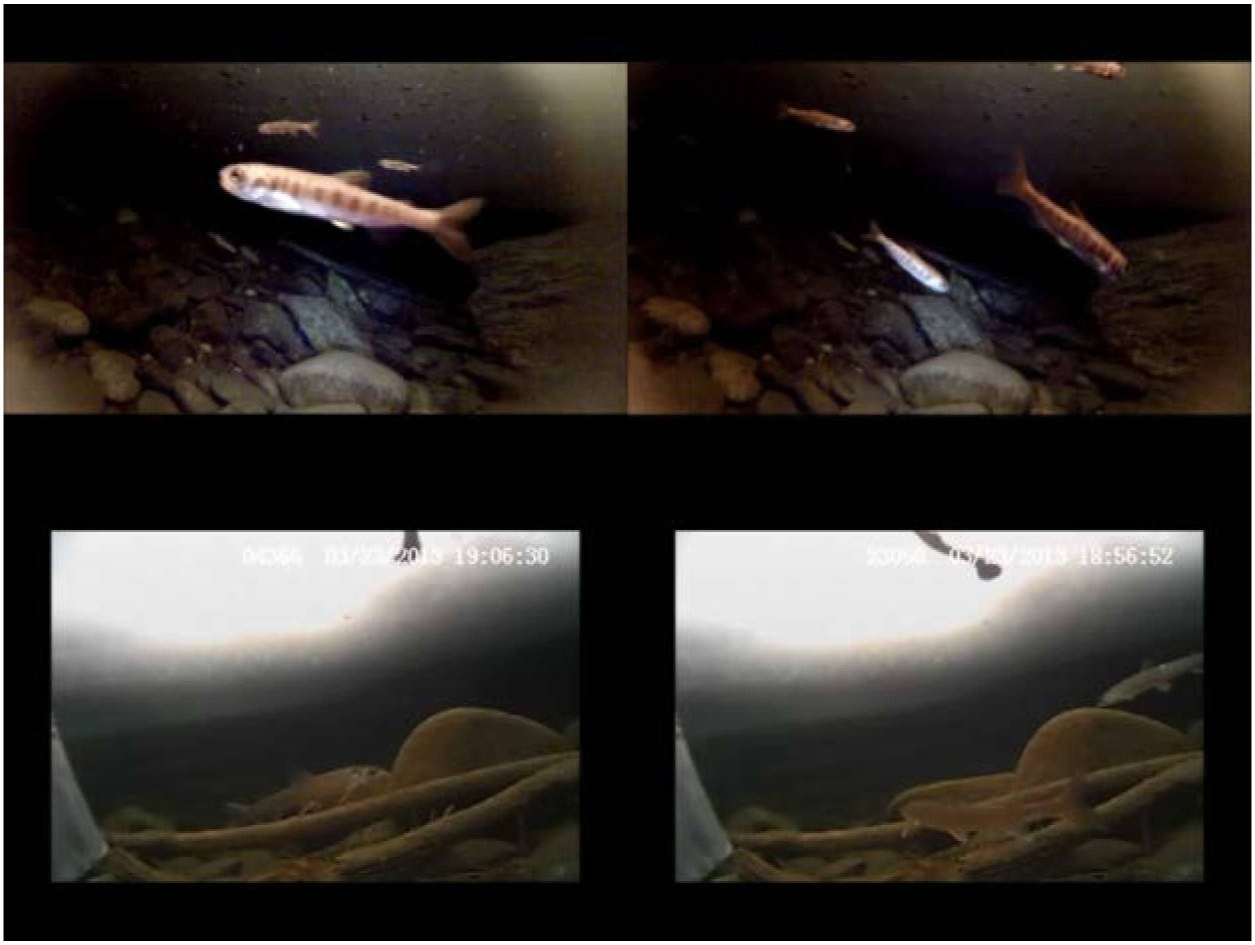

Figure 4.3-1. Underwater video screen shots of juvenile Chinook salmon during night observations taken with GoPro at FA-128 (Slough 8A; top) and round whitefish at during daytime observations with Aqua-Vu Micro at FA-104 (Whiskers Slough; bottom). Sonar unit housing is on lower left hand of bottom images.

Figure 4.3-2. Photograph showing an ARIS unit deployed at the FA-104 Whiskers Creek site on 4 March 2014.

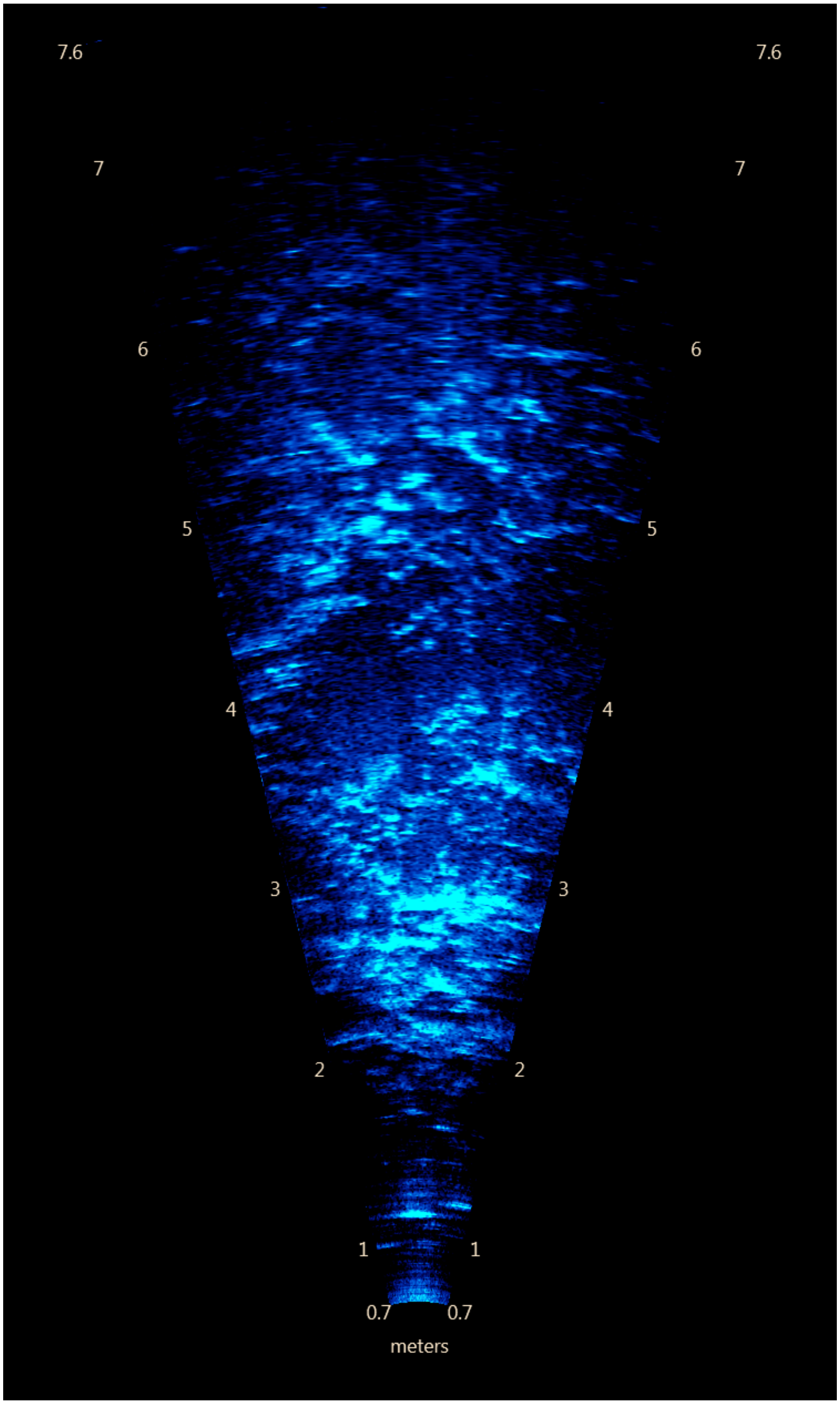

Figure 4.3-3. Still image from ARIS data collected at FA-104 Side Slough on 3 February 2014. Gravel and cobble are shown as bright features along the substrate. Note range markers along sides of image are in 1-m increments.

Figure 4.3-4. Photograph showing the electronic components for an ARIS system inside a portable shelter taken at the FA-138 Upper Side Channel site, February 12, 2014.

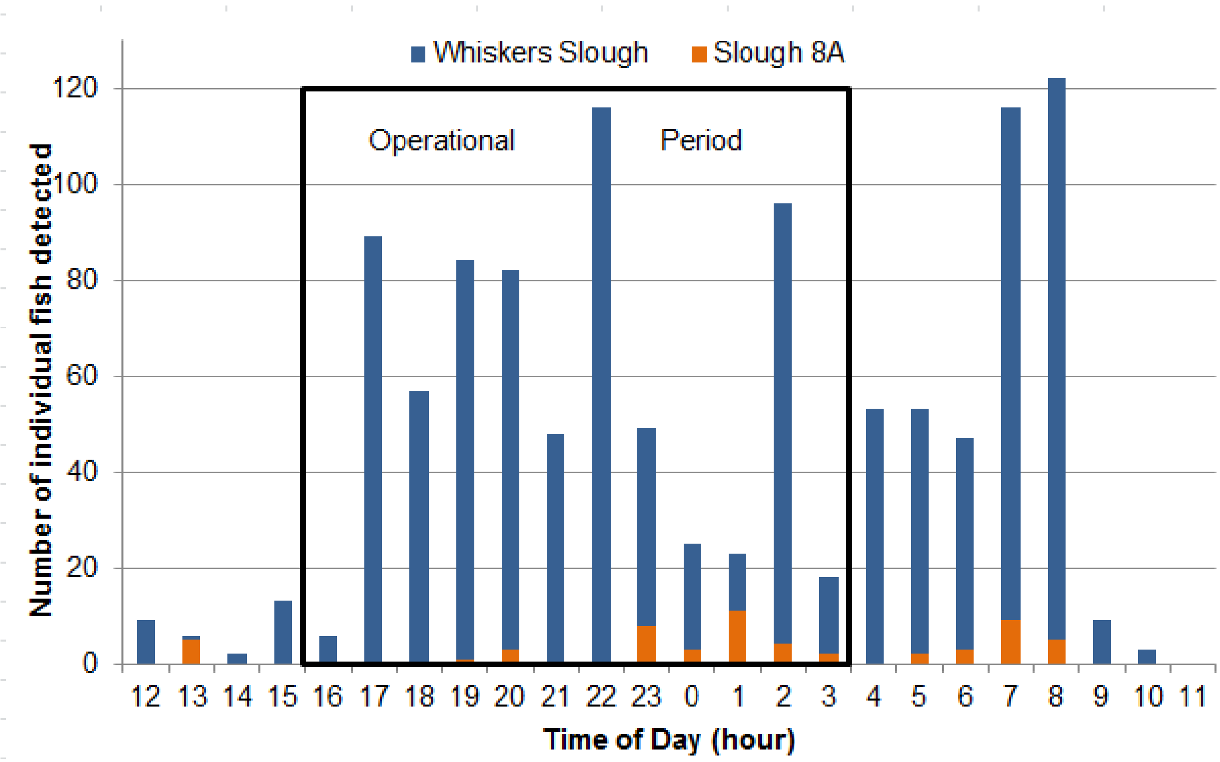

Figure 4.3.1-1. Number of individual fish detected per hour at the FA-104 (Whiskers Slough) and FA-128 (Slough 8A) PIT arrays during the period October 12-November 20, 2013.

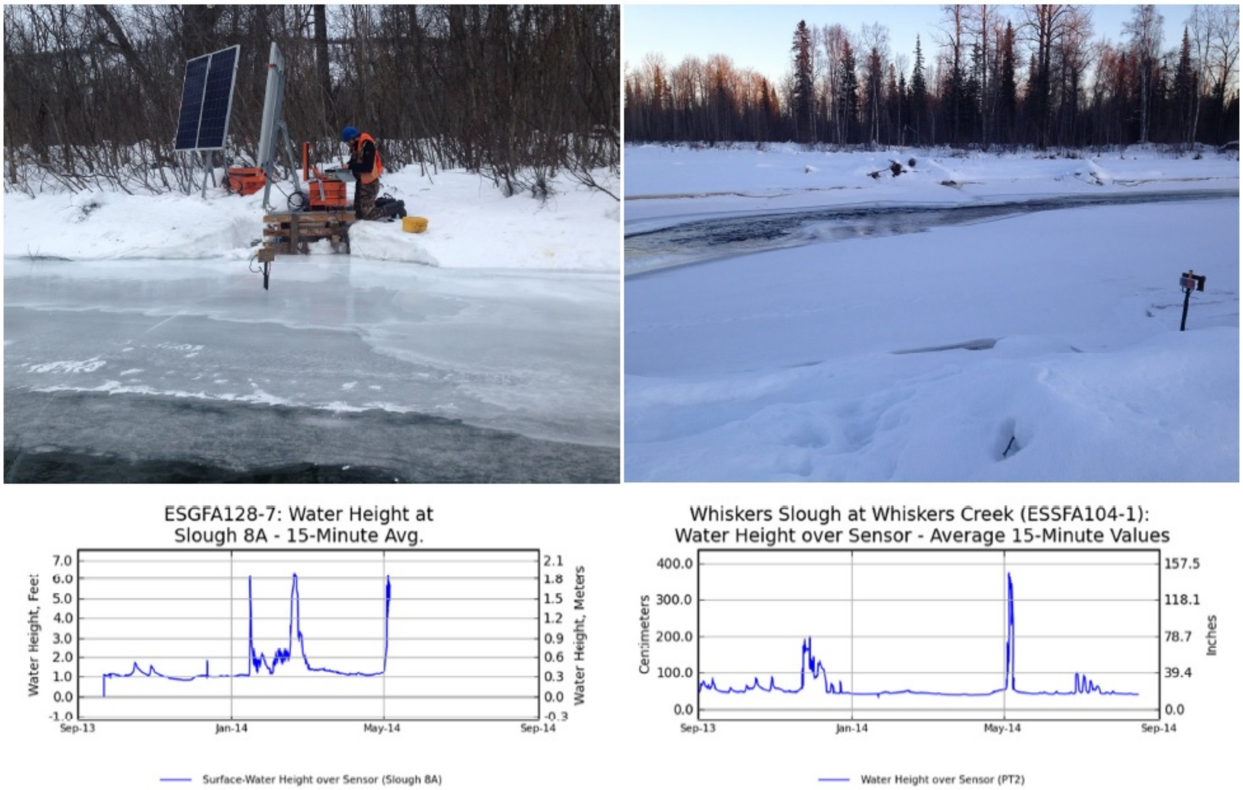

Figure 4.6.2-1. PIT tag antennas frozen into the ice at FA-128 (Slough 8A, top left) and Montana Creek (top right) and preliminary water surface water height data next to antenna locations at FA-128 (Slough 8A, lower right) and FA-104 (Whiskers Slough, lower left) showing mid-winter ice jamming and flooding events.

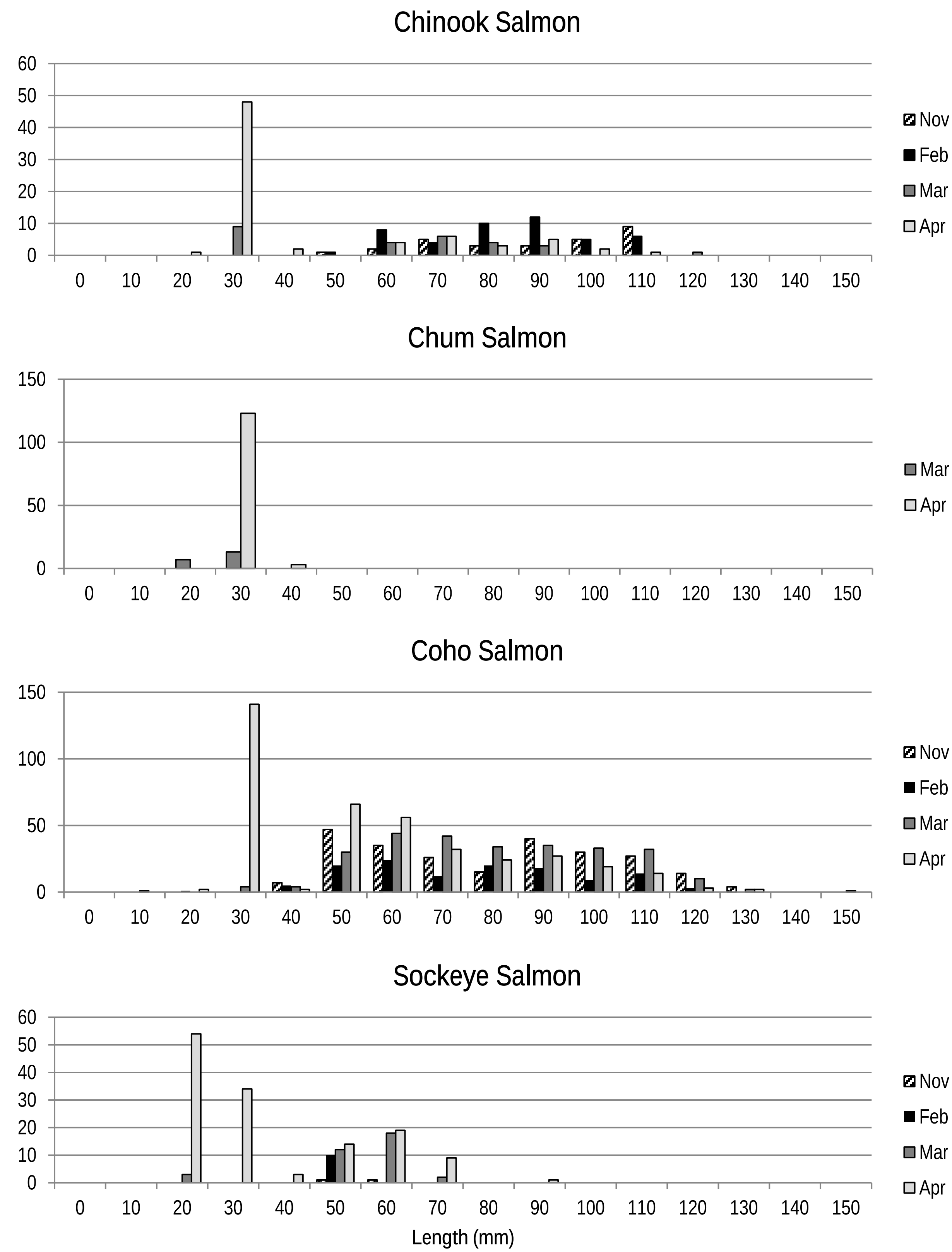

Figure 5.3.1-1. Length frequencies of Pacific salmon captured by month, 2013-2014.

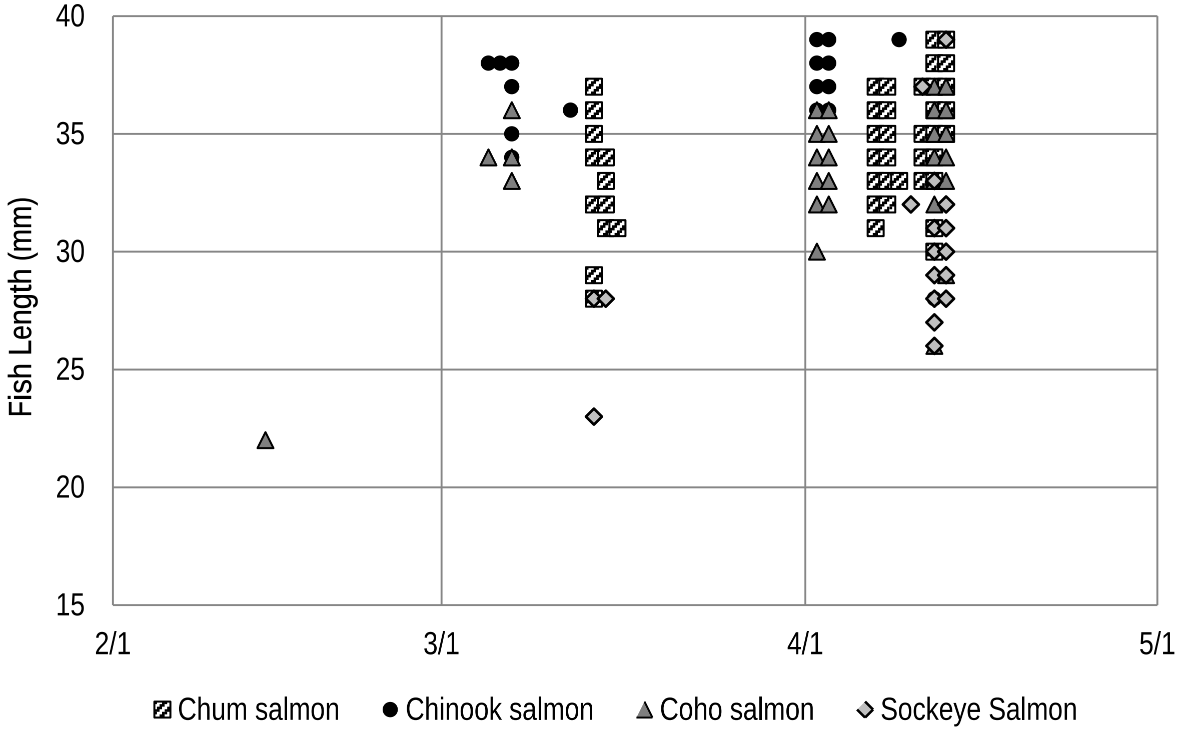

Figure 5.3.1-2. Juvenile Pacific salmon less than 40 mm (1.6 in) captured during winter fish sampling, 2014.

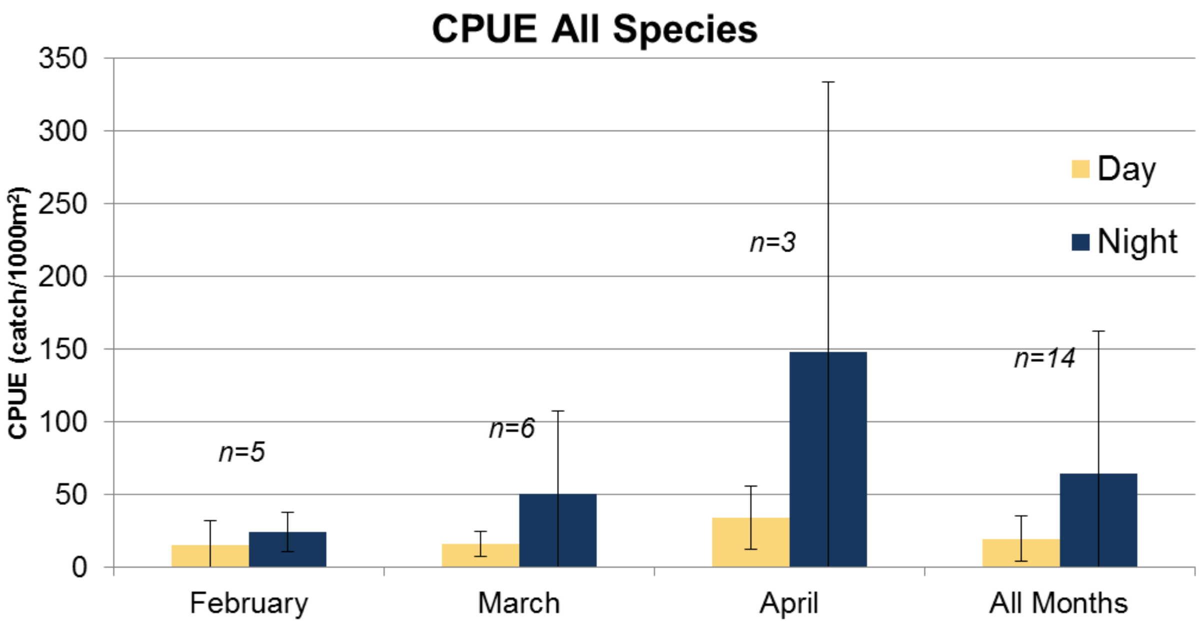

Figure 5.3.3-1. Average monthly paired day and night electrofishing CPUE (Catch/1000m^2) and standard deviation for all species combined.

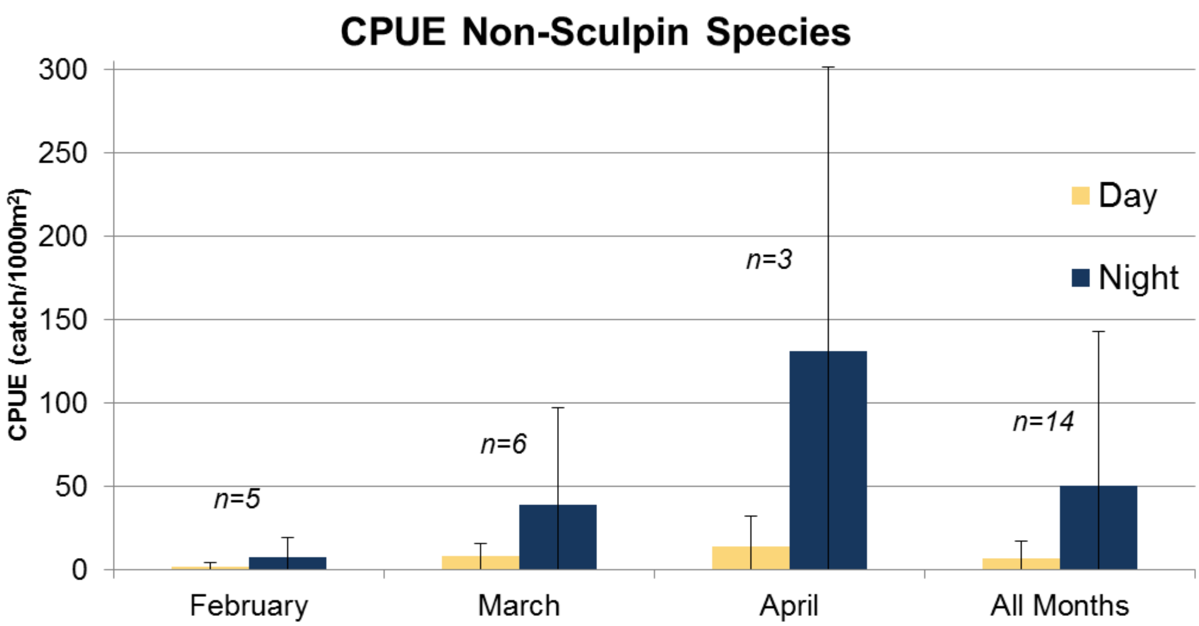

Figure 5.3.3-2. Average monthly paired day and night electrofishing CPUE (Catch/1000m^2) and standard deviation for all species combined except sculpin.

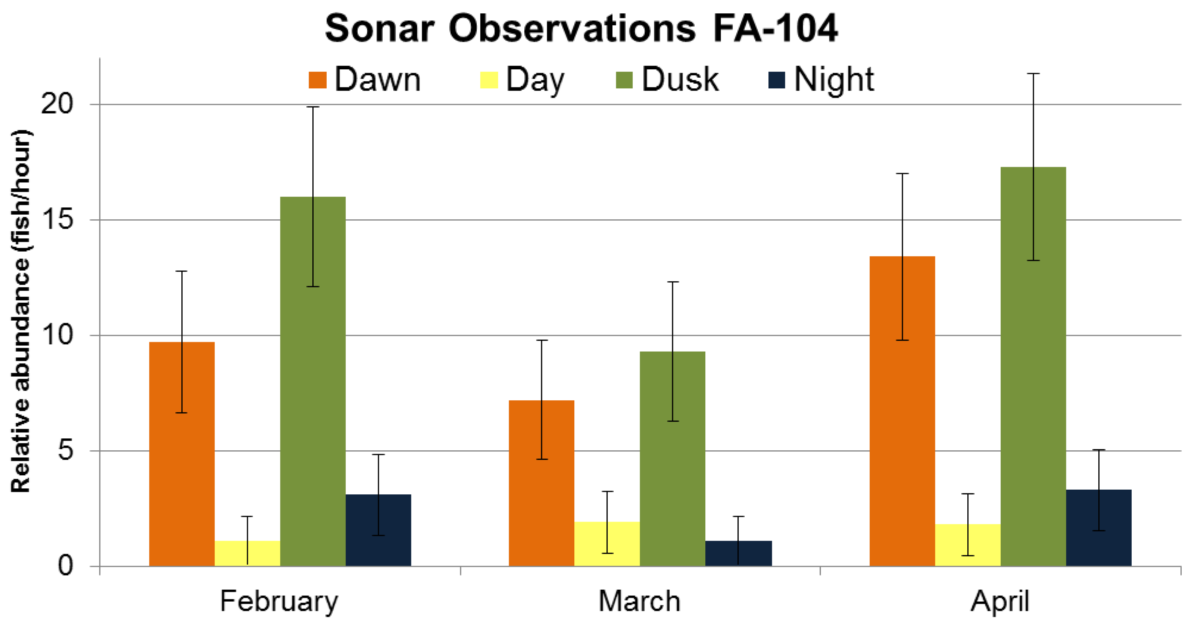

Figure 5.3.3-3. Average monthly diel relative abundance (fish per hour) and standard deviation for juvenile salmon targets from sonar observations at FA-104 (Whiskers Sough).

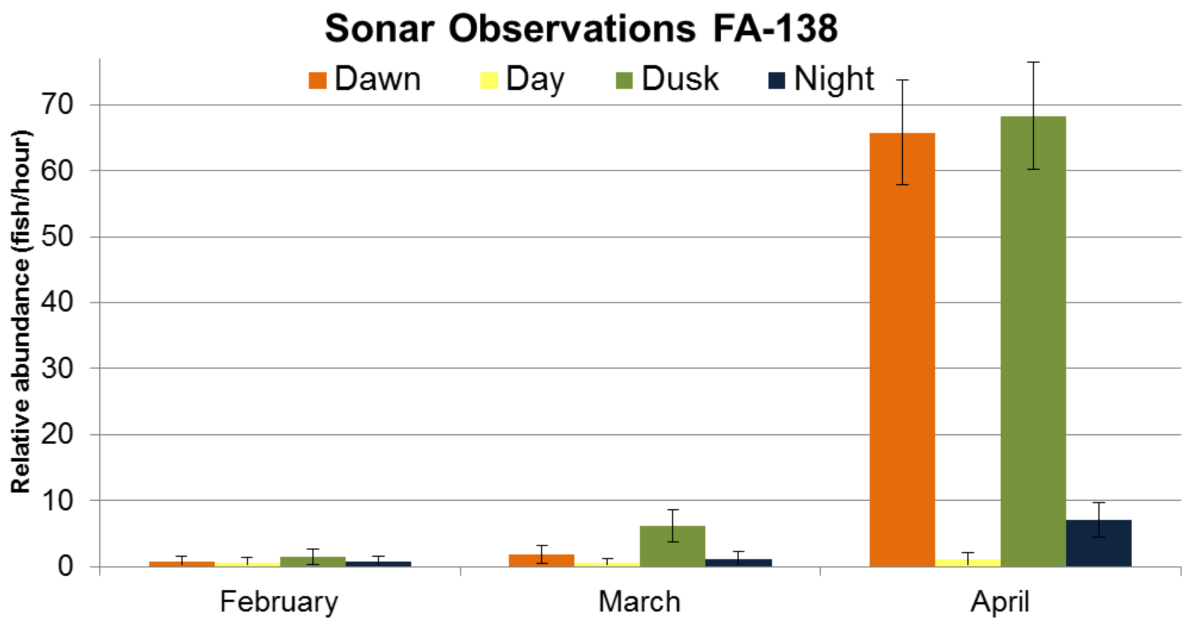

Figure 5.3.3-4. Average monthly diel relative abundance (fish per hour) and standard deviation for juvenile salmon targets from sonar observations at FA-138 (Gold Creek).

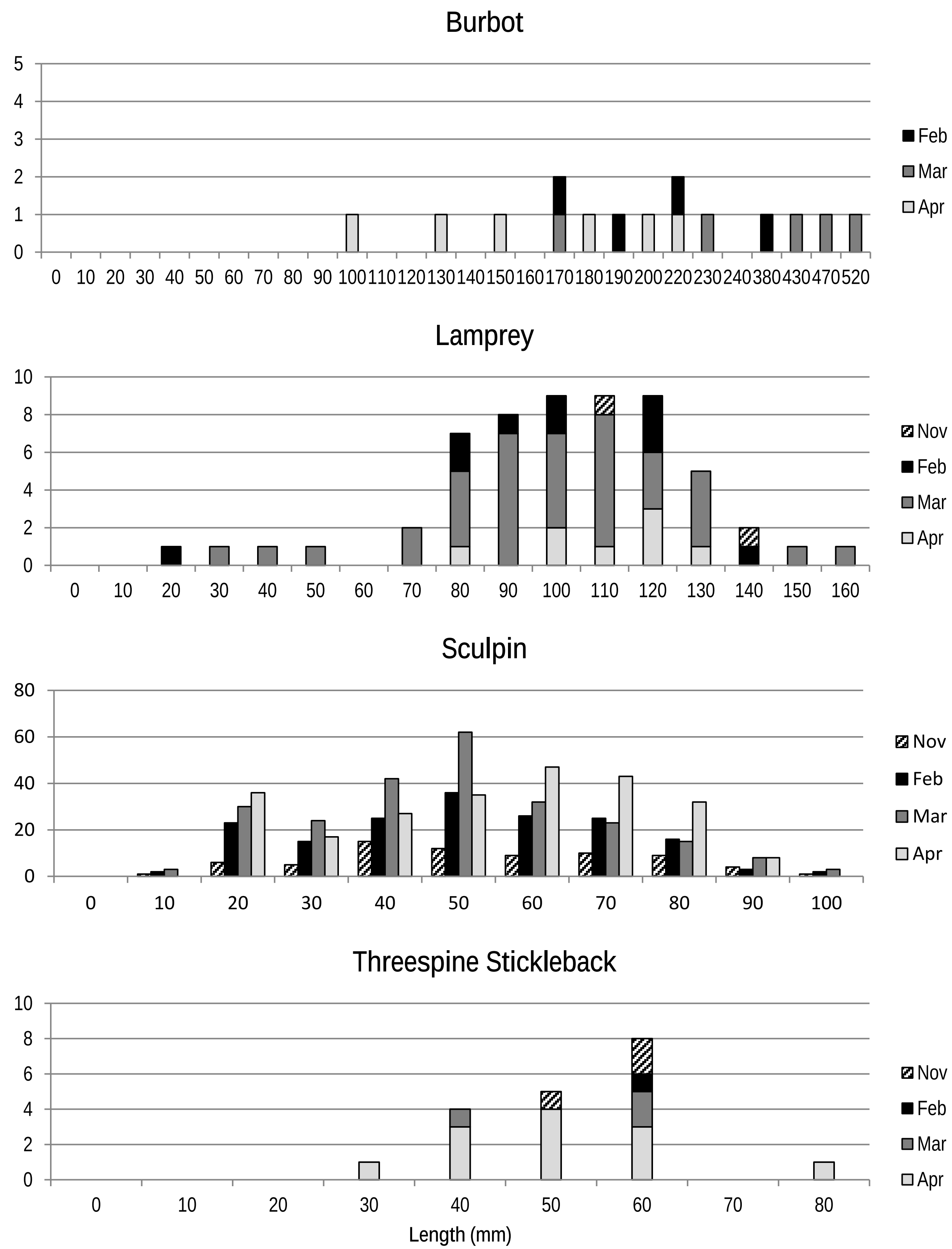

Figure 5.4-2. Length frequencies of burbot, lamprey, sculpin and Threespine stickleback captured by month, 2013-2014.

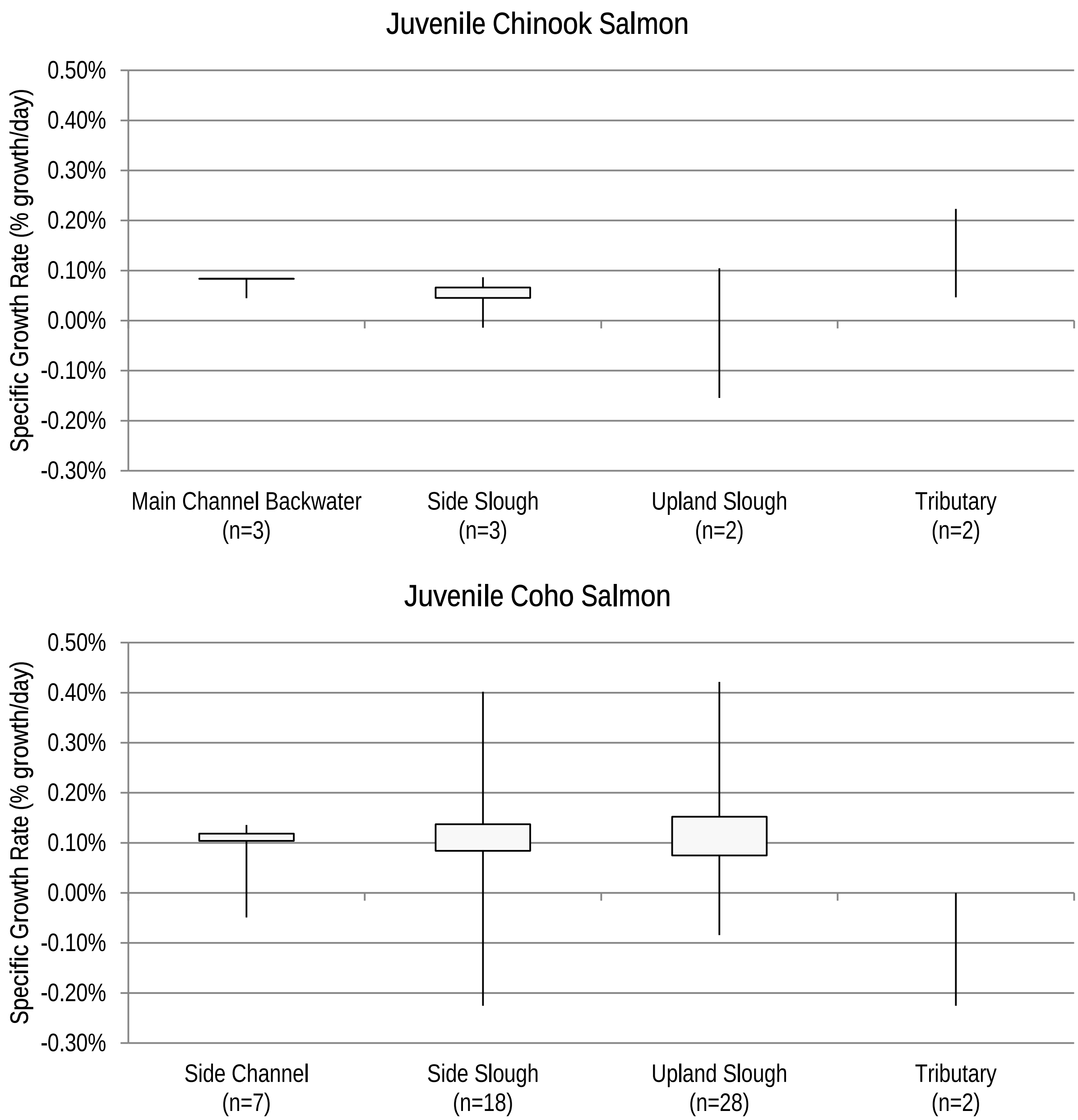

Figure 5.4.2-1. Specific growth rates of juvenile Chinook and coho salmon by recapture habitat type during the winter study period.

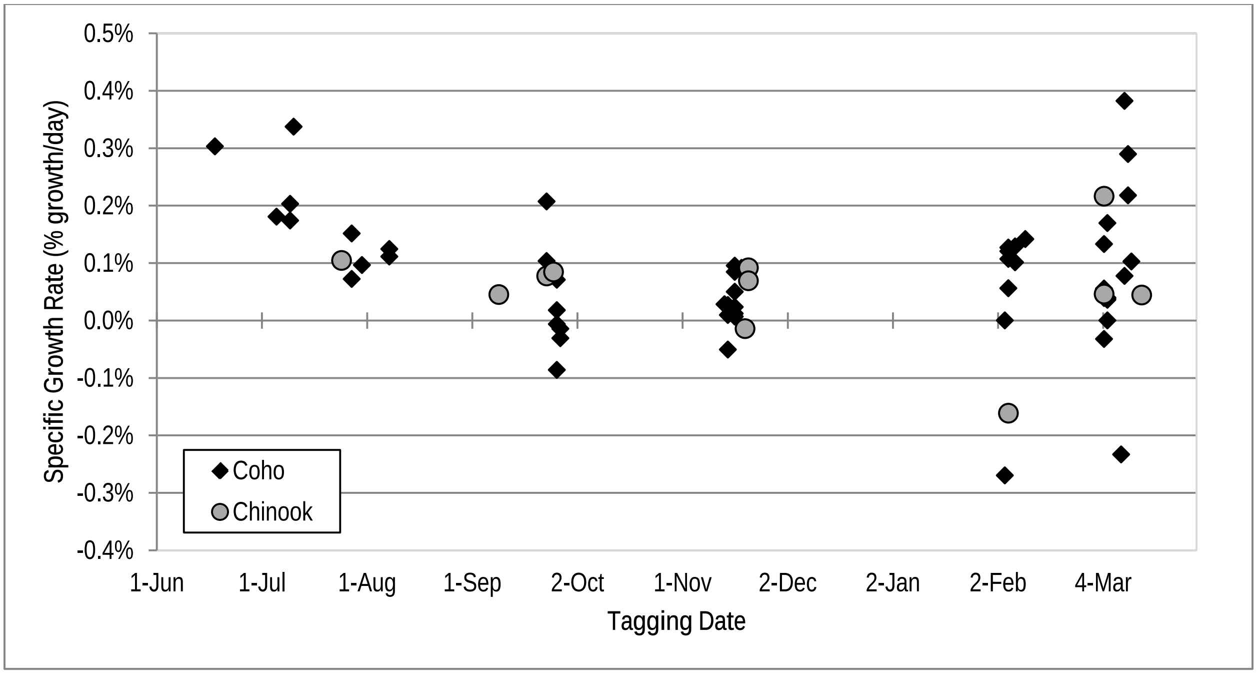

Figure 5.4.2-2. Specific growth rate of juvenile Chinook and coho salmon recaptured during winter study presented by tagging date, 2013-2014.

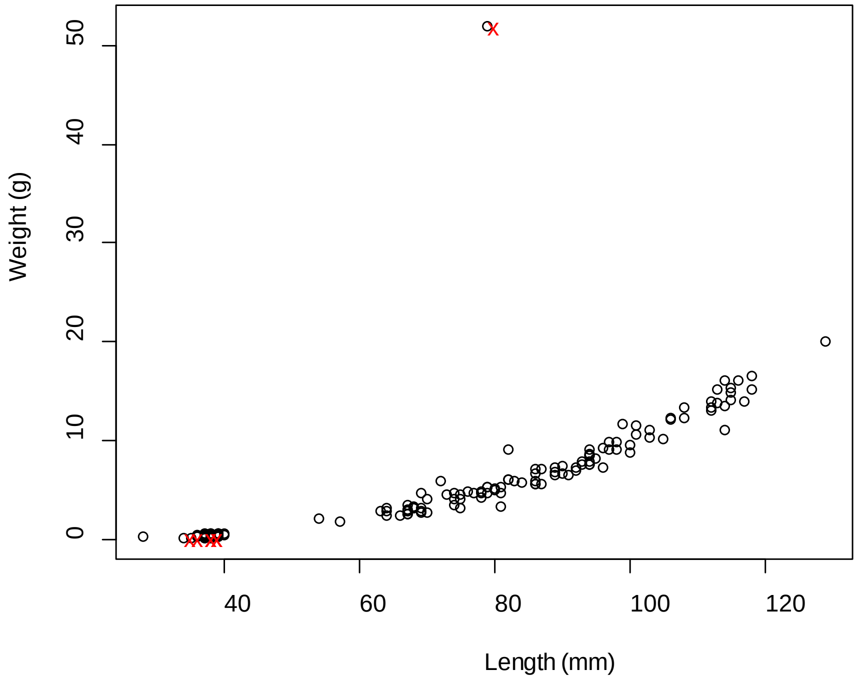

Figure 5.4.3-1. Fish weight plotted against length for Chinook salmon. Outliers identified by Grubbs Test are marked with red "x".

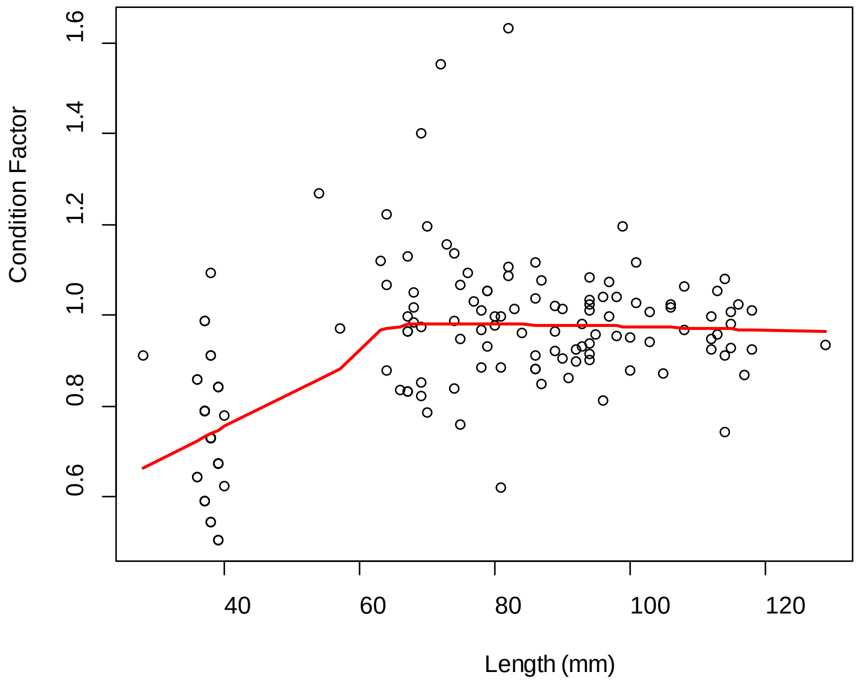

Figure 5.4.3-2. Condition factor plotted against fish length for Chinook salmon. Red line is a local regression smoother, which indicates that condition factors are lower for small fish.

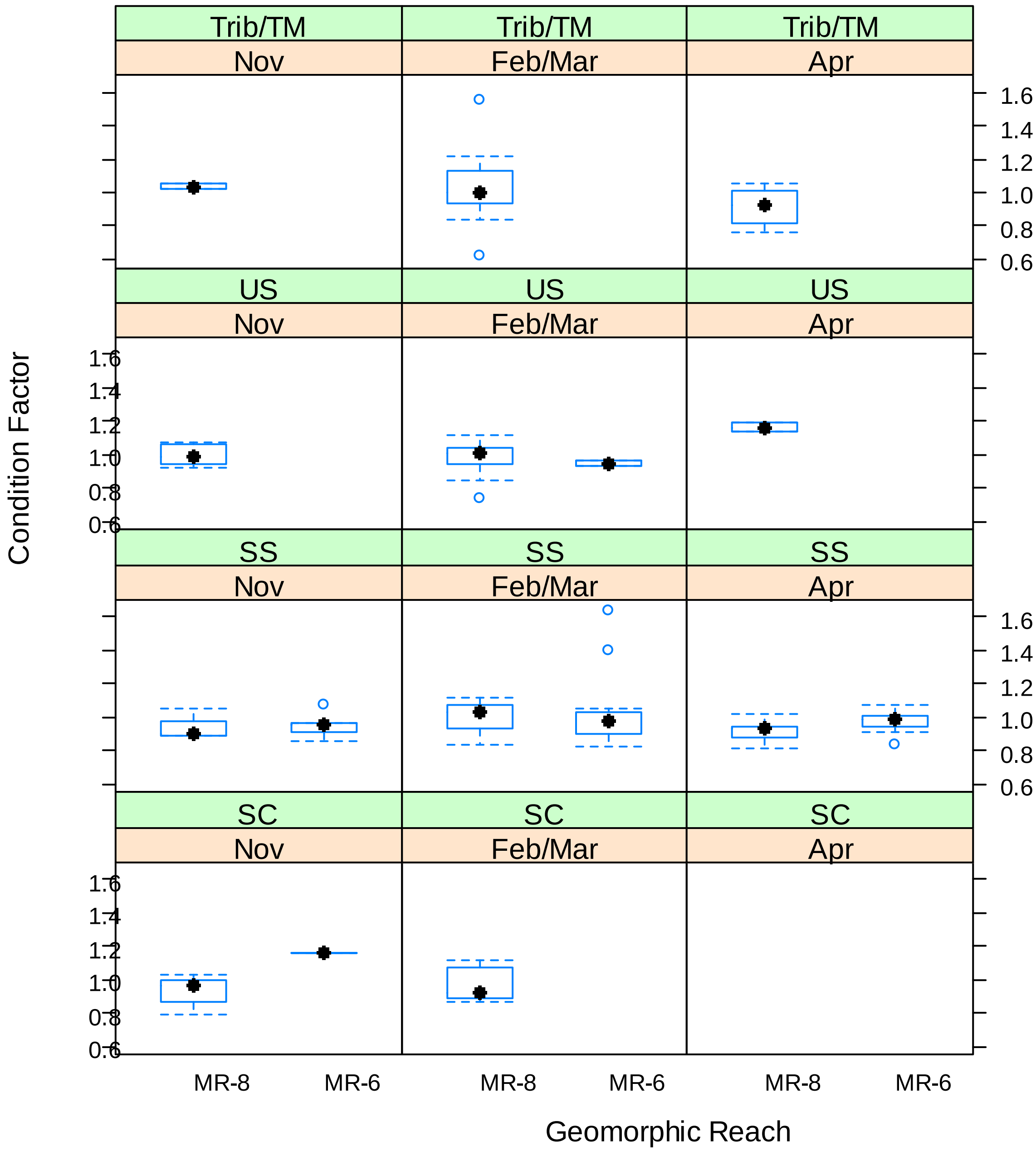

Figure 5.4.3-3. Box plot showing distribution of condition factors for Chinook salmon by Geomorphic Reach, sampling period, and macrohabitat type

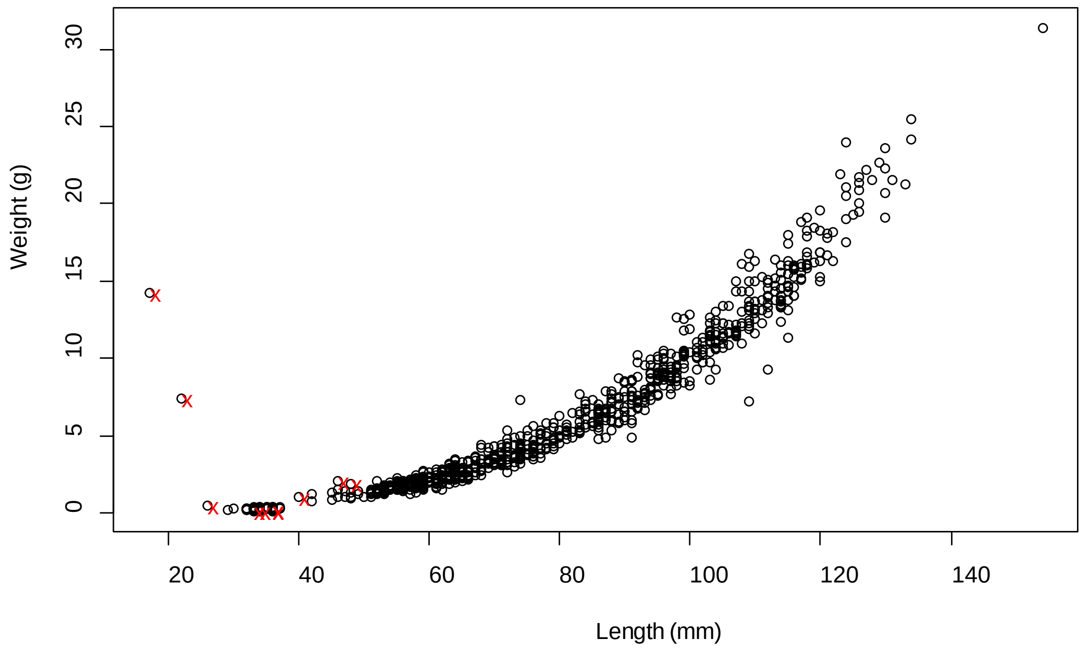

Figure 5.4.3-4. Fish weight plotted against length for coho salmon. Outliers identified by Grubbs Test are marked with red "x".

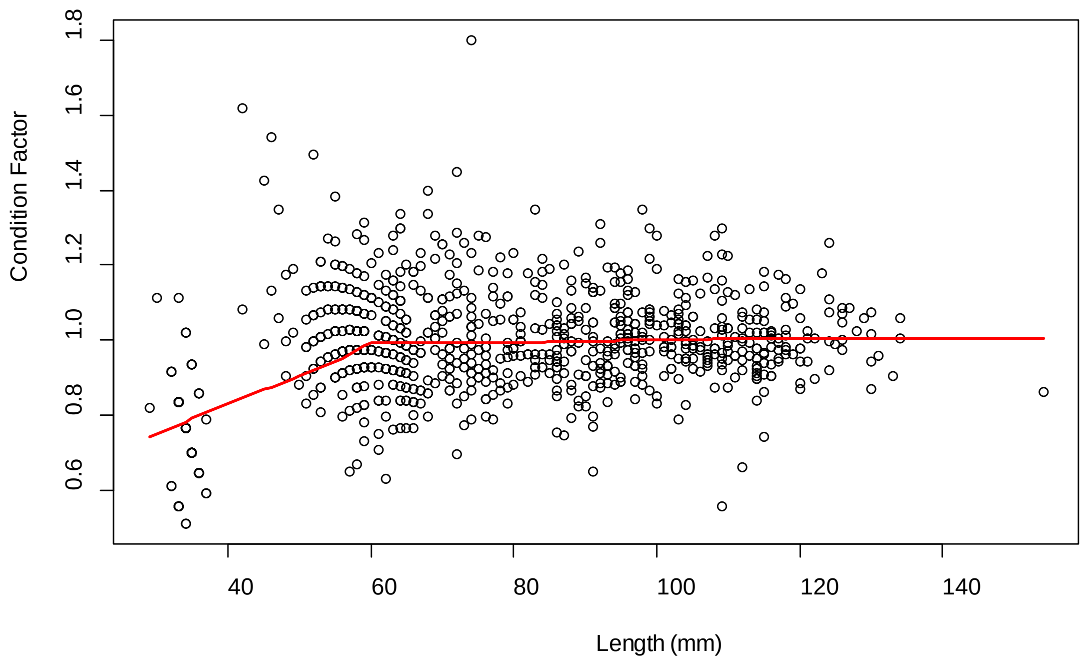

Figure 5.4.3-5. Condition factor plotted against fish length for coho salmon. Red line is a local regression smoother, which indicates that condition factors are lower and increasing for fish < 60mm.

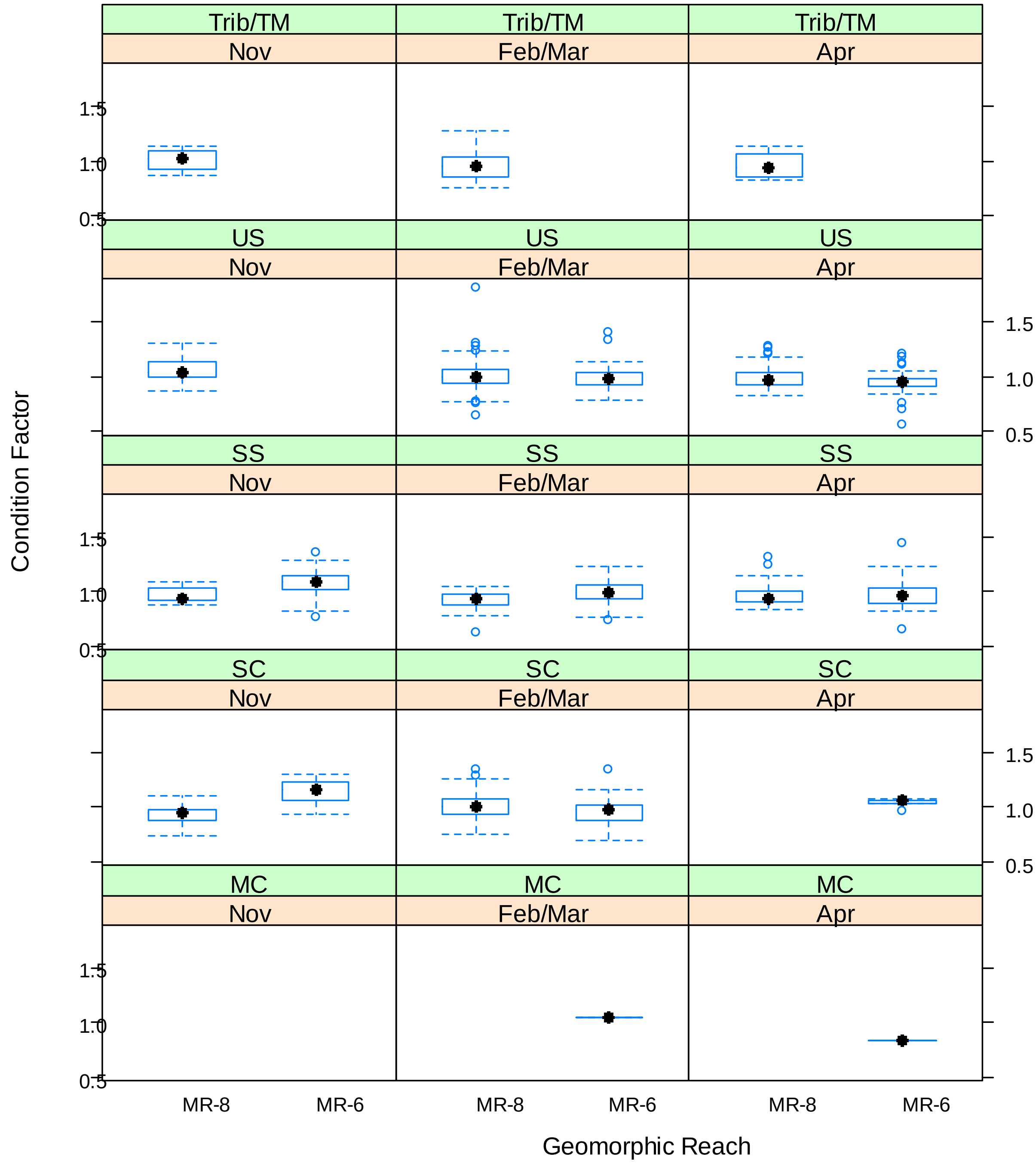

Figure 5.4.3-6. Box plot showing distribution of condition factors for coho salmon by Geomorphic Reach, sampling period, and macrohabitat type.

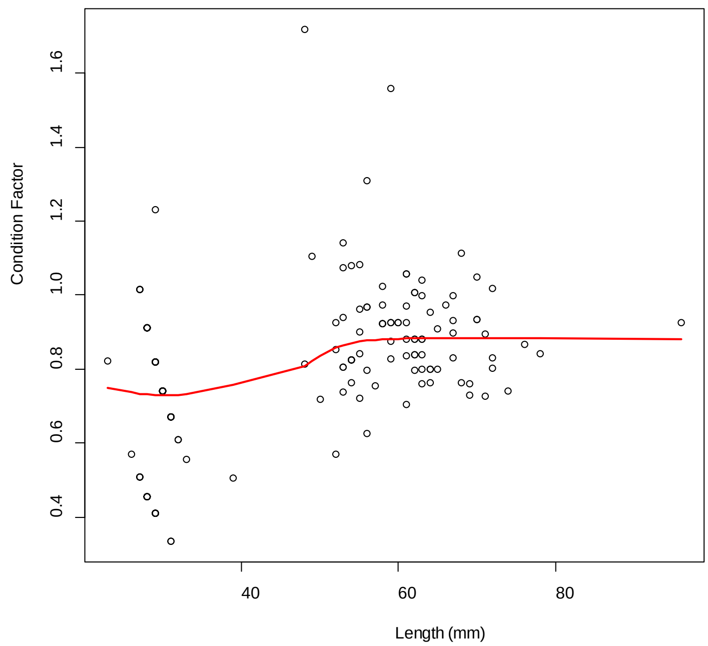

Figure 5.4.3-7. Condition factor plotted against fish length for sockeye salmon. Red line is a local regression smoother, which indicates that condition factors are highly variable for small fish.

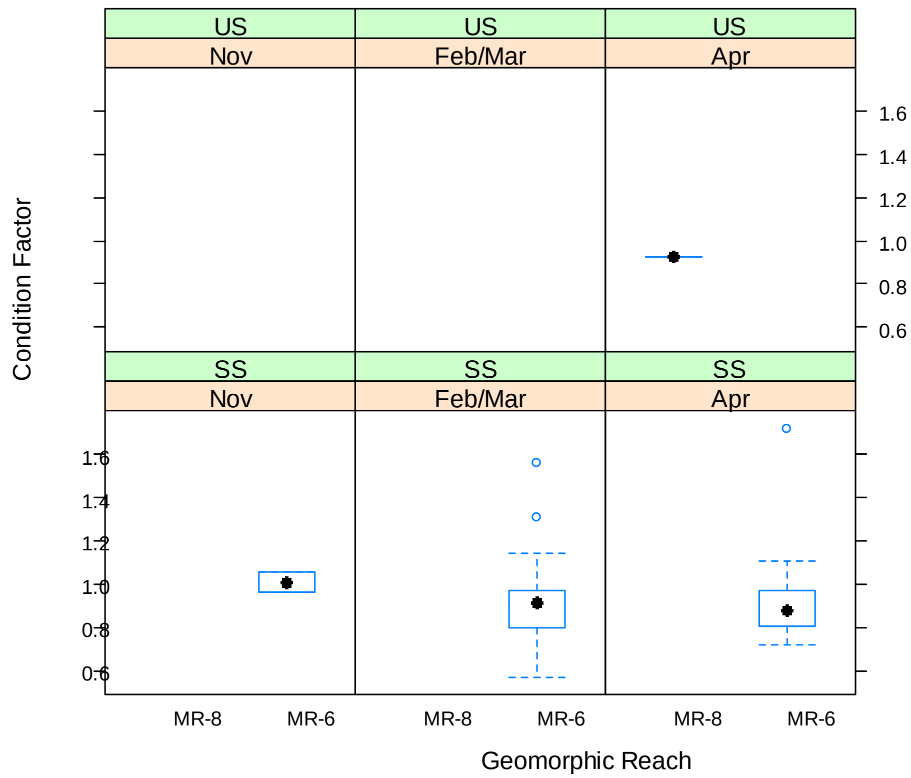

Figure 5.4.3-8. Box plot showing distribution of condition factors for sockeye salmon by Geomorphic Reach, sampling period, and macrohabitat type.

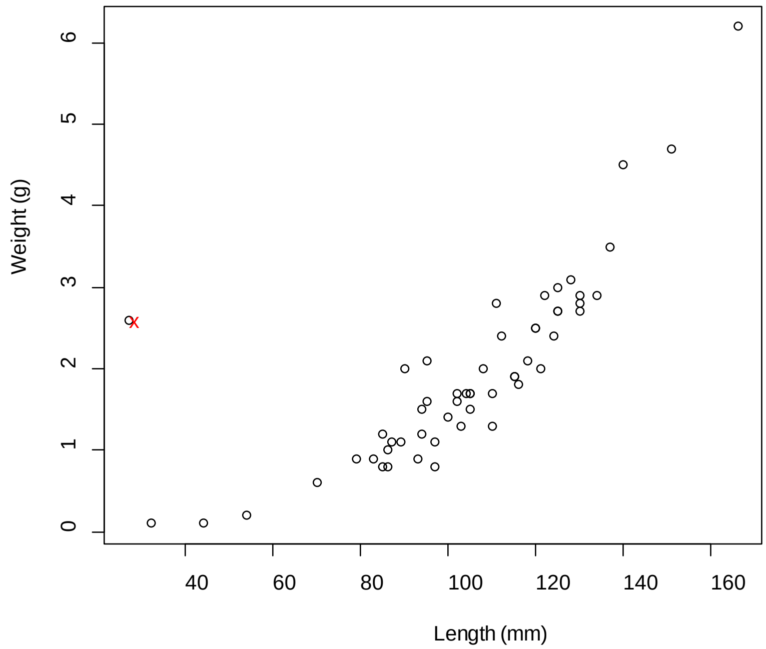

Figure 5.4.3-9. Fish weight plotted against length for lamprey. One outlier identified by Grubbs Test is marked with red "x".

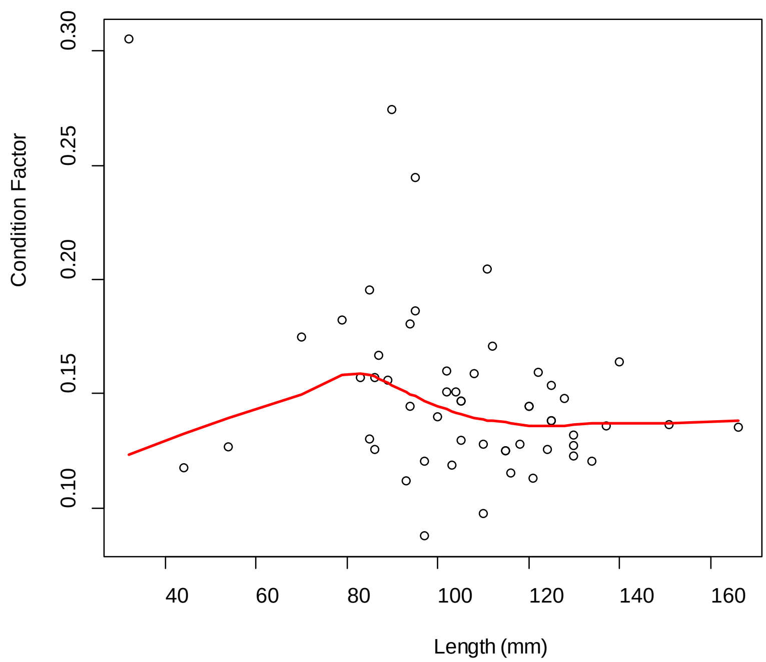

Figure 5.4.3-10. Condition factor plotted against fish length for lamprey. Red line is a local regression smoother.

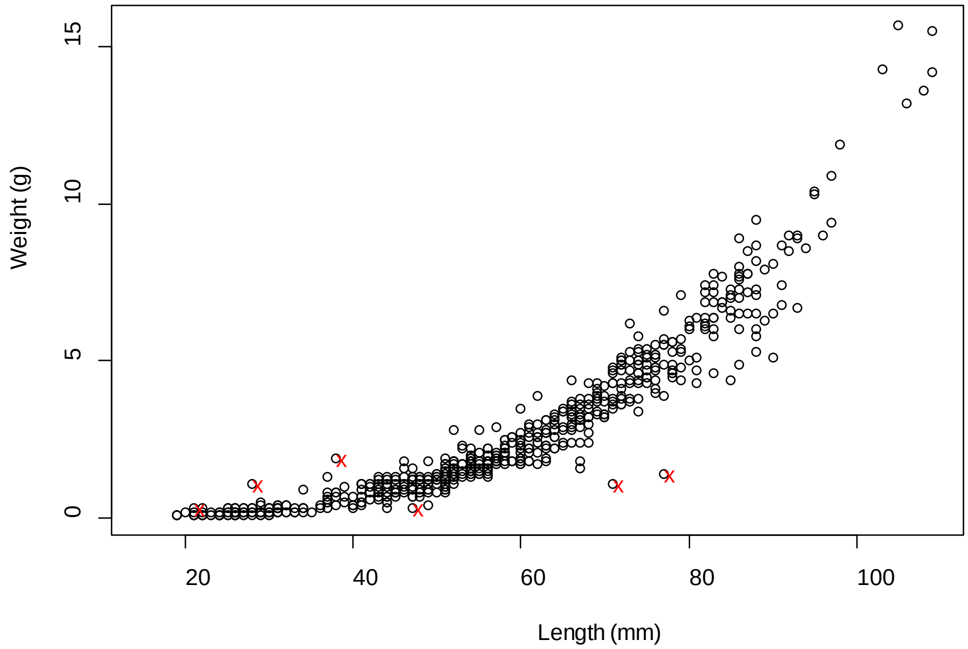

Figure 5.4.3-11. Fish weight plotted against length for sculpin. Outliers identified by Grubbs Test are marked with red "x".

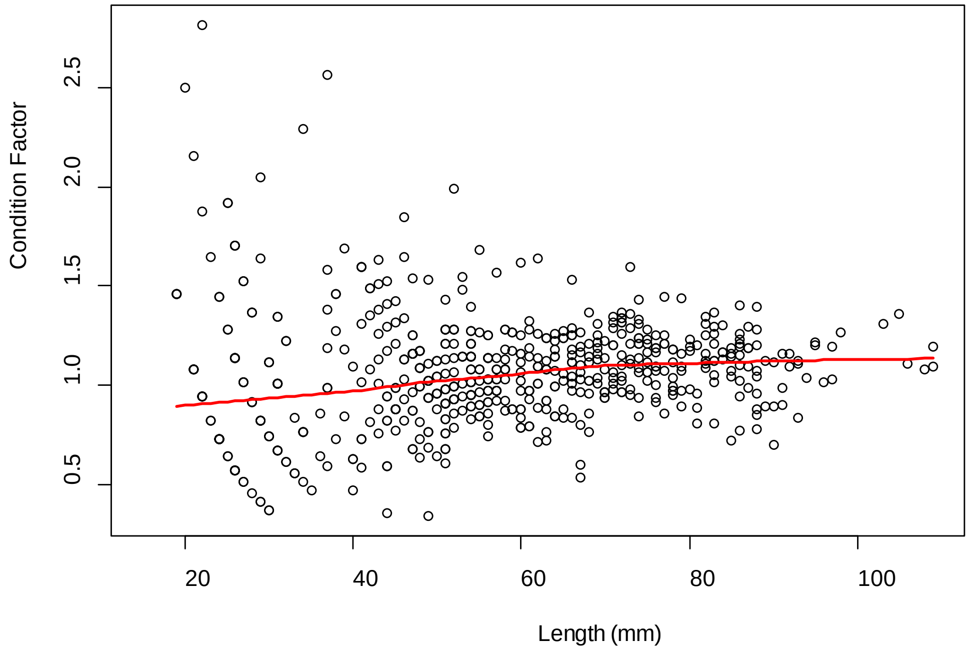

Figure 5.4.3-12. Condition factor plotted against fish length for sculpin. Red line is a local regression smoother, which indicates that condition factors are highly variable for small fish.

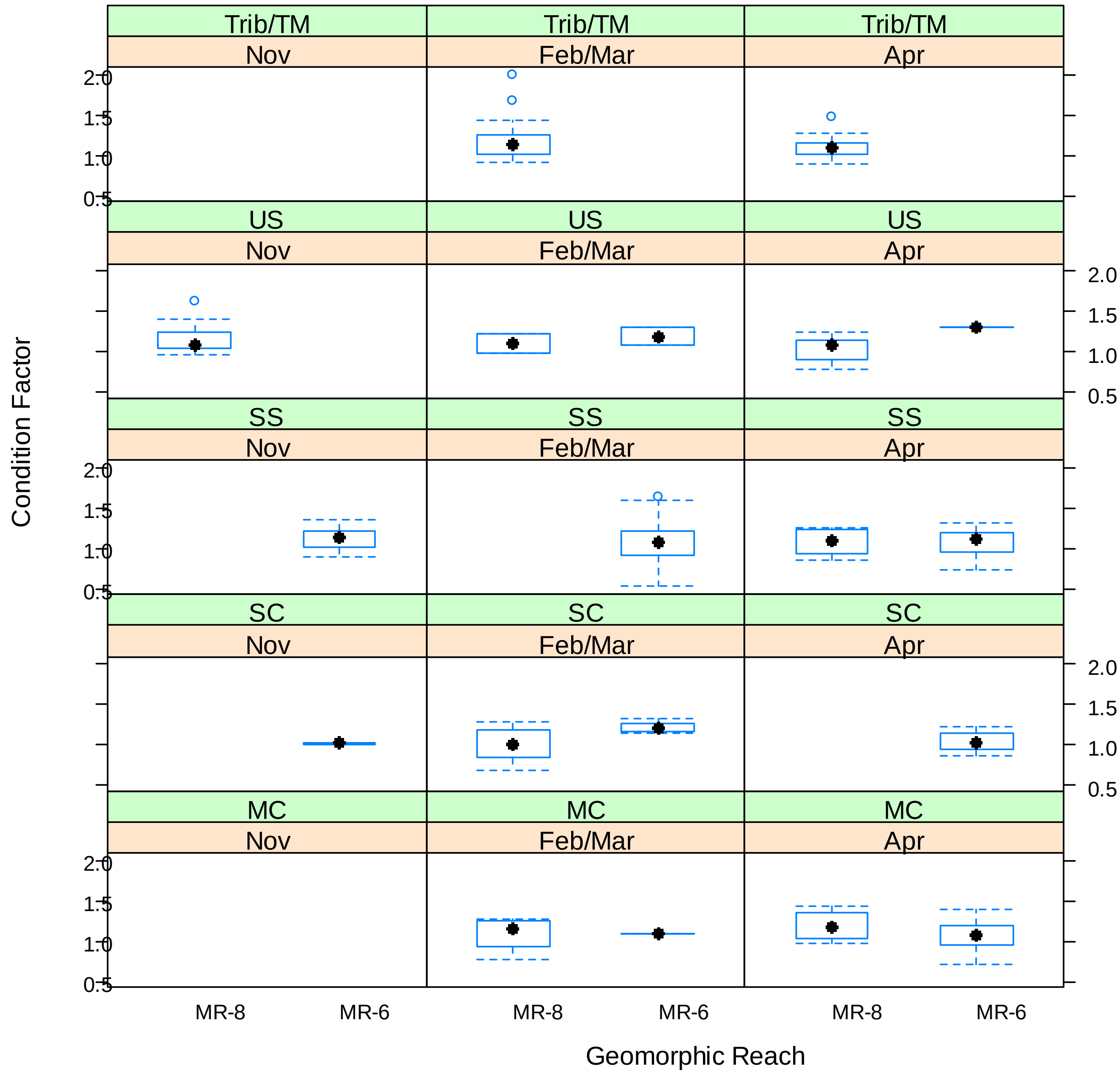

Figure 5.4.3-13. Box plot showing distribution of condition factors for sculpin by Geomorphic Reach, sampling period, and macrohabitat type.