

Peterson Creek Streamgage, 2012–2018

by

Jarrold Sowa

March 2013

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

The following symbols and abbreviations, and others approved for the Système International d'Unités (SI), are used without definition in the following reports by the Divisions of Sport Fish and of Commercial Fisheries: Fishery Manuscripts, Fishery Data Series Reports, Fishery Management Reports, and Special Publications. All others, including deviations from definitions listed below, are noted in the text at first mention, as well as in the titles or footnotes of tables, and in figure or figure captions.

Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative Code		all standard mathematical signs, symbols and abbreviations	
deciliter	dL		AAC		
gram	g	all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.	alternate hypothesis	H _A
hectare	ha			base of natural logarithm	e
kilogram	kg	all commonly accepted		catch per unit effort	CPUE
kilometer	km	professional titles	e.g., Dr., Ph.D., R.N., etc.	coefficient of variation	CV
liter	L			common test statistics	(F, t, χ^2 , etc.)
meter	m	at	@	confidence interval	CI
milliliter	mL	compass directions:		correlation coefficient (multiple)	R
millimeter	mm	east	E	correlation coefficient (simple)	r
Weights and measures (English)		north	N	covariance	cov
cubic feet per second	ft ³ /s	south	S	degree (angular)	°
foot	ft	west	W	degrees of freedom	df
gallon	gal	copyright	©	expected value	E
inch	in	corporate suffixes:		greater than	>
mile	mi	Company	Co.	greater than or equal to	≥
nautical mile	nmi	Corporation	Corp.	harvest per unit effort	HPUE
ounce	oz	Incorporated	Inc.	less than	<
pound	lb	Limited	Ltd.	less than or equal to	≤
quart	qt	District of Columbia	D.C.	logarithm (natural)	ln
yard	yd	et alii (and others)	et al.	logarithm (base 10)	log
Time and temperature		et cetera (and so forth)	etc.	logarithm (specify base)	log ₂ , etc.
day	d	exempli gratia		minute (angular)	'
degrees Celsius	°C	(for example)	e.g.	not significant	NS
degrees Fahrenheit	°F	Federal Information Code	FIC	null hypothesis	H ₀
degrees kelvin	K	id est (that is)	i.e.	percent	%
hour	h	latitude or longitude	lat. or long.	probability	P
minute	min	monetary symbols		probability of a type I error	
second	s	(U.S.)	\$, ¢	(rejection of the null hypothesis when true)	α
Physics and chemistry		months (tables and figures): first three letters	Jan,...,Dec	probability of a type II error	
all atomic symbols		registered trademark	®	(acceptance of the null hypothesis when false)	β
alternating current	AC	trademark	™	second (angular)	"
ampere	A	United States		standard deviation	SD
calorie	cal	(adjective)	U.S.	standard error	SE
direct current	DC	United States of America (noun)	USA	variance	
hertz	Hz	U.S.C.	United States Code	population sample	Var var
horsepower	hp				
hydrogen ion activity (negative log of)	pH				
parts per million	ppm	U.S. state	use two-letter abbreviations		
parts per thousand	ppt, ‰		(e.g., AK, WA)		
volts	V				
watts	W				

REGIONAL OPERATIONAL PLAN SF.4A.2013.04

PETERSON CREEK STREAMGAGE, 2012–2018

by

Jarrold Sowa

Alaska Department of Fish and Game, Sport Fish Division, Douglas

Alaska Department of Fish and Game
Sport Fish Division

March 2013

The Regional Operational Plan Series was established in 2012 to archive and provide public access to operational plans for fisheries projects of the Divisions of Commercial Fisheries and Sport Fish, as per joint-divisional Operational Planning Policy. Documents in this series are planning documents that may contain raw data, preliminary data analyses and results, and describe operational aspects of fisheries projects that may not actually be implemented. All documents in this series are subject to a technical review process and receive varying degrees of regional, divisional, and biometric approval, but do not generally receive editorial review. Results from the implementation of the operational plan described in this series may be subsequently finalized and published in a different department reporting series or in the formal literature. Please contact the author if you have any questions regarding the information provided in this plan. Regional Operational Plans are available on the Internet at: <http://www.adfg.alaska.gov/sf/publications/>

*Jarrod Sowa
Alaska Department of Fish and Game, Division of Sport Fish
802 3rd Street, Douglas AK 99811-0024*

This document should be cited as:

Sowa, J. 2013. Peterson Creek Streamgage, 2012–2018. Alaska Department of Fish and Game, Division of Sport Fish, Regional Operational Plan ROP.SF.4A.2013.04, Douglas.

The Alaska Department of Fish and Game (ADF&G) administers all programs and activities free from discrimination based on race, color, national origin, age, sex, religion, marital status, pregnancy, parenthood, or disability. The department administers all programs and activities in compliance with Title VI of the Civil Rights Act of 1964, Section 504 of the Rehabilitation Act of 1973, Title II of the Americans with Disabilities Act (ADA) of 1990, the Age Discrimination Act of 1975, and Title IX of the Education Amendments of 1972.

If you believe you have been discriminated against in any program, activity, or facility please write:

ADF&G ADA Coordinator, P.O. Box 115526, Juneau, AK 99811-5526

U.S. Fish and Wildlife Service, 4401 N. Fairfax Drive, MS 2042, Arlington, VA 22203

Office of Equal Opportunity, U.S. Department of the Interior, 1849 C Street NW MS 5230, Washington DC 20240

The department's ADA Coordinator can be reached via phone at the following numbers:

(VOICE) 907-465-6077, (Statewide Telecommunication Device for the Deaf) 1-800-478-3648,

(Juneau TDD) 907-465-3646, or (FAX) 907-465-6078

For information on alternative formats and questions on this publication, please contact:

ADF&G, Division of Sport Fish, Research and Technical Services, 333 Raspberry Rd, Anchorage AK 99518 (907) 267-2375

Signature Page

Project Title: Peterson Creek Streamgage

Project leader(s): Jarrod Sowa

Division, Region and Area: Sport Fish, Region 4

Project Nomenclature:

Period Covered: 09/27/2012 to 10/01/2018

Field Dates: 09/27/2012 to 10/01/2017

Plan Type: Category I

Approval

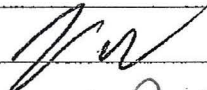
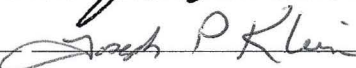
Title	Name	Signature	Date
Project leader	Jarrod Sowa		3/22/2013
Research Coordinator	Joe Klein		3/23/2013

TABLE OF CONTENTS

	Page
LIST OF TABLES.....	iii
LIST OF FIGURES.....	iii
LIST OF APPENDICES	iv
PURPOSE.....	1
OBJECTIVE.....	2
METHODS.....	2
Study area	2
Study design	3
Data Compilation and Collection	3
Biologic Data Compilation	3
Hydrologic Data Collection.....	3
Biologic Data Collection	4
Data Reduction	4
Data Analysis.....	5
SCHEDULES AND DELIVERABLES.....	5
RESPONSIBILITIES	6
REFERENCES CITED	6
TABLES AND FIGURES.....	7
APPENDIXA: FIELD CHECKLIST	21

LIST OF TABLES

Table	Page
Table 1.–Fish periodicity table for Peterson Creek.	8
Table 2.–ADF&G Gage (13601) discharge measurement summary.	10

LIST OF FIGURES

Figure	Page
Figure 1.–Peterson Creek area map.	11
Figure 2.–Barrier falls 2.5 miles upstream from salt chuck on Peterson Creek that inhibits upstream fish passage.	12
Figure 3.–Peterson Creek Reach A and location selected for streamgage 13601.....	13
Figure 4.–Looking downstream from Glacier Highway bridge at ADF&G Streamgage 13601, with pressure transducer house in pipe secured to stream bank with brackets and rebar.	14
Figure 5.–ADF&G Gage 11401 reference mark map.....	15
Figure 6.–Looking downstream from Glacier Highway bridge showing reference mark (RM1) for comparative water surface elevation measurements.	16
Figure 7.–Second water surface elevation marker (RM2) located at end of bridge abutment.....	17
Figure 8.–Third water surface elevation marker (RM3) ;bolt on guardrail seen looking south along Glacier Highway.	18
Figure 9.–Five discharge measurements used to define the preliminary stage-discharge relationship (rating curve) at ADF&G Gage 13601.	19

LIST OF APPENDICES

Appendix	Page
Appendix A1.—Field check list.	22

PURPOSE

Alaska's rivers and lakes support some of North America's most viable and productive salmon fisheries. Over 17,000 streams, rivers, or lakes have been identified throughout the state as being important for spawning, rearing or migration of anadromous fish (Klein 2012). Fish migration, spawning, rearing, and ultimately production in these water bodies are dependent upon sufficient seasonal quantities of water. Demand for water to support hydroelectric power generation, petroleum production, mining, water supply (including out-of-state export), residential, forestry, agriculture, and other projects have the potential to modify the naturally occurring instream flows to which fish have adapted to and are dependent upon (Poff et al. 1997).

The Fish and Game Act requires the Alaska Department of Fish and Game (ADF&G), to "...manage, protect, maintain, improve, and extend the fishery resources of the state in the interest of the economy and general well-being of the state" (Alaska Statute 16.05.020; AS). One mechanism ADF&G uses to fulfill its mandate is to reserve water in rivers and lakes for fish and wildlife. An appropriation of water that remains within a river is legally defined under Alaskan law (AS 46.15.145) and regulations (11 AAC 93.970) as a reservation of water. To reserve water, an application with supporting data and analyses must be submitted to the Alaska Department of Natural Resources (DNR). A minimum of five years of mean daily flow data is recommended by DNR to quantify instream flow requirements within an application. A reservation of water application must contain supporting data and analyses that demonstrate the need for the amount of water being requested.

The State of Alaska Legislature amended the Alaska Water Use Act in 1980 to allow instream flows to be legally reserved by a private individual, group, or government agency in order to maintain specific flow rates in a river or volumes and water levels in a lake during specified time periods for one or a combination of four types of uses:

- protection of fish and wildlife habitat, migration, and propagation;
- recreation and parks purposes;
- navigation and transportation purposes; and
- sanitary and water quality purposes.

Priority dates for reservation of water applications are based on the date that they are accepted by the DNR. Alaska water law is based on the doctrine of prior appropriation also known as "first in time first in right". According to the rules of prior appropriation, the right to the full volume of water is first given to the appropriator who has the earliest priority date to beneficially use the water. This senior water right holder has a legal standing to assert that right against conflicting uses of water from others who do not have water rights or who are junior in priority.

In 2004, Peterson Creek was selected through a process of regional staff scoping by Region 1 ADF&G Division of Sport Fish staff as a candidate for a reservation of water. The streamflow data necessary to file a reservation of water does not exist for Peterson Creek. This project will collect the streamflow data necessary to file a reservation of water application with the DNR for one reach of Peterson Creek.

This operational plan serves to provide project-specific information and rationale to supplement the Surface-water data manual for the Statewide Aquatic Resources Coordination Unit (SARCU; Klein 2013).

OBJECTIVE

The objective of this project is to collect the streamflow data necessary to file a reservation of water application to reserve instream flows within one reach of Peterson Creek. Two tasks are necessary to complete this objective and include:

Tasks

1. Install and operate a streamgage for five years within one reach of Peterson Creek.
2. Complete and file a reservation of water application for one reach of Peterson Creek in order to protect fish habitat, migration, and propagation.

METHODS

STUDY AREA

Peterson Creek is located 19 miles northwest of Juneau at mile 25 of Glacier Highway (Figure 1). The creek has been catalogued by the ADF&G as Anadromous Waters Catalog (AWC) stream number 111-50-10100 (Johnson and Blanche 2012) and has approximately two miles of anadromous waters. The creek supports populations of coho salmon (*Oncorhynchus kisutch*), pink salmon (*O. gorbuscha*), chum salmon (*O. keta*), steelhead (*O. mykiss*), cutthroat trout (*O. clarki*), and Dolly Varden char (*Salvelinus malma*).

Peterson Creek drains out of Peterson Lake and flows downstream five miles to a salt chuck before eventually entering Amalga Harbor. A barrier falls (Figure 2) is located 2.5 miles upstream from the salt chuck and prevents anadromous fish from accessing the upper creek and lake. The watershed has a drainage area of approximately 10 square miles.

Peterson Creek is located within the temperate coastal rainforest of Southeast Alaska. The climate of this area is characterized by cold, snowy winters and cool wet summers. The majority of the Peterson Creek watershed is within the Tongass National Forest. The lower portion of watershed near the Glacier Highway is City and Borough of Juneau land.

Peterson Creek is a popular steelhead fishery for Juneau area anglers. It also serves as a steelhead index stream for the ADF&G Division of Sport Fish snorkel survey project. An ADF&G Division of Sport Fish weir on the creek monitored steelhead immigration from 1989 to 1991. During this study an average of 205 steelhead immigrated into the creek per year.

STUDY DESIGN

Following the approach and guidelines set forth in Klein (2013) and the DNR Handbook (DNR 1985), one reach (Reach A, Figure 3) of Peterson Creek was selected for instream flow protection. Reach A begins just upstream of the salt chuck and extends approximately 2.5 miles to the base of the barrier falls. No major tributaries enter the creek between the salt chuck and the barrier falls. Therefore, streamflows within the reach are assumed to be relatively uniform. This reach encompasses all the anadromous waters of the mainstem and provides important habitat for fish spawning, incubation, rearing, and passage life phases (Johnson and Blanche 2012; B. Glynn, ADF&G, Fishery Biologist, Douglas, Alaska, 2007, personal communication).

In order to collect the stream flow data necessary to file a reservation of water application for Reach A ADF&G will operate a streamgage (ADF&G Gage 13601) for five years within the reach. The streamgage is located just downstream of the Glacier Highway bridge near the middle of the reach (Figure 3). ADF&G Gage 13601 has been operational since September 27, 2012 and will continue to operate until October 1st, 2017 or until five years of streamflow data has been collected.

After biological data compilation and streamflow data collection are completed and the data have been analyzed, work will begin to complete a reservation of water application for submittal to DNR for one reach of Peterson Creek. Instream flow requests for the reach will be determined using the flow duration method (Annear 2004).

DATA COMPILATION AND COLLECTION

Biologic Data Compilation

Fish distribution and periodicity data will be compiled and summarized from scientific literature, local ADF&G biologists, the *Catalog of Waters Important for the Spawning, Rearing or Migration of Anadromous Fishes*, its associated Atlas (Johnson and Blanche 2012), and the Division of Sport Fish Statewide Harvest Survey publication.. With the help of Juneau area fishery biologists, a fish periodicity chart (Table 1) that includes all fish species present in Peterson Creek and details the timing of life history phases, will be finalized and included in the reservation of water application.

Hydrologic Data Collection

Hydrologic data collection for Peterson Creek will follow U.S. Geological Survey (USGS) standards as described in Klein (2013). When the creek is wadeable a Price AA, Pygmy, or acoustic Doppler velocity meter and tagline will be used to measure discharge. During high water conditions when the creek cannot be waded, a Teledyne-RDI Streampro[®] Acoustic Doppler Current Profiler (ADCP) will be used. One person will cross the bridge to the opposite bank or a throw bag will be used to get the rope used to tether and tow the Streampro[®] across the creek.

All scientific equipment will be calibrated and maintained according to manufacturer specifications and USGS standards. ADF&G employees Jason Hass and Jarrod Sowa will perform all field duties with funding provided by the Alaska Sustainable Salmon Fund.

Stage and water temperature are measured at ADF&G gage 13601 using an Insitu[®] Level Troll 500 pressure transducer housed in a 1-1/4" pipe that is secured to the stream bank with custom pipe brackets and 5/8" rebar (Figure 4). The pressure transducer was programmed at the time of installation to measure stage and water temperature every fifteen minutes on the quarter hour.

Typically, ADF&G installs a staff gage in the gage pool and the pressure transducer is programmed to read the same as the staff gage. To avoid the potential for vandalism and also make the streamgage site more aesthetically pleasing it was decided to not install a highly visible staff gage. In lieu of installing a staff gage, water surface elevations (WSE) will be surveyed using an auto level every field visit. Three survey reference marks (RMs) were established near the transducer (Figure 5) to establish the gage datum. An arbitrary elevation of 20 feet was given to RM 1 (Figure 6). WSE in relation to RM 1 was determined by differential surveying techniques at the time of the transducer installation. At this time, the transducer was set to read the surveyed water surface elevation. The transducer and surveyed WSE are compared at each site visit to determine if the surveyed WSE is being represented correctly by the transducer. If a deficiency is identified, protocols described in Klein (2013) or manufacturer guidelines will be followed to correct the problem.

Two additional RMs (named RM2 and RM3) were established near the gage site to monitor possible changes in the elevation of RM1. These RM's are part of the bridge abutment and a bolt on the nearby highway guardrail (Figures 7 and 8). The differences in the elevations of these RM's in relation to RM1 were measured using standard differential surveying techniques following USGS protocols (Kenney 2010). The RM elevations will be surveyed at least once a year and also at the time of gage removal.

To define the stage-discharge relationship, discharge measurements will be taken near ADF&G gage 13601, at least twelve times a year over a range of low to high flows and during different seasons that the gage is operational. To date, seven instantaneous discharge measurements have been collected (Figure 9, Table 2). When the creek is frozen during the winter, the ice will be removed by spud bar or an ice auger will be used to drill holes in the ice.

Biologic Data Collection

At this time, biological data will not be collected at the creek. If it is determined that biological data are lacking or needs further refinement protocols will be developed to collect the necessary data.

DATA REDUCTION

Stage and water temperature data will be transferred from the transducer to a Rugged Reader[®] Pocket PC then uploaded to a personal desktop computer. The stage data will then be converted to Excel or comma delimited text files and entered into the Water Information System Kisters Inc. (WISKI) hydrologic software package. Discharge measurements and observed staff gage readings will be entered into the BIBER component of WISKI. Electronic copies of field notes,

photographs, and level summary records will be stored in folders associated with the gaging station name and number on the WISKI dedicated server. Further data reduction details are provided in Klein (2013).

DATA ANALYSIS

Analyses for ADF&G Gage 13601 will be performed following USGS standards and protocols and will include: development of a stage-discharge rating, discharge measurement summaries, associated shift analysis if applicable, a table of applied datum and gage-height corrections, mean daily flow computations for each day of record, mean monthly flow for each month of record, and a station description and manuscript (a synopsis that describes the gage site, mechanics and other pertinent information regarding the gage station operation).

SCHEDULES AND DELIVERABLES

Activity	Completion Date
Site Scoping	Completed
Gage installation	Completed on 09/27/2012
Site Visits (download stage data, perform discharge measurement)	At least 12 times a year at range of low to high flows, during different seasons, and when repairs and maintenance are required
Complete Surface Water Records for Water Year	February 28, following end of water year
Reservation of water application for reach completed	06/01/2014
Field data collection completed	10/01/2017
Amended reservation of water application	06/01/2018
FDS Report	10/01/2018

RESPONSIBILITIES

Jarrold Sowa, Fishery Biologist III

Duties: Project manager. Responsible for study design, data collection, reduction, and administration of project responsibilities. Responsible for preparation and review of operational plan, reservation of water application, and FDS report.

Jason Hass, Fishery Biologist II

Duties: Assist with data collection, reduction, and administration of project responsibilities. Provides biologic and hydrologic technical assistance. Assist with preparation and review of operational plan, reservation of water application, and FDS report.

Shawn Johnson, Fishery Biologist III

Duties: Assist with management, coordination, and administration of project responsibilities. Provides biologic and hydrologic technical assistance. Assist with preparation and review of operational plan, reservation of water application, and FDS report.

REFERENCES CITED

- Alaska Department of Fish and Game (ADF&G). 1999. Catalog of waters important for spawning, rearing, or migration of anadromous fishes, 1999. Alaska Department of Fish and Game, Habitat Division, Juneau.
- Annear, T., I. Chisholm, H. Beecher, A. Locke, and 12 other authors. 2004. Instream flows for riverine resource stewardship, revised edition. Instream Flow Council. Cheyenne, WY.
- DNR (Alaska Department of Natural Resources). 1985. State of Alaska instream flow handbook; a guide to reserving water for instream use. Alaska Department of Natural Resources, Division of Land and Water Management, Water Management Section, Anchorage.
- Johnson, J. and P. Blanche. 2012. Catalog of waters important for spawning, rearing, or migration of anadromous fishes – Southeastern Region, Effective June 1, 2012. Alaska Department of Fish and Game, Special Publication No. 12-07, Anchorage.
- Klein, J. 2012. Instream flow protection in Alaska, 2011. Alaska Department of Fish and Game, Special Publication No. 12-11, Anchorage.
- Klein, J. 2013. Surface-water data manual for the statewide aquatic resources coordination unit. Alaska Department of Fish and Game, Special Publication No. 13-05, Anchorage.
- Kenney, T. A. 2010. Levels at gaging stations. U. S. Department of Interior, U.S. Geological Survey Techniques and Methods 3-A19, Reston, VA. <http://pubs.usgs.gov/tm/tm3A19/>
- Poff, N.L., J.D. Allen, M.B. Bain, J.R. Karr, K.L. Prestergaard, B. Richter, R. Sparks, and J. Stromberg. 1997. The natural flow regime: a paradigm for river conservation and restoration. *Bioscience* 47:769-784.
- Rantz, S. E., and others. 1982. Measurement and computation of streamflow: Volume 1 and 2. Geological Survey Water-Supply Paper 2175, Reston, Va.

TABLES AND FIGURES

Table 1.–Fish periodicity table for Peterson Creek.

Coho Salmon

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage			XX	XXXX	XXXX	XX						
Adult Passage								XXXX	XXXX	XXXX	XX	
Spawning								XX	XXXX	XXXX	XXXX	XX
Incubation	XXXX	XXXX	XXXX	XXXX				XX	XXXX	XXXX	XXXX	XXXX
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

Pink Salmon

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fry Passage			XX	XXXX	XXXX	XX						
Adult Passage							XXXX	XXXX	XXXX			
Spawning							XX	XXXX	XXXX	XX		
Incubation	XXXX	XXXX	XXXX	XXXX	XX		XX	XXXX	XXXX	XXXX	XXXX	XXXX
Rearing				XXXX	XX							

Chum Salmon

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fry Passage			XX	XXXX	XXXX	XX						
Adult Passage							X	XXXX	XXXX	XX		
Spawning								XXXX	XXXX	XXX		
Incubation	XXXX	XXXX	XXXX	XXXX				XXXX	XXXX	XXXX	XXXX	XXXX
Rearing				XXXX	XX							

Dolly Varden

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt passage *			XXXX	XXXX	XXXX							
Adult passage			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	
Spawning									XX	XXXX	XX	
Incubation	XXXX	XXXX	XXXX	XXXX	XX				XX	XXXX	XXXX	XXXX
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

* DV and CT smolt defined as those fish undergoing initial emigration

Based upon professional judgment of ADF&G biologists

Smolt passage is for juvenile emigration to estuarine/marine environment

Adult passage: for salmon is immigration: for trout, char, and other species, immigration and emigration.

Incubation life phase includes time of egg deposition to fry emergence

? = Data not available or timing is incomplete

Table 1.–Page 2 of 2.

Cutthroat Trout

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt passage *			XXXX	XXXX	XXXX							
Adult passage			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	
Spawning				XXX	XXXX	XX						
Incubation				XXX	XXXX	XXXX	XXXX	XX				
Rearing	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX	XXXX

Steelhead

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Smolt Passage				XX	XXXX	XXXX						
Adult Passage Up				XXXX	XXXX	XXXX						
Adult Passage Down					XXXX	XXXX	XX					
Spawning				XX	XXXX	XXXX						
Incubation				XX	XXXX	XXXX	XXXX	XXXX				

* DV and CT smolt defined as those fish undergoing initial emigration

Based upon professional judgment of ADF&G biologists

Smolt passage is for juvenile emigration to estuarine/marine environment

Adult passage: for salmon is immigration; for trout, char, and other species, immigration and emigration.

Incubation life phase includes time of egg deposition to fry emergence

? = Data not available or timing is incomplete

Table 2.--ADF&G Gage (13601) discharge measurement summary.

<i>Data Record Number</i>	<i>Date</i>	<i>Start Time</i>	<i>End Time</i>	<i>Made By</i>	<i>Width(ft)</i>	<i>Area (ft²)</i>	<i>Mean Vel (ft/s)</i>	<i>Q (cfs)</i>	<i>Staff Gage Stage Start</i>	<i>Staff Gage Stage End</i>	<i>No. Sections</i>	<i>Quality</i>	<i>Control</i>	Comments
1	9/27/2012	13:47	14:42	JJS/JTH	40	94	1.50	142	8.49	8.45	28	fair	clear	taken w/ AA. Installed gage.
2	10/3/2012	12:12	12:46	JJS/JTH	38	26	0.45	11	6.62	6.61	27	fair	clear	taken w/ AA
3	10/5/2012	14:12	14:56	JJS/JTH	40	27	0.56	13	6.63	6.62	32	fair	clear	taken w/ flowtracker. Flowtracker file corrupt.
4	12/20/2012	10:44	11:26	JJS/JTH	36	18	0.43	7.7	ice	ice	32	fair	ice	taken w/ flowtracker.
5	1/16/2013	11:29	12:03	JJS/JTH	44	70	1.30	89	7.81	7.77	27	fair	clear	taken w/ flowtracker.
6	2/1/2013	12:09	12:45	JJS/JTH	41	54	0.39	21	ice	ice	28	fair	ice	taken w/ flowtracker.
7	02/15/13	12:44	13:04	JJS/TCS	67	225	1.72	386	9.61	9.61	NA	fair	clear	near bankfull, creek overflowing at left edge. Taken w. Streampro

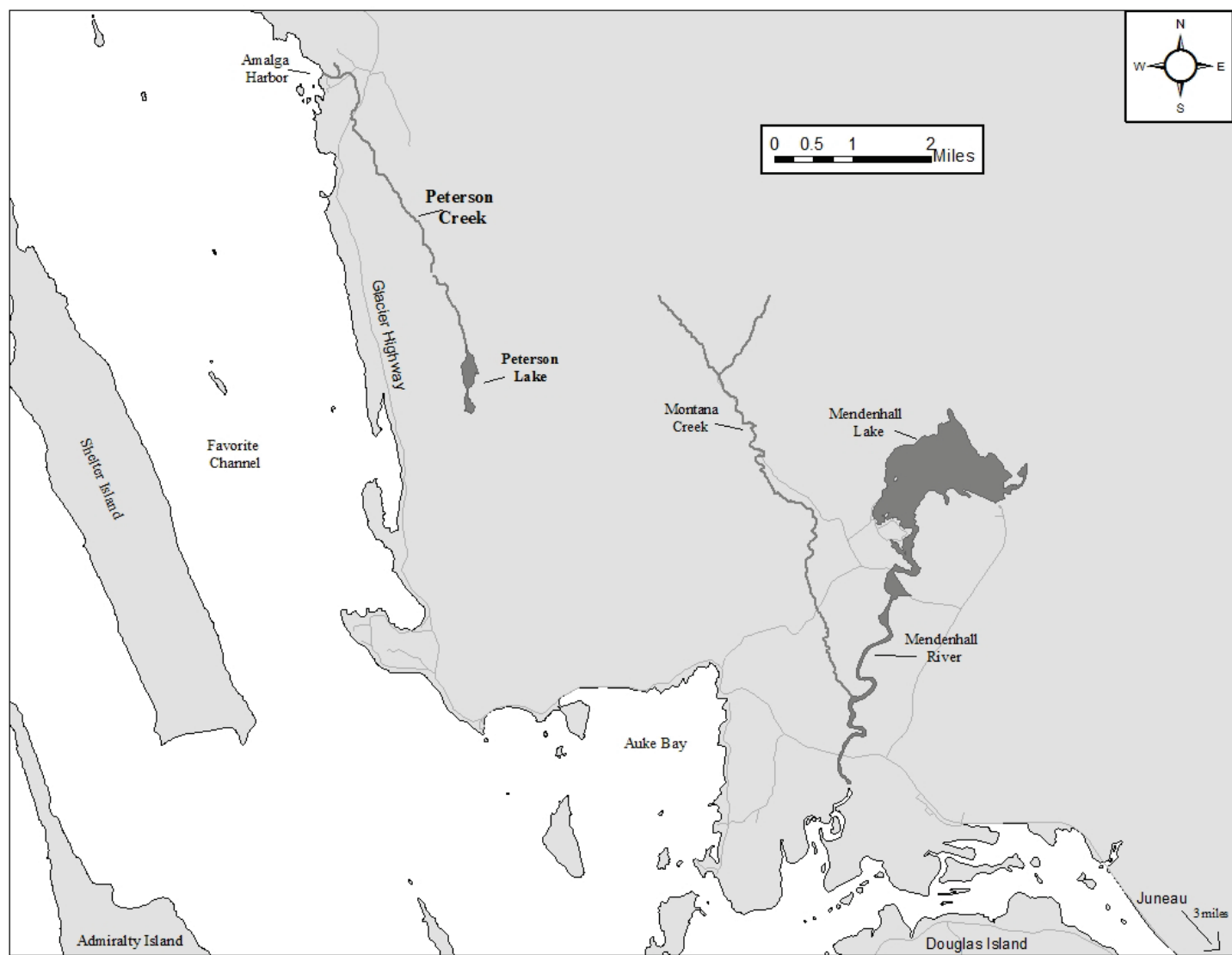


Figure 1.—Peterson Creek area map.



Figure 2.—Barrier falls 2.5 miles upstream from salt chuck on Peterson Creek that inhibits upstream fish passage.

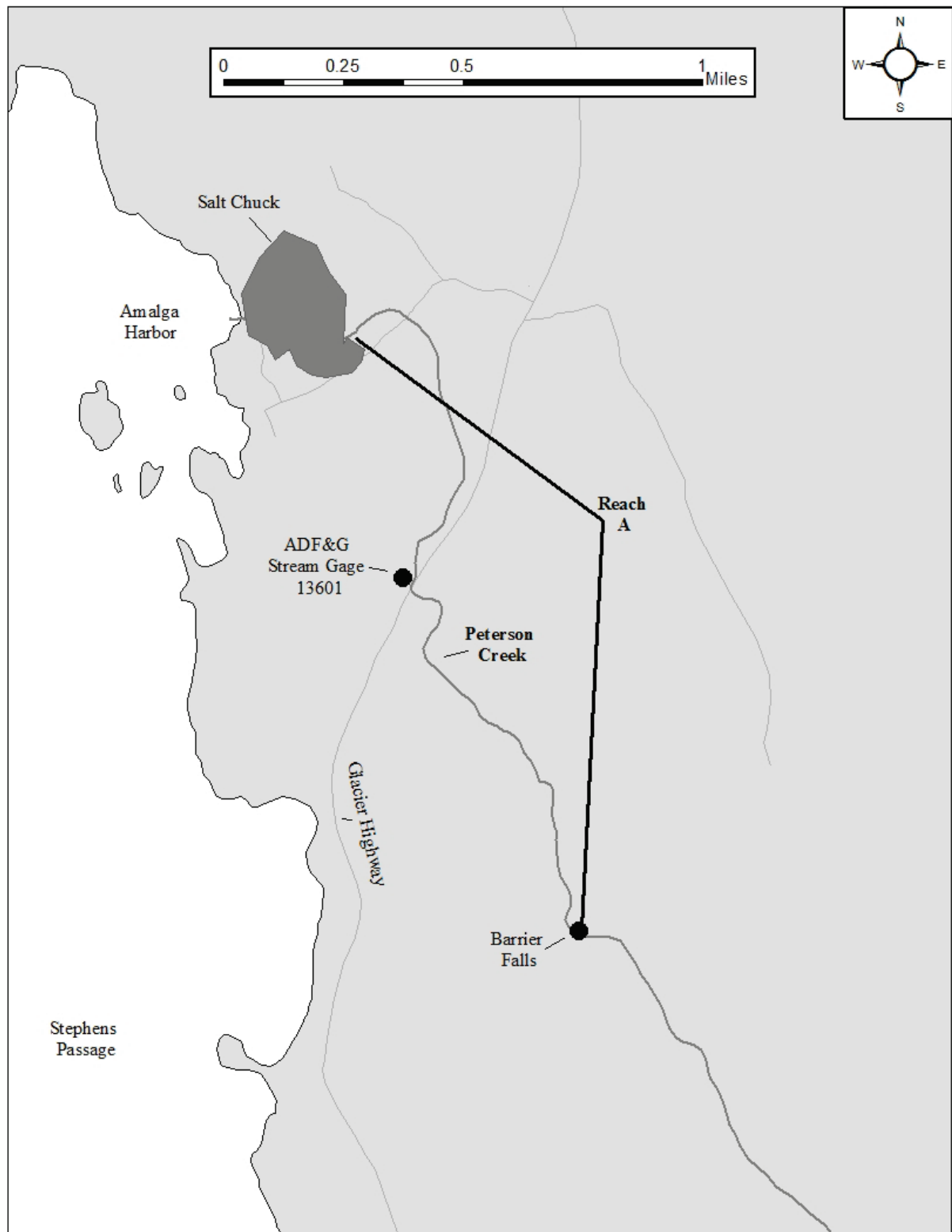


Figure 3.—Peterson Creek Reach A and location selected for streamgage 13601.



Figure 4.–Looking downstream from Glacier Highway bridge at ADF&G Streamgage 13601, with pressure transducer house in pipe secured to stream bank with brackets and rebar.

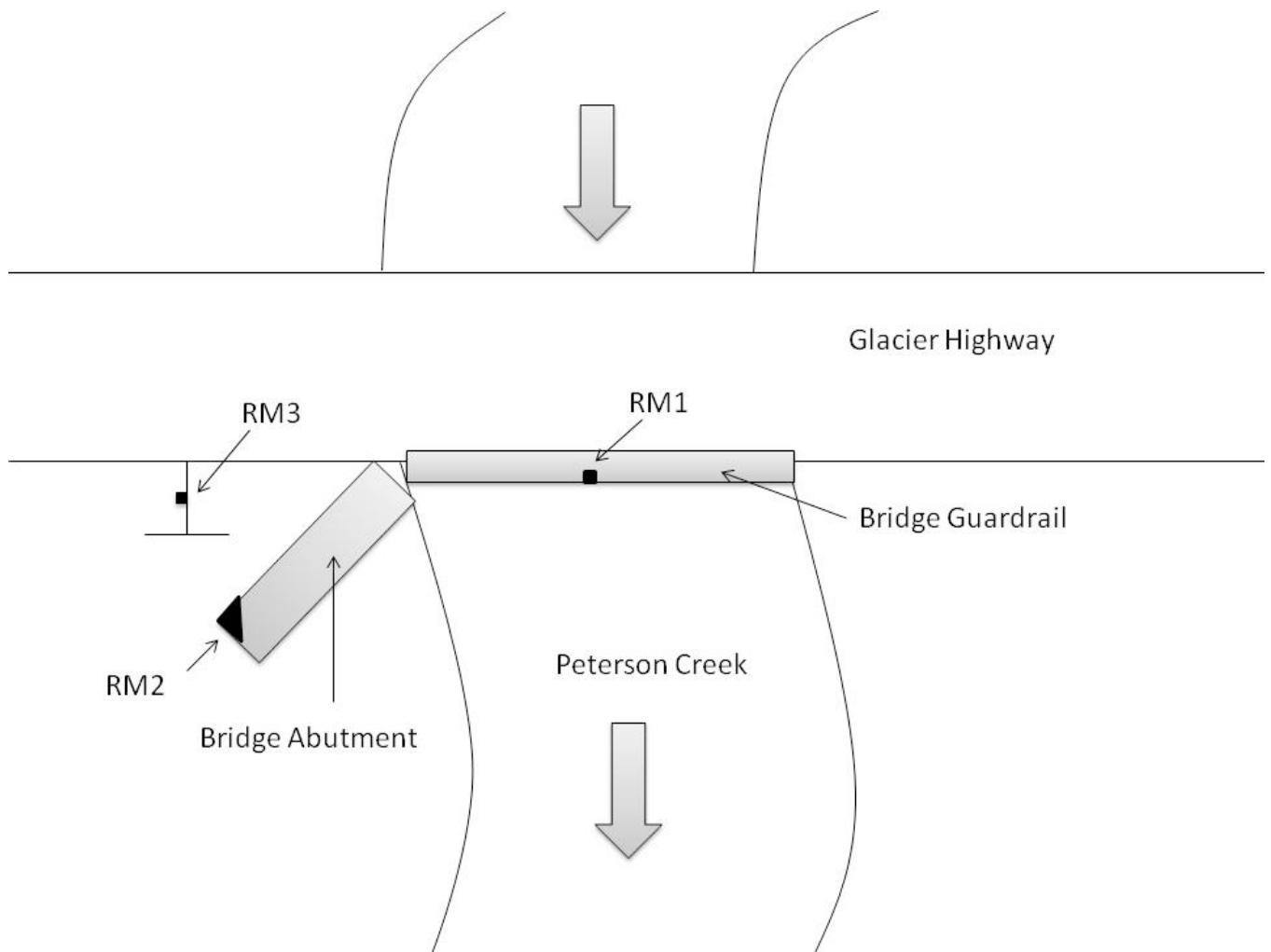


Figure 5.—ADF&G Gage 11401 reference mark map.



Figure 6.–Looking downstream from Glacier Highway bridge showing reference mark (RM1) for comparative water surface elevation measurements.



Figure 7.—Second water surface elevation marker (RM2) located at end of bridge abutment.



Figure 8.—Third water surface elevation marker (RM3) ;bolt on guardrail seen looking south along Glacier Highway.

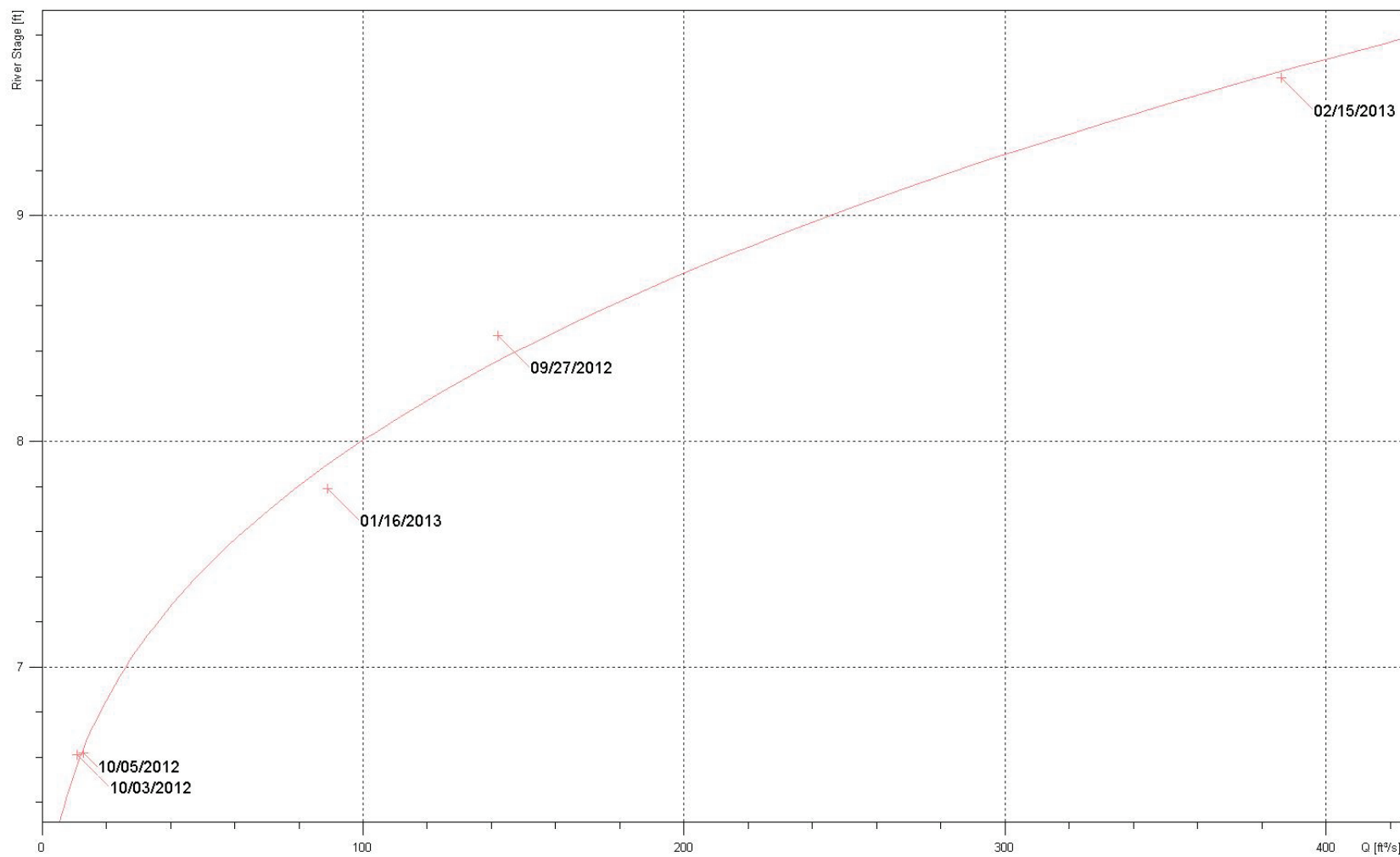


Figure 9.—Five discharge measurements used to define the preliminary stage-discharge relationship (rating curve) at ADF&G Gage 13601.

APPENDIXA: FIELD CHECKLIST

Appendix A1.–Field check list.

Pre Site Visit Checklist

- ☐ Obtain approval to travel from supervisor via email
- ☐ Contact Watershed Councils or other partners
- ☐ Reserve cabin, air charter, ferry (use STO unless < 4hr notice, or Wings of Alaska)
- ☐ Charge Batteries: camera, Rugged Reader, VHF, Aquacalc
- ☐ Spin test velocity meters
- ☐ Check weather
- ☐ Read last Field Trip Report
- ☐ Review stage data, rating curves, rating table, discharge summary sheet
- ☐ Print rating table, rating curve, benchmark locations, survey notes

Equipment Checklist

- ☐ Velocity meters (Pryce and/or Pygmy)
- ☐ Wading rod
- ☐ Tape measure
- ☐ Aquacalc
- ☐ Headphones
- ☐ Stopwatch
- ☐ Cables to connect Aquacalc to velocity meters
- ☐ Pencils
- ☐ Notebook/Discharge Measurement Sheets
- ☐ Camera
- ☐ Rating Table
- ☐ Stadia Rod, Auto Level, Tripod, Survey Notes
- ☐ Rugged Reader and cable to download data
- ☐ Dessicant
- ☐ Pipe wrenches, pipe goop, misc tools
- ☐ First Aid Kit
- ☐ Watch
- ☐ Extra 9V batteries for Aquacalc
- ☐ 12 gage w/ slugs/bear spray (if needed)
- ☐ Spare parts and oil for velocity meters
- ☐ Calculator

-continued-

Appendix A1.–Page 2 of 2.

Site Visit Checklist

- ☐ Take staff gage reading and photos
- ☐ Inspect site for changes to control, staff gage, channel, etc
- ☐ Take discharge measurement and record exact start/end time on discharge measurement notes sheet
- ☐ Take photos upstream/downstream, across discharge measurement
- ☐ Take staff gage reading after discharge measurement
- ☐ Take picture of control
- ☐ Download datalogger data. Check battery level and memory. View data.
- ☐ Take instantaneous probe reading and compare to staff gage
- ☐ Make sure probe test is running (Running Man)
- ☐ Record all pertinent information on discharge measurement sheet i.e.; weather, site conditions, equipment problems, changes to channel, changes to control, differences between staff gage and probe, work that needs to be completed at next visit, wildlife seen (especially fish activity), etc.
- ☐ Survey benchmarks/staff gage/control/WSE at installation, yearly, at decommission, and if staff gage is suspected to have moved. Make sure to move level and survey all stations again. Check data in the field before leaving and compare with old survey data.

Post Visit Checklist

- ☐ Download data from Aquacalc
- ☐ Download data from Rugged Reader
- ☐ Compare discharge data from Aquacalc to discharge measurement sheet.
- ☐ Make sure all pertinent information is posted to discharge measurements notes sheet.
- ☐ Post discharge measurement data to Shift Analysis sheet.
- ☐ Plot discharge measurement to rating curve.
- ☐ Post discharge measurement data to Flow Summary sheet.
- ☐ Convert stage, water temperature, observed staff gage, discharge measurement data into WISKI compatible format. Import data into WISKI.
- ☐ Review stage data to make sure probe is operating correctly.
- ☐ Post observed staff gage readings and probe readings to Gage Height Corrections Sheet. Difference between the two should be less than or equal to .03ft.
- ☐ Complete Field Trip Report
- ☐ Download and label pictures.