

**Fishery Data Series No. 12-08**

---

---

**Southeast Alaska Steelhead Snorkel Surveys of  
Regional Index Streams, 2008 and 2009**

by

**Roger D. Harding**

---

---

March 2012

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries





*FISHERY DATA SERIES NO. 12-08*

**SOUTHEAST ALASKA STEELHEAD SNORKEL SURVEYS OF  
REGIONAL INDEX STREAMS, 2008 AND 2009**

by  
Roger D. Harding  
Alaska Department of Fish & Game, Division of Sport Fish, Douglas

Alaska Department of Fish and Game  
Division of Sport Fish, Research and Technical Services  
333 Raspberry Road, Anchorage, Alaska, 99518-1599

Month 2012

Development and publication of this manuscript were partially financed by the Federal Aid in Sport fish Restoration Act (16 U.S.C.777-777K) under Projects F-10-23 and F-10-24.

ADF&G Fishery Data Series was established in 1987 for the publication of Division of Sport Fish technically oriented results for a single project or group of closely related projects, and in 2004 became a joint divisional series with the Division of Commercial Fisheries. Fishery Data Series reports are intended for fishery and other technical professionals and are available through the Alaska State Library and on the Internet: <http://www.adfg.alaska.gov/sf/publications/>. This publication has undergone editorial and peer review.

*Roger D. Harding<sup>a</sup>*

*Alaska Department of Fish and Game, Division of Sport Fish  
802 3<sup>rd</sup> St., Douglas, AK 99824, P.O. Box 110024, Juneau, AK 99811, USA*

*<sup>a</sup> Author to whom all correspondance should be addressed: [roger.harding@alaska.gov](mailto:roger.harding@alaska.gov)*

*This document should be cited as:*

*Harding, R. D. 2012. Southeast Alaska steelhead snorkel surveys of regional index streams, 2008 and 2009. Alaska Department of Fish and Game, Fishery Data Series No. 12-08, Anchorage.*

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

# TABLE OF CONTENTS

	<b>Page</b>
LIST OF TABLES.....	ii
LIST OF FIGURES.....	ii
LIST OF APPENDICES.....	ii
ABSTRACT.....	1
INTRODUCTION.....	1
OBJECTIVES.....	2
METHODS.....	2
Southeast Alaska Snorkel Surveys.....	2
Stream Temperature Monitoring.....	3
Calibration of Snorkel Counts to Weir Count.....	4
2008 and 2009.....	4
RESULTS.....	4
Southeast Alaska Snorkel Surveys, 2008.....	4
Southeast Alaska Snorkel Surveys, 2009.....	5
Stream Temperature Monitoring.....	6
Calibration of Snorkel Counts to Weir Count.....	6
2008 and 2009.....	6
Peak Survey to Total Escapement.....	8
DISCUSSION.....	9
ACKNOWLEDGMENTS.....	12
REFERENCES CITED.....	13
APPENDIX A.....	17
APPENDIX B.....	27

## LIST OF TABLES

<b>Table</b>	<b>Page</b>
1. Steelhead index streams surveyed in 2008 along with dates of peak or high counts and numbers of steelhead counted. ....	5
2. Steelhead index streams surveyed in 2009 along with dates of peak or high counts and numbers of steelhead counted. ....	5
3. Calibration of steelhead snorkel survey counts to Sitkoh weir escapements, 2008 and 2009. ....	6
4. Peak survey count to total escapement expansion factor data and calculations for Sitkoh Creek steelhead. ....	9
5. Steelhead snorkel surveys conducted on index streams in Southeast Alaska, 1997–2009. ....	11

## LIST OF FIGURES

<b>Figure</b>	<b>Page</b>
1. Locations of the Situk River and the steelhead index systems in Southeast Alaska surveyed in 2008 and 2009. ....	2
2. The daily average and high and low water temperatures recorded at steelhead index streams and the dates of “high” or “peak” snorkel counts during our 2008 and 2009 Southeast Alaska steelhead snorkel surveys. ....	7
3. Annual deviations from the 1997–2009 median peak snorkel survey count and the average annual deviation for Southeast Alaska steelhead snorkel surveys, 1997–2009. ....	10

## LIST OF APPENDICES

<b>Appendix</b>	<b>Page</b>
A1. Steelhead index stream name, anadromous stream number, management area, length and percent of stream surveyed, number of survey reaches, and approximate dates for start of weekly surveys for steelhead in 2008 and 2009. ....	18
A2. Counts of steelhead from 2008 surveys by stream, date, and reach of stream along with measured environmental variables. ....	19
A3. Counts of steelhead snorkel surveys from 2009 by stream, date, and reach of stream along with measured environmental variables. ....	23
B1. Computer data files used to prepare and generate estimates for the Southeast Alaska Snorkel Surveys of Regional Index Streams, 2008–2009. ....	28

## ABSTRACT

Snorkel surveys have been conducted annually since 1997 to monitor the spawning abundance of steelhead *Oncorhynchus mykiss* in 10 index streams in Southeast Alaska, and were conducted again during 2008 and 2009. These index streams were surveyed by a two- or three-person team using snorkel gear between mid-April and early June. Snorkel surveyors observed peak counts (counts bracketed by lower counts) in 7 of the index streams during 2008, and 9 during 2009. The peak survey counts in index streams during 2008 and 2009 were generally lower, and observers reported average to below average peak counts in most index streams. For the first time since 2002 no “record high” peak counts were recorded in either 2008 or 2009.

Key words: steelhead, *Oncorhynchus mykiss*, emigration, abundance, Eagle Creek, Harris River, Humpback Creek, Ketchikan Creek, McDonald Lake Creek, White River, Slippery Creek, Petersburg Creek, Sitkoh Creek, Ford Arm Creek, Peterson Creek, Pleasant Bay Creek, weir, sex, length, abundance indices, snorkel survey, index stream.

## INTRODUCTION

Southeast Alaska has 271 uniquely identified steelhead *Oncorhynchus mykiss* systems and an additional 60 tributaries flow into these systems, for a total of 331 known water bodies containing steelhead. Most populations are believed to contain 200 or fewer spawning adults. Major sport fisheries occur on larger systems such as the Thorne River on Prince of Wales Island, which may support up to 1,000 spawning steelhead, and on the Situk River, which has had annual returns of over 10,000 steelhead. Steelhead harvests in Southeast Alaska generally increased from the late 1970s through 1989, but then began to decline (Mills 1993). As fishery managers and participants reported lower escapements, an emergency order (EO) prohibiting steelhead harvests in the Situk River was enacted in 1991. In 1992, harvests were prohibited by EO in 24 popular systems, and in 1993 the Situk and 47 other systems were closed to steelhead harvest. In 1994, the Alaska Board of Fisheries enacted conservative regulations for steelhead in Southeast Alaska, and since 1994 anglers have been limited regionwide to a harvest of 2 steelhead per year and a minimum size limit of 36 inches TL (914 mm).

Intensive research on steelhead stocks in Southeast Alaska has largely been limited to Petersburg Creek (Jones 1972–1976), Situk River (Johnson 1990, 1991, 1996; Didier and Marshall 1991; Johnson and Marshall 1991; Glynn 1992; Glynn and Elliott 1993; Bain et al. 2003; Johnson and Jones 2003), and Sitkoh Creek (Love and Harding 2008, 2009). Estimates of migratory timing, abundance, and age composition have also been made for a few other systems (Jones 1983; Harding and Jones 1990–1992; Jones et al. 1991; Yanusz 1997). Creel surveys of steelhead fisheries have also been conducted (Freeman and Hoffman 1989–1991; Hubartt 1989, 1990; Hoffman et al. 1990; Harding and Jones 1991, 1993, 1994; Schmidt 1992), and enhancement has been studied in 1 system (Ward Creek drainage; Freeman 1992, 1995).

Although counts of adult steelhead have been conducted in a few select systems for many years, consistent foot surveys to monitor peak abundance were not initiated until 1994. Since then, survey methodology has evolved, and the streams and reaches selected to survey have changed as observers gained experience with each system (Johnson and Jones 1998–2001; 2003; Harding 2005; Harding and Love 2008; Harding 2009).

Substantial changes in survey methods were also instituted in 1997 to increase the proportion of steelhead observed in index streams and to better identify dates of peak instream abundance (Johnson and Jones 1998). All surveys were converted to snorkel surveys because Shardlow et al. (1987) found that among the most common survey methods, snorkel surveys by experienced

observers yield the highest proportion counted (i.e., the number of fish observed per number of fish in a stream).

## **OBJECTIVES**

The research objective in 2008 and 2009 was to:

1. Count the number of steelhead once a week until a peak is detected and for a minimum of 3 weeks in established index sections of 10 stream systems in Southeast Alaska from late-April through May using snorkel-dive surveys by trained observers.

Associated tasks included:

1. Calculate an expansion factor for converting future and past snorkel survey counts in Sitkoh Creek to estimates of escapement above the weir.
2. Monitor stream temperatures in the snorkel index streams.

## **METHODS**

### **SOUTHEAST ALASKA SNORKEL SURVEYS**

Snorkel surveys were scheduled to provide indices of peak steelhead abundance for 10 streams in Southeast Alaska in 2008 and 2009 (Figure 1). All index streams have been surveyed for steelhead since 1997 (Johnson and Jones 1998–2001, 2003; Harding 2005; Harding and Love 2008; Harding 2009) with the exception of Slippery Creek, which has been surveyed 5 times since 2000 (Slippery Creek was not surveyed in 2005). The percentage of available stream area surveyed (feet surveyed per feet of anadromous stream) annually averages 54% and ranges from 19% in Ford Arm Creek to 100% in McDonald Lake Creek (Appendix A1).

As in prior years, surveys of index streams were conducted weekly, up to 4 times (depending on the stream), from late April through the end of May when instream abundance was expected to peak. A peak count is successfully achieved if it is bracketed by lower counts; if the highest count occurred during the last survey, an additional survey was attempted to obtain a peak count. In many cases a final survey was not achieved, thus a final lower count was not obtained and the count was considered a “high” count.

Surveys were conducted by at least 2 employees wearing dry suits and snorkel gear. One surveyor was always a senior, trained observer. Data from each survey in each stream were recorded for discrete sections (reaches) of the river (Appendix A1). If a shore-side (third) party was available, counts were verbally conveyed to them, and they tabulated and then recorded the counts by reach as the survey progressed. When a shore-side party was not available, one or both snorkelers recorded the counts by stream reach with a waterproof (wax-based) marker on a small plastic diver’s slate until it could be transcribed to conventional data forms.

Observers, as a team, counted all adult steelhead seen during the survey. The surveyors attempted to stay abreast of each other in the stream and coordinated their observations to obtain maximum coverage. When passing through high concentrations of steelhead, both observers counted the number of steelhead in their area of responsibility before consulting with each other on their counts.

If either or both surveyors felt that a questionable count was made in a particular pool or stretch of river, the area was recounted. Typically, steelhead were minimally disturbed on the first snorkel pass so second counts of a pool or run were usually possible.

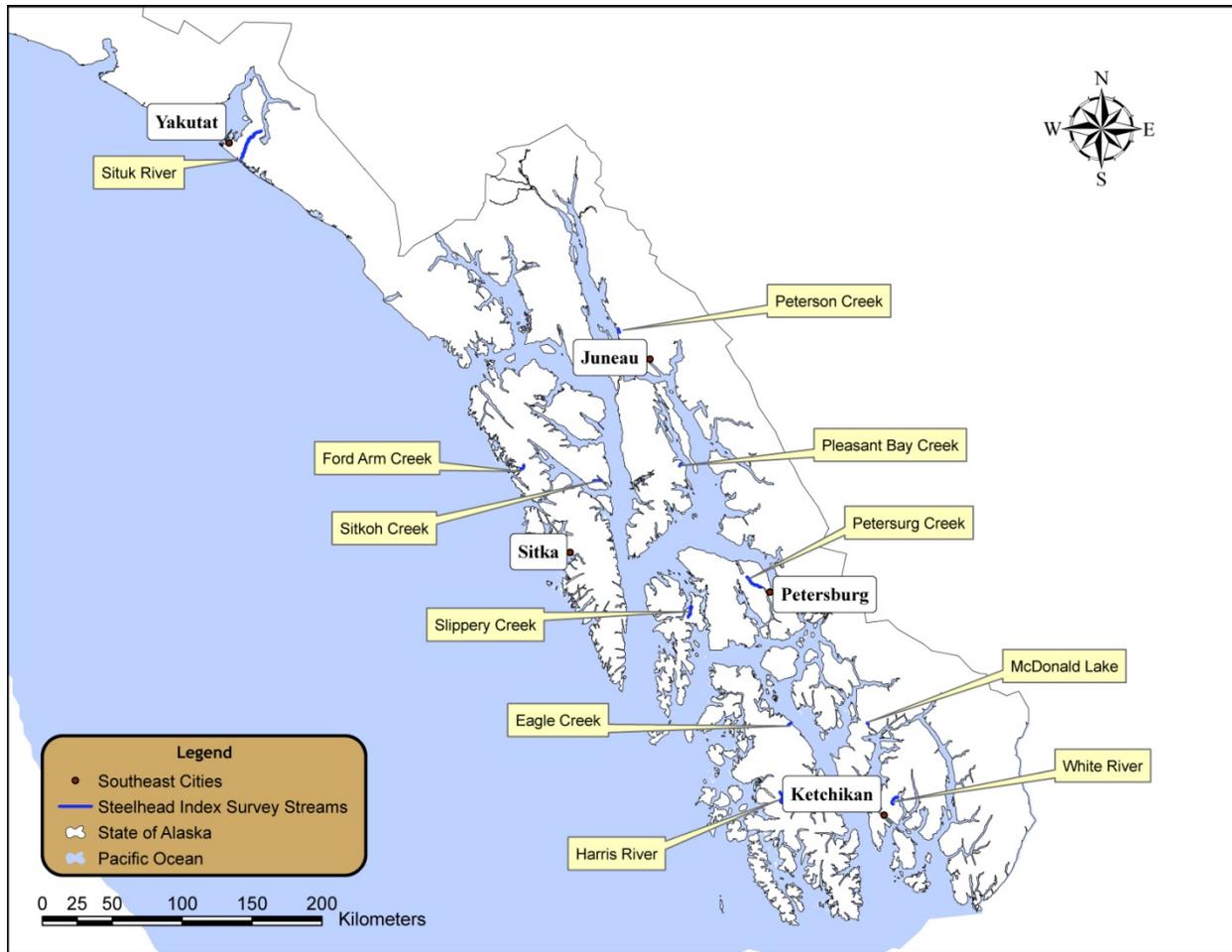


Figure 1.—Locations of the Situk River and the steelhead index systems in Southeast Alaska surveyed in 2008 and 2009.

Surface water temperature ( $^{\circ}\text{C}$ ), and weather conditions (cloud cover, wind, and precipitation) were recorded at the beginning of each survey (Appendices A2 and A3). In each index system, water levels were recorded at a permanent benchmark established in 1997. This benchmark was either a permanent mark on a bridge abutment, a U.S. Geological Survey (USGS) gauging station, or a mark carved in bedrock. Water clarity was measured using a Secchi disk; the Secchi disk was held underwater by 1 observer approximately 20 cm below the surface. The second snorkel observer then backed away underwater keeping visual contact with the disk while feeding out the line. The point at which the Secchi disk disappeared was the distance that was recorded.

## STREAM TEMPERATURE MONITORING

Temperature data loggers (HOBO<sup>®</sup> temp logger model H8)<sup>1</sup> were installed in 9 of the 10 snorkel index streams to provide information on temperature versus peak abundance (no temperature logger was installed in McDonald Lake Creek). The temperature loggers were scheduled to be

<sup>1</sup> Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

retrieved each year during the first survey and replacement loggers installed. The temperature loggers were programmed to record and store temperatures every 2 hours.

## **CALIBRATION OF SNORKEL COUNTS TO WEIR COUNT**

### **2008 and 2009**

The “peak” survey counts for a given year on streams with known escapement, e.g., those with weir counts, may be used to produce an estimate of the survey count-to-escapement expansion factor for that year and observer team. The averages of several yearly estimates of these expansion factors under differing snorkeling conditions could eventually be used (for a given observer team and system) to estimate total abundance when weir counts are unavailable but peak snorkel counts are obtained. Detailed methods are described in Appendix A3 in Weller et al. (2007).

Snorkel counts were used for calculating snorkel team-specific count-to-escapement expansion factors ( $\pi_i$ ) for Sitkoh Creek steelhead in 2008 and 2009. Snorkel survey expansion factors were calculated as the weir count  $N_i$  on the survey day (immigrants upstream less any adults already passed downstream and any known mortalities at the time), divided by the snorkel survey count  $C_i$  for an observer team  $i$ , as per the following equation:

$$\pi_i = N_i / C_i \quad (1)$$

An average ( $\hat{\pi}$ ) of  $k$  available expansion factor estimates could then be estimated for Sitkoh Creek using:

$$\hat{\pi} = \sum_{i=1}^k \pi_i / k, \quad (2)$$

and the sample variance is calculated:

$$\text{var}(\hat{\pi}) = \sum_{i=1}^k (\pi_i - \hat{\pi})^2 / (k - 1). \quad (3)$$

The sample standard deviation is calculated as the square root of the sample variance.

Estimates across time (multiple survey days) for individual teams were calculated using these equations with appropriate substitutions for  $i$ .

## **RESULTS**

### **SOUTHEAST ALASKA SNORKEL SURVEYS, 2008**

Thirty-six snorkel surveys were conducted in the 10 steelhead index streams between April 18 and June 11, 2008. (Table 1 and Appendix A2). Observers obtained a peak count bracketed by lower counts in 7 of the index streams. The streams where peak counts were not obtained included the Prince of Wales area streams (Eagle Creek and Harris River) and McDonald Creek in the Ketchikan area. The peak 2008 steelhead counts ranged from 26 (May 23) in Peterson Creek to 266 (June 4) in Ford Arm Creek.

Table 1.–Steelhead index streams surveyed in 2008 along with dates of peak (P; bracketed) or high (H; unbracketed) counts and numbers of steelhead counted.

Stream name	No. of surveys	Peak/high count date	Peak/high count of steelhead		General location
Eagle Creek	1	June 4	8	(H)	Prince of Wales Island
Harris River	2	May 7	122	(H)	Prince of Wales Island
White River	3	May 6	45	(P)	Revillagiedo Island
McDonald Lake Creek	2	May 30	45	(H)	Southern mainland
Slippery Creek	4	May 7	46	(P)	Kuiu Island
Petersburg Creek	4	May 8	251	(P)	Kupreanof Island
Pleasant Bay Creek	4	May 19	53	(P)	Admiralty Island
Ford Arm Creek	6	June 4	266	(P)	Chichagof Island
Sitkoh Creek	4	June 6	167	(P)	Chichagof Island
Peterson Creek	6	May 23	26	(P)	Northern mainland

## SOUTHEAST ALASKA SNORKEL SURVEYS, 2009

Forty-one snorkel surveys were conducted on the 10 steelhead index streams between April 21, and June 11, 2009 (Table 2 and Appendix A3). Observers obtained a peak count bracketed by lower counts in 9 of the index streams. One Ketchikan area stream (McDonald Lake Creek) was not surveyed during 2009. The peak or high 2009 steelhead counts ranged from 22 (May 19) in Peterson Creek to 201 (May 28) in Sitkoh Creek.

Snorkel surveys were also conducted in 2 non-index streams in the Ketchikan area during 2009 to address local fisheries managers concerns, i.e., sport fish angler reports of poor returns. Two surveys on Humpback Creek produced a high count of 23, well below the historic peak of 105 during 2003 and the high count of 118 recorded during 2006 (Appendix A3). One survey on Ketchikan Creek produced a count of 14; no surveys had been conducted on Ketchikan Creek since 2005 when 94 steelhead had been observed.

Table 2.–Steelhead index streams surveyed in 2009 along with dates of peak (P; bracketed) or high (H; unbracketed) counts and numbers of steelhead counted.

Stream name	No. of surveys	Peak/high count date	Peak/high count of steelhead		General location
Eagle Creek	3	May 22	137	(P)	Prince of Wales Island
Harris River	4	April 30	90	(P)	Prince of Wales Island
White River	5	May 21	45	(P)	Revillagiedo Island
McDonald Lake Creek	0	NA	NA	(NA)	Southern mainland
Slippery Creek	4	May 12	86	(P)	Kuiu Island
Petersburg Creek	4	May 14	198	(P)	Kupreanof Island
Pleasant Bay Creek	5	May 14	64	(P)	Admiralty Island
Ford Arm Creek	7	June 2	194	(P)	Chichagof Island
Sitkoh Creek	4	May 28	201	(P)	Chichagof Island
Peterson Creek	5	May 19	22	(P)	Northern mainland

## STREAM TEMPERATURE MONITORING

Complete water temperature records during the 2008 and 2009 surveys are available only for Peterson Creek. Partial records are available from other index streams (Figure 2). Peak and high snorkel counts were recorded in index streams when the daily average water temperatures ranged from 3.5°C (Peterson Creek in 2009) to 8.8°C (Sitkoh Creek in 2008), but generally were between 4.0 and 7.3°C (Slippery, Peterson, and Petersburg Creeks, and Harris River). The peak counts at Peterson Creek in 2008 and 2009 occurred on May 23 and 19, when average daily water temperatures were 4.4 and 3.5°C, respectively.

## CALIBRATION OF SNORKEL COUNTS TO WEIR COUNT

### 2008 and 2009

Division of Sport Fish staff from the Sitka area office conducted snorkel surveys in 2008 and 2009 during weir operations at Sitkoh Creek. A total 7 surveys were conducted over 2008 and 2009 which allowed for calibration of snorkel counts. The Sitka team saw an average of 44.3% of the upstream weir count (Table 3) over the 2 years. Although snorkel-to-weir calibrations were planned for both years at Peterson Creek, difficulties with electronic counting devices failed to provide useable data.

Table 3.—Calibration of steelhead snorkel survey counts to Sitkoh weir escapements, 2008 and 2009. Counts by date, weir counts at time of survey for that day, percent of total instream escapement, and snorkel conditions for surveys made by the Sitka survey team.

Date	Snorkel team	Snorkel count	Weir count <sup>a</sup>	% Observed	$\pi_t$	Snorkel conditions
<b>2008</b>						
April 30	Sitka	11	37	29.7%	3.36	Poor survey conditions
May 24	Sitka	71	312	22.8%	4.39	Water very high for snorkel count
June 6	Sitka	161	215	74.9%	1.34	Normal water levels and visibility
June 11	Sitka	78	147	53.1%	1.88	Normal water levels and visibility
Average	Sitka			45.1%	2.74	
<b>2009</b>						
May 7	Sitka	3	3	100.0%	1.00	Water very high; partial survey <sup>b</sup>
May 20	Sitka	102	296	34.5%	2.90	Water clear but too high for good survey
May 28	Sitka	180	313	57.5%	1.74	Normal water levels and visibility
June 9	Sitka	34	119	28.6%	3.50	Normal water level, excellent visibility
Average <sup>c</sup>	Sitka			40.2%	2.71	
Average <sup>c</sup> for 2008–09				44.3%	2.26	

<sup>a</sup> Weir count of known adult steelhead above weir when snorkel team finished survey at weir.

<sup>b</sup> Upper reach (closest to Sitkoh Lake) was not surveyed.

<sup>c</sup> Survey on May 7, 2008 not included in average.

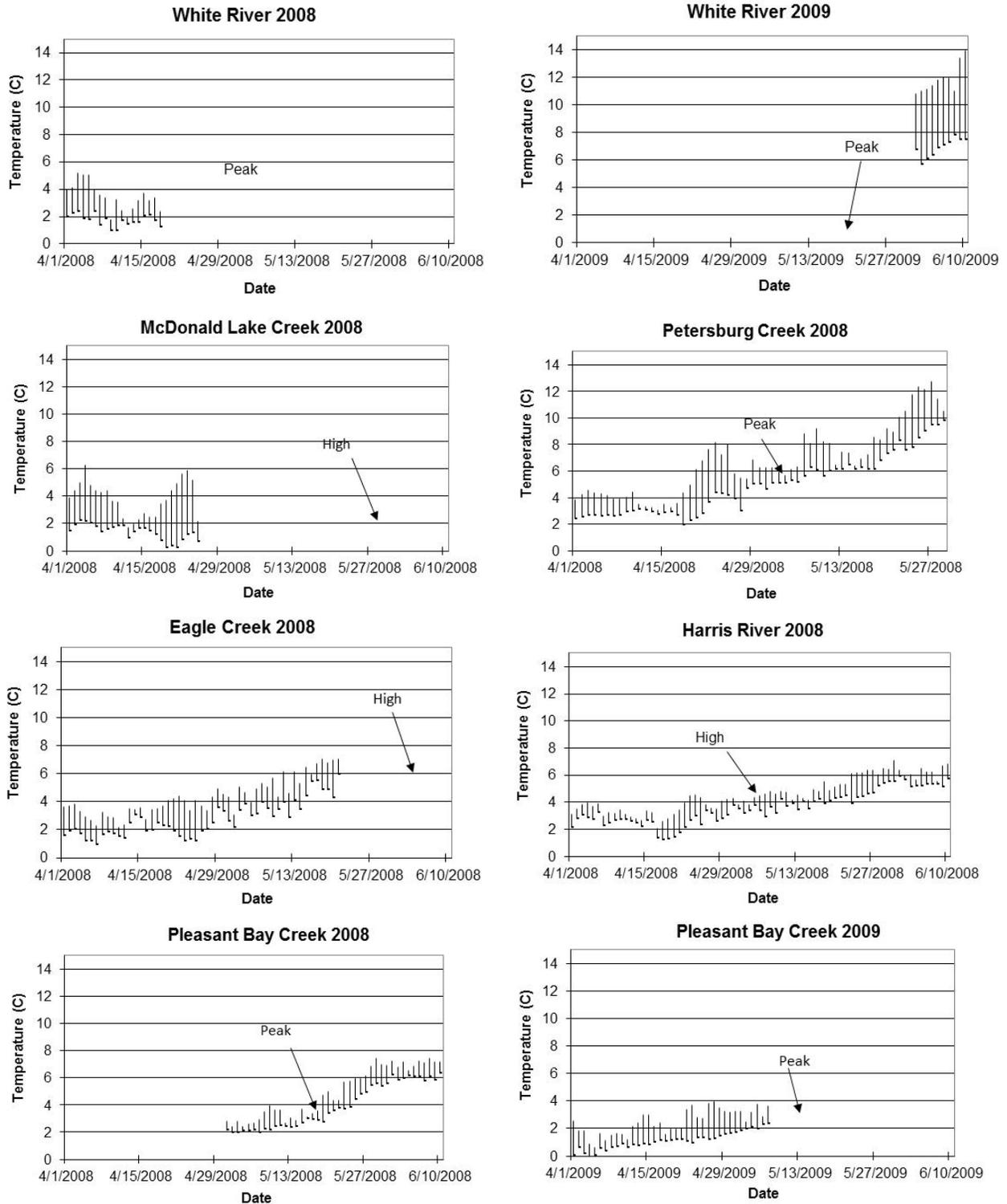


Figure 2.—The daily average, high, and low water temperatures recorded at steelhead index streams and the dates of “high” or “peak” snorkel counts during our 2008 and 2009 Southeast Alaska steelhead snorkel surveys. Data unavailable for Ford Arm in 2008 and McDonald, Eagle, Harris and Petersburg creeks in 2009.

-continued-

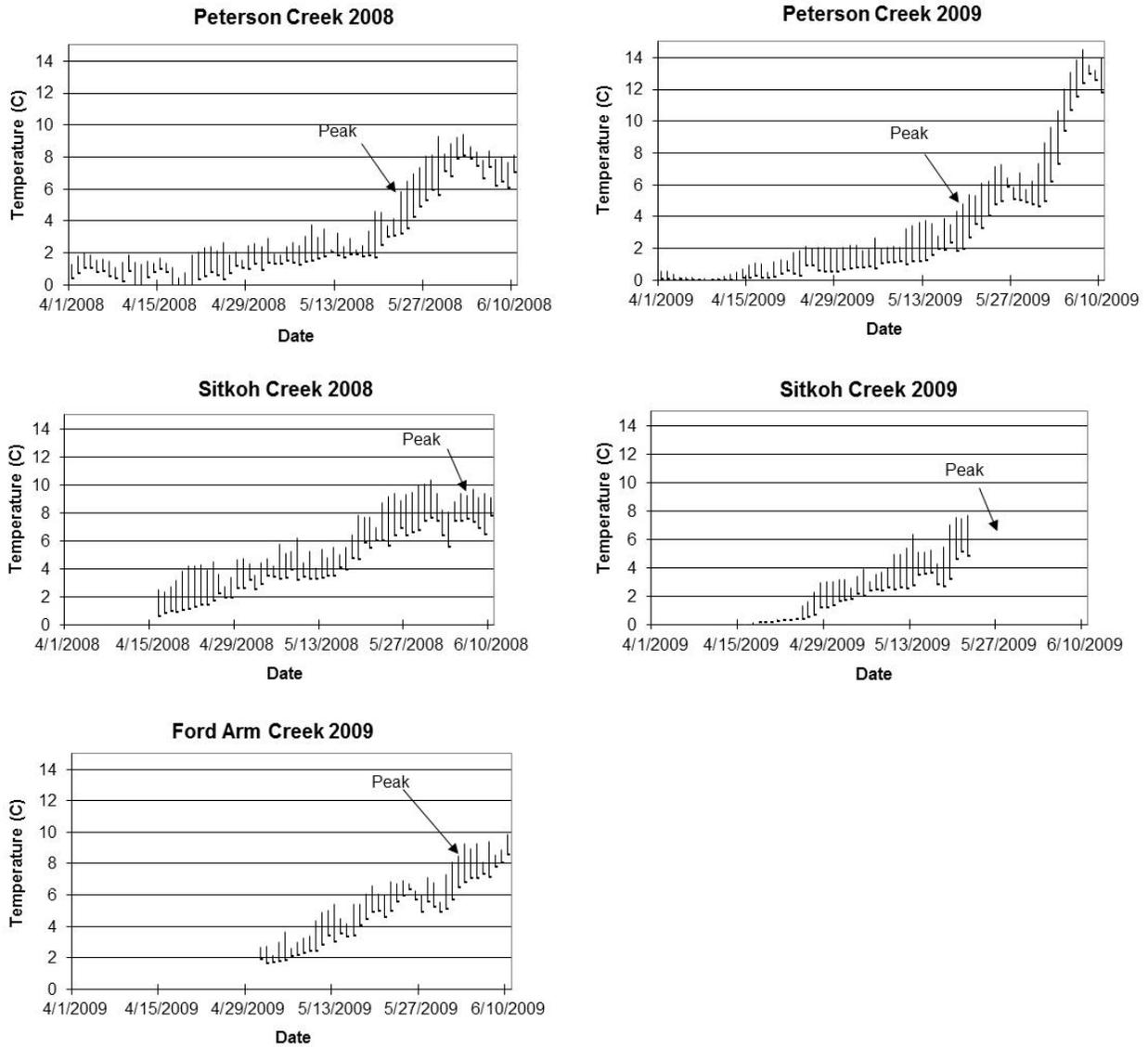


Figure 2.–Page 2 of 2.

### Peak Survey to Total Escapement

Total escapement estimates and peak survey counts from 2003 to 2006 and 2008 to 2009 (Table 4) were used to estimate the expansion factor for expanding peak survey counts to estimates of total escapement. The estimated expansion factor was 2.561. The variance term for the expansion factor, to be used when predicting escapement in years when only the peak survey count is available, was 0.153.

Table 4.–Peak survey count (above weir only) to total escapement expansion factor data and calculations for Sitkoh Creek steelhead.

Year	Peak snorkel count above weir <sup>a</sup>	Estimated escapements from weir counts (mark/recapture)		Expansion factors	
		$\hat{N}_y$	$var(\hat{N}_y)$	$\hat{\pi}_y$	$var(\hat{\pi}_y)$
2003	246	682 <sup>b</sup>	4.352	2.772	7.19E-05
2004	329	780 <sup>b</sup>	8.381	2.371	7.74E-05
2005	231	574 <sup>c</sup>	22.28	2.485	4.18E-04
2006	181	416 <sup>c</sup>	12.171	2.298	3.71E-04
2008	161	511 <sup>d</sup>	41.952	3.174	1.62E-03
2009	180	408 <sup>b</sup>	1.277	2.267	3.79E-05
				$\bar{\pi} =$	2.561
				$var(\bar{\pi}_p) =$	0.153

<sup>a</sup> Peak counts above weir do not include counts below weir, and thus differs from total peak counts.

<sup>b</sup> From Love et al. (*in prep* b).

<sup>c</sup> From Love et al. (*in prep* a).

<sup>d</sup> From Love and Harding (2009).

## DISCUSSION

We have consistent snorkel survey data for 9 index streams from 1997 through 2009 (Table 5). Reviewing the peak and high survey counts for index streams in all years reveals that the 2008 and 2009 counts were generally lower, and observers reported median to below median peak counts in most index streams (Figure 3). The number of steelhead observed during the 2008 and 2009 snorkel counts was consistent with anecdotal angler reports made to Division of Sport Fish area management biologists that indicated steelhead abundance was down from recent years. Peak counts were obtained for 7 of the 10 index systems in 2008, and 9 in 2009, which reflects the dedication of all surveyors.

For the first time since 2002 no “record high” peak counts were recorded in either 2008 or 2009. However, during 2009 surveyors at Eagle Creek recorded the second highest count in the last 8 years, and at Slippery Creek the 2009 peak count was just 6 short of the record high count of 92 recorded in 2004.

Steelhead snorkel survey counts in Southeast Alaska have been made since 1997 to monitor trends in steelhead abundance (Johnson and Jones 1998–2001, 2003; Harding 2005, 2008, 2009). The initiation of the Sitkoh Creek steelhead weir project in 2003 provided a unique opportunity to compare snorkel survey counts to weir counts. The concept of calibrating snorkel counts is to investigate conversions for each snorkel team so that a consistent estimate (defined bias) of true abundance, with an associated precision, can be obtained. Harding and Love (2008) reported details on calibration efforts at Sitkoh during 2003–2005, and Harding (2009) reported calibration results during 2006. The average percent of steelhead observed during the 2008 and 2009 surveys (44.3%) is slightly lower than the averages observed (45.3%, 53.9%, 56.6%, and 60.0%) in 2003–2006, respectively; no calibrations were generated during 2007. Snorkel team members did vary between and within years, but these differences reinforce the overall management objective that a peak snorkel survey will observe approximately 40 to 60% of actual escapement.

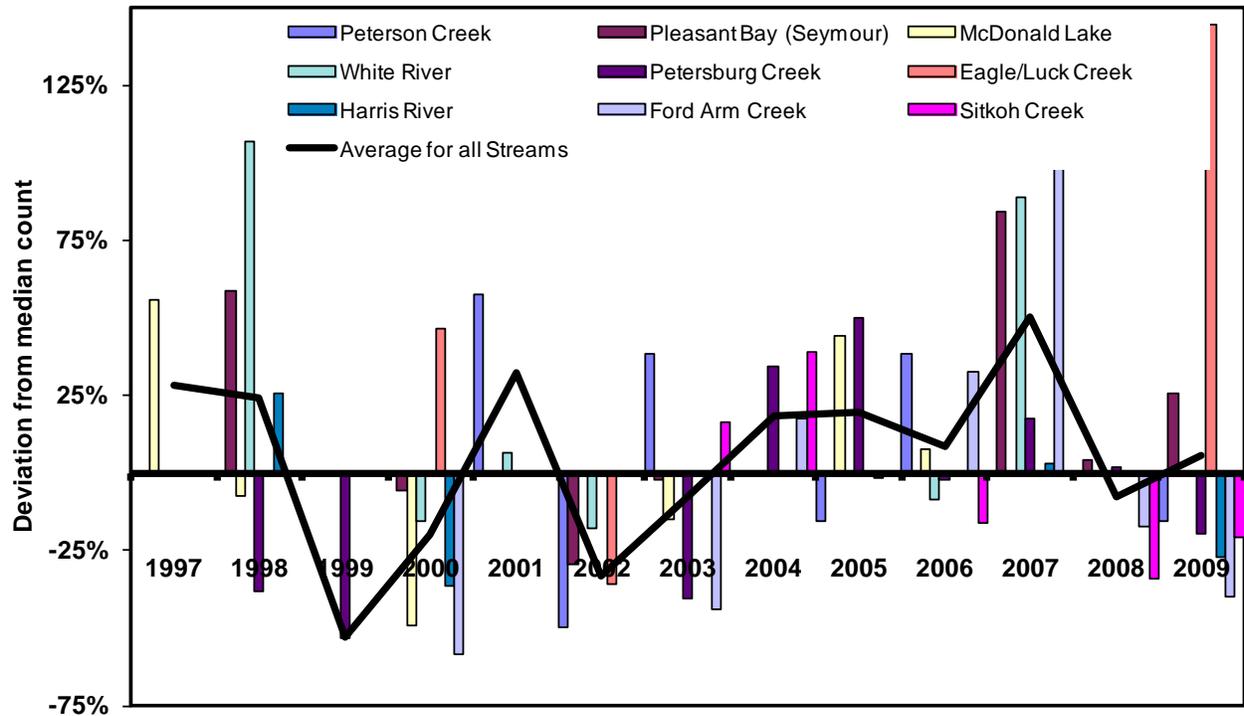


Figure 3.—Annual deviations from the median peak snorkel survey count (bars) and the average annual deviation (line) for Southeast Alaska steelhead snorkel surveys, 1997–2009. Only peak counts were used and only for systems surveyed since 1997, i.e., not Slippery Creek.

Developing a complete temperature record for each index stream continued to be problematic during this reporting period. Several of the temperature data loggers were either lost or the data was unreliable due to malfunction; at least one of the loggers had been damaged by bear activity. The limited number of snorkel surveys also contributes to incomplete records as the logger is often either set or retrieved (brought back to office) during the snorkel season and subsequently must be returned to the stream. Steps have been taken to improve the consistency of data collection with a new generation of loggers which allows retrieval of the data in the field thus allowing the logger to remain in the field.

The average daily water temperatures during peak snorkel counts ranged from 3.5 °C at Petersen Creek (2009) to 8.8 °C at Sitkoh Creek (2008). The daily maximum water temperatures recorded in Southeast Alaska fall within the range of temperatures during which spawning activity (6-9 °C) occurs (Behnke 1992). Implications between water temperature and spawning activity may become important if significant climate changes occur, e.g., timing of peak spawning activity may change. Survey conditions during 2008 were initially complicated as warm spring temperatures and rain rapidly melted the heavy winter snowfall causing some delays and poor counting conditions due to the ensuing high water. Conditions generally returned to normal levels, but there were sporadic high water conditions in some systems from mid to late May. Survey conditions during 2009 were similar to 2008, but steelhead immigration appeared to be a little later than in previous years. Water temperatures were generally higher and water levels lower during the last of the snorkel surveys.

Table 5.—Steelhead snorkel surveys conducted on index streams in Southeast Alaska, 1997–2009. Peak count (bold) is defined as a bracketed count or a count having a lower count before and after the high or “peak” count; high count (italicized) is defined as an unbracketed count and is the highest count for that year/system.

Management area	Stream name	Year												
		1997 <sup>a</sup>	1998 <sup>a</sup>	1999 <sup>a</sup>	2000 <sup>a</sup>	2001	2002	2003	2004	2005 <sup>a</sup>	2006	2007	2008	2009
		<b>Peak</b> <i>/ high</i>												
Juneau	Peterson Creek	<b>26</b>	29	38	27	<b>41</b>	<b>13</b>	<b>36</b>	39	<b>22</b>	<b>36</b>	<b>26</b>	<b>26</b>	<b>22</b>
	Pleasant Bay (Seymour)	155	<b>81</b>	132	<b>48</b>	48	<b>36</b>	<b>50</b>	<b>51</b>	47	59	<b>94</b>	<b>53</b>	<b>64</b>
Ketchikan	Humpback Creek	<b>91</b>	24	4	7	101	94	<b>105</b>	65	<b>38</b>	112	18	NA	23
	Ketchikan Creek	48	47	19	<b>15</b>	24	5	<b>60</b>	53	94	NA	NA	NA	14
	McDonald Lake	<b>145</b>	<b>86</b>	100	<b>47</b>	74	14	<b>79</b>	76	<b>134</b>	<b>100</b>	25 <sup>b</sup>	45	NA
	White River	84	<b>93</b>	60	<b>38</b>	<b>48</b>	<b>37</b>	77	35	67	<b>41</b>	<b>85</b>	<b>45</b>	<b>45</b>
Petersburg	Petersburg Creek	123	<b>152</b>	<b>115</b>	68	64	41	<b>146</b>	<b>330</b>	<b>369</b>	<b>241</b>	<b>289</b>	<b>251</b>	<b>198</b>
	Bear (Big) Creek	NA	132	NA	NA	NA	NA							
	Marten Creek	14	17	18	NA									
	Slippery Creek	NA	NA	NA	NA	41	31	76	92	NA	79	<b>68</b>	<b>46</b>	<b>86</b>
Prince of Wales	Eagle Creek	90	<b>56</b>	118	<b>82</b>	NA	<b>36</b>	95	67	102	<b>154</b>	134	8	<b>137</b>
	Harris River	104	<b>156</b>	192	<b>79</b>	53	200	195	<b>124</b>	<b>122</b>	<b>92</b>	<b>128</b>	122	<b>90</b>
Sitka	Ford Arm Creek	296	103	89	<b>134</b>	28	122	<b>181</b>	<b>379</b>	<b>459</b>	<b>428</b>	<b>673</b>	<b>266</b>	<b>194</b>
	Sitkoh Creek	329	154	120	112	115	65	<b>296</b>	<b>354</b>	<b>259</b>	<b>213</b>	70	<b>167</b>	<b>201</b>

<sup>a</sup> Slippery Creek not surveyed in 1997–2000 and 2005.

<sup>b</sup> Based on only one survey count.

Over 15 years have elapsed since the implementation of the 1994 regulations, and the response of steelhead stocks has been mixed. With the exception of 2001, snorkel index counts were, on average, lower between 1999 and 2003, than those previous or since (Figure 3). Beginning in 2004 and continuing through 2007, snorkel counts trended upwards but declined to at or below average during 2008 and 2009. Collectively these counts suggest that the steelhead stocks surveyed during 2008 and 2009 were closer to historic averages and generally had lower escapements compared to 2004–2007. Even though index stocks appear stable and near average levels, it remains unclear whether these stocks have rebounded from the depressed levels observed in the late 1980s and early 1990s when the Department issued emergency orders closing 24 and 48 streams to the retention of steelhead in 1992 and 1993, respectively.

The opportunity to calibrate snorkel counts with weir counts in Peterson Creek during both 2008 and 2009 was unsuccessful. The objective of the Peterson Creek project was to evaluate less intrusive means of counting steelhead escapement as an alternative to standard picket weirs. Neither the resistivity counter, operated during 2008, nor the Dual Frequency Identification Sonar (DIDSON) in 2009 provided enough resolution to calibrate immigrant counts with snorkel counts (Coyle and Reed *in prep* a and b).

The estimation of a peak snorkel count to total steelhead escapement expansion factor for Sitkoh Creek was a joint objective of this project and the intensive research conducted at Sitkoh Creek during 2003–2009 (Love and Harding 2008, 2009; Love et al. *in prep* a and b). The expansion factor will allow us to estimate steelhead escapement in Sitkoh Creek in future years when a peak snorkel count has been obtained. Estimates of escapement based on the expansion factor will have 80% confidence intervals that are  $\pm 25\%$  of the point estimate based on a Student's t-distribution with 5 df. While these escapement estimates are much less precise than obtained by operating a weir at Sitkoh Creek, they are sufficiently precise to detect major changes in steelhead abundance and initiate changes in harvest management, if necessary.

Efforts to develop “expansion factors” comparing snorkel counts with weir counts should continue in the future as this procedure continues to be refined. Ideally, more of the snorkel index streams will be “calibrated” using this method as opportunities become available.

## **ACKNOWLEDGMENTS**

Funding for this project came from the U.S. Fish and Wildlife Service Federal Aid in Sport Fish Restoration Act, with matching funds coming from the State of Alaska's Fish and Game Fund. We would also like to acknowledge staff who contributed to the 2008 and 2009 snorkel surveys: Brian Glynn, Jason Shull, Carol Coyle, Judy Lum, Anthony Crupi, John Der Hovanisian, Dan Teske, Dave Love, Kurt Kondzela, Ed Jones, Brian Frenette, Jeff Williams, Matt Kearns, Troy Tydingco, Grant Hagerman, Patrick Fowler, Monica Matz, Dirk Middleton, Joe Nelson, Jack Lorrigan, Dan Bennion, Mike Woods, Kelly Piazza, Steve McCurdy, Malika Brunette, Todd Johnson, Andy Piston, Steve Heintz, Doug Fleming, and Vera Goudima. Also thanks to Dan Reed and John Der Hovanisian who provided planning, analytical and editorial support.

## REFERENCES CITED

- Bain, C., S. T. Elliot, R. E. Johnson, and G. Woods. 2003. Situk River steelhead: A review of historical data through 1996. Alaska Department of Fish and Game, Fishery Manuscript No. 03-01, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fms03-01.pdf>
- Behnke, R. J. 1992. Native trout of western North America. American Fisheries Society Monograph 6.
- Coyle, C. L., and D. J. Reed *In prep* a. Assessment of the performance of a flat panel resistivity fish counter at Peterson Creek, 2007 and 2008. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.
- Coyle, C. L. and D. J. Reed. *In prep* b. Assessment of the performance of a DIDSON (dual frequency identification sonar) to count steelhead in Peterson Creek, 2009. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.
- Didier, A. J., Jr., and R. P. Marshall. 1991. Incidental harvest and voluntary release of steelhead and Chinook salmon in the Situk River commercial set gill net fishery during 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-19, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds91-19.pdf>
- Freeman, G. M. 1992. An evaluation of juvenile hatchery steelhead in the Ward Creek system, Ketchikan, Alaska, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-55, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-55.pdf>
- Freeman, G. M. 1995. An evaluation of steelhead enhancement in the Ward Creek drainage, Ketchikan, Alaska, 1991–1994. Alaska Department of Fish and Game, Fishery Manuscript No. 95-2, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fms95-02.pdf>
- Freeman, G. M., and S. H. Hoffman. 1989. Steelhead *Oncorhynchus mykiss* creel census on the Klawock River, southeast Alaska, 1987–1988. Alaska Department of Fish and Game, Fishery Data Series No. 118, Juneau. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds-118.pdf>
- Freeman, G. M., and S. H. Hoffman. 1990. Steelhead *Oncorhynchus mykiss* creel census and recreation survey on the Thorne River, southeast Alaska, 1988–89. Alaska Department of Fish and Game, Fishery Data Series No. 90-34, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds90-34.pdf>
- Freeman, G. M., and S. H. Hoffman. 1991. Thorne River steelhead creel and recreation survey, 1989–1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-30, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds91-30.pdf>
- Glynn, B. 1992. Situk River steelhead trout and Chinook salmon creel surveys and weir, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-47, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-47.pdf>
- Glynn, B., and S. Elliott. 1993. Situk River steelhead trout counts, 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-29, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds93-29.pdf>
- Harding, R. D. 2005. Southeast Alaska steelhead snorkel surveys of regional index streams, 2002 and 2003. Alaska Department of Fish and Game, Fishery Data Series No. 05-74, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds05-74.pdf>
- Harding, R. 2008. Southeast Alaska steelhead and Dolly Varden management. Alaska Department of Fish and Game, Special Publication No. 08-21, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidpdfs/sp08-21.pdf>
- Harding, R. D. 2009. Southeast Alaska steelhead snorkel surveys of regional index streams, 2006 and 2007. Alaska Department of Fish and Game, Fishery Data Series No. 09-74, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS09-74.pdf>
- Harding, R., and J. D. Jones. 1990. Peterson Creek and lake system steelhead evaluation, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-37, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds90-37.pdf>

## REFERENCES CITED (Continued)

- Harding, R., and J. D. Jones. 1991. Peterson Creek and Lake system steelhead evaluation, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-31, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds91-31.pdf>
- Harding, R., and J. D. Jones. 1992. Peterson Creek and Lake system steelhead evaluation, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-46, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-46.pdf>
- Harding, R., and J. D. Jones. 1993. Karta River steelhead: 1992 escapement and creel survey studies. Alaska Department of Fish and Game, Fishery Data Series No. 93-30, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds93-30.pdf>
- Harding, R., and J. D. Jones. 1994. Sitkoh creek steelhead: 1993 escapement and harvest. Alaska Department of Fish and Game, Fishery Data Series No. 94-36, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds94-36.pdf>
- Harding, R. D., and D. C. Love. 2008. Southeast Alaska steelhead snorkel surveys of regional index streams, 2004 and 2005. Alaska Department of Fish and Game, Fishery Data Series No. 08-19, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds08-19.pdf>
- Hoffman, S., H. Koerner, and D. J. Magnus. 1990. Steelhead creel and escapement statistics, in-river distribution, and recreational use survey, Karta River, southeast Alaska, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-45, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds90-45.pdf>
- Hubartt, D. J. 1989. Ward Creek steelhead creel survey, Ketchikan, Alaska, 1988. Alaska Department of Fish and Game, Fishery Data Series No. 119, Juneau. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds-119.pdf>
- Hubartt, D. J. 1990. Ward Creek steelhead creel survey, Ketchikan, Alaska, October 1988 - May 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-40, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds90-40.pdf>
- Johnson, R. E. 1990. Steelhead studies: Situk River, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-47, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds90-47.pdf>
- Johnson, R. E. 1991. Situk river steelhead studies, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-49, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds91-49.pdf>
- Johnson, R. E. 1996. Situk River steelhead trout studies, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 96-1, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds96-01.pdf>
- Johnson, R. E., and J. D. Jones. 1998. Southeast Alaska steelhead studies, 1997: Situk River weir and surveys of index streams. Alaska Department of Fish and Game, Fishery Data Series No. 98-45, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds98-45.pdf>
- Johnson, R. E., and J. D. Jones. 1999. Southeast Alaska steelhead studies, 1998: Situk River weir and surveys of regional index streams. Alaska Department of Fish and Game, Fishery Data Series No. 99-33, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds99-33.pdf>
- Johnson, R. E., and J. D. Jones. 2000. Southeast Alaska steelhead studies, 1999: Situk River weir and surveys of regional index streams. Alaska Department of Fish and Game, Fishery Data Series No. 00-16, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds00-16.pdf>
- Johnson, R. E., and J. D. Jones. 2001. Southeast Alaska steelhead studies, 2000: Situk River weir and surveys of regional index streams. Alaska Department of Fish and Game, Fishery Data Series No. 01-20, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds01-20.pdf>
- Johnson, R. E., and J. D. Jones. 2003. Southeast Alaska steelhead studies, 2001: Situk River weir and surveys of regional index streams. Alaska Department of Fish and Game, Fishery Data Series No. 03-18, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds03-18.pdf>

## REFERENCES CITED (Continued)

- Johnson, R. E., and R. P. Marshall. 1991. Harvest estimates for selected sport fisheries in Yakutat, Alaska in 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-42, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds91-42.pdf>
- Jones, D. E. 1972. A study of steelhead-cutthroat trout in Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1971–1972, Project F-9-4, 13 (G-II-I), Juneau.
- Jones, D. E. 1973. Steelhead and sea-run cutthroat trout life history in Southeast Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1972–1973, Project AFS-42, 14 (AFS-42-1), Juneau.
- Jones, D. E. 1974. Life history of steelhead trout in Southeastern Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1973–1974, Project AFS-42, 15 (AFS-42-2), Juneau.
- Jones, D. E. 1975. Life history of steelhead trout. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1974–1975, Project AFS 42, 16 (AFS 42-3-A), Juneau.
- Jones, D. E. 1976. Life history of steelhead trout. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report 1975–1976, Project F-9-8(17)AFS-42-4a, Juneau. [http://www.sf.adfg.state.ak.us/FedAidpdfs/FREDF-9-8\(17\)AFS-42-4a.pdf](http://www.sf.adfg.state.ak.us/FedAidpdfs/FREDF-9-8(17)AFS-42-4a.pdf)
- Jones, D. E. 1983. Steelhead investigations in Southeast Alaska. Alaska Department of Fish and Game. Federal Aid in Fish Restoration, Annual Performance Report, 1982–1983, Project AFS-42, 24 (AFS-42-10-A), Juneau.
- Jones, J. D., R. Harding, and A. Schmidt. 1991. Sitkoh Creek steelhead study, 1990. Alaska Department of Fish and Game, Fishery Data Series No. 91-32, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds91-32.pdf>
- Love, D. C., and R. D. Harding. 2008. Steelhead trout production studies at Sitkoh Creek, Alaska, 2003–2004. Alaska Department of Fish and Game, Fishery Data Series No. 08-44, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds08-44.pdf>
- Love, D. C., and R. D. Harding. 2009. Steelhead trout production studies at Sitkoh Creek, Alaska, 2005–2006. Alaska Department of Fish and Game, Fishery Data Series No. 09-68, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/FDS09-68.pdf>
- Love, D.C., C. L. Coyle, and R. D. Harding. *In prep* a. Steelhead trout production studies at Sitkoh Creek, Alaska, 2007–2008. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.
- Love, D.C., C. L. Coyle, and R. D. Harding. *In prep* b. Steelhead trout production studies at Sitkoh Creek, Alaska, 2009. Alaska Department of Fish and Game, Fishery Data Series, Anchorage.
- Mills, M. J. 1993. Harvest, catch, and participation in Alaska sport fisheries during 1992. Alaska Department of Fish and Game, Fishery Data Series No. 93-42, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds93-42.pdf>
- Schmidt, A. E. 1992. Sitkoh Creek steelhead study, 1991. Alaska Department of Fish and Game, Fishery Data Series No. 92-31, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds92-31.pdf>
- Shardlow, T., R. Hilborn, and D. Lightly. 1987. Components analysis of instream escapement methods for Pacific salmon (*Oncorhynchus* spp). pp 1031–1037 [In] Canadian Journal of Fisheries and Aquatic Sciences, Vol. 44.
- Weller, J. L., D. L. Magnus, D. J. Reed, and K. A. Pahlke. 2007. A mark-recapture experiment to estimate the escapement of Chinook salmon in the Blossom River, 2006. Alaska Department of Fish and Game, Fishery Data Series No. 07-66, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds07-66.pdf>
- Yanusz, R. J. 1997. Status of sea-run cutthroat trout, sea-run Dolly Varden, and steelhead populations at Sitkoh Creek, Southeast Alaska, during 1996. Alaska Department of Fish and Game, Fishery Data Series No. 97-23, Anchorage. <http://www.sf.adfg.state.ak.us/FedAidPDFs/fds97-23.pdf>



## **APPENDIX A**

Appendix A1.—Steelhead index stream name, anadromous stream number, management area, length and percent of stream surveyed, number of survey reaches, and approximate dates for start of weekly surveys for steelhead in 2008 and 2009.

Index streams	Anadromous stream number	Area	Stream length/survey length (ft <sup>a</sup> )	Percent of stream surveyed	Number of reaches	Target survey start <sup>b</sup>
Ford Arm Creek	113-73-10030	Sitka	4,582/24,002	19%	2	Apr 30
Sitkoh Creek	113-59-10004	Sitka	16,192/20,136	80%	3	Apr 30
Peterson Creek	111-50-10010	Juneau	3,663/7,553	48%	1	Apr 30
Pleasant Bay Creek	111-12-10005	Juneau	6,633/12,405	53%	2 <sup>c</sup>	Apr 30
Petersburg Creek	106-44-10600	Petersburg	28,282/72,983	35%	2	Apr 30
Slippery Creek	109-43-10030	Petersburg	9,618/11,491	84%	2 <sup>d</sup>	Apr 30
Eagle Creek	107-40-10055	POW	28,716/49,136	58%	4	Apr 23
Harris River	102-60-10820	POW	38,758/96,466	40%	5	Apr 23
McDonald Lake Creek	101-80-10068	Ketchikan	11,259/11,259	100%	4	Apr 23
White River	101-44-10024	Ketchikan	19,719/35,750	55%	3	Apr 23

<sup>a</sup> Feet to be surveyed/feet of anadromous stream.

<sup>b</sup> Additional surveys are required if highest counts occur during last of three surveys.

<sup>c</sup> Stream reach 3 was dropped in 2000 due to safety concerns and because <10% of steelhead were ever observed in this section of river.

<sup>d</sup> Stream reach 3 was dropped in 2007 due to safety concerns.

Appendix A2.-Counts of steelhead from 2008 surveys by stream, date, and reach of stream along with measured environmental variables.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Eagle Creek	6/4/2008	1	SM	S	13,712		23	31	O				1	
Eagle Creek	6/4/2008	2	SM	S	6,253		23	31	O				4	
Eagle Creek	6/4/2008	3	SM	S	5,044		23	31	O				0	
Eagle Creek	6/4/2008	4	SM	S	3,707		23	31	O				2	
Eagle Creek	6/4/2008	5	SM	S			23	31	O				1	Survey ended at start of canyon. Top of canyon to salt water not surveyed due to high flow.
Ford Arm Creek	5/2/2008	1	TT	S	1,723	41	22	32	O	18	15/17	3.5	32	A couple of fall fish at top. Not able to download logger.
Ford Arm Creek	5/2/2008	2	TT	S	2,859	41	22	32	R	18		3.5	62	
Ford Arm Creek	5/13/2008	1	TT	S	1,723	43	22	31	R	12	17/18	4.5	115	
Ford Arm Creek	5/13/2008	2	TT	S	2,859	43	22	31	R	12	17/18	4.5	80	
Ford Arm Creek	5/21/2008	1	TT	S	1,723	42	22	32	O	14.5	17/18	4.5	74	
Ford Arm Creek	5/21/2008	2	TT	S	2,859	42	22	32	O	14.5	17/18	4.5	152	
Ford Arm Creek	5/29/2008	1	TT	S	1,723	43	21	32	C	15.5	16.5/32	7.5	135	
Ford Arm Creek	5/29/2008	2	TT	S	2,859	43	21	32	C	15.5	16.5/32	7.5	109	
Ford Arm Creek	6/4/2008	1	TT	S	1,723	41	22	32	R	16.5	19/22	6.5	125	
Ford Arm Creek	6/4/2008	2	TT	S	2,859	41	22	32	R	16.5	19/22	6.5	141	
Ford Arm Creek	6/9/2008	1	TT	S	1,723	42	22	32	R	19.5	22/23	7	77	20 fish below canyon, several not counted.
Ford Arm Creek	6/9/2008	2	TT	S	2,859	42	22	32	R	19.5	22/23	7	170	
Harris River	5/7/2008	1	SM	S	3,993		22	32	O			7	0	
Harris River	5/7/2008	2	SM	S	11,073		22	32	O				72	
Harris River	5/7/2008	3	SM	S	10,147		22	32	O				43	
Harris River	5/7/2008	4	SM	S	9,400		22	32	O				7	
Harris River	5/7/2008	5	SM	S	4,145		22	32	O				0	
Harris River	6/3/2008	1	SM	S	3,993		23	31	O				0	
Harris River	6/3/2008	2	SM	S	11,073		23	31	O				11	
Harris River	6/3/2008	3	SM	S	10,147		23	31	O				0	
Harris River	6/3/2008	4	SM	S	9,400		23	31	O				1	
Harris River	6/3/2008	5	SM	S	4,145		23	31	O				0	
McDonald Lake	4/25/2008	1	KP	S	2,375		22	32	C		3.5	1.2	0	Clear day, dry, light winds
McDonald Lake	4/25/2008	2	KP	S	2,714		22	32	C				0	Many Rainbows
McDonald Lake	4/25/2008	3	KP	S	2,553		22	32	C				0	Many Rainbows
McDonald Lake	4/25/2008	4	KP	S	3,617		22	32	C				14	
McDonald Lake	5/30/2008	2	KP	F	2,714		23	31	O				45	High water, indicator rock midstream submerged by 6 inches (normally rock is 3/4 exposed). Did not snorkel, foot count on lower river only.
Petersburg Creek	5/1/2008	1	DF	S	11,386		22	32	O			5	49	
Petersburg Creek	5/1/2008	2	DF	S	7,392		22	32	O		5.0/6.0		54	
Petersburg Creek	5/1/2008	3	DF	S	9,504	42	22	32	R	80.5			35	
Petersburg Creek	5/8/2008	1	DF	S	11,386		22	32	O			6	61	Good Conditions
Petersburg Creek	5/8/2008	2	DF	S	7,392		22	32	O		5.2/6.5		73	
Petersburg Creek	5/8/2008	3	DF	S	9,504	41	22	32	O	75			117	Boat counted, high tide. 75 in cabin hole

-continued-

Appendix A2.-Page 2 of 4.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Petersburg Creek	5/20/2008	1	DF	S	11,386		22	32	O				26	Good conditions. Water level down 36 inches from last weeks deluge.
Petersburg Creek	5/20/2008	2	DF	S	7,392		22	32	O		4.6/5.8	7	36	
Petersburg Creek	5/20/2008	3	DF	S	9,504		22	32	O	61			81	
Petersburg Creek	5/29/2008	1	DF	S	11,386		22	32	O				6	Water conditions very good. Pulled temp. logger today
Petersburg Creek	5/29/2008	2	DF	S	7,392		22	32	O		4.9/5.8	9.5	6	
Petersburg Creek	5/29/2008	3	DF	S	9,504	42	22	32	O	61			44	
Peterson Creek	5/2/2008	1	BG	S	3,663		22	32	O	26			1	Trout were unconfirmed, believed to be RBT
Peterson Creek	5/9/2008	1	BG	S	3,663		22	32	O	31	2.9	2	6	Also were 5-6 unidentified trout.
Peterson Creek	5/14/2008	1	BG	S	3,663		22	32	C	19	3	1.8	13	
Peterson Creek	5/23/2008	1	BG	S	3,663		22	32	O	26	3	5	26	
Peterson Creek	5/30/2008	1	BG	S	3,663		22	32	C	27	3	7.2	17	
Peterson Creek	6/5/2008	1	KK	S	3,663		23	31	C		1.5		2	Canyon not surveyed. High flow.
Pleasant Bay	5/1/2008	1	BG	S	3,802		22	32	O	36		2.3	18	
Pleasant Bay	5/1/2008	2	BG	S	2,831		22	32	O			2.3	15	
Pleasant Bay	5/8/2008	1	BG	S	3,802		22	32	O	35		2.4	35	
Pleasant Bay	5/8/2008	2	BG	S	2,831		22	32	O				8	
Pleasant Bay	5/19/2008	1	BG	S	3,802		22	31	C				36	
Pleasant Bay	5/19/2008	2	BG	S	2,831		22	31	C	20		3	17	
Pleasant Bay	5/28/2008	1	JS	S	3,802		22	31	C				13	
Pleasant Bay	5/28/2008	2	JS	S	2,831		22	31	C	10		6.5	27	
Sitkoh Creek	4/30/2008	1	TT	S	3,264		23	32	C	165	13/8.5	3	0	11 fish above weir, but survey conditions were poor, high water, long stretches of white water in riffles, fast currents and low visibility. Although we may not have seen all fish above weir, I suspect that we did see most. We did see more large rainbows than usual.
Sitkoh Creek	4/30/2008	2	TT	S	6,128		23	32	C	165		3	2	
Sitkoh Creek	4/30/2008	3	TT	S	5,600		23	32	C	165		3	9	
Sitkoh Creek	4/30/2008	4	TT	S	1,200	42	23	32	C	165		3	55	
Sitkoh Creek	5/24/2008	1	TT	S	3,264	42	22	31	C	193	16/9.5	8.5	2	Water very high for snorkel count. 76 inches on staff gauge. Max level for effective survey is about 65 inches.
Sitkoh Creek	5/24/2008	2	TT	S	6,128	42	22	31	C	193		8.5	8	
Sitkoh Creek	5/24/2008	3	TT	S	5,600	42	22	31	C	193			61	
Sitkoh Creek	5/24/2008	4	TT	S	1,200	42	22	31	C	193			10	
Sitkoh Creek	6/6/2008	1	TT	S	3,264	41	22	32	O	59.5	12/12.5	10	0	Only saw one redd, top section.
Sitkoh Creek	6/6/2008	2	TT	S	6,128	41	22	32	O	59.5		10	0	
Sitkoh Creek	6/6/2008	3	TT	S	5,600	41	22	32	O	59.5		8	161	
Sitkoh Creek	6/6/2008	4	TT	S	1,200	41	22	32	O	59.5		8	6	
Sitkoh Creek	6/11/2008	1	TT	S	3,264	43	22	32	O	51	10.5/16	10	0	
Sitkoh Creek	6/11/2008	2	TT	S	6,128	43	22	32	O	51	10.5/16	8	1	
Sitkoh Creek	6/11/2008	3	TT	S	5,600	43	22	32	O	51	10.5/16	8	77	
Sitkoh Creek	6/11/2008	4	TT	S	1,200	43	22	32	O	51	10.5/16	8	4	

-continued-

Appendix A2.–Page 3 of 4.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Petersburg Creek	5/20/2008	1	DF	S	11,386		22	32	O				26	Good conditions. Water level down 36 inches from last weeks deluge.
Petersburg Creek	5/20/2008	2	DF	S	7,392		22	32	O		4.6/5.8	7	36	
Petersburg Creek	5/20/2008	3	DF	S	9,504		22	32	O	61			81	
Petersburg Creek	5/29/2008	1	DF	S	11,386		22	32	O				6	Water conditions very good. Pulled temp. logger today
Petersburg Creek	5/29/2008	2	DF	S	7,392		22	32	O		4.9/5.8	9.5	6	
Petersburg Creek	5/29/2008	3	DF	S	9,504	42	22	32	O	61			44	
Peterson Creek	5/2/2008	1	BG	S	3,663		22	32	O	26			1	Trout were unconfirmed, believed to be RBT
Peterson Creek	5/9/2008	1	BG	S	3,663		22	32	O	31	2.9	2	6	Also were 5-6 unidentified trout.
Peterson Creek	5/14/2008	1	BG	S	3,663		22	32	C	19	3	1.8	13	
Peterson Creek	5/23/2008	1	BG	S	3,663		22	32	O	26	3	5	26	
Peterson Creek	5/30/2008	1	BG	S	3,663		22	32	C	27	3	7.2	17	
Peterson Creek	6/5/2008	1	KK	S	3,663		23	31	C		1.5		2	Canyon not surveyed. High flow.
Pleasant Bay	5/1/2008	1	BG	S	3,802		22	32	O	36		2.3	18	
Pleasant Bay	5/1/2008	2	BG	S	2,831		22	32	O			2.3	15	
Pleasant Bay	5/8/2008	1	BG	S	3,802		22	32	O	35		2.4	35	
Pleasant Bay	5/8/2008	2	BG	S	2,831		22	32	O				8	
Pleasant Bay	5/19/2008	1	BG	S	3,802		22	31	C				36	
Pleasant Bay	5/19/2008	2	BG	S	2,831		22	31	C	20		3	17	
Pleasant Bay	5/28/2008	1	JS	S	3,802		22	31	C				13	
Pleasant Bay	5/28/2008	2	JS	S	2,831		22	31	C	10		6.5	27	
Sitkoh Creek	4/30/2008	1	TT	S	3,264		23	32	C	165	13/8.5	3	0	11 fish above weir, but survey conditions were poor, high water, long stretches of white water in riffles, fast currents and low visibility. Although we may not have seen all fish above weir, I suspect that we did see most. We did see more large rainbows than usual.
Sitkoh Creek	4/30/2008	2	TT	S	6,128		23	32	C	165		3	2	
Sitkoh Creek	4/30/2008	3	TT	S	5,600		23	32	C	165		3	9	
Sitkoh Creek	4/30/2008	4	TT	S	1,200	42	23	32	C	165		3	55	

-continued-

Appendix A2.–Page 4 of 4.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Sitkoh Creek	5/24/2008	1	TT	S	3,264	42	22	31	C	193	16/9.5	8.5	2	Water very high for snorkel count. 76 inches on staff gauge. Max level for effective survey is about 65 inches.
Sitkoh Creek	5/24/2008	2	TT	S	6,128	42	22	31	C	193		8.5	8	
Sitkoh Creek	5/24/2008	3	TT	S	5,600	42	22	31	C	193			61	Only saw one redd, top section.
Sitkoh Creek	5/24/2008	4	TT	S	1,200	42	22	31	C	193			10	
Sitkoh Creek	6/6/2008	1	TT	S	3,264	41	22	32	O	59.5	12/12.5	10	0	
Sitkoh Creek	6/6/2008	2	TT	S	6,128	41	22	32	O	59.5		10	0	
Sitkoh Creek	6/6/2008	3	TT	S	5,600	41	22	32	O	59.5		8	161	
Sitkoh Creek	6/6/2008	4	TT	S	1,200	41	22	32	O	59.5		8	6	
Sitkoh Creek	6/11/2008	1	TT	S	3,264	43	22	32	O	51	10.5/16	10	0	
Sitkoh Creek	6/11/2008	2	TT	S	6,128	43	22	32	O	51	10.5/16	8	1	
Sitkoh Creek	6/11/2008	3	TT	S	5,600	43	22	32	O	51	10.5/16	8	77	
Sitkoh Creek	6/11/2008	4	TT	S	1,200	43	22	32	O	51	10.5/16	8	4	

<sup>a</sup> Primary observer: TT (Troy Tydingco), DF (Doug Fleming), VG (Vera Goudima), KP (Kelly Piazza), MW (Mike Wood), KK (Kurt Kondzela), BG (Brian Glynn), SM (Steve McCurdy).

<sup>b</sup> S = snorkel, F = foot, R&R = rod and reel.

<sup>c</sup> 41 = high, 42 = low, 43 = intermediate.

<sup>d</sup> 21 = excellent visibility, 22 = normal visibility, 23 = poor visibility.

<sup>e</sup> 31 = high water, 32 = normal water, 33 = low water.

<sup>f</sup> C = clear, O = overcast, R = rain, W = wind on water surface, O/C = overcast with breaks.

Appendix A3.—Counts of steelhead snorkel surveys from 2009 by stream, date, and reach of stream along with measured environmental variables.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Eagle/Luck	5/12/2009	1	SJM	S	13,712		22	32	R		7	5	8	Active Spawning
Eagle/Luck	5/12/2009	2	SJM	S	6,253		22	32	R		7	5	13	
Eagle/Luck	5/12/2009	3	SJM	S	5,044		22	32	R				41	Lots of active spawning
Eagle/Luck	5/12/2009	4	SJM	S	3,707		22	32	R				25	From top of canyon to salt
Eagle/Luck	5/22/2009	1	SJM	S	13,712		21	33					6	
Eagle/Luck	5/22/2009	2	SJM	S	6,253		21	33					22	
Eagle/Luck	5/22/2009	3	SJM	S	5,044		21	33					79	
Eagle/Luck	5/22/2009	4	SJM	S	3,707		21	33					30	
Eagle/Luck	6/2/2009	1	KSP	S	13,712		22	32	C				13	Lots of rainbows up to 14 inch.
Eagle/Luck	6/2/2009	2	KSP	S	6,253		22	32	C				0	
Eagle/Luck	6/2/2009	3	KSP	S	5,044		22	32	C				20	
Eagle/Luck	6/2/2009	4	KSP	S	3,707		22	32	C				0	
Ford Arm Creek	4/30/2009	1	TAT	S	1,723	41	21	31	C	34	35	2	8	
Ford Arm Creek	4/30/2009	2	TAT	S	2,859	43	21	31	C	34	35	2	19	
Ford Arm Creek	5/8/2009	1	TAT	S	1,723		22	31	O	43	5.5	3	60	Secchi disk 7.5m up, 5.5m down
Ford Arm Creek	5/8/2009	2	TAT	S	2,859		22	31	O	43	5.5	3	88	Secchi disk 7.5m up, 5.5m down
Ford Arm Creek	5/15/2009	1	TAT	S	1,723		22	32	O	20	17	3.5	56	Secchi disk 20m and 17m, not sure which is which.
Ford Arm Creek	5/15/2009	2	TAT	S	2,859		22	32	O	20	17	3.5	104	
Ford Arm Creek	5/21/2009	1	TAT	S	1,723		22	32	O	21	17	4.5	62	Secchi Disk 17m up, 18m down
Ford Arm Creek	5/21/2009	2	TAT	S	2,859	41	22	32	O			4.5	105	
Ford Arm Creek	5/27/2009	1	TAT	S	1,723		22	32	O	16	21	5	57	
Ford Arm Creek	5/27/2009	2	TAT	S	2,859	43	22	32	O			5	113	
Ford Arm Creek	6/2/2009	1	TAT	S	1,723		22	32	C	43	5	7	87	Secchi disk 5.0m up, 7.5m down
Ford Arm Creek	6/2/2009	2	TAT	S	2,859		22	32	C	43	5	7	107	Secchi disk 5.0m up, 7.5m down
Ford Arm Creek	6/10/2009	1	TAT	S	1,723		21	33	O		23	8	25	Secchi disk, 23m up, 27m down.
Ford Arm Creek	6/10/2009	2	TAT	S	2,859		21	33	O				65	
Harris River	4/23/2009	1	KSP	S	3,993		22	32	C		3.5	5	6	
Harris River	4/23/2009	2	KSP	S	11,073		22	32	C				36	
Harris River	4/23/2009	3	KSP	S	10,147		22	32	C				6	
Harris River	4/23/2009	4	KSP	S	9,400		22	32	C				5	
Harris River	4/23/2009	5	KSP	S	4,145		22	32	C				0	

continued-

Appendix A3.–Page 2 of 4.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Harris River	4/30/2009	1	SJM	S	3,993		21	32	C			5	0	
Harris River	4/30/2009	2	SJM	S	11,073		21	32	C				56	
Harris River	4/30/2009	3	SJM	S	10,147		21	32	C				32	
Harris River	4/30/2009	4	SJM	S	9,400		21	32	C				2	
Harris River	4/30/2009	5	SJM	S	4,145		21	32	C				0	
Harris River	5/8/2009	1	SJM	S	3,993		21	33	O		8	5	0	
Harris River	5/8/2009	2	SJM	S	11,073		21	33	O				39	
Harris River	5/8/2009	3	SJM	S	10,147		21	33	O				31	
Harris River	5/8/2009	4	SJM	S	9,400		21	33	O				18	
Harris River	5/8/2009	5	SJM	S	4,145		21	33	O				0	
Harris River	5/13/2009	1	SJM	S	3,993		22	31	O		6	5	0	
Harris River	5/13/2009	2	SJM	S	11,073		22	31	O				17	
Harris River	5/13/2009	3	SJM	S	10,147		22	31	O				9	
Harris River	5/13/2009	4	SJM	S	9,400		22	31	O				3	
Harris River	5/13/2009	5	SJM	S	4,145		22	31	O				0	
Humpback Creek	4/24/2009	1	KSP	S	1,292		22	32	O		4	3	2	
Humpback Creek	4/24/2009	2	KSP	S	1,372		22	32	O				0	
Humpback Creek	4/24/2009	3	KSP	S	1,447		22	32	O				0	
Humpback Creek	4/24/2009	4	KSP	S	4,672		22	32	O				0	
Humpback Creek	5/1/2009	1	KSP	S	1,292		22	32	C				8	
Humpback Creek	5/1/2009	2	KSP	S	1,372		22	32	C				15	
Humpback Creek	5/1/2009	3	KSP	S	1,447		22	32	C		5	4.5	0	
Humpback Creek	5/1/2009	4	KSP	S	4,672		22	32	C				0	
Ketchikan Creek	5/28/2009	1	KSP	F	4,096		23	31	O				14	
McDonald Creek	5/6/2009													Water very high, did NOT survey.
Petersburg Creek	4/30/2009	1	DFP	S	11,386		23	32	C				14	Visibility is not great today
Petersburg Creek	4/30/2009	2	DFP	S	7,392		23	32	C		5.4	4.5	24	Secchi disk up 4m, down 5m.
Petersburg Creek	4/30/2009	3	DFP	S	9,504	43	23	32	C	58			23	Lake still frozen today, hiked up from saltwater, 0 fish in cabin hole. 8 anglers today
Petersburg Creek	5/7/2009	1	DFP	S	11,386		22	32	O				39	Total observed angler count: 14. Guides present: 3, one logbook violation. Stream level dropping. Dead steelhead (angler-killed)
Petersburg Creek	5/7/2009	2	DFP	S	7,392		22	32	O		4	5.5	54	Secchi disk, 4m up, 4.9m down
Petersburg Creek	5/7/2009	3	DFP	S	9,504	42	22	32	O	70			38	

-continued-

Appendix A3.–Page 3 of 4.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Petersburg Creek	5/14/2009	1	DFF	S	11,386		22	32	O				50	Lower water, clearing. Enforcement issues again (guiding).
Petersburg Creek	5/14/2009	2	DFF	S	7,392		22	32	O		5		71	Secchi disk, 5m up, 8.9m down.
Petersburg Creek	5/14/2009	3	DFF	S	9,504	43	22	32	O	79		7	77	
Petersburg Creek	5/26/2009	1	DFF	S	11,386			31	O				8	Light rain on and off. Downloaded temp. logger. Cutthroat trout seen but not counted.
Petersburg Creek	5/26/2009	2	DFF	S	7,392			31	O				14	
Petersburg Creek	5/26/2009	3	DFF	S	9,504			31	O	45	5.3	7	19	
Peterson Creek	4/21/2009	1	KAK	S	3,663		22	32	R				0	Surveyed upstream to just below the canyon. Deep snow and hazardous conditions above this point.
Peterson Creek	5/4/2009	1	BJG	S	3,663		23	31	O		3	2	2	
Peterson Creek	5/12/2009	1	BJG	S	3,663		22	32	C		2.5		15	
Peterson Creek	5/19/2009	1	BJG	S	3,663		22	32	C	28	5	3	22	Water temp. at falls 2.0c, Water temp at Highway bridge 4.0c.
Peterson Creek	6/1/2009	1	KAK	S	3,663		22	33	C	37.5	2.2	8	3	
Peterson Creek	6/4/2009	1	KAK	S	3,663		22	33	O			11	1	
Pleasant Bay Creek	4/30/2009	1	BJG	S	3,802		22	32	C	25		3	17	
Pleasant Bay Creek	4/30/2009	2	BJG	S	2,831		22	32	C				15	
Pleasant Bay Creek	5/7/2009	1	BJG	S	3,802		21	32	O	25		2.8	38	
Pleasant Bay Creek	5/7/2009	2	BJG	S	2,831		21	32	O				15	
Pleasant Bay Creek	5/14/2009	1	BJG	S	3,802		22	32	O			3.2	37	
Pleasant Bay Creek	5/14/2009	2	BJG	S	2,831		22	32	O	32.5	8		27	
Pleasant Bay Creek	5/20/2009	1	BJG	S	3,802		22	32	C	29		5	35	3 small unidentified trout observed.
Pleasant Bay Creek	5/20/2009	2	BJG	S	2,831		22	32	C		7		26	
Pleasant Bay Creek	5/28/2009	1	DJT	S	3,802		22	32	C			6.5	25	
Pleasant Bay Creek	5/28/2009	2	DJT	S	2,831		22	32	C	41	10	6.5	19	
Sitkoh Creek	5/7/2009	1	TAT	S	3,264			31	O					Did not survey reach 1, water <u>very</u> high
Sitkoh Creek	5/7/2009	2	TAT	S	6,128		22	31	O	73	4	3	0	Secchi disk, 4m up, 5m down.
Sitkoh Creek	5/7/2009	3	TAT	S	5,600		22	31	O				3	
Sitkoh Creek	5/7/2009	4	TAT	S	1,200		22	31	O		4	3.5	155	Secchi disk 4m up, 5m down
Sitkoh Creek	5/20/2009	1	TAT	S	3,264		22	31	C	63	13	7	2	Water clear, but too high for good survey. Secchi Disk 13m up, 20m down.
Sitkoh Creek	5/20/2009	2	TAT	S	6,128		22	31	C				19	
Sitkoh Creek	5/20/2009	3	TAT	S	5,600		22	31	C				81	
Sitkoh Creek	5/20/2009	4	TAT	S	1,200	42	22	31	C			6.5	21	
Sitkoh Creek	5/28/2009	1	TAT	S	3,264		22	32	C	54	15	8.5	8	Secchi disk 15m up, 20m down.
Sitkoh Creek	5/28/2009	2	TAT	S	6,128		22	32	C				7	
Sitkoh Creek	5/28/2009	3	TAT	S	5,600		22	32	C				165	
Sitkoh Creek	5/28/2009	4	TAT	S	1,200	42	22	32	C				21	
Sitkoh Creek	6/9/2009	1	TAT	F	3,264		21	33	O	51			0	

-continued-

Appendix A3.–Page 4 of 4.

Stream name	Survey date	Survey reach	Primary observer <sup>a</sup>	Survey type <sup>b</sup>	Distance surveyed (ft)	Tide code <sup>c</sup>	Remark codes <sup>d</sup>	Water level code <sup>e</sup>	Weather codes <sup>f</sup>	Staff Gauge Level/Depth (cm)	Secchi disk (m)	Surface temp. (C)	Number of live steelhead	General comments
Sitkoh Creek	6/9/2009	2	TAT	F	6,128		21	33	O				4	
Sitkoh Creek	6/9/2009	3	TAT	F	5,600		21	33	O				30	
Sitkoh Creek	6/9/2009	4	TAT	S	1,200		22	33	O				9	
Sitkoh Creek	6/22/2009	1	TAT	S	3,264		22	32	O			12		15 smolt
Sitkoh Creek	6/22/2009	2	TAT	S	6,128									0 smolt
Sitkoh Creek	6/22/2009	3	TAT	S	5,600									0 smolt
Sitkoh Creek	6/22/2009	4	TAT	S	1,200									0 smolt
Slippery Creek	4/28/2009	1	DFF	S	2,640		22		C			3	1	Reach 3 no longer surveyed.
Slippery Creek	4/28/2009	2	DFF	S	7,920	43	22		C	40	6		8	Fish present at mouth but not counted. Fish pass was clean and has been open for 7 days prior to todays survey. Lake 90% ice covered.
Slippery Creek	5/5/2009	1	DFF	S	2,640		22		C			4.5	18	Good conditions, long hike from tidewater. Many trout observed (40-50)
Slippery Creek	5/5/2009	2	DFF	S	7,920		22		C	41	5.2		52	Secchi disk, 5.2m up, 6.4m down.
Slippery Creek	5/12/2009	1	DFF	S	2,640		22		O			7	24	Numerous CT and RBT. Enforcement issue, first time here (guiding).
Slippery Creek	5/12/2009	2	DFF	S	7,920		22		O	34	3		62	Secchi disk up 3m, down 8.5.
Slippery Creek	5/19/2009	1	DFF	S	2,640		21		C				24	
Slippery Creek	5/19/2009	2	DFF	S	7,920		21		C	35	9	8.5	43	Still no coho fry seen. Pulled temp. logger. Fish dark and tattered. Rainbow and Cuts seen but not counted.
White River	4/22/2009	1	KSP	S	7,825		21		C				9	
White River	4/22/2009	2	KSP	S	7,607		21		C		3.75	4	0	
White River	4/22/2009	3	KSP	S	4,287		21		C				0	
White River	4/28/2009	1	KSP	S	7,825		22		C				17	Several Bright fish
White River	4/28/2009	2	KSP	S	7,607		22		C		3.5	4	2	
White River	4/28/2009	3	KSP	S	4,287		22		C				0	
White River	5/7/2009	1	KSP	S	7,825		21		O				27	
White River	5/7/2009	2	KSP	S	7,607		21		O		4	4	9	
White River	5/7/2009	3	KSP	S	4,287		21		O				2	
White River	5/21/2009	1	KSP	S	7,825		21		C				16	
White River	5/21/2009	2	KSP	S	7,607		21		C		4.5	5	17	
White River	5/21/2009	3	KSP	S	4,287		21		C				12	
White River	6/1/2009	1	KSP	S	7,825		21		C				2	
White River	6/1/2009	2	KSP	S	7,607		21		C		4.5		0	
White River	6/1/2009	3	KSP	S	4,287		21		C				7	

<sup>a</sup> Primary observers: TAT (Troy Tydingco), DFF (Doug Fleming), DJT (Dan Teske), KSP (Kelly Piazza), KAK (Kurt Kondzela), BJB (Brian Glynn), SJM (Steve McCurdy).

<sup>b</sup> S = snorkel, F = foot, R&R = rod and reel.

<sup>c</sup> 41 = high, 42 = low, 43 = intermediate.

<sup>d</sup> 21 = excellent visibility, 22 = normal visibility, 23 = poor visibility, 31 = high water, 32 = normal water, 33 = low water.

<sup>e</sup> 31 = high water, 32 = normal water, 33 = low water.

<sup>f</sup> C = clear, O = overcast, R = rain, W = wind on water surface, O/C = overcast with breaks.

## **APPENDIX B**

Appendix B1.–Computer data files used to prepare and generate estimates for the Southeast Alaska Snorkel Surveys of Regional Index Streams, 2008–2009. All files are organized on the Region 1-Douglas Sport fish Server under G:\Trout-SF\REGIONSH\SURVEYS\2008 REPORT\FINALS.

File Name	Description
Temp_data_08_09_FDS.XLS	EXCEL spreadsheet with HOBO temperature data and graphs for 2008 and 2009.
Snorkel_97-09_NORMALIZED	EXCEL spreadsheet containing normalized graph (Figure 3).
97-10SRV_FOR 08_09 FDS.XLS	EXCEL spreadsheet with snorkel survey data for 1997–2010.