

Fishery Data Series No. 09-74

**Southeast Alaska Steelhead Snorkel Surveys of
Regional Index Streams, 2006 and 2007**

by

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December 2009

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



Symbols and Abbreviations

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

FISHERY DATA SERIES NO. 09-74

**SOUTHEAST ALASKA STEELHEAD SNORKEL SURVEYS OF
REGIONAL INDEX STREAMS, 2006 AND 2007**

by
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ABSTRACT

Snorkel surveys to investigate the spawning abundance of steelhead *Oncorhynchus mykiss* in 10 index streams in Southeast Alaska have been conducted annually since 1997 and were conducted again during 2006 and 2007. 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 eight of the index streams during 2006, and seven during 2007. The peak survey counts in index streams during 2006 and 2007 were similar to the counts recorded in the preceding 2 years and somewhat higher in a few systems; two new record high peak counts were recorded during both 2006 and 2007. The number of steelhead observed during 2006 and 2007 of the Juneau and Prince of Wales Island areas remained stable but below the counts of steelhead observed during the late 1990s.

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 two steelhead per year and a minimum size limit of 36 inches (914 mm).

Intensive research on steelhead stocks in Southeast Alaska has largely been limited to Petersburg Creek (Jones 1972-1976) and the 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). Estimates of migratory timing, abundance, and age

composition have also been made for a few other systems (Jones 1983; Harding and Jones 1990-92; Jones et al. 1991; Yanusz 1997). Creel surveys of steelhead fisheries have also been conducted (Freeman and Hoffman 1989-91; Hubartt 1989, 1990; Hoffman et al. 1990; Harding and Jones 1991, 1993, 1994; Schmidt 1992), and enhancement has been studied in one system (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).

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/number of known fish in stream).

During late April through early June 2006 and 2007, the primary objective of the steelhead survey project was to conduct weekly counts of steelhead, for a minimum of 3 weeks, in standardized sections of 10 index streams. The

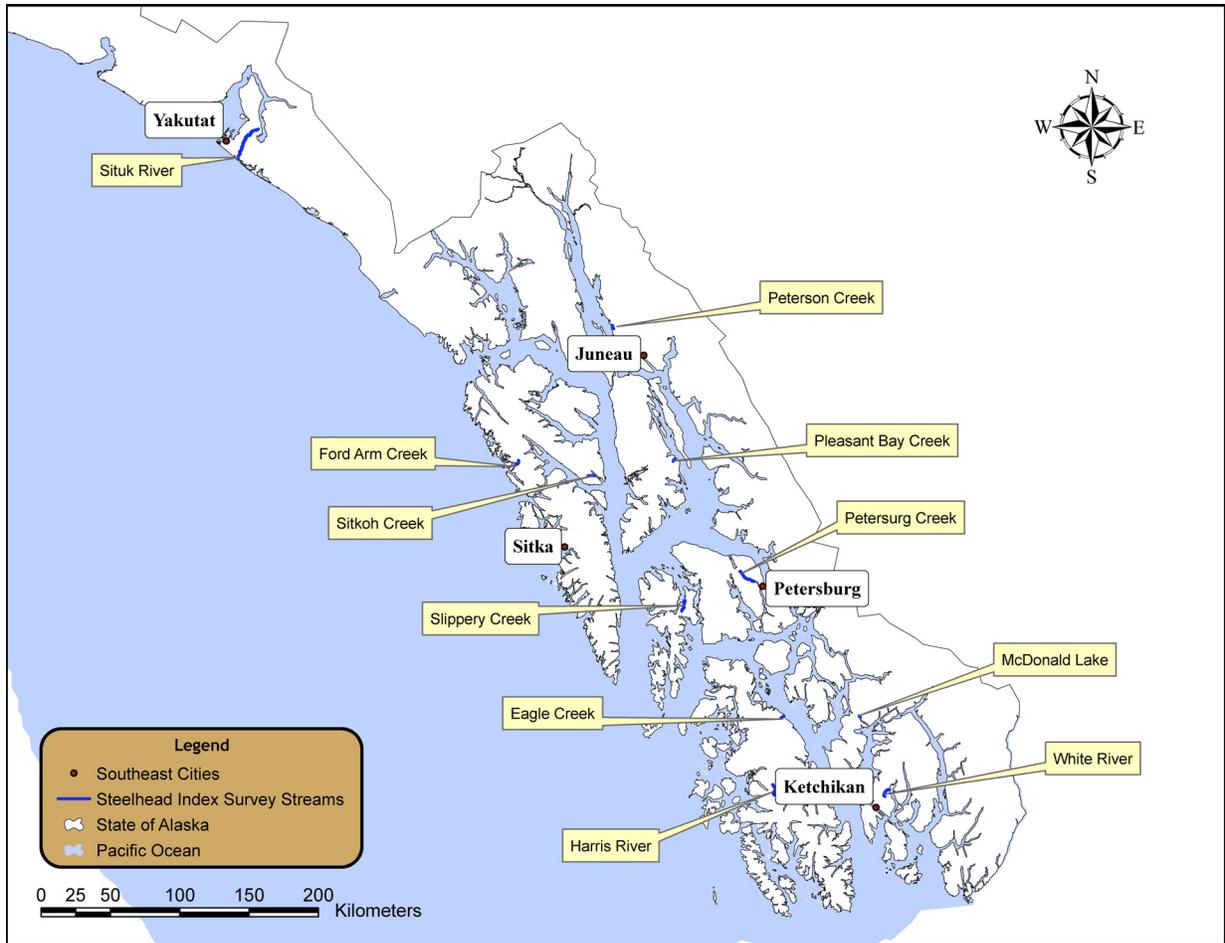


Figure 1.—Locations of the Situk River and the steelhead index systems in Southeast Alaska surveyed in 2006 and 2007.

index streams surveyed for steelhead in 2006 and 2007 were dispersed across Southeast Alaska (Figure 1). Snorkel surveys were also conducted on several non-index streams during 2006 and 2007 to address management concerns (angler reports of poor returns) and straying of steelhead (previously-tagged fish returning to different stream). Non-index streams surveyed included Humpback Creek during 2006 and 2007 and Sitkoh Bay River in 2007. Additional snorkel surveys were conducted during 2006 and 2007 as part of two federally-funded subsistence research weirs on Prince of Wales Island (Eagle Creek and Cable Creek, Piazza 2009b; Natzuhini Creek and Big Ratz Creek, Piazza 2009a). The objective of these projects was to correlate snorkel counts to weir counts and the snorkel survey data associated with these surveys are presented in the cited reports.

METHODS

SOUTHEAST ALASKA SNORKEL SURVEYS

Snorkel surveys were scheduled to provide indices of peak steelhead abundance for 10 streams in Southeast Alaska in 2006 and 2007 (Figure 1). All index streams have been surveyed for steelhead since 1997 (Johnson and Jones 1998-2001, 2003; Harding 2005; Harding and Love 2008) with the exception of Slippy Creek, which has been surveyed five times since 2000 (Slippy Creek was not surveyed in 2005). The percentage of available stream area surveyed (feet surveyed/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 four 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 two 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 shoreside (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 shoreside 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.

Surface water temperature (°C), and weather conditions (cloud cover, wind, and precipitation) were recorded at the beginning of each survey during 2006 and 2007. On 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 one 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[®] temp logger model H8)¹ were installed in nine 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 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

2006 and 2007

The “peak” survey counts for a given year on streams with known escapement, i.e., 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 (π_i) for Sitkoh Creek steelhead in 2006. 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:

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

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

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, 2006

Thirty-one snorkel surveys were conducted in the 10 steelhead index streams during April and May 2006. (Table 1 and Appendix A2). Observers obtained a peak count bracketed by lower counts for eight of the index streams. One Petersburg area stream (Petersburg River) was only surveyed twice. The peak 2006 steelhead counts ranged from 36 (May 16) in Peterson Creek to 428 (May 8) in Ford Arm Creek.

One additional Ketchikan area system (Humpback Creek) was surveyed during 2006 that is not an index stream (Appendix A2). Two snorkel surveys of Humpback Creek yielded a high count of 112 steelhead, just above the historic peak of 105 recorded during 2003.

One survey was conducted in Sitkoh River (near Sitkoh Creek) to investigate possible straying of uniquely-tagged steelhead with adipose finclips from the Sitkoh Creek research project (Love and Harding 2009). Sitkoh River was divided into two sections for this survey and two teams were employed to snorkel approximately 4 km each. The upper team observed 16 steelhead and none had been previously adipose clipped. The lower river team observed a total of 50 fish close enough to distinguish presence/absence of adipose fin (11 were

not observed close enough) and 6 fish had clearly been previously adipose finclipped. Thus a total of 55 steelhead were observed in Sitkoh River adequately enough to evaluate the presence/absence of their adipose fin and 6 of these 55 fish, or 11%, had been adipose finclipped.

SOUTHEAST ALASKA SNORKEL SURVEYS, 2007

Thirty-nine snorkel surveys were conducted on the 10 steelhead index streams during April, May and June 2007 (Table 2 and Appendix A3). Observers obtained a peak count bracketed by lower counts in seven of the index streams. One Ketchikan area stream (McDonald Creek) was only surveyed once. The peak or high 2007 steelhead counts ranged from 26 (May 1) in Peterson Creek to 673 (June 2) in Ford Arm Creek.

One survey was made on a non-index stream in the Ketchikan area (Humpback Creek). This one survey produced a high count of 18, well below the historic peak of 105 during 2003 and the high count of 118 recoded during 2006 (Appendix A3).

STREAM TEMPERATURE MONITORING

Complete water temperature records during the 2006 and 2007 surveys are available only from White River and Peterson Creek. Partial records are available from Petersburg, Ford Arm, Harris, Eagle, and Slippery creeks (Figure 2). The temperature logger at Pleasant Bay was not recovered during 2006 or 2007; data from Sitkoh Creek are only available from a department weir located approximately 400 m above saltwater. Data loggers at Pleasant Bay and Humpback Creek were not retrieved during winter 2007 or 2008.

Peak and high snorkel counts were recorded in index streams when the daily average water temperatures ranged from 3.8°C (White River) to 9.6°C (Slippery Creek), but generally were between 5.0 and 6.5°C (Harris, Sitkoh, Peterson, Petersburg, and Ford Arm). The peak counts at Peterson Creek in 2006 and 2007 occurred on May 16th and 18th, when average daily water temperatures were 5.4 and 5.8°C, respectively.

Table 1.–Steelhead index streams surveyed in 2006 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 17	154	(P)	Prince of Wales Island
Harris River	3	May 12	92	(P)	Prince of Wales Island
White River	4	May 17	41	(P)	Revillagigedo Island
McDonald Lake Creek	3	May 12	100	(P)	Southern mainland
Slippery Creek	2	April 26 & May 9	79	(H)	Kuiu Island
Petersburg Creek	3	May 2	241	(P)	Kupreanof Island
Pleasant Bay Creek	3	May 22	59	(H)	Admiralty Island
Ford Arm Creek	3	May 8	428	(P)	Chichagof Island
Sitkoh Creek	3	May 17	354	(P)	Chichagof Island
Peterson Creek	4	May 16	36	(P)	Northern mainland

Table 2.–Steelhead index streams surveyed in 2007 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	2	May 2	134	(H)	Prince of Wales Island
Harris River	3	May 4	128	(P)	Prince of Wales Island
White River	4	April 29	85	(P)	Revillagigedo Island
McDonald Lake Creek	1	May 3	38	(H)	Southern mainland
Slippery Creek	4	May 22	68	(P)	Kuiu Island
Petersburg Creek	4	May 14	289	(P)	Kupreanof Island
Pleasant Bay Creek	5	May 22	94	(P)	Admiralty Island
Ford Arm Creek	7	June 2	673	(P)	Chichagof Island
Sitkoh Creek	2	May 10	70	(H)	Chichagof Island
Peterson Creek	7	May 18	26	(P)	Northern mainland

CALIBRATION OF SNORKEL COUNTS TO WEIR COUNT

2006 and 2007

Division of Sport Fish staff from the Sitka area office (“Sitka team”) conducted three snorkel surveys in 2006 during weir operations at Sitkoh Creek. During their surveys they saw an average of 66% of the upstream weir count (Table 3).

There was also an event conducted at Sitkoh Creek during 2006 to calibrate snorkel counts to the weir count on the same day/time, i.e., an attempt to calibrate under as nearly identical conditions and abundance as possible. This event occurred on May 17 when the Sitka team observed 49.2% of the escapement while the Juneau A and Juneau B teams observed 49.2% and 53.5%, respectively. The instream steelhead abundance was identical during these three surveys, i.e., the weir did not pass any fish during

the surveys and each survey was conducted approximately 2–3 hours apart. The distribution of steelhead observed by each snorkel team was nearly identical, e.g., 70 to 78 steelhead were observed in the 3rd reach.

Combining the Sitka team’s three surveys with two additional surveys from other snorkel teams (Juneau A and Juneau B) resulted in an average of 60% of the total immigrant weir count observed at the time of each survey. Snorkel counts from the Sitka team suggest that detection probabilities may change in relation to density as the Sitka team observed proportionately more (83%) fish when the density of steelhead in Sitkoh Creek was the lowest (i.e., 39 observed when weir count was 47, Table 3).

No analyses of snorkel calibrations were completed for 2007. Slow spring thaw prevented the Sitkoh weir installation until May 2, and high water for the duration the season created unsafe survey conditions and cancellation of surveys.

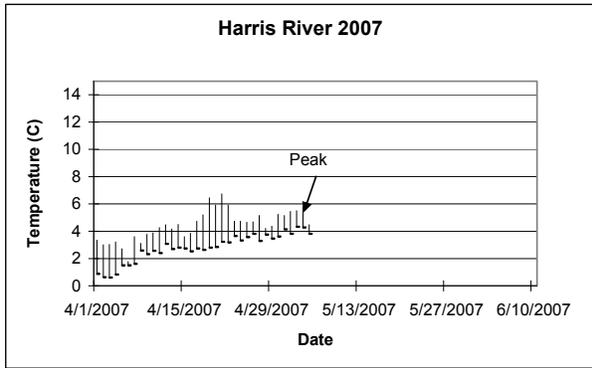
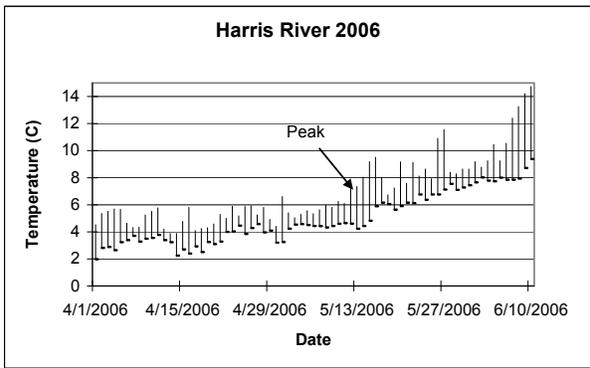
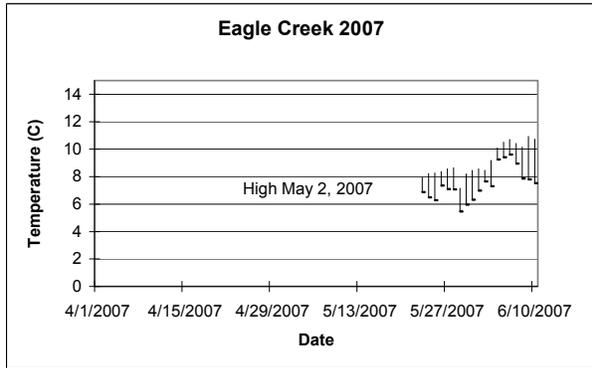
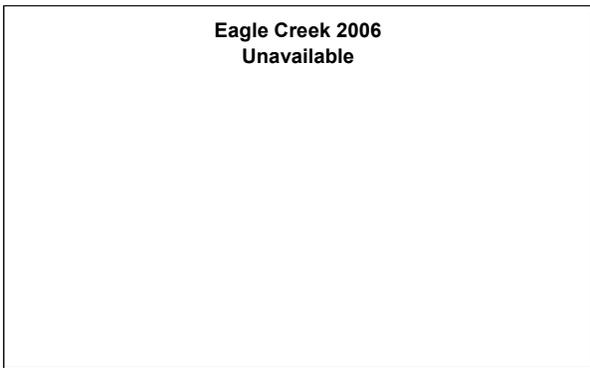
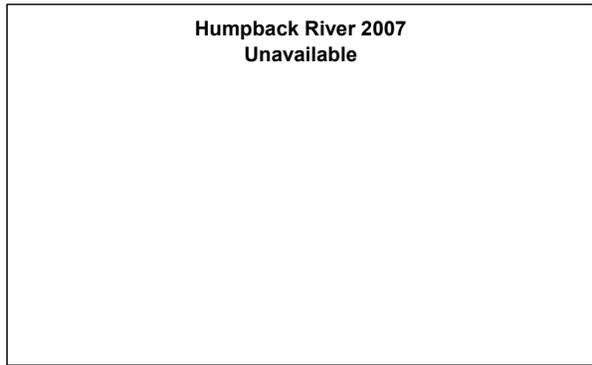
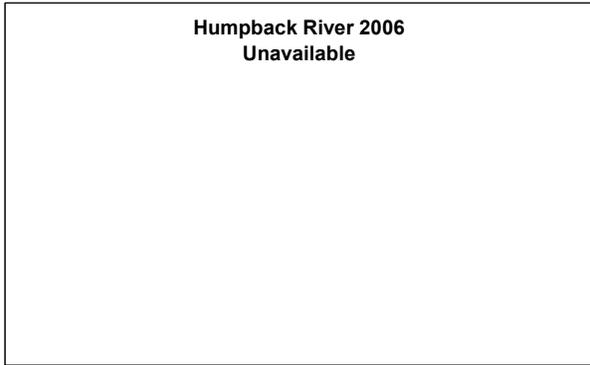
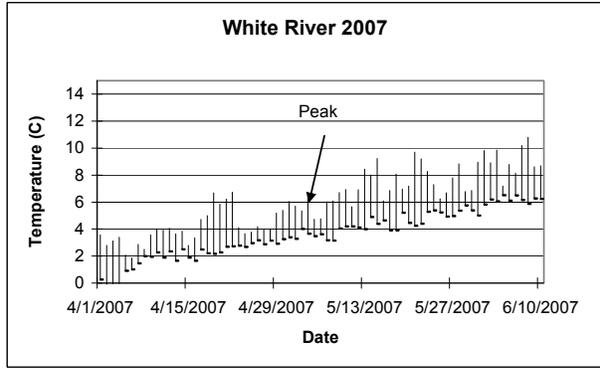
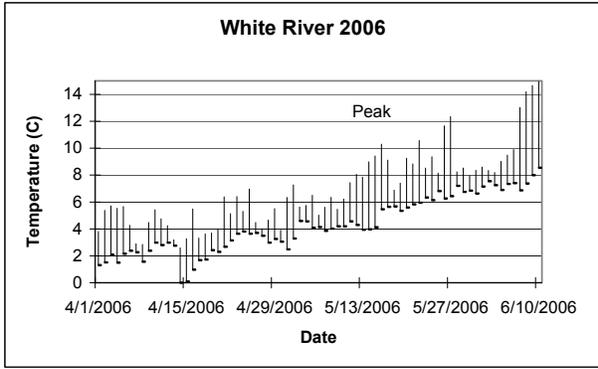
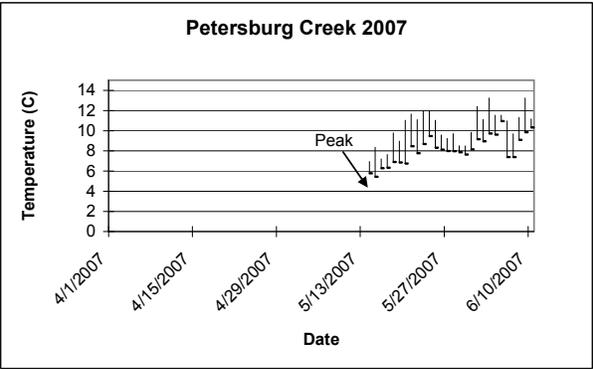


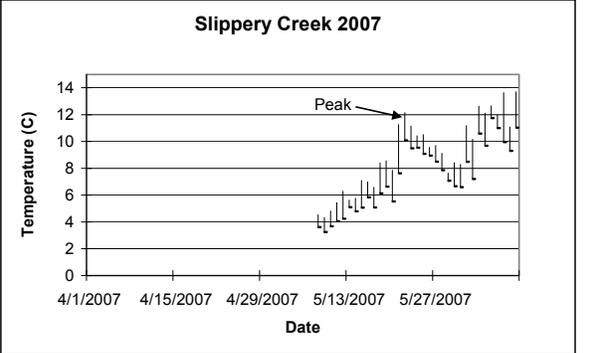
Figure 2.—The daily average and high and low water temperatures recorded at steelhead index streams and the dates of “high” or “peak” snorkel counts during our 2006 and 2007 Southeast Alaska steelhead snorkel surveys.

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Petersburg Creek 2006
Unavailable



Slippery Creek 2006
Unavailable



Ford Arm Creek 2006
Unavailable

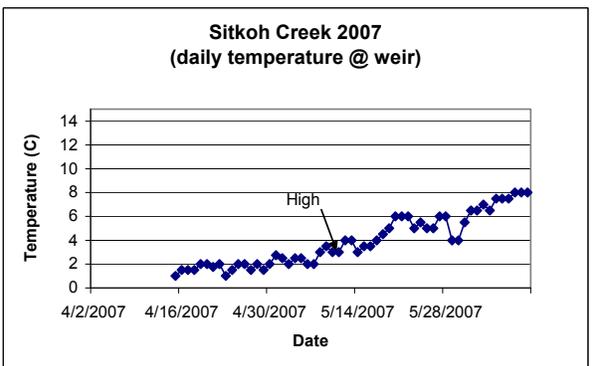
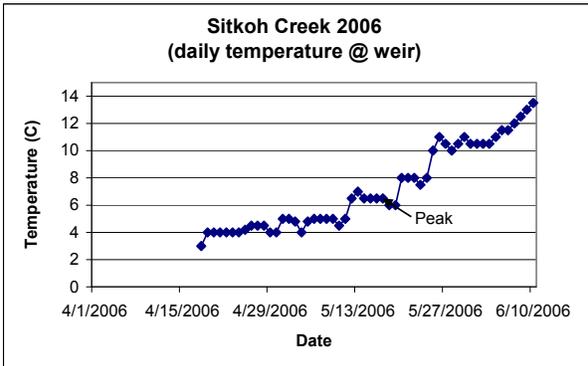
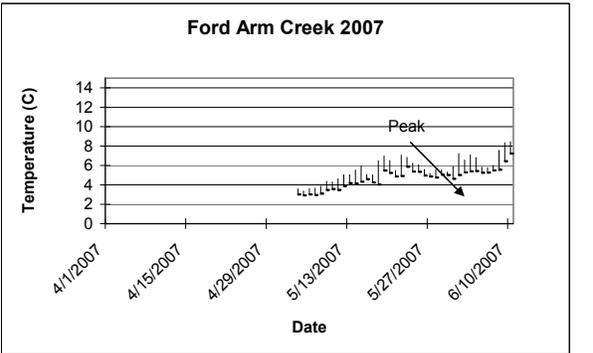


Figure 2.-Page 2 of 3.

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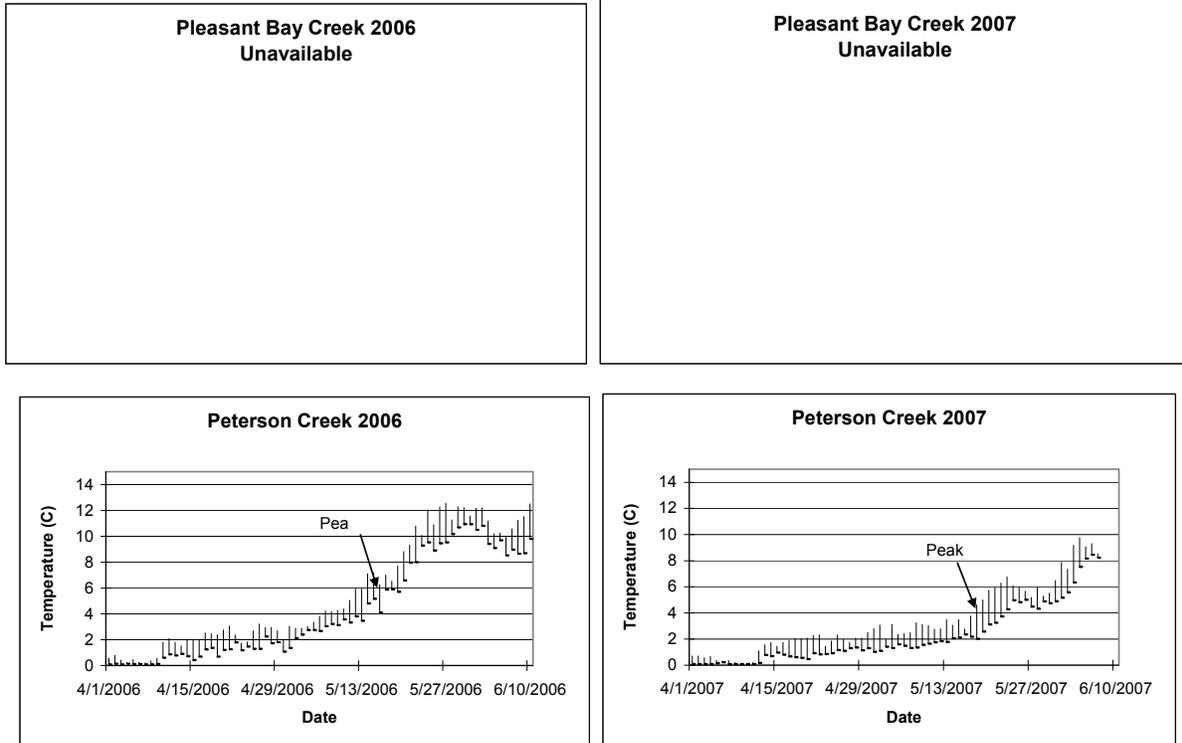


Figure 2.–Page 3 of 3.

Table 3.–Calibration of steelhead snorkel survey counts to Sitkoh weir escapements, 2006. Multiple counts by date, weir counts at time of survey for that day, percent of total instream escapement, and snorkel conditions for surveys made by three snorkel teams: Sitka, Juneau A, and Juneau B (SD in parentheses).

Date	Snorkel team	Snorkel	Count above weir ^a	% Observed	π_t	Snorkel conditions
April 25	Sitka	39	47	83.0%	1.21	Water visibility normal
May 17	Sitka	91	185	49.2%	2.03	Water visibility poor, high water
May 17	Juneau A	99	185	53.5%	1.87	Water visibility poor, high water
May 17	Juneau B	91	185	49.2%	2.03	Water visibility poor, high water
May 31	Sitka	181	278	65.1%	1.54	Water visibility normal, water level normal
All days	Sitka			65.8%	1.59 (0.42)	
May 17	All teams			50.6%	1.98 (0.09)	
Average Overall				60.0%	1.74 (0.36)	

^a Weir count of known adult steelhead above weir when snorkel team finished survey at weir.

DISCUSSION

We have consistent snorkel survey data for nine index streams from 1997 through 2007 (Table 4). Reviewing the peak/high surveys for index streams in all years reveals that the 2006 and 2007 counts were generally good with observers reporting strong peak counts in most index streams (Figure 3). Peak counts were obtained for eight of the 10 index systems in 2006 and seven in

2007, which reflects the dedication of all surveyors.

In 2007, surveyors at Pleasant Bay and White rivers recorded the highest peak counts in the last 8 years. The peak count at Ford Arm during 2007 was the highest number of steelhead ever observed in any index stream. The Eagle/Luck system recorded a record high peak count during 2006, and a record high count again during 2007

Table 4.–Steelhead snorkel surveys conducted on index streams in Southeast Alaska, 1997–2007. 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	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Juneau	Peterson Creek	26	<i>29</i>	<i>38</i>	<i>27</i>	41	13	36	<i>39</i>	22	36	26
	Pleasant Bay (Seymour)	<i>155</i>	81	<i>132</i>	48	<i>48</i>	36	50	51	<i>47</i>	<i>59</i>	94
Ketchikan	McDonald Lake	145	86	<i>100</i>	47	<i>74</i>	<i>14</i>	79	<i>76</i>	134	100	<i>38</i>
	White River	<i>84</i>	93	<i>60</i>	38	48	37	77	<i>35</i>	<i>67</i>	41	85
Petersburg	Petersburg Creek	<i>123</i>	152	115	<i>68</i>	<i>64</i>	<i>41</i>	146	330	369	241	289
	Slippery Creek ^a	NA	NA	NA	<i>42</i>	<i>41</i>	<i>31</i>	<i>76</i>	92	NA	<i>79</i>	68
Prince of Wales	Eagle/Luck Creek	<i>90</i>	56	<i>118</i>	82	NA	36	<i>95</i>	<i>67</i>	<i>102</i>	154	<i>134</i>
	Harris River	<i>104</i>	156	<i>192</i>	79	<i>53</i>	<i>200</i>	<i>195</i>	124	122	92	128
Sitka	Ford Arm Creek	<i>296</i>	<i>103</i>	<i>89</i>	134	<i>28</i>	<i>122</i>	181	379	459	428	673
	Sitkoh Creek	<i>329</i>	<i>154</i>	<i>129</i>	<i>112</i>	<i>115</i>	<i>65</i>	296	354	259	213	<i>70</i>

^a Slippery Creek not surveyed in 1997–1999 and 2005.

^b Based on only one survey count.

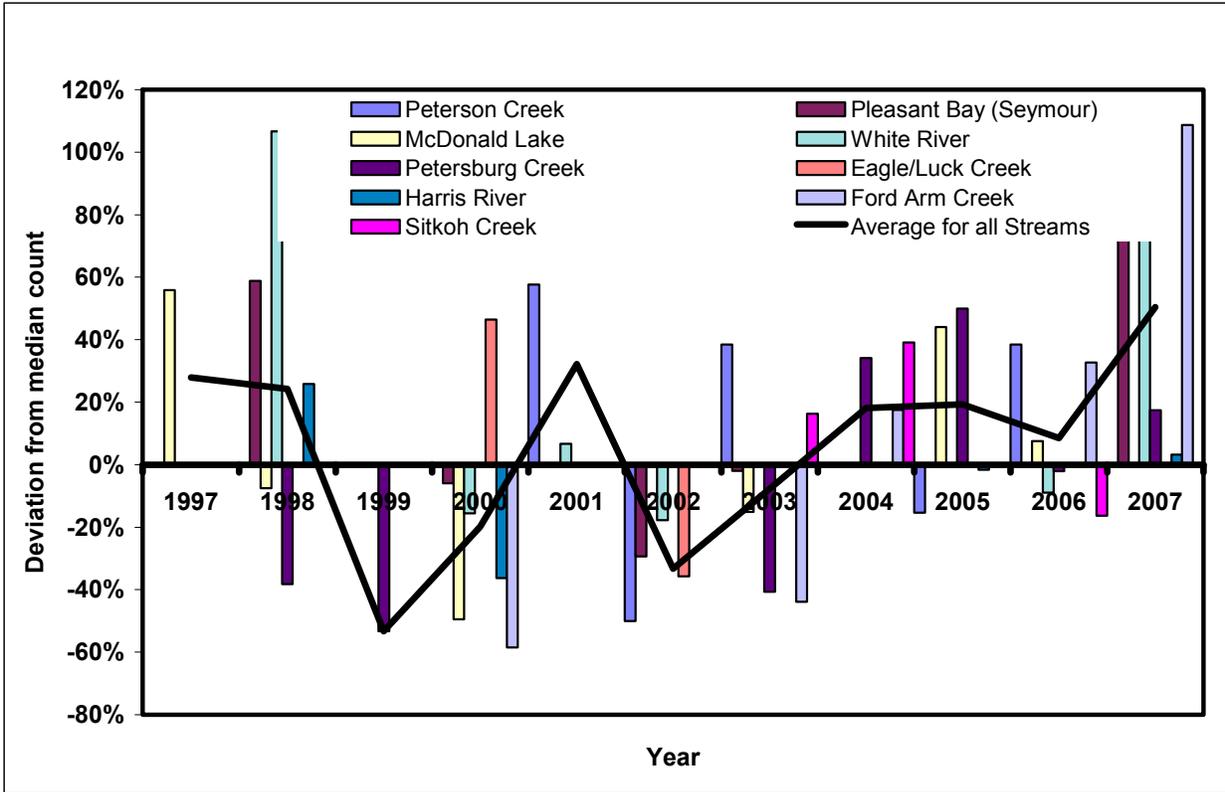


Figure 3.—Southeast Alaska peak snorkel surveys and the deviation of these counts from the median count combined with a trend line, 1997–2007. Only peak counts were used and only for systems surveyed since 1997, i.e., not Slippery Creek.

while counts in Harris and Slippery creeks were similar to counts recorded since 2003.

The number of steelhead observed during the 2006 and 2007 snorkel counts was consistent with anecdotal angler reports made to Division of Sport Fish area management biologists that indicated steelhead abundance was relatively high.

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; Harding 2008). 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 2004–2005. The average percent of steelhead observed during the 2006 surveys (60.0%) is similar to the averages

observed (45.3%, 53.9%, and 56.6%) in 2003, 2004, and 2005, respectively.

The average daily water temperatures during peak snorkel counts ranged from 3.8°C at White River (2007) to 9.6°C at Slippery Creek (2007). The daily maximum temperatures during the peak surveys ranged from 5.8 to 11.3°C. 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.

In some streams snorkel surveys were delayed and even cancelled because of late ice cover and dangerously high water caused by higher than normal snowfall during the 2006/2007 winter. For example, the Sitkoh Creek weir installation normally occurs in early April (Love and Harding 2008) but was delayed until May 2. The 2007

high/peak surveys also occurred later than normal in the northern streams. The Ford Arm peak count was not observed until June 2, as compared to peak counts observed during 2004, 2005, and 2006 on May 6, May 10, and May 8, respectively.

Over 13 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, snorkel counts have trended upwards and been above average. Collectively these counts suggest that the steelhead stocks surveyed during 2006 and 2007 are stable and generally have higher escapements since 1999. However, even though index stocks appear stable or slightly higher 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.

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 techniques are developed to estimate immigrant steelhead abundance, e.g., use of DIDSON technology (*Coyle In prep*).

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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 2006 and 2007.

Index Streams	Anadromous stream number	Area	Dist. to be surveyed in feet ^a	Percent of stream surveyed	Number of reaches	Target survey start ^b
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 ^c	Apr 30
Petersburg Creek	106-44-10600	Petersburg	28,282/72,983	35%	2	Apr 30
Slippery Creek	109-43-10030	Petersburg	10,560/11,491	92%	3	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

^a Feet to be surveyed/feet of anadromous stream.

^b Additional surveys are required if highest counts occur during last of three surveys.

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

AppendixA2.–Counts of steelhead from 2006 surveys by stream, date, and reach of stream along with measured environmental variables.

Stream name	Date	Reach	Distance surveyed (ft)	Survey type ^a	Live	Weather codes ^b	Observers ^c	Codes ^d	Temp (C)	Comments
Eagle/Luck	05/02/06	1	13,712	S	4		PB, KM	22, 32	6.0	Water level 960 mm at weir
	05/02/06	2	6,253	S	5		PB, KM	22, 32	6.0	Water level 960 mm at weir
	05/02/06	3	5,044	S	23		PB, KM	22, 32	6.0	Water level 960 mm at weir
	05/02/06	4	3,707	S	67		PB, KM	22, 32	6.0	Water level 960 mm at weir
	05/17/06	1	13,712	S	1		KM, SM	22, 31		
	05/17/06	2	6,253	S	11		KM, SM	22, 31		
	05/17/06	3	5,044	S	65		KM, SM	22, 31		
	05/17/06	4	3,707	S	77		KM, SM	22, 31		
	05/28/06	1	13,712	S	8		KM, AK	21, 32		
	05/28/06	2	6,253	S	10		KM, AK	21, 32		
	05/28/06	3	5,044	S	106		KM, AK	22, 32		
	05/28/06	4	3,707	S	17		KM, AK	22, 32		
	Ford Arm	05/01/06	1	1,723	S	46	O-R	TT, HR, KF	22, 32	4.0
05/01/06		2	2,859	S	139	O-R	TT, HR, KF	22, 32	4.0	Water level 21, Secchi Disk 13/15 feet. Stream depth measured from a point on reference rock down to water level. Therefore larger reading = shallower stream.
05/08/06		1	1,723	S	211	R, O, C, W	BC, TT, GH	22, 31	3.5	Secchi Disk 16.5 feet, Water level 16 inches.
05/08/06		2	2,859	S	217	R, O, C, W	BC, TT, GH	22, 31	5.5	Secchi Disk 16.5 feet, Water level 16 inches.
05/16/06		1	1,723	S	178	O	BC, TT, HR	23, 32	5.5	Secchi Disk 14 feet, Water level 22 inches
05/16/06		2	2,859	S	201	O	BC, TT, HR	23, 32	5.5	Secchi Disk 14 feet, Water level 22 inches
Harris River		04/21/06	1	3,993	S	17		KM, MC	22, 32	
	04/21/06	2	11,073	S	22		KM, MC	22, 32		
	04/21/06	3	10,147	S	13		KM, MC	22, 32		
	04/21/06	4	9,400	S	0		KM, MC	22, 32		
	04/21/06	5	4,145	S	0		KM, MC	22, 32		
	05/12/06	1	3,993	S	6	C	KP, DE	22, 32		
	05/12/06	2	11,073	S	49	C	KP, DE	22, 32		
	05/12/06	3	10,147	S	23	C	SM, MS	22, 32		
	05/12/06	4	9,400	S	12	C	SM, MS	22, 32		
	05/12/06	5	4,145	S	2	C	SM, MS	22, 32		
	05/22/06	1	3,993	S	0	O	SM, KM	21, 32		
	05/22/06	2	11,073	S	45	O	SM, KM	21, 32		
	05/22/06	3	10,147	S	19	O	SM, KM	21, 32		
	05/22/06	4	9,400	S	9	O	USFS	21, 32		
	05/22/06	5	4,145	S	0	O	USFS	21, 32		
Humpback Creek	04/20/06	1	1,292	S	5	C	AL, GF, SH	21, 32	2.2	Secchi Disk 7.3 meters 50/50 Dark vs bright fish.
	04/20/06	2	1,372	S	50	C	AL, GF, SH	21, 32	2.2	Secchi Disk 7.3 meters

-continued-

Stream name	Date	Reach	Distance surveyed (ft)	Survey type ^a	Live	Weather codes ^b	Observers ^c	Codes ^d	Temp (C)	Comments
Humpback Creek	04/20/06	3	1,447	S	57	C	AL, GF, SH	21, 32	2.2	Secchi Disk 7.3 meters
	04/20/06	4	4,672	S	0	C	AL, GF, SH	21, 32	2.2	Secchi Disk 7.3 meters
	05/02/06	1	1,292	S	6	C	SH, KP, CN	22, 31	3.0	Secchi Disk 5 meters. No water level
	05/02/06	2	1,372	S	23	C	SH, KP, CN	22, 31	3.0	Secchi Disk 5 meters. No water level
	05/02/06	3	1,447	S	22	C	SH, KP, CN	22, 31	3.0	Secchi Disk 5 meters. No water level
	05/02/06	4	4,672	S	12	C	SH, KP, CN	22, 31	3.0	Secchi Disk 5 meters. No water level
McDonald Lake	04/25/06	1	2,375	S	11	O	SH, GF	22, 32	2.0	Secchi Disk 5.5 meters
	04/25/06	2	2,714	S	3	O	SH, GF	22, 32	2.0	Secchi Disk 5.5 meters
	04/25/06	3	2,553	S	27	O	SH, GF	22, 32	2.0	Secchi Disk 5.5 meters
	04/25/06	4	3,617	S	9	O	SH, GF	22, 32	2.0	Secchi Disk 5.5 meters
	05/12/06	1	2,375	S	36	O	MW, GF	22, 32	5.0	Secchi Disk 5.0 meters
	05/12/06	2	2,714	S	20	O	MW, GF	22, 32	5.0	Secchi Disk 5.0 meters
	05/12/06	3	2,553	S	40	O	MW, GF	22, 32	5.0	Secchi Disk 5.0 meters
	05/12/06	4	3,617	S	4	O	MW, GF	22, 32	5.0	Secchi Disk 5.0 meters
	05/24/06	1	2,375	S	20	O	SH, GF, TC	22, 31	4.5	Secchi Disk 4.5 meters
	05/24/06	2	2,714	S	28	O	SH, GF, TC	22, 31	4.5	Secchi Disk 4.5 meters
	05/24/06	3	2,553	S	10	O	SH, GF, TC	22, 31	4.5	Secchi Disk 4.5 meters
	05/24/06	4	3,617	S	4	O	SH, GF, TC	22, 31	4.5	Secchi Disk 4.5 meters
	Petersburg Creek	04/25/06	1	11,386	S	25	O-R	DF, VG, JC	23, 31	4.0
04/25/06		2	7,392	S	41	O-R	DF, VG, JC	23, 31	4.0	
04/25/06		3	9,504	S	53	O-R	DF, VG, JC	23, 31	4.0	Lost water level mark in collapsed bank, Secchi Disk 11 feet shade, 14 feet sun 20 of these fish counted in Cabin pool.
05/02/06		1	11,386	S	65	O	DF, VG, HW	23, 32	5.0	Secchi Disk 15 feet, Water level -31.5 inches Note new staff gauge.
05/02/06		2	7,392	S	98	O	DF, VG, HW	22, 32	5.0	
05/02/06		3	9,504	S	78	O	DF, VG, HW	22, 32	5.0	Secchi Disk 15 feet, Water level -31.5 inches Note new staff gauge. 12 of these fish counted in Cabin Hole.
05/10/06		1	11,386	S	25	O, R	DF, VG, ES	23, 31	5.0	Secchi Disk 12 feet, Water level -19.5 inches.
05/10/06		2	7,392	S	14	O, R	DF, VG, ES	23, 31	5.0	Secchi Disk 12 feet, Water level -19.5 inches.
05/10/06		3	9,504	S	7	O, R	DF, VG, ES	23, 31	5.0	Secchi Disk 12 feet, Water level -19.5 inches.
Peterson Creek	04/26/06	1	3,663	S	8	O	KK, NZ, RD	23, 32	3.0	Water Level 19"; Secchi Disk 1.5 meters.
	05/10/06	1	3,663	S	13	O, R, W	DL, PB, RH	23, 31	4.0	Secchi Disk 1.75 meters, Water level 14 inches
	05/16/06	1	3,663	S	36	O,R	DL, JD, KK	22, 32	6.0	Secchi Disk 2.0 meters, Water level 17 inches
	05/24/06	1	3,663	S	7	C	KK, DL, NZ	21, 33	11.0	Water level 19 inches

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Stream name	Date	Reach	Distance surveyed (ft)	Survey type ^a	Live	Weather codes ^b	Observers ^c	Codes ^d	Temp (C)	Comments
Pleasant Bay	05/02/06	1	3,802	S	25	R-W	RH, KK, RH	23, 31	3.0	Water level 14 inches, Secchi Disk 3.5 meters. Swapped out Hobo. #5 to town, #14 in water at 1100.
	05/02/06	2	2,831	S	14	R-W	RH, KK, RH	23, 31	3.0	Water level 14 inches, Secchi Disk 3.5 meters. Swapped out Hobo. #5 to town, #14 in water at 1100.
	05/11/06	1	3,802	S	41	O, R	KK, RH, AC	22, 31	4.0	Secchi Disk 5.5 meters, Water level 7 inches.
	05/11/06	2	2,831	S	17	O, R	KK, RH, AC	22, 31	4.5	Secchi Disk 5.5 meters, Water level 7 inches.
	05/22/06	1	3,802	S	39	C	KK, PB, JL	21, 32	6.0	Secchi Disk 5.75 meters, Water Level 12 inches.
	05/22/06	2	2,831	S	20	C	KK, PB, JL	21, 32	7.0	Secchi Disk 5.75 meters, Water Level 12 inches.
Sitkoh River ^e	05/18/06	1	13,200	S	16	O, R	BC, TT, HR	23, 31	5.0	Secchi Disk 10 feet
	05/18/06	2	13,200	S	50	O, R	RH, DL, AC	23, 31	5.0	
Sitkoh Creek	04/25/06	1	3,264	S	0	O	TT, HR, DM	22, 42	4.5	Water level 37mm; Secchi Disk 3 meters
	04/25/06	2	6,128	S	10	O	TT, HR, DM	22, 42	4.5	Water level 37mm; Secchi Disk 3 meters
	04/25/06	3	5,600	S	29	O	TT, HR, DM	22, 42	4.5	Water level 37mm; Secchi Disk 3 meters
	04/25/06	3 ^f	1,200	S	29	O	TT, HR, DM	22, 42	4.5	Water level 37mm; Secchi Disk 3 meters
	05/17/06	1	3,264	S	6	O, R	BC, TT, HR	23, 31	6.5	Secchi Disk 11 ft. Sitka Crew
	05/17/06	2	6,128	S	15	O, R	BC, TT, HR	23, 31	6.5	Secchi Disk 11 ft. Sitka Crew
	05/17/06	3	5,600	S	70	O, R	BC, TT, HR	23, 31	6.5	To weir Sitka crew
	05/17/06	3 ^f	1,200	S	101	O, R	BC, TT, HR	23, 31	6.5	Below weir Sitka crew
	05/17/06	1	3,264	S	4	O, R	RE, CS, DL			Juneau crew
	05/17/06	2	6,128	S	18	O, R	RE, CS, DL			Juneau crew
	05/17/06	3	5,600	S	77	O, R	RE, CS, DL			To weir Juneau crew
	05/17/06	3 ^f	1,200	S	114	O, R	RE, CS, DL			Below weir Juneau crew
	05/17/06	1	3,264	S	9		RH, DB, PB			Juneau crew # 2 RH-Rocky Holmes, DB=Dale Brandenburger, PB=Peter Bangs
	05/17/06	2	6,128	S	11		RH, DB, PB			Juneau crew # 2
	05/17/06	3	5,600	S	71		RH, DB, PB			Juneau crew # 2
	05/17/06	3 ^f	1,200	S	78		RH, DB, PB			Below weir Juneau crew #2
05/31/06	1	3,264	S	4	O, R	TT, HR, PM	22, 32		Secchi Disk 10.5 meters	
05/31/06	2	6,128	S	5	O, R	TT, HR, PM	22, 32		Secchi Disk 10.5 meters	
05/31/06	3	5,600	S	172	O, R	TT, HR, PM	22, 32		Secchi Disk 10.5 meters These fish above weir	
05/31/06	3 ^f	1,200	S	29	O, R	TT, HR, PM	22, 32		Secchi Disk 10.5 meters These fish below weir	
Slippery Creek	04/26/06	1	2,640	S	25	O-R	DF, VG	22, 31	5.0	Water level 1.1 feet, Secchi Disk 14 feet
	04/26/06	2	7,920	S	54	O-R	DF, VG	22, 31	5.0	Water level 1.1 feet, Secchi Disk 14 feet
	05/09/06	1	2,640	S	21	O, R	DF, VG	22, 31	6.5	Secchi Disk 17 feet, Water level 1.3 feet.
	05/09/06	2	7,920	S	58	O, R	DF, VG	22, 31	6.5	Secchi Disk 17 feet, Water level 1.3 feet.
White River	04/17/06	1	7,825	S	3	O	GF, SH, AH	21	4.0	Water level 36"; Secchi Disk 4 meters
	04/17/06	2	7,607	S	10	R, Hail	GF, SH, AH	22	4.0	Water level 36"; Secchi Disk 4 meters
	04/17/06	3	4,287	S	8	R, Hail	GF, SH, AH	23	4.0	Water level 36"; Secchi Disk 4 meters

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Appendix A2.–Page 4 of 4.

Stream name	Date	Reach	Distance surveyed (ft)	Survey type ^a	Live	Weather codes ^b	Observers ^c	Codes ^d	Temp (C)	Comments
White River	05/01/06	1	7,825	S	27	O	MW, CN, KP	21		Water level 48 inches, Secchi Disk 4.5 meters No temperature taken
	05/01/06	2	7,607	S	10	O	MW, CN, KP	22		Water level 48 inches, Secchi Disk 4.5 meters
	05/01/06	3	4,287	S	2	O	MW, CN, KP	23		Water level 48 inches, Secchi Disk 4.5 meters
	05/17/06	1	7,825	S	11	C	SH, KP, AH	21, 32	5.5	Secchi Disk 6 meters, Water level 42 inches
	05/17/06	2	7,607	S	7	C	SH, KP, AH	21, 32	5.5	Secchi Disk 6 meters, Water level 42 inches
	05/17/06	3	4,287	S	23	C	SH, KP, AH	21, 32	5.5	Secchi Disk 6 meters, Water level 42 inches
	05/23/06	1	7,825	S	10	O	SH, AH, JG	22, 32	6.5	Secchi Disk 5 meters. Water Level 3.5 ?
	05/23/06	2	7,607	S	0	O	SH, AH, JG	22, 32	6.5	Secchi Disk 5 meters. Water Level 3.5 ?
	05/23/06	3	4,287	S	4	R	SH, AH, JG	22, 32	6.5	Secchi Disk 5 meters. Water Level 3.5 ?

^a S = snorkel, F = foot, R&R = rod and reel.

^b C = clear, O = overcast, R = rain, W = wind on water surface, O/C = Overcast with breaks.

^c Primary observers: DL (Dave Love), KK (Kurt Kondzela), AH (Amy Holm), MW (Mike Wood), BC (Bob Chadwick), GF (Glenn Freeman), RH (Roger Harding), TT (Troy Tydingco), DF (Doug Fleming), VG (Vera Goudima), SH (Steve Hoffman), JG (Jodi Goffinet), RD (Rob Dinneford), KP (Kelly Piazza, nee Reppert), CN (Chris Newson), PM (Phil Mooney), HR (Heather Riggs), DB (Dale Brandenburger), CS (Charlie Swanton), RE (Randy Ericksen), PB (Sitkoh & Pleasant Bay: Peter Bangs), JL (Judy Lum), DM (Dirk Middleton), AC (Anthony Crupi), ES (Elizabeth Smith), HW (Hilary Wood), AL (Andy Leitz), PB (Eagle/Luck: Pete Brown), JD (John Der Hovanisian).

^d 21 = excellent visibility, 22 = normal visibility, 23 = poor visibility, 31 = high water, 32 = normal water, 33 = low water.

^e Surveyed as part of Sitkoh Creek weir project to investigate possible straying of previously adipose clipped fish from Sitkoh Creek; 6 of 33 fish were observed with adipose clips while 11 fish were not observed closely enough to evaluate.

^f Between the Sitkoh River weir and saltwater.

Appendix A3.—Counts of steelhead snorkel surveys from 2007 by stream, date, and reach of stream along with measured environmental variables.

Stream name	Date	Reach	Distance surveyed (ft)	# Live	Tide code	Visibility code	Water level code	Weather codes	Lead observer	Secchi disk (m)	Staff gauge level/depth (cm)	Water temp.	Comments
Eagle Creek	5/2/2007	1	13,712	14		22	32	O	KM				
	5/2/2007	2	6,253	11		22	32	O	KM				
	5/2/2007	3	5,044	109		22	32	O	KM				
	5/3/2007	4	3,707			22		O	KM				Data from Reach 3 and 4 reported as one number (109)
	5/11/2007	1	13,712	7		22	32	O	KM				
	5/11/2007	2	6,253	9		22	32	O	KM				Incorrect reaches surveyed: data from Reach 2 & 3 should only be Reach 2
	5/11/2007	3	5,044	2		22	32	O	KM				
	5/11/2007	4	3,707	15		22	31	O	KM				Incorrect reaches reported: data reported as reach 4 & "5" are reach 3 & 4.
	5/11/2007	5		55	42	23	31	O	KM				Fast water, lots of new wood in river. Danger.
Ford Arm	4/24/2007	1	1,723	54	43	21	31	R	BC	7			
	4/24/2007	2	2,859	17	42	21	31	R	BC	7	22.2	2.5	
	5/4/2007	1	1,723	69	42	21	31	R	BC	7	14.5	1.5	
	5/4/2007	2	2,859	71	43	21	31	R	BC	7	14.5	1.5	
	5/11/2007	1	1,723	117	42	21	31	R	TT	4.8	18.5	3	
	5/11/2007	2	2,859	101	43	21	31	R	TT	4.8	18.5	3	
	5/22/2007	1	1,723	166	43	22	32	R	TT	3	17	4	
	5/22/2007	2	2,859	256	43	22	32	R	TT	3	17	4	
	5/28/2007	1	1,723	212	43	22	32	O	TT	5.9	14.25	4.5	
	5/28/2007	2	2,859	321	43	22	32	O	TT	5.9	14.25	4.5	
	6/2/2007	1	1,723	350	42	22	32	O	BC	5.7	13	5	
	6/2/2007	2	2,859	323	43	22	32	O	BC	5.7	13	5	
	6/21/2007	1	1,723	50	43	22	33	O	BC	3.5	18.5	11.5	
	6/21/2007	2	2,859	36	43	22	33	O	BC	3.5	18.5	11.5	
Harris River	4/20/2007	1	3,993	12	43	21	32	C	KM				
	4/20/2007	2	11,073	33	43	21	32	C	KM				
	4/20/2007	3	10,147	20	43	21	32	C	KM				
	4/20/2007	4	9,400	24	43	21	32	C	KM				

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Stream name	Date	Reach	Distance surveyed (ft)	# Live	Tide code	Visibility code	Water level code	Weather codes	Lead observer	Secchi disk (m)	Staff gauge level/depth (cm)	Water temp.	Comments
Harris River	4/20/2007	5	4,145	2	43	21	32	C	KM				
	5/4/2007	1	3,993	0		22	31	R	SM				
	5/4/2007	2	11,073	83		22	31	R	SM				
	5/4/2007	3	10,147	34		22	31	R	SM				
	5/4/2007	4	9,400	10		22	31	R	SM				
	5/4/2007	5	4,145	1		22	31	R	SM				
	5/30/2007	1	3,993	0		23	31	O	SM				
	5/30/2007	2	11,073	11		23	31	O	SM				
	5/30/2007	3	10,147	5		23	31	O	SM				
	5/30/2007	4	9,400	0		23	31	O	SM				
5/30/2007	5	4,145	0		23	31	O	SM					
Humpback Creek	5/4/2007	1	1,292	1		22	31	C	KP	4		4	
	5/4/2007	2	1,372	0		22	31	C	KP				
	5/4/2007	3	1,447	17		22	31	C	KP				
	5/4/2007	4	4,672	0		22	31	C	KP				
McDonald Lake	5/3/2007	1	2,375	2		23	31	O	KP	1.5		4	In sections 1 and 2 water levels came up overnight and was smoking. Too fast to snorkel and strainers not examined for fish due to current. Secchi reading not entirely representative due to turbulent water at reading location.
	5/3/2007	2	2,714	11		23	31	O	KP				
	5/3/2007	3	2,553	0		22	31	O	KP				
	5/3/2007	4	3,617	0		22	31	O	KP				
	5/3/2007	1	2,375	2		23	31	O	TJ	3.5		4	Hobo 2007 deployed at 1230pm.
	5/3/2007	2	2,714	15		23	31	O	TJ				
	5/3/2007	3	2,553	5		23	31	O	TJ				
5/3/2007	4	3,617	3		23	31	O	TJ					
Petersburg Creek	4/27/2007	1	11,386	12		23	31	R	DF				
	4/27/2007	2	7,392	35		23	31	R	DF				

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Stream name	Date	Reach	Distance surveyed (ft)	# Live	Tide code	Visibility code	Water level code	Weather codes	Lead observer	Secchi disk (m)	Staff gauge level/depth (cm)	Water temp.	Comments
Petersburg Creek	4/27/2007	3	9,504	6	42	23	31	R	DF	3	54.6	4	
	5/3/2007	1	11,386	79		23	32	R	DF				
	5/3/2007	2	7,392	123		22	32	R	DF				
	5/3/2007	3	9,504	58	41	22	32	R	DF	4	64	5	
	5/14/2007	1	11,386	102		22	32	O	DF				
	5/14/2007	2	7,392	101		21	32	O	DF	6.5	74	5	
	5/14/2007	3	9,504	86	42	21	32	O	DF				
	5/21/2007	1	11,386	44		21	32	C	DF				
	5/21/2007	2	7,392	71		21	32	C	DF				
5/21/2007	3	9,504	95	43	21	32	C	DF	6.7	67	7		
Peterson Creek	5/1/2007	1	3,663	5		22	31	C	BG			2	Canyon and upper pool not surveyable.
	5/7/2007	1	3,663	2		23	31	O	BG			2	Water level one inch above weld mark under bridge. Canyon and upper pool not surveyable.
	5/11/2007	1	3,663	7		23	31	O	BG		72.5	3	Canyon and upper pool not surveyable.
	5/14/2007	1	3,663	10		23	31	O	BG		90.8	2.5	Canyon and upper pool not surveyable. Very high water. Only surveyed lower half of survey area.
	5/14/2007			6		23	31	O	BG			2.5	Snorkel survey extended for 200 yards below highway bridge as part of Peterson Creek weir project.
	5/15/2007	1	3,663	24		23	31	O	BG		81.9	3.5	Canyon not surveyable
	5/18/2007	1	3,663	26		22	32	C	BG		68.5	4	Canyon difficult to survey, dark and aerated water.
5/24/2007	1	3,663	17		22	32	O	BG		72.2	6		
Pleasant Bay Ck	5/2/2007	1	3,802	26		21	31	C	BG		32	2	Only one snorkeler
	5/2/2007	2	2,831	41		21	31	C	BG		32		
	5/9/2007	1	3,802	31		22	31	O	BG		20	2.5	
	5/9/2007	2	2,831	27		22	31	O	BG		20	2.5	
	5/16/2007	1	3,802	49		22	31	O	BG		6	2.5	

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Stream name	Date	Reach	Distance surveyed (ft)	# Live	Tide code	Visibility code	Water level code	Weather codes	Lead observer	Secchi disk (m)	Staff gauge level/depth (cm)	Water temp.	Comments
Pleasant Bay Ck	5/16/2007	2	2,831	38		22	31	O	BG		6	2.5	
	5/22/2007	1	3,802	45		22	32	O	BG		17	3	
	5/22/2007	2	2,831	49		22	32	O	BG		17	3	
	6/1/2007	1	3,802	36		22	32	O	BG		14	4	
	6/1/2007	2	2,831	29		22	32	O	BG		14	4	
Sitkoh Creek	5/10/2007	1	3,264	2	42	22	31	R	TT	4.2	61	3.8	
	5/10/2007	2	6,128	13	42	22	31	R	TT		61	3.8	
	5/10/2007	3	5,600	16	42	22	31	R	TT		61		
	5/10/2007	3 ^e	1,200	39	42	22	31	R	TT		61		Below Weir
	6/14/2007	1	3,264	4		21	32	C	DL	5.5	2.38	10.5	
	6/14/2007	2	6,128	14		21	32	C	DL				
	6/14/2007	3	5,600	35		21	32	C	DL				
	6/14/2007	3 ^e	1,200	2		21	32	C	DL				
Slippery Creek	5/9/2007	1	2,640	6		22	32		DF			4	Lake iced out today, last pieces at the outlet
	5/9/2007	2	7,920	48		22	32		DF	5	38	4	
	5/9/2007	3	1,543						DF				Reach 3 not surveyed
	5/15/2007	1	2,640	12		21	32	C	DF				Water high but clear with good vis.
	5/15/2007	2	7,920	49		21	32	C	DF	6.1	54	6.5	
	5/15/2007	3	1,543		41				DF				Reach 3 not surveyed
	5/22/2007	1	2,640	7		21	32	C	DF				
	5/22/2007	2	7,920	61		21	32	C	DF	7	40	10	
	5/22/2007	3	1,543		43				DF				Reach 3 not surveyed
	5/31/2007	1	2,640	0		22	31-32		DF		44	7	Snow finally gone
5/31/2007	2	7,920	6		22	31-32		DF	6		7	No fry seen yet	
5/31/2007	3	1,543		43				DF				No longer surveyed	
White River	4/22/2007	1	7,825	37		21	32	C	MW				
	4/22/2007	2	7,607	13		21	32	C	MW				
	4/22/2007	3	4,287	31		21	32	C	MW	4.75		6	Staff gauge gone

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Stream name	Date	Reach	Distance surveyed (ft)	# Live	Tide code	Visibility code	Water level code	Weather codes	Lead observer	Secchi disk (m)	Staff gauge level/depth (cm)	Water temp.	Comments
White River	4/29/2007	1	7,825	55		22	31	C	KP				
	4/29/2007	2	7,607	6		22	31	C	KP				
	4/29/2007	3	4,287	15		22	31	C	KP	4.25		6	
	5/14/2007	1	7,825	34		21		O	AH				60/40 dark/light
	5/14/2007	2	7,607	21		21		O	AH				
	5/14/2007	3	4,287	30		21		O	AH			8	2007 Hobo set @ 2:00 PM
	5/21/2007	1	7,825	14		21	32	C	TJ				
	5/21/2007	2	7,607	10		21	32	C	TJ				
	5/21/2007	3	4,287	30		21	32	C	TJ	8.5		8	

^a S = snorkel, F = foot, R&R = rod and reel.

^b C = clear, O = overcast, R = rain, O/C = Overcast with breaks.

^c Primary observers: DL (Dave Love), AH (Amy Holm), MW (Mike Wood), SM (Steve McCurdy), TT (Troy Tydingco), DF (Doug Fleming), BG (Brian Glynn), TJ (Todd Johnson), BC (Bob Chadwick), KM (Kris Maledy), KP (Kelly Piazza, nee Reppert).

^d 21 = excellent visibility, 22 = normal visibility, 23 = poor visibility, 31 = high water, 32 = normal water, 33 = low water.

^e Between the Sitkoh River weir and saltwater.

APPENDIX B

Appendix B1.–Computer data files used to prepare and generate estimates for the Southeast Alaska Snorkel Surveys of Regional Index Streams, 2006–2007. All files are organized on the Region 1-Douglas Sport fish Server under G:\Trout-SF\REGIONSH\SURVEYS\2007 REPORT DATA\FDS_06_07.

File Name	Description
Temperature data for 06_07 Snorkel FDS.XLS	EXCEL spreadsheet with HOBO temperature data and graphs for 2006 and 2007.
Snorkel_97-07NORMAILIZED_Graph.XLS	Summary graph of trends.
Snorkel_Calibration.XLS	EXCEL spreadsheet of snorkel calibration data.
Survey_Data_used for 06_07 FDS.XLS	EXCEL spreadsheet with snorkel survey data for 1997–2005.