Regional Operational Plan SF.1J.2013.03

Southeast Alaska Steelhead Trout Escapement Surveys: 2013

by

Carol L. Coyle

May 2013

Alaska Department of Fish and Game **Divisions of Sport Fish and Commercial Fisheries**

Symbols and Abbreviations

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

Weights and measures (metric)

centimeter	cm
deciliter	dL
gram	g
hectare	ha
kilogram	kg
kilometer	km
liter	L
meter	m
milliliter	mL
millimeter	mm

Weights and measures (English)

cubic feet per second	ft^3/s
foot	ft
gallon	gal
inch	in
mile	mi
nautical mile	nmi
ounce	oz
pound	lb
quart	qt
yard	yd

Time and temperature

day	d
degrees Celsius	°C
degrees Fahrenheit	°F
degrees kelvin	K
hour	h
minute	min
second	s

Physics and chemistry

all atomic symbols	
alternating current	AC
ampere	A
calorie	cal
direct current	DC
hertz	Hz
horsepower	hp
hydrogen ion activity (negative log of)	pH
parts per million	ppm
parts per thousand	ppt, ‰
volts	V
watts	W

General

Alaska Administrative Code	AAC
all commonly accepted abbreviations	e.g., Mr., Mrs., AM, PM, etc.
all commonly accepted professional titles	e.g., Dr., Ph.D., R.N., etc.
at	@
compass directions:	
east	E
north	N
south	S
west	W
copyright	©
corporate suffixes:	
Company	Co.
Corporation	Corp.
Incorporated	Inc.
Limited	Ltd.
District of Columbia	D.C.
et alii (and others)	et al.
et cetera (and so forth)	etc.
exempli gratia (for example)	e.g.
Federal Information Code	FIC
id est (that is)	i.e.
latitude or longitude	lat. or long.
monetary symbols (U.S.)	$, ¢
months (tables and figures): first three letters	Jan,...,Dec
registered trademark	®
trademark	™
United States (adjective)	U.S.
United States of America (noun)	USA
U.S.C.	United States Code
U.S. state	use two-letter abbreviations (e.g., AK, WA)

Mathematics, statistics

all standard mathematical signs, symbols and abbreviations	
alternate hypothesis	H_A
base of natural logarithm	*e*
catch per unit effort	CPUE
coefficient of variation	CV
common test statistics	(F, t, χ^2, etc.)
confidence interval	CI
correlation coefficient (multiple)	R
correlation coefficient (simple)	r
covariance	cov
degree (angular)	°
degrees of freedom	df
expected value	*E*
greater than	>
greater than or equal to	≥
harvest per unit effort	HPUE
less than	<
less than or equal to	≤
logarithm (natural)	ln
logarithm (base 10)	log
logarithm (specify base)	log_2, etc.
minute (angular)	'
not significant	NS
null hypothesis	H_O
percent	%
probability	P
probability of a type I error (rejection of the null hypothesis when true)	α
probability of a type II error (acceptance of the null hypothesis when false)	β
second (angular)	"
standard deviation	SD
standard error	SE
variance	
population	Var
sample	var

REGIONAL OPERATIONAL PLAN SF.1J.2013.03

SOUTHEAST ALASKA STEELHEAD TROUT ESCAPEMENT SURVEYS: 2013

by

Carol L. Coyle

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

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Division of Sport Fish

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SIGNATURE PAGE

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Approval

Title	Name	Signature	Date
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PURPOSE

The purpose of this project is to obtain index counts of steelhead in 10 streams in Southeast Alaska during 2013 for comparison to indices collected since 1997. These surveys are intended to provide a long-term data set for evaluating trends in escapement and formulating subsequent management action.

BACKGROUND

Steelhead are found in coastal streams of Alaska from Dixon Entrance to the Cold Bay area on the Alaska Peninsula. Southeast Alaska (SEAK) has 309 watersheds known to support annual escapements of steelhead. Most of the known steelhead streams in SEAK are believed to contain 200 or fewer adults. However, some of the larger systems, like Karta River, may have once supported annual escapements >1,000 steelhead, while the Thorne River watershed is still believed to have an annual escapement >1,000. The largest known steelhead producer in SEAK is the Situk River near Yakutat, which has annual kelt counts (adult emigrants) that vary from 3,000 to just over 15,000 fish.

Steelhead harvests in SEAK generally increased from the late 1970s through 1989 (Howe et al. 1999), then began to decline until in 1994 the Alaska Board of Fisheries (board) passed conservative regulations that limited steelhead sport harvest to 2 fish per angler per year with a minimum size limit of 914 mm (36 in). The board adopted regulations at its 2009 meeting that prohibited the retention of steelhead in fall steelhead drainages, Ward Creek, Thorne River, Karta River, and all streams crossed by Juneau road system.

Annual harvest from 1994 through 2011 averaged 95.5% less than harvest in years prior to the regulatory action (1982–1992). Steelhead harvest during 1993 was also significantly reduced as 48 streams were closed to retention through emergency order (EO) action. Since 1994, annual harvests have remained low. An average of 97 steelhead were harvested annually in the SEAK sport fishery between 2000 and 2011, while an average of 15,428 steelhead were caught each year. Incidental hooking mortality is not thought to have a detrimental impact on steelhead stocks because the use of bait is also prohibited during the spring fishing season in all systems, and year-round in 6 streams with fall steelhead. The hooking mortality for steelhead caught on artificial gear is estimated to be 2–3% (Hooten 1987).

Historically, little emphasis has been placed on annual evaluations of steelhead escapement in SEAK. However, in light of the stock declines observed in the early 1990s, a cost-effective method to monitor steelhead stock status and trends became necessary. This project is a continuation of a study designed to monitor steelhead escapements in a number of index systems located throughout SEAK. From 1994 to 1996, foot surveys were conducted, and standardized snorkel surveys began in 1997. Repeated snorkel survey counts of steelhead escapement are made each year at each index stream to provide a count of peak steelhead escapement.

These surveys are intended to continue indefinitely to provide a long-term data set for describing trends in escapement. From 2003 to 2006, snorkel index counts were, on average, similar or higher than those during 2000 to 2002, and 6 of the 10 index streams had record snorkel counts between 2004 and 2007 (Table 1). As in the 2008 and 2009 study periods, the 2010, 2011, and 2012 counts showed a slight decrease in numbers from the recent high years. The recent index counts are still generally higher than the late 1990s counts (Table 1 and Figure 1), but the median trend line for index counts in Southeast Alaska has been slightly negative since 2010 (Figure 1).

Table 1.–Steelhead snorkel surveys conducted in Southeast Alaska, 1997–2012, by stream and management area. 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) defined as an unbracketed count and is the highest count for that year/system.

		Year							
Management area	Stream name	1997 **Peak** / *high*	1998 **Peak** / *high*	1999 **Peak** / *high*	2000 **Peak** / *high*	2001 **Peak** / *high*	2002 **Peak** / *high*	2003 **Peak** / *high*	2004 **Peak** / *high*
Ketchikan	White River	*84*	**93**	*60*	**38**	**48**	**37**	**77**	*35*
	McDonald Lake	**145**	**86**	*100*	**47**	*74*	*14*	**79**	*76*
Prince of Wales	Harris River	*104*	**156**	**192**	**79**	*53*	*200*	*195*	**124**
	Eagle/Luck Creek	*90*	*56*	*118*	**82**	NA	**36**	*95*	*67*
Petersburg	Petersburg Creek	*123*	**152**	**115**	*68*	*64*	*41*	**146**	**330**
	Slippery Creek	NA	NA	NA	NA	*41*	*31*	*76*	*92*
Sitka	Ford Arm Creek	*296*	*103*	*89*	**134**	*28*	*122*	**181**	**379**
	Sitkoh Creek	*329*	*154*	*120*	*112*	*115*	*65*	**296**	**354**
Juneau	Pleasant Bay (Seymour)	*155*	**81**	*132*	**48**	*48*	**36**	**50**	**51**
	Peterson Creek	**26**	*29*	*38*	*27*	**41**	**13**	**36**	*39*

Table 1.–Page 2 of 2.

		Year							
Management		2005	2006	2007	2008	2009	2010	2011	2012
area	Stream name	**Peak** / *high*	**Peak** / *high*	**Peak** / *high*	**Peak** / *high*	**Peak** / *high*	**Peak** / *high*	**Peak** / *high*	**Peak** / *high*
Ketchikan									
	White River	*67*	**41**	**85**	**45**	**45**	**42**	**47**	*73*
	McDonald Lake	**134**	**100**	*25*	*45*	NA	**88**	ND	ND
Prince of Wales	Harris River	**122**	**92**	**128**	*122*	**90**	**95**	*58*	**84**
	Eagle/Luck Creek	*102*	**154**	*134*	*8*	**137**	**69**	*54*	**116**
Petersburg	Petersburg Creek	**369**	**241**	**289**	**251**	**198**	**221**	**131**	**112**
	Slippery Creek	NA	*79*	**68**	**46**	**86**	**66**	*52*	**83**
Sitka	Ford Arm Creek	**459**	**428**	**673**	**266**	**194**	**99**	**169**	**125**
	Sitkoh Creek	**259**	**213**	*70*	**167**	**201**	*35*	**68**	**69**
Juneau	Pleasant Bay (Seymour)	*47*	*59*	**94**	**53**	**64**	**51**	**94**	**76**
	Peterson Creek	**22**	**36**	**26**	**26**	**22**	**35**	**27**	**12**

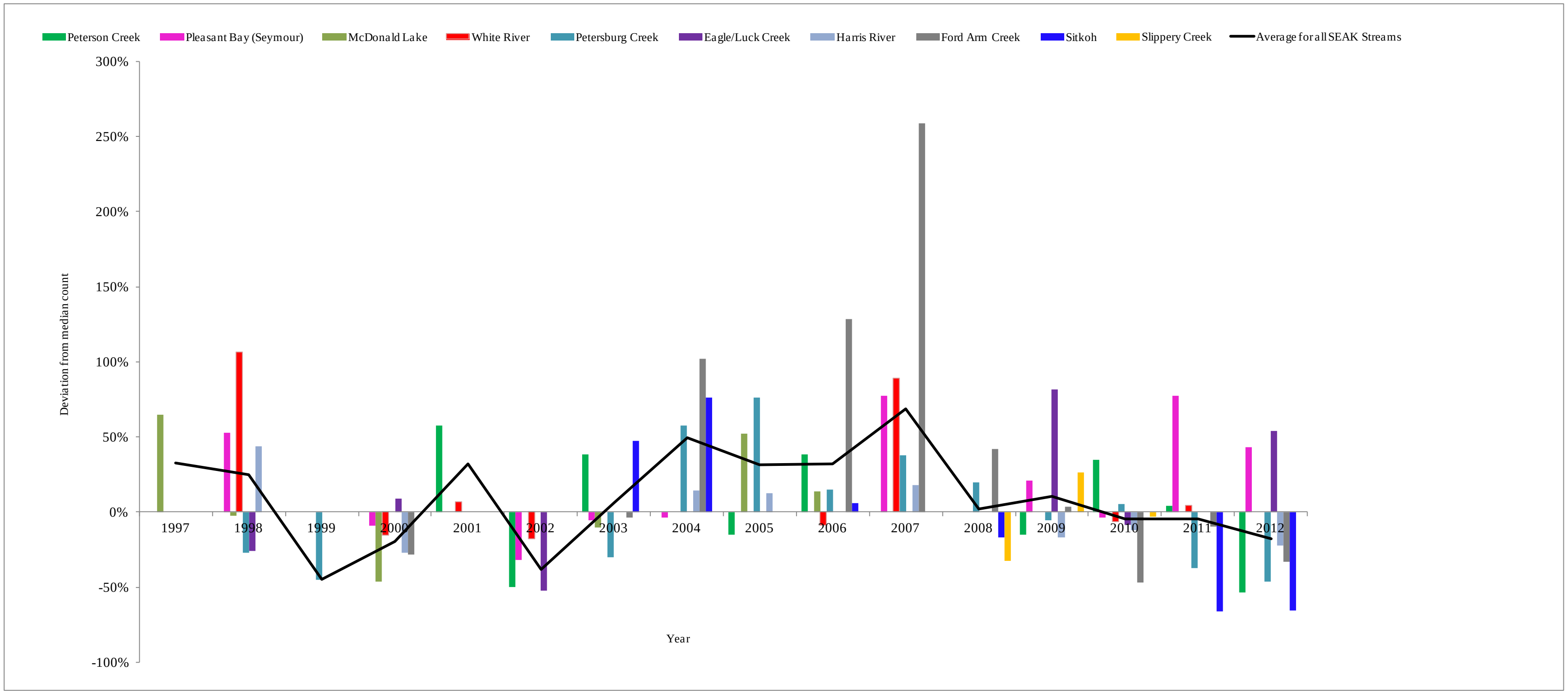

Figure 1.–The deviation of peak snorkel counts from the median count for steelhead index streams, 1997–2012.

Although not a peak, the 2012 White River count was the highest since 2007, while the 2012 Peterson Creek of 12 was the lowest count on record (albeit it was 13 in 2002).

Snorkel surveys provide fisheries managers with the first snapshot of steelhead abundance, and inseason management actions (i.e., systems closed to fishing and/or retention of steelhead) have been initiated when surveys suggested drastically low levels of steelhead abundance. However, there are no escapement goals, and thus no steelhead management plans for any steelhead system in SEAK. At a minimum, the surveys can serve as a red flag to identify catastrophic declines in steelhead escapement in the systems where they are conducted. The surveys also provide management biologists with a minimal amount of "hands-on" steelhead information that is useful when discussing management and the health of steelhead stocks with members of the public. The snorkel surveys also provide information for postseason evaluation of abundance and when combined with harvest information, may assist state and federal managers in establishing guidelines in subsequent years. Results from the snorkel survey project are routinely provided to the board (e.g., Harding and Coyle 2011) as background information for regulatory proposals.

There are no substantive changes in the methods of the survey program planned for 2013. The index streams to be surveyed in 2013 are well dispersed across Southeast Alaska (Figure 2).

OBJECTIVE

Once a week for a minimum of 3 weeks from late April through early June 2013, count the number of steelhead in established index sections of 10 stream systems in Southeast Alaska using snorkel surveys by trained observers until a peak is detected.

METHODS

Snorkel surveys will provide inseason indices of peak steelhead abundance in 10 streams in Southeast Alaska during 2013 (Table 2). Weir data from 7 streams across the region suggest instream abundance peaks in May (Table 3). Tagging studies at weirs (Hoffman et al. 1990; Love and Harding 2008) and information on instream abundance over time (Figure 3) suggest residence times for individuals and instream abundance "peaks" usually last a week or more. Thus, efforts will be made to survey index streams weekly from late April through early June. Early-system streams have started 10 days to 2 weeks prior to the later systems that start surveys during the first week of May. An early starting date in such systems is particularly critical during years with warm early spring temperatures if the surveys are to successfully bracket peak instream abundance. At a minimum, each stream will be surveyed 3 times. If the peak count occurs during the last survey, an additional survey will be done. Snorkel surveys will be done using dry suits and snorkel gear. If a scheduled survey is missed because of unsuitable weather, the missed survey will be performed as soon as conditions permit. If an entire survey is not completed, the sections surveyed will be marked on maps (Appendix A) and the distances surveyed estimated using the GIS system. The survey schedule will be adjusted such that a near-weekly counting interval is maintained. In addition to the base index streams, other streams may be evaluated by management staff for potential use as index systems as time and funding permit.

There are several underlying assumptions when using snorkel counts as an index of population abundance. It is assumed that there is no interannual variation in observer efficiency, arrival timing, and the duration of the time spawners spend in the system (Korman et al. 2002). Even if all of these assumptions hold, one still has to assume that there is no change in detection probabilities as changes in absolute abundance occur. No objective quantitative tools are

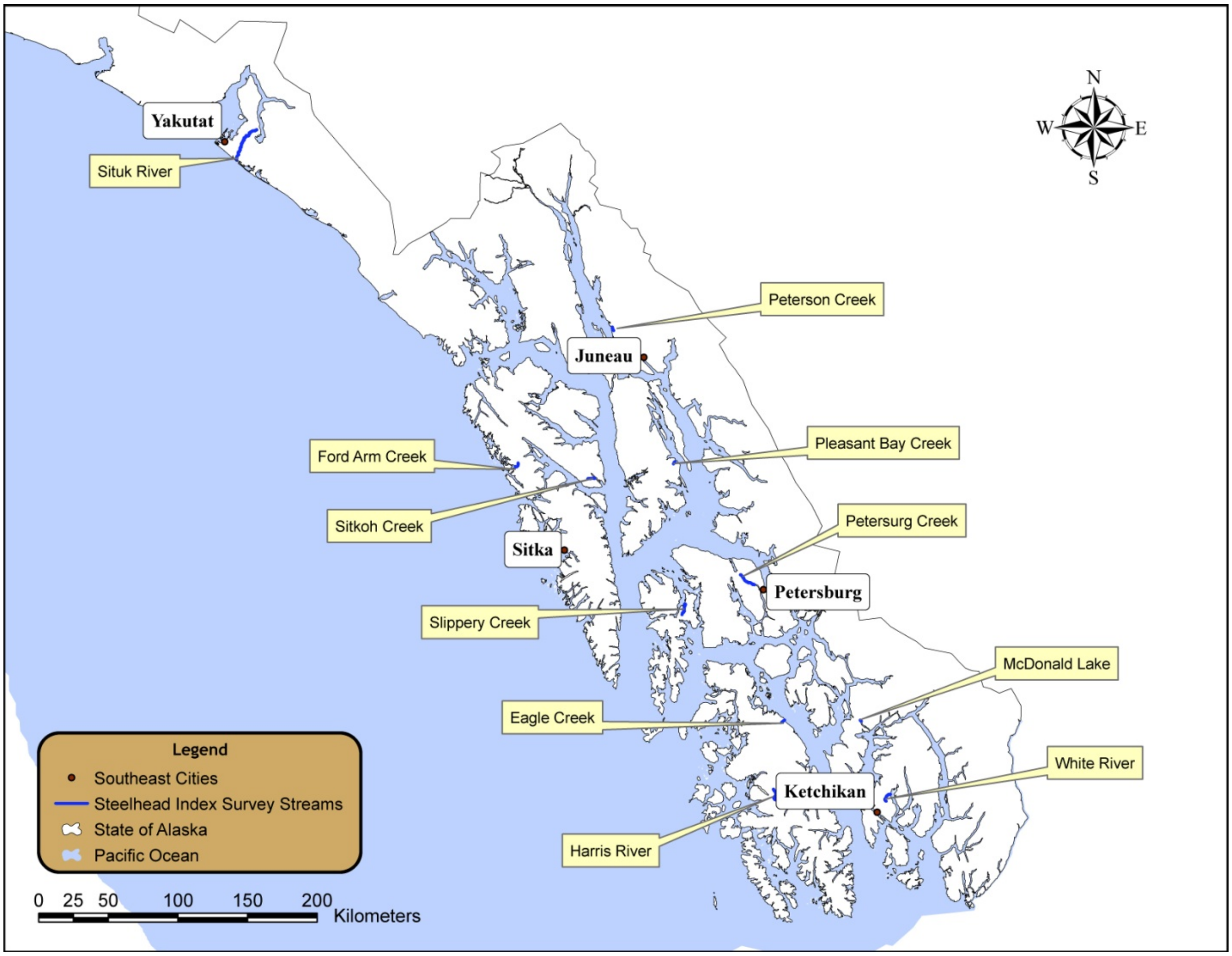

Figure 2.–Location of the ten survey streams in Southeast Alaska and the Situk River near Yakutat.

available to evaluate these assumptions for systems when only snorkel counts are available. Objective evaluation of snorkel surveys on an individual stream requires a series or collection of annual paired observations of peak snorkel count, and either total escapement counts or scientifically estimated escapement. The collection of these data was completed at Sitkoh Creek in the Sitka area from 2003 to 2006 and 2008 to 2009 (Harding 2012), and at Peterson Creek in the Juneau area from 2010 to 2011 (Coyle 2012). The average expansion factor for Sitkoh Creek is 2.29, whereas the average expansion factor for Peterson Creek is 4.09. No other snorkel survey streams have yet been identified in the strategic plan as candidates for collection of this more detailed information (Harding et al. *unpublished*[1]), therefore no expansion factors will be developed in 2013. In the absence of objective measures, evaluation of the utility of snorkel counts as indices of population abundance is largely dependent on the experience, perceptions, and opinions of survey personnel.

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[1] Harding, R. D., A.P. Crupi, D.J. Reed. *Unpublished*. Strategic plan for Southeast Alaska steelhead research and monitoring program. Available at Alaska Department of Fish and Game, Division of Sport Fish, Douglas, AK.

Table 2.–Index stream name, stream number, length and percent of stream surveyed, number of survey reaches, and dates for start of weekly surveys for steelhead in 2013.

Index Stream Name	Anadromous stream number	Area	Distance to be surveyed in feet[a]	Percent of stream surveyed	Number of reaches[b]	Target survey start[c]
White River[e]	101-44-10024	Ketchikan	19,719/35,750	55	3	16–23Apr
McDonald Lake Creek[e]	101-80-10068	Ketchikan	7,222[g]/9,949	73[g]	4	16–23Apr
Harris River[e]	102-60-10820	POW	38,758/96,466	40	5	16–23 Apr
Eagle Creek[e]	107-40-10055	POW	28,716/49,136	58	4	16–23 Apr
Petersburg Creek[d]	106-44-10600	Petersburg	17,727/44,235	40	3	30 April
Slippery Creek[d]	109-43-10030	Petersburg	9,618/11,491	84	2	30 April
Ford Arm Creek[d]	113-73-10030	Sitka	8,048/28,949	28	2	30 April
Sitkoh Creek[d]	113-59-10004	Sitka	16,192/20,136	80	3	30 April
Peterson Creek[d]	111-50-10010	Juneau	3,663/7,553	48	1	30 April
Pleasant Bay Creek[d]	111-12-10005	Juneau	6,630/12,405	54	2	30 April
Non-Index Streams						
Humpback Creek[e]	101-30-10080	Ketchikan	3,696/3,696	100	4	NA
Ketchikan Creek[e]	101-47-10250	Ketchikan	4,096/4,096	100	3	NA
Bear Creek[f]	108-50-10030	Petersburg	13,260/35,516	37	3	NA

[a] Feet to be surveyed/feet of anadromous stream.

[b] See Appendix A for maps showing reach boundaries.

[c] Additional surveys are required if highest counts occur during last of 3 surveys.

[d] Considered "late" run systems. The surveys should begin during the week where this day falls.

[e] Considered "early" run systems. The surveys should begin during the week where this day falls

[f] Area 3 dropped in 2000 due to safety concerns and because <10% of steelhead were observed in area.

[g] Measurements for McDonald Lake Creek done in GIS including the total available anadromous waters, which is taken directly from the Anadromous Waters Catalog stream arc lengths.

Surveys will be conducted by at least 2 employees, and 1 surveyor will always be a senior, trained observer. In the most challenging systems, teams will consist of 2 snorkelers and 1person walking with safety equipment and a firearm. The observers will count all steelhead observed within the index reaches of each stream, and record counts by reach (numbers of reaches are tabulated in Table 2; stream reaches and access points are described in Table 4, and maps are presented in Appendix A). If a shoreline third party is available, they can temporarily record counts on hand counters (tallywackers) as the survey progresses. If a shoreline party is not available, one or both snorkelers will record the counts by reach on a small plastic diver's slate using a waterproof marker. Counts will then be transferred to data forms (Table 5) when accessible.

Table 3.–Steelhead run timing past weirs in Southeast Alaska including dates when 75% and 90% of the upstream immigrations were complete and, where available, the estimated peak of inriver abundance (immigration counts minus emigration counts).

		Immigration		Peak of inriver
Stream	Year	75%	90%	abundance
Karta River	1989[a]	30–Apr	11–May	16–May
	1992[b]	1–May	9–May	2–May
	2005[c]	30–Apr	15–May	5–May
Ward Creek	1993[d]	10–May	15–May	17–May
	1994	8–May	20–May	21–May
Sitkoh Creek	1936[e]	19–May	23–May	-
	1937[e]	23–May	28–May	-
	1982[f]	17–May	22–May	-
	1990[g]	11–May	17–May	15–May
	1993[h]	11–May	18–May	19–May
	1996[i]	15–May	24–May	19–May
	2003[j]	7–May	18–May	11–May
	2004[j]	8–May		17–May
	2005[k]	8–May	17–May	9–May
	2006[k]	21–May	26–May	26–May
	2007[l]	24–May	31–May	20–May
	2008[l]	22–May	28–May	23–May
	2009[m]	14–May	27–May	27–May
Peterson Creek	1989[n]	16–May	25–May	21–May
	1990[o]	20–May	26–May	24–May
	1991[p]	16–May	20–May	22–May
	2010 [cc]	6–May	11–May	12–May
	2011 [cc]	20-May	30-May	20-May
Petersburg Creek	1973[q]		-	25–May
	1974[r]	18–May	24–May	25–May
	1975[s]	21–May	28–May	29–May
Ratz Creek	2010 [bb]	7-May	19-May	24-April
	2011[bb]	13-May	23-May	14-May
Situk River	1994[t]	-	-	21–May
	1996[u]	-	-	18–May
	1997[v]	-	-	5–May
Windfall Creek	1997[w]	8–May	12–May	24–May
12 Mile Creek	2004[x]	18–Apr	26–April	
Natzuhini Creek	2007 [y]	11–May	20–May	
Cable Creek	2006 [z]	1–May	8–May	
Eagle/Luck Creek	2006 [z]	12–May	19–May	
Harris River	2005 [aa]	27–Apr	12–May	

-continued-

Table 3.–Page 2 of 2.

[a] Hoffman et al. (1990)
[b] Harding and Jones (1993)
[c] Hoffman (2008)
[d] Freeman (1995)
[e] Reported in 5-day intervals, from Chipperfield, W.A. *Unpublished*. Report on Dolly Varden trout research Sitkoh Bay stream. Available at U.S. Forest Service, Juneau, AK
[f] Jones (1983)
[g] Jones et al. (1991)
[h] Harding and Jones (1994)
[i] Yanusz (1997)
[j] Love and Harding (2008)
[k] Love and Harding (2009)
[l] Love et al. (2012 a)
[m] Love et al. (2012 b)
[n] Harding and Jones (1990)
[o] Harding and Jones (1991)
[p] Harding and Jones (1992)
[q] Petersburg Creek, Jones (1972–1974)
[r] Jones (1975)
[s] Jones (1976)
[t] Float counts used to identify peak run timing, Johnson (1996)
[u] Bain et al. (2003)
[v] Float counts used to identify peak run timing, Johnson and Jones (1998)
[w] Yanusz (1998)
[x] Hoffman (2007)
[y] Piazza (2009 a)
[z] Piazza (2009 b)
[aa] Piazza et al. (2008)
[bb] David Love, ADF&G fisheries biologist, Douglas, Alaska, personal communication
[cc] Coyle (2012)

Observers will count adult steelhead as a team during the survey. The surveyors should attempt to stay abreast of each other in the stream and coordinate their observations to obtain maximum coverage. When passing through high concentrations of steelhead, both observers will count the number of steelhead in their area of responsibility before consulting with each other on their counts. If either or both surveyors feel that a questionable count was made in a particular pool orstretch of river, the area will be recounted. Counts agreed upon by both observers will be recorded at the end of each reach (Appendix A, Table 5). In addition, steelhead redds may also be counted and recorded at the discretion of the local management biologist. However, redd counts are not required and there are no current plans to catalogue or use this information on a regional basis.

Particular attention should be given to observing steelhead along wide, brushy-edged sections where fish commonly seek shelter. Steelhead tend to remain in the pools or reaches where they are encountered, generally schooling towards the downstream end of a pool bounded by a riffle. Past snorkel surveys in the Situk River (Bob Johnson, retired, Alaska Department of Fish and Game, Division of Sport Fish, Yakutat, personal communication) indicate steelhead typically do not hold beneath logjams, however, they frequently hold directly downstream of such structures. Habitat variables that will be recorded on the form at the beginning of each survey include surface water temperature in degrees Celsius, and weather conditions (cloud cover, wind, and precipitation). Water clarity will be measured at some point in the survey using a Secchi disk. The Secchi disk will be held underwater by one observer approximately 20 cm (8 in) below the surface, or the diameter of the Secchi disk. The second snorkel observer will then back away underwater keeping visual contact with the disk and feeding out the line as s/he goes. The point at which the Secchi disk disappears and then reappears is the distance that should be recorded on the data form (Table 5). Some streams may not be wide enough to accommodate this method, but crews are encouraged to attempt to find a wide enough spot to take the measurement.

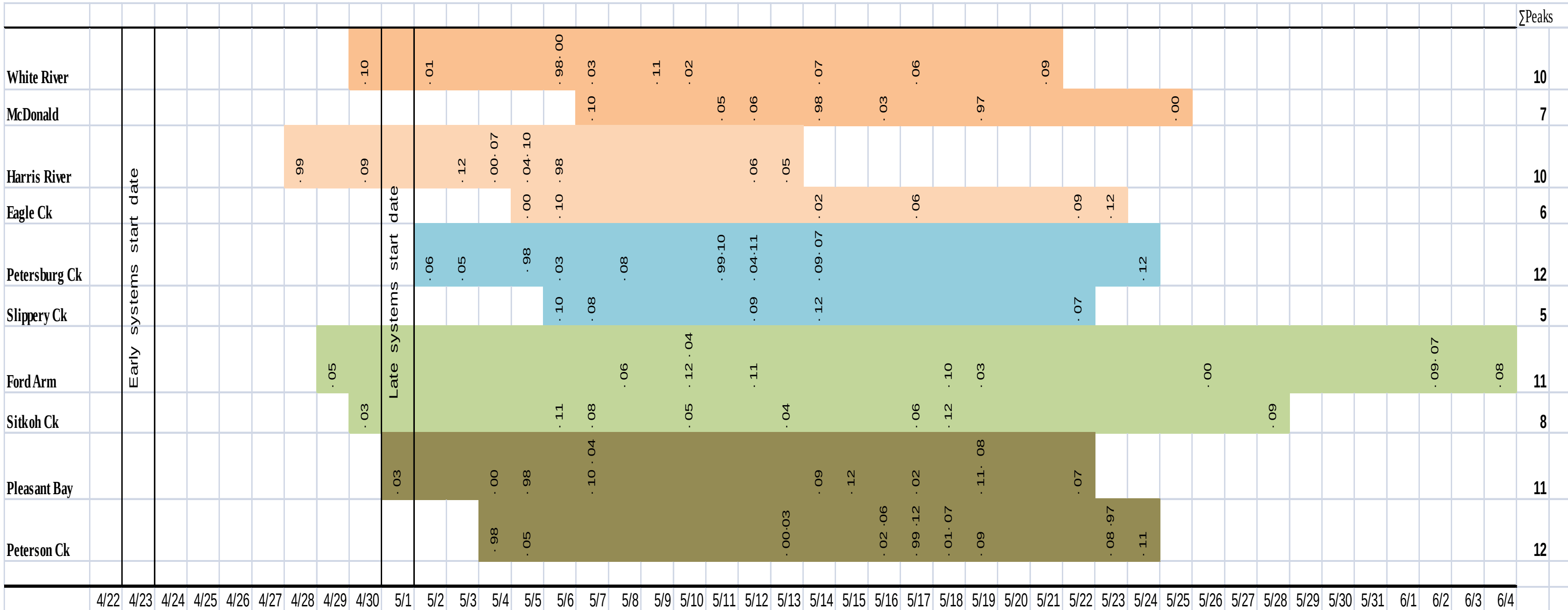


Figure 3.–Historical run timing information for steelhead index streams in Southeast Alaska.

Table 4.–Site-specific information for steelhead index systems in Southeast Alaska. Streams in bold are annual index streams.

Management area: stream name	Description of index area and directions for access
Ketchikan: **White River**	Obtain key from Cape Fox Corporation to access locked gate. Drive out Ward Lake Road to locked gate accessing Cape Fox property. Area 1 starts in upper reach of creek at merger of three forks and continues downstream to second large logjam going downstream. The top of this section is reached by walking down first right hand spur road driving down into this drainage. Area 2 runs from log jam downstream to pulled logging bridge. Area 3 runs from pulled bridge downstream to ¼ mile below lower bridge crossing of White River. Survey is facilitated by leaving second vehicle or motorcycle at lower bridge crossing of White River. The water level gauge is downstream bridge abutment on lower bridge crossing of White River located in area 3.
Ketchikan: **McDonald Lake Creek**	Fly to McDonald Lake. Survey inlet stream (Wolverine Creek) from falls downstream to lake confluence (1 mile). Then, boat 4 miles to lake outlet, survey downstream from lake to start of canyon at the old weir site. Hike back upstream along trail to lake. Water height gauge is large rock located in the first pool of this section current goes around both sides of this rock. Area 1 starts at large deep corner hole with large log across stream just below falls & runs downstream to hole with large rock in middle which is stream height gauge. Area 2 runs from this point downstream to where creek enters McDonald Lake. Area 3 runs from outlet of McDonald Lake downstream to log jam at bottom of 3-sided shelter hole. Area 4 runs from this point downstream to top of canyon just below old F&G weir site.
POW: **Harris River**	Drive to the Hydaburg Road crossing on the Harris and survey downstream 7 miles to saltwater. Stream reaches change at each logging bridge as you snorkel downstream. Hike back to lower footbridge road crossing to retrieve stashed vehicle. Permanent water level benchmark is drilled into the rock just upstream of the Hydaburg highway bridge.
POW: **Eagle Creek**	Monitor CB radio for large truck traffic. From the Luck Lake outlet, Survey downstream to saltwater. Hike back to vehicle and drive into upper Luck Creek on road 30334 and survey downstream to Luck Lake. Stream reaches were permanently marked and photographed in 2000.
Petersburg: **Petersburg Creek**	The best option is to jet skiff upstream at high tide to Hammer Slough (the upper extent of tide water), adjacent to two cabins the day prior to the survey. Leave the jet boat overnight and return to town via a second jet skiff. Fly to the lake the next day. Reach 1 begins approximately 0.5 mi below the lake outlet at the confluence with a tributary stream entering from river-right, and ends at the confluence with Shakey Frank's Creek 2.7 miles downstream. Within this reach, a 0.6 mi portion of this reach is not surveyed for safety reasons, and bypassed using the foot trail. Reach 2 extends 1.4 miles to the large stable logjam blocking upstream boat traffic. Reach 3 extends 1.8 miles downstream ending at Hammer Slough, where three cabins are located. A benchmark includes a metal spike driven into a vertical bedrock wall on river-left, 100 meters upstream from the survey's end. When survey is completed, Jet boat back to town. Total surveyed distance is 5.3 miles.

-continued-

Table 4.–2 of 2.

Management area: stream name	Description of index area and directions for access
Petersburg: **Slippery Creek**	Fly-in from Petersburg via floatplane to the outlet creek at Slippery Lake on Kuiu Island. Survey reach 1 downstream .5 mile to the smolt trap site. Survey reach 2 (1.5 miles) from the smolt trap to the fish pass (note any upstream fish passage problems). Record depth at the staff gauge located on the fishpass bulkhead. Hike one mile to beach for saltwater floatplane pick up in Port Camden.
Sitka: **Sitkoh Creek**	Survey area starts at the lake outlet and extends to tidewater. The stream reach boundary between 1 and 2 is the logjam just above the canyon where the trail adjacent to the stream bypasses about ½ mile of high gradient water. Reach 2 extends between the area where the trail again meets the stream and a tributary enters on the left as the ridge on the left going downstream is approached. The benchmark for this stream is in bedrock near tidewater on river left.
Sitka: **Ford Arm Creek**	Survey area starts at the lake outlet and extends to tidewater. The boundary between the two stream reaches is the tributary that enters on river right about halfway through the survey. The permanent benchmark is a rock located on river right just below weir site at the outlet of the lake.
Juneau: **Pleasant Bay Creek**	Charter in to the lake and hike downstream through muskeg meadows on the right side of the stream facing downstream. Survey starts at the barrier falls and continues downstream to the break between Area 2 and Area 3 (approximately 3,000 ft above tidewater). The permanent benchmark is on the large bedrock outcropping on the right side of the stream going downstream between area #1 and area #2.
Juneau: **Peterson Creek**	Peterson Creek is located at 25 mile on Glacier Highway. Park at the main highway bridge and hike upstream to the barrier falls. Survey area goes from the falls downstream to the highway bridge. The permanent benchmark is on the steel piling under the main highway bridge.

A permanent benchmark for water levels was established on each index system in 1997 and 1998 (description in Table 4). The purpose of the permanent benchmark was to allow water levels to be compared from one year to the next. On each steelhead survey during 2013, the water level will be recorded from the benchmark.

If rain, wind, or turbidity obscure subsurface visibility, the survey will be halted temporarily until conditions improve. In addition, if the conditions are such that any member of the snorkel team is uncomfortable with conducting or continuing the survey, it will be postponed until conditions are more favorable. If conditions continue to deteriorate or do not improve, the survey will be postponed and repeated in its entirety as soon as possible. Safety is a primary consideration and observers should train with experienced personnel before conducting surveys. A safety class in whitewater survival and rescue is required for all snorkelers.

DATA REDUCTION

Survey personnel will be responsible for checking forms for accuracy following each survey. Counts by discrete survey section will be compared to the total counts to ensure counts by section are correctly totaled. Environmental data will be compared with expected and historical trends to insure correct recording (degrees Celsius vs. degrees Fahrenheit, etc.). The area management biologist, if not a member of the survey team, will later inspect data for legibility and completeness. Survey forms will be forwarded biweekly to the Douglas office, preferably by electronic mail, to be included in the regional steelhead survey database. Survey data will be

Table 5.–Sport fish steelhead escapement survey form (White River used as an example).

White River Stream 101-45-10240 Survey Date:____/____/13

Reach No. Code	Initials - Primary Observer	Reach Name or Description	Survey Type Code	Distance Surveyed (miles)	Tide Code	Visibility Code	Water Level Code	Weather Code	Staff Gauge Level/Depth (cm)	Secchi Disk (meters)	Water Surface Temp. (cel)	Remark Codes	Steelhead live	Steelhead dead	# Redds	Rainbow	Dolly Varden	Cutthroat	Coho	Comments

Survey Type Codes	Tide Codes	Visibility Codes	Water Level Codes	Weather Codes	Remark Codes
F = Foot	41 = High	21 = Excellent	31 = High	C = Clear	11 = Fish present but not counted at mouth
S = Snorkel	42 = Low	22 = Normal	32 = Normal	O = Overcast	12 = Fish present but not counted in tidal
B = Boat	43 = Intermed	23 = Poor	33 = Low	R = Raining	13 = Fish present but not counted in stream
				W = Wind on Water surfac	

Observer Names: ____

entered into an Excel®[2] spreadsheet and into the Division of Commercial Fisheries ALEX/IFDB escapement survey database.

ANALYSIS

Counts for each river will be tabulated by stream reach and date. All environmental data collected will also be tabulated by date to facilitate interpretation of the relative quality of count data by stream. Counts over time will be compared with environmental data collected over time to bracket dates of peak inriver abundance, as possible.

SCHEDULE AND DELIVERABLES

Week of April 16–23	Complete the first weekly survey on each of the early systems (Table 2)
Week of April 30	Complete the first weekly survey on each of the late systems (Table 2)
Late May to early June	Complete all snorkel surveys
Weekly	Ensure survey data are forwarded to Douglas office
September, 2013	Draft summary report covering 2012 and 2013

This project will produce a draft Fishery Data Series report with counts for each of the survey sections summarized for the 2-year reporting period (2012 and 2013) by April 2014.

RESPONSIBILITIES

List of personnel and duties:

Carol Coyle, Fishery Biologist II.

> Duties: Prepare operational plan, enter survey results into the regional steelhead survey database, write report, and assist with snorkel surveys.

Roger Harding, Fishery Biologist III.

> Duties: Assist with operational plan preparation, research oversight, review and edit report. Assist with snorkel surveys

John Der Hovanisian, Fishery Biologist IV, Regional Research Coordinator.

> Duties: Research oversight, assist with plan preparation and with snorkel surveys; review operational plan and data analysis, and review all reports.

Dan Reed, Biometrician III.

> Duties: Provide input to sampling design and evaluation. Assist in data analysis and report writing. Review operational plan and data analysis.

Bob Chadwick, Fishery Biologist IV, Regional Management Coordinator.

> Duties: Management oversight, operational planning, and coordinate index surveys in all management areas.

[2] This product name is included for a complete description of the process and does not constitute product endorsement.

Vacant, Fishery Biologist III, Juneau Area Management Biologist.

Duties: Conduct and/or supervise staff who index surveys in the Juneau Management Area.

Dan Teske, Fishery Biologist II, Assistant Juneau Area Management Biologist.

Duties: Conduct and/or supervise staff who index surveys in the Juneau Management Area.

Troy Tydingco, Fishery Biologist III, Sitka Area Management Biologist

Duties: Conduct and/or supervise staff who index surveys in the Sitka Management Area.

Patrick Fowler, Fishery Biologist II, Assistant Sitka Area Management Biologist

Duties: Conduct index surveys in the Sitka Management Area.

Kelly Piazza, Fishery Biologist III, Ketchikan Area Management Biologist.

Duties: Conduct and/or supervise staff who conduct index surveys in the Ketchikan Management Area.

Vacant, Fishery Biologist II, Prince of Wales (POW) Area Management Biologist

Duties: Conduct and/or supervise staff who conduct index surveys in the POW Management Area.

Doug Fleming, Fishery Biologist III, Petersburg Area Management Biologist.

Duties: Conduct and/or supervise staff who conduct index surveys in the Petersburg Management Area.

Dave Love, Fishery Biologist II.

Duties: Assist with snorkel surveys.

Mike Wood, Fish and Game Technician IV

Duties: Assist with snorkel surveys.

Vera Goudima, Fish and Game Technician III

Duties: Assist with index surveys in the Petersburg Management Area.

Micah Sanguinetti, Fish and Game Technician IV

Duties: Assist with snorkel surveys.

REFERENCES CITED

Bain, C., S. T. Elliott, R. E. Johnson, and G. Woods. 2003. Situk River steelhead: a review of historical data through 1996. Alaska Department of Fish and Game, Fisheries Manuscript No. 03-01, Anchorage.

Coyle, C.L. 2012. Southeast Alaska steelhead snorkel surveys of regional index streams, 2010 and 2011. Alaska Department of Fish and Game, Fishery Data Series No. 12-79, Anchorage.

Freeman, G.M. 1995. An evaluation of steelhead enhancement in the Ward Creek Drainage, Ketchikan Alaska, 1991–1994. Alaska Department of Fish and Game, Fisheries Data Series No. 95-2, Anchorage.

Harding, R.D., and C.L. Coyle. 2011. Southeast Alaska steelhead and Dolly Varden management. Alaska Department of Fish and Game, Special Publication No. 11-17, Anchorage.

REFERENCES CITED (continued)

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.

Harding, R., and D. Jones. 1990. Peterson Creek and lake system steelhead evaluation. 1989. Alaska Department of Fish and Game, Fisheries Data Series No. 90-37, Anchorage

Harding, R., and D. Jones. 1991. Peterson Creek and lake system steelhead evaluation.1990. Alaska Department of Fish and Game, Fisheries Data Series No. 91-31, Anchorage.

Harding, R., and D. Jones. 1992. Peterson Creek and lake system steelhead evaluation.1991. Alaska Department of Fish and Game, Fisheries Data Series No. 92-46, Anchorage.

Harding, R., and D. Jones. 1993. Karta River steelhead: 1992 escapement and creel survey studies. Alaska Department of Fish and Game, Fishery Data Series No. 93-30, Juneau.

Harding, R., and D. Jones. 1994. Sitkoh Creek steelhead: 1993 escapement and harvest. Alaska Department of Fish and Game, Fishery Data Series No. 94-36, Anchorage.

Hoffman, S.H., J. Koerner, and D Magnus, 1990. Steelhead habitat preference, creel census, and recreation survey on the Karta River, Southeast, Alaska, 1989. Alaska Department of Fish and Game, Fishery Data Series No. 90-45, Anchorage

Hoffman, S. H. 2007. Weir enumeration and assessment of mark-recapture estimates for steelhead abundance in Twelve Mile Creek, 2004. Alaska Department of Fish and Game, Fishery Data Series No. 07-34, Anchorage.

Hoffman, S. H. 2008. Steelhead abundance and composition in the Karta River, 2005. Alaska Department of Fish and Game, Fishery Data Series No. 08-13, Anchorage.

Hooten, R. S. 1987 Catch and release as a management strategy for steelhead in British Columbia. In R. Barnhart and T. Roelofs, editors, Proceedings of catch and release fishing-a decade of experience. Sept. 30 – Oct. 1, 1987, Humboldt State University, Arcata.

Howe, A. L., R. J. Walker, C. Olnes, G. Heineman, and A. E. Bingham. 1999. Harvest and catch in Alaska sport fisheries during 1998. Alaska Department of Fish and Game, Fishery Data Series No. 99-41, Anchorage.

Johnson, R. E. 1996. Situk River steelhead trout studies, 1994. Alaska Department of Fish and Game, Fishery Data Series No. 96-1, Anchorage.

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.

Jones, Darwin E. 1972. A study of steelhead-cutthroat trout in Alaska. Alaska Dept. of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1971–1972. Project F-9-4. 13(G-II-I). pp. 91–108.

Jones, Darwin E. 1973. Steelhead and sea-run cutthroat trout life history in southeast Alaska. Alaska Dept. of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1972–1973. Project AFS-42. 14(AFS-42-1). pp. 1–18.

Jones, Darwin E. 1974. Life history of steelhead trout in southeast Alaska. Alaska Dept. of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1973–1974. Project AFS-42. 15(AFS-42-2). pp. 1–14.

Jones, Darwin E. 1975. Life history of steelhead trout. Alaska Dept. of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1974–1975. Project AFS-42. 16(AFS-42-3-A). pp. 1–22.

Jones, Darwin E. 1976. Life history of steelhead trout. Alaska Dept. of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1975–1976. Project AFS-42. 17(AFS-42-4-A). pp. 1–27.

Jones, Darwin E. 1983. A study of cutthroat - steelhead in Alaska. Alaska Dept. of Fish and Game, Federal Aid in Fish Restoration, Annual Report of Progress, 1982–1983. Volume 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, Fisheries Data Series No. 91-32, Anchorage

REFERENCES CITED (continued)

Korman, J., R.N.M. Ahrens, P.S. Higgins, and C.J. Walters. 2002. Effects of observer efficiency, arrival timing, and survey life on estimates of escapements for steelhead trout (Oncorhynchus mykiss) derived from repeat mark-recapture experiments. Can. J. Fish. Aquat. Sci. 59:1116–1131.

Love, D. C., and R. D. Harding. 2008. Steelhead trout production studies at Sitkoh Creek, Alaska, 2003 and 2004. . Alaska Department of Fish and Game, Fisheries Data Series No. 08-44, Anchorage.

Love, D. C., and R. D. Harding. 2009. Steelhead trout production studies at Sitkoh Creek, Alaska, 2005 and 2006. . Alaska Department of Fish and Game, Fisheries Data Series No. 09-68, Anchorage.

Love, D.C., C.L. Coyle and R.D. Harding. 2012 a. Steelhead trout studies at Sitkoh Creek, Alaska, 2007 and 2008. Alaska Department of Fish and Game, Fishery Data Series No. 12-60, Anchorage.

Love, D. C., D.J. Reed and R. D. Harding. 2012 b. Steelhead trout production studies at Sitkoh Creek, Alaska, 2003–2009, and 2009 final report. Alaska Department of Fish and Game Fishery Data Series No. 12-82, Anchorage.

Piazza, K. S., G. K. Chen, and R. Mullen. 2008. Assessment of adult steelhead populations on Prince of Wales Island, Alaska: Harris River and Big Ratz Creek, 2005. Alaska Department of Fish and Game, Fishery Data Series No. 08-46, Anchorage.

Piazza, K. S. 2009 a. Assessment of adult steelhead populations on Prince of Wales Island Alaska: Big Ratz Creek and Nazuhini Creek, 2007 and 2005–2007 final report. Alaska Department of Fish and Game, Fishery Data Series No. 09-56, Anchorage.

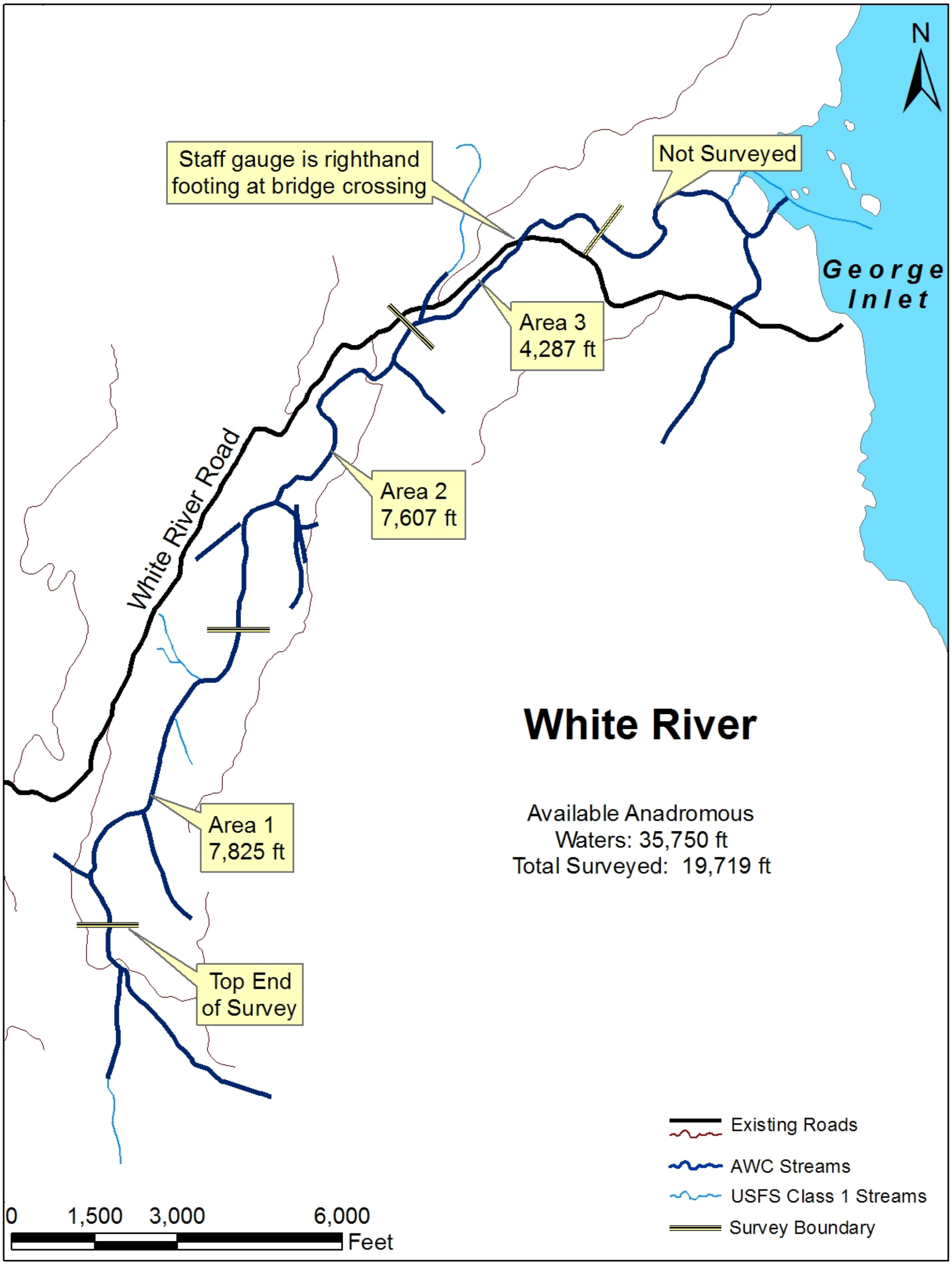
Piazza, K. S. 2009 b. Assessment of Adult Steelhead Populations on Prince of Wales Island, Alaska: Eagle Creek and Cable Creek, 2006. Alaska Department of Fish and Game, Fishery Data Series No. 09-14, Anchorage.

Yanusz, Richard. 1997. Sea-run cutthroat trout, sea-run Dolly Varden, and steelhead population status at Sitkoh Creek, Southeast Alaska, during 1996. Fishery Data Series No. 97-23, Anchorage.

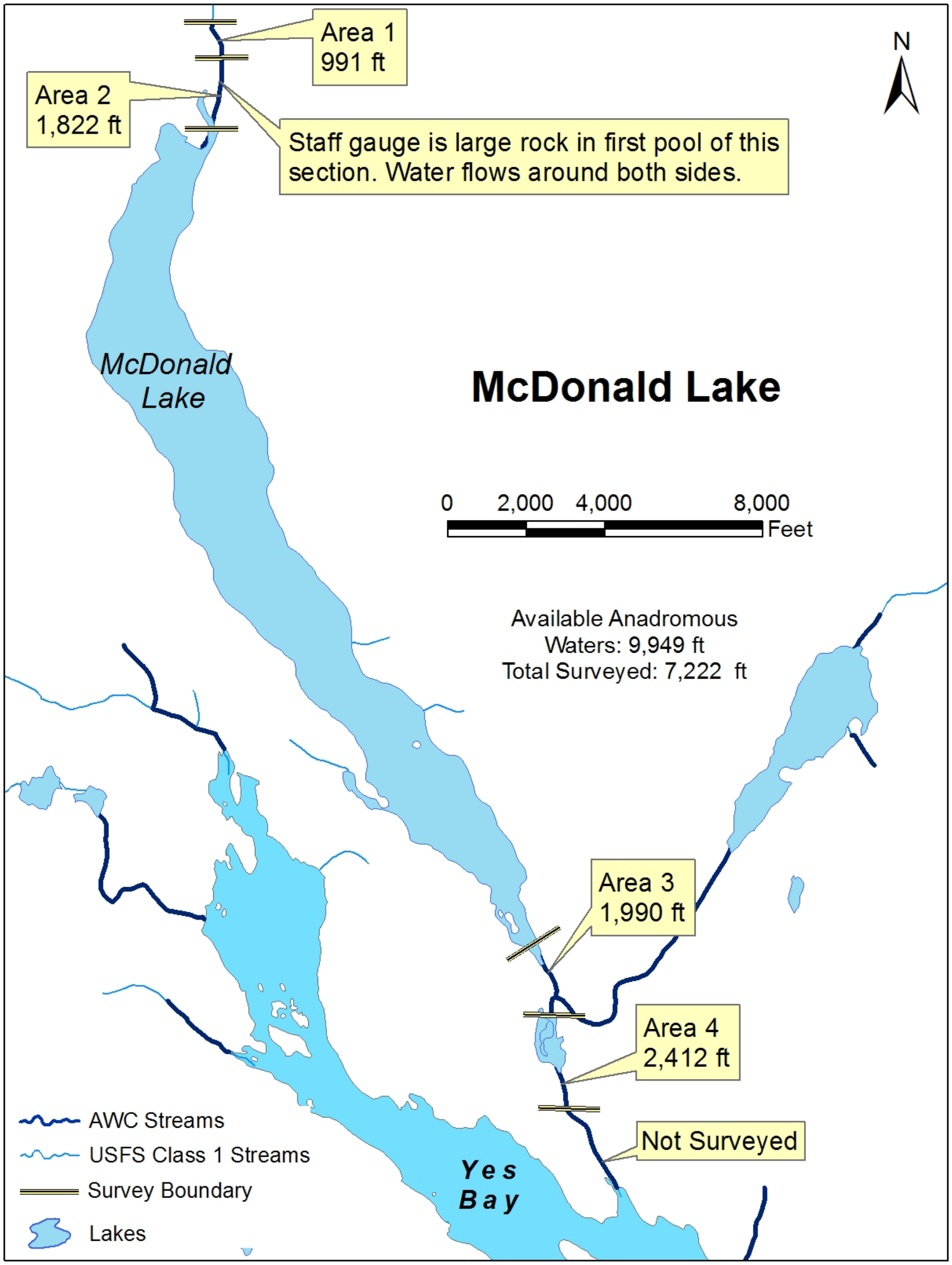
Yanusz, R. J. 1998. Sockeye salmon escapement to Windfall Lake during 1997. Alaska Department of Fish and Game, Fishery Data Series No. 98-32, Anchorage.

APPENDIX A: STREAM MAPS SHOWING DISCRETE COUNTING REACHES

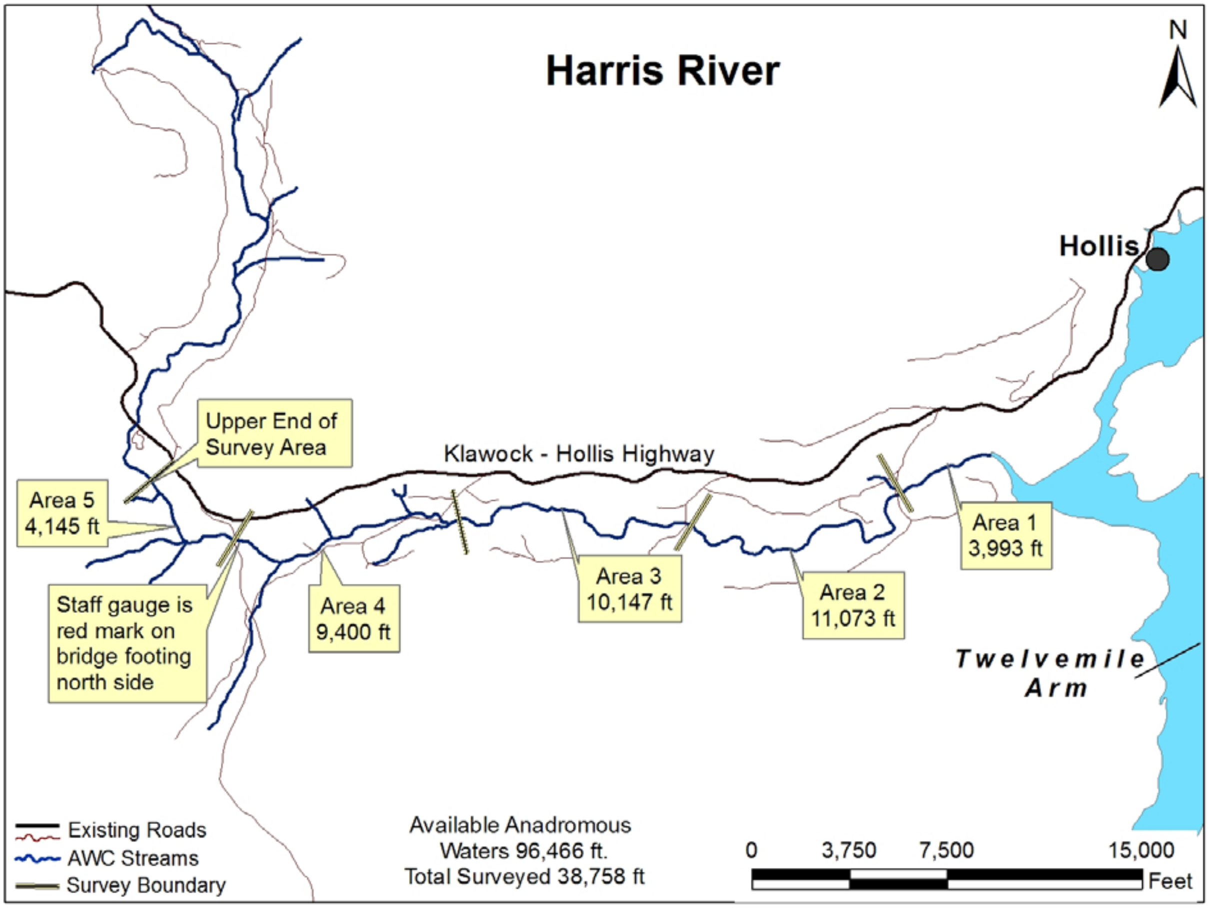
Appendix A1.–White River, Ketchikan index stream: AWC # 101-45-10240. AWC = Anadromous Waters Catalog.



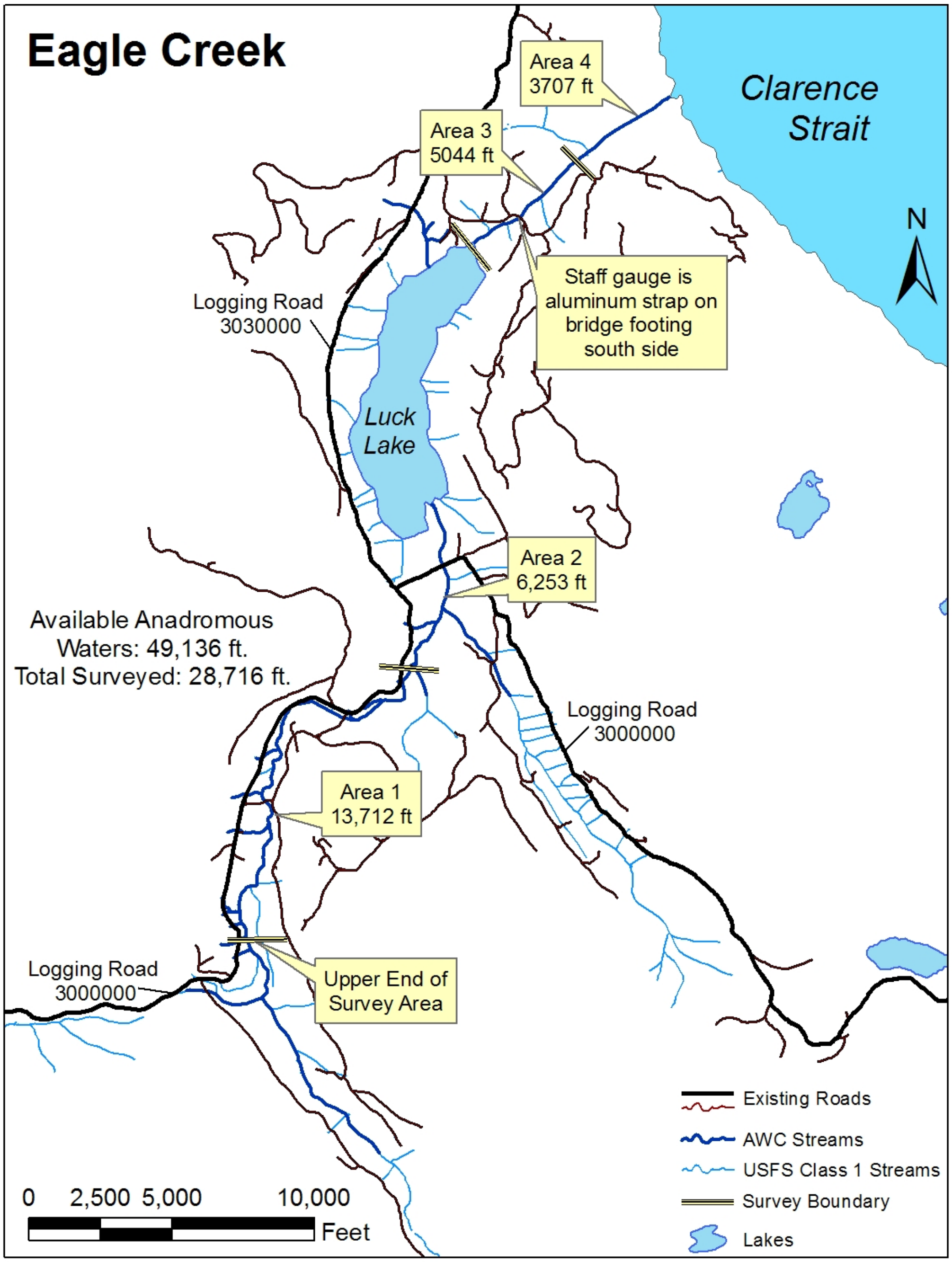
Appendix A2.–McDonald Creek, Ketchikan index stream: AWC # 101-80-10680-0020. AWC = Anadromous Waters Catalog.



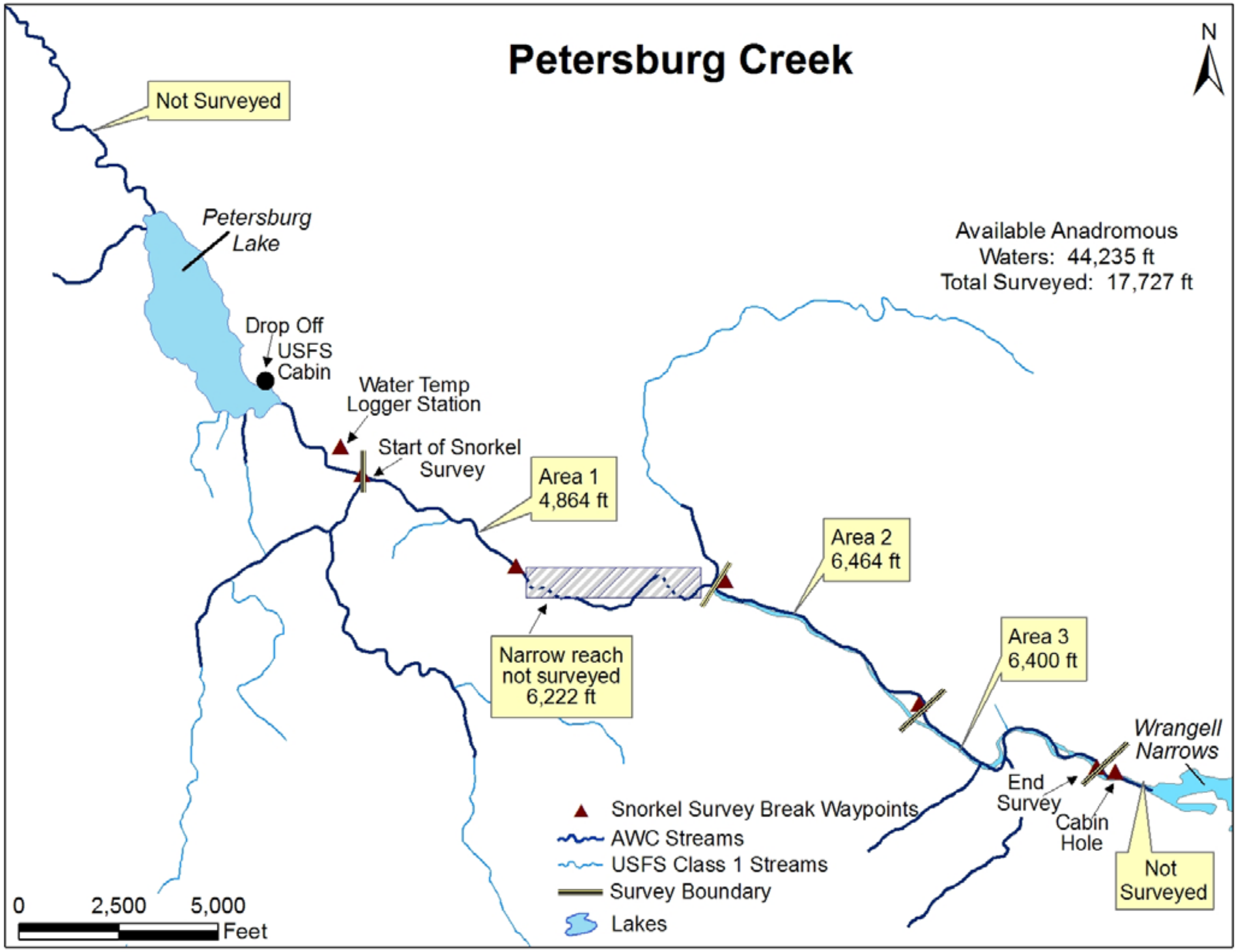
Appendix A3.–Harris River, Prince of Wales index stream: AWC # 102-60-10820. AWC = Anadromous Waters Catalog.



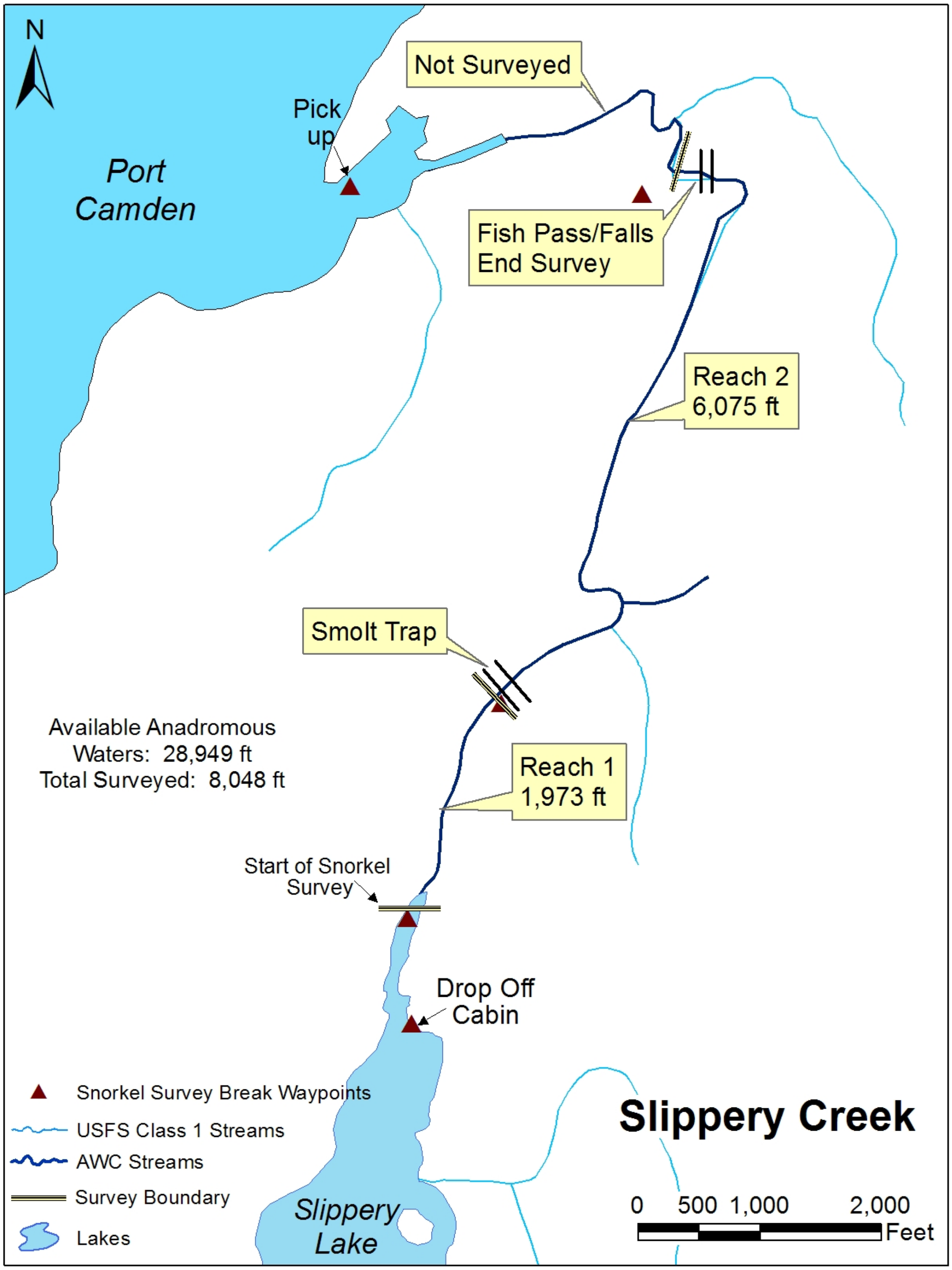
Appendix A4.–Eagle Creek, Prince of Wales index stream: AWC # 106-10-10300. AWC = Anadromous Waters Catalog.



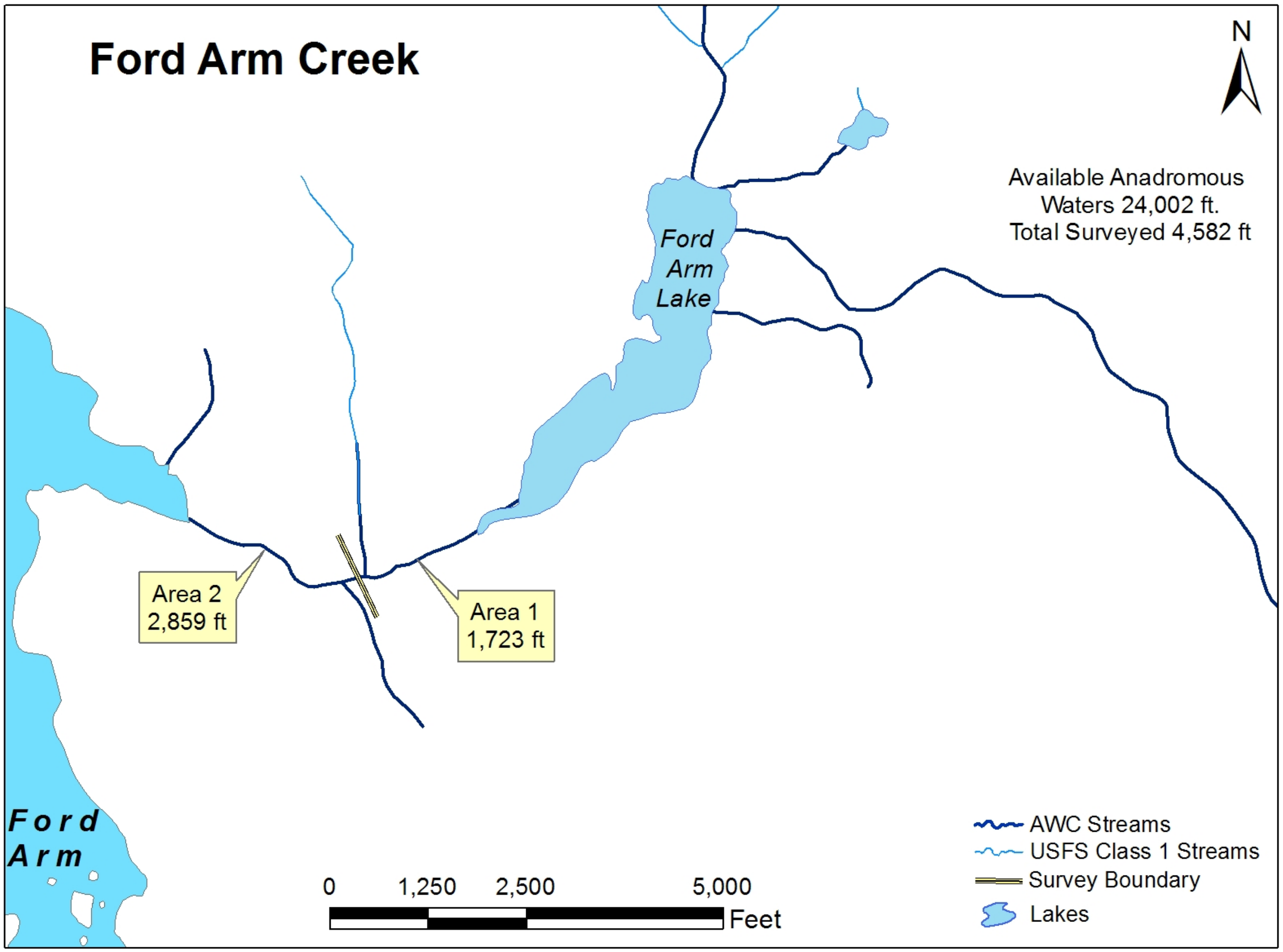
Appendix A5.–Petersburg Creek, Petersburg index stream: AWC # 106-44-10600. AWC = Anadromous Waters Catalog.



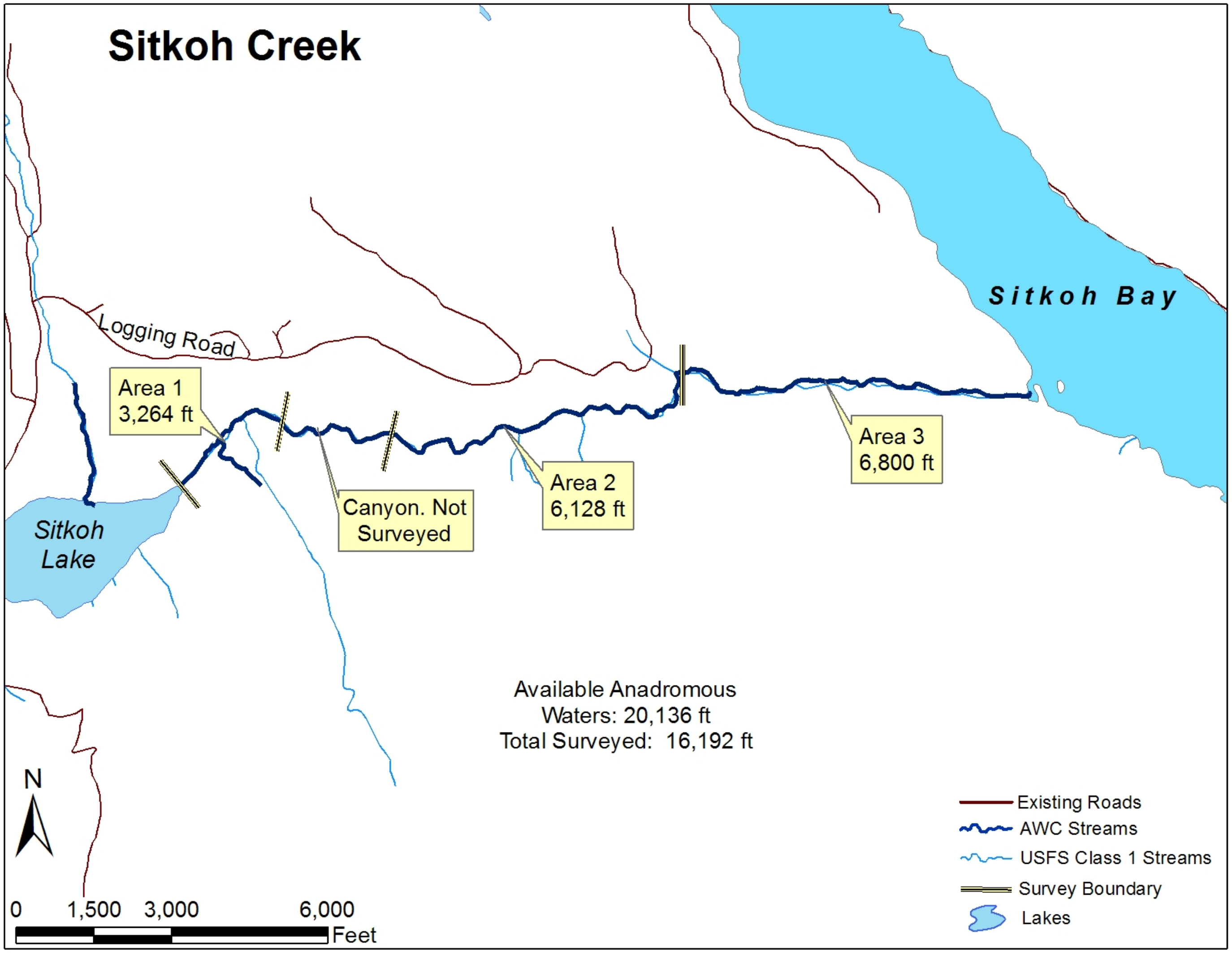
Appendix A6.–Slippery Creek, Petersburg index stream: AWC # 109-43-10030. AWC = Anadromous Waters Catalog.



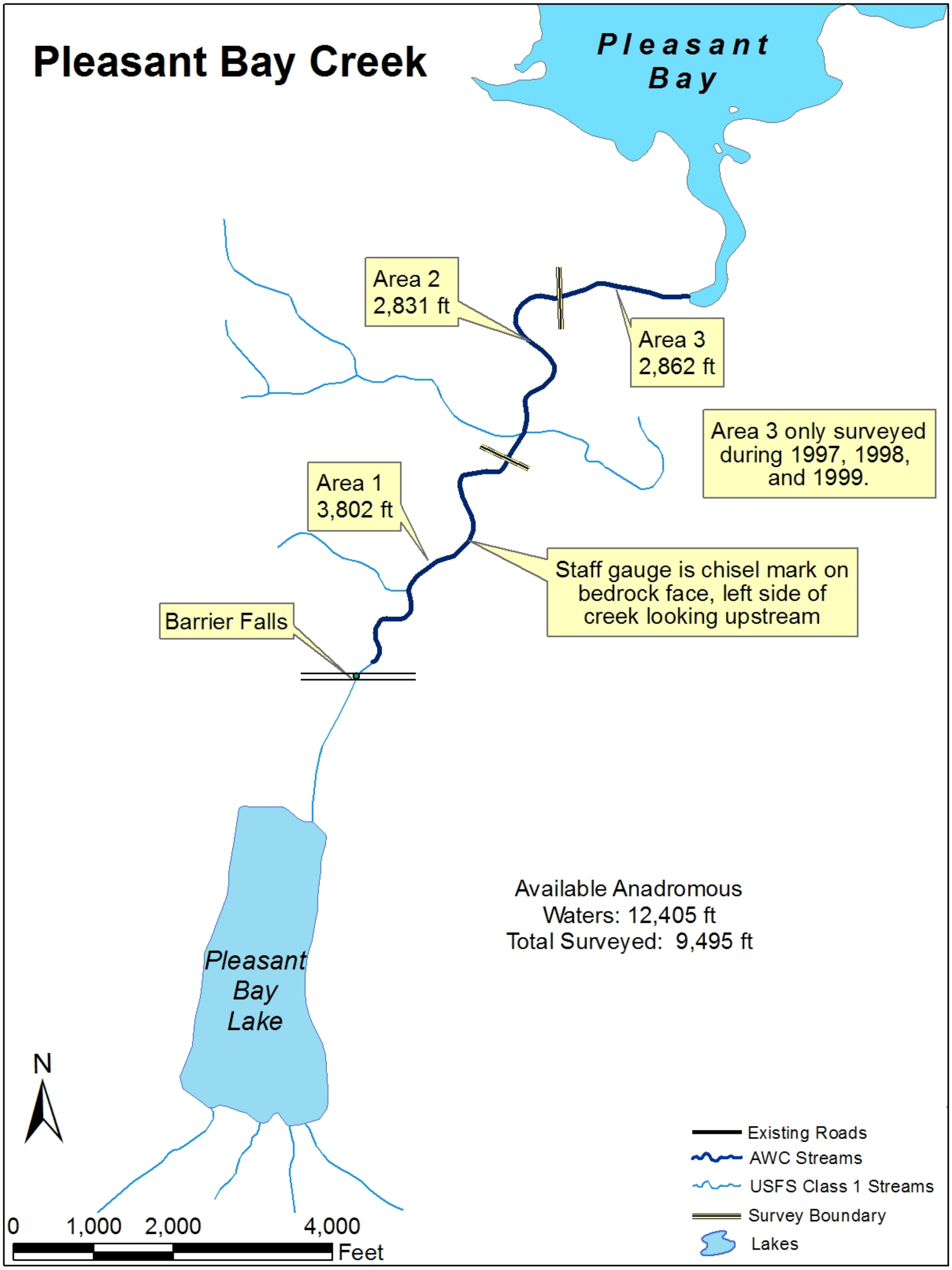
Appendix A7.–Ford Arm Creek, Sitka index stream: AWC # 113-73-10030. AWC = Anadromous Waters Catalog.



Appendix A8.–Sitkoh Creek, Sitka index stream: AWC # 113-59-10040. AWC = Anadromous Waters Catalog.



Appendix A9.–Pleasant Bay Creek, Juneau index stream: AWC # 111-12-10050. AWC = Anadromous Waters Catalog.



Appendix A10.–Peterson Creek, Juneau index stream: AWC # 111-50-10100. AWC = Anadromous Waters Catalog.