

Northern Boundary Area Summer Chum Salmon Monitoring Project 2014: Final Report to the Pacific Salmon Commission Northern Fund

by

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ABSTRACT

The Alaska Department of Fish and Game (ADF&G) currently monitors summer chum salmon spawning abundance in 13 index streams in the Boundary Area of southern Southeast Alaska that are assessed primarily through aerial survey methods. ADF&G commercial fisheries managers had expressed concern regarding their ability to obtain reliable counts of chum salmon in some of the large mainland rivers where chum salmon may be masked by high densities of pink salmon, particularly in years of low chum salmon abundance. The primary objective of this project was to conduct helicopter surveys of summer chum salmon on currently monitored, large mainland river systems east of Ketchikan. Three complete helicopter surveys of the five targeted mainland rivers were conducted by three Ketchikan area management biologists in 2014. Additional foot surveys conducted on three smaller chum salmon index systems similarly allowed for direct comparisons with aerial or helicopter survey estimates. In general, management biologists felt their views from helicopter surveys were improved over fixed-wing surveys. As part of the regular chum salmon monitoring program in Southeast Alaska, we recommend that a peak foot survey be conducted during the first week of August at as many of the smaller index streams as funding allows. In addition, a single helicopter survey conducted annually in late July or early August may offer a relatively inexpensive way for managers to help validate their fixed-wing aerial survey chum salmon counts at large mainland river systems.

INTRODUCTION

The Alaska Department of Fish and Game (ADF&G) currently monitors summer chum salmon spawning abundance in 13 index streams in the Boundary Area of southern Southeast Alaska that are assessed primarily through aerial survey methods (Eggers and Heintz 2008, Piston and Heintz 2011). Annual peak survey counts at these streams provide a meaningful indicator of trends in relative abundance, and form the basis of the current lower-bound sustainable escapement goal for southern Southeast Alaska summer chum salmon (Piston and Heintz 2011). High pink salmon abundance in many of these chum salmon index streams, however, can make it difficult to identify chum salmon during routine fixed-wing aerial surveys (Van Alen 2000). This is particularly true of the large mainland river systems where the size of the rivers also makes it difficult to ground-truth aerial survey counts. Although there is broad overlap in run timing of pink and summer-run chum salmon in these rivers, chum salmon tend to spawn earlier in the season than pink salmon (Van Alen 2000), which tend to hold in deeper areas in the lower portions of the river prior to spawning later in the summer.

ADF&G commercial fisheries managers have expressed concern regarding their ability to obtain reliable counts of chum salmon in some large mainland rivers where chum salmon may be masked by high densities of pink salmon, particularly in years of low chum salmon abundance. Improved stock assessment was needed to ensure that perceived low chum salmon abundance was not simply the result of limitations in the methods used to monitor chum salmon, and to provide biologists confidence in their ability to effectively separate chum salmon from more numerous pink salmon on the spawning grounds. The primary objective of this project was to conduct helicopter surveys of summer chum salmon on currently monitored, large mainland river systems east of Ketchikan. Helicopter surveys provided surveyors improved views of these streams, and an opportunity to validate observations of chum and pink salmon abundance, identify primary chum salmon spawning areas, and improve managers' ability to identify chum salmon during routine aerial surveys of other index streams in the area. Additional foot and aerial surveys conducted concurrently on two smaller chum salmon index systems and one proposed new index stream (Harris River) similarly allowed for direct comparison between methods. Results from these surveys will guide future chum salmon monitoring in the Boundary Area.

Although not a primary focus of this project, baseline pink and chum salmon genetic samples were collected opportunistically while conducting foot surveys.

PROJECT OBJECTIVES

- Compare fixed-wing aerial survey counts to helicopter survey counts of chum salmon on five large mainland chum salmon index streams east of Ketchikan.
- Compare fixed-wing aerial survey counts to foot survey counts of chum salmon on two smaller chum salmon index streams east of Ketchikan and one proposed index stream on Prince of Wales Island.
- Document peak spawning periods in targeted chum salmon index streams.

STUDY SITE

Surveys were conducted at ADF&G summer chum salmon index streams in the Southern Southeast Subregion (SSE) of Southeast Alaska, which extends from Sumner Strait, in the north, to the Canadian border in the south—a distance of approximately 240 km (Figure 1). The SSE Subregion includes 13 streams, many of which are located on the mainland, east of Ketchikan, Alaska. Fixed-wing aircraft and helicopter surveys were conducted at the five largest mainland chum salmon index streams: the Tombstone (ADF&G stream no. 101-15-019), Keta (ADF&G stream no. 101-30-030), Marten (ADF&G stream no. 101-30-060), Wilson (ADF&G stream no. 101-55-020), and Blossom (ADF&G stream no. 101-55-040) rivers (Figure 1). Fixed-wing aircraft and foot surveys were conducted at two smaller chum salmon index streams: Hidden Inlet (ADF&G stream no. 101-11-101) and Carroll River (ADF&G stream no. 101-45-078). An additional paired foot and fixed-wing aircraft survey was conducted at the Harris River (102-60-082), which is a proposed new chum salmon index stream on Prince of Wales Island.

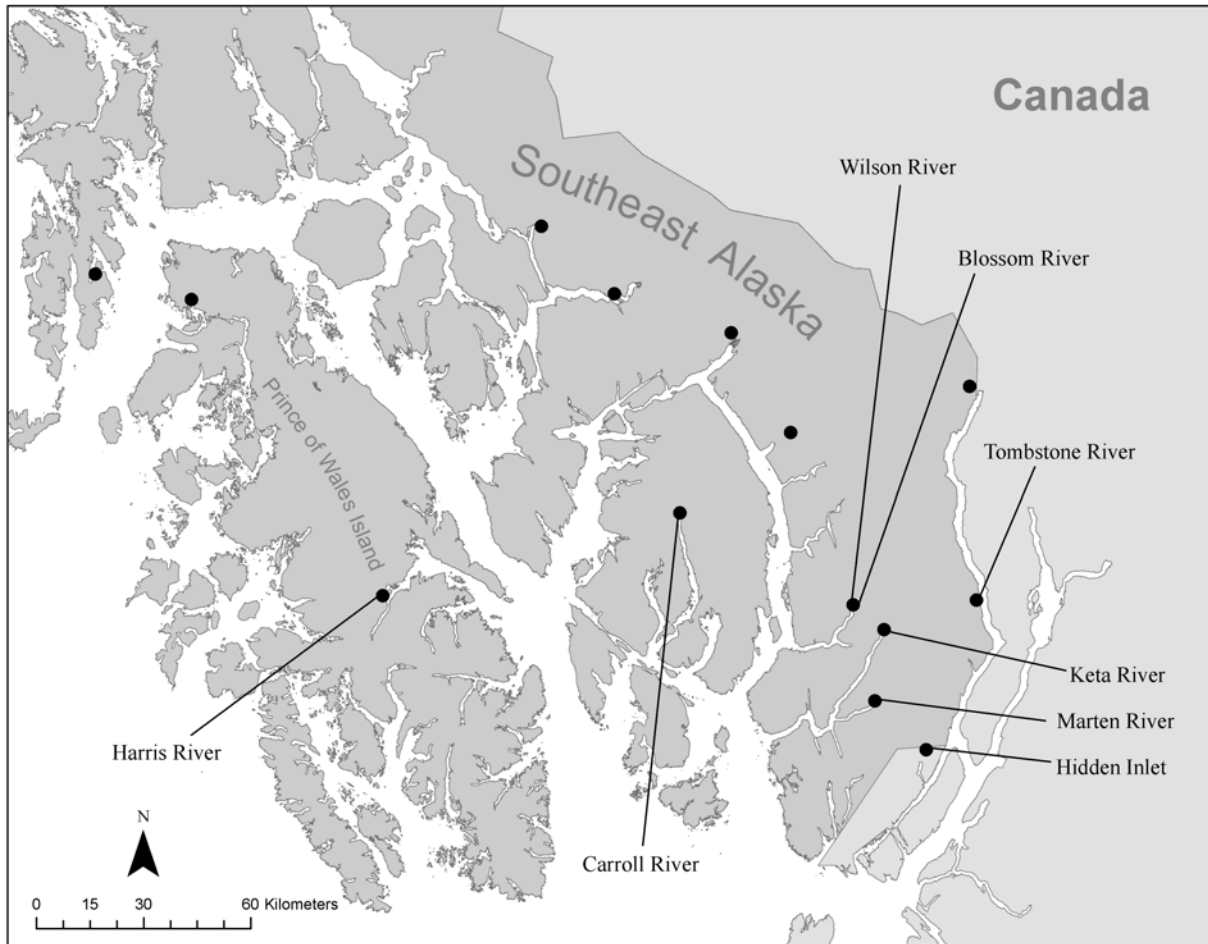


Figure 1.—Southern Southeast Subregion summer chum salmon index streams and index streams targeted for helicopter and foot surveys in 2014.

METHODS

In 2014, comparison of fixed-wing and helicopter surveys were conducted at the five largest mainland chum salmon index streams in southern Southeast Alaska: the Tombstone (ADF&G stream no. 101-15-019), Keta (ADF&G stream no. 101-30-030), Marten (ADF&G stream no. 101-30-060), Wilson (ADF&G stream no. 101-55-020), and Blossom (ADF&G stream no. 101-55-040) rivers. Each of the three Ketchikan area management biologists flew at least one complete fixed-wing aerial survey of all five systems, followed by a complete helicopter survey of the same systems the next day (or as soon as possible). Aerial surveys were conducted in a Cessna 185 airplane flown at an altitude of 150–200 meters and a speed of approximately 110 km/hour. Helicopter surveys were conducted in a Hughes 500 helicopter following standard survey protocols (Pahlke 1996; Shaul and Tydinco 2006). At least one survey was conducted in mid-to-late July when chum salmon abundance was assumed to peak and prior to the first large influx of pink salmon onto spawning areas. Two additional surveys were conducted through mid-August to allow for observations under different densities and distribution of pink and chum salmon, and to ensure that the peak of chum salmon abundance was observed in the late July surveys. Observers wore polarized glasses during surveys to reduce glare off the water and

optimize visibility. Survey counts, survey conditions (visibility, water levels, weather, and tide stage), and other pertinent observations were recorded on standardized escapement survey forms, and entered into the Southeast Alaska Integrated Fisheries Database.

Three complete helicopter surveys of the five targeted mainland rivers were conducted by three Ketchikan area management biologists in 2014. The first helicopter survey was completed on 17 July 2014, the second on 31 July 2014, and the third on 13 August 2014. Aerial surveys were not always paired to the helicopter surveys in 2014 due to the intensity of the fishing season in southern Southeast Alaska, which made it difficult for managers to devote consecutive full days for surveying the same set of streams. Almost 80% of the total Southeast Alaska pink salmon harvest was caught in the Ketchikan management area, Districts 101–104. Once it was established that pink salmon returns to the rivers targeted in this study were strong, managers had to devote their time elsewhere to monitor effort, harvests, and escapements as much of the seine fleet moved into southern Southeast Alaska. Despite the difficulty in pairing each helicopter survey with an aerial survey the overall set of surveys at each river allowed for some direct comparison between methods, and most importantly, allowed managers the best possible look at each river through the peak of the escapement.

Comparisons of fixed-wing aircraft and foot surveys were conducted at two smaller chum salmon index streams: Hidden Inlet (ADF&G stream no. 101-11-101) and Carroll River (ADF&G stream no. 101-45-078). An additional paired foot and helicopter survey was conducted at a proposed new index stream (Harris River) on Prince of Wales Island. Foot surveys were conducted by research staff and available management staff from late July to late August as close as possible to regularly scheduled fixed-wing aircraft surveys to provide direct comparison and ground-truth aerial surveys. Hidden Inlet and Carroll River were surveyed three times over the course of the season, and the Harris River was surveyed once in late August.

RESULTS

HELICOPTER SURVEYS

Helicopter surveys were conducted on 17 July, 31 July, and 13 August and each of the three Ketchikan area management biologists completed a survey of all five targeted rivers. For each river, the complete set of aerial and helicopter surveys showed a general low to average abundance of chum salmon, with peak survey estimates occurring from mid-to-late July at each river. Peak helicopter survey estimates were 6,400 at the Tombstone River, 4,250 at the Keta River, 5,000 at the Marten River, and 10,000 at the Wilson River (Table 1). At the Blossom River, a helicopter estimate of 20,000 during the 17 July survey was thought to have been an over estimate—an estimated 400,000 pinks were already present in the river, which made separation of chum salmon more difficult than normal. Subsequent aerial and helicopter surveys of the Blossom River all resulted in much lower chum salmon estimates, which better matched the overall low abundance of wild summer chum salmon in southern Southeast Alaska in 2014. One observer was again able to obtain high definition video footage of a portion of his helicopter survey, which allowed for a review of the survey with other managers and may provide future training opportunities for new observers. All managers agreed that helicopter surveys provided a valuable learning experience that would improve their ability to survey large mainland rivers.

Table 1.—Helicopter and aerial survey chum salmon counts at five southern Southeast Alaska summer chum salmon index streams, 2014.

Stream	Date	Survey Type	Stream Live	Stream Dead	Total	Observer
Tombstone River	7/16/2014	Aerial	2,500		2,500	C
Tombstone River	7/17/2014	Helicopter	2,000		2,000	C
Tombstone River	7/31/2014	Helicopter	6,400		6,400	B
Tombstone River	8/6/2014	Aerial	2,500		2,500	B
Tombstone River	8/13/2014	Helicopter	820		820	A
Keta River	7/9/2014	Aerial	1,000		1,000	A
Keta River	7/17/2014	Helicopter	4,000		4,000	C
Keta River	7/31/2014	Helicopter	4,250		4,250	B
Keta River	8/13/2014	Helicopter	870		870	A
Marten River	7/3/2014	Aerial	1,000		1,000	C
Marten River	7/9/2014	Aerial	500		500	A
Marten River	7/16/2014	Aerial	1,000		1,000	C
Marten River	7/17/2014	Helicopter	5,000		5,000	C
Marten River	7/31/2014	Helicopter	500		500	B
Marten River	8/13/2014	Helicopter	200		200	A
Wilson River	7/9/2014	Aerial	500		500	A
Wilson River	7/14/2014	Aerial	5,000		5,000	A
Wilson River	7/17/2014	Helicopter	10,000		10,000	C
Wilson River	7/21/2014	Aerial	8,000		8,000	B
Wilson River	7/31/2014	Helicopter	400		400	B
Wilson River	8/13/2014	Helicopter	1,158		1,158	A
Blossom River	7/9/2014	Aerial	500		500	A
Blossom River	7/14/2014	Aerial	500		500	A
Blossom River	7/17/2014	Helicopter	20,000		20,000	C
Blossom River	7/21/2014	Aerial	10,000		10,000	B
Blossom River	7/31/2014	Helicopter	2,500		2,500	B
Blossom River	8/13/2014	Helicopter	1,240		1,240	A

FOOT SURVEYS

Carroll River

In 2014, four complete aerial surveys of the Carroll River were conducted by three Ketchikan area management biologists and three foot surveys were conducted by Ketchikan area research biologists (Table 2). Foot surveys were conducted on 25 July, 7 August, and 14 August (Table 2). Aerial surveys were conducted 17 July, 22 July (pink count only), 30 July (pink count only), and 2 August. An additional helicopter survey was flown on 31 July as part of a regular circuit of the targeted mainland rivers. Carroll River offers excellent counting conditions during a foot survey, particularly in the upper half of the river where chum salmon spawning density is highest.

During the first two aerial surveys on 17 and 22 July 2014, the aerial observer did not see any chum salmon in the creek, but estimated 500 fish in the intertidal section during the 17 July survey. The first foot survey conducted on 25 July confirmed that there were very few chum salmon in the creek and both observers counted less than 200 chum salmon. The next aerial survey occurred on 30 July, and again the observer could not detect any live chum salmon—the observer estimated 120,000 live pink salmon in the creek. The following day a different observer conducted a helicopter survey of the river and estimated 500 live chum salmon. The peak of chum salmon abundance occurred during the first week of August. On 2 August, an aerial survey observer estimate 2,500 live chum salmon; a number that was corroborated by foot survey estimates on 7 August (chum salmon estimates of 2,560 and 2,460). A foot survey conducted on 14 August confirmed that the peak of the escapement had passed and live counts dropped to approximately 1,500 live and 350 dead chum salmon. The difficulty counting chum salmon from the air on the earliest surveys was as much a factor of very low chum salmon abundance as it was a result of large numbers of pink salmon masking chum salmon in the creek.

Hidden Inlet

In 2014, three aerial surveys of Hidden Inlet were conducted by three Ketchikan area management biologists and three foot surveys were conducted by Ketchikan area research biologists. Foot surveys were conducted on 30 July, 6 August, and 15 August (Table 2) and aerial surveys were conducted 16 July, 6 August, and 22 August. Hidden Inlet is a relatively small, clear stream that offers excellent counting conditions during a foot survey with few areas for chum salmon to avoid detection.

During the first aerial survey the observer estimated 200 live chum salmon in the creek—an estimated 6,000 chum salmon off the mouth of the creek were almost certainly pink salmon. Subsequent aerial surveys failed to detect chum salmon in the creek due to the very low numbers present in 2014. All foot surveys counts during the 6 and 15 August foot surveys were less than 300 fish, which were mixed with thousands of pink salmon (peak count 75,000).

Harris River

In 2014, paired helicopter and foot surveys were conducted at the Harris River on 20–21 August. On 20 August, the helicopter survey observer estimated 3,720 live chum salmon and 802,000 live pink salmon in the river. The following day, foot surveyors estimated approximately 3,700 live chum salmon and 212,000 live pink salmon in the river. Foot surveyors found that most of the chum salmon were actively spawning in riffles where easily visible, but most large pools had small numbers of chum salmon mixed in with schools of pink salmon. From the ground it was clear that pink salmon density was not as high as was generally thought by aerial surveyors. Although most large holes appeared to be black with pink salmon from the air, foot surveyors observed mostly single layers of fish covering the bottom of holes with most of the water column open—most holding pools were far from maximum capacity.

The foot survey began approximately 0.5 km above the bridge Hydaburg Road bridge on the upper river and ended approximately 7 miles downriver at the Harris River Road bridge just above intertidal. The helicopter survey continued down through intertidal and pink salmon were still present below the foot survey area. However, very few chum salmon were observed in the lower river and very few chum salmon were likely to have been missed by foot survey observers in the lower 0.5 km of river. Although the Harris River is a very long system, virtually the entire system is easily walked and the visibility is excellent under normal or low water levels.

Table 2.– Aerial and foot survey counts of chum salmon at three southern Southeast Alaska summer chum salmon index streams (Carroll River, Hidden Inlet, and Harris River), 2014.

Stream	Date	Survey Type	Intertidal	Stream Live	Stream Dead	Total	Observer
Carroll River	7/17/2014	Aerial	500			500	A
Carroll River	7/22/2014	Aerial		No Chum salmon observed			C
Carroll River	7/25/2014	Foot		135	1	136	E
Carroll River	7/25/2014	Foot		183	1	184	F
Carroll River	7/30/2014	Aerial		No Chum salmon observed			A
Carroll River	7/31/2014	Helicopter		500		500	B
Carroll River	8/2/2014	Aerial		2,500		2,500	A
Carroll River	8/7/2014	Foot		2,550	10	2,560	D
Carroll River	8/7/2014	Foot		2,450	10	2,460	F
Carroll River	8/14/2014	Foot		1,530	350	1,880	D
Carroll River	8/14/2014	Foot		1,500	350	1,850	F
Hidden Inlet	7/16/2014	Aerial		200		200	C
Hidden Inlet	7/30/2014	Foot		146		146	D
Hidden Inlet	7/30/2014	Foot		143		143	F
Hidden Inlet	8/6/2014	Aerial		No Chum salmon observed			B
Hidden Inlet	8/6/2014	Foot	52	233		285	D
Hidden Inlet	8/6/2014	Foot	45	212		257	F
Hidden Inlet	8/15/2014	Foot	10	176	40	226	D
Hidden Inlet	8/15/2014	Foot	10	197	40	247	F
Hidden Inlet	8/22/2014	Aerial		No Chum salmon observed			A
Harris River	8/20/2014	Helicopter		3,720		3,720	A
Harris River	8/21/2014	Foot		3,610	480	4,090	D
Harris River	8/21/2014	Foot		3,760	480	4,240	F

SPAWNING PERIODS

At most streams surveyed peak chum salmon abundance was generally highest from mid-July to early August, with the exception of Harris River on Prince of Wales Island which has generally later run timing than the mainland systems. Similar to the 2013 season, pink salmon escapements in southern Southeast Alaska were exceptionally strong in 2014. The East Behm Canal pink salmon stock group, the location of nearly all the targeted streams for this project, had the 4th highest escapement index since 1960. In 2013 and 2014, there was no window of opportunity for counting chum salmon before they were highly mixed with pink salmon at most streams. The Blossom River, for example, contained an estimate 400,000 pink salmon by 17 July 2014, and most of the large mainland systems had in excess of 200,000 pink salmon by late July.

Genetic Sampling

In 2014, we collected pink salmon tissue samples from Hidden Inlet (121) and a set of streams on Prince of Wales Island that were accessed on the trip to survey Harris River: Harris River (206), Klawock River (201), Maybeso Creek (53), Steelhead Creek (27), Sal Creek (202), Ratz Creek (207), Black Bear Creek (205), and Gutchi Creek (20). In addition, 154 chum salmon tissue samples were collected at Harris River and 63 chum salmon samples were collected at Carroll River. All of these samples are for future use in genetic baselines for Southeast Alaska. Tissue samples are archived at the ADF&G Gene Conservation Laboratory, Anchorage.

DISCUSSION

The helicopter and foot surveys conducted in the first three years of this project have been invaluable for giving management and research biologist increased confidence in chum salmon index counts to SSE boundary area streams. In 2013, pink salmon returned to southern Southeast Alaska in record numbers (highest escapement index and 2nd highest harvest on record). In 2014 pink salmon escapements were again very strong in southern Southeast Alaska; the index value for the East Behm Canal stock group, where most of the targeted streams for this project are located, was the 4th highest since 1960 (Figure 2). Without the helicopter and additional foot surveys conducted for this project, management biologists would have been uncertain about wild chum salmon escapements at many index streams. Most index streams were inundated with pink salmon early in the season and there was no opportunity to conduct peak chum salmon escapement surveys prior to the arrival of large numbers of pink salmon on the spawning grounds. The helicopter and foot surveys made it clear that wild chum salmon abundance was very low at some of the smaller index streams and poor to average at most of the larger mainland systems (further supported by catch data). Without these extra surveys it may have been assumed that large numbers of chum salmon were missed during aerial surveys due to masking by pink salmon in both 2013 and 2014. The first three years of this project have provided radically different counting conditions and additional years would be beneficial to help current managers see the full range of variation in combined chum/pink salmon escapement sizes.

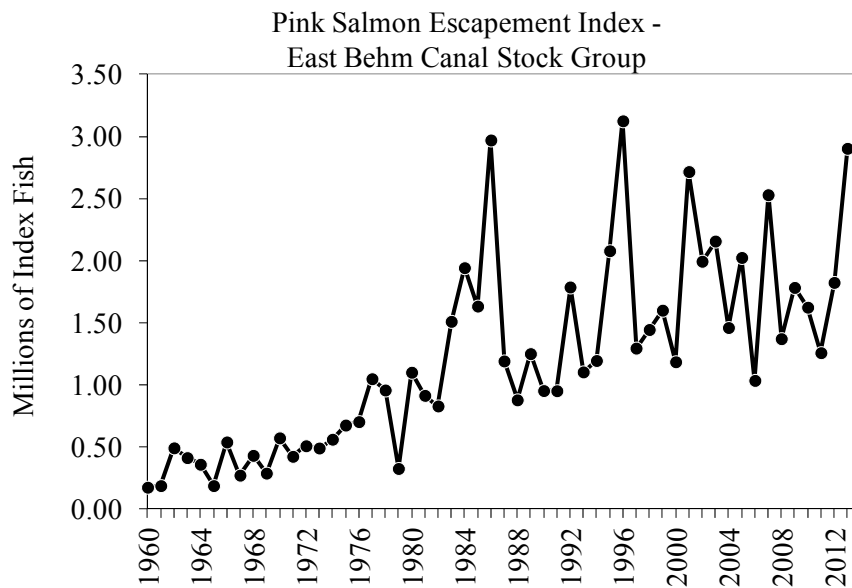


Figure 2.—Annual pink salmon escapement index for the East Behm Canal stock group, 1960–2014.

Foot surveys of smaller streams were extremely valuable for ground-truthing aerial survey estimates and may offer the best opportunity for obtaining reliable and consistent chum salmon index counts, particularly for smaller streams with large, overlapping pink salmon runs. Chum salmon tend to move quickly to spawning riffles in smaller Southeast Alaska streams and can be easily picked out from more numerous pink salmon during foot surveys, even on years of very high pink salmon abundance. High definition video of surveys conducted from a helicopter showed promise as a tool for improving peak survey estimates on larger rivers. The videos

obtained from 2012 to 2014 provided an additional opportunity to review counts and differentiate between species.

The Alaska Department of Fish and Game (ADF&G) currently maintains an escapement index of 13 summer-run chum salmon streams in the Boundary Area that are assessed primarily through aerial survey methods. Two additional index streams were identified during the first three years of this project, including one that was determined to be suitable for conducting long-term foot and aerial surveys (Harris River). These streams will be added to the Southern Southeast Subregion summer chum salmon escapement index during the next Alaska Board of Fisheries meeting in winter 2014/2015, and the escapement goal for chum salmon in the Southern Southeast Subregion has been updated to reflect the addition of these streams (Piston and Heintl 2014). In 2015, we plan on expanding our helicopter survey coverage to include three additional southern Southeast Alaska mainland rivers: King Creek (existing index stream), Eulachon River (new index stream for 2015), and the Harding River (existing index stream). At the conclusion of this project (additional years pending), it is recommended that a peak foot survey be conducted during the first week of August at as many of the smaller index streams as funding allows. In addition, a single helicopter survey conducted annually in late July or early August may offer a relatively inexpensive way for managers to help validate fixed-wing aerial survey chum salmon counts at large mainland river systems.

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APPENDIX A

Appendix A 1.–Financial statement of expenditures, 2014.

Site / Project Costs	Description	Project Budget	Actual Expenditures
Travel	Small plane charters for conducting foot surveys at Hidden Inlet and Carroll River, 8 hours @\$675/hr.	\$9,315	\$9,315
	Helicopter charters for conducting surveys at Keta, Marten, Blossom, Wilson, and Tombstone rivers, 24 hours @\$1000/hr.	\$14,276	\$13,580
	Fixed-wing aerial survey of Disappearance Creek (southern Southeast Alaska fall chum salmon index stream; allowed direct comparison with foot survey).		\$1,208
	Ferry to Prince of Wales Island for Harris River survey.	\$500	\$437
	Per diem for Prince of Wales survey trip.		\$88
	Campsite for Harris River survey and genetic sample collections		\$57
	Two fuel barge charters to deliver helicopter fuel to remote storage site near targeted rivers.	\$5,850	\$5,850
Helicopter Fuel	Helicopter Fuel, 330 gallons at \$5.00/gallon	\$1,560	\$1,560
Small Tools & Equipment	Misc, supplies	\$875	\$150
Work and Safety Gear	Satellite phone		\$62
Total Site / Project Costs		\$32,376	\$32,307

Total expenditures for the 2014 Northern Boundary Area summer chum salmon monitoring project came very close to the overall budget. Costs for small plane charters to Hidden Inlet and Carroll River and costs for the helicopter surveys were also very close to what we anticipated. Using savings from other areas, we were able to fund a helicopter survey of the Harris River, which was timed to coincide with our scheduled foot survey. We also funded an extra fixed-wing survey of fall chum salmon in Cholmondeley Sound in southern Southeast Alaska, which allowed for comparison with foot surveys at this important Northern Boundary Area stock. Overall, we ended the season with preliminary estimate of approximately \$69 remaining in our budget for the 2014 season.