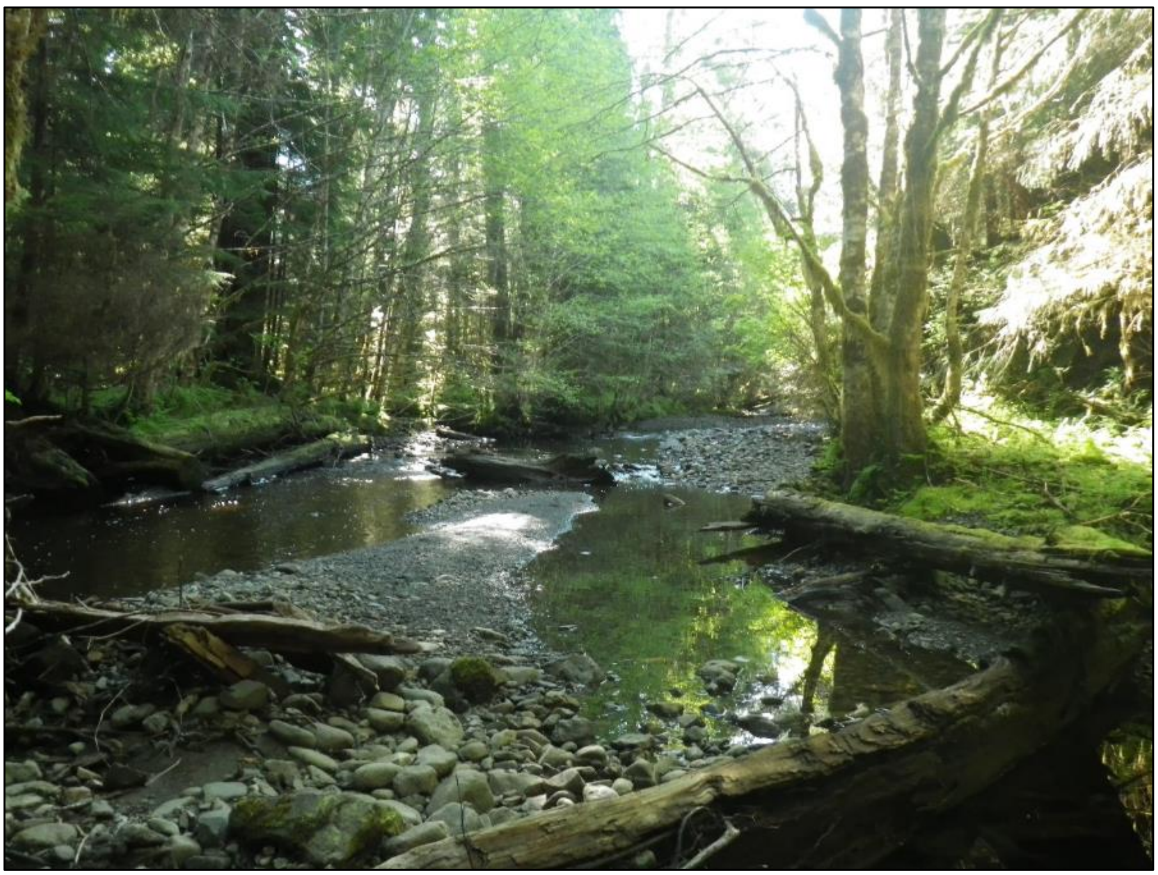
Coffman Creek Habitat Assessment
Prince of Wales Island, Alaska

by

Robina Moyer[1],
Cathy Needham[1],
and
Christine Woll[2]



[1] Kai Environmental Consulting Services, Juneau, Alaska
[2] The Nature Conservancy, Juneau, Alaska

January 2019

ACKNOWLEDGEMENTS

This project was funded by the City of Coffman Cove, to address concerns from community members regarding fish habitat on Coffman Creek. This research is also funded in part by the Gordon and Betty Moore Foundation.

The authors would like to express their gratitude to the Hydaburg Cooperative Association for partnering on this project by providing field crew members to collect all of the field data. Field crew members included Tony Sanderson, Melanie Kadake, Frances Charles and Curtis Cline. We'd like to thank Mr. Dick Stewart from Coffman Cove for providing housing for the Hydaburg field crew, conducting an initial field visit with project personnel, and providing local knowledge of past timber harvest actions in the lower Coffman Creek watershed. We would also like to thank Dr. Steve Mathews for accompanying the crew leader during field reconnaissance and providing valuable fisheries information for Coffman Creek.

Other contributions to the project include technical feedback regarding channel type process groups and interpretation from Emil Tucker with the U.S. Forest Service, report review and editing from Michael Kampnich (The Nature Conservancy) and Kathryn Erickson (Kai Environmental, and mapping support from Colin Shanley (The Nature Conservancy).

Table of Contents

Table of Figures

Table of Tables

List of Appendices

1.0 Executive Summary

On behalf of the community of Coffman Cove, The Nature Conservancy, Kai Environmental Consulting Services, and Hydaburg Cooperative Association completed stream surveys in the Coffman Creek watershed in the summer of 2016. Fish trapping and adult foot counts were also performed to determine the presence and distribution of fish in Coffman Creek. This study was undertaken to address concerns from the residents of Coffman Cove, that stream conditions in Coffman Creek were degraded and possibly impacting fish and fish habitat. Stream surveys followed protocols established by the Alaska Department of Fish and Game (ADFG) for Southeast Alaska, which is an adaptation of the U.S. Forest Service (USFS) Tier 2 aquatic habitat survey (Nichols et al. 2013). Spatial data was recorded with a handheld GPS at approximately 20 meter intervals. Notable stream features, such as riparian disturbance, potential barriers to fish passage, and large accumulations of wood were documented with additional notes and photographs.

Additionally, aerial imagery of the Coffman Creek watershed spanning 1929 to present was used to analyze visible changes in the watershed. This imagery was useful in identifying changes in the watershed resulting from timber harvest, as well as shifting patterns in stream channels at the mouth of the creek.

The data collected during these surveys was used to classify channel types within Coffman Creek and compared to known standards for Southeast Alaska, when available. It was found that throughout the mapped reaches, Coffman Cove is limited in instream large key woody debris, an important feature in creating high quality fish habitat. While Coffman Creek habitat conditions are not significantly degraded in reaches that were comparable to known standards, there are some reaches which may greatly benefit from the addition of large woody debris, and some that look to have large sediment loads and flooding potential. It is likely that historic logging and road building has altered these reaches with low woody debris, and with variable and large sediment transport.

With respect to fish, Coffman Creek supports Coho salmon, cutthroat trout, Dolly Varden and sculpin. Both juvenile and adult Coho salmon were observed in the lower and upper reaches of the stream, with no indication that fish migration and connectivity was significantly limited. Steelhead trout were not found in Coffman Creek.

The area immediately downstream of the Coffman Cove bridge needs further evaluation before any restorative measures are implemented, due to its dynamic nature. This is where the single stream course becomes highly braided as water moves downstream. During flood stage, water moves freely across the landscape into numerous mapped and unmapped channels, and in some places floods the forest floor. More in-depth hydrological and geomorphological measurements could help in evaluating and analyzing upstream sediment sources and metering the supply. Depending on the results, adding wood upstream of the bridge may encourage energy dissipation and storage. Once sediment loading is slowed, the area downstream of the bridge may be evaluated for other restoration options that would encourages water to remain in one or two channels.

2.0 Introduction

Coffman Creek is located on eastern Prince of Wales Island in Southeast Alaska, near the community of Coffman Cove. Historically, Coffman Cove was part of the Wrangell-Stikine Tlingit territory and there is evidence that there was a seasonal camp located at the head of the cove, near where Coffman Creek discharges into Coffman Cove (Goldschmidt and Haas 1998). While there is evidence that Coffman Creek was used for fish harvest, the record is limited as to how extensively the system was utilized by the Wrangell-Stikine Tlingits. Beginning in the 1950s, the community of Coffman Cove was used as a seasonal logging camp and incorporated as a second-class city in 1989 (ADEC 2016). Today, many Coffman Cove residents maintain a subsistence lifestyle, utilizing fish and game resources as a staple of their diet. Coffman Creek is utilized by some Coffman Cove residents for subsistence fish harvest, but the majority of residents go to Hatchery Creek for subsistence fishing (PWAA 2014).

The Anadromous Waters Catalog lists Coffman Creek for Coho salmon (*Onchorhynchus kisutch)* and pink salmon (*O. gorbuscha*). Additionally, there are unconfirmed, anecdotal reports that Coffman Creek previously supported a population of steelhead (*O. mykiss)* (D. Stewart, personal communication, 2016). Previously, the City of Coffman Cove, in cooperation with The Prince of Wales Hatchery Association and the Southern Southeast Regional Aquaculture Association, raised and released Chinook salmon (*O. tshawytscha*) smolt in floating pens in Coffman Cove. These smolt were intended to enhance commercial and sport fishing opportunities in the Coffman Cove area and a weir was operated at the mouth of the Creek to keep adult chinook salmon from migrating upstream. The program was discontinued in 2016. Coffman Creek is classified as a first order stream (Strahler 1964), originating as a high gradient confined channel before flowing into moderate gradient channels and the surveyed floodplain and estuary channels.

The majority of land surrounding the community of Coffman Cove is owned by the United States Forest Service (USFS) and the State of Alaska and timber harvest has been ongoing since the 1970s. Additionally, the area has seen continued road construction, residential, and light industrial development since the 1970s. The majority of the timber harvest in the Coffman Cove area, including near Coffman Creek, took place prior to the Alaska Forest Resources and Practices Act, meaning that there was no buffer to riparian vegetation harvest (ADNR 2016a). As a result, the Coffman Creek watershed is likely degraded from its pre-timber harvest condition. The community of Coffman Cove is interested in how this degradation may be impacting anadromous fish habitat and populations and would like to explore possible opportunities to restore and enhance Coffman Creek anadromous fish habitat and increase productivity.

3.0 Methods

3.1 Study Area

Coffman Creek is located at the head of Coffman Cove, just north of the town of Coffman Cove, and is approximately 8 stream miles in length (Figure 1). The Coffman Creek Watershed is approximately 15,000 acres and contains 32 miles of road, including logging roads. Between 1955 and 2006, approximately 3,114 acres of timber harvest occurred within the watershed with the most substantial harvest taking place in the 1960s and 1990s (USFS 2018). This harvest activity has been carried out by the USFS and private industry (USFS 2018). The stream survey summarized in this document began at the outfall of Coffman Creek into the waterbody of Coffman Cove and continued upstream as shown in Figure 1.

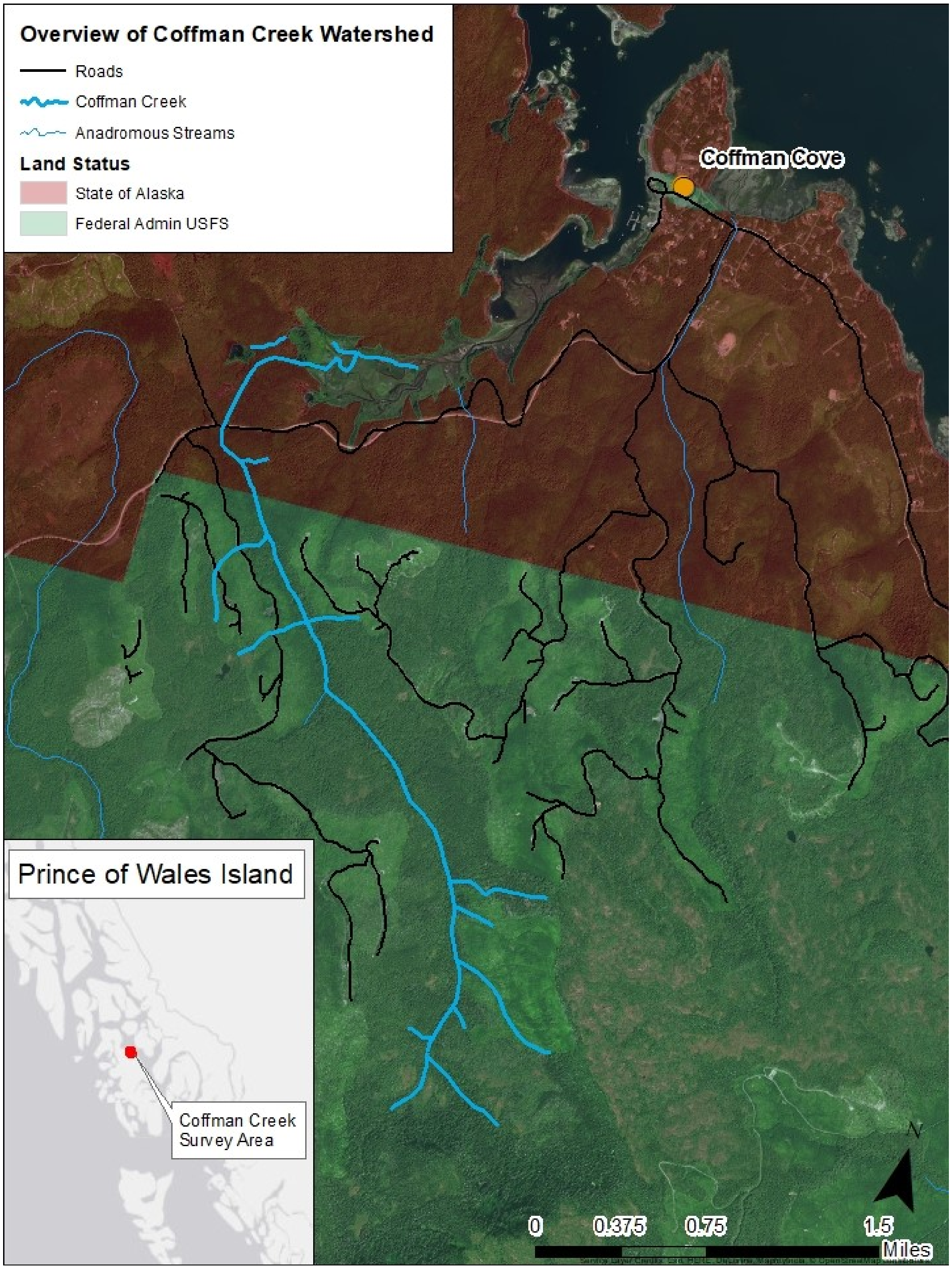


Figure 1: Overview of Coffman Creek, near the community of Coffman Cove, on Prince of Wales Island, Alaska. Coffman Creek has historically been an important salmon stream for Coffman Cove.

3.2 Survey Methods

Beginning in May 2016, stream habitat surveys were completed on the lower extent of Coffman Creek by Hydaburg Cooperative Association staff. The goal of these surveys was to document current conditions, record spatial data, and stream metrics in an effort to identify opportunities for habitat enhancement. In addition, aerial imagery dating back to 1929 was analyzed for visible changes of the Coffman Creek watershed and estuary.

Stream surveys followed the protocols established by Alaska Department of Fish and Game (ADFG) for Southeast Alaska, which is an adaptation of the U.S. Forest Service (USFS) Tier 2 aquatic habitat survey (Nichols et al. 2013). Spatial data was recorded with a handheld GPS at approximately 20 meter intervals. Notable stream features, such as riparian disturbance, potential barriers to fish passage, and large accumulations of wood were documented with additional notes and photographs.

Stream segments were broken into reaches based on changes in substrate, gradient, and riparian conditions. At the beginning of each reach, average channel bed width was measured and that value was used to establish size criteria for macro pools and key wood; large wood (smaller than key wood) size criteria is constant regardless of channel bed width. Pools, key and large wood were counted for each reach. Additionally, a channel type verification (CTV) was performed in each reach, where additional measurements, such as bankfull width and incision depth, were taken, a pebble count was performed to identify the dominant substrates, and riparian vegetation from 0 – 30 meters along each bank was identified and recorded using a dichotomous key based on Vierick et al. (1992). All waypoints, stream measurements, and pool and wood tallies were recorded in the field.

On September 13, 2016, adult foot counts were completed in the surveyed portions of Coffman Creek. During these surveys, crew members walked upstream and documented the number and species of adult salmon present in the stream. Where conditions allowed, the upstream terminus of each species was documented; in some cases, the water was too deep to allow the crew to safely continue upstream.

3.3 Data Analysis

Extensive work has been done in Southeast Alaska by the USFS, ADFG, and others to establish protocols for stream surveys and standard metrics for comparison of anadromous fish habitat. Paustian et al. (2010) have developed a USFS Channel Type User Guide which documents conditions for the channel types commonly encountered in Southeast Alaskan stream systems. This document also summarizes the suitability of each channel type as spawning and rearing habitat for pink, Coho, sockeye, chum (*Oncorhynchus keta*), and Chinook salmon (*O. tshawytscha*), steelhead (*Oncorhynchus mykiss*), and Dolly Varden (*Salvelinus malma*. A summary of this guide was used to channel type surveyed reaches and for information regarding habitat suitability during analysis (Table 1).

The USFS Habitat Management Objectives (2007) uses survey data from 279 stream reaches to establish reference metrics for habitat conditions found in floodplain, moderate gradient mixed control, and moderate/low gradient contained stream channels (Table 2). Tucker and Caouette

Table 1: Species habitat rating by select channel type for select anadromous fish in Southeast Alaska streams (Paustian et al. 2010).

Channel Type:[1]	**LCS**		**LCM**		**MCM**		**MMS**		**FPS**		**PAB**		**AFM**		**ESL**		**ESSg**	
Species	**ASA**[2]	**ARA**	**ASA**	**ARA**	**ASA**	**ARA**	**ASA**	**ARA**	**ASA**	**ARA**	**ASA**	**ARA**	**ASA**	**ARA**	**ASA**	**ARA**	**ASA**	**ARA**
Coho salmon	No Data		Mod.[3]	Mod.	Low	Mod.	Mod.	Mod.	High	High	Neg.	High	Mod.	Mod.	High	Low	High	High
Pink salmon	No Data		Mod.	Neg.	Low	Neg.	Mod.	Neg.	Mod.	Neg.	Neg.	Neg.	Mod.	Neg.	High	High	High	High
Chum salmon	No Data		Mod.	Neg.	Low	Neg.	Mod.	Neg.	Mod.	Neg.	Neg.	Neg.	Mod.	Neg.	Neg.	Neg.	High	Low
Sockeye salmon	No Data		Low	Neg.	Neg.	Neg.	Low	Neg.	High	Neg.	Low	High	Mod.	Neg.	Neg.	Neg.	Neg.	Neg.
Chinook salmon	No Data		Neg.	Neg.	Neg.	Neg.	Low	Low	Low	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.
Dolly Varden char	No Data		High	High	Neg.	Mod.	High	High	Mod.	High	Neg.	High	Mod.	Mod.	Neg.	Neg.	Mod.	Mod.
Steelhead trout	No Data		Mod.	High	Low	Mod.	Low	Low	High	High	Neg.	Neg.	Low	Low	Neg.	Neg.	Neg.	Neg.

[1]LCS = Small Low Gradient Contained Channel; LCM = Medium Width Low Gradient Contained Channel; MCM = Moderate Gradient Contained Channel; MMS = Small Width Moderate Gradient Mixed Control Channel; FPS = Small Floodplain; PAB =Beaver Dam/Pond Channel; AFM = Moderate Gradient Alluvial Fan; ESL = Large Estuarine Channel; ESSg =Small Estuarine Channel, gravel substrate
[2]ASA = Available spawning habitat; ARA = Available rearing habitat
[3] Mod. = Moderate; Neg. = Negligible

Table 2: Selected percentiles for habitat metrics in unmanaged channels by channel type based on reference streams in Southeast Alaska (USFS 2007).

Habitat Variable[1]	Percentiles	Process Group=FP[2]	Process Group=MM[2]	Process Group=MC/LC[2]	Process Group=HC[2]	Channel Type=FPS[2]	Channel Type=FPM[2]	Channel Type=FPL[2]	Channel Type=MMS[2]
WD	25	16.5	10.4	9.2	8.3	10.9	18.5	23.1	10.2
	50	19.3	15.3	14.5	11.1	14.9	20.2	27.2	14.2
	75	26.7	22.4	21.0	13.0	19.0	32.8	43.6	22.0
TLWD/M	25	0.26	0.27	0.20	0.23	0.24	0.31	0.15	0.27
	50	0.36	0.38	0.28	0.34	0.40	0.37	0.17	0.38
	75	0.50	0.50	0.42	0.48	0.55	0.50	0.46	0.51
TKWD/M	25	0.04	0.05	0.05	0.07	0.10	0.06	0.02	0.06
	50	0.10	0.12	0.07	0.08	0.17	0.11	0.03	0.12
	75	0.15	0.14	0.09	0.27	0.25	0.15	0.08	0.14
POOLS/KM	25	30	40	30	50	30	30	10	50
	50	45	60	50	60	40	40	20	60
	75	70	70	60	100	70	60	25	70
POOL SPACE	25	1.4	2.8	2.2	2.4	2.2	1.3	1.7	2.8
	50	2.2	4.0	3.7	3.4	3.2	1.8	2.7	4.0
	75	3.5	5.8	4.8	5.7	5.1	2.2	3.2	5.8

[1]*WD = Width-to-Depth Ratio; TLWD/M = Total Large Wood/Meter; TKWD/M = Total Key Wood/Meter; Pools/KM = Marcopools per kilometer; Pool Space = (Stream Length/Average Channel Bed Width)/Number of Macropools*

[2]*FP = Floodplain; MM = Moderate Gradient Mixed Control: MC/LC = Moderate Gradient/Low Gradient Contained; HC = High Gradient Contained; FPS = Small Floodplain; FPM = Moderate Floodplain; FPL = Large Floodplain; MMS = Small Width Moderate Gradient Mixed Control Channel*

Table 3: Interpretation criteria for specific variables habitat metrics based on reference streams in Southeast Alaska (Tucker and Caouette 2008).

	< 25th Percentile	**> 25th and < 75th**	**> 75th**
WD[1]	Fair	Good	Fair
TLWD/M	Fair	Good	Excellent
TKWD/M	Fair	Good	Excellent
POOLS/KM	Fair	Good	Excellent
POOL SPACE	Excellent	Good	Fair

[1]*WD = Width-to-Depth Ratio; TLWD/M = Total Large Wood/Meter; TKWD/M = Total Key Wood/Meter; Pools/KM = Marcopools per kilometer; Pool Space = (Stream Length/Average Channel Bed Width)/Number of Macropools*

(2008) also use this dataset in their statistical analysis of aquatic habitats in the Tongass National Forest (Table 3). The results of these two documents provide quantitative reference metrics for habitat conditions, as well as corresponding qualitative values.

Based on the data collected during surveys, metrics were calculated for width-to-depth ratio, total large wood per meter, total key wood per meter, total pools per kilometer, and pool spacing. These results were then compared with established USFS metrics for the given channel type and assigned to the appropriate percentile (USFS 2007). Where possible, each metric was assigned a qualitative value of "fair," "good," or "excellent" based on its percentile rank; this value assignment was done using criteria established in Tucker and Caouette (2008). Qualitative values were then assigned a value of 1, 2, or 3, which correspond to a value of fair, good, or excellent, respectively. Where possible, a final score was calculated for each reach by taking the mean average of the metric scores.

In addition, a visual comparison was done of aerial imagery from 1929, 1971, 1979, and 2011 to identify change in the Coffman Creek Watershed, particularly at the mouth of the creek. This qualitative analysis was done using historic aerial imagery collected by the United States Geologic Survey (USGS) and contemporary imagery available through Environmental Systems Research Institute (ESRI). The earlier imagery is not georeferenced, however, its approximate location is identified through a tiled index system. A selection of photos in the Coffman Creek area were identified using this index and then narrowed down based on a visual comparison of the coast line to the Coffman Cove area. The images include an approximate north arrow to help orient the reader.

4.0 Results

4.1 Survey Results

From May 4-12, 2016 a stream habitat survey was completed on 6,575 meters of Coffman Creek by staff from Hydaburg Cooperative Association (Figures 2 and 3). A primary goal of the survey was to assess instream conditions, identify potentially impaired stream reaches, and identify possibilities for restoration. The site was accessed from the main road through Coffman Cove, the stream crew began their survey at the mouth and worked upstream. Figure 2 represents mapped reaches from the estuary to the bridge where the road crosses the creek. Figure 3 represents mapped reaches upstream of the bridge. In addition to stream mapping, the stream crew set minnow traps to capture, identify, and release juvenile fish throughout the study area, thus documenting the presence and distribution of specific species.

Surveys took place in late spring and water levels were generally high due to snowmelt and recent rainfall. Between the bridge crossing Coffman Creek and the outflow into Coffman Cove, the creek splits from a contained channel into multiple smaller braided channels. These channels all originate from the main stem of Coffman Creek before fanning through the estuary as shown in Figure 2. The estuarine reaches were generally flat with grassy and herbaceous riparian vegetation as exemplified in Photo 1. At the time of the survey, all of the channels in the lower reaches contained water with the exception of Stream 2, Reach 5, shown in Photo 2 (Figure 2).

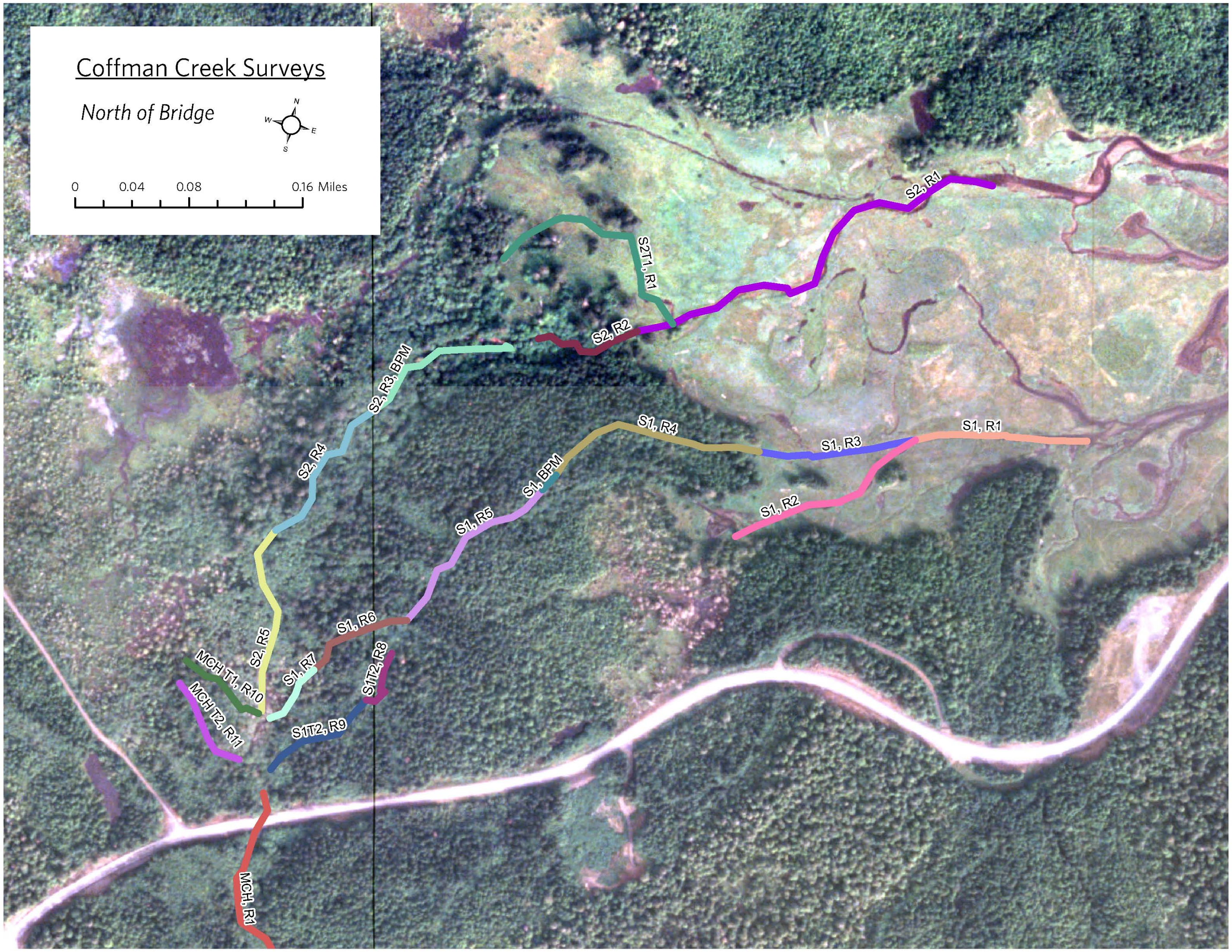


Figure 2: Map showing unique reaches and their stream and mapping identification number in Coffman Creek below the bridge near Coffman Cove, Alaska.

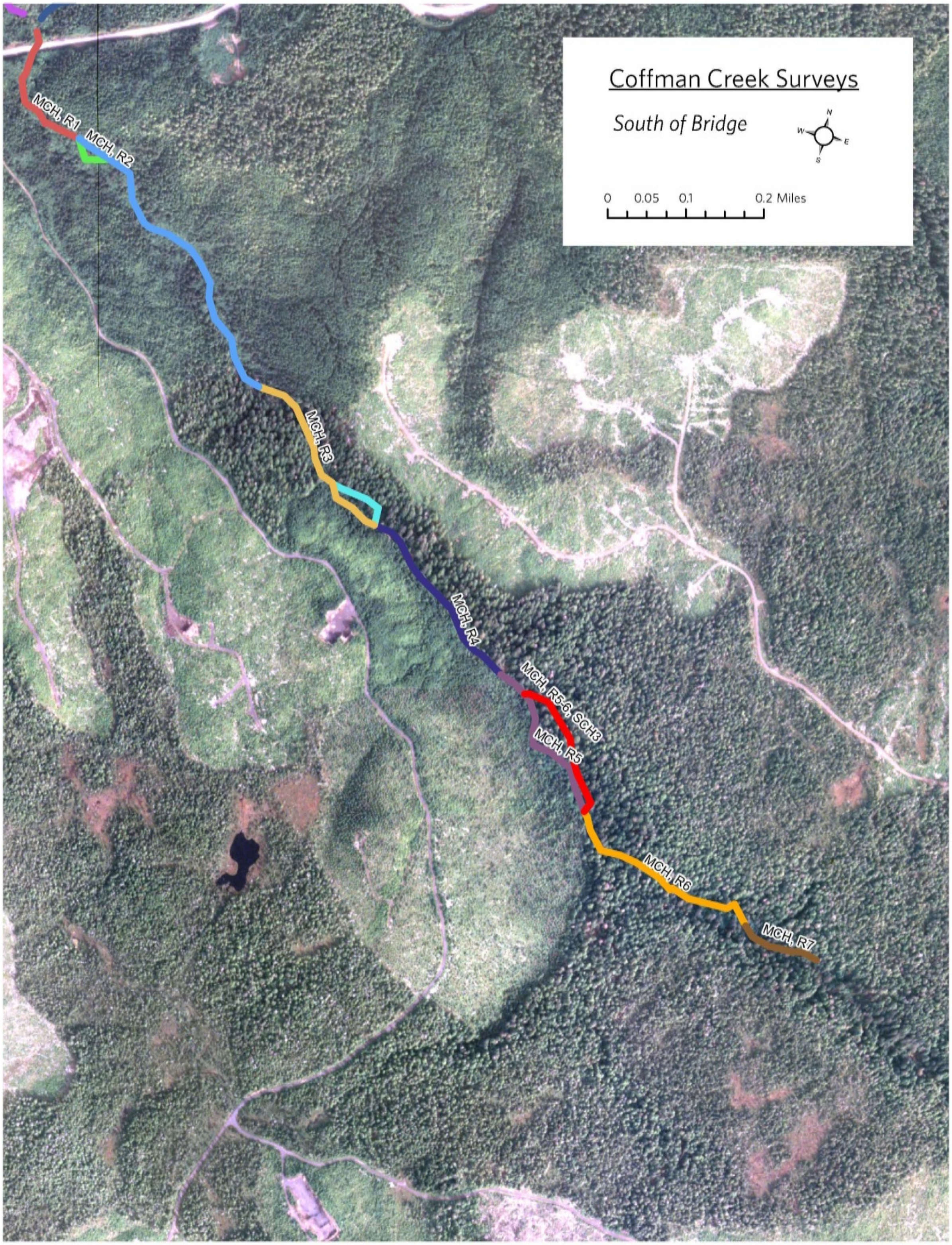


Figure 3: Map showing unique reaches and their stream and mapping identification number in Coffman Creek above the bridge near Coffman Cove, Alaska.

Photo 1: Channel type verification point during stream surveys on Coffman Creek, near Coffman Cove, Alaska. Photo taken looking upstream, representing conditions in the estuarine reaches dominated by grassy riparian vegetation. Taken in Stream 1, Reach 1 (Figure 2).

Photo 2: Dry channel mapped during stream surveys in Coffman Creek, near Coffman Cove, Alaska. Photo taken looking upstream in Stream 2, Reach 5 (Figure 2).

An extensive beaver dam complex was documented in the northern section of the survey area (Photo 3), immediately north of Stream 2. Two surveyed reaches (Main Channel, Tributary 1, Reach 10 and Main Channel, Tributary 2, Reach 11) split off of the main stem of Coffman Creek and flowed into this beaver pond complex. There was a smaller beaver pond complex south of Stream 1 and north of the road, as shown in Figures 1 and 2.

.

Photo 3: Beaver dam on Coffman Creek, near Coffman Cove, Alaska. The dam was documented along Stream 2, Reach 3 of Coffman Creek (Figure 2) and was part of a series of beaver dams along the creek.

Upstream of the braided estuarine channels and beaver ponds, the creek begins to form a singular main channel just below the bridge crossing. Photo 4 was taken in the main channel at the midpoint of Reach 1 (MCH, Reach 1 on Figure 2). The photo was taken during a high-water event to depict how water begins to divert into separate channels due to the flat nature of the landscape.

Photo 4: Main channel of Coffman Creek, just below the bridge, near Coffman Cove, Alaska. The photo was taken during high water to show how water is diverted to multiple channels. The photo was taken in the Main Channel, Reach 1 (Figure 2).

Moderate gradient, singular channels were present above the bridge, as shown in Photo 5.

Photo 5: Channel type verification point during stream surveys on Coffman Creek, near Coffman Cove, Alaska. Photo taken looking downstream, representing conditions in the floodplain and moderate gradient reaches surveyed above Coffman Creek Road. Photo taken in Reach 6 of the main channel 1 (Figure 3).

Minnow traps were set throughout the surveyed reaches in an effort to identify juvenile fish species present. Traps were set for a minimum of one hour and baited with salmon eggs rinsed in a betadine solution. Trapped fish were identified by species and measured from snout to tail-fork and released back into the stream. Sculpin (*Cottoidea*), Coho salmon, Dolly Varden Char, and cutthroat trout (*Oncorhynchus clarkii*) were trapped and identified within the surveyed area. Figure 4 shows where juvenile fish were trapped at fish observation points (FOPs).

Juvenile Coho salmon were trapped in Main Channel Reaches 1, 3-6; Main Channel, Tributary 1; Reach 10; and Stream 1, Reach 7. Cutthroat trout were trapped in the aforementioned reaches, as well as Main Channel, Reach 2; Stream 1, Reaches 5 and 7; Main Channel, Side Channel 1; and Main Channel, Tributary 2, Reach 11.

In Stream 1, Reaches 5 and 6; Stream 2, Reach 2; Main Channel, Reach 1; and Stream 2, Tributary 1, Reach 1 juvenile fish were observed adjacent to traps but were not caught nor identified to species; these instances are denoted as "unidentified minnows" in Figure 3. A complete summary of fish trapping data may be found in Appendix B.

Foot surveys for adult salmon were performed on one day in mid-September. Adult pink and Coho salmon were observed during the survey. Figure 5 shows the location of where adult salmon were observed, the species observed, along with the number of fish counted during the observation. Datasheets for the adult salmon foot count surveys may be found in Appendix C. Adult pink and Coho salmon were observed above the bridge, indicating that the alluvial fan, floodplain and beaver dam complex are not blocking adult salmon migration.

Riparian disturbance was noted along Reaches 4 and 5 of Stream 1. Construction, more than 20 years old, was recorded along both banks of Reach 4, while timber harvest, also more than 20 years old, was documented along both banks of Reach 5. In the estuarine channels, much of the riparian vegetation was dominated by shrubs, gramminoids and saltwater tolerant grasses.

Excluding the beaver pond margin mapped in Streams 1 and 2, there were 23 distinct reaches identified in the survey area. Above the bridge these reaches were low to moderate gradient confined channels, while below the bridge they were a mixture of floodplain, estuarine, and palustrine channels. Reach data is summarized in Table 4 and Table 5 and displayed in Figures 2, 3 and 6.

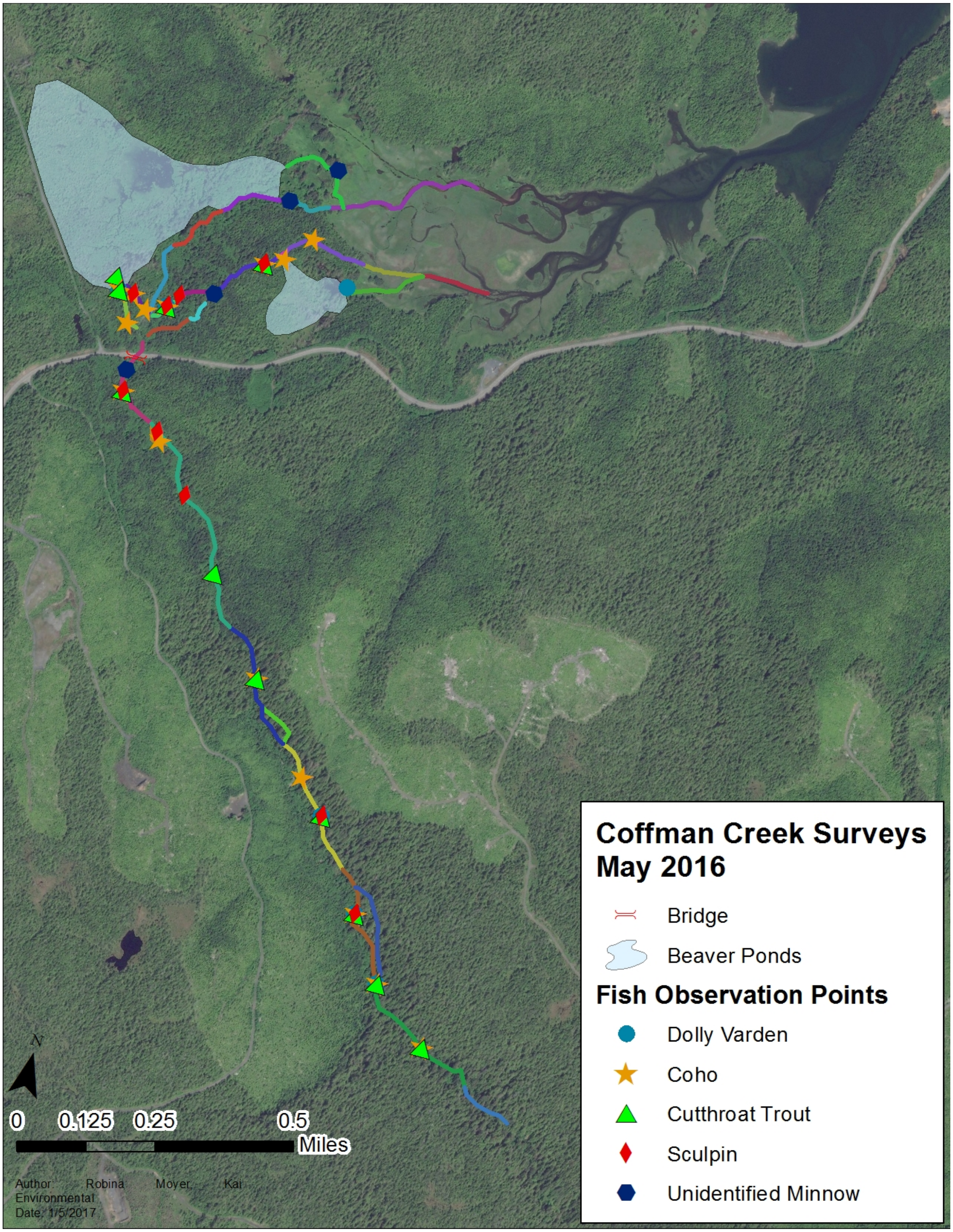


Figure 4: Fish observation points for juvenile fish for the surveyed reaches in Coffman Creek, near Coffman Cove, Alaska.

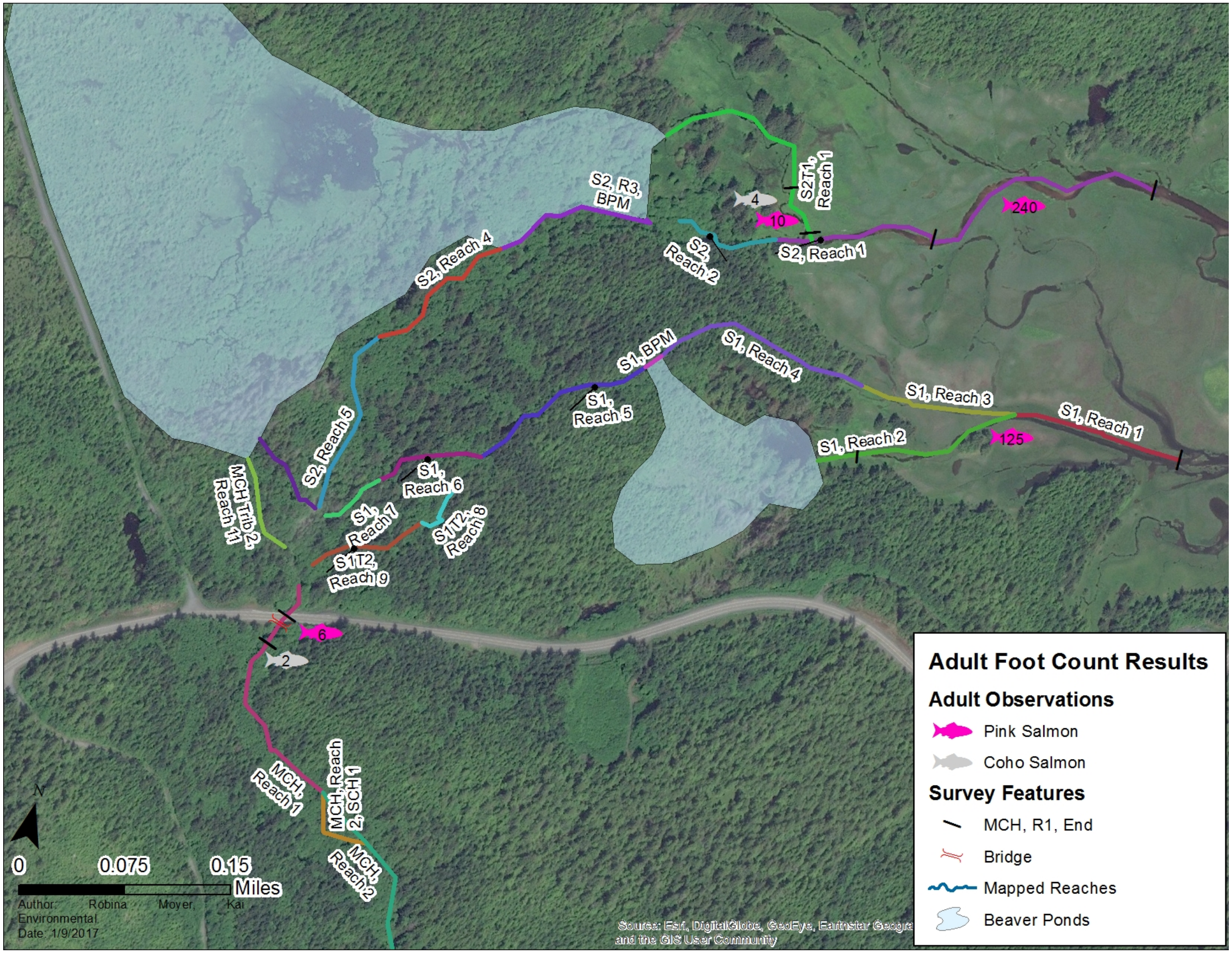


Figure 5: Fish observation points for adult fish for the surveyed reaches in Coffman Creek, near Coffman Cove, Alaska.

Table 4: Reach data for surveyed reaches in Coffman Creek at Coffman Cove, Alaska. Reaches correspond to those shown in Figures 2 and 3 and channel types are shown in Figure 6.

Reach	Length (m)	Average Channel Bed Width (m)	Channel Type[1]	Bank Composition	Substrate[2]		
					Dominant	Secondary	Tertiary
MCH, Reach 1	295	13.8	MMS	alluvium	SC	VCG	CGR
MCH, Reach 2	681	8.9	LCM	mixed	LC	SC	VCG
MCH, Reach 3	398	9.8	MCM	mixed	VCG	SC	LC
MCH, Reach 4	415	11	LCM	organic	VCG	SC	LC
MCH, Reach 5	361	8.4	MMS	mixed	VCG	SC	BR
MCH, Reach 6	452	9.6	MCM	mixed	SC	VCG	LC
MCH, Reach 7	169	9.7	MCM	mixed	SC	VCG	LC
MCH, Trib 1, Reach 10	107	5.2	AFM	alluvium	VCG	VCG	MGR
MCH, Trib 2, Reach 11	115	4.5	AFM	alluvium	CGR	FGR	SS
Stream 1, Reach 1	196	9.3	ESSg	organic	CGR	VCG	MGR
Stream 1, Reach 2	240	4.1	ESSg	organic	SS	CGR	MGR
Stream 1, Reach 3	180	2.6	ESSg	organic	CGR	MGR	SS
Stream 1, Reach 4	256	5.2	FPS	organic	VCG	CGR	MGR
Stream 1, Reach 5	224	5.6	FPS	alluvium	SC	VCG	SS
Stream 1, Reach 6	128	6.3	AFM	alluvium	VCG	CGR	MGR
Stream 1, Reach 7	78	4.6	AFM	alluvium	CGR	MGR	VCG
Stream 1, BPM	23	*No data – beaver pond margin*					
Stream 1, Trib 2, Reach 8	77	3.5	LCS	alluvium	VCG	SC	CGR
Stream 1, Trib 2, Reach 9	140	3.1	FPS	organic	ORG	SS	
Stream 2, Reach 1	485	10.36	ESL	alluvium	CGR	VCG	SS
Stream 2, Reach 2	126	7.1	FPS	organic	ORG	VCG	MGR
Stream 2, Reach 3, BPM	195	*No data – beaver pond margin*					
Stream 2, Reach 4	186	4.7	FPS	alluvium	CGR	ORG	MGR
Stream 2, Reach 5	219	*No data – dry channel*					
Stream 2, Trib 1, Reach 1	284	3.7	PAB	organic	SS	VFG	ORG

[1]AFM = Moderate Gradient Alluvial Fan; ESL = Large Estuarine Channel; ESSg = Small Estuarine Channel, gravel substrate; FPS = Small Floodplain; LCM = Medium Low Gradient Contained Channel; LCS = Small Low Gradient Contained Channel; MCM = Medium Moderate Gradient Contained Channel; MMS =Small Moderate Gradient Mixed Control Channel; PAB = Beaver Dam/Pond Channel

[2] CGR = Coarse Gravel; FGR = Fine Gravel; LC = Large Cobble; MGR = Medium Gravel; ORG = Organic; SC = Small Cobble; VCG = Very Coarse Gravel; SS = Sand/Silt

Table 5: Riparian vegetation classifications for surveyed reaches of Coffman Creek at Coffman Cove, Alaska. Class codes are adapted from Viereck et al. (1992), key to the class codes can be found in Appendix A. Stream reaches correspond to those in Figures 2 and 3.

Reach	Left Bank 0-5m	Left Bank 5-10m	Left Bank 10-20m	Left Bank 20-30m	Right Bank 0-5m	Right Bank 5-10m	Right Bank 10-20m	Right Bank 20-30m
MCH, Reach 1	IB1a	IA2b	IA2b	IA2b	IB1a	IB1a	IA2b	IA2b
MCH, Reach 2	IB1a	IA2d	IA2d	IA2d	IB1a	IB1a	IA2d	IA2d
MCH, Reach 3	IC2	IA1b	IA1b	IA1b	IC2	IA2c	IA2c	IA2c
MCH, Reach 4	IA2b + RDB: IA1b	IA2b + RDB: IA1b	IA2b + RDB: IA1b	IA2b + RDB: IA1b	IB1a	IA2c	IA2c	IA2c + RDB: IA1b
MCH, Reach 5	IB1a + RDB: IA1b)	IA2a + RDB: IA1b	IA2a + RDB: IA1b	IA2a + RDB: IA1b	IB1a	IA2b	IA2b	IA2b
MCH, Reach 6	IA1b	IA1b	IA1b	IA1b	IA1c	IA1c	IA1b	IA1b
MCH, Reach 7	IA1c	IA1c	IA2b	IA2b	IA1c	IA1c	IA2b	IA2b
MCH, Trib 1, Reach 10	IA2a	IA2a	IA2a	IA2a	IA2a	IB2	IB2	IB2
MCH, Trib 2, Reach 11	IB2	IB2	IA2a	IA2a	IB2	IB2	IA2a	IA2a
Stream 1, Reach 1	IIIA3h	IIIA2	IIIA2	IIIA2	IIIA3h	IIIA2	IIIA2	IIIA2
Stream 1, Reach 2	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2
Stream 1, Reach 3	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2	IIIA2
Stream 1, Reach 4	IB1a	IA1d + RDB: IA2d	IA1d + RDB: IA2d	IA1d + RDB: IA2d	IA1d + RDB: IA2d	IA1d + RDB: IA2d	IA1d + RDB: IA2d	IA1d + RDB: IA2d
Stream 1, Reach 5	IB3	IA2b + RDB: IA1d	IA2b + RDB: IA1d	IA2b + RDB: IA1d	IB3	IA2b + RDB: IA1d	IA2b + RDB: IA1d	IA2b + RDB: IA1d
Stream 1, Reach 6	IA2b	IA2b	IA2b	IA2b	IA2a	IA2a	IA2a	IA2a
Stream 1, Reach 7	IB1a	IB1a	IB1a	IB1a	IB1a	IB1a	IA2a	IA2a
Stream 1, BPM	*No data – beaver pond margin*							
Stream 1, Trib 2, Reach 8	IA2b	IA2b	IA2b	IA2b	IA2a	IA2a	IA2a	IA2a
Stream 1, Trib 2, Reach 9	IC2	IC2	IC2	IC2	IC2	IC2	IC2	IC2
Stream 2, Reach 1	IIIA2	II	II	II	IIIA2	II	II	II
Stream 2, Reach 2	IB2	IB2	IA2a	IA2a	IA1c	IA1c	IA1c	IA1c
Stream 2, Reach 3, BPM	*No data – beaver pond margin*							
Stream 2, Reach 4	IB1a	IA2a	IA2a	IA2a	IB1a	IB1a	IA2a	IA2a
Stream 2, Reach 5	*No data – dry channel*							
Stream 2, Trib 1, Reach 1	IIIA	IIIA	IIIA	IIIA	IIIA	IIIA	IIIA	IIIA

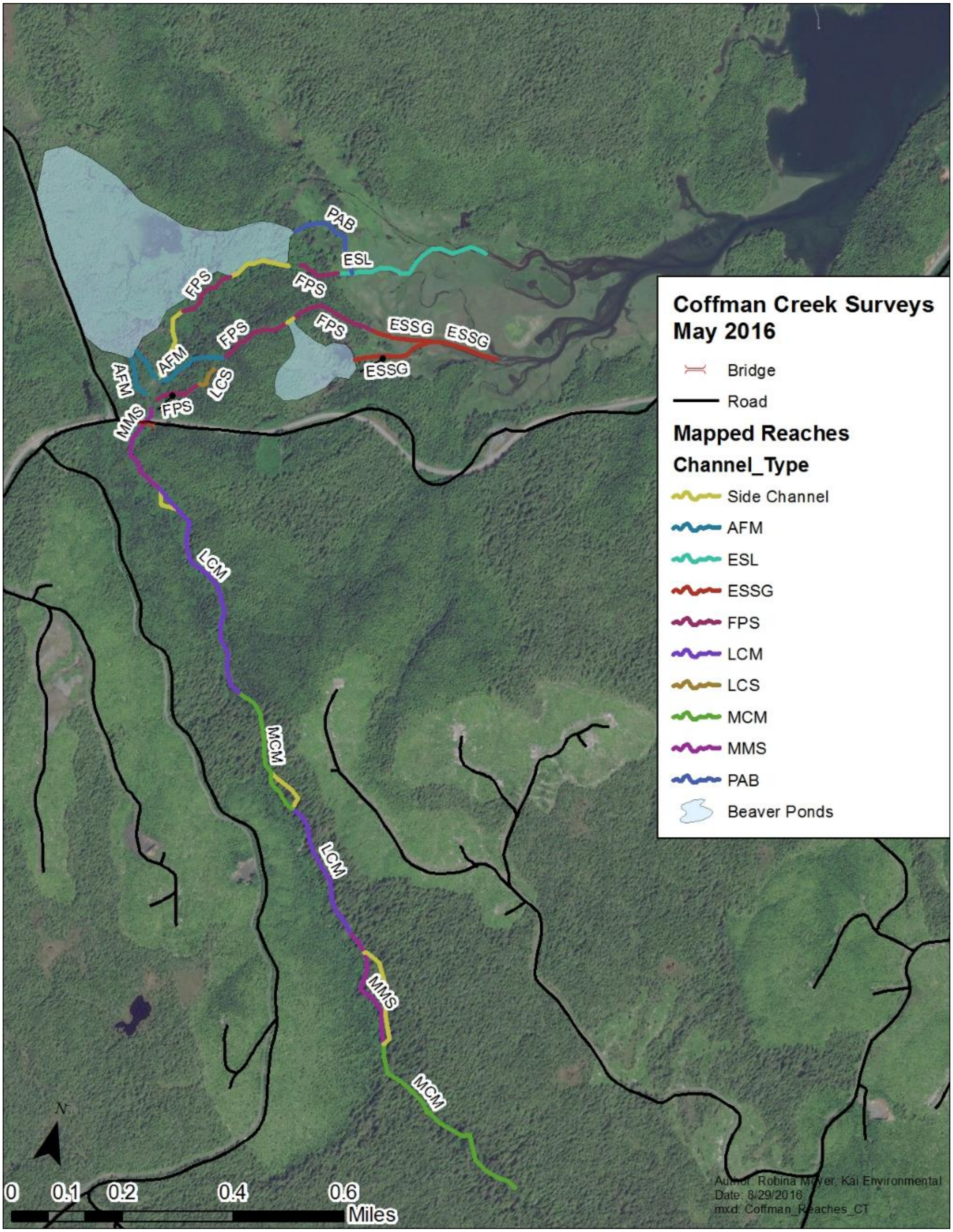


Figure 6: Map showing channel types of surveyed reaches along Coffman Creek near Coffman Cove, Alaska.

As described in Section 2.3, metrics were calculated from the survey data for comparison to established metrics for unmanaged streams in Southeast Alaska (Table 2). Metrics for Coffman Creek are shown in Table 6.

Table 6: Metrics calculated from data taken during stream surveys in Coffman Creek, near Coffman Cove, Alaska. Stream reaches correspond to those shown in Figure 2.

Reach	Width to Depth	Large Wood/Meter	Key Large Wood/Meter	Pools/ kilometer	Pool Spacing
MCH, Reach 1	25.56	0.43	0.01	71	1.0
MCH, Reach 2	12.71	0.44	0.08	63	1.8
MCH, Reach 3	14.00	0.53	0.06	55	1.8
MCH, Reach 4	25.58	0.41	0.04	46	2.0
MCH, Reach 5	13.77	0.48	0.06	83	1.4
MCH, Reach 6	14.12	0.28	0.07	49	2.1
MCH, Reach 7	10.21	0.42	0.14	41	2.5
MCH, Trib 1, Reach 10	14.05	0.33	0.05	178	1.1
MCH, Trib 2, Reach 11	12.16	0.54	0.05	270	0.8
Stream 1, Reach 1	16.91	0.01	0.00	0	0.0
Stream 1, Reach 2	4.51	0.01	0.00	50	4.9
Stream 1, Reach 3	4.33	0.02	0.00	78	4.9
Stream 1, Reach 4	8.39	0.36	0.00	66	2.9
Stream 1, Reach 5	7.37	0.58	0.02	98	1.8
Stream 1, Reach 6	8.40	0.53	0.05	133	1.2
Stream 1, Reach 7	8.85	0.65	0.05	167	1.3
Stream 1, BPM	*No data – beaver pond margin*				
Stream 1, Trib 2, Reach 8	5.56	0.05	0.00	39	7.3
Stream 1, Trib 2, Reach 9	6.08	0.30	0.00	193	1.7
Stream 2, Reach 1	10.91	0.00	0.00	16	5.9
Stream 2, Reach 2	12.91	0.27	0.03	56	2.5
Stream 2, Reach 3, BPM	*No data – beaver pond margin*				
Stream 2, Reach 4	18.80	0.14	0.03	32	6.6
Stream 2, Reach 5	*No data – dry channel*				
Stream 2, Trib 1, Reach 1	4.11	0.05	0.01	49	5.5

Based on the percentile each metric fell into for its given channel type, it was assigned a qualitative value using the information provided in Table 3. The qualitative values for Coffman Creek are shown in Table 7, with the corresponding numerical score shown in parentheses. Established metrics were not available for comparison for all channel types, these omissions are indicated in Table 7. A total score for each reach was calculated as the mean average of the five individual scores. These scores are visually displayed in Figure 7.

Table 7: Qualitative summary of Coffman Creek reaches based on comparison to established metrics (Tucker and Caouette 2008, USFS 2007). Numerical scores are shown in parentheses and correspond to the qualitative score, the final column shows the mean average of the five individual scores. Stream reach scores are displayed in Figure 7.

Reach	Width to Depth	Large Wood/Meter	Key Large Wood/Meter	Pools/ kilometer	Pool Spacing	Score
MCH, Reach 1	Fair (1)	Good (2)	Fair (1)	Excellent (3)	Excellent (3)	2.0
MCH, Reach 2	Good (2)	Excellent (3)	Good (2)	Good (2)	Excellent (3)	2.4
MCH, Reach 3	Good (2)	Excellent (3)	Fair (1)	Good (2)	Excellent (3)	2.2
MCH, Reach 4	Fair (1)	Good (2)	Fair (1)	Good (2)	Excellent (3)	1.8
MCH, Reach 5	Good (2)	Good (2)	Good (2)	Excellent (3)	Excellent (3)	2.4
MCH, Reach 6	Good (2)	Good (2)	Good (2)	Good (2)	Excellent (3)	2.2
MCH, Reach 7	Good (2)	Excellent (3)	Excellent (3)	Good (2)	Good (2)	2.4
MCH, Trib 1, Reach 10	*No comparative metrics available for channel type*					
MCH, Trib 2, Reach 11						
Stream 1, Reach 1						
Stream 1, Reach 2						
Stream 1, Reach 3						
Stream 1, Reach 4	Fair (1)	Good (2)	Fair (1)	Good (2)	Good (2)	1.6
Stream 1, Reach 5	Fair (1)	Excellent (3)	Fair (1)	Excellent (3)	Excellent (3)	2.2
Stream 1, Reach 6	*No comparative metrics available for channel type*					
Stream 1, Reach 7						
Stream 1, BPM						
Stream 1, Trib 2, Reach 8	Fair (1)	Fair (1)	Fair (1)	Good (2)	Fair (1)	1.2
Stream 1, Trib 2, Reach 9	Fair (1)	Good (2)	Fair (1)	Excellent (3)	Excellent (3)	2.0
Stream 2, Reach 1	*No comparative metrics available for channel type*					
Stream 2, Reach 2	Good (2)	Good (2)	Fair (1)	Good (2)	Good (2)	1.8
Stream 2, Reach 3, BPM	*No comparative metrics available for channel type*					
Stream 2, Reach 4	Good (2)	Fair (1)	Fair (1)	Good (2)	Fair (1)	1.4
Stream 2, Reach 5	*No comparative metrics available for channel type*					
Stream 2, Trib 1, Reach 1						

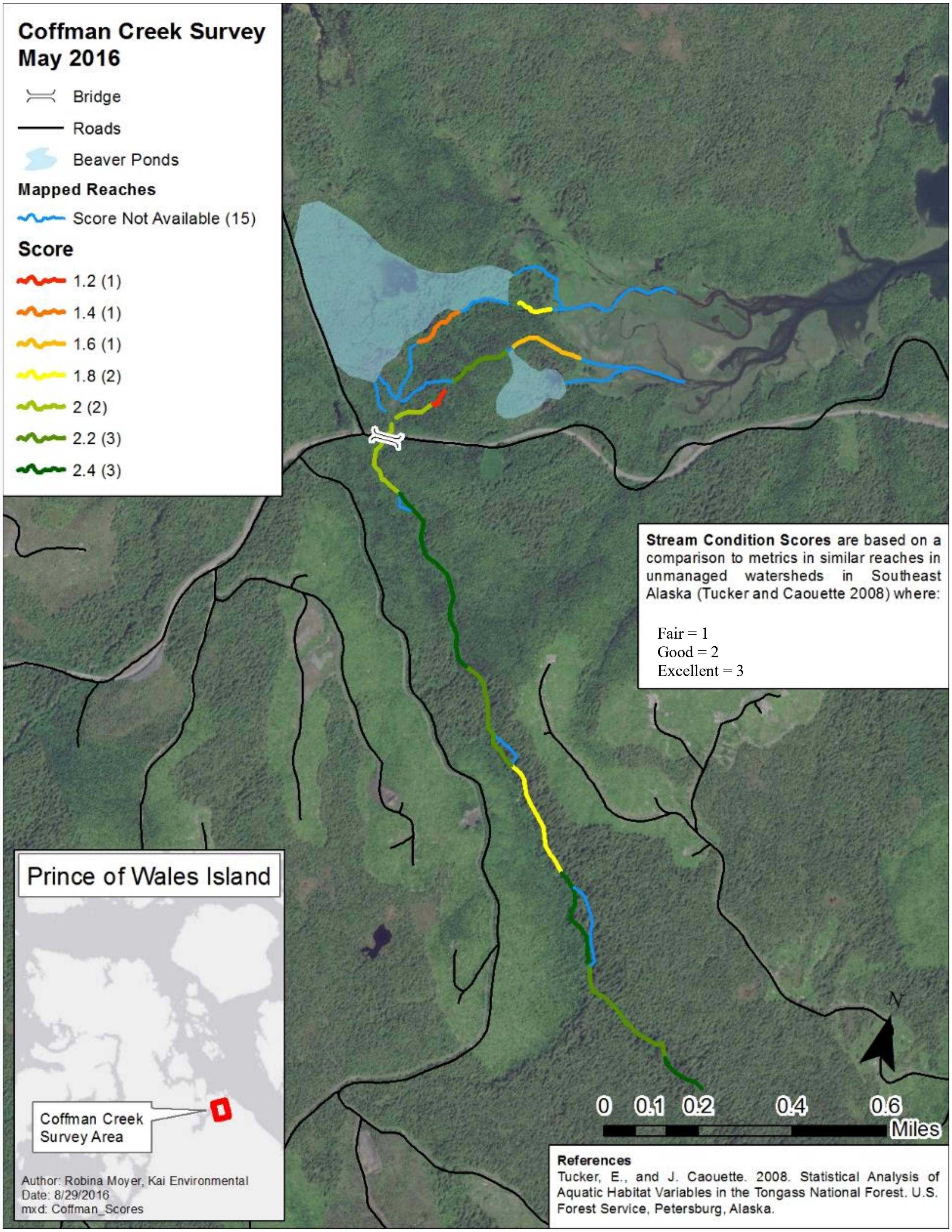


Figure 7: Map of habitat condition for Coffman Creek near Coffman Cove, Alaska. Scores are based on an analysis of stream survey data with 1 being poor condition and 3 being excellent; the number of stream reaches with that score are shown in parenthesis in the map legend.

4.2 Channel Geometry and Substrate

As shown in Table 7, the available width-depth ratios for Coffman Creek were "fair" to "good," based on comparison to similar streams in Southeast Alaska. For width-to-depth ratio, values below the 25th percentile and above the 75th percentile are "fair," while those between the 25th and 75th percentile are "good" (Tucker and Caouette 2008). The small estuarine channels, palustrine channel, and several floodplain channels had banks composed of organic material, while the alluvial fan channels, large estuarine channel, remaining floodplain channels, one small, and one moderate gradient contained channels had alluvium banks. The remaining moderate gradient contained channels had mixed alluvium and bedrock banks (Table 4). Dominant, secondary, and tertiary substrates are shown in Table 4. Dominate substrates ranged from large cobbles to sand and silt in the surveyed reaches.

With the exception of Reaches 1, 6, and 7 on the main stream, which had singular channels, all other surveyed reaches were braided or had multiple channels. Three side channels (measuring longer than 50 meters) were mapped along the main stem (Figure 6).

The area surveyed below the bridge over Coffman Creek began at tide water in Coffman Cove and included several channels, fanning out from the main stem of Coffman Creek. These channels included alluvial fans (AFM), estuarine channels (ESSg, ESL), floodplains (FPS), beaver dam/pond channel (PAB) and ponds (Figure 2). In addition to the channel typed as beaver dam (PAB), further beaver ponds were documented, but no reach data was taken. Polygons roughly representing these ponds are shown on Figure 4. The reaches above the bridge consisted of medium low gradient contained (LCS), small moderate gradient contained (MCM), and small moderate gradient mixed control (MMS) channels (Figure 3). The LCS, MCM, and MMS channels above the bridge have negligible to moderate spawning and rearing habitat, as do the AFM channels below the bridge. The estuarine channels have a high amount of potential spawning and rearing habitat for Coho, pink, and chum salmon, but are moderate to negligible for other anadromous species. Further details about the suitability of the surveyed channel types for spawning and rearing habitat are shown in Table 1.

4.3 Key Wood and Riparian Vegetation

The large wood per meter values for the reaches with available data comparison have "good" and "excellent" values, meaning that they were above the 25th and 75th percentiles respectively. While Stream 1, Tributary 2, Reach 8 and Stream 2, Reach 4, had "fair" values, meaning they scored below the 25th percentile (Table 7). All percentiles are based on conditions in similar streams in Southeast Alaska. Key wood per meter was "fair" to "good" in the surveyed reaches, with the exception of Reach 7 of the creek's main stem, which was "excellent" (Table 7); indicating that large wood was present in somewhat greater quantities than key wood for the majority of reaches.

Reaches 1, 2, and 4 of the main channel, Reach 7 of Stream 1 and Reach 4 of Stream 2 were dominated by red alder (*Alnus rubra*) with occasional Sitka spruce and western hemlock present. Reaches 1-3 of Stream 1, which is an estuarine channel, were dominated by salt tolerant grasses and gramminoids. Reach 1 of Stream 2 (an estuarine channel) and Reach 1 of the tributary to Stream 2 (a palustrine channel) were dominated by grasses, sedges, gramminoids, and shrubs. In the remaining reaches of the surveyed area, riparian vegetation was dominated by a combination of western hemlock (*Tsuga* heterophylla) and Sitka spruce (*Picea sitchensis*).

4.4 Pool Habitat

In Coffman Creek, the pools per kilometer metric was "good" and "excellent" for all surveyed reaches. This is an indicator that although key wood metrics were not as favorable as possible, the large and key wood present was functioning well enough to help provide stream structure. Pool spacing (length of the stream surveyed/channel bed width/total number of pools) was similar, with "good" and "excellent" values throughout the survey area with the exception of Stream 1, Tributary 2, Reach 8 and Stream 2, Reach 4, which had "fair" values (Table 7).

4.5 Fish Trapping and Foot Counts

As shown in Figure 4, juvenile fish, including Coho salmon, were trapped throughout the study area. Juvenile Coho were trapped in the upper reaches of the survey area; indicating that juvenile fish, including Coho salmon, are currently able to access the reaches of Coffman Creek above the bridge. During adult foot counts, adult Coho salmon and pink salmon were found above the bridge within the study area (Figure 5). Adult foot count data can be found in Appendix C. There were no barriers to fish passage for either juvenile or adult fish documented within the study area.

4.6 Imagery Analysis

The USGS and USFS have flown aerial photography missions in Southeast Alaska since the 1920s, including the Coffman Creek Watershed. Figures 8-11 show the Coffman Creek watershed in 1929, 1971, 1979, and 2006. The images were georeferenced and the extent of each image is representative of the same area. An "X" was placed on each image to reference where the bridge crossing to Coffman Creek is located. Annotations were then added to the figures, to call attention to changes to the landscape over time.

Figure 8, showing imagery taken in 1929, documents conditions prior to timber harvest. A beaver pond, in the northwest corner of the figure is pointed out, and the open estuary area shows the natural stream course prior to human impacts. Figure 9 represents conditions in 1971, when timber harvest had occurred throughout much of the extent of the imagery; the majority of this harvest took place in 1955, 1959 and 1961 (USFS 2018). In addition to an altered tree canopy, there is a noticeable diversion of flow from the main channel into the estuary between the 1929 (Figure 8) and 1971 (Figure 9) imagery. This diversion appears to have contributed to a dewatering of the sinuous channel seen within the estuary in 1929; post-timber harvest the natural bends in the stream appear to be less influenced by drainage but may still have water from ebbing tides. Additionally, in the southwest section of Figure 9, the canopy around the mainstem of Coffman Creek has opened up compared to the 1929 image and shows wide creek banks.

By 1979 (Figure 10), the Coffman Cove road had been built and the straightened estuary channel from the 1971 image remained. Based on USFS harvest records, there was approximately 175 acres of timber harvest in the watershed between 1971 and 1979, all east of the imagery analysis area, implying that changes seen between Figures 9 and 10 may be the results of road construction and continued impacts from previous timber harvest (USFS 2018). By 2006 (Figure 11), beaver ponds have been established immediately north of the road, seen in the center of the image. The main stream of Coffman Creek remains straight as it enters the estuary in comparison to the 1929 imagery; it is unclear from the images, exactly where and how the diversion occurs. The impacts of 1990 timber harvest can be seen in the southwestern portion of the 2006 imagery. There was additional logging upstream of the imagery area throughout the 1980s and 1990s, in some cases immediately adjacent to the mainstem of Coffman Creek (USFS 2018).

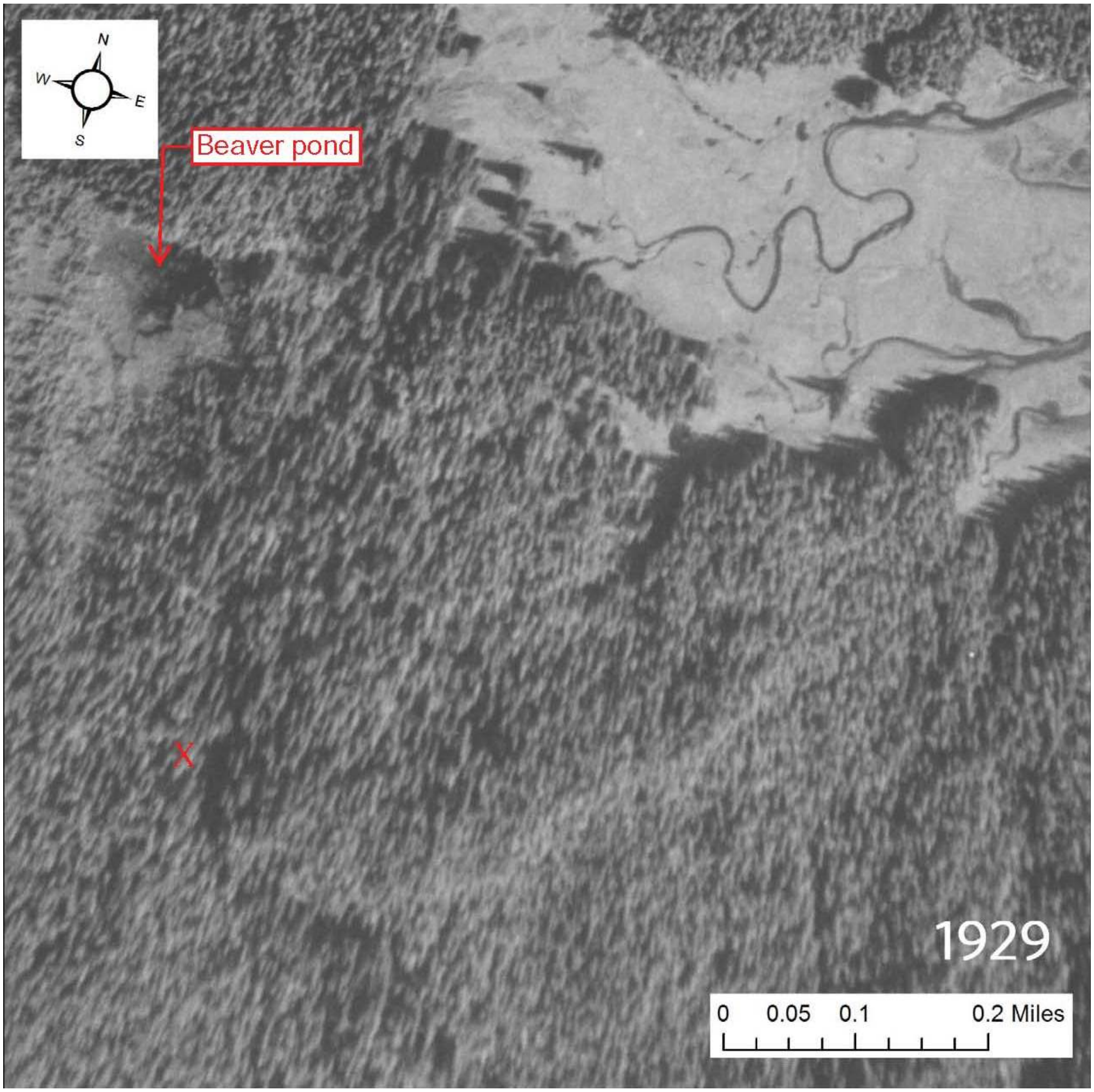


Figure 8: Aerial imagery from 1929 of the Coffman Creek estuary and Coffman Creek, near Coffman Cove, Alaska. The red X on the image refers to where a future road crossing occurs over the mainstem of Coffman Creek. Annotations on the image refer to changes in imagery when compared to other figures in the Coffman Creek Habitat Assessment report (2018).

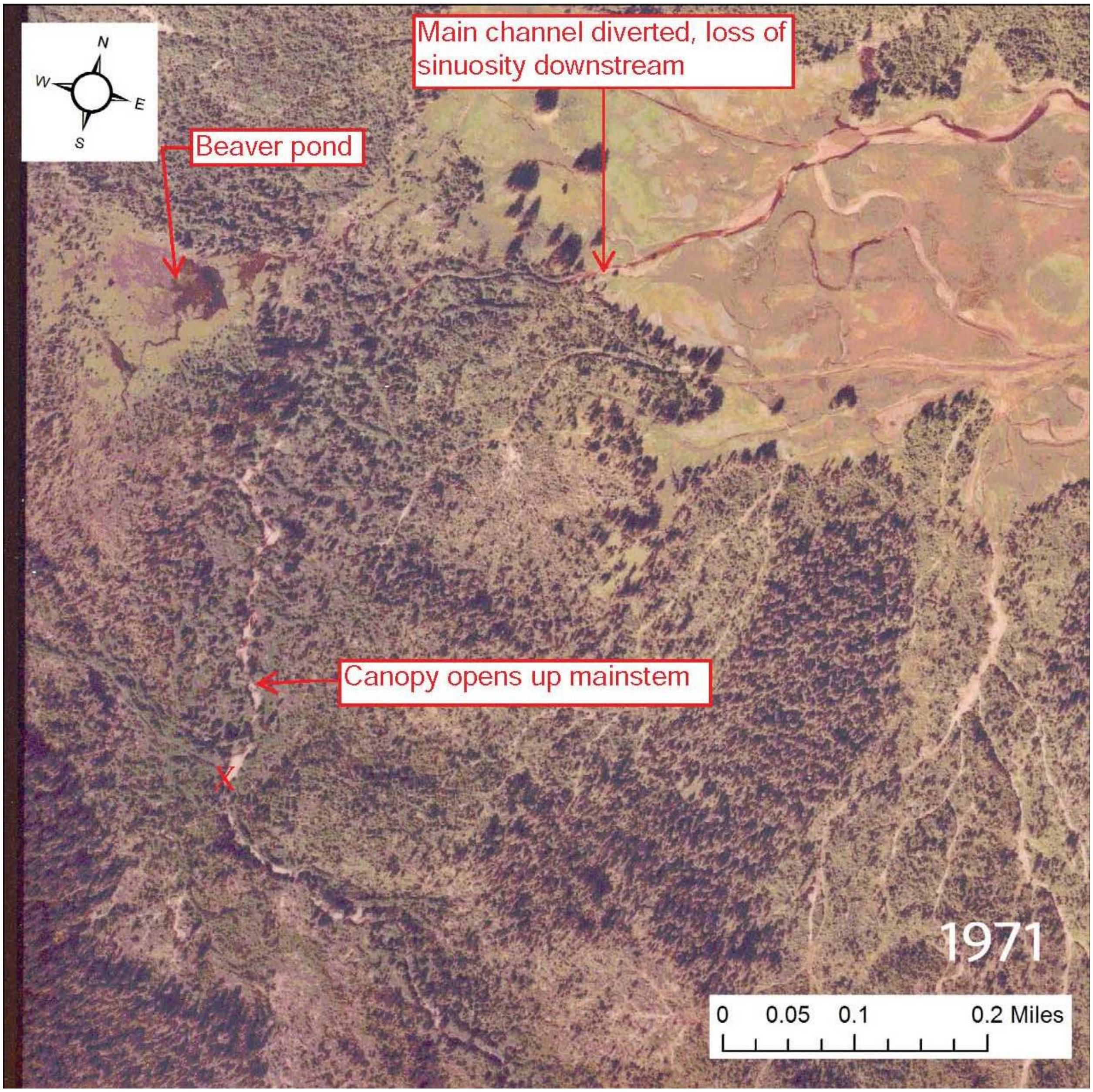


Figure 9: Aerial imagery from 1971 of the Coffman Creek estuary and Coffman Creek, near Coffman Cove, Alaska. The red X on the image refers to where a future road crossing occurs over the mainstem of Coffman Creek. Annotations on the image refer to changes in imagery when compared to other figures in the Coffman Creek Habitat Assessment report (2018).

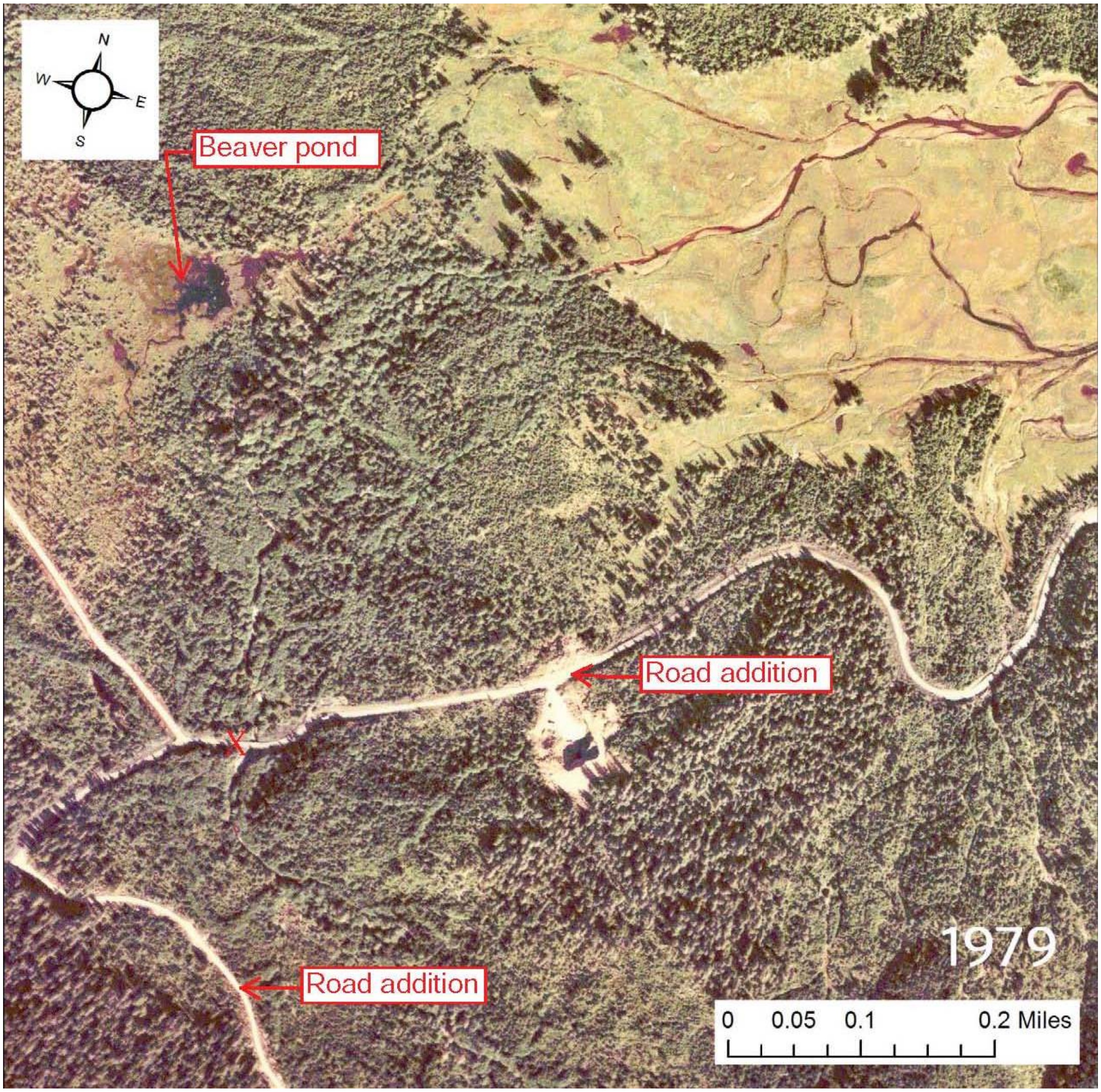


Figure 10: Aerial imagery from 1979 of the Coffman Creek estuary and Coffman Creek, near Coffman Cove, Alaska. The red X on the image is a reference point to earlier imagery before the construction of the road crossing over the mainstem of Coffman Creek. Annotations on the image refer to changes in imagery when compared to other figures in the Coffman Creek Habitat Assessment report (2018).

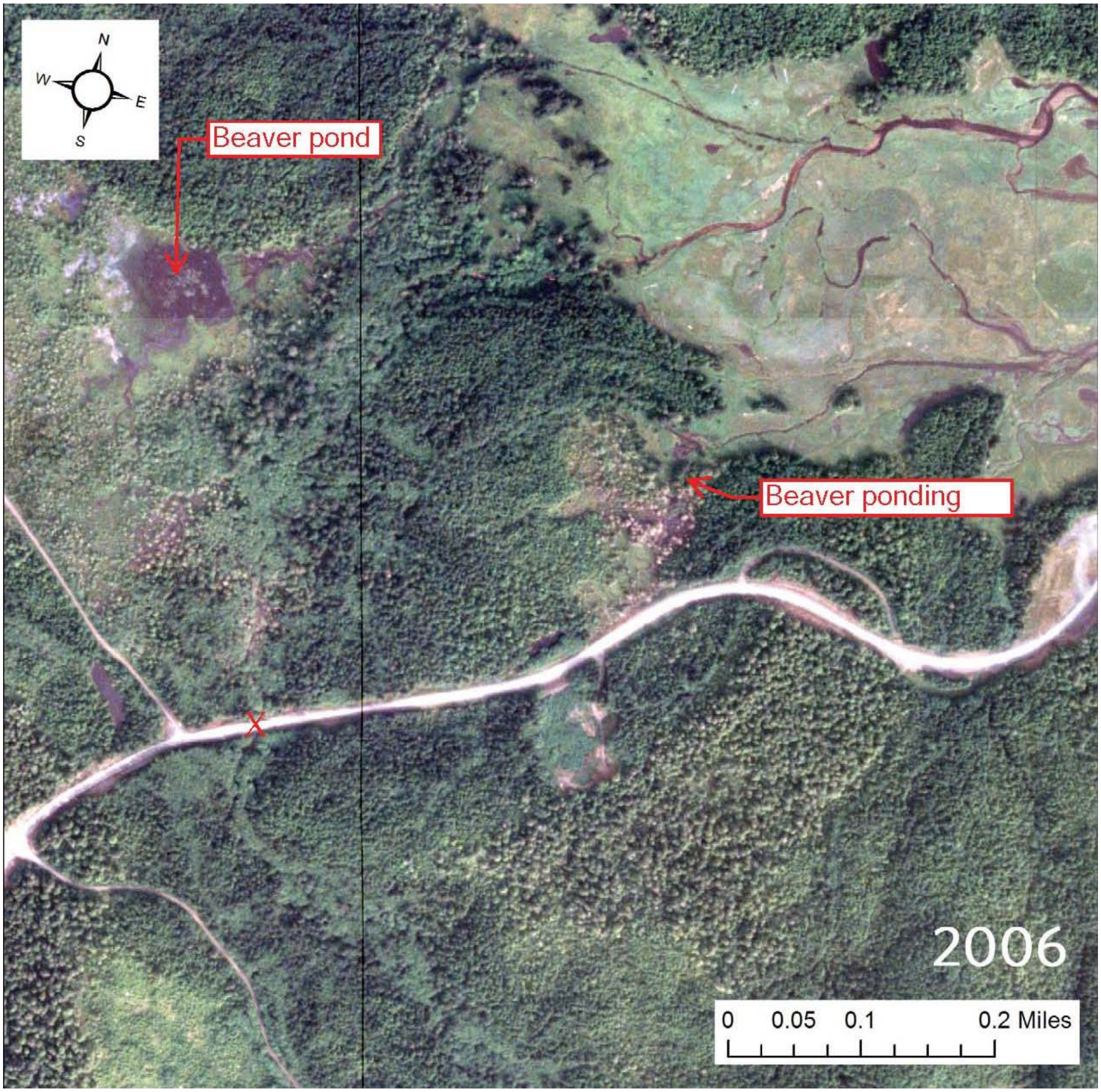


Figure 11: Aerial imagery from 2006 of the Coffman Creek estuary and Coffman Creek, near Coffman Cove, Alaska. The red X on the image is a reference point to earlier imagery before the construction of the road crossing over the mainstem of Coffman Creek. Annotations on the image refer to changes in imagery when compared to other figures in the Coffman Creek Habitat Assessment report (2018).

5.0 Discussion

The metrics described in Section 3.0 and analyzed below are commonly used because they can provide information about both fish habitat and overall stream functionality. Width-to-depth ratio can indicate channel stability; it often increases in floodplain channels after disturbances which alter the normal sediment load of the system (Rosgen 1996; Tucker and Caouette 2008). Large woody debris is crucial to the creation of fish habitat and aids in maintaining normal channel function by dispelling stream energy. In areas where there has been riparian vegetation harvest, in-stream woody debris may decay faster than young growth can produce wood substantial enough to contribute to maintaining stream structure (Tucker and Caouette 2008). A highly productive stream has alternating pools and ripples of roughly the same size; the pool frequency metric can be used to estimate this relationship without counting ripples (Groot and Margolis 1991, Tucker and Caouette 2008). Pool metrics can also help evaluate channel complexity and stability.

Absent historic stream survey data, historic imagery helps provide an understanding of how the watershed has changed over time. Here, the 1929 imagery is especially useful as it was taken prior to any timber harvest in the area. Combining this information with timber harvest data from the USFS can help narrow down when significant changes took place within the watershed that may have impacted salmon habitat.

5.1 Limitations

5.1.1 Metrics

The surveyed portions of Coffman Creek included estuary, palustrine, and alluvial fan channels; reference metrics were not available for these channel types in Southeast Alaska. As a result, metrics were calculated for those reaches, but not numerically analyzed. However, *The Channel Type User's Guide* contains information about the spawning and rearing habitat suitability of these channel types for anadromous species and therefore that aspect of habitat is discussed for those channel types (Paustian et al. 2010). Paustian et al. (2010) does not have habitat information for small low gradient contained channels, which were found in Reach 8 of Stream 1, Tributary 2. Additionally, no data, other than GPS points, were recorded for Stream 1, Beaver Pond Margin (S1, BPM) and Stream 2, Reach 3, Beaver Pond Margin (S2, R3, BPM). The reach designations were given during spatial data processing to account for the entirety of the area surveyed and connect otherwise disparate reaches. Stream 2, Reach 5 (S2, R5) was a dry channel bed which was mapped and shown in Photo 2, but no additional data was recorded.

5.1.2 Aerial Imagery

The biggest limitation of the aerial imagery analyzed in this report is the significant time gaps between the original imagery and 1971 imagery and between the 1979 and 2006 imagery. During these gaps, timber harvest occurred both within the analysis area and further upstream. However, the fact that there is pre- and post-harvest imagery provides a good place to begin.

5.2 Analysis

5.2.1 Channel Type

Floodplain channels facilitate sediment storage in the form of pool and point bar deposition of sediments transported from upstream. These sediments typically remain until a high flow event. Woody debris plays a significant role in providing structure to floodplain channels, creating pools and providing cover for rearing fish (Paustian et al. 2010). Estuarine (ESS) channels are predominately depositional and due to their location, these channels are influenced by ocean erosion more than upstream discharge (Paustian et al. 2010). Floodplain and estuarine channels dominate the lower reaches of Coffman Creek (Figure 4). Given that Coffman Creek discharges directly into saltwater, it is logical that estuarine channels exist at its downstream terminus, their presence likely indicates a well-functioning estuarine and intertidal zone.

Beaver ponds and adjacent channels (PAB) are often found in association with floodplain and palustrine channels, which have been inhabited and worked by beavers. Due to low energy flow, these channels tend to trap fine sediment, silt, and gravel (Paustian et al. 2010). Two beaver ponds complexes were mapped in Coffman Creek, as shown in Figures 5 and 6. Beaver ponds may be considered important overwintering habitat for Coho salmon, when their presence is not disrupting infrastructure or blocking fish passage.

Alluvial fans (AFM) are typically found at the bottom of hills and are often used by anadromous fish species for spawning and rearing; however, spawning and rearing habitat is dependent on large woody debris to provide structure to the stream (Paustian et al. 2010). Four alluvial fan reaches were identified within the surveyed portion of Coffman Creek; as shown in Figure 6, these reaches connect upstream moderate gradient channels with the beaver pond complex, as well as downstream estuarine channels. A normal function of alluvial fans is to collect large quantities of sediment and debris, which wash downstream during high water events and dissipate overtime (Paustian et al. 2010). Given the degraded condition of some upstream channels (as shown in Figure 7) and the known timber harvest in the watershed, it is highly likely that the sediment loads washing downstream during high water events are larger than they would be if there was no disturbance in the watershed. As a result, there is a significant likelihood that the alluvial fan channels are seeing greater sediment depositions than they did in the past, leading to accumulations of sediment and debris which are altering natural stream processes. In a subsequent site visit by U.S. Forest Service hydrologist Emil Tucker, it was noted that channel typing for Reaches 1 and 2 of the main channel (upstream of the bridge) are not supported by the data and aerial photography. Mr. Tucker's evaluation stated that both reaches are likely floodplain channel types, and that Reach 2 is displaying down-cutting with deposition into Reach 1 and below. Much of that deposition is in the area just below the bridge where multiple braided channels can be seen in Figure 2. This would call into question whether the alluvial fan channel types below the bridge are indeed alluvial fan channels or significantly altered floodplain channels (E. Tucker, personal communication, 2018).

5.2.2 Metrics

Reaches upstream of the bridge, designated MCH Reaches 1-7, had the best relative scores in the system (Table 7). Only side channels did not have comparative metrics. The scores were above

2.0, except in Reach 4 which scored a 1.8. The reaches with lower scores appear to be due to insufficient key wood instream. Reach 1 and 4 also scored low on width to depth ratio. Overall, large wood, pool frequency and spacing all had higher scores, therefore conditions upstream of the bridge are currently functioning well. One future concern may be large wood recruitment, particularly because of lower key wood conditions, as much of the upper main channel reaches were dominated by red alder (Table 5).

Twelve of the 18 reaches below the bridge did not have comparable metrics. Of these twelve, four were estuarine, four were alluvial fan, three were beaver pond, and one was a dry channel which was likely used as a road for equipment. Estuarine and beaver pond areas are further discussed in Section 4.2.3.

Stream 2 Reach 5 was a dry channel bed. The field crew was specifically asked to map this reach, as it was identified by residents in Coffman Cove as being a main channel that was diverted during timber harvest, and used as a road (D. Stewart, personal communication, 2016). This section of stream is not the same channel diversion shown in Figure 9 in the aerial analysis of the estuary. The concern was that the dewatered channel was impeding fish passage upstream, however, there was sufficient connectivity in other areas that the Stream 2 Reach 5 diversion does not necessarily impact fish passage.

The remaining six reaches below the bridge had comparative metrics. The final scores varied between 1.2 and 2.2, with only two reaches scoring 2.0 and 2.2. Stream 1, Tributary 2, Reach 8 had the lowest score of 1.2. The reach was 77 meters long with a width to depth ratio of 5.56. There was 0.05 large wood per meter and 0.00 key large wood per meter, indicating the reach lacked large wood almost entirely. The riparian area was classed as having 25-60% cover, dominated by Sitka spruce and Western hemlock. While the current stream condition appears to be lacking in stream structure, large wood recruitment may not be a concern. Reaches above and below Stream 1, Tributary 2, Reach 8 are generally better, while reaches in adjacent braided channels have no comparative metrics. The reach may be a candidate for restoration efforts, such as placing key woody debris into the channel, to improve connectivity within Stream 1.

It should be noted that Stream 1 Reach 4 (the third lowest scoring reach) is connected to Stream 1, Tributary 2, Reach 8. This reach should be considered if any site-specific evaluation for restoration occurs for Stream 1, Tributary 1, Reach 8. Stream 1 Reach 4 had a final score 1.6. The reach was 18.8 meters, and represents the reach immediately downstream of a beaver pond. Riparian disturbance was noted for both sides of the stream, presumably timber harvest but noted as construction. The reach had a low width to depth ratio and 0.0 key large wood/meter. The remaining metrics scored in the “good” range.

The second lowest scoring reach in Coffman Creek was Stream 2 Reach 4. The reach scored poorly for large wood (0.14 per meter), key large wood (0.03 per meter) and pool spacing (score of 6.6). This reach is downstream of the dry channel (Stream 2 Reach 5 previously discussed), as well as immediately adjacent to the large beaver pond complex. Further evaluation of the reach should take into account how water is flowing into the reach, and additional evaluation of the reach should be conducted prior to determining any restoration efforts.

5.2.3 Aerial Imagery

The aerial imagery shows that the lower portion of Coffman Creek has been a wide estuary for decades, suggesting that this portion of habitat has not been strongly influenced by timber harvest and road construction. However, further upstream, changes due to timber harvest are apparent adjacent to the stream, which could reduce large wood recruitment within Coffman Creek and increase sediment loads. These changes may be directly related to the low amount of large and key wood seen in some reaches.

There was one key difference in the estuary between the 1929 imagery and the 1971 imagery - an apparent diversion of stream flow into a main channel (Figure 9). It is unclear if this diversion was anthropogenic or natural. The imagery indicates that at least some selective harvest around the stream occurred prior to 1971. The change may also be due to an increase in flow regime, which can occur post timber harvest. However, it should also be noted that just inside the treeline from the estuary, is the confluence of two streams that are fed by a larger beaver pond complex, which may have caused or influenced downstream hydrology. While it is noticeable in the imagery, the diverted stream course in the estuary may not be an issue for stream function and/or fish habitat and passage. The new channel appears to be stable through the 1976 and 2006 images, with some of the remnant sinuosity still playing a roll from the salt water influence it receives.

Other changes noted in the image analysis include aforementioned timber harvest, the addition of the Coffman Cove road and adjacent logging roads, and the addition of a beaver pond. The imagery is not conducive for interpreting much about the mapped stream, meaning it is unclear if floodplain/alluvial channels have changed dramatically between images. This is due to the fact that the braided stream courses are not visible through the canopy/vegetation. However, it appears likely that road construction may have contributed to channel diversions over this time period.

The larger pond in the north section of the images is persistent throughout the historical imagery. While it is unknown if its origin is from beaver activity, rather than just being low gradient palustrine/lacustrine in nature, current data collection indicates that beavers have been very active in the area more recently. Minnow trapping in the area was limited to the channelized area of the creek, therefore it is unknown the extent to which the ponding serves as juvenile fish habitat. A second beaver ponded area appeared between the 1979 and 2006 imagery as noted in Figure 10. Juvenile Coho salmon were trapped in and around this ponded area (Figure 4). Both beaver ponds are closer to the estuary, relative to the extent of Coffman Creek, appear to be providing juvenile fish habitat, and do not appear to impeding fish passage.

5.2.4 Fish Distribution and Passage

Juvenile Coho salmon and minnow sized cutthroat trout and Dolly Varden were found all the way into the upper extent of the surveyed habitat on Coffman Creek, as shown on Figure 4. The presence of juvenile Coho salmon throughout the study area indicates that fish in this life stage are finding suitable rearing habitat in Coffman Creek. Adult Coho and pink salmon were also documented in Coffman Creek, during adult foot count surveys. There were 381 adult pink salmon and six Coho salmon observed during one survey in mid-September. This indicates that

Coho and pink salmon are finding spawning habitat. While the number of Coho salmon observed was low, a total of six adults, the timing of the surveys and extent of surveys were limited. Surveys later in the season may have shown more Coho salmon in the system.

It should be noted that stream surveys and fish trapping occurred during one week in May, and the previous week the creek was at flood stage. The data do not necessarily reflect how fish distribution and migration may be limited during lower flow conditions or drier summer seasons. One location where flow measurements under different conditions may be useful would be just below the bridge where the main channel of the creek becomes highly braided. This area has been previously identified as an area where restoration may be necessary, based on visual observations. The data collected during stream surveys identified the braided channels as alluvial fan, but subsequent observations by a U.S. Forest Service hydrologist has called that determination into question; the area likely needs additional, more intensive physical and hydrological data collected to better understand flow patterns. This will help to determine whether migration of spawning salmon may be more likely to imbedded during lower flow conditions.

6.0 Conclusion

This study was undertaken to address concerns from the residents of Coffman Cove, that stream conditions in Coffman Creek were degraded and possibly impacting fish and fish habitat. Data collection in May and September of 2016 focused on mapping stream habitat conditions using Alaska Department of Fish and Game for Southeast Alaska stream survey protocols, which are an adaptation of the U.S. Forest Service Tier 2 aquatic habitat survey protocols. Further, fish trapping and adult foot counts were performed, to determine the presence and distribution of fish in Coffman Creek. With respect to fish, Coffman Creek supports Coho salmon, cutthroat trout, Dolly Varden and sculpin. Both juvenile and adult Coho salmon were observed in the lower and upper reaches of the stream. Steelhead trout were not found in Coffman Creek. Throughout the mapped reaches, Coffman Cove is limited in instream large key woody debris. While Coffman Creek habitat conditions are not significantly degraded, there are some reaches (discussed above) which may greatly benefit from the addition of large woody debris. This is especially true in areas that are also limited in large recruitment, such as Stream 1, Tributary 2, Reach 8 and Stream 2 Reach 4.

The area immediately below the Coffman Cove bridge needs further evaluation. This is where the single stream course becomes highly braided as water moves downstream. During flood stage, water moves freely across the landscape into numerous mapped and unmapped channels, and in some places floods the forest floor. While previously thought to be an alluvial fan, the location may be more indicative of a sediment loaded floodplain as discussed in Section 4.2.2. Mr. Tucker recommended evaluating and analyzing upstream sediment sources and metering the supply. Depending on the results, adding wood upstream of the bridge may encourage energy dissipation and storage. Once sediment loading is slowed, the area downstream of the bridge may be evaluated for restoration that encourages water to remain in one or two channels.

7.0 References

Alaska Department of Environmental Conservation, Drinking Water Protection Program. Accessed August 10, 2016: http://dec.alaska.gov/eh/dw/dwp/protection_areas_map.html

Alaska Department of Natural Resources. 2016a. Division of Forestry, Alaska Forest Resources and Practices Act. Accessed August 10, 2016: http://forestry.alaska.gov/forestpractices

Goldschmidt, Walter R., and Theodore H. Haas. 1998. Haa Aaní Our Land: Tlingit and Haida Land Rights and Use. University of Washington Press, Seattle and London; Sealaska Heritage Foundation, Juneau, Alaska.

Groot, C. and L. Margolis. 1991. Pacific salmon life histories. Vancouver, BC: University of British Columbia Press.

Nichols, J., K. Schroeder, B. Frenette, J. Williams, A. Crupi, and K. Smikrud. 2013. A user guide for performing stream habitat surveys in Southeast Alaska. Alaska Department of Fish and Game, Special Publication No. 13-04, Anchorage.

Paustian, S. J. E., K. Anderson, D. Blanchet, S. Brady, M. Cropley, J. Edgington, J. Fryxell, G. Johnejack, D. Kelliher, M. Kuehn, S. Maki, R. Olson, J. Seesz, and M. Wolanek. 2010. A Channel Type Users Guide for the Tongass National Forest, Southeast Alaska. Page 179 in A. R. USDA Forest Service, editor. US Department of Agriculture, Forest Service, Alaska Region. Accessed: https://dspace.nmc.edu/handle/11045/20008.

Prince of Wales Watershed Association (PWWA). December 2014. Prince of Wales Island Unified Watershed Assessment.

Rosgen, D.L., 1996. Applied River Morphology. Western Hydrology, Lakewood, Colorado.

Stewart, Dick. 2016. Personal Communication with Cathy Needham.

Strahler, A. 1964. Quantitative geomorphology of drainage basins and channel networks. Pages 39-76 in V. T. Chow, editor. Handbook of applied hydrology. McGraw-Hill, New York.

Tucker, Emil. 2018. Personal Communication with Cathy Needham.

Tucker, Emil and John Caouette. 2008. Statistical Analyses of Aquatic Habitat Variables in the Tongass National Forest. Unpublished report. U.S. Forest Service, Petersburg, Alaska. Accessed: http://www.seakfhp.org/wp-content/uploads/2013/03/Tucker_Caouette_habitat_statistics_nov08.pdf

United States Forest Service. 2007. Habitat Management Objectives – Statistical Update. Forest Service Handbook, Juneau, Alaska.

United States Forest Service. 2018. S_USA.Activity_TimberHarvest. Vector Digital Data. Accessed: http://data.fs.usda.gov/geodata/edw/datasets.php

Viereck, L. A., C. T. Dyrness, A. R. Batten, and K. J. Wenzlick. 1992. The Alaska Vegetation Classification. USDA Forest Service, Pacific Northwest Research Station, Oregon. PNW-GTR-286.

Appendix A: Riparian Vegetation Key

VEGETATION CLASS CODES (adopted from Viereck, et al. 1992)

I. Trees > 3m tall with canopy cover of $\geq$ 10%. If not, got to II.

- **IA**. >75% of tree cover contributed by coniferous species. If not, go to IB.
  - **IA1**. Tree canopy of 60-100%. If not, go to IA2.
    - **IA1a**. Sitka Spruce dominates overstory and regeneration. Occupies wet sites in SE AK, primarily in alluvial flood plains.
    - **IA1b**. Western Hemlock dominates overstory; other species <25% of overstory.
    - **IA1c**. Sitka Spruce and Western Hemlock each contribute >30% cover. Sitka Spruce constitutes most of overstory, Western Hemlock usually provides most of understory. Occurs on moist sites throughout SE AK.
    - **IA1d**. Western Hemlock dominates. Sitka Spruce >25% cover but < Western Hemlock.
    - **IA1e**. Western Hemlock and Alaska Cedar dominate (each contributes 25-75% of canopy cover) Occurs on a variety of upland sites from sea level to subalpine.
    - **IA1f**. Mountain Hemlock dominates canopy cover. Occurs near treeline, normally on saturated soil throughout SE AK.
    - **IA1g**. Western Hemlock and Western Red cedar dominate (each contribute 25-75% of canopy). Alaska Cedar and Mountain Hemlock may also be significant. Occurs on low-producing, poorly drained sites in southern SE AK.
    - **IA1h**. Silver Fir and Western Hemlock dominate (each contributes 25 - 75% of canopy cover). Sitka Spruce and Western Red cedar may also be important. Limited distribution in southernmost SE AK.
    - **IA1i**. Subalpine Fir dominates canopy cover. Other important species include Sitka Spruce, Mountain Hemlock, and Alaska-cedar. Occurs I scattered locations near treeline in SE AK.
  - **IA2**. Tree canopy of 25 - 60% cover. If not, go to IA3.
    - **IA2a**. Sitka Spruce dominates overstory. Other species <25% of canopy cover. Often occurs in alluvial deposits and glacial moraines and outwash in SE AK.
    - **IA2b**. Western Hemlock and Sitka Spruce dominate overstory (each contribute 25-75% of canopy cover). Occurs from low to mid-elevations in SE AK.
    - **IA2c**. Mountain Hemlock dominates overstory. Other trees <25% of canopy cover. Primarily on high mountain slopes in SC and SE AK.
    - **IA2d**. Dominated by various combinations of cedar, Western Hemlock, Mountain Hemlock, Sitka Spruce, Lodgepole pine, Western Red cedar, and Pacific Yew. Stands with 3-5 overstory conifer species common on level or gently sloping wet sites in SE AK.
  - **IA3**. Tree canopy of 10-25% cover.
    - **IA3a**. Lodgepole Pine dominates overstory. Other species <25% of canopy cover. Generally on boggy, poorly-drained sites in SE AK.
    - **IA3b**. Sitka Spruce dominates overstory. Other species <25% of canopy cover. On poorly-drained sedge peat in SE and coastal SC AK.
- **IB**. >75% of tree cover contributed by broadleaf species. If not, go to IC.
  - **IB1**. Tree canopy of 60-100% cover. If not, go to IB2.
    - **IB1a**. Red Alder dominates overstory. Other species <25% of canopy cover.
    - **IB1b**. Black Cottonwood dominates overstory. Other species <25% of canopy over. Generally along streams in SE and SC AK.
  - **IB2**. Tree canopy of 25-60% cover. If not, go to IB3.
  - **IB3**. Tree canopy of 10-25% cover.
- **IC**. Broadleaf or coniferous species both contribute 25-75% of tree cover.
  - **IC1**. Tree canopy of 60-100% cover. If not, go to IC2.
  - **IC2**. Tree canopy of 25-60% cover. If not, go to IC3.
  - **IC3**. Tree canopy of 10-25% cover.

II. Erect to decumbent (reclining or laying on the ground with the tip ascending) woody shrubs with cover $\geq$25% OR dwarf trees (<3m tall) with cover $\geq$ 10% cover. If not, go to III.

- **IIA**. Dwarf trees (<3m tall) with cover $\geq$ 10% cover. If not, go to IIB.
  - **IIA1**. Dwarf tree canopy of 60-100% cover. If not, go to IIA2.
    - **IIA1a**. Mountain Hemlock dominates overstory. Sitka Spruce may be present. Occurs at treeline in SE AK.
    - **IIA1b**. Subalpine Fir dominates overstory. Mountain Hemlock and Sitka Spruce may be present. Forms dense stands at elevational treeline in SE AK.
  - **IIA2**. Dwarf canopy of 25-59% cover. If not, go to IIA3.
    - **IIA2b**. Mountain Hemlock dominates overstory. Sitka Mountain-ash may be present. Common on peatlands and sometimes on exposed ridges in SE AK.
  - **IIA3**. Dwarf tree canopy of 10-25% cover.
- **IIB**. Shrubs >1.5m tall and $\geq$25% cover dominate. If not, go to IIC.
  - **IIB1**. Shrub canopy cover >75%. If not, go to IIB2.
    - **IIB1a**. Willow species dominate overstory (<25% other canopy species). Characteristic of floodplains.
    - **IIB1b**. Alder species dominate overstory (<25% other canopy species). Common on steep slopes, floodplains and stream banks.
    - **IIB1d**. Alder and Willow co-dominate overstory. (each contributes 25-75% of canopy cover). Occurs on floodplains terraces and drainages on slopes.
    - **IIB1f**. Standing water present most or all of growin season Alder & Willow typically dominate. Common in Interior, SC, and SE Alaska on sites with poorly drained soil and hummocky micro-relief with depressions containing standing water.
  - **IIB2**. Shrub canopy cover 25-74% OR $\geq$ 2% IF little or no other vegetation cover resent.
    - **IIB2a**. Willow species dominate overstory (<25% other canopy species). Occupies a variety of sites, from dunes to river banks. Most common in Interior, W, SC and Arctic AK.
    - **IIB2b**. Alder species dominate overstory (<25% other canopy species). Found throughout state, but not as abundant as closed alder communities.
    - **IIB2d**. Alder and Willow co-dominate overstory. (each contributes 25-75% of canopy cover). On floodplain terraces and steep slopes near treeline in Interior and N. AK
    - **IIB2f**. Standing water present most or all of growing season. Alder (usually) and Willow typically dominate. Occurs on floodplains and drainages in Interior and SC AK.
- **IIC**. Shrubs 0.2-1.5m tall and $\geq$25% cover dominate. If not, go to IID.
  - **IIC1**. Shrub canopy cover >75%. If not, go to IIC2.

IIC1b. Willow species dominate overstory (<25% other canopy species). Common in Interior, W and N AK along streams and lakes.

IIC1d. Ericaceous (e.g. Copperbush Cladothamnus pyrolaeflorus) species dominate. Near treeline in SE AK (Copperbush Cladothamnus pyrolaeflorus).

IIC1e. Alder and Willow co-dominate overstory. (each contributes 25-75% of canopy cover). Reported from SE AK on poorly drained soils.

IIC2. Shrub canopy cover 25-74% OR ≥ 2% IF little or no other vegetation cover present.

IIC2e. Ericaceous species dominate (<25% other canopy species). Wet peal soils. Common in maritime climates of SE and SC Alaska and Aleutian Is. Hydrophytic sedges and Sphagnum mosses generally present.

IIC2i. Willow species dominate overstory (<25% other canopy species); graminoids dominate understory on peat soils (in subarctic and subalpine regions within treeline). Occurs in wet stream bottoms and depressions in Interior, SW, SC and SE AK.

IIC2j. Sweetgale and graminoids dominate on extremely wet (often standing water) on peat soils. Occupies poorly drained lowlands and pond margins in SE, SC and SW AK.

IID. Shrubs < 0.2 m tall and ≥ 25% cover OR ≥ 2% IF little or no other vegetation cover present.

IID1. Dryas species dominate. If not, go to IID2.

IID1a. Dryas species dominate.

IID1b. Dryas species and sedges dominate.

IID1c. Dryas species and fruticose lichens dominate.

IID2. Ericaceous species dominate. If not, go to IID3.

IID2c. Crowberry Empetrum nigrum dominates.

IID2d. Mountain-Heath Phyllodoce aleutica dominates. Common on alpine slopes.

IID2e. Cassiope species dominate. Widespread on moist alpine sites.

IID3. Willow species dominate.

III. Herbaceous (non-woody) vegetation dominates with < 25% scrub and < 10% forest cover. If not, go to IV.

IIIA. Grasses and Sedges dominate (Rushes and Horsetails are treated as forbs). If not, go to IIIB.

IIIA1. Graminoids dominate on well- to excessively-drained sites. If not, go to IIIA2. Grasslands of well-drained, dry sites, such as south facing bluffs, old beaches and sand dunes.

IIIA1a. Elymus species dominate. Occurs on beaches, dunes, gravel outwash flats, and dry slopes mostly in coastal areas, but occasionally in Alaska and Brooks Ranges and Interior Alaska.

IIA1d. Medium height grasses and broad-leaved herbs dominate.

IIIA1e. Hair-grasses Deschampsia species dominate. Common in Aleutian Islands and along southern coast of Alaska. Often diverse stands with small numbers of a great many species.

IIIA2. Graminoids dominate or co-dominate on mesic sites. Grasslands on moist sites, but usually not with standing water (tussocks often present).

IIIA2a. Bluejoint Calamagrostis dominates (includes lawns). Found throughout Alaska except for SE and Arctic Alaska. Occupies large areas in SC and SW Alaska. Includes installed and maintained lawns.

IIIA2b. Bluejoint Calamagrostis and herbs co-dominate. Widely distributed in southern half of state.

IIIA2c. Bluejoint Calamagrostis dominates with conspicuous shrubs providing < 25% cover. Extensive in SW AK and probably also common in SC and Interior AK.

IIIA2d. Sedges in tussock growth form dominate (in arctic and alpine regions beyond treeline). Widely distributed throughout W, N and Interior AK.

IIIA2e. Sedges and Grasses dominate in various combinations (in arctic and alpine regions beyond treeline).

IIIA2f. Sedges and broad-leaved herbs co-dominate (in arctic and alpine regions beyond treeline

IIIA2g. Grasses and broad-leaved herbs co-dominate (in arctic and alpine regions beyond treeline).

IIIA2h. Sedges dominate with conspicuous willow component providing < 25% cover (in arctic and alpine regions beyond treeline).

IIIA2i. Sedges dominate with conspicuous shrub birch component providing < 25% cover (in arctic and alpine regions beyond treeline).

IIIA2j. Sedges dominate with conspicuous dryas component providing < 25% cover (in arctic and alpine regions beyond treeline).

IIIA3. Graminoids dominate or co-dominate on wet (saturated or flooded most or all of growing season) sites.

IIIA3c. Sedges and broad-leaved herbs co-dominate (in arctic and alpine regions beyond treeline). Found on very wet, poorly drained sites with standing water, such as oxbow lakes and alpine bogs. Apparently widely distributed throughout Alaska.

IIIA3d. Tall Sedges emerging from standing water (> 0.15 m deep) dominate.

IIIA3e. Grasses emerging from standing water (>0.15 m deep) dominate. Common in ponds, slow-flowing streams, lake margins, and thermokarst pits in N and W Alaska. Depth of water ranges from seasonally flooded to 2 m.

IIIA3f. Coarse, relatively tall Sedges in saturated/shallow soils dominate (in subarctic and subalpine regions within tree limit). Common in very wet areas on floodplains, margins of ponds, lakes, and sloughs and in depressions in upland areas. Reported from W, SC, SE, Interior Alaska and Aleutian Is.

IIIA3g. Sedges in saturated or shallow flooded (≤ 0.15 m deep) soils dominate with conspicuous shrub component providing <25% cover (in subarctic and subalpine regions within tree limit). Occupies upper parts of coastal marshes in SC and SE Alaska.

IIIA3h. Salt-tolerent Grasses (e.g., Puccinellia) dominate. Commonly occupies tidal mud flats along entire AK coast.

IIIA3i. Salt-tolerent Sedges (e.g., Carex) dominate. Commonly occupies tidal mud flats along entire AK coast.

IIIA3j. Delicate, low Sedges on bog peats dominate (in subarctic and subalpine regions within tree limit). Develops on peat deposits, sometimes forming quaking sedge mats, in filled lakes, ponds, and depressions throughout the southern two-thirds of Alaska

IIIA3k. Mosses (e.g., Sphagnum) dominate with delicate, low sedges present and usually co-dominant on peat soils (in subarctic and subalpine regions within tree limit). Occurs on peat soils, including seepage slopes, raised bogs, slope bogs, early stages of flat bogs, and floating bogs in SE and SC Alaska and Aleutian Is.

IIIB. Forbs (broad-leaved herbs), Rushes (Juncaceae), Horsetails (Equisetaceae), and Ferns dominate. If not, go to IIIC.

IIIB1. Forbs dominate on dry sites (often sparsely vegetated pioneer communities). On dry sites, usually rocky and well-drained; mostly tundra sites. If not, go to IIIB2.

IIIB1a. Open Herb communities colonizing previously un-vegetated non-alpine sites. Found throughout AK on floodplains, river banks and eroding bluffs.

IIIB1b. Wide variety of herbs and sedges dominate on sites covered by late melting snow beds.

IIIB1c. Sparse herb communties on alpine rock outcrops, talus and blockfields.

IIIB2. Forbs dominate in mesic soils.

IIIB2a. Mixture of herbs dominate.

IIIB2b. Fireweed Epilobium angustifolium dominates.

IIIB2c. Tall (0.5-1.5 m) Umbilliferae (e.g., Heracleum and Angelica) dominate.

IIIB2d. Ferns (e.g., Athyrium and Dryopteris) dominate.

IIIB3. Forbs dominate on wet (saturated or flooded most or all of growing season) sites.

IIIB3a. Herbs (e.g., Equisetum, Menyanthes trifoliata, and Potentilla palustris) emerging from standing water (> 0.15 m) – found in ponds and sloughs

IIIB3b. Herbs on saturated or shallow flooded (≤ 0.15 m deep) non-peat soils dominate (in subarctic and subalpine regions within tree limit).

IIIB3c. Broad-leaved Herbs on saturated or shallow flooded (≤ 0.15 m deep) peat soils (often floating mat) dominate (in subarctic and subalpine regions within tree limit).

IIIB3d. Halophytic Herbs dominate on tidal areas inundated ≥ a few times/month by salt water.

IIIC. Bryophytes (mosses and liverworts) and/or Lichens dominate. If not, go to IIID.

IIIC1. Bryophytes (mosses and liverworts) dominate. If not, go to IIIC2.

IIIC1a. Bryophytes (e.g., Gymnocolea, Scapania, and Nardia) dominate on non-wet sites. Vascular plants are virtually absent.

IIIC1b. Bryophytes (e.g., Rhacomitrium, Grimmia, and Andreaea) dominate on non-wet sites. Vascular plants are virtually absent. Occurs on gravelly slopes, sand dunes and mounds. Cover is usually sparse.

IIIC2. Lichens dominate.

IIIC2a. Crustose Lichen species dominate. Occurs on extremely harsh, dry, windblown rocky sites with little or no soil development primarily in alpine regions throughout Alaska

IIIC2b. Foliose and Fruticose Lichen species dominate. Other plant types are absent or nearly so. Occurs on dry fellfields and exposed ridges.

IIID. Plants with floating or submerged leaves dominate. Plants may also have emergent leaves and flowers.

IIID1. Aquatic communities in fresh water.

IIID1a. Pond lilies Nuphar and Nymphaea dominate.

IIID1b. Common Marestail Hippuris vulgaris dominates. Standing water may dry up for several weeks during growing season. Emergents are absent or nearly so.

IIID1c. Aquatic Buttercup Ranunculus species dominate or co-dominate.

IIID1d. Berreed Sparganium species dominate.

IIID1e. Water Milfoil Myriophyllum spicatum dominate.

IIID1f. Pondweeds Potamogeton species dominate.

IIID1g. Water Star-Wort Callitriche species dominate.

IIID1h. Aquatic Cryptogams (e.g., mosses Fontinalis, liverwort Scapania, lichen Siphula, and quillwort Isoetes) dominate.

IIID2. Aquatic communities in brackish water.

IIID2a. Four-Leaf Marestail Hippuris tetraphylla dominates.

IIID2b. Brackish water-tolerent Pondweed Potamogeton, Wigeongrass Ruppia spiralis, or Horned Pondweed Zannichellia palustris dominate.

IIID3. Aquatic communities in marine water

IIID3a. Eelgrass Zostera marina dominates.

IIID3b. Marine Algae dominates.

IV. <2% vegetative cover.

DISTURBANCE CLASS CODES (RDB)

I. Anthropogenic Disturbance

IA. Unique

IA1. Timber Harvest

IA1a. 0-1 year post-harvest

IA1b. 1-5 year post-harvest

IA1c. 10-20 year post-harvest

IA1d. 20+ year post-harvest

IA2. Construction

IA2a. 0-1 year post-construction

IA2b. 1-5 year post-construction

IA2c. 10-20 year post-construction

IA2d. 20+ year post-construction

IA3. Enhancement/Restoration

IA3a. Bank stabilization

IA3b. Riparian thinning

IA3c. Fisheries related

IA3d. Rip-rap

IB. Repeated Seasonal

IB1. Foot traffic

IB1a. Anglers

IB1b. Non-anglers

IB2. Vehicle traffic

IB2a. Non-recreational (road vehicle)

IB2b. Recreational (atv, snowmachine, etc)

IC. Permanent

IC1. Pervious Surfaces

IC1a. Urban/commercial landscaping

1C1b. Agricultural

IC1c. Gravel

IC1d. Other

IC2. Impervious surfaces

IC2a. Parking area

IC2b. Paved trail/walkway

IC2c. Concrete wall/abutment

II. Natural Disturbance

IIA. Water/flood

IIA1. Bank disturbance (slumping/undercutting/erosion)

IIA1a. Wood inputs

IIA1b. Sediment inputs

IIA2. Chronic sediment deposition from tributary

IIB. Windthrow

IIC. Glacial retreat

IID. Fire

IIE. Mass wasting

IIE1. Avalanche

IIE2. Creep/solifluction

IIE3. Landslide

IIE4. Debris torrent

IIF. Natural tree mortality

Appendix B: Fish Trapping Data

Watershed	Stream/ Tributary	Reach	Date	GPS Unit #	Trap #	Waypoint	Capture Method	Time In	Time out	Water Temp (°C)	Meso Habitat	Species	Life Stage	Size (mm)	Size Class	Notes
Coffman Cove	S2T1	1	5/11/2016	1	1	251	Minnow Trap	11:20	18:05	10	GL					No fish initially, trap reset. Minnows present
Coffman Cove	S1	2	5/11/2016	1	2	250	Minnow Trap	11:45	17:55	14	SR	CDV	YOU	135	**B**	Below BPM. No fish trapped initially, fish present; trap reset.
Coffman Cove	S1	4	5/11/2016	1	3	249	Minnow Trap	8:47	11:55	7	GL	SCO	JUV	75	**A**	
Coffman Cove	S2	5	5/11/2016	1	3	249	Minnow Trap	8:47	11:55	7	GL	SCO	JUV	65	**A**	
Coffman Cove	S3	6	5/11/2016	1	3	249	Minnow Trap	8:47	11:55	7	GL	SCO	JUV	45	**A**	
Coffman Cove	S4	7	5/11/2016	1	3	249	Minnow Trap	8:47	11:55	7	GL	SCO	JUV	52	**A**	
Coffman Cove	S1	BPM	5/11/2016	1	4	248	Minnow Trap	8:40	12:06	7	GL	SCO	JUV	87	**A**	Above BPM on S1T1
Coffman Cove	S1	BPM	5/11/2016	1	4	248	Minnow Trap	8:40	12:06	7	GL	SCO	JUV	85	**A**	Above BPM on S1T1
Coffman Cove	S1	BPM	5/11/2016	1	4	248	Minnow Trap	8:40	12:06	7	GL	SCO	JUV	72	**A**	Above BPM on S1T1
Coffman Cove	S1	BPM	5/11/2016	1	4	248	Minnow Trap	8:40	12:06	7	GL	SCO	JUV	75	**A**	Above BPM on S1T1
Coffman Cove	S1	BPM	5/11/2016	1	4	248	Minnow Trap	8:40	12:06	7	GL	SCO	JUV	72	**A**	Above BPM on S1T1
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	TCT	JUV	142	**B**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	SCO	JUV	70	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	ULP	JUV	90	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	ULP	JUV	75	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	ULP	JUV	70	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	ULP	JUV	90	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	SCO	JUV	64	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	SCO	JUV	85	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	SCO	JUV	70	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	ULP	JUV	72	**A**	
Coffman Cove	S1	5	5/11/2016	1	5	247	Minnow Trap	8:31	12:14	7	GL	ULP	JUV	84	**A**	
Coffman Cove	S1	5	5/11/2016	1	6	246	Minnow Trap	8:25	12:25	7	GL					Above BPM, no fish trapped, fish present
Coffman Cove	Main, T1	10	5/11/2016	1	7	245	Minnow Trap	8:05	12:58	10	GL	TCT	JUV	110	**B**	Above BPM, smaller fish present by trap
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	SCO	JUV	68	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	CDV	JUV	73	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	TCT	JUV	87	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	TCT	JUV	82	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	SCO	JUV	80	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	TCT	JUV	jumper	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	TCT	JUV	75	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	SCO	JUV	72	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	8	244	Minnow Trap	8:00	13:07	9	SR	SCO	JUV	64	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	9	243	Minnow Trap	13:20	17:01	10	GL	SCO	JUV	46	**A**	

Watershed	Stream/ Tributary	Reach	Date	GPS Unit #	Trap #	Waypoint	Capture Method	Time In	Time out	Water Temp (°C)	Meso Habitat	Species	Life Stage	Size (mm)	Size Class	Notes
Coffman Cove	Main, T2	11	5/11/2016	1	9	243	Minnow Trap	13:20	17:01	10	GL	SCO	JUV	52	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	9	243	Minnow Trap	13:20	17:01	10	GL	SCO	JUV	49	**A**	
Coffman Cove	Main, T2	11	5/11/2016	1	9	243	Minnow Trap	13:20	17:01	10	GL	SCO	JUV	54	**A**	soaked from 8am-1pm w/ no fish, but pink(?) seen. Was reset
Coffman Cove	Main	1	5/11/2016	1	10	242	Minnow Trap	7:50	13:25	8	GL					Under bridge
Coffman Cove	Main	1	5/11/2016	1	11	257	Minnow Trap	11:30	16:40	8	GL					No fish trapped above bridge, fish present.
Coffman Cove	Main, T1	10	5/11/2016	1	12	255	Minnow Trap	12:50	17:15	9	SR	SCO	JUV	82	**A**	
Coffman Cove	Main, T1	10	5/11/2016	1	12	255	Minnow Trap	12:50	17:15	9	SR	SCO	JUV	71	**A**	
Coffman Cove	Main, T1	10	5/11/2016	1	13	256	Minnow Trap	12:58	17:20	9	GL	ULP	JUV	130	**B**	
Coffman Cove	Main, T1	10	5/11/2016	1	13	256	Minnow Trap	12:58	17:20	9	GL	SCO	JUV	77	**A**	
Coffman Cove	Main, T1	10	5/11/2016	1	13	256	Minnow Trap	12:58	17:20	9	GL	SCO	JUV	67	**A**	
Coffman Cove	Main, T1	10	5/11/2016	1	13	256	Minnow Trap	12:58	17:20	9	GL	ULP	JUV	100	**A**	
Coffman Cove	S1	7	5/11/2016	1	14	254	Minnow Trap	12:45	17:30	9	GL	ULP	JUV	80	**A**	
Coffman Cove	S1	7	5/11/2016	1	14	254	Minnow Trap	12:45	17:30	9	GL	SCO	JUV	75	**A**	
Coffman Cove	S1	7	5/11/2016	1	14	254	Minnow Trap	12:45	17:30	9	GL	TCT	JUV	88	**A**	
Coffman Cove	S1	7	5/11/2016	1	14	254	Minnow Trap	12:45	17:30	9	GL	SCO	JUV	68	**A**	
Coffman Cove	S1	7	5/11/2016	1	14	254	Minnow Trap	12:45	17:30	9	GL	CDV	JUV	91	**A**	
Coffman Cove	S1	7	5/11/2016	1	14	254	Minnow Trap	12:45	17:30	9	GL	ULP	JUV	72	**A**	
Coffman Cove	S1	6	5/11/2016	1	15	253	Minnow Trap	12:35	17:35	9	SR	ULP	JUV	70	**A**	
Coffman Cove	S2	2	5/11/2016	1	16	252	Minnow Trap	11:35	18:13	10	SR					No fish trapped, minnows present.
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	ULP	JUV	97	**A**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	TCT	JUV	147	**B**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	TCT	JUV	120	**B**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	TCT	JUV	205	**B**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	TCT	JUV	120	**B**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	SCO	JUV	75	**A**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	SCO	JUV	68	**A**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	ULP	JUV	105	**B**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	TCT	JUV	88	**A**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	SCO	JUV	72	**A**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	17	258	Minnow Trap	14:40	7:51	7	GL	ULP	JUV	95	**A**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	1	5/12/2016	1	18	262	Minnow Trap	14:53	8:10	7	GL	ULP	JUV	86	**A**	Soaked overnight (5/11-5/12)
Coffman Cove	Main	6	5/12/2016	1	19	314	Minnow Trap	12:20	14:40	9	GL	TCT	JUV	245	**B**	
Coffman Cove	Main	6	5/12/2016	1	19	314	Minnow Trap	12:20	14:40	9	GL	SCO	JUV	67	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	65	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	TCT	JUV	110	**B**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	60	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	62	**A**	

Watershed	Stream/ Tributary	Reach	Date	GPS Unit #	Trap #	Waypoint	Capture Method	Time In	Time out	Water Temp (°C)	Meso Habitat	Species	Life Stage	Size (mm)	Size Class	Notes
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	67	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	60	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	TCT	JUV	108	**B**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	62	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	TCT	JUV	112	**B**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	CDV	JUV	78	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	74	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	SCO	JUV	57	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	TCT	JUV	92	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	CDV	JUV	66	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	CDV	JUV	85	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	CDV	JUV	70	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	CDV	JUV	81	**A**	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	CDV	JUV	77	A	
Coffman Cove	Main	6	5/12/2016	1	20	308	Minnow Trap	11:56	12:55	9	GL	CDV	JUV	53	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	90	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	98	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	115	B	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	98	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	87	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	ULP	JUV	110	B	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	84	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	CDV	JUV	88	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	ULP	JUV	95	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	ULP	JUV	98	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	95	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	TCT	JUV	70	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	SCO	JUV	77	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	SCO	JUV	64	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	SCO	JUV	67	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	SCO	JUV	60	A	
Coffman Cove	Main	5	5/12/2016	1	21	302	Minnow Trap	11:22	15:44	9	SR	SCO	JUV	58	A	
Coffman Cove	Main	4	5/12/2016	1	22	294	Minnow Trap	9:50	16:18	9	SR	CDV	JUV	88	A	
Coffman Cove	Main	4	5/12/2016	1	22	294	Minnow Trap	9:50	16:18	9	SR	TCT	JUV	88	A	
Coffman Cove	Main	4	5/12/2016	1	22	294	Minnow Trap	9:50	16:18	9	SR	ULP	JUV	92	A	
Coffman Cove	Main	4	5/12/2016	1	23	291	Minnow Trap	9:41	16:49	9	GL	SCO	JUV	64	A	
Coffman Cove	Main	3	5/12/2016	1	24	281	Minnow Trap	8:52	17:13	9	GL	TCT	JUV	93	A	
Coffman Cove	Main	3	5/12/2016	1	24	281	Minnow Trap	8:52	17:13	9	GL	TCT	JUV	97	A	

Watershed	Stream/ Tributary	Reach	Date	GPS Unit #	Trap #	Waypoint	Capture Method	Time In	Time out	Water Temp (°C)	Meso Habitat	Species	Life Stage	Size (mm)	Size Class	Notes
Coffman Cove	Main	3	5/12/2016	1	24	281	Minnow Trap	8:52	17:13	9	GL	SCO	JUV	63	A	
Coffman Cove	Main	2	5/12/2016	1	25	278	Minnow Trap	8:30	18:03	9	GL	TCT	JUV	245	B	
Coffman Cove	Main	2	5/12/2016	1	25	278	Minnow Trap	8:30	18:03	9	GL	TCT	JUV	140	B	
Coffman Cove	Main	2	5/12/2016	1	25	278	Minnow Trap	8:30	18:03	9	GL	TCT	JUV	93	A	
Coffman Cove	Main	2	5/12/2016	1	25	278	Minnow Trap	8:30	18:03	9	GL	TCT	JUV	110	B	
Coffman Cove	Main	2	5/12/2016	1	25	278	Minnow Trap	8:30	18:03	9	GL	TCT	JUV	105	B	
Coffman Cove	Main	2	5/12/2016	1	25	278	Minnow Trap	8:30	18:03	9	GL	TCT	JUV	56	A	
Coffman Cove	Main	R2	5/12/2016	1	26	277	Minnow Trap	8:13	18:16	10	GL	ULP	JUV	88	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	30	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	25	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	37	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	30	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	32	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	37	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	35	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	37	A	
Coffman Cove	Main	SCH R2	5/12/2016	1	27	276	Minnow Trap	8:05	18:23	11	BW	SCO	JUV	33	A	

Appendix C: Adult Foot Count Data

FISH ESCAPEMENT COUNTS

Hydaburg Cooperative AssocitION Stream Habitat Surveys

Fish Habitat permit: SF2014-154 (various stream)

Date of Survey	Watershed	Stream/Tributary	Reach	Survey End GPS Point
9/13/16	Coffman Cove	mcH	1	

Index Area	Pink Salmon		Chum Salmon		Coho Salmon		Sockeye Salmon		Other	
	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass
Mount										
Intertidal										
In Stream	6	0	0	0	2	0				
Riparian										
TOTAL NUMBERS	6				2					
Upper GPS Point										

Observers	Wind	Weather	Water	Visibility	Bottom	Additional Comments
Tony, S Pete, A	light	Rain		Ok		I found one carcass About Half WAY Down Reach 10 on trB 1 mch The carcass WAS A Pink

FISH ESCAPEMENT COUNTS

Hydaburg Cooperative Associtiion Stream Habitat Surveys

Fish Habitat permit: SF2014-154 (various stream)

Date of Survey	Watershed	Stream/Tributary	Reach	Survey End GPS Point
9/13/16	coffman cove	S2T1	1	

Index Area	Pink Salmon		Chum Salmon		Coho Salmon		Sockeye Salmon		Other	
	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass
Mount										
Intertidal										
In Stream	10	0	0	0	4	0				
Riparian										
TOTAL NUMBERS	10				4					
Upper GPS Point										

Observers	Wind	Weather	Water	Visibility	Bottom	Additional Comments
Tony, S Pete, A	light	Rain		ok		after About 50 meters the chalel Got to Deep And I was not able to See any more fish.

FISH ESCAPEMENT COUNTS

Hydaburg Cooperative Assocition Stream Habitat Surveys

Fish Habitat permit: SF2014-154 (various stream)

Date of Survey	Watershed	Stream/Tributary	Reach	Survey End GPS Point
9/13/16	coffman cove	stream 2	1	

Index Area	Pink Salmon		Chum Salmon		Coho Salmon		Sockeye Salmon		Other	
	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass
Mount										
Intertidal	240	0	0		0					
In Stream	0	0	0		0					
Riparian	0	0								
TOTAL NUMBERS	240									
Upper GPS Point										

Observers	Wind	Weather	Water	Visibility	Bottom	Additional Comments
Tony, S Pete, A	light	Rain		ok		

FISH ESCAPEMENT COUNTS

Hydaburg Cooperative Associtaion Stream Habitat Surveys

Fish Habitat permit: SF2014-154 (various stream)

Date of Survey	Watershed	Stream/Tributary	Reach	Survey End GPS Point
9/13/16	Coffman Cove	Stream 1	1+2	

Index Area	Pink Salmon		Chum Salmon		Coho Salmon		Sockeye Salmon		Other	
	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass	Live	Carcass
Mount										
Intertidal	50	0	0	0	0	0				
In Stream	75	0	0	0	0	0				
Riparian										
TOTAL NUMBERS	125									
Upper GPS Point										

Observers	Wind	Weather	Water	Visibility	Bottom	Additional Comments
Tony, S pete, A	light	Rain		ok		