MEMORANDUM

State of Alaska

Department of Fish and Game
Division of Habitat

TO: Jackie Timothy
Southeast Regional Supervisor

DATE: July 2, 2018

FILE NO: 56.8024 N 132.9959 W

SUBJECT: Kupreanof Island Micro Hydro Trip Report

FROM: Greg Albrecht
Habitat Biologist

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On June 6, 2018, I visited an unnamed creek on Kupreanof Island (Figure 1) with Alaska Department of Fish and Game Sport Fish Division Area Management Biologist Patrick Fowler and resident Doug Leen. Mr. Leen proposes to construct a micro hydro facility on the creek which transits private and US Forest Service Land. The purpose of our visit was to survey the creek for fish and fish habitat in preparation for reviewing a permit application for the micro hydro and a buried inclined plate intake, a 450 foot long penstock, and a powerhouse at the high tide line with about a 250 gallon per minute (GPM) design flow.

1.7 inches of rain fell in the two weeks prior to our visit and water level was about 4 inches below the ordinary high water mark. We set baited minnow traps throughout the bypass reach and upstream habitats for about 4 hours, measured discharge with a FlowTracker Acoustic Doppler Velocimeter, and surveyed a longitudinal channel profile with a clinometer and stadia rod (Table 1).

Downstream of the high tide line and the potential powerhouse location, we observed a <1% gradient estuary with about 1,000 linear feet of intertidal spawning habitat (Figure 2) in which Mr. Leen reported seeing spawning pink salmon annually. Between the power house and proposed intake locations, the stream varies from 3–10 feet wide with a 1–6% gradient that averages 4.5% over 508 feet, to a confluence (Figures 3–5). Substrate is predominantly moss-covered cobble and boulders with woody debris and salmon spawning habitat is almost entirely absent. Pools occur about every 40 feet and have residual depths of 1.2–0.4 feet. We estimated[1] 261 GPM in the mainstem (Figure 6) and 218 GPM (84% of the total) in the river right branch. Aside from two areas where we observed water dripping into the channel at <5 GPM, there are no other sources of supplemental flow in the proposed bypass reach.

We captured rearing coho salmon, Dolly Varden char, cutthroat trout, and sculpin in and upstream of the proposed bypass reach (Figure 7). Mr. Leen proposes to construct an intake either below the fork, which would provide 23 feet gross head (Figure 8), or 50 feet upstream of it in the river right channel, which would provide 26.9 feet gross head (Figure 9). Mr. Leen was unsure if he would attempt to capture flow from the river left channel (Figure 10) with a second intake or leave it untapped to provide instream flow.

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[1] Actual measurements were 234 and 193 GPM, though not all flow could be captured in the measurement due to shallow depths and the limitations of the FlowTracker.

Mr. Leen operated a stream gauge weir on the creek from November 2008 to October 2009 and shared his observations and data with me for analysis. His observations show the creek can drop to about 25 GPM with ice forming in the channel during the winter and about 25 GPM in the summer during dry spells. During prolonged rain, flow exceeds 30,000 GPM. Out of the 317 days recorded, discharge was >250 GPM 52% of the time, >350 GPM 50% of the time, and <50 GPM 26% of the time.

Recommendation

I will work with Mr. Leen to develop a hydro proposal with an intake structure that provides upstream fish passage and maintains >50 GPM of flow in the bypass reach when in operation to provide year round habitat for rearing fish. I will submit the attached nomination for rearing coho salmon to the Anadromous Waters Catalog.

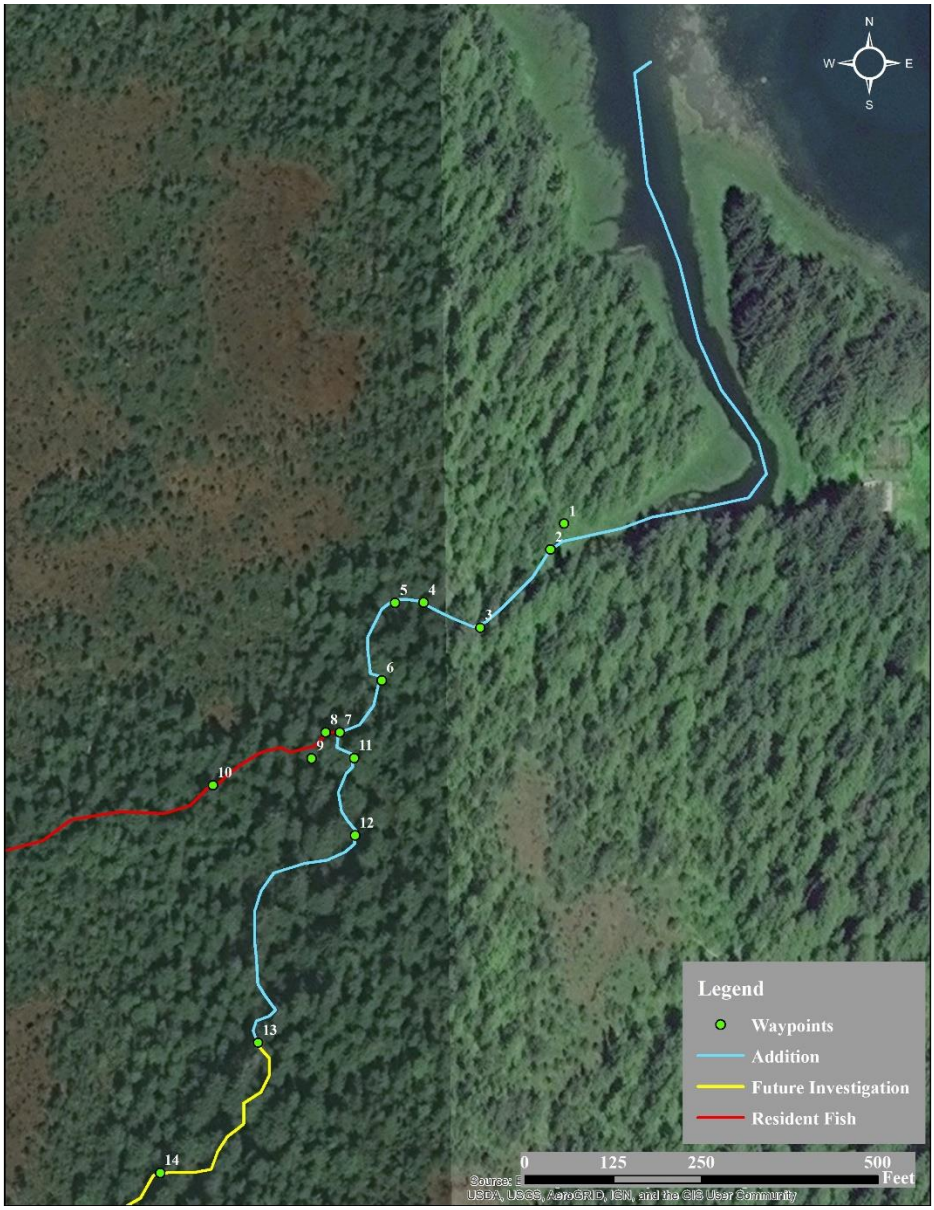

Figure 1.–Area map.

Table 1.–Survey data.

Waypoint	Latitude	Longitude	Survey distance (ft)	Survey elevation (ft)	OHW width (ft)	Maximum pool depth (residual depth; ft)	Trap captures	Notes
1	56.8024	-132.9959						19 foot tide elevation.
2	56.8023	-132.9960	0	0				Power house location.
			14	0.9	9			Moss covered cobble, riffle.
			44	1.4				Downstream of riffle.
			50	2		0.8(0.4)	1 CT	
			56	2.3	8			
			89	3.2	5.5		1 SC	
							3 CO, 2 CT, 1 DV	
			100	4.2	3			Mossy cobble, no spawning habitat.
			125	5.3	10			Upstream end of cobble riffle entering pool tail.
			153	6.9	5, 15	1.1(0.9)	2 CT, 1 DV	Upstream end of pool.
							1 CO	
			168	7.5	9		4 CO, 2 CT, 3 SC	Downstream end of boulder riffle.
			185	9.2	8	0.8(0.6)	2 CO, 1 CT, 1 SC	Upstream of boulder riffle and at tail of pool.
			201	9.3				Downstream of boulder cascade.
3	56.802	-132.9965	219	11.4	8			Upstream end of boulder cascade. Two seeps with <5 GPM entering.
4	56.8021	-132.9969	250	12.7		1(0.8)		Riffles downstream of this point and 3 foot long pool here.
			264	13.8	10	1.1(0.9)		6 foot long pool here.
			281	14.6			2 CO, 6 CT	Mossy cobble and some gravel.
5	56.8021	-132.9971	301	15.7	10	1(0.7)	2 CO	Mossy cobble riffle and a pool.
			332	17.2				~1 GPM of flow seeping from wetland here.
			357	18.2				Mossy cobble step pools and riffles.
			392	20.3	9			Upstream of riffle and downstream of pool.
			406	20.3		1.0(0.6)		
6	56.8018	-132.9972	423	21.4		1.4(1.2)		Upstream of riffle and downstream of a pool. 236 GPM measured in this riffle, though probably a 25 GPM underestimate due to low flow.
			435	21.4			2 CO. 3 DV, 1 SC	Upstream of pool and downstream of log jam.

			448	22				Upstream of log jam.
			480	22.2	8	1(0.8)		Upstream of 32 foot long pool formed by log jam.
7	56.8016	-132.9975	508	23		0.9(0.6)	6 CO, 3 CT, 1 DV	Confluence and possible intake location here at 10 foot long pool. 10 feet upstream in river right branch 193 GPM discharge measured, though probably a 25 GPM underestimate due to low flow.
			522RR	24.2				In river right branch upstream of boulder cluster above potential intake location.
11	56.8015	-132.9974	573RR	26.9			2 DV	In pool where potential intake option 2 would go.
8	56.8016	-132.9976	532RL	25.4		1(0.8)	2 DV	In river left channel upstream of boulder step pools.
			558RL	26.9	4		1 CO, 1 CT	In river left branch at potential intake option 3.
9	56.8015	-132.9977					1 DV	Upstream of some subsurface flow. One minnow trap 50 feet upstream of here.
10	56.8014	-132.9984					4 DV	River left fork, transition from 10% gradient to about 5%, 3-5 foot OHW widths, top of survey, minnow trap here.
12	56.8012	-132.9974					2 CO, 1 CT	Several CT >150 mm visually observed.
13	56.8004	-132.9981					7 CO, 6 CT	6-12 foot OHW widths.
14	56.7999	-132.9988					2 DV, 2 CT	Top of river right channel survey, low gradient and good habitat continues as far as I can see. Future investigation recommended. Minnow trap here.

Figure 2.–Looking downstream at the intertidal reach.

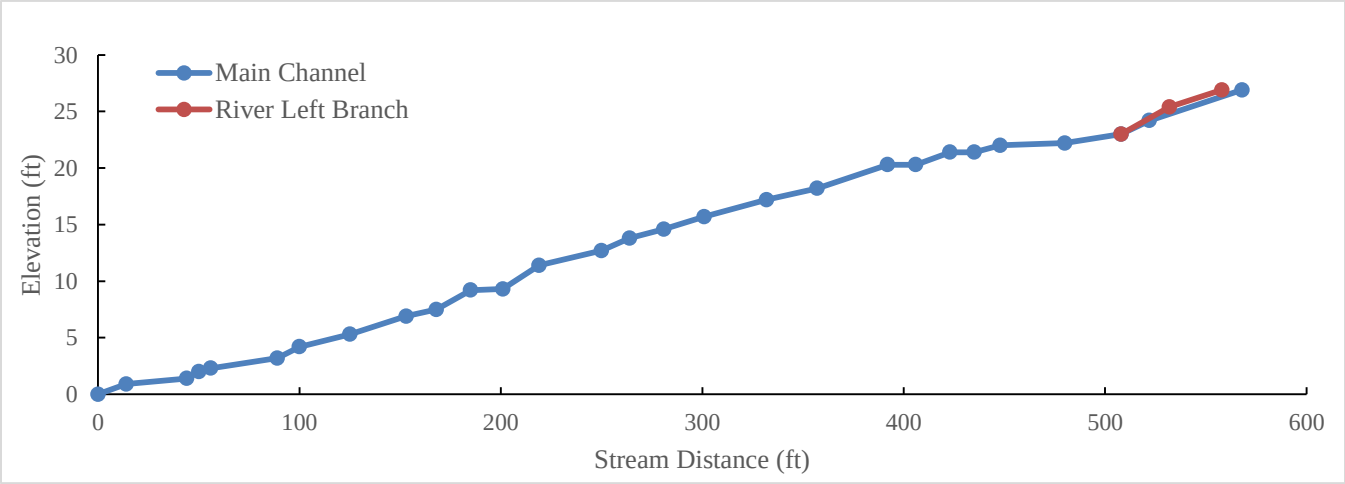

Figure 3.–Longitudinal elevation profile of the proposed bypass reach.

Figure 4.–Typical reach with boulders, riffles, and pools.

Figure 5.–Pools and riffles.

Figure 6.–Discharge measurement site.

Figure 7.–Cutthroat trout and coho salmon.

Figure 8.–Proposed intake site at confluence.

Figure 9.–Proposed intake site in river right branch.

Figure 10.–River left branch.

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