Eklutna River Salmon Habitat Assessment and Collaboration to Recommend Restoration Flows

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Eklutna River was surveyed on foot from the Cook Inlet to Eklutna Lake within a 3-week interval in June of 2019 for salmon habitat characterization. The California Salmonid Stream Habitat Restoration Manual (*CSSHRM,* Flosi et al., 1998) was used to develop survey methods in a previous 2007 survey of the lower Eklutna River and the same methods, utilizing the 2010 updates, were applied to the entire length of Eklutna River below the lake during the 2019 survey season. Photos were taken throughout the survey and will be displayed as an interactive photo tour on the NVE website. Survey results will help scientists and officials make decisions to restore anadromous habitat functions of the Eklutna River.

Historically this is a dry time of year for the Eklutna Valley, but recent rain events prior to the start of data collection increased the volume of water in the Eklutna River. Extreme daily temperatures were also a factor. Data was collected during an eleven day stretch. The river was walked as data was collected. Data was inputted off handwritten data sheets into a Microsoft Excel database. Hand drawn maps were also completed during the survey of each reach with field notes of interest.

Eklutna River

Surveying started approximately ½ mile from the confluence of the Eklutna River and Cook Inlet and commenced at the Eklutna Lake Dam. This system is mainly a single channel system for the length of the lower river. Some braiding is present, but is due to beaver dams flooding areas, rather than geomorphological features. The river is approximately 62,292.70 feet in length (11.8 miles) with only half of the river having continuous water flow (5.97 miles). The river is predominately a run ecosystem with 15% being completely dry. Sixteen percent of the river has instream shelter values, with the largest category of instream shelter provided by small woody debris and terrestrial vegetation (34.4% and 21.2% respectively). Almost ¾ of the river's banks are vegetated with deciduous trees (45%), brush (28%), and grasses (11%). Roughly 12% of the bank substrate composition is bedrock, with the remainder split three ways between boulders (29%), cobble/gravel (31%), and silt/sand/clay (27%). Water temperature averaged 8.3 degrees Celsius, with a pH of 8.3.

Native Village of Eklutna

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Photos representing each reach of the Eklutna River

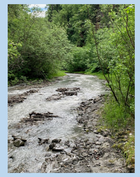
Reach 1

Reach 2

Reach 3

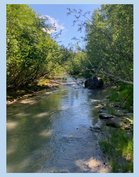
Reach 4

Reach 5



Reach 6

Reach 7



Reach 8

Reach 9

Reach 10

Reach 11

Areas of interest

In Reach 4, a flooded forest area with no defined channel. This is between the Glenn Highway bridges and the rail road bridge.

Beaver Dams is various places along the river. These dams provide habitat for salmon, but could also be barriers for salmon.

Area behind the lower dam site where there is still a build up of silt. Eventually this silt will wash down the river, more than likely in large amounts at once.

Discussion for the lower Eklutna River

The Eklutna River still has good salmon habitat throughout the river channel below the Eklutna Lake Dam. Restoration work and increase in water flow would be needed to allow a sustainable river system to reestablish itself, including allowing spawning of salmon between the Thunderbird confluence and Eklutna Lake. Fry, of all five salmon species, have been observed in the river below the Thunderbird confluence, although the numbers do not indicate a high population of salmon return to Eklutna River to spawn. Two studies were completed in 2003 and 2010. The NVE 2003 study estimated the number of salmon returning to the river approximately 1000 per year (< 100 coho), while the Ward study in 2010 estimated over 3000 juvenile coho salmon in the lower Eklutna River. Ward did not survey other species of salmon. Alaska Department of Fish and Game have done informal observations on juvenile salmonids in the river between the Glenn Highway bridges and the lower dam site. The observations are reported in the Anadromous Stream Catalogue online (https://www.adfg.alaska.gov/sf/SARR/AWC/). More studies on the numbers of salmon returning to the river to spawn would need to be completed to track the progress of the lower dam removal and the natural return of habitat due to the dam removal. This study and other USFWS studies on the Eklutna River show that there is habitat for salmon along the entire 12 miles of lower river, pending an increase in water flow to the river. Areas of the river would benefit from manual restoration techniques. These areas are generalized currently as increased waterflow is needed to assess the area's progress and define the areas further. Flushing flows will help move sediment downstream and create more spawning areas throughout the river. Sustained higher waterflows will increase the total amount of salmon habitat from the Eklutna Lake Dam to the confluence in the Knik Arm of the Cook Inlet.

Questions that arose while surveying the river were: How much water would it take to provide sustained flow to the river channel for salmon habitat; How low is the water table in Reach 11 and how much water would be lost initially during a release due to infiltration to the water table; and how would a sustained higher flow impact the existing highway and railroad bridges. These questions were not answered during the study, but warrant further investigation.

Table 1. Eklutna River Reach Lengths, Widths, and % watered.

	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10	Reach 11	Whole River
Avg. Depth (in)	13.43	21.33	12.75	20.70	18.75	9.92	11.91	7.45	6.21	9.24	11.00	12.97
Avg. Width (ft)	34.83	79.20	15.25	33.44	33.67	16.07	17.35	9.55	8.36	13.65	17.33	25.15
Approx. Length (ft)	1813.00	3282.00	3778.00	4025.00	3780.70	6040.00	4441.00	4781.00	4308.00	10994.00	14050.00	61292.70
Approx. Length (miles)	0.34	0.62	0.72	0.76	0.72	1.14	0.84	0.91	0.82	2.08	2.66	11.60847
continuous water flow	y	y	y	y	y	y	y	y	n	n	n	n
% watered	100	100	100	100	100	100	100	100	100	100	0.61	

Table 2. Percentages of Habitat Types by Reach.

Reach	1	2	3	4	5	6	7	8	9	10	11	Whole River
Length (ft)	1813.0	3282.0	3778.0	4025.0	3780.7	6040.0	4441.0	4781.0	4308.0	10994.0	14050.0	61292.7
Habitat type												
Run	0.87000		0.33298	0.01988	0.50644	0.66639	0.46724	0.03033	0.13556	0.51428	0.22819	0.33478
Glide		0.32084	0.39995	0.05714		0.04040		0.05124		0.30198	0.05246	0.11975
Riffle	0.09211		0.26707	0.73491	0.37321	0.16076	0.15740	0.85923	0.78575	0.03302	0.02135	0.25078
lateral pool	0.03751			0.01375								0.00196
BWP		0.50152		0.02484			0.01914					0.02987
SCP		0.17764										0.00951
HGP				0.02037	0.08543	0.08742	0.01801	0.04079		0.00737		0.02103
C. Pool					0.02116							0.00131
LSP						0.04305	0.09975		0.00464			0.01180
MCP							0.13758	0.00418		0.07149	0.07431	0.04015
Cascade							0.06035	0.01213	0.01161			0.00613
Waterfall						0.00199						0.00020
DPL							0.04053					0.00294
Plunge Pool								0.00209				0.00016
Pocket Pool									0.05316	0.02274		0.00781
Dry										0.04912	0.62370	0.15178
Flooded Forest				0.14286								0.00938

Table 3. In-Stream Shelter Values per Reach

Reach	1	2	3	4	5	6	7	8	9	10	11	total
in stream shelter values												
% unit covered	10.71	43.33	10.63	21.50	20.56	4.64	10.43	21.36	18.93	16.82	17.89	16.03
% undercut bank				16.00								1.58
% wet			2.14	45.50		33.33	25.00	52.50	29.17	38.33	80.77	34.36
% herb				5.00		16.67	29.17	22.50	45.83	45.00	11.54	20.79
% root mass			22.86	0.00			4.17	15.00		1.67		3.81
% terr. Veg	100.00	52.50	75.00	33.00	85.00							21.24
% aquatic Veg		47.50										1.88
% bubble curtain					6.25							0.50
% boulders					2.50		8.33	10.00	8.33	15.00		5.45
% bedrock ledges					6.25	50.00	33.33		16.67	6.67	7.69	11.39
% total canopy	0	0	50	74.4	74.4	52.86	50	95.91	86.07	73.64	68.25	61.42
% deciduous	0	0	100	100	50	100	100	97.73	100	100	100	96.32
% coniferous	0	0	0	0	0	0	0	0	0	0	0	0.00
% rt bank vegetated	68.3	100	100	83.3	94.4	39.29	29.13	97.73	86.07	83.64	65.75	72.92
% lt bank vegetated	44.29	100	100	82.2	94.4	61.43	32.17	98.18	82.5	74.55	68.75	73.00

Table 4. Percent Substrate Composition by Reach

Reach	1	2	3	4	5	6	7	8	9	10	11	River
Substrate composition												
silt/clay	44.286	66.667	55.313	3.000	11.111	15.714	32.826	7.273	6.786	37.955	22.250	25.815
sand	11.429	33.000	17.813	16.500	4.889	0.000	10.000	30.455	30.357	4.318	8.500	13.058
gravel	14.286	0.333	14.375	10.500	13.222	57.143	20.870	0.000	20.000	14.545	6.500	17.247
sm cobble	18.571	0.000	8.125	35.000	14.778	1.429	10.652	0.909	0.000	5.909	5.800	8.004
lg cobble	11.429	0.000	3.125	25.000	28.667	0.714	8.478	18.182	0.714	4.091	10.450	9.023
boulder	0.000	0.000	0.000	9.000	23.222	9.286	13.913	43.182	35.714	28.636	51.400	23.817
bedrock	0.000	0.000	0.000	0.000	0.000	15.714	3.261	0.000	6.429	4.545	0.000	3.410
% exposed substrate	0.000	0.000	0.000	0.556	4.222	0.000	5.522	16.818	9.643	30.000	45.000	13.334

Table 5. Bank Composition for Whole River, N=151

	Substrate						Vegetation									
	1		2		3		4		5		6		7		8	9
	Bedrock		Boulders		Cobble/Gravel		Silt/Clay/Sand		Grass		Brush		Deciduous Trees		Conifer Trees	No Vegetation
Right Bank	21	0.139073	43	0.284768	47	0.311258	39	0.258278	16	0.10596	46	0.304636	64	0.423841	0	0	21	0.139073
Left Bank	14	0.092715	45	0.298013	47	0.311258	43	0.284768	18	0.119205	38	0.251656	73	0.483444	0	0	20	0.13245

Table 6. Data from Reach and Flow Forms, averaged for each reach

	Reach 1	Reach 2	Reach 3	Reach 4	Reach 5	Reach 6	Reach 7	Reach 8	Reach 9	Reach 10	Reach 11	
CFS	32.46	24.3	19.1	55.03	37.1	3.8	10.8	6.8	2.6	2.796	-	
Flood Prone Width (ft)	54.1	400	na	na	na	28	80	49	67	35	-	
Entrenchment	1.69	na	na	na	na	1.4	6.96	5.44	8.38	8.75	-	
Dominate Substrate	Cobble	Silt/Clay	Gravel	n a	Cobble	Gravel	Gravel	Sand	Sand	Gravel	-	
current bankfulls (in)	28	60	24	42	36	12	20	20	10	12	-	
max bankfull depth (in)	14	30	12	21	18	6	10	10	5	6	-	

Below: Substrate photos of Eklutna River (not exhaustive): from left to right: silt/clay, Cobble/gravel with silt, embedded gravel.