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WILLAMETTE VALLEY FISH PASSAGE MONITORING VIA ROTARY SCREW TRAPS

Bi-Weekly Report: November 1, 2021 – November 15, 2021

Prepared for: United States Army Corps of Engineers

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PROJECT SCHEDULE

Task	Start	End	Days
Fall Creek RST			
Deployment	3/04/21	3/05/21	2
Operation	3/10/21	5/31/21	82
Retrieval	6/2/21*	6/3/2021	1
Cougar Dam RST			
Deployment	2/15/21	2/16/21	2
Operation	3/24/21	11/30/21*	251
Lookout Point RST			
Deployment	3/12/21	3/13/21	2
Operation	3/15/21	07/19/21	126
Big Cliff RST			
Deployment	5/18/21	5/19/21	2
Operation	5/23/21	11/30/21*	191

*Projected date for task to be started/completed.

There are no anticipated changes to the project schedule.

SUMMARY OF ROTARY SCREW TRAP DATA

Rotary screw traps (RSTs) were operated at two locations in the southern Willamette river watershed: on the South Fork McKenzie river below Cougar Dam (Cougar), and on the North Santiam river below Big Cliff dam (Big Cliff). The location of each sampling site is depicted in Figure 1. Sampling began at the Cougar Dam site on 2021 March 24, and at the Big Cliff Dam site on 2021 May 24 (Table 1). Earlier in the year sampling took place above Fall Creek Reservoir near Dolly Varden Campground to trap and transport juvenile Chinook salmon around the Fall Creek Project. Sampling at the Fall Creek site began on 2021 March 10 and ended on 2021 May 31. Sampling also occurred below Lookout Point dam on the Middle Fork Willamette River. Sampling began at Lookout Point on 2021 March 15 and ended on 2021 July 19.

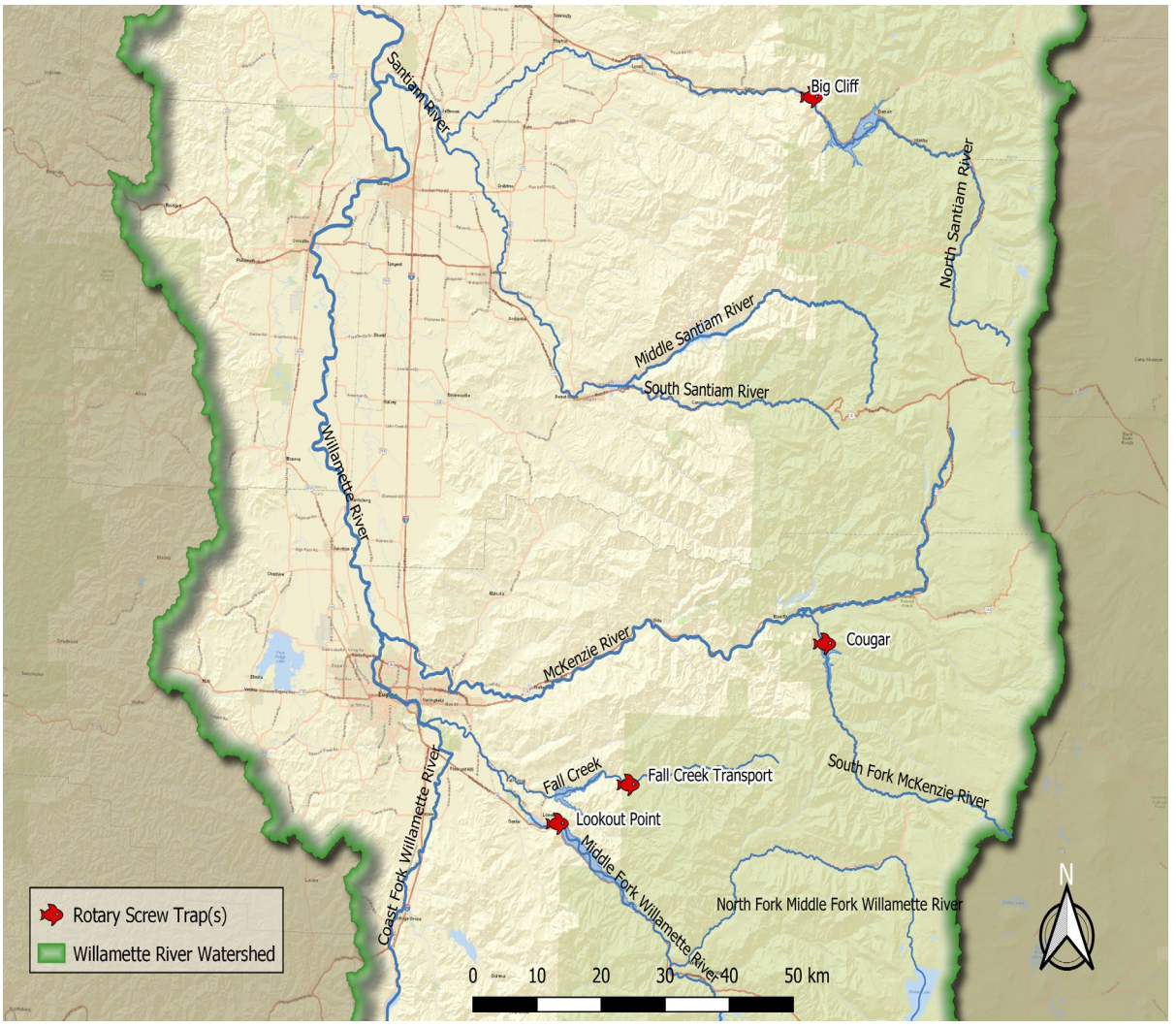

Figure 1: Sampling Locations

Table 1: Sampling dates

Site	Total Sampling Period Start	Recent Sampling Period Start	Sampling Period End	Recent Days Sampled	Total Days Sampled
Big Cliff	2021-05-22	2021-11-01	2021-11-15	15 days	177 days
Cougar	2021-03-23	2021-11-01	2021-11-15	15 days	237 days

Table 2 summarizes the naturally produced Chinook salmon that have been captured and recaptured at each site. All naturally produced Chinook salmon that are captured are marked and released upstream of the trap. Recaptured fish are those that were caught at the trap, marked, released upstream of the trap, and subsequently recaptured. The goal of this practice is to provide trap efficiency estimates.

Table 2: Willamette Valley Rotary Screw Trap Monitoring catch summary.

Site	Species	Catch (Reporting Period)	Recaptures (Reporting Period)	Total Catch	Total Recaptures
Big Cliff	CHS	54	2	615	37
Cougar	CHS	926	34	3,145	89

Table 3 summarizes trap efficiency trials that have been conducted with releases of ODFW hatchery reared Chinook salmon.

Table 3: Results of trap efficiency trials conducted with ODFW hatchery reared Chinook salmon.

Date	Site	Route	Species	Mean Length (mm)	Released	Recaptured	Efficiency (%)
2021-05-05	CGR	PH	HCHS	62.5	105	37	35.2
2021-04-08	LOP	PH	HCHS	165.0	993	3	0.3
2021-05-26	BCL	PH	HCHS	159.0	543	8	1.5
2021-07-09	BCL	PH	HCHS	66.0	454	21	4.6
2021-07-13	LOP	PH	HCHS	90.4	950	1	0.1
2021-09-23	CGR	RO	HCHS	86.4	508	22	4.3
2021-10-04	CGR	RO	HCHS	88.2	450	10	2.2
2021-10-05	BCL	PH	HCHS	93.3	446	23	5.2
2021-10-12	BCL	PH	HCHS	93.0	450	9	2.0
2021-10-15	CGR	RO	HCHS	95.0	450	24	5.3

Date	Site	Route	Species	Mean Length (mm)	Released	Recaptured	Efficiency (%)
2021-10-25	BCL	PH	HCHS	97.5	450	60	13.3
2021-11-09	BCL	PH	HCHS	106.0	450	14	3.1
2021-11-05	CGR	PH	HCHS	101.5	450	15	3.3
2021-11-01	CGR	RO	HCHS	98.1	451	25	5.5

South Fork McKenzie - Cougar Dam

Target Species

Sampling below Cougar dam from 2021-11-01 to 2021-11-15 (14 days) resulted in the capture of 926 juvenile Chinook salmon. Table 4 summarizes the catch of juvenile Chinook salmon at the Cougar site. Figure 2 illustrates the length distribution of juvenile Chinook salmon caught at the Cougar site to date.

Table 4:Descriptive statistics of target species captured below Cougar dam.

					Lengths (mm)				Weights (g)			
Site	Route	Species	Life Stage	n	Min	Max	Mean	S.D.	Min	Max	Mean	S.D.
Cougar (Reporting Period)	Powerhouse	CHS	PARR	1	85	85	85.0	NA	6.2	6.2	6.2	NA
		CHS	SMOLT	18	110	223	129.8	26.4	13.5	112.9	26.3	23.1
	Regulating Outlet	CHS	PARR	7	82	98	88.9	5.6	5.6	9.5	7.6	1.4
		CHS	SMOLT	900	81	239	123.6	19.3	5.5	135.5	21.5	14.1
Cougar (Total)	Powerhouse	CHS	ADULT	3								
		CHS	FRY	61	33	57	39.7	6.8				
		CHS	PARR	123	48	177	86.2	16.4	1.5	54.1	8.3	5.4
		CHS	SMOLT	169	84	223	126.9	21.5	5.6	112.9	23.4	13.9
	Regulating Outlet	CHS	FRY	3	36	45	42.0	5.2				
		CHS	PARR	45	79	108	91.9	7.1	5.3	13.5	8.5	2.1
		CHS	SMOLT	2,741	10	297	133.6	29.5	3.5	322.1	29.1	24.2

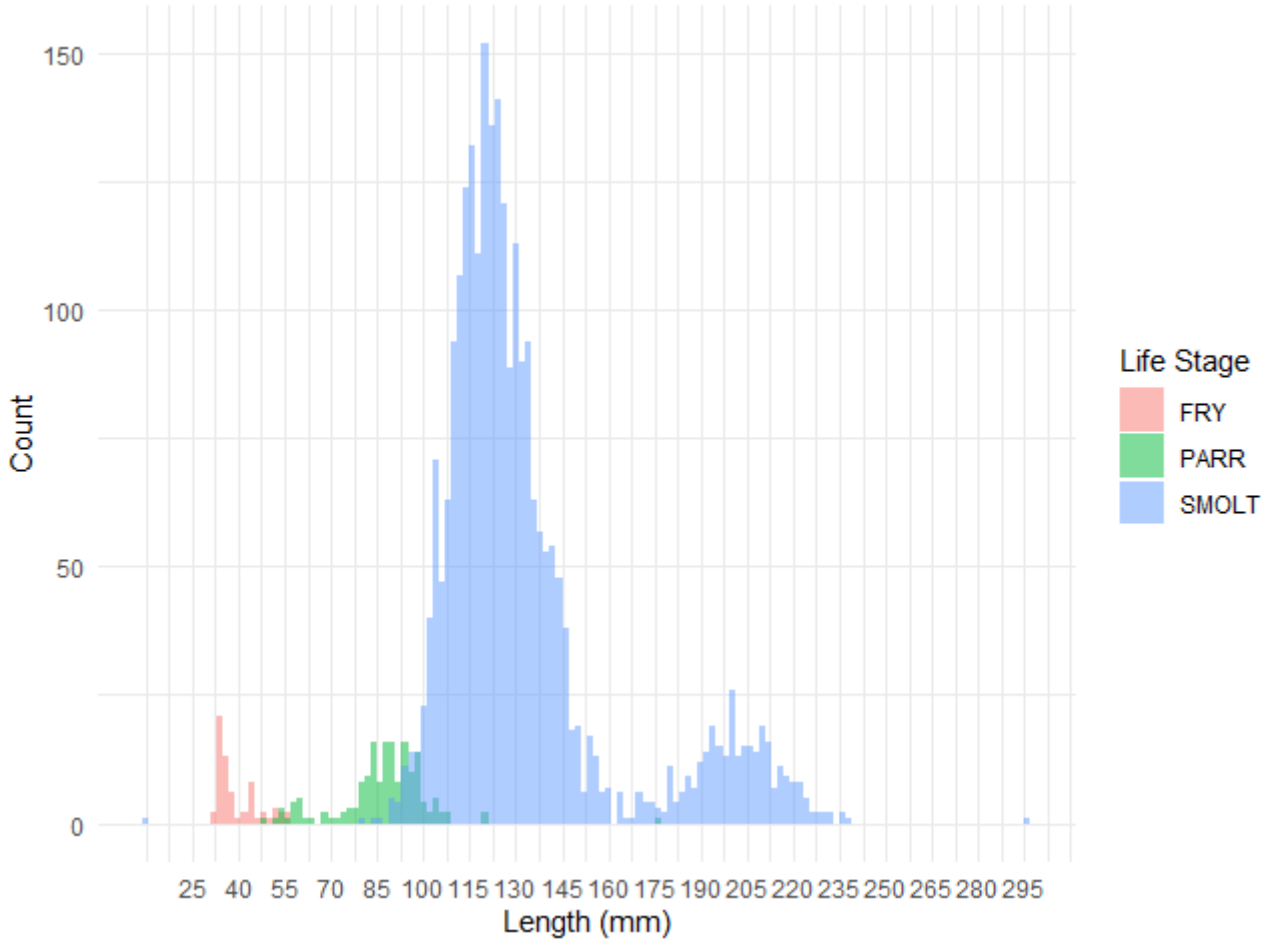

Figure 2: Length frequency of juvenile Chinook salmon captured at the Cougar Dam site.

Dam Operations and Trap Effort

Dam operations data were downloaded from the USACE Dataquery 2.0 website. Table 5 presents the range of total discharge (outflow), powerhouse discharge, spill discharge and forebay elevation for the Cougar Dam project during the current two-week reporting period. Forebay elevation, outflow, powerhouse discharge and spill discharge are plotted along with daily catch of juvenile Chinook salmon and trapping effort in Figure 3. Trapping effort was calculated as cone rotations since the trap was last checked divided by the number of minutes expired since the trap was last checked.

Table 5: Range of total outflow (cfs), powerhouse discharge (cfs), spill discharge (cfs) and forebay elevation (ft) at Cougar dam during the current reporting period. PH, SP, and FB stand for powerhouse, spill and forebay elevation, respectively.

Site	outflow_min	outflow_max	PH_min	PH_max	SP_min	SP_max	FB_min	FB_max
Cougar	410	1,070	0	900	0	660	1,500.03	1,514.1

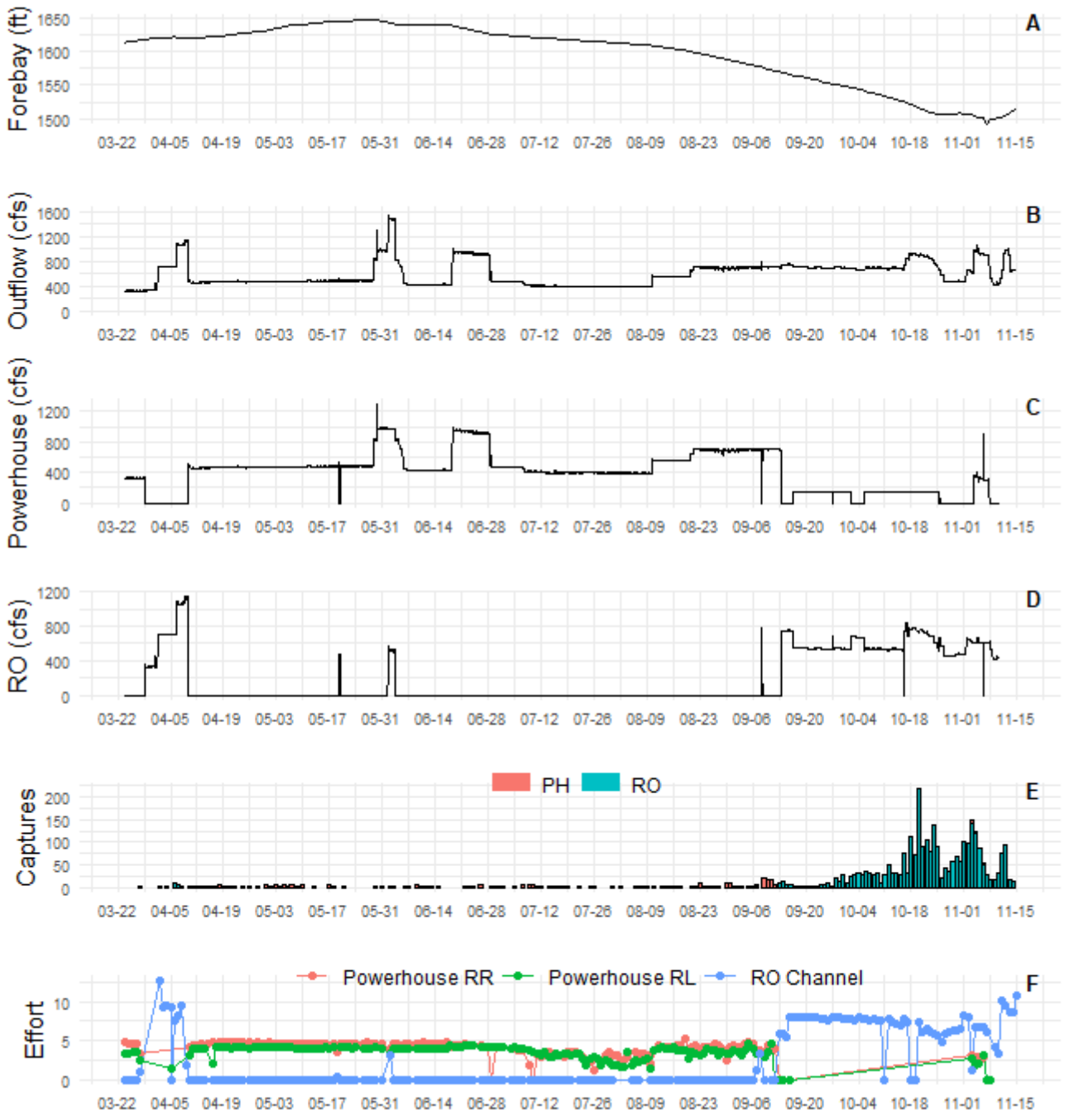

Figure 3: Forebay elevation (panel A), total outflow (panel B), powerhouse flow (panel C), spill (panel D), captured Chinook salmon (panel E), and trapping effort (panel F) below Cougar Dam. Trapping effort is calculated as trap revolutions divided by the number of minutes elapsed since the trap was last checked.RL and RR stand for river left and river right, respectively.

Injuries and Copepod Infection

Table 6 summarizes the type and number of injuries observed at the Cougar site.

Table 6: Injuries sustained by juvenile Chinook salmon captured at the Cougar site. BVT = bloody vent, DS<20 = descaling less than 20%,DS>20 = descaling greater than 20%, COP = copepods, EYB = bloody eye, FID = fin damage, FUN = fungus, HBP = hole behind pectoral fin, MORT = mortality, OPD = opercle damage, POP = pop eye, TEA = body injury (tears, scrapes, etc.)

Site	Route	Life Stage	Injury Code	Reporting Period Injuries	Total Injuries
Cougar	Powerhouse	FRY	TEA	0	2
		PARR	FID	1	3
			COP	0	25
			EYB	0	1
			MORT	0	2
			TEA	0	3
		SMOLT	COP	16	129
			DS<20	6	7
			OPD	3	3
			BVT	2	2
			DS>20	2	3
			FID	2	2
			MORT	2	4
			BO	1	1
			HBP	1	1
			TEA	1	3
			EYB	0	1
			POP	0	1
	Regulating Outlet	PARR	DS<20	6	18
			COP	2	29
			FID	1	5
			OPD	1	2
			DS>20	0	3
			EYB	0	3
			FUN	0	1
			HBP	0	2

Site	Route	Life Stage	Injury Code	Reporting Period Injuries	Total Injuries
			MORT	0	3
			TEA	0	1
			COP	525	2,043
			DS<20	393	1,255
			OPD	162	213
			BRU	133	164
			FID	93	257
			DS>20	87	438
			TEA	56	102
			MORT	24	258
			HBV	18	24
		SMOLT	EYB	17	76
			HBP	12	32
			FVB	7	26
			POP	4	11
			GBD	2	2
			FUN	1	1
			HPV	1	1
			BVT	0	3
			BYB	0	1

Table 7 summarizes copepod infestation of juvenile Chinook salmon captured at the Cougar Dam site.

Table 7: Copepod infestation of target species captured at the Cougar site. Infestations are the number of fish with copepods, Rate is calculated as the number of fish with copepods divided by total catch, Gill Rate is calculated as the number of fish with copepods in their gills divided by total catch and Gill Severity is calculated as the total number of copepods observed in the gills divided by the number of fish with copepods observed in their gills (mean number of gill copepods). Fin metrics were calculated using the same method, but with copepods observed on the fins.

		Reporting Period						Overall					
Site	Species	Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity	Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity
Cougar	CHS	610	0.66	0.63	3.77	0.37	1.7	2,440	0.78	0.74	5.39	0.44	2.12

24-Hour Post Collection Holding Trial

The 24-Hour Post Collection Holding Trial at Cougar Dam began the week of 2021-09-19. The first 50 natural origin fish caught each week are held for 24 hours and examined for mortalities. Table A provides a summary of preliminary results from the holding trial. Table B summarizes standard metrics of the fish used for each trial.

Table A. 24-Hour Post Collection Trial: total number of "subjects", mortalities, and mortality rate by week.

Week	total subjects	mortalities	mortality rate
9/19/2021	13	2	0.15
9/26/2021	47	13	0.28
10/3/2021	87	32	0.37
10/10/2021	50	11	0.22
10/17/2021	50	14	0.28
10/24/2021	50	17	0.34
10/31/2021	50	12	0.24
11/07/2021	50	6	0.12

Table B. 24-Hour Post Collection Trial: mean subject length (Mean Sub. Length), mean subject fin copepods (Mean Sub. Fins) and mean subject gills copepods (Mean Sub. Gill) compared to the same metrics for mortalities (shaded).

Week	Mean Sub. Length	Mean Mort Len	Mean Sub. Fins	Mean Mort Fins	Mean Sub. Gill	Mean Mort Gill
9/19/21	180	140	1.2	2	10.8	1.5
9/26/21	149	149	1	1.5	6.8	7.5
10/3/21	147	140	1.3	1.5	7.2	8.7
10/10/21	148	131	1.1	1.4	8.7	6.3
10/17/2021	140	151	1.9	3	7	8
10/24/2021	130	131	1	1.1	4.8	6.3
10/31/2021	124	114	0.9	1.2	3.1	3.7
11/07/2021	121	119	1.2	2.5	3.3	5.3

Non-Target Species

Non-target species that have been captured at the Cougar Dam site are summarized in Table 8.

Table 8: Non-target species captured at the Cougar site. BLG = bluegill, COT = sculpin, CUT = cutthroat trout, LSS = large-scale sucker, LND = long nose dace, MWF = mountain whitefish, RBT = rainbow trout, SMB = smallmouth bass, Newt = rough-skinned newt.

Site	Species	Reporting Period Catch	Total Catch
Cougar	LSS	0	452
	COT	8	140
	RBT	2	79
	LND	0	54
	CUT	1	36
	MWF	14	32
	BLG	0	4
	SMB	0	4
	LMB	0	2
	LPY	0	1
	Newt	0	1

North Santiam - Big Cliff Dam

Target Species

Sampling below Big Cliff dam from 2021-11-01 to 2021-11-15 resulted in the capture of 52 juvenile Chinook salmon and 2 jacks. Table 9 summarizes the catch of juvenile Chinook salmon at the Big Cliff site. Figure 4 illustrates the length distribution of juvenile Chinook salmon captured at the Big Cliff site to date.

Table 9: Descriptive statistics of target species captured at the Big Cliff dam site.

				Lengths (mm)				Weights (g)			
Site	Species	Life Stage	n	Min	Max	Mean	S.D.	Min	Max	Mean	S.D.
Big Cliff (Reporting Period)	CHS	ADULT	2	NA	NA	NA	NA	NA	NA	NA	NA
	CHS	SMOLT	52	117	261	169.9	30.8	15.0	197.2	61.6	39.6
Big Cliff (Total)	CHS	ADULT	4	NA	NA`	NA	NA	NA	NA		NA
	CHS	FRY	1	43	43	43.0		Inf	-Inf		
	CHS	PARR	11	56	102	81.6	15.5	3.2	11.8	7.6	2.9
	CHS	SMOLT	599	80	305	136.7	26.8	4.5	197.2	31.2	22.8

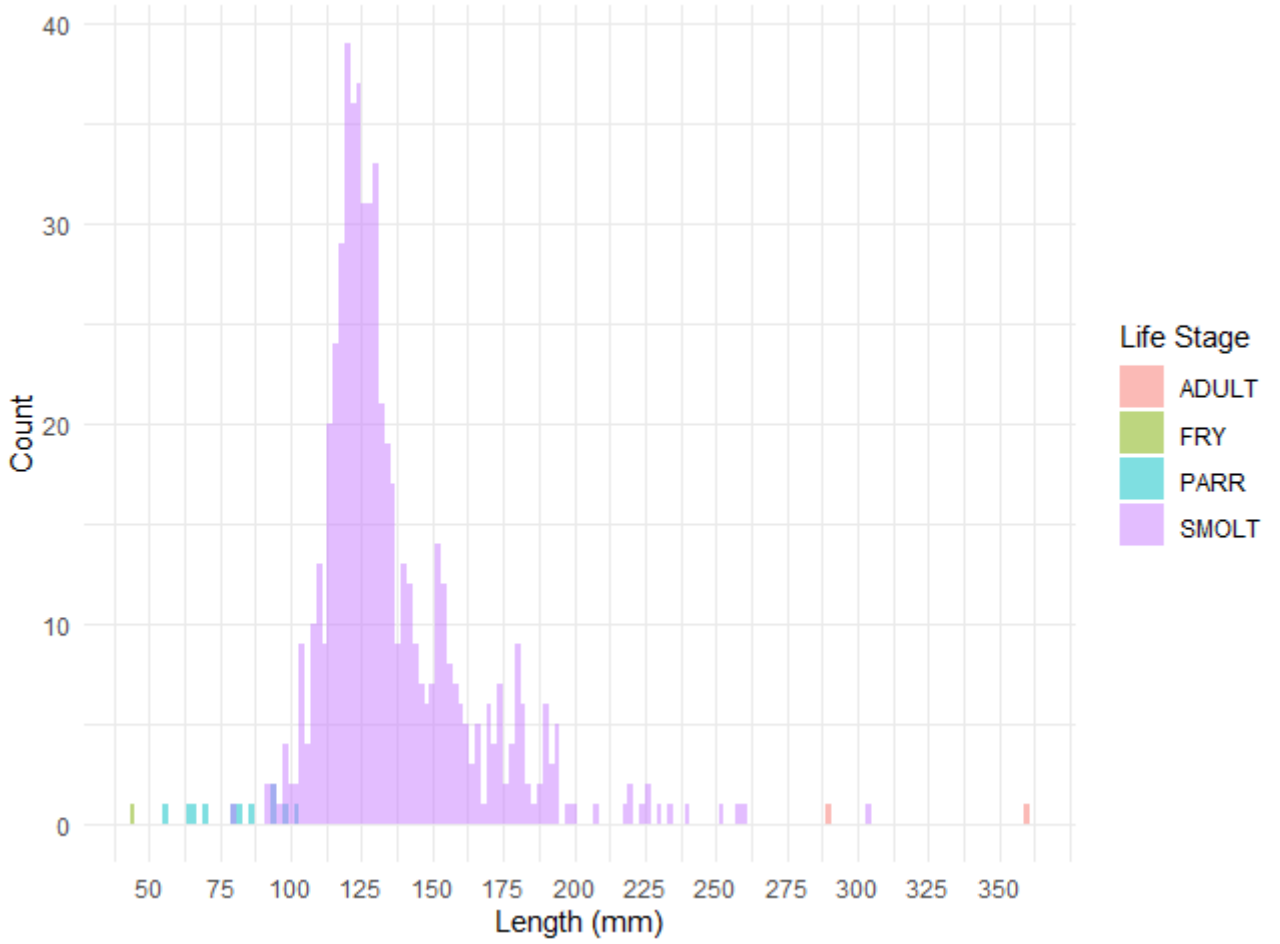

Figure 4: Length distribution of juvenile Chinook salmon captured at the Big Cliff Dam site.

Dam Operations and Trap Effort

Dam operations data were downloaded from the USACE Dataquery 2.0 website. Table 10 presents the range of total discharge (outflow), powerhouse discharge, spill discharge and forebay elevation for the Big Cliff dam project during the current two-week reporting period. Forebay elevation, outflow, powerhouse discharge and spill discharge are plotted along with daily catch of juvenile Chinook salmon and trapping effort in Figure 5. Trapping effort was calculated as cone rotations since the trap was last checked divided by the number of minutes expired since the trap was last checked. Table 11 and Figure 6 present dam operations for Detroit along with catch and effort below Big Cliff.

Table 10 : Range of total outflow (cfs), powerhouse discharge (cfs), spill discharge (cfs) and forebay elevation (ft) at Big Cliff dam during the current reporting period. PH, SP, and FB stand for powerhouse, spill and forebay elevation, respectively.

Site	outflow_min	outflow_max	PH_min	PH_max	SP_min	SP_max	FB_min	FB_max
Big Cliff	1,240	3,000	1,240	1,340	0	0	1,196.44	1,199.78

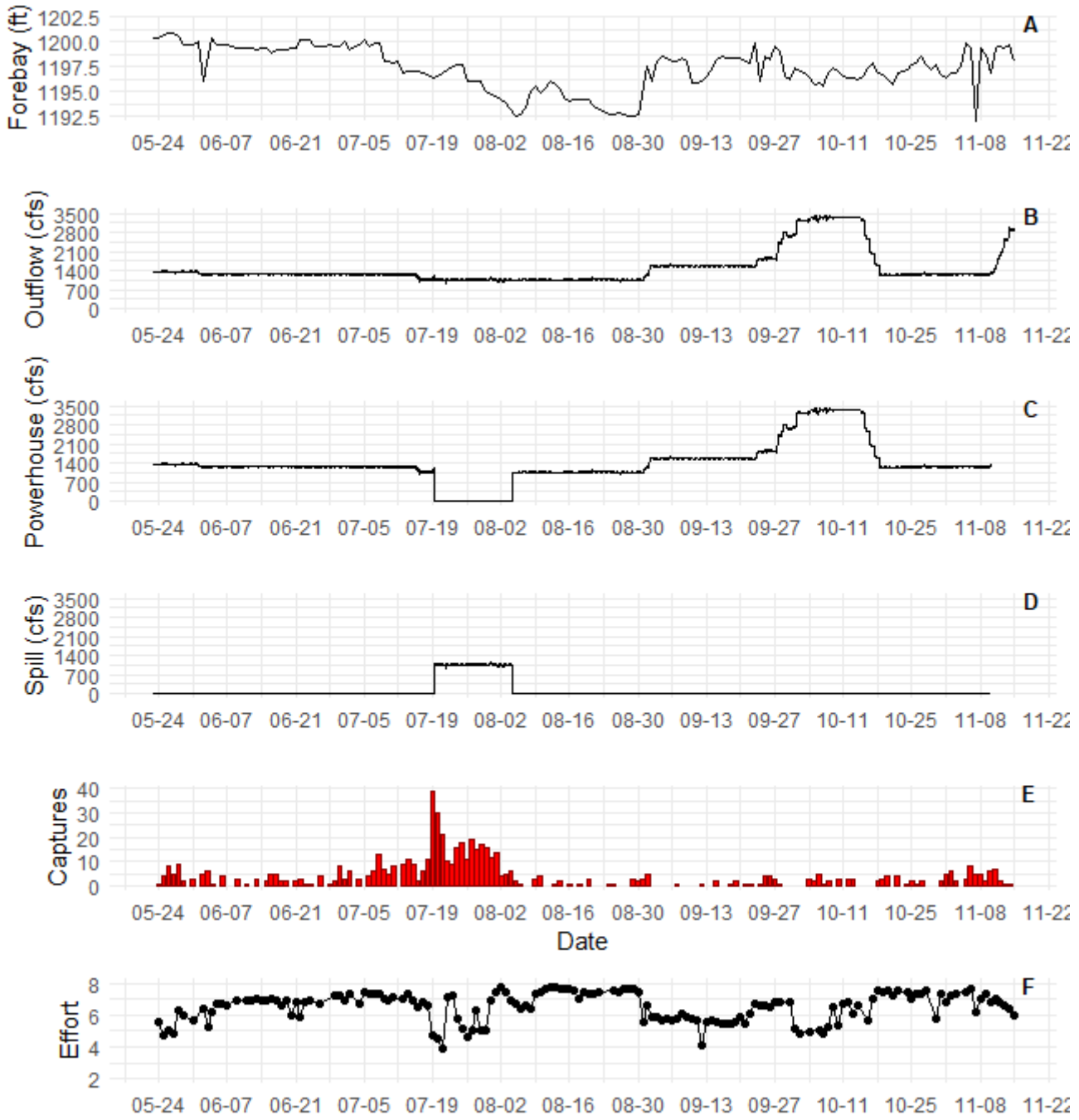

Figure 5: Forebay elevation (panel A), total outflow (panel B), powerhouse flow (panel C), spill (panel D), captured Chinook salmon (panel E), and trapping effort (panel F) below Big Cliff Dam. Trapping effort is calculated as trap revolutions divided by the number of minutes elapsed since the trap was last checked. RL and RR stand for river left and river right, respectively.

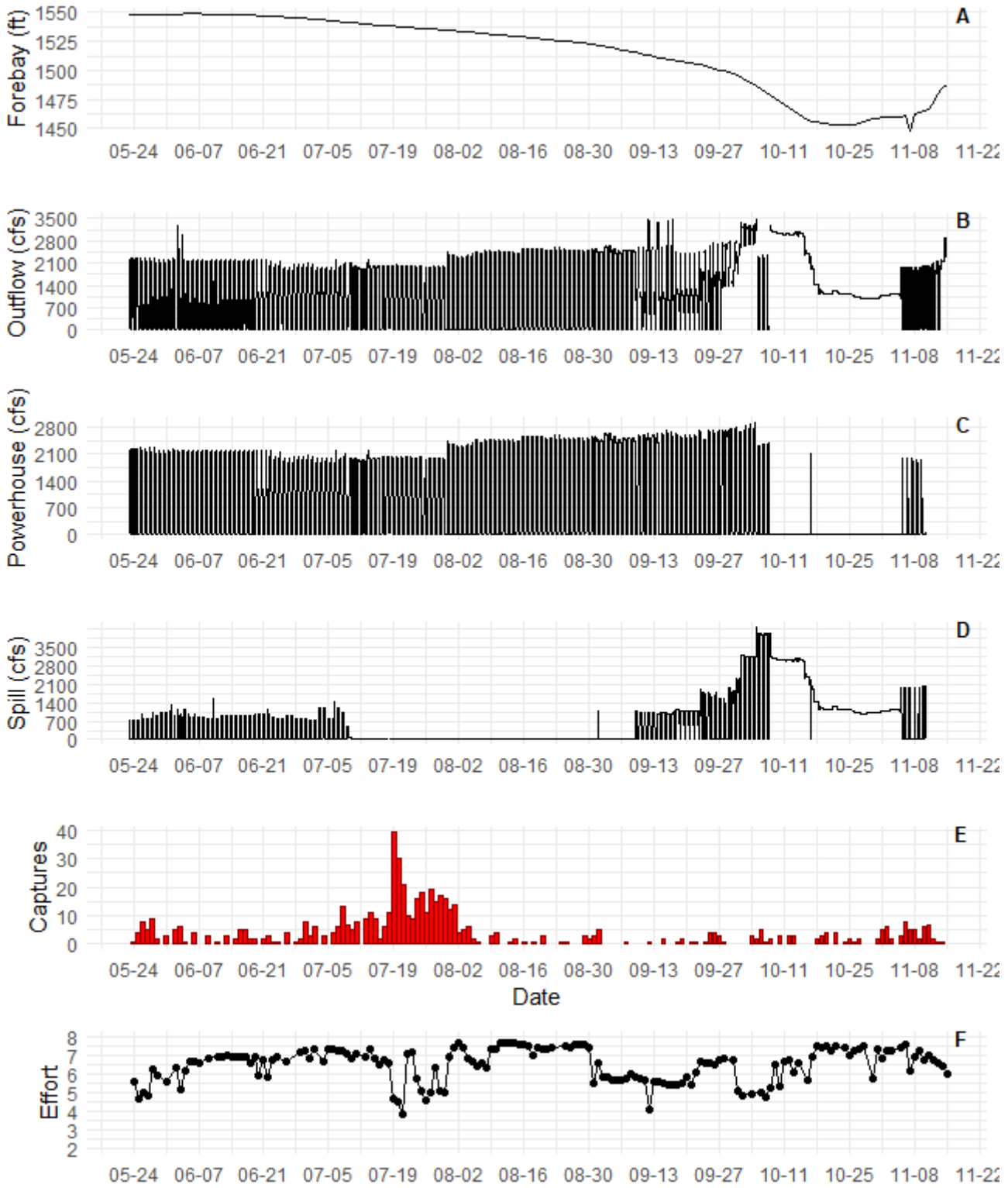

Figure 6: Forebay elevation (panel A), total outflow (panel B), powerhouse flow (panel C), and spill (panel D) at Detroit dam along with juvenile Chinook salmon catch (panel E) and trapping effort (panel F) below Big Cliff Dam. Trapping

effort is calculated as trap revolutions divided by the number of minutes elapsed since the trap was last checked.RL and RR stand for river left and river right, respectively.

Injuries and Copepod Infection

Table 11 summarizes the type and number of injuries observed at the Big Cliff site.

Table 11: Injuries sustained by target species captured at the Big Cliff site.BO = body only, COP = copepods, DS<20 = descaling less than 20%, DS>20 = descaling greater than 20%, EYB = bloody eye, FID = fin damage, OPD = opercle damage, POP = pop eye, TEA = body injury (tears, scrapes, etc.)

Site	Species	Life Stage	Injury Code	Reporting Period Injuries	Total Injuries
Big Cliff	CHS	ADULT	MORT	2	4
			BO	1	2
			FID	1	1
			FUN	1	1
			PRD	0	1
		PARR	DS>20	0	1
		SMOLT	COP	28	468
			DS<20	24	83
			DS>20	15	36
			FID	15	23
			BRU	13	16
			MORT	13	48
			OPD	13	20
			TEA	6	20
			FVB	4	5
			EYB	3	14
			BVT	1	1
			FUN	1	5
			HIN	1	1
			BO	0	5
			POP	0	4
			PRD	0	1

Table 12 summarizes copepod infestation of juvenile Chinook salmon captured at the Cougar Dam site.

Table 12: Copepod infestation of target species captured at the Cougar site. Infestations are the number of fish with copepods, Rate is calculated as the number of fish with copepods divided by total catch, Gill Rate is calculated as the number of fish with copepods in their gills divided by total catch and Gill Severity is calculated as the total number of copepods observed in the gills divided by the number of fish with copepods observed in their gills (mean number of gill copepods). Fin metrics were calculated using the same method, but with copepods observed on the fins.

		Reporting Period						Overall					
Site	Species	Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity	Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity
Big Cliff	CHS	40	0.74	0.72	5.33	0.2	1.36	489	0.8	0.72	4.1	0.48	1.93

Non-Target Species

Table 13 summarizes the catch of non-target species at the Big Cliff site.

Table 13: Non-target species captured at the Big Cliff site. BLG = Bluegill, COT = Sculpin spp., HRBT = hatchery rainbow trout, KOK = kokanee, PKS = pumpkinseed, RBT = rainbow trout

Site	Species	Reporting Period Catch	Total Catch
BigCliff	PKS	328	1,883
	RBT	2	95
	BLG	0	80
	HCS	0	9
	COT	0	3
	HRBT	0	3
	KOK	0	3
	MWF	1	1

Issues Encountered

We are unable to access the road that goes to the peninsula that separates the powerhouse channel from the RO channel. Without access to that road we are unable to release hatchery fish for trap efficiency trials.

Upcoming USACE Support Services

None.