

WILLAMETTE VALLEY FISH PASSAGE MONITORING VIA ROTARY SCREW TRAPS

Bi-Weekly Report: November 15, 2021 – November 29, 2021



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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

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 (CGR), and on the North Santiam river below Big Cliff dam (BCL). 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.

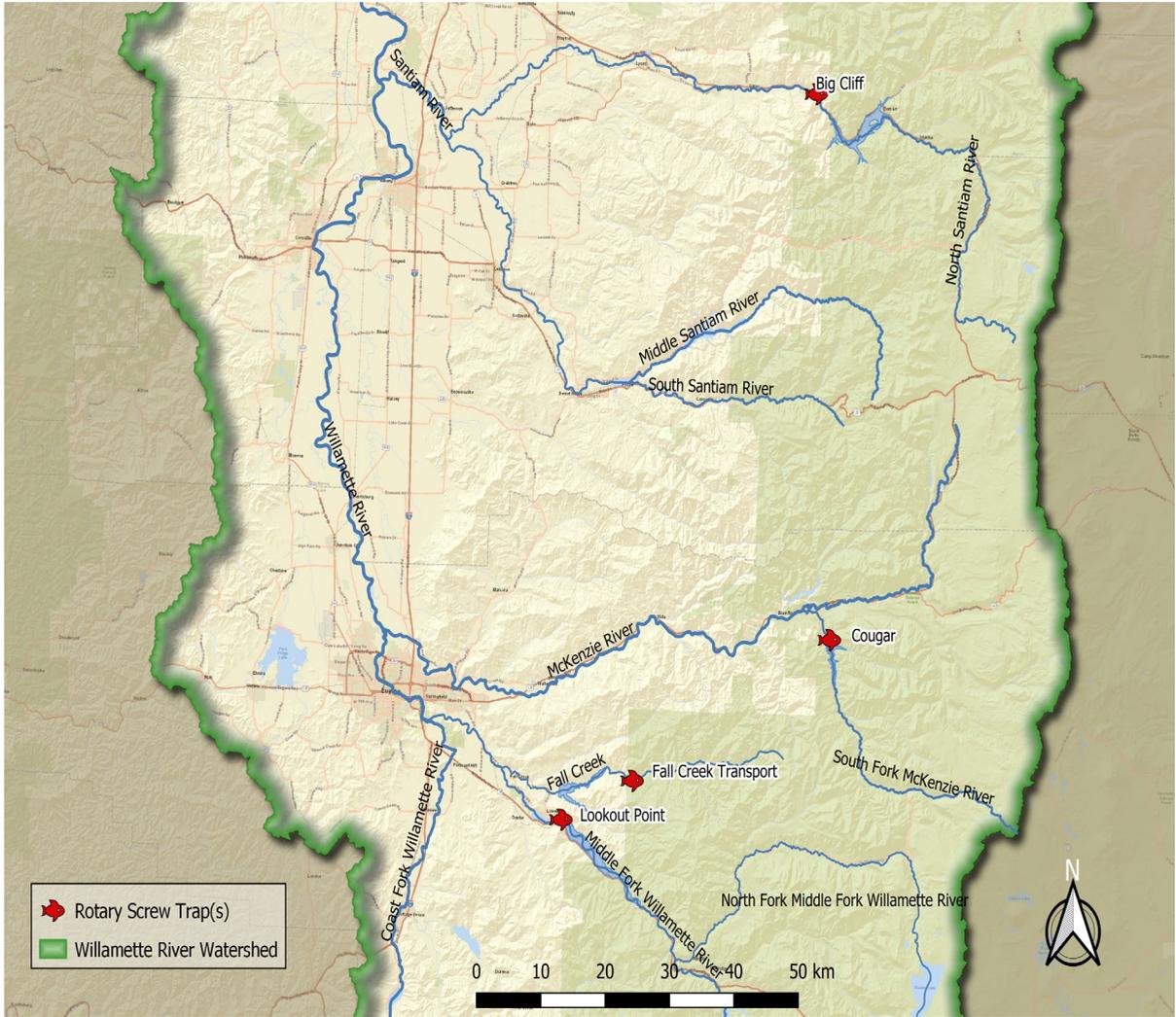


Figure 1: Sampling Locations

Table 1: Sampling Dates

Site	Total Sampling Period Start	Recent Sampling Period Start	Sampling Period End	Recent Days Sampled	Total Days Sampled
BCL	2021-05-22	2021-11-15	2021-11-29	14 days	191 days
CGR	2021-03-23	2021-11-15	2021-11-29	14 days	251 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
BCL	CHS	46	0	660	37
CGR	CHS	203	12	3,327	101

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
2021-10-25	BCL	PH	HCHS	97.5	450	60	13.3
2021-11-09	BCL	PH	HCHS	106.0	450	14	3.1

Date	Site	Route	Species	Mean Length (mm)	Released	Recaptured	Efficiency (%)
2021-11-05	CGR	PH	HCHS	101.5	450	15	3.3
2021-11-01	CGR	RO	HCHS	98.1	451	25	5.5
2021-11-24	CGR	RO	HCHS	105.8	450	34	7.6
2021-11-25	BCL	PH	HCHS	115.3	182	0	0.0

South Fork McKenzie - Cougar Dam

Target Species

Sampling below Cougar dam from 2021-11-15 to 2021-11-29 (14 days) resulted in the capture of 203 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 at the Cougar dam site.

Site	Route	Species	Life Stage	n	Lengths (mm)				Weights (g)			
					Min	Max	Mean	S.D.	Min	Max	Mean	S.D.
CGR (Reporting Period)	Regulating Outlet	CHS	PARR	17	69	98	87.5	7.0	4.7	9.5	7.2	1.4
		CHS	SMOLT	186	86	238	124.8	22.9	6.6	263.0	24.9	25.5
		CHS	ADULT	3	Inf	-Inf			Inf	-Inf		
CGR (Total)	Powerhouse	CHS	FRY	61	33	57	39.7	6.8	1.5	1.5	1.5	
		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	
	CHS	FRY	3	36	45	42.0	5.2	Inf	-Inf			
	Regulating Outlet	CHS	PARR	59	69	108	90.8	7.4	4.7	13.5	8.2	2.0
		CHS	SMOLT	2,909	10	297	133.1	29.2	3.5	322.1	28.9	24.4

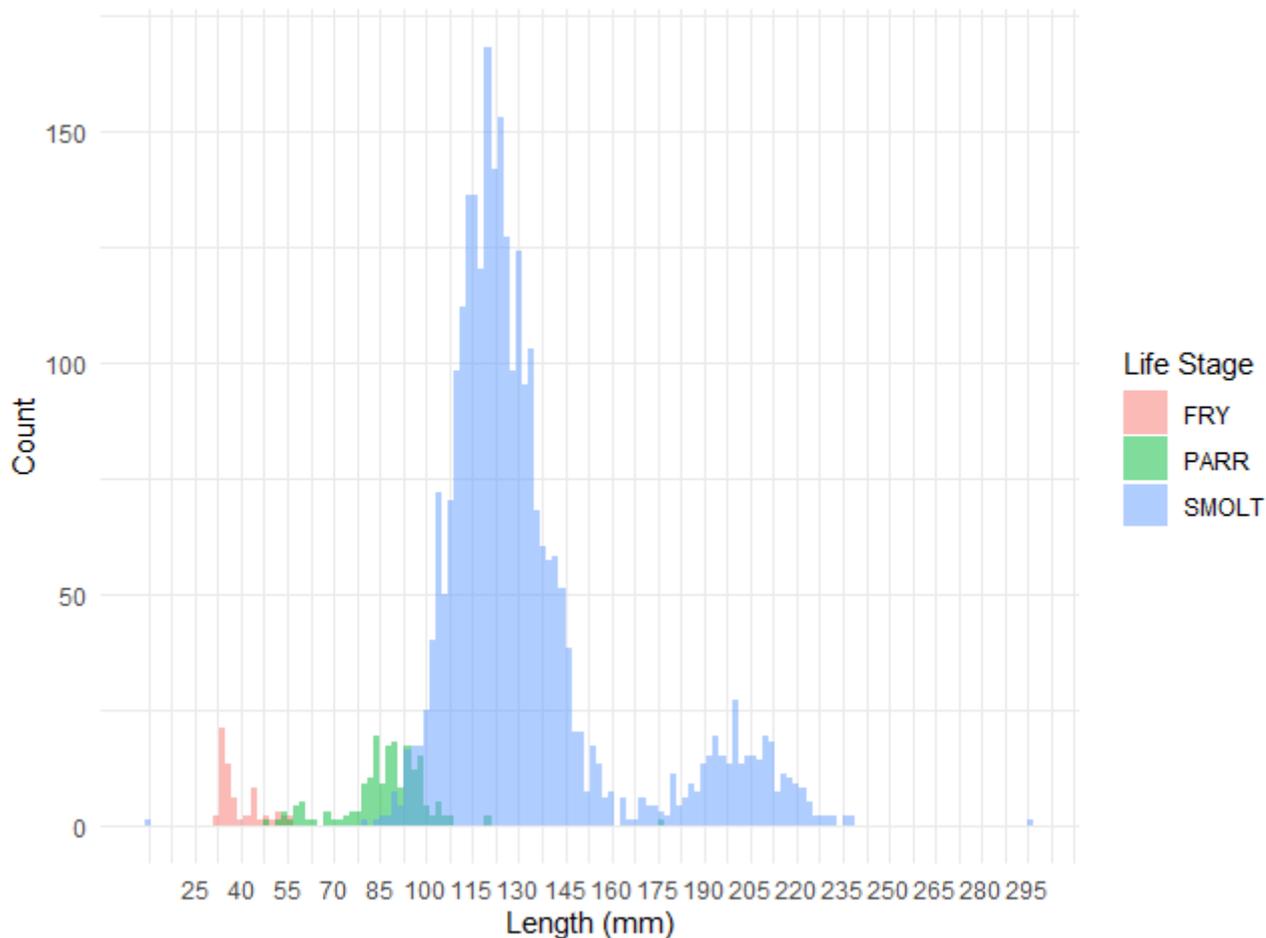


Figure 2: Length of juvenile Chinook salmon captured at the Cougar Dam site.

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
CGR	620	1,500	0	1,480	0	1,500	1,502.47	1,514.91

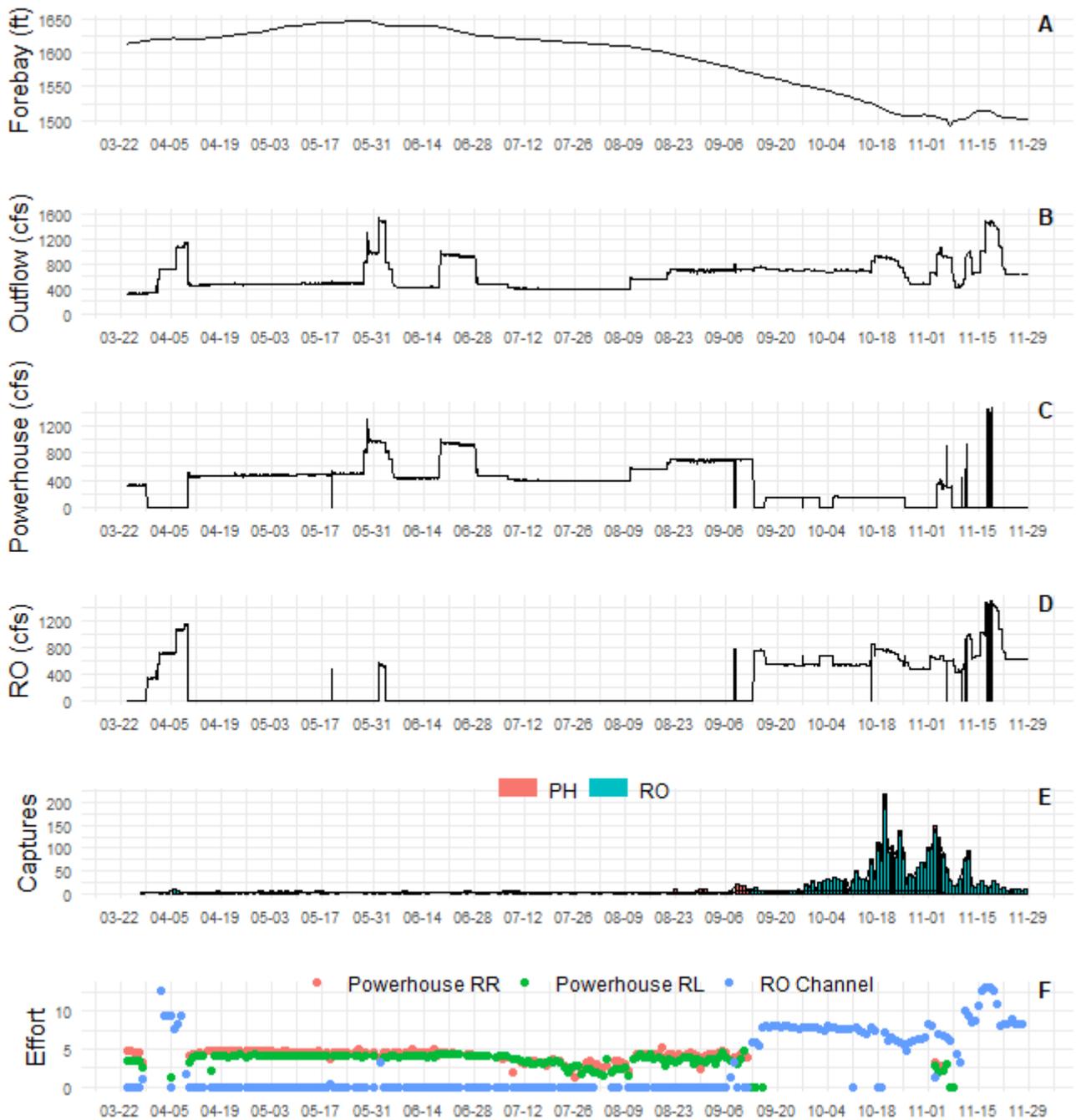


Figure 3: Forebay elevation (panel A), total outflow (panel B), powerhouse flow (panel C), spill (panel D), captured Chinook salmon (panel E), and trapping effort (panel F) below Cougar Dam. Trapping effort is calculated as trap revolutions divided by the number of minutes elapsed since the trap was 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	Species	Life Stage	Injury Code	Reporting Period Injuries	Total Injuries
	Powerhouse		FRY	TEA	0	2
	Powerhouse			COP	0	25
	Powerhouse			EYB	0	1
	Powerhouse		PARR	FID	0	3
	Powerhouse			MORT	0	2
	Powerhouse			TEA	0	3
	Powerhouse			BO	0	1
	Powerhouse			BVT	0	2
	Powerhouse			COP	0	129
	Powerhouse			DS<20	0	7
	Powerhouse			DS>20	0	3
CGR	Powerhouse	CHS	SMOLT	EYB	0	1
	Powerhouse			FID	0	2
	Powerhouse			HBP	0	1
	Powerhouse			MORT	0	4
	Powerhouse			OPD	0	3
	Powerhouse			POP	0	1
	Powerhouse			TEA	0	3
	Regulating Outlet			DS<20	13	29
	Regulating Outlet			DS>20	3	6
	Regulating Outlet		PARR	FID	3	7
	Regulating Outlet			EYB	2	5

Site	Route	Species	Life Stage	Injury Code	Reporting Period Injuries	Total Injuries
	Regulating Outlet			OPD	2	3
	Regulating Outlet			FVB	1	1
	Regulating Outlet			TEA	1	3
	Regulating Outlet			COP	0	30
	Regulating Outlet			FUN	0	1
	Regulating Outlet			HBP	0	2
	Regulating Outlet			MORT	0	3
	Regulating Outlet			COP	137	2,220
	Regulating Outlet			DS<20	121	1,395
	Regulating Outlet			OPD	53	260
	Regulating Outlet			BRU	40	197
	Regulating Outlet			DS>20	28	475
	Regulating Outlet		SMOLT	FID	27	286
	Regulating Outlet			HBP	12	45
	Regulating Outlet			EYB	10	84
	Regulating Outlet			TEA	9	116
	Regulating Outlet			GBD (10% OF DORSAL)	7	7

Site	Route	Species	Life Stage	Injury Code	Reporting Period Injuries	Total Injuries
	Regulating Outlet			HBV	6	31
	Regulating Outlet			HIN	4	4
	Regulating Outlet			FVB	3	31
	Regulating Outlet			MORT	3	262
	Regulating Outlet			FUN	2	2
	Regulating Outlet			GBD	2	4
	Regulating Outlet			BVT	1	4
	Regulating Outlet			GBD (10% OF VENTRAL FIN)	1	1
	Regulating Outlet			GBD (30% DORSAL)	1	1
	Regulating Outlet			GBD (30% OF DORSAL)	1	1
	Regulating Outlet			GBD (5% ON DORSAL)	1	1
	Regulating Outlet			HBA	1	1
	Regulating Outlet			POP	1	13
	Regulating Outlet			BYB	0	1
	Regulating Outlet			HPV	0	1
	Regulating Outlet			PRED	0	2

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.

Site	Species	Reporting Period						Overall					
		Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity	Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity
CGR	CHS	165	0.81	0.77	4.15	0.53	1.59	2,588	0.78	0.74	5.32	0.45	2.09

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
11/14/2021	50	2	0.04
11/21/2021	50	3	0.06

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
11/14/2021	113	132	.74	1	2.7	5.5
11/21/2021	122	119	.74	0	3.8	2.3

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
	LSS	0	452
	COT	0	140
	RBT	1	80
	LND	0	54
	CUT	0	36
Cougar	MWF	1	33
	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 2021-11-15 to 2021-11-29 (14 days) resulted in the capture of 46 juvenile Chinook salmon. 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.

Site	Species	Life Stage	n	Lengths (mm)				Weights (g)			
				Min	Max	Mean	S.D.	Min	Max	Mean	S.D.
BCL (Reporting Period)	CHS	SMOLT	46	91	282	172.0	40.1	8.7	266.2	66.3	51.6
	CHS	ADULT	6	253	360	291.0	48.7	180.5	495.4	288.0	145.1
BCL (Total)	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	642	80	305	138.7	28.3	4.5	266.2	33.0	25.3

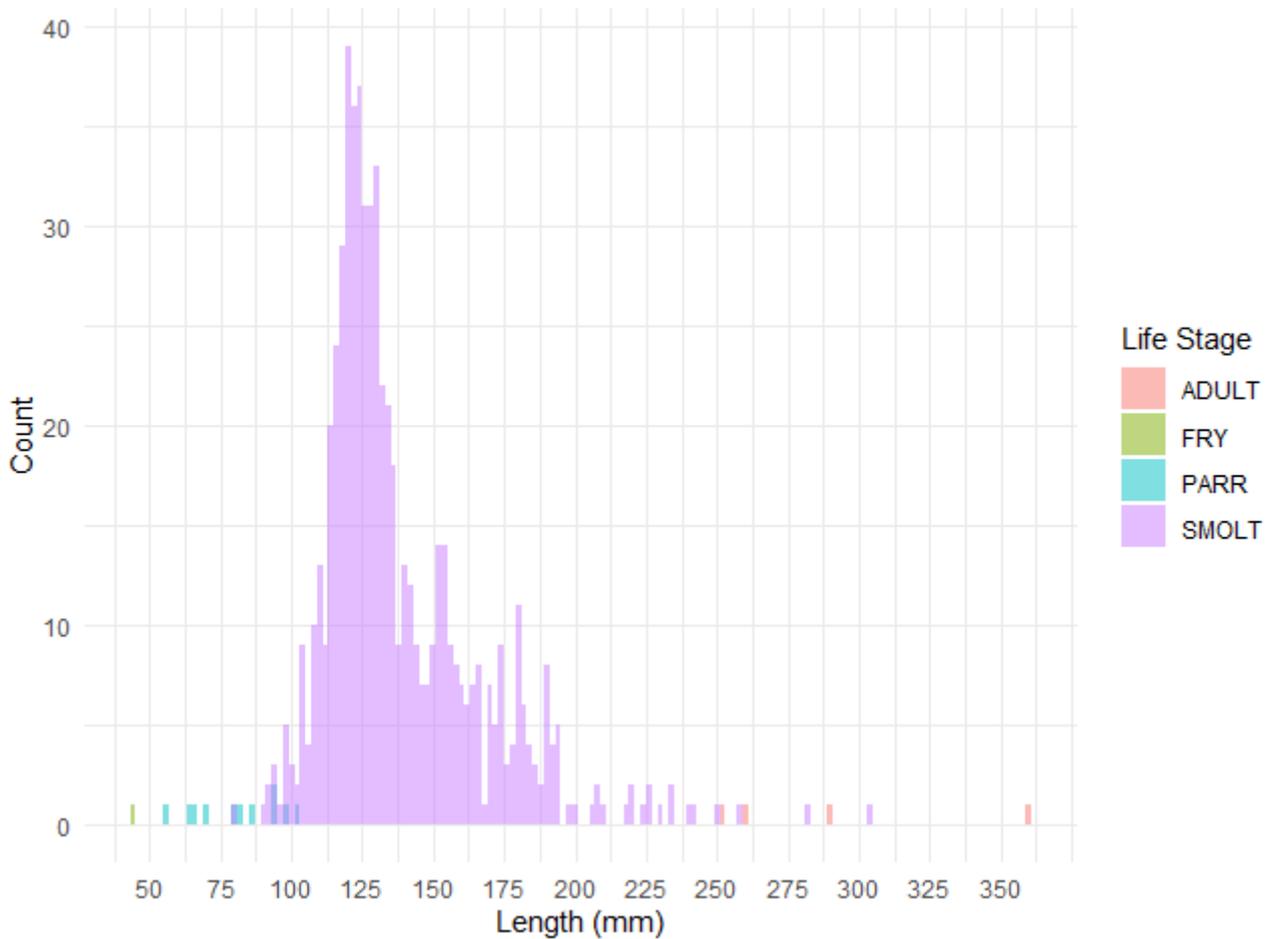


Figure 4: Length distribution of juvenile Chinook salmon captured at the Big Cliff Dam site.

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
BCL	2,890	6,070	2,800	4,020	0	2,080	1,191.75	1,199.7

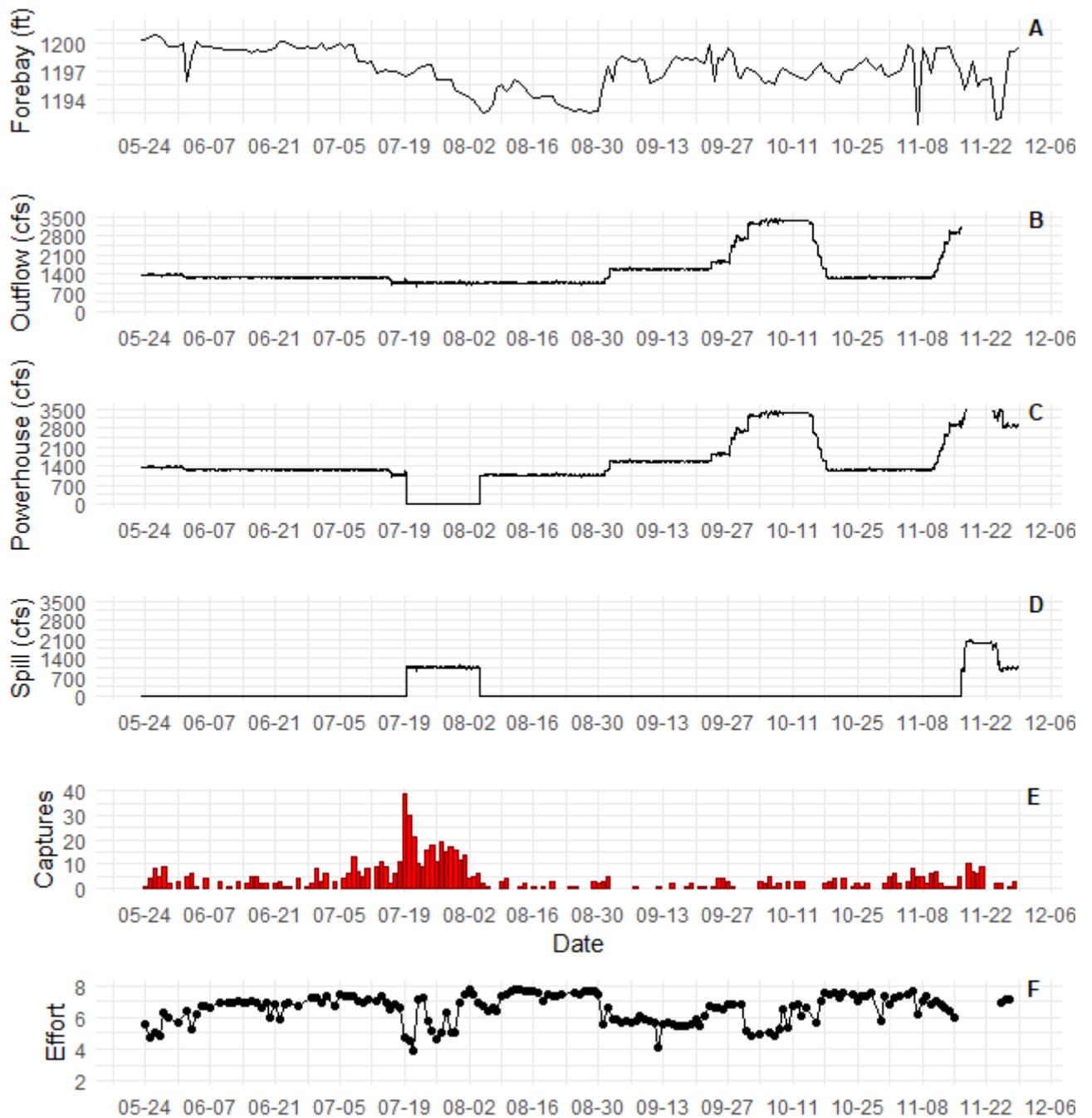


Figure 5: Forebay elevation (panel A), total outflow (panel B), powerhouse flow (panel C), spill (panel D), captured Chinook salmon (panel E), and trapping effort (panel F) below Big Cliff Dam. Trapping effort is calculated as trap revolutions divided by the number of minutes elapsed since the trap was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

Table 11: Range of total outflow (cfs), powerhouse discharge (cfs), spill discharge (cfs) and forebay elevation (ft) at Detroit 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
Detroit	2,180	6,460	0	2,940	0	4,430	1,456.72	1,488.54

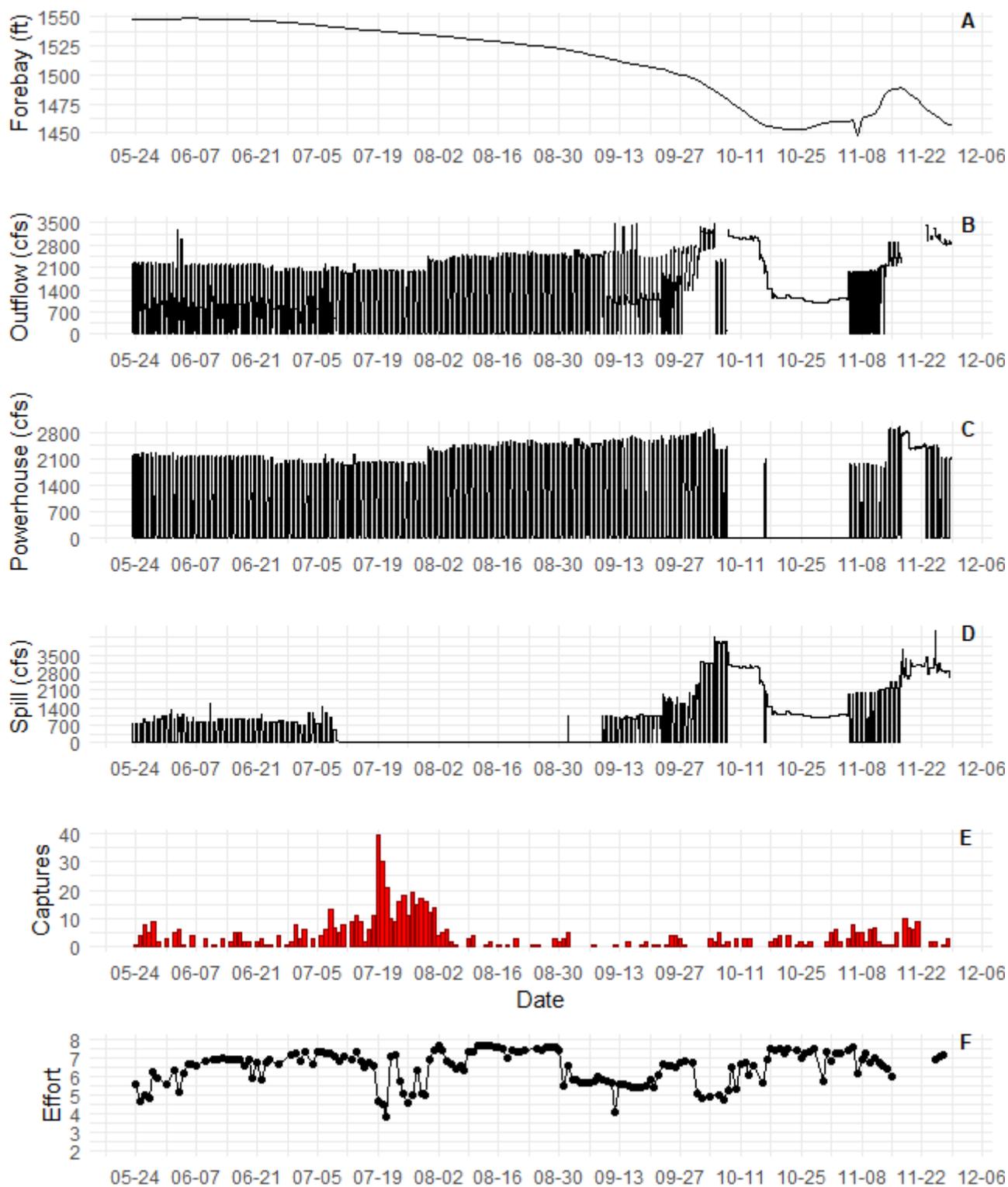


Figure 6: Forebay elevation (panel A), total outflow (panel B), powerhouse flow (panel C), and spill (panel D) at Detroit dam along with juvenile Chinook salmon catch (panel E) and trapping effort (panel F) below Big Cliff Dam. Trapping

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

Table 12: 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
			BO		0	2
			DS<20		0	1
			DS>20		0	1
		ADULT	FID		0	3
			FUN		0	1
			MORT		0	5
			PRD		0	1
			TEA		0	1
		PARR	DS>20		0	1
			COP		26	494
BCL	CHS		DS<20		21	103
			DS>20		18	52
			BRU		12	27
			TEA		11	29
			FID		7	28
		SMOLT	MORT		6	53
			OPD		6	26
			EYB		2	16
			BVT		1	2
			FVB		1	6
			HID		1	1
			BO		0	5

Site	Species	Life Stage	Injury Code	Reporting Period Injuries	Total Injuries
			FUN	0	5
			HIN	0	1
			POP	0	4
			PRD	0	1

Table 13 summarizes copepod infestation of juvenile Chinook salmon captured at the Cougar Dam site.

Table 13: 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.

Site	Species	Reporting Period						Overall					
		Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity	Infections	Rate	Gill Rate	Gill Severity	Fin Rate	Fin Severity
BCL	CHS	32	0.7	0.7	6.81	0.3	2.21	522	0.79	0.72	4.28	0.47	1.94

Non-Target Species

Table 14 summarizes the catch of non-target species at the Big Cliff site.

Table 14: 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
	PKS	215	2,083
	RBT	0	95
	BLG	0	80
BCL	KOK	2	5
	COT	0	3
	HRBT	0	3
	MWF	1	1

Issues Encountered

We did not sample at Big Cliff from 11-22-2021 – 11-24-2021 due to unsafe conditions caused by high discharge.

Upcoming USACE Support Services

None.