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Report Period: December 16 to December 31, 2021
Report No.: 2021 Willamette RST Bi-Weekly Report 12/16 – 12/31 by EAS

Re: WILLAMETTE VALLEY FISH PASSAGE MONITORING VIA ROTARY SCREW TRAPS

Project Schedule

Table 1. Project Schedule

| Site | Task | Start | End | Days |
|------------------------|--|----------|----------|------|
| Hills Creek RO and PWR | Deployment | 10/12/21 | 10/12/21 | 1 |
| Hills Creek RO | Operation | 10/21/21 | 3/15/22 | 146 |
| Hills Creek PWR | Operation | 10/23/21 | 3/15/22 | 144 |
| Hills Creek | Trap Efficiency Release (1,200 fish, 600 per route) ^a | 12/13/21 | 12/13/21 | 1 |
| Cougar Dam RST | Operation | 12/01/21 | 12/31/22 | 396 |
| Big Cliff Dam RST | Operation | 12/01/21 | 2/15/22 | 292 |
| Big Cliff Dam RST | Operation | 3/15/22 | 10/15/22 | |

^a Tentative schedule of first trap release.

Summary of Rotary Screw Trap Data

Rotary screw traps (RSTs) were operated at three locations in the southern Willamette river watershed: on the Middle Fork Willamette River below Hills Creek Dam (Hills Creek), the South Fork McKenzie river below Cougar Dam (Cougar Dam), and on the North Santiam River below Big Cliff Dam (Big Cliff). The locations of the RST's are depicted in Figures 1, 2 and 3 respectively. Sampling sites generally monitor individual routes for fish passage at the dams, including powerhouse (PWR) and regulating outlets (RO). Sampling began at the Hills Creek site on October 21, 2021, and at the Cougar and Big Cliff sites on December 1, 2021. Sampling dates and catch summaries are provided in Tables 2 and 3, respectively.



Figure 1. Hills Creek Dam RST Locations



Figure 2. Cougar Dam RST Locations



Figure 3. Big Cliff RST Location

Table 2. Sampling Dates for Reporting Period

| Site | Total Sampling Period Start | Current Reporting Period Start | Current Reporting Period End | Days Sampled This Period | Total Days Sampled |
|-----------------|-----------------------------|--------------------------------|------------------------------|--------------------------|--------------------|
| Hills Creek RO | 10/21/21 | 12/16/21 | 12/31/21 | 15 days | 61 days |
| Hills Creek PWR | 10/21/21 | 12/16/21 | 12/31/21 | 15 days | 61 days |
| Cougar RO | 12/1/21 | 12/16/21 | 12/31/21 | 15 days | 30 days |
| Cougar PWR | 12/1/21 | 12/16/21 | 12/31/21 | 15 days | 30 days |
| Big Cliff | 12/1/21 | 12/16/21 | 12/31/21 | 15 days | 30 days |

Table 3. Willamette Valley Rotary Screw Trap Monitoring Catch Summary

| Site | Species | Catch (Reporting Period) | Recaptures (Reporting Period) | Total Catch | Total Recaptures |
|-------------|---------|--------------------------|-------------------------------|-------------|------------------|
| Hills Creek | CHS | 19 | 0 | 72 | 0 |
| Cougar | CHS | 6 | 0 | 24 | 0 |
| Big Cliff | CHS | 46 | 39 | 56 | 39 |

Middle Fork Willamette – Hills Creek Dam

Target Species

This reporting period began on December 16 and ended on December 31. A total of 19 Chinook salmon (CHS) were captured during the 15-day sampling period (Figure 4). Sampling durations were 87% for both RO RST and Powerhouse RST, the traps were raised and not sampling for 2 days due to inclement weather. Table 4 provides life stage, length, and weight data for all Chinook salmon that have been caught at the Hills Creek site to-date and Figure 5 shows length frequency data to-date.

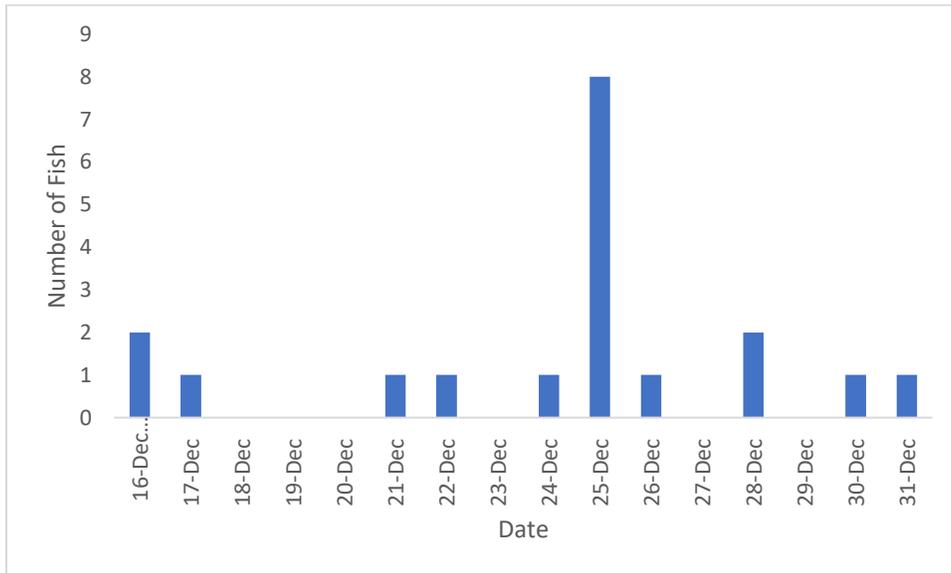


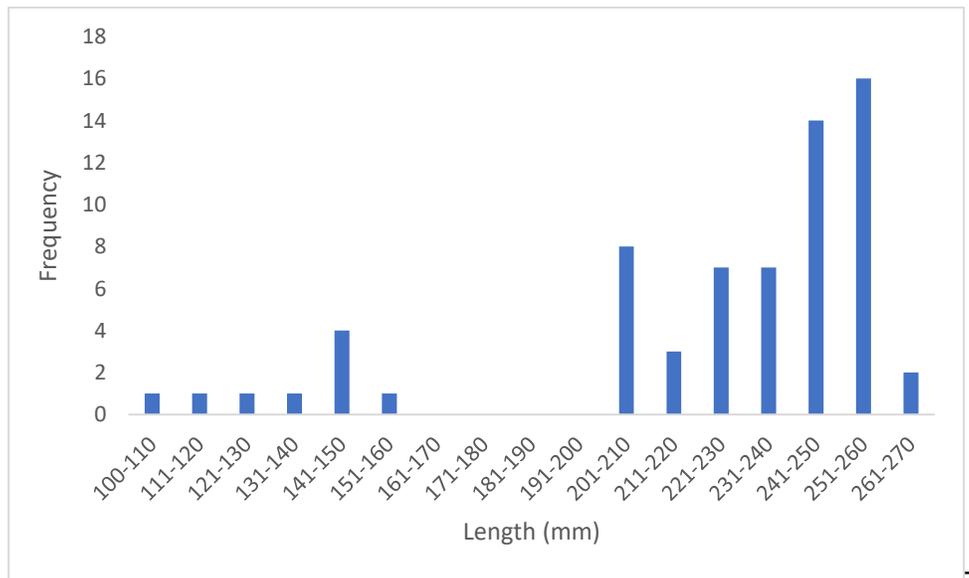
Figure 4. Chinook Captured Per Day 12/16/2021 to 12/31/2021 (Hills Creek)

Table 4. Descriptive Statistics of Target Species Captured at Hills Creek Dam Season To-Date and for the Reporting Period

| To-Date | | | | | | | | | | |
|-------------|-------|---------|------------|-----------|--------------|-------|-------|-------------|-------|-------|
| Site | Route | Species | Life stage | Collected | Length (mm)* | | | Weight (g)* | | |
| | | | | | Min | Max | Mean | Min | Max | Mean |
| Hills Creek | RO | CHS | Smolt | 26 | 143 | 264 | 230.2 | 107.8 | 192.3 | 159.3 |
| | | CHS | Parr | 3 | 102 | 141 | 123 | 10.3 | 23.4 | 17.3 |
| Hills Creek | PWR | CHS | Smolt | 42 | 137.0 | 262.0 | 225.7 | 27.4 | 202.2 | 131.1 |
| | | CHS | Parr | 1 | 111.0 | 111.0 | 111 | 11.9 | 11.9 | 11.9 |

| December 16-31, 2021 | | | | | | | | | | |
|----------------------|-------|---------|------------|-----------|--------------|-------|-------|-------------|-------|----------|
| Site | Route | Species | Life stage | Collected | Length (mm)* | | | Weight (g)* | | |
| | | | | | Min | Max | Mean | Min | Max | Mean |
| Hills Creek | RO | CHS | Parr | 3 | 102.0 | 141.0 | 123.0 | 10.3 | 23.4 | 17.3 |
| | | CHS | Smolt | 4 | 201.0 | 264.0 | 232.8 | 120.5 | 192.3 | 148.3 |
| Hills Creek | PWR | CHS | Smolt | 11 | 205.0 | 260 | 246.6 | 100.9 | 202.2 | 171 2 |
| | | CHS | Parr | -- | -- | -- | -- | -- | -- | -- |

Fish that were missing heads are not included in length and weight calculations. One fish was a head only and could not be assigned a life stage



*Figure does not include fish without heads

Figure 5. Length Frequency of Juvenile Chinook Sampled Season To-Date (Hills Creek)

Injuries and Copepod Infection

Partial descaling <20% was observed on 2 of 7 Chinook collected at the RO RST (29%), and 7 of 12 Chinook collected at the PWR RST (58%). Descaling >20% was observed on 2 of 7 Chinook collected at the RO RST (29%), and 4 of 12 Chinook collected at the PWR RST (33%). 15 of 19 Chinook fish collected during this reporting period had copepods present (79%). Of the 19 Chinook captured, 2 displayed body injuries and 2 had eye injuries present. There were 2 Chinook mortalities collected in the RO RST, and 6 collected in the PWR RST (Table 5). A summary of injuries observed during the reporting period, and for the duration of the season are provided in Appendix A.

Table 5. Number of Descaled and Partially Descaled Chinook Salmon.

| Site | # CHS Collected | # DSC* <20% | # DSC* >20% | # with Body Injuries | # with Eye Injuries | # with COP* In B.C. | # with COP* on Fins | Mortalities |
|-----------------|-----------------|-------------|-------------|----------------------|---------------------|---------------------|---------------------|-------------|
| Hills Creek RO | 7 | 2 | 2 | 1 | 0 | 6 | 3 | 2 |
| Hills Creek PWR | 12 | 7 | 4 | 1 | 2 | 11 | 7 | 6 |

*DSC=Descaled, COP=Copepods, B.C.=Branchial Cavity

Non-Target Species

A total of 16 non-target fish were captured at Hills Creek during the reporting period; the data is summarized below in Table 6.

Table 6. Summary of Non-target Species (Hills Creek).

| Species | RO Capture | RO Mortality | PWR Capture | PWR Mortality | Season Total | Season Total Mortality |
|------------------|------------|--------------|-------------|---------------|--------------|------------------------|
| Bluegill | 3 | 2 | 3 | 2 | 30 | 10 |
| Brook Lamprey | 0 | 0 | 0 | 0 | 1 | 0 |
| Bullhead | 0 | 0 | 0 | 0 | 1 | 0 |
| Bull Trout | 1 | 0 | 0 | 0 | 1 | 0 |
| Crappie | 1 | 1 | 0 | 0 | 54 | 39 |
| Longnose Dace | 0 | 0 | 0 | 0 | 2 | 0 |
| Red-Sided Shiner | 0 | 0 | 2 | 0 | 16 | 2 |
| Sculpin | 0 | 0 | 1 | 0 | 33 | 0 |
| Spotted Bass | 0 | 0 | 1 | 0 | 6 | 1 |
| Sucker | 0 | 0 | 0 | 0 | 2 | 1 |
| Whitefish | 0 | 0 | 0 | 0 | 1 | 1 |
| <i>O. mykiss</i> | 4 | 4 | 2 | 1 | 48 | 15 |
| Totals | 9 | 7 | 9 | 3 | 195 | 69 |

Stream Statistics

Basic stream statistics at the Hills Creek site were calculated from data downloaded from the U.S. Geological Survey stream gage number 14145110. Gage height (feet) is the only metric provided at this gage. During the reporting period, daily maximum values for instantaneous gage height ranged from 1,225.12 feet to 1,227.41 feet (mean: 1,225.96 feet). Figure 6 shows instantaneous gage height.

Stream temperatures were recorded every 2 hours for the both the RO RST and the PWR RST (Figures 7 and 8). Temperature probes operated normally throughout this reporting period.

Flows through the PWR and RO during the reporting period averaged 846.6 and 1,159.5 cubic feet per second (cfs) respectively (Figure 9). The average flow of the PWR while the PWR was generating was 725.2cfs and the RO was 721.4cfs. Catch per unit of effort (CPUE) data are summarized in Table 7. Discharge and capture data for the duration of monitoring efforts at this location are provided in Appendix B.

Table 7. Summary of Chinook CPUE, Hills Creek.

| Description | Chinook | |
|----------------|----------|----------|
| | RO (5ft) | PWR(8ft) |
| Catch | 7 | 12 |
| Effort (hrs) | 385 | 331.52 |
| CPUE (fish/hr) | 0.018 | 0.036 |

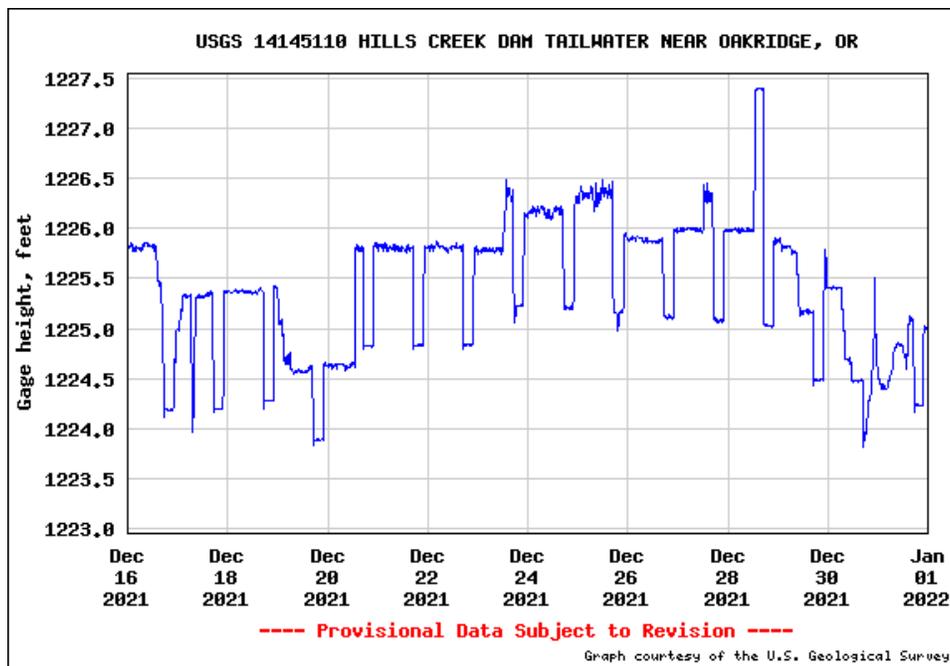


Figure 6. Gage Height (feet); below Hills Creek Dam, Middle Fork Willamette River



Figure 7. Temperature at RO RST (Hills Creek)



Figure 8. Temperature at Powerhouse RST (Hills Creek)

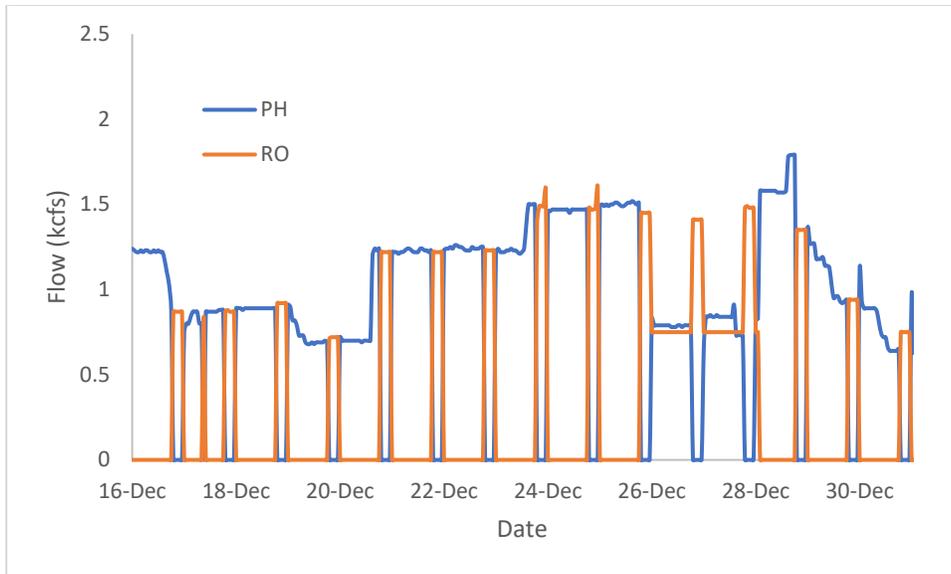


Figure 9. Hourly Flows PWR vs. RO (Hills Creek)

South Fork McKenzie – Cougar Dam

Target Species

This reporting period began on December 15 and ended on December 31. There was a total of 6 Chinook salmon (CHS) during the 15-day sampling period (Figure 10). Sampling durations were 93% for the RO RST and 43% for the Powerhouse RST. There was no flow through the powerhouse until December 23rd during the reporting period, so the RST cones were lifted out of the sampling position for the PWR traps to avoid damage until that time. Additionally, inclement weather prevented reliable access to the site on the 27th and the RST cones were lifted for that day. Table 8 provides life stage, length, and weight data for all Chinook salmon that have been caught at the Cougar Dam site to-date and Figure 11 shows length frequency data to-date.

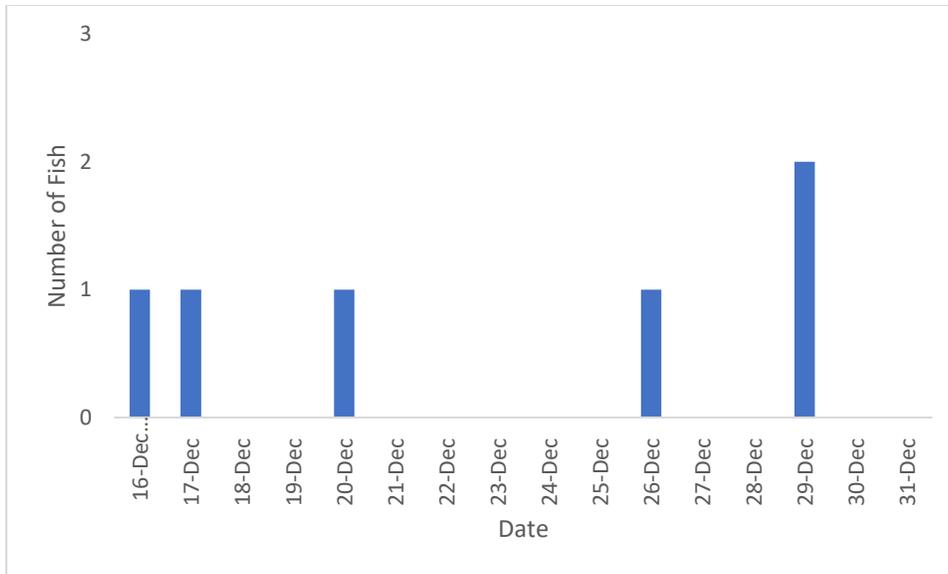


Figure 10. Chinook Captured Per Day 12/16/2021 to 12/31/2021 (Cougar Dam)

Table 8. Descriptive Statistics of Target Species Captured at the Cougar Dam Season To-Date

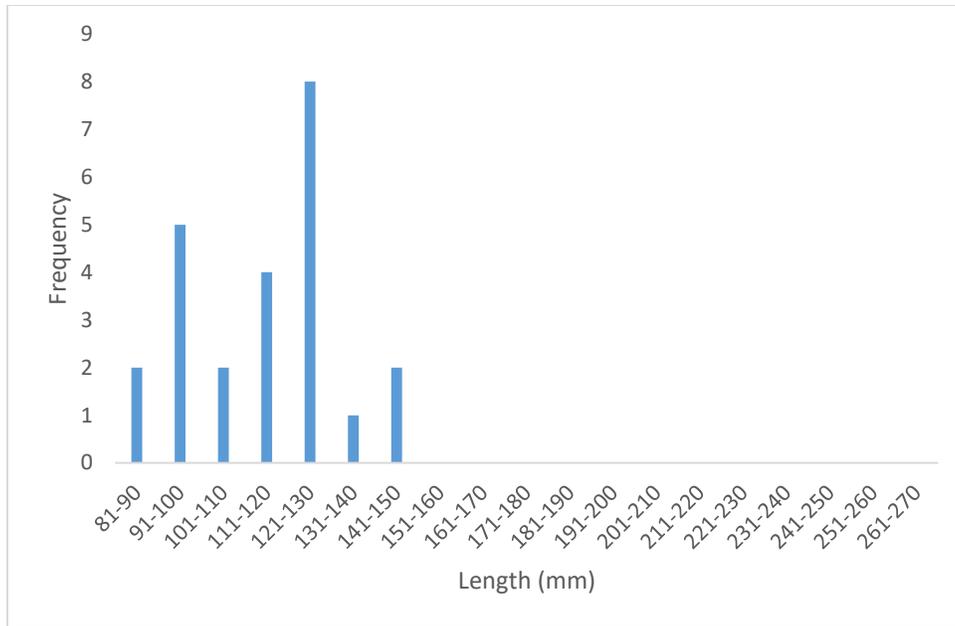
| To-Date | | | | | | | | | | |
|---------|-------|---------|------------|-----------|--------------|-------|-------|-------------|------|------|
| Site | Route | Species | Life stage | Collected | Length (mm)* | | | Weight (g)* | | |
| | | | | | Min | Max | Mean | Min | Max | Mean |
| Cougar | RO | CHS | Smolt | 2 | 127.0 | 127.0 | 127 | 20.6 | 22.4 | 21.5 |
| | | CHS | Parr | 22 | 90.0 | 145.0 | 112.8 | 7.34 | 30.6 | 16 |
| Cougar | PWR | CHS | Smolt | 0 | -- | -- | -- | -- | -- | -- |
| | | CHS | Parr | 0 | -- | -- | -- | -- | -- | -- |

| December 16-31, 2021 | | | | | | | | | | |
|----------------------|-------|---------|------------|-----------|--------------|-------|-------|-------------|------|------|
| Site | Route | Species | Life stage | Collected | Length (mm)* | | | Weight (g)* | | |
| | | | | | Min | Max | Mean | Min | Max | Mean |
| Cougar | RO | CHS | Parr | 6 | 90.0 | 127.0 | 112.5 | 8.6 | 24.1 | 15.8 |
| | | CHS | Smolt | 0 | -- | -- | -- | -- | -- | -- |
| Cougar | PWR | CHS | Smolt | 0 | -- | -- | -- | -- | -- | -- |
| | | CHS | Parr | 0 | -- | -- | -- | -- | -- | -- |

*Fish that were missing heads are not included in length and weight calculations.

24-Hour Post Collection Holding Trial

A total of 4 Chinook captured in the RSTs were held for ~24 hours in holding tanks and then evaluated for survival rates. All fish were captured in the RO trap. All fish (100%) held during this period were released alive.



*Figure does not include fish without heads

Figure 11. Length Frequency of Juvenile Chinook Sampled Season To-Date (Cougar Dam)

Injuries and Copepod Infection

Partial descaling <20% was observed on 4 of 6 Chinook collected at the RO RST (66%), and descaling >20% was observed on 1 of 6 Chinook collected at the RO RST (17%). The PWR RST was not in operation for this reporting period due to low water levels. 4 of 6 Chinook fish collected during this reporting period had copepods present. Of the 6 Chinook captured, 0 displayed body injuries and 0 had eye injuries present. There were 2 Chinook mortalities collected in the RO RST, and 0 collected in the PWR RST (Table 5). A summary of injuries observed during the reporting period, and for the duration of the season are provided in Appendix A.

Table 9. Number of Descaled and Partially Descaled Chinook Salmon (Cougar Dam).

| Site | # CHS Collected | # DSC* <20% | # DSC* >20% | # with Body Injuries | # with Eye Injuries | # with COP* In B.C. | # with COP* on Fins | Mortalities |
|------------|-----------------|-------------|-------------|----------------------|---------------------|---------------------|---------------------|-------------|
| Cougar RO | 6 | 4 | 1 | 0 | 0 | 4 | 2 | 2 |
| Cougar PWR | 0 | -- | -- | -- | -- | -- | -- | -- |

*DSC=Descaled, COP=Copepods, B.C.=Branchial Cavity

Non-Target Species

A total of 2 non-target species fish were captured during the reporting period; the data is summarized below in Table 6.

Table 10. Summary of Non-target Species (Cougar Dam).

| Species | RO Capture | RO Mortality | PWR Capture | PWR Mortality | Season Total Live | Season Total Mortality |
|------------------|------------|--------------|-------------|---------------|-------------------|------------------------|
| Bluegill | 0 | 0 | 0 | 0 | 0 | 0 |
| Brook Lamprey | 0 | 0 | 0 | 0 | 0 | 0 |
| Bullhead | 0 | 0 | 0 | 0 | 0 | 0 |
| Crappie | 0 | 0 | 0 | 0 | 0 | 0 |
| Longnose Dace | 0 | 0 | 0 | 0 | 0 | 0 |
| Kokanee | 0 | 0 | 0 | 0 | 0 | 0 |
| Red-Sided Shiner | 0 | 0 | 0 | 0 | 0 | 0 |
| Sculpin | 0 | 0 | 0 | 0 | 0 | 0 |
| Spotted Bass | 0 | 0 | 0 | 0 | 0 | 0 |
| Sucker | 0 | 0 | 0 | 0 | 0 | 0 |
| Whitefish | 1 | 0 | 0 | 0 | 1 | 0 |
| <i>O. mykiss</i> | 1 | 0 | 0 | 0 | 3 | 0 |
| Totals | 2 | 0 | 0 | 0 | 4 | 0 |

Stream Statistics

Basic stream statistics at the Cougar Dam site were calculated from data downloaded from the U.S. Geological Survey stream gage number 14159410. Gage height (feet) is the only metric provided at this gage. During the reporting period, daily maximum values for instantaneous gage height ranged from 1,251.24 feet to 1,253.54 feet (mean: 1,252.5 feet). Figure 12 shows instantaneous gage height.

Stream temperatures were recorded every 2 hours for the length of the report period for the RO and beginning December 26 for the PWR RST (Figure 13). Temperature probes for the RO and PWR RST operated normally throughout this reporting period.

Flows through the Powerhouse and RO during the reporting period averaged 133.9 and 615.6 cubic feet per second (cfs) respectively (Figure 14). Catch per unit of effort (CPUE) data are summarized in Table 11. Discharge and capture data for the duration of monitoring efforts at this location are provided in Appendix B.

Table 11. Summary of salmonid CPUE, Cougar Dam.

| Description | Chinook | |
|----------------|----------|----------|
| | RO (5ft) | PWR(8ft) |
| Catch | 6 | 0 |
| Effort (hrs) | 333.93 | 337.4 |
| CPUE (fish/hr) | 0.018 | 0 |

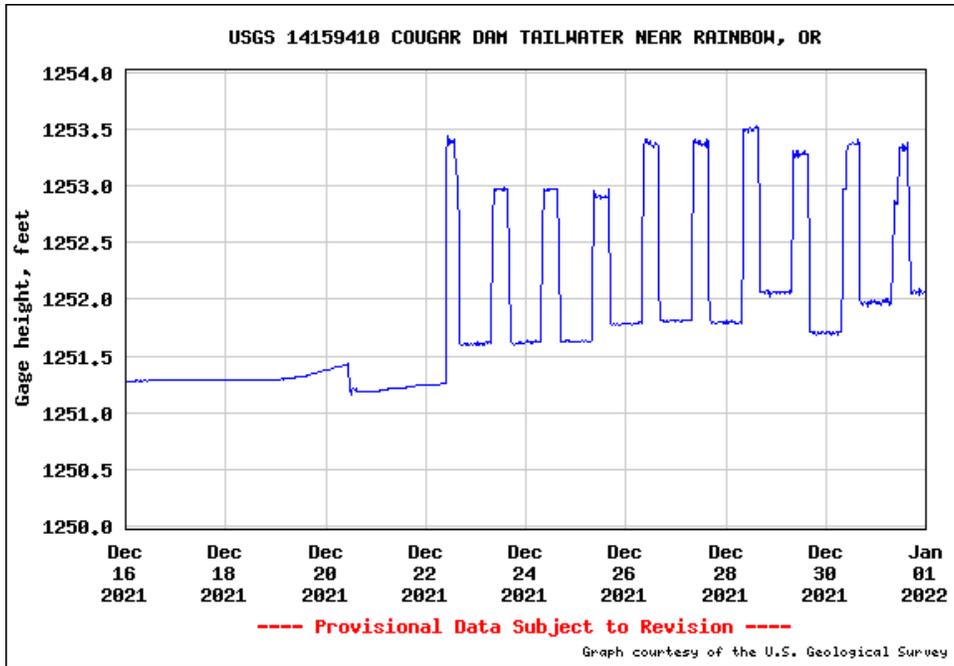


Figure 12. Gage Height (feet); below Cougar Dam, South Fork McKenzie River

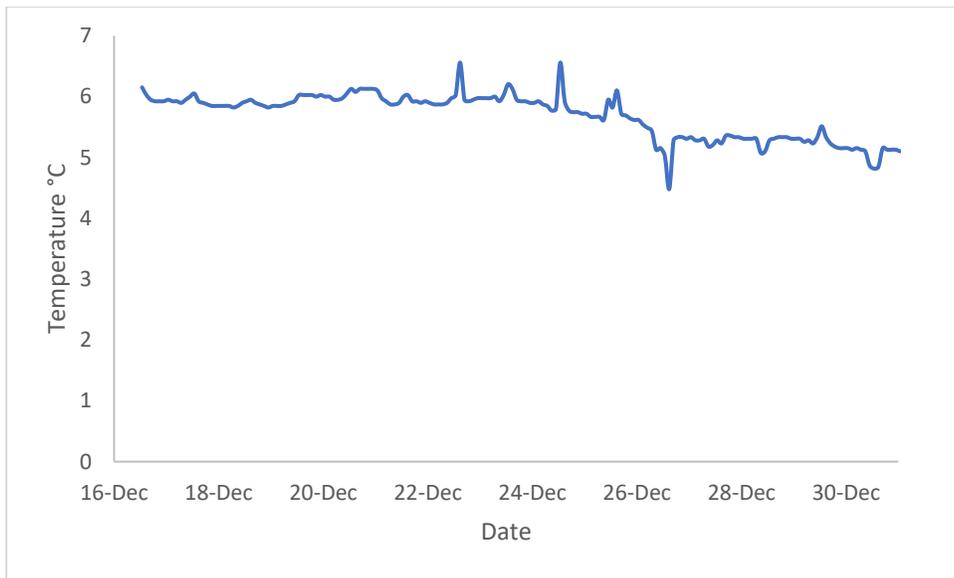


Figure 13. Temperature at RO RST (Cougar Dam)

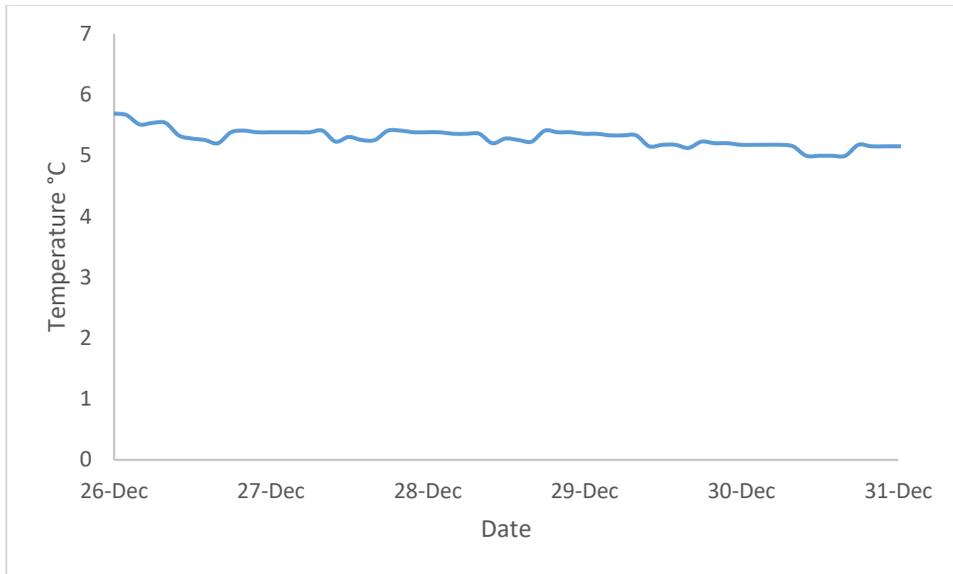


Figure 14. Temperature at PWR RST (Cougar Dam)

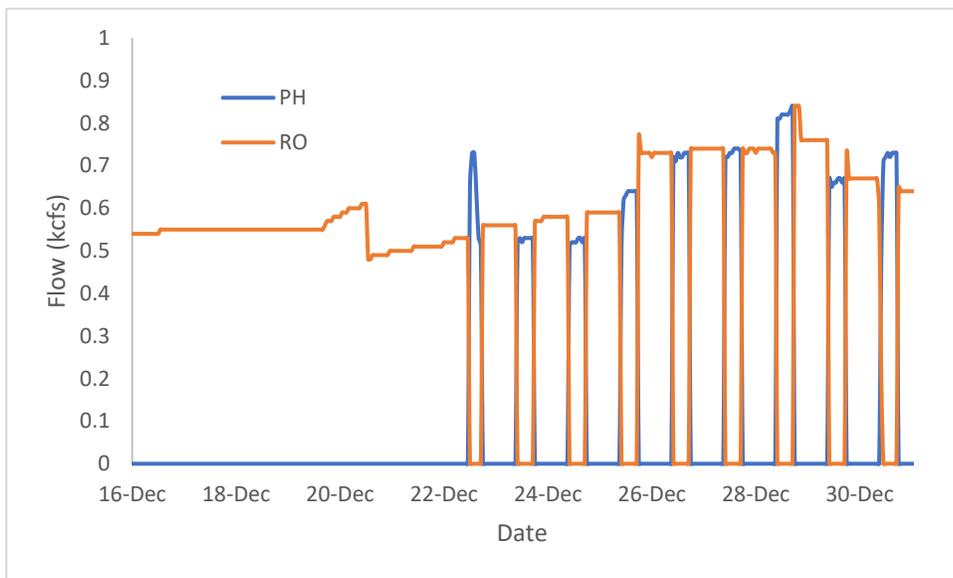


Figure 15. Hourly Flows PWR vs. RO (Cougar Dam)

North Santiam – Big Cliff Dam

Target Species

The reporting period began on December 15 and ended on December 31. 46 Chinook salmon (CHS) were collected during the 15-day sampling period (Figure 16). The sampling duration was 87% for the trap, the cone was raised and not sampling for 2 days due to inclement weather. Table 12 provides life stage, length, and weight data for all Chinook salmon that have been caught at the Big Cliff site to-date and Figure 17 shows length frequency data to-date.

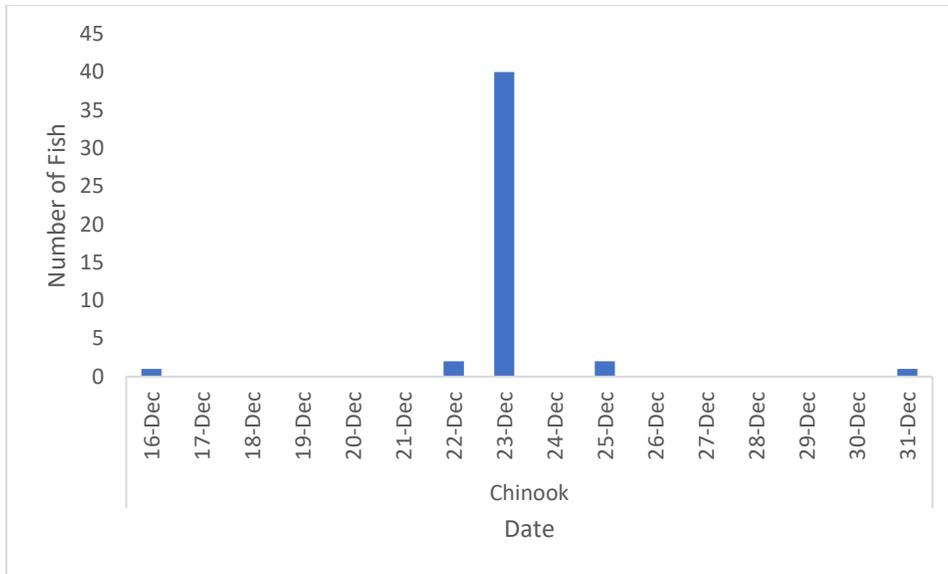
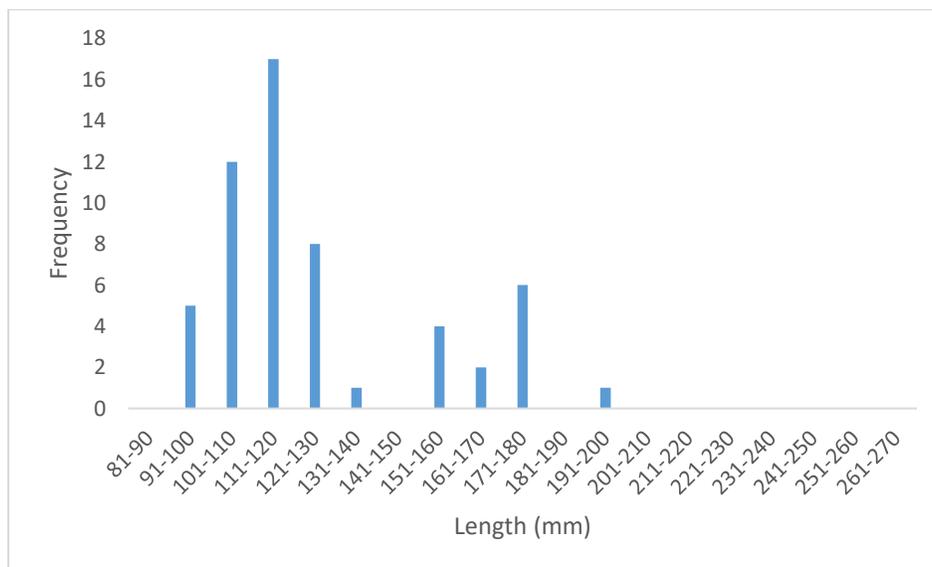


Figure 16. Chinook Captured Per Day 12/16/2021 to 12/31/2021 (Big Cliff)

Table 12. Descriptive Statistics of Target Species Captured at Big Cliff Dam Season To-Date

| Site | Route | Species | Life stage | Collected | Length (mm)* | | | Weight (g)* | | |
|---------------|-------|---------|------------|-----------|--------------|-----|-------|-------------|------|------|
| | | | | | Min | Max | Mean | Min | Max | Mean |
| Big Cliff Dam | PWR | CHS | Smolt | 14 | 137 | 195 | 166.5 | 27.9 | 90.8 | 47.2 |
| | | CHS | Parr | 42 | 95 | 127 | 111.6 | 9.2 | 21.3 | 14.4 |

Fish that were missing heads are not included in length and weight calculations.



*Figure does not include fish without heads

Figure 17. Length Frequency of Juvenile Chinook Sampled Season To-Date (Big Cliff)

Trapping Efficiency

A total of 996 juvenile Chinook (parr) were dyed and released on 12/22/21 below Big Cliff Dam to evaluate the efficiency of the screw trap at that location. The average fork length of fish released was 109mm. A total of 39 fish were recaptured on 12/29/21. Capture efficiency for this test was 3.92%.

Injuries and Copepod Infection

Partial descaling <20% was observed on 3 of 46 target Chinook collected (6.5%), and descaling >20% was observed on 1 of 46 Chinook collected (2.1%). 9 of 46 Chinook collected during this reporting period had copepods present (19.5%). Of the 46 Chinook captured, 0 displayed body injuries and 0 had eye injuries present. There were 0 Chinook mortalities (Table 5). A summary of injuries observed during the reporting period, and for the duration of the season are provided in Appendix A.

Table 13. Number of Descaled and Partially Descaled Chinook Salmon.

| Site | # CHS Collected | # DSC* <20% | # DSC* >20% | # with Body Injuries | # with Eye Injuries | # with COP* In B.C. | # with COP* on Fins | Mortalities |
|-----------|-----------------|-------------|-------------|----------------------|---------------------|---------------------|---------------------|-------------|
| Big Cliff | 46 | 3 | 1 | 0 | 0 | 6 | 3 | 0 |

*DSC=Descaled, COP=Copepods, B.C.=Branchial Cavity

Non-Target Species

A total of 12 non-target fish were captured at Big Cliff during the reporting period; the data is summarized below in Table 14.

Table 14. Summary of Non-target Species (Big Cliff Dam).

| Species | PWR Capture | PWR Mortality | Season Total | Season Total Mortality |
|------------------|-------------|---------------|--------------|------------------------|
| Bluegill | 1 | 0 | 4 | 2 |
| Brook Lamprey | 0 | 0 | 0 | 0 |
| Bullhead | 0 | 0 | 0 | 0 |
| Crappie | 0 | 0 | 0 | 0 |
| Longnose Dace | 0 | 0 | 0 | 0 |
| Kokanee | 11 | 7 | 26 | 14 |
| Red-Sided Shiner | 0 | 0 | 0 | 0 |
| Sculpin | 0 | 0 | 0 | 0 |
| Spotted Bass | 0 | 0 | 0 | 0 |
| Sucker | 0 | 0 | 0 | 0 |
| Whitefish | 0 | 0 | 0 | 0 |
| <i>O. mykiss</i> | 0 | 0 | 0 | 0 |
| Totals | 12 | 7 | 30 | 16 |

Stream Statistics

Basic stream statistics at the Big Cliff site were calculated from data downloaded from the U.S. Geological Survey stream gage number 14181410. Gage height (feet) is the only metric provided at this gage.

During the reporting period, daily maximum values for instantaneous gage height ranged from 1,110.15 feet to 1,113.88 feet (mean: 1,112.47 feet). Figure 18 shows instantaneous gage height.

Stream temperatures were recorded every 2 hours for the Big Cliff RST (Figure 18). Temperature probes for the Big Cliff RST operated normally throughout this reporting period.

Flows through the Powerhouse and spill during the reporting period averaged 2,916.4 and 695.6 cubic feet per second (cfs) respectively (Figure 20). Catch per unit of effort (CPUE) data are summarized in Table 15. Discharge and capture data for the duration of monitoring efforts at this location are provided in Appendix B.

Table 15. Summary of salmonid CPUE, Big Cliff Dam.

| | Chinook |
|----------------|----------|
| Description | PWR(8ft) |
| Catch | 39 |
| Effort (hrs) | 266.85 |
| CPUE (fish/hr) | 0.1461 |

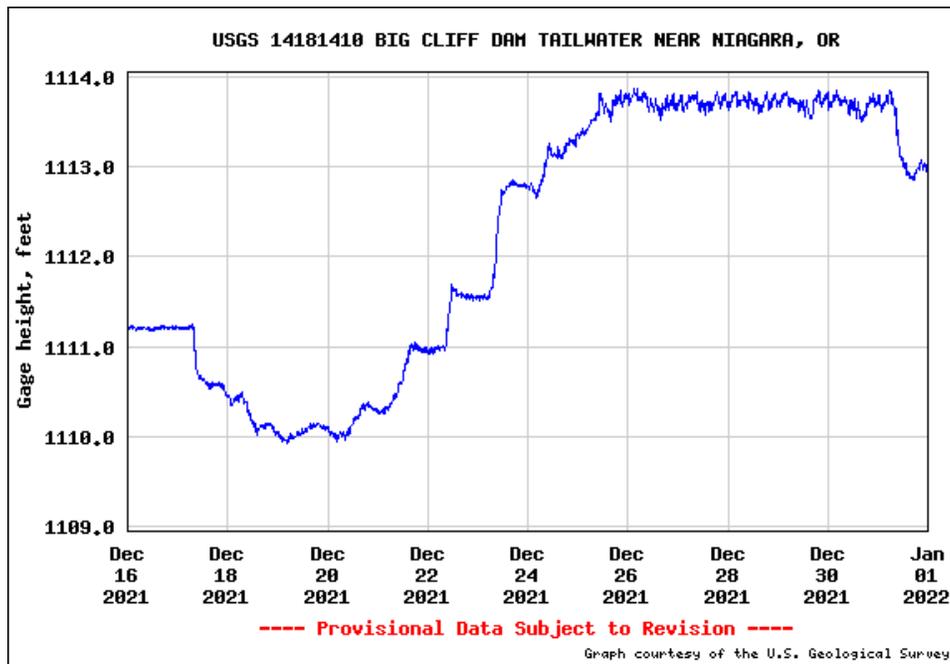


Figure 18. Gage Height (feet); below Big Cliff Dam, North Santiam River

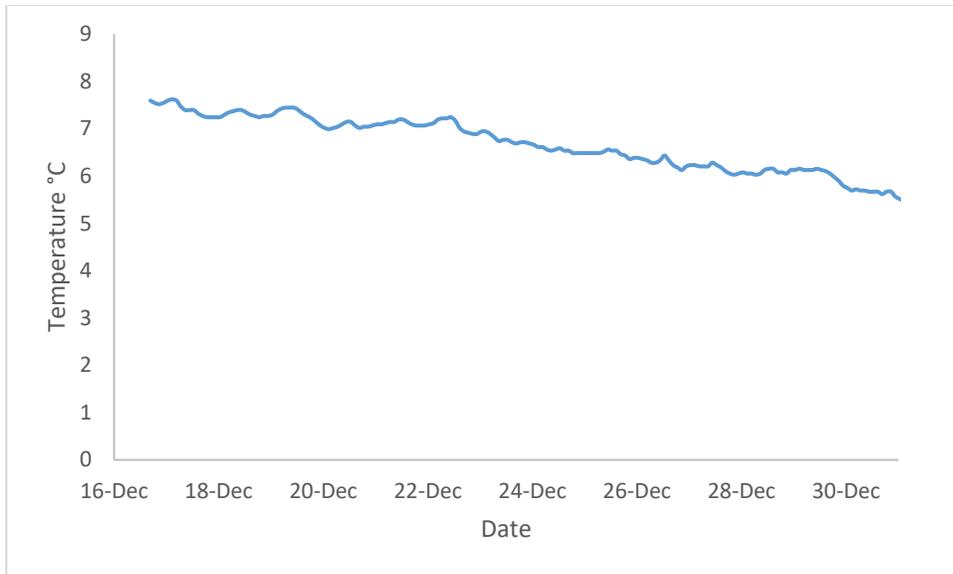


Figure 19. Temperature at RST (Big Cliff)

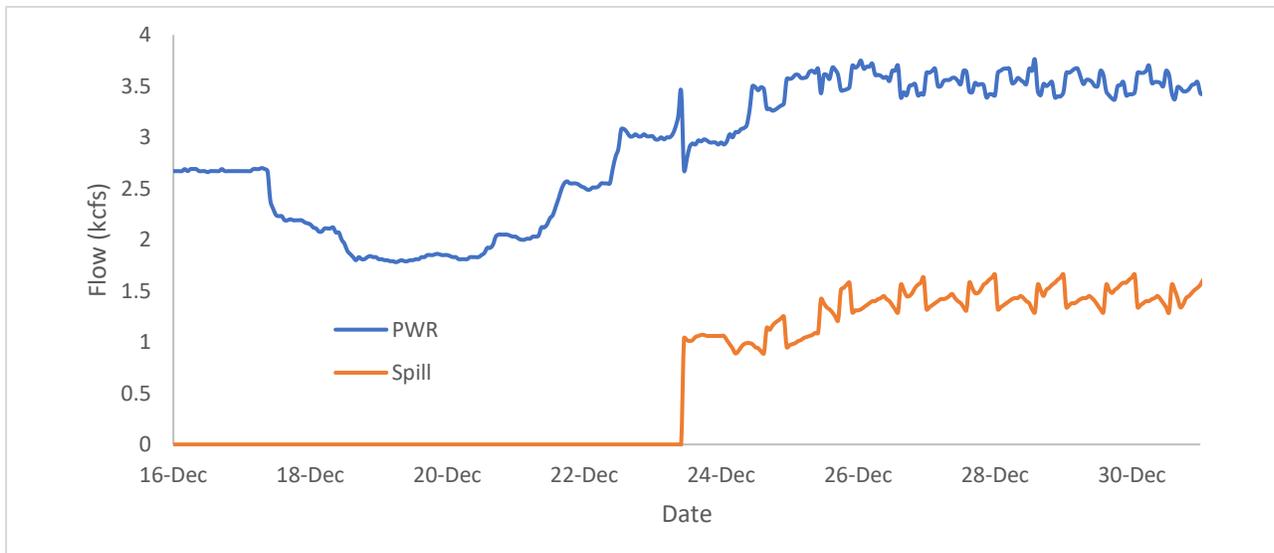


Figure 20. Hourly Flows PWR vs. Spill (Big Cliff)

Issues Encountered

None during this reporting period.

Upcoming USACE Support Services

None.

Appendix A

| Injuries During Reporting Period (12-16-21 to 12-31-21) | | | | | | | | | | | | | | | | | | | | | | | |
|---|------------|------|------|-----|-----|-----|-----|-----|------|-----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Site/Trap/Life Stage | Total Fish | MUNK | DS<2 | BLO | EYB | FUN | BKD | COP | DS>2 | PRD | FID | HBO | BO | HO | BVT | HBP | BRU | TEA | OPD | HIN | FVB | POP | GBD |
| Big Cliff | 46 | | 3 | | | 1 | | 6 | 1 | | 2 | | | | | | | 1 | | | | | |
| 8 ft (PH) | 46 | | 3 | | | 1 | | 6 | 1 | | 2 | | | | | | | 1 | | | | | |
| Parr | 42 | | 1 | | | 1 | | 2 | | | 1 | | | | | | | | | | | | |
| Smolt | 4 | | 2 | | | | | 4 | 1 | | 1 | | | | | | | 1 | | | | | |
| Cougar | 6 | | 4 | | | | | 3 | 1 | | | | | | | | | | | | 2 | | |
| 5 ft (RO) | 6 | | 4 | | | | | 3 | 1 | | | | | | | | | | | | 2 | | |
| Parr | 5 | | 3 | | | | | 2 | 1 | | | | | | | | | | | | 1 | | |
| Smolt | 1 | | 1 | | | | | 1 | | | | | | | | | | | | | 1 | | |
| Hills Creek | 19 | | 9 | | 2 | | | 15 | 6 | | 6 | | 2 | 1 | 6 | | 1 | | | | | | |
| 5 ft (RO) | 7 | | 2 | | | | | 4 | 2 | | 1 | | 1 | | 1 | | | | | | | | |
| Parr | 3 | | | | | | | 1 | | | | | | | | | | | | | | | |
| Smolt | 4 | | 2 | | | | | 3 | 2 | | 1 | | 1 | | 1 | | | | | | | | |
| 8 ft (PH) | 12 | | 7 | | 2 | | | 11 | 4 | | 5 | | 1 | 1 | 5 | | 1 | | | | | | |
| Unknown | 1 | | | | | | | | | | | | | 1 | | | | | | | | | |
| Smolt | 11 | | 7 | | 2 | | | 11 | 4 | | 5 | | 1 | | 5 | | 1 | | | | | | |

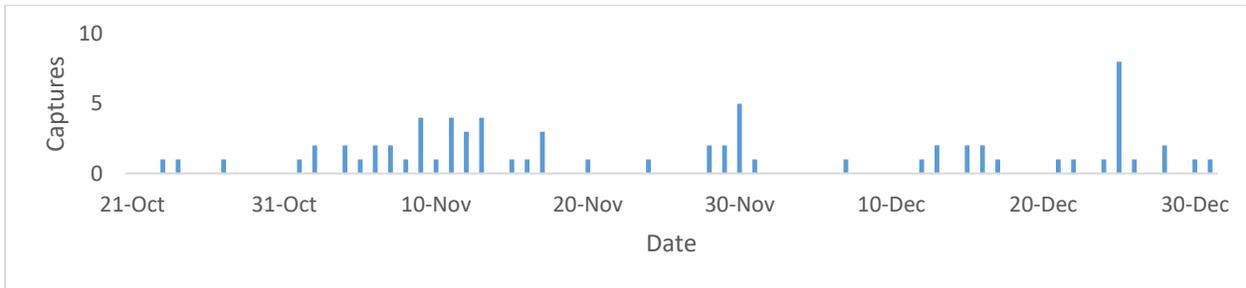
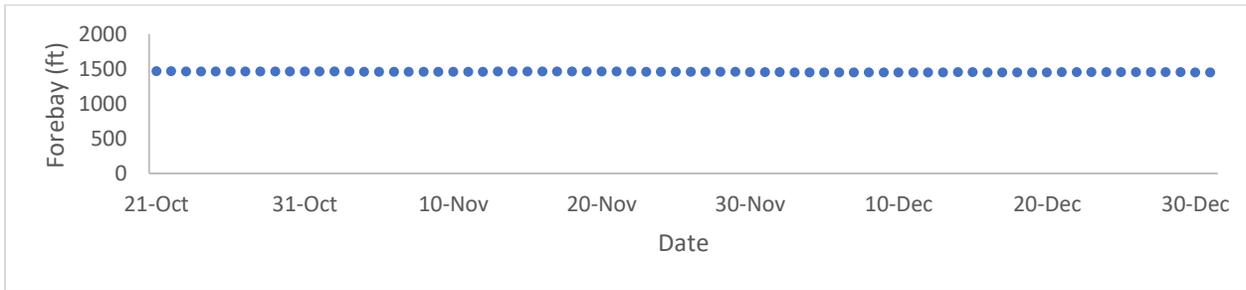
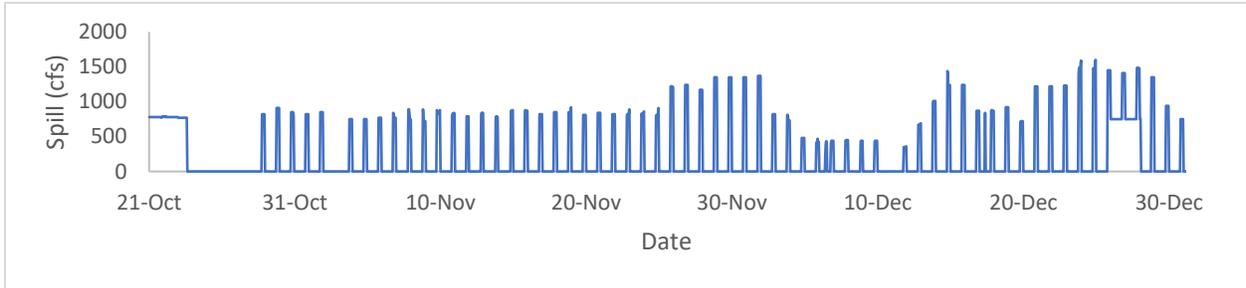
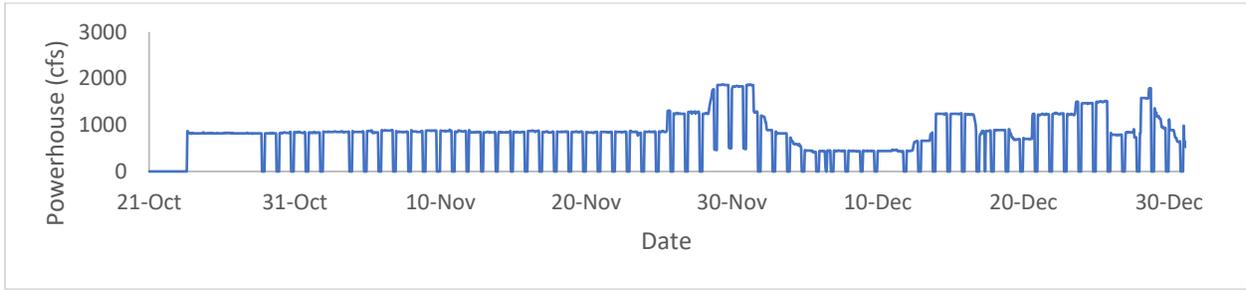
| Injuries Since Project Initiation (10-21-21 to 12-15-21) | | | | | | | | | | | | | | | | | | | | | | | |
|--|------------|------|------|-----|-----|-----|-----|-----|------|-----|-----|-----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Site/Trap/Life Stage | Total Fish | MUNK | DS<2 | BLO | EYB | FUN | BKD | COP | DS>2 | PRD | FID | HBO | BO | HO | BVT | HBP | BRU | TEA | OPD | HIN | FVB | POP | GBD |
| Big Cliff | 56 | | 8 | | 2 | 1 | | 16 | 2 | | 3 | 1 | | | 1 | | | 2 | 3 | | | | |
| 8 ft (PH) | 56 | | 8 | | 2 | 1 | | 16 | 2 | | 3 | 1 | | | 1 | | | 2 | 3 | | | | |
| Parr | 42 | | 1 | | | 1 | | 2 | | | 1 | | | | | | | | | | | | |
| Smolt | 14 | | 7 | | 2 | | | 14 | 2 | | 2 | 1 | | | 1 | | | 2 | 3 | | | | |
| Cougar | 24 | | 11 | | | 1 | | 17 | 1 | | 4 | | | | | | | 1 | 3 | 2 | | | |
| 5 ft (RO) | 9 | | 4 | | | | | 5 | 1 | | | | | | | | | | | 2 | | | |
| Parr | 8 | | 3 | | | | | 4 | 1 | | | | | | | | | | | 1 | | | |
| Smolt | 1 | | 1 | | | | | 1 | | | | | | | | | | | | 1 | | | |

| | | | | | | | | | | | | | | | | | | | |
|-------------|----|----|---|----|----|----|---|---|----|---|---|---|---|---|---|---|--|--|--|
| 8 ft (PH) | 15 | 7 | 1 | 12 | 4 | | | | | | | | | 1 | 3 | | | | |
| Parr | 14 | 6 | 1 | 11 | 4 | | | | | | | | | 1 | 3 | | | | |
| Smolt | 1 | 1 | | 1 | | | | | | | | | | | | | | | |
| Hills Creek | 72 | 41 | 6 | 59 | 24 | 14 | 7 | 1 | 23 | 6 | 2 | 2 | 4 | 2 | 2 | | | | |
| 5 ft (RO) | 56 | 31 | 4 | 44 | 19 | 10 | 6 | | 17 | 6 | 1 | 2 | 4 | 1 | 1 | | | | |
| Parr | 4 | | | 1 | | | | | | | | | | | | | | | |
| Smolt | 52 | 31 | 4 | 43 | 19 | 10 | 6 | | 17 | 6 | 1 | 2 | 4 | 1 | 1 | | | | |
| 8 ft (PH) | 16 | 10 | 2 | 15 | 5 | 4 | 1 | 1 | 6 | | 1 | | | 1 | 1 | | | | |
| Unknown | 1 | | | | | | | 1 | | | | | | | | | | | |
| Smolt | 15 | 10 | 2 | 15 | 5 | 4 | 1 | | 6 | | 1 | | | | 1 | 1 | | | |

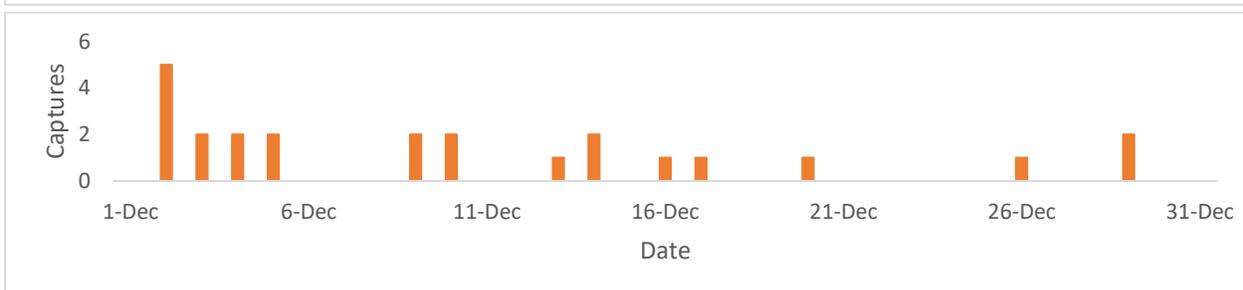
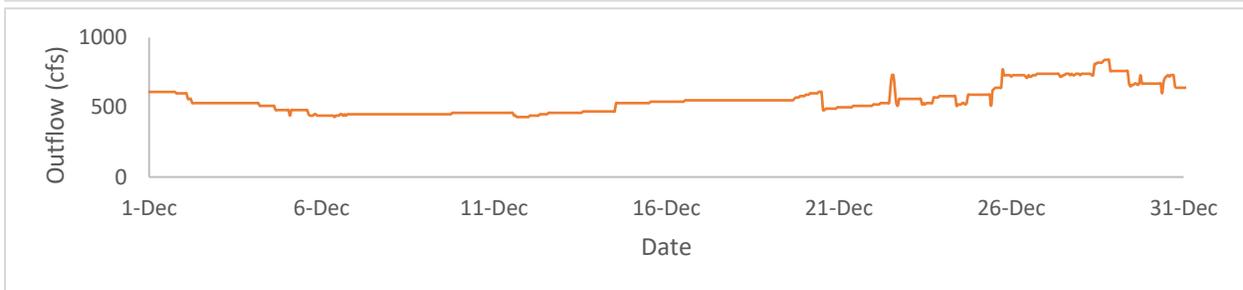
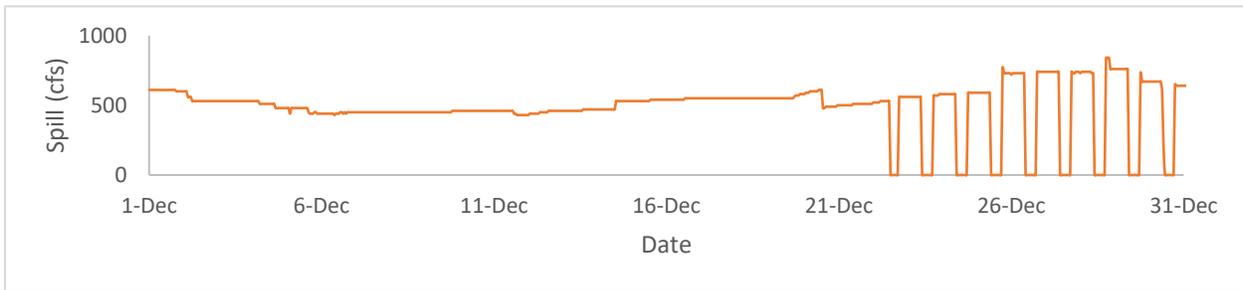
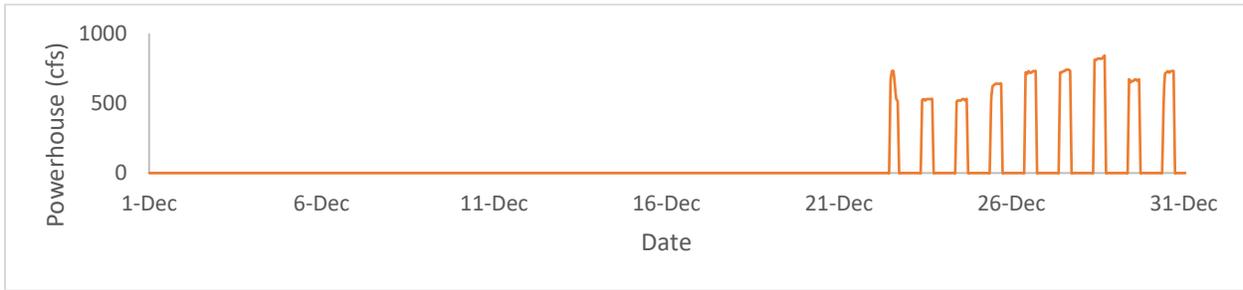
| Injury Code | Description of Injury/Condition |
|--------------------|---|
| NXI | Live fish with no external injuries |
| MUNK | Mortality with no external injuries |
| DS<2 | Descaling <20% |
| BLO | Bloated |
| EYB | Bloody Eye (hemorrhage) |
| BVT | Bleeding from Vent |
| FVB | Fin Blood Vessels Broken |
| GBD | Gas Bubble Disease (fin ray/eye inclusions) |
| POP | Pop Eye (eye popping out of head) |
| HIN | Head Injury |
| OPD | Opercle Damage |
| TEA | Body Injury (tears, scrapes, mechanical damage) |
| BRU | Bruising (any part of the body) |
| HBP | Hole Behind Pectoral Fin |
| DS>2 | Descaling > 20% |
| HO | Head Only |
| BO | Body Only |
| HBO | Head Barely Connected |
| FID | Fin Damage |
| PRD | Predation Marks (vert. claw or teeth marks) |
| COP | Copepods (on gills or fins) |
| BKD | BKD (distended abdomen) |
| FUN | Fungus |

Appendix B

Hills Creek Operational and Capture Data Since Start of Monitoring



Cougar Dam Operational and Capture Data Since Start of Monitoring



Big Cliff Dam Operational and Capture Data Since Start of Monitoring

