Assessment of Juvenile Salmonid Passage at the Young's Dam Fish Ladder, Scott River, Siskiyou County, CA

Prepared for:

Siskiyou County Resource Conservation District

Prepared by:

Dr. Christopher Adams, Fish Wiz LLC

Funding provided by:

Department of Interior 15.608 - Fish and Wildlife Management Assistance ($118,245.00)

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Executive Summary

We monitored juvenile fish movement in the Young's Point fish ladder in the summer of 2022 and 2023 using a series of underwater cameras and PIT tag antennas. Camera footage review during the low flow period in 2022 (less than 30 cfs in channel downstream of ladder) suggests that very few juvenile salmonids were passing through the ladder, despite large numbers consistently being observed at the downstream end of the ladder. In 2023 juvenile salmonids were PIT tagged in reaches up and downstream of the ladder. Six percent of those tagged (9 of 149) were detected at antennas in the ladder and no detections occurred in the ladder when flow was less than 1.5 cfs. Successful upstream movements of age 0 coho through the ladder were confirmed by PIT detections when flow in the ladder was between 1.5 and 2.5 cfs. We also measured water velocity and hydraulic drop in the ladder at a range of discharges. Velocities and hydraulic drop were higher than recommended for juvenile fish passage by the National Marine Fisheries Service (1 foot per second velocity and 6-inch hydraulic drop) at all measured flows, which includes the minimum flow allowable through the ladder on the date measured (1.85 cfs). Manipulation of dam boards in the ladder and adjacent channel by multiple entities made tracking flows difficult and we recommend that user groups establish protocols and a more cohesive approach to manipulating flows at the site to maximize potential for juvenile fish passage, particularly during low flow periods. Additional research should be done to assess juvenile fish passage in the main channel adjacent to the fish ladder. Based on the data collected here, we recommend allowing all instream flow to be directed down the main channel during the low flow period, and that an alternative structure to the current fish ladder or stream channel modifications be considered to maximize potential for upstream passage of juvenile salmonids at the site. As part of this project, alternatives to the fish ladder were explored by Waterways Consulting Inc., and 30% plans for ladder and channel modifications are included in this report.

Background

Recent studies of salmonids in general, and in the Scott River specifically, have highlighted the importance of juvenile fish migrations. One of the key migration periods in the Scott River occurs during summer when conditions in many mainstem spawning locations become unsuitable for juvenile rearing. Age 0 salmonids may move up or downstream to areas where summer hydrologic and thermal refugial areas occur, which exist as deeper mainstem pools or in tributaries.

Young's Dam (Figure 1) is located at River Kilometer (RKM) 75.1 and is the diversion site for Scot Valley Irrigation District (SVID), which flows from the east bank. A fish ladder was built by the California Department of Fish and Wildlife (CDFW) in 2006 and is situated along the east bank just downstream of the SVID diversion downstream extending approximately 50 meters downstream (Photo 1). The ladder is an approximately 3-meter-wide concrete channel with 17 v-notched iron baffles seated in concrete sills in a downstream angle (Photo 2). Dam boards may be added at both the upstream and downstream ends to manipulate flow through the ladder and depth in the downstream bay. A fish screen exists at the upstream end of the SVID diversion, with the return flow entering the Scott River just downstream of the fish ladder. A concrete apron and flashboard dam spans the remainder of the mainstem channel, consisting of 6 bays in which dam boards may be added to manipulate flow into the ladder and diversion. A high-water channel exists on the west side.

The reaches adjacent to Young's Point are frequently used by spawning salmonids (Siskiyou RCD). French Creek, a known summer rearing habitat, enters the Scott River at RKM 77.6, 1.5 kilometers upstream of Young's Dam. The reach between French Creek and Horn Lane, 2.3 km downstream of Young's Dam, is a gaining reach with groundwater entering the channel between those two locations during low flow periods (Siskiyou RCD). During extreme low flow and disconnection periods, isolated pools exist in this reach and can provide salmonid rearing habitat (Siskiyou RCD). Fish passage at Young's Dam may be important for the movement of juvenile salmonids from reaches downstream to summer refugial areas upstream. During most hydrologic conditions, depth and flow in the mainstem adjacent to the fish ladder are likely sufficient for both upstream and downstream movement of all post-fry life stages of salmonids. Low flow periods have been of concern for passage at the site, and passage of adults during these conditions was the reason for installing the fish ladder. In this study we set out to determine if juveniles use the ladder for upstream passage during low flow periods, and if there are discharge levels through the ladder that impede upstream movement through the structure.

Figure 1. Aerial image of Young' Dam. Image date July 2014, which provides the best unobstructed view of structures.

Methods Overview

We evaluated juvenile fish movements at the Young's Dam site by using underwater cameras and PIT tags/antennas. In 2022, low flow conditions in the mainstem Scott River began before age-0 coho and steelhead were large enough to PIT tag in substantial numbers. Therefore, we only monitored fish using cameras in 2022. In 2023, suitable conditions persisted longer, and we were able to deploy RFID tags in juvenile salmonids and operate PIT tag antennas in the ladder. In 2022 flow and temperature data was collected just downstream of the ladder and detailed notes were taken on dam board configurations. In 2023 continuous flow data was collected in the ladder itself and point measurements of velocity and depth were taken in the ladder at a range of flows. Photos were taken of the site throughout the study and those that are not included in this report are available through the Siskiyou RCD.

Temperature Monitoring

Temperature data was collected by the Siskiyou RCD using an Onset temperature logger located in the mainstem Scott River approximately 20 meters downstream of the Young's Dam fish ladder. Stream temperatures during the low flow periods of 2022 and 2023 (June 30-August 30) are shown in Figure 2.

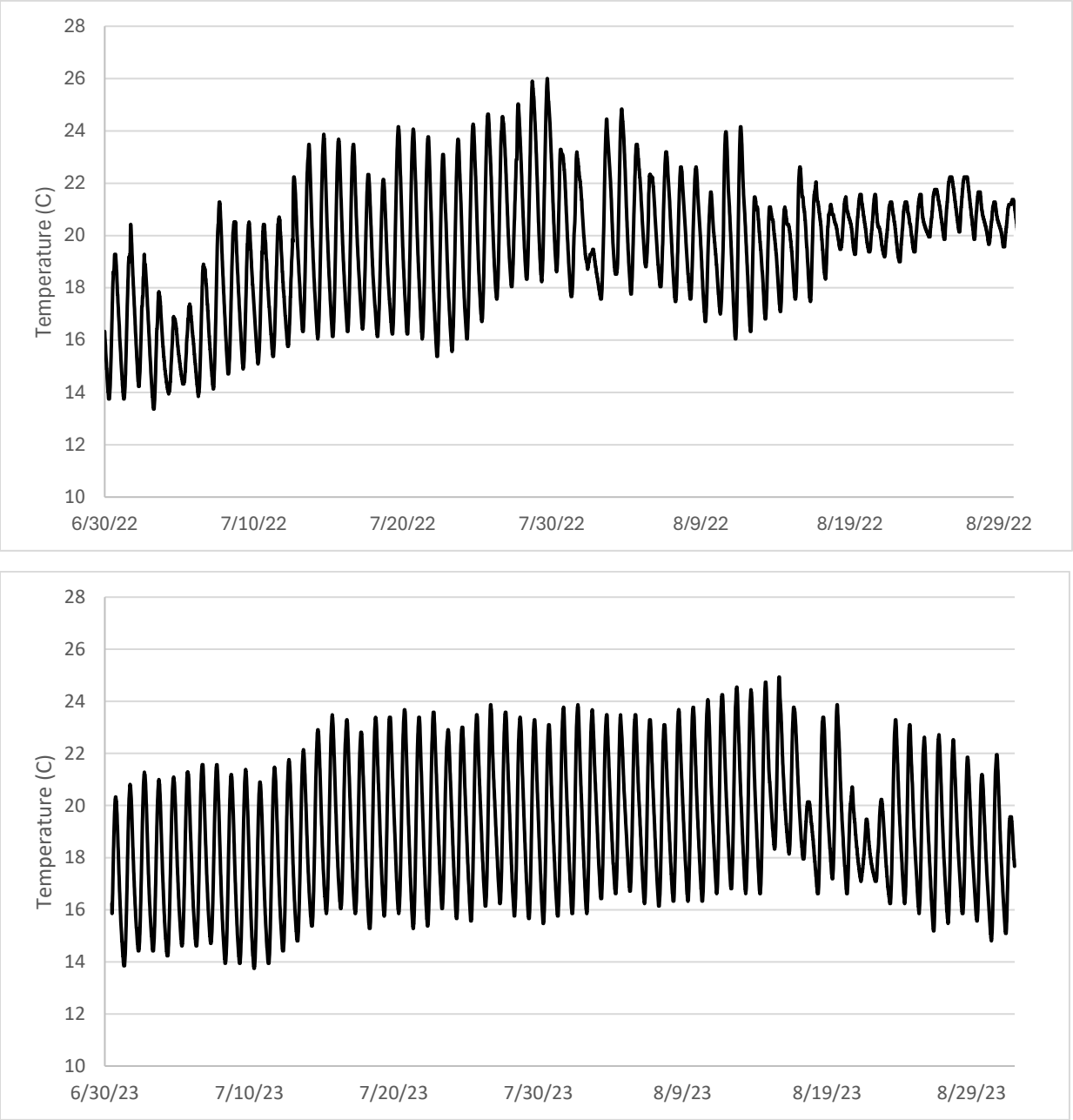


Figure 2. Scott River Water Temperature Below Young's Dam- 6/30/2022-8/30/22 (top) and 6/30/2023-8/30/23 (bottom).

Flow Monitoring

The Siskiyou RCD operated an Onset pressure transducer to measure stage height in the mainstem Scott River approximately 20 meters downstream of the Young's Dam fish ladder. A rating curve was established and calculated discharge at the site was available for 2022 (Figure 3). In 2023 a pressure transducer was installed in the upstream bay of the fish ladder and discharge was calculated in the ladder in 2023 (Figure 4). Staff plates were installed in the upstream and downstream bay of the ladder in 2022, and stage heights were recorded during site visits in 2022 (Figure 5). In addition, a USGS gage located at RKM 33.8 (41.3 km downstream of Young's Dam) operates continuously and discharges at that site during the summer periods of 2022 and 2023 are shown in Figure 6.

In 2022 notes were taken on the position and number of dam boards in place at the upstream and downstream end of the ladder, as well as in the dam board slots across the main channel adjacent to the ladder (Table 1). Dam board placement and positioning changed often, with several entities manipulating dam boards to adjust flow into the SVID diversion, fish ladder, and main channel.

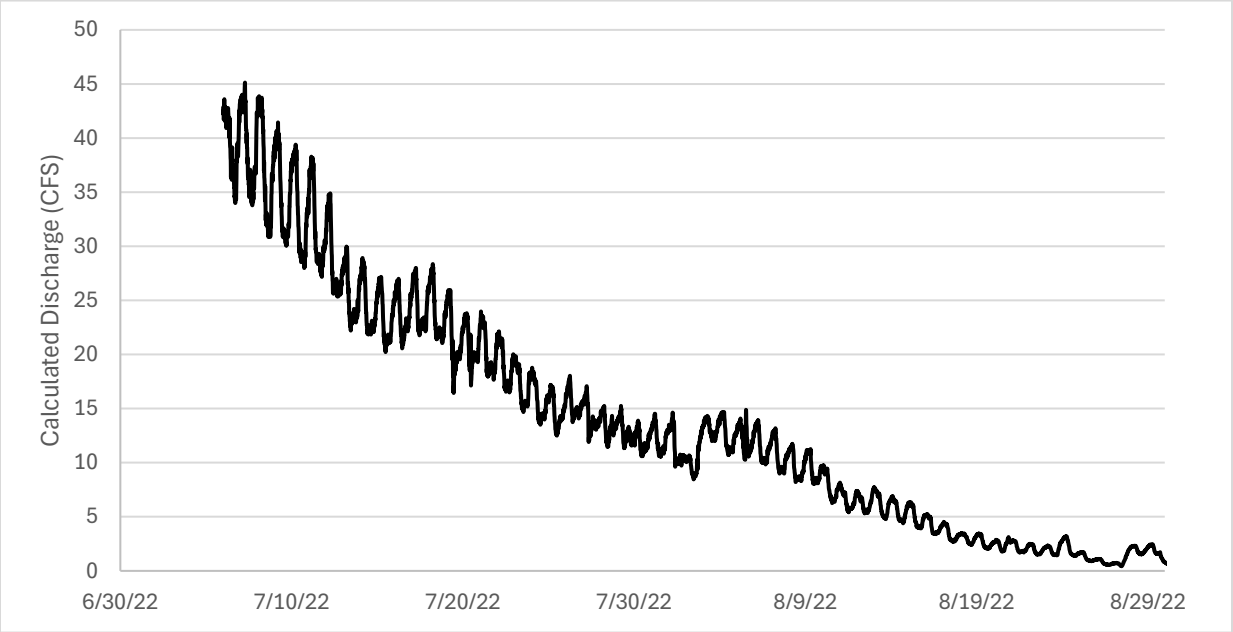


Figure 3. Calculated discharge in the Scott River Below Young's Dam- 7/5/2022-8/30/22 (Siskiyou RCD).

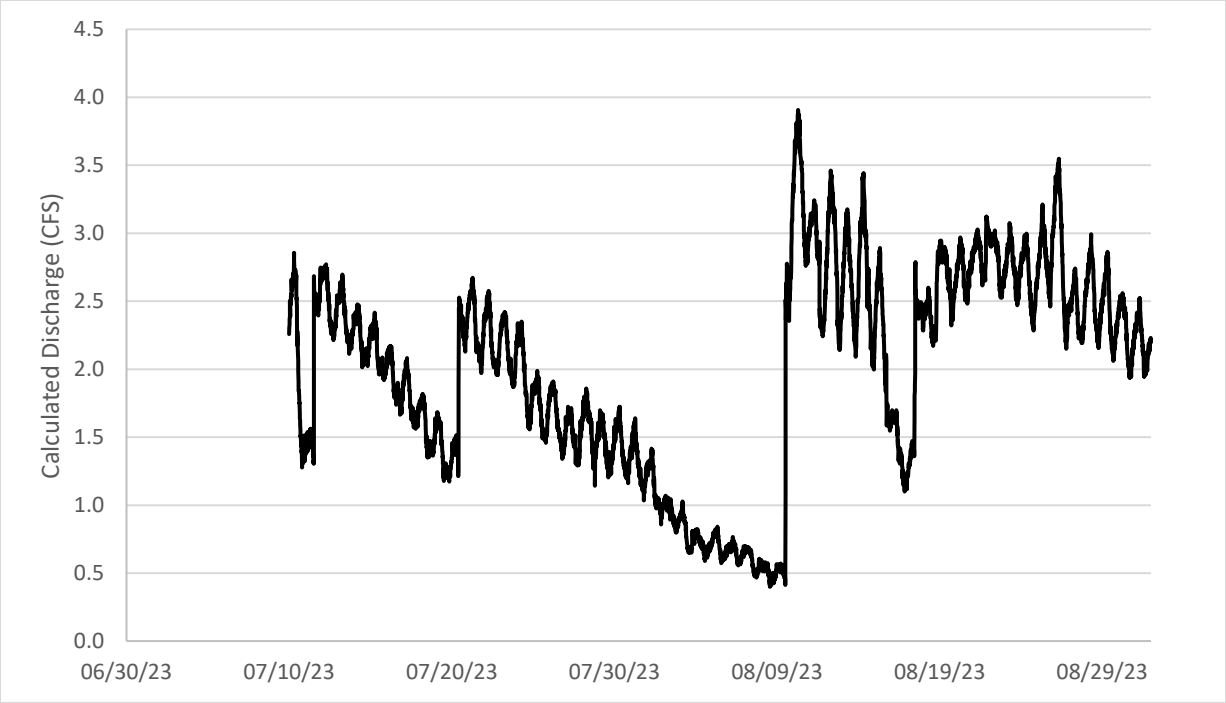


Figure 4. Calculated discharge in the Young's Dam fish ladder 7/10/2023-8/30/23 (Siskiyou RCD).

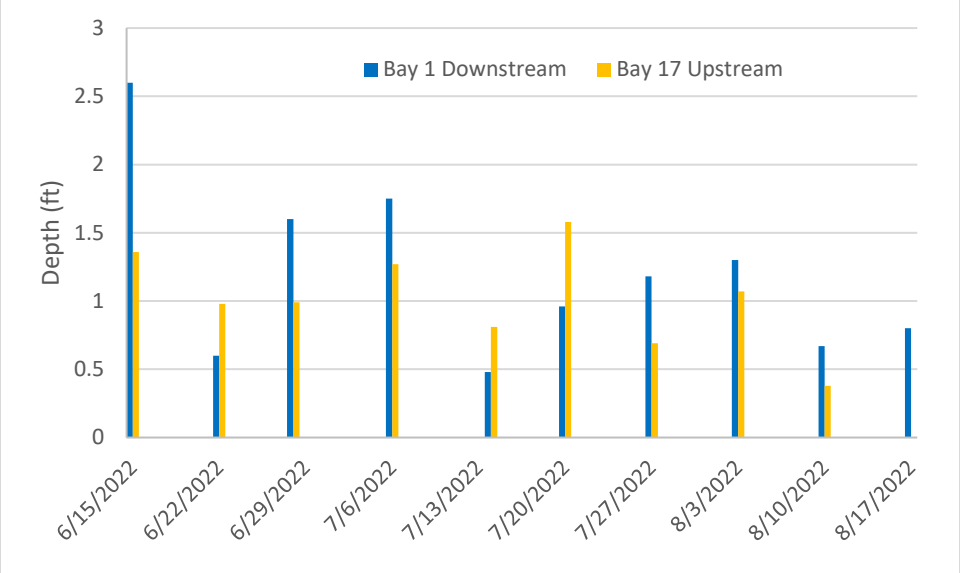


Figure 5. Stage height in Bay 1 (downstream) and Bay 17 (upstream) in Young's Dam fish ladder, 2022.

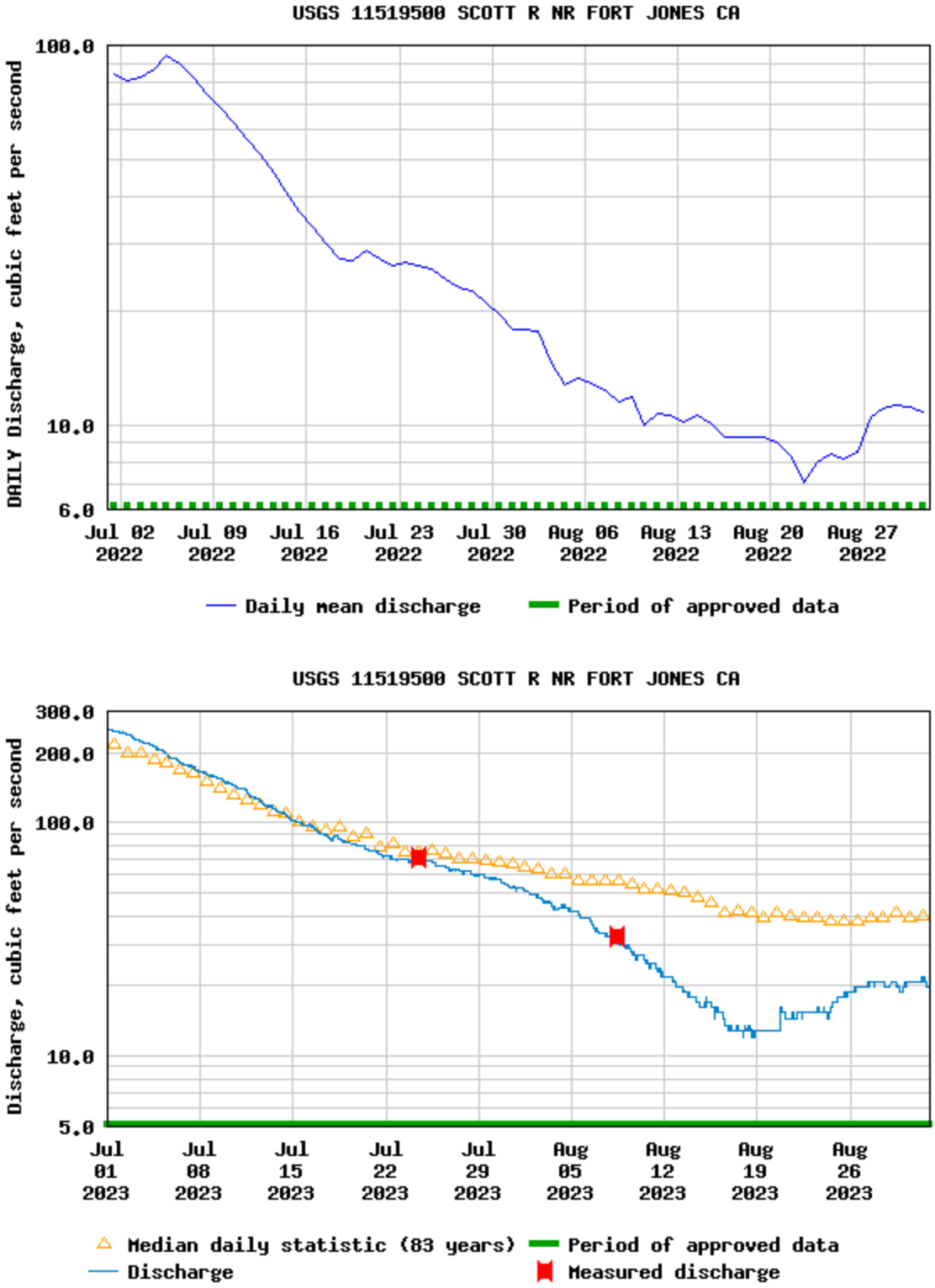


Figure 6. USGS flow data for the Scott River at RKM 33.8, July and August 2022 (top) and 2023 (bottom).

Table 1. Dam boards in place in the upstream and downstream ends of the ladder and in slots across the mainstem adjacent to the ladder.

Date	Slot 1 River	Slot 2	Slot 3	Slot 4	Slot 5	Slot 6 River	Ladder Downstream	Ladder Upstream
5/25/2022	2	2	2	1	0	0	2	2
6/1/2022	2	2	2	2	0	0	2	2
6/15/2022	4	4	4	3	3	3	3	3
6/22/2022	2	2	2	1	1	1	3	1
6/28/2022	2	3	3	2	2	2	4	2
7/6/2022	2	3	3	3	3	3	2	2
7/14/2022	3	4	4	3	3	3	3	3
7/20/2022	3	3	3	3	3	3	3	2
7/27/2022	3	2	3	3	3	2	2	2
8/3/2022	3	2	3	3	3	3	2	2
8/10/2022	3	1	3	3	3	3	0	1
8/17/2022	3	0	3	3	3	3	1	2

Photo Points

Photo points were established at three locations along the fish ladder. Images were captured at these locations during each site visit in 2022 and are available through the Siskiyou RCD.

Video Monitoring

Equipment and Set Up

We used Barlus underwater 5-megapixel cameras connected to a hard drive on digital recorder. Data was backed up data to external hard drives. Power was supplied by solar panel and batteries until 7/14/22 when it was switched to AC outlet at the CDFW pump station. Cameras were mounted in a cinder block so they were protected and held in place but could easily be moved around (Photo 3). Cameras were placed in bay 1 (furthest downstream, Photo 4), bay 12 (Photo 5), and just upstream of the dam boards at the upper end of the fish ladder (Photo 6) (Figure 1). Cameras operate continuously and record color imagery during daylight hours (Photo 7). When light levels are low, the cameras switch to infrared mode, recording black and white imagery (Photo 8). Crews checked the system and cleared camera lenses of algae on a weekly basis.

Video Review

Video data was subsampled so that a representation of the low flow period was obtained. Footage was reviewed in hour long segments. Most video footage was reviewed at 8X speed and slowed down or paused to aid in counting and identifying fish observed. Unreviewed files are stored and are available for future review. The 10th and 23rd hours were reviewed for 18 days during the July and August low flow period in 2022, representing an hour of daylight and an hour of darkness for each of those dates. Four days were reviewed in full (every other hour of the day) to account for peaks in activity at certain hours. A total of 168 hours of footage were reviewed from the summer of 2022, 55 from camera 1, 82 from camera 2, and 31 from camera 3 (Figure 7). Cameras were also installed in the mainstem adjacent to the ladder in July and August in 2022 and in the fish ladder for several days in November and December 2022. Footage from these cameras has not been reviewed. Unreviewed footage is available through the Siskiyou RCD.

Algae accumulation on lenses diminished resolution on some footage. At times, sunlight obstructed view, as did bubbles and small organisms attached to the lens. During the review, notes on water clarity, resolution and other specific observations were made. In some cases, species could be identified and noted in review files. However, most could not definitively be identified to species and so for the purpose

of analyses here, were recorded as juvenile salmonid (other species such as dace, lamprey, suckers could be differentiated).

Three datapoints were recorded to reflect the fish observations within a given hour. The first was the total number of individual fish observed moving into the field of view during the hour period. These may be (and often almost certainly were) the same individuals that had moved into and out of the field of view earlier in that hour, perhaps multiple times. However, this cannot be confirmed and so this "hourly max" represents a maximum possible number of individuals present during that hour. In cases where fish were holding in the area near the camara, this number becomes much higher than the actual number of individuals observed. In cases where fish were essentially passing by and seen moving unidirectionally from one side of the field of view to the other, this number is reduced and likely more closely represents the actual number of individuals present during the hour. Regardless, it is a useful metric in comparing the number of observations across cameras or time periods.

The second data point recorded was the maximum number of individuals observed in a single frame during the hour. This "hourly min" number represents the minimum number of individuals to have been observed (assuming that no individual was seen moving back into the field of view during the viewing hour). This number helps to inform whether fish observed during that hour tended to be holding in the area and observed multiple times or passing the camera without multiple observations of the same individual. The third data point recorded for each hour indicates the reviewers estimate of the total number of individuals actually observed by the camera during the review hour ("hourly estimated total"), taking the aforementioned data points and fish behavior into consideration. To illustrate these metrics so that each day is comparable despite the unequal number of hours reviewed, the average hourly total was calculated for each day for the three metrics (Figure 8).

Large numbers of juvenile salmonids were observed at camera 1 (in the downstream-most bay) throughout the study period. In many cases, schools of age 0 *0. mykiss* were rearing in the area of the camera. Likewise, large numbers of juvenile salmonids were observed on camera 3 at the upstream end of the ladder. Files from this camera after July 20 were corrupted or inadvertently deleted and so were unavailable for review. Observations at camera 2 (bay 12, midway up ladder) were relatively few and zero on many days in late July. Observations at this camera tended to indicate that individuals were passing by (observed moving into the field of view from one side and exiting the other then not seen again). It is unknown if fish observed at camera 2 entered the ladder from the upstream or downstream end. To compare observations in the ladder with temperature and flow conditions, the hourly average maximum observations were plotted for each day along with average daily flow downstream of the fish

ladder, stream temperature, and stage height point measurements in the ladder (Figure 9). Observations at camera 2 did increase slightly following increases in flow in the ladder due to dam board manipulations.

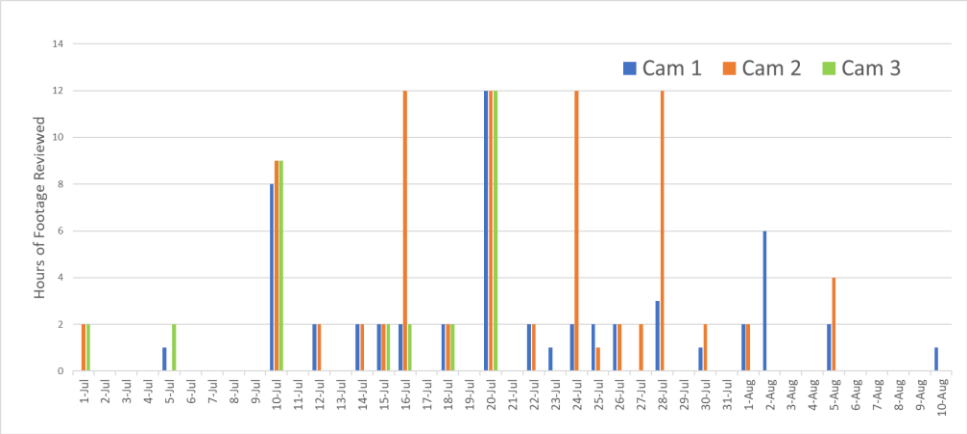


Figure 7. Hours of video footage reviewed from 2022.

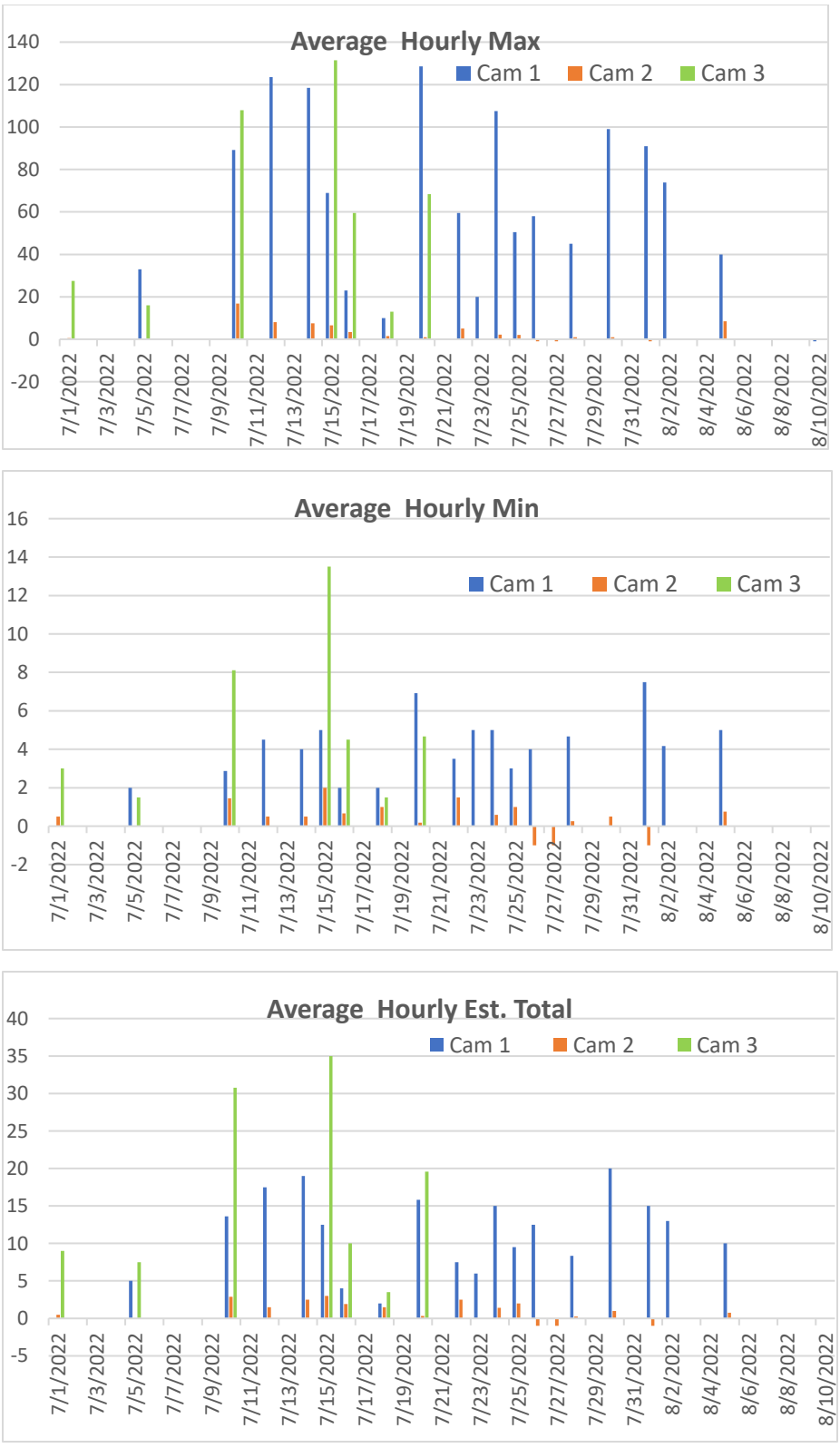


Figure 8. Maximum (top), Minimum (middle), and estimated actual (bottom) number of individual juvenile salmonids observed per day (average of all hours reviewed that day). Daily observations of zero fish are shown as -1 to allow differentiation from days when no footage was reviewed.

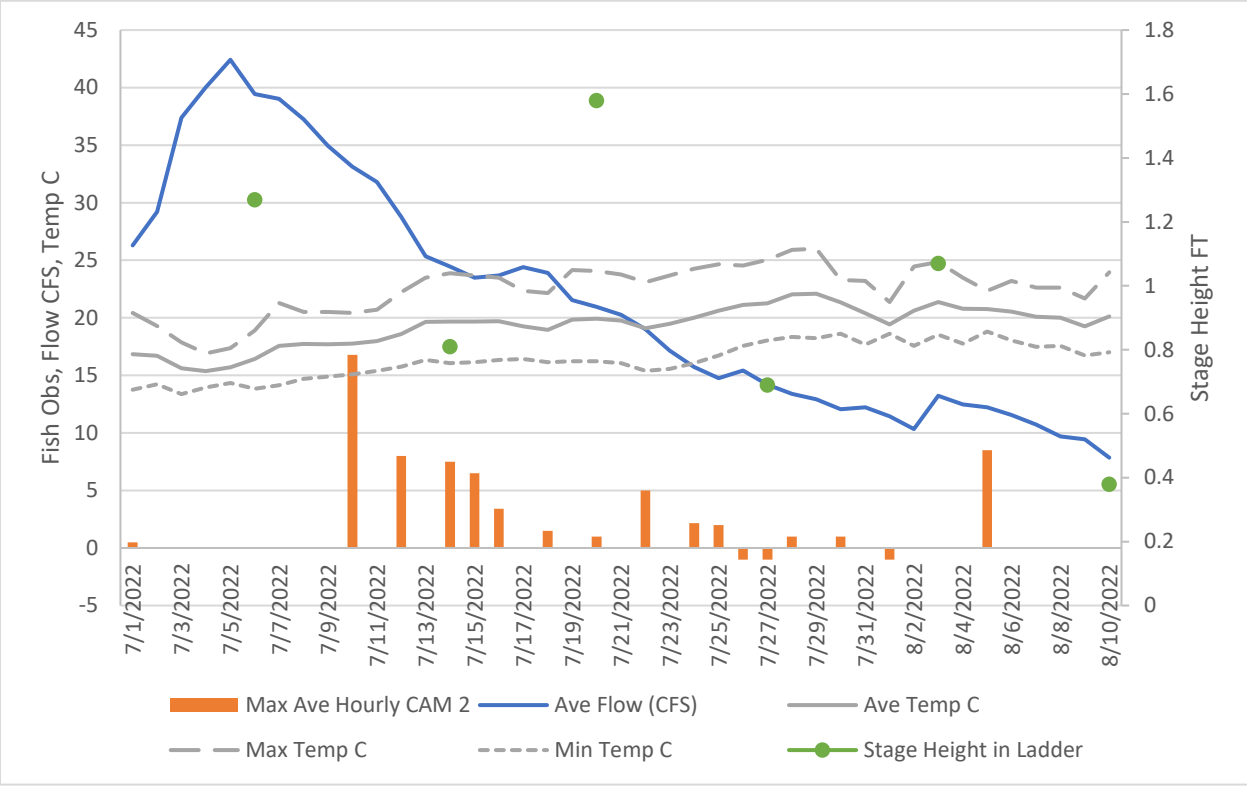


Figure 9. Daily average discharge, minimum, maximum, and average daily temperature in mainstem Scott River downstream of Young's Dam fish ladder and "max average hourly fish observations at CAM 2 located midway up fish ladder (see Figure 8). Daily observations of zero fish are shown as -1. Point measurements of stage height in bay 17 (upstream end) of the fish ladder are shown on secondary Y axis.

PIT Tag Monitoring

In 2023 a PIT tag antenna station (Fish Wiz LLC) was installed at Young's Dam. Antennas were constructed of 12 gage wire housed in PVC pipe in dimensions that fit in the fish ladder (10' x 2') installed in bay 1 (downstream), bay 12 (mid-ladder, Photo 9), and the upstream-most bay (Figure 1). Power was supplied by an AC/DC converter with power supplied by the CDFW pump station. Antennas were operated from 7/5/23 through 10/15/23.

Juvenile salmonids were collected using seine nets and implanted with 12mm FDX tags (BioMark) by the Karuk Tribe fisheries team in upstream and downstream locations within 100 meters of the ladder. Eighty-two salmonids (79 coho, 3 *O. mykiss*) were tagged upstream of the ladder, and 67 (65 coho, 2 *O. mykiss*) were tagged downstream (Table 2). In addition, 5 speckled dace and 1 Klamath small Scaled sucker were tagged but not subsequently detected.

A total of 9 tagged salmonids were detected in the ladder during the study period, which included one coho tagged downstream, seven coho tagged upstream, and one steelhead tagged upstream (Table 3). Detections at each antenna are illustrated in Figure 10. For example, the first fish detected (dark blue points) was detected at the downstream end of the ladder (antenna 1), then in the middle (antenna 2), then the upstream end (antenna 3), but then again in the middle and finally the downstream end (ascended but then descended the ladder). Four individuals were detected successfully ascending the ladder between 7/14/23 and 7/21/14, all being detected at each antenna (1-2-3) subsequently. Three of those individuals were tagged upstream of the ladder so must have passed Young's Dam in the mainstream as they moved downstream between the time of tagging and detection. No additional detections occurred until 8/21/23 when a coho moved downstream, and two more coho were detected at the upper and middle antennas only on 9/9/23 and 9/12/23. To compare detections in the ladder with temperature and flow conditions, the detections (with upstream vs downstream indicated) were plotted for each day along with average daily flow in the fish ladder and stream temperature (Figure 11). Successful upstream movements of age 0 coho through the ladder were confirmed by PIT detections when flow in the ladder was between 1.5 and 2.5 cfs.

Table 2. PIT tags deployed near Youngs Dam on 7/13/2023 and 7/19/2023

	Downstream of Ladder				Upstream of Ladder			
		Fork Length (mm)				Fork Length (mm)		
Species	**Total**	**Mean**	**Min**	**Max**	**Total**	**Mean**	**Min**	**Max**
Coho Salmon	65	68	63	90	79	68	63	0
Steelhead	2	63	63	63	3	65	64	67
Speckled Dace	5	64	63	66				
Sucker	1	263						

Table 3. Detections of PIT tagged salmonids in the fish ladder.

	Total Detected in Ladder	Tagged Downstream	Tagged Upstream
Coho	8	1	7
Steelhead	1	0	1

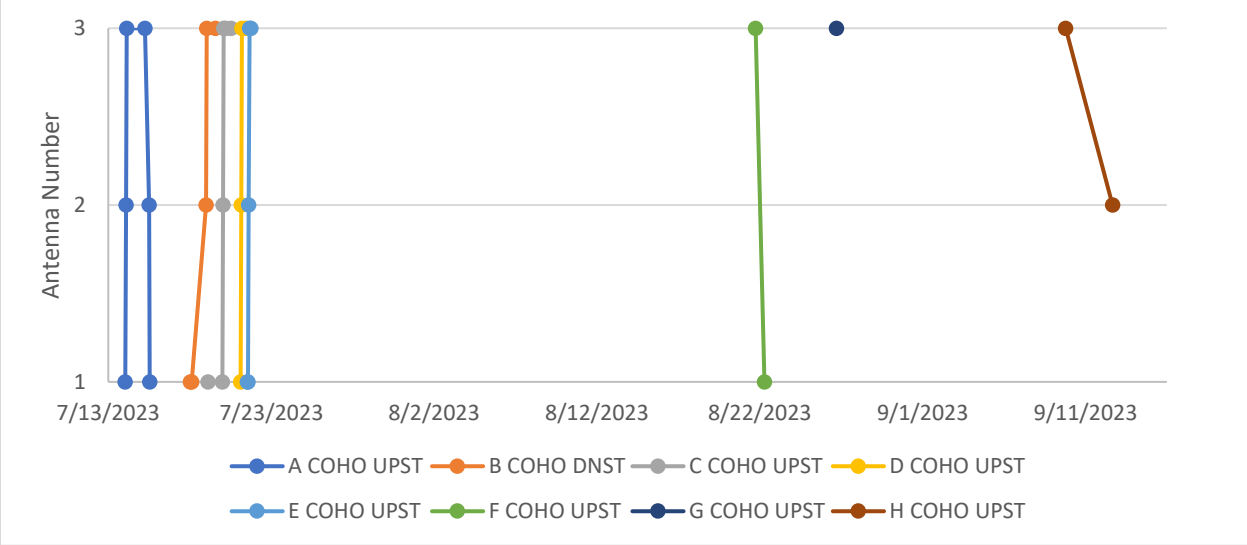


Figure 10. Detections of tagged coho in the Youngs Dam fish ladder. Each color represents an individual fish, with tagging location relative to ladder indicated in legend. Antenna 1 is located at the downstream end of the ladder, 2 is located midway up the ladder, and 3 is located at the upstream end of the ladder.

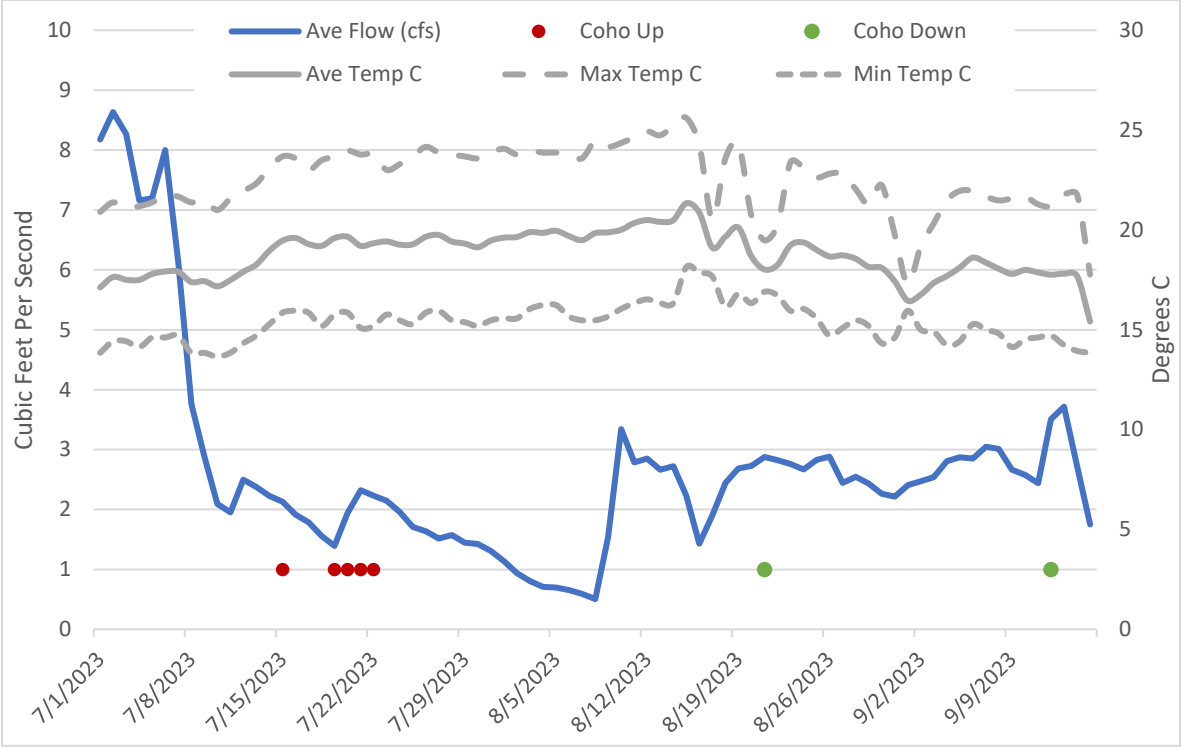


Figure 11. Daily average discharge in the fish ladder, minimum, maximum, and average daily temperature in mainstem Scott River downstream of the fish ladder and detection of tagged fish (see Figure 10), colors indicating whether the fish was detected moving upstream (red) or downstream (green).

Velocity and Depth in the Fish Ladder

Water velocity, hydraulic drop, and jump pool depth were measured during three discharge levels in the ladder on 7/1/2023 by manipulating dam boards at the upstream end of the ladder (Figure 12). Velocity and height/depth was measured in the V notch of the upstream and downstream-most baffles using an OTT MF Pro Water Flow Meter on 7/1/2023 (Figure 12, Photo 10, Photo 11). Three discharge levels were measured, controlled by number of dam boards in the upstream end of the ladder (no boards, one board, and 2 boards, photo 12. Discharge through the ladder was calculated for each scenario and three- or four-point velocity measurements were made at each location at each discharge, and averages were calculated (Table 4). Velocities and hydraulic drop were higher than recommended for juvenile fish passage by the National Marine Fisheries Service (1 foot per second velocity and 6-inch hydraulic drop) at all measured flows, which includes the minimum flow allowable through the ladder on the date measured (1.85 cfs).

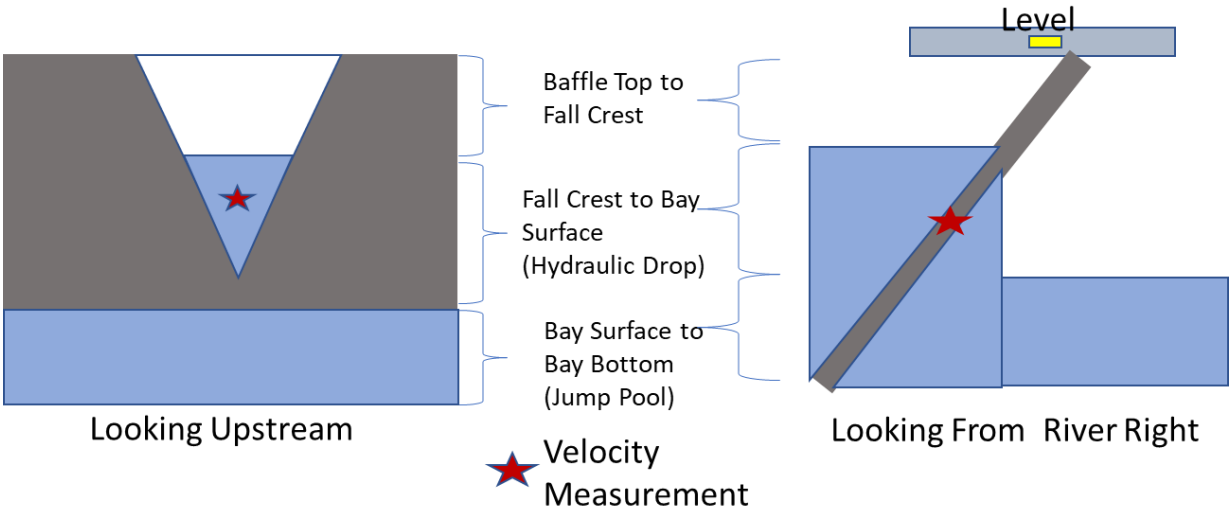


Figure 12. Illustration of velocity, hydraulic drop, and jump pool measurements.

Table 4. Measurements of discharge, velocity, hydraulic drop, and jump pool depths at three different flow levels in the ladder, taken on 7/1/2023

Flash Boards In	3	2	1
Staff Gauge Reading (upst ladder)	0.4'	0.6'	1.49'
CFS	1.85	4.47	7+
Baffle 1 Mean Velocity in Crest (fps)	1.12	2.88	N/A
Baffle 1 Top to Fall Crest	1'	0.64'	N/A
Baffle 1 Fall Crest to Bay Surface (Jump Height)	1.1'	0.63'	N/A
Bay 1 Surface to Bay 1 Bottom (Jump Pool Depth)	0.85'	0.85'	N/A
Baffle 1 Mean Velocity in Crest (fps)	1.07'	0.62'	N/A
Baffle 1 Top to Fall Crest	0.45'	0.43'	N/A
Baffle 1 Fall Crest to Bay Surface (Jump Height)	1.45'	1.8'	N/A
Baffle 17 Mean Velocity in Crest (fps)	1.76	3.26	3.12

Proposed Fish Ladder and Channel Modification

Waterways Consulting INC was contracted by the Siskiyou RCD to submit 30% designs for potential modifications to the Youngs Dam site to improve fish passage (Appendix A). Two alternative plans were submitted: a) extending the fish ladder downstream and b) extending the existing roughened channel downstream.

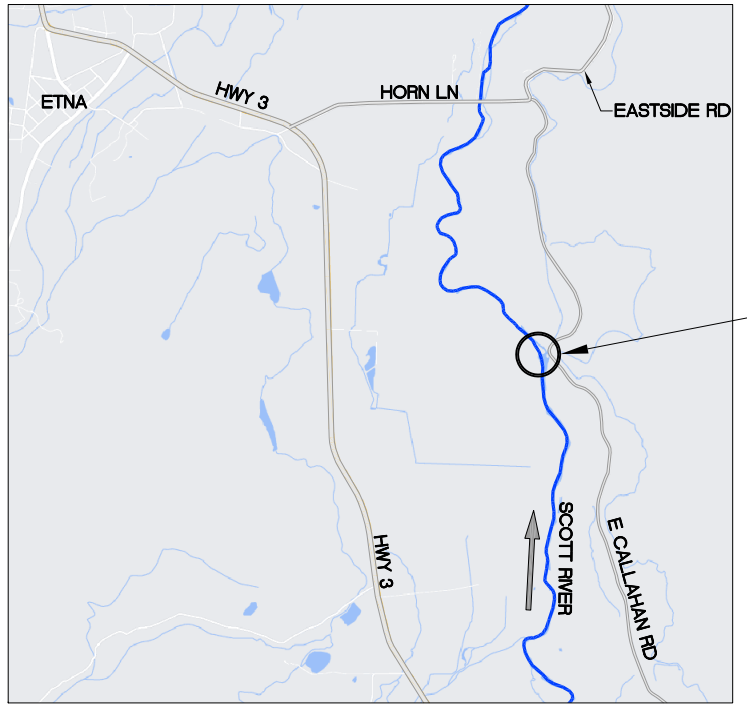
Acknowledgements

This project was made possible by funding from Department of Interior 15.608 - Fish and Wildlife Management Assistance. Thanks to Gareth Plank for providing access to the site, the California Department of Fish and Game for use of equipment and power to run electronics, Preston Harris for coordinating work between individuals and agencies, Chris Voigt and Evan Senf for field and data management assistance, and the Karuk Tribe for PIT tagging fish for this study.

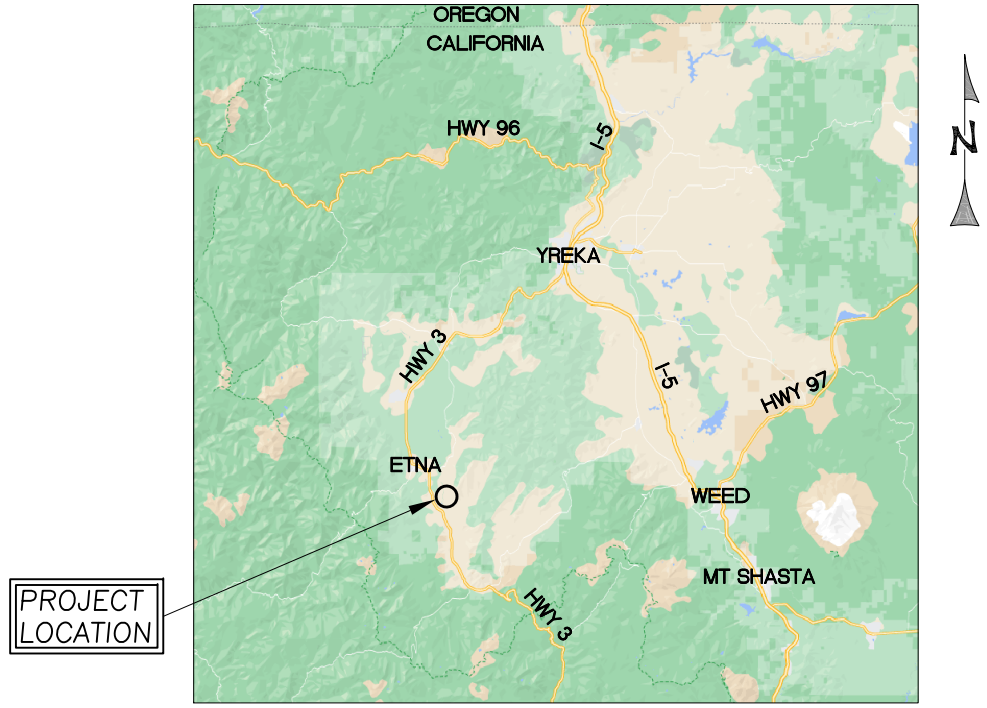
Appendix A. 30% design submittal for Young's Dam fish ladder and channel modifications (Waterways Consulting Inc).

YOUNG'S DAM- SCOTT PROJECT

30% DESIGN SUBMITTAL



VICINITY MAP
N.T.S. (GOOGLE)



REGIONAL MAP
N.T.S. (GOOGLE)

GENERAL NOTES

1. TOPOGRAPHIC MAPPING WAS PERFORMED BY:
   SISKIYOU LAND SURVEYING
   8919 SCOTT RIVER RD
   FORT JONES, CA 96032
   SURVEY DATE; OCTOBER 5, 2022.
2. LIDAR CONTOURS OUTSIDE OF TOPOGRAPHIC MAPPING AREA WERE PROVIDED BY NOAA, 2017.
3. ELEVATION DATUM: GPS TIES TO NAVD88 USING THE LEICA GEOSYSTEMS SMARTNET GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) NETWORK.
4. BASIS OF BEARINGS: GPS TIES TO NAD83 CALIFORNIA STATE PLANE, ZONE 1 USING THE LEICA GEOSYSTEMS SMARTNET GLOBAL NAVIGATION SATELLITE SYSTEM (GNSS) NETWORK.
5. AERIAL PHOTO SOURCE:
   MICROSOFT BING MAXAR
   PHOTOGRAPH DATE: 2023
6. CONTOUR INTERVAL IS ONE FOOT. ELEVATIONS AND DISTANCES SHOWN ARE IN DECIMAL FEET.
7. THIS IS NOT A BOUNDARY SURVEY. PROPERTY LINES ARE NOT SHOWN HEREON.
8. THIS IS NOT A BOUNDARY SURVEY. PROPERTY LINES WERE COMPILED FROM RECORD INFORMATION. THE LOCATION OF THESE LINES IS SUBJECT TO CHANGE, PENDING THE RESULTS OF A COMPLETE BOUNDARY SURVEY.
9. ALL CONSTRUCTION AND MATERIALS SHALL CONFORM TO THE 2023 EDITION OF THE STATE OF CALIFORNIA STANDARD SPECIFICATIONS, ISSUED BY THE DEPARTMENT OF TRANSPORTATION (HEREAFTER REFERRED TO AS "STANDARD SPECIFICATIONS").
10. THESE DESIGNS ARE INCOMPLETE WITHOUT THE FINAL STAMPED TECHNICAL SPECIFICATIONS PREPARED BY WATERWAYS CONSULTING, INC. REFER TO TECHNICAL SPECIFICATIONS FOR DETAILS NOT SHOWN HEREON.

ABBREVIATIONS

AVG.	AVERAGE
BW	BOTTOM OF WALL
CC	CONCRETE
CY	CUBIC YARDS
DIA.	DIAMETER
E	EXISTING
EG	EXISTING GROUND
ELEV.	ELEVATION
DI	DRAINAGE INLET
FG	FINISHED GRADE
FT	FEET
INV	INVERT
MIN	MINIMUM
N	NEW
NIC	NOT IN CONTRACT
N.T.S.	NOT TO SCALE
O.C.	ON CENTER
RC	RELATIVE COMPACTION
RSP	ROCK SLOPE PROTECTION
SPK	SPIKE
SQ.FT.	SQUARE FOOT
T	TREE
TBD	TO BE DETERMINED
TW	TOP OF WALL
TYP	TYPICAL
UNK	UNKNOWN
WSE	WATER SURFACE ELEVATION
YR	YEAR

SECTION AND DETAIL CONVENTION

SECTION OR DETAIL IDENTIFICATION (NUMBER OR LETTER)

5
C3

SHEET REFERENCE

PROJECT DESCRIPTION

THESE DRAWINGS PROVIDE DESIGN DETAILS FOR FISH PASSAGE IMPROVEMENTS AT YOUNG'S DAM ON THE SCOTT RIVER IN SISKIYOU COUNTY, CALIFORNIA.

TWO ALTERNATIVES ARE PRESENTED:
- A) EXTENDING THE EXISTING FISH LADDER
- B) EXTENDING THE EXISTING ROUGHENED CHANNEL

SHEET INDEX

** CALL BEFORE YOU DIG **

CONTACT UNDERGROUND SERVICE ALERT (USA) PRIOR TO ANY CONSTRUCTION WORK 1-800-642-2444

WATERWAYS CONSULTING INC.
1020 SW TAYLOR STREET, STE. 380
PORTLAND, OR 97205
PH:(503)227-5979 // FAX:(888)819-6847
WWW.WATWAYS.COM

PRELIMINARY
NOT FOR CONSTRUCTION

PREPARED AT THE REQUEST OF:
SISKIYOU RESOURCE CONSERVATION DISTRICT

COVER

YOUNG'S DAM -SCOTT RIVER PROJECT
30% DESIGN SUBMITTAL

DESIGNED BY: A.M.S.
DRAWN BY: M.P.L
CHECKED BY: A.M.S.
DATE: 2/28/2024
JOB NO.: 21-061

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

C1 | OF 5

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LEGEND

- EXISTING CONTOURS (SLS SURVEY, 2023)
- EXISTING CONTOURS (LIDAR, 2018)
- EXISTING FISH RETURN PIPE
- EXISTING SHEET PILE WALL
- EXISTING WEIR LOCATIONS
- EXISTING OVERHEAD ELECTRICAL
- EXISTING CONCRETE
- EXISTING TRASH RACK
- EXISTING POWERPOLE
- EXISTING GUY WIRE
- PROPOSED ESM

REGRADE (E) RSP BANK

EXTEND (E) FISH RETURN PIPE 25 FEET DOWNSTREAM

EXTEND (E) FISH LADDER 25 FEET DOWNSTREAM
INV (OUT) 2788.6

CC: 2787.4

(E) FISH RETURN PIPE 24-IN DIA PLASTIC
INV (OUT): 2788.7

(E) CC FISH RETURN PIPE DIMENSIONS UNKNOWN

(E) TRASH RACK

IRRIGATION DITCH

SCOTT RIVER PROFILE 1 C4

SCOTT RIVER

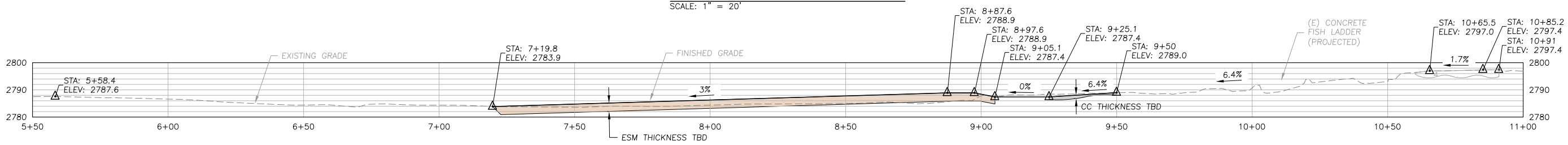
A C4

B C4

1

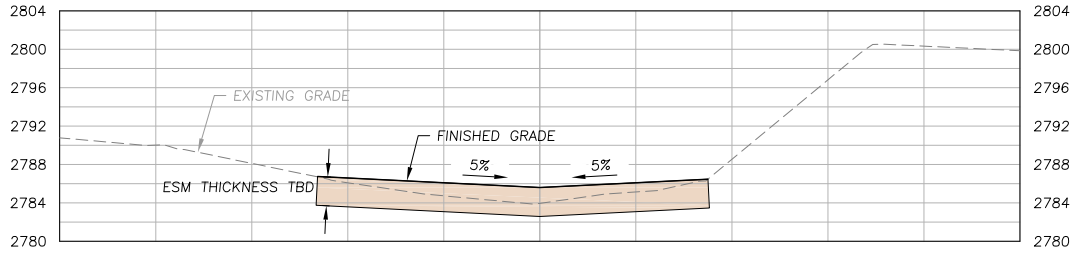
TW: 2800.8

ALT A - EXTEND FISH LADDER
SCALE: 1" = 20'

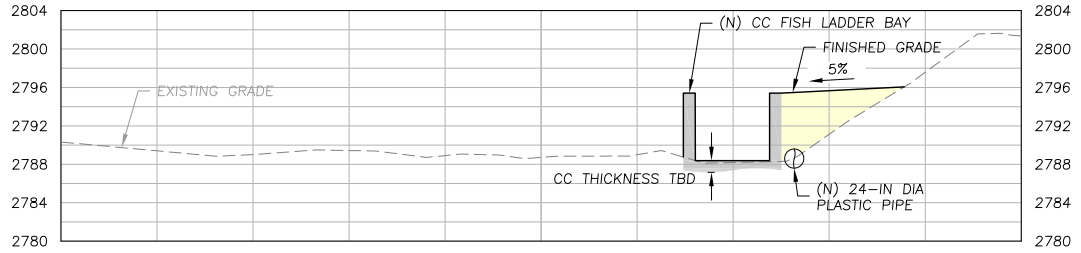


SCOTT RIVER PROFILE 1 C4
SCALE: 1" = 20'

ROUGHENED CHANNEL SECTION A C4
SCALE: 1" = 10'



FISH LADDER SECTION B C4
SCALE: 1" = 10'



KEY NOTE

1. ADDITIONAL ACTIONS MAY BE REQUIRED TO RESTRICT FLOW INTO THE FISH LADDER (MAXIMUM DESIGN FLOW = XX CFS)

WATERWAYS CONSULTING INC.
1020 SW TAYLOR STREET, STE. 380
PORTLAND, OR 97205
PH:(503)227-5979 // FAX:(888)819-6847
WWW.WATWAYS.COM

PRELIMINARY

NOT FOR CONSTRUCTION

PREPARED AT THE REQUEST OF:
SISKIYOU RESOURCE CONSERVATION DISTRICT

YOUNG'S DAM -SCOTT RIVER PROJECT
30% DESIGN SUBMITTAL

ALT A - EXTEND FISH LADDER

DESIGNED BY:	A.M.S.
DRAWN BY:	M.P.L
CHECKED BY:	A.M.S.
DATE:	2/28/2024
JOB NO.:	21-061

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS
0 1"

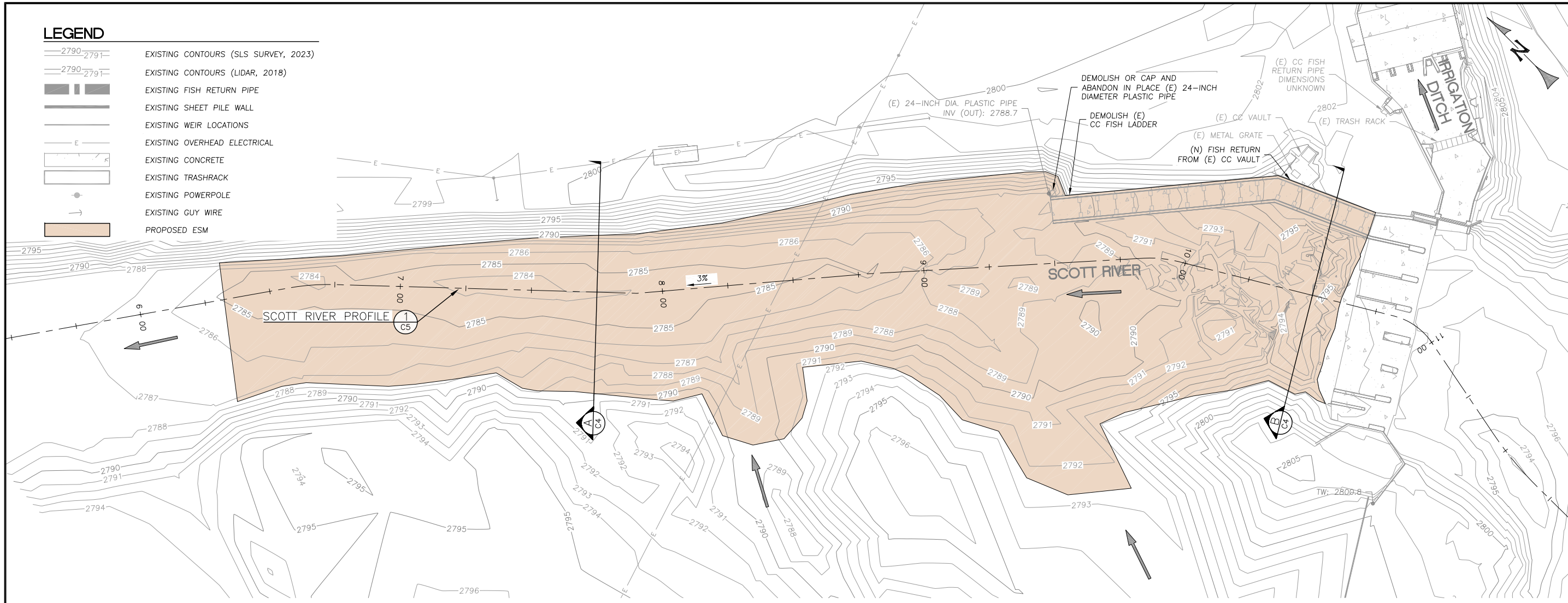
C4

4 OF 5

F:\Projects\21-061_YoungsDam_ScottR\CAD\21-061 Fish Ladder Alt.dwg — 2/28/2024 10:25 AM

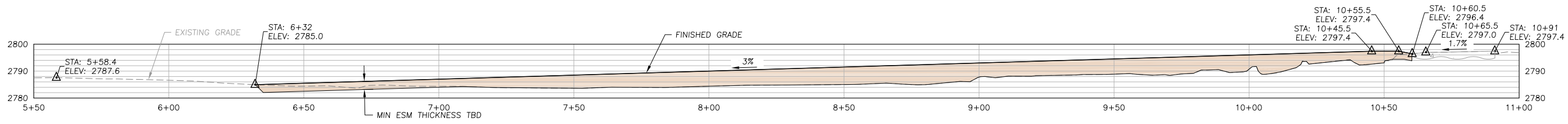
LEGEND

- EXISTING CONTOURS (SLS SURVEY, 2023)
- EXISTING CONTOURS (LIDAR, 2018)
- EXISTING FISH RETURN PIPE
- EXISTING SHEET PILE WALL
- EXISTING WEIR LOCATIONS
- EXISTING OVERHEAD ELECTRICAL
- EXISTING CONCRETE
- EXISTING TRASHRACK
- EXISTING POWERPOLE
- EXISTING GUY WIRE
- PROPOSED ESM



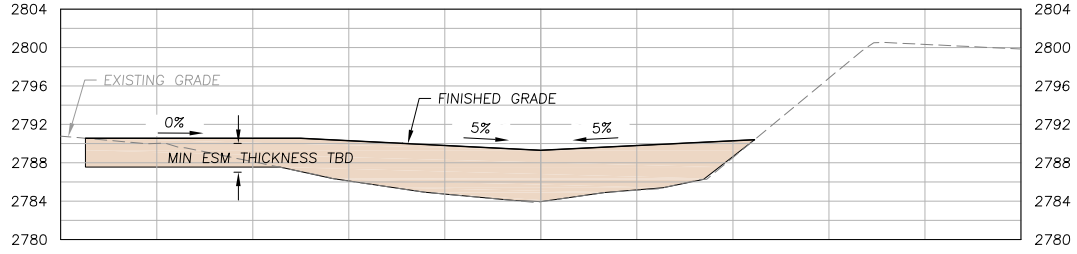
ALT B - EXTEND ROUGHENED CHANNEL

SCALE: 1" = 20'



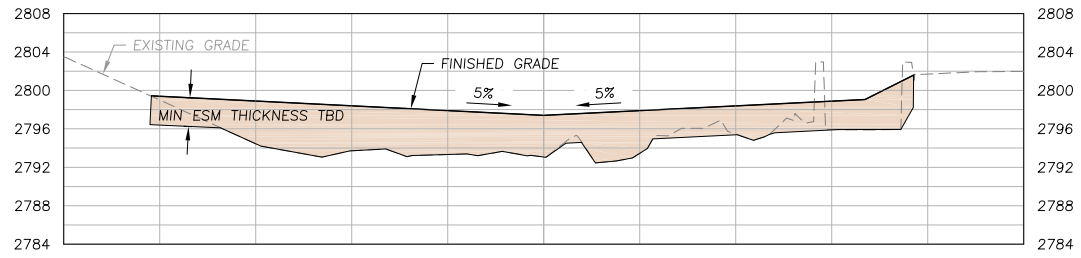
SCOTT RIVER PROFILE (1 / C5)

SCALE: 1" = 20'



ROUGHENED CHANNEL SECTION (A / C5)

SCALE: 1" = 10'



ROUGHENED CHANNEL CREST (B / C5)

SCALE: 1" = 10'

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PRELIMINARY

NOT FOR CONSTRUCTION

PREPARED AT THE REQUEST OF:

SISKIYOU RESOURCE CONSERVATION DISTRICT

ALT B - EXTEND ROUGHENED CHANNEL

YOUNG'S DAM -SCOTT RIVER PROJECT

30% DESIGN SUBMITTAL

DESIGNED BY:	A.M.S.
DRAWN BY:	M.P.L.
CHECKED BY:	A.M.S.
DATE:	2/28/2024
JOB NO.:	21-061

BAR IS ONE INCH ON ORIGINAL DRAWING, ADJUST SCALES FOR REDUCED PLOTS

0 1"

C5 | 5 OF 5

F:\Projects\21-061_YoungsDam_ScottR\CAD\21-061 RC Alt.dwg - 2/28/2024 10:25 AM

Photo 1. Young's dam with the headgate to the Scott Valley Irrigation District ditch in the left foreground, upstream end of fish ladder in the right foreground, and condrete apron with dam board slotst extending across the main channel.

Photo 2. Looking upstream at the Young's Dam fish ladder.

Photo 3. Barlus underwater camera mounted in a cinder block.

Photo 4. Camera 1 position in bay 12 and underwater view.

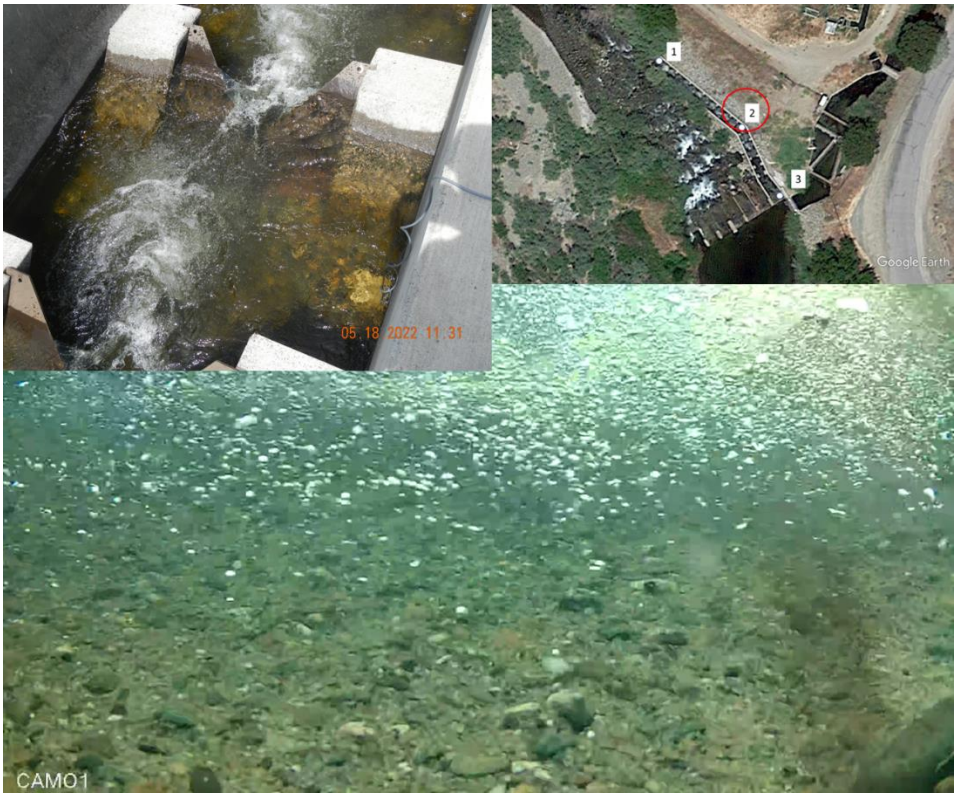

Photo 5. Camera 2 position in bay 12 and underwater view.

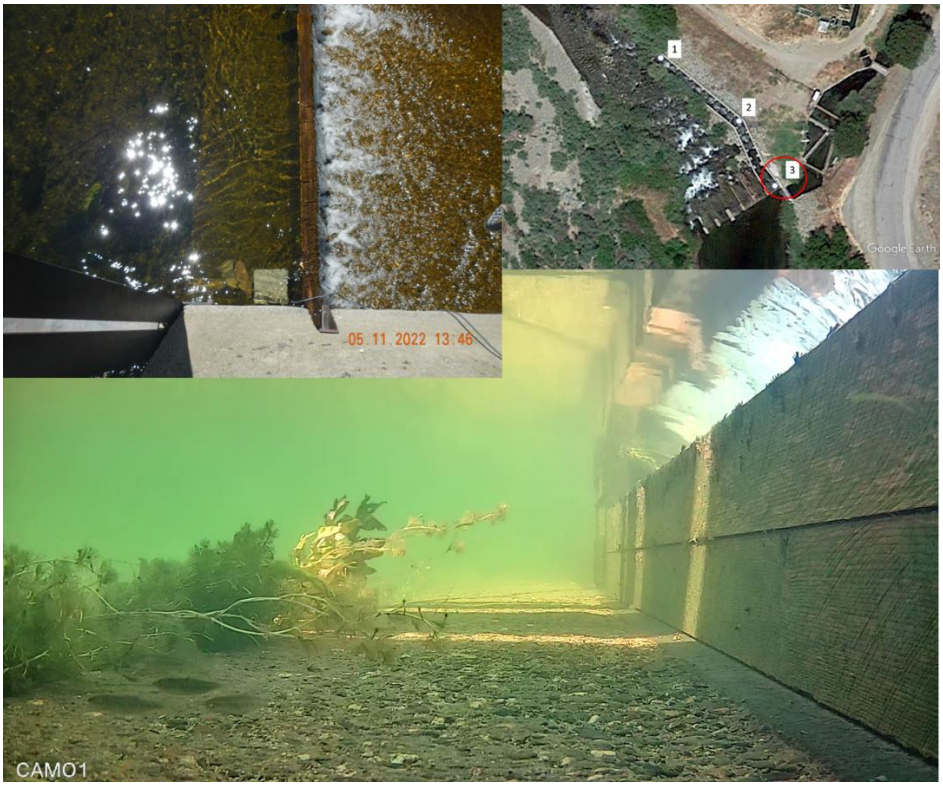

Photo 6. Camera 3 position in bay 12 and underwater view.

Photo 7. Image from camera during light hours.

Photo 8. Image from camera during dark hours.

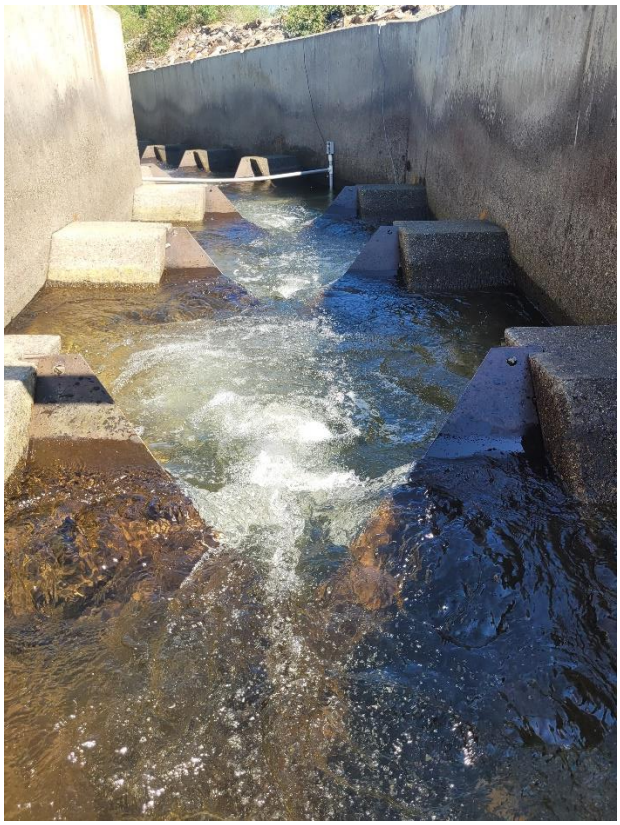

Photo 9. PIT tag antenna in bay 12.

Photo 10. Measuring velocity in the V notch of baffle 1 at 1.85 cfs.

Photo 11. Measuring fall crest to bay surface and bay surface to bay bottom at 1.85 cfs.

Photo 12. Flash boards (top) and view from downstream end of ladder (bottom) at 1.85 cfs (left), 4.47 cfs (middle) and 7+ cfs (right).