



July 21, 2019

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USACE Bonneville AFF Project Coord.
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RE: In-Season Steelhead Report Task 3 Update 2 (April – July 17, 2019)

Dear Jon Hess, Jeff Fryer, John Whiteaker and Andrew Derugin,

Task 3: Reporting. The overall objective as expressed in the Statement of Work (SOW) was to “Install and utilize the scanning system to collect high quality images enabling fish species identification and to measure biological characteristics of individual steelhead including fork length, adipose fin status (clipped or unclipped), dorsal fin condition (eroded fin or intact), and other quantifiable traits.”

Methods: *Biological characteristics of each steelhead identified*

a). The FishL™ Recognition system uses the multiple images from the three different camera angles, together with a proprietary algorithm, to rapidly calculate the fork length of an individual fish to 1/10 mm. Provided a single fish is captured in the images, fork length data is automatically calculated and was later uploaded and associated with the scan index and manual classification data in the database. Table 1 is a continuous extension of Table 1 submitted in the first In-season Report which covered April through June 30, 2019. The previously provided information (April -June 30, 2019) is shaded and the new information (July 1-July17, 2019) has a white background. As the fish passed through the system of their own volition, assisted only by the water flow in the flume and gravity, the fish passed through the scanner in a fraction of a second and exhibited a wide host of positions and orientations, at times, quite clearly visualized and at others specific identifying features were obstructed either by fish position or the water passing through the scanner bed along with the fish. A number of features were used in the steelhead species identification determination which included some of the following:

- | | |
|------------------------------|--|
| Anal fin \leq 12 rays | Distinctive, radiating, uniform spots on tail |
| White mouth and jaw | Spot presence on dorsal fin |
| Torpedo-like shaped body | Uniform spot size across body (often very small) |
| Red gill plate | Spots both above and below lateral line |
| Red stripe down lateral line | Flat, straight tail edge |
| Wide, thick caudal | |

b). The adipose presence or absence (clipped) is recorded in Table 1 for each steelhead. Experience in adipose identification via scanned color images and utilization of near-infrared images to confirm adipose presence was employed.

c). As the fish assumed a wide host of positions and orientations as they traveled down the scanner bed and interacted with the water streaming down as well, the dorsal fin was not always in view or

extended. A partially extended dorsal fin can roll up on itself out of the water and thus a conservative approach to defining eroded or “stubby dorsal” was adopted. Notes as to a potential altered state of the dorsal fin are recorded in Table 1. If there is no entry, it is assumed the dorsal fin is likely full and healthy. A question mark (?) indicates that the dorsal fin viewing was not ideal and thus status is inconclusive. Observations of split dorsal fins are noted. Those that are eroded or all but absent have been given a “stubby” descriptor.

d). The date and time a given steelhead passed through the scanner with images captured is also recorded in Table 1. There were a handful of cases in which substantial damage, possibly associated with pinniped injury occurred. Injury descriptions are also noted in Table 1.

Results: From April – June 30, 2019 thirty-eight steelhead were conclusively identified via various features with one additional fish considered as a possible (39th) steelhead. From July 1- July 17 thirty-two additional steelhead were identified.

Of the thirty-two steelhead identified July 1-July 17 there was one instance in which 2 fish were imaged together, W40. The W40 steelhead slid through the scanner just behind a sockeye. The full image of the steelhead was not captured and thus a forklength and adipose fin assessment are not available for W40. Of the 31 remaining, one was larger than 780 mm (W61 was 830.9 mm). Of the additional 31 steelhead for which adipose assessment was possible, 23 had an adipose fin (wild) and 8 had a clipped adipose fin (hatchery).

Conclusion: Between April and July 17, 2019 there were series of dates in which the Bonneville AFF was operational and fish that passed over the right-side false weir, and were not selected for sampling, slid through the right-side bypass and were imaged via the Whooshh FishL™ Recognition system before exiting into a calm channel connected to the fish ladder. Within this timeframe and under these conditions, 6499 scans were recorded, and date and time of scan logged. Seventy scans contained fish that were conclusively identified as steelhead. One additional possible steelhead was also identified. Three steelhead were greater than 780 mm.

The FishL™ Recognition system is functioning well. Nine different species have been identified in the scans to date which are: Chinook, sockeye, steelhead, peamouth chub, small mouth bass, pacific lamprey, northern pikeminnow, large scale sucker, and America shad. First pass species identification resulted in a relatively small number of scans (30-40) to be re-reviewed prior to tabulating species totals for a given time period (steelhead have been ruled out in this set). The project is providing a wealth of images for algorithm development and additional data for fisheries management.

Inquires as to the data or report please feel free to contact me.

Best regards,

Janine Bryan

Table 1: Steelhead identified via the FishL™ Recognition system at Bonneville AFF between April and July 17, 2019. July 1- Jul 17 in white background. W# is steelhead number. Number is the scan number. Dark shaded fork length boxes highlight >780 mm steelhead. W39 was a possible steelhead but inconclusive shaded in gold.

W#	Number	Species	Adipose	Fork Length	Date	Time	Dorsal	Condition
1	1687	Steelhead	clipped	700.2	5/7/2019	12:05:31 PM		descale 5-19%
2	1757	Steelhead	clipped	788.4	5/7/2019	12:34:12 PM	?	scrape
3	2477	Steelhead	not visible	578.0	5/15/2019	12:12:02 PM		
4	2648	Steelhead	clipped	522.1	5/22/2019	10:58:39 AM		redband stripe
5	2796	Steelhead	clipped	717.5	5/30/2019	12:23:45 PM	?	
6	3225	Steelhead	present	618.3	6/13/2019	11:58:08 AM		descale >20%
7	3457	Steelhead	present	781.1	6/18/2019	11:41:47 AM		
8	3473	Steelhead	clipped	629.6	6/18/2019	11:55:00 AM	?	
9	3542	Steelhead	present	690.6	6/20/2019	9:59:50 AM		
10	3571	Steelhead	present	583.2	6/20/2019	10:30:55 AM		
11	3613	Steelhead	present	635.6	6/20/2019	11:18:19 AM	?	
12	3619	Steelhead	present	560.5	6/20/2019	11:23:13 AM		bright yellow marking near anal fin
13	3627	Steelhead	clipped	644.8	6/20/2019	11:29:44 AM		
14	3783	Steelhead	present	631.8	6/21/2019	10:37:44 AM		
15	4218	Steelhead	present	692.3	6/25/2019	9:32:30 AM		
16	4283	Steelhead	clipped	674.7	6/25/2019	10:58:22 AM	?	
17	4297	Steelhead	present	724.0	6/25/2019	11:06:06 AM		
18	4401	Steelhead	present	727.2	6/25/2019	12:12:05 PM	?	
19	4440	Steelhead	present	699.1	6/25/2019	12:47:24 PM	split fin	
20	4515	Steelhead	present	642.0	6/26/2019	10:42:33 AM	?	
21	4542	Steelhead	clipped	618.8	6/26/2019	11:06:20 AM	stubby	
22	4625	Steelhead	clipped	601.0	6/26/2019	12:21:38 PM		tail split
23	4628	Steelhead	present	616.8	6/26/2019	12:24:17 PM		tail split
24	4697	Steelhead	clipped	719.1	6/27/2019	11:46:19 AM	split fin	descale >20%
25	4755	Steelhead	present	676.5	6/27/2019	12:33:27 PM	split fin	
26	4771	Steelhead	present	774.0	6/27/2019	12:51:57 PM		
27	4798	Steelhead	clipped	638.9	6/27/2019	1:32:01 PM	?	
28	4861	Steelhead	clipped	659.6	6/28/2019	9:02:11 AM	?	
29	4882	Steelhead	clipped	651.1	6/28/2019	9:31:22 AM		
30	4980	Steelhead	clipped	623.8	6/28/2019	10:39:35 AM	?	
31	4984	Steelhead	present	614.0	6/28/2019	10:42:06 AM	?	
32	4993	Steelhead	clipped	647.3	6/28/2019	10:47:17 AM	?	curved scratch
33	4995	Steelhead	present	645.7	6/28/2019	10:48:13 AM		
34	5002	Steelhead	present	2 Fish - no FL	6/28/2019	10:56:12 AM		open wound, steelhead + sockeye in the same scan view
35	5011	Steelhead	present	696.0	6/28/2019	11:01:34 AM		open wound
36	5039	Steelhead	present	646.7	6/28/2019	11:15:55 AM	split fin	open wound, split tail
37	5111	Steelhead	clipped	651.1	6/28/2019	11:57:13 AM	?	
38	4513	Steelhead	present	2 Fish - no FL	6/26/2019	10:39:53 AM		Steelhead and sockeye in the same scan view - together plus water limited feature viewing
39	4519	Possible Steelhead	present	618.1	6/26/2019	10:47:35 AM	no or few spots	spot related features inconsistent but may be an imaging issue, white mouth and jaw, and anal fin suggestive of steelhead
W#	Number	Species	Adipose	Fork Length	Date	Time	Dorsal	Condition
40	5186	Steelhead	not visible	2 Fish - no FL	7/1/2019	11:20:49 AM	?	
41	5294	Steelhead	clipped	719.8	7/2/2019	10:23:28 AM		multiple open wounds
42	5338	Steelhead	present	682.7	7/2/2019	11:36:15 AM	split dorsal	
43	5403	Steelhead	present	525.9	7/2/2019	12:29:10 PM		
44	5418	Steelhead	present	702.8	7/3/2019	8:59:01 AM		large descale and scrape
45	5437	Steelhead	present	689.3	7/3/2019	10:01:17 AM		
46	5451	Steelhead	clipped	559.0	7/3/2019	10:30:20 AM		tail damage
47	5520	Steelhead	present	522.0	7/3/2019	11:49:20 AM	split dorsal	
48	5532	Steelhead	present	700.5	7/3/2019	12:01:32 PM		
49	5596	Steelhead	present	652.4	7/4/2019	9:01:50 AM		
50	5669	Steelhead	present	618.3	7/4/2019	10:05:06 AM		
51	5685	Steelhead	present	687.7	7/4/2019	10:15:25 AM		
52	5775	Steelhead	present	690.8	7/8/2019	10:26:08 AM		
53	5867	Steelhead	present	720.6	7/9/2019	10:21:20 AM		
54	5907	Steelhead	present	701.6	7/9/2019	11:04:10 AM	?	
55	5921	Steelhead	present	689.5	7/9/2019	11:20:49 AM		
56	5991	Steelhead	present	541.8	7/9/2019	12:20:29 PM		
57	6126	Steelhead	clipped	571.8	7/10/2019	11:21:40 AM	stubby	
58	6194	Steelhead	present	578.0	7/10/2019	1:02:20 PM		
59	6260	Steelhead	clipped	657.5	7/11/2019	12:11:38 PM	stubby	scrapes descale
60	6287	Steelhead	present	666.5	7/11/2019	12:59:30 PM		
61	6315	Steelhead	present	830.9	7/12/2019	9:37:41 AM		
62	6327	Steelhead	present	712.2	7/15/2019	9:50:42 AM		open wound
63	6355	Steelhead	present	500.4	7/15/2019	11:40:59 AM		
64	6369	Steelhead	clipped	657.1	7/15/2019	12:14:04 PM		descale
65	6402	Steelhead	present	694.3	7/16/2019	10:18:04 AM	split dorsal	
66	6423	Steelhead	present	661.7	7/16/2019	11:55:31 AM		
67	6425	Steelhead	present	515.9	7/16/2019	12:03:30 PM		
68	6437	Steelhead	clipped	664.0	7/16/2019	12:37:11 PM	split dorsal	scrape
69	6456	Steelhead	clipped	666.6	7/17/2019	10:04:42 AM	split dorsal	open wound, split tail, injury tail and anal fin
70	6473	Steelhead	clipped	516.2	7/17/2019	11:36:11 AM		
71	6486	Steelhead	present	676.3	7/17/2019	12:05:42 PM	?	open wound