

## ***Stream Fish Populations*** **SUMMARY**

Consistent with Section 6.0 of the *Stream Fish Populations Study Plan* (Plan) as filed with FERC on January 9, 2017,<sup>1</sup> SSWD provides the following status update for the *Stream Fish Populations Study* (Study). The summary includes a description of work completed to date, key findings, variances, and remaining work. Links to associated data files are also included. SSWD consider these data to be public.

### **Work Completed as of October 1, 2018:**

The Study is complete. SSWD has completed each of the three steps outlined in the Plan. Step 1, SSWD selected sampling sites on the Bear River; Step 2, fall fish population sampling was conducted in October 2017 and September 2018. Spring fish population sampling were conducted in April, May, and June 2018, and eDNA (environmental deoxyribonucleic acid) sample collection was conducted in February and March 2017; and Step 3, QA/QC and data analysis was completed after each sampling event.

Fish population sampling included boat and backpack electrofishing in Reach 1 and snorkel surveys and seine hauls for the fall 2017 and 2018 and spring 2018 sampling periods in Reaches 2, 3, and 4 (Table 1). Imagery of each fish population site can be found on SSWD's public relicensing website. eDNA sampling was conducted in Reaches 2 through 4 (Table 1).

**Table 1. Location and Dates of Stream Fish Surveys.**

Location	Survey Type	River Mile	Date of Survey(s)	Latitude	Longitude
<b>CAMP FAR WEST DAM REACH</b>					
Reach 1	Backpack Electrofishing	17.8	10/27/2017	39.0484111	121.3192528
Reach 1	Boat Electrofishing	17.0	9/10/2018	39.042564	121.330631
<b>LOWER BEAR RIVER</b>					
Reach 2	eDNA	16.9	2/22/2017, 3/8/2017	39.0417222	121.3322222
Reach 2	eDNA	16.7	2/22/2017, 3/8/2017	39.0394444	121.3347500
Reach 2	Snorkel/Seine	15.0	10/25/2017	39.0233500	121.3544417
Reach 2	Snorkel/Seine	15.0	4/24/2018	39.02234	121.35386
Reach 2	Snorkel/Seine	15.0	5/21/2018	39.02242	121.35387
Reach 2	Snorkel/Seine	15.0	6/21/2018	39.02239	121.35389
Reach 3	eDNA	11.4	2/23/2017, 3/8/2017	38.9996667	121.4072222
Reach 3	Snorkel/Seine	7.8	10/24/2017	38.9879889	121.4692667
Reach 3	Snorkel/Seine	7.8	4/25/2018	38.98764	121.47198
Reach 3	Snorkel/Seine	7.8	5/22/2018	38.98765	121.471918
Reach 3	Snorkel/Seine	7.8	6/20/2018	38.98775	121.472000
Reach 4	eDNA	5.1	3/1/2017, 3/15/2017	38.9783056	121.5166389
Reach 4	Snorkel/Seine	4.5	10/26/2017	38.9736389	121.5244111
Reach 4	Snorkel/Seine	4.5	4/26/2018	38.97362	121.52636
Reach 4	Snorkel/Seine	4.5	5/23/2018	38.960045	121.527953

<sup>1</sup> The Plan is available on SSWD's public relicensing website ([www.sswdrelicensing.com](http://www.sswdrelicensing.com)) under 'Study Plans.'

Reach 4	Snorkel/Seine	4.5	6/19/2018	38.973611	121.526333
Reach 4	eDNA	4.0	3/1/2017, 3/15/2017	38.9740833	121.5349167
Reach 4	eDNA	0.6	2/28/2017, 3/15/2017	38.9434722	121.5709444

## Key Findings:

### Electrofishing, Seining, and Snorkeling

The fish population sample site in Reach 1 was represented by a series of riffle, pool, and glide habitat units. The channel and substrate was visibly composed of bedrock with moderate amounts of cobble. Depth was minimal and averaged 0.2 meters (m) (Table 2). Reach 1 was subsequently sampled by boat electrofishing in the pool habitat of the diversion dam impoundment. The effort was divided into five unique habitat units defined by their dominant characteristics; shoal and dam (1), emergent and overhanging vegetation (2), shoal with artificial structure (3), drop off and overhanging vegetation (4), and midchannel (5). Average sampled depths ranged from 1.5 to 6 feet (ft), with a maximum encountered pool depth of 14 ft. Reach 2 was represented by a series of riffle, run, and pool habitat units. Dominant substrate consists of cobble, with gravel as sub-dominant. Maximum and average depths were 1.7 and 0.5 m, respectively (Table 2). Similar to Reach 2, Reach 3 was represented by a series of riffle, run, and pool habitat units. Dominant substrate consists of gravel, with sand as sub-dominant. Maximum and average depths were 1.1 and 0.3 m, respectively (Table 2). Reach 4 was represented by a series of riffle, glide, and pool habitat units. Dominant substrate consists of gravel, with sand as sub-dominant. Maximum and average depths were 1.5 and 0.5 m, respectively (Table 2).

**Table 2. Habitat characteristics for all sites.**

		Reach 1	Reach 2	Reach 3	Reach 4
Timing	Sample date	October 27, 2017	October 25, 2017 April 24, May 21, June 21, 2018	October 24, 2017 April 25, May 22, June 20, 2018	October 26, 2017 April 26, May 23, June 19, 2018
Water Quality <sup>1</sup>	Air temp. (C)	16.0	24.1-28.3 (26.6)	19.7-33.9 (26.1)	20.7-32.2 (26.9)
	Water temp. (C)	12.9	12.3-17.1 (15)	14.0-24.5 (19.6)	18.0-25.2 (21.1)
	Dissolved oxygen (mg/l)	9.8	9.08-10.70 (10.16)	7.79-10.40 (9.24)	7.40-10.50 (8.49)
	Conductivity (µS)	88.7	73.0-86.2 (77.1)	79.0-85.0 (82.7)	113.0-146.0 (130.7)
Site Characteristics <sup>2</sup>	Elevation (m msl)	41.1	29.3	21.3	20.1
	Rivermile	17.8	15	7.8	4.5
	Site length (m) <sup>3</sup>	83.8	139.4	265.6	170.5
	Average site width (m)	7.2	12.6	12.3	11.3
	Average depth (m)	0.2	0.5	0.3	0.6
	Average Maximum depth (m)	1.0	1.4	1.0	1.4
	Estimated Flow Range	16 cfs	16-246 cfs	16-37 cfs <sup>4</sup>	16-36 cfs <sup>4</sup>
	Dominant substrate	Bedrock/Cobble	Cobble	Gravel	Gravel
Habitat Characteristics	Sub-dominant substrate	Gravel	Gravel	Sand	Sand
	Confinement	--	--	--	--
	Fish passage impediments present	No	No	No	No
	Number of Large Woody Debris Pieces	0	0	0	0
	Suitable spawning gravel (sq ft) <sup>5</sup>	--	0-500	3,400-11,270	900-3,440
	Low-gradient riffle	38%	21%	26%	4%
	High-gradient riffle	--	--	--	--
	% Run	--	11%	6%	7%

	% Glide	15%	8%	15%	26%
	% Lateral Pool	--	27%	14%	--
	% Mid-channel Pool	45%	33%	38%	47%
	% Chute	3%	--	2%	>0%
	% Trench Pool	--	--	--	15%
GPS Units	Upstream Coordinate	Latitude	Latitude	Latitude	Latitude
		39.048411	39.023350	38.987989	38.973639
		Longitude	Longitude	Longitude	Longitude
	Downstream Coordinate	121.319253	121.354442	121.469267	121.524411
		Latitude	Latitude	Latitude	Latitude
		39.047894	39.022283	38.987758	38.973625
		Longitude	Longitude	Longitude	Longitude
		121.319486	121.353883	121.472219	121.526675

1 – Water quality parameters for reaches 2 through 4 are presented as a range and (average).

2 – Site characteristics averaged overall all sampling events.

3 – Site length fluctuated with changes in habitat and flows and is averaged over all sampling events.

4 – Flows not available for the April sampling event.

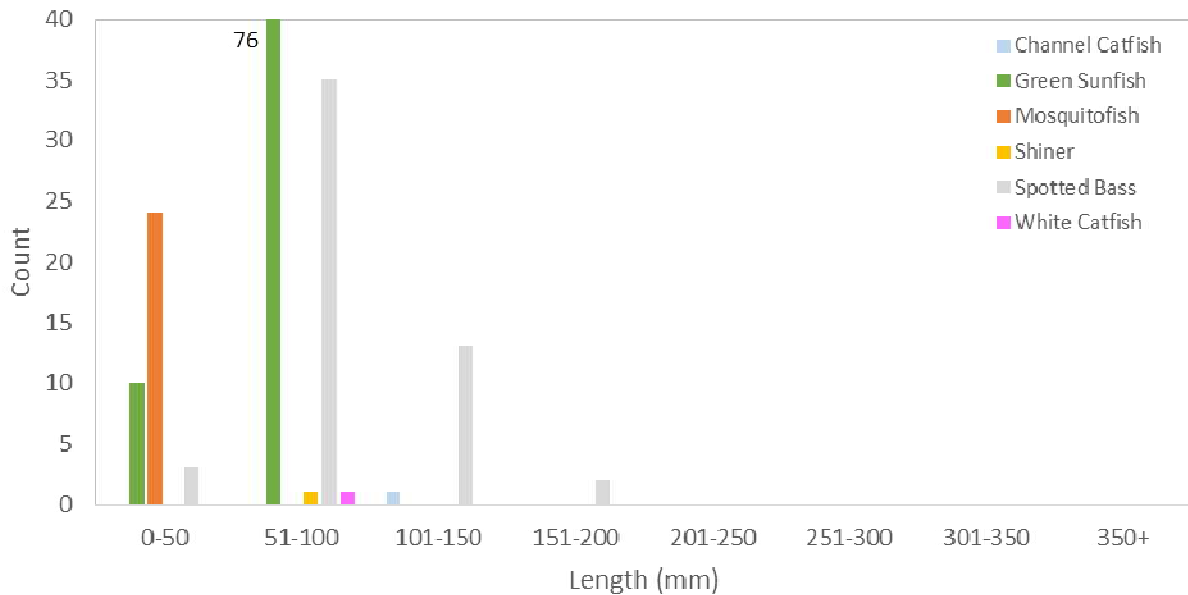
5 – Spawning gravel presented as a range through all sampling events.

## Reach 1

In the stream portion of Reach 1 (i.e. the portion between the powerhouse and the head of the diversion pool), multi-pass depletion sampling was conducted using two Smith Root LR-24 backpack electrofishers in October 2017. Sampling results are presented in Table 3, and length-frequency of fish is presented in Figure 1.

**Table 3. Population summary of backpack electrofished habitat in Reach 1.**

Summary Metrics		Species						
		Green Sunfish	Spotted Bass	Mosquitofish	Bluegill	Channel Catfish	Shiner	White Crappie
Abundance	No. captured by pass (total)	43-30-13 (86)	42-6-5 (53)	9-11-4 (24)	6-2-2 (10)	0-1-0 (1)	0-1-0 (1)	0-1-0 (1)
	Estimated abundance	104	53	33	10	1	1	1
	95% CI	83-125	51-55	11-55	7-13	1-1	1-1	1-1
	Fish/100m <sup>1</sup>	124.1	63.2	39.4	11.9	1.2	1.2	1.2
	Fish/mi <sup>1</sup>	1,996.8	1017.6	633.6	192.0	19.2	19.2	19.2
Length (mm)	Range (Average)	32-98 (63)	49-167 (85)	21-50 (36)	52-103 (79)	112	55	56
Weight (g)	Total	396.1	498.1	13	70.1	7.3	1.5	1.3
	Range (Average)	0.4-17.1 (4.6)	1.2-53.7 (9.4)	0.1-1.3 (0.5)	2.1-15.0 (7.0)	7.3	1.5	1.3
	Total estimated weight (g)	479.0	498.1	17.9	70.0	7.3	1.5	1.3
	Weight (g)/100m	472.6	594.2	15.5	83.6	8.7	1.8	1.6
	lbs/ac	6.5	6.7	0.2	0.9	0.1	<0.1	<0.1
	kg/ha	8.0	8.3	0.3	1.2	0.1	0.03	0.02
Condition Factor	Relative – range	0.67-1.42	0.73-1.89	0.51-1.83	0.44-1.22	N/A	N/A	N/A
	Fulton's – range (average)	1.09-2.33 (1.57)	0.86-2.21 (1.17)	0.57-2.16 (1.07)	0.52-1.49 (1.30)	0.52	0.90	0.74
RSD (% of population >150mm FL) <sup>3</sup>		0	0	3.8	0	0	0	0

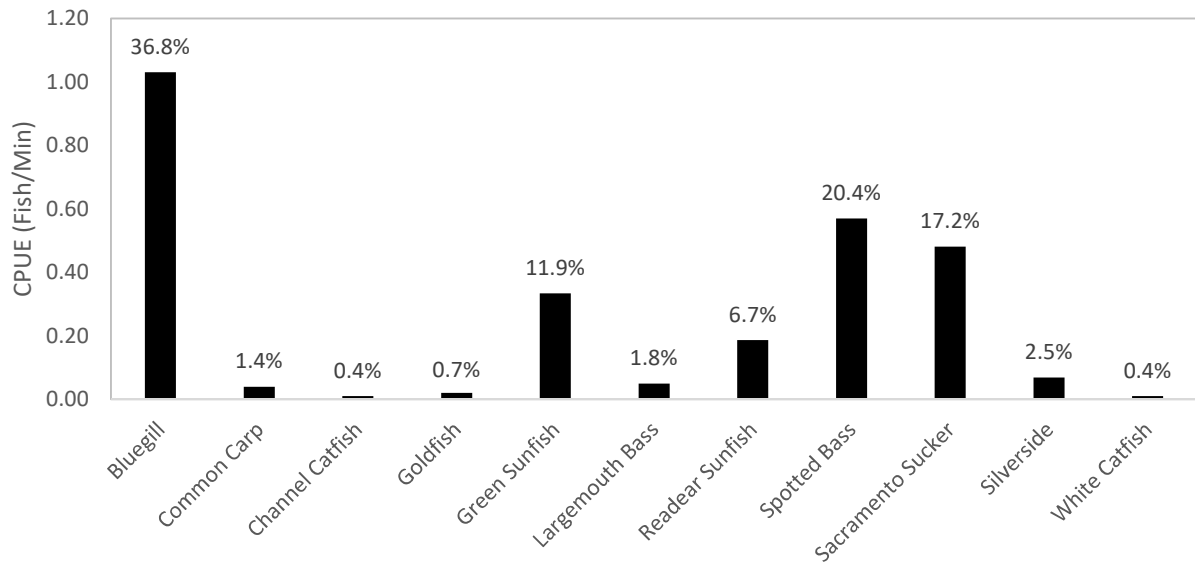


**Figure 1. Length-frequency of fish collected during backpack electrofishing in Reach 1.**

In the diversion pool portion of Reach 1, boat electrofishing sampling was conducted using a Smith Root 5.0 GPP system in September 2018. Sampling results are presented in Table 4, composition by unit and catch per unit (CPUE) by species with overall composition (Figure 2 and 3), and overall CPUE (Table 5).

**Table 4. Population summary of boat electrofished habitat in Reach 1.**

Common Name	Scientific Name	# Captured	Length (mm)		Weight (g)		% Composition	CPUE (#/min)
			Range	Mean	Range	Mean		
Bluegill	<i>Lepomis macrochirus</i>	105	62-162	109	3.7-96.9	28.5	36.8%	1.03
Spotted bass	<i>Micropterus punctulatus</i>	58	44-260	137	1.7-230.5	40.5	20.4%	0.57
Sacramento sucker	<i>Catostomus occidentalis</i>	49	76-495	412	4.2-1,540.0	913.4	17.2%	0.48
Green sunfish	<i>Lepomis cyanellus</i>	34	53-128	82	2.2-42.5	12.9	11.9%	0.33
Readeare sunfish	<i>Lepomis microlophus</i>	19	70-179	128	16.0-114.9	43.6	6.7%	0.19
Silverside	<i>Menidia beryllina</i>	7	36-110	76	1.5-9.0	3.9	2.5%	0.07
Largemouth bass	<i>Micropterus salmoides</i>	5	147-400	230	38.0-890.0	279.2	1.8%	0.05
Common carp	<i>Cyprinus carpio</i>	4	507-571	539	2,170-3,450	2,670	1.4%	0.04
Goldfish	<i>Carassius auratus</i>	2	192-260	226	130-360	245	0.7%	0.02
Channel catfish	<i>Ictalurus punctatus</i>	1	482	482	1,160	1,160	0.4%	0.01
White catfish	<i>Ameiurus catus</i>	1	147	147	40.0	40.0	0.4%	0.01
<b>Total</b>		<b>285</b>	--	--	--	--	<b>100.0%</b>	<b>2.80</b>

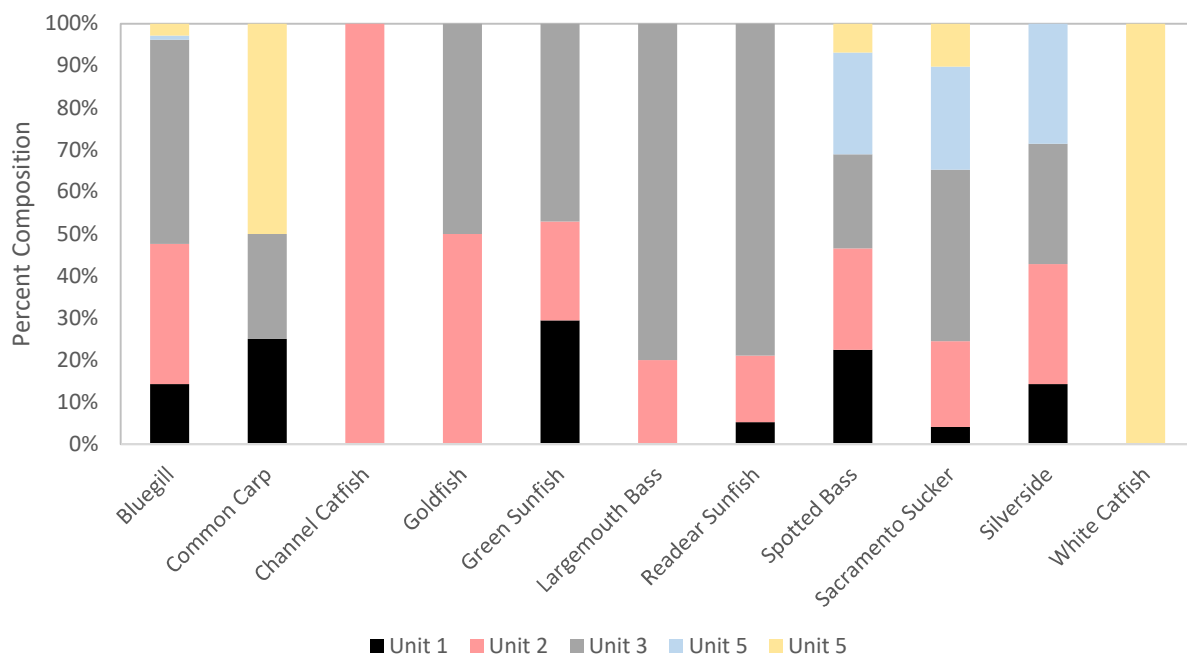


**Figure 2. Overall CPUE (fish/min) with composition of species collected during boat electrofishing in Reach 1.**

The five unique habitat units sampled were: 1) shoal and dam, 2) emergent and overhanging vegetation, 3) shoal with artificial structure, 4) drop off and overhanging vegetation, and 5) midchannel.

**Table 5. Overall CPUE (fish/min) by habitat unit during boat electrofishing in Reach 1.**

Species	Total Catch	Overall #/min	Unit 1		Unit 2		Unit 3		Unit 4		Unit 5	
			Raw	#/min	Raw	#/min	Raw	#/min	Raw	#/min	Raw	#/min
Bluegill	105	1.03	15	1.43	35	1.93	51	2.23	1	0.03	3	0.21
Spotted Bass	58	0.57	13	1.24	14	0.77	13	0.57	14	0.39	4	0.28
Sacramento Sucker	49	0.48	2	0.19	10	0.55	20	0.88	12	0.33	5	0.35
Green Sunfish	34	0.33	10	0.96	8	0.44	16	0.70	0	0.00	0	0.00
Readear Sunfish	19	0.19	1	0.10	3	0.17	15	0.66	0	0.00	0	0.00
Silverside	7	0.07	1	0.10	2	0.11	2	0.09	2	0.06	0	0.00
Largemouth Bass	5	0.05	0	0.00	1	0.06	4	0.18	0	0.00	0	0.00
Common Carp	4	0.04	1	0.10	0	0.00	1	0.04	0	0.00	2	0.14
Goldfish	2	0.02	0	0.00	1	0.06	1	0.04	0	0.00	0	0.00
Channel Catfish	1	0.01	0	0.00	1	0.06	0	0.00	0	0.00	0	0.00
White Catfish	1	0.01	0	0.00	0	0.00	0	0.00	0	0.00	1	0.07
<b>Total Catch</b>	<b>285</b>		<b>43</b>		<b>75</b>		<b>123</b>		<b>29</b>		<b>15</b>	
<b>Overall #/min</b>	<b>2.8</b>		<b>4.11</b>		<b>4.13</b>		<b>5.39</b>		<b>0.8</b>		<b>1.06</b>	



**Figure 3. Percent composition by habitat unit during boat electrofishing in Reach 1.**

### **Reaches 2 through 4**

A three-pass composite snorkel survey and three standardized 10 m seine hauls were completed at one site in Reaches 2 through 4. Habitat characteristics for each site can be found in Table 2. Sampling results are presented in Tables 6 and 7.

**Table 6. Population summary of snorkeled habitat units in Reaches 2 through 4.**

Species	Abundance						Fork length (mm)	
	# Counted by Pass (Total)	% of Total Fish Counted	Estimated abundance	95% CI	Fish/100m	Fish/mi	Min (bin)	Max (bin)
<b>October 2017</b>								
<b>SNORKELED REACH 2 - 145.4 Meters</b>								
Mosquitofish	131-114-102 (347)	51.8%	116	113-118	80	1,280	0-50	0-50
Spotted Bass	71-76-83 (230)	34.3%	77	75-78	53	849	0-50	151-200
Sacramento Sucker	30-10-8 (48)	7.2%	16	10-22	11	177	0-50	151-200
Sacramento Pikeminnow	13-8-7 (28)	4.2%	9	7-11	6	103	51-100	151-200
Bluegill	4-9-4 (17)	2.5%	6	3-8	4	63	0-50	51-100
<b>SNORKELED REACH 3 - 271.3 Meters</b>								
Spotted Bass	127-162-181 (470)	57.7%	157	152-161	58	929	0-50	251-300
Mosquitofish	77-115-130 (322)	39.6%	107	102-113	40	637	0-50	0-50
Bluegill	7-3-6 (16)	2.0%	5	4-7	2	32	0-50	101-150

Sacramento Pikeminnow	2-2-2 (6)	0.7%	2	2	1	12	151-200	251-300
<b>SNORKELED REACH 4 - 176.8 Meters</b>								
Lepomis sp.	45-66-83 (194)	49.6%	65	60-69	37	589	0-50	201-250
Spotted Bass	40-36-30 (106)	27.1%	35	34-37	20	321	0-50	301-350
Mosquitofish	30-30-30 (90)	23.0%	30	30	17	273	0-50	0-50
Sacramento Pikeminnow	0-1-0 (1)	1.0%	1	1.0	1	9	101-150	101-150
<b>April 2018</b>								
<b>SNORKELED REACH 2 - 140.21 Meters</b>								
Chinook Salmon	99-100-76 (275)	98.92%	92	89-95	65	1,052	0-50	51-100
Spotted Bass	0-0-2 (2)	0.72%	1	2	1	8	0-50	51-100
Mosquito Fish	1-0-0 (1)	0.36%	<1	1	<1	4	0-50	0-50
<b>SNORKELED REACH 3 - 270.97 Meters</b>								
Chinook Salmon	198-270-282 (750)	75.53%	250	244-256	92	1,485	0-50	101-150
Unknown Minnow	155-0-0 (155)	15.61%	52	27-76	19	307	0-50	0-50
Bluegill	5-9-21 (35)	3.52%	12	7-17	4	69	0-50	151-200
Spotted Bass	6-11-15 (32)	3.22%	11	8-14	4	63	0-50	301-350
Rainbow Trout	10-1-6 (17)	1.71%	6	2-10	2	34	0-50	51-100
Smallmouth Bass	1-0-1 (2)	0.20%	1	1.0	<1	4	>350	>350
Sacramento Pikeminno	1-1-0 (2)	0.20%	1	1	<1	4	51-100	101-150
<b>SNORKELED REACH 4 - 174.80 Meters</b>								
Chinook Salmon	16-11-7 (34)	75.56%	11	9-14	7	104	0-50	51-100
Bluegill	0-1-7 (8)	17.78%	3	0-8	2	25	0-50	151-200
Spotted Bass	0-0-3 (3)	6.67%	1	0-4	1	9	51-100	101-150
<b>May 2018</b>								
<b>SNORKELED REACH 2 - 119.48 Meters</b>								
Unknown Minnow	5-35-35 (75)	45.18%	25	18-32	21	337	0-50	0-50
Chinook Salmon	3-36-33 (72)	43.37%	24	17-31	20	323	51-100	151-200
Spotted Bass	1-1-10 (12)	7.23%	4	0-9	3	54	51-100	301-350
Sacramento Pikeminnow	3-1-0 (4)	2.41%	1	0-4	1	18	51-100	151-200
Bluegill	1-0-1 (2)	1.20%	1	1	1	9	151-200	151-200
Unknown Sculpin	0-1-0 (1)	0.60%	<1	1	<1	5	51-100	51-100
<b>SNORKELED REACH 3 - 283.16 Meters</b>								
Unknown Minnow	720-1,000-1,000 (2,720)	87.26%	907	896-917	320	5,153	0-50	0-50
Chinook Salmon	71-62-61 (194)	6.22%	65	63-66	23	368	51-100	151-200
Spotted Bass	46-36-51 (133)	4.27%	44	42-47	16	252	51-100	251-300
Bluegill	8-30-29 (67)	2.15%	22	17-28	8	127	51-100	151-200

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<b>Rainbow Trout</b>	0-2-0 (2)	0.06%	1	2	<1	4	101-150	101-150
<b>Smallmouth Bass</b>	0-1-0 (1)	0.03%	<1	1	<1	2	101-150	101-150
<b>SNORKELED REACH 4 - 174.80 Meters</b>								
<b>Unknown Minnow</b>	50-0-0 (50)	78.13%	17	3-31	10	153	0-50	0-50
<b>Bluegill</b>	2-6-5 (13)	20.31%	4	2-6	3	40	51-100	51-100
<b>Spotted Bass</b>	0-0-1 (1)	1.56%	<1	1	<1	3	51-100	51-100
<b>June 2018</b>								
<b>SNORKELED REACH 2 - 119.48 Meters</b>								
<b>Sacramento Sucker</b>	833-778-833 (2,444)	76.90%	815	813-817	535	8,603	0-50	0-50
<b>Unknown Minnow</b>	50-465-200 (715)	22.50%	238	164-313	156	2,517	0-50	0-50
<b>Spotted Bass</b>	5-7-5 (17)	0.53%	6	5-7	4	60	51-100	>350
<b>Prickly Sculpin</b>	0-1-1 (2)	0.06%	1	1	<1	7	101-150	101-150
<b>SNORKELED REACH 3 - 237.13 Meters</b>								
<b>Spotted Bass</b>	586-539-563 (1,688)	56.95%	563	561-565	237	3,819	0-50	251-300
<b>Unknown Minnow</b>	200-200-125 (525)	17.71%	175	169-181	74	1,188	0-50	0-50
<b>Sacramento Pikeminnow</b>	80-133-186 (399)	13.46%	133	124-142	56	903	0-50	0-50
<b>Bluegill</b>	54-49-66 (169)	5.70%	56	54-59	24	382	0-50	101-150
<b>Sacramento Sucker</b>	13-5-62 (80)	2.70%	27	15-39	11	181	0-50	51-100
<b>Green Sunfish</b>	18-19-15 (52)	1.75%	17	16-18	7	118	51-100	101-150
<b>Smallmouth Bass</b>	8-9-11 (28)	0.94%	9	8-10	4	63	0-50	151-200
<b>Mosquito Fish</b>	10-7-6 (23)	0.78%	8	6-9	3	52	0-50	0-50
<b>SNORKELED REACH 4 - 237.13 Meters</b>								
<b>Unknown Minnow</b>	420-425-300 (1,145)	75.23%	382	375-389	226	3,641	0-50	0-50
<b>Spotted Bass</b>	54-77-70 (201)	13.21%	67	64-70	40	639	0-50	>350
<b>Bluegill</b>	45-47-48 (140)	9.20%	47	46-47	28	445	51-100	151-200
<b>White Catfish</b>	2-3-3 (8)	0.53%	3	2-4	2	25	>350	>350
<b>Sacramento Sucker</b>	2-4-1 (7)	0.46%	2	0-5	1	22	0-50	51-100
<b>Channel Catfish</b>	2-3-0 (5)	0.33%	2	0-5	1	16	251-300	>350
<b>Sacramento Pikeminnow</b>	1-3-1 (5)	0.33%	2	0-4	1	16	0-50	151-200
<b>Redear Sunfish</b>	0-1-3 (4)	0.26%	1	0-4	1	13	51-100	51-100
<b>Smallmouth Bass</b>	0-0-4 (4)	0.26%	1	0-6	1	13	101-150	101-150
<b>Green Sunfish</b>	0-1-1 (2)	0.13%	1	1	<1	6	51-100	101-150
<b>Unknown Centrarchid</b>	1-0-0 (1)	0.07%	<1	1	<1	3	101-150	101-150



**Table 7. Population summary of 10 m standardized seine hauls in Reaches 2 through 4.**

Species	Abundance			Fork length (mm)	Weight (g)	Condition Factor	
	# By Pass (Total)	% of Total Fish	CPUE (catch by pass)	Min-Max (Avg)	Min-Max (Avg)	Relative – range	Fulton's – range (average)
<b>October 2017</b>							
<b>REACH 2 SEINE (n=47)</b>							
Spotted Bass	0-23-10 (33)	70.2%	11.0	45-152 (61)	1.1-43.9 (3.7)	0.79-0.87	0.86-2.22 (1.22)
Bluegill	0-5-0 (5)	10.6%	1.7	50-58 (54)	1.6-2.4 (1.9)	0.8-1.32	1.02-1.68 (1.23)
Green Sunfish	0-3-0 (3)	6.4%	1.0	44-61 (52)	1.6-3.8 (2.5)	1.08-1.17	1.67-1.88 (1.77)
Mosquito Fish	0-3-0 (3)	6.4%	1.0	30-41 (35)	0.4-0.6 (0.5)	0.89-1.38	0.87-1.48 (1.16)
Sacramento Pikeminnow	2-0-0 (2)	4.3%	0.7	84-88 (86)	5.9-6.1 (6.0)	0.73-1.81	0.90-1.00 (0.95)
Pumkinseed	0-1-0 (1)	2.1%	0.3	72 (72)	5.1 (5.1)	N/A <sup>1</sup>	1.37
<b>REACH 3 SEINE (n=6)</b>							
Spotted Bass	5-0-1 (6)	100.0%	2.0	125-150 (136)	19.4-37.7 (28.3)	0.85-1.38	0.92-1.49 (1.10)
<b>REACH 4 SEINE (n=60)</b>							
Mosquitofish	0-43-0 (43)	71.7%	14.3	12-52 (27)	N/A <sup>2</sup>	N/A <sup>1</sup>	N/A <sup>1</sup>
Bluegill	0-3-9 (12)	20.0%	4.0	26-117 (54)	0.3-21.5 (3.3)	0.84-1.23	1.07-1.71 (1.26)
Rifle Sculpin	0-1-3 (4)	6.7%	1.3	15-110 (63)	2.0-18.0 (6.7)	N/A <sup>1</sup>	1.25-1.51 (1.35)
Spotted Bass	0-0-1 (1)	1.7%	0.3	153 (153)	37.1 (37.1)	0.97	1.04
<b>April 2018</b>							
<b>REACH 2 SEINE<sup>3</sup> (n=140)</b>							
Chinook Salmon	3-42-3-78-11 (137)	97.9%	27.4	30-74 (55.8)	0.3-4.3 (2.2)	0.5-3.2	0.58-4.46 (1.25)
Lamprey Ammocete	0-0-2-0-0	1.4%	0.4	N/A <sup>2</sup>	N/A <sup>2</sup>	N/A <sup>1</sup>	N/A <sup>1</sup>
Inland Silverside	0-0-0-1-0	0.7%	0.2	33 (33)	0.3 (0.3)	N/A <sup>1</sup>	0.83
<b>REACH 3 SEINE (n=183)</b>							
Chinook Salmon	0-0-7-29-147 (183)	100.0%	36.6	45-95 (64.5)	0.9-10.3 (3.6)	0.7-1.6	0.99-1.96 (1.25)
<b>REACH 4 SEINE (n=139)</b>							
Chinook Salmon	0-3-6-70-17 (96)	69.1%	19.2	38-71 (55.2)	0.4-4.4 (2.0)	0.5-1.5	0.61-2.19 (1.11)
Bluegill	0-0-0-1-38 (39)	28.1%	7.8	43-80 (54.1)	1.2-7.1 (2.7)	0.8-1.6	1.16-2.26 (1.64)
Mosquito Fish	0-0-0-1-2 (3)	2.2%	0.6	36-46 (41.0)	0.3-0.6 (0.5)	0.7-1.0	0.62-0.64 (0.63)
Spotted Bass	0-1-0-0-0 (1)	0.7%	0.2	126 (126)	25.5 (25.5)	1.2	1.27
<b>May 2018</b>							
<b>REACH 2 SEINE (n=55)</b>							
Chinook Salmon	1-0-49 (50)	90.9%	16.7	58-101 (82.4)	1.8-8.6 (4.7)	0.5-0.9	0.59-0.98 (0.80)
Sacramento Pikeminnow	0-0-3 (3)	5.5%	1.0	109-129 (118.7)	11.0-15.8 (14.0)	0.9-1.1	0.74-0.92 (0.83)
Sacramento Sucker	2-0-0 (2)	3.6%	0.7	76-93 (84.5)	7.0-9.1 (8.1)	1.4-1.9	1.13-1.59 (1.36)

REACH 3 SEINE (n=4)							
Chinook Salmon	0-2-0 (2)	50.0%	0.7	59-67 (63.0)	2.4-3.8 (3.1)	0.9-1.0	1.17-1.26 (1.22)
Rainbow Trout	0-1-0 (1)	25.0%	0.3	74 (74.0)	5.7 (5.7)	N/A <sup>1</sup>	1.41
Spotted Bass	1-0-0 (1)	25.0%	0.3	96 (96.0)	7.1 (7.1)	0.7	0.80
REACH 4 SEINE (n=0)							
No seining conducted per CDFW scientific collecting permit requirements; water temperature was above 21°C							
June 2018							
REACH 2 SEINE (n=147)							
Sacramento Sucker	144-0-0 (144)	98.0%	48.0	17-34 (25.5)	1.1-2.2 (1.7)	0.6-1.9	0.56-2.24 (1.11)
Pumpkinseed	0-1-0 (1)	0.7%	0.3	46 (46.0)	0.6 (0.6)	N/A <sup>1</sup>	0.62
Spotted Bass	0-0-1 (1)	0.7%	0.3	82 (82.0)	4.3 (4.3)	0.7	0.78
Green Sunfish	0-0-1 (1)	0.7%	0.3	76 (76.0)	5.8 (5.8)	1.0	1.32
REACH 3 SEINE (n=0)							
No seining conducted per CDFW scientific collecting permit requirements; water temperature was above 21°C							
REACH 3 SEINE (n=0)							
No seining conducted per CDFW scientific collecting permit requirements; water temperature was above 21°C							

1 – Condition factor could not be calculated for single species or because lengths and weights were not collected.

2 – Lengths and weights were not collected for some species due to concerns about fish health.

3 – Five seine hauls were completed during April 2018 due to lower visibility and higher flows at the sampling locations.

Chinook salmon (*Oncorhynchus tshawytscha*) parr were observed in Reaches 2, 3 and 4 during snorkeling events in April and May of 2018. They were also captured during the April and May seine sampling in the same reaches, except for Reach 4 in May. A total of 416 Chinook salmon parr were captured in April and 52 in May.

Rainbow trout (*Oncorhynchus mykiss*) were observed in Reach 3 in April and May of 2018. Only one individual parr was captured during the May seine event and can be seen in Figure 4.



Figure 4. *O. mykiss* captured in Reach 3 during the May sampling event.

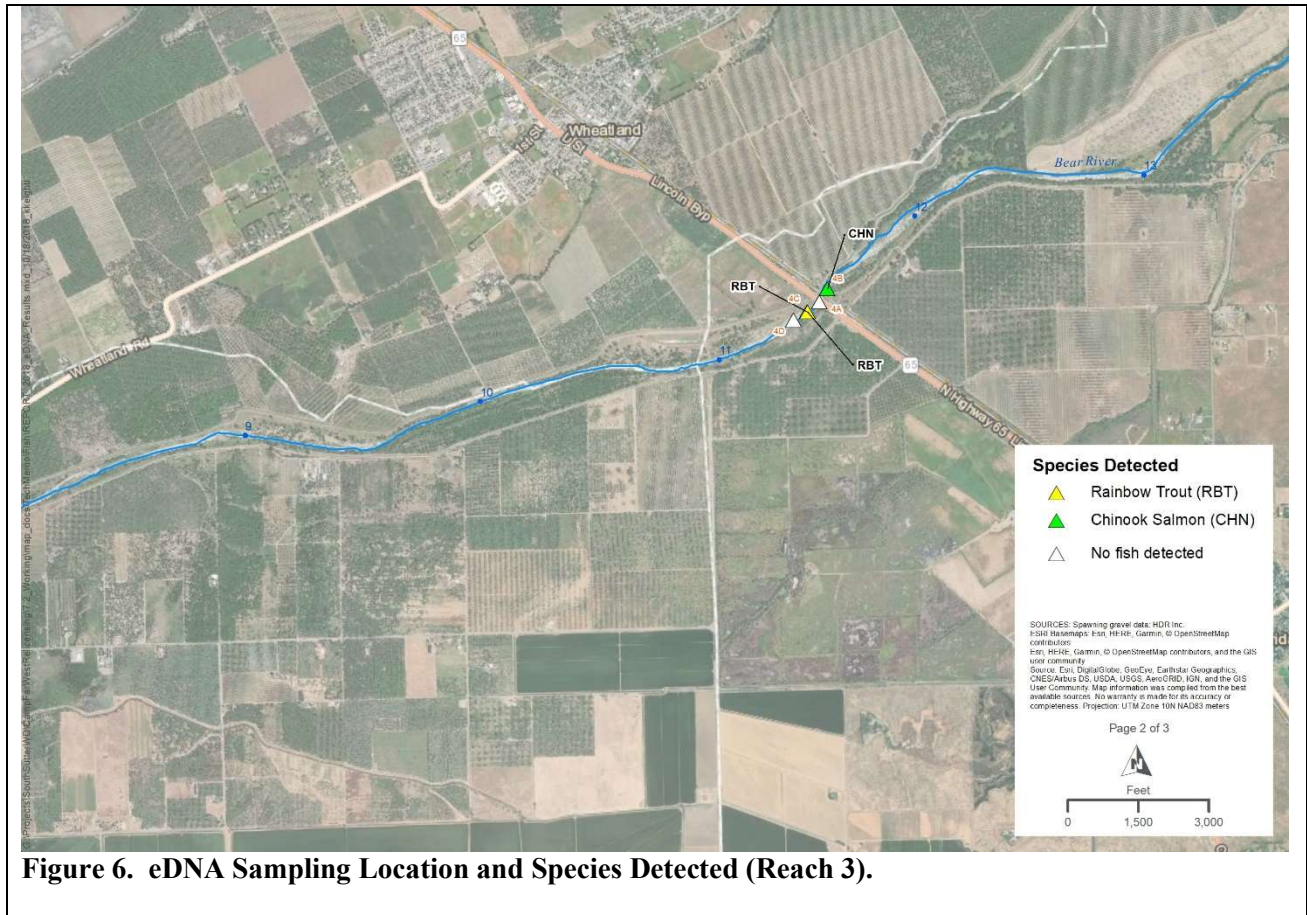
### eDNA

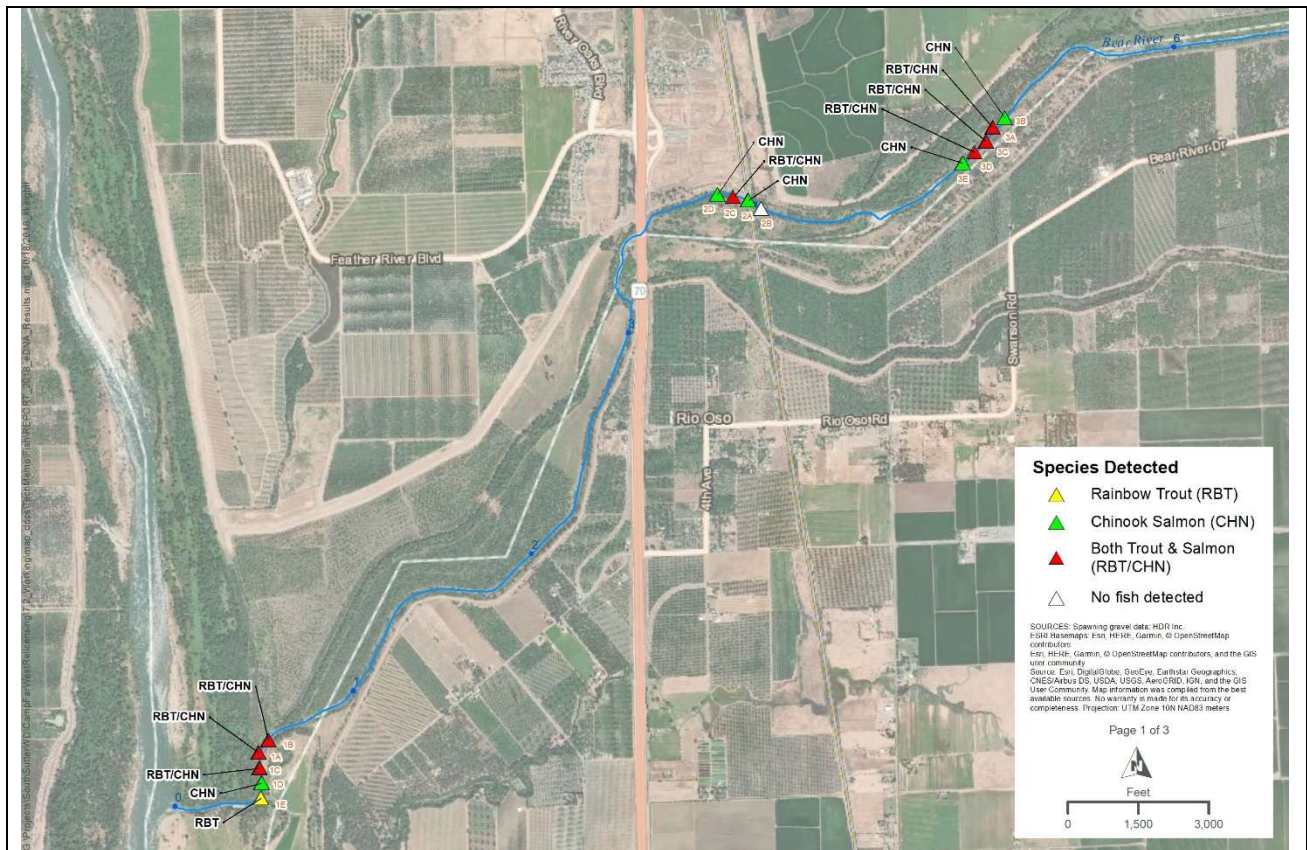
The eDNA survey sample collection occurred from February 22 through March 1, 2017, and was followed by a second survey that occurred on March 8, 2017 and March 15, 2017. The eDNA testing selectively targeted salmonids and sturgeon species. Chinook salmon and rainbow trout were detected in the eDNA analysis, while both green sturgeon (*Acipenser medirostris*) and white sturgeon (*Acipenser transmontanus*) were not. Chinook salmon and rainbow trout were detected in all reaches sampled by eDNA sampling (Table 2; Figures 5 through 7). All eDNA results from the filter analysis can be found on SSWD's relicensing website.



**Figure 5. eDNA Sampling Locations and Species Detected (Reach 2).**







**Figure 7. eDNA Sampling Locations and Species Detected (Reach 4).**

All of the data collected was checked according to SSWD's QA/QC procedures and scanned to PDF files.

### Associated Data Files:

The seven data files listed in Table 8 below are available on SSWD's public relicensing website ([www.sswdrelicensing.com](http://www.sswdrelicensing.com)).

**Table 8. Data files associated with Study summary.**

File Name	Data Description	File Type and Size
SSWD_eDNA sampling results	Results from eDNA sampling, including all sample sites, elution controls, no template controls, and positive controls.	Excel workbook – 21 KB
SSWD_Population sampling database 2017_10	Includes all raw data from population sampling completed in October 2017.	Excel workbook – 50 KB
SSWD_Population sampling database 2018_04	Includes all raw data from population sampling completed in April 2018.	Excel workbook – 104 KB
SSWD_Population sampling database 2018_05	Includes all raw data from population sampling completed in May 2018.	Excel workbook – 105 KB
SSWD_Population sampling database 2018_06	Includes all raw data from population sampling completed in June 2018.	Excel workbook – 111 KB
SSWD_Boat electrofishing database	Includes all raw data from boat electrofishing sampling completed to date.	Excel workbook – 23 KB
SSWD_Population photos	Photos of each population sampling site.	Word – 2,374 KB

### **Variances from Study:**

There were three variances. The first variance was that according to the Plan, Study sites were to be located “within one mile (mi) of the non-Project diversion dam, within 0.5-mi of the Highway 65 Bridge and, within 0.5-mi of the Highway 70 Bridge. These were geographic bounds based on SSWD’s understanding of access to the Bear River when the Plan was written. During implementation of Study 3.1 *Salmonid Redd Surveys* and Study 3.3 *Instream Flow*, access points were developed to reach more appropriate Study sites. As a result, SSWD determined that it would be beneficial to co-locate the sites for the Study with the sites from Study 3.3 *Instream Flow*. The third site was located approximately one mile upstream of Highway 70 because a site conducive to snorkel sampling was not identified within 0.5-mi of Highway 70 as described in the Plan. This change resulted in improved data coordination with other studies and is seen as a benefit.

The second variance was related to schedule. Snorkel sampling and seining in Reaches 2 through 4 were to be conducted in April, May, and June of 2017, but due to high flows after the wet water year sampling was postponed due to concerns over safety and quality of data collection. Instead, SSWD conducted sampling in the spring of 2018 which did not affect the outcome of the overall Study. In addition, boat electrofishing in Reach 1 was not conducted in October 2017 due to operations of the Project and non-Project diversion dam and safety concerns. This delay in sampling did not affect the outcome of the overall Study, as populations in small reservoirs do not undergo significant population fluctuations. SSWD completed boat electrofishing on September 10, 2018.

The third variance to the Study Plan was the amount of water filtered for eDNA analysis. Samples were collected during high flows in the Bear River, as described in the Study Plan filed with FERC. As a result of the high flows, turbidity was also high, which severely limited the volume of water that could be filtered for each sample. Suspended sediment clogged the filter quickly. As a result, the field team used five filters for each sample and recorded the volume of water filtered by each filter. On average, this was approximately one liter (total of five filters) for each sample. Discussions with the analysis lab determined that filtering close to one liter would not adversely affect the results (Personal Communication, Scott Blankenship [Genidaqs], February 2017).

### **Remaining Work:**

The Study is complete.

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