Technical Memorandum

San Joaquin River Steelhead Monitoring Plan 2020-21

Prepared by:

Shaun T. Root and Zachary Sutphin*

U.S. Bureau of Reclamation, Technical Science Center, Denver, CO 80225
* To whom correspondence should be addressed: zsutphin@usbr.gov

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EXECUTIVE SUMMARY

San Joaquin River (SJR) Basin Central Valley (CV) steelhead (*Oncorhynchus mykiss*) have been in decline in recent decades, due, in part, to impassable barriers developed in the early-mid twentieth century (McEwan 2001). Instream barriers have led to the reported extirpation of CV steelhead upstream of the SJR-Merced River confluence (i.e., the San Joaquin River Restoration Program (SJRRP) Restoration Area). In accordance with the 2012 SJRRP Record of Decision and National Marine Fisheries Service (NMFS) Biological Opinion (2011/05814:ELS), the U.S. Bureau of Reclamation (Reclamation) annually monitors for presence of CV steelhead in the Restoration Area when Restoration Flows are being released. This is of particular importance, as recent restored flows, reconnecting historically desiccated river sections, as well as Restoration Flows, could attract adult CV steelhead into the Restoration Area. Adult steelhead accessing the Restoration Area could be exposed to loss into sloughs and would not have access to appropriate spawning habitat due to a number of impassable in-river barriers. In 2020-21 Reclamation completed the eighth year of the SJRRP Steelhead Monitoring Plan (SMP). A combination of fyke netting/trapping, and raft electrofishing were completed monthly for approximately two weeks between December 2020 and April 2021 in Reach 4 and 5 of the Restoration Area. For the eighth consecutive monitoring effort (2012, 2013, 2014, 2017, 2018, 2019, 2020, and 2021) since the inception of the SMP, no steelhead were detected. However, 985 fish comprising 22 species, including five native species (23.7 % of total individuals captured) were captured. Continued monitoring of potential steelhead immigration in the Restoration Area is important to provide information regarding the status of the CV steelhead Distinct Population Segment (DPS), as well as to assess fish assemblages in the Restoration Area, an important metric to evaluate SJRRP progress.

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Table of Contents

Page

Figures

Tables

Page

List of Abbreviations and Acronyms

CDEC	California Data Exchange Center
CDFW	California Department of Fish & Wildlife
cfs	cubic-feet-per-second
CPUE	Catch-per-unit-effort
CV steelhead	Central Valley steelhead
DPS	Distinct Population Segment
ESA	Endangered Species Act
ESBP	Eastside Bypass
FL	Fork Length
NMFS	National Marine Fisheries Service
NRDC	National Resource Defense Council
SJR	San Joaquin River
SJRRP	San Joaquin River Restoration Program
SMP	Steelhead Monitoring Plan
TL	Total length

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1.0 Introduction

In 1988, a coalition of environmental groups, led by the Natural Resources Defense Council (NRDC), filed a lawsuit challenging the renewal of long-term water service contracts between the United States and the Central Valley Project Friant Division Long-Term Contractors known as *NRDC*, *et al. v Kirk Rodgers, et al.,* (NRDC 2006). In response, the San Joaquin River Restoration Program (SJRRP) was established, followed successively by a SJRRP Fisheries Management Plan which provides guidance for achieving demands of the lawsuit. During programmatic Endangered Species Act (ESA) consultation with the National Marine Fisheries Service (NMFS), the U.S. Bureau of Reclamation (Reclamation) determined that implementing the SJRRP would not affect Central Valley (CV) steelhead (*Oncorhynchus mykiss*) populations, as they were extirpated from the SJRRP Restoration Area (confluence of Merced River to Friant Dam) following construction of Friant Dam. Thus, Reclamation did not request ESA consultation on effects to CV steelhead but proposed to implement a CV Steelhead Monitoring Plan (SMP) to determine whether CV steelhead were using the lower Restoration Area, with the caveat that if steelhead were detected, then Reclamation would reinitiate ESA consultation with NMFS. The Steelhead Monitoring Plan (SMP) was vetted through the SJRRP Fisheries Management Workgroup in response to a request from Reclamation and is being implemented in accordance with the SJRRP Record of Decision (ROD) and NMFS Biological Opinion (BO).

1.1 Central Valley steelhead

The CV steelhead Distinct Population Segment (DPS) is protected under the Endangered Species Act; 61 FR 4722 (NMFS 2005), and includes naturally spawning populations, and their progeny, in the Sacramento and San Joaquin Rivers and their tributaries; tributaries include those that drain the western slopes of the Sierra Nevada Mountains (*i.e.,* Mokelumne, Calaveras, Stanislaus, Tuolumne, Merced, Chowchilla, Fresno, upper San Joaquin, Kings, Kaweah, and Kern Rivers, and Caliente Creek; NMFS 2005). According to Eilers *et al*. (2010), CV steelhead are currently extirpated from all waters upstream of the Merced-San Joaquin River confluence. In 2016 NMFS completed a 5-year CV steelhead DPS status review and recommended they remain classified as a threatened species under the ESA (NMFS 2016).

2.0 Methods

2.1 Study Period and Area

The SJRRP Restoration Area is separated into five distinct reaches and includes the mainstem SJR from Friant Dam (Reach 1) downstream to the Merced River confluence (Reach 5; Figure 1). Steelhead Monitoring Plan (SMP) sampling efforts were completed for 12, 11, 12, 11, and 2 days in December, January, February, March, and April, respectively. April efforts were truncated due to the capture of an adult spring-run Chinook Salmon (April 5, 2021) which necessitated transition to adult spring-run monitoring and Trap and Haul. Sampling was restricted to Reaches 4 – 5, from Eastside Bypass Control Structure downstream to the Merced River confluence, including adjoining sloughs (Mud and Salt Slough). The Eastside Bypass Control Structure was deemed the most accessible upstream location to immigrating salmonids, and comprised the furthest upstream sections sampled during the 2021 season. During 2020-21 SMP sampling efforts, Restoration Flows were released in accordance with the Settlement. Restoration Flows connected the river, which was routed through the Eastside Bypass from the Sand Slough Control Structure to the confluence of Bear Creek and the SJR mandating SMP monitoring.

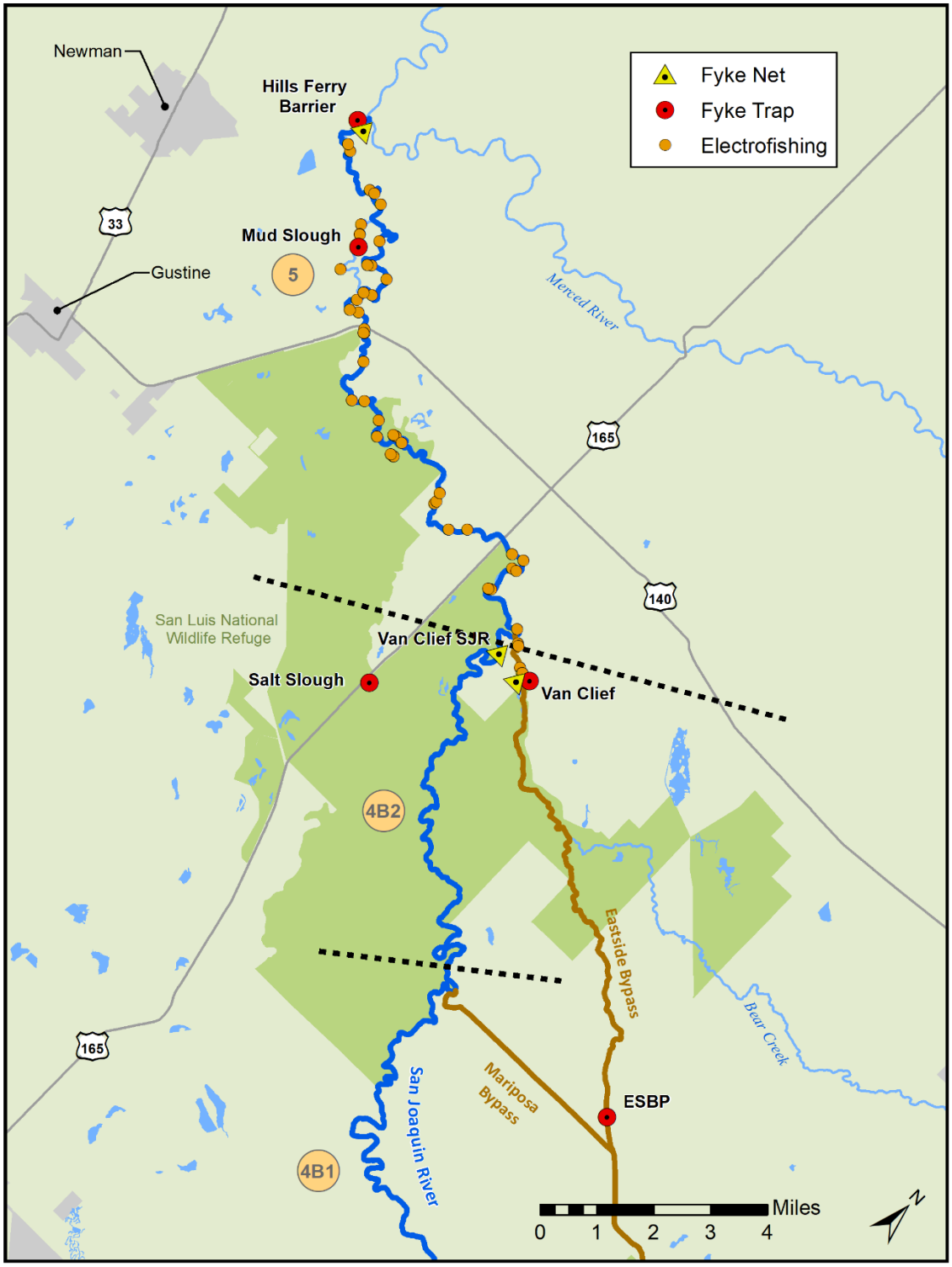

Figure 1. Map of the Reach 4–5 of the San Joaquin River Restoration Area (defined by yellow circles and dashed lines). Electrofishing locations are represented by the upstream end of each transect. The 2020–21 Steelhead Monitoring Plan efforts were constrained to Reach 4–5.

2.2 Fish Capture and Processing Methods

Given the turbid environment common in the lower reaches (4-5) of the SJRRP Restoration Area, methods commonly employed (i.e., snorkel and redd surveys) to monitor for immigrating adult salmonids were not suitable. Therefore, a multiple method sampling regime, including fyke netting, fyke trapping, and electrofishing, was designed and used to actively and passively monitor for steelhead in various habitat types on the SJR.

2.2.1 Fyke Netting/Trapping

Fyke nets are a passive fish sampling gear capable of spanning the full river width, and are, therefore, an efficient and effective tool to capture upstream moving adult fish. Steelhead Monitoring fyke nets were constructed of 2.4-cm square #252 knotless nylon netting formed over 5 consecutive 1.2-m hoops and a 1.2-m square welded-conduit frame entrance. The nets contained two throats with a 25-cm diameter opening. Wing walls, attached to the sides of the net opening, were 1.2 m deep and spanned the majority of the river's width (leaving boat passage). The opening of the net faced downstream with the wing walls extending to shore in a v-shaped pattern and were held in place with t-posts (Figure 2).

Fyke traps are similar in design as fyke nets, but do not have wing walls and their construction allows them to be fished at deeper depths and elevated flows. Fyke traps have a larger opening (2.4-m or 3-m), and were constructed of 5.0-cm chain link formed over 6 consecutive 3.0-m hoops. The traps contained two throats with the smaller opening of 60-cm. Traps were placed in natural riverine bottlenecks with a minimum depth of 1.5-m. The mouth of the trap faced downstream, and the trap was anchored utilizing t-posts and other readily available anchor points (Figure 3).

During 2020-21 SMP sampling, fykes (inclusive of both fyke nets and fyke traps) were fished in five locations: approximately 0.2 river miles upstream of the SJR and Merced River confluence (Hills Ferry; ~ RM 119), Mud Slough (~ RM 121.5), Van Clief (~ RM 136), Van Clief San Joaquin River (~ RM 136), East Side Bypass (~ RM 147; Figure 1). Historically fyke monitoring has occurred in Salt Slough, but due to elevated water hyacinth levels access was restricted (Appendix 3). When river conditions (water depth $\leq$ 5 ft.) were suitable, fyke nets were fished continuously during each monthly sampling period. Nets were checked at least once daily to reduce the likelihood of injuring fish. All captured fish were removed, transferred to a trough filled with on-site SJR water, identified to species, measured for length (total and fork length), and released upstream of the sampling location to minimize likelihood of recapture. In cooperation with FISHBIO, piscivores (Striped Bass, Channel Catfish, White Catfish, and Bullhead spp.) were opportunistically PIT tagged and released to support efforts to quantify piscivore populations, movements, and distribution in the SJR.

Figure 2. Deployed overlapping fykes net at Hills Ferry Barrier location, Reach 5 of the San Joaquin River Restoration Area. Note opening and v-shape of wing walls facing downstream.

Figure 3. Fyke trap deployed in Eastside Bypass, Reach 4 of the San Joaquin River Restoration Area. Note downstream orientation of the trap opening and riverine bottleneck location.

2.2.2 Electrofishing

Electrofishing is a common method used to monitor steelhead populations *(e.g.,* Mill and Deer creeks, and Feather, American, Mokelumne, Stanislaus, and Merced rivers), and was used during the 2020-21 season to sample mainstem habitats largely inaccessible by other means (Temple and Peasrons 2007). A Smith-Root^{TM} 5.0 GPP raft-mounted electrofisher (Smith-Root, Vancouver, WA) was used to electrofish the mainstem SJR thalweg and portions of adjacent sloughs while gradually traversing downstream (Figure 1; Appendix 1). This approach allowed efficient coverage of large expanses of river potentially traveled by immigrating steelhead. Voltage range, cyclic frequency and output (pulsed direct current) were determined based on local water conductivity and adjusted to maximize capture efficiency while minimizing electrical exposure. During electrofishing, captured fish were immediately transferred to an onboard live well where they were maintained until each section was sampled. Fish were processed in the same manner as defined in the *Methods: 2.2.1 Fyke Netting* section. A sufficient distance (> 0.25 km) was given between shocking locations to minimize likelihood of resampling the same individuals at downstream locations.

2.2.3 Steelhead Handling and Relocation

A specification of the program NMFS 10(a)(1)(A) permit #16608-2R is to translocate any captured steelhead out of the Restoration Area due to insufficient spawning habitat and the possibility of irrigation canal entrainment. In the event steelhead were captured during monitoring activities, capture location and method would be documented, they would be measured (FL/TL), sexed (if possible), tissue and scale samples would be collected, they would be checked for injuries and presence of identifying tags, and they would be photographed. Additionally, fish would be provided an external spaghetti-type tag (Floy Tag & Mfg., Seattle, WA) and internally tagged with a Passive Integrated Transponder (PIT), each of which has a unique identification number for future identification if recaptured. Captured steelhead would be transported downstream in a 550-L transport tank and released near the SJR confluence with the Merced River.

3.0 Results

Monthly site-specific water quality collected during sampling is reported in Appendix 2. In combination, all sampling methodologies resulted in monitoring spanning approximately 28 river miles of the SJR, as well as adjacent sloughs (approximately 1.3 river miles), totaling approximately 29.4 river miles monitored (Figure 1). For the eighth consecutive year of SJRRP SMP (2012, 2013, 2014, 2017, 2018, 2019, 2020, and since the inception of the SJRRP, no steelhead were detected. A Critical-Low Restoration Year type in 2015 and flood control releases in 2016-17 negated the need for SMP as such conditions (no Restoration Flows) do not require the SJRRP to monitor for steelhead in the RA. However, across all sampling methods for the 2020-21 season, a total of 985 fish and 22 different species were captured (Figure 6). Non-native fishes comprised 76.3 % (n=752) of the total. Common Carp (*Cyprinus carpio*), White Catfish

(*Ameiurus catus*) and Striped Bass (*Morone saxatilis*) were the most abundant species captured, constituting 62 % of all fish captured. Five species of native fish were captured (n=233; 23.7 % of total): Sacramento Sucker (*Catostomus occidentalis*, 83.3 %), Chinook Salmon (*O. tshawytscha*, 8.6 %), Sacramento Splittail (*Pogonichthys macrolepidotus*, 7.7 %), and Sacramento Blackfish (*Orthodon microlepidotus*).

Figure 4. Reclamation Biologist with a Sacramento Splittail (*Pogonichthys macrolepidotus*) captured while electrofishing during Steelhead Monitoring Plan efforts, Reach 5, San Joaquin River, CA.

3.1 Fyke Netting

Across all sample months and inclusive of all six sample locations, fyke traps and nets were fished for 257 days (traps n=151; nets n=106 respectively), resulting in the capture of 327 fish. Of the two trap types, fyke traps had a slightly greater capture per unit of effort (CPUE) of fish CPUE 1.3 (n=196), vs fyke nets (CPUE 1.2; n=131). Most fish captured during fyke netting/trapping were non-native (n=315, 96.3 %), including the most abundant species: Common Carp (n=114, 36.2 %), White Catfish (n=67, 21.3 %), and Striped Bass (n=38, 12.1 %). Native fish captured fyke-netting/trapping (n=12, 3.7 %) included fall-run Chinook Salmon (n=6, 50.0 %), Sacramento Splittail (n=4, 33.3 %), Sacramento Blackfish (n=1, 8.3 %), and Chinook Salmon spring-run (n=1, 8.3 %).

3.2 Electrofishing

(+/-) shock time per section was 12.0 ± 4.4 minutes (total sections n = 54), with a CPUE of 0.9 fish per minute. Non-native fishes contributed 66.4 % (n=437), whereas native fish contributed 33.6 % (n=221) of the electrofishing total. Of native SJR species captured electrofishing, Sacramento Suckers and Sacramento Splittail were most abundant, comprising 31.6 % (n=194 and 29.5 %; n=14 and 2.1 %) of total fish captured, respectively. Of interest, six adult fall-run Chinook Salmon were also captured.

Figure 5. Reclamation Biologist with a Striped Bass *(Morone saxatilis)* captured while Fyke Netting during Steelhead Monitoring Plan efforts. Reach 5, Hills Ferry Barrier, San Joaquin River, CA.

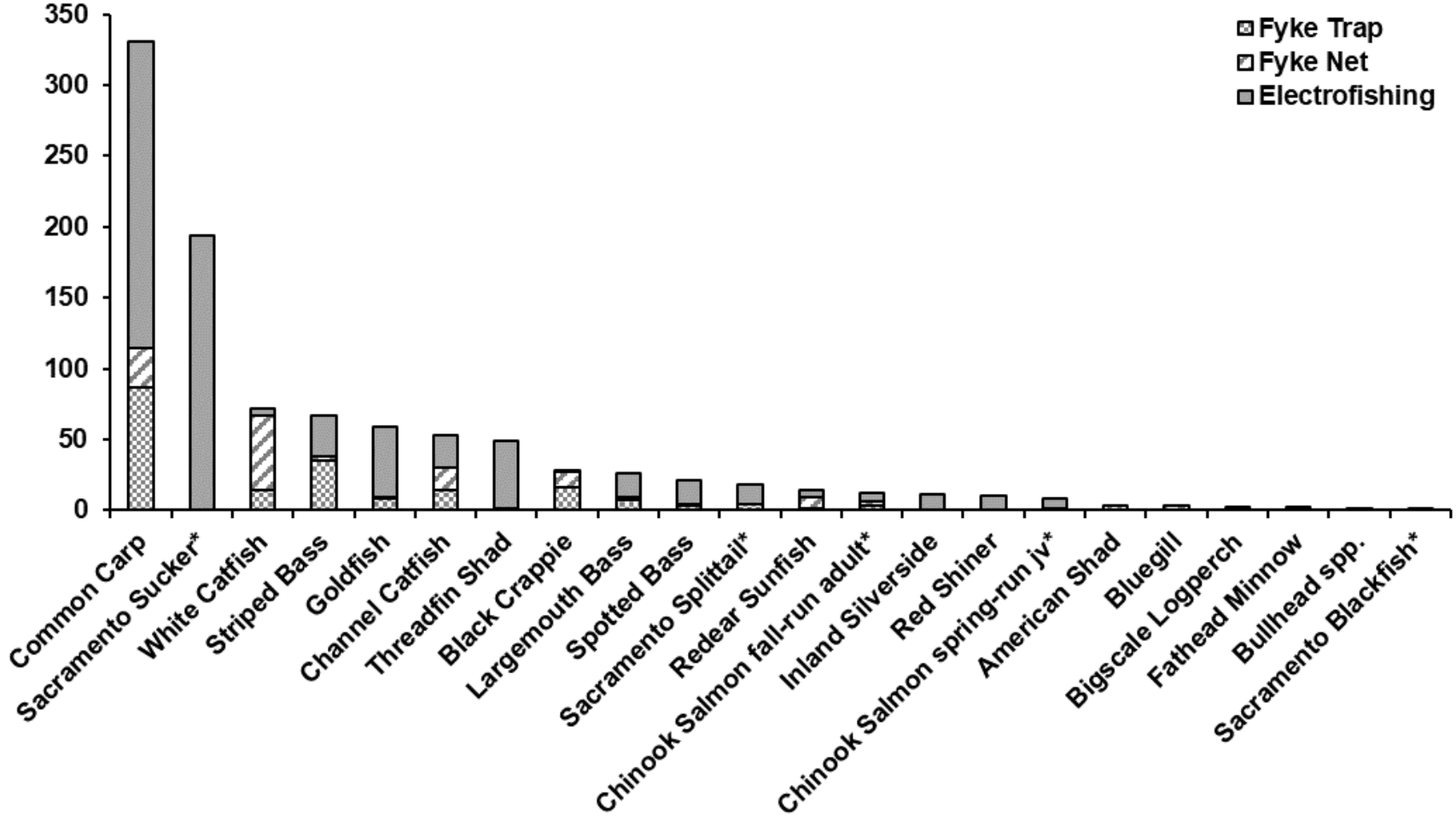

Figure 6. Fish captured (n = 985) during 2020-21 Steelhead Monitoring Plan in the San Joaquin River Restoration Area. No Central Valley Steelhead were captured. Native fish are identified with "*"; juvenile = "juv". Columns are stacked to show number of individuals captured by method. Chinook Salmon have also been segregated by age class (adult & juvenile) and run (spring & fall).

4.0 Discussion

Historically, the SJR Restoration Area was a potential migratory pathway for CV steelhead to reach spawning grounds; however, little detailed information on their distribution and abundance is available for these river reaches (McEwan 2001; Lindley et al. 2006). Much of the downstream habitat (Reaches 3-5) is unsuitable for rearing because of high summer water temperatures (Yoshiyama et al. 1996). However, as restoration efforts continue, increasing flows and the connection of upstream to downstream reaches in the Restoration Area may present the opportunity for steelhead to move into the area and access suitable spawning habitat in upper reaches. As a result, and in compliance with the SJRRP ROD and BO, Reclamation will continue to monitor for the presence of steelhead in the Restoration Area. Though this monitoring does not target non-salmonid species, ancillary data collected are, nonetheless, valuable in providing information regarding fish distributions, and presence absence data, in the Restoration Area. This data, combined with data from other monitoring programs, may provide an indication of SJRRP progress.

5.0 References

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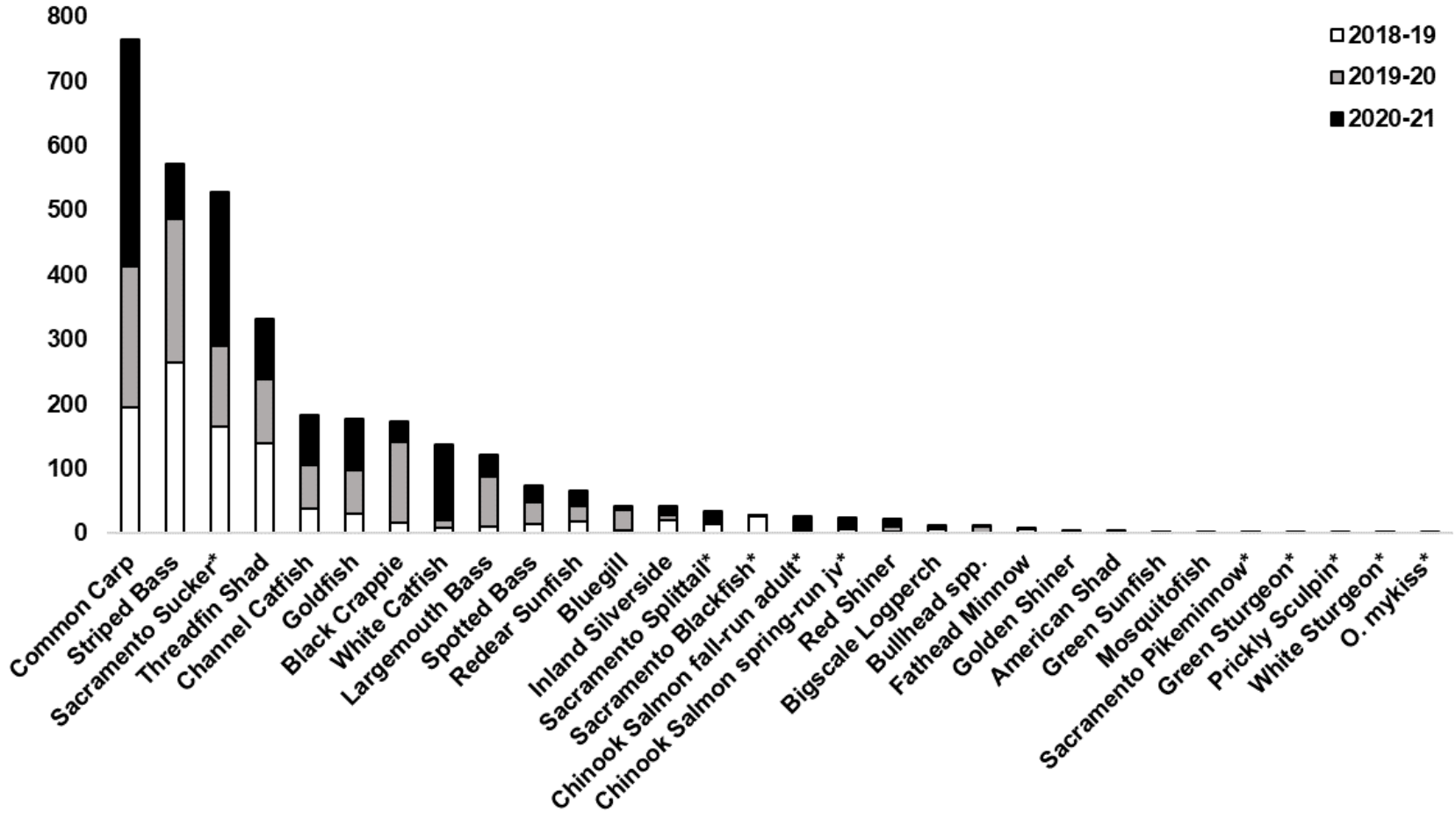
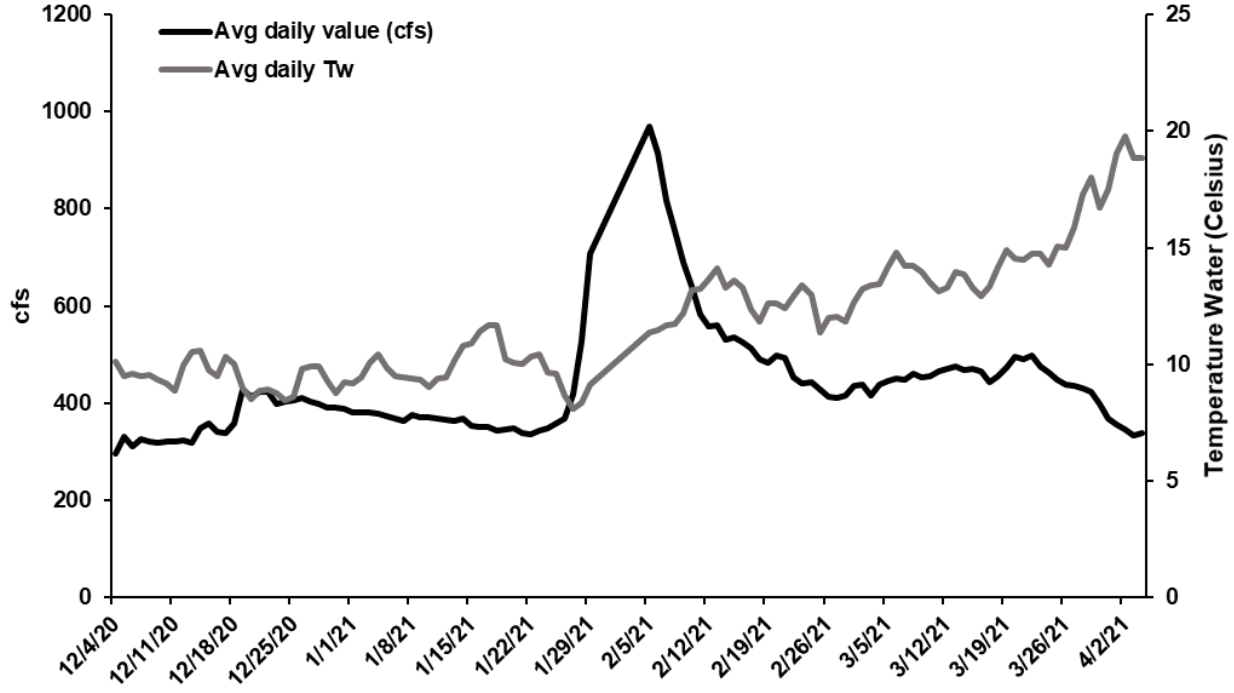
6.0 Appendices

6.1 Appendix 1: Fish Species Captured During Steelhead Monitoring Program 2018-2021(n=3,411)



6.2 Appendix 2: San Joaquin River Flow and Temperature 2020-21



6.3 Appendix 3: Fishing Locations 2020-21

Table A1.1. Fyke Trapping Locations

Sites:	UTM	Easting	Northing
Eastside Bypass	10 S	704088	4120326
Hills Ferry Barrier	10 S	679243	4135295
Mud Slough	10 S	681677	4132775
Van Clief	10 S	693535	4127382
Freitas Boat Launch	10 S	690624	4124265

Table A1.2. Fyke Netting Locations

Sites:	UTM	Easting	Northing
VC SJR	10 S	692643	4127515
Van Clief	10 S	693535	4127382
Hills Ferry Barrier	10 S	679309	4135321

Table A1.3. Electrofishing Locations and Data

Date:	Site:	UTM	UTM Start		UTM End		Minutes
12/5/2020	Van Clief to Fremont	10 S	693491	4127517	691268	4128567	11.0
12/5/2020	Van Clief to Fremont	10 S	692808	4128020	692175	4128265	10.0
12/5/2020	Van Clief to Fremont	10 S	691162	4128541	691236	4128736	4.5
12/5/2020	Van Clief to Fremont	10 S	691185	4129406	691176	4129775	12.4
12/5/2020	Salt Slough	10 S	686562	4129269	686411	4129591	14.5
12/5/2020	Van Clief to Fremont	10 S	686212	4129728	685975	4129334	12.2
12/6/2020	Fremont to Hills Ferry Barrier	10 S	683503	4131166	683360	4131291	4.7
12/6/2020	Fremont to Hills Ferry Barrier	10 S	682980	4131460	682568	4131551	6.7
12/6/2020	Fremont to Hills Ferry Barrier	10 S	682907	4132073	682924	4132430	12.2
12/6/2020	Fremont to Hills Ferry Barrier	10 S	682304	4132666	682259	4132913	13.4
12/6/2020	Mud Slough	10 S	681272	4133274	681406	4133579	10.8
12/6/2020	Fremont to Hills Ferry Barrier	10 S	680758	4134129	680301	4134053	11.5
12/6/2020	Fremont to Hills Ferry Barrier	10 S	679580	4134519	679108	4134652	10.8
1/12/2021	Fremont to Hills Ferry Barrier	10 S	683505	4131163	682792	4131355	16.6
1/12/2021	Fremont to Hills Ferry Barrier	10 S	682702	4131678	682857	4132106	15.7
1/12/2021	Fremont to Hills Ferry Barrier	10 S	682211	4132586	682200	4132804	8.6
1/12/2021	Mud Slough	10 S	681439	4133046	681405	4133561	16.9
1/12/2021	Fremont to Hills Ferry Barrier	10 S	680920	4134152	680344	4134029	13.8
1/12/2021	Fremont to Hills Ferry Barrier	10 S	679405	4134623	679166	4134812	10.0
1/13/2021	Van Clief to Fremont	10 S	693338	4127578	692931	4127895	12.8
1/13/2021	Van Clief to Fremont	10 S	692865	4127983	692394	4128223	15.0
1/13/2021	Van Clief to Fremont	10 S	691158	4128541	691272	4129740	26.4
1/13/2021	Van Clief to Fremont	10 S	688336	4129148	688001	4129729	15.2
1/13/2021	Salt Slough	10 S	686570	4129285	686425	4129584	12.4
1/13/2021	Van Clief to Fremont	10 S	685546	4129703	685245	4129851	7.9
2/6/2021	Van Clief to Fremont	10 S	693481	4127504	692745	4128064	17.8
2/6/2021	Van Clief to Fremont	10 S	691184	4128565	691086	4129166	11.5
2/6/2021	Van Clief to Fremont	10 S	691317	4129438	691400	4129594	6.8
2/6/2021	Van Clief to Fremont	10 S	690905	4129692	690591	4129766	7.5
2/6/2021	Van Clief to Fremont	10 S	689138	4128911	688780	4128795	10.3
2/6/2021	Van Clief to Fremont	10 S	688331	4129231	688086	4129573	11.1
2/6/2021	Salt Slough	10 S	686473	4129259	686404	4129586	12.5
2/6/2021	Van Clief to Fremont	10 S	686130	4129698	685823	4129387	13.1
2/6/2021	Van Clief to Fremont	10 S	684880	4129798	684588	4129560	7.1
2/6/2021	Van Clief to Fremont	10 S	684073	4130570	683802	4130961	12.0
2/7/2021	Fremont to Hills Ferry Barrier	10 S	682750	4131334	682558	4131530	3.8
2/7/2021	Fremont to Hills Ferry Barrier	10 S	683503	4131166	683127	4131488	3.8

Date:	Site:	UTM	UTM Start		UTM End		Minutes
3/6/2021	Van Clief to Fremont	10 S	693490	4127516	693040	4127716	10.0
3/6/2021	Van Clief to Fremont	10 S	692501	4128295	691942	4128670	15.0
3/6/2021	Van Clief to Fremont	10 S	691115	4128526	691094	4129094	13.0
3/6/2021	Van Clief to Fremont	10 S	691249	4129791	690127	4129633	16.0
3/6/2021	Van Clief to Fremont	10 S	689509	4129285	688901	4128795	15.0
3/6/2021	Van Clief to Fremont	10 S	688227	4129464	687585	4130004	16.0
3/6/2021	Van Clief to Fremont	10 S	686460	4129706	686115	4129661	15.0
3/6/2021	Van Clief to Fremont	10 S	685849	4129339	685319	4129844	17.0
3/6/2021	Van Clief to Fremont	10 S	684611	4129562	684115	4129988	16.0
3/7/2021	Fremont to Hills Ferry Barrier	10 S	683434	4131247	682660	4131319	15.2
3/7/2021	Fremont to Hills Ferry Barrier	10 S	682684	4131955	683079	4132048	16.5
3/7/2021	Fremont to Hills Ferry Barrier	10 S	681759	4131966	682155	4132764	16.8
3/7/2021	Fremont to Hills Ferry Barrier	10 S	681976	4133297	681620	4133645	17.1
3/7/2021	Salt Slough	10 S	681445	4133048	681406	4133565	15.5
3/7/2021	Fremont to Hills Ferry Barrier	10 S	681263	4134060	680467	4133974	17.5
4/3/2021	Fremont to Hills Ferry Barrier	10 S	683493	4131154	682881	4132107	39.0
4/3/2021	Fremont to Hills Ferry Barrier	10 S	682885	4132686	682077	4132713	16.6

6.4 Appendix 2: Water Quality 2020-21

Table A2. Mean monthly water quality (± SD) at fyke netting/trapping locations.

Location	Month	Temp. (°C):	DO (mg/L):	Cond. (µS/cm):	Turb. (NTU):
Hills Ferry Barrier	December	9.4 ± 0.8	10.6 ± 0.7	1537.1 ± 66.3	NA
	January	9.5 ± 0.6	11.6 ± 0.4	1627.9 ± 13.8	27.7 ± 5.7
	February	12.1 ± 0.9	7.9 ± 2.3	1738.4 ± 261.8	38.4 ± 16.0
	March	13.2 ± 0.4	9.1 ± 0.3	2134.0 ± 23.1	44.9 ± 4.3
	April	18.5 ± 1.2	7.8 ± 0.5	2490.3 ± 165.6	40.9 ± 16.7
Mud Slough	December	10.1 ± 0.9	8.7 ± 0.6	2185.9 ± 444.6	NA
	January	10.2 ± 0.9	10.2 ± 0.8	2623.9 ± 64.6	15.3 ± 6.2
	February	13.0 ± 1.2	6.6 ± 0.2	2781.7 ± 231.3	38.7 ± 12.0
	March	12.8 ± 0.5	8.0 ± 0.5	2401.6 ± 51.4	41.8 ± 3.3
	April	19.4 ± 4.0	8.5 ± 0.7	3152.0 ± 352.9	64.3 ± 70.0
Van Clief	December	8.9 ± 0.6	11.1 ± 0.4	515.7 ± 18.5	NA
	January	9.2 ± 0.7	12.1 ± 0.4	533.9 ± 20.9	24.1 ± 3.4
	February	12.0 ± 0.9	9.6 ± 0.4	580.0 ± 99.3	115.7 ± 162.5
	March	13.0 ± 0.6	9.9 ± 0.7	983.8 ± 94.8	43.1 ± 5.6
	April	18.7 ± 0.8	7.6 ± 0.8	1177.8 ± 87.4	78.0 ± 125.6
VC SJR	December	9.0 ± 0.8	8.2 ± 0.5	1047.9 ± 126.0	NA
	January	10.0 ± 0.8	8.9 ± 0.3	1011.3 ± 10.8	10.7 ± 12.0
	February	12.1 ± 1.0	7.7 ± 0.3	1178.2 ± 28.2	10.9 ± 1.2
	March	13.2 ± 0.5	7.6 ± 0.4	1430.6 ± 37.4	12.3 ± 1.0
	April	18.3 ± 0.9	7.2 ± 1.0	1547.8 ± 40.8	9.9 ± 4.1
Eastside Bypass	December	NA	NA	NA	NA
	January	NA	NA	NA	NA
	February	11.5 ± 0.9	10.5 ± 0.4	602.8 ± 60.4	68.2 ± 94.5
	March	13.1 ± 0.1	9.9 ± 0.9	1508.0 ± 951.8	41.8 ± 10.5
	April	NA	NA	NA	NA

6.3 Appendix 3: Photos 2020-21

Figure A-1. Reach 4B2, Salt Slough, San Joaquin River, CA. Elevated water hyacinth restricted access, and likely fish passage, and monitoring was not completed at this location during 2020-21 Steelhead Monitoring Plan.

Figure A-2. Fyke trap monitoring, 2020-21 Steelhead Monitoring Plan, Mud Slough, Reach 5, San Joaquin River, CA.

Figure A-3. Overlapping fyke trapping and netting during the 2020-21 Steelhead Monitoring Plan at Van Clief, Reach 4B2, Bear Creek, CA.

Figure A-4. Fyke netting during the 2020-21 Steelhead Monitoring Plan at Van Clief SJR. Reach 4B2, San Joaquin River, CA.

Figure A-5. American Shad (*Alosa sapidissima*) captured while electrofishing, Reach 5, San Joaquin river, CA.

Figure A-6. Fall-run Chinook Salmon (*Oncorhynchus tshawytscha*) captured while electrofishing, Reach 5, San Joaquin river, CA.

Figure A-7. Striped Bass (*Morone saxatilis*) captured while electrofishing, Reach 5, San Joaquin River, CA.