

**Lower Mokelumne River Project
FERC Project No. 2916**

2020 Project Operations Report



EAST BAY MUNICIPAL UTILITY DISTRICT

**Submitted to the Federal Energy Regulatory Commission in
Compliance with Ordering Paragraph (C) of the November 27, 1998
Order Approving Settlement Agreement and Amending License**

February 2021

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ABBREVIATIONS

AFRP	Anadromous Fish Restoration Program
AOP	Annual Operations Plan
CAMP	Comprehensive Assessment and Monitoring Program
CBDA	California Bay Delta Authority
CDFW	California Department of Fish and Wildlife
CVPIA	Central Valley Project Improvement Act
CWT	Coded Wire Tag
DCC	Delta Cross Channel
DWR	Department of Water Resources
EBMUD	East Bay Municipal Utility District
FERC	Federal Energy Regulatory Commission
HOS	Hypolimnetic Oxygenation System
JSA	Joint Settlement Agreement
LMRMP	Lower Mokelumne River Management Plan
LMRSP	Lower Mokelumne River Stewardship Program
LWWC	Lodi-Woodbridge Winegrape Commission
MRA	Mokelumne River Association
MRDUA	Mokelumne River Day Use Area
MRFH	Mokelumne River Fish Hatchery
MRTAC	Mokelumne River Technical Advisory Committee
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollution Discharge Elimination System Permit
PCC	Partnership Coordinating Committee
PSC	Partnership Steering Committee
SAFCA	Sacramento Area Flood Control Agency
SCWA	Sacramento County Water Agency
SJCOG	San Joaquin Council of Governments
SJCRCD	San Joaquin County Resource Conservation District
SWRCB	State Water Resources Control Board
TNC	The Nature Conservancy
USFWS	United States Fish and Wildlife Service
USBR	United States Bureau of Reclamation
USGS	United States Geological Survey
WID	Woodbridge Irrigation District
WQRMP	Water Quality and Resource Management Program

I. PURPOSE AND SCOPE

This report is submitted to the Federal Energy Regulatory Commission (FERC) in compliance with Ordering Paragraph (C) of the FERC’s November 27, 1998 Order Approving Settlement Agreement and Amending License (FERC Order), which provides:

“On February 15 of each year, the licensee shall file a report describing all measures completed pursuant to the Settlement during the previous calendar year, and actions proposed to be completed during the then-current calendar year.”

In this report, “Settlement Agreement” refers to the March 23, 1998 Joint Settlement Agreement (JSA) among the East Bay Municipal Utility District (EBMUD), the United States Fish and Wildlife Service (USFWS), and the California Department of Fish and Wildlife (CDFW), and “License” refers to the license for EBMUD’s Lower Mokelumne River Project, FERC Project No. 2916.

This report summarizes the measures EBMUD implemented in the previous calendar year (2020), and those that it plans to implement in the current calendar year (2021), pursuant to the JSA, to protect and enhance the fishery resources and ecosystem of the lower Mokelumne River.

II. INTRODUCTION

This submittal is EBMUD’s Project Operations Update Report¹ for 2020. EBMUD actions in 2020 were designed to improve water quality, flow regimes, and physical habitat in the lower Mokelumne River area for the benefit of the river’s anadromous and resident fish populations, the riparian zone, associated uplands, and recreational angling. In 1993, EBMUD began voluntarily releasing flows consistent with the Lower Mokelumne River Management Plan (LMRMP), and in March 1996, voluntarily began releasing flows to the lower Mokelumne River consistent with the flow requirements of the then proposed JSA. As part of EBMUD’s implementation of the JSA and FERC Order, EBMUD continues to release flows consistent with the requirements of the JSA.

Additional efforts to improve the health of the river ecosystem have been implemented through the Water Quality and Resource Management Program (WQRMP). This program, developed by the Partnership Steering Committee (PSC) consisting of representatives from EBMUD, CDFW, and USFWS, in cooperation with NOAA Fisheries and the Mokelumne River Technical Advisory Committee (MRTAC) members, and in accordance with Sections E.3, F.5, and H.5 of the JSA, was approved by FERC on May 9, 2001. The

¹ EBMUD submitted earlier Project Operations Reports to FERC prior to the JSA (for the years 1990-94, 1995-96) and after the JSA (for the years 1997-1998 through 2019).

WQRMP includes a comprehensive monitoring and applied research program integrated with a well-coordinated program to adaptively manage water and power supply operations, flood control, hatchery operations, and ecosystem rehabilitation actions. The PSC oversees the implementation of the measures identified in the JSA and the WQRMP.

This report is composed of five sections. Section I describes the purpose and scope of EBMUD's Project Operations Update Report and Section II is an introduction to the report. Section III contains current and past data on the status of the lower Mokelumne River salmon populations, including escapement data, redd counts, and outmigration. Section IV covers six key areas in which EBMUD and the JSA partners have made efforts to restore, enhance, and protect the fisheries resource and ecosystem of the lower Mokelumne River. These areas are Flow, Water Quality, Lower Mokelumne River Partnership, Mokelumne River Technical Cooperation, Research and Monitoring, and Habitat Improvements. This section describes efforts made during the 2020 calendar year and efforts planned for 2021. Section V contains the appendices.

III. STATUS OF THE LOWER MOKELUMNE RIVER SALMON POPULATION

Through the 1990s and into 2020, the lower Mokelumne River Chinook salmon population continues to demonstrate characteristics consistent with long-term sustainability. As of January 7, 2021, the Mokelumne River fall-run Chinook salmon escapement in 2020 was 4,039 (Table 1; Figure 1). EBMUD and Woodbridge Irrigation District (WID) continue to work cooperatively in managing operations to maximize the accuracy of monitoring systems.

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Table 1: Lower Mokelumne River Fall-Run Chinook Salmon Data, 1989–2020

Year	Outmigration		Total Escapement	Hatchery Returns	Natural Spawners	Percent Natural Spawners of Total	Number of Redds
	Fry	Smolts					
1989	no data	no data	280	81	199	71	no data
1990	See note 3	78,179	497	68	429	86	71
1991	See note 3	31,025	410	42	368	90	127
1992	See note 3	69,993	1,645	710	935	57	345
1993	11,006	172,442	3,157	2,164	993	31	530
1994	554	142,670	3,157	1,919	1,238	39	777
1995	260,103	174,103	5,517	3,323	2,194	40	888
1996	103,270	80,744	7,921	3,883	4,038	51	929
1997	405,350	135,116	10,175	6,494	3,681	36	1,325
1998	1,336,768	511,771	7,213	3,091	4,122	57	1,116
1999	1,232,958	302,481	5,333	3,150	2,183	41	627
2000	107,134	61,391	7,423	5,450	1,973	27	987
2001	37,754	81,580	8,035	5,728	2,307	29	843
2002	11,791	66,132	10,753	7,913	2,840	26	848
2003	8,297	132,174	10,239	8,117	2,122	21	807
2004	45,467	42,187	11,944	10,356	1,588	13	835
2005	197,390	235,484	15,969	5,563	10,406	65	2,170
2006	1,008,289	179,264	5,871	4,139	1,732	30	755
2007	10,349	29,278	1,521	1,051	470	31	306
2008	1,835	16,512	412	239	173	42	63
2009	960	29,654	2,250	1,553	697	31	248
2010	4,243	63,106	7,196	5,275	1,921	27	314*
2011	228,829	52,288	18,596	15,922	2,674	14	564
2012	13,888	38,049	12,091	6,556	5,535	46	1,287
2013	49,102	98,488	12,252	5,170	7,082	58	1,823
2014	15,764	154,100	12,117	8,817	3,300	27	909
2015	12,599	48,707	12,879	8,295	4,584	36	1,357
2016	7,182	127,411	8,871	6,887	1,984	22	405*
2017	261,209	209,696	19,963	14,319	5,644	28	1,255
2018	10,569	29,548	17,475	7,280	10,195	58	2,432
2019	2,669,037	130,172	12,870	8,509	4,361	34	1,051
2020	13,345	24,099	4,039	3,443	596	15	290

Notes:

1. Escapement monitoring generally occurs from August through January, but dates vary each year.
 2. Hatchery Returns: count by CDFW at the Mokelumne River Fish Hatchery.
 3. Estimates were not segregated into fry and smolts.
 4. The data for the most recent year may change as estimates are finalized and new information is analyzed.
- * Redd survey incomplete due to high flows.

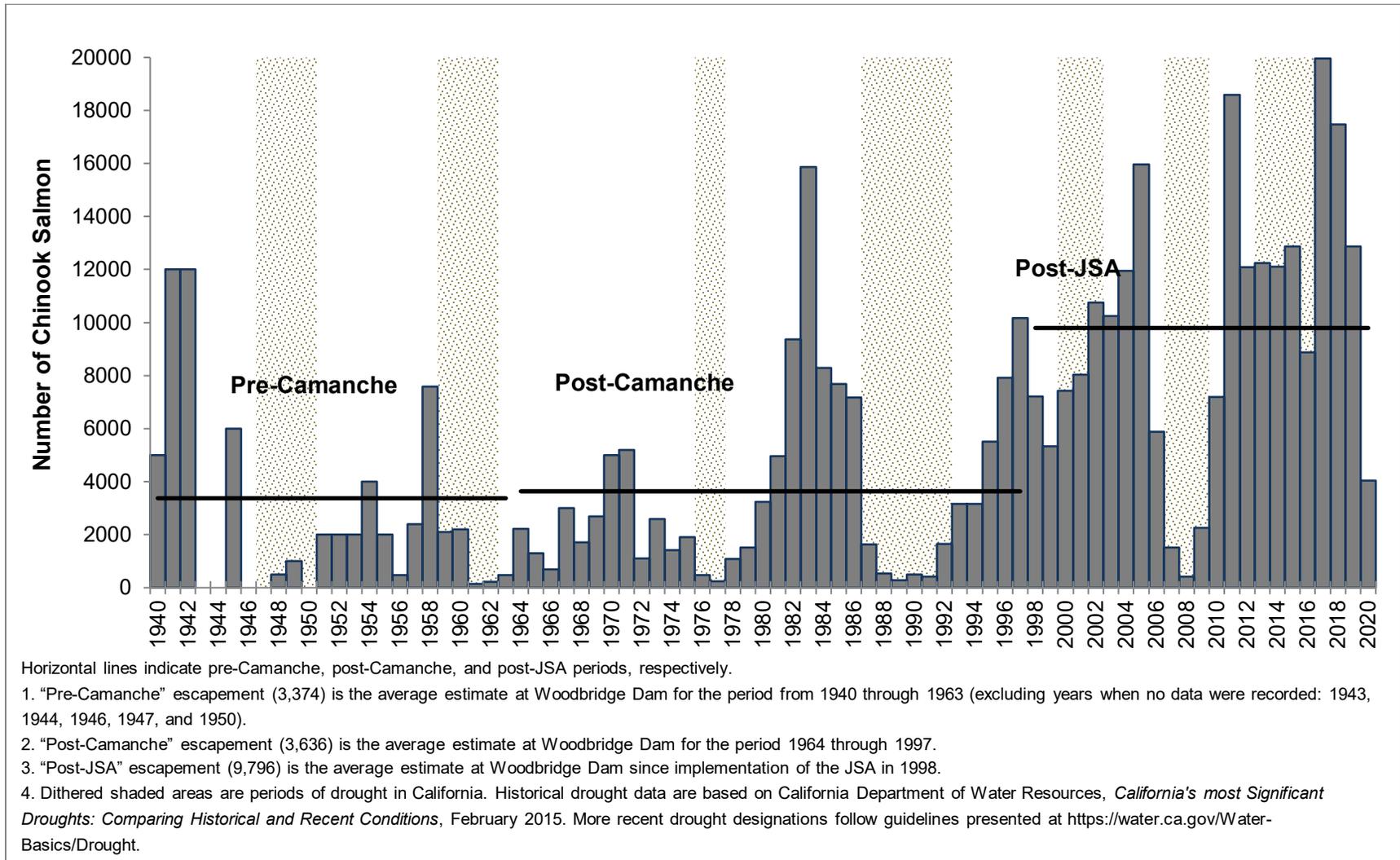


Figure 1: Estimated Annual Spawning Escapement of Fall-Run Chinook Salmon in the Lower Mokelumne River, 1940–2020

Eight of the past ten years have seen run sizes of over 10,000 adult salmon returning to the Mokelumne River, including the highest three returns in 2011, 2017, and 2018. The trend of above average returns is indicative of positive response to the adaptive management actions (discussed in later sections) implemented during 2009–2020. Despite having been mired in a multi-year drought and associated flow regimes, along with deteriorating ocean conditions, the lower Mokelumne River Chinook salmon population continues to demonstrate characteristics consistent with long-term sustainability. In fact, the Mokelumne produces one of the few salmon populations nearing the natural production doubling goal relative to baseline 1967–1991 levels established by the USFWS Anadromous Fish Restoration Program (AFRP) through the 1992 Central Valley Project Improvement Act (CVPIA). The AFRP-established doubling goal for the Mokelumne is 9,300, while the river’s 1992–2015 average natural production was 8,976 as of the last official AFRP update published in 2016. This represents a higher percentage of attainment (97%) for the Mokelumne River than any other Central Valley river salmon population. While the 2020 return was lower than typical escapement during the past 10 years, the American, Stanislaus, and Tuolumne rivers similarly experienced returns lower than typical of recent years. The cause of the low returns is currently unknown, but may be related to continued dry conditions, lack of change in barometric pressure or other environmental cues to signal up-migration from the ocean, or high mortality during initial juvenile releases of returning fish.

Due to the consistently strong runs on the Mokelumne River in recent years, the Mokelumne River Fish Hatchery (MRFH), owned by EBMUD and operated by the California Department of Fish and Wildlife (CDFW), reported in the 2017 MRFH Annual Operations Plan (AOP) that it would continue into the long-term the import ban of eggs originating from other hatcheries whenever possible. Due to the long-term nature of the egg importation ban, EBMUD and CDFW are focused on achieving hatchery production goals through spawning only Mokelumne-origin fish returning to MRFH. However, in 2020 due to the projected low fish returns at the start of the season, CDFW coordinated the import of approximately 2.8 million salmon eggs from the Feather River Fish Hatchery to support MRFH production goals. Imported eggs will not be used to satisfy the mitigation production requirement of 3.4 million fish, which will be produced using Mokelumne River broodstock. It is estimated that the imported eggs will yield 1.8 million eyed eggs, which will be applied towards ocean enhancement targets of 3 million fish once the Mokelumne River broodstock supply is exhausted. Any excess imported eggs will be discarded.

From October 2020 through January 5, 2021, approximately 596 salmon spawned within the river, constructing approximately 290 redds (nests) in the 10-mile reach below Camanche Dam (Figure 2). Based on salmon emergence temperature models the peak of

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Brood Year 2020 fry emergence will occur during the first two weeks of February 2021 and be completed by early April 2021.

Outmigrating juvenile salmon from Brood Year 2019 were sampled at the beginning of 2020 through spring. The estimated outmigration of juvenile salmon in 2020 was 37,444 (Table 1).

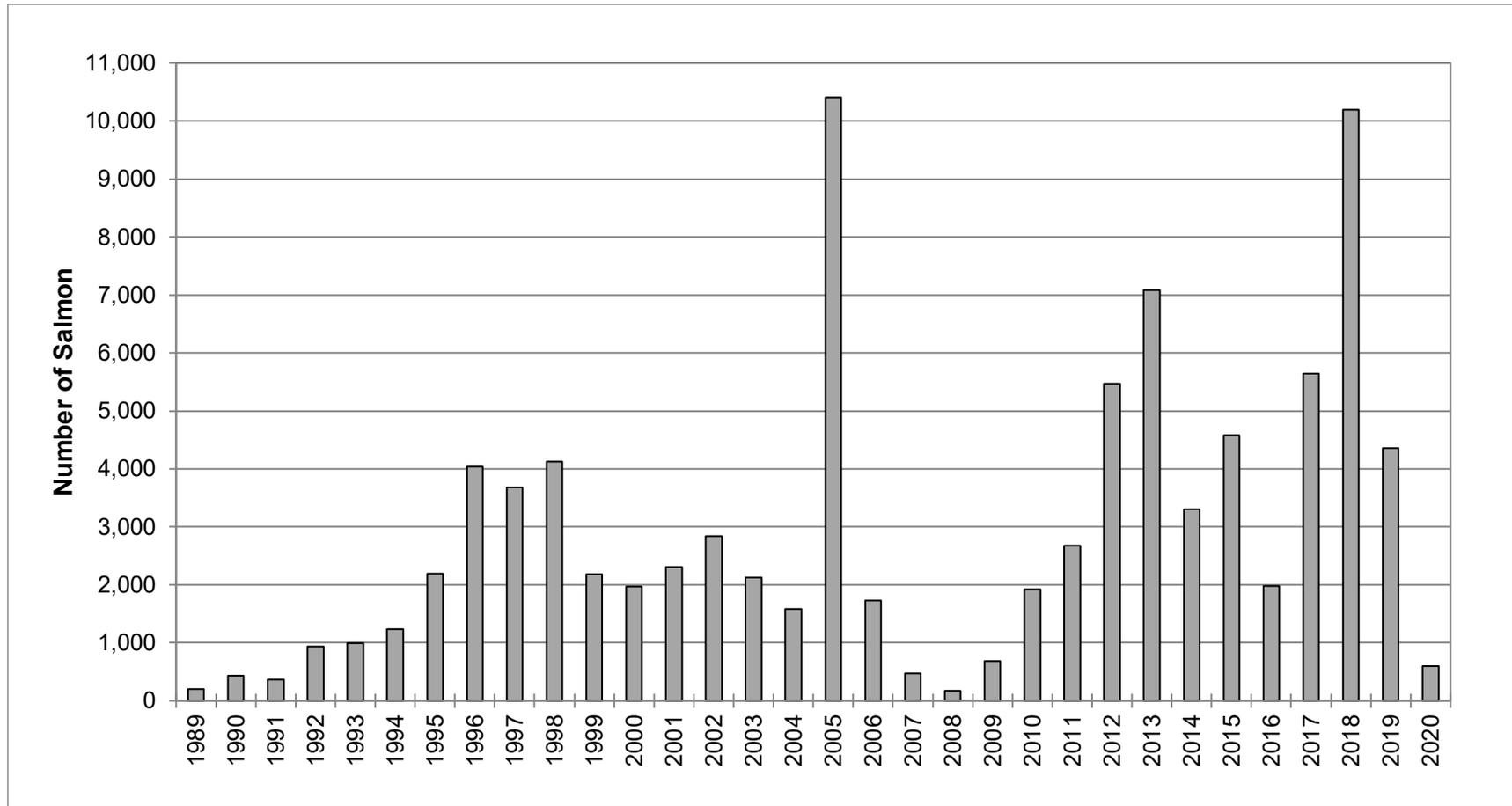


Figure 2: Fall-Run Chinook Salmon Naturally Spawning in the Lower Mokelumne River, 1989–2020

IV. EBMUD EFFORTS TO RESTORE, ENHANCE, AND PROTECT THE FISHERIES RESOURCES AND ECOSYSTEM OF THE LOWER MOKELUMNE RIVER

Responding to drought conditions, increased environmental concerns, and an improved understanding of fishery resource needs on the lower Mokelumne River, in 1987 EBMUD began to develop a multifaceted plan to protect and enhance the fishery and riparian resources of the lower Mokelumne River. This plan, known as the Lower Mokelumne River Management Plan (LMRMP), was developed over five years and was voluntarily implemented by EBMUD beginning in 1993. The 1998 Joint Settlement Agreement (JSA) incorporates the knowledge gained through the development of the LMRMP and contains additional actions to protect the lower Mokelumne River resource beyond those already undertaken by EBMUD under the LMRMP. Actions taken by EBMUD in 2020, and those actions planned for 2021, are described in this section.

A. FLOW

Consultation with CDFW and USFWS, on a real-time basis, began during the 1992–1993 salmon run with voluntary flow releases consistent with the LMRMP, and real-time consultation has continued since that time. In March 1996, EBMUD voluntarily began releasing flows to the lower Mokelumne River consistent with the flow requirements of the JSA. The 2020 releases to the lower Mokelumne River are summarized in this section.

EBMUD owns and operates the gaging stations below Woodbridge Dam and below Camanche Dam and measures the flow in accordance with United States Geological Survey (USGS) stream gaging procedures. Releases were measured at Camanche Dam using its Accusonic flow meters. The flow data is verified by USGS staff annually and subsequently published in the USGS Water Data Reports, approximately one to two years later. Because of the delay between the time flow data are collected and the timing of publication in the USGS Water Data Reports, the 2020 flow data included in this report have not yet been verified or published by the USGS.

On December 29, 1999, the State Water Resources Control Board (SWRCB) issued Water Right Decision 1641 (D-1641), a decision involving numerous parties throughout the Central Valley. Among other regulatory changes, D-1641 modified water rights on the Mokelumne River, significantly increasing assurances that operations under the JSA will provide the expected flows below Woodbridge Dam. D-1641, which was re-confirmed by the SWRCB's Water Right Order 2000-2 on March 15, 2000, modified the water rights of both EBMUD and the Woodbridge Irrigation District (WID). It conforms EBMUD's water rights to the FERC-approved JSA flow requirements and requires WID to curtail its diversions at Woodbridge Dam that exceed its Permanent Regulated Base Supply

entitlement released from Camanche Dam under its 1965 Agreement with EBMUD to ensure that the JSA flows are met below Woodbridge Diversion Dam.

2020

In accordance with the November 27, 1998 FERC approval of the JSA and based upon EBMUD's end of September forecast of total Pardee and Camanche Reservoir storage on November 5, 2019, EBMUD provided "Normal and Above" JSA water year type Camanche dam flow releases from October 1, 2019 through March 31, 2020. Pardee and Camanche Reservoir actual total storage on November 5, 2019 was 480,830 acre-feet.

Based on the California Department of Water Resources (DWR) April 1, 2020 forecast of 405,000 acre-feet of unimpaired runoff into Pardee Reservoir, EBMUD operated under a "Dry" JSA water year type for Camanche Dam flow releases from April 1, 2020 through September 30, 2020. EBMUD is making, at a minimum, "Below Normal" JSA water year type Camanche Dam flow releases from October 1, 2020 through March 31, 2021. This is based on EBMUD's forecast of total Pardee and Camanche Reservoir storage on November 5, 2020. Actual Pardee and Camanche reservoir storage on November 5, 2020 was 449,270 acre-feet.

As further described in the Adaptive Management and Pulse Flow Operations sections of this report, EBMUD's 2020 flow operations included close coordination with the Partnership Coordinating Committee (PCC) and EBMUD's Fisheries and Wildlife Division to utilize necessary Camanche Permit Extension (CPE) Mitigation releases to provide four pulses for salmon attraction during adult up-migration. Flows at the Woodbridge Dam were also modulated to create three additional fish attraction pulse flow releases in November. Through EBMUD coordination with the PCC, this management strategy made efficient use of CPE Mitigation releases. These pulse flows are credited with helping improve the salmon returns to the Mokelumne through reduced straying to other systems.

Calendar year 2020 actual Camanche Dam average daily flow releases and agreed JSA flow releases from Camanche Dam are shown in Table 2 and Figure 3. The average daily flows below Camanche Dam did not fall below the required minimum daily flow.

Calendar year 2020 actual average daily flows and expected JSA flows below Woodbridge Dam are shown in Table 3 and Figure 4. The average daily flows below Woodbridge Dam fell 3cfs below the minimum daily expected flows on October 27, 2020. The drop in average daily flow likely resulted from maintenance work performed by WID. Given the small magnitude of deviation from the daily expected minimum flows, EBMUD's biologists determined that there was no impact to fisheries resources. EBMUD will

continue to coordinate with WID to share information and data as it becomes available to make best faith efforts to continue to operate to meet JSA expected daily flows.

In addition to the deviation from minimum daily expected flows, provisional fifteen-minute flow readings revealed temporary excursions from expected minimum flows below Woodbridge dam. The excursions in the fifteen-minute data appear to have occurred during WID's routine maintenance operations, such as fish screen cleaning and canal maintenance. These excursions and the deviation, at EBMUD's gaging station, USGS No. 11325500 ("Mokelumne River below Woodbridge Dam") are included in Appendix B (Tables B-1 through B-4) of this report.

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Table 2: Calendar Year 2020 Average Daily Release in Cubic Feet per Second from Camanche Dam

Date	Actual Camanche Release	JSA Agreed Release	Date	Actual Camanche Release	JSA Agreed Release	Date	Actual Camanche Release	JSA Agreed Release	Date	Actual Camanche Release	JSA Agreed Release	Date	Actual Camanche Release	JSA Agreed Release
1/1/2020	330	325	3/15/2020	330	325	5/28/2020	442	220	8/10/2020	304	100	10/23/2020	257	250
1/2/2020	330	325	3/16/2020	330	325	5/29/2020	445	220	8/11/2020	300	100	10/24/2020	255	250
1/3/2020	330	325	3/17/2020	329	325	5/30/2020	456	220	8/12/2020	300	100	10/25/2020	255	250
1/4/2020	330	325	3/18/2020	330	325	5/31/2020	443	220	8/13/2020	300	100	10/26/2020	256	250
1/5/2020	330	325	3/19/2020	330	325	6/1/2020	359	100	8/14/2020	300	100	10/27/2020	256	250
1/6/2020	330	325	3/20/2020	331	325	6/2/2020	336	100	8/15/2020	299	100	10/28/2020	430	250
1/7/2020	329	325	3/21/2020	330	325	6/3/2020	311	100	8/16/2020	301	100	10/29/2020	467	250
1/8/2020	330	325	3/22/2020	331	325	6/4/2020	291	100	8/17/2020	301	100	10/30/2020	318	250
1/9/2020	329	325	3/23/2020	330	325	6/5/2020	296	100	8/18/2020	300	100	10/31/2020	256	250
1/10/2020	330	325	3/24/2020	334	325	6/6/2020	304	100	8/19/2020	299	100	11/1/2020	255	250
1/11/2020	330	325	3/25/2020	331	325	6/7/2020	305	100	8/20/2020	299	100	11/2/2020	255	250
1/12/2020	330	325	3/26/2020	330	325	6/8/2020	306	100	8/21/2020	301	100	11/3/2020	257	250
1/13/2020	330	325	3/27/2020	332	325	6/9/2020	305	100	8/22/2020	301	100	11/4/2020	256	250
1/14/2020	330	325	3/28/2020	330	325	6/10/2020	305	100	8/23/2020	301	100	11/5/2020	256	250
1/15/2020	331	325	3/29/2020	330	325	6/11/2020	306	100	8/24/2020	299	100	11/6/2020	256	250
1/16/2020	332	325	3/30/2020	331	325	6/12/2020	303	100	8/25/2020	299	100	11/7/2020	256	250
1/17/2020	331	325	3/31/2020	331	220	6/13/2020	306	100	8/26/2020	299	100	11/8/2020	255	250
1/18/2020	331	325	4/1/2020	327	220	6/14/2020	305	100	8/27/2020	300	100	11/9/2020	256	250
1/19/2020	330	325	4/2/2020	323	220	6/15/2020	315	100	8/28/2020	296	100	11/10/2020	255	250
1/20/2020	330	325	4/3/2020	315	220	6/16/2020	325	100	8/29/2020	292	100	11/11/2020	256	250
1/21/2020	328	325	4/4/2020	316	220	6/17/2020	325	100	8/30/2020	292	100	11/12/2020	256	250
1/22/2020	330	325	4/5/2020	315	220	6/18/2020	324	100	8/31/2020	291	100	11/13/2020	255	250
1/23/2020	331	325	4/6/2020	307	220	6/19/2020	320	100	9/1/2020	290	100	11/14/2020	255	250
1/24/2020	330	325	4/7/2020	294	220	6/20/2020	315	100	9/2/2020	291	100	11/15/2020	256	250
1/25/2020	330	325	4/8/2020	290	220	6/21/2020	316	100	9/3/2020	286	100	11/16/2020	255	250
1/26/2020	330	325	4/9/2020	290	220	6/22/2020	315	100	9/4/2020	280	100	11/17/2020	255	250
1/27/2020	330	325	4/10/2020	290	220	6/23/2020	328	100	9/5/2020	280	100	11/18/2020	258	250
1/28/2020	330	325	4/11/2020	291	220	6/24/2020	336	100	9/6/2020	280	100	11/19/2020	257	250
1/29/2020	330	325	4/12/2020	290	220	6/25/2020	329	100	9/7/2020	281	100	11/20/2020	254	250
1/30/2020	331	325	4/13/2020	289	220	6/26/2020	320	100	9/8/2020	282	100	11/21/2020	255	250
1/31/2020	330	325	4/14/2020	291	220	6/27/2020	320	100	9/9/2020	275	100	11/22/2020	255	250
2/1/2020	330	325	4/15/2020	291	220	6/28/2020	321	100	9/10/2020	265	100	11/23/2020	255	250
2/2/2020	331	325	4/16/2020	290	220	6/29/2020	313	100	9/11/2020	265	100	11/24/2020	255	250
2/3/2020	330	325	4/17/2020	291	220	6/30/2020	301	100	9/12/2020	264	100	11/25/2020	255	250
2/4/2020	330	325	4/18/2020	290	220	7/1/2020	301	100	9/13/2020	264	100	11/26/2020	254	250
2/5/2020	330	325	4/19/2020	295	220	7/2/2020	301	100	9/14/2020	266	100	11/27/2020	254	250
2/6/2020	330	325	4/20/2020	305	220	7/3/2020	301	100	9/15/2020	265	100	11/28/2020	254	250
2/7/2020	330	325	4/21/2020	312	220	7/4/2020	300	100	9/16/2020	265	100	11/29/2020	255	250
2/8/2020	330	325	4/22/2020	329	220	7/5/2020	300	100	9/17/2020	266	100	11/30/2020	256	250
2/9/2020	330	325	4/23/2020	355	220	7/6/2020	301	100	9/18/2020	260	100	12/1/2020	256	250
2/10/2020	330	325	4/24/2020	364	220	7/7/2020	302	100	9/19/2020	255	100	12/2/2020	256	250
2/11/2020	330	325	4/25/2020	364	220	7/8/2020	301	100	9/20/2020	256	100	12/3/2020	255	250
2/12/2020	330	325	4/26/2020	365	220	7/9/2020	319	100	9/21/2020	256	100	12/4/2020	255	250
2/13/2020	330	325	4/27/2020	365	220	7/10/2020	303	100	9/22/2020	255	100	12/5/2020	256	250
2/14/2020	330	325	4/28/2020	365	220	7/11/2020	302	100	9/23/2020	255	100	12/6/2020	256	250
2/15/2020	330	325	4/29/2020	365	220	7/12/2020	306	100	9/24/2020	255	100	12/7/2020	255	250
2/16/2020	330	325	4/30/2020	365	220	7/13/2020	320	100	9/25/2020	257	100	12/8/2020	254	250
2/17/2020	330	325	5/1/2020	364	220	7/14/2020	320	100	9/26/2020	256	100	12/9/2020	254	250
2/18/2020	332	325	5/2/2020	364	220	7/15/2020	321	100	9/27/2020	254	100	12/10/2020	254	250
2/19/2020	332	325	5/3/2020	364	220	7/16/2020	320	100	9/28/2020	255	100	12/11/2020	254	250
2/20/2020	330	325	5/4/2020	365	220	7/17/2020	316	100	9/29/2020	255	100	12/12/2020	255	250
2/21/2020	330	325	5/5/2020	364	220	7/18/2020	310	100	9/30/2020	259	100	12/13/2020	255	250
2/22/2020	330	325	5/6/2020	366	220	7/19/2020	310	100	10/1/2020	265	250	12/14/2020	255	250
2/23/2020	331	325	5/7/2020	377	220	7/20/2020	310	100	10/2/2020	264	250	12/15/2020	255	250
2/24/2020	330	325	5/8/2020	385	220	7/21/2020	311	100	10/3/2020	266	250	12/16/2020	255	250
2/25/2020	330	325	5/9/2020	384	220	7/22/2020	310	100	10/4/2020	265	250	12/17/2020	255	250
2/26/2020	331	325	5/10/2020	386	220	7/23/2020	311	100	10/5/2020	265	250	12/18/2020	255	250
2/27/2020	330	325	5/11/2020	385	220	7/24/2020	313	100	10/6/2020	440	250	12/19/2020	255	250
2/28/2020	329	325	5/12/2020	384	220	7/25/2020	321	100	10/7/2020	478	250	12/20/2020	255	250
2/29/2020	328	325	5/13/2020	385	220	7/26/2020	321	100	10/8/2020	328	250	12/21/2020	255	250
3/1/2020	328	325	5/14/2020	387	220	7/27/2020	321	100	10/9/2020	265	250	12/22/2020	255	250
3/2/2020	330	325	5/15/2020	387	220	7/28/2020	321	100	10/10/2020	265	250	12/23/2020	255	250
3/3/2020	330	325	5/16/2020	387	220	7/29/2020	320	100	10/11/2020	265	250	12/24/2020	255	250
3/4/2020	331	325	5/17/2020	386	220	7/30/2020	320	100	10/12/2020	475	250	12/25/2020	255	250
3/5/2020	332	325	5/18/2020	385	220	7/31/2020	320	100	10/13/2020	559	250	12/26/2020	255	250
3/6/2020	331	325	5/19/2020	384	220	8/1/2020	321	100	10/14/2020	408	250	12/27/2020	255	250
3/7/2020	331	325	5/20/2020	384	220	8/2/2020	320	100	10/15/2020	294	250	12/28/2020	255	250
3/8/2020	330	325	5/21/2020	386	220	8/3/2020	317	100	10/16/2020	266	250	12/29/2020	255	250
3/9/2020	330	325	5/22/2020	384	220	8/4/2020	311	100	10/17/2020	266	250	12/30/2020	255	250
3/10/2020	330	325	5/23/2020	384	220	8/5/2020	310	100	10/18/2020	265	250	12/31/2020	257	250
3/11/2020	330	325	5/24/2020	385	220	8/6/2020	311	100	10/19/2020	432	250			
3/12/2020	329	325	5/25/2020	396	220	8/7/2020	310	100	10/20/2020	467	250			
3/13/2020	329	325	5/26/2020	413	220	8/8/2020	310	100	10/21/2020	320	250			
3/14/2020	329	325	5/27/2020	431	220	8/9/2020	310	100	10/22/2020	255	250			

1. Flow measured using Accusonic Flow meter (USGS Gage #11323500 - Mokelumne River below Camanche Dam)
2. Actual flow data has not yet been verified and published by the U.S. Geological Survey

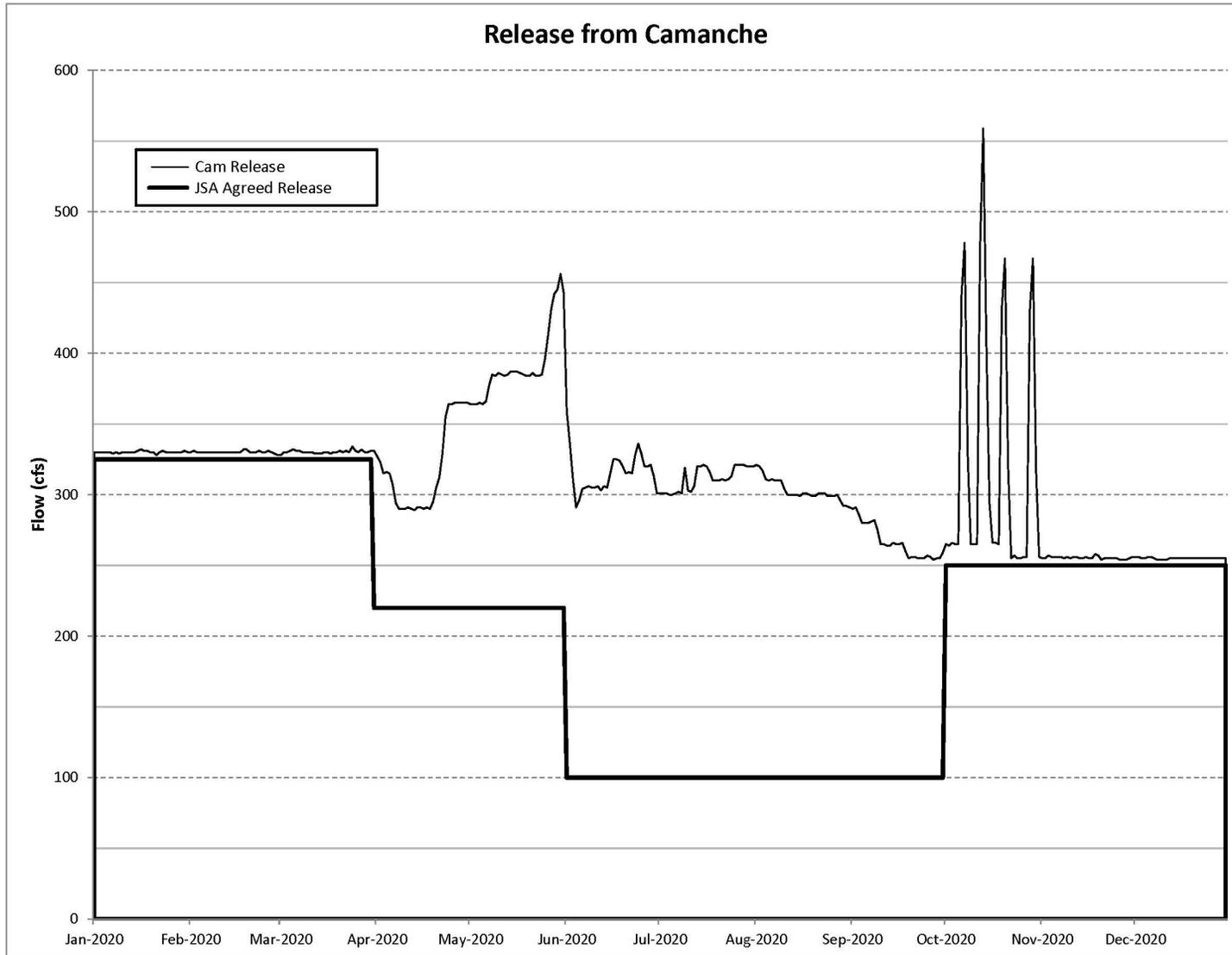


Figure 3: Calendar Year 2020 Average Daily Release in Cubic Feet per Second from Camanche Dam

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Table 3: Calendar Year 2020 Average Daily Flow in Cubic Feet per Second below Woodbridge Dam

Date	Actual Flow	JSA Expected Flow	Date	Actual Flow	JSA Expected Flow	Date	Actual Flow	JSA Expected Flow	Date	Actual Flow	JSA Expected Flow	Date	Actual Flow	JSA Expected Flow
1/1/2020	279	100	3/15/2020	242	100	5/28/2020	199	150	8/10/2020	37	20	10/23/2020	105	100
1/2/2020	281	100	3/16/2020	255	100	5/29/2020	197	150	8/11/2020	35	20	10/24/2020	104	100
1/3/2020	281	100	3/17/2020	225	100	5/30/2020	201	150	8/12/2020	35	20	10/25/2020	104	100
1/4/2020	280	100	3/18/2020	218	100	5/31/2020	201	150	8/13/2020	34	20	10/26/2020	101	100
1/5/2020	280	100	3/19/2020	218	100	6/1/2020	81	20	8/14/2020	35	20	10/27/2020	97	100
1/6/2020	280	100	3/20/2020	219	100	6/2/2020	91	20	8/15/2020	34	20	10/28/2020	130	100
1/7/2020	281	100	3/21/2020	220	100	6/3/2020	57	20	8/16/2020	35	20	10/29/2020	352	100
1/8/2020	282	100	3/22/2020	219	100	6/4/2020	38	20	8/17/2020	35	20	10/30/2020	269	100
1/9/2020	294	100	3/23/2020	224	100	6/5/2020	39	20	8/18/2020	35	20	10/31/2020	191	100
1/10/2020	283	100	3/24/2020	218	100	6/6/2020	40	20	8/19/2020	35	20	11/1/2020	175	100
1/11/2020	284	100	3/25/2020	222	100	6/7/2020	40	20	8/20/2020	35	20	11/2/2020	127	100
1/12/2020	284	100	3/26/2020	209	100	6/8/2020	56	20	8/21/2020	35	20	11/3/2020	244	100
1/13/2020	284	100	3/27/2020	213	100	6/9/2020	43	20	8/22/2020	35	20	11/4/2020	104	100
1/14/2020	286	100	3/28/2020	212	100	6/10/2020	42	20	8/23/2020	35	20	11/5/2020	102	100
1/15/2020	284	100	3/29/2020	204	100	6/11/2020	43	20	8/24/2020	36	20	11/6/2020	244	100
1/16/2020	310	100	3/30/2020	202	100	6/12/2020	42	20	8/25/2020	36	20	11/7/2020	102	100
1/17/2020	286	100	3/31/2020	210	100	6/13/2020	42	20	8/26/2020	36	20	11/8/2020	106	100
1/18/2020	288	100	4/1/2020	202	150	6/14/2020	43	20	8/27/2020	35	20	11/9/2020	261	100
1/19/2020	285	100	4/2/2020	189	150	6/15/2020	43	20	8/28/2020	35	20	11/10/2020	108	100
1/20/2020	287	100	4/3/2020	173	150	6/16/2020	44	20	8/29/2020	35	20	11/11/2020	148	100
1/21/2020	286	100	4/4/2020	161	150	6/17/2020	43	20	8/30/2020	35	20	11/12/2020	176	100
1/22/2020	293	100	4/5/2020	215	150	6/18/2020	43	20	8/31/2020	35	20	11/13/2020	180	100
1/23/2020	290	100	4/6/2020	225	150	6/19/2020	43	20	9/1/2020	36	20	11/14/2020	181	100
1/24/2020	410	100	4/7/2020	184	150	6/20/2020	43	20	9/2/2020	37	20	11/15/2020	179	100
1/25/2020	463	100	4/8/2020	163	150	6/21/2020	43	20	9/3/2020	36	20	11/16/2020	182	100
1/26/2020	439	100	4/9/2020	163	150	6/22/2020	41	20	9/4/2020	36	20	11/17/2020	189	100
1/27/2020	381	100	4/10/2020	164	150	6/23/2020	36	20	9/5/2020	35	20	11/18/2020	199	100
1/28/2020	327	100	4/11/2020	165	150	6/24/2020	37	20	9/6/2020	36	20	11/19/2020	182	100
1/29/2020	317	100	4/12/2020	165	150	6/25/2020	36	20	9/7/2020	36	20	11/20/2020	185	100
1/30/2020	314	100	4/13/2020	164	150	6/26/2020	36	20	9/8/2020	36	20	11/21/2020	181	100
1/31/2020	313	100	4/14/2020	164	150	6/27/2020	36	20	9/9/2020	37	20	11/22/2020	180	100
2/1/2020	311	100	4/15/2020	165	150	6/28/2020	37	20	9/10/2020	36	20	11/23/2020	183	100
2/2/2020	311	100	4/16/2020	165	150	6/29/2020	42	20	9/11/2020	36	20	11/24/2020	184	100
2/3/2020	309	100	4/17/2020	164	150	6/30/2020	36	20	9/12/2020	35	20	11/25/2020	187	100
2/4/2020	309	100	4/18/2020	164	150	7/1/2020	35	20	9/13/2020	35	20	11/26/2020	176	100
2/5/2020	321	100	4/19/2020	165	150	7/2/2020	36	20	9/14/2020	36	20	11/27/2020	182	100
2/6/2020	309	100	4/20/2020	167	150	7/3/2020	35	20	9/15/2020	36	20	11/28/2020	184	100
2/7/2020	305	100	4/21/2020	166	150	7/4/2020	36	20	9/16/2020	35	20	11/29/2020	184	100
2/8/2020	302	100	4/22/2020	161	150	7/5/2020	37	20	9/17/2020	35	20	11/30/2020	188	100
2/9/2020	299	100	4/23/2020	164	150	7/6/2020	36	20	9/18/2020	35	20	12/1/2020	183	100
2/10/2020	295	100	4/24/2020	168	150	7/7/2020	36	20	9/19/2020	35	20	12/2/2020	182	100
2/11/2020	292	100	4/25/2020	169	150	7/8/2020	36	20	9/20/2020	35	20	12/3/2020	185	100
2/12/2020	290	100	4/26/2020	170	150	7/9/2020	36	20	9/21/2020	35	20	12/4/2020	185	100
2/13/2020	289	100	4/27/2020	169	150	7/10/2020	36	20	9/22/2020	35	20	12/5/2020	182	100
2/14/2020	290	100	4/28/2020	168	150	7/11/2020	35	20	9/23/2020	35	20	12/6/2020	178	100
2/15/2020	291	100	4/29/2020	169	150	7/12/2020	36	20	9/24/2020	35	20	12/7/2020	187	100
2/16/2020	290	100	4/30/2020	170	150	7/13/2020	37	20	9/25/2020	36	20	12/8/2020	178	100
2/17/2020	290	100	5/1/2020	169	150	7/14/2020	37	20	9/26/2020	35	20	12/9/2020	213	100
2/18/2020	288	100	5/2/2020	169	150	7/15/2020	37	20	9/27/2020	36	20	12/10/2020	253	100
2/19/2020	289	100	5/3/2020	170	150	7/16/2020	37	20	9/28/2020	36	20	12/11/2020	194	100
2/20/2020	288	100	5/4/2020	171	150	7/17/2020	36	20	9/29/2020	36	20	12/12/2020	207	100
2/21/2020	284	100	5/5/2020	171	150	7/18/2020	36	20	9/30/2020	38	20	12/13/2020	236	100
2/22/2020	284	100	5/6/2020	171	150	7/19/2020	36	20	10/1/2020	102	100	12/14/2020	192	100
2/23/2020	285	100	5/7/2020	171	150	7/20/2020	36	20	10/2/2020	109	100	12/15/2020	192	100
2/24/2020	279	100	5/8/2020	172	150	7/21/2020	37	20	10/3/2020	105	100	12/16/2020	190	100
2/25/2020	236	100	5/9/2020	173	150	7/22/2020	36	20	10/4/2020	105	100	12/17/2020	198	100
2/26/2020	256	100	5/10/2020	175	150	7/23/2020	36	20	10/5/2020	105	100	12/18/2020	187	100
2/27/2020	161	100	5/11/2020	174	150	7/24/2020	37	20	10/6/2020	126	100	12/19/2020	192	100
2/28/2020	108	100	5/12/2020	174	150	7/25/2020	37	20	10/7/2020	368	100	12/20/2020	188	100
2/29/2020	127	100	5/13/2020	177	150	7/26/2020	37	20	10/8/2020	275	100	12/21/2020	190	100
3/1/2020	132	100	5/14/2020	179	150	7/27/2020	37	20	10/9/2020	109	100	12/22/2020	192	100
3/2/2020	166	100	5/15/2020	180	150	7/28/2020	36	20	10/10/2020	106	100	12/23/2020	194	100
3/3/2020	177	100	5/16/2020	182	150	7/29/2020	36	20	10/11/2020	106	100	12/24/2020	187	100
3/4/2020	209	100	5/17/2020	184	150	7/30/2020	36	20	10/12/2020	116	100	12/25/2020	191	100
3/5/2020	219	100	5/18/2020	187	150	7/31/2020	36	20	10/13/2020	422	100	12/26/2020	199	100
3/6/2020	209	100	5/19/2020	188	150	8/1/2020	36	20	10/14/2020	337	100	12/27/2020	187	100
3/7/2020	214	100	5/20/2020	188	150	8/2/2020	37	20	10/15/2020	211	100	12/28/2020	192	100
3/8/2020	217	100	5/21/2020	189	150	8/3/2020	37	20	10/16/2020	120	100	12/29/2020	187	100
3/9/2020	205	100	5/22/2020	191	150	8/4/2020	36	20	10/17/2020	106	100	12/30/2020	187	100
3/10/2020	196	100	5/23/2020	193	150	8/5/2020	36	20	10/18/2020	108	100	12/31/2020	194	100
3/11/2020	190	100	5/24/2020	193	150	8/6/2020	34	20	10/19/2020	147	100			
3/12/2020	194	100	5/25/2020	195	150	8/7/2020	35	20	10/20/2020	355	100			
3/13/2020	190	100	5/26/2020	197	150	8/8/2020	35	20	10/21/2020	268	100			
3/14/2020	209	100	5/27/2020	199	150	8/9/2020	35	20	10/22/2020	118	100			

1. Flow measured at USGS Gage #11325500 - Mokelumne River at Woodbridge
2. Actual flow data has not yet been verified and published by the U.S. Geological Survey

1. The provisional average daily flow for 10/27/2020 is 97 cfs; this deviation is attributed to maintenance work. Given the small magnitude of deviation from the daily expected minimum flows, EBMUD’s biologists determined that there was no impact to biological resources.

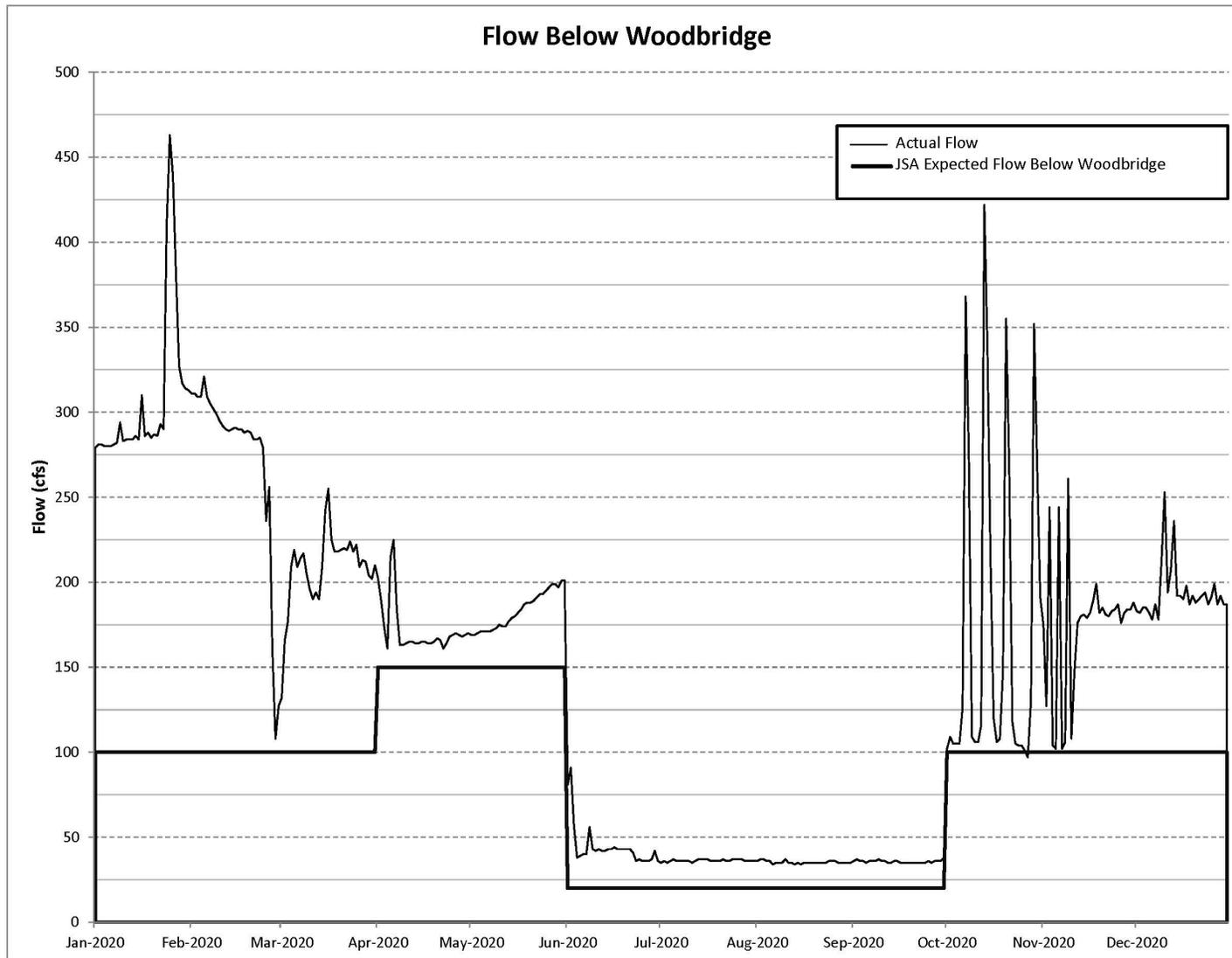


Figure 4: Calendar Year 2020 Average Daily Flow in Cubic Feet per Second below Woodbridge Dam

Adaptive Management

The JSA contains an adaptive management provision related to minimum flows. The flow schedule may be changed to optimize fishery habitat and other ecosystem values as long as the total quantity of water released in any given year will not be less than the quantity of water provided by the flow requirements for that type of year. In 2020, because water year conditions were dry; EBMUD maintained Camanche releases at the JSA minimum flows in the spring, summer, and fall (with the exception of fall pulse flows operations, as described in the section below). In the spring and summer of 2020, out-migrating juvenile salmon were experiencing high levels of stress and mortality due to a basin-wide thiamine deficiency issue, so an adaptive management plan was not pursued.

Pulse Flow Operations

The fall pulse attraction flows were a result of successful collaboration between several different agencies and stakeholders, primarily through the Partnership Coordinating Committee (PCC). Due to the dry conditions in 2020, flood control releases were not available for fall pulse flows. However, the CPE Mitigation Measure FISH-1 requires the release of up to 2,000 acre-feet of additional water above required releases during the September through February period in Below Normal and Dry water years to facilitate adult salmonid fish passage below Woodbridge Dam. The EBMUD Fisheries and Wildlife Division closely coordinated with the PCC to manage these necessary releases so that they could be used to provide fish attraction pulse flows to maximize returns to the Mokelumne River by reducing straying of Mokelumne-origin salmon to other systems. Each pulse resulted in an increase in salmon numbers entering the Mokelumne River (see Figure 5).

Water for 2020 pulse flows came from releases from the CPE FISH-1 requirement as well as an additional 2,000 acre-feet of discretionary releases from Camanche Reservoir storage to support the Lower Mokelumne fishery. Four pulses were planned for October. The first pulse had a peak flow of 565 cfs, the second pulse had a peak flow of 645 cfs, and the third and fourth pulses had peak flows of 555 cfs, while the base flow was maintained at 265 cfs. An additional three pulses were developed through collaboration with the Woodbridge Irrigation District (WID) on reoperation of Woodbridge Dam elevations to support Chinook salmon and steelhead passage in November.

Fish Straying during Up-migration

Coded Wire Tag (CWT) return data clearly indicate that release locations for hatchery-reared juvenile salmon play a significant role in straying.² In 2007, CDFW released nearly

² M. Palmer-Zwahlen, and B. Kormos. December 2013. Recovery of Coded-Wire Tags from Chinook Salmon in California's Central Valley Escapement and Ocean Harvest in 2011. California Department of Fish and Wildlife Fisheries Branch Administrative Report 2013-02.

the entire MRFH production in the San Pablo Bay region. While this practice may increase overall survival, it significantly increases straying rates when fish return to spawn. With the MRFH AOP long-term import ban of eggs originating from other hatcheries, the overall impact straying has on Mokelumne returns is significant. In 2020, CDFW continued the practice of releasing production in net pens at Jersey Point, which previous return data has indicated leads to less straying and better returns to the Mokelumne River. The duration of releases was 2 consecutive days, which had been previously decreased from 5 days in order to improve overall survival by reducing predation on later release groups.

Analysis of return data collected through a 2010 5-year study with the USBR indicated that adaptive management of Mokelumne River pulse flows and Delta Cross Channel (DCC) closures during the up-migration period could reduce straying of Mokelumne-origin salmon to the Sacramento River watershed. In October 2019, the 2019 Biological Opinions for the Central Valley Project and California’s State Water Project issued by NOAA under Endangered Species Act Section 7 Consultation proposed to “within 48 hours of start of Lower Mokelumne River attraction flow release, close the Delta Cross Channel gates for up to 5 days (dependent upon continuity of favorable water quality conditions)”. In 2020, DCC gates were closed for six periods between October and November, and then closed from December 1 through the end of the year (Figure 5). Each pulse flow was coordinated with the USBR for parallel DCC gate closure to provide protection from potential straying to the Sacramento River watershed. The first pulse flow was not protected after USBR modeling showed potential water quality impacts to the interior Delta, but the remaining three pulses resulted in DCC closures.³

In 2020, approximately 62% of up-migrating Mokelumne fish strayed to the Sacramento River watershed, while the MRFH Chinook salmon returns were comprised of 80% Mokelumne-origin fish based on preliminary coded wire tag recovery data. Many factors play a role in annual escapement numbers to the Mokelumne River. It is currently unknown what specific factors caused the high stray rate in 2020. Two potential factors under investigation include (1) whether high flows from the Sacramento River system diluted the homing capability of returning adults toward the Mokelumne, and (2) whether fall pulse flows were sufficiently protected by DCC gate operations.

To minimize Mokelumne fish straying to the south, pulse flow release timing was also coordinated with releases in the San Joaquin tributary. The peak of the first Mokelumne pulse flow release occurred approximately 10 days ahead of the first Stanislaus River release. In 2020, approximately 2% of up-migrating Mokelumne fish strayed to other tributaries in the San Joaquin River watershed.

³ <https://www.usbr.gov/mp/cvo/>; Cross Channel Gate Operations Historical Log

2021

EBMUD is committed, pursuant to the FERC Order, to “Below Normal” JSA year type Camanche Dam flow releases through March 31, 2021. In accordance with the stipulation in Attachment 1 of the JSA, EBMUD will determine the JSA water year type which will govern EBMUD’s flow schedule for the period April 1, 2021 through September 30, 2021 based on the DWR forecasted unimpaired runoff into Pardee Reservoir as identified in the April 1, 2021 DWR Bulletin 120. EBMUD will report to the FERC in the February 2021 report on the flow releases made in accordance with the JSA during the entire calendar year 2020. EBMUD will include finalized flow data in an Appendix of the report as it is verified and published by USGS. Refer to Appendix C (Tables C-1 and C-2) for finalized flow data for the 2018 and 2019 calendar years.

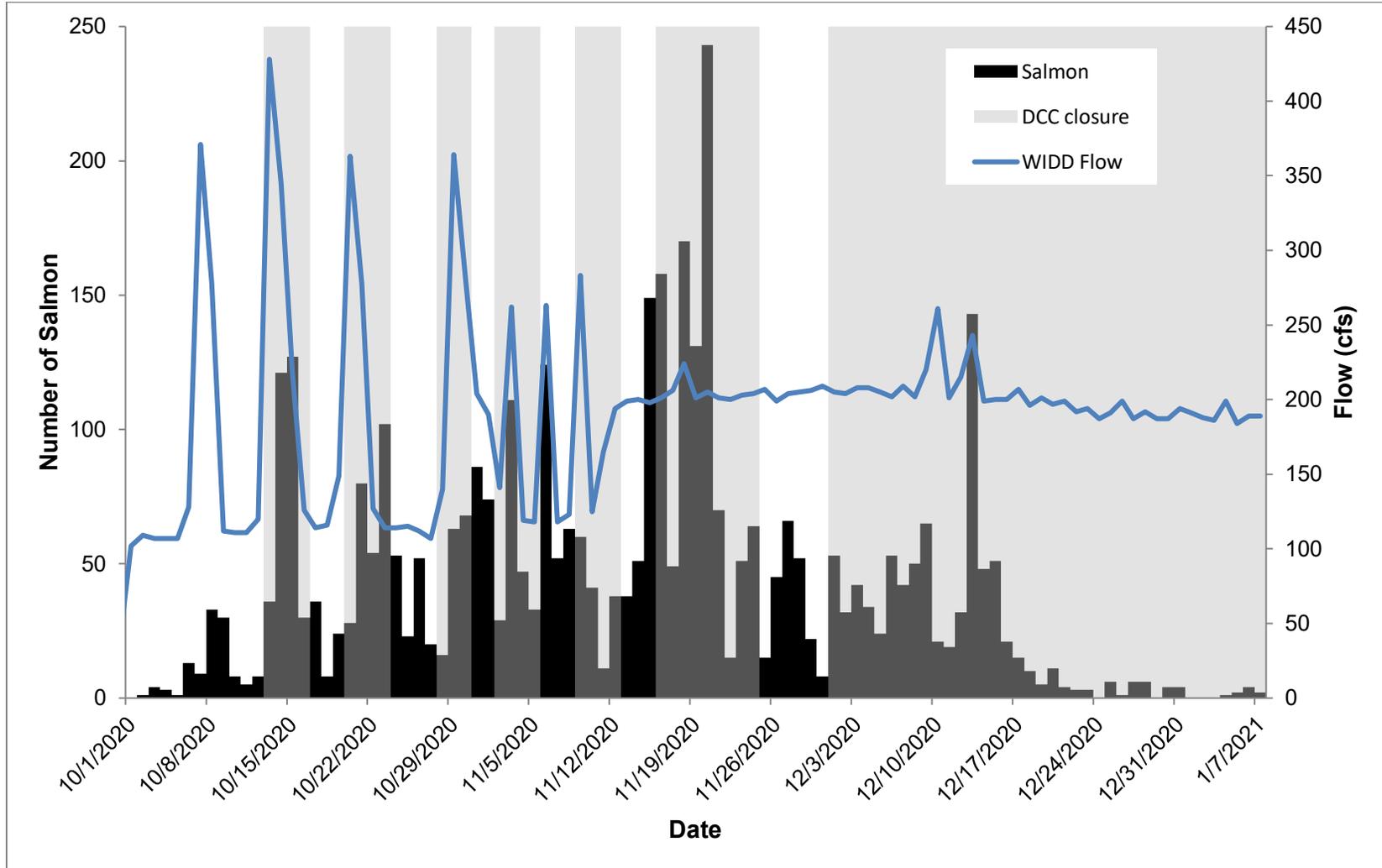


Figure 5: Daily Upstream Passage of Chinook Salmon at Woodbridge Dam Relative to Flow and Delta Cross Channel Closure, October 1, 2020–January 7, 2021

B. WATER QUALITY

Water quality in the MRFH and lower Mokelumne River continues to be actively managed by EBMUD through its extensive data collection and analysis, reservoir operations, and the use of EBMUD's Hypolimnetic Oxygenation System (HOS). Supplemental chillers are used to sustain MRFH water temperatures in the optimal range for egg incubation. Sand filters remove suspended solids from the hatchery water supply. Ultraviolet (UV) disinfection equipment continuously protects against pathogenic organisms. These measures increase fish survival and decrease the need for use of medicated feed or chemical treatment of the water supply and have reduced the effort needed to comply with provisions of the hatchery's National Pollution Discharge Elimination System (NPDES) Permit. The operation of Pardee and Camanche Reservoirs is coordinated to maintain thermal stratification in Camanche Reservoir through October and manage water temperature for native fish in the lower Mokelumne River. The HOS is operated to prevent hydrogen sulfide formation in Camanche Reservoir (the functions of the HOS system are described in Section IV.B.2 of this report).

1. Reservoir Operations

EBMUD has developed and implemented adaptive reservoir operations plans (which include management of cold water in the reservoir; reservoir water quality monitoring; and weekly review of conditions, modeling and forecasting of conditions, and scheduling of operations) that effectively meet the water temperature needs in the MRFH and the lower Mokelumne River. EBMUD manages temperatures in water released from Camanche Reservoir by keeping Camanche Reservoir thermally stratified until its surface waters naturally cool, usually in the fall. To maintain the volume of Camanche Reservoir's hypolimnion, which is needed to keep the reservoir thermally stratified, EBMUD manages the release of cold water available in Pardee Reservoir.

EBMUD's approach to managing the system is based on direct control of the cold water hypolimnion in both Camanche and Pardee Reservoirs. This approach has been developed operationally; incorporating a flexible response to several unique features of the Pardee Reservoir/Camanche Reservoir system and is possible because of extensive monitoring during operation. The operational criteria for reservoir stratification in EBMUD's reservoir operations plan are:

1. Maintain stratification in Camanche Reservoir to the extent feasible from May through October to provide cold water releases to the lower Mokelumne River and the MRFH during the fall.
2. Maintain the stratification in Camanche by scheduling inflows of cold water from Pardee Reservoir, as needed, to replenish the hypolimnion of Camanche Reservoir. Releases from Pardee are normally not necessary for temperature management

from approximately mid-November to April when Camanche Reservoir is cold and de-stratified.

3. Make best efforts to maintain a minimum of 28,000 acre-feet of hypolimnetic volume in Camanche Reservoir through October whenever Pardee Reservoir volume exceeds 100,000 acre-feet.

2020

The operational plan used by EBMUD since 1990 has proven effective in maintaining thermal stratification in Camanche Reservoir during Normal and Above, Below Normal, Dry, and Critically Dry JSA water year conditions. Average daily water temperatures in the Mokelumne River resulting from 2020 operations are shown in Figure 6. From April 1, 2020 through September 30, 2020 EBMUD operated under a “Dry” JSA water year type, with releases at the JSA minimum flows. Consistent with the JSA, EBMUD continued to adaptively manage its reservoir and was successful in maintaining a hypolimnion volume of 28,000 acre-feet in Camanche Reservoir at the end of October by coordinating releases from Pardee Reservoir. EBMUD successfully maintained stratification in Camanche Reservoir. Pardee and Camanche reservoirs were operated to provide cold water releases in the lower Mokelumne River through the critical spawning period from October through December. EBMUD also provided bypass (sluice) flows from Camanche Reservoir to increase dissolved oxygen levels in the lower Mokelumne River when needed during 2020.

2021

EBMUD will continue to manage Pardee and Camanche Reservoir operations based on real-time reservoir and riverine conditions. Pursuant to Section H.4 of the JSA, EBMUD will continue to consult with the resource agencies about changes in real-time Lower Mokelumne River Project operations.

2. Hypolimnetic Oxygenation System

EBMUD takes proactive steps to prevent naturally occurring hydrogen sulfide in Camanche Reservoir from entering the river. EBMUD studies found that when pure oxygen is added to Camanche Reservoir's anoxic hypolimnion, hydrogen sulfide production in the oxygenated area is eliminated. In response to these studies, EBMUD designed and installed, and began operating in 1993, a Hypolimnetic Oxygenation System (HOS) to add pure oxygen into the Camanche Reservoir hypolimnion. EBMUD monitors oxidation-reduction potential and dissolved oxygen concentrations in the hypolimnion (at elevation 115 ft.). The annual decision to activate the HOS is based on the dissolved oxygen concentration in the hypolimnion. The HOS is deactivated in anticipation of reservoir turnover in the fall. The HOS has proven to be very effective in preventing hydrogen sulfide formation in the Camanche Reservoir hypolimnion.

*Lower Mokelumne River Project – FERC Project No. 2916
2020 Project Operations Report*

2020

The HOS was activated from July 17, 2020 through November 23, 2020. The HOS has effectively prevented hydrogen sulfide formation.

2021

In 2021 EBMUD will continue to operate the HOS to manage the hydrogen sulfide concentrations for the benefit of the Camanche Reservoir, the lower Mokelumne River, and the MRFH.

East Bay Municipal Utility District

HYPLOT V134 Output 01/14/2021

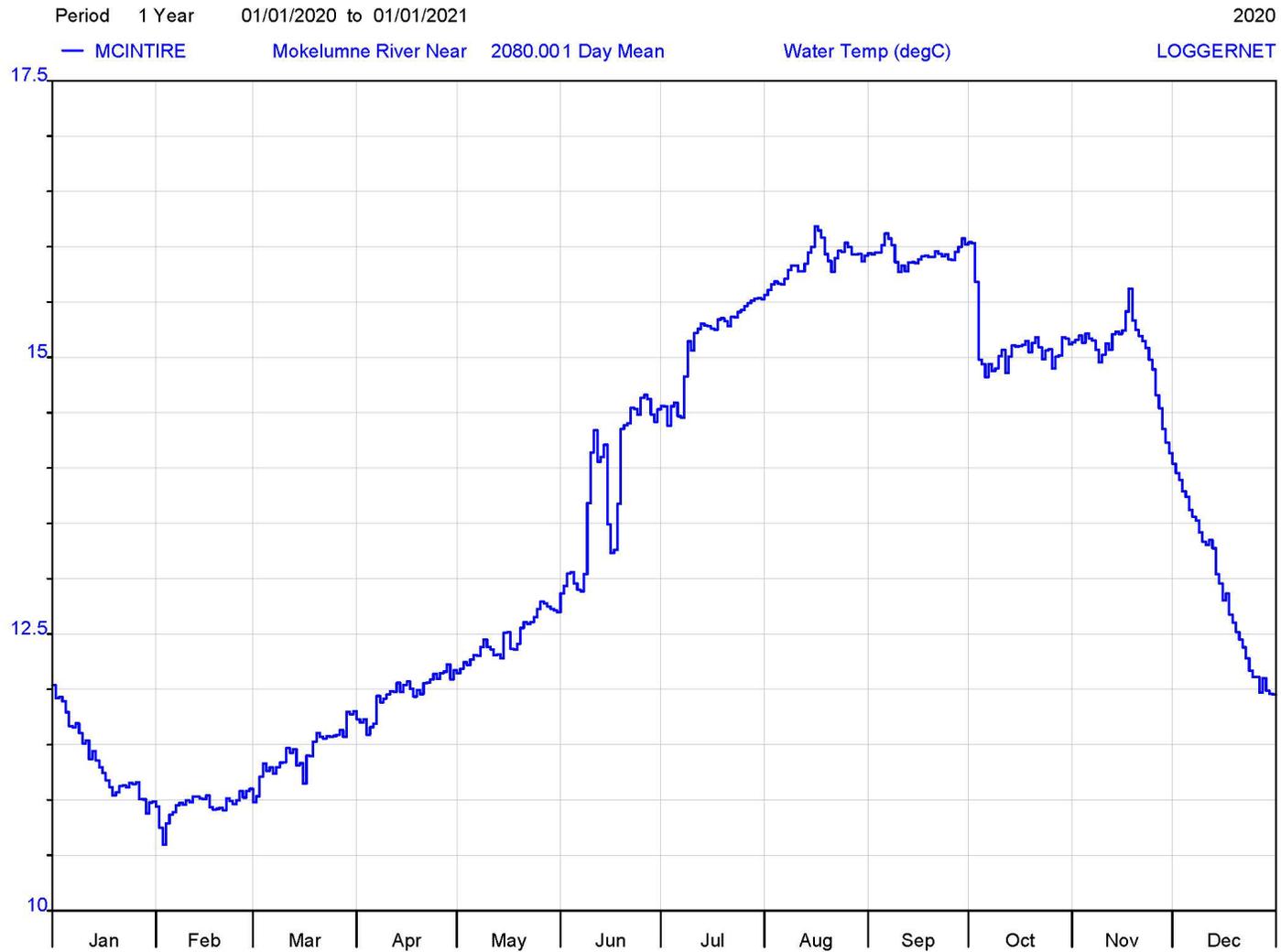


Figure 6: Calendar Year 2020 Mokelumne River Water Average Daily Temperatures of the Release from Camanche Dam

C. THE LOWER MOKELUMNE RIVER PARTNERSHIP

1. The Partnership Steering Committee

The Partnership Steering Committee (PSC), consisting of representatives from EBMUD, CDFW, USFWS, and NOAA Fisheries, met on December 4, 2020. Minutes of the PSC meeting are included in Appendix D. The PSC continued to oversee the operation of the Partnership Coordinating Committee (PCC), the technical group of Partnership representatives that meets biannually to ensure timely implementation of the measures identified in the JSA and the Water Quality and Resource Management Program (WQRMP). The PCC met on April 28, 2020 and September 23, 2020. A total of 50 projects since 1999 have been approved for Partnership funding (three were subsequently cancelled by the applicant). See Section IV.C.2 of this report for projects approved for Partnership funding in 2020 and projects with activity in 2020. For recent news articles on Partnership projects and Mokelumne River fisheries, refer to Appendix A.

2. The Partnership Fund

EBMUD established the \$2 million Partnership Fund in 1999, pursuant to Section E.2 of the JSA, to provide support to the Partnership programs. The interest income earned provides operating funds to pay for projects and programs that protect and enhance the lower Mokelumne River ecosystem. Since its inception, the fund has earned \$1,026,408. The available balance, subtracting the funds that have been obligated to approved projects, was approximately \$175,000 as of December 31, 2020. EBMUD concluded a Fund balance reconciliation in early 2020 covering the entire 20-year history of the Partnership Fund that resulted in correct attribution of all incomes, expenses, and reimbursements to the Fund.

Projects funded by the PSC with activity in 2020 for ecosystem protection and restoration in the lower Mokelumne River are summarized in Table 4 on the following page.

Table 4: Partnership Fund-Supported Projects 2020 Activity Summary

Project Title	Project Sponsor	Project Description	Partnership Fund			Additional Funding	
			Date Approved by PSC	Anticipated Project Completion	Amount Obligated or Expended	Amount	Program
2019-20 Lower Mokelumne River Watershed Education Legacy Project	City of Lodi	Educational field trips for students	1/14/20	Awarded and Completed	\$5,445.00	-	-
Mokelumne River Salmon Life-Cycle Models	Cramer Fish Sciences	Use long-term data to measure management action effects on JSA Goals	5/13/20	Awarded	\$89,316.00		
2020-21 Lower Mokelumne River Watershed Education Legacy Project	City of Lodi	Educational field trips for students	10/27/20	Awarded	\$7,040.00		

3. Water Quality and Resource Management Program

The Water Quality and Resource Management Program (WQRMP), developed by the PSC in cooperation with NOAA Fisheries and the Mokelumne River Technical Advisory Committee (MRTAC) members, and in accordance with Sections E.3, F.5, and H.5 of the JSA, was submitted to FERC in June 1999 and approved by FERC on May 9, 2001. The WQRMP vision includes a comprehensive monitoring and applied research program integrated with a well-coordinated program to adaptively manage water and power supply operations, flood control, hatchery operations, and ecosystem rehabilitation actions.

EBMUD, the USFWS, and CDFW began implementing the specific WQRMP measures in 1999. These measures, including the ones implemented in 2020, are described in detail in Section IV.E, Research and Monitoring.

4. Lower Mokelumne River Stakeholders Group

The members and the role of the Lower Mokelumne River Stakeholders Group are specified in Section E.5 of the JSA. These members include public resource agency representatives, private landowners, community and non-profit organizations, and local government staff. At the time the Lower Mokelumne River Stakeholders Group was convened, the Mokelumne/Cosumnes Watershed Alliance (Watershed Alliance) and the Lower Mokelumne Watershed Stewardship Program (Stewardship Program) were already functioning organizations. These two groups' areas of interest overlap geographically and share the same stakeholder base as the Lower Mokelumne River Partnership. To improve effectiveness and to eliminate redundant efforts, the PSC agreed that Partnership representatives would concentrate outreach activities by working directly with the existing Watershed Alliance and the Stewardship Program.

Since 2006, the stakeholder outreach efforts of the Partnership have focused on support and cooperation with the Lower Mokelumne River Watershed Stewardship Group, which is led by a Steering Committee. The Watershed Stewardship Steering Committee meets monthly and includes participation from private landowners, farmers, community groups, local government staff, and agency representatives, including representatives for EBMUD and the Partnership Coordinating Committee (PCC), and the Partnership Fund administrator.

A Lower Mokelumne River Watershed Stewardship Plan (LMRWSP), 2002, was initiated as a proposal to the former CALFED made by the San Joaquin County Resource Conservation District. EBMUD was a key contributor to this proposal, coordinating the implementation and participating in the biological monitoring necessary to complete the proposal. The Plan is available at <http://sjcred.com/articles/MokP.htm>.

During 2020, EBMUD and the Partnership continued as regular participants in the work of the Watershed Stewardship Steering Committee to implement elements of the LMRWSP. The Watershed Stewardship Steering Committee continued to work towards increasing watershed stewardship awareness among urban landowners along the Mokelumne River and elsewhere in the watershed through the distribution of the updated LMRSP *Mokelumne River Watershed Owner's Manual* and researching grant opportunities that would support the implementation of the Lower Mokelumne River Watershed Stewardship Plan. The Owner's Manual can be obtained by contacting the San Joaquin County Resource Conservation District.

Additional activities during 2020 of the Watershed Steering Committee included:

- Support for the San Joaquin County Public Works & Eastern San Joaquin Groundwater Authority grant application to the California Department of Conservation 2020 Sustainable Groundwater Management Watershed Coordinator Program (\$300,000).
- Support for the North San Joaquin Water Conservation District grant application to the federal Water Smart program. Application is for up to \$3 million grant for the South System Groundwater Recharge Project.
- Updating the 2002 LMR Stewardship Plan to include a groundwater element.
- Updating the SJRCD website with information that is more relevant, similar to the Sonoma County RCD webpage.
- Reconnected the California Indian Basketweavers Association (CIBA) to white sedge gathering beds at Lodi Lake Park along the Mokelumne River on October 10, 2020. The gathering day was video recorded, and a video is being produced. Future gathering days will continue.
- Monthly LMRWSC meetings that allow communication between landowners, League of Women Voters, SJC representative, county and city agencies, and growers, which has benefited most especially the SJC-PW, whose task for SGMA is to connect with actual watershed stakeholders. The SJC Water Resources Manager began attending these meeting.

5. Additional EBMUD Stakeholder Activities

2020

In 2020, EBMUD pursued numerous opportunities to solicit Mokelumne River stakeholder participation independently of, but coordinated with, Partnership activities. Collaborative stakeholder activities that EBMUD representatives were involved with in 2020 included the following:

- Participation in the Mokelumne River Association (MRA). The mission of the MRA is to stimulate a greater understanding and cooperative atmosphere and to provide information to the private owners, political entities, and public agencies responsible for the operation, maintenance, control, and management of Mokelumne River water systems. The MRA membership consists of representatives of any duly constituted public or private entity within the Mokelumne River Watershed. There are 19 public and private entities that are members of the MRA (1993–present). The MRA meets quarterly.
- Ongoing cooperation with the U.S. Fish and Wildlife Service to implement the Central Valley Project Improvement Act’s Anadromous Fish Restoration Program (AFRP) on the Mokelumne River. The goal of AFRP is to make all reasonable efforts to at least double natural production of anadromous fish in California’s Central Valley streams on a long-term, sustainable basis. EBMUD continues to monitor anadromous fish populations in the lower Mokelumne River using AFRP protocols, participates cooperatively in restoration activities through cost sharing, provides scientific data for the analysis of AFRP projects, and supports biological research activities throughout the lower Mokelumne River basin and Sacramento-San Joaquin Delta. In 2020, EBMUD completed actions on two AFRP-funded habitat restoration projects:
 - (1) Creation of two 0.40 and 0.66 acre sites designed to function as ephemeral floodplain for juvenile salmonids and native fish and maintenance of a 1-mile restoration reach in the lower Mokelumne River. Construction included the addition of 815 yd³ of gravel to the river and 840 yd³ of fine sediment to build up rearing habitat.
 - (2) Preparation of technical schematics, contracts, and permitting documents for protective fish screens for three diversions on the lower Mokelumne River (final construction planned for 2021).
- Participation in the CVPIA Science Integration Team to develop a structured decision making (SDM) model to develop CVPIA funding priorities for FY2020 and ultimately a 5-year plan. Staff are providing accurate empirical physical and biological data into the model to ensure the Mokelumne River is fairly represented in the process and contributing technical input into the model scenarios to determine priorities.
- Participation in annual Sandhill Crane Festival in Lodi, CA. The festival provides information and education as well as field trips to various locations along the lower Mokelumne River. The Sandhill Crane Festival seeks to promote broad public awareness of lower Mokelumne River natural resource values. EBMUD staff has led field trips to view bald eagles at Pardee Reservoir. (1997–present) (Cancelled in 2020 due to COVID-19 pandemic)

- Participation in Central Valley Birding Symposium in Stockton, CA. (Cancelled in 2020 due to COVID-19 pandemic)
- Continuing participation in the Upper Mokelumne River Anadromous Fish Restoration Work Group. The workgroup’s mission statement is to “Reestablish a successfully reproducing population of fall-run Chinook salmon and or central valley steelhead in the upper Mokelumne River.” EBMUD staff is participating in the group to provide technical assistance based on sound science and addresses concerns from multiple stakeholders, resource agencies and other local entities. The group has developed a draft pilot project study plan, has implemented a fish pathology study with the USFWS, and completed a habitat assessment in the upper watershed. Ongoing activities include continued evaluation of issues related to pathology and seeking additional funding.
- Continuing active involvement with the state’s Biologically Integrated Orchard Systems Program (BIOS) in San Joaquin County. BIOS is designed to support local agricultural growers through the use of biological pest control and ecologically friendly (Integrated Pest Management Program) agricultural methods. EBMUD biologists participate as advisors to individual farmers, UC Cooperative Extension specialists, and Natural Resource Conservation Service staff on wildlife issues in San Joaquin County. (1998–present)
- Continuing active involvement with the Lodi-Woodbridge Winegrape Commission (LWWC). The LWWC is designed to support local grape growers through the use of biological pest control and ecologically friendly (Integrated Pest Management Program) agricultural methods. EBMUD biologists participate as advisors to the LWWC, individual farmers, UC Cooperative Extension specialists, and Natural Resource Conservation Service staff on wildlife issues in the lower Mokelumne River watershed. (1998–present)
- Presentations on fish and wildlife issues to local sportsmen’s groups, community groups, local schools, and local fishing and environmental organizations. (Ongoing)
- Periodic participation as docents for the Lodi Parks and Recreation Department by giving presentations, nature tours, and demonstrations on fish and wildlife issues in the lower Mokelumne River. (1998–present)
- Providing continuing technical support to the San Joaquin County Resource Conservation District (SJCRC) and private landowners to enhance anadromous fish habitat in Murphy Creek (a tributary to the lower Mokelumne River).
- Participating in San Joaquin Council of Governments Habitat Technical Advisory Committee meetings.
- Participating in Mokelumne River Clean-up Day, which was associated with the Greater Sierra River Cleanup events. EBMUD provided dumpster, watercraft and

personnel for the event. In 2020, the event was limited in scope due the COVID-19 pandemic, but still occurred.

- Continue to participate with the U.S. Fish and Wildlife Service in the “Lower Mokelumne Safe Harbor Cooperative Agreement” (SHA). The SHA covers the valley elderberry longhorn beetle on EBMUD land in San Joaquin County. (2007–present)
- Continue to participate with the U.S. Fish and Wildlife Service in the “Safe Harbor Agreement for East Bay Municipal Utility District Lands in San Joaquin, Amador, and Calaveras Counties”, which was implemented in 2009. The SHA covers valley elderberry beetles, California tiger salamanders, and California red-legged frogs on EBMUD land in the aforementioned counties.
- Participate in an annual “Kids Fishing Day” at Camanche South Shore. EBMUD partners with Camanche Concessionaire staff, local residents, and local fishing groups to provide free angling opportunities and instruction to children under 12 years of age. (2014–present) (Cancelled in 2020 due to COVID-19 pandemic)
- Participation in the City of Lodi’s “Watershed Education Legacy” Program which connects Lodi Unified School District students to the Mokelumne River and watershed. (2016–present)

2021

In 2021, EBMUD plans to continue the above activities, as well as search for new opportunities to participate in collaborative stakeholder activities. Specific efforts will be made to evaluate the implementation efforts and priorities of the Lower Mokelumne River Watershed Stewardship Plan and, for implementation efforts consistent with Partnership objectives, to determine how Partnership funding could possibly support the Watershed Stewardship Stakeholder Group.

6. Mokelumne River Technical Advisory Committee

EBMUD established the Mokelumne River Technical Advisory Committee (MRTAC) in 1988 to improve communication and coordination among a variety of state and federal agencies, EBMUD, irrigation districts, and interest groups. Agencies and organizations that currently participate in the MRTAC include EBMUD, CDFW, USFWS, NOAA Fisheries, and Woodbridge Irrigation District (WID). California Sportfishing Protection Alliance (CSPA), San Joaquin County, the State Water Resources Control Board (SWRCB), and the Federal Energy Regulatory Commission (FERC) are also members of the MRTAC, but do not attend consistently. The MRTAC provides an interactive and proactive forum in which factors affecting lower Mokelumne River aquatic resources are identified, specific scientific investigations are formulated, technical data and analyses are presented and

discussed, and agency activities are coordinated to improve the aquatic resources of the lower Mokelumne River.

2020

In 2020, the MRTAC met semiannually (alternating quarterly meetings between the MRTAC and the PCC). Representatives from WID, CDFW, EBMUD, USFWS, NOAA Fisheries, CA State Water Resources Control Board, and the North San Joaquin Water Conservation District participated in the MRTAC meetings held on February 25, 2020 and August 11, 2020.

2021

Pursuant to Section H.1 of the JSA, EBMUD, USFWS, and CDFW agree that they will continue to actively support the MRTAC as a technical information-sharing forum and that the Partnership Steering Committee will review the need for the MRTAC periodically, with input from the Stakeholders Group. The first meeting of 2021 will be held in February.

7. Mokelumne River Science Database

Section H.2 of the JSA specifies that EBMUD will develop a science database for the lower Mokelumne River. In 2020, EBMUD continued updating this database. The Mokelumne Science Database consists of two parts, the written record (reports, correspondence, scientific literature and historic documents) and an electronic database (Oracle® format). The written record is compiled and cataloged by EBMUD. EBMUD also provides scientific data to the Central Valley Project Improvement Act (CVPIA) Comprehensive Assessment and Monitoring Program (CAMP) to evaluate the relative effectiveness of CVPIA actions in restoring anadromous fish production. This includes regular transfers of all EBMUD juvenile trapping data collected on the lower Mokelumne River to the CAMP standardized database for juvenile outmigration monitoring in the California Central Valley.

D. RESEARCH AND MONITORING

In 1987, EBMUD initiated and presently continues proactive, comprehensive programs to monitor, research, and improve anadromous salmonids in the lower Mokelumne River and to investigate potential ecological factors affecting the lower Mokelumne River anadromous fishery. The programs encompass every freshwater life phase of lower Mokelumne River salmon including upstream migration, spawning, egg incubation, fry and juvenile rearing, and outmigration. As a result, EBMUD has carried out some of the most extensive monitoring and research activities on anadromous fish and their habitats in the Central Valley. EBMUD has made a significant commitment and contribution to improving the technical understanding of the lower Mokelumne River salmon resource

through intensive in-river scientific investigations. The results of those investigations were used to develop the agreed upon flows and non-flow measures identified in the Joint Settlement Agreement.

2020

The ongoing research and monitoring actions undertaken pursuant to the JSA and WQRMP include:

- Seasonal monitoring of fish populations in the lower Mokelumne River from Camanche Dam downstream to the San Joaquin River.
- Enumeration of migrating adult Chinook salmon and steelhead by video monitoring at Woodbridge Dam.
- Salmon and steelhead redd surveys in the lower Mokelumne River between Camanche Dam and the Elliott Road Bridge.
- Estimation of redd production and emigration of juvenile Chinook salmon and steelhead by operation of rotary screw traps.
- Monitoring Camanche Reservoir water to measure temperature, pH, dissolved oxygen, conductivity, and oxidation-reduction potential.
- Collection of monthly water samples in the lower Mokelumne River at the Elliott Road Bridge and in Camanche Reservoir at PENN20 to measure hardness, cadmium, copper, and zinc.
- Monitoring of spawning reach substrate characteristics, including channel configuration and gradient.
- Monitoring temperature, pH, dissolved oxygen, conductivity, and oxidation-reduction potential of the Mokelumne River Fish Hatchery water supply and effluent.
- Continuing seasonal electrofishing and seining surveys of the lower Mokelumne River fish community (limited in 2020 under COVID-19 pandemic field protocol restrictions).
- Cooperation with the state-wide Constant Fractional Marking (coded-wire tagging) of Chinook salmon released from the Mokelumne River Fish Hatchery.
- Continuing predation management and research program using stomach content analysis and acoustic tracking of non-native salmonid predators from the Mokelumne River.
- Genetic analysis of steelhead broodstock.

- Adaptive management actions to promote healthy fish populations including fall pulse flows to attract salmon and steelhead into the Mokelumne River and managing Camanche cold water pool to maximize benefit for fall-run Chinook salmon.
- Bathymetry surveys to develop a 2D model of the riverbed to Woodbridge Dam to aid in habitat restoration projects.
- Mokelumne River Riparian Diversion assessment to prioritize diversions for screening through a grant with the USFWS Anadromous Fish Restoration Program.
- Assessment of the effects of feed rate on hatchery Chinook maturation rates, to manage the return of 2-year-old fish to the spawning population.

2021

EBMUD will continue similar research and monitoring activities in 2021.

E. HABITAT IMPROVEMENTS

1. Ongoing Efforts

EBMUD has continued to enhance the instream and riparian habitat of the lower Mokelumne River. These ongoing projects include:

2021

Gravel Enhancement: Gravel enhancement projects began in 1990. They consist of placing clean, washed gravel of a size suitable for salmon spawning mixed with seasoned gravel in the river to increase spawning habitat. In 2021, long-term maintenance of a 1-mile restoration reach continued with placement of 815 yd³ of gravel into the reach. Since 1998, EBMUD has placed approximately 52,800 yd³ of spawning gravel in the Lower Mokelumne River.

Floodplain Restoration: One floodplain habitat (0.40 acre) was created in the Mokelumne River Day Use Area to provide juvenile fish rearing and growth opportunities. The new floodplain habitat was designed to inundate at ~700 cfs and function as ephemeral habitat. Additional floodplain habitat (0.66 acre) was created through the deposition of 840 yd³ of fine sediment to build elevation of a side channel historical tailing pit.

Riparian Habitat Enhancement: EBMUD continues working with winegrape and walnut growers to enhance and restore riparian vegetation. This is achieved primarily through development of a cooperative program with local interests to improve land management with agricultural best management practices and livestock grazing along riparian zones to reduce stream bank erosion and fine sediment input.

Lower Mokelumne River Watershed Stewardship Program: EBMUD has continued to support and collaborate with the Lower Mokelumne River Watershed Stewardship Program, including, but not limited to, the following projects:

- Providing technical support in seeking grant funding to continue implementation of the *Lower Mokelumne River Stewardship Plan*, primarily in restoration and invasive plant removal. Anticipated funding sources include the Wildlife Conservation Board, USFWS Partners for Fish and Wildlife and Private Stewardship Grant Program, LMR Partnership, DWR, CBDA, Central Valley Joint Venture, and Ducks Unlimited.
- Continued participation in the Student and Landowner Education and Watershed Stewardship (SLEWS) program.
- Continuing to work with the San Joaquin County Farm Bureau to educate local teachers about farming and conservation practices along the Mokelumne River through the Ag in the Classroom program. (2002–present).
- Continuing to work with NGO Environmental Defense, USFWS, and California Association of RCD’s to conduct management activities noted in the Lower Mokelumne River Safe Harbor Agreement for the valley elderberry longhorn beetle on EBMUD property in the Mokelumne River Watershed in San Joaquin County.
- Continuing to work with the U.S. Department of Agriculture’s Natural Resources Conservation Service to promote Environmental Quality Incentives Program (EQIP), Wildlife Habitat Incentive Program (WHIP), and other federal programs that benefit watershed resources.

2021

Many of the above habitat improvement activities will continue in 2021.

2. Fish Guidance Fence

The guidance fence is put in place in conjunction with opening the fish ladder and is used to guide fish towards the ladder opening. The fence was installed on October 1, 2020. It is anticipated that it will be installed on the first Monday in October 2021 and operated through the steelhead migration season unless high flows require early removal.

V. APPENDICES

Appendix A: Sample of Lower Mokelumne River Related Stories from Local Press

Appendix B: Temporary Flow Excursions Below Woodbridge Dam

Appendix C: USGS Verified Flow Data for 2018 and 2019

Appendix D: Meeting Minutes of the Partnership Steering Committee

Appendix E: Correspondence Related to Fall 2020 Attraction Flow

APPENDIX A

**SAMPLE OF LOWER MOKELUMNE RIVER
RELATED STORIES FROM LOCAL PRESS**

Pardee Reservoir count reflects dramatic comeback of America's national bird

- By Rich Hanner/Special to the News-Sentinel
- Jan 11, 2020



A young bald eagle flies.



Lora Sparrowk, a ranger/naturalist with East Bay Municipal Utility District, looks at a young bald eagle.



Two young bald eagles fly together.



James Jones, a wildlife biologist with East Bay Municipal Utility District, records an eagle spotted during the National Eagle Count on Tuesday at Pardee Reservoir.



James Jones and his son Will Jones (in back), point to a bald eagle during the National Eagle Count, organized by the U.S. Fish and Wildlife Service, at Pardee Reservoir on Tuesday.



A young bald eagle flies during the National Eagle Count at Pardee Reservoir on Tuesday.



James Jones gets the pontoon boat ready during the National Eagle Count, organized by the U.S. Fish and Wildlife Service, at Pardee Reservoir on Tuesday.

As the pontoon boat chugged across the silvery surface of Pardee Reservoir, a call went out.
“Eagle at 6 o’clock!”

In an instant, binoculars were raised, eyes squinted, skies scanned.

“I see it,” said James Jones, the biologist leading the party.

“And there is another one.”

And another.

And one more.

High above, the bald eagles were wheeling, soaring, diving.

“Juveniles hanging out together. Like teens cruising the mall,” Jones said.

In the 1960s, spying a foursome of young eagles frolicking above a lake 30 miles east of Lodi was unlikely if not impossible.

Bald eagles, fierce and iconic, the symbol of our nation, were on the edge of doom.

But changes were made, poisons banned, protections adopted.

Now, across the country — and in the rolling foothills of the Sierra — the eagles are back.

A simple job: Spot eagles

Pardee, with 38 miles of shoreline, is closed for the season. There are no boaters, no campers or fisherman. It is eerily calm and quiet. Miles below, the valley is cloaked in gray. Here, the sun streams through a creamy wash of clouds.

Today is the national Eagle Count organized by the U.S. Fish and Wildlife Service.

The Pardee tabulation has fallen to Jones, a wildlife biologist with East Bay Municipal Utility District, which operates Pardee Dam. He’s joined by his daughter and son, Brianna and William, both college students majoring in wildlife-related coursework, and Lora Sparrowk, a ranger/naturalist for EBMUD.

Their job on this winter day is simple: Spot eagles.

At one point, there were few if any eagles to spot at Pardee, and relatively few anywhere in North America.

When the bald eagle was named the national symbol in 1782, the bird ranged throughout North America with a population of perhaps 100,000, according to the National Eagle Foundation.

The eagle’s decline, though, was steady and precipitous.

They were hunted and killed for many years because they were seen as a threat to livestock and salmon. The insecticide DDT decimated the bald eagle population. Others were poisoned by lead ammo, ingested by the eagles as they fed on carcasses.

By 1963, only 418 nesting pairs were found in the lower 48 states, according to research by the National Geographic Society. There was fear America’s national symbol would become extinct.

The publication of Rachel Carson's "Silent Spring" in 1962 documented how widespread use of pesticides was destroying wildlife, particularly bird populations. The creation of the U.S. Environmental Protection Act followed, and DDT was eventually banned in 1972.

Many states, including California, now ban lead ammunition for hunting.

There are an estimated 15,000 nesting pairs in the U.S. now, and the bald eagle is no longer considered threatened.

"The recovery of the bald eagle from nearly extinct to now is an awesome success story," Sparrowk said. She and other rangers lead "eagle tours" on Pardee and nearby Lake Camanche this time of year, and they always fill up quickly.

"It's often just freezing cold on the water up here in January. But people can't wait to come out. They are fascinated by the eagles."

Not like a Disney movie

The boat moved along Pardee Dam, finished in 1929, and past the water intake tower, a gothic concrete castle rising from the depths. It's an essential feature of the system that delivers water across the valley and delta to 1.4 million people in the East Bay.

Pardee was built for water supply, but it's prime habitat for bald eagles. The reservoir holds pure Sierra water that's rich with fish, including rainbow trout, bass and catfish. It's fringed by lofty gray pines and live oaks, offering eagles a fine perch for roosting and spying prey.

Bald eagles are renowned as hunters, and for good reason: Their blazing yellow eyes can see a trout from several hundred feet from above. They can see a jackrabbit from a mile away.

They are large and powerful, with wingspans of up to 8 feet. At speeds of up to 75 miles per hour, mature eagles swoop down on prey, seizing it with vice-like talons and devouring it or taking it back to a nest.

Oddly, bald eagles are also excellent swimmers.

Yet along with being adaptable, predatory machines, there is a less iconic side.

"They are scavengers," Jones said. "They will eat rotting fish or rodents. They won't pass up an easy meal."

Motoring along the shoreline, Jones pointed to a distant gray pine holding a mass of sticks and twigs. An eagle's nest. Nests are deep and heavy, sometimes 10 feet across and 5 feet deep. They may be used by generations of eagles.

Not far from the nest, a juvenile lifted off and soared, circled over the boat and coasted to a perch perhaps 200 yards away. A short distance from the juvenile, a pair of mature eagles could be seen in the woodland canopy, resting on the branches of a large oak.

Eagles usually mate for life, but there are reports of intruding eagles displacing one of the birds. And if one eagle dies, the other will find a new mate and continue breeding.

Bald eagles lay two or three eggs a year, and the hatchlings are in constant competition.

It is eat or perish.

“An aggressive hatchling can grab most of the food and a weaker one may die as a result,” Jones said. “Nature is not always like a Disney movie. It can be brutal.”

Rollicking through the sky

As morning stretched into the afternoon, the spotters covered the reservoir’s entire shoreline, noting loons, ducks, egrets, scrub jays, red-tailed hawks, and more eagles.

A single golden eagle was seen, its feathery, coffee-colored coat lighter than the mahogany-brown of the bald eagle.

Unlike bald eagles, which are found near water, golden eagles often roam over open fields and grasslands, speeding low to the ground, flushing out squirrels or mice.

The pontoon boat rumbled back toward the marina as the day drew to a close. There had been 11 eagles counted, each a testament to the resilience of nature.

Quite suddenly, the group of juveniles appeared overhead.

To the human eye, the youngsters were downright playful, rollicking through the sky with impossible ease, a study in unbridled joy.

Demanding, it seemed, that they be counted, too.

Contact Rich Hanner at rhanner100@gmail.com.

Salmon roe to grow



NEWS-SENTINEL PHOTOGRAPHS BY BEA AHBECK

Lodi High School student Bryan Velez, 16, drops salmon eggs into the classroom tank as Kathy Grant, City of Lodi's Watershed Program Coordinator, drops off salmon eggs at Lodi High on Friday.

Last Friday, 14 sets of Chinook salmon eggs were delivered to Lodi classrooms participating in a California Department of Fish and Wildlife education program.

Students will tend to the eggs and once they have hatched and matured to fry size, they will be released back to the lower Mokelumne River near the Mokelumne River Fish Hatchery.

Right: Salmon eggs settle into their new home in a Lodi High School classroom tank on Friday.



Right: Kathy Grant, City of Lodi's Watershed Program Coordinator, right, enlists the help of Shawn Gowan, 16, to drop eggs into the classroom tank at Lodi High on Friday. Above: Grant holds a bundle of salmon eggs.





Celebrating 20 years of Storm Drain Detectives

Editor's note: Established in 2000, the Storm Drain Detectives are a group of teachers, students, community members and City of Lodi, Public Works staff who monitor Lodi Lake and the Mokolumne River monthly at several different sites where stormwater enters the river. As the program celebrates 20 years, students reflect on what they've learned and what Storm Drain Detectives means to them.

Our water is important!

By Jasmine Mayo
LODI HIGH SCHOOL

Have you ever wondered how runoff from the streets affects the Mokolumne River? Well that's where Storm Drain Detectives come in. SDD is a program that has been sponsored by the City of Lodi for 20 years, helping students learn how the runoff affects the river.

Every two weeks, Storm Drain Detectives meet at the Discovery Center at Lodi Lake to test the Mokolumne River and Lodi Lake at five different sites, conducting six different water quality tests. The students first calibrate their equipment, then form teams of six. Then each team goes to one of the five sites.

Once at the site, students grab a bucket of water, then begin the testing. Mokolumne River water is tested for dissolved oxygen, water temperature, electrical conductivity, pH, turbidity, and nitrates. We also make visual observations around the site, looking for trash, recording the weather, and noticing anything that can change water quality.

Dissolved oxygen is the amount of oxygen in the water, which is important because organisms need oxygen to live. The data is collected by a CheMet kit and a D.O. meter, which dangles in the water for data. Temperature is measured by the D.O. meter and a thermometer probe. An electrical conductivity, or E.C., probe measures the salt in the water. We measure pH with two pieces of equipment, a pH strip and a probe, which helps us learn how

PLEASE SEE MAYO, PAGE 4



Anna Weigel, an AP Environmental Science student at Lodi High School, wanted to celebrate the 20th anniversary of the Storm Drain Detectives program. So she came up with a sweet idea: a birthday cake. After she took photos of the cake, she and her family took the celebration a step further and ate their fill of the sugary treat.

COURTESY PHOTOGRAPHS

Tokay High students help local ecosystem by raising salmon

Classroom aquarium gives inside look at salmon's life cycle

By Kali Anema
TOKAY HIGH SCHOOL

At first glance, the rectangular glass box sitting in my environmental science class at Tokay High School seemed to hold little significance. However, students soon discovered that it held an essential role in securing the future of our local ecosystem.

The aquarium, lined with fine gravel and equipped with chillers to keep the water at a cool 55 degrees fahrenheit, annually serves as a temporary home for 40 salmon eggs.

In January, after the eggs were reared by the Mokolumne Fish hatchery for 30 days, students excitedly received a first-hand glimpse of this federally protected species. Looking through the walls of the tank, my classmates and I eagerly watched the eggs hatch into plump, bottom dwelling alevins. Under the direction of our teacher, Sandra Starr, we calculated the date of their hatching based on the temperature of the water, and became familiar with the life cycle of a salmon.

Throughout the development of the salmon fry, we not only learned about the shockingly low survival rate of young salmon, but also their irreplaceable role in California ecosystem. In fact, for every 5,000 salmon hatched in the wild, only 5 will survive the journey out to the ocean and return to their hatching grounds to reproduce. Known as a keystone species, these fish provide essential sustenance for carnivores, keep soils rich with nutrients, and support thousands of jobs and local economies.

After approximately 2 months, the alevins developed into fast swimming fry, seemingly eager to be released into their natural habitat. Buses full of high schoolers departed to the Mokolumne Fish Hatchery to bid farewell to the temporary classroom residents. After witnessing the fry begin to explore the Mokolumne River for the first time, I think we could all agree that this salmon project was so much better than simply reading about it in a textbook.

Thanks to this experience, I hope that others will realize the unique opportunity Lodi residents have to see this iconic species in the surrounding local rivers. Due to constant destruction of their habitats, salmon need our help, and with the protection of salmon we in turn help our forests, rivers, food security, and economies.

"Known as a keystone species, these fish provide essential sustenance for carnivores, keep soils rich with nutrients, and support thousands of jobs and local economies."

Heritage students get to test the waters at San Joaquin River

By Dylan O'Ryan
SAN JOAQUIN DELTA COLLEGE

On a blustery day in October of last year, Heritage fifth grade Storm Drain Detective students; Janine Jacinto, their teacher; Kristine Stepping, the Program Manager for Outdoor Education for the San Joaquin County Office of Education (SJCOE); and myself, a Storm Drain Detectives leader who has been a part of SDD for about four years, set out to test water quality at Durham Ferry.

We all met at the Durham Ferry Outdoor Education Center, which is a "center for STEM and environmental exploration, owned and operated by SJCOE," as stated on the SJCOE website. We set off on a 0.75-mile hike to a part of the San Joaquin River, which

eventually flows into the Pacific Ocean by way of the Delta.

A select few of Jacinto's fifth-grade class usually tests at Lodi Lake, which is part of the Lower Mokolumne River Watershed. However, the students were able to test at a new river system at Durham Ferry. This unique experience showed the students that more water sources are essential to test for water quality.

An important distinction between the Lower Mokolumne River Watershed and San Joaquin River is that they have different stream bed sizes. The San Joaquin River near Durham Ferry has a significantly wider stream bed, which can contribute to lower water levels, as noted on our testing day. This distinction created some issues in testing,



where we were unable to test Dissolved Oxygen (DO) using the meter at Durham Ferry due to the shallowness.

It is important to note that both river systems' water quality is graded by the same scale, which is published by the San Joaquin Basin Plan; therefore, we can compare values of water quality as a distinction from the water sources.

The water quality parameters tested at both locations were similar in data we would expect; however, Electrical

PLEASE SEE O'RYAN, PAGE 4

EBMUD biologists share fins and outs of the job with students

By Leonardo Salazar, Max Hernandez, Yaneisy Roman Ortiz, Eduardo Lopez, Paul Roman Ortiz and Jaylene Guerrero
HERITAGE ELEMENTARY SCHOOL

Students at Heritage Elementary School used Zoom, a distance learning software, to interview Ed Ribble and Alan Webster, biologists who work for the East Bay Municipal Utility District.

Q: How is COVID-19 affecting the wildlife?

Ed: COVID-19 is actually having the opposite effect on wildlife compared to the effect on humans. There is less pressure from people on the wildlife, and more room for the wildlife to roam.

Q: How has COVID-19 affected how you do your job?

Ed and Alan: As EBMUD employees we are following their strict protocol, including wearing masks, and working from home when possible.



KATHY GRANT/COURTESY PHOTOGRAPH

A small boat is ready to carry East Bay Municipal Utility District biologists Ed Ribble and Alan Webster to a screwtrap, which captures fish for monitoring.

Q: What is one specific machine that is used to observe the salmon?

Ed: There are cameras on either a fish ladder or a weir to count the returning salmon. Another machine that is used is a rotary screw trap that cap-

tures the salmonids and other fish that are heading downstream.

Q: What is your career or job title?

Alan: Fisheries and wildlife technician.
Ed: Fisheries and wildlife bi-

ologist II.

Q: Where did you attend college?

Ed: Humboldt State.
Alan: UC Davis.

Q: What degree did you receive?

Ed: Fisheries biology.
Alan: Wildlife, fish and conservation biology.

Q: In what way do you work with the watershed and the Mokolumne River?

Ed: We are part of a six-person crew that monitors the salmon run. We also do habitat enhancement projects, such as moving gravel to create reefs.

PLEASE SEE EBMUD, PAGE 4



RIBBLE



WEBSTER



Watershed's birds fly high

Students celebrate the birds who live in the local watershed in art, along with the Sandhill cranes that migrate to the area each winter. **3**



'Toy Story 4' sets a trend

Inspired by the character of Forky and a teacher's challenge, students create their own "quarantine buddies" using recycled items. **5**



Marine science adventure time!

Students share their trips aboard the Marine Science Institute's research vessel in San Francisco Bay. **7**

SALMON IN THE CLASSROOM

Tokay students reflect on Salmon in the Classroom project

TOKAY HIGH SCHOOL

The salmon cycle includes seven stages: egg, alevins, fry, parr, smolt, adult, and kelt. Salmon live in both the Atlantic and Pacific oceans, as well as the Great Lakes and other land-locked lakes. They are born in fresh water, migrate to the ocean, then return to fresh water to reproduce. Salmon are important prey for many species, including critically endangered southern resident orcas, and they are significant to the culture of First Nations and to the economy of the West Coast. Salmon are also indicators of healthy river and marine ecosystem; as habitats degrade and disappear, so do salmon, and as salmon disappear, the

quality of the ecosystem decreases as well, since salmon are an important source of nutrients. And also I learned that different temperatures can show you how fast they will hatch.
— *Jesus Bobadilla*

I learned that when the fish are at the hatchery they keep the fish separated by sizes, like really tiny ones and medium ones and the large ones. The salmon fit into our biology topic because it showed how they started from one cell into a salmon fish. It did help me better understand it because it helped me see how they were developing, like when they were hatched already and they still had the yoke.
— *Elisa Gonzalez*

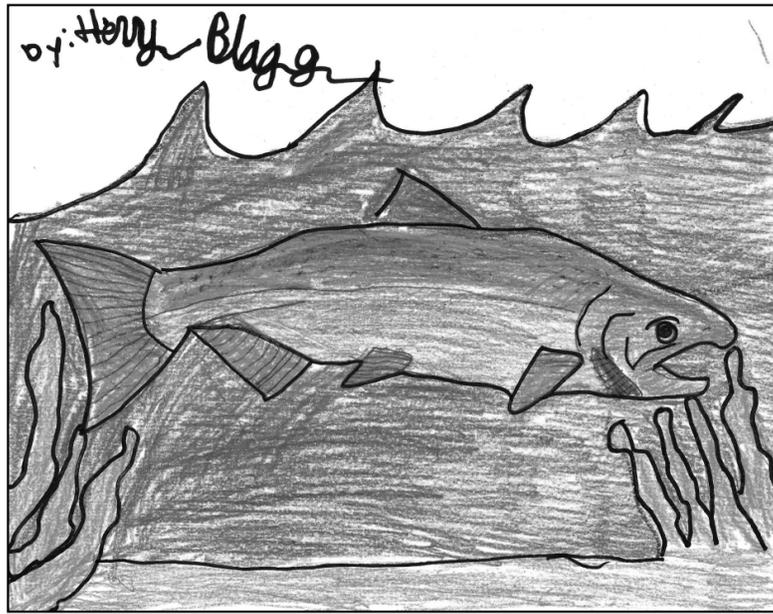
I learned that the life cycle of a salmon is not weird, but not what people think of it as. Like a mother of a salmon can have 5,000 eggs and only five of her eggs would live, which I think is honestly crazy. Also, it's crazy that people keep the life cycle going by taking eggs out of a female salmon and squeezing sperm on them. I think it's weird, but it's a way of us keeping their lifecycle going since we took their habitat by creating the dam. The way I think of it, salmon help us learn a lot about mitosis because of the way they start from an egg to a fish. I know you're probably thinking that we can just do that with a chicken egg, but you really can't, because chicken and salmon are different. A

chicken egg is white and covered, but salmon are orange and a little bit clear so you can see how they develop into a little fish. The salmon really helped me understand a little bit more about them and how mitosis works.
— *Alyssa Rivera*

A few things that I have learned about the baby salmon and how they develop in a cycle are that they first start out as a red egg then to alevins, fry, parr, smolt, adult, and kelt. This is the entire cycle of salmon. My teacher, Mrs. Starr, was given lots of baby salmon eggs to grow in her classroom. They grew very quickly, and then we had to release them. On Tuesday, March 3, a large group of kids

from her biology classes all got together to meet on a bus to go on a field trip to the fish hatchery to release the fish.
— *Robert Lydon*

I learned that the salmon start off as eggs then grow to be an adult salmon. Their bodies can learn to live in fresh water and salt water. We learned in class that some salmon are born in the Sacramento River and travel all the way to the ocean into saltwater. The salmon helped me understand how they are born in one place and can travel so many miles in one lifetime. Some fish don't make it back to spawn because they get caught by fishermen and eaten.
— *Jonathan Solis*



HENRY BLAGG/LOCKEFORD SCHOOL

Learning about salmon at Lockeford School

By Henry Blagg
LOCKEFORD SCHOOL

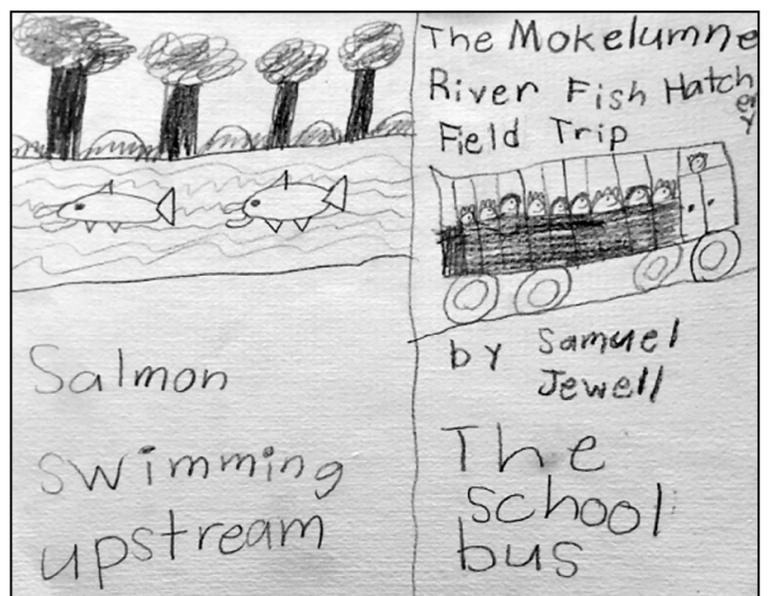
My favorite part of second grade was when we did the salmon project. First, we learned about salmon and the life cycle. Then, we went on a field trip to the hatchery. We saw fish and got to feed them. We also saw the salmon in the river. The people at the hatchery showed us the inside of the salmon and the eggs and milt. After that, they came to deliver our eggs to our classroom. There were 35 eggs. We got to watch them until they hatched. We watched the alevin grow in the fish tank. Then, we took them to the Mokelumne River and released them. I learned a lot about fish.

Fascinating facts about salmon

By Alexander Arreola Garcia
HERITAGE ELEMENTARY SCHOOL

Do you want to learn about salmon? Then here are some awesome facts that you may not have known. Did you know that salmon have teeth in their tongue? Terrifying isn't it? Additionally, salmon have fins that allow them to swim in rivers and in the ocean. The dorsal fin keeps the salmon upright. The other fins are used for steering and

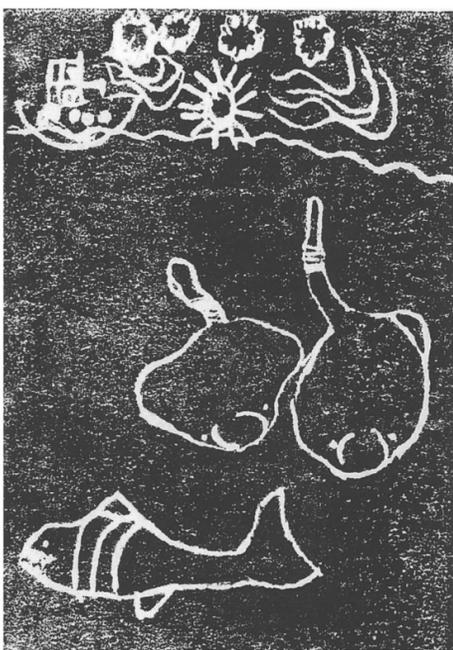
balance. Also, it is not an easy life for salmon. Only about 2% of salmon babies will make it to adulthood. Once salmon are ready to spawn, they return to where they were born. After spawning, the salmon die. If you like eating fish, salmon is a very healthy option. Salmon has protein and many vitamins. If you haven't tried it before, you should!



SAMUEL JEWELL/LOCKEFORD SCHOOL

Alevin Haiku

*Swimming in water
With a hanging small yolk sac
These are Alevin*



YAHIR GOMEZ/HERITAGE SCHOOL

Haiku

*Sam the salmon saw
Something bad that made her mad
No, it was people!*



MAX HERNANDEZ/HERITAGE SCHOOL

Cinquain

*Alevin
Small, Weird
Calming, Growing, Hiding
A confused looking animal
Salmon*



ESTEVAN MARTINEZ/HERITAGE SCHOOL

Raising salmon eggs at Heritage Elementary School

By Nafees Khan
HERITAGE ELEMENTARY SCHOOL

At our school this year, one class raised baby salmon. Once they were ready to be released, both fifth-grade classes got to go to the Mokelumne River Fish Hatchery to

release the baby fish into the river. I learned all about the life cycle of a salmon. For example, once salmon are old enough they swim out to the ocean. I also learned that many salmon never make it to the ocean because there are so many predators that want to eat. The

salmon that do not get eaten get very big very fast because they eat a lot of food. It was really fun to release the salmon and learn about their life cycle. My favorite part was watching them splash as they swam away.

The students of Heritage, Elkhorn, Lakewood, Lockeford, Reese and Vinewood elementary schools, Lodi, Millwood and Aspire Benjamin Holt middle schools, Lodi and Tokay high schools, Turner Academy and San Joaquin Delta College would like to thank the following sponsors for their support:



FOR THE BIRDS



KATHRYN FABRO/LODI MIDDLE SCHOOL



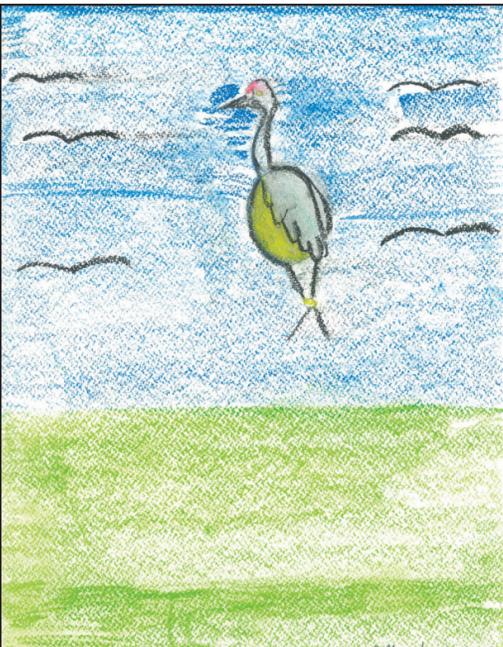
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BRITTANY DELGADO LOPEZ/HERITAGE SCHOOL

Season of the Sandhill Crane coming this fall

SPECIAL TO THE MOKELUMNE CURRENT

Art featuring a pair of cranes by Rodrigo Acosta, an eighth-grade student in art teacher Zachery Luchetti's class at Lodi Middle School, has been chosen for the 2020 Season of the Sandhill Crane.

The Season of the Sandhill Crane will shine the spotlight on the ancient, migratory birds that winter in the Lodi area this year.

Normally, this is the mission of the annual Lodi Sandhill Crane Festival, held each November. However, the Lodi Sandhill Crane Association has announced it will not stage the festival this year.

Given the uncertainty surrounding the COVID-19 pandemic, the board decided that planning for a fall festival is impractical.

Though the LSCA has canceled the event, they remain committed to promoting awareness, appreciation and conservation of Sandhill cranes and are implementing alternate methods for sharing their messages.

"While the two-day festival has served as an exciting showcase for the wintering cranes, it has also concentrated considerable activity into a very short period," LSCA President Ken Nieland said. "Limited capacity puts pressure on

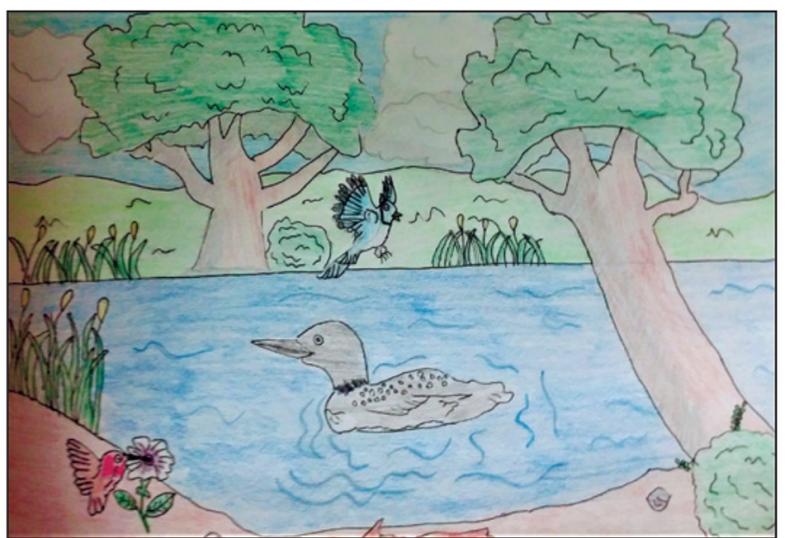
crane viewing sites ... something that could be alleviated by celebrating the cranes throughout the entire five months that they overwinter in the Lodi area."

LSCA leaders are developing new strategies for delivering information from conservation professionals, providing educational resources for students and teachers, encouraging wildlife artists and supporting opportunities for viewing the cranes.

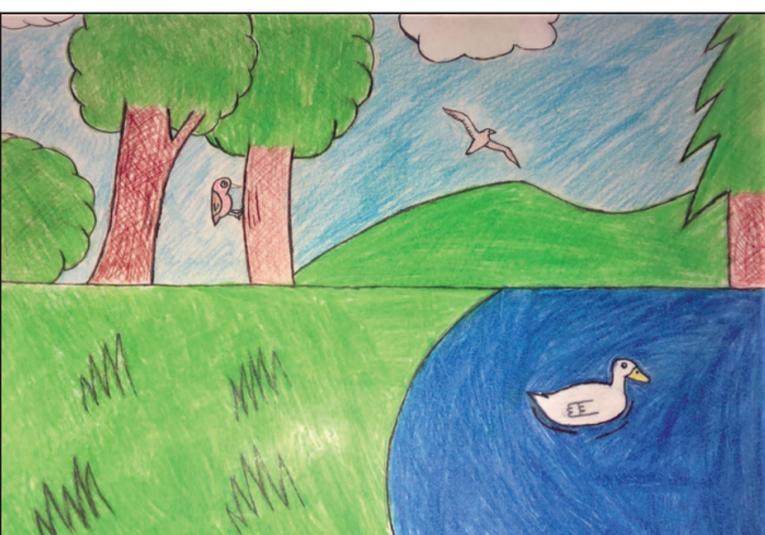
For more information, visit www.cranefestival.org or follow the Lodi Sandhill Crane Festival on Facebook.



CALI RATHBURN/LODI MIDDLE SCHOOL



ANAHI PENAFLOR/LODI MIDDLE SCHOOL



CHRISTOPHER MENDOZA DE LA PAZ/LODI MIDDLE SCHOOL



SHANE SANCHEZ/LODI MIDDLE SCHOOL

STORM DRAIN DETECTIVES

EBMUD

CONTINUED FROM PAGE 1

Q: What interested you to work as a fisheries biologist?

Alan: I've always been a fisherman. I grew up near Vacaville, raised by a single mom who was a teacher and also environmentally conscious. Our school didn't take us on field trips, but my mom always took us out into nature and taught us about the importance of being a good steward.

Ed: I grew up in Stockton, but my family always went up to the Sierra hiking, fishing and camping. Even as a kid I noticed that the Stockton-area waterways were polluted compared to the pristine water in the high country.

Q: What are the most rewarding aspects of your job?

Ed: I love the years with the big salmon runs because you see the results of the work we do with the whole ecosystem.

Alan: For me, it's the salmon run as well, but also it's seeing groups of people coming out for events like Coastal Cleanup to pick up trash and help take care of the environment.

Q: What are the least rewarding?

Alan: As much as I love being out on the river in a



COURTESY PHOTOGRAPH

A screwtrap used to monitor fish populations.

kayak as part of my job, there are times in the winter when it's cold and rainy that I don't love being out there.

Ed: I am not a fan of "bad water" years (when there is little rain, the water level is low, and the water is too warm). I also don't like the pollution that I come across from homeless encampments.

Q: What is your favorite thing about the Mokelumne River?

Ed: My favorite thing about the Mokelumne is the riparian corridor that runs along the river. It's the trees and plants of the riparian corridor that create shade and cool water for the salmonids.

Alan: My favorite thing about the Mokelumne River is the salmon run. For

example, in 2017, almost 30% of the total commercial salmon catch came from the Mokelumne River.

Q: Are there any interesting stories that influenced you to work helping the Earth?

Ed: I grew up backpacking in the Sierra, and went fishing often at the Port.

Alan: I used to fish at Liberty Island, and saw how much trash was in the waterways.

Q: Who are some of your personal heroes, and why?

Alan: My personal hero is my mom. She raised us as a single mom, teaching us about the environment.

Ed: The people who vol-

unteer to take care of the environment, picking up trash.

Q: What activities do you enjoy in your spare time?

Ed: Fishing, hunting, hiking, camping, baseball; any outdoor activities with my kids.

Q: What would you like the people of Lodi to know about the Mokelumne River, salmon, and ways they can protect them?

Alan: I would like people to be conscious of what they put down the drain, and also for them to know that the Mokelumne River contributes more than 20% of the salmon that are in the ocean off the coast of California.

O'RYAN

CONTINUED FROM PAGE 1

Conductivity (EC) was significantly elevated from values we see at Lodi Lake. We recorded a value of 310 uS at Durham Ferry, where on average, we record values of 40 uS around the Lodi area. Electrical Conductivity can be thought of as the amount of salt, or salinity, in the water. Some questions that arise when pondering this elevated value of salinity: is there brackish water or tidal influence on the San Joaquin River? Are draining agricultural fields affecting this value?

These questions would

have to be further researched and studied before making a conclusive decision. However, the Heritage SDD students were left with a question to ponder: how do changes in location affect our water quality, and what impact could we potentially be having on our waterways? This trip, among others, allows for students to make observations that water quality is dynamic and changes with location.

The Storm Drain Detectives program hopes to foster an interest in water-quality related issues and create a stream of future adults who will better our environment, both locally and globally.



COURTESY MAP

The two locations where Heritage students tested water quality with Storm Drain Detectives.

MAYO

CONTINUED FROM PAGE 1

acidic or basic the water is. Nitrates are measured with a different type of test strip, which shows how much nitrogen is in the water. The final test is turbidity, which tells us how clear or muddy the water is. A sample is put into a small bottle, and brought back to the Discovery Center, then put into a machine that measures the turbidity.

Once we are finished gathering data, we give each site a letter grade, comparing SDD data to the San Joaquin River Basin water quality plan, which tells us if the streets' runoff is affecting the Mokelumne River.

We also help in many events like Love Lodi, Coastal Cleanup, and the NorCal Science Festival at Tokay High, working to clean up trash or educate



COURTESY PHOTOGRAPH

Storm Drain Detectives — including Jasmine Mayo, second from right — pose for a photo.

people so that they learn how runoff can cause water pollution.

Each fall, we also go on a boat trip in San Francisco Bay, where we learn

that all rivers in Northern California drain into the bay then into the ocean.

A goal of the SDD program helps people understand how each individual

affects the river, so help us and keep our water clean!

To learn more about the SDD program, go to www.lodi.gov/492/Storm-Drain-Detectives.

Cruz and Luca Martinez on life as junior Storm Drain Detectives

SPECIAL TO THE CURRENT

Editor's note: Cruz and Luca Martinez are the third generation of their family to get involved with the City of Lodi's Storm Drain Detectives program, along with their mother Melanie Martinez and their grandmother Janine Jacinto. The pair — two of the program's youngest volunteers — answered a few questions about Storm Drain Detectives.

Q: How many years have you participated in Storm Drain Detectives?

Cruz: I have been at SDD for 4 or 5 years.

Q: How old are up?

Cruz: I am 8 years old.
Luca: 4.

Q: What do you do as a Storm Drain Detective?

Cruz: I usually sit down and do my homework while the older kids are testing the water.

Q: Who do you participate with?

Cruz: I participate with my mom, my mom's stu-

dents, and my brother, Luca.

Q: What have you learned being a Storm Drain Detective?

Cruz: I have learned that the water that comes from your sprinklers goes down to Lodi Lake. If you hit a baseball and it went down the drain, then it would go to Lodi Lake. It's telling you that, for example, if you put a piece of trash on the sidewalk that the rain might wash it down the storm drain and it would go to Lodi Lake,

and then the animals will think it's something to eat, then they'll eat it and then they'll die.

Q: What message would you like to tell other kids that they can do to help the environment?

Cruz: The message I would like to send to other kids is don't leave trash on the sidewalk.

Luca: Stay home! Because if someone else would get sick then you could get sick. Right now the coronavirus is not stopping!

Learning about how we use the watershed

By Katelyn Collette
TOKAY HIGH SCHOOL

Our watershed is comprised of water being delivered from a variety of sources. As the water travels downstream, it is accumulating chemicals, fertilizers, and so many more harmful wastes caught in its path. Our AP Environmental Science class along with students from other schools have been working with the City of Lodi to learn about and monitor the waterflow that travels through our community and into the Mokelumne River.

This program has given each of us the opportunity to work hands-on with the properties of the water and the equipment we use to measure that. This involvement brings light to potentially avoidable man-made issues surrounding the water quality where we learn to measure various sources of water pollution, com-

ponents in the water that can make it difficult for aquatic organisms to survive, and attributes that can disable the water to be potable.

Throughout the process of our work, we are able to learn more about how we affect the environment and visa versa which, in turn, results in the further awareness of how people in the community can do their part to keep the water safe and clean including watching what we put down the drains and keeping the streets clean of harmful things that can wash down the sewer.

It's important to keep the community involved and knowledgeable about the characteristics of their water in order to keep it a healthy place for our swimming and floating members of the community, but also to keep it a functioning part of our society through our need for clean water.

Community buy-in is vital in caring for the watershed

By Benjamin Gobel
TOKAY HIGH SCHOOL

It's hardly arguable that the most important resource for human survival is clean, fresh water, yet too often we and our communities ignore our access to this valuable resource as a given right. To promote a more sustainable method of water consumption, the city of Lodi obtains a large percentage of its water from the Mokelumne River, helping to lower the rate at which water is pumped out of our aquifers and thus the rate at which our soil subsides. Unfortunately, however, the river we obtain our drinking water from is the very same one in which a great number of our storm drains run into.

This year I was given the opportunity to participate in the Storm Drain Detectives program, a partnership between teachers, students and Lodi Public Works to help ensure that the quality of our drinking water is kept at an acceptable level for public consumption. Using various tools and methods to collect, sample and test water for pH, nitrate

concentrations, temperature, dissolved oxygen, salinity, turbidity and more has given me a greatly improved understanding of incredibly important real-world processes that we hardly notice due to how smoothly our city keeps them operating.

Seeing and interacting with the place that the water I've been drinking for most of my life comes from has also made me think much more about how much water I consume. When I brush my teeth or wash my hands, I now have seen and understand the maintenance of the exact area my water comes from and try to take greater care in using less water.

Seeing the resource you're depleting in person can have a massive impact on the way you think about resource use in general, as though water may be a sustainable resource in paper, it is only sustainable if the rate at which we use it at regularly is responsible. The more members of our community interact with our local resources, water being the most important of all, the more responsibly we will use them.

How I became a Storm Drain Detective

By Madalynn Westland
BENJAMIN HOLT
MIDDLE SCHOOL

The Storm Drain Detective program is an amazing opportunity available to anyone. I am proof that any young person can join, even if your school does not currently participate in the joint City of Lodi Public Works and Lodi Unified School District programs.

From personal experience, I can share that I do not get school credit for my work at the various body of water locations. Most students are involved in SDD as part of their school curriculum and environmental sciences learning opportunities. I attend a charter school that is not currently connected with SDD.

However, when my

mom first learned of SDD and all the cool things they got to do and learn, like calibrating specialized equipment, teamwork, journaling, practicing organizational skills, and especially being on the lake, I knew I wanted to sign up. Learning about nature, pollution and the environment is a passion of mine.

My family made a commitment to the program and I enjoyed all of my time with the staff, teachers, and other students. SDD has allowed me the opportunity to grow in a supervised environment.

I have enjoyed meeting new people and developing new skills. My lifelong goal is to be an environmental engineer. SDD is enabling me to meet my goal. Thank you, SDD.

CELEBRATING PLANET EARTH

EARTH DAY IDEAS: Students weigh ways to care for our planet

Editor's note: Students were asked to journal using these five daily prompts from April 21 to 24, in honor of Earth Day. This year was the 50th anniversary of Earth Day, which has been held every April 22 since 1970.

'We should take care of Earth ... Earth is where we live'

By Alexandra Geronimo
HERITAGE ELEMENTARY

Monday: Why do we need to take care of the Earth?

I think that we should take care of the Earth for many reasons. One reason why I think we should take care of Earth is because Earth is where we live, and if we don't take care of it, then it won't be a good place to live in. Another reason why I think we should take care of Earth is because we are destroying it and that is bad.

This is why I think we should take care of the Earth.

Tuesday: What do you love most about nature?

One thing that I like the most about nature is that nature makes a lot of beautiful sounds, places and much. Another thing I like about nature is that it is very peaceful. This is what I love about nature.

Wednesday: Why is it important to recycle?

I think it is important to recycle because it is good to reuse items to make more items. That way, we won't be making more of the items when we can be reusing other items to make other items.

Thursday: How can you teach people about the environment?

There are many ways to teach people about the environment, but here are a few. One way is to make posters that tell and show about the environment and put them up around different places. Another way, is maybe make a book about the environment and how it's really been changing. These are two ways that you can teach people about the environment.

Friday: What are some ways that you and your family could reduce and reuse?

One way my family can reduce and reuse is save items like plastic bottles, newspapers, etc. and send them to recycling centers. Another way is to use used items around the house and make some items that we would need. These are some ways my family can reuse and reduce.

'Earth has been here far longer than us, even all of humanity'

By Mohammad Ahsan
HERITAGE ELEMENTARY

Monday: Why do we need to take care of the Earth?

We need to take care of Earth and there are many reasons. Here are a few. In my opinion we need to protect the Earth because it is not only our planet, but so many other living things home too. The Earth has been here far longer than us, even all of humanity. The human race has only been polluting it. Then, for the future years, the drinking water will be bad, the air will be bad to breathe, and plants and other living things that do not have homes like us will die. The Earth will have

gone from a lush green planet, to a place where no one can live. These are a few reasons why we need to take care of Earth.

Tuesday: What do you love most about nature?

Something that I love about nature is that it is so beautiful. It is full of magic and wonders, and it has kept people curious.

Wednesday: Why is it important to recycle?

Here are some reasons why it is important to recycle. It is important to recycle because if we do not we will eventually run out of resources. With recycling we can reuse and keep the cycle going. Also recycling keeps the world clean. The Earth is our planet and it is the only one we get so we need to take care of it.

Thursday: How can you teach people about the environment?

Here is one way that you can teach someone about the environment. If they like animals you can talk to them about how you need to take care of the environment, or the animals will not have a home. Then, they will take care of the environment and protect the animals they care about. This is one way you can teach someone about the environment.

Friday: What are some ways that you and your family could reduce and reuse?

There are many ways that we could reduce and reuse. For example, if we were to have bought something that came with cardboard, we could have been creative and made a model of a house or something. This is only one of many ways you could reduce and reuse.

'Your trash could end up anywhere in the world'

By Yahir Gomez Gonzalez
HERITAGE ELEMENTARY

Monday: Why do we need to take care of the Earth?

We need to take care of the Earth because it is the only planet that we can live on. We also need to take care of the Earth because if we don't then some animals can die or go extinct. For example, if we litter, animals might mistake it for food and eat it and that can sometimes kill them or harm them. These are some reasons why we need to take care of the Earth.

Tuesday: What do you love most about nature?

What I love most about nature is that you can go out and explore. For example, if you go camping you can explore and see if there are animals out there.

What I also love most about nature is that you can go hiking. And, at the end, you can see how far you have gone. This is what I love about nature the most.

Wednesday: Why is it important to recycle?

It is important to recycle because if you don't, then your trash could end up anywhere in the world. For example, it could end up on a beach, and the beach would eventually be covered in trash. It could even end up in lakes, rivers, and in an ocean. If it does end up in an ocean, river or lake, then it could harm wildlife. These are some reasons why I think we

Kids make new friends while social distancing

Inspired by "Toy Story 4" and the beloved new character Forky, Heritage Elementary School teacher Janine Jacinto challenged students to make new friends while social distancing during the COVID-19 pandemic — literally. Here are their new friends, made from recyclable materials and trash.



Max Hernandez-Velasquez of Heritage School with his hammerhead shark pal Hammer.



Yaneisy Roman Ortiz of Heritage Elementary School holds her homemade friend Kathy.



So much fun she didn't stop at one: Jaylene Guerrero of Heritage Elementary School with Jack and Jill.



Cruz Martinez of Reese Elementary holds his new friend, Cruz Jr., made of cardboard tubes and corks.

should recycle.

Thursday: How can you teach people about the environment?

Some ways I could teach people about the environment is by telling them that smoke pollutes the environment and that sometimes it might harm animals. You could also tell them that trash could end up in the ocean and harm fish or the ecosystem. You could tell them that trash pollutes the air and makes it unhealthy for people, animals, and plants. These are some ways you can teach people about the environment.

Friday: What are some ways that you and your family could reduce and reuse?

Some ways my family could reduce and reuse is by throwing plastic things into a recycling bin. Another way that my family could reduce and reuse is if we don't litter. And we could reduce and reuse by not using the car so it doesn't pollute the air. These are some ways that my family could reduce and reuse.

'It is important to recycle ... supplies on Earth are scarce'

By Eduardo Lopez Coyazo
HERITAGE ELEMENTARY

Monday: Why do we need to take care of the Earth?

I think we need to take care of Earth because we live on it, and so far it is the only planet that has breathable air and has water.

Tuesday: What do you love most about nature?

What I love most about nature is trees because they provide oxygen for people and for the liv-

ing things on Earth.

Wednesday: Why is it important to recycle?

It is important to recycle because supplies on Earth are scarce and we can reuse the supplies we have to save supplies for future generations.

Thursday: How can you teach people about the environment?

You can tell people that plastic is very harmful to the environment because many animals mistake it for food.

Friday: What are some ways that you and your family could reduce and reuse?

These are ways to reuse paper. One way we could reuse paper is if one side is full you turn the page and start writing there.

'The thing I love most is the sound of nature'

By Leonardo Salazar Flores
HERITAGE ELEMENTARY

Monday: Why do we need to take care of the Earth?

It's our only planet viable for us to live on. I think the reason we have to take care of our Earth is because it's the only planet that we can live on. Another reason is because it's a beautiful planet as well. This is why I think we need to take care of Earth.

Tuesday: What do you love most about nature?

I love the pleasing sounds of nature. There are many things I love about nature, but the thing I love the most is the sounds of nature. For example, you're walking through a forest and you hear the birds chirping and the wind making the trees move.

Wednesday: Why is it important to recycle?

It's important to recycle because when we recycle we also reuse items, for example water bottles or anything that uses plastic. While recycling we also reduce the use of other items.

Thursday: How can you teach people about the environment?

I can teach people about the environment by telling them what type of animals there are.

There are many ways on how to teach people about the environment. For example, talking about the environment or the type of trees in that area. I would teach them about what kind of animals are in the area. The reason is because they would then know what kind of animals there are and know their weaknesses, and they know what not to do in the environment and not harm the animals.

Friday: What are some ways that you and your family could reduce and reuse?

Ways that my family and I could reduce and reuse is by using reusable bags. It also helps the environment. My family can also use reusable water bottles. My family is not only reducing and reusing, but also helping the environment.

'All the things we don't recycle will somehow end up in the ocean'

By Nathalie Osorio-Rogel
HERITAGE ELEMENTARY

Monday: Why do we need to take care of the Earth?

We need to take care of Earth for many reasons. One of those reasons is because we should take

care of Earth is because we live on Earth and it is our responsibility to take care of it. We need to care for animals that live on Earth. Some animals are food for some humans. We also need to consider walking more than using cars. My reason for that is because all the smoke that is released when driving, or turning on your engine, stays in the air. And too much smoke in the air can be harmful to humans and animals.

Tuesday: What do you love most about nature?

What I love most about nature is every landscape is different, and has its own unique feature. For example, I really like that some landscapes have flowers that are very pretty. What is really cool is there is different types of rocks in different areas. Some might have crystals, diamonds, gems, or other types of rocks. Each different part of nature is different from the rest, which makes it very exciting, because you will not know what another part of nature has.

Nature also has animals. Animals are very fascinating. Looking at animals that you have never seen is amazing because of what you can observe, and learn from them.

One last thing I love about nature is there is a smell that is different wherever you go in nature, that might or not be pleasant.

Wednesday: Why is it important to recycle?

It is important to recycle, because all the things we don't recycle will somehow end up in the ocean. An estimate of 14 billion pounds of plastic that enter the ocean a year. Why? Because some people don't recycle, and when they don't, and they put plastic in their

PLEASE SEE EARTH, PAGE 6

ALL AND SUNDRY

Pacific lamprey is a little friend near you

By Max Hernandez-Velasquez

HERITAGE ELEMENTARY SCHOOL

Hello. Did you know that there's a native eel in the Mokelumne River? Many residents of Lodi don't even know this, or have even heard of the eel.

For those of you who have never heard about the eel, it is called the Pacific lamprey, and it grows to be 30 inches long. When it's an adult, its diet consists of salmon, flatfish, rockfish and many other marine animals. Their lifespan in the wild is eight years and they are native to North America. The

species name is Petromyzontidae. They latch onto their prey with their needle-like sharp teeth. They have a pair of fins, an anterior dorsal fin, the posterior fin and the caudal fin. Their body also has eyes, a nostril, a buccal tunnel with its teeth, and external gill slits. The adults are a bluish-black, or greenish above and completely pale underneath.

Pacific lamprey spend most of their life as larvae and live in the freshwater environment for several years. After the larvae become juveniles or adults they no longer have jaws and are considered jawless. This gives them the ability to suck on salmon or

other marine animals and feed off of them. They live for one or two years in the ocean and then they will return to freshwater to spawn. Then, when they lay eggs they build a nest, or a redd, in tiny gravel. The female Pacific lamprey can lay up to 100,000 eggs!

In many ways they are like the salmon because they both are euryhaline, which means they can survive in both fresh and saltwater. They are also alike because their life cycles are practically the same. And now you know about a very tiny fella that might live in a river near you!



COURTESY PHOTOGRAPH

Joey Richle poses for a photo with his giant cabbage plant.

My AgVenture cabbage plant

By Joey Richle
LAKEWOOD ELEMENTARY SCHOOL

My teacher Mrs. Milligan took our third-grade class from Lakewood Elementary

to AgVenture. There we learned that plants grow with water and sunlight. Every day I watered my cabbage. As it grows you can see layers and you can eat the middle.

Visiting the Mokelumne River Fish Hatchery on a field trip

By Samuel Jewell

LOCKEFORD ELEMENTARY

Last fall in 2019, our second-grade class got to go to the Mokelumne River Fish Hatchery. We rode on the school bus with our teacher Mrs. Gilbert and Mr. Rogers, the principal of Lockeford School. We got to see salmon swim upstream and jump up the fish ladder. We also saw the workers through the windows: they were milting the males and taking the eggs out of the females in order to fertilize the eggs. There were MILLIONS of them! Later we got 35 eggs delivered to our classroom. We put them in a fish tank to watch them grow. Then we went back to the river and let them go free.

The grossest part of the field tri was when we got to hold a sac of eggs. They felt so slimy and they were cold. The coolest part was when the tour guide let us go in the deep freezer — you won't believe what we saw!



KATIE MANIES/MILLSWOOD MIDDLE SCHOOL

What are lampreys?

By Emma Starr

VINEWOOD ELEMENTARY SCHOOL

Lampreys are ancient fish that have no jaws! They suck onto everything they can. They stick onto other fish to suck their blood

for food and travel around the ocean. Lampreys are meant to be there because they are native fish. At the Mokelumne River a lamprey sucked onto my hand! It tickled but it didn't hurt. In my opinion lampreys are awesome fish!

GET INVOLVED WITH THE MOKELUMNE CURRENT

Every year, classes that participate in the City of Lodi Watershed Program and Storm Drain Detectives put together the Mokelumne Current. To get involved, interested teachers may call program coordinator Kathy Grant at 209-333-6878 or email kgrant@lodi.gov.

To see past editions of the Mokelumne Current, visit lodieei.wordpress.com.

EARTH

CONTINUED FROM PAGE 5

regular trash cans. They will fall out of the garbage trucks and end up in the oceans.

It is also good to recycle because there are animals suffering and dying because people don't take the time that it takes to recycle. For example, whales, turtles, fish and more think that plastic is food so they eat it and plastic is not edible. Others get stuck in nets or plastic. Because we don't recycle, it can affect other living things other than ourselves.

Thursday: How can you teach people about the environment?

There are many ways to teach someone about the environment. One way to teach someone about the environment is to watch a video about the environment. A video could teach a person a lot about the topic of the video.

You can actually teach a person about the environment yourself with the facts you know. Like when you talk about an environment, tell the person what you know, like animals that live there, or flowers, plants or crops that live there, or what the weather is usually like.

Another way you can teach a person about the environment by reading books about your environment. Books help us in many ways. One can be by learning about your environment.

My last way to teach a person about the environment is by actually experiencing what it is to live in that. Those are my ways to teach someone

about the environment.

Friday: What are some ways that you and your family could reduce and reuse?

One way we can reduce is by using less of something. A way of how we can reduce something is all the fruits and vegetables that we get at the store we can grow ourselves. That way we can reduce all the plastic that we get when we buy fruits and vegetables.

Another way I can reduce plastic in my house is to not buy as many plastic water bottles. My family and I have a big reusable gallon of water that almost always contains water. Every time we run out of water in that gallon we refill it.

One way we reuse is when we have leftover food, we store it in empty food buckets. Another way you can reuse is all the plastic bags we get when we go to the store. We reuse them as garbage bags. Gift bags we get we reuse to give gifts to other people. Those are some ways me and my family reuse and reduce.

'Trees are like family because we need them!'

By Yaneisy Roman Ortiz
HERITAGE ELEMENTARY

Monday: Why do we need to take care of the Earth?

Based on what I know, we need to take care of the Earth because without Earth we would not be alive. We need Earth. For example, if we don't take care of the water on Earth we will not survive. We need that water

to drink, plant crops and take showers. Also if we don't take the time to have plentiful soil on Earth, how are we going to grow crops, fruit and everything we eat? Without food we wouldn't be able to survive either.

Without water we can't grow trees! What do we use trees for? A lot of things, for example: paper, houses, pencils, maple syrup, candy wrappers, chewing gum, rubber and sponges. The bark of trees that we grow with water could be used for dyes and medicine, and the leaves and roots create oils that makes cosmetics and medicine.

Tuesday: What do you love most about nature?

What I love most about nature is the trees. It is really interesting to see how long they been alive and investigate how many more years it will live. They are super big and help us with our lives. Even though some people just see trees as not that important, without trees we wouldn't be alive. Trees make lots of things including oxygen, which we need to survive. Trees are like family because we need them! My favorite tree is the oak tree!

Wednesday: Why is it important to recycle?

It's important to recycle because if we don't recycle it could cause pollution. If we recycle it could help the environment from trash. Also, if we recycle that saves energy which reduces gas emissions, which helps to not change the climate.

If we don't recycle the oceans or rivers would be

full of trash. How does not recycling not help us and anything around us? If we don't recycle the rivers or driveways and oceans would be full of trash. That affects us and things around us because if the water is full of trash that will destroy animals home. With that, animals could get extinct.

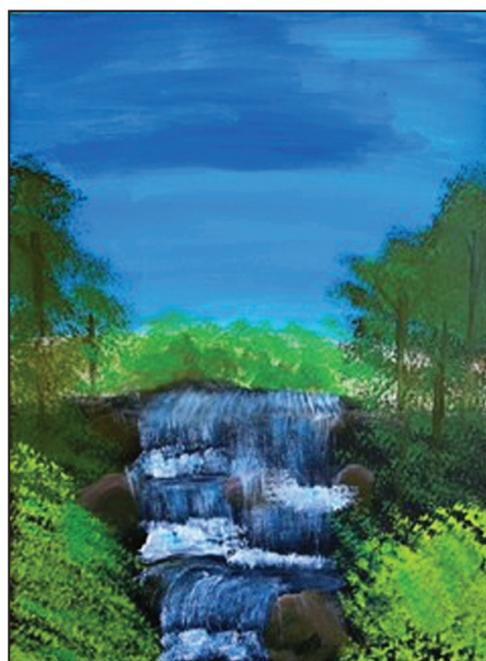
For the driveway, that would affect us because all the trash there is could cause things in the air which would cause pollution which is not good for us.

Thursday: How can you teach people about the environment?

I can teach people about the environment by doing lots of things. One way i could help teach about the environment maybe could be by writing about the environment and how to protect it and the Mokelumne River. Another way i could help teach is by going outside and seeing how clean the environment is. Also, we could join a club that teaches us about the environment. The environment is where we live so it would be interesting if we learned about our environment.

Friday: What are some ways that you and your family could reduce and reuse?

Some ways my family could reduce and reuse is in many ways. For example, instead of using plastic bottles we could use reusable water bottles, so then we don't use as much plastic. When we go shopping it's better to use bags of material than plastic bags. If we reuse and reduce it will help Earth a lot.



JAIDA GAO/ELKHORN SCHOOL

Alevin Haiku

*Alevin, small fish
Camouflaging in the rocks
They hatched from an egg*



YAHIR GOMEZ GONZALEZ/HERITAGE

OCEAN ADVENTURES WITH MSI

Tokay, Lodi High students reflect on Marine Science Institute trip

SPECIAL TO THE CURRENT

In fall, 2019, the City of Lodi Watershed Education Program organized study trips for five Lodi schools. Students were able to attend a Marine Science Institute Discovery Voyage to the San Francisco Bay, and also visited either the Aquarium of the Bay or the Academy of Science in San Francisco, depending on the trip.

Many sponsors helped make these trips possible, including the Lower Mokelumne River Partnership (East Bay Municipal Utility District, U.S. Fish and Wildlife, and California Department of Fish and Wildlife), the C.A. Webster Foundation, Waste Management, and a GoFundMe consortium of private donors.

The students wrote and sent many “thank you” letters. Below are a few excerpts showing the importance of these trips to the students. Thank you, sponsors!

“Hello, this is one of the many students who went on past Wednesday’s amazing field trip! ... I am the kid who wore the T-Rex hat. I wanted to say thank you very much for the experience and the knowledge I was able to gather by going.

... on the boat I think the coolest thing I learned was not even the things that were taught but the things we could experience, hands on. Nothing super important, but things like how the fish felt and what they looked like, where we caught them, how we caught them, all that. While I did lean plenty



COURTESY PHOTOGRAPH

High school students pose for a photo on the dock with the Marine Science Institute’s research vessel, the Robert G Brownlee, behind them.

from those aboard the boat, the most intriguing experiences were those that I could take part in myself, not just hear about.

Thank you once again for allowing us to take part in those two wonderful experiences. The ability to get out of a classroom and really focus and study science hands-on is not something anyone really get to do unless it is their profession, a very unique and undervalued opportunity!”

— *Ethan Fulton, Tokay High AP Environmental Science*

“Thank you for your generous donation that allowed my classmates and me to attend a trip with hands on learning. It was amazing to take everything we learned

from Storm Drain Detectors and apply it in a broader sense. We got to see the way our watershed works starting from the Mokelumne River out to San Francisco Bay and the ocean. It was really eye opening to be able to see it all myself, and how everything works rather than from solely in a classroom. Firsthand, we got to test water quality, and examine life forms and see all the ways each one of us is helping or hurting the ecosystem in the Bay, even from hours away. We examined tiny organisms like plankton and saw how they live, the many different types, and their role in the ocean. We also examined the mud, and fish. This trip was eye opening seeing the effect every per-

son has in our California watersheds and even the worlds’ oceans and that we can contribute to helping preserve our watershed and world.”

— *Savanna Berry, Lodi High Biology*

“I learned so much on this breathtaking trip. I learned about plankton and how they are drifters, including some crabs and even microscopic plankton. I learned how to pet a fish from head to tail, not from tail to head — otherwise you will remove the scales. Thank you so much for the experience of a lifetime, catching fish, learning about phytoplankton and realizing how much we need to protect the environment. I wish you would carry on these trips for future

students as it is a great experience that everybody ... needs”.

— *Seth Cunha, Tokay High AP Environmental Science*

“... during the boat rotations, I was surprised to learn the amount of non-native species in the San Francisco Bay. It gets one thinking about the amount of invasive species in environments around us that we don’t even realize are invasive, and are choking out native species. Also, I found several different species of plankton in the bay very interesting as well. I didn’t realize the wide range of species there are in just a small amount of water.”

— *Kali Anema, Tokay High AP Environmental Science*

“Thank you so much for paying for our trip. The entire class learned so much about marine life. Once the class got to San Francisco, we visited the Aquarium of the Bay. We learned about the marine life of the Bay, such as sharks, invertebrates, and fish. After that, we stopped to eat lunch and explored Pier 39. We then got back on the bus and traveled to a dock where we boarded the boat (in Richmond). While on the boat we learned about plankton, hydrology, invertebrates, and ichthyology. My group caught two rays and three fish in the ichthyology station. Because of your sponsorship, we got a day to be immersed in biology.”

— *Maggie Fugate, Lodi High Biology*

All about my trip to the Marine Science Institute

By **Brian Torres**
HERITAGE ELEMENTARY

The day we went on the MSI research vessel, it was cold and windy. The boat shook at the beginning, then it calmed down.

We went to all four study stations. There was a station where we saw plankton. I saw the plankton by first using a contraption to catch them. We used a microscope to see the tiny plankton.

There was also a station where we touched sea creatures, and caught some too. We caught them by tossing a big net into the bay from the back of the boat. One of the creatures that I touched was a stingray. I felt kinda nervous and it felt slimy.

Also, we studied the water at a station called hydrology. We checked temperature and density. We also put mud on our faces from the bottom of the bay, and made a promise to never harm a sea creature.

The best part was that



COURTESY PHOTOGRAPH

Brian Torres and his mother pose for a photo in front of the Robert G. Brownlee research vessel that his class got to sail on during a field trip to the Marine Science Institute.

my mom came with me on the trip. One thing my mom liked about the trip was that she was in the middle of the bay on a boat for her first time, and

she thought it was amazing! Another thing she liked was that she could help the teacher with the kids. One thing my mom

learned on the trip was the temperature and density of the water. My mom liked that there were no problems and everything went well!

California native fish: the hitch

By **Charlie Starr**
LODI HIGH SCHOOL

The hitch is a minnow that is native to some Northern California lakes and streams. One of those streams happens to be the Mokelumne River.

The hitch is usually 2 to 3 inches long, but can grow much larger. When I was out on the Mokelumne River checking screw traps with East Bay MUD, we caught a hitch that was 6 inches long! Along with the one huge hitch, we caught another five smaller 2- to 3-inch hitch.

One fact about the hitch is that they grow at different speeds and to different sizes depending on the body of water they are living in. This may be attributed to different water conditions in different areas.

All in all, hitch are some pretty cool little fish.

Littering endangers birds and other animals in the food chain

By **Max Hernandez-Velasquez**
HERITAGE ELEMENTARY SCHOOL

Hello residents of Lodi, this is an important message brought to you by Dr. Hernandez:

“I am here to inform you about the dangers of littering, and how dangerous it is to our environment, the animals, to us, and to our watershed especially.

“First of all, due to extensive research, and of course technology, we can confirm that if people keep throwing bad stuff on the soil it can kill the nutrients the soil has. Then, it won’t be able to support plants, nor would we be able to harvest the food that people and animals need. Something else we can confirm is that it’s really harmful to many animals that are native, and non-native. For example, let’s say an endangered bird species happens to live near your house and you just litter near the nest of the bird. The bird can eat, swallow, or even chew on something that it is not supposed to eat. The population of

that species could rapidly decrease ‘til it’s died out and there will be no more. And, if that animal dies out, it then could kill the whole food chain it’s in. Then, it could hurt the other food chains that depend on its food chain. Then the food web could get hurt, and if the food web dies and animals that pollinate couldn’t help the plants, the plants die, too.

“And this is something all scientists can agree on. It can destroy humanity drastically because, back to the animals. If they die, then our food source dies. So if the animals die, we follow right behind them. And if there is too much trash and litter, it can also affect global warming. It can also be bad for our health, because if germs, diseases, and bacteria build up it could create illnesses that could be fatal for the human body. Not only that, but it will make the water we depend on contaminated. And those are some details that show littering could really affect Lodi’s ecosystem and environment. So keep on cleaning Lodi, so it can be here for generations to come!”

Exploring with MSI in San Francisco Bay

By **Brittany Delgado Lopez**
HERITAGE ELEMENTARY

The Marine Science Institute is a wonderful place to visit, because you get to go on a huge boat and see the beautiful view. On the boat, which is named the Robert G Brownlee, students get to know the leaders who will take them to the stations, and students get to learn a lot of stuff that they probably didn’t know about.

One station is the Plankton Station. Plankton are drifting aquatic plants and animals. At that station students collect water from the bay, put the water in a test tube, and then use a microscope to see what type of plankton are in the water.

Another station that students visit is the Hydrology Station. Hydrology is the study of water. At that station students throw a bottle into the bay to collect water to test. Students test the temperature and the amount of salt, or salinity, in the water.

A third station to go to

is the Ichthyology Station. Ichthyology is the study of fish. At that station students work together with their team and their leader to throw a big net into the bay and then bring it back onto the boat. Everyone hopes to catch fish and other sea creatures. Once the net is back on the boat, students study everything that has been caught.

The last station is called the benthic station. At the benthic station students work together to scoop mud from the bottom of the bay. Then students study the creatures that live in the mud on the bottom of the bay. At the end, students put the mud on their face and promise to save the animals.

My class had so much fun and learned so much when we were on the MSI field trip. It was my first time getting on a boat, and it was very fun. Our boat was very nice, big, and cool. It was very exciting to get to do science experiments on the boat. I will never forget the experience that I had.

MARINE SCIENCE INSTITUTE AT A GLANCE

The Marine Science Institute was founded in 1970 with the goal of educating local students about the environment of the Sacramento-San Joaquin River Delta and the San Francisco Bay. The non-profit organization has the goal of building children’s curiosity about nature and teaching them to be good stewards by putting them in direct contact with the Bay and Delta environments.

The institute offers a number of programs aimed at students from kindergarten through college, including Marine Camp, which ranges from a day camp to a multi-day expedition depending on student grade level; school programs focused on exploring wetlands, beaches and sloughs, the Robert G. Brownlee Discovery Voyage and the MSI’s ocean lab and aquarium; and a number of family programs.

For more information, visit www.sfbaymsi.org.

— *Source: The Marine Science Institute*

SALMON IN THE CLASSROOM

The salmon life cycle

By Cole Bozeman
LOCKEFORD ELEMENTARY SCHOOL



At this stage, the salmon eggs don't really do anything.



At this stage, the salmon have yolk sacs. We can't feed them yet.



At this stage, the salmon are almost ready to be free.



At this stage, we release the salmon and the salmon has to take care of itself.



Now the salmon are full grown.

All about salmon, from egg to adult

By James Donally
TURNER ACADEMY

Salmon go through many changes in their lives. Salmon can jump up to 11 feet; that is like a human jumping over a two story building. Salmon are one of the few fish that are anadromous. Salmon can change many times in their lives.

The egg is the first stage of the salmon life cycle. They have black eyes in the egg. They are red, pink, orange and tiny. If the water is too warm they can hatch sooner or die. That is the first stage of a salmon's life.

The second stage of the salmon life cycle is the alevin. They stay in

alevin for four to six weeks to two months. Their yolk sack is still attached and is their food. This takes place in early spring. This stage is unique because they don't have to get their own food.

The third and fourth stages of the salmon life cycle are the fry and parr. Parr have camouflage and stripes. But not all chinook have stripes. They eat plankton, eggs, insects and plants. They leave the redd and hide in plants and under rocks. Fry and parr are like young adults.

The fifth stage of the salmon life cycle is the smolt. They go to an estuary to get used to the salt water. They travel at night and hide in the

day so they are not found by predators. They follow the current to get to the ocean. The smolt stage is right before they become adults.

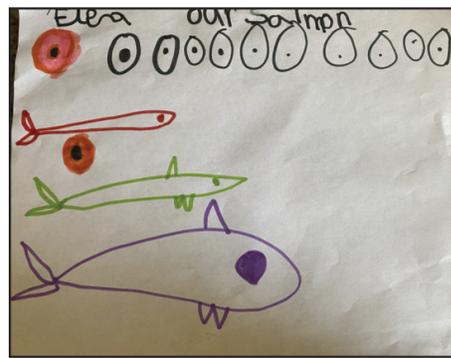
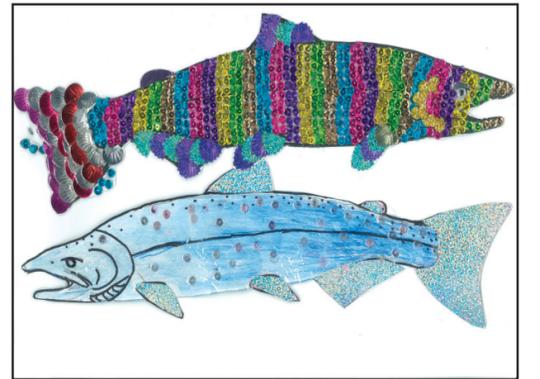
Adult salmon are the last stage of the salmon life cycle. They die a short time after they spawn. Salmon stay adults for two to fifteen years at this stage. Salmon can lay 1,500 to 10,000 eggs at a time. This is the final transition in their life cycle.

Salmon are unique fish. They are anadromous, they can go from salt-water to freshwater and vice versa. They have six life stages in their life cycle. They are an important part of the ecosystem. There are many reasons why salmon are interesting fish.

Salmon in the Classroom at Heritage Elementary



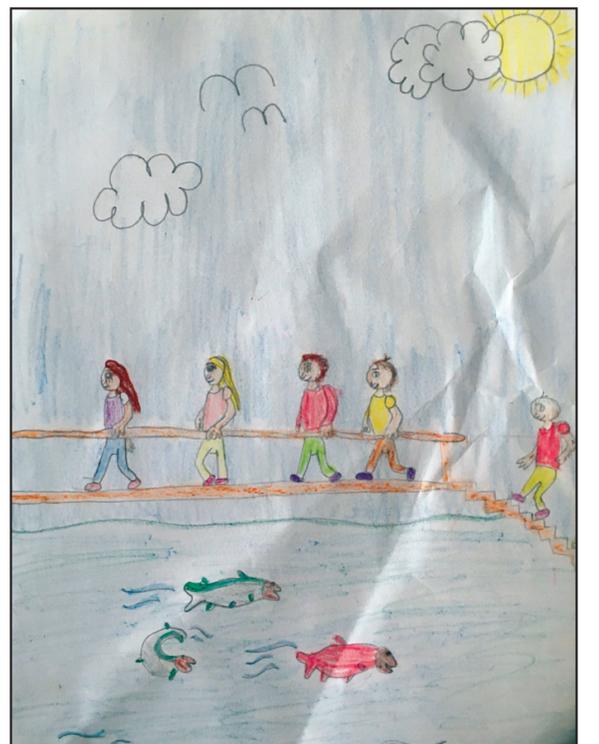
Left: Heritage Elementary School students were given an outline of a salmon to take home and decorate with their family, using items from around their house. Those salmon were posted on the "watershed wall" that was a backdrop for the school's tank with salmon eggs. Below left: Emmanuel Mendez, Nathalie Osorio and Jesse Granados chat while visiting the salmon tank. Below right: Salmon by Heritage students.



ELENA WALBRIDGE/WOODBRIDGE SCHOOL



HERITAGE ELEMENTARY

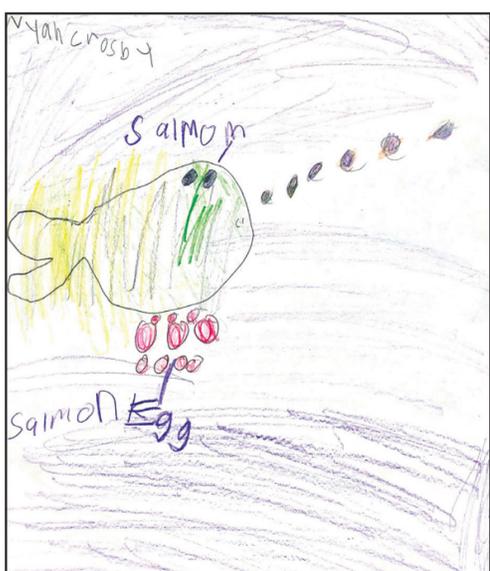


CHARLOTTE STAMPER-PALMER/LOCKEFORD SCHOOL

All about a salmon

By Rebecca Starr
VINEWOOD ELEMENTARY SCHOOL

A salmon is a type of fish that is born in fresh water and then migrates to the ocean. That makes salmon anadromous fish. Once the salmon are full grown they return to fresh water to spawn. Salmon are very important to the river's ecosystem. They bring back nutrients from the ocean to help the next generation of fish and other species to thrive. Salmon need cool, clean water to live so all the trash that humans put into rivers and streams can harm the salmon. That means we have to keep our waterways free of trash and pollutants.



NYAH CROSBY/WOODBRIDGE SCHOOL

Alevin Haiku

*Alevin, small fish
Camouflaging in the rocks
They hatched from an egg*



EDUARDO LOPEZ/HERITAGE ELEMENTARY

Cinquain

Salmon
Beautiful, fascinating
Hurdling, swimming, devouring
A salmon swimming gracefully
Fish



JAYLENE GUERRERO/HERITAGE ELEMENTARY

FISHING

Fish managers hopeful despite low numbers of fall-run Chinook salmon

Dan Bacher Stockton Record Correspondent

Published 11:36 a.m. PT Nov. 3, 2020

CLEMENTS — The numbers of fall-run Chinook salmon that have gone over the Woodbridge Diversion Dam fish ladder on the Mokelumne River to date are much lower than those in recent years, but fish managers are hopeful that a lot more fish will show soon.

In 2017, a year of high flows and heavy precipitation, an all-time record of 19,954 fish went over the dam.

More: Fishing, boating returns to Del Valle Reservoir

More: Stocktonians come up big at Lake Pardee trout challenge

“This year 925 salmon have gone over the diversion dam through Oct. 28,” said Bill Smith, manager of the CDFW’s Mokelumne River Fish Hatchery in Clements. “That compares to 10,000 fish at the same time last year. It’s a little early in the run, so I’m still optimistic that the fish will show.”

Michelle Workman, supervising biologist for the East Bay Municipal Utility District (EBMUD), confirmed the relatively low numbers showing on the Mokelumne this fall so far.

“Run timing is variable, so we are still optimistic,” Workman said. “We keep getting reports of anglers catching fish in the ocean. Numbers on American and San Joaquin tributaries are still low also.”

For example, the number of fall Chinook salmon reported on the Stanislaus was 955 through Oct. 29, compared to 3,000 fish a year ago, she noted.

There were about 500 salmon in the hatchery on Monday.

“We have done two spawns so far this season,” said Smith. “Most of the fish aren’t ripe yet — we’ve only spawned 12 salmon to date. We plan to keep spawning salmon until Christmas,”

Workman said river releases this year are under a dry year scenario under the joint settlement agreement between the U.S. Fish and Wildlife Service, CDFW and EBMUD that was approved by the Federal Regulatory Energy Commission (FERC) in 1998.

On Oct. 1, EBMUD increased minimum flows below Woodbridge Dam to 100 cubic feet per second (cfs) and 250 cfs below Camanche Dam. Over the past month, EBMUD has released four pulse flows to attract more fish up the Mokelumne River as it does every year.

EBMUD released three-day pulse flows down the river on Oct. 6, Oct. 12, Oct. 19 and Oct. 26. The peak flows were 550 to 650 cfs. This year 4,000-acre feet of water was available for the pulse flows.

In addition to the Lower Mokelumne River Partnership member agencies CDFW, United States Fish and Wildlife Service, National Marine Fisheries Service and EBMUD, stakeholders responsible for the overall improvements in the river include the California Sportfishing Protection Alliance, North San Joaquin Water Conservation District, Woodbridge Irrigation District and landowners along the river, according to EBMUD. Information: (209) 759-3383.

Amador trout: Staff at Lake Amador Resort's on-site hatchery began stocking trout on Oct. 15 and the trout plants continue. A total of 3,600 pounds of trout, including the lake's unique "Amagolds" and cutbows, have been planted so far.

"Anglers are averaging about 1 to fish per rod while using garlic chartreuse PowerBait and white Power Eggs from shore," said Sheree Rose at the resort.

Daryl Carter reported catching two trout to 4 pounds while trolling a copper Trigger Spoon and a silver/black broken-back Rapala, along with bagging two catfish while bait fishing with nightcrawlers near the dam on his latest trip.

The lake level is 38 feet from full and one boat lane is open on the ramp. The surface water temperature is 65 degrees. Information: (209) 759-3383.

West Delta sturgeon: Sturgeon fishing is excellent in the West Delta and Suisun Bay. Four anglers fishing with Zack Medinas of Gatecrasher Fishing Adventures on Saturday, Oct. 31 caught and released 15 sturgeon, including five keeper-sized, one oversized and 9 undersized fish. They fished with roe and eel at the Middle Grounds in 29 to 30 feet of water. Information: (925) 487-7171.

Contact Record correspondent Dan Bacher at danielbacher@fishsniffer.com.

November 7, 2020

KFBK Radio

2020 Moklumne River salmon returns discussed

Listen to clip here: http://archive.tveyes.com/18120/3484155-49444/579a9cbc-7013-4ebe-8d39-a208186e0158/RADKFBK_11-07-2020_05.53.06.mp3

LIVE BY

important except in the impact it has on other lives.'

— JACKIE ROBINSON

Lodi News Sentinel
December 13, 2020

Grape growers Charlie and Mamie Starr receive Frank Beeler Stewardship Award

SPECIAL TO THE NEWS-SENTINEL

Mamie and Charlie Starr, grape growers in the Lodi and Acampo areas, have been awarded the 2020 Frank R. Beeler Watershed Stewardship Award.

The Frank R. Beeler Watershed Stewardship Award is presented the Lower Mokelumne River Watershed Stewardship Steering Committee, a sub-committee of the San Joaquin County Resource Conservation District, and the Lower Mokelumne River Partnership, a consortium between California Department of Fish and Wildlife, U.S. Fish and Wildlife Service, and East Bay Municipal Utility District.

It is awarded annually to acknowledge and recognize an individual or organization within the Lower Mokelumne River watershed who has shown outstanding leadership, responsibility, or activism in the promotion of sound and innovative natural resource stewardship practices that help sustain the environment and enhance productivity and profitability in the Mokelumne River watershed.

Lodi region grape growers and watershed-wide enthusiasts, Charlie and Mamie Starr have been long-time members of the Lower Mokelumne River Watershed Stewardship Committee, the stakeholder group formed in 1999 by the SJC-RCD as a way for local stakeholders to improve the Mokelumne River's water quality across the region, usually through land-based practices.

The Mokelumne River is a valuable resource that supports the economic, environmental, and aesthetic welfare of California. The Lower Mokelumne River watershed stretches from the base of Camanche Reservoir to the toe of the tidally influenced sloughs of the lower Mokelumne River, just off Woodbridge

Road, east of Interstate 5.

The Starrs were also among the first grape growers to follow the sustainable grape growing guidelines created by the Lodi Rules program as they raise Syrah and Primitivo grapes.

Mamie Starr is a retired planner for the City of Lodi and Lodi Unified School District. She has served on the Lodi Wine Visitors Center's board of directors, leads hunting safety classes, and for more than 20 years has been a driving force in California Fish and Wildlife's Sandhill Crane Docent Program on the Isenberg Reserve on Woodbridge Road, the heart of Sandhill crane winter habitat. She is also known for her master Rosarian efforts towards teaching others how to grow and care for roses.

Charlie Starr is a retired City of Lodi firefighter. He serves on the North San Joaquin Water Conservation District and farms grapes with his son in the Lodi-Acampo area.

The Starrs have hosted multiple events and parties for local community and civic groups at their home.

The public presentation of the award would normally be held at the annual EMBUD Pardee Barbecue in October; however, this year's event was canceled due to COVID-19 social gathering restrictions.

Frank Robert Beeler, a water and wastewater superintendent for the City of Lodi, passed away in 2009. He was an active participant and advocate for the Lower Mokelumne River Watershed Stewardship Plan and the Lower Mokelumne River Watershed Stewardship Steering Committee.

Beeler was a leader in the city's stormwater program and supported volunteer watershed stewardship activities such as the Storm Drain Detectives.

What a catch

We have a new record! This 5-year-old male Chinook salmon arrived at the Mokelumne River Hatchery weighing 35 pounds, making it the biggest fish recorded to date.

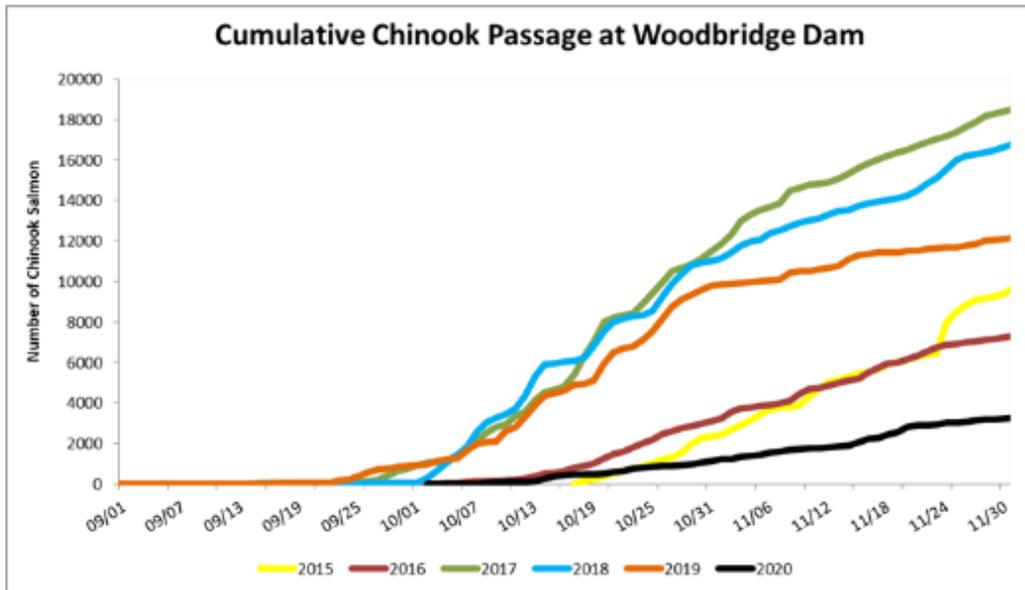
*Below, California Department of Fish and Wildlife Mokelumne River Hatchery Manager Bill Smith with the new heavy-weight. Photo submitted by Director of Water and Natural Resources **Mike Tognolini**.*



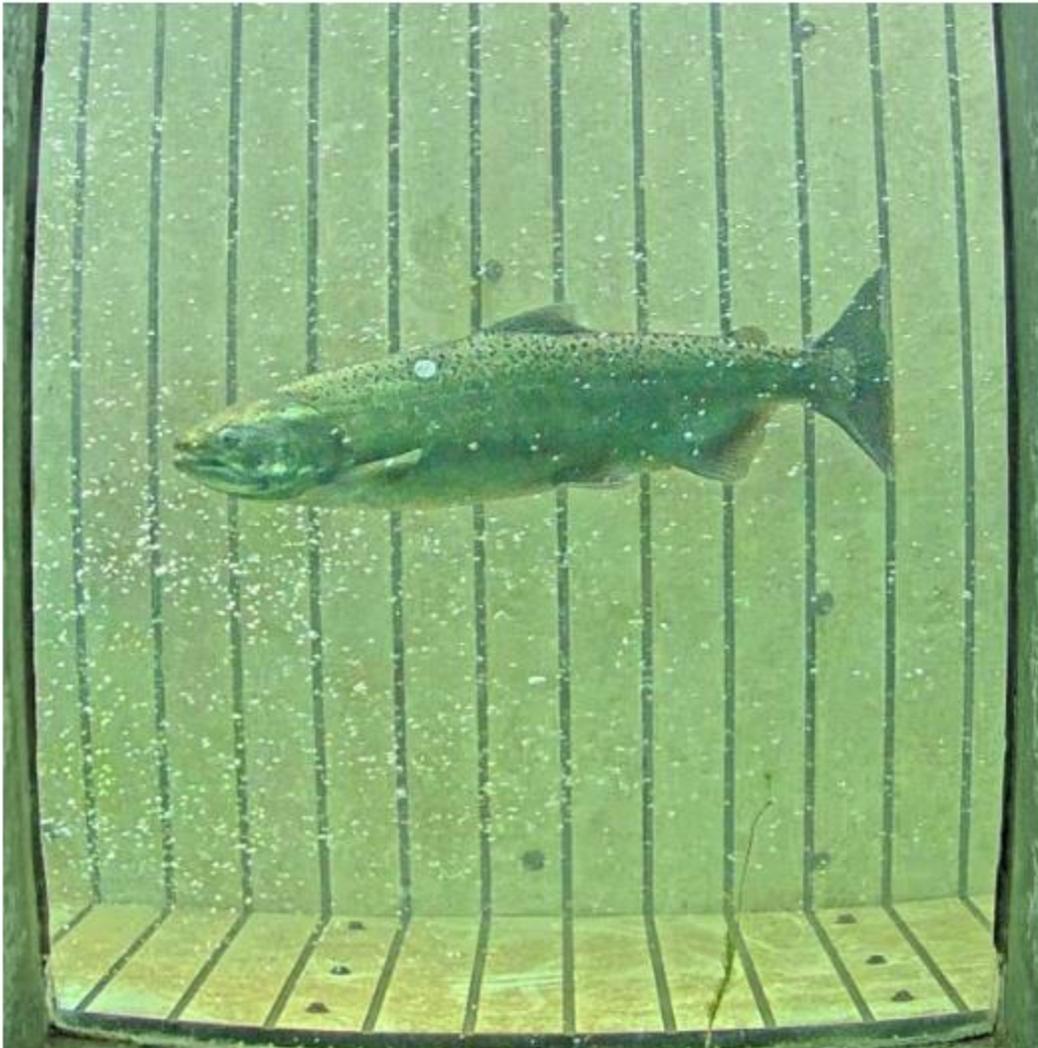
Keep counting

After years of historic Chinook salmon returns, this year's fall run is the lowest recorded in five years. EBMUD's Water and Natural Resources Department is carefully monitoring the numbers, which, as of Tuesday, December, 15, stood just shy of 4,000.

Stay tuned for a self-guided virtual tour of our fisheries and wildlife work on the Mokelumne River.



Above, this graph shows the five most recent Chinook salmon returns to the Mokelumne River.



Above, a screenshot from the SalmCam at Woodbridge Dam. Submitted by Fisheries and Wildlife Biologist I **Matt Saldate**.

APPENDIX B

TEMPORARY FLOW EXCURSIONS BELOW WOODBRIDGE DAM

Table B-1: Flow Below Woodbridge Dam February 27, 2020

Reading Date and Time	Interval	Unit	JSA Water Year Type	Golf Gage Measured Flow	JSA Expected Flow (below WID Dam)
2/27/2020 10:30	15 Minute	cfs	Normal and Above	109	100
2/27/2020 10:45	15 Minute	cfs	Normal and Above	97	100
2/27/2020 11:00	15 Minute	cfs	Normal and Above	86	100
2/27/2020 11:15	15 Minute	cfs	Normal and Above	78	100
2/27/2020 11:30	15 Minute	cfs	Normal and Above	78	100
2/27/2020 11:45	15 Minute	cfs	Normal and Above	86	100
2/27/2020 12:45	15 Minute	cfs	Normal and Above	85	100
2/27/2020 13:00	15 Minute	cfs	Normal and Above	82	100
2/27/2020 13:15	15 Minute	cfs	Normal and Above	85	100
2/27/2020 15:00	15 Minute	cfs	Normal and Above	79	100
2/27/2020 15:15	15 Minute	cfs	Normal and Above	78	100
2/27/2020 15:30	15 Minute	cfs	Normal and Above	81	100
2/27/2020 15:45	15 Minute	cfs	Normal and Above	87	100
2/27/2020 16:30	15 Minute	cfs	Normal and Above	89	100
2/27/2020 16:45	15 Minute	cfs	Normal and Above	85	100
2/27/2020 17:00	15 Minute	cfs	Normal and above	86	100
2/27/2020 17:15	15 Minute	cfs	Normal and Above	90	100
2/27/2020 17:30	15 Minute	cfs	Normal and above	101	100

1. The cause of 2/27/2020 temporary flow excursion is likely due to refilling of Lodi Lake by WID.
2. The provisional average daily flow for 2/27/2020 is 161 cfs.

Table B-2: Flow Below Woodbridge Dam February 29, 2020

Reading Date and Time	Interval	Unit	JSA Water Year Type	Golf Gage Measured Flow	JSA Expected Flow (below WID Dam)
2/29/2020 11:45	15 Minute	cfs	Below Normal	110	100
2/29/2020 12:00	15 Minute	cfs	Below Normal	98	100
2/29/2020 11:45	15 Minute	cfs	Below Normal	83	100
2/29/2020 12:00	15 Minute	cfs	Below Normal	87	100
2/29/2020 12:00	15 Minute	cfs	Below Normal	101	100

1. The cause of 2/29/2020 temporary flow excursion is likely due to operational maintenance work.
2. The provisional average daily flow for 2/29/2020 is 127 cfs.

Table B-3: Flow Below Woodbridge Dam March 1, 2020

Reading Date and Time	Interval	Unit	JSA Water Year Type	Golf Gage Measured Flow	JSA Expected Flow (below WID Dam)
3/1/2020 13:00	15 Minute	cfs	Below Normal	104	100
3/1/2020 13:15	15 Minute	cfs	Below Normal	91	100
3/1/2020 13:30	15 Minute	cfs	Below Normal	85	100
3/1/2020 13:45	15 Minute	cfs	Below Normal	87	100
3/1/2020 14:00	15 Minute	cfs	Below Normal	103	100

1. The cause of 3/1/2020 temporary flow excursion is likely due to operational maintenance work.
2. The provisional average daily flow for 3/1/2020 is 132 cfs.

Table B-4: Flow Below Woodbridge Dam October 1, 2020

Reading Date and Time	Interval	Unit	JSA Water Year Type	Golf Gage Measured Flow	JSA Expected Flow (below WID Dam)
10/1/2020 0:30	15 Minute	cfs	Below Normal	101	100
10/1/2020 0:45	15 Minute	cfs	Below Normal	96	100
10/1/2020 1:00	15 Minute	cfs	Below Normal	93	100
10/1/2020 1:15	15 Minute	cfs	Below Normal	86	100
10/1/2020 1:30	15 Minute	cfs	Below Normal	81	100
10/1/2020 1:45	15 Minute	cfs	Below Normal	77	100
10/1/2020 2:00	15 Minute	cfs	Below Normal	77	100
10/1/2020 2:15	15 Minute	cfs	Below Normal	77	100
10/1/2020 2:30	15 Minute	cfs	Below Normal	79	100
10/1/2020 2:45	15 Minute	cfs	Below Normal	82	100
10/1/2020 3:00	15 Minute	cfs	Below Normal	83	100
10/1/2020 3:15	15 Minute	cfs	Below Normal	89	100
10/1/2020 4:45	15 Minute	cfs	Below Normal	89	100
10/1/2020 5:00	15 Minute	cfs	Below Normal	87	100
10/1/2020 5:15	15 Minute	cfs	Below Normal	86	100
10/1/2020 5:30	15 Minute	cfs	Below Normal	86	100
10/1/2020 5:45	15 Minute	cfs	Below Normal	87	100
10/1/2020 6:00	15 Minute	cfs	Below Normal	89	100
10/1/2020 6:15	15 Minute	cfs	Below Normal	89	100
10/1/2020 6:30	15 Minute	cfs	Below Normal	89	100
10/1/2020 6:45	15 Minute	cfs	Below Normal	87	100
10/1/2020 7:00	15 Minute	cfs	Below Normal	87	100
10/1/2020 7:15	15 Minute	cfs	Below Normal	86	100
10/1/2020 7:30	15 Minute	cfs	Below Normal	86	100
10/1/2020 7:45	15 Minute	cfs	Below Normal	85	100
10/1/2020 8:00	15 Minute	cfs	Below Normal	85	100
10/1/2020 8:15	15 Minute	cfs	Below Normal	86	100
10/1/2020 8:30	15 Minute	cfs	Below Normal	87	100
10/1/2020 8:45	15 Minute	cfs	Below Normal	89	100
10/1/2020 11:00	15 Minute	cfs	Below Normal	89	100
10/1/2020 11:15	15 Minute	cfs	Below Normal	89	100
10/1/2020 11:30	15 Minute	cfs	Below Normal	91	100
10/1/2020 11:45	15 Minute	cfs	Below Normal	91	100
10/1/2020 12:00	15 Minute	cfs	Below Normal	91	100
10/1/2020 12:15	15 Minute	cfs	Below Normal	91	100

10/1/2020 12:30	15 Minute	cfs	Below Normal	90	100
10/1/2020 12:45	15 Minute	cfs	Below Normal	90	100
10/1/2020 13:00	15 Minute	cfs	Below Normal	90	100
10/1/2020 13:15	15 Minute	cfs	Below Normal	91	100
10/1/2020 13:30	15 Minute	cfs	Below Normal	93	100
10/1/2020 13:45	15 Minute	cfs	Below Normal	97	100
10/1/2020 14:00	15 Minute	cfs	Below Normal	106	100

1. The cause of 10/1/2020 temporary flow excursion is likely due to operational maintenance work.
2. The provisional average daily flow for 10/1/2020 is 102 cfs.

APPENDIX C

USGS VERIFIED FLOW DATA FOR 2018 AND 2019

Table C-1: Calendar Year 2018 – USGS Verified Average Daily Flow from Camanche Dam

11323500 Mokelumne River below Camanche Dam, CA												
DISCHARGE, CUBIC FEET PER SECOND CALENDAR YEAR 2018												
DAILY MEAN VALUES												
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	335	400	330	455	699	564	451	365	398	637	975	339
2	336	402	332	623	699	531	361	365	427	450	877	339
3	336	402	332	1100	770	539	321	367	427	713	537	339
4	336	402	331	1770	1150	744	321	367	425	1260	349	339
5	336	402	331	2500	1300	1100	321	366	401	1550	350	339
6	335	379	331	2500	1300	1120	321	366	351	1380	350	339
7	334	342	341	2500	1300	916	321	365	350	1040	350	339
8	334	331	350	2500	1300	717	320	366	353	637	350	339
9	335	331	345	2370	1300	517	320	365	353	450	350	339
10	335	331	342	2020	1300	425	322	367	351	713	350	339
11	332	331	342	1590	1300	638	323	366	352	1260	350	339
12	334	331	341	1220	1300	1030	328	366	351	1340	350	339
13	334	332	339	821	1300	1090	343	367	401	956	350	339
14	336	331	334	542	1190	894	353	367	451	606	350	339
15	335	331	331	499	994	694	362	367	452	450	342	337
16	335	331	332	500	794	504	366	365	450	449	335	335
17	379	330	332	500	841	425	366	352	402	695	335	335
18	402	331	329	500	1050	425	366	341	351	1190	335	335
19	401	331	330	500	1050	425	368	341	351	1280	335	335
20	402	331	332	500	1060	425	366	342	352	957	335	336
21	400	332	331	499	864	426	366	342	351	607	335	336
22	401	332	330	500	693	424	365	342	409	450	335	337
23	401	333	331	501	626	438	366	342	550	450	335	337
24	402	333	330	500	625	445	368	342	552	695	335	337
25	402	333	331	500	625	454	365	341	551	1190	335	337
26	399	332	330	498	625	470	365	341	797	1280	335	336
27	401	331	330	499	625	460	366	341	1300	956	335	337
28	401	331	329	501	625	325	366	341	1550	608	335	337
29	401	---	329	500	625	501	367	341	1380	450	335	336
30	400	---	329	587	625	501	367	342	1040	450	337	336
31	399	---	381	---	626	---	365	342	---	664	---	336
Total	11,350	9,689	10,390	30,600	29,180	18,170	10,950	10,990	16,230	25,810	11,610	10,460
Mean	366	346	335	1020	941	606	353	355	541	833	387	337
Max	402	402	381	2500	1300	1120	451	367	1550	1550	975	339
Min	332	330	329	455	625	325	320	341	350	449	335	335
Ac-ft	22,510	19,220	20,600	60,680	57,880	36,030	21,710	21,800	32,190	51,200	23,020	20,750

Note- Data published by USGS

Table C-2: Calendar Year 2019 – USGS Verified Average Daily Flow from Camanche Dam

11323500 Mokelumne River below Camanche Dam, CA												
DISCHARGE, CUBIC FEET PER SECOND CALENDAR YEAR 2019												
DAILY MEAN VALUES												
Day	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	1460	1060	2000	2000	2400	2900	1300	854	452	452	451	329
2	1460	1250	2000	2000	2400	2900	1300	855	452	772	451	329
3	1460	1250	2000	2130	2400	2900	1300	851	453	1370	450	330
4	1830	1250	2000	2200	2400	2900	1300	851	451	1490	452	329
5	3710	1250	2180	2330	2410	2900	1300	851	451	1190	451	330
6	4940	1250	2580	2400	2410	2900	1300	851	452	891	452	331
7	4980	1300	2800	2400	2400	2900	1300	850	450	592	452	330
8	4990	1350	2800	2400	2400	2900	1300	850	452	455	452	330
9	4990	1350	2800	2400	2400	2900	1420	850	452	774	451	330
10	4980	1350	2800	2400	2400	3150	1700	850	452	1370	451	329
11	4960	1350	2800	2400	2400	3300	1700	850	451	1490	452	329
12	4960	1530	2800	2400	2400	3300	1700	850	452	1190	451	329
13	4960	1860	2800	2400	2400	3300	1700	850	454	892	450	330
14	4960	2180	2800	2400	2400	3300	1700	850	453	590	451	330
15	4960	2580	2610	2400	2400	3300	1700	849	451	452	418	330
16	4960	2800	2400	2390	2400	3300	1620	848	665	773	370	332
17	4960	2800	2400	2400	2400	3300	1400	849	1070	1370	352	331
18	4950	2800	2400	2400	2400	3300	1300	850	1460	1490	351	331
19	4950	2800	2400	2400	2400	3300	1190	851	1800	1190	351	331
20	4940	2800	2400	2400	2400	3090	1100	853	1900	893	351	331
21	4940	2800	2220	2400	2400	2900	1100	854	1810	592	350	331
22	4940	2800	1820	2400	2400	2900	1030	790	1660	452	346	331
23	4940	2800	1600	2400	2400	2900	896	690	1510	771	340	331
24	4930	2800	1600	2400	2450	2690	851	594	1370	1370	340	330
25	4930	2800	1600	2400	2500	2290	850	490	1220	1490	340	330
26	4930	2800	1600	2400	2500	2000	850	451	1060	1190	341	332
27	4920	2640	1600	2400	2500	1790	850	450	915	893	340	332
28	4860	2220	1600	2400	2670	1600	850	450	764	613	340	333
29	4830	---	1780	2400	2900	1390	850	452	614	488	336	332
30	4810	---	2000	2400	2900	1300	850	451	490	452	329	331
31	4780	---	2000	---	2900	---	851	451	---	451	---	331
Total	138,200	57,800	69,200	70,700	76,500	83,800	38,460	23,140	25,090	28,450	11,910	10,250
Mean	4457	2065	2232	2355	2469	2793	1241	746	836	918	397	330
Max	4990	2800	2800	2400	2900	3300	1700	855	1900	1490	452	333
Min	1460	1060	1600	2000	2400	1300	850	450	450	451	329	329
Ac-ft	274,100	114,700	137,200	140,100	151,800	166,210	76,280	45,890	49,760	56,430	23,630	20,320

Note- October through December data provisional until approved by USGS

APPENDIX D

MEETING MINUTES OF THE PARTNERSHIP STEERING COMMITTEE

**Lower Mokelumne River, Joint Settlement Agreement
Annual Partnership Steering Committee Meeting
December 4, 2020
1:00 pm to 4:00 pm**

JSA Steering Committee Representatives: Kevin Thomas, CDFW; Dan Welsh, USFWS; Mike Tognolini, EBMUD; Erin Strange, NMFS

JSA Coordinating Committee Representatives: Colin Purdy, CDFW; J. D. Wikert, USFWS; Michelle Workman, EBMUD; Monica Gutierrez, NMFS

Meeting Agenda

1. Introductions	All	10
2. Water Supply Update	Chris Potter, EBMUD	15
3. 2020 Mokelumne Fisheries Review a) 2020 Outmigration and Escapement (and final 2019 escapement numbers) b) 2020 Redd Survey c) 2020 Habitat Restoration d) 2020 Management Actions e) Upcoming Year	Michelle Workman, EBMUD	20
4. 2020 MRFH Operations Summary a) 2020 Spawning b) Meeting Goals for enhancement and mitigation c) Planting Schedule and Netpen Budget	Michelle Workman, EBMUD, and CDFW	20
5. HGMP status update	ALL	10
6. 2021 Habitat Restoration Plans a) Prop 68 funds	Michelle Workman, EBMUD	10
7. AFRP Diversion Screens grant and Telemetry Funding	Denise Barnard	5
8. Update on JSA Partnership Fund and activities a) Fund balance b) 2020 Awarded Projects and progress	Jon Bauer, Fund	10

9. Lower Mokelumne Stewardship Group Update	Jon Bauer, Fund	5
10. Upper Mokelumne River Status	Workman	10
11. SWRCB Delta Water Quality Control Plan Update a) Voluntary Agreements Process b) Mokelumne Agreement Discussions c) Next Steps	All	10
12. USFWS Updates		5
13. NMFS Updates		5
14. Other Related Activities, updates, open forum. EBMUD a) WQCP b) San Joaquin Groundwater Banking (DREAM Project) c) Los Vaqueros Enlargement Any additional items from Partners a) USFWS b) CDFW c) NMFS	All	15
Meeting Adjournment		Total: 150

Minutes

1. Attendance:

- EBMUD: Michael Tognolini, Michelle Workman, Jose Setka, Denise Barnard, Chris Potter, Jon Bauer
- NMFS: Erin Strange, Monica Gutierrez
- USFWS: Dan Welsh, J.D. Wikert
- CDFW: Kevin Thomas, Colin Purdy, Jason Juliette, Morgan Kilgore

2. Water Supply Update - Chris Potter, EBMUD:

- Rainfall Year 2020 (July 2019–June 2020): Overall total precipitation volume 33.70", ~70% of average, but distribution was unusual. December 2019 precipitation well above average, but Jan/Feb one of lowest on record.
- Water Year 2020/runoff and carryover storage: final runoff quantity 420 TAF (average is 745 TAF). WY19 was wet, so started WY20 full, so even with drier conditions managed to have fair amount (576 TAF) of carryover storage on Sept 30 (630 TAF is average).
- DWR April 2020 Bulletin 120 forecast for total runoff was low, put us in **JSA Dry Year type for Apr–Sept 2020**.
- Cold Water Pool Management: Finished Oct well above 28 TAF target for Camanche hypolimnion volume. Typically see better outcome for Camanche temperatures during JSA Dry Year types, which was the case this year. Lake Camanche turnover was around second week of November.
- Good temperatures in lower Mokelumne River, maintained about 16 C through summer. Closed high level outlet early Oct, resulted in 1C drop in temps below Camanche. Saw temps around 15 C from that point through fall-run salmon spawning period.
- Currently in **Below Normal JSA year type for Oct–Mar 2021** period based on carryover storage on Sept 30. On Oct 1 began making JSA below normal releases from Camanche. For current water supply conditions, 3.54" precipitation or 38% of average precipitation through end of Nov, 0 precipitation in December to date. National Weather synopsis was that we're moving into La Niña winter, associated with drier conditions. This would be year 2 of dry year cycle.
- Snowpack: one storm in mid-Nov with snow, cooler temps in Nov. Beginning Dec at about average. Last year was pretty average year for snowpack, but did see earlier melt than usual.
- In East Bay, only 10% average precipitation. Mokelumne River has seen 38% average for season precipitation. Snow depth about average.
- Storage conditions: Pardee is at 109% average, 92% capacity; Camanche is 102% average, 62% capacity. Most likely we will be making JSA min releases through winter for below normal conditions, trying to recover storage.
- Water supply projects: This year likely to be median year close to overall average.
 - Projected to be at JSA min release rate until April, then will adjust based on DWR Bulletin 120 forecast.
- Flows below Woodbridge Irrigation District (WID) dam controlling for JSA targets in the April–October period.

3. 2020 Mokelumne Fisheries Review - Michelle Workman
 - a) 2020 Outmigration and Escapement (and final 2019 escapement numbers)
 - b) 2020 Redd Survey
 - c) 2020 Habitat Restoration
 - d) 2020 Management Actions
 - e) Upcoming Year

 4. 2020 MRFH Operations Summary - Michelle Workman
 - a) 2020 Spawning
 - b) Meeting Goals for enhancement and mitigation
 - c) Planting Schedule and Netpen Budget
- 2020 outmigrating juvenile salmon trapping (BY2019 fish).
 - 2019 escapement was 12,870.
 - Typical juvenile monitoring trapping operations include upstream and downstream trap. Upstream trap is just below spawning grounds near Elliot Road (rkm 87), estimates production in gravel. Downstream trap below Lake Lodi (Golf trap), estimates outmigration for the season. Most of fish pass upstream trap by end of April. Get more inter-annual variation in downstream trap, this past year over 50% passed in May and season was complete by end of June.
 - This year at upper trap abundance estimate was 215,000 (average for dry years is about 554,000). In 2019, we had record high number of fish observed in upstream trap, a lot of water that year, record number of adults in system and redds in the river.
 - Annual abundance estimate in lower trap in 2020 was around 24,099 (average for dry years is about 81,600).
 - High losses in system could be due to thiamine deficiency. Treated fish in hatchery, but no treatment for fish in river.
 - Historically, survival between traps ranges from about 60% to 8%, this year was at 11%.
 - Low survival was likely not related to flow or temperature. Flows were at JSA minimums, temperatures were pretty good. Rearing temperatures never went over 16C which is considered optimal for rearing.

 - Habitat restoration:
 - Project for 2020 completed end of August/beginning of Sept. Completed in Mokelumne River Day Use Area. This project consisted of expanding, and grading a tiered floodplain in the Mokelumne River Day Use Area that was created by EBMUD in 2016. This project added almost half an acre to the existing floodplain that will inundate at about 700 cfs. Excavated material was sorted into fines, gravel, and cobble and resulted in 675 yd³ of spawning gravel. This volume along with 140 yd³ of purchased material was used to build up an upstream riffle. The fines and large cobbles were used to fill in a tailing pit to create more rearing habitat.
 - Total project cost was \$68,000. AFRP restoration funding of ~\$10,000 and the rest funded by EBMUD. The AFRP grant is complete.

 - 2020 escapement:
 - Conducted four pulse flows in October. We used 2 TAF of Camanche Permit Extension (CPE) mitigation water. There was no adaptive management water from the spring, because

- juveniles were already stressed from thiamine deficiency so no request for AM water was made. We used an additional 2 TAF from Camanche storage to supplement CPE water. WID also operated water at Lake Lodi to provide three smaller pulses.
- The 2019 OCAP BioOp specified that DCC gates will close up to 5 days to protect pulses from Mokelumne River. Colin Purdy helped with coordination. The first pulse was not protected because USBR modeling showed potential water quality impacts in interior Delta, the last three pulses were protected. Shifted pulse start dates to could get maximum coverage from DCC closures.
 - Pulse patterns are typically coordinated pulse timing from the San Joaquin system to try to reduce straying to south. And with DCC closures trying to reduce straying to north.
 - This year's run has been later than usual. The first pulse saw some fish response, but not many fish in the system at that point yet. Could be due to continued dry conditions, no change in barometric pressure or other environmental cues to bring fish in. However, there were good ocean conditions, Mokelumne was heavily represented in ocean catches, but did not translate into river.
 - J.D.: Saw similar trend on Tuolumne, fish showed up in late November.
 - Summary of pulses since 2010: Wetter years have flood control water that can shape into pulses. In drier years we are able to use adaptive management to acquire water. Gainshare provision able to provide water when use supplemental supplies, available during last long-term drought and gave us substantial amount for pulses.
 - Current escapement is 3,250 as of about Dec 1. Cumulative passage has been slow and steady, no peaks or jumps. Typically the run is mostly over by the end of December.
 - During years with low numbers of fish in system, adapt hatchery operations to ensure mitigation and enhancement goals are reached. Hatchery gates have remained open, leaving fewer fish in river to spawn. Spawning in river will probably end up being below average, but good temperatures mean that those that do spawn in river will likely have good survival.
 - Results from 2019 run contribution to ocean harvest as presented in fish information in Feb/Mar 2020 - Mokelumne is a stand out for San Joaquin system. Mokelumne fish contributed 18–19% of commercial ocean harvest. Anecdotally, have heard that Mokelumne fish are second highest contributor to CWT returns in ocean harvest so far, looks like major contributor to ocean fishery again this year.
 - 2020 hatchery releases: all mitigation fish and portion of enhancement fish were released at Sherman Island net pens, marked at 25%. Remaining enhancement fish released at Fort Baker Half Moon Bay, Santa Cruz, and Monterey. Steelhead were released at Feist Ranch (couple miles downstream of Golf trap) and also at New Hope.
 - Hatchery has trapped around 2,800 salmon so far this year, and has about 4.5 million eggs in inventory. Aim to release 3.4 million juveniles for mitigation targets, another 3 million for enhancement.
 - DFW coordinated the import of ~2.8 million salmon eggs from Feather River Hatchery to support enhancement program. Will use Mokelumne broodstock first, then use Feather eggs if needed. Feather River Hatchery had surplus of eggs.
 - So far hatchery has trapped about 100 steelhead this season. Typically get steelhead in through Feb, will start spawning mid-December. Last couple years have been banner steelhead years.
 - Historically, steelhead program started with a large portion of imported eggs, program has been able to move away from that and meet mitigation targets with Mokelumne sourced eggs.

- Colin Purdy: Working out communication chain between agencies regarding DCC gate closures was new this year, but was a success. Discussed with USBR (Josh Israel) finalizing guidelines on future process. Decision for pulse flows remains in JSA realm, moves to USBR to coordinate DCC closures.
- Chris Potter: If conditions continue to be dry and temperatures in Camanche would support it, this group could consider adaptive management water this spring. Should go on agenda for MRTAC meeting at end of Jan/beg Feb. EBMUD Lodi staff mock up some suggested recommendations based on number of redds and emergence timing that would be supportable and non-impactful.
- Jose Setka: During past adaptive management coordination, had a stronger connection with SWRCB Executive Director than do now. Might behoove group to start communications with Executive Director earlier than have in the past, and to forward some examples of past strategies.

5. HGMP status update – Michelle Workman

This process has been in the works for decades. Last year CDFW entered into a contract with PSMFC to push the product forward, but changing staffing at EBMUD and CDFW has slowed the process down. A draft Plan exists. CDFW wants one last round of comments. EBMUD would like an informal NMFS review.

Colin Purdy: Likes the plan. The Feature River HGMP was reviewed– the Fisheries branch will want to do a state-level sufficiency review, then on to NMFS. Also, within CDFW Region 2 they are building out their scientific staff to help with HGMP development and implementation.

6. 2021 Habitat Restoration Plans – Michelle Workman

a) Prop 68 funds

- Prop 68 funding: granted \$450,000 in Prop 68 funding. Identified 3 projects: \$50,000 for annual gravel maintenance, \$100,000 for new gravel augmentation project to build new spawning habitat, \$300,000 for floodplain creation. Those 3 proposals submitted in group with other tributaries' proposals through DWR as one package. Entire package was funded, around 15 projects (including the 3 EBMUD projects). Money has to be spent by June 2024.
- Lodi staff working on floodplain creation project. Will consist of new floodplain adjacent to 2019 floodplain project, on the north side of the river, across from the Mokelumne river Day use Area. Area is covered in 4–8 feet of blackberries. Area has tailing spoils, lots of gravel, a lot of elevation changes. Going to be about 1.2 acres restored area, intended to inundate at ~700 cfs. Staff has been clearing blackberries to get accurate topo points.

7. AFRP Diversion Screens grant and Telemetry Funding - Denise Barnard

AFPR diversion screens:

- Cooperative Agreement Grant entered with USFWS in July 2018
 - Guaranteed \$160,000, and potentially more funds after that (though not specified)
- Report finalized and submitted in November 2019
 - Surveys covered from Camanche Dam (rkm 103) to rkm 46, near Thornton
 - Identified 57 active or unknown diversions
 - 49 unscreened
 - Prioritized diversion screening based on:
 - Diversion timing and magnitude
 - Physical characteristics of diversion
 - Outmigration timing and size of native anadromous fish near diversion
 - Top eight diversions prioritized for screening
- Landowner outreach initiated in January 2019
 - Several landowners expressed interest,
- RFP to screen 3 diversions released in April 2019
 - Was based on landowner interest , ended up being rank 3, rank 4, and one that was unranked in report
- Contract for construction entered with Intake Screens, Inc. in September 2019
 - In their schematics recommended 66" cone screen with wedgewire screen material and self-cleaning brush system
- Original timeline was that we we're going to screen one diversion per year, but our new plan is to get them done all at once this coming late summer/early fall
- Working on permitting and CEQA, preparing an NOE
- \$160,000 won't fully cover all 3 diversions, EBMUD going to contribute the rest from our FW capital funds if not provided by AFRP

Telemetry:

- May 2020, Lodi F&W received Board approval to implement acoustic telemetry studies researching outmigration survival of juvenile salmon starting in 2021
 - 3-year proposal leverages the current funding of \$85,000 per year for telemetry with an additional \$150,000 per year for purchase of tags and receivers. Total over \$700,000.
- Casey Del Real on our staff has become a member of the IEP ITAG group (Interagency Telemetry Advisory Group). Through coordination with that group decided to go with JSATS tags and Lotek receivers.
 - Lotek receivers are more reliable, but have reduced detection ranges.
 - They are slightly less expensive, and much less expensive to maintain over time due to significant differences in battery cost. All brands read the JSATS tags and so can be interchanged. EBMUD prefers the reliability of the Lotek Receivers, and because the Mokelumne River and Delta Forks are much smaller than other mainstem rivers, most sites accommodate the reduced detection range. To accommodate some of our wider river reaches, we will need to procure more Lotek receivers than we would ATS receivers to attain high quality data. This also maximizes our flexibility in receiver deployment.
- Currently working on project design and purchasing

- Have purchased 28 Lotek receivers, will be able to purchase around 1,240 tags to start off (waiting until the last minute to get max battery life)
 - Will use some tags for tag life study.
 - Will most likely use Hatchery fish for the study, specific tagging/release dates have not been set yet.
 - Considering 2 release locations, one just downstream of GOLF RST and one just upstream from Wimpy's Marina. Our hope is that by utilizing these release locations, we can supplement the upstream release groups with additional fish in order to calculate survival and entrainment downstream of our RSTs and also within the Central Delta (since we expect high rates of mortality)
- Colin Purdy: **Should coordinate to see if we can update Central Valley screen database.**
 - Colin Purdy: are you going to have receiver array outside of Mokelumne River? No, part of purpose in joining ITAG group is to coordinate with other agencies and leverage what's already out there. 28 receivers will just cover what we need in Mokelumne.
 - Dan Welsh: Is telemetry tied in with the diversion screening project? Not directly, other than both are intended to better understand or increase survival of outmigrating juvenile salmon.

8. Update on JSA Partnership Fund and activities – Jon Bauer
 - a) Fund balance
 - b) 2020 Awarded Projects and progress
 - The Partnership Fund balance available to future projects as of the end of September 2020 was about \$183K.
 - In 2020, one project was completed – the Lodi Education Legacy 2019-2020 project. It was somewhat hampered at the end by COVID related closures but still managed to get the deliverables accomplished.
 - In 2020, two projects were awarded:
 - Cramer Life Sciences, *Mokelumne River Salmon Lifecycle Models: Using long-term data to measure management action effects on Joint Settlement Agreement Goals*, \$89,316. Originally intended to conclude in December 2020, has been extended through June 2021.
 - City of Lodi, *2020-21 Watershed Education Legacy Project*, \$7,040.
 - Interest on the Partnership Fund has dropped from about \$50K per year to \$20K per year for the past six month period.

9. Lower Mokelumne Stewardship Group Update – Jon Bauer
 - Support for SJ County Public Works / Eastern San Joaquin Groundwater Authority – California Department of Conservation 2020 Sustainable Groundwater Management Watershed Coordinator Program Grants grant application. \$300,000;
 - Support for North San Joaquin Water Conservation District for the federal Water Smart up to \$3 million grant- “South System Groundwater Recharge Project”;
 - Updating twenty year old LMR Stewardship Plan to include a groundwater element;
 - Work in Progress- updating SJRCD website with information that is more relevant, like the Sonoma County RJC webpage;
 - CIBA- California Indian Basketweavers Association- reconnected California Indian Basketweavers to white sedge gathering beds at Lodi Lake Park along the Mokelumne River on October 10, 2020. The gathering day was video recorded and a video is being produced. Future gathering days will continue;
 - Monthly LMRWSC meetings allow communication between landowners, League of Women Voters- SJC- representative, county and city agencies, growers, which has benefited most especially SJC-PW, whose task for SGMA is to connect with actual watershed stakeholders. Only since July has the SJC Water Resources Manager been attending these meeting.

10. Upper Mokelumne River Status – Michelle Workman

Since 2013, a Stakeholder's group has been developing a process for short-term solutions to move salmonids into the upper Mokelumne watershed. A pilot project was proposed. A habitat assessment for habitat availability was completed. CDFW has authority over fish passage programs. The primary non-starter on moving this forward is fish pathology – CDFW is concerned about introducing pathogens upstream and into Pardee reservoir because of the potential risk to the hatchery program below Camanche. The stakeholder's group agreed that the project should be shelved for now until new technology is available to address the pathogen risk. Okay to remove from future PSC agendas.

11. SWRCB Delta Water Quality Control Plan Update – Jose Setka and Mike Tognolini

- a) Voluntary Agreements Process
- b) Mokelumne Agreement Discussions
- c) Next Steps

- Jose: we've been working on developing a VA that is an alternative to SWRCB unimpaired flow approach. The h Voluntary Agreements process includes Mokelumne River Stakeholders (includes EBMUD, North San Joaquin Water Conservation District, Amador Water Agency, Calaveras Water Agency). Started activities in 2017. Process morphed in February of this year when the Secretaries of Cal EPA and CNRA released their 2020 framework. Mokelumne stakeholders didn't get details until summer, the ask was different than our proposal. Included significant increase in funding, different perspective in flows. Our original proposal was designed to be integrated with habitat improvements, covered increases in minimum releases, blocks of water targeted at inundating floodplain habitat and in-river habitat at targeted times of years to benefit juvenile life history stages for salmonids. There is interest on the state team side to see more measureable Delta outflow and in measuring contributions from each system. Key challenges from EBMUD perspective are overcoming temperature constraints, water supply for downstream users, and risk to water supply. However, negotiations have been positive related to non-flow measures (e.g., habitat enhancement, research, hatchery improvements and practices). Team is optimistic that can get to some kind of consensus agreement.
- Mike: Regarding non-flow measures, funding is projected to be split half between state and Mokelumne stakeholders. Another consideration is importance of governance. Would like decision making for Mokelumne River assets to remain with PSC.
 - Only a few tributaries currently have active negotiations with the state. Since we're not a CVP/SWP tributary, we're not involved in BioOp or ITP litigation, so we have opportunity to continue negotiations that others don't.

12. USFWS Updates – Dan Welsh

- Dan Castleberry has retired as Assistant Regional Director for Fish and Aquatic Conservation. Kaylee Allen, Field Supervisor for USFWS Bay-Delta Office, selected as replacement, starts Jan 4.
- Assistant Regional Director of Ecological Services Mike Fris has moved to fill vacancy in Sacramento field office starting Jan 4.
- J.D.: Lodi AFRP still down to two habitat restoration coordinators. No anticipated changes moving forward, still awaiting 2020 project funding.

13. NMFS Updates - Erin Strange

Assistant Regional Administrator Maria Ray went into partial retirement starting in March this year, replaced by Cathy Marcinkevage. She may want to join these meetings in future, she would like to **go on a tour once that is possible (likewise for Kaylee Allen)**.

CDFW Updates - Colin Purdy

- Regional Program Manager over permitting unit Habitat Conversation Program has moved to Habitat Conservation and Planning Branch as Branch Chief. Kelly Barker will now be Program Manager over CEQA, CESA, and LSA program. Other new Program Manager, Jennifer Garcia. covers timber, cannabis, and water/FERC,
- Fisheries Branch: Fish Passage Coordinator retired, in process of hiring position. Vanessa Guston hired under Jonathan Nelson in Anadromous Fisheries Branch, filling out CWT analysis abilities to help with analysis of special releases for enhancement program from hatcheries around Central Valley.
- CDFW completed fishing regulation/simplification process, geared towards trout waters up in Sierras. As part of effort to promote fishing across the state standardizing and simplifying fishing regulations across large geographic areas to make easier to interpret and enforce. This coming year trying to make pivot to similar process for Central Valley, will take years to get through
- Looking at finalizing data for final cohort of barging studies on Feather and Mokelumne rivers. Working on putting together completed report summarizing effort for both studies, should see report in in 2021.

14. Other Related Activities, updates, open forum.

EBMUD – Mike Tognolini

- a) WQCP
 - b) San Joaquin Groundwater Banking (DREAM Project)
 - c) Los Vaqueros Enlargement
- EBMUD has ongoing program to diversity water supply portfolio for resilience in face of climate change, regulatory pressures, and increasing water demands within watershed. This program led to Freeport regional Water Project, but continuing to look at ways to diversify water supply. Two storage efforts underway, very different stages.
 - San Joaquin Groundwater Banking (Demonstration Recharge Extraction and Aquifer Management [DREAM] Project): Pilot groundwater banking project at a single well. Will divert 1,000 AF from river in wet years and deliver to agricultural customers in North San Joaquin Water Conservation District service area. In exchange, EBMUD will get half back as credit in groundwater basin (500AF). In process of constructing necessary facilities. This is a small-scale project intended to act as pilot for potential larger groundwater storage projects. Project has been in the works for decades. Project is completely within North San Joaquin Water Conservation District, diversion is in their South System on Mokelumne River. The facilities being built connect to a single grower's well in south part of system, which then make connection to Mokelumne Aqueduct.
 - Los Vaqueros Enlargement: Another project to take water in wet years and store for dry years. In Brentwood area. Reservoir owned and operated by Contra Costa Water District. Looking at expansion and including regional partners. Project is in planning stages, early stages of design. Potential funding from Prop 1 and perhaps federal WIIN funds. EBMUD will make decision over next couple years whether will participate as official partner. Potential expanded storage capacity is 275TAF, EBMUD would receive 30TAF.
- EBMUD has CVP contract to move supplemental water through Freeport. Any potential dry year supplemental supply operations would result in potential 20% gainshare water for use on Mokelumne as part of JSA formula.
- EBMUD new General Manager, Clifford Chan, started in June.
 - Jose Setka: Mokelumne enhancement fish were discussed as part of Golden State Salmon Association Richmond net pens. Looking into it, that program/idea is going through different tracks. If you have questions or want to discuss Jose or Michelle. EBMUD is not in control of project messaging.

Meeting Adjourned

Next Year in Rancho Cordova!!!

APPENDIX E

CORRESPONDENCE RELATED TO FALL 2020 ATTRACTION FLOW

From: [Purdy, Colin@Wildlife](mailto:Purdy_Colin@Wildlife)
To: [Workman, Michelle](mailto:Workman_Michelle); john_wikert@fws.gov; monica.gutierrez@noaa.gov
Cc: [Barnard, Denise](mailto:Barnard_Denise); [Del Real, Casey](mailto:Del_Real_Casey)
Subject: RE: PCC pulse plan for Mokelumne River
Date: Thursday, September 24, 2020 5:18:42 PM
Attachments: [image001.png](#)
[image002.png](#)

CAUTION – This email came from outside of EBMUD. Do not open attachments or click on links in suspicious emails.

Thank you for accommodating the change in date range for the ramping rate. I support the pulse flow proposal.

Colin Purdy, M.S.
Environmental Program Manager - Fisheries
CA Department of Fish and Wildlife, North Central Region
1701 Nimbus Rd., Rancho Cordova, CA 95670
Office (916) 358-2943 | Cell (916) 704-2154 | Fax (916) 358-2912
Colin.Purdy@wildlife.ca.gov



*** Due to COVID-19 response, I will be teleworking until further notice. Cell phone and email are the best ways to reach me during this time. ***

From: Workman, Michelle <michelle.workman@ebmud.com>
Sent: Thursday, September 24, 2020 4:53 PM
To: Purdy, Colin@Wildlife <Colin.Purdy@wildlife.ca.gov>; john_wikert@fws.gov;
monica.gutierrez@noaa.gov
Cc: Barnard, Denise <denise.barnard@ebmud.com>; Del Real, Casey <casey.delreal@ebmud.com>
Subject: RE: PCC pulse plan for Mokelumne River

Warning: This email originated from outside of CDFW and should be treated with extra caution.

Absolutely. Thanks Colin. If everyone agrees, let me know.

Ps – Colin – sorry I didn't respond to your call. I just got out of a meeting, and want to respect the end of day and not disturb you further.

Michelle

From: Purdy, Colin@Wildlife [<mailto:Colin.Purdy@wildlife.ca.gov>]
Sent: Thursday, September 24, 2020 3:46 PM
To: Workman, Michelle; john_wikert@fws.gov; monica.gutierrez@noaa.gov
Cc: Barnard, Denise; Del Real, Casey
Subject: RE: PCC pulse plan for Mokelumne River

CAUTION – This email came from outside of EBMUD. Do not open attachments or click on links in suspicious emails.

Does this language give you the flexibility you're looking for? Eliminate 50 cfs ramping rate requirement from October 5 through **November 30, 2020** ~~December 31, 2020~~.

Colin Purdy, M.S.
Environmental Program Manager - Fisheries
CA Department of Fish and Wildlife, North Central Region
1701 Nimbus Rd., Rancho Cordova, CA 95670
Office (916) 358-2943 | Cell (916) 704-2154 | Fax (916) 358-2912
Colin.Purdy@wildlife.ca.gov



*** Due to COVID-19 response, I will be teleworking until further notice. Cell phone and email are the best ways to reach me during this time. ***

From: Workman, Michelle <michelle.workman@ebmud.com>
Sent: Thursday, September 24, 2020 3:27 PM
To: Purdy, Colin@Wildlife <Colin.Purdy@wildlife.ca.gov>; john_wikert@fws.gov;
monica.gutierrez@noaa.gov
Cc: Barnard, Denise <denise.barnard@ebmud.com>; Del Real, Casey <casey.delreal@ebmud.com>
Subject: RE: PCC pulse plan for Mokelumne River

Warning: This email originated from outside of CDFW and should be treated with extra caution.

Colin,

The reason I extended the time period on the ramping rates, is because if we end up having a wet

fall, and have excess water to release, we could potentially reshape in November. But, we could always agree to relaxing ramping rates in October, and re-evaluating any decisions for November if that gives you more comfort.

Michelle

From: Purdy, Colin@Wildlife [<mailto:Colin.Purdy@wildlife.ca.gov>]
Sent: Thursday, September 24, 2020 2:42 PM
To: Workman, Michelle; john_wikert@fws.gov; monica.gutierrez@noaa.gov
Cc: Barnard, Denise; Del Real, Casey
Subject: RE: PCC pulse plan for Mokelumne River

CAUTION – This email came from outside of EBMUD. Do not open attachments or click on links in suspicious emails.

Hi Michelle,

Quick question. Since the pulse flows are only schedule do go through October with some possible additions from WID in November, do we need to eliminate the ramping rate requirement through December 31, 2020? Is the end of November alright?

Thanks,

Colin Purdy, M.S.
Environmental Program Manager - Fisheries
CA Department of Fish and Wildlife, North Central Region
1701 Nimbus Rd., Rancho Cordova, CA 95670
Office (916) 358-2943 | Cell (916) 704-2154 | Fax (916) 358-2912
Colin.Purdy@wildlife.ca.gov



*** Due to COVID-19 response, I will be teleworking until further notice. Cell phone and email are the best ways to reach me during this time. ***

From: Workman, Michelle <michelle.workman@ebmud.com>
Sent: Thursday, September 24, 2020 2:27 PM
To: Purdy, Colin@Wildlife <Colin.Purdy@wildlife.ca.gov>; john_wikert@fws.gov;
monica.gutierrez@noaa.gov
Cc: Barnard, Denise <denise.barnard@ebmud.com>; Del Real, Casey <casey.delreal@ebmud.com>
Subject: PCC pulse plan for Mokelumne River

Warning: This email originated from outside of CDFW and should be treated with extra caution.

PCC Partners,

At our August 11 MRTAC meeting, we proposed a pulse pattern using 2,000 af, and gained verbal concurrence from representatives at that time to relax our ramping rate restrictions to allow for maximizing the number and magnitude of pulses. Between the MRTAC and our LMR Partnership Coordinating Committee meeting on Wednesday September 23, we were able to double the amount of available water, and discussed in detail the various options related to fall pulse flows and keeping in mind hypolimnion conditions, San Joaquin tributary pulse timing, and Delta Cross Channel Gate operations. Collectively we agreed on the following:

1. Eliminate 50 cfs ramping rate requirement from October 5 through December 31, 2020. Due to limited water amounts and reduced pulse magnitudes the elimination of the ramping rate will maximize the effectiveness of the water available. Moreover, the shortened pulse flow periods will not allow for any spawning activity in areas that are temporarily submerged. All projected releases will be contained in the channel, and no juvenile salmonids in river in the fall, so no risk to stranding of fish species is assumed.
2. A four pulse pattern, with reduced magnitudes was preferred over a 3 pulse plan with higher magnitudes, in order to provide pulses in the peak migration period of October. We have confirmation from WID to support these pulses with reoperation of Camanche Releases through their dam.
3. Shift the highest magnitude pulse from the first position, to the second position, to better compete with San Joaquin Tributary pulses.

If you agree, please respond to this email with your approval of the current plan, knowing if plans need to change for some reason, we will circle back with you all. Also, please provide any additional comments you may have and feel free to call me with any questions.

Michelle Workman

Manager of Fisheries and Wildlife

East Bay Municipal Utility District

ph: 209-263-6350 cell: 209-256-4987

michelle.workman@ebmud.com

Stewardship ~ Integrity ~ Respect ~ Teamwork



From: [Monica Gutierrez - NOAA Federal](#)
To: [Workman, Michelle](#)
Cc: colin.purdy@wildlife.ca.gov; john.wikert@fws.gov; [Barnard, Denise](#); [Del Real, Casey](#)
Subject: Re: PCC pulse plan for Mokelumne River
Date: Thursday, September 24, 2020 4:54:26 PM
Attachments: [image001.png](#)

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Thanks Michelle, I don't have anything else to add. Looks good to me with the four pulses.

On Thu, Sep 24, 2020 at 2:28 PM Workman, Michelle <michelle.workman@ebmud.com> wrote:

PCC Partners,

At our August 11 MRTAC meeting, we proposed a pulse pattern using 2,000 af, and gained verbal concurrence from representatives at that time to relax our ramping rate restrictions to allow for maximizing the number and magnitude of pulses. Between the MRTAC and our LMR Partnership Coordinating Committee meeting on Wednesday September 23, we were able to double the amount of available water, and discussed in detail the various options related to fall pulse flows and keeping in mind hypolimnion conditions, San Joaquin tributary pulse timing, and Delta Cross Channel Gate operations. Collectively we agreed on the following:

1. Eliminate 50 cfs ramping rate requirement from October 5 through December 31, 2020. Due to limited water amounts and reduced pulse magnitudes the elimination of the ramping rate will maximize the effectiveness of the water available. Moreover, the shortened pulse flow periods will not allow for any spawning activity in areas that are temporarily submerged. All projected releases will be contained in the channel, and no juvenile salmonids in river in the fall, so no risk to stranding of fish species is assumed.
2. A four pulse pattern, with reduced magnitudes was preferred over a 3 pulse plan with higher magnitudes, in order to provide pulses in the peak migration period of October. We have confirmation from WID to support these pulses with reoperation of Camanche Releases through their dam.
3. Shift the highest magnitude pulse from the first position, to the second position, to better compete with San Joaquin Tributary pulses.

If you agree, please respond to this email with your approval of the current plan, knowing if plans need to change for some reason, we will circle back with you all. Also, please provide any additional comments you may have and feel free to call me with any questions.

Michelle Workman

Manager of Fisheries and Wildlife

East Bay Municipal Utility District

ph: 209-263-6350 cell: 209-256-4987

michelle.workman@ebmud.com

Stewardship ~ Integrity ~ Respect ~ Teamwork



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Monica Gutierrez | Fisheries Biologist

[San Joaquin River Branch](#)

[California Central Valley](#)

[NOAA Fisheries](#) | [West Coast Region](#)

U.S. Department of Commerce

650 Capitol Mall, Suite 5-100, Sacramento, CA 95814

916-930-3657 (Office) | 916-201-3259 (Cell)

Monica.Gutierrez@noaa.gov



During the COVID-19 pandemic, I am on mandatory telework. I may be working flexible hours to balance family and personal needs. I appreciate your patience if my response time is delayed. If you have a request, please specify important time frames or deadlines. I will do my best to respond accordingly. Because I have limited ability to retrieve mail, please send any formal correspondence that would normally be sent through the physical mail to ccvo.consultationrequests@noaa.gov. Thank you.

From: [Wikert, John](#)
To: [Workman, Michelle](#); colin.purdy@wildlife.ca.gov; monica.gutierrez@noaa.gov
Cc: [Barnard, Denise](#); [Del Real, Casey](#)
Subject: Re: [EXTERNAL] PCC pulse plan for Mokelumne River
Date: Thursday, September 24, 2020 2:53:50 PM
Attachments: [image001.png](#)

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Works for me. Thanks Michelle.

J.D. Wikert

U.S. Fish & Wildlife Service
Anadromous Fish Restoration Program
850 S. Guild Avenue, Suite 105,
Lodi , CA 95240
(209) 403-1046 - Cellular
email: john_wikert@fws.gov
Stanislaus River Salmon Festival: <https://www.facebook.com/SRSFest>

Please stay safe during the pandemic.

NYT CA Covid Numbers: <https://www.nytimes.com/interactive/2020/us/california-coronavirus-cases.html>

From: Workman, Michelle <michelle.workman@ebmud.com>
Sent: Thursday, September 24, 2020 2:26 PM
To: colin.purdy@wildlife.ca.gov <colin.purdy@wildlife.ca.gov>; Wikert, John <john_wikert@fws.gov>; monica.gutierrez@noaa.gov <monica.gutierrez@noaa.gov>
Cc: Barnard, Denise <denise.barnard@ebmud.com>; Del Real, Casey <casey.delreal@ebmud.com>
Subject: [EXTERNAL] PCC pulse plan for Mokelumne River

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