Assessment of CVP and SWP Delta Operations on Green Sturgeon

June 22, 2026

Executive Summary

On June 13, the cumulative salvage of 15 Green Sturgeon exceeded the incidental take statement in the 2024 NMFS Biological Opinion of 14 fish per water year. Juvenile Green Sturgeon are typically in the Delta year-round and salvaged at low levels.

Juvenile production appears to be higher than other recent years. The zone of influence from export pumping is currently small. Juvenile Green Sturgeon are likely to move volitionally; therefore, exports are unlikely to affect migratory behaviors. Salvage effects are non-lethal and fish are released.

Detections of Green Sturgeon in salvage are potentially due to higher juvenile production and hypothesized environmental conditions affecting migration behavior. No information suggests salvage poses additional risks to the population than considered in the 2025 Record of Decision.

Operational and Regulatory Conditions

Green Sturgeon annual cumulative salvage exceeded both the annual (14 individuals) and 3-year rolling average (5 individuals) Incidental Take Limit set by the 2024 NMFS Biological Opinion (BiOp) on June 13 with the salvage of 15 individuals. The cumulative salvage ITL threshold resets on September 30, 2026.

Biology Distribution and Evaluation of Green Sturgeon

Delta Life Stages

Juvenile/Adult/Subadult

Historic Information

Subadult/Adult: Most abundant during spring spawning migration period of March through May, and post spawning out-migration periods May through June (early outmigrants) or September through January (late outmigrants) depending on interannual flow conditions in the spring and winter. Adults are present year-round to a lesser extent in the Delta, but mainly in San Pablo Bay. In 2021, the adult abundance estimate was 13,161 (Dudley et al 2021 in NMFS 2021).

Juvenile: Age-1 through Age-3 juveniles are present year-round and widely distributed, with more frequent detections in the Delta. This life stage is migrating, sheltering, foraging, and rearing in the Delta with greater detection in the winter and spring than in the summer and fall (Miller et al. 2020). Juveniles tagged with acoustic tags in the Sacramento River near

Sherman Island were detected as far upstream as the Cache Slough complex, in the San Joaquin River at the Antioch Bridge, and in Threemile, Horseshoe Bend, and Montezuma Sloughs (CDFW 2021). Seasonal abundance at the study's primary sampling site (near Sherman Island) appears to be highest during summer based on capture and telemetry data. Residence time at the primary sampling site for individual fish ranges from one day to over one year but telemetry data show outmigration from the primary sampling site to the Pacific Ocean ranges from 27 to 552 days. In 2021, the juvenile abundance estimate was 4,387 (Dudley et al 2021 in NMFS 2021). Juvenile Green Sturgeon develop osmoregulatory capacity by 1.5 years (~750mm, Allen and Cech 2007) and are hypothesized to migrate into estuarine conditions to maintain optimal growth.

Salvage: Salvage events have historically been infrequent (**Figure 1**). Since 2008, juvenile salvage has occurred only in 2016, 2017, 2020, 2024, and 2025 with recent salvage events occurring in the summer.

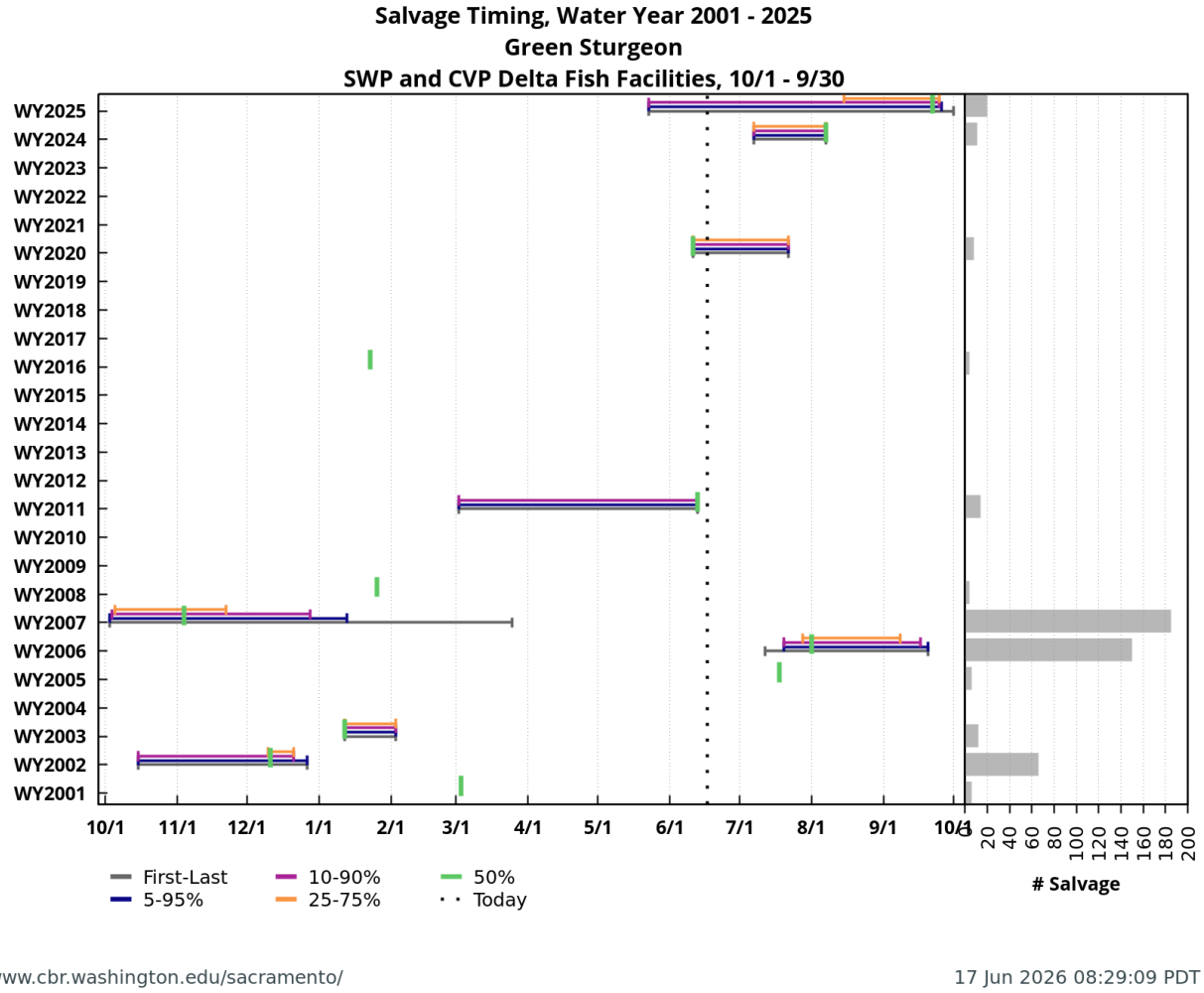


Figure 1. Historical salvage timing, Water Years 2001-2025. Source: SacPAS Salvage Timing Query (https://www.cbr.washington.edu/sacramento/data/query_salvage_hrt.html).

Current Information

As of June 13, 2025, 2 Green Sturgeon were salvaged at the CVP and 4 were salvaged at the SWP facilities. This results in a WY2026 cumulative expanded salvage of 15 fish (annual expanded salvage threshold = 14 fish). Fish were salvaged between 11/12/2025 and 06/13/2026. Size of the fish range from 347-600 mm with back-calculated ages based on Von Bertalanffy growth curves developed in Farr et al. (2002) for Oregon Green Sturgeon ranging from Age 1 to Age 2.

Other recent Green Sturgeon catch includes:

CDFW Juvenile Sturgeon monitoring and tagging (Marc Beccio, pers. comm.):

- 2 tagged juvenile Green Surgeon in Grizzly Bay for 2026. CPUE is expected to be at its highest mid-July through mid-October

CDFW Bay Study (Kenji Soto, pers. Comm.):

- 7/1/2025 Green Sturgeon at Station 736 (Sacramento River near Sherman Island) – 423mm TL
- 7/15/2025 Green Sturgeon at Station 106 (San Francisco Bay) – 767mm TL
- 8/11/2025 Green Sturgeon at Station 431 (Suisun Bay) – 417mm TL
- 9/3/2025 Green Sturgeon at Station 431 (Suisun Bay) – 591mm TL (Wanded, no PIT Tag)
- 3/3/2026 Green Sturgeon at Station 752 (Lower Sacramento River – North End of Decker Island) – 193mm TL. Likely to be a young-of-the-year.
- All released alive

USFWS Rotary Screw Trap Monitoring (Bill Poytress, pers. comm.):

- Larval Green Sturgeon were being caught daily in increasing numbers along juvenile size class sturgeon during periods of 06/01/2026-06/09/2026.

Table 1. Historical Green Sturgeon Catch and CPUV

Water Year	Salvage Facility Catch	Expanded Salvage	CDFW Bay Study Captures	USFWS Red Bluff Green Sturgeon RST CPUV (fish/ac-ft)
2010	0	0	2	n/a
2011	0	0	0	n/a
2012	0	0	0	n/a
2013	0	0	3	2.86
2014	0	0	4	2.98
2015	0	0	1	3.25

2016	1	4	0	30.35
2017	1	4	1	29.79
2018	0	0	2	0.41
2019	0	0	1	22.19
2020	2	8	0	1.58
2021	0	0	0	12.32
2022	0	0	1	0.02
2023	0	0	0	37.05
2024	3	11	3	9.10
2025	7	20	4	2.88
2026	5	15	n/a	8.71 (through 6/10/2026)

Evaluation

At current operations is salvage of Green Sturgeon likely to continue?

Possibly, based on historical salvage data (Figure 1), salvage has occurred through summer and fall months. Juvenile and subadult Green Sturgeon are observed in the Delta and Bay in the Fall, though usually in low abundance (Miller et al. 2020, Figure A1). Limited detections occurred this this winter and spring.

Will continued salvage of Green Sturgeon have population level effects?

With limited recent juvenile or adult abundance data, there is high uncertainty regarding the magnitude of Green Sturgeon salvage and if there is significant associated mortality. However, based on historical salvage levels, periodicity patterns, and lack of mortality observed in 2026 so far, continued salvage on Green Sturgeon is unlikely to have a population level effect. Similar levels of salvage observed between 2016-2020 (annual salvage= 0 to 8 fish) were considered a low threat in the most recent 5-year status review (NMFS 2021) compared to the period prior to 2009, when annual salvage ranged from 0 to less than 200 fishes.

All sturgeon salvaged in 2026 were successfully released alive in the Delta. Laboratory studies by Steel et al. (2022) demonstrated that fish guidance through louvers similar to those utilized in salvage facilities was varied for sturgeon less than 120 mm (43%-99%), much higher (99%) for sturgeon exceeding 120 mm in length, and 100% for sturgeon greater than 280 mm. Furthermore, research by Baird et al. (2019) indicates that Green Sturgeon larger than 200 mm face minimal predation risk from common predators such as Striped Bass and Largemouth Bass present adjacent to salvage facilities. Given that sturgeon salvaged were greater than 280 mm,

these findings collectively suggest that unobserved take of Sturgeon over the same salvage period did not occur.

Is increased facility entrainment in WY 2026 a result of delta hydrodynamics due to delta operations or increased population size of Green Sturgeon due to ongoing recovery?

Favorable spring hydrologic conditions during Above Normal (AN) and Wet (W) water years in 2023, 2024, and 2025 may have promoted increased survival rates for early life stages in these years, contributing to increased juvenile Green Sturgeon presence in the Delta. Dudley et al (2026) noted that there is an increasing number of spawners with a larger line occurring every 4-year cycle (e.g. BY2026, BY2022, etc.), which could suggest greater spawner abundance around the dominant year (e.g. on the shoulders of these brood years). Annual Red Bluff Green Sturgeon CPUV since 2023 has included the highest recorded estimate in 26 years of monitoring (Poythress & McCraney 2025; Table 1), with 4,290 larvae and 26 juveniles caught and continued larval recruitment in the past few years. The fish salvaged this year were likely 1+ and 2-year-old fish hatched during these favorable spring hydrological conditions.

The presence of Green Sturgeon salvage over the past week may have been influenced by different environmental attributes affecting movement behavior. For instance, hydrodynamic conditions during the last two weeks have had smaller zones of influence than typically observed during the summer when green sturgeon salvage occurs. Over the 7-day period from June 08 through June 15, 2026, which encompasses the majority of WY 2026 salvage, mean flows at Sacramento River at Freeport and San Joaquin River at Vernalis were 12,342 cfs, 1,555 cfs, respectively. On 6/16, daily exports were 923 cfs for Jones Pumping Plant and 271 cfs for Harvey O. Banks Pumping Plant. Ranges for the daily, 5-day, and 14-day average OMRI from June 08 to June 15, were –3,305 to –1661, -3,684 to –2,839, and –3,044 to –3,400 cfs, respectively. Based on the real-time hydrodynamic modeling from June 1 and June 8 (Figure A3), the zone of influence extends through the Old and Middle River corridor only as far north as Victoria Cut. An environmental attribute which could affect behavior is temperature. Temperatures have increased over the last two weeks in the South Delta (Figure A4), and this is hypothesized to potentially affect juvenile green sturgeon distribution and residence time in freshwater (Heublein et al 2017).

Appendix.

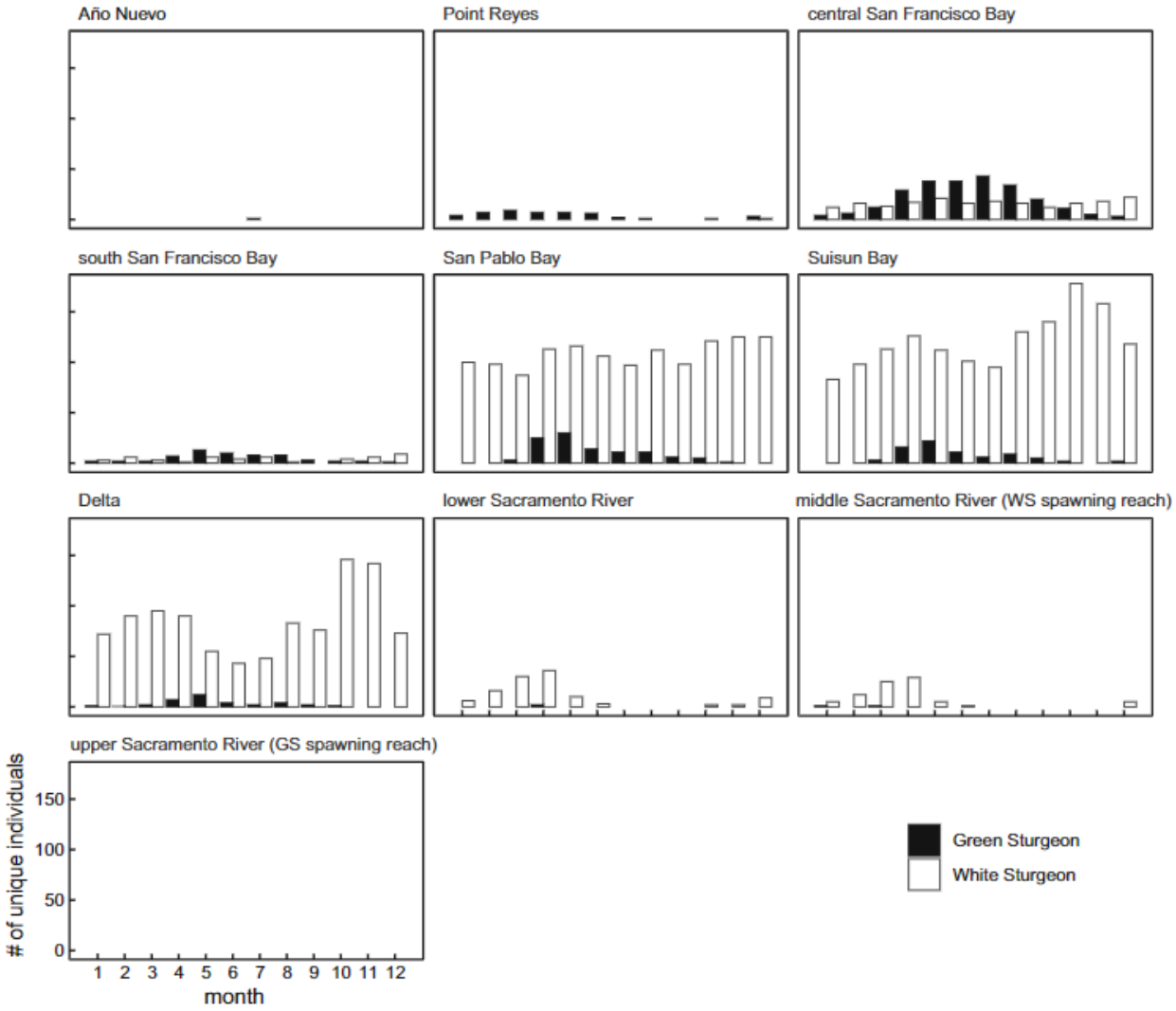


Figure A1. Subadult Green Sturgeon Presence Across all Months by River Reach (Source: Miller et al. 2020)

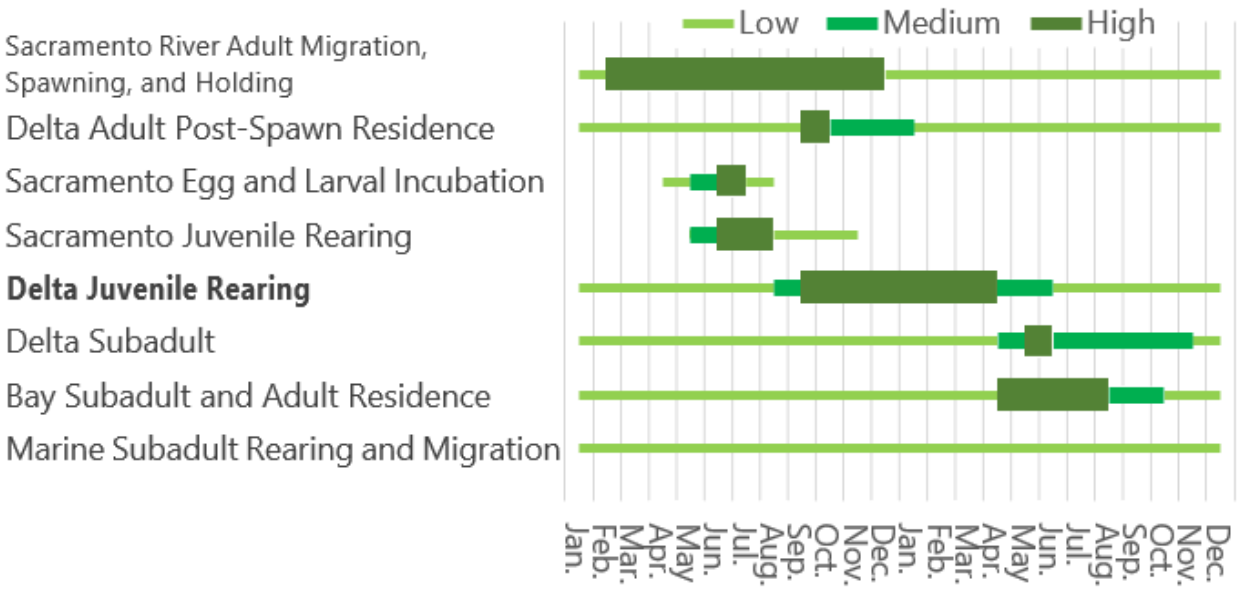


Figure A2. Temporal Life Stage Domains for Green Sturgeon (Figure D-8 from LTO EIS Appendix AB-D)

Table A1. Downriver Adult Migration Timing Based on Early and Late Groups Identified in Telemetry Analysis (Table C-125 of LTO EIS Appendix AB-C)

	Early Downriver				Late Downriver			
Year	Count	First Date	Mean Date	Last Date	Count	First Date	Mean Date	Last Date
2007	1	Aug 17	–	–	3	Dec 7	Dec 18	Jan 6
2008	0	–	–	–	–	–	–	–
2009	0	–	–	–	3	Oct 14	Nov 16	Jan 14
2010	0	–	–	–	3	Dec 7	Dec 9	Dec 11
2011	1	Jun 28	–	–	1	Jan 23	–	–
2012	10	May 24	Jun 14	Jul 24	7	Nov 21	Nov 25	Dec 2
2013	3	Jul 1	Jul 7	Jul 12	10	Dec 15	Feb 5	Feb 14
2014	3	May 22	Jun 11	Jul 26	10	Dec 1	Dec 4	Dec 6
2015	4	May 20	Jun 23	Jul 26	16	Oct 15	Dec 14	Jan 9
2016	9	Apr 15	May 21	Jul 7	17	Sep 22	Nov 13	Dec 12
2017	6	May 18	Jun 9	Jul 7	10	Nov 22	Jan 14	Mar 24

Source: Colborne pers. comm.

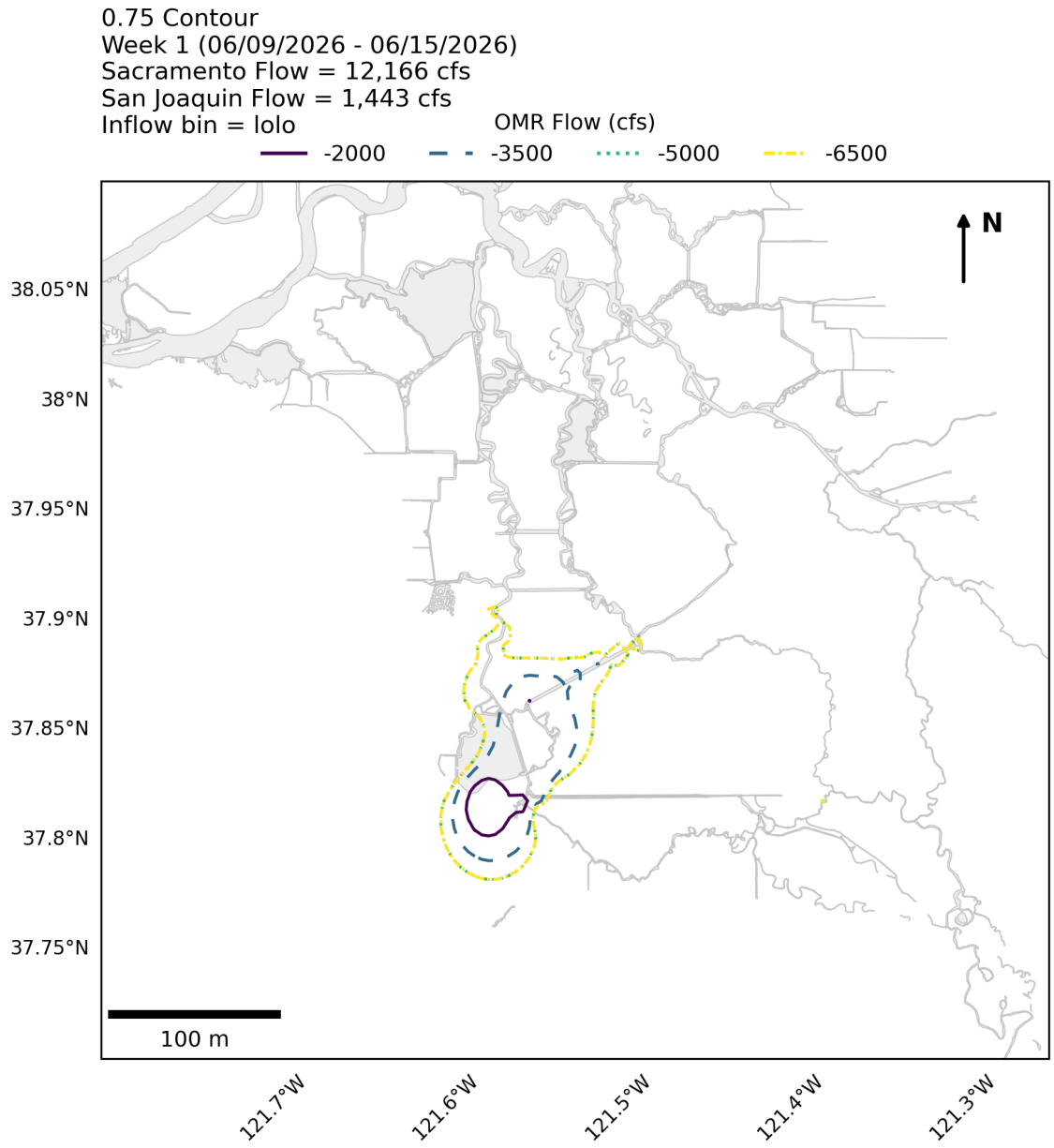


Figure A3. Contour maps delineating Delta Export Zone of Influence under varying inflows and OMR (Source Stantec 2026).

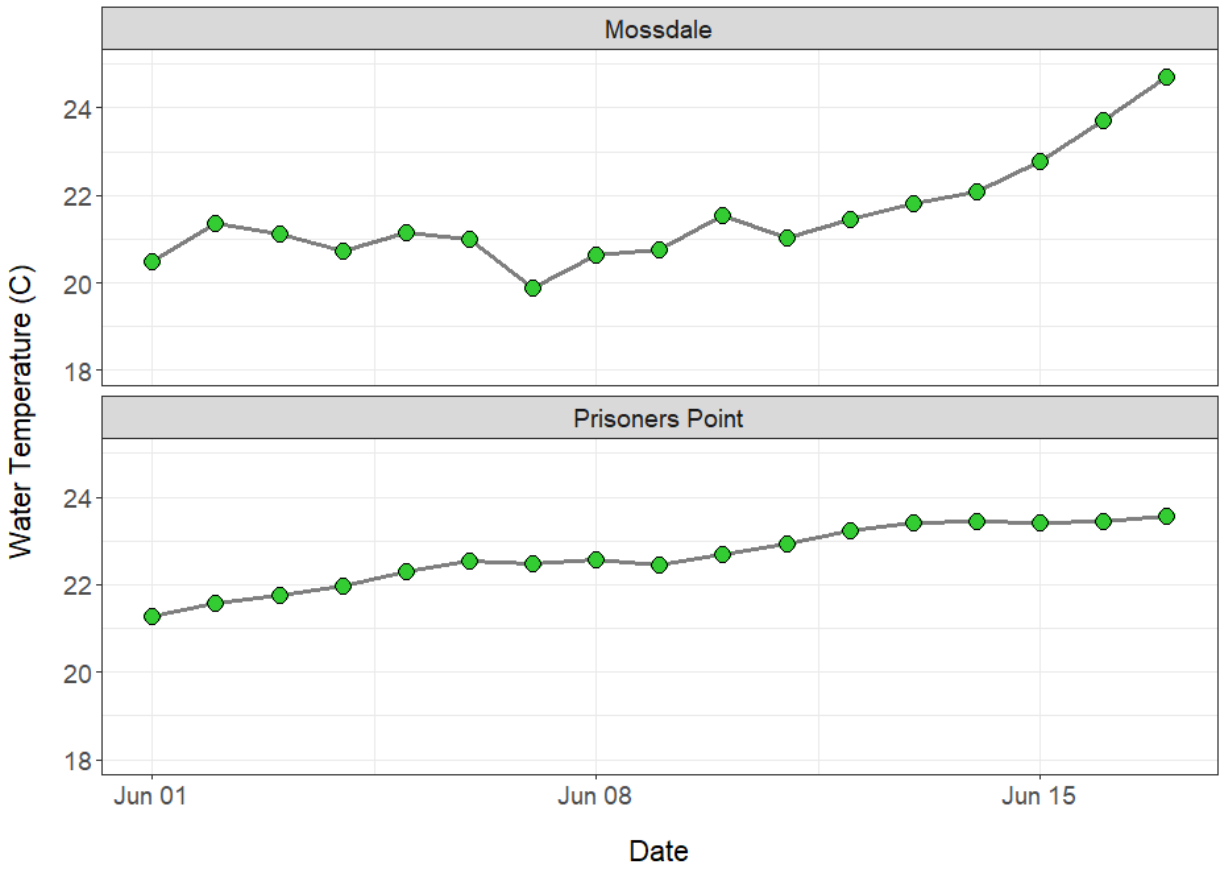


Figure A4. Daily water temperatures (°C) at Mossdale and Prisoners Point in the Sacramento-San Joaquin Delta, June 1-16, 2026.

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