State of California
Department of Fish and Wildlife

Memorandum

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To: Nick Bauer
Senior Environmental Scientist; Supervisor

Department of Fish and Wildlife
North Central Region
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

From: Marc Beccio; Environmental Scientist
Department of Fish and Wildlife
1701 Nimbus Road, Suite A
Rancho Cordova, CA 95670

Subject: Summary of 2023 Fish Rescue Operations at Tisdale Weir

Background

The Tisdale Bypass is a passive flood control structure located at river kilometer (RKm) 286 or river mile (RM) 177.7 as measured from the Golden Gate Bridge **(Figure 1)**. When Sacramento River flows exceed a stage height of 45.5 feet above mean sea level or a flow of approximately 595 cubic meters per second (21,012 cfs), the Tisdale Weir overtops, and floodwaters enter the Tisdale Bypass. The Tisdale Bypass conveys flows east for approximately seven km (four miles) into the Sutter Bypass. Of all Sacramento River flood control structures, the Tisdale Weir spills with the greatest frequency and longest duration.

Adult Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley steelhead (*Oncorhynchus mykiss*), and sDPS green sturgeon (*Acipenser medirostris*), and other fish species often become isolated and subsequently stranded behind the Tisdale Weir when migrating up the Sutter Bypass and then into the Tisdale Bypass as they attempt to return to the Sacramento River at Tisdale Weir. When flows recede below the top of the Tisdale Weir, fish become stranded in the Tisdale Weir splash basin and in inundated areas downstream of the weir. Juvenile salmonids migrating downstream in the Sacramento River may follow floodwater flows overtopping the Tisdale Weir and

become stranded in the stilling basin and downstream scour areas when overtopping events cease. When flows over the weir decrease or end and connectivity between the Tisdale and Sutter bypasses is lost, juvenile salmonids and can become stranded in the weir stilling basin and inundated areas downstream.

The 2023 water year was classified as a wet year, and the resulting runoff caused Sacramento River flows to overtop the Tisdale Weir four times between 31 December 2022 and 26 March 2023. **(Figures 2 and 3)**. The first overtopping event was a two-day event (31 December 2022 to 2 January 2023) was followed by a 15-day overtopping event (6 January to 21 January 2023); and the third overtopping event, also 15 days (11 March to 26 March), was followed by a three-day overtopping event (29 March to 1 April 2023).

Methods

CDFW staff began daily monitoring of conditions at the Tisdale Weir when the California Data Exchange Center (CDEC) National Weather Service River Forecast Center forecasted the Sacramento River stage height to cease overtopping of the weir. Daily assessments of conditions included water depth, clarity, water temperature, observations of fish species composition and numbers, and potential safety issues regarding fish rescue operations. CDFW staff conducted three days of rescue operations within the Tisdale Weir stilling basin after the second overtopping event on 30 January; 6 and 13 February; and one day of rescue operations after the fourth overtopping event on 10 April 2023. The initial rescue operation on 30 January targeted adult Chinook salmon (*Oncorhynchus tshawytscha*) because they are highly susceptible to poaching and mortality or stress due to poor water quality when they become stranded in the stilling basin. Adult Chinook salmon were captured using a combination of crowder racks, beach seines, and dip nets. Adult Chinook salmon were measured for fork length and tagged with externally visible Floy (anchor) tags in the muscle tissue posterior to the dorsal fin. Tissue samples (approximately 2 x 2 mm caudal fin clips) were collected from adult Chinook salmon for genetic analysis to provide ESU determination.

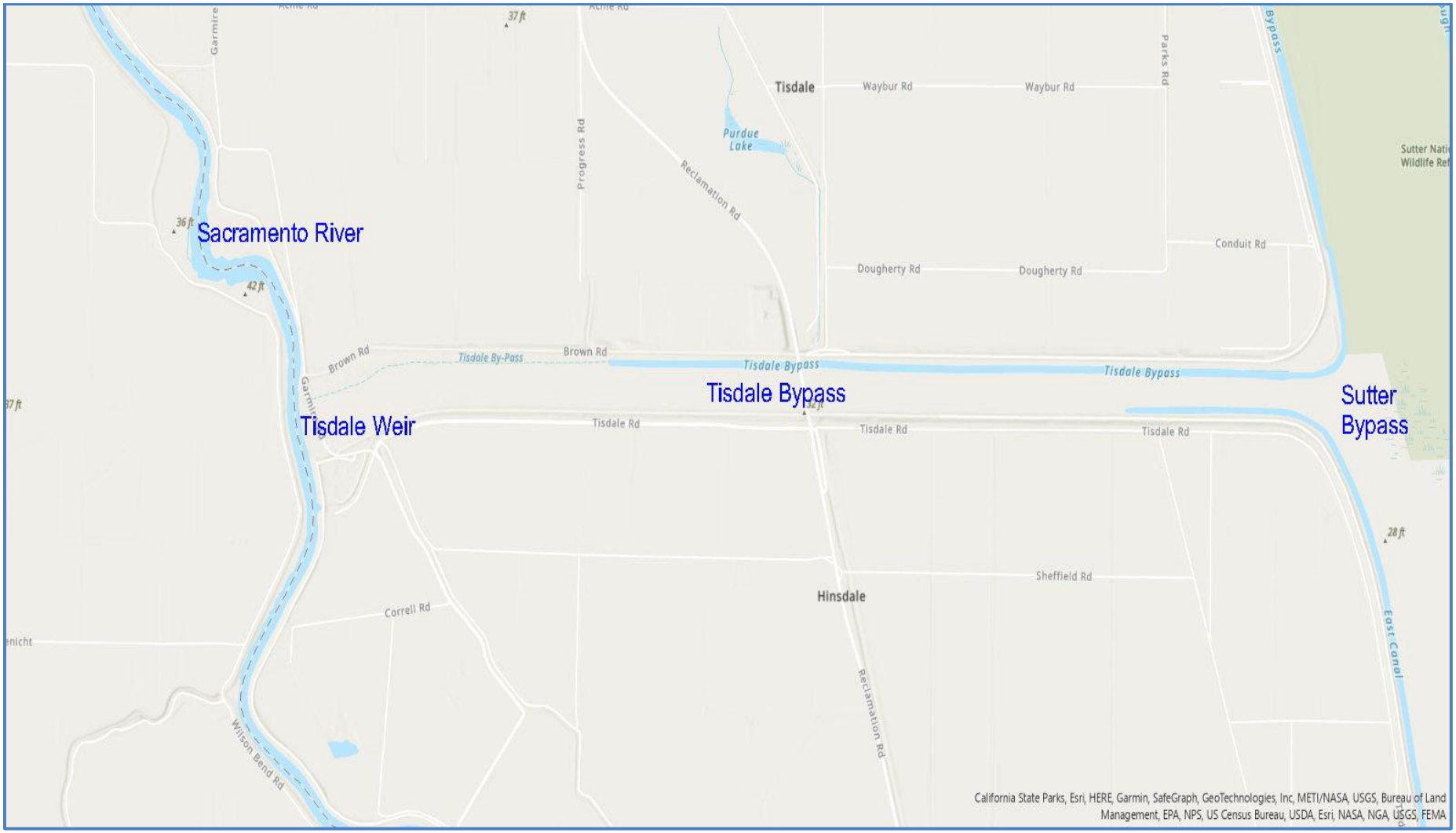

Figure 1. Tisdale Weir Site and Vicinity.

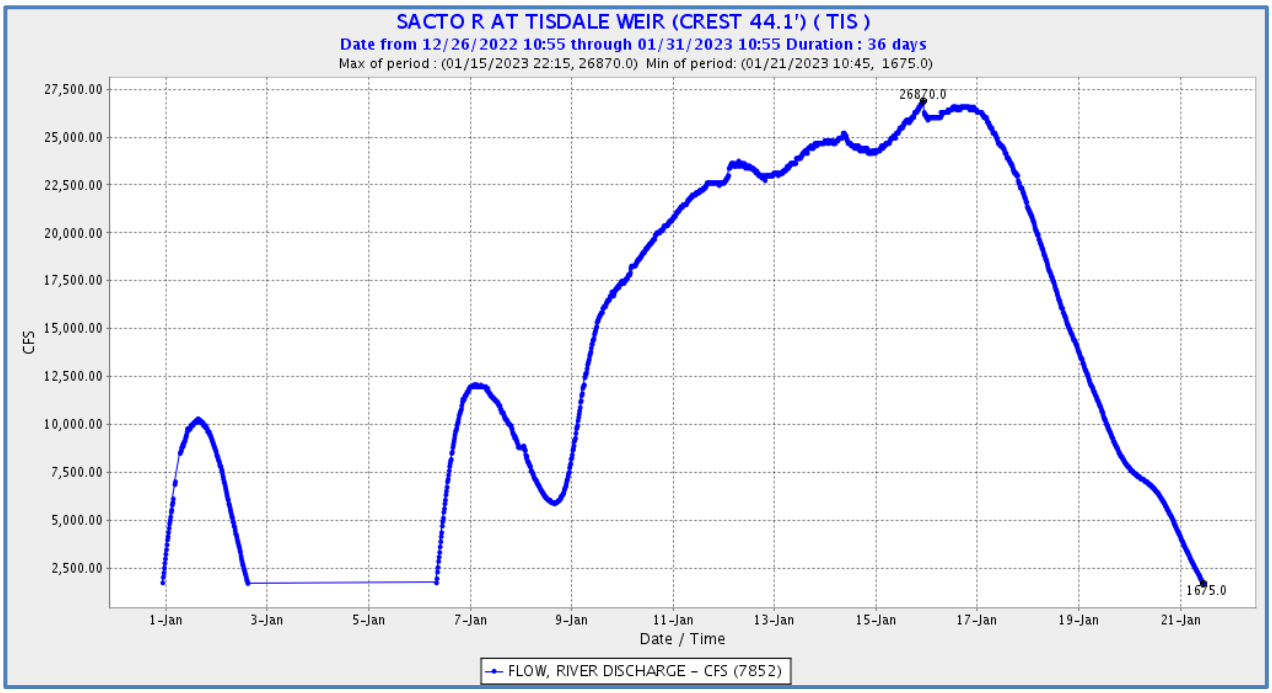

Figure 2. Hydrograph of Tisdale Weir first and second overtopping events, 2023 water year, California Data Exchange Center.

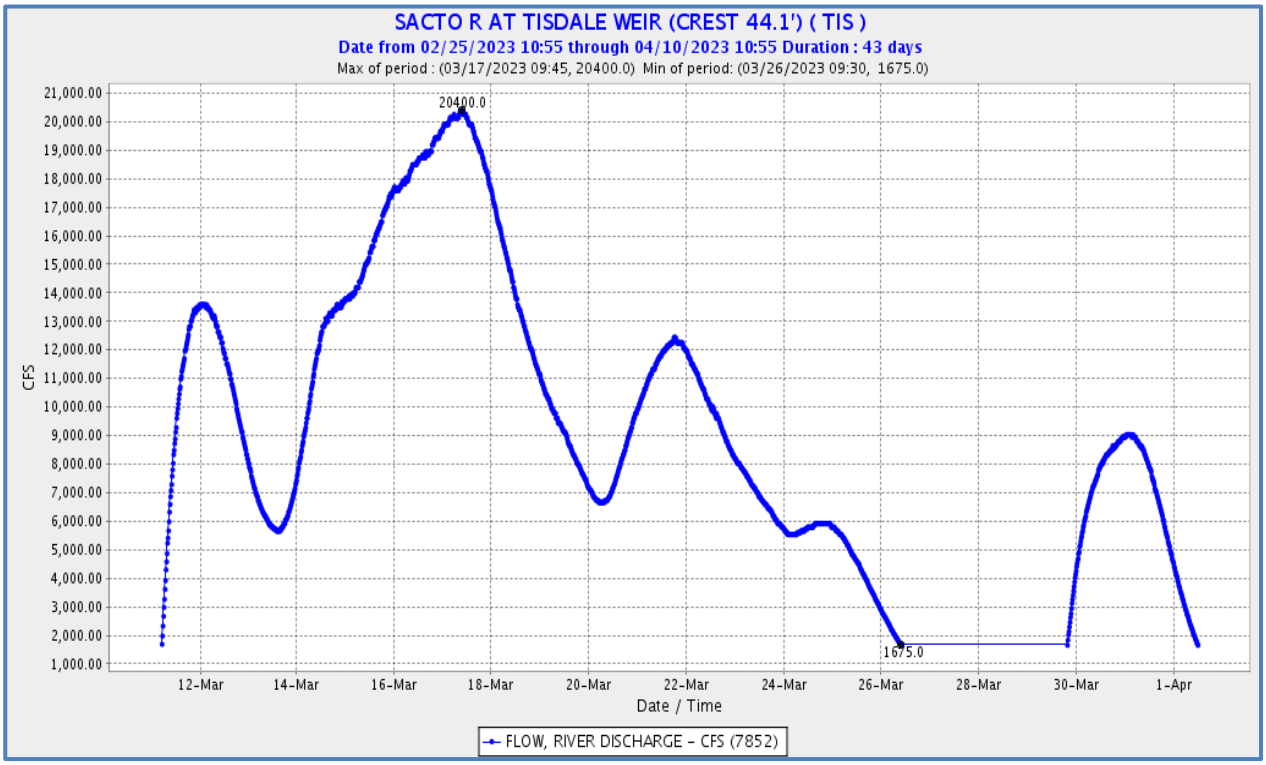

Figure 3. Hydrograph of Tisdale Weir third and fourth overtopping events, 2023 water year, California Data Exchange Center.

CDFW staff conducted subsequent rescue efforts for other fish species on 6 and 13 February and 10 April and using a combination of 1/8-inch and 1/4-inch mesh beach seines, dip nets, and backpack electro-fishers. Captured fish which were placed in aerated coolers prior to work-up. All fish were identified to species, enumerated, and transported to the Sacramento River at the Tisdale Boat Launch for release. Juvenile Chinook salmon were measured for fork length to determine Evolutionary Significant Unit (ESU) or race designation (Greene 1992).

Results

CDFW staff rescued 292 fish comprised of seven native and six nonnative species was rescued during the fish rescue operations (**Table 1**). Among these were federal and state listed species including Sacramento River winter-run Chinook salmon (federal and State endangered), Central Valley spring-run Chinook salmon (federal and State threatened), and Central Valley steelhead (federal threatened). Other native species rescued included Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), California roach (*Lavinia symmetricus*), and Tule perch (*Hysterocarpus traskii*). Non-native species rescued included striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), smallmouth bass (*M. dolomieu*), black crappie (*Pomoxis nigromaculatus*), bigscale logperch (*Percina macrolepida*), and golden shiner (*Notemigonus crysoleucas*).

Table 1. Fish species rescued from the Tisdale Weir splash basin 30 January; 6 and 13 February; and 10 April 2023.

Date	Species common name	Life Stage	Number rescued
30 Jan	Winter-run Chinook salmon	Adult	1
	Late fall-run Chinook salmon	Adult	3
6 Feb	Sacramento pikeminnow	Adult	17
	Black crappie	Adult	2
13 Feb	Winter-run Chinook salmon (hatchery)	Juvenile	1
	Central Valley steelhead (wild)	Adult	1
	Central Valley steelhead (hatchery)	Juvenile	3
	Sacramento pikeminnow	Adult	141
	Sacramento splittail	Adult	3
	Sacramento sucker	Adult	15
	California roach	Adult	1
	Tule perch	Adult	5
	Striped bass	Adult	4
	Smallmouth bass	Adult	2
	Largemouth bass	Adult	1
	Black crappie	Adult	2

Date	Species common name	Life Stage	Number rescued
	Bigscale logperch	Adult	3
	Golden shiner	Adult	3
10 Apr	Winter-run Chinook salmon	Adult	3
	Late fall-run Chinook salmon	Adult	1
	Sacramento pikeminnow	Adult	56
	Sacramento sucker	Adult	21
	Black crappie	Adult	2

CDFW also recovered two adult Chinook salmon carcasses during fish rescue operations. A hatchery origin adult winter-run Chinook salmon carcass was recovered 25 January during a pre-resuce site visit, and a wild origin adult winter-run Chinook salmon carcass was recovered during the 10 April 2023 rescue effort.

Discussion

Rescue operations at Tisdale Weir prevented 292 fish, including federal and State listed species, from perishing from factors such as lack of water, poor water quality, predation, or poaching. However, adult Chinook salmon and Central Valley steelhead stranded in the Tisdale Weir stilling basin were still subjected to migration delays. Migration delays and exposure to unfavorable water quality parameters can affect gamete viability. One adult late fall-run Chinook salmon adult rescued on 30 January was captured and spawned at the Coleman National Fish Hatchery on 15 February 2023.

Capturing fish from the weir stilling basin of the weir is problematic due to the quantity of large woody debris, cobble substrate, and exposed rebar infrastructure, and it is likely that a number of fish escaped capture and subsequently perished from one or more of the aforementioned factors. Capture and handling stress could also result in post-rescue mortality disease resulting from slime coat and scale loss, particularly to adult salmonids (Donaldson et al. 2010). The Tisdale Weir Rehabilitation and Fish Passage Project should provide volitional passage back to the Sacramento River when weir overtopping events cease. However, the estimated project completion date of June 30, 2027, means that there will likely be several more stranding events necessitating fish rescue operations.

While rescue of listed fish species is considered high priority, considerable human resources were expended to conduct fish rescues at Tisdale Weir. Staff involvement over the four days of rescue operations included three to five Environmental Scientists and three to five to seven scientific aides and necessitated ted a de-prioritization of regularly assigned tasks. In addition, CDFW Wildlife Officers were required to increase patrols at Tisdale Weir prior to rescue efforts to deter potential poaching events.

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