State of California
Department of Fish and Wildlife

Memorandum

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Subject: Summary of 2024 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 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*), 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 be transported with floodwater flows overtopping the Tisdale Weir. When

flows over the weir decrease and connectivity between the Tisdale and Sutter bypasses is lost, juvenile salmonids can become stranded in the weir stilling basin and inundated areas downstream. The 2024 water year will likely be classified as an above normal water year, and the resulting runoff caused Sacramento River flows to overtop the Tisdale Weir three times between 22 January and 16 March 2024 **(Figure 2)**.

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. The last overtopping event ended on 17 March; CDFW staff conducted rescue operations on 27 March and 6 May. CDFW staff used a single backpack electrofisher unit on 27 March and two backpack electrofisher units on 6 May. The initial rescue operation was challenging due to the relatively high water level in the stilling basin; as only a single backpack electrofisher unit could be deployed and a number of fish avoided capture. The 6 May rescue effort was much more successful, as the water depth in the stilling basin was shallow enough for the use of two backpack electrofisher units and there was minimal inundation in the area immediately downstream of the stilling basin. Captured fish were placed in aerated coolers or 150-gallon tubs prior to species identification and enumeration. Juvenile Chinook salmon were measured for fork length to determine Evolutionary Significant Unit (ESU) designation (Greene 1992). All fish were released in the Sacramento River at the Tisdale Boat Launch.

Figure 1. Tisdale Weir Site and Vicinity.

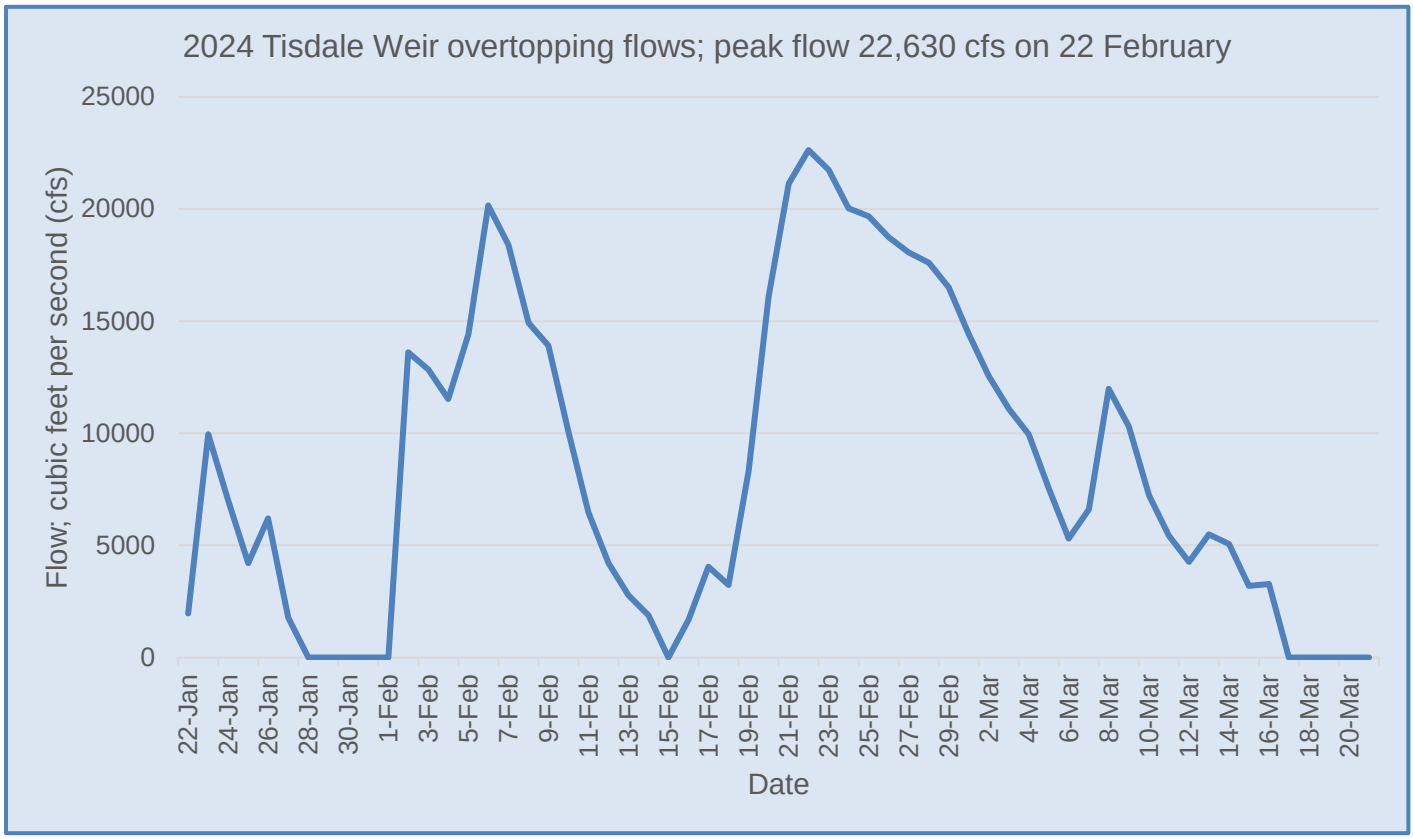

Figure 2. Hydrograph of 2024 Tisdale Weir overtopping events,
Data from California Department of Water Resources Data Exchange Center.

Figure 3. Tisdale Weir stilling basin on 26 March 2024. Photograph taken facing west.

Results

CDFW staff rescued 607 fish comprised of 10 native and 10 nonnative species during the fish rescue operations (**Table 1**). Among these were federal and state listed species including Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*; federal and State endangered), Central Valley spring-run Chinook salmon (*Oncorhynchus tshawytscha;* federal and State threatened), and Central Valley steelhead (*Oncorhynchus mykiss;* federal threatened). Other native species rescued included Sacramento sucker (*Catostomus occidentalis*), Sacramento pikeminnow (*Ptychocheilus grandis*), Sacramento splittail (*Pogonichthys macrolepidotus*), hitch (*Lavinia exilicauda*) tule perch (*Hysterocarpus traskii*), riffle sculpin (*Cottus gulosus*), Pacific lamprey (*Lampetra tridentata*), and river lamprey (*Lampetra ayresi)*. Non-native species rescued included largemouth bass (*Micropterus salmoides*), spotted bass (*M. punctulatus*), bluegill (*Lepomis macrochirus*), redear sunfish (*L. microlophus*), green sunfish (*L. cyanellus*), warmouth sunfish (*L. gulosus*), black crappie

(*Pomoxis nigromaculatus*), bigscale logperch (*Percina macrolepida*), threadfin shad (*Dorosoma petenense*), and golden shiner (*Notemigonus crysoleucas*).

Table 1. Fish species rescued from the Tisdale Weir splash basin 27 March and 6 May 2024.

Date	Species common name	Life Stage	Number rescued
3/27	Winter-run Chinook salmon (hatchery)	Juvenile	2
	Spring-run Chinook salmon (wild)	Juvenile	4
	Spring-run Chinook salmon (hatchery)	Juvenile	6
	Central Valley steelhead (wild)	Juvenile	1
	Central Valley steelhead (hatchery)	Juvenile	5
	Sacramento pikeminnow	Adult	25
	Sacramento splittail	Adult	1
	Hitch	Juvenile	1
	Sacramento sucker	Adult	22
	Sacramento sucker	Juvenile	20
	Pacific lamprey	Juvenile	4
	Spotted bass	Adult	1
	Spotted bass	Juvenile	1
	Redear sunfish	Juvenile	1
	Green sunfish	Juvenile	1
	Bigscale logperch	Adult	1
	Threadfin shad	Adult	6
	Golden shiner	Adult	1
5/6	Central Valley steelhead (wild)	Juvenile	1
	Sacramento pikeminnow	Adult, juvenile	37
	Sacramento splittail	Juvenile	1
5/6	Sacramento sucker	Adult, juvenile	110
	Pacific lamprey	Juvenile (ammocoete)	122
	River lamprey	Adult	31
	Riffle sculpin	Adult	7
	Largemouth bass	Adult	2
	Spotted bass	Adult	10
	Bluegill	Adult	12
	Redear sunfish	Adult	31
	Green sunfish	Adult	77
	Warmouth sunfish	Adult	1
	Black crappie	Adult	19
	Bigscale logperch	Adult	31
	Threadfin shad	Adult	6
	Golden shiner	Adult	1

Fish mortalities occurred during both rescue efforts and were likely caused by attempted capture with the backpack electrofishing units and poor water conditions. Juvenile salmon and juveniles of other fish species were often encountered hiding under debris in the shallower parts of the stilling basin while electrofishing and as a result were subjected to higher voltage fields than fish encountered in deeper parts of the stilling basin. Fish that were captured by electrofishing and did not recover included four juvenile Sacramento River winter-run Chinook salmon (one wild and three hatchery origin), five juvenile Central Valley spring-run Chinook salmon (four wild and one hatchery origin), and one juvenile fall-run Chinook salmon (27 March); and two juvenile fall-run Chinook salmon, one juvenile Central Valley steelhead (hatchery origin), 25 juvenile Sacramento sucker, two juvenile Sacramento pikeminnow, five adult bigscale logperch, and one adult golden shiner (6 May).

Discussion

Rescue operations at Tisdale Weir prevented 607 fish, including federal and State listed species, from perishing from factors such as lack of water, poor water quality, predation, or poaching. Adult fish stranded in the Tisdale Weir stilling basin that were rescued and returned to the Sacramento River were still subjected to migration delays.

Capturing fish from the weir stilling basin and inundated area downstream of the weir is problematic due to the quantity of large woody debris, cobble substrate, and emergent vegetation, and it is likely that a number of fish escaped capture and subsequently perished from one or more of the aforementioned factors. Migration delays can affect gamete viability. Capture and handling stress also results 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 more weir overtopping events resulting in stranding events necessitating fish rescue operations.

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

References:

California Department of Water Resources. 2010. Division of Flood Management, Sacramento River Flood Control Project Weirs and Flood Relief Structures Fact Sheet.

Donaldson, M. R., S. G. Hinch, D. A. Patterson, J. Hills, J. O. Thomas, S. J. Cooke, S. G. Rady, L. A. Thompson, D. Robichaud, K. K. English, A. P. Farrell. 2011. The consequences of angling, beach seining, and confinement on the physiology, post-release behavior and survival of adult sockeye salmon during upriver migration. Fisheries Research 108 (2011) 133–141.

California Department of Water Resources, California Data Exchange Center (CDEC), Tisdale Weir gauge. Data retrieved 20 May 2020. http://cdec.water.ca.gov/

Greene, S. 1992. Daily fork-length table from data by Frank Fisher, California Department of Fish and Game. California Department of Water Resources, Environmental Services Department, Sacramento.

Mora, E. A., R. D. Battleson, S. T. Lindley, M. J. Thomas, R. Bellmer, L. J. Zarri, and A. P. Klimley. 2018. Estimating the Annual Spawning Run Size and Population Size of the Southern Distinct Population Segment of Green Sturgeon. Transactions of the American Fisheries Society 147(1):195-203.

Poytress, W. R., J. J. Gruber, J. P. Van Eenennaam, and M. Gard. 2015. Spatial and Temporal Distribution of Spawning Events and Habitat Characteristics of Sacramento River Green Sturgeon. Transactions of the American Fisheries Society 144(6):1129-1142.

Thomas, M.J., M. L. Peterson, L. Friedenberg, J. P. Van Eenennaam, J. R. Johnson, J. J. Hoover A. P. Klimley. 2013. Stranding of Spawning Run Green Sturgeon in the Sacramento River: Post-Rescue Movements and Potential Population-Level Effects. North American Journal of Fisheries Management North American Journal of Fisheries Management, 33:2, 287-297.