

Memorandum

Date: June 5, 2020

To: Morgan Kilgour
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 2018 Fish Rescue Operations at Tisdale Weir

Background

The Tisdale Bypass is inundated by overtopping of the Tisdale Weir, 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 which occurs at a flow of approximately 595 cubic meters per second (21,012 cfs) The Tisdale Weir capacity is 1,076 cubic meters per second (38,000 cfs) (DWR 2010). 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. During the 2018 water year, a below normal water year, Sacramento River flows overtopped Tisdale Weir two times. The first overtopping event occurred 24 March for very brief period of 17 hours with a maximum flow of approximately 830 cubic feet per second (cfs). The second overtopping event was also relatively brief, beginning 8 April and ending 10 April with a maximum flow of 11,443 cfs (DWR 2020), (**Figure 2**). Adult Chinook salmon, steelhead, sturgeon, and other fish may become isolated and subsequently stranded in the Tisdale Bypass when migrating up the Sutter Bypass from the Sacramento River during overtopping of the Tisdale Weir. When flows recede below the top of the Tisdale Weir, these and other fish species become stranded in the Tisdale Weir splash basin

and in inundated areas downstream of the weir. Butte Creek also drains through the Sutter Bypass prior to its confluence with the Sacramento River, and high flows within the Sutter and Tisdale bypasses can attract salmonids returning to Butte Creek into the Sutter and then Tisdale bypass where they can become isolated when overtopping of the weir ceases.



Figure 1. Tisdale Weir Site and Vicinity.

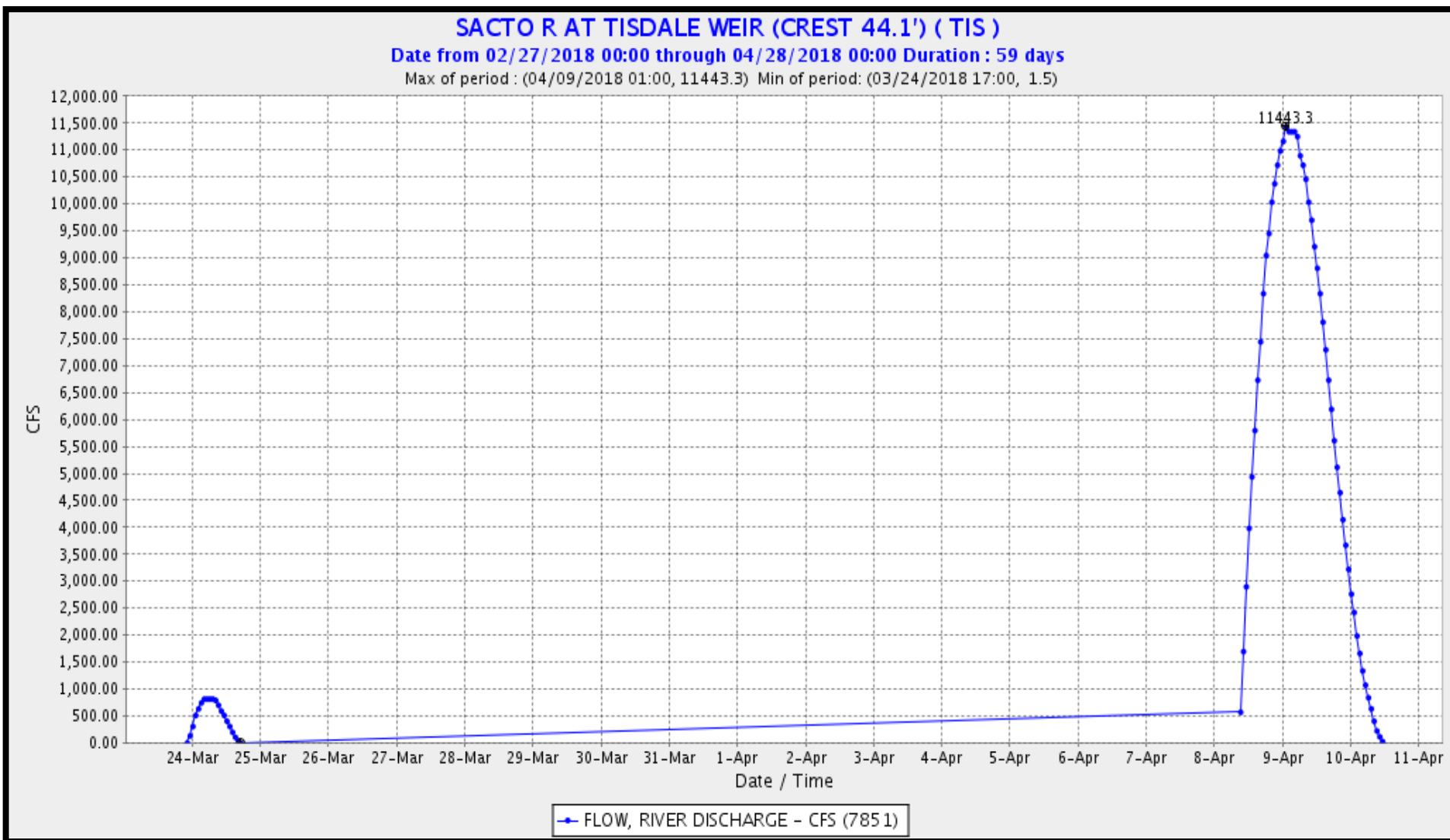


Figure 2. Hydrograph of Tisdale Weir overtopping events, 2018 water year.

Methods

CDFW staff began monitoring conditions at the Tisdale Weir when the California Data Exchange Center (CDEC) National Weather Service River Forecast Center forecasted Sacramento River stage height at the weir to drop below 45.5 feet mean sea level (msl). Several days after the 24 March overtopping event, CDFW staff conducted a visual survey of the Tisdale Weir stilling basin but did not observe any fish. After cessation of the second overtopping event ending 10 April, CDFW staff conducted daily assessments of conditions including water depth and inundated area estimates, water temperature, observations of fish species composition and numbers; and potential safety issues regarding fish rescue operations. CDFW staff conducted rescue operations at the Tisdale Weir on 24 April 2018 when water levels within the stilling basin and inundated immediately downstream were shallow enough to seine effectively. Staff used a combination of 1/8-inch and 1/4-inch mesh beach seines, backpack electro-fishers, and dip nets to capture fish. Captured fish were placed in aerated coolers filled with water from the weir stilling basin prior to work-up. All fish captured were identified to species, enumerated, and transported to the Sacramento River at the Tisdale Boat Launch for release. Adult Chinook salmon (*Oncorhynchus tshawytscha*) were tagged with external anchor (Floy) tags and adult and juvenile steelhead (*O. mykiss*) were internally tagged with integrated passive transponder (PIT) tags to monitor post-rescue survival and migration patterns. Tissue samples (approximately 2 x 2 mm dorsal lobe caudal fin clips) were collected from adult Chinook salmon for genetic analysis to determine Evolutionary Significant Unit (ESU) or run (winter, spring, etc.). Fork lengths of juvenile Chinook salmon were measured to determine ESU (Greene 1992).

Results

Federal and State listed fish species rescued during the 24 April rescue operation included one wild origin adult and two juvenile Central Valley spring-run Chinook salmon (federal and state threatened), and one juvenile Central Valley steelhead.

A total of 317 fish comprised of ten native and thirteen nonnative species were rescued during the 24 April 2018 fish rescue operation (**Table 2**). Native species rescued included Central Valley spring-run Chinook salmon, Central Valley steelhead, Pacific lamprey (*Entosphenus tridentatus*), Sacramento splittail (*Pogonichthys macrolepidotus*), Sacramento pikeminnow (*Ptychocheilus grandis*), hardhead (*Mylopharodon conocephalus*), Sacramento sucker (*Catostomus occidentalis*), riffle sculpin (*Cottus gulosus*), prickly sculpin (*Cottus asper*) and tule perch (*Hysterocarpus traskii*). Nonnative species rescued included striped bass (*Morone saxatilis*), American shad (*Alosa sapidissima*), largemouth bass (*Micropterus salmoides*), smallmouth bass

(*Micropterus dolomieu*), black crappie, (*Pomoxis nigromaculatus*), bluegill (*Lepomis macrochirus*), green sunfish (*Lepomis cyanellus*), black bullhead (*Ameiurus melas*), common carp (*Cyprinus carpio*), bigscale logperch, (*Percina macrolepida*), threadfin shad (*Dorosoma petenense*), and golden shiner (*Notemigonus crysoleucas*).

Table 1. Fish species rescued from the Tisdale Weir splash basin and downstream inundated area, 24 April 2018.

| Species | Life Stage | Number | Tag type; ID | Listing Status ¹ |
|--|--------------------|--------|---------------------|-----------------------------|
| Spring-run Chinook salmon ² | Adult | 1 | Floy; 4476, 4477 | FT; ST |
| Spring-run Chinook salmon ³ | Juvenile | 2 | | FT; ST |
| Fall-run Chinook salmon | Juvenile | 10 | | |
| Central Valley steelhead ⁴ | Adult | 1 | PIT; 3D6.00181F319E | |
| Central Valley steelhead ⁵ | Juvenile | 2 | PIT; 3D6.00181F316E | FT |
| Pacific lamprey | Juvenile | 3 | | |
| Sacramento pikeminnow | Adult; juvenile | 28 | | |
| Sacramento splittail | Adult | 12 | | |
| Hardhead | Adult; juvenile | 4 | | |
| Sacramento sucker | Adult; juvenile | 78 | | |
| Riffle sculpin | Adult | 1 | | |
| Prickly sculpin | Adult | 2 | | |
| Tule perch | Adult | 8 | | |
| Striped bass | Adult | 46 | | |
| American shad | Adult | 11 | | |
| Largemouth bass | Adult | 1 | | |
| Smallmouth bass | Adult | 3 | | |
| Black crappie | Adult | 2 | | |
| Bluegill | Adult | 4 | | |
| Green sunfish | Adult | 3 | | |
| Black bullhead | Adult | 4 | | |
| Common carp | Adult | 2 | | |
| Bigscale logperch | Adult | 5 | | |
| Threadfin shad | Adult | 73 | | |
| Golden shiner | Adult | 11 | | |

¹ FT = Federal threatened; ST = State threatened.

² Adipose fin intact (wild origin); 72.5 cm fork length.

³ Based on length-at-date; minimum size for spring-run is 87 mm on 24 April; both fish were 87 mm and therefore could be fall-run.

⁴ Adipose fin clipped (hatchery origin); 46 cm fork length.

⁵ Fork length of tagged juvenile = 222 mm; 135 mm juvenile not tagged; both fish adipose fin intact (wild origin).

Discussion

Rescue operations at Tisdale Weir prevented 317 fish, including federal and State listed species from perishing from factors such as lack of water, poor water quality, predation, or poaching. However, anadromous fish stranded downstream of Tisdale Weir were subjected to migration delays. Capture and handling stress could result in post-rescue mortality. Capturing fish from the weir stilling basin and inundated area downstream of the weir is problematic due to the quantity of large woody debris, exposed rebar, cobbles, and emergent vegetation; it is likely that a number of fish escaped capture and subsequently perished from one or more of the aforementioned factors. As of August 2020, there have been no tag recoveries reported for the adult spring run Chinook salmon which would have spawned in fall 2019 or PIT tag detections for the two Central Valley steelhead. When completed, the Tisdale Weir Rehabilitation and Fish Passage Project should minimize fish stranding by providing volitional passage back to the Sacramento River after weir overtopping events. The estimated project completion date of June 30, 2027, so therefore it is likely that there will be several more stranding events necessitating fish rescue operations in the next seven years.

References

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

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.