

Memorandum

Date: October 21, 2022

To: Colin Purdy
Environmental Program Manager

From: Grant Henley
Environmental Scientist

Subject: 2022 Butte Creek Spring-run Chinook Salmon Holding Snorkel Survey

The annual Butte Creek spring-run Chinook salmon (*Oncorhynchus tshawytscha*; spring-run) holding snorkel survey was conducted July 15 – August 9, 2022. This survey is used to estimate the number of adult spring-run Chinook salmon holding over summer and their distribution in Butte Creek prior to spawning in the fall. The survey was conducted using a standard swimming snorkel methodology from Centerville Head Dam (CHD) to Parrot-Phelan Diversion Dam (PPDD) (Figure 1). One reach between the Honey Run Covered Bridge (HRCB) and PPDD was surveyed on July 15 and three reaches between Quartz Bowl Pool and HRCB were surveyed on three consecutive days, July 19-21. A fifth reach from CHD to Quartz Bowl Pool was surveyed on August 9.

Data collection and analyses have been standardized for this survey since 2001.¹ The survey protocol requires each pool to be surveyed once by each crew member (either swimming the pool or observing from above the pool), and each crew member records a count separately for each pool. To increase accuracy of the count, snorkel surveys are conducted in an upstream to downstream direction, and the number of snorkelers entering a pool at a time is dictated by the width of the pool. This approach utilizes the swimming direction of the adult salmon to minimize double counting within a pool and prevents groups of fish from swimming around individual crewmembers and avoiding detection. Upon analysis of individual pool specific counts, uncertain or obvious outliers are excluded, and the estimated number of fish observed for an individual pool is calculated by averaging individual crewmember counts. The total estimate of holding salmon is calculated by summing the averages for

¹ Prior to 2001, each crew member developed an independent estimate for each holding pool, and before proceeding, a single estimate was made by group consensus and recorded in the field.

each pool. **The estimate for the 2022 adult snorkel survey was 2,852 salmon holding in Butte Creek.**

Table 1 displays the range and average number of adult spring-run Chinook salmon observed within each of the five reaches.

Table 1. Range and average number of spring-run Chinook salmon observed in each surveyed reach from Centerville Head Dam (CHD) to Parrot-Phelan Diversion Dam (PPDD) during the 2022 Butte Creek spring-run Chinook salmon snorkel survey.

Date	Reach	Range	Average	% Of Total
8/9	Centerville Head Dam to Quartz Bowl Pool	0	0	0%
7/19	Quartz Bowl Pool to Whisky Flat	1,458 - 2,291	1,846	64.73%
7/20	Whiskey Flat to Centerville Powerhouse	820 - 1083	936	32.82%
7/21	Centerville Powerhouse to Honey Run Covered Bridge	66 - 73	70	2.45%
7/15	Honey Run Covered Bridge to Parrot-Phelan Diversion Dam	0	0	0%
	Totals	2,344 – 3,447	2,852	100%

A Vaki RiverWatcher Fish Counter (Vaki) has been installed in Butte Creek at Durham Mutual Fish Ladder since 2014 to monitor passage of adult salmon and steelhead returning to Butte Creek. The Vaki is utilized to estimate the number of adult spring-run entering holding and spawning reaches of Butte Creek. This is particularly important for spring-run Chinook salmon in Butte Creek as the number of adults entering the creek is often greater than the estimate of adult spawners due to prespawn mortality and predation during the summer holding period. The first spring-run documented to pass through the Vaki for the 2022 migration season occurred on February 1. The Vaki was operational for the majority of the spring-run migration season though there were issues with camera image quality throughout the season. Due to an equipment failure the Vaki ceased operation on May 19 which resulted in an incomplete passage estimate. Prior to equipment failure, the Vaki detected 5,463 salmon traveling upstream through the ladder and migrating into the summer holding habitat. It is important to note that salmon were also observed bypassing the fish ladder and ascending over Durham Mutual Dam on several occasions indicating 5,463 salmon is a minimum estimate. Historical Vaki data on Butte Creek demonstrates adult spring-run passage into upper Butte Creek can take place from February through June depending on the water year and flow. Historical data trends demonstrate variability with Vaki estimates when compared to snorkel and carcass survey estimates (Figure 2).

A prespawn mortality survey is conducted annually from June through mid-September to assess the number of adult spring-run that did not survive to spawn over the summer holding period. Once the

first sign of spawning is observed, usually in mid-September, a mark-recapture post-spawn carcass survey (Cormack Jolly-Seber model) is conducted through October to estimate the number of adult spring-run that survived to spawn during the fall. The estimated number of prespawn mortalities along with the estimate of spawning adults are combined to produce the official escapement estimate for Butte Creek. This number is reported to Grand Tab (see <https://wildlife.ca.gov/Conservation/Fishes/Chinook-Salmon/Anadromous-Assessment>). This will be the twenty-second year in which a mark re-capture carcass survey estimate will be used to compare escapement estimates against the traditional swimming snorkel methodology. Long-term data suggests snorkel survey methodology likely underestimates the number of spring-run adults in Butte Creek when there are large populations (Figure 2); however, adult holding estimates can provide valuable data to assess long-term population trends and holding patterns.

This year's participants of the holding snorkel survey included Department of Fish and Wildlife employees: Anna Allison, Drew Huneycutt, Claire Bryant, Mike Healey, Chris McKibbin, Ryan Revnek, and Gabe Loera. Please address any questions regarding the survey to Grant Henley at (916) 272-4152.

ec: DFW North Central Region
Kevin Thomas
Anna Allison
Tracy McReynolds

DFW Fisheries Branch
Jonathan Nelson
Jason Azat

DFW Northern Region
Michael Harris
Ryan Renvak

NOAA Fisheries
Steve Edmondson
Ellen McBride
Allison Bosworth

Pacific Gas & Electric Company
Catalina Reyes
Jackie Pope
Ed Cheslak
Andrew Anderson

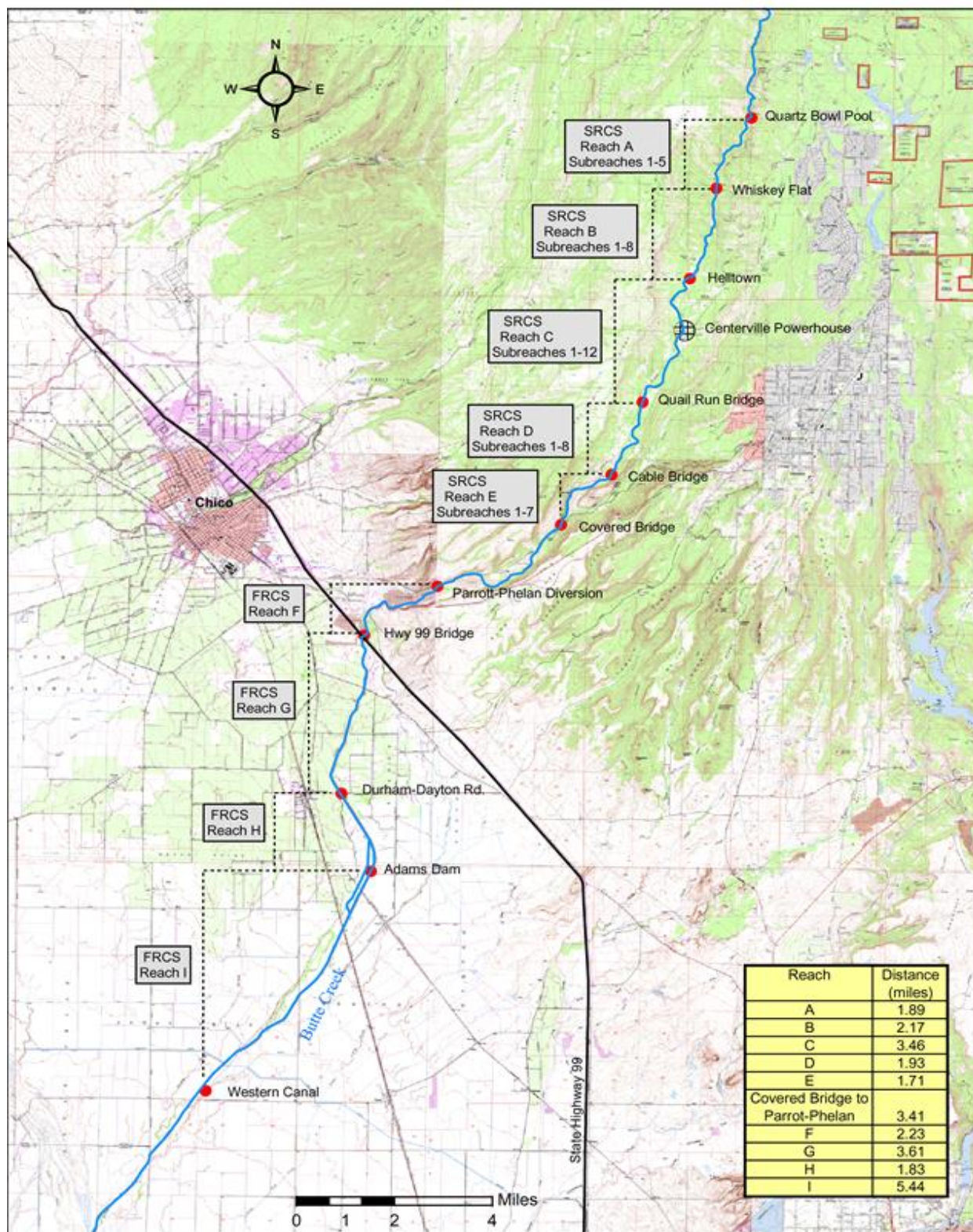


Figure 1. Map of Butte Creek showing survey reaches from Centerville Head Dam (CHD) to Parrot-Phelan Diversion Dam (PPDD) for spring-run Chinook salmon holding and spawning surveys.

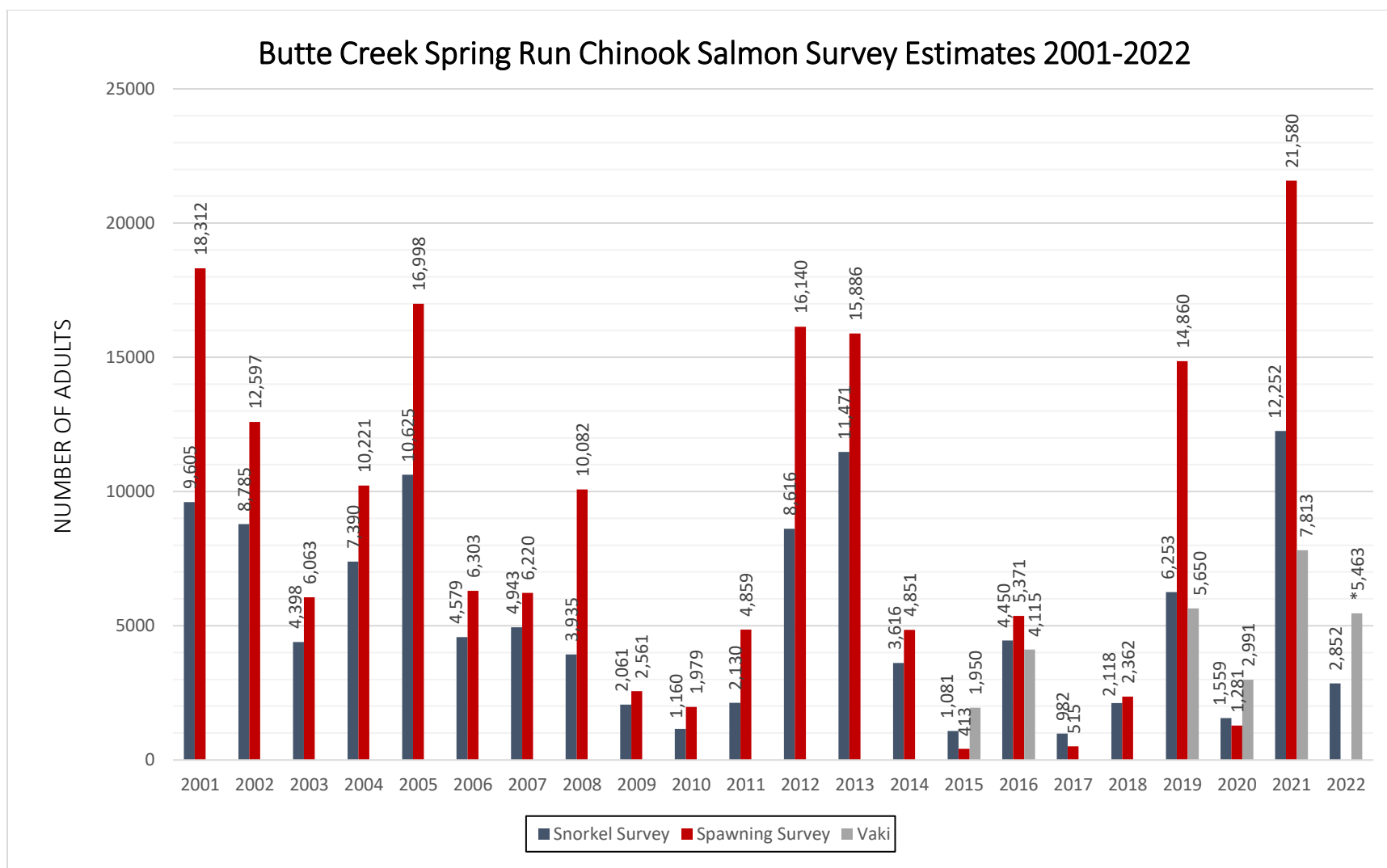


Figure 2. Butte Creek adult spring-run Chinook salmon escapement estimates (red bars) from 2001-2021, holding snorkel survey estimates (blue bars) from 2001-2022, and Vaki estimates (gray bars) from 2015, 2016, and 2019-2022. Escapement estimates are not currently available for 2022. *Vaki passage counts for 2022 were incomplete due to equipment failure.