# Data Types

Upstream passage

Redd

# Adult Upstream Passage

Objective: Estimate escapement numbers

Type: Overhead camera and three underwater cameras

Location: Mouth of Clear Creek

Times of operation: December - August; 24 hours/day

Consistency: Some years are not directly comparable to others. Please contact staff associated with this package for more information.

The Clear Creek video monitoring system has been in operation near the mouth of Clear Creek since 2012 and is operated December through August. Fish are funneled through a resistance board weir where one overhead camera and three underwater cameras record fish passage upstream. Footage is viewed and entered into MS excel spreadsheets at the end of each monitoring season. When fish counts are unclear from the footage, it is reviewed by up to three experts.

Video data are focused on upstream counting of fish passage through the resistance board weir. Additional information describing fish biology is collected by the Clear Creek monitoring program: date, time, count, run, adipose fin clip status, sex, passage direction, jack size, and spawning condition. Viewing condition is collected less consistently (75% NAs). Run assignment of Chinook Salmon is recorded based on date of passage observation. Some limitations of the video system and passage estimates based on the video system include identification challenges because of camera placement, turbidity visibility challenges, run determination by date inaccuracies, video outages in high flow years, and GAM model performance when there are low counts or uneven daily counts.

# Snorkel Surveys

Objective: Evaluate spatiotemporal distribution of spring-run Chinook Salmon within Clear Creek. Snorkel surveys also evaluate responses of spring Chinook Salmon to artificial attraction flows (pulse flows) released from Whiskeytown Dam and to generate a population index prior to spawning.

Type: Direct observation via downstream snorkel

Location: The snorkel survey is broken up into several logistic survey reaches in Lower Clear Creek from Whiskeytown Dam located at river mile 18.1, (40.597786N latitude, -122.538791W longitude) to the Clear Creek Video Station located at river mile 0.1 (40.504836N latitude, -122.369693W longitude) near the confluence with the Sacramento River.

Times of operation: Surveys are conducted before and after each pulse flow and at the end of August to generate a population index of returning adults (August Index).

Consistency: From 1999-2005, snorkel surveys were carried out monthly from April through August to determine spring Chinook Salmon migration timing, evaluate levels of pre-spawn mortality, spatiotemporal distribution, and presence of winter Chinook Salmon in Clear Creek. In 2006, survey frequency was reduced to only June and August after it was established that winter Chinook Salmon were not spawning in Clear Creek and established migration timing and distribution of spring Chinook Salmon. Pulse flow releases from Whiskeytown Dam began in 2010, thus survey frequency was increased to include surveys before and after each pulse flow event. External environmental factors limited survey frequency in some years therefore all years within the dataset are not directly comparable with other years. Please contact staff associated with this package for more information.

# Redd

Objective: Estimate spawning population

Type: Direct observation via downstream snorkel.

Location: The snorkel survey is broken up into several logistic survey reaches in Lower Clear Creek from Whiskeytown Dam located at river mile 18.1, (40.597786N latitude, -122.538791W longitude) to the Clear Creek Video Station located at river mile 0.1 (40.504836N latitude, -122.369693W longitude) near the confluence with the Sacramento River.

Times of operation: Surveys are conducted approximately bi-weekly from the beginning of September through the end of October, although surveys extended into early November in some years.

Consistency: Spawning surveys have occurred from 2000-present.

Variables collected consistently on Clear Creek include date, latitude, longitude, reach, year, method, and run. Species is collected less consistently (57% NAs). Sample reaches are surveyed multiple times per season to determine redd decomposition rate. Redd data is considered an accurate count of the spawning population in years where 3 or more surveys are conducting during the survey year. Redd data most accurately counts total spawning population in years with fewer redds and is a less reliable measure in years with large spawning populations.

Redds are assigned a unique redd ID upon observation. If a redd is observed more than once, it may be assigned an age, and that redd ID may have multiple observations in a table.

There is a partial natural barrier to fall and late-fall Chinook Salmon passage on Clear Creek. A picket weir is temporarily installed upstream of the barrier to prevent any fall Chinook Salmon from mixing with spring Chinook Salmon. Any Chinook redds observed above this picket weir are considered spring Chinook Salmon.

Methods for measuring substrate size has varied over the years and for this package, substrate class was standardized using the Wentworth scale, created by W.C. Krumbein. This scale is what is commonly used in the United States. When the size range fell into two categories, they were rounded down. The scale, in descending size order, is boulder (>256mm), cobble (64-256mm), very coarse gravel (32-64mm), coarse gravel (16-32mm), medium gravel (8-16mm), fine gravel (4-8mm), very fine gravel (2-4mm), very coarse sand (1-2mm), coarse sand (0.5-1mm), medium sand (0.25-0.5mm), fine sand – clay (<0.25mm).