



Memorandum

Date: March 23, 2006

To: Mary Halle, Contra Costa County Public Works Department

cc: Carrie Dovzak, Contra Costa County Public Works Department;
Kim Stevens, U. S. Army Corps of Engineers, Sacramento District.

From: Jeff Kozlowski, Fish Biologist

Subject: **Lower Walnut Creek Project - Preliminary Results of Water Year 2006
Chinook Salmon Carcass Survey**

1.0 Introduction

This memorandum transmits the preliminary results of monitoring activities conducted in water year (WY) 2006 to document the occurrence of adult Chinook salmon, carcasses, and redds in lower Walnut Creek between October and December 2005. Jones & Stokes conducted this monitoring as part of a study to document Chinook salmon fry emergence in lower Walnut Creek. Monitoring is being conducted under contract to the U. S. Army Corps of Engineers (Corps), Sacramento District, Sacramento, California. A draft report of monitoring activities for adult Chinook salmon migration and spawning and fry emergence is currently being prepared by Jones & Stokes for the Corps and the Contra Costa County Public Works Department. The purpose of this memorandum is to provide the Corps and Contra Costa County Public Works Department with preliminary monitoring results for one of the indicators that was monitored under the Corps' contract: the adult migration and spawning indicator.

2.0 Methods

In WY 2006, Jones & Stokes biologists conducted monitoring on lower Walnut Creek, from the upstream limit of tidal influence (a short distance downstream of Highway 4) to Drop Structure No. 1, which is located upstream of the Willow Pass Road bridge. The purpose of this monitoring was to document the occurrence of adult Chinook salmon, carcasses, and redds. Occurrence monitoring was conducted once every 2 weeks from October 7 to December 15, 2005, for a total of six monitoring activities (Table 1).

Monitoring for adult migration and spawning was conducted by walking in the channel or along the bank and visually surveying the stream channel for the presence of adult Chinook salmon. Observations for adult Chinook salmon included both live and dead (carcasses) fish. During

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monitoring activities, special emphasis was placed on viewing stream habitats where spawning fish or redds would be expected to occur, such as the downstream end of pools and the head of riffles. Monitoring data were recorded on data collection forms and included:

- the number and location of live adult fish, carcasses, and redds observed;
- the date monitoring was conducted;
- the name of each monitoring team member;
- the water temperature and field-measured stream flow and time of these measurements;
- the water clarity (based on Secchi tube readings); and
- the beginning and ending times of the monitoring activity.

In addition, the fork length and sex of each carcass, if they could be determined, were recorded.

The locations of redds, live fish, and carcasses were marked on aerial photographs (printed at a scale of 1 inch = 100 feet) and recorded using GPS. In instances where multiple numbers of live or dead fish were observed at a single location, the occurrence was mapped as a single point on the aerial photographs and one GPS location was recorded to represent the multiple observations of adults and/or adults at this location. Carcasses were marked with a color-coded jaw tag to indicate that they had been counted and to prevent recounting during subsequent monitoring activities. Marking of the carcasses was also used in an attempt to conduct a mark-recapture estimate of carcass abundance; however, low numbers of marked carcasses and low (one) tag recoveries precluded the calculation of an precise estimate of abundance.

Table 1. WY 2006 Chinook Salmon Carcass Survey Dates for Lower Walnut Creek

Monitoring Activity	Date in 2005	Field-Measured Streamflow Immediately Downstream of Clayton Valley Drain (cfs)
1	October 7	11.7
2	October 20	13.0
3	November 3	13.3
4	November 16	13.1
5	November 30	26.8
6	December 15	16.1

Note:
cfs = cubic feet per second.

3.0 Results

Over the course of the monitoring period (i.e., October 7 – December 15, 2005), one hundred and seven (107) live adult Chinook salmon and sixty-three (63) carcasses were observed on lower Walnut Creek between approximately Highway 4 and Drop Structure Number 1 (Table 2). In addition, twenty-three (23) Chinook salmon redds were observed in this reach of stream over the course of the monitoring period. Out of the 63 carcasses observed, 39 were females, 8 were males, 8 were grilse, and 8 were adults of unknown sex (Table 2). Typically, grilse are 2-year-old males that return to spawn early, but they can also be females. Due to the small size of grilse, sexually dimorphic characteristics may not be as pronounced in grilse carcasses, making it more difficult to determine their gender. The eight unknown carcasses either were in an advanced state of decomposition or the head of the carcass was missing, which made it difficult to accurately determine the sex of the carcass. All of the Chinook salmon carcasses were examined for the presence of their adipose fin, and all carcasses observed were found to have their adipose fin intact. (A portion of hatchery Chinook salmon are given an adipose fin clip to indicate that they have been marked with a coded-wire tag). Because not all hatchery Chinook salmon are given an adipose fin clip, the presence of an adipose fin does not confirm their origin (i.e., whether they were hatchery fish or naturally spawned).

Numerous female carcasses were found to have unspawned eggs. The presence of unspawned eggs in the carcass indicates that the female died prior to spawning, and may indicate stress from unsuitable conditions prior to spawning. However, only one of the observed female carcass was believed to have died on its own before spawning. A large number of female (and some male) carcasses near Drop Structure No. 1 were observed to have been cut open; this observation and the bright, silvery appearance of these fish suggested that the fish had been poached (taken

illegally). Anglers were frequently observed fishing for Chinook salmon below Drop Structure No. 1 and poaching was observed on several occasions. Most of the female carcasses found to be cut open had been stripped of their eggs. (Fresh salmon roe is a popular and valuable bait among anglers.). The occurrence of poached female adult Chinook salmon makes it impossible to accurately estimate pre-spawning mortality of females.

Table 2. WY 2006 Chinook Salmon Carcass Survey Data for Lower Walnut Creek

Monitoring Activity	Date in 2005	Live Adults	Carcasses			
			Males	Females	Grilse	Unknown
1	October 7	0	0	0	0	0
2	October 20	2	0	0	0	0
3	November 3	5	0	0	0	0
4	November 16	18	2	3	0	1
5	November 30	34	0	5	0	0
6	December 15	50	6	31	8	7
Total		107	8	39	8	8

Note: Unknown = adults for which sex determination was not possible.

4.0 Discussion and Conclusions

The observation of adult Chinook salmon and redds indicates that lower Walnut Creek supports migration and spawning of Chinook salmon. In addition, the data collected from lower Walnut Creek confirm that adults are able to migrate at least as far upstream as Drop Structure No. 1.

The numbers of live adult Chinook salmon and carcasses observed do not represent an actual count of the total number of the adult Chinook salmon that migrated and spawned in lower Walnut Creek in WY 2006. (The term ‘spawning escapement’ is often used to refer to these fish because they ‘escaped’ the commercial and sport fishery in their return to freshwater to spawn.). The numbers reported above represent the total number of carcasses observed during the last 3 days of monitoring over a period lasting slightly more than 30 days (i.e., from November 16 to December 15, 2005). This 30-day period represents the only time that carcasses were observed in lower Walnut Creek as part of this monitoring; no carcasses were observed during monitoring activities conducted prior to November 16 (Table 2). Although it is not possible to calculate a precise estimate of the spawning escapement with the above field-collected data, it is possible however to make a reasonable estimate of escapement for lower Walnut Creek between Highway

4 and Drop Structure No. 1 based on some reasonable, yet conservative, assumptions. (It should be noted, however, that any estimates of escapement using these data do not include fish that migrated up Grayson or Pine Creeks since these stream reaches were not included in the monitoring.).

For the purposes of making a reasonable estimate of spawning escapement, the following are assumed:

1. Carcasses observed during a single monitoring activity represent all carcasses that have been recruited to the stream over the previous 5-day period (which is a reasonable but conservative assumption based on observations of carcass retention times on Central Valley rivers).
2. The number of carcasses observed for that 5-day period are representative of the number of carcasses that could be expected to occur during the 5-day period preceding and following the 5-day period that encompasses the day that actual counts of carcasses were made (see Table 3).

Table 3 shows the dates of each of the 5-day periods and the assumed number of carcasses within each 5-day period based on the number of carcasses observed on the monitoring days.

Based on these assumptions and the results of the monitoring data, 189 adults represents a reasonable estimate of the number of Chinook salmon that returned to lower Walnut Creek from November 7 through December 20, 2005. This value represents 120 more carcasses and 82 more live adult Chinook salmon than was actually observed during the 3 monitoring activities that adults and carcasses were observed. However, it should be noted that the poaching of live adult fish most assuredly reduced the number of carcasses in lower Walnut Creek that would have been recruited in subsequent days by removing adults from the stream before they died and could be counted as carcasses. This removal of adults through poaching may have resulted in an underestimation of the spawning escapement estimate, however.

Even if we make the unlikely, but theoretically possible, assumption that the respective number of carcasses observed during each monitoring activity were representative of a daily count of Chinook salmon carcasses, then the 63 carcasses would represent an average daily carcass count of 21 carcasses per day (i.e., 63 carcasses/30 days), or 630 carcasses over the 30-day period that carcasses were observed in lower Walnut Creek (i.e., 21 carcasses/day X 30 days).

Recently, a statement has been made about the abundance of spawning Chinook salmon in lower Walnut Creek numbering into the thousands in the fall of 2005 (i.e., WY 2006). However, to our knowledge this abundance figure has not been substantiated by empirical data. The results above provide a rough, but reasonable estimate of the numbers of adults returning to lower Walnut Creek in WY 2006 and these results contrast sharply with the statement that thousands of

fish were observed below Drop Structure No. 1 in fall 2005. Even if we use the scenario of the inflated estimate of 630 carcasses, our results do not support anecdotal evidence of Chinook salmon runs of several thousand fish returning to the stream this year.

Table 3. Actual and Assumed Number of Chinook Salmon Carcasses Observed in Lower Walnut Creek by each Five-Day Period for November 7 through December 20, 2005.

Five-day Period	Dates in 2005	Actual (bold) and Assumed Number of Carcasses
1	November 7 – 11	6
2	November 12 – 16	6
3	November 17 – 21	6
4	November 22 – 26	5
5	November 27 – 30	5
6	December 1 – 5	5
7	December 6 – 10	52
8	December 11 – 15	52
9	December 16 – 20	52
Total		189

Note: Values in bold represent the actual number of carcasses observed on November 16 and 30 and December 15. All other values are assumed.