2006 Feather River Chinook Salmon Spawning Escapement Summary

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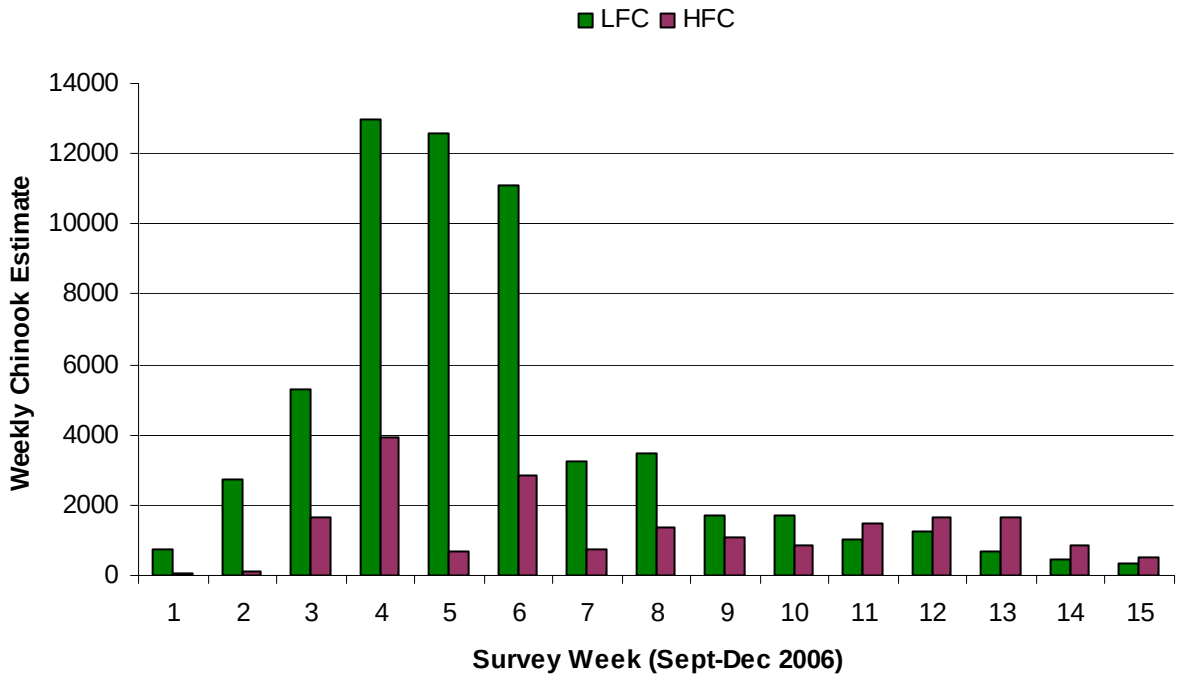
The Chinook salmon spawning escapement survey began September 5 and continued through December 14, 2006. The survey was conducted on the upper 16 river miles of the Feather River from the Fish Barrier Dam (FBD) downstream to Gridley Bridge (GB). Separate population estimates were calculated for two distinct reaches: the Low Flow Channel (LFC) from the FBD downstream to the Thermalito Afterbay Outlet (TAO), and the High Flow Channel (HFC) from the TAO downstream to the GB.

Population Estimate:

The spawning population estimate for the LFC was calculated from salmon carcass mark recapture data using a modified Schaefer table. The escapement estimate for the LFC was 59,273 salmon of which, 1,582 were grilse (fish ≤ 65 cm fork length). Due to several weeks (6 out of 15) of zero recaptures in the HFC, a pooled Peterson estimator was used to generate a population estimate of 16,602 salmon including 277 grilse. Total in-river spawning for the Feather River (LFC + HFC) was 75,875 which consisted of 74,352 adults and 1,859 grilse. These estimates include both fall-run and spring-run Chinook salmon since their spawning is currently not fully segregated on the Feather River.

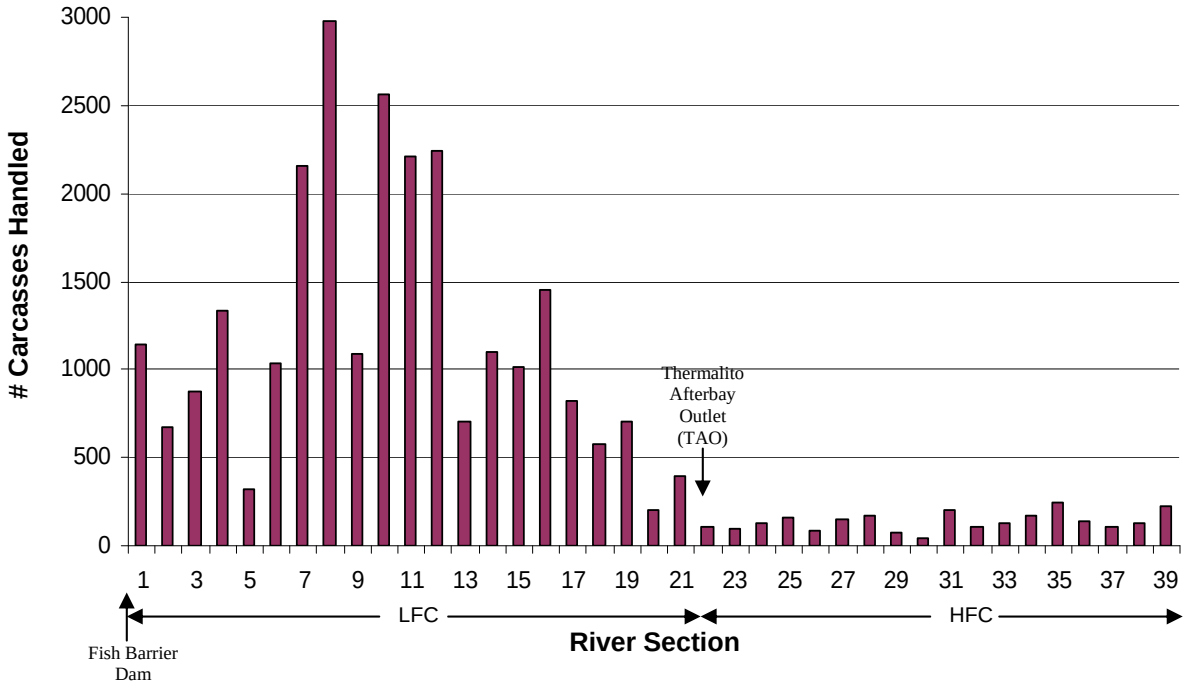
Overall, spawning peaked about the same time in the LFC as the HFC (Figure 1), with the HFC showing a second small increase during weeks 11 through 13.

Figure 1. Weekly population estimates in the LFC and HFC of the lower Feather River during the 2006 Chinook salmon escapement survey.



Approximately 78% of the population spawned in the LFC. This is higher than any of the previous years monitored by DWR (began surveys in 2000). The long term average for the LFC's spawning population is 67%. In the LFC, section 8, river mile (RM) 66.5, had the highest carcass concentration followed by section 10, RM 65.5 (Figure 2). The highest concentrations of spawning in the HFC were found in sections 35, RM 54, and section 39, RM 51 (Figure 2).

Figure 2. Carcasses handled by survey section in the LFC and HFC of the lower Feather River during the 2006 Chinook salmon escapement survey. Note: Section 1 in the LFC and Section 22 in the HFC are the most upstream areas surveyed in each reach.



Spawning Mortality:

In 2006, 42.2% of female salmon examined died before the majority of their eggs were deposited (Table 1). This level of pre-spawning mortality is slightly higher than the long term average, 38%. Weekly pre-spawning mortality was higher early in the survey (September and October) and in the HFC (Figure 3). However, when calculating the distribution of pre-spawning mortality over time, it is higher during weeks 4 and 5 of the survey, which corresponds with higher concentrations of fish (Figure 4). The cause of pre-spawning mortality is unclear, but likely results from stresses associated with upstream migration, water temperatures, angling pressure, and intense competition for limited spawning habitat. These causes inherently vary between channels due to several factors. For example, concentrations of the spawning population are higher in the LFC than the HFC and there is more suitable spawning habitat in the LFC than the HFC.

Table 1. Spawning status of female Chinook salmon examined during the 2006 escapement survey in the lower Feather River.

River Section	# Spawned	# Unspawned	Total	Unspawned
LFC (Sect. 1-21)	1423	1048	2471	42.4%
HFC (Sect. 22-39)	202	136	338	40.2%
Overall	1625	1184	2809	42.2 %

Figure 3: Weekly percentage of unspawned females and weekly population estimate in the lower Feather River during the 2006 Chinook salmon escapement survey.

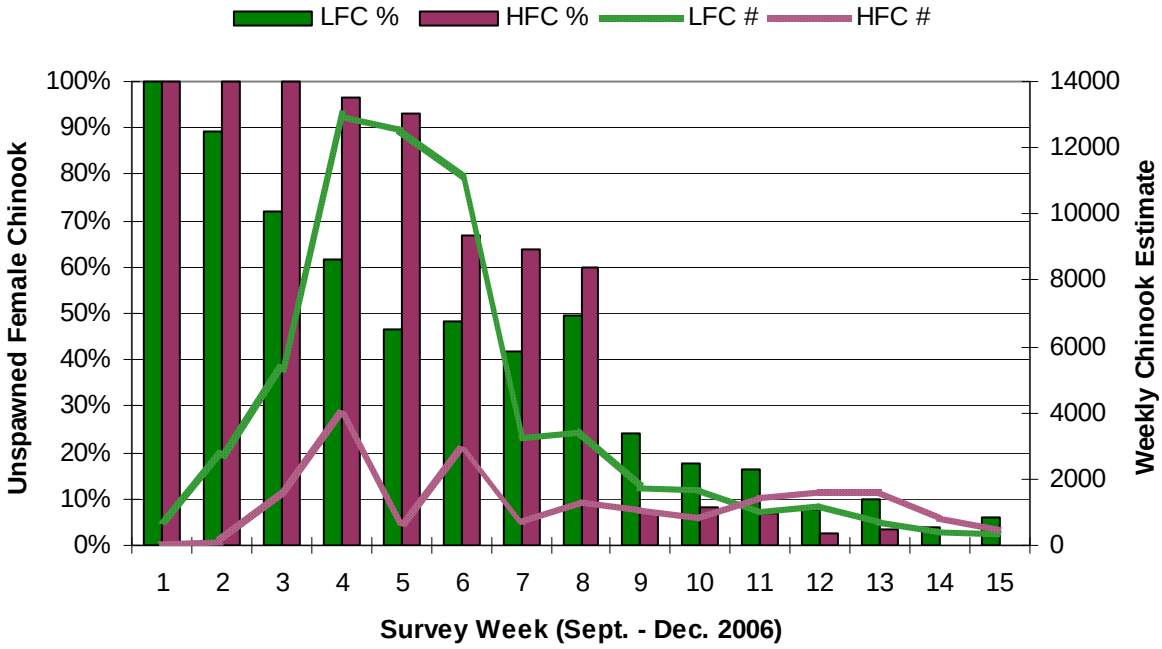
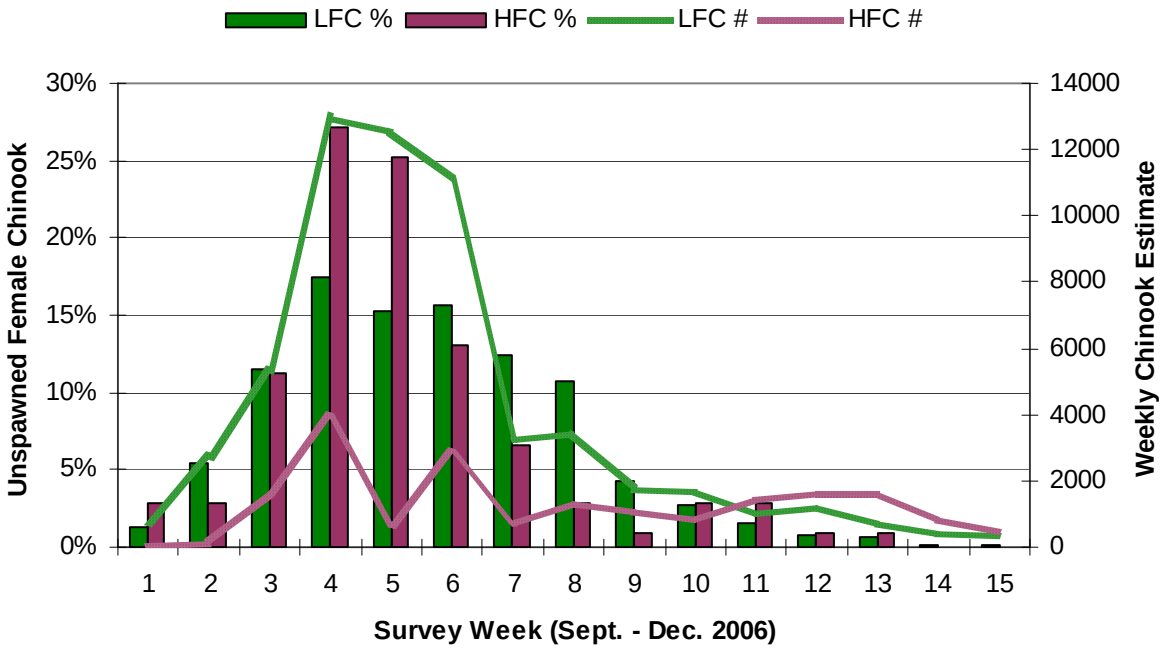


Figure 4: Weekly distribution of unspawned females examined during the entire survey in the lower Feather River during the 2006 Chinook salmon escapement survey.



CWT Sampling:

During the CWT survey we examined 3,913 salmon. Of these, 380 had adipose fin clips and 3,446 were not clipped (Table 2). 87 fish were discarded from the data due to unknown clip status. In addition to the CWT survey there were 17 heads taken from fish that were found and checked for adipose fin clips before the carcass survey began. The head was collected from a total of 397 salmon and sent to DFG for processing. The CWT was recovered from 352 (88.7%) of the in-river adipose clipped fish processed, 16 of these were strays (see Table 4). In 2006, upon request of DFG, we increased the number of fish assessed for an adipose fin clip. We examined 3,137 fish in addition to the CWT survey that were recorded as clipped or not clipped, but the heads were not collected from clipped fish. Of these, 12.3% were adipose fin clipped. The majority of clipped fish were found early in the survey (Figure 5) and in the LFC (Table 2). This year's spawning season showed a similar clip rate in the LFC (11.1%) and a decrease in the HFC (2.6%) compared to the 5 year average of 11.6% and 6.6%, respectively (2001 through 2005).

Table 2. Adipose fin presence/absence summary from Chinook salmon examined for the CWT survey in the Feather River during the 2006 escapement survey.

River Section	Clipped	Non-clipped	CWT Rate
LFC (Sect. 1-23)	366	2927	11.1%
HFC (Sect. 23-46)	14	519	2.6%
Overall	380	3446	9.9%

Figure 5. Weekly percentage of examined Chinook salmon with CWTs in the LFC and HFC of lower Feather River during the 2006 Chinook salmon escapement survey.

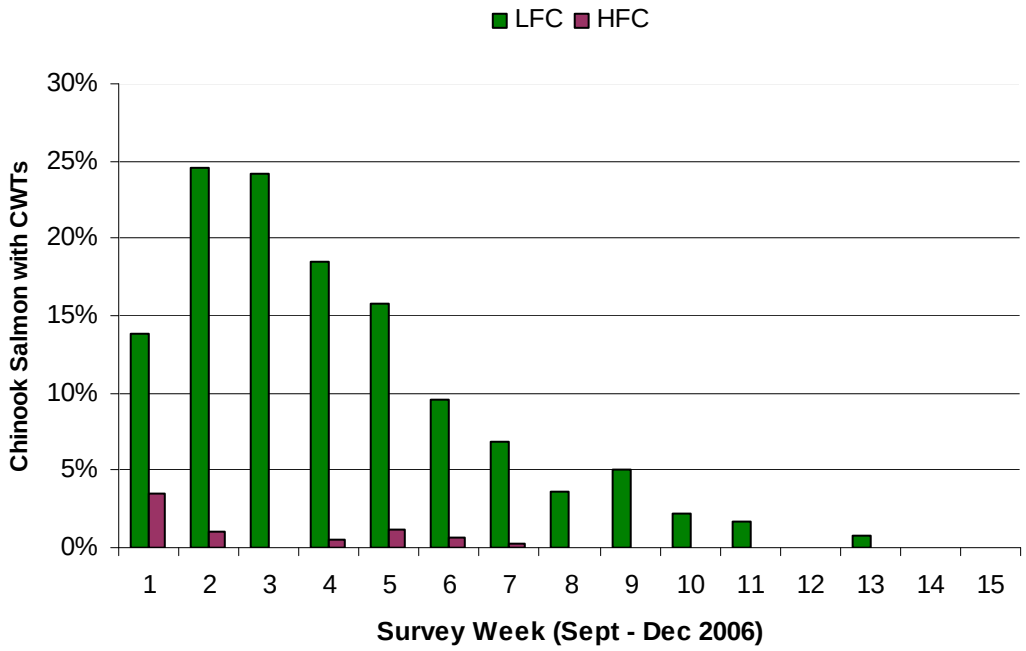


Table 3A shows the in-river spawning population of Chinook was slightly more dominated by age-4 fish (52.7%) than age-3 (43.5%) fish. The hatchery population was almost the opposite of the in-river population (Table 3A & B); they recovered more age-3 (59.6%) fish than age-4 fish (33.5%), which is more comparable to the previous 3-yr average of both in-river and hatchery populations (where age-3 fish were 62.7% and 66.1%, respectively and age-4 fish were 27.4% and 15.7%, respectively). Data from the last 3 years show that age-2 fish are recovered in the hatchery (17.8%) twice as much as in-river (9.3%). The higher portion of age-2 fish in the hatchery may reflect sampling bias against finding smaller fish in the river. However, it is important to note that an inconsistent tagging rate for each brood year does affect the overall proportions of each age-class represented. In addition, a very small percentage of fall-run get tagged (~10%) compared to spring-run (~100%).

Table 3. Age composition of Feather River Hatchery origin Chinook salmon recovered during 2006 from the A) in-river escapement survey including both the LFC and HFC, and B) the Feather River Hatchery.

A) In-river

Age	LFC CWT Recoveries	HFC CWT Recoveries	Total	%
2	11	1	12	3.6
3	144	3	147	43.5
4	172	6	178	52.7
5	1	0	1	0.30

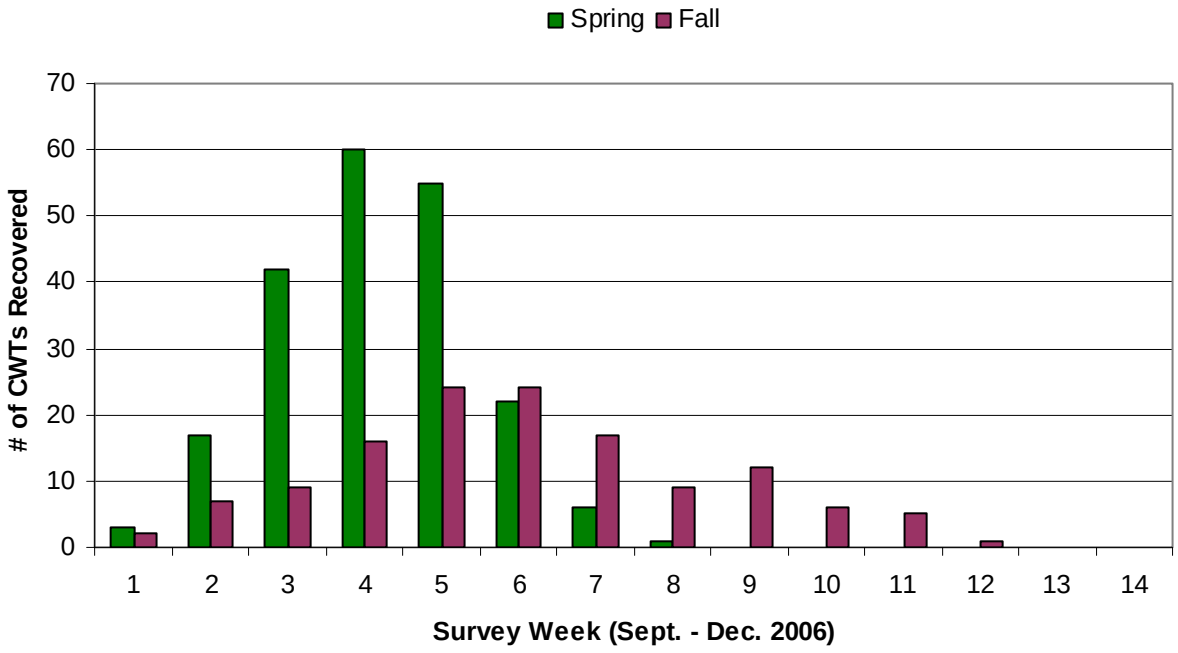
B) Hatchery

Age	CWT Recoveries	%
2	89	6.8
3	779	59.6
4	437	33.5
5	1	0.10

Spring and Fall Chinook CWT Composition:

Salmon tagged as spring-run and fall-run at the Feather River Hatchery demonstrated considerable overlap in their temporal distribution (Figure 6). Occurrence of spring-run Chinook CWTs peaked at Week 4; a week earlier than fall-run Chinook CWTs. No spring run CWTs were collected after week 8. Only 45.3% (153 out of 338) of the fish displayed the phenotypic behavior of the run that their CWT designated them as. Of the fish that displayed phenotypic fall-run behavior, 92.4% were coded as fall-run. And of the fish that displayed phenotypic spring-run behavior, 15.0% were coded as spring-run.

Figure 6. Weekly CWT in-river Chinook salmon recoveries by run of Feather River Hatchery origin fish from the Feather River during the 2006 spawning season.



Strays:

The majority (99.0%) of the tagged Chinook that returned to the lower Feather River and Feather River Hatchery in 2006 were of Feather River Hatchery Origin. Sixteen tagged fish consisted of strays from Coleman National Fish Hatchery, Merced River Fish Facility, and Mokelumne River Fish Instillation (Table 4). They were collected between the third week of September and the third week of November. All of these fish were fall-run fish ranging from age-2 to age-4.

Table 4. Weekly strays recovered by hatchery during the 2006 Chinook salmon spawning season. Note: River = in-river recoveries and FRH = Feather River Hatchery.

	River	FRH	Total
Coleman	1	4	5
Merced R	1	9	10
Mokelumne R	0	1	1
Total	2	14	16