

2007 Feather River Chinook Salmon Spawning Escapement Summary

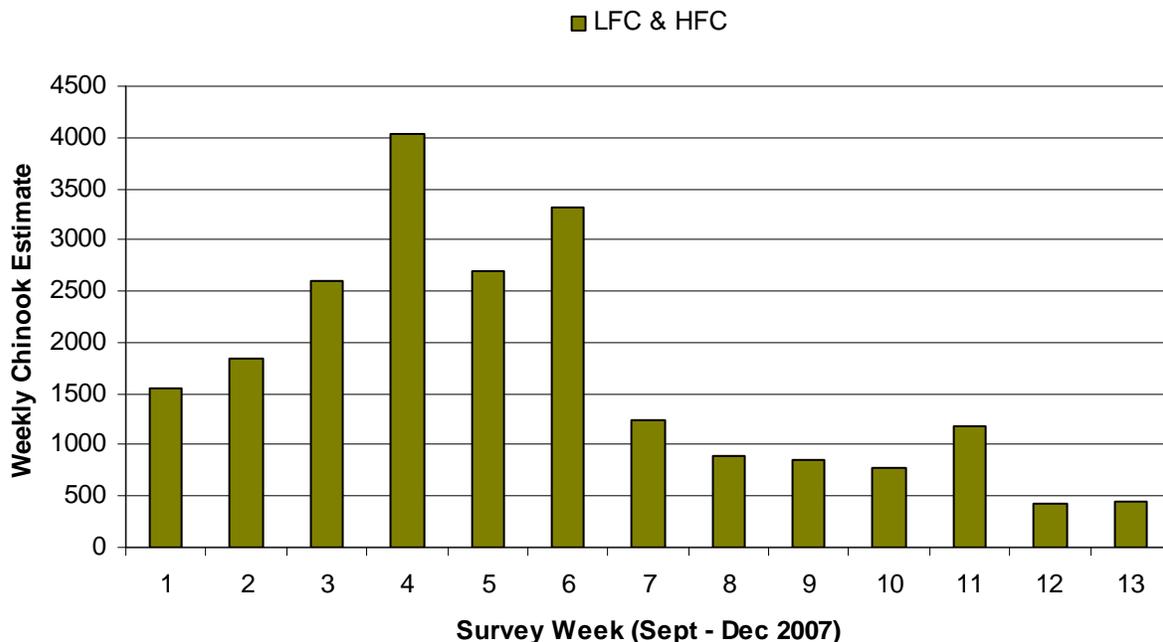
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The Chinook salmon spawning escapement survey began September 4 and continued through December 9, 2007. Due to the low numbers of returning fish, the data from the Low Flow Channel (LFC) and High Flow Channel (HFC) were pooled to generate one estimate for the lower Feather River. The LFC included the area in the Feather River from the Fish Barrier Dam downstream to the Thermalito Outlet and the HFC extended from the Thermalito Afterbay Outlet (TAO) downstream to the Gridley Bridge (GB).

Population Estimate:

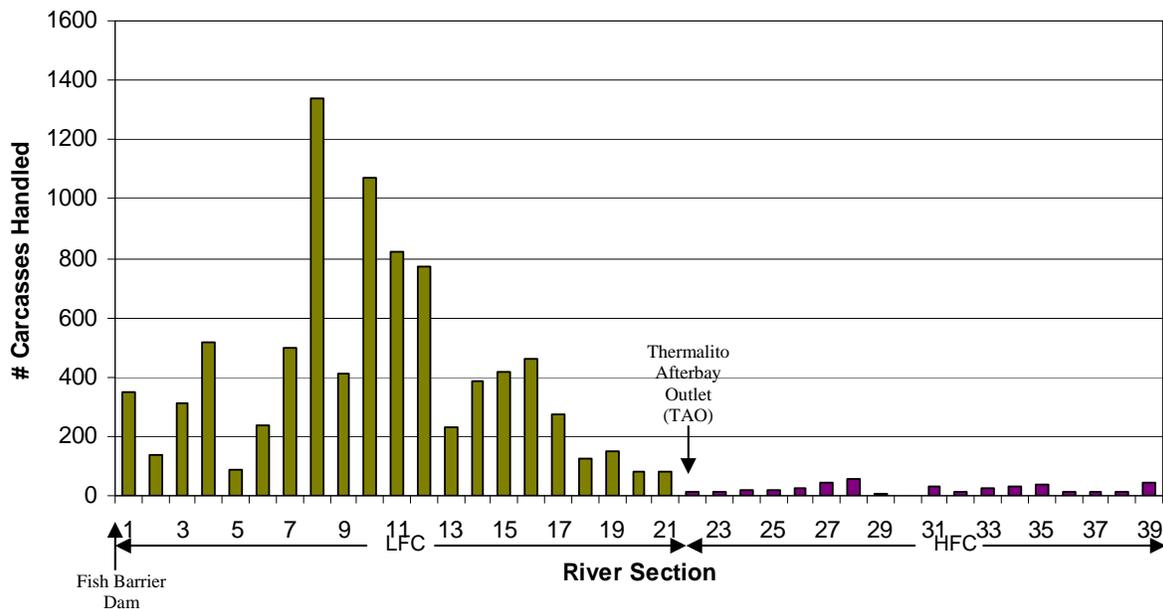
Using a pooled Peterson estimator to total escapement estimate for the lower Feather River was 21,862. There were an estimated 321 grilse (fish \leq 65 cm fork length). These estimates include both fall-run and spring-run Chinook salmon since their spawning is currently not fully segregated on the Feather River.

Figure 1. Weekly population estimates in the lower Feather River (LFC & HFC) during the 2007 Chinook salmon escapement survey.



Approximately 96% of the spawning population utilized 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 since 2000 is 67%. In the LFC, section 8, river mile (RM) 66.5, had the highest carcass concentration followed by section 10, RM 65.5. The highest concentrations of spawning in the HFC were found in sections 28, RM 56, and 39, RM 51 (Figure 2).

Figure 2. Carcasses recovered by survey section in the LFC and HFC of the lower Feather River during the 2007 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.



Pre-spawning Mortality:

The average pre-spawn mortality rate from 2000 to 2006 is 38.7%. This year, on average, 36% of the 1,168 female salmon examined in-river died before the majority of their eggs were deposited (Table 1). Weekly pre-spawning mortality was higher during the first few weeks of the survey and in the HFC (Figure 3). However, when calculating the distribution of pre-spawning mortality over time, it is higher during weeks 5 and 6 of the survey and in the LFC, which corresponds with higher concentrations of fish (Figure 4). This trend is similar to previous years. 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 available in the LFC than the HFC. There is a correlation between yearly pre-spawning mortality and population densities. For the years 2000-2007 a regression was done using the inverse sine of pre-spawning mortality percentages as the dependent variable and population density as the independent variable. Figure 5 displays the results of a regression analysis indicating that 62.8% of pre-spawning mortality can be explained by population density ($p=0.0054$).

Table 1. Spawning status of female Chinook salmon examined during the 2007 escapement survey in the lower Feather River.

River Section	# Spawned	# Unspawned	Total	Unspawned
LFC (Sect. 1-21)	702	413	1115	37.0%
HFC (Sect. 22-39)	45	8	53	15.1%
Overall	747	421	1168	36.0%

Figure 3. Weekly percentage of unspawned females and population estimate by channel in the lower Feather River during the 2007 Chinook salmon escapement survey.

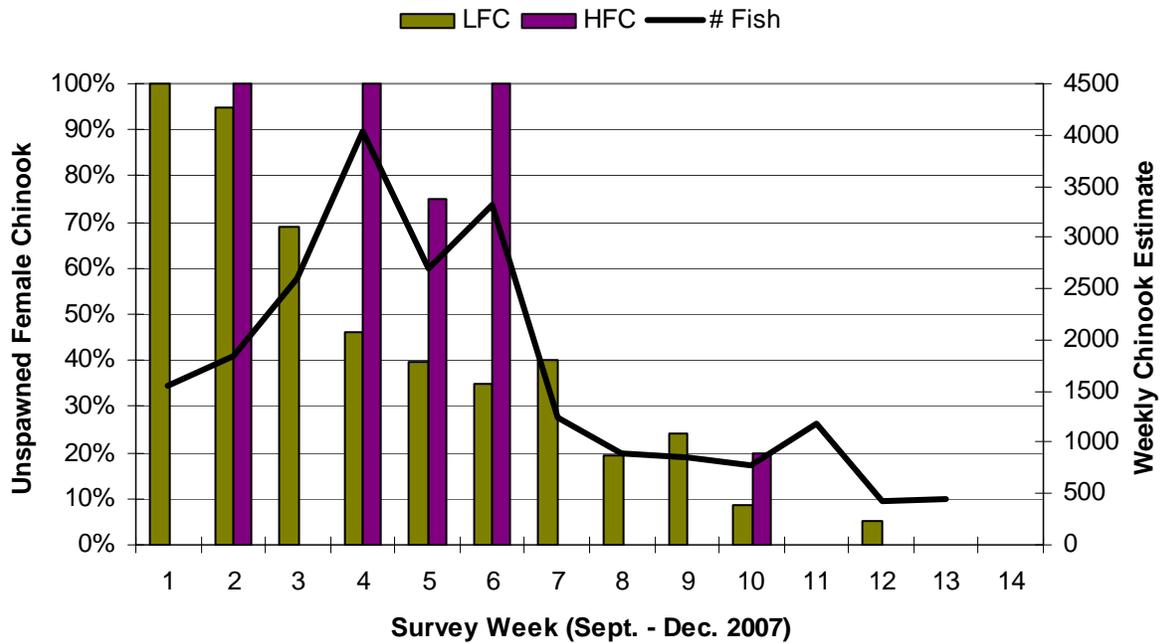


Figure 4. Weekly distribution of unspawned females examined during the entire survey by channel in the lower Feather River during the 2007 Chinook salmon escapement survey.

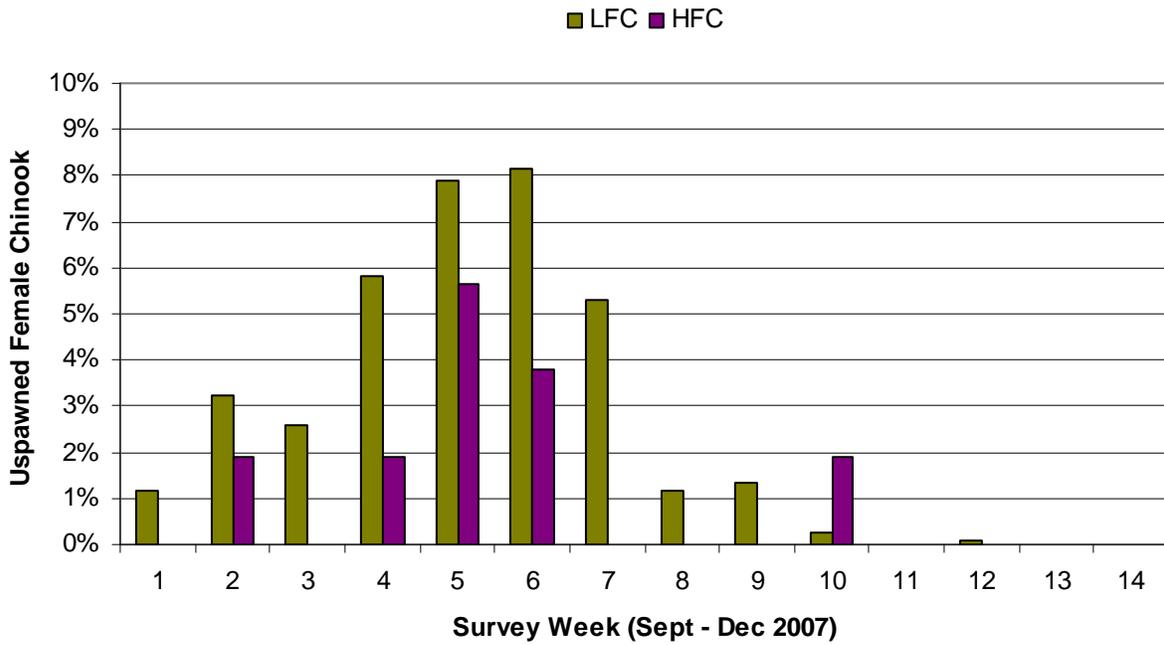
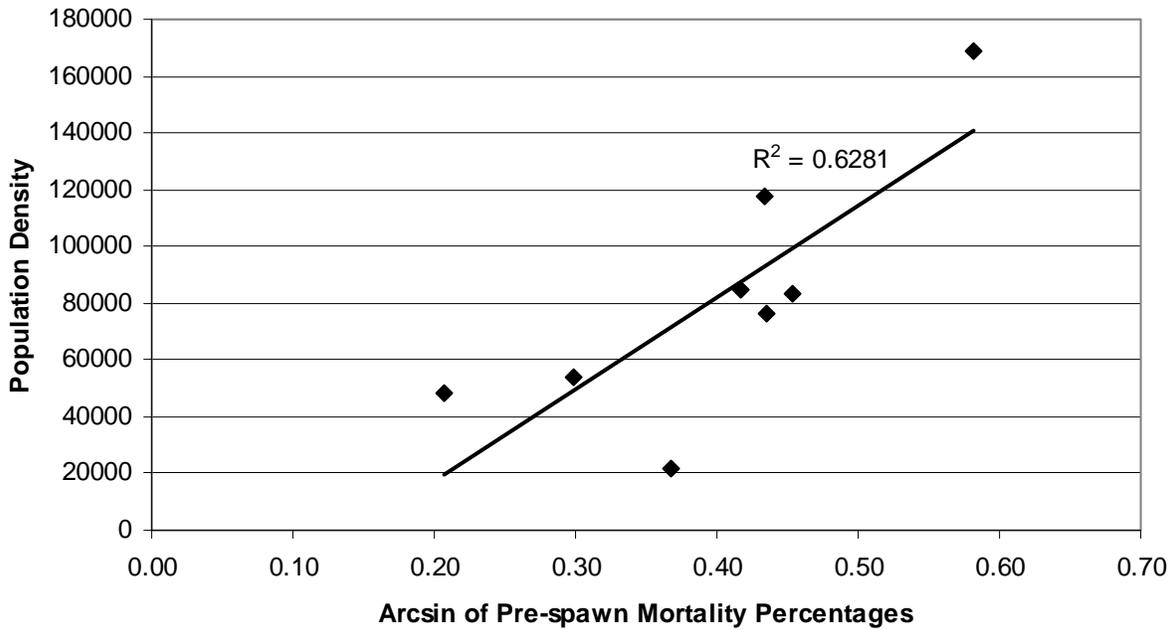


Figure 5. Regression showing correlation between pre-spawn mortality and population density for the years 2000-2007.



CWT Sampling:

During the CWT survey we examined 1,664 fish for adipose fin clips; of these we were able to identify 1,637 as clipped or not clipped, leaving a remainder of 26 fish with unknown clip status. Of the 1,637, 246 adipose fin clipped fish were found and the heads were taken and sent to DFG for processing. In addition to the CWT survey we took heads from all fresh clipped hallprint tagged fish, of which 27 heads were taken. We also collected heads from clipped fish found before the carcass survey began (non-random recoveries). We collected 10 heads from these fish and sent them to DFG for processing. DFG processed 283 fish and the CWT was recovered from 250 (88.3%), 1 of these was a stray from Coleman Fish Hatchery (see Table 5). The majority of the clipped fish were found in the LFC (Table 2) and earlier in the survey (Figure 6). We examined 1,091 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 250 (22.9%) were adipose fin clipped.

Table 2. Adipose fin presence/absence summary from Chinook salmon examined for the CWT survey in the Feather River during the 2007 escapement survey.

River Section	Clipped	Non-clipped	CWT Rate
LFC (Sect. 1-23)	244	1287	15.9%
HFC (Sect. 23-46)	2	104	1.9%
Overall	246	1391	15.0%

Figure 6. Weekly percentage of examined Chinook salmon with adipose fin clips for the CWT survey in the LFC and HFC of lower Feather River during the 2007 Chinook salmon escapement survey.

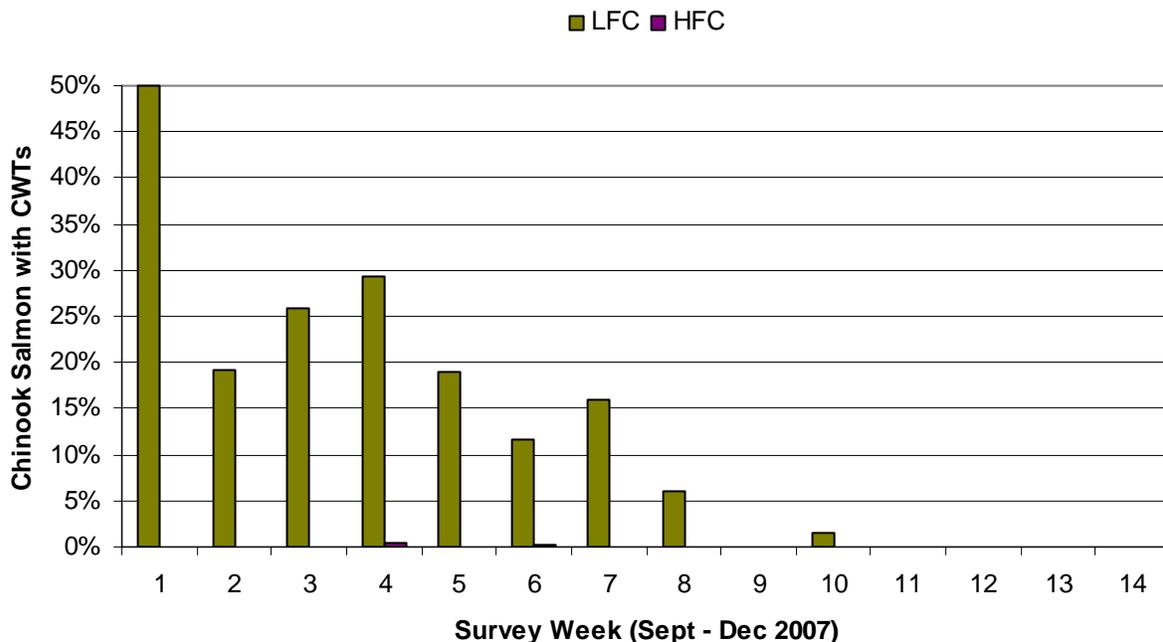


Table 3A shows the in-river spawning population of Chinook was dominated by age-3 fish (63.9%), while age-4 fish (34.4%) made up nearly the remainder of the population, with a few age-3 fish (1.3%) and only 1 age-5 fish (0.4%). The hatchery population showed a similar trend, but with a greater percentage of age-3 fish (81.9%) and a smaller percentage of age-4 fish (17.4%) (Table 3B). Ages 1, 2, & 5-fish were very uncommon; together making up less than 1% of the total hatchery population (Table 3B). Data from the previous 3 years showed that age-2 fish were recovered in the hatchery (17.8%) twice as much as in-river (9.3%), however this year's hatchery age-2 fish population (0.5%) was less than half in-river (1.3%). It is important to note, however, 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 2007 from the A) in-river escapement survey including both the LFC and HFC, and B) the Feather River Hatchery.

A) In-river

Age	HFC CWT Recoveries	LFC CWT Recoveries	Total	%
1	0	0	0	0.0
2	0	3	3	1.3
3	0	145	145	63.9
4	2	76	78	34.4
5	0	1	1	0.4

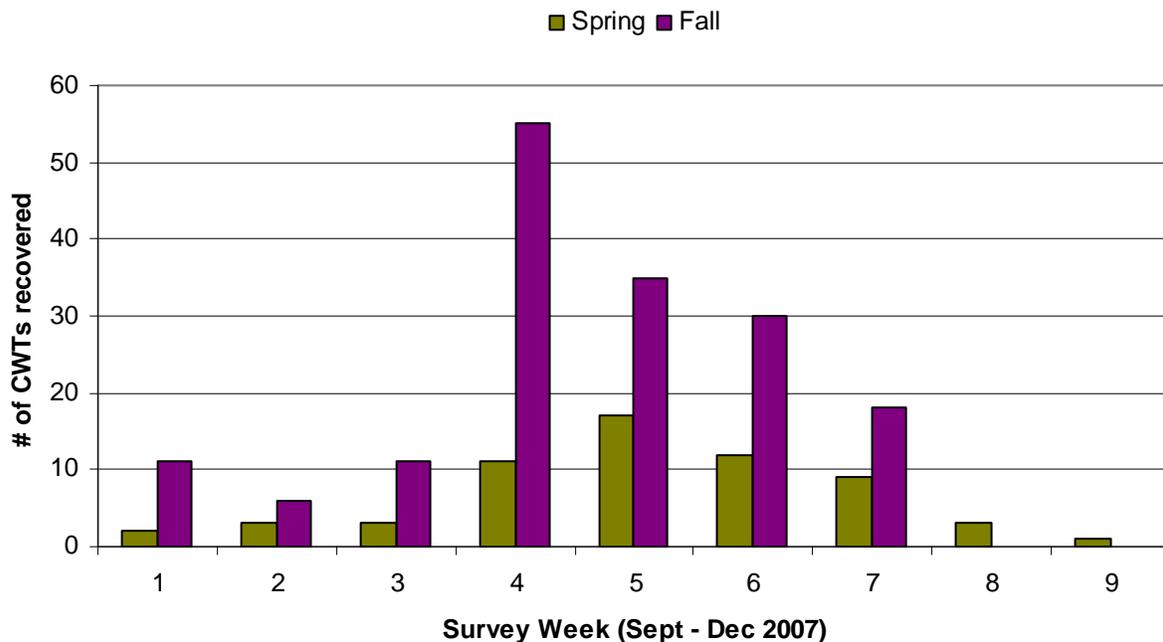
B) Hatchery

Age	CWT Recoveries	%
1	1	0.1
2	6	0.5
3	977	81.9
4	208	17.4
5	1	0.1

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 7). 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 9. Only 49.3% (111 out of 225) 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, only 32.3% were coded as fall-run. And of the fish that displayed phenotypic spring-run behavior, 87.1% were coded as spring-run. Furthermore, it appears that Chinook exhibiting the spring-run phenotype were more successful spawners than their fall-run counterparts.

Figure 7. Weekly CWT in-river Chinook salmon CWT survey recoveries by run of Feather River Hatchery origin fish from the Feather River during the 2007 spawning season.



Strays:

The majority (99%) of the tagged Chinook that returned to the lower Feather River and Feather River Hatchery in 2007 were of Feather River Hatchery Origin. Thirteen tagged fish consisted of strays from Coleman National Fish Hatchery, Merced River Fish Facility, Mokelumne River Fish Instillation, and Nimbus Fish Hatchery (Table 4). They were collected between the second week of October and the first week of December. All of these fish were fall-run fish ranging from age-2 to age-4, except for one age-1 late-fall from Coleman NFH.

Table 4. Weekly strays recovered by hatchery-origin during the 2007 Chinook salmon spawning season. Note: River = in-river recoveries and FRH = Feather River Hatchery.

	River	FRH	Total
Coleman	1	5	6
Merced R	0	4	4
Mokelumne R	0	1	1
Nimbus FH	0	1	1
Total	1	11	12