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M e m o r a n d u m

To : To Files **Date**: March 14, 2005

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Northern California-North Coast Region

Subject : Mill Creek Spring- and Fall-run Chinook Escapement Surveys for 2004

Spring-Run Chinook Spawning Surveys

An estimated 998 spring-run Chinook salmon spawned in Mill Creek in 2004. This estimate was made by expanding salmon redd counts within the spring-run Chinook spawning habitat in Mill Creek. In addition to redds, live salmon and carcasses were also counted. Fin tissue samples were collected from carcasses for genetic analysis.

The known spawning habitat of spring-run Chinook salmon in Mill Creek extends a total distance of 41 miles from approximately the Hwy-36 Bridge crossing to the Steel Tower Transmission Lines located three miles downstream from Little Mill Creek's confluence with Mill Creek (Figure 1). We use a combination of ground and aerial surveys to count redds. Ground surveys are used to count redds from upstream of Hwy 36 to Buckhorn Gulch, a distance of 36 miles. Helicopter aerial surveys are used from Buckhorn Gulch to the Steel Tower Transmission Lines. Typically, fewer redds are counted from the air than on the ground due to poor visibility from shadows and vegetation. To correct for this problem, we conduct both ground and aerial surveys from Black Rock to Buckhorn Gulch to obtain a corrected ground-to-air redd ratio. This ratio is applied to the air-only counts to obtain a corrected redd count downstream of Buckhorn Gulch.

The ground survey section is separated into 13 survey reaches. Based on prior years' surveys, it is estimated that the peak of spawning activity is Julian weeks 39-41, with spawning starting earlier at higher elevations. Each year's survey is scheduled to coincide with this time period. In 2004, surveys extended from 29 September thru 7 October, Julian weeks 40 and 41. The aerial redd survey was flown on 27 September and extended from Black Rock to the Steel Tower Transmission Lines. (Note: annual variation in the peak spawning weeks may cause these standardized redd surveys to under-estimate the population in years when peak spawning occurs after Julian weeks 39-41. Currently spawning surveys are a one-time pass due to labor shortages and overtime costs).

During the spawning surveys, a total of 88 live salmon, 50 carcasses and 499 redds was observed (Table 1). In order to expand redd counts to a population estimate, we assumed that each female constructs one redd and there is a 1:1 male to female sex ratio in the population. Otherwise stated: each redd represents two salmon:

499 redds x 1 female/redd x 2 = 998 salmon.[1]

Adult Salmon Holding Surveys

In 2004, no adult salmon holding surveys were made in Mill Creek. Since no surveys were attempted it is not known whether water clarity would have allowed accurate counting of salmon.

Spring-run Salmon Population Trends

This year's estimate of 998 spring-run Chinook salmon is lower than the previous three years estimates which ranged from 1,104 to 1,594 (Table 1). During the previous eight years on record when redd surveys have consistently been used to estimate population levels, spring run estimates have ranged from a high of 1,594 in 2002 to a low of 202 in 1997. Adult spring-run Chinook counts in Mill Creek dates back to late 1940's. An average of 1,900 spring-run Chinook spawned in Mill Creek annually from 1947-1964.

Isolation from Fall-run Chinook

Fall-run Chinook surveys in Mill Creek are used to determine the extent of temporal and spatial isolation between the two runs. In 2004, fall-run Chinook salmon began migrating into Mill Creek 18 October, and spawning peaked the second week of November. Spring-run Chinook had completed spawning activities prior to the peak of fall-run fish spawning, and therefore remain temporally isolated from fall run. No fall run spawning surveys were made upstream of the Mill Creeks canyon mouth, since little spawning activity occurred between the upper diversion dam and the canyon mouth. Fall-run salmon in Mill Creek remained spatially isolated from spring run.

Tissue Samples

Seventeen fin-tissue samples taken from adult spring-run Chinook salmon carcasses will be sent to the Department of Fish and Games, Central Valley Salmon Stock Tissue Collection Project archives.

Acknowledgements

The completion of a comprehensive spawning survey within the Mill Creek watershed is a monumental effort which is further complicated by the Departments ongoing budget and labor crisis. This year's survey would not have been completed without the dedicated efforts of 18 participants from state, federal and private projects. Most of the participants are repeats from previous Mill Creek surveys and are familiar with redd counting methodology and survey routes. Participants included Randy Benthin, Mike Berry, Bret Rohrer, and Colleen Harvey Arrison from the Departments Fisheries Program; Curt Babcock and Teri Moore from the Departments Timber Harvest Program; Jennifer Navicky and Rob Grasso from the Departments Salmon Tissue Archive Project; Ken Roby, Jake Alliman and Matt Stodacher from Lassen National

[1]Expanding the redd counts by a multiplier of two is assuming that each female builds one redd and there is a 1:1 sex ratio in the population. Ratios of redds-to-holding salmon in Deer Creek from 1997-2004 have ranged from 1.1 to2.5 with an 8-year average of 2.1. For the 2004 Mill Creek estimate a multiplier of 2 will be used.

Forest; Julie Kelley from Sierra Pacific Industries; Aric Lester from the Department of Water Resources Mike Spiker, Andy Holland, Matt Johnson and James Lyons from Pacific States Marine Fisheries Commission, and Kerry Burke a Mill Creek landowner. The winner of this year's Mill Creek Salmon guess contest was Julie Kelley who won the "2004 Tour de Mill Creek" custom ball cap with a guess of 982 salmon. Thank-you to all who volunteered their time to participate in this year's survey efforts.

In addition to adult salmon counts, the Department also monitors juvenile salmon emigration and collects stream flow and water temperature data at locations in the watershed critical to adult and juvenile salmon survival. The results from this spring-run Chinook life history monitoring are reported in a separate annual Broodyear Report.

Fall-run Chinook Spawning Surveys

On October 18, post-diversion flows on lower Mill Creek increased from 17 to 157 cfs, providing transportation flows for immigrating fall-run Chinook. This bypassing of irrigation water is done after fall water temperatures drop below lethal levels for spawning Chinook and when bypassed flows can be sustained to protect redds. Post-diversion flows ranged between 93 and 440 cfs for the duration of the October thru December spawning period. During 5 November and 29 November, four weekly spawner surveys were made from the canyon mouth 2.5 miles upstream of the Upper Diversion Dam to Mill Creek's confluence with the Sacramento River (Figure 1). Using salmon carcass mark-and-recovery methods to estimate population levels, an estimated **1,192 fall run salmon spawned in Mill Creek in 2004**. A total of 401 carcasses were encountered with an average recovery rate of 32% on tagged carcasses. Sixty-three of the fall-run carcasses encountered were ad-clipped for Coded-wire-tags (CWT's). CWT recoveries were made from Coleman National Fish Hatchery, Feather River Hatchery and Merced River Fish Facility releases. Since only a small fraction of a hatcheries production receives a CWT, and not all hatcheries tag fish, a large percentage of fall-run Chinook returning to Mill Creek may be strays from any of the five salmon hatcheries in California's Central Valley.

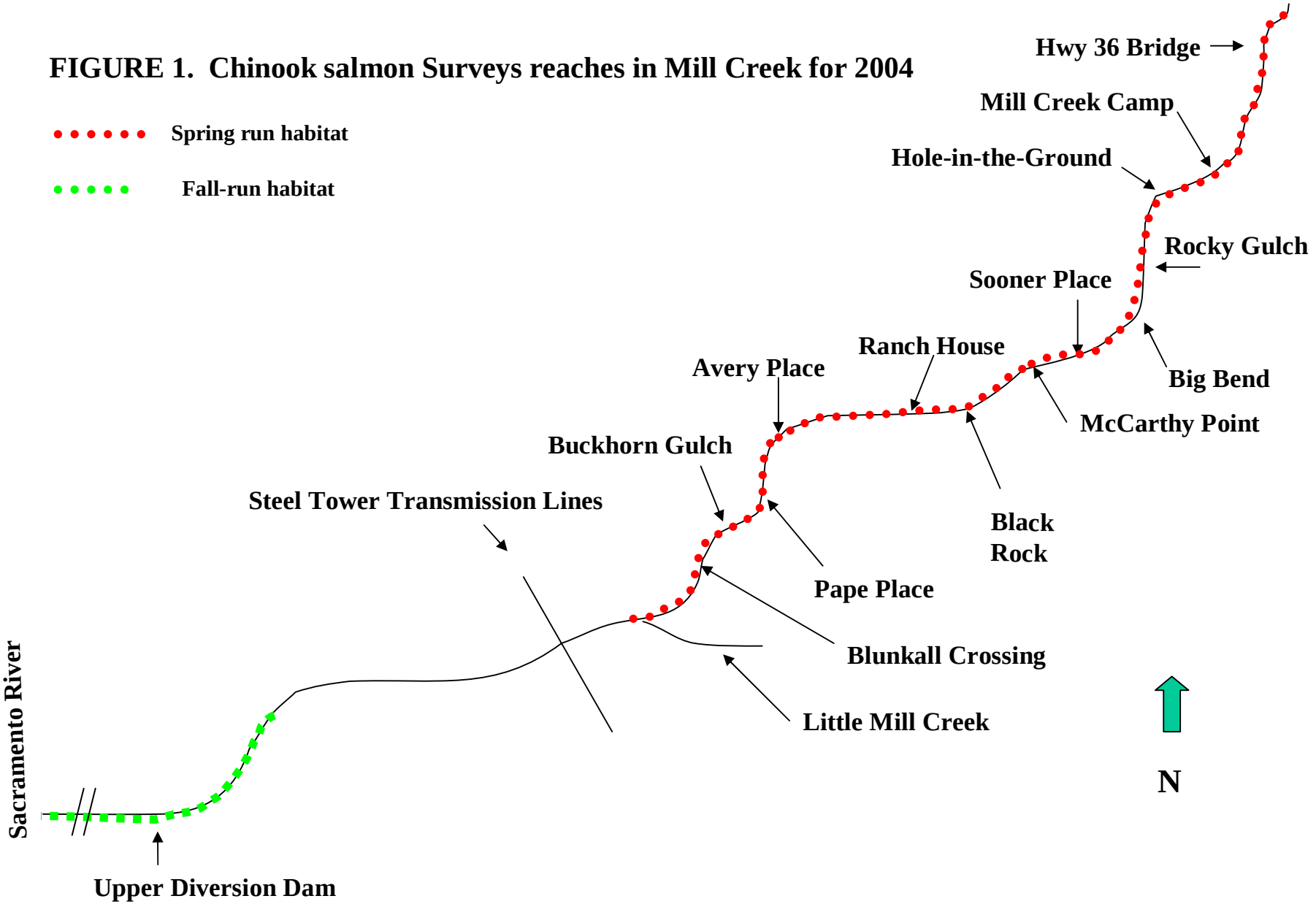
Fall-run Chinook population estimates on Mill Creek date back to 1947. In years when surveys were made, estimates have ranged from 16,000 to 150.

TABLE 1. Spring-run Chinook salmon redd counts and population estimates in Mill Creek, 1997 - 2004

Section	1997	1998	1999	2000	2001	2002	2003	2004
Above Hwy-36	0	NS [1/]	NS	NS	NS	12	0	0
Hwy-36 to Little Hole-in-the-Ground	1	1	0	0	3	13	6	1
Little Hole-in-the-Ground to Hole-in-the-Ground	7	2	1	0	19	23	14	23
Hole-in-the-Ground to Ishi Trailhead	1	1	3	4	13	38	44	5
Ishi Trailhead to Big Bend	7	1	11	6	14	8	24	9
Big Bend to Canyon Camp	53	11	6	12	92	103	121	49
Canyon Camp to Sooner Place	NS	NS	NS	NS	NS	NS	NS	NS
Sooner Place to McCarthy	19	21	22	59	129	172	133	97
McCarthy to Black Rock	1	25	75	77	153	119	137	95
Black Rock to Ranch House	5	19	58	34	71	127	39	38
Ranch House to Avery Place	7	33	}52	53	44 [2/]	83	67	146
Avery Place to Pape Place	NS	39		15	12 [2/]	27 [2/]	58	8
Pape Place to Buckhorn Gulch	NS	13	12 [2/]	3 [2/]	0 [2/]	63 [2/]	64	18
Buckhorn Gulch to Blunkall Crossing	NS	25	23 [2/]	9 [2/]	0 [2/]	0	3 [2/]	
Blunkall Crossing to Little Mill Creek	NS	17	17 [2/]	0 [2/]	0 [2/]	0	3 [2/]	10 [2/]
Little Mill Creek to Transmission Line	NS	4	0 [2/]	0 [2/]	0 [2/]	9 [2/]	0	
Total Redds	101	212	280	272	552	797	713	499
Population Estimate	**202**	**424**	**560**	**544**	**1,104**	**1,594**	**1,426**	**998**

1/ NS = not surveyed
2/ Estimated redds from a ground: aerial redd survey ratio.

FIGURE 1. Chinook salmon Surveys reaches in Mill Creek for 2004



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