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SURVEY REPORT
1995 SEASON

SNORKEL AND REDD SURVEYS OF SPRING CHINOOK SALMON IN THE SOUTH FORK TRINITY RIVER BASIN

by

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for
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ABSTRACT

The United States Bureau of Reclamation and the U.S. Natural Resource Conservation Service in cooperation with the Trinity County Resources Conservation District funded a summer snorkel survey and fall redd count for spring-run chinook salmon (Oncorhynchus tshawytscha) in the South Fork Trinity River (SFTR) basin. Survey work was completed by Huber, Harpham, and Associates, under a private contract. Results and discussion presented here were also funded by that contract.

Systematic snorkel surveys were conducted in the South Fork Trinity River Basin between 26 July and 3 August, and were repeated between 29 August and 9 September, 1995. Two hundred ninety two spring chinook salmon were counted during the first survey period, and 579 were counted in the second period. Thirty and 41 spring-run steelhead, respectively, were also counted.

Pools were the primary spring chinook summer holding habitat in the basin. Twenty-one pools were located which held three or more spring chinook during both snorkel surveys. However, spring chinook were seen to use other habitat types, and did move between pools.

Systematic redd surveys were conducted in the basin between 21 September and 15 November, 1995. One hundred sixty eight spring chinook salmon redds were counted in the mainstem SFTR and 19 in Hayfork Creek. Spring chinook spawning began on 15 September and was complete by 11 November, 1995. Redds were distributed upstream and downstream of Forest Glen in the SFTR, with few downstream of Hyampom. Redds were seen farther upstream in Hayfork Creek than previously reported, but overall distribution was similar to other years studied (Dean 1995; in press) (LaFaunce, 1967).

OBJECTIVES

1. To count spring chinook salmon over-summering in the South Fork Trinity River basin. And, coincident with this effort, to count spring-run steelhead in the basin.
2. To count spring-run chinook salmon redds in the South Fork Trinity River Basin.
3. To provide this data as a rough index for comparison with data from other years.

INTRODUCTION

This survey was funded by the United States Bureau of Reclamation and the U.S. Natural Resource Conservation Service (NRCS) in cooperation with the Trinity County Resources Conservation District (TCRCD). This survey was conducted by Huber, Harpham, & Associates of Hyampom. It was designed simply to be a count of spring-run chinook salmon (spring chinook), Oncorhynchus tshawytscha, and the subsequent number of spring chinook redds seen in the South Fork Trinity River (SFTR) basin. The California Department of Fish and Game (CDFG) conducted more comprehensive studies of SFTR spring chinook in 1964 (LaFaunce) and from 1991 through 1994 (Dean). CDFG and the U.S. Forest Service (USFS) have made other efforts to count adult spring chinook (and spring-run steelhead) in the SFTR in order to track population trends and evaluate habitat recovery. These efforts have been sporadic and often only covered "index sections" (Appendix 1).

The current population of spring chinook in the SFTR is, at most, several hundred fish. Estimates of annual run size from various sources range from multiples of ten to about 700 fish (Appendix 1; Dean 1995). The population has experienced serious decline since 1964, when the run was estimated to be 11,604 (LaFaunce 1967).

These surveys were intended to provide limited data on SFTR spring-run stocks in the absence of other organized, official studies.

METHODS

The survey area included the SFTR from Surprise Creek (22.5 river kilometers from the mouth; RKM) upstream to Raspberry Gulch (RKM 123.8), the lower 7 km of the East Fork of the SFTR, and the lower 48 km of Hayfork Creek, totaling 201 km of river. CDFG (Dean 1995, LaFaunce 1967) divided this area into 14 roughly equal sections. We used these same sections for easy comparison, but added four new sections in Hayfork Creek for the redd survey (Figures 1, 2, & 3).

This survey was comprised of three separate surveys, each intended to make a systematic, accurate count of spring chinook and spring chinook redds. Coincident with this effort, spring-run steelhead (spring steelhead) were also counted. Snorkel and redd surveys were conducted using methods essentially identical to those used in the recent CDFG South Fork Trinity Spring Chinook Project (Dean 1995; in press). Further, most field staff were the same individuals who worked for this CDFG Project.

Snorkel Survey

During the summer of 1995, two separate snorkel surveys were conducted which systematically covered the entire survey area upstream of Surprise Creek, including lower

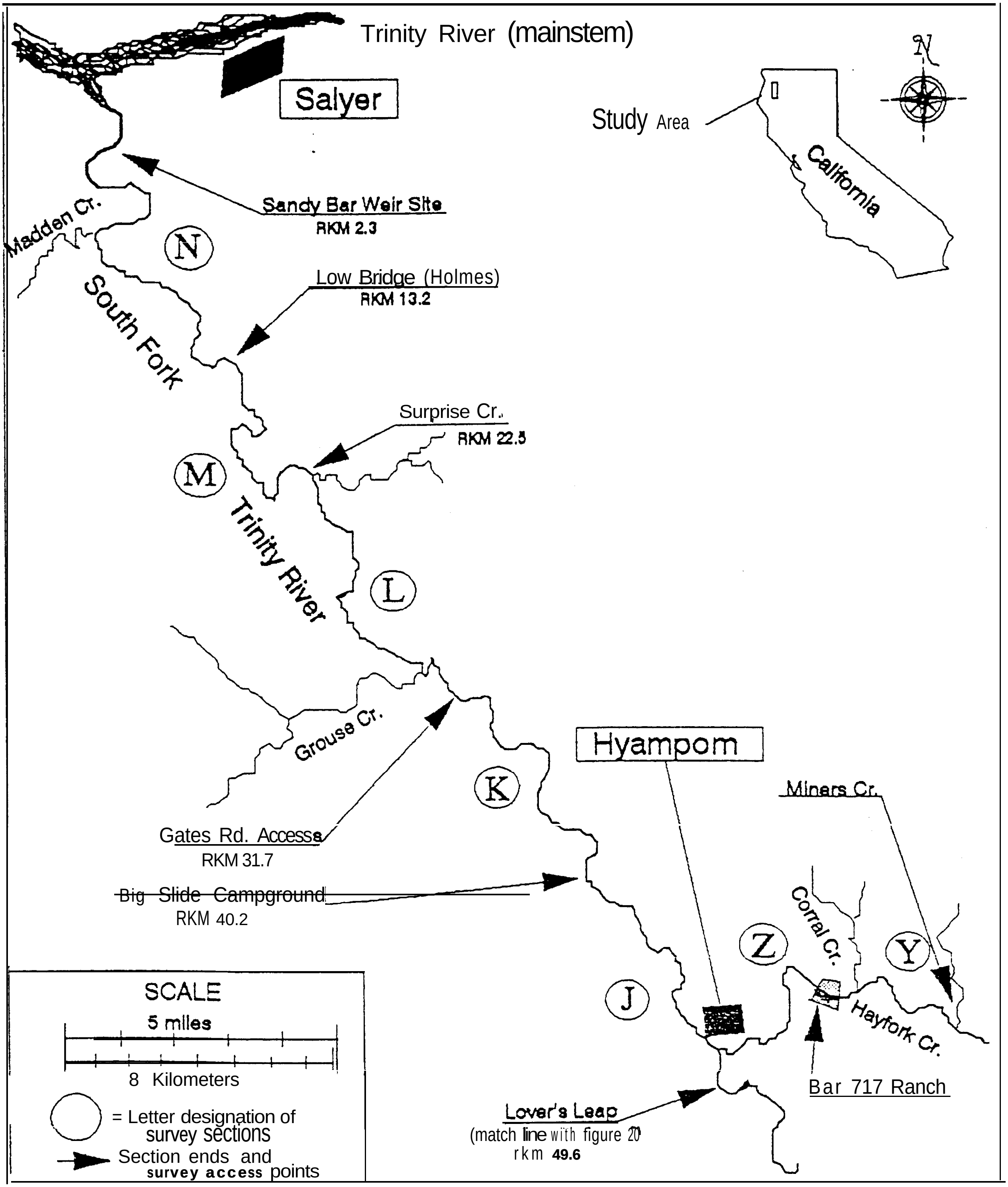

FIGURE 1. Map of South Fork Trinity River showing survey sections and access points, Hyampom downstream. RKM = river kilometers from river mouth,

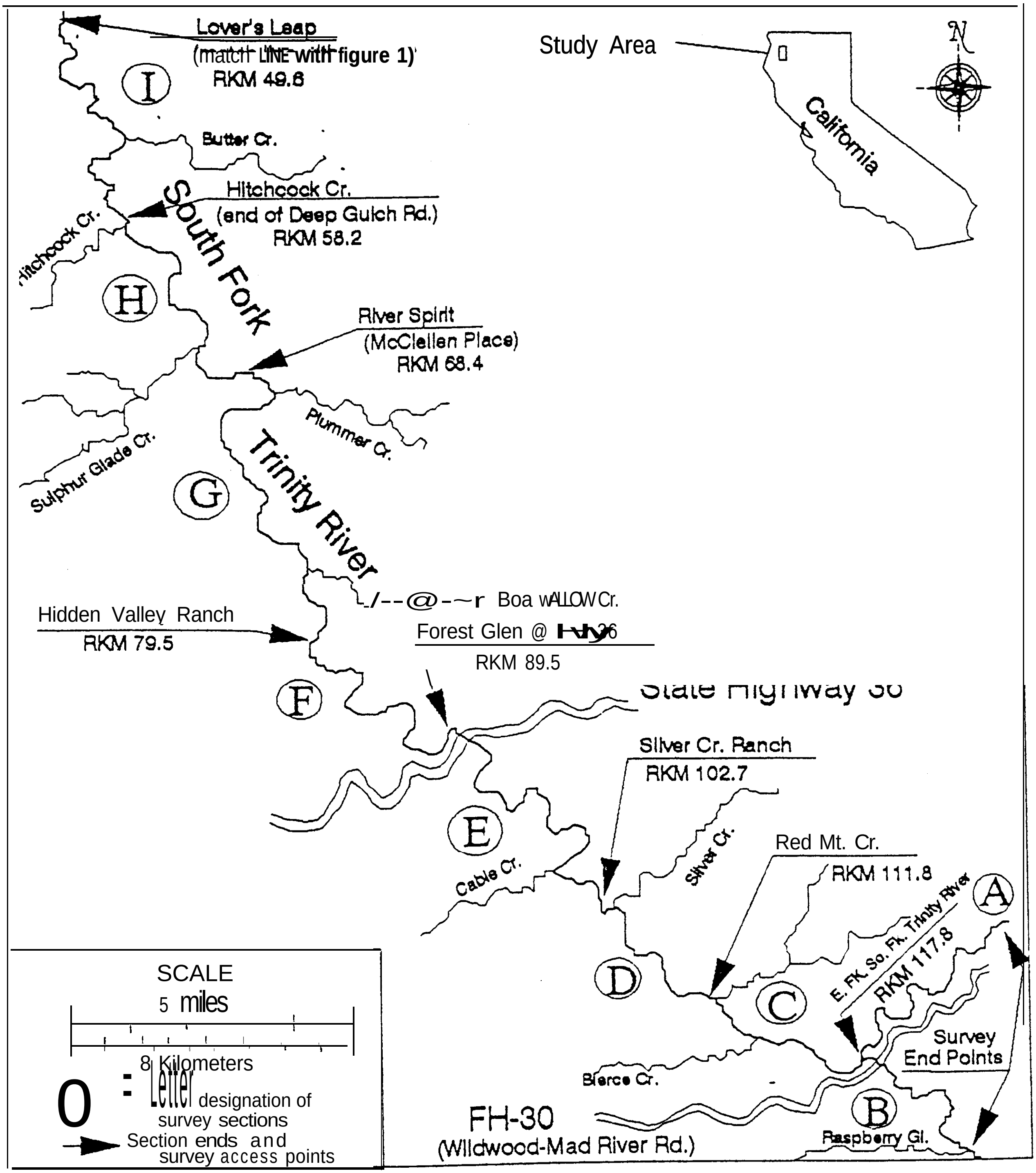

FIGURE 2. Map of South Fork Trinity River showing survey sections and access points upstream of Hyampom. RKM = river kilometers from river mouth,

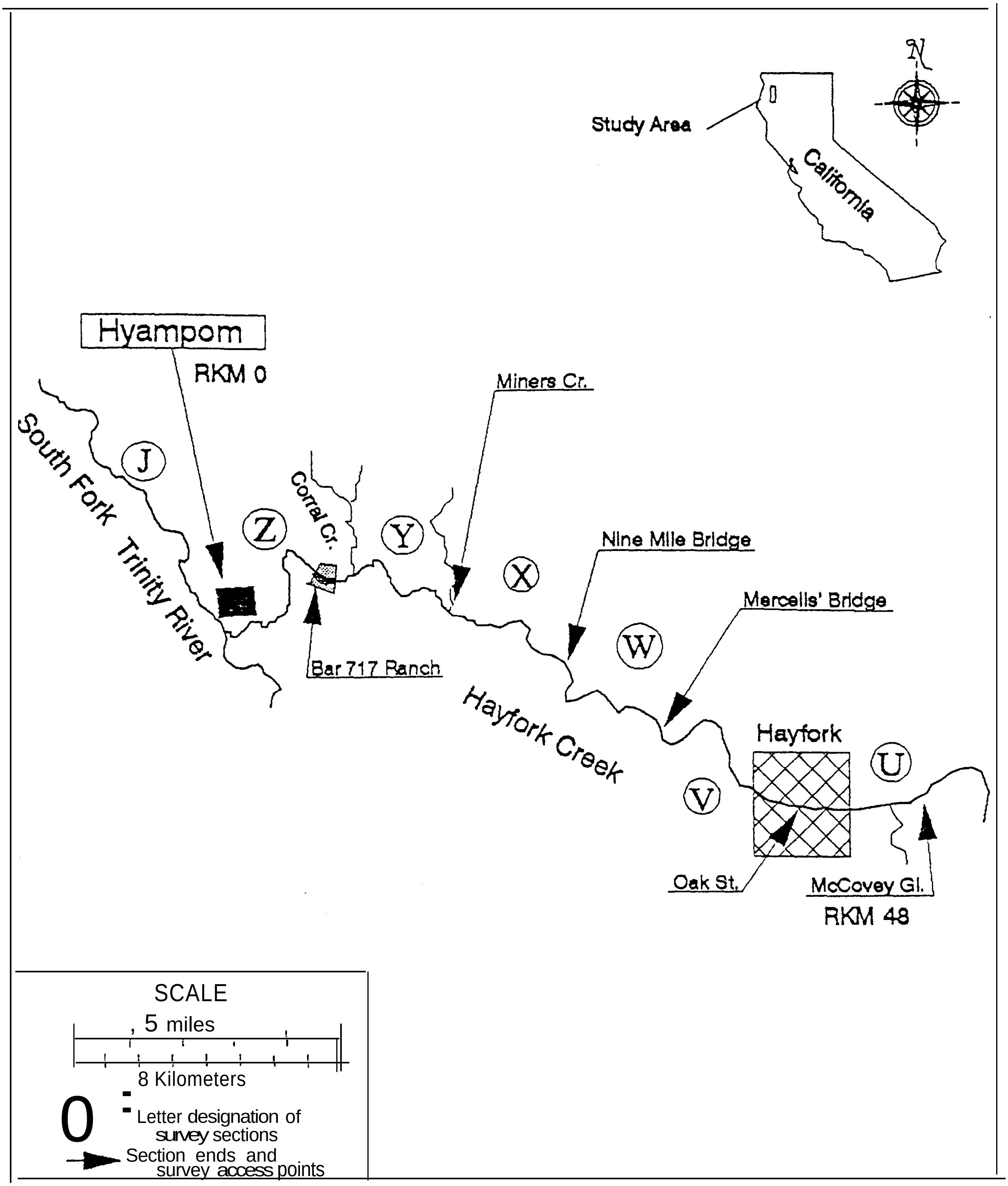

FIGURE 3. Map of Hayfork Creek showing survey sections and access points. RKM = river kilometers from stream mouth,

Hayfork Creek upstream to Miners' Creek (Figures 1, 2, & 3). We counted and recorded the numbers of spring chinook and spring-run steelhead seen. We also documented the number and location of over-summer holding pools utilized by three or more spring chinook, and any prespawn (over-summer) mortalities.

Utilized summer holding pools were defined as those that held three or more spring chinook during both snorkel surveys. A distinction was made between pools with three or more spring chinook and those with fewer than three, because those pools which met this criterion were utilized consistently. Those pools which did not meet this criterion were used intermittently, or only for a short period of time. In addition, we did not feel it important to document the location of pools which held only one or two fish.

Surveys were conducted by two teams of two-to-three individuals, equipped with mask, snorkel, wetsuit, anti-slip footwear, notepads, and appropriate safety gear (e.g., rescue rope and first aid kit). We typically entered the river at approximately 9:30 AM and covered 7.0 to 10.5 km of river per day, depending on the length and difficulty of each river section. Each team floated or swam downstream, recording the number of spring chinook and spring steelhead seen. We also noted habitat types and conditions, water temperatures, presence of tributaries and their respective temperatures, and the presence or absence of summer holding habitat. The most difficult task was finding adult fish. A great deal of effort was spent searching beneath undercut rocks, ledges, vegetation, overhangs, etc., where fish often hid to avoid divers.

FIGURE 1. Map of South Fork Trinity River showing survey sections and access points, Hyampom downstream. RKM = river kilometers from river mouth.

FIGURE 2. Map of South Fork Trinity River showing survey sections and access points, upstream of Hyampom. RKM = river kilometers from river mouth.

FIGURE 3. Map of Hayfork Creek showing survey sections and access points. RKM = river kilometers from stream mouth.

Two contiguous river sections were surveyed per day, four days per week. Surveys began in the lowest sections first and progressed systematically upstream. We were careful to minimize disturbance to fish so that fish movement from one river section to another, and possible double counting, was negligible.

Once we determined which pools were being utilized by spring chinook, we made follow-up observations of fish at these sites. We used binoculars from a vantage point which afforded a good view, without the fish being aware of us. Almost every pool had an adjacent steep bluff which was ideal for this purpose. Our goals were to determine if fish were moving into or out of the pools, assess summer mortality, make counts, and to observe pre -spawning behavior in order to begin redd surveys on time.

Redd Surveys

Redd surveys began in mid-September and continued through mid- November. Each river section was surveyed on foot by two person crews. Each section was surveyed about weekly. When redds were located, their location was documented (by local landmarks) and each was assigned a specific identification number and flagged. We measured overall redd size and position in the stream, water depth, and estimated gravel size. We also estimated the percent fines in surrounding gravels and noted various aspects of fish behavior (e.g., female present or absent, evidence of false redd activity, estimated. time spent on redd). We repeated surveys until no new redds or live fish were seen.

Surveys were extended upstream until the upper spawning limit was determined. This upper limit was defined by the river section upstream of the uppermost section where spring chinook were seen during snorkel surveys, and in which no spawning was observed. This required the extension of the survey area of Hayfork Creek to a point just upstream of McCovey Gulch (Figure 3).

No aerial surveys were conducted.

RESULTS

Snorkel Surveys. Snorkel surveys were conducted between 26 July and 3 August (early survey), and again between 29 August and 9 September (late survey), 1995. Fourteen individual surveys were conducted during each survey period. During the early and late survey periods, we counted 292 and 579 spring chinook in the SFTR basin, respectively. Two hundred eighty-four spring chinook were seen in the mainstem SFTR and eight in Hayfork Creek during the early survey, while 550 spring chinook were seen in the mainstem SFTR and 29 in Hayfork Creek during the late survey (Table 1). The estimated ratio of adults to grilse based on size estimation (fork length > 53cm) was 221:71, and 488:91, respectively. In the early survey, we also counted 24 spring steelhead in the SFTR and six in Hayfork Creek. During the late survey, we counted 30 spring steelhead in the SFTR and 11 in Hayfork Creek.

Spring chinook were seen as far upstream in the SFTR as the East Fork Trinity River confluence pool (RKM 117.8) and downstream to near the Gates Rd. access (RKM 33.8). Spring steelhead distribution closely paralleled that for spring chinook. Interestingly, this is the first year significant numbers of spring chinook and steelhead have been documented in lower Hayfork Creek.

Only one spring chinook pre-spawn (over-summer) mortality was found. This compares with 13 found by CDFG in 1994 (Dean, in press).

SFTR flows were noticeably higher and water temperatures cooler than any of the previous four years. These observations are based on temperature data from handheld thermometers and subjective comparison between years for select SFTR locations.

No snorkel surveys were conducted in other SFTR tributaries in 1995.

TABLE 1. Distribution of spring-run chinook salmon and spring chinook redds seen in the South Fork Trinity River basin during 1995, as determined from snorkel and foot surveys.

River Section	Number of salmon: July Survey	Number of salmon: August Survey	Number of Redds
South Fork Trinity			
A(RKM 124)	2	0	0
B	3*	10*	0
C	26	14	17
D	31	28	7
E	48	68	29
F	68	95	23
G	70	162	52
H	30	122	18
I	3	19	8
J	2	16	14
K	1	9	--
L	0	7	--
M	--	--	--
N(RKM 0)	--	--	--
Hayfork Creek			
U(RKM 48)	--	--	0
V	--	--	1
W	--	--	1
X	--	--	10
Y	5	12	0
Z (RKM 0)	3	17	7
Totals	292	579	187

* These fish were seen in the East Fork Trinity confluence pool and probably spawned downriver in section C. However, they may have been poached from this pool.

-- No surveys were conducted in these sections.

Holdinq Pools. We documented 21 spring chinook summer holding pools throughout the SFTR basin, all in the mainstem SFTR upstream of Hyampom (Appendix 2). Each of these pools was occupied by at least three spring chinook during both snorkel surveys. No pools were found in Hayfork Creek which satisfied this definition.

Most holding pools documented, contained five or more spring chinook and all but a few of the pools used this season were also used last season. Such recurrent use suggests either that these pools are providing optimal oversummer holding conditions that chinook are able to distinguish and locate, or that the number of such "good" pools is limited. LaFaunce (1967) found that holding pools were often utilized by more than one hundred fish (sometimes several hundred fish). Local citizens have many anecdotal reports indicating the same high level of usage. Based on this years' survey it does not appear that holding pools are a limiting factor for SFTR spring chinook.

TABLE 1. Distribution of spring-run chinook salmon and spring chinook redds seen in the South Fork Trinity River basin during 1995, as determined from snorkel and foot surveys.

Follow-up Observations at Holdinq Pools. During August, spring chinook numbers more than doubled in most of the pools in sections G and H, but increased only slightly in those pools in sections E and F. Since SFTR flows were high this summer, spring chinook were able to easily move between pools below Forest Glen. Also, spring chinook were seen in habitat types other than pools. We feel that fish which had been holding in and moving through lower SFTR reaches moved upstream into sections G and H during August. Spring chinook numbers actually decreased in sections B, C, and D (Table 1). As noted elsewhere, poaching may have caused this decline. Fishing line was noted in some locations, and human activity was considerable in the area this summer.

By late August and into September we began to see fall-run chinook entering the lower reaches of the SFTR (downstream of section I). These fish were bright, sharply contrasting in color with those we were sure to be spring chinook. Therefore, changes in chinook numbers in these sections must be viewed with caution.

The onset of spawning can be determined from the pre-spawning activity of spring chinook in holding pools. When fish are in a "summer holding mode", they simply circle lazily about the pool. Once fish near spawning condition, some (esp. the males) begin chasing one another around the pool, and some males and females form "loose pairs". Many times most of the fish then leave the pool at the same time, and females often dig false redds near the pool (Dean 1995). When we observed these activities, we saw fish begin spawning within a week to ten days.

Redd Surveys. We conducted 50 individual redd surveys between 21 September and 15 November i955, locating 187 spring chinook redds; 168 in the mainstem SFTR and 19 in lower Hayfork Creek (Table 1). We first observed spring chinook spawning in the upper river (upstream of Red Mt. Creek) on 18 October during a pool follow-up check. This redd was about three days old. Spawning incidences progressed downstream over time, and spawning was complete by about 11 November (Figure 4).

Most spring chinook redds were found upstream of Hyampom (RKM 48.3), but at least 14 (8%) were found downstream in section J, and 19 (10%) in Hayfork Creek (sections V, W, X, & Z; Table 1). Spring chinook spawning in Hayfork Creek has never been documented this far upstream.

The majority (77%) of mainstem SFTR spring chinook redds were found between Hitchcock Creek (RKM 60.7) and Red Mountain Creek (RKM 111.8). Prior to the 1964 flood, LaFaunce (1967) also found the majority (82%) of mainstem SFTR spring chinook redds in this same reach (Hitchcock Creek to Red Mt. Creek). This clearly illustrates the importance of these reaches to SFTR spring chinook.

LaFaunce also found 58 redds (2.5%) in the East Fork of the SFTR. However, we did not see spring chinook spawning in the East Fork this year. This is especially interesting considering that ten ! spring chinook summered in the East Fork confluence pool. This further supports the hypothesis that the East Fork is the upper limit of spring chinook spawning, and is only utilized to any significant degree when spring chinook are abundant (Dean 1995). However, we did see evidence of poaching in this area and it is possible that these fish did not have an opportunity to spawn.

By 14 October the influx of fall chinook was so pronounced in the lower SFTR that we could not differentiate between spring and fall-run fish. Therefore, we discontinued redd surveys downstream of the section I, since any redd count for spring chinook could be misleading.

Most redds were typical for chinook salmon with regard to size, location in the stream, gravel size, current velocity, and water depth (Chapman 1943; Mattson 1948; Cramer and Hammack 1952; Groot and Margolis 1991). We did see the superimposition (overlap) of redds in several areas.

Rainy weather, high streamflows, and poor water clarity can make river access difficult, and make finding redds next to impossible. However, weather and water clarity were excellent throughout the 1995 survey period.

DISCUSSION

Data presented in this report, however valuable, are at best an index of the status of SFTR spring chinook. Considering this effort to duplicate CDFG's methods, this data can provide much needed information which can be compared to recent studies. However, extrapolation of run size estimates from these data will be inaccurate and will not withstand statistical tests. CDFG's run size estimates were consistently roughly double

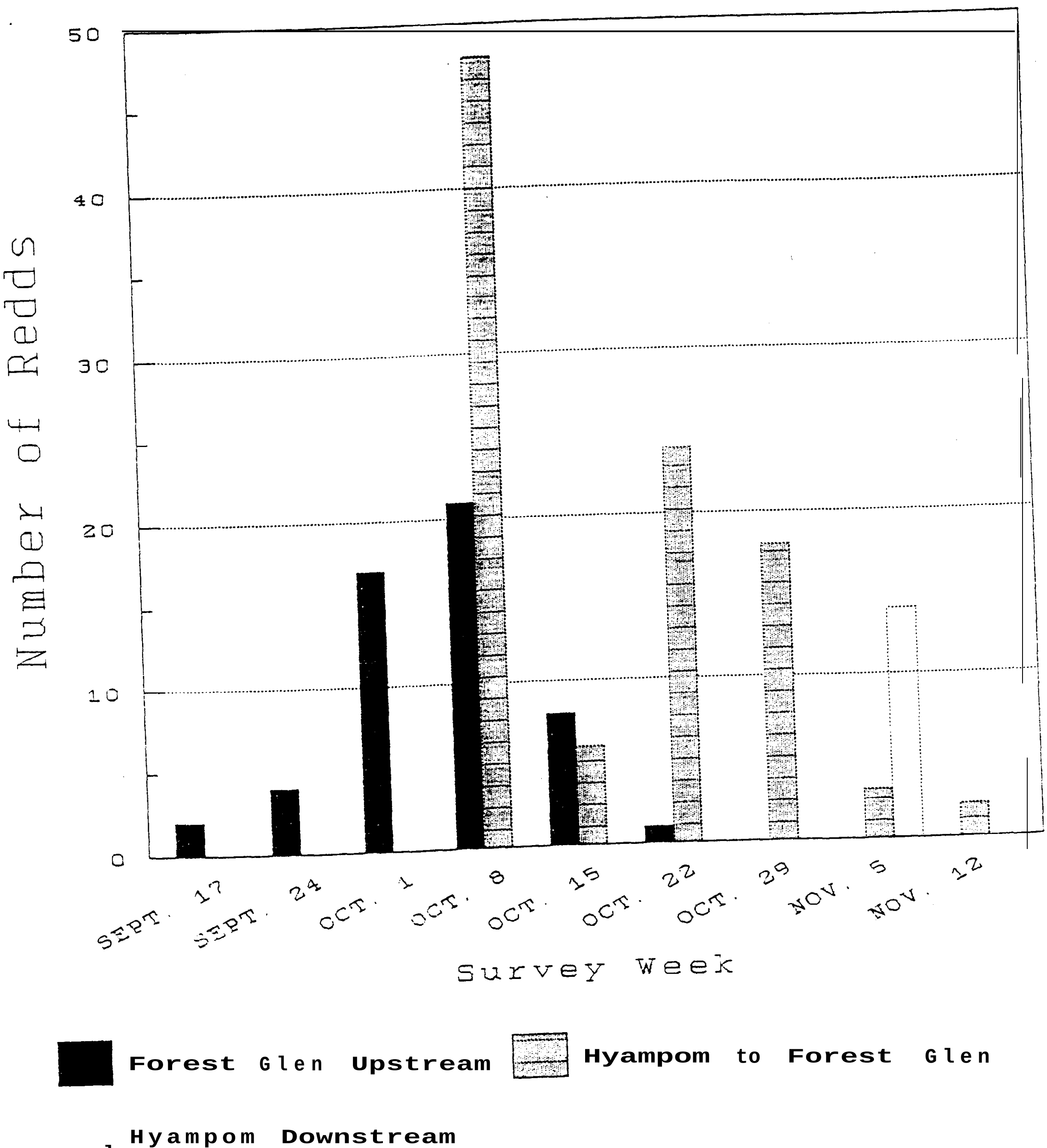

FIGURE 4. Number of "new" spring-run chinook salmon redds grouped by survey week, and by upper, middle, and lower South Fork Trinity River reaches.

the number of fish actually counted in snorkel surveys. This years' SFTR spring chinook run size can be assumed to be higher than the snorkel count. However, the number of spring chinook possibly present (considering good oversummer survival) does not correlate well with the number of redds seen. It is possible that the snorkel count is closer than usual to the actual run size, or that poaching was significant this summer.

The fact that spring chinook were found in and downstream of the Hyampom valley (RKM 48) is further confirmation that, even in wet years, spring chinook over-summer farther downstream in the SFTR than was previously believed. However, it is evident that the bulk of true spring chinook were well upstream of Hyampom this year.

The difference in the numbers of spring chinook seen during the early and late snorkel surveys (Table 1) supports the hypothesis that fish continue immigration into the system through July and into August (Dean 1995). Based on this year's data and observations, this is even more pronounced during wet years. So much so, that there was no clear demarcation between spring and fall-run chinook during late summer near and downstream of Hyampom. Based on CDFG's recent weir capture studies (Dean 1995), the SFTR spring chinook run appears to peak in June. However, some spring chinook continue to enter the SFTR until the vanguard of fall-run chinook begins to appear, creating a distinct overlap of the runs. This was observed again this season. Such behavior has obvious selective advantages, discussion of which is well beyond the scope of this report.

Based on this seasons' work and recent CDFG studies, the SFTR spring chinook run appears to be fairly stable at between 400 and 1000 fish, but may be increasing slightly. However, this year the closure of the commercial ocean salmon fishery in the Klamath Management Zone and higher instream flows both contributed to increased spawning escapement for most Klamath Basin stocks, including SFTR spring chinook.

Cooler water temperatures and higher stream flows in the SFTR and Hayfork Creek in 1995 were no doubt the result of the very wet previous winter. However, NRCS and Trinity County Resource Conservation District are undertaking a cooperative program with local land owners and water users to improve water quality and quantity in the basin. Although it is certainly too early to expect to see benefits from this effort, early indications are encouraging. This years increases in water quantity and quality almost certainly resulted in spring chinook spawning farther up Hayfork Creek than has ever been documented. These conditions were also the most significant factors in the apparent high survival of over-summering spring chinook (low pre-spawn mortality).

RECOMMENDATIONS

1. Obtain statistically valid spring chinook run size estimates.
2. Obtain SFTR juvenile spring chinook production estimate.

3. Poor spawning gravel permeability and bedload movement may be affecting spring chinook egg and alevin survival. Additional studies are needed in this area.

4. Major and minor landslides, as well as some land-use activities, are adversely affecting juvenile rearing habitat as well as adult spawning habitat in the SFTR. Studies are needed to quantify these effects, and to make recommendations for remedial action.

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Appendix 1. Other sources of data.

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* All references in this appendix available from M. Dean, P.O. Box 234, Douglas City, Ca. 96024.

Appendix 2. List of twenty-one holding pools "utilized" by SFTR spring chinook in 1995.

Section C
East Fork of the South Fork Trinity Confluence Pool
Bierce Creek Confluence Pool
Section E
Silver Creek Ranch Hole
Hoffman Hole
Vision Hole
Section F
Upper Dump Hole (F)
Wannabe Hole
Oreo Cookie Pool
Lower Oreo Cookie Pool
Upper Klondike Mine Hole
Hidden Valley Ranch (House) Hole
Section G
Little Bear Wallow Creek Confluence Pool
G-Lunch Pool
Palla Cliffs Pool
Lower's Hole
Plummer Creek Pool (Log Jam Hole)
Section H
H-Slot Pool
Cliffs of Insanity Pool
Middle French Ranch Pool
Lower French Ranch Pool
Horizontal Snag Pool