

The High Risk of Extinction for the Natural Fall-Run Chinook Salmon Population in the Lower Merced River due to Insufficient Instream Flow Releases

Prepared by

Carl Mesick, Ph.D.
Carl Mesick Consultants
7981 Crystal Boulevard
El Dorado, California 95623
carl_mesick319@comcast.net

Prepared for

California Sportfishing Protection Alliance
30 November 2010

ABSTRACT

Fall-run Chinook salmon (*Oncorhynchus tshawytscha*) escapement in the Merced River, which is tributary to the San Joaquin River in the Central Valley of California, has fluctuated from 29,749 adult salmon in 1984 to 82 adult salmon in 1990. The Merced River Chinook salmon population has been augmented with hatchery fish since the Merced River Hatchery (MRH) began operating in summer 1970 and there are large numbers of out-of-basin adult hatchery salmon that stray to the Merced River annually. The Merced River's population of naturally produced fall-run Chinook salmon was judged to be at a high risk of extinction based on criteria by Lindley et al. (2007), because from 1998 to 2007, the population declined at an excessive rate (> 20% annually) and the mean percentage of hatchery fish in the escapement was too high (72.8%).

The decline in escapement is primarily due to inadequate minimum instream flow releases from Crocker-Huffman Dam during the spring when the daily maximum water temperatures in the lower river exceed the EPA (2003) threshold of 59°F for smoltification and to a lesser extent during late October when adult salmon are migrating upstream. The importance of flow and water temperatures in the Merced River and the San Joaquin River near Vernalis during the spring smolt migration period was apparent in analyses with both adult recruitment and smolt CWT survival studies. It is likely that maintaining water temperatures below the EPA (2003) threshold of 59°F, particularly in the lower Merced River, is important for smoltification and is highly correlated with the number of smolts that leave the Merced River. Flow releases from Crocker-Huffman Dam during the spring not only help maintain suitable water temperatures in the Merced River, but also improve smolt survival in the San Joaquin Delta by increasing flows and water temperatures in the Delta. Late October flows are important, because up to 58% of the adult MRH fall-run Chinook salmon with CWTs that were recovered in Central

Valley rivers during the fall-run Chinook salmon escapement surveys from 1979 to 2007 (Mesick et al. 2009a) strayed to the Sacramento River Basin when the 10-day mean flow in the San Joaquin River at Vernalis in late October was less than 3,500 cfs. Other factors that put the population at a high risk of extinction include unusually unfavorable ocean conditions for the survival of juvenile salmon, such as occurred during spring 2005 and 2006 (Lindley et al. 2009).

INTRODUCTION

The escapement of fall-run Chinook salmon (*Oncorhynchus tshawytscha*) population in the Merced River, which is a tributary to the San Joaquin River in the Central Valley of California, was usually less than 500 fish until minimum instream flows were established under the Davis-Grunsky Act in October 1966 and the Merced River Hatchery began operating in summer 1970 (Fig. 1). The total escapement increased to a high of 29,749 in fall 1984 following prolonged flood control releases during the spring of 1982 and 1983. However, total escapement declined to an average of about 500 fish in fall 2007, 2008, and 2009 in spite of high flows in spring 2005 and 2006, presumably as a result of abnormally poor ocean conditions (Lindley et al. 2009).

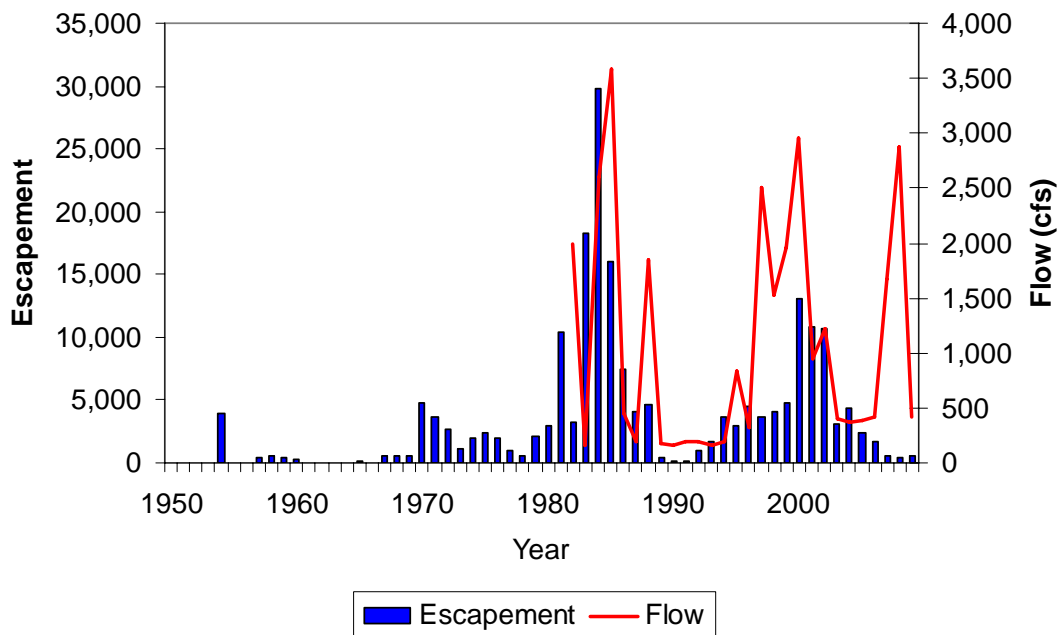


Fig. 1. Total escapement of fall-run Chinook salmon in the Merced River and Merced River Hatchery from 1954 to 2009 and the mean streamflow in the Merced River near Cressy (rivermile 27.75) from 1 February to 15 June two years prior to the escapement estimate. Escapement estimates from 1954 to 2007 were published in the California Department of Fish and Game GrandTab file in March 2010 which is available at www.CalFish.org.

The Merced River Chinook salmon population has been augmented with hatchery fish since the Merced River Hatchery (MRH) began operating in summer 1970. Initially, the hatchery consisted of an artificial spawning channel and off-river ponds for raising juvenile salmon to a yearling size. The artificial spawning channel was 4,372 feet long with 3,830 feet of spawning gravels interspersed with 6 resting pools that were used by naturally spawning fish. During fall 1970, 38 female salmon spawned in the channel and approximately 59,127 juvenile salmon migrated from the channel (Menchen 1971). The

spawning channel was used until the fall of 1980, when artificial spawning was first used at the hatchery (Poe 1982). An off-channel rearing pond with a capacity to hold about 100,000 juvenile salmon was used in summer 1971 to rear juveniles to a yearling size for fall releases in the Merced River. Three off-channel rearing ponds were operational by spring 1974, with a total capacity of about 450,000 yearlings (Chase 1978). From 1971 to 1973, the fish reared in the ponds were the progeny of adult salmon that were trapped in the Stanislaus River near the Orange Blossom Bridge (Menchen 1971). Yearlings were reared in the ponds through October 1991; whereas subyearling smolts were released during April through May thereafter. In 1991, the hatchery was modernized to include a permanent hatchery building with the capacity to incubate 3,000,000 eggs, 2 nursery tanks with the capability to start feeding of approximately 100,000 swim-up size salmon each, 10 nursery tanks that hold up to 90,000 fingerlings each, 1,000 linear feet of concrete raceways consisting of ten 100 foot-long ponds, larger water supply lines, and ultraviolet treatment for the water supply (Cozart 2005).

To assess the viability of the Merced River fall-run Chinook salmon population, it is necessary to determine number of hatchery reared fish in the escapement. This has not been previously been done, because many of the MRH fish are not marked for identification and it is likely that unmarked fish from other Central Valley hatcheries, such as the Coleman National Fish Hatchery (CNFH) on Battle Creek, Feather River Hatchery (FRH), Nimbus Fish Hatchery (NFH) on the American River, and the Mokelumne River Fish Installation (MRFI), migrated into the Merced River to spawn. Estimates of the number of naturally produced and hatchery produced salmon in the Merced River escapements from 1980 to 2007 are provided here. The estimates of hatchery reared fish were derived from 28 years of coded-wire-tag (CWT) studies that provide data on the rates that adult hatchery salmon were recovered in the Merced River relative to habitat conditions that affected the survival of the juvenile fish, ocean harvest rates of the adult fish, and habitat conditions that would have affected the homing success of the adults returning to spawn.

The estimates of the number of naturally produced fish in the Merced River escapement are used in this report to show that the population is at a high risk of extinction based on the population level criteria developed by Lindley et al. (2007). Lindley et al. (2007) characterized Chinook salmon populations with a high risk of extinction (greater than 20 percent chance of extinction within 20 years) as those with a total escapement that is less than 250 spawners in three consecutive years (mean of 83 fish per year), a precipitous decline in escapement, a catastrophe defined as an order of magnitude decline within one generation occurring within the last 10 years, and a high hatchery influence. Populations with a low risk of extinction (less than 5 percent chance of extinction in 100 years) have a minimum total escapement of 2,500 spawners in three consecutive years (mean of 833 fish per year), no apparent decline in escapement, no catastrophic declines occurring within the last 10 years, and a low hatchery influence. Populations with a moderate risk of extinction are those at intermediate levels to the low and high risk criteria (e.g., total escapement in three consecutive years between 250 and 2,500 spawners). The overall risk for the population is determined by the criterion indicating the highest risk of extinction. These criteria are slight modifications of those used by Allendorf et al. (1997).

This study further demonstrates that there is a strong relationship between the number of naturally produced adult salmon that return to the Merced River and the magnitude of flow and water temperature during the winter and spring that affect the survival of the juvenile fish. Therefore, the high risk of extinction for the naturally produced population in the Merced River is primarily due to the combined effects of inadequate flow releases in the Merced River and periodically poor ocean conditions, such as occurred in spring 2005 and 2006 (Lindley et al. 2009), that negatively affect the survival of juvenile salmon.

METHODS

The methods used to estimate the number of adult salmon with CWTs recovered in the Merced River are described in Mesick et al. (2009a). Assessing trends in the escapement of naturally produced fish requires estimates of recruitment, which is defined as the number of salmon in the same cohort (same age) that survive to Age 2. The methods used estimate the number of naturally produced adult recruits in the Merced River population are described in Mesick et al. (2009b). Described below are the methods used to estimate the number of untagged hatchery produced Chinook salmon releases that returned to the lower Merced River in the adult escapement.

Untagged Hatchery Salmon Estimates

The estimated numbers of unmarked hatchery fish that returned to the Merced River as adult salmon from 1980 to 2007 are based on the assumption that the unmarked hatchery fish would have returned to the Merced River at the same rates that the marked hatchery fish returned to the Merced River if they were released in the same general location under similar habitat conditions. The number of unmarked fish released was obtained from the CDFG annual reports for the FRH, NFH, MRFI, and MRH and from the Regional Mark Information System for the CNFH. Some of the MRH release data was obtained from planting release records.

If there were a sufficient number of CWT releases of hatchery reared juvenile salmon over a range of habitat conditions, separate logistic models were developed for the CWT recovery rate in the Merced River and important habitat conditions for Age 2, Age 3, and Age 4 salmon. The coefficients for the habitat variables and the model's constant were then used to compute the logit value of the estimated CWT return rate, which corresponded to the number of adults that migrated to the Merced River divided by the number of juveniles released. The logit value was converted into a return rate using the standard formula:

$$\text{Probability of Return} = 1.0 / (1.0 + \text{EXP}(-\text{LOGIT}))$$

Separate models were developed for hatchery releases of juvenile salmon from the MRH, MRFI, and the Sacramento Basin hatcheries because the tendency to migrate to the Merced River differed between them. Based on the CWT recoveries, the MRH releases return to the Merced River at the highest rates because these fish would naturally home to the Merced River (Mesick et al 2009a). The MRFI releases return to the Merced River at moderate rates because the Mokelumne and Merced rivers are both tributaries to the San Joaquin River so the MRFI fish would home to the Mokelumne River with a tendency to stray to other San Joaquin tributaries, particularly the Merced River (Mesick et al. 2009a). The Sacramento Basin hatchery releases return to the Merced River at the lowest rates, because most would home to the Sacramento River (Mesick et al. 2009a).

Separate models were also developed for different release locations because the farther downstream the juvenile fish are trucked from the hatchery, the greater the likelihood that the adults would stray to a non-natal river. Almost all of the recoveries of adult CWT salmon from the Sacramento Basin hatcheries, which include the Coleman National Fish Hatchery (CNFH), Nimbus Fish Hatchery (NFH), and the Feather River Hatchery (FRH), were from juvenile releases in the West Delta. I define the West Delta where the flow from the Sacramento and San Joaquin rivers mix. This includes the release sites near Collinsville on the Sacramento River and Jersey Point on the San Joaquin River and all others in the Bay to the west. The MRFI releases were segregated into Tributary, Mainstem, East Delta, and West Delta regions. Tributary releases were upstream of the confluence with the Delta Cross Channel. The East Delta releases were made in the Mokelumne River between the confluence with the Delta Cross Channel and the mouth of the Mokelumne River, which includes releases at New Hope Landing. The Mainstem releases were made in the Sacramento River near Rio Vista and West Sacramento. The MRH releases were segregated into 3 regions: (1) tributary which includes releases throughout the Merced River; (2) mainstem San Joaquin River releases upstream from Jersey Point; and (3) West Delta releases that included Jersey Point.

The initial steps of the analysis were to make two comparisons: (1) compare various indices of ocean conditions to identify the best one that reflects the survival of juvenile salmon as they entered the ocean at the Gulf of Farallones; and 2) determine whether the month of juvenile release affected adult recovery rates. First, logistic models were used to evaluate different indices of ocean conditions on an index of survival. An index of survival, which was the rate that each CWT release group was recovered in all Central Valley rivers combined as well as the sport and commercial ocean harvest, was used to focus the evaluation on juvenile survival by eliminating the effect of straying and ocean harvest. The survival indices included the CWT data on West Delta releases for the CNFH, FRH, NFH, and MRFI hatcheries that were primarily made at Benicia, Wickland Oil Net Pens, Crockett, and Port Chicago. The logistic models were computed for the survival indices separated by the month of release for April through November. The results indicated that the Coastal Upwelling Index (CUI) that corresponds to the Gulf of Farallones (37.5° N, 123.5° W) for the month of April was most highly correlated with the West Delta survival indices for CWT releases made in April through August (Fig. 2) than were CUI estimates for the months of May through August. The CUI for the month of April was also more highly correlated with the West Delta survival indices than were

spring (mean for March, April, and May) estimates of curl and sea surface temperatures (Wells et al. 2007) as well as estimates of production of zooplankton, shortbelly rockfish (*Sebastes jordani*), and a top Predator, the common murre (*Uria aalge*, Wells et al. 2008). Therefore, the April CUI index was used as the sole index of ocean conditions for the spring and summer releases of hatchery fish. The CUI database is developed and distributed by the Pacific Fisheries Environmental Laboratory, National Marine Fisheries Service's Southwest Fisheries Science Center, Pacific Grove, California.

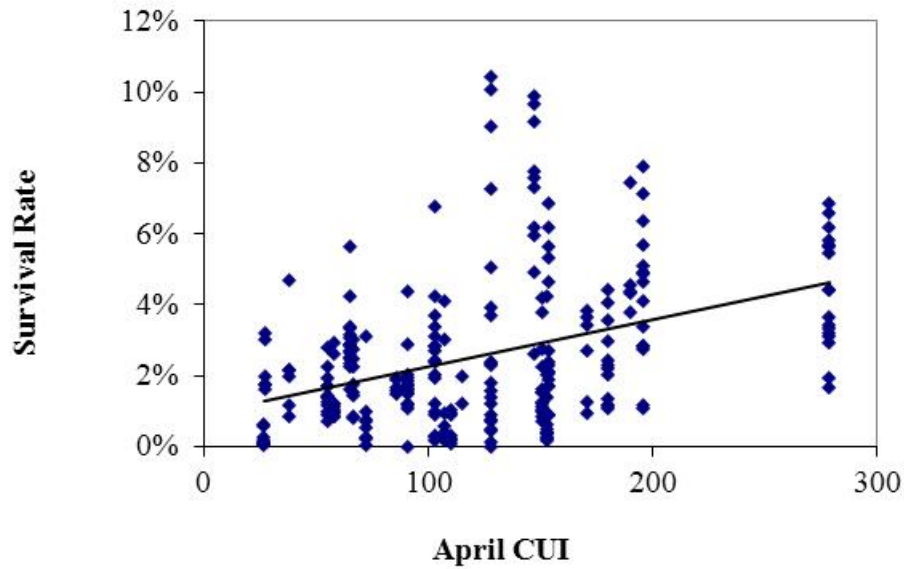


Fig. 2. Survival rates for each coded-wire-tag code of juvenile Central Valley hatchery fall-run Chinook salmon released in the West Delta from April through August from 1980 to 2004 relative to the mean coastal upwelling index for April corresponding to the Gulf of Farallones. Survival rates were computed as the number of adults recovered during inland escapement surveys and in the ocean fisheries divided by the total number of juveniles released. The line represents a linear regression generated by Excel 2010. A linear regression was the best fit to the observed estimates compared to logistic or polynomial regressions.

A similar analysis was conducted for West Delta releases made in September, October, and November. The results indicated that the November CUI was more highly correlated with the West Delta survival indices than were CUI indices for all the months between the April prior to the CWT release and the February following the CWT release. Therefore, the November CUI index was used as the sole index of ocean conditions for the fall releases of hatchery fish.

To determine whether the month when juvenile releases were made affected adult recovery rates (i.e., juvenile survival rates), a conditional variable was added to the West Delta release dataset that identified the month of release and comparisons were made using Analysis of Covariance that included the April CUI index as a covariable. A Tukey HSD all-pairwise comparison test indicated that there were no significant differences in the survival index between releases made in April, May, June, and August. The mean

survival indices for May, June, and August ranged between 0.023 and 0.027; whereas, the mean of the survival index for April was 0.017. Although, the survival index for releases made in July was significantly higher ($P \leq 0.05$, mean 0.036) than the other spring and summer months based on the comparison test, most of the July releases were made during a few years when the April CUI was unusually high. Therefore, it was assumed that the effect of different release dates could be accounted for in the logistic model by including a variable of the mean weight of the juvenile salmon for the West Delta releases or a variable on maximum water temperature for the tributary and mainstem releases. The mean weights for the West Delta Sacramento Basin releases were 6.5 g, 9.7 g, and 14.8 g, for the months of April, May-June-Aug, and July, respectively, and it is likely that the high survival rates for July were a function of the large size of the fish released.

Inland Habitat Variables and Smolt Migration Rates

The CWT recovery rate models were developed by using step-wise procedures with a variety of habitat and biological variables including streamflow, maximum daily water temperature, Delta export rates, adult harvest rates in the ocean, rates that MRH adults strayed to the Sacramento River Basin, the April or November CUI index, the mean weight of the juveniles at the time of their release, and the total number of juveniles released in each CWT group (Table 1).

The time periods used to estimate the mean estimates for the habitat variables described in Table 1 were based on the mean number of days for CWT juvenile salmon released in the upper Merced River between the Merced River Hatchery and Shaffer Bridge and recovered at the Hagaman rotary screw trap near the mouth of the Merced River (RM 13), the Mossdale trawl, Chipps Island trawl, and National Marine Fisheries Service trawls in the Bay and ocean. Generally, the average migration rates were slowest in the river and during high flow releases in the Merced River, when water temperatures were low from 1994 to 2006:

Merced River Flows	Hagaman Park	Mossdale	Chipps Island
<2,000 cfs	5.2 days	7.3 days	14.7 days
>2,000 cfs	7.4 days	20.4 days	24.0 days
Miles Traveled	50.6	114.4	170.1

The average migration rate for MRH juveniles released near the mouth of the Merced River, which was typically at Hatfield Park (RM 1.3), was 6.8 days and 5.9 days when Merced River flows were below and above 2,000 cfs, respectively. Trawling by the National Marine Fisheries Service (MacFarlane and Norton 2002) recaptured 3 MRH fish that were released at Hatfield State Park, Dos Reis Park, and Mossdale and then recovered in the trawl between Carquinez Strait and the Gulf of Farallones after an average of 17 days (12 to 28 days) from the date of release in spring 1997. One MRFI CWT juvenile released at Woodbridge Dam in the Mokelumne River was recaptured at the Golden Gate Bridge after 11 days from the date of release in 1997 (MacFarlane and Norton 2002). These results suggest that although the entire group of fish slowly

migrated downstream in the Merced River, those that survived were migrating at a faster rate compared to those that died.

To simplify the analysis, it was assumed that the migration rates observed when Merced River flows were less than 2,000 cfs would accurately reflect the habitat conditions that affected the survival of all CWT release groups regardless of flow level. This assumption is reasonable because habitat conditions would be relatively stable during wet year flood control releases and so the precise time period would be less important for computing the mean habitat conditions during high flows. For example, daily water temperatures do not vary as much at high flows as they do at low flows.

The time periods for the habitat variables (Table 1) were intended to track the majority of the release group as they migrated downstream to the ocean. For example, it was assumed that the survival of a group of fish released at the MRH would be primarily affected by the mean habitat conditions (e.g., maximum daily water temperature) near the mouth of the Merced River from day 3 to day 6 after their release. Then it was assumed that they would be affected by the mean conditions in the San Joaquin River near Vernalis, including water temperature, flow, installation of the Head of the Old River Barrier, and export rates, from day 6 to day 15 after their release. Finally, they would be affected by the mean conditions in the Bay west of Chipps Island from day 13 to day 19 after their release.

Age Specific Model Development

It was assumed that the Age 3 CWT recovery models were more accurate than the Age 2 or Age 4 models, particularly for the recovery rates of CWT Sacramento Basin hatchery fish in the Merced River, because Age 3 fish return to spawn in the highest numbers and therefore there is a higher likelihood that rare CWTs would be recovered as Age 3 fish. Furthermore, it was assumed that the factors that affected the juvenile stage would have the same effect on the recovery rates of Age 2, Age 3, and Age 4 fish, because they all belong to the same cohort. Therefore, the Age 3 models were developed first and then the coefficient of the most highly correlated juvenile habitat variable in the Age 3 model was inserted into the Age 2 and Age 4 models. This was done in the *Statistix* program by using an “Offset Variable” that subtracted the coefficient of the most highly correlated juvenile habitat variable from the linear predictor (Analytical software 2008).

RESULTS

The results are presented in two sections. The first presents the logistic models of CWT recovery rates and the estimated number of hatchery salmon in the Merced River escapement. The second pertains to the risk of extinction analysis.

CWT Recovery Rates and Hatchery Salmon in the Merced River Escapement

The coefficients of the logistic regression models used to estimate the CWT recovery rates are presented in Tables 2a-e. The models were moderately predictive of the mean CWT recovery rates for most years when a substantial amount of CWT recovery data were available (Appendix 1). However, the models were not predictive of the observed recovery rates during some years, presumably when the indices used to represent ocean conditions (April and November CUI) did not accurately reflect low rates of survival of juvenile salmon. For example, none of the indices of ocean conditions tested here predicted the unusually low survival rate of 0.08% for the hatchery juveniles released in the West Delta in spring 2005. Survival rates were based on the total CWT recoveries in the ocean fisheries and inland escapements and so only ocean conditions (i.e., not adult harvest or straying) should have affected the survival of West Delta releases.

When the models were used to predict the recoveries of untagged salmon for all years in the preliminary analyses, the total estimated hatchery escapement of tagged and untagged fish exceeded the total observed escapement of naturally produced and hatchery fish in some years. A comparison of the observed to the estimated recovery rates based on the preliminary models indicated that the preliminary models were overestimating the CWT recovery rates during the same years when total estimated hatchery escapements exceeded the total observed escapement estimates. Therefore, the unusually low observed recovery rates (i.e., model outliers) are probably accurate whereas the preliminary models probably did not include all the habitat variables needed to predict the unusually low recovery rates. Some of the missing habitat variables in the model may include factors such as whether the tagged fish were impaired by disease or high predation rates at the site of release. Many factors, such as disease and predation, that are not routinely monitored cannot be empirically modeled.

To develop the final models used to estimate the total number of untagged hatchery fish in the escapement, the unusually low CWT recovery rates were not used in model development. Instead, the models were used for years when the model was fairly predictive compared to the observed data, whereas when CWT recovery rates were unusually low compared to the model prediction, the mean annual CWT recovery rate was used to expand the untagged releases made in the same year (Tables 2a-e). It is assumed that this method overcame the weakness of the final model caused by missing habitat variables, such as disease or predation at the specific release site.

CWT recovery rate models were also not used when there were too few data for some of the release groups. For example, MRH CWT yearling releases during the fall in the San Joaquin River near Mossdale were made only during 5 years (brood years 1980 to 1984) and there was insufficient variation in the habitat variables to construct a meaningful model with those data. So whenever there were too few recovery data to develop a model, the mean annual CWT recovery rate was used to expand the untagged releases made in the same year, and it was assumed that no fish were recovered in the Merced River during years when there were no observed data.

None of the logistic regression models of CWT recovery rates, which were based on individual CWT code releases, were statistically significant. The coefficients for the variables used (Tables 2a-e) had probabilities of at least 0.74 and typically greater than 0.90. A partial explanation is that there was a high level of variability in recovery rates among replicate CWT releases. For example on 26 April 2001, three replicate CWT groups (codes 064419-21) of about 25,000 fish each were released at the Hatfield State Park and the fish in each group were similarly sized (average of 6.9 grams per fish). Although these 3 CWT groups were exact replicates, the recovery rate of the Age 3 adults in the Merced River escapement ranged between 0.0237% and 0.237% (10-fold difference) between the three different CWT groups. A high level of variance among CWT replicate groups primarily reflects the problem that recovering individual CWTs in the escapement is like looking for a needle in a haystack. The total number of CWTs in the escapement is low because very few juvenile fish are tagged and mortality rates to the adult stage are high. In addition, only a portion of the adult carcasses in the escapement are examined for tags and so the potential for sampling error is high. On the other hand, the effect of this sampling error is reduced by the models, which reflect the average of all the observed recovery rates. The plots of the mean observed values versus the predicted values shown in Appendix 1 suggest that the models are moderately predictive.

The estimated numbers of naturally produced, tagged hatchery salmon with CWTs, and untagged hatchery salmon in the Merced River escapement from 1980 to 2007 are summarized in Table 3 and presented by untagged release group in Appendix 2. The estimates of untagged hatchery salmon are probably conservative because no estimates were made for some release groups in years that lacked observed data. For example, MRH yearling releases in the Merced River in fall 1987, 1988, 1989, and 1991 were assumed to produce no returns to the Merced River due to a lack of CWT recovery data.

Risk Of Extinction Analysis

The Merced River fall-run Chinook salmon population would be considered to be at a high risk of extinction based on the criteria by Lindley et al. (2007) because there was a high percentage of hatchery fish in the escapement from 1998 to 2007 and there was a precipitous decline in escapement from 1998 to 2008. The overall risk for the population is determined by the criterion indicating the highest risk of extinction (Lindley, Fishery Biologist, National Marine Fisheries Service, personal communication) and the high percentage of hatchery strays from the MRFI, FRH, and NFH and the precipitous decline in escapement both indicate that the population is at a high risk of extinction.

Based on the other risk of extinction criteria (Lindley et al. 2007), the population would be considered to be at a moderate risk of extinction from 1981 to 2007: (1) the minimum population size was at least 250 adults over a three year period; and (2) there was no catastrophic decline in escapement over a generation. My analyses are based on estimates of the number of naturally produced and hatchery produced adult fall-run Chinook salmon that have returned to the Merced River between 1981 and 2007 (Table 3).

Effective Population Size

The effective population size criteria relates to the loss of genetic diversity (Lindley et al. 2007). The effective population consists of individuals that are reproductively successful, including grilse (Allendorf et al. 1997). In Chinook salmon populations, not all individuals are reproductively successful and the mean ratio of the effective population size to total escapement over a three year period (N_e/N) has been estimated to be 0.20 based on spawner-recruit evaluations of over 100 salmon populations from California to British Columbia (Waples et al. 2004 as cited in Lindley et al. 2007). A few examples of why adult salmon may not reproduce successfully in the Merced River include: (1) redd superimposition that destroys eggs; (2) spawning in habitats with excessive levels of fines; and (3) low survival rates for juveniles that migrate late when high water temperatures in the lower Merced River are unsuitable for survival. Therefore based on effective population size (N_e), the Merced River could be considered to be at high risk if annual escapement (N) drops below a mean of 83 fish for three consecutive years and at low risk if escapement remains above a mean of 833 fish for three consecutive years.

The escapement estimates of naturally produced fish over a three year period dropped to lows of 284 adults from 1989 to 1991, 1,254 adults from 2003 to 2005, and 1,309 adults from 2005 to 2007 (Table 3). Population levels of 284 to 1,309 adults over three years are categorized as a moderate risk of extinction based on the Lindley et al. (2007) criterion. However, the method used to estimate the number of untagged hatchery fish in the escapement was very conservative and it is highly likely that the true numbers of naturally produced fish are lower than those presented in Table 3. Although it is possible to obtain relatively accurate estimates of the number of hatchery reared salmon in the escapement using microchemical analyses of otoliths (Barnett-Johnson et al. 2007), specific analyses have not been done for the Merced River. Therefore, until these studies have been conducted, it would be prudent to consider that the Merced River escapements of naturally produced fish have at least approached the Lindley et al. (2007) definition of a high risk of extinction since 1989.

Population Decline

Another serious threat to the viability of natural salmonid populations identified by Lindley et al. (2007) is a precipitous decline in escapement. Lindley et al. (2007) define a precipitous decline as a decline within the last two generations (6 years) to an annual

run size of 500 spawners or fewer or a run size greater than 500 spawners but declining at a rate of at least 10% per year. Lindley et al. (2007) recommend that the population decline rate should be computed as the slope of the natural log of the escapement versus time multiplied by 100 over a ten year period.

The escapement of natural spawners in the Tuolumne River meets both of these criteria. First, the natural escapement declined to fewer than 500 spawners in fall 2003, 2005, and 2007 (Table 3). Second, the population declined at an average rate of 23.7% per year from 1998 to 2007 (Fig. 4).

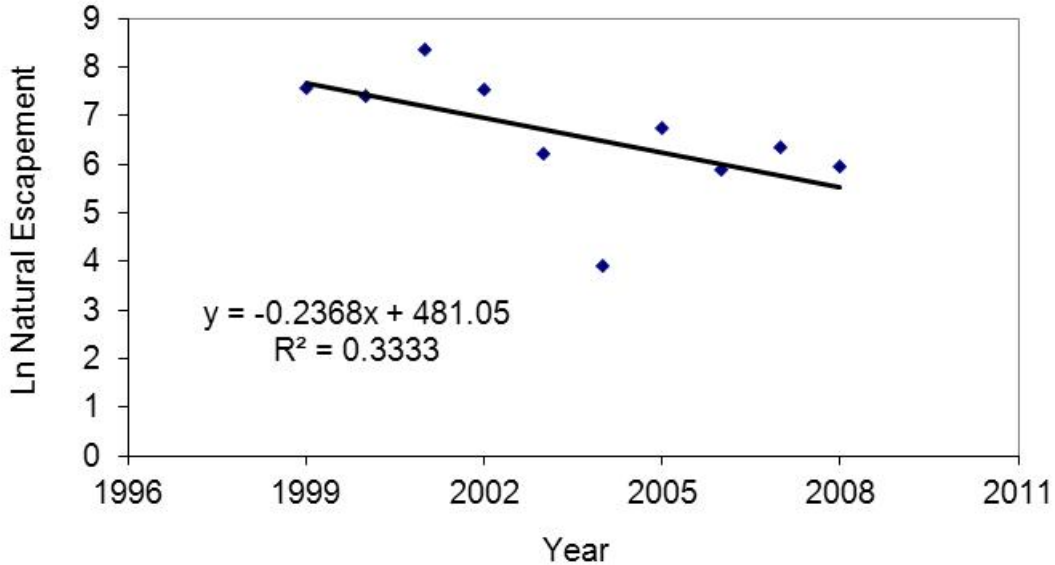


Fig. 4. The natural log (Ln) of the natural escapement of fall-run Chinook salmon in the Merced River from 1999 to 2008. The slope of the regression indicates that the population decline was 23.7% per year.

Catastrophe

Catastrophes are defined by Lindley et al. (2007) as instantaneous declines in population size due to events that occur randomly in time that reflect a sudden shift from a low risk state to a higher one. They view catastrophes as singular events with an identifiable cause and only negative immediate consequences, as opposed to normal environmental variation which can produce very good as well as very bad conditions. Some examples of catastrophes include disease outbreaks, toxic spills, or volcanic eruptions. A high risk situation is created by an order of magnitude (90%) decline in population size over one generation.

The Merced River natural escapement declined by about 82% when the 1999-2001 generation declined from a total of 7,732 fish to a total 1,392 fish for the 2002-2004 generation. The likely cause of this decline is the extended drought conditions and low instream flow releases in the Merced River from 2001 to 2004, which probably resulted

in high juvenile mortality rates (see section below titled “*Juvenile Survival in the Merced River*”).

Hatchery Influence

The estimated percentages of hatchery fish in the Merced River escapement exceed the Lindley et al. (2007) high risk criterion of less than 10% (3 generations) to 15% (1 to 2 generations) hatchery fish. Since 1998, the mean percentage of hatchery fish in the Merced River escapement is estimated to be 72.8% (range 34.1% to 98.4%, Table 3). It is likely that the mean percentage of hatchery fish in the Merced River escapement is actually higher than 72.8%, because the methods used to estimate the number of untagged hatchery salmon in the escapement were conservative.

Environmental Factors That Affect Salmon Recruitment

The production of Merced River salmon is primarily determined by the instream flow releases from Crocker-Huffman Dam as they affect juvenile survival in the Merced River and provide attraction flows for migrating adult salmon to navigate back to the Merced River. The salmon population is also affected by conditions that affect salmon survival in the San Joaquin Delta and the ocean, although these effects are relatively small or infrequent compared to the importance of instream flow releases. The following describes the factors that affect salmon escapement and/or recruitment relative to adult upstream migration, spawner abundance, spawning habitat and fry production, juvenile survival in the Merced River, Delta, and ocean, and the harvest of adult salmon in the ocean.

Adult Upstream Migration

Up to 58% of the adult MRH fall-run Chinook salmon with CWTs that were recovered in Central Valley rivers during the fall-run Chinook salmon escapement surveys from 1979 to 2007 (Mesick et al. 2009a) strayed to the Sacramento River Basin when San Joaquin River flows were low or Delta exports at the State and Federal pumping facilities were high during the October and November migratory period. From 1996 to 2006, the mean stray rate was 13.9% (range 0% in 2006 to 42.5% in 1999). The relationships between the MRH stray rates and the 10-day mean flow in the San Joaquin River at Vernalis in late October (Fig. 5), the mean October and November Vernalis flows (Fig. 6), and the mean ratio of Delta Exports to Vernalis flows for October and November (Fig. 7) are nearly identical. Adult salmon home to their natal streams in part by following olfactory cues from their natal stream (Quinn 2005) and presumably a minimum flow from each of the three San Joaquin River tributaries, including the Merced River, must pass through the Delta for the salmon to home successfully. Therefore, it should be possible to minimize the percentage of adult San Joaquin Basin salmon that stray to the Sacramento River Basin using a combination of flow and export management. An efficient use of water would be to provide a 10-day pulse flow in late October of 3,600 cfs at Vernalis, when high water temperatures might delay migrating salmon, and then rely on a

combination of base flows and Delta export restrictions throughout the remainder of the migratory period to provide suitable conditions for spawning and egg incubation in the tributaries as well as minimum flows through the Delta for homing cues. For example, a 10-day pulse of 1,200 cfs from each of the Stanislaus, Tuolumne, and Merced rivers in late October, October and November base flows of at least 275 cfs for each tributary for spawning and egg incubation, and a maximum Delta export rate of 250% of Vernalis flows during October and November should keep stray rates at or below 6% based on the relationships shown in Figures 5 and 7. If these actions are successful, San Joaquin River Basin stray rates should decrease from the mean of 13.9% for the 1996 to 2006 period to a mean of about 4.8% (maximum of 6% per year).

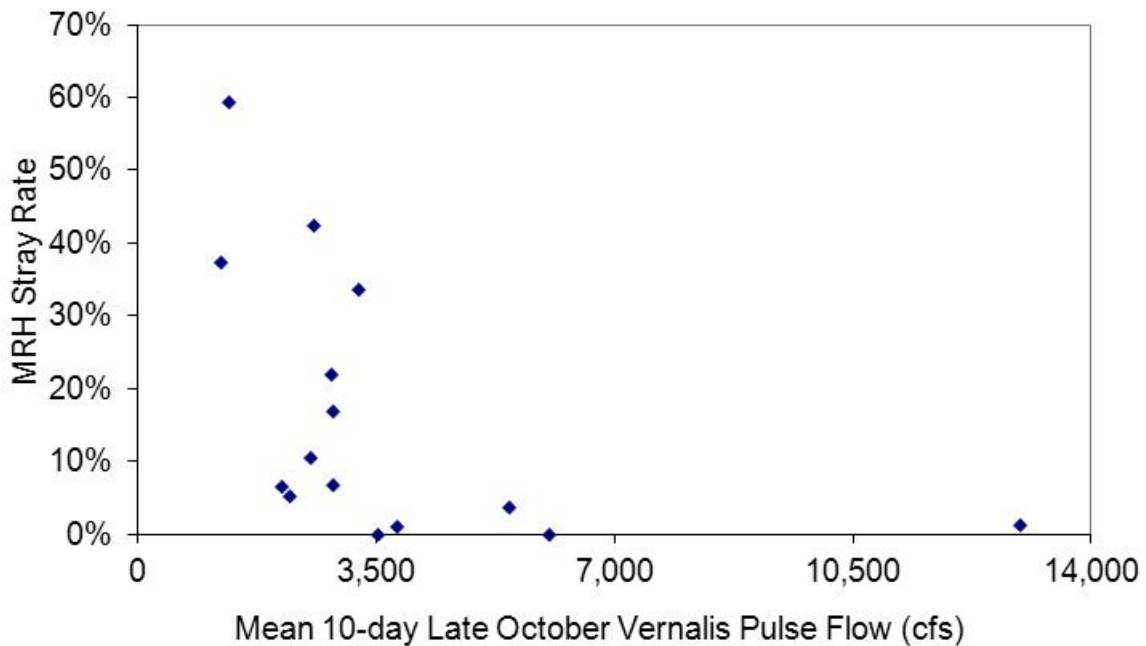


Fig. 5. Adult Merced River Hatchery Chinook salmon stray rates relative to the magnitude of 10-day pulse flows as measured in the San Joaquin River at Vernalis (Dayflow estimates) during late October. Stray rates are computed as the percentage of Merced River Hatchery fall-run Chinook salmon with CWTs (Mesick et al. 2009a) that were released in the San Joaquin River Basin upstream from Jersey Point as juveniles and then recovered as adults in the Sacramento River Basin relative to the adult recoveries in the Central Valley from 1983 to 1988 and from 1995 to 2003. Estimates for 1989 to 1994 were not used because there were less than an estimated total of 1,000 MRH adults with CWTs that returned to all Central Valley rivers during each year and so there was a high degree of uncertainty for these stray rate estimates. The mean Vernalis flows (USGS gauge 11303500) were computed for the 10-day period in mid to late October with the highest flows.

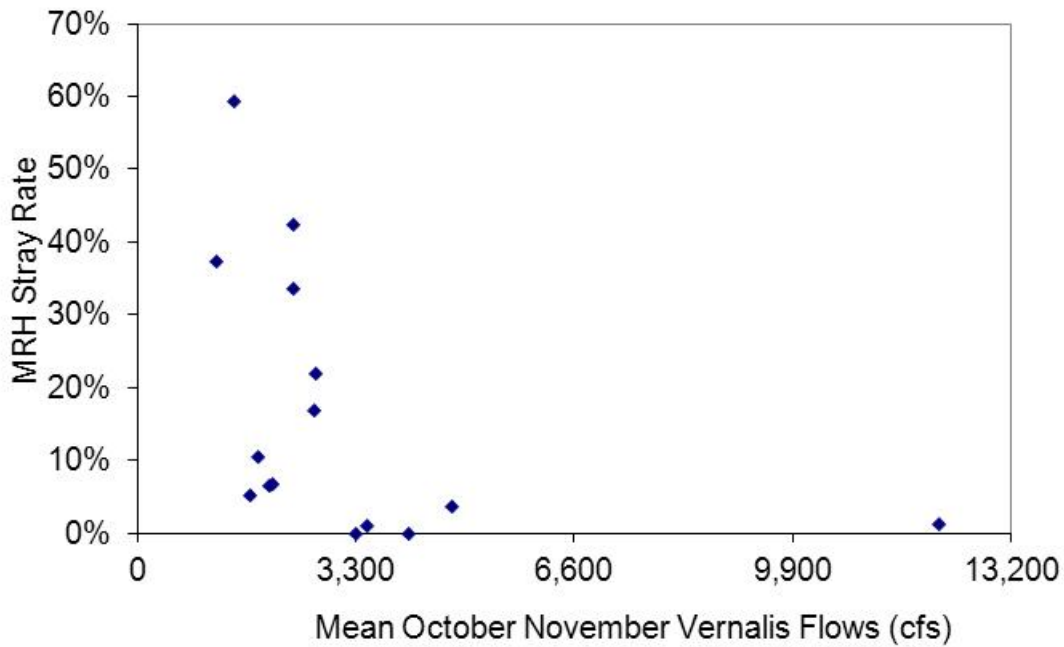


Fig. 6. Adult Merced River Hatchery Chinook salmon stray rates relative to the mean flow in the San Joaquin River at Vernalis (Dayflow estimates) during October and November. Stray rates are computed as the percentage of Merced River Hatchery fall-run Chinook salmon with CWTs (Mesick et al. 2009a) that were released in the San Joaquin River Basin upstream from Jersey Point as juveniles and then recovered as adults in the Sacramento River Basin relative to the adult recoveries in the Central Valley from 1983 to 1988 and from 1995 to 2003. Estimates for 1989 to 1994 were not used because there were less than an estimated total of 1,000 MRH adults with CWTs that returned to all Central Valley rivers during each year and so there was a high degree of uncertainty for these stray rate estimates. The mean Vernalis flows (USGS gauge 11303500) were computed for the 10-day period in mid to late October with the highest flows.

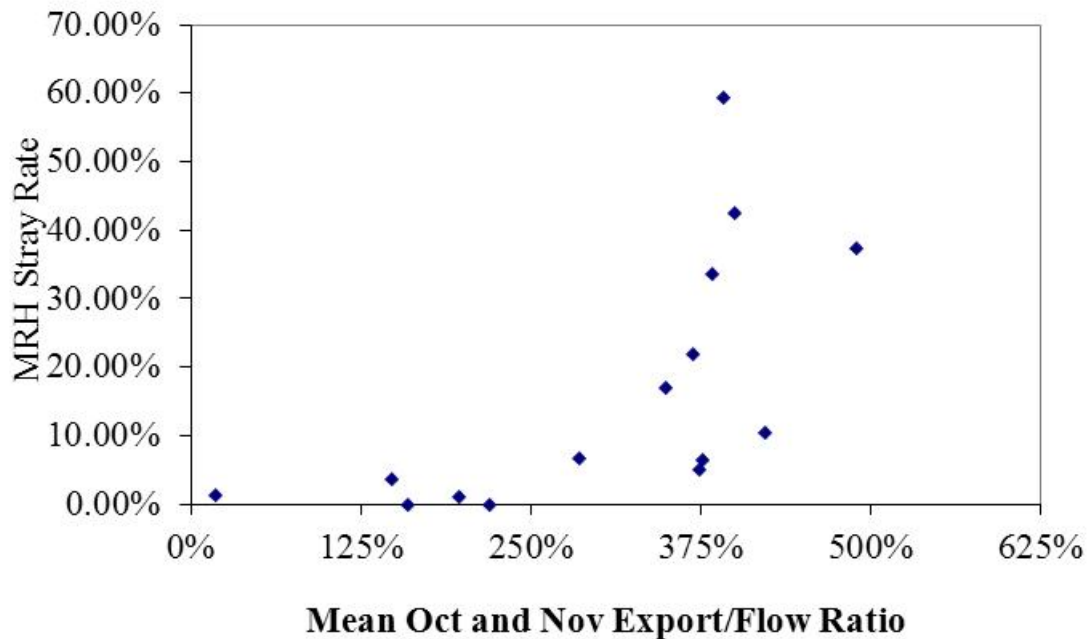


Fig. 7. Adult Merced River Hatchery Chinook salmon stray rates relative to the mean ratio of Delta Exports at the State, Federal, and Contra Costa pumping facilities (Dayflow estimates) to the flow in the San Joaquin River at Vernalis (Dayflow estimates) during October and November. Stray rates are computed as the percentage of Merced River Hatchery fall-run Chinook salmon with CWTs (Mesick et al. 2009a) that were released in the San Joaquin River Basin upstream from Jersey Point as juveniles and then recovered as adults in the Sacramento River Basin relative to the adult recoveries in the Central Valley from 1983 to 1988 and from 1995 to 2003. Estimates for 1989 to 1994 were not used because there were less than an estimated total of 1,000 MRH adults with CWTs that returned to all Central Valley rivers during each year and so there was a high degree of uncertainty for these stray rate estimates. The mean Vernalis flows (USGS gauge 11303500) were computed for the 10-day period in mid to late October with the highest flows.

Spawner Abundance

Spawner abundance can affect juvenile salmon production in two ways. First, too few spawners results in low production of juveniles due to a lack of eggs. On the other hand, the limited availability of spawning habitat in the Merced River could result in high rates of redd superimposition when spawner abundance is high. Redd superimposition could result in egg mortality for early spawners when late spawners dig up the redds of the early spawners.

The Merced River spawner-recruit analysis suggests that recruitment increases as spawner abundance increases; however, the relationship appears to be driven primarily by

the data associated with high flows and the relationship with spawner abundance is not statistically significant (Fig. 8). Spawner abundance has no effect on recruitment during dry and normal water year types, which are the majority of observations, as evidenced by a nearly flat relationship from about 500 spawners to 10,500 spawners for the low and medium flow estimates (Fig. 9). This suggests that during dry and normal water year types when only the minimum required flows are released (mean March 20 to April 20 flows < 1,262 cfs), the capacity of the juvenile habitat is so constrained that a small number of spawners can saturate the habitat with juvenile salmon.

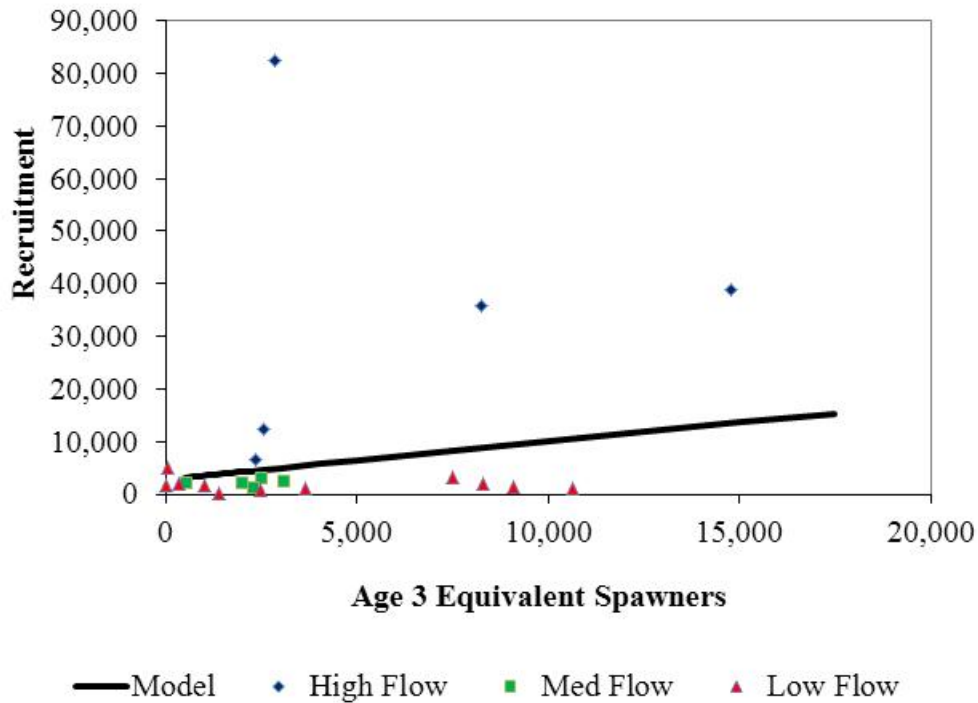


Fig. 8. The observed and modeled relationships between the number of natural recruits and the number of Age 3 equivalent spawners in the Merced River. The model is a 2nd order polynomial regression for adult Merced River recruitment that includes the mean flow at the river’s mouth from March 20 to April 20, the number of Age 3 equivalent spawner, which includes both hatchery and natural adults, and a 1st order interaction term for flow and spawner abundance. The plotted model line in the figure represents the stock-recruitment relationship at an average flow of 900 cfs at the mouth of the Merced River. The model was significant ($P = 0.00$), the adjusted R^2 was 0.74, and the probabilities for the spawner variables were 0.09 and 0.97 for the first and second order terms, respectively. The high flow data occurred when the mean March 20 to April 20 flow was at least 2,500 cfs. The low flow data occurred when the mean March 20 to April 20 flow was less than 275 cfs. The methods used to estimate natural recruitment and Age 3 spawner abundance are described in (Mesick et al. 2009b).

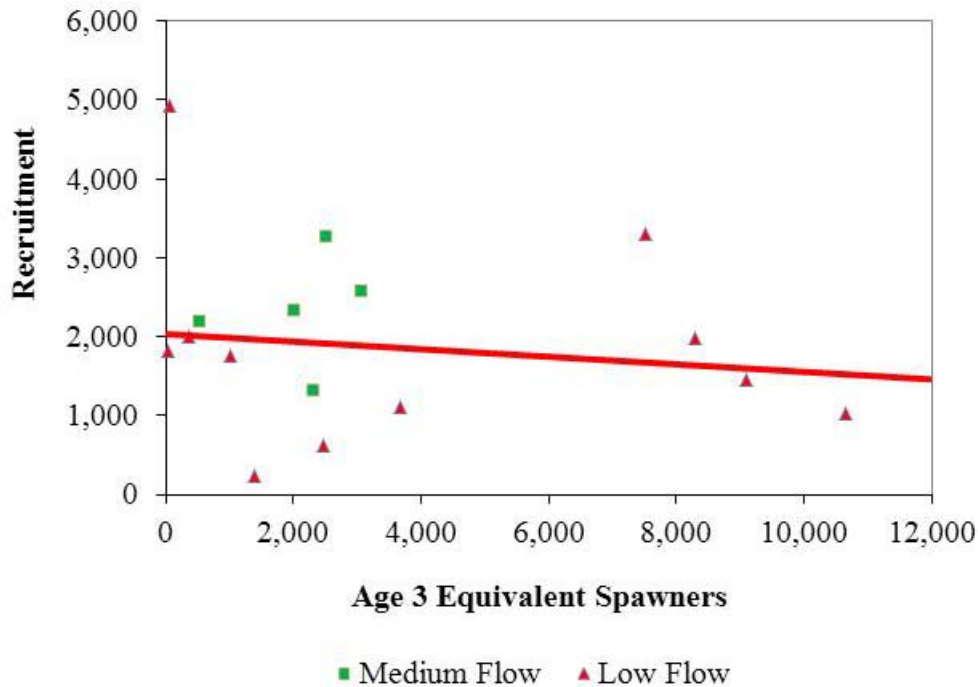


Fig. 9. The number of natural recruits relative to the number of Age 3 equivalent spawners in the Merced River at low and medium flows at the Merced River’s mouth from March 20 to April 20. The medium flow data occurred when the mean March 20 to April 20 flow ranged between 618 and 1,272 cfs. The low flow data occurred when the mean March 20 to April 20 flow was less than 325 cfs. The line represents the linear regression for the low flow data. The methods used to estimate natural recruitment and Age 3 spawner abundance are described in (Mesick et al. 2009b).

Juvenile Survival in the Merced River

The survival of juvenile fall-run Chinook salmon that migrate from the Merced River into the San Joaquin River and Delta is thought to be relatively low for fry that must rear for a prolonged period before completing their migration to the ocean compared to the relatively high survival rates for smolt-sized juveniles. The mean recovery rates in the escapement for Coleman National Fish Hatchery (CNFH) fall-run Chinook salmon with CWTs that were released in the Sacramento River range between 0.29% to 0.45% for releases in January through April whereas the mean recovery rate is 1.98% for May releases, when the size of the CNFH juveniles is comparable to the size of the Tuolumne River smolts (methods described in Mesick et al. 2009a). The survival of fry sized juveniles is low during dry and normal water years in the Central Delta, where the Merced River smolts migrate, compared to the North Delta based on ocean recovery rates of CNFH fry with CWTs (Brandes and McLain 2001). The low survival rates of juveniles rearing in the Delta in dry and normal water years may be caused by a combination of factors such as predation, entrainment at numerous small, unscreened

diversions, unsuitable water quality, high water temperatures, disease, and direct mortality at the state and federal pumping facilities in the Delta.

The Merced River recruitment of naturally produced adult salmon is strongly correlated with spring flows and water temperatures during the early spring when parr and smolts are migrating from the Merced River. The R^2 values are highest for relationships between recruitment and the mean Vernalis flow during April (Fig. 10), followed by the mean flow at the mouth of the Merced river from March 20 to April 20 (Fig. 11), and the mean daily maximum water temperature from March 20 to April 20 (Fig. 12). The relationship with maximum water temperatures indicates that juvenile survival declines rapidly as water temperatures approach about 59°F. This 59°F threshold corresponds to the upper water temperature threshold for the smoltification process that has been recommended by the EPA (2003). Smoltification is a reversible process such that when conditions are not suitable for smoltification (e.g., water temperatures exceed 59°F), the juveniles can revert to a freshwater or parr stage (Hoar 1988 as summarized in Myrick and Cech 2001). The strong relationship between recruitment and water temperatures during March and April suggest that when maximum daily temperatures exceed 59°F, smoltification ceases and mortality rates are high for the juveniles that do not smolt during the early spring.

The number of Merced River natural recruitments was strongly correlated with the number of days when the maximum water temperatures at the river's mouth were less than 59°F (Fig. 13). An increase in recruitment was not observed until the duration with low temperatures reached at least 23 days (1980); whereas recruitment was highest for the spring 1983 cohort when there were 55 days of maximum temperatures below 59°F (Fig. 13). Exceptions occurred for 1995, when there 54 days of low temperatures (Fig. 14), and 2005, when there were 47 days of low temperatures. In 2005, ocean conditions were unusually poor for juvenile survival (Lindley et al. 2009). The reason for the low recruitment for the spring 1995 cohort is unknown, although it is likely that poor ocean conditions also caused the low recruitment for the 1995 cohort. The April CUI in 1995 was 91, which indicates that conditions were worse for juvenile survival in the ocean than occurred in 2005, when the April CUI was 121. However, the April CUI does not consistently indicate when ocean conditions were poor for the survival of juvenile salmon (Fig. 14).

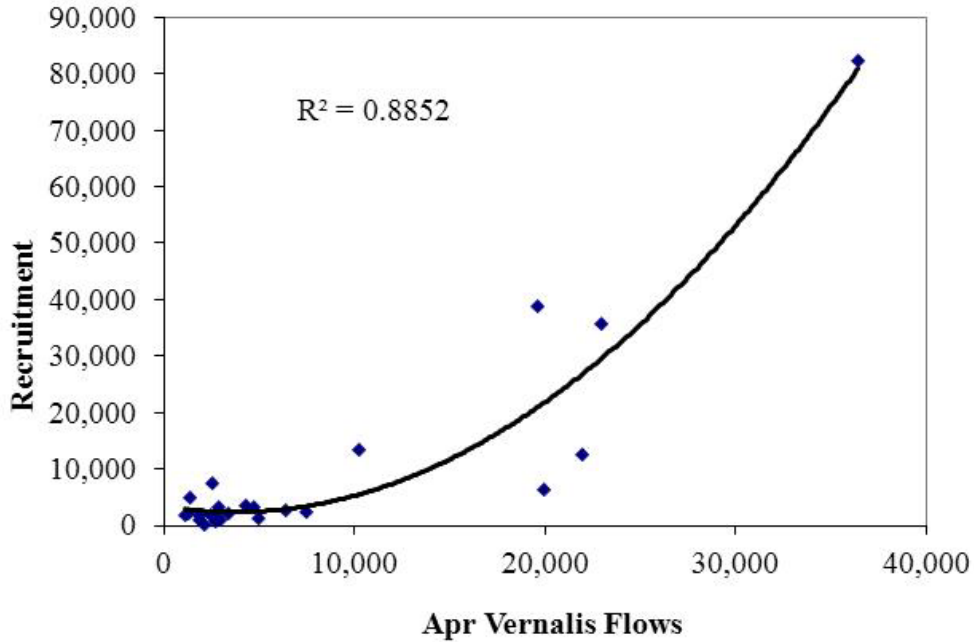


Fig. 10. The number of natural adult recruits relative to the average flow in the San Joaquin River at Vernalis during April from when the cohorts migrated as juveniles toward the ocean from 1980 to 2004. The 2nd order polynomial regression (line) and R^2 value were generated with Excel 2010.

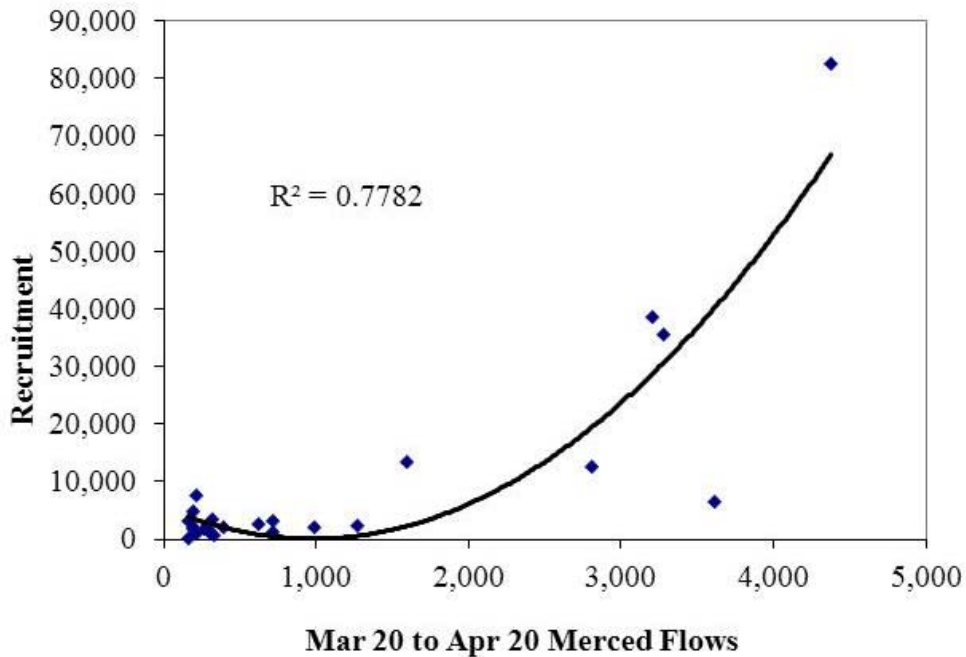


Fig. 11. The number of natural adult recruits relative to the average flow at the Merced River mouth from March 20 to April 20 when the cohorts migrated as juveniles toward the ocean from 1980 to 2004. The 2nd order polynomial regression (line) and R^2 value were generated with Excel 2010.

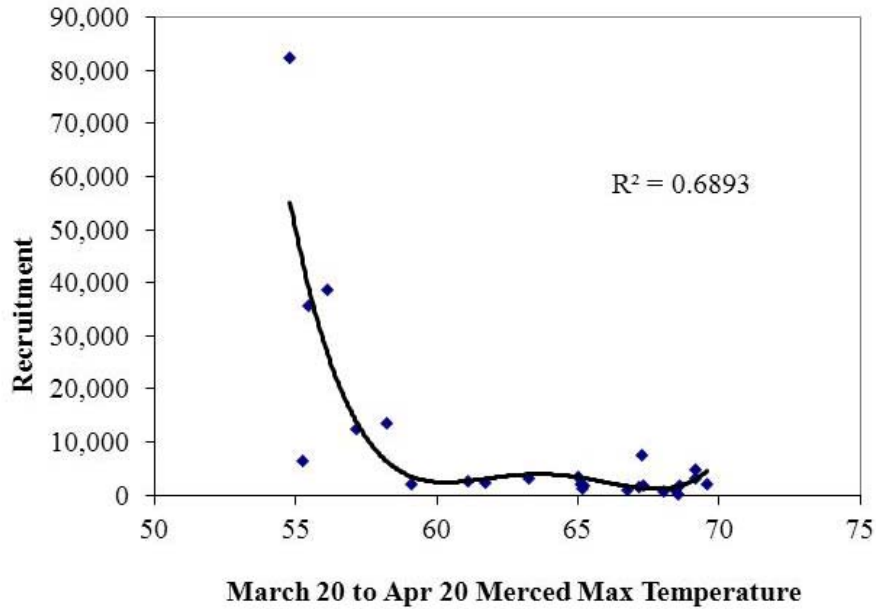


Fig. 12. The number of natural adult recruits relative to the average daily maximum water temperature at the Merced River mouth from March 20 to April 20 when the cohorts migrated as juveniles toward the ocean from 1980 to 2004. The 4th order polynomial regression (line) and R^2 value were generated with Excel 2010.

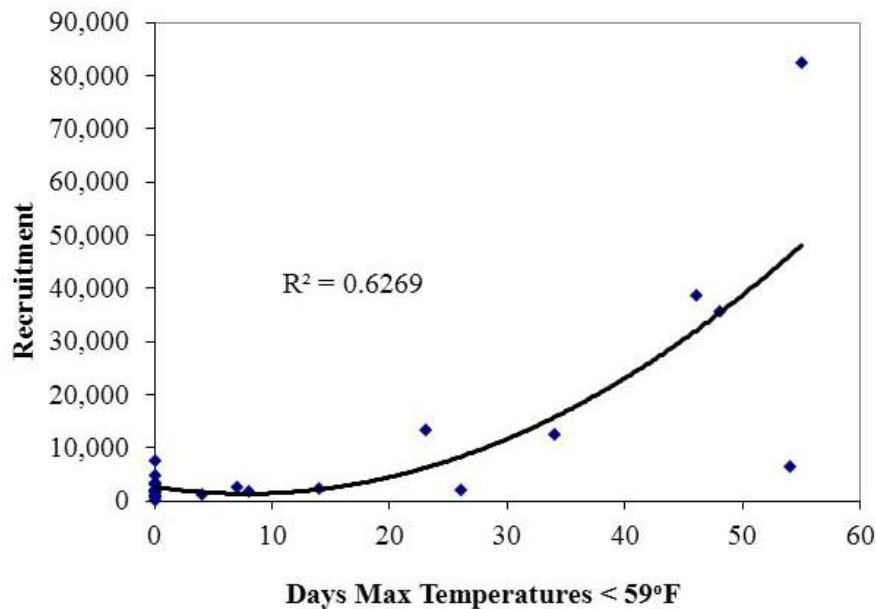


Fig. 13. The number of natural adult recruits relative to the number of days that the maximum water temperature at the Merced River mouth was less than 59°F from March 20 to June 15 when the cohorts migrated as juveniles toward the ocean from 1980 to 2004. The 2nd order polynomial regression (line) and R^2 value were generated with Excel 2010.

Juvenile Survival In The Delta

CWT smolt survival studies have been conducted in the San Joaquin River to evaluate the effects of flow, Delta export rates, and the installation of a barrier at the head of the Old River which had the objective of minimizing the diversion of flow and juvenile salmon into the Old River, which led to the Federal and State pumping facilities in the Delta, from 1985 to 2004 (SJGRA 2007, Newman 2008). The results indicated that smolt survival was positively correlated with the flow in the San Joaquin River at Dos Reis and the installation of the Old River Barrier (Newman 2008). However, associations between the pumping rates at the State and Federal facilities and smolt survival were weak to negligible (Newman 2008). Therefore, flow releases in the Merced River improve smolt survival in the Delta as well as in the Merced River.

Juvenile Survival In The Ocean

The survival of Central Valley smolts entering the ocean during May and June (MacFarlane and Norton 2002) is probably the most critical phase for salmon in the ocean (Pearcy 1992, Mantua et al. 1997, Quinn 2005). Smolt survival in the ocean is highly correlated with food availability as affected by freshwater outflow from the estuary and coastal upwelling (Casillas 2007). The coastal areas provide abundant food resources for salmon smolts particularly when coastal upwelling provides cold, nutrient rich water and when high freshwater flows create a large interface area between freshwater and saltwater (Casillas 2007). Long-term records indicate that there are 15- to 25-year cycles of warm and cool periods that strongly correlate with marine ecosystem productivity (Mantua et al. 1997; Hollowed et al. 2001). However, more recent cycles have been relatively short with a cool productive cycle from July 1998 to July 2002, a warm unproductive cycle from August 2002 to July 2006, followed by cool productive cycle through at least July 2009 (Ocean Ecosystem Indicators 2008, web site provided by the Northwest Fisheries Science Center, NOAA Fisheries Service). Ocean productivity was particularly poor for the Gulf of the Farallones in 2005 and 2006 as indicated by the abandonment of nests on the Farallon Islands by Cassin's auklets, which have a similar diet compared to juvenile Chinook salmon, because of poor food availability (Sydeman et al. 2006; Wolf et al. 2009). The Pacific Decadal Oscillation is a basin-scale index of North Pacific sea surface temperatures and provides a good index of sea surface temperatures and has been correlated with Chinook salmon landings in California (Mantua et al. 1997).

An important local process that affects plankton production along the Oregon coast is coastal upwelling (Peterson et al. 2006). Upwelling is caused by northerly winds from April to September that transport offshore surface water southward and away from the coastline. This offshore, southward transport of surface waters is balanced by onshore northward transport of typically cool, high-salinity, nutrient-rich water that drives the marine food-web. The Coastal Upwelling Index (CUI) is based on the wind speed that drives coastal upwelling (Bakun 1973) and the CUI database is developed and distributed by the Pacific Fisheries Environmental Laboratory, National Marine Fisheries Service's Southwest Fisheries Science Center, Pacific Grove, California. The survival of juvenile coho salmon (*O. kisutch*) is positively correlated with the April and mean April-May CUI

values for Oregon coho salmon (Petersen et al. 2006), the mean June to August curl-driven upwelling indices are positively correlated with growth rates of Chinook salmon in a tributary to the Smith River near the California-Oregon border (Wells et al. 2007), and the mean April CUI are positively correlated with the survival to adulthood of Central Valley hatchery salmon released in the San Francisco Bay based on the result presented in the Methods section here. However, strong upwelling is not always correlated with high plankton productivity because the deep source waters for upwelling can be warm and nutrient poor (Peterson et al. 2006).

Merced River fall-run Chinook salmon adult recruitment is poorly correlated with the mean April CUI values for the Gulf of Farallones. For example, the relationship between mean April CUI values and Merced River recruitment (Fig. 14) shows the low recruitment for spring 2005 at low CUI values as expected, but also indicates that recruitment was high in 1986 and 1998 at even lower CUI values. When incorporated into a multiple regression model with the mean La Grange flow from 1 February to 15 June and 2nd order polynomial Age 3 equivalent spawner abundance variables, the CUI had negative coefficients for all periods from April through August, which is contrary to those reported for Oregon coho salmon (Peterson et al. 2006) and the Chinook salmon in the Smith River tributary (Wells et al. 2007). One explanation is that Merced River fall-run Chinook salmon are primarily affected by instream flows in the Merced River when the juveniles are rearing and migrating downstream, whereas ocean conditions would only have an effect during wet years, such as 2005 and 2006, when ocean conditions were unusually unproductive. On the other hand, the survival of hatchery raised salmon that are trucked to the Bay and Chinook salmon migrating in undamed rivers with frequent floodplain inundation such as the Smith River would be expected to be primarily affected by ocean conditions.

Adult Harvest In The Ocean

The decline in the Merced River escapement of naturally produced fall-run Chinook salmon since 1999 (Fig. 4) cannot be explained by the sport and troll harvest rates of adult salmon in the ocean. The Central Valley Index of Ocean Harvest (CVI), which is estimated each year by the Pacific Fishery Management Council (PFMC 2008) by dividing total harvest south of Point Arena by the total hatchery and natural escapement to all Central Valley rivers, averaged 67.2% from 1980 to 1998 and 42.1% from 1999 to 2007 (Fig. 15). CWT based estimates of ocean harvest rates for Central Valley fall-run Chinook salmon were computed by dividing the total number of all Central Valley hatchery CWT salmon harvested in the ocean by the total number of Central Valley hatchery CWT salmon in the ocean harvest and inland escapements for each year (Fig. 15; Mesick et al. 2009a, 2009b). Since the CWT based estimates are not based on the assumption that they are only caught south of Point Arena, they are probably more accurate than the CVI estimates. There is no relationship between the escapement of naturally produced fall-run Chinook salmon in the Merced River from 1999 to 2007 and the CWT based ocean harvest rates (Fig. 16).

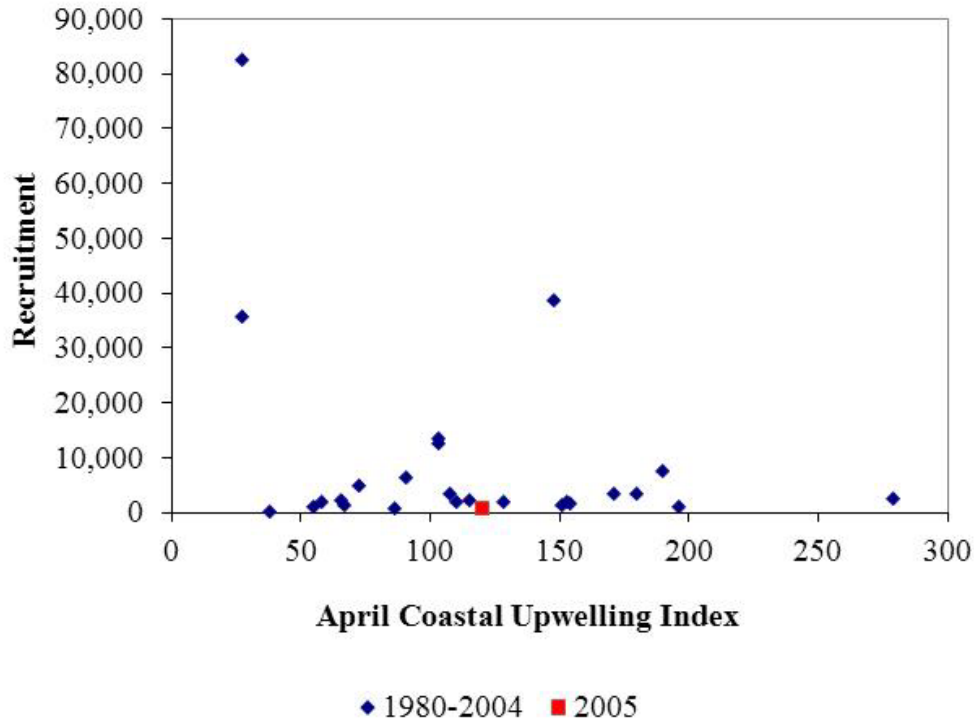


Fig. 14. The relationship between Merced River naturally produced adult fall-run Chinook salmon recruitment and the mean Cumulative Upwelling Index at 37.5°N latitude (Gulf of the Farallones) for May and June from 1980 to 2005.

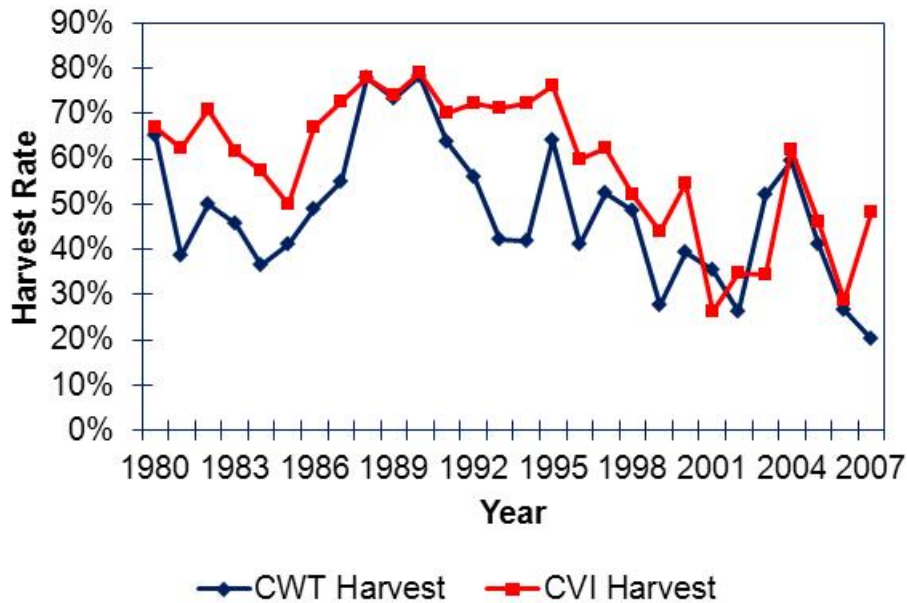


Fig. 15. Estimated ocean harvest rates of Central Valley fall-run Chinook salmon from 1980 to 2007 in the combined commercial (troll) and sport fisheries based on CWT recovery estimates (Mesick et al. 2009a, 2009b) and the Central Valley Index (PFMC 2008).

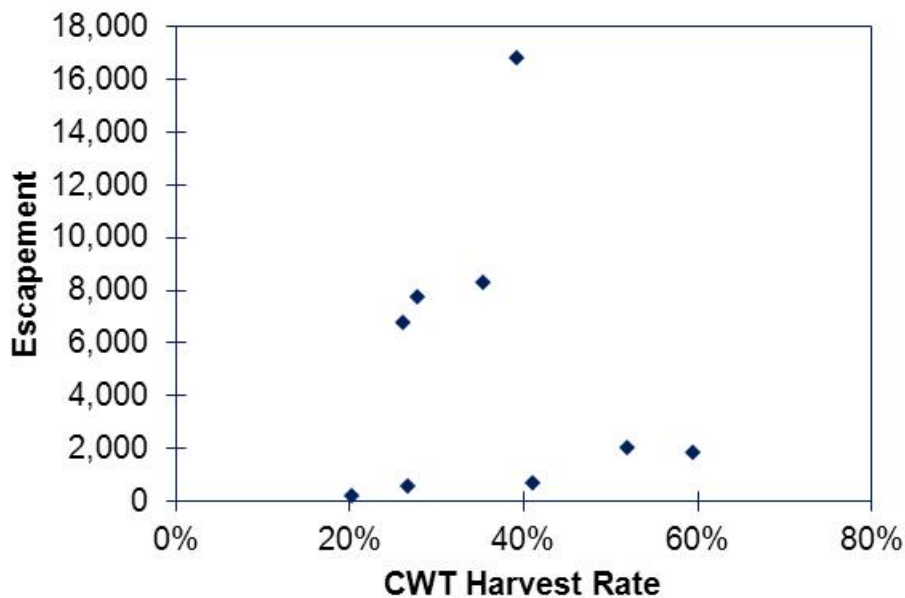


Fig. 16. Escapement of naturally produced Chinook salmon relative to the CWT harvest rate estimates from 1999 to 2007.

DISCUSSION

The Merced River fall-run Chinook salmon population is at a high risk of extinction primarily due to inadequate instream flow releases from Crocker-Huffman Dam, during the spring when the daily maximum water temperatures in the lower river exceed the EPA (2003) threshold of 59°F for smoltification and to a lesser extent during late October when adult salmon are migrating upstream. The importance of flow and water temperatures in the Merced River and the San Joaquin River near Vernalis was apparent in analyses with both adult recruitment and smolt CWT survival studies. It is likely that maintaining water temperatures below the EPA (2003) threshold of 59°F, particularly in the lower Merced River, is important for smoltification and the number of smolts that leave the Merced River; whereas flows and water temperatures in the San Joaquin River are an important determinant of smolt survival in the Delta. The logistic model analysis of CWT return rates of juvenile MRH smolts released in the Merced River indicate that Delta export rates, the presence of a physical barrier at the Head of the Old River, Delta outflow, and ocean conditions (April CUI) have little effect on smolt survival rates compared to the effect of flow and water temperature.

Other factors that put the population at a high risk of extinction include unusually unfavorable ocean conditions for the survival of juvenile salmon and the large numbers of out-of-basin hatchery fish that stray to the Merced River. Unusually unfavorable ocean conditions occurred during spring 2005 and 2006 that caused an extensive failure

of the Central Valley fisheries (Lindley et al. 2009). It is likely that these extremely unfavorable ocean conditions were infrequent during the 1980 to 2005 period of study because adult recruitment for the 2005 cohort was unusually low considering that the 2005 April CUI was moderate and high recruitments occurred at much lower April CUI levels (e.g., 1983 and 1998; Fig. 12). The number of out-of-basin hatchery fish in the Merced River is primarily determined by the number of MRFI juvenile salmon that are released in the Delta. Substantially reducing the number of out-of-basin hatchery fish could be accomplished by minimizing the number of juvenile salmon that are trucked to the Delta for release.

To maintain the Merced River fall-run Chinook salmon population at a low risk of extinction, it will be necessary to increase the population in regard to all four of the Lindley et al. (2007) risk of extinction criteria. First, it will be necessary to increase the dry water year flow releases to keep escapement above 833 fish. Second, it will be necessary to increase normal water year flow releases to double the escapements and thereby reduce the rate of decline between wet-year escapements and dry-year escapements to below 10% or less annually. Increasing normal water year flow releases would also help reduce the percentage of hatchery fish. Third, it will be necessary to minimize the number of MRFI juvenile fish that are trucked to the Delta for release.

To keep escapement above 833 fish during Critical and Dry water year types, when the San Joaquin Water Year Index is 2.5 MAF or less, it will be necessary to implement a flow schedule that includes: (1) a 10-day, 1,200 cfs late October pulse flow release to minimize adult straying; and (2) flow management for Crocker-Huffman Dam releases to keep water temperatures throughout the river below a threshold of 59°F from 20 March through at least 20 April to improve smolt survival. The recommended 59-degree Fahrenheit threshold should be maintained from 20 March to 30 April in Below Normal water year types and to at least 15 May in Above Normal and Wet water year types to help reduce the magnitude in population fluctuations and reduce the percentage of hatchery fish.

Another recommendation is to gradually ramp down the flood control releases during early summer to improve the recruitment of riparian tree species and thereby augment the amount of organic matter, shade, and woody debris and thereby improve the habitat quality for juvenile salmon. Research on a variety of cottonwood and willow species suggests that 1 to 1.5 inches/day is the maximum rate of water table decline for seedling survival (McBride et al. 1989; Segelquist et al. 1993; Mahoney and Rood 1993, 1998; Amlin and Rood 2002). Ramping down is necessary so that the root growth of the tree seedlings can keep up with the decline in the groundwater table as flows recede. Ramping rates of 100 to 300 cfs/day in the San Joaquin Basin are thought to prevent seedling desiccation under the assumed 1 inch/day maximum root growth rate.

REFERENCES

- AD Consultants, Resource Management Associates, Inc., and Watercourse Engineering, Inc. 2009. San Joaquin River Basin water temperature modeling and analysis. Prepared for CALFED, ERP-06D-S20. Moraga, California. October 2009.
- Allendorf, F.W., D. Bayles, D.L Bottom, K.P. Currens, C.A. Frissell, D. Hankin, J.A. Lichatowich, W. Nehlsen, P.C. Trotter, T.H. Williams. 1997. Prioritizing Pacific salmon stocks for conservation. *Conservation Biology* 11:140–152.
- Amlin, N.M. and S.B. Rood. 2002. Comparative tolerances of riparian willows and cottonwoods to water-table decline. *Wetlands* 22: 338.
- Bakun, A. 1973. Coastal upwelling indices, west coast of North America, 1946– Department of Commerce, NOAA Technical Report NMFS-SSRF-671.
- Barnett-Johnson, R., C.B. Grimes, C.F. Royer, and C.J. Donohoe. 2007. Identifying the contribution of wild and hatchery Chinook salmon (*Oncorhynchus tshawytscha*) to the ocean fishery using otolith microstructure as natural tags. *Canadian Journal of Fisheries and Aquatic Sciences* 64:1683-1692.
- Brandes, P.L. and J.S. McLain. 2001. Juvenile Chinook salmon abundance, distribution, and survival in the Sacramento-San Joaquin Estuary. In: Brown, R.L., editor. *Fish Bulletin 179: Contributions to the biology of Central Valley salmonids. Volume 2.* Sacramento (CA): California Department of Fish and Game. Pages 39-138.
- Casillas, E. 2007. Coastal and ocean ecosystems – current findings linking plume and ocean conditions to salmon growth and survival. Oral presentation given at the Science Policy Exchange, Pacificorp Auditorium, Portland State University, Portland, Oregon, September 12-13, 2007. The exchange was part of the Columbia River Fish and Wildlife Program amendment process sponsored by the Northwest Power and Conservation Council.
<http://www.nwcouncil.org/fw/program/2008amend/spe/agenda.htm>.
- Chase, C.O. 1978. Merced River Fish Facility Annual Report. 1973-74. Anadromous Fisheries Branch Administrative Report No. 78-3.
- Cozart, M.D. 2005. Annual Report, Merced River Hatchery, 2004-2005. Lands and Facilities Branch Administrative Report.
- [EPA] United States Environmental Protection Agency. 2003. EPA Region 10 Guidance for Pacific Northwest State and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. 49 pp. April.

- Hoar, W.S. 1988. The physiology of smolting salmonids. Pages 275-326 in W.S. Hoar and D.J. Randall, editors. *Fish Physiology*. Academic Press, New York.
- Hollowed, A. B., S. R. Hare, and W. S. Wooster. 2001. Pacific Basin climate variability and patterns of Northeast Pacific marine fish production. *Progr. Oceanography* 49: 257-282.
- Lindley, S.T., R.S. Schick, E. Mora, P.B. Adams, J.J. Anderson, S. Greene, C. Hanson, B.P. May, D.R. McEwan, R.B. MacFarlane, C. Swanson, and J.G. Williams. 2007. Framework for assessing viability of threatened and endangered salmon and steelhead in the Sacramento- San Joaquin Basin. *San Francisco Estuary and Watershed Science* Volume 5, Issue 1 [February 2007], article 4. Available at: <http://repositories.cdlib.org/jmie/sfews/vol5/iss1/art4>
- Lindley, S.T., C.B. Grimes, M.S. Mohr, W. Peterson, J. Stein, J.T. Anderson, L.W. Botsford, , D.L. Bottom, C.A. Busack, T.K. Collier, J. Ferguson, J.C. Garza, A.M. Grover, D.G. Hankin, R.G. Kope, P.W. Lawson, A. Low, R.B. MacFarlane, K. Moore, M. Palmer-Zwahlen, F.B. Schwing, J. Smith, C. Tracy, R. Webb, B.K. Wells, and T.H. Williams. 2009. What caused the Sacramento River fall Chinook stock collapse? Pre-publication report to the Pacific Fishery Management Council. March 18, 2009
- Mantua, N.J., S. R. Hare, Y. Zhang, J.M. Wallace, and R.C. Francis. 1997. A Pacific interdecadal climate oscillation with impacts on salmon production. *Bulletin American Meteorological Society* 78: 1069-1079.
- MacFarlane, R. B., and Norton, E. C. 2002. Physiological ecology of juvenile Chinook salmon (*Oncorhynchus tshawytscha*) at the southern end of their distribution, the San Francisco Estuary and Gulf of the Farallones, California. *Fisheries Bulletin* 100: 244-257.
- Mahoney, J. M., and S. B. Rood. 1993. A model for assessing the effects of altered river flows on the recruitment of riparian cottonwoods. B. Tellman, H. J. Cortner, M. G. Wallace, L. F. DeBano and R. H. Hamre, editors. *Riparian management: common threads and shared interests*. General Technical Report RM-226. USDA Forest Service.
- Mahoney, J. M., and S. B. Rood. 1998. Streamflow requirements for cottonwood seedling recruitment – an integrative model. *Wetlands* 18: 634-645.
- McBride, J. R., N. Sugihara, and E. Norberg. 1989. Growth and survival of three riparian woodland species in relation to simulated water table dynamics. Environment, Health, and Safety Report No. 009.4-89.3. Prepared by University of California, Department of Forestry and Resource Management, Berkeley for Pacific Gas and Electric Company, Department of Research and Development, San Ramon, California.

- Menchen, R.S. 1971. Merced River King (Chinook) salmon spawning channel annual report for 1970-1971 season. Anadromous Fisheries Branch Administrative Report No. 72-6. Submitted October 1971.
- Mesick, C.F., D. Marston, and T. Heyne. 2009a. Estimating the total number of coded-wire-tagged adult fall-run Chinook salmon (*Oncorhynchus tshawytscha*) in California's Central Valley rivers. El Dorado, CA. Manuscript submitted to the California Fish and Game Scientific Journal, October 2009. Excel file database: CV Summary August 2009 Fall-Run Surveys Final.xls.
- Mesick, C.F., D. Marston, and T. Heyne. 2009b. Estimating recruitment for fall-run Chinook salmon populations in the Stanislaus, Merced, and Merced rivers. El Dorado, CA. Manuscript submitted to the California Fish and Game Scientific Journal, October 2009.
- Myrick, C.A. and J.J. Cech, Jr. 2001. Temperature effects on Chinook salmon and steelhead: a review focusing on California's Central Valley populations. Report produced for the CalFed Science Program.
- Newman, K.B. An evaluation of four Sacramento-San Joaquin River Delta juvenile salmon survival studies. Report prepared for the CalFed Science Program by the U.S. Fish and Wildlife Service, Stockton. 31 March 2008.
- Pearcy, W. G. 1992. Ocean ecology of north pacific salmonids. University of Washington.
- Peterson, W.T., R.C. Hooff, C.A. Morgan, K.L. Hunter, E. Casillas, and J.W. Ferguson. 2006. Ocean conditions and salmon survival in the northern California Current. Northwest Fisheries Science Center, NOAA Fisheries Service. Seattle.
- [PFMC] Pacific Fisheries Management Council. 2008. Preseason Report I: stock abundance analysis for 2007 ocean salmon fisheries. February 2008. Portland, OR.
- Poe, S.D. 1982. Annual Report, Merced River Fish Facility Annual Report 1980-1981. Anadromous Fisheries Branch Administrative Report No. 82-23. Submitted 1982.
- Segelquist, C. A., M. L. Scott, and G. T. Auble. 1993. Establishment of *Populus deltoides* under simulated alluvial groundwater decline. The American Midland Naturalist 130: 274-285.
- Sydeman, W. J., R. W. Bradley, P. Warzybok, C. L. Abraham, J. Jahncke, K. D. Hyrenbach, V. Kousky, J. M. Hipfner, and M. D. Ohman. 2006. Planktivorous auklet *Ptychoramphus aleuticus* responses to ocean climate, 2005: Unusual atmospheric blocking? Geophysical Research Letters 33:L22S09.

- Quinn, T.P. 2005. The behavior and ecology of Pacific salmon & trout. American Fisheries Society in association with University of Washington, Press, Seattle.
- Wells, B.K, B. Churchill, B. Grimes, and J.B. Waldvogel. 2007. Quantifying the effects of wind, upwelling, curl, sea surface temperature and sea level height on growth and maturation of a California Chinook salmon (*Oncorhynchus tshawytscha*) population. Fisheries Oceanography 16(4): 363–382.
- Wells, B.K, J.C. Field, J.A. Thayer, C.B. Grimes, S.J Bogad, W.J. Sydeman, F.B. schwing, and R. Hewitt. 2008. Untangling the relationships among climate, prey and top predators in an ocean ecosystem. Marine Ecology Progress Series. 364: 15-29.
- Wolf, S. G., W. J. Sydeman, J. M. Hipfner, C. L. Abraham, B. R. Tershy, and D. A. Croll. 2009. Range-wide reproductive consequences of ocean climate variability for the seabird Cassins Auklet. Ecology 90:742–753.

Table 1. Habitat and biological variables evaluated in the development of logistic models estimating the recovery rate of adult fall-run Chinook salmon in the Merced River that were released as juvenile salmon reared at the Central Valley hatcheries and marked with coded-wire-tags.

Merced River Hatchery Releases in the Merced River in Spring and Fall

1. Mean flow at the confluence (RM 0) for days 3 to 6 following the release date for releases in the upper river and for the day of the release for releases made near the confluence with the San Joaquin River. The flow estimates were generated from the San Joaquin River basin HEC5Q hydrodynamic and thermodynamic computer model developed by AD Consultants et al. (2009).
2. Mean maximum water temperature at the confluence (RM 0) for days 3 to 6 following the release date for releases in the upper river and for the day of the release for releases made near the confluence with the San Joaquin River. The temperature estimates were generated from the San Joaquin River basin HEC5Q hydrodynamic and thermodynamic computer model developed by AD Consultants et al. (2009).
3. Mean flow in the San Joaquin River at Vernalis for days 6 to 15 following the release date. The flow estimates were obtained from the California Department of Water Resources' (DWR) Dayflow output files, which are available at <http://www.water.ca.gov/dayflow/output/>
4. Mean maximum water temperature in the San Joaquin River at Vernalis for days 6 to 15 following the release date. The source of the data was USGS gage 11303500.
5. Mean total export rate at the SWP, CVP and CCC for days 6 to 15 following the release date. The export rate estimates were obtained from the DWR Dayflow output files, which are available at <http://www.water.ca.gov/dayflow/output/>
6. The mean of a conditional variable indicating the presence of the Head of the Old River Barrier (HORB) for days 6 to 15 following the release date. The operation schedule for the HORB is posted at http://baydeltaoffice.water.ca.gov/sdb/tbp/web_pg/tempbsch.cfm. The variable was assigned a value of 1 when the HORB was completed, a value of 0 when the HORB was not installed, and a fraction of 1 during the construction of the barrier that reflected the degree of construction. For example, if it took 10 days to construct the barrier, a value of 0.9 was given on the ninth day of construction.
7. Mean Delta outflow (cfs) for days 13 to 19 following the release date. The Delta outflow estimates (QOut) were obtained from the California Department of Water Resources' (DWR) Dayflow output files, which are available at <http://www.water.ca.gov/dayflow/output/>
8. Rate that MRH adult salmon strayed to the Sacramento River Basin. Stray rates were computed as the estimated total adult CWT recoveries in the Sacramento River Basin divided by the total Central Valley inland CWT recoveries. The CWT recovery database is described by (Mesick et al. 2009a).
9. Age-specific rate that adult salmon with CWTs were harvested in the sport and commercial ocean fisheries. Harvest rates were computed as the estimated total

- number of adult Central Valley hatchery salmon with CWTs caught in the ocean fisheries divided by the total number of adult salmon recovered in the ocean fisheries and the Central Valley inland escapements. Age-specific rates were used for each model. For example, the model of Age 3 CWT recoveries evaluated the effect of ocean harvest rates of Age 3 salmon. The CWT recovery database is described by (Mesick et al. 2009a).
10. The mean weight of the juvenile fish at the time of their release. The source of the size estimates were obtained from the Regional Mark Information System (RMIS), which is an online database managed by the Regional Mark Processing Center in Portland, Oregon.
 11. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases from April through August and the CUI index for the month of November for juvenile releases from September through November. The CUI database is developed and distributed by the Pacific Fisheries Environmental Laboratory, National Marine Fisheries Service's Southwest Fisheries Science Center, Pacific Grove, California.
 12. A conditional variable called "Reach" was used to segregate releases in the upper river from those released near the confluence with the San Joaquin River. A value of zero was used for the upper releases, which were usually made near the hatchery; whereas a value of 1.0 was used for the confluence releases typically made at the Hatfield and Hagaman parks.

Merced River Hatchery Releases in the San Joaquin River upstream of Jersey Point in Spring and Fall

1. The 7-day mean flow in the San Joaquin River at Vernalis following the release date.
2. The 7-day mean maximum water temperature in the San Joaquin River at Vernalis following the release date.
3. The 7-day mean total export rate at the SWP, CVP, and CCC following the release date.
4. The 7-day mean for the conditional variable indicating the presence of the Head of the HORB.
5. Mean Delta outflow (cfs) for days 7 to 13 following the release date.
6. The rate that MRH adult salmon strayed to the Sacramento River Basin.
7. Age-specific ocean harvest rates.
8. The mean weight of the juvenile fish at the time of their release.
9. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases from April through August and the CUI index for the month of November for juvenile releases from September through November.

Merced River Hatchery Releases in the West Delta at Jersey Point in Spring

1. The 7-day mean Delta outflow (cfs) following the release date.
2. The rate that MRH adult salmon strayed to the Sacramento River Basin.
3. Age-specific ocean harvest rates.
4. The mean weight of the juvenile fish at the time of their release.
5. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases made in April and May.

Mokelumne River Fish Installation Releases in the Mokelumne River in Spring and Fall

1. The 7-day mean flow at Woodbridge Dam in the Mokelumne River (USGS gage 11325500) following the release date.
2. Mean flow in the Mokelumne River at Woodbridge Dam (USGS gage 11325500) from October 16 to 31 when the adult fish would be migrating upstream in the Delta.
3. The mean flow of water from the Sacramento River to the lower Mokelumne River through Georgiana Slough and the Delta Cross Channel (XGEO) for days 6 to 15 following the release date. The XGEO flow estimates were obtained from the DWR Dayflow output files, which are available at <http://www.water.ca.gov/dayflow/output/>
4. Mean total export rate at the SWP, CVP and CCC for days 6 to 15 following the release date.
5. Mean Delta outflow (cfs) for days 13 to 19 following the release date.
6. Rate that MRH adult salmon strayed to the Sacramento River Basin.
7. Age-specific rate that adult salmon with CWTs were harvested in the sport and commercial ocean fisheries.
8. The mean weight of the juvenile fish at the time of their release.
9. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases from April through August and the CUI index for the month of November for juvenile releases from September through November.

Mokelumne River Fish Installation Releases in the Sacramento River in Spring and Fall

1. The 7-day mean flow in the Sacramento River following the release date. The flow estimates were obtained from the DWR Dayflow output files, which are available at <http://www.water.ca.gov/dayflow/output/>
2. Mean Delta outflow (cfs) for days 7 to 13 following the release date.
3. Mean flow in the Mokelumne River at Woodbridge Dam (USGS gage 11325500) from October 16 to 31 when the adult fish would be migrating upstream in the Delta.
4. The rate that MRH adult salmon strayed to the Sacramento River Basin.

5. Age-specific rate that adult salmon with CWTs were harvested in the sport and commercial ocean fisheries.
6. The mean weight of the juvenile fish at the time of their release.
7. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases from April through August and the CUI index for the month of November for juvenile releases from September through November.

Mokelumne River Fish Installation Releases in the East Delta (Mokelumne River between Delta Cross Channel and its mouth) in Spring and Fall

1. The 7-day mean flow of water from the Sacramento River to the lower Mokelumne River through Georgiana Slough and the Delta Cross Channel (XGEO) following the release date.
2. Mean Delta outflow (cfs) for days 3 to 13 following the release date.
3. Mean flow in the Mokelumne River at Woodbridge Dam (USGS gage 11325500) from October 16 to 31 when the adult fish would be migrating upstream in the Delta.
4. The rate that MRH adult salmon strayed to the Sacramento River Basin.
5. Age-specific rate that adult salmon with CWTs were harvested in the sport and commercial ocean fisheries.
6. The mean weight of the juvenile fish at the time of their release.
7. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases from April through August and the CUI index for the month of November for juvenile releases from September through November.

Mokelumne River Fish Installation Releases in the West Delta in Spring and Fall

1. The 7-day Mean Delta outflow (cfs) following the release date.
2. Mean flow in the Mokelumne River at Woodbridge Dam (USGS gage 11325500) from October 16 to 31 when the adult fish would be migrating upstream in the Delta.
3. The rate that MRH adult salmon strayed to the Sacramento River Basin.
4. Age-specific rate that adult salmon with CWTs were harvested in the sport and commercial ocean fisheries.
5. The mean weight of the juvenile fish at the time of their release.
6. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases from April through August and the CUI index for the month of November for juvenile releases from September through November.

Sacramento Basin Hatchery Releases in the West Delta in Spring

1. The 7-day Mean Delta outflow (cfs) following the release date.
2. The mean flow of water from the Sacramento River to the lower Mokelumne River through Georgiana Slough and the Delta Cross Channel (XGEO) from October 10 to 25 when adult fish would be migrating upstream in the Delta.
3. Age-specific rate that adult salmon with CWTs were harvested in the sport and commercial ocean fisheries.
4. The mean weight of the juvenile fish at the time of their release.
5. The total number of juvenile fish released in each CWT group.
6. The Coastal Upwelling Index (CUI) for the month of April for juvenile CWT releases from April through August.

Table 2a. Coefficients of the logistic regression models used to predict CWT recovery rates to the Merced River. Models include CWT releases of Merced River Hatchery (MRH) juvenile salmon into the Merced River (Trib) and San Joaquin River (Mainstem) during the spring and fall. The excluded brood years are those with observed recovery rates near zero that were substantially lower than the predicted estimates or those years without observed recovery rates and the model over predicted the observed escapement. “Pos” indicated that the coefficient was positive, whereas the expected response was negative and so the variable was omitted from the model.

	MRH Trib Spring (Apr-May)			MRH Trib Fall (Sep-Nov)			MRH Mainstem Spring		
Model Deviance	0.12	0.17	0.03	0	0.02	0	0.1	0.06	0.01
Degrees of Freedom	120	135	138	7	7	9	88	79	88
	<u>Coefficients</u>								
<u>Variable</u>	Age 2	Age 3	Age 4	Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
Constant	10.4825	11.7777	-2.36988	-7.18501	-7.03883	-10.1657	-7.66714	-4.02061	-9.90351
April Coastal Upwelling Index							0.007061	0.007061	0.007061
Adult Harvest	Pos	-3.80361	Pos	-4.41985	-1.34971	Pos	-1.6662	-7.77867	-1.42525
Adult MRH Stray Rate	-9.14173	-2.98646	Pos	-10.8257	-2.03314	-3.19962	-4.50147	-6.02739	-0.57462
Merced Flow	0.0007511	0.000751	0.000751						
Vernalis Max Temperature	-0.2726	-0.27466	-0.12151		Pos				
Vernalis Flow				0.00005351	0.00003628	0.000112	0.00005825	0.00003896	0.00002716
	<u>Excluded Brood Years</u>								
	1981	1981		1979	1979	1979	1987	1981	1987
	1986	1986	1986	1985-1992	1985-1992	1985-1992	1989-1994	1987	1989-1994
	1987	1987	1987	1994-2004	1994-2004	1994-2004	2003	1989-1994	2004
	1989	1989	1989				2004	2003	
	1990	1990	1990					2004	
	1991	1991	1991						
	1992	1992	1992						
	1994	2003							
	May-98	2004	2004						
	Apr-02								
	2004								

Table 2b. Mean recovery estimates by brood year for CWT releases of Merced River Hatchery (MRH) juvenile salmon into the San Joaquin River (Mainstem) during the fall, Sacramento Basin hatchery juvenile salmon into the West Delta in spring, and Mokelumne River Fish Installation (MRFI) juvenile salmon into the West Delta in fall. A logistic regression model was developed only for the recovery of Age 3 adults from Sac Basin releases in the West Delta in spring. The coefficients of this logistic model were used to predict CWT recovery rates to the Merced River. The excluded brood years are those with observed recovery rates near zero that were substantially lower than the predicted estimates or those years without observed recovery rates and the model over predicted the observed escapement. “Pos” indicated that the coefficient was positive, whereas the expected response was negative and so the variable was omitted from the model.

Model Deviance Degrees of Freedom <u>Variables</u>	Brood Year	MRH Mainstem Fall			Sac West Delta Spring (Apr-Aug)			MRFI West Delta Fall		
		No Model	No Model	No Model	No Model	0.01	No Model	No Model	No Model	No Model
		<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	145 <u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>
Constant	1977	no data	no data	no data	0.0000%	-13.5669	0.0000%	no data	no data	no data
April CUI	1978	no data	no data	no data	0.0000%	0.006518	0.0000%	no data	no data	no data
Adult Harvest	1979	no data	no data	no data	0.0000%	Pos	0.0000%	0.0000%	0.0000%	0.0000%
Total Released	1980	0.0397%	0.0212%	0.0000%	0.0000%	8.995E-07	0.0000%	0.0000%	0.0000%	0.0000%
Mean Fish Weight	1981	0.0349%	0.0000%	0.0000%	0.0000%	0.02568	0.0000%	0.0000%	0.0000%	0.0000%
October XGEO	1982	0.0000%	0.1405%	0.0000%	0.0000%	0.0002958	0.0000%	no data	no data	no data
	1983	0.1035%	0.3813%	0.0000%	0.0000%		0.0000%	no data	no data	no data
	1984	0.1132%	0.0000%	0.0000%	0.0000%		0.0000%	no data	no data	no data
	1985	no data	no data	no data	0.0000%		0.0000%	0.0000%	0.0000%	0.0000%
	1986	no data	no data	no data	0.0000%	<u>Excluded</u> <u>Brood Years</u>	0.0000%	no data	no data	no data
	1987	no data	no data	no data	0.0000%	77, 78, 83	0.0000%	no data	no data	no data
	1988	no data	no data	no data	0.0000%	86-89	0.0010%	no data	no data	no data
	1989	no data	no data	no data	0.0000%	2004	0.0000%	no data	no data	no data
	1990	no data	no data	no data	0.0000%		0.0027%	no data	no data	no data
	1991	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data

Model Deviance Degrees of Freedom <u>Variables</u>	Brood Year	MRH Mainstem Fall			Sac West Delta Spring (Apr-Aug)			MRFI West Delta Fall		
		No Model	No Model	No Model	No Model	0.01	No Model	No Model	No Model	No Model
		<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	145 <u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>
	1992	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data
	1993	no data	no data	no data	0.0021%		0.0001%	no data	no data	no data
	1994	no data	no data	no data	0.0000%		0.0002%	no data	no data	no data
	1995	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data
	1996	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data
	1997	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data
	1998	no data	no data	no data	0.0030%		0.0000%	no data	no data	no data
	1999	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data
	2000	no data	no data	no data	0.0136%		0.0019%	no data	no data	no data
	2001	no data	no data	no data	0.0024%		0.0007%	0.0291%	0.1054%	0.0127%
	2002	no data	no data	no data	0.0009%		0.0000%	no data	no data	no data
	2003	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data
	2004	no data	no data	no data	0.0000%		0.0000%	no data	no data	no data

Table 2c. Coefficients of the logistic regression models used to predict CWT recovery rates to the Merced River. Models include CWT releases of Merced River Hatchery (MRH) and Mokelumne River Fish Installation (MRFI) juvenile salmon into the West Delta during the spring and MRFI juveniles into the East Delta in spring. Mean recovery estimates by brood year are provided for Age 4 recoveries of MRFI juveniles in the East Delta in spring. The excluded brood years are those with observed recovery rates near zero that were substantially lower than the predicted estimates or those years without observed recovery rates and the model over predicted the observed escapement. “Pos” or “Neg” indicated that the sign of the coefficient was opposite of the expected response and so the variable was omitted from the model.

	MRH Delta Spring			MRFI West Delta Spring			MRFI East Delta Spring			
Model Deviance	0.03	0.03	0	0.01	0.01	0	0	0.01	No Model	
Degrees of Freedom	19	18	16	27	31	32	33	55		
	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	<u>Age 3</u>	Age 4	Brood Year
<u>Variables</u>	<u>Coefficients</u>									
Constant	-4.41055	-4.79326	-9.57798	-10.3569	-8.96425	-10.7096	-9.10828	-5.61953	no data	1977
April CUI	Neg	0.002692	0.003779	0.01167	0.01167	0.01167	Neg	Neg	no data	1978
Adult Harvest	-8.59806	-5.64387	-1.37149	-0.33279	-1.41048	Pos	Pos	-7.61826	no data	1979
Adult MRH Stray Rate	-17.7749	-6.5203	-0.09696	-1.36962	-2.74197	-0.18827	-4.60144	-5.42516	no data	1980
Delta Outflow	0.00002981		0.00001025						no data	1981
Total Number Released							3.073E-07	Neg	no data	1982
Mean Fish Weight	0.22094	0.22094	0.22094						no data	1983
Spring XGEO							0.00005944	0.00002392	no data	1984
									no data	1985
									no data	1986
	1979-1994	1979-1994	1979-1994	1982, 1984	1987-1990	1985-1990	1979-1991	1979-1990	no data	1987
	2004	2004	2004	1986-1990	2001, 2004	2001, 2004	1996	2003-2004	no data	1988
				1994, 1996			2001-2004		no data	1989
				2000, 2004					no data	1990
									0.0000%	1991
									0.0005%	1992
									0.0010%	1993
									0.0004%	1994

	MRH Delta Spring			MRFI West Delta Spring			MRFI East Delta Spring			
Model Deviance	0.03	0.03	0	0.01	0.01	0	0	0.01	No Model	
Degrees of Freedom	19	18	16	27	31	32	33	55		
	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	<u>Age 3</u>	Age 4	Brood Year
									0.0000%	1995
									0.0000%	1996
									0.0000%	1997
									0.0000%	1998
									0.0000%	1999
									0.0000%	2000
									0.0000%	2001
									0.0000%	2002
									0.0000%	2003
									0.0000%	2004

Table 2d. Mean recovery estimates by brood year for CWT releases of Mokelumne River Fish Installation (MRFI) juvenile salmon into the East Delta during the fall, the Sacramento River near West Sacramento (mainstem) in spring, and the Sacramento River near Rio Vista (mainstem) in fall.

Brood Year	MRFI East Delta Fall			MRFI Mainstem Spring (Spring 2001 only)			MRFI Mainstem Fall (Fall 77-81)		
	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>
1977	No Data	No Data	No Data	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1978	No Data	No Data	No Data	No Data	No Data	No Data	0.0000%	0.0648%	0.0000%
1979	No Data	No Data	No Data	No Data	No Data	No Data	0.0000%	0.0432%	0.0000%
1980	No Data	No Data	No Data	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1981	No Data	No Data	No Data	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1982	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1983	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1984	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1985	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1986	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1987	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1988	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1989	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1990	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1991	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1992	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1993	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1994	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1995	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1996	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1997	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1998	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
1999	0.0227%	0.0312%	0.0059%	No Data	No Data	No Data	No Data	No Data	No Data
2000	No Data	No Data	No Data	0.0167%	0.0084%	0.0007%	No Data	No Data	No Data

Brood Year	MRFI East Delta Fall			MRFI Mainstem Spring (Spring 2001 only)			MRFI Mainstem Fall (Fall 77-81)		
	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>
2001	0.0000%	0.0100%	0.0007%	No Data	No Data	No Data	No Data	No Data	No Data
2002	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2003	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data
2004	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data	No Data

Table 2e. Mean recovery estimates by brood year for CWT releases of Mokelumne River Fish Installation (MRFI) juvenile salmon into the Mokelumne River (Trib) during the spring and fall.

<u>Brood Year</u>	MRFI Trib Spring			MRFI Trib Fall		
	No Model	No Model	No Model	No Model	No Model	No Model
	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>	<u>Age 2</u>	<u>Age 3</u>	<u>Age 4</u>
1977	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1978	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1979	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1980	No Data	No Data	No Data	No Data	No Data	No Data
1981	No Data	No Data	No Data	No Data	No Data	No Data
1982	0.0000%	0.0000%	0.0000%	No Data	No Data	No Data
1983	No Data	No Data	No Data	No Data	No Data	No Data
1984	No Data	No Data	No Data	No Data	No Data	No Data
1985	No Data	No Data	No Data	No Data	No Data	No Data
1986	No Data	No Data	No Data	No Data	No Data	No Data
1987	No Data	No Data	No Data	No Data	No Data	No Data
1988	No Data	No Data	No Data	No Data	No Data	No Data
1989	No Data	No Data	No Data	No Data	No Data	No Data
1990	0.0000%	0.0010%	0.0000%	No Data	No Data	No Data
1991	0.0000%	0.0000%	0.0000%	0.0000%	0.0044%	0.0000%
1992	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%	0.0000%
1993	No Data	No Data	No Data	0.0000%	0.0044%	0.0080%
1994	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1995	No Data	No Data	No Data	0.0135%	0.0000%	0.0000%
1996	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1997	No Data	No Data	No Data	0.0000%	0.0000%	0.0000%
1998	No Data	No Data	No Data	No Data	No Data	No Data
1999	No Data	No Data	No Data	No Data	No Data	No Data
2000	No Data	No Data	No Data	No Data	No Data	No Data

<u>Brood Year</u>	MRFI Trib Spring			MRFI Trib Fall		
	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>	No Model <u>Age 2</u>	No Model <u>Age 3</u>	No Model <u>Age 4</u>
2001	No Data	No Data	No Data	0.0000%	0.0005%	0.0000%
2002	0.0000%	0.0000%	0.0000%	No Data	No Data	No Data
2003	0.0000%	0.0000%	0.0000%	No Data	No Data	No Data
2004	No Data	No Data	No Data	No Data	No Data	No Data

Table 3. Department of Fish and Game estimates of total escapement of fall-run Chinook Salmon in the Merced River and the Merced River Hatchery (GrandTab), estimated total number of marked (coded-wire tag and adipose clipped) hatchery adults that returned to the Merced River and hatchery, estimated number of unmarked hatchery adults from the Coleman National Fish Hatchery, Mokelumne River Fish Installation, Nimbus Fish Hatchery, Feather River Hatchery, and Merced River Hatchery that returned to the Merced River and hatchery, estimated total escapements of naturally produced and hatchery produced adults, and the percent hatchery fish in the total escapement from 1981 to 2008.

	Unmarked Adults									
	<u>Total Escapement</u>	<u>Marked Hatchery Adults</u>	<u>Coleman National Fish Hatchery</u>	<u>Mokelumne Hatchery</u>	<u>Nimbus Hatchery</u>	<u>Feather River Hatchery</u>	<u>Merced River Hatchery</u>	<u>Estimated Natural Escapement</u>	<u>Estimated Hatchery Escapement</u>	<u>Percent Hatchery</u>
1981	10,415	445	0	166	0	0	0	9,805	610	5.9%
1982	3,263	955	0	387	0	1	0	1,920	1,343	41.2%
1983	18,248	5,708	0	6	539	219	0	11,775	6,473	35.5%
1984	29,749	5,355	0	88	38	59	0	24,209	5,540	18.6%
1985	16,052	1,895	0	158	30	86	285	13,599	2,453	15.3%
1986	7,439	2,037	0	297	130	20	1,607	3,348	4,091	55.0%
1987	4,126	700	0	101	71	119	161	2,974	1,152	27.9%
1988	4,592	344	0	0	93	85	142	3,928	664	14.5%
1989	427	157	0	115	0	0	58	97	330	77.3%
1990	82	7	0	0	0	0	4	71	11	13.9%
1991	119	3	0	0	0	0	0	116	3	2.5%
1992	986	252	0	0	33	42	0	658	328	33.3%
1993	1678	493	167	234	93	221	0	638	1,207	71.9%
1994	3589	363	161	692	124	209	15	2,186	1,564	43.6%

Unmarked Adults

	<u>Total</u>	<u>Marked</u>	<u>Coleman</u>			<u>Feather</u>	<u>Merced</u>	<u>Estimated</u>	<u>Estimated</u>	<u>Percent</u>
	<u>Escapement</u>	<u>Hatchery</u>	<u>National</u>	<u>Mokelumne</u>	<u>Nimbus</u>	<u>River</u>	<u>River</u>	<u>Natural</u>	<u>Hatchery</u>	<u>Hatchery</u>
		<u>Adults</u>	<u>Fish</u>	<u>Hatchery</u>	<u>Hatchery</u>	<u>Hatchery</u>	<u>Hatchery</u>	<u>Escapement</u>	<u>Escapement</u>	<u>Hatchery</u>
1995	2922	1,155	0	1,013	131	338	14	271	2,651	90.7%
1996	4,432	1,551	0	559	97	156	1,298	772	3,660	82.6%
1997	3,660	956	0	290	52	56	1,341	964	2,696	73.7%
1998	4,091	1,392	0	251	31	41	450	1,926	2,165	52.9%
1999	4,766	1,538	0	883	111	140	446	1,648	3,118	65.4%
2000	13,076	4,430	0	1,722	174	207	2,314	4,228	8,848	67.7%
2001	10,844	5,507	0	2,588	147	193	554	1,856	8,988	82.9%
2002	10,706	7,017	0	1,868	32	429	857	503	10,203	95.3%
2003	3,079	1,848	0	1,189	78	197	332	50	3,029	98.4%
2004	4,320	862	0	1,508	104	189	818	839	3,481	80.6%
2005	2532	308	0	867	87	108	797	365	2,167	85.6%
2006	1621	177	0	612	68	118	80	566	1,055	65.1%
2007	574	48	0	113	0	1	35	378	196	34.1%

APPENDIX 1

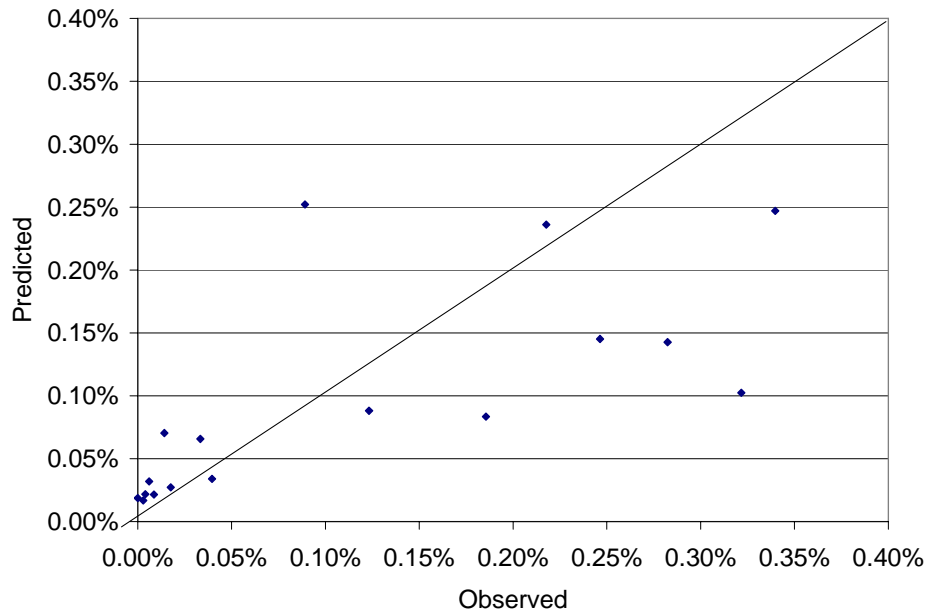


Figure A-1. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 2 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the Merced River during spring. Plot does not include low CWT recovery estimates excluded from model development.

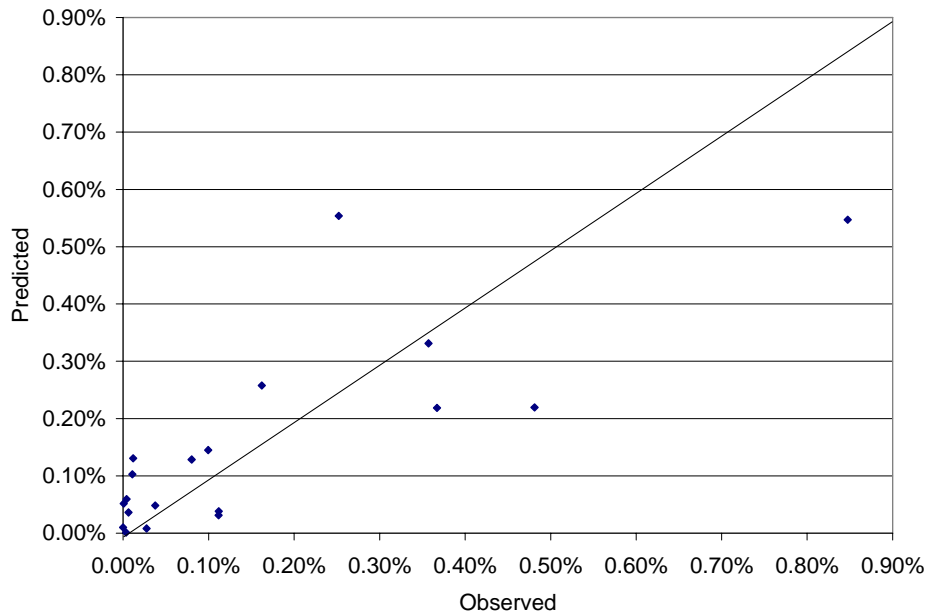


Figure A-2. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 3 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the Merced River during spring. Plot does not include low CWT recovery estimates excluded from model development.

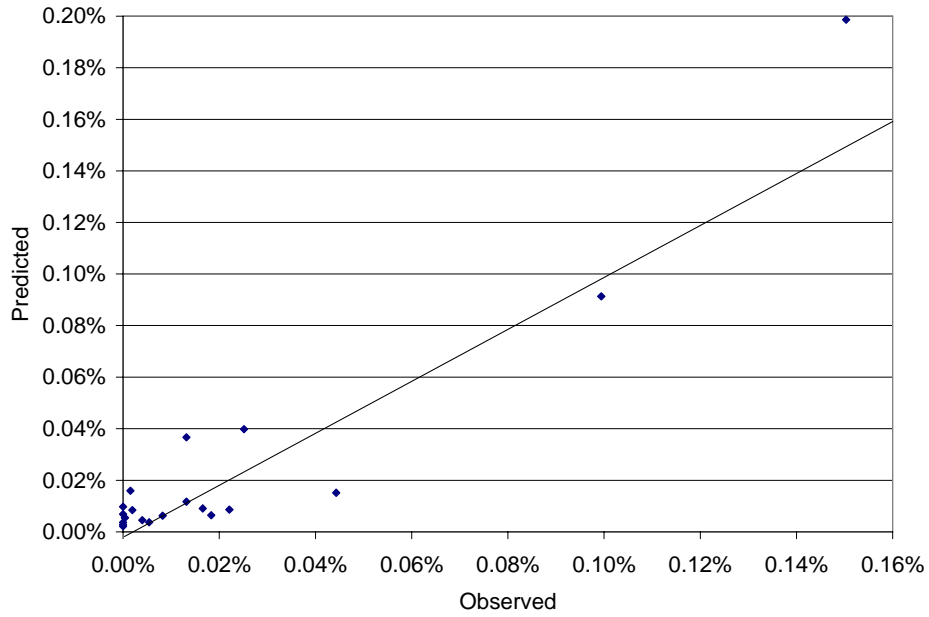


Figure A-3. Predicted recovery rates from the final logistic regression model versus observed recovery rates for each brood year of Age 4 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the Merced River during spring. Plot does not include low CWT recovery estimates excluded from model development.

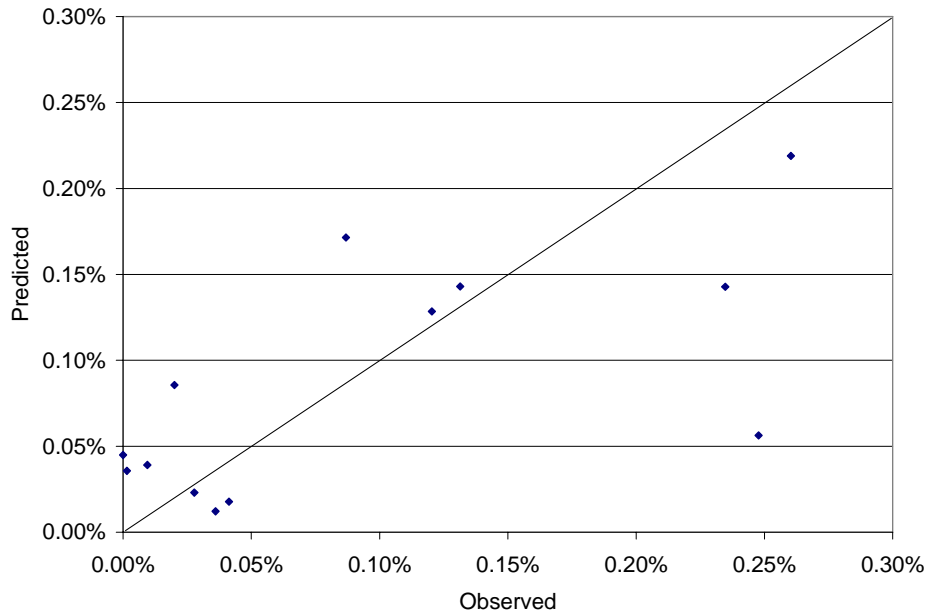


Figure A-4. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 2 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the San Joaquin River upstream from Jersey Point during spring. Plot does not include low CWT recovery estimates excluded from model development.

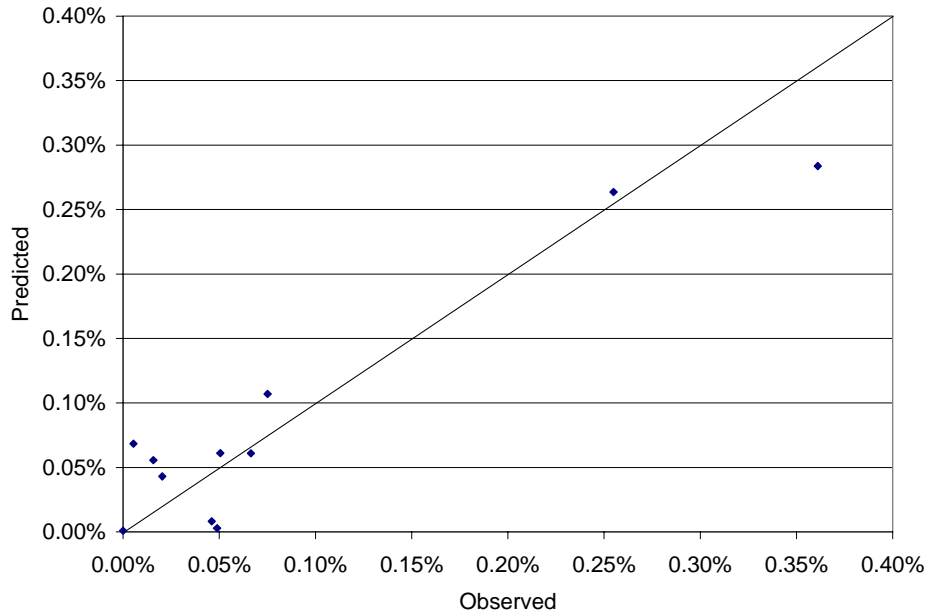


Figure A-5. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 3 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the San Joaquin River upstream from Jersey Point during spring. Plot does not include low CWT recovery estimates excluded from model development.

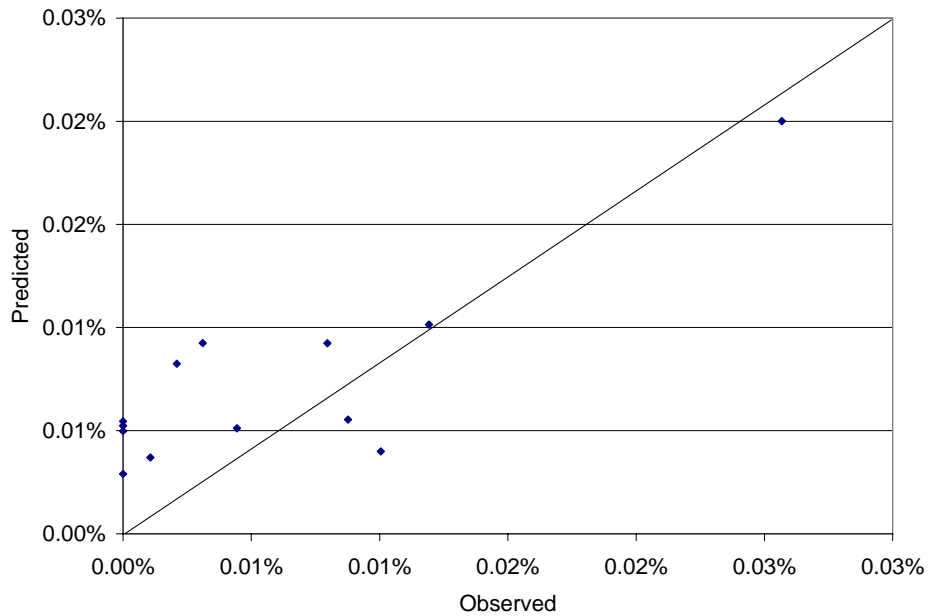


Figure A-6. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 4 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the San Joaquin River upstream from Jersey Point during spring. Plot does not include low CWT recovery estimates excluded from model development.

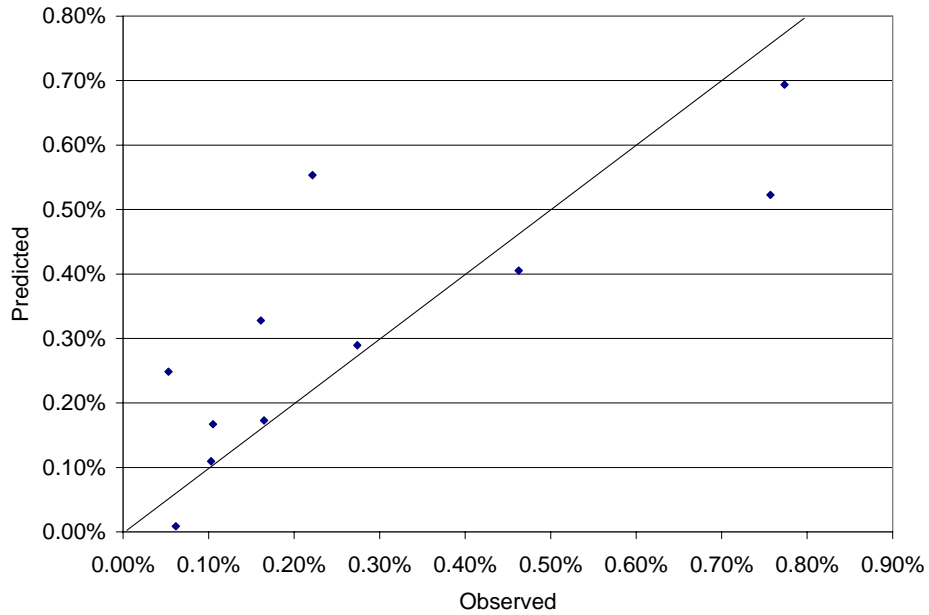


Figure A-7. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 2 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the West Delta at Jersey Point during spring. Plot does not include low CWT recovery estimates excluded from model development.

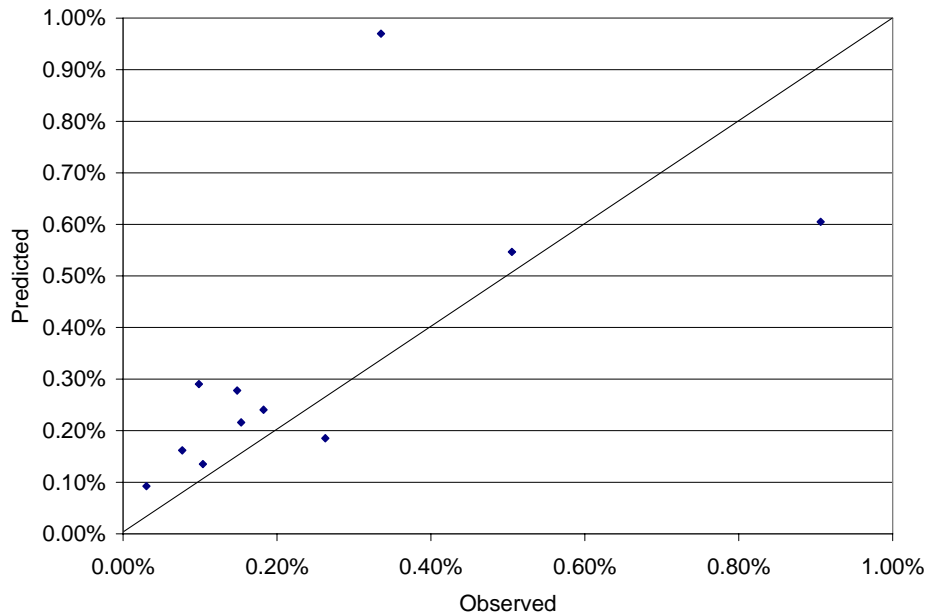


Figure A-8. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 3 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the West Delta at Jersey Point during spring. Plot does not include low CWT recovery estimates excluded from model development.

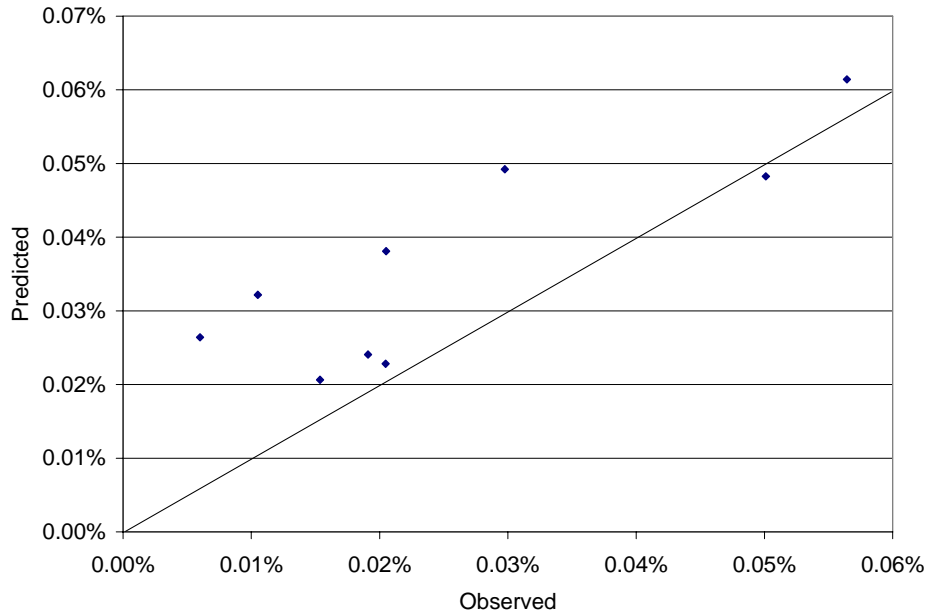


Figure A-9. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 4 Merced River Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the West Delta at Jersey Point during spring. Plot does not include low CWT recovery estimates excluded from model development.

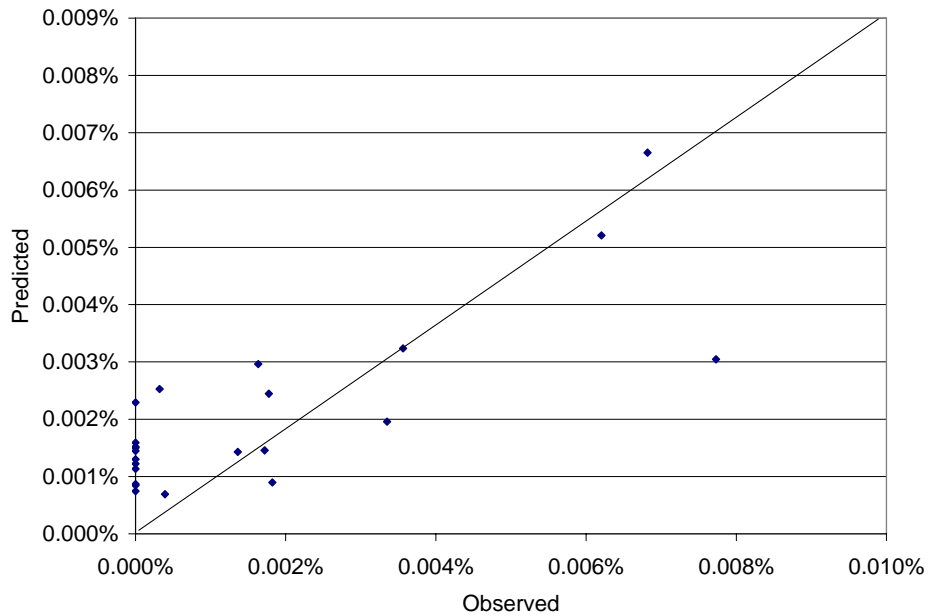


Figure A-10. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 3 Sacramento Basin Hatchery fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the West Delta during spring. Plot does not include low CWT recovery estimates excluded from model development. Models were not developed for Age 2 and Age 4 salmon.

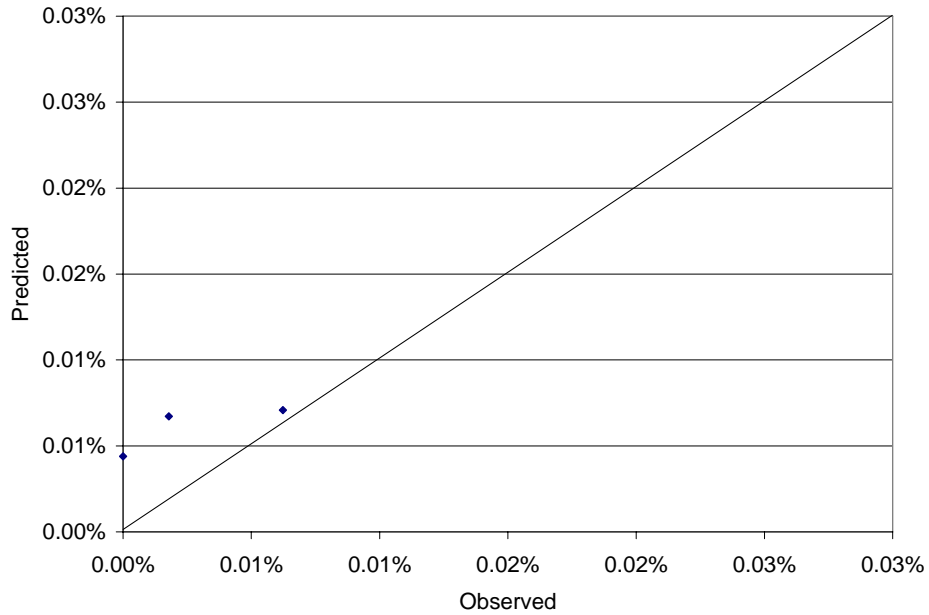


Figure A-11. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 2 Mokelumne River Fish Installation fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the West Delta during spring. Plot does not include low CWT recovery estimates excluded from model development.

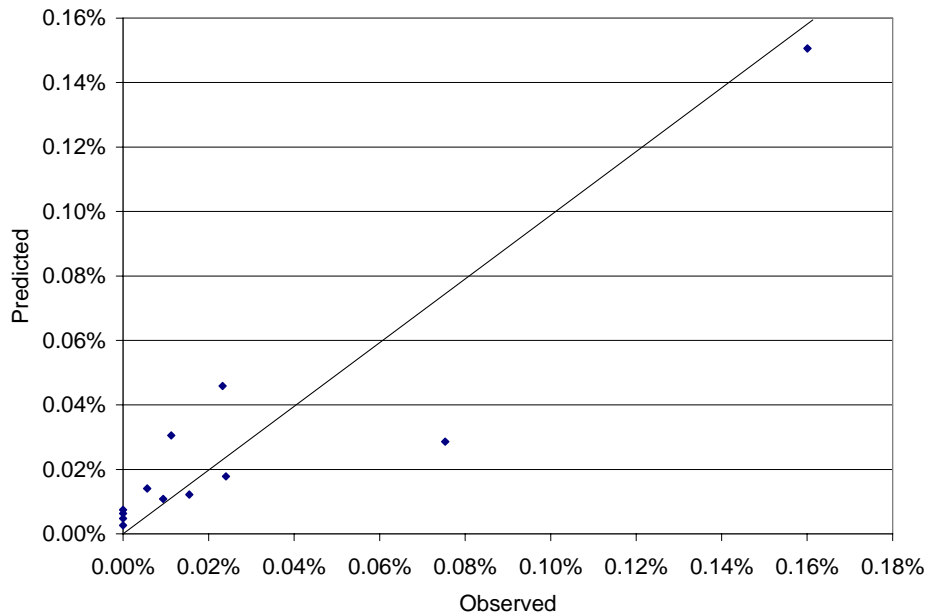


Figure A-12. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 3 Mokelumne River Fish Installation fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the West Delta during spring. Plot does not include low CWT recovery estimates excluded from model development.

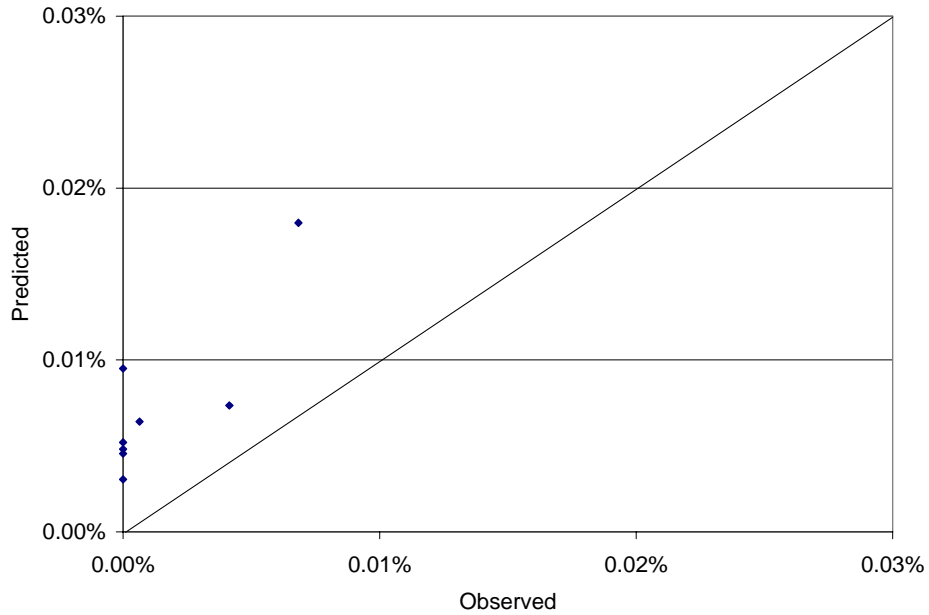


Figure A-13. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 4 Mokelumne River Fish Installation fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the West Delta during spring. Plot does not include low CWT recovery estimates excluded from model development.

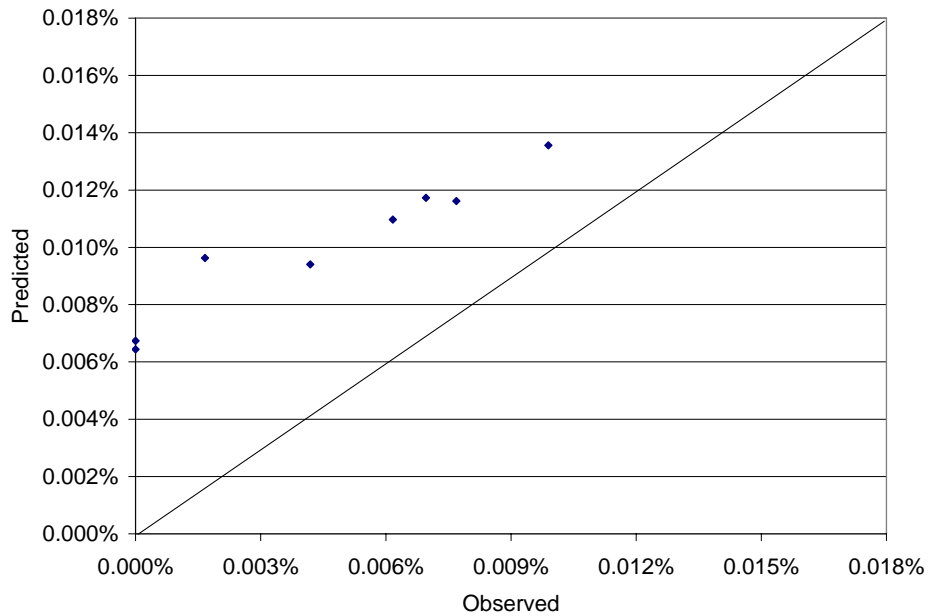


Figure A-14. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 2 Mokelumne River Fish Installation fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the East Delta during spring. Plot does not include low CWT recovery estimates excluded from model development.

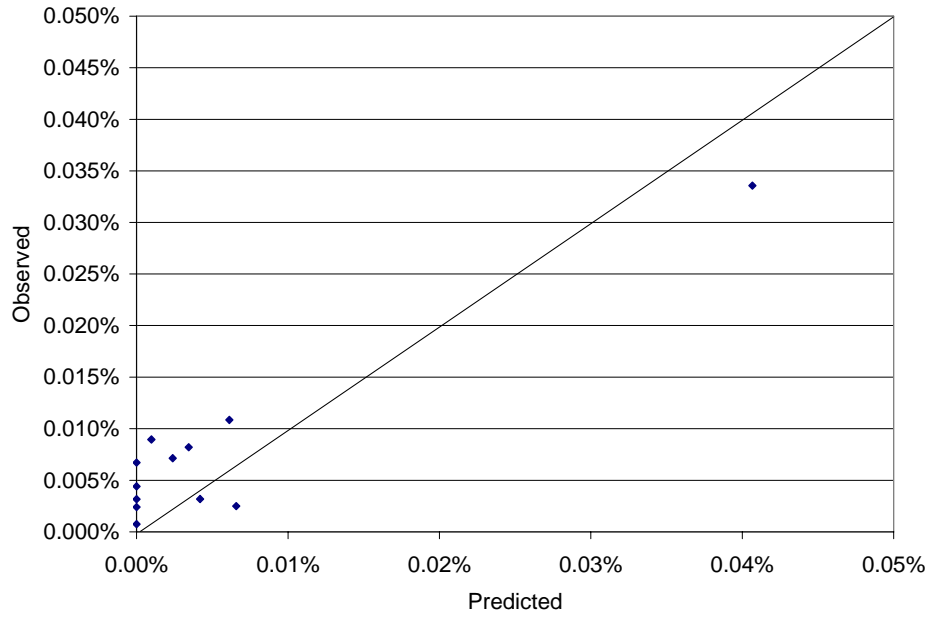


Figure A-15. Predicted recovery rates from the final logistic regression model versus mean observed recovery rates for each brood year of Age 3 Mokelumne River Fish Installation fall-run Chinook salmon in the Merced River that were released as CWT juveniles in the East Delta during spring. Plot does not include low CWT recovery estimates excluded from model development.

APPENDIX 2

Releases of untagged juvenile salmon organized by hatchery, release date, and release location, the estimated rate that each group would be recovered in the Merced River escapement, and the estimated number of untagged adult hatchery salmon in the Merced River escapement from 1980 to 2007. The Release Location Codes 1, 2, 3.1, and 3.2 correspond to tributary, mainstem, East Delta, and West Delta.

Coleman National Fish Hatchery									
				Merced Recovery Rates			Escapement		
Release Location Code	Date Released	Release Location	Total Number Released	Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	4-Feb-80	CNFH	92,700	0.0000%	0.0000%	0.0000%	0	0	0
1	20-Apr-79	CNFH	680,975	0.0000%	0.0000%	0.0000%	0	0	0
1	9-May-79	CNFH	42,275	0.0000%	0.0000%	0.0000%	0	0	0
1	19-Oct-79	CNFH	1,013,462	0.0000%	0.0000%	0.0000%	0	0	0
1	3-Dec-79	CNFH	827,504	0.0000%	0.0000%	0.0000%	0	0	0
2	20-Apr-79	Posse Grounds	3,405,975	0.0000%	0.0000%	0.0000%	0	0	0
2	4-Sep-79	RED BLUFF DIVER. DAM	522,575	0.0000%	0.0000%	0.0000%	0	0	0
1	13-Mar-80	BATTLE CREEK	190,000	0.0000%	0.0000%	0.0000%	0	0	0
1	17-Apr-80	BATTLE CREEK	3,515,605	0.0000%	0.0000%	0.0000%	0	0	0
1	7-May-80	BATTLE CREEK	7,101,883	0.0000%	0.0000%	0.0000%	0	0	0
1	22-Sep-80	BATTLE CREEK	613,309	0.0000%	0.0000%	0.0000%	0	0	0
1	2-Jun-82	BATTLE CREEK	250,000	0.0000%	0.0000%	0.0000%	0	0	0
1	17-Jan-83	Tehama Colusa Fish Facilities	538,720	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Jan-83	Antelope Creek	805,420	0.0000%	0.0000%	0.0000%	0	0	0
1	4-Feb-83	BATTLE CREEK	1,136,090	0.0000%	0.0000%	0.0000%	0	0	0
1	28-Apr-83	BATTLE CREEK	3,114,000	0.0000%	0.0000%	0.0000%	0	0	0
1	3-May-83	CLEAR CREEK	200	0.0000%	0.0000%	0.0000%	0	0	0
1	4-May-83	BATTLE CREEK	3,671,312	0.0000%	0.0000%	0.0000%	0	0	0

Coleman National Fish Hatchery

Merced Recovery Rates

Escapement

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	15-Sep-83	BATTLE CREEK	441,178	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Dec-82	Tehama Colusa Fish Facilities	799,200	0.0000%	0.0000%	0.0000%	0	0	0
1	28-Dec-82	Antelope Creek	219,040	0.0000%	0.0000%	0.0000%	0	0	0
2	18-Jan-83	Posse Grounds	2,101,920	0.0000%	0.0000%	0.0000%	0	0	0
2	23-Feb-83	Posse Grounds	545,720	0.0000%	0.0000%	0.0000%	0	0	0
2	24-May-83	RED BLUFF DIVER. DAM	1,173,350	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Apr-84	BATTLE CREEK	1,787,312	0.0000%	0.0000%	0.0000%	0	0	0
1	10-Jul-84	BATTLE CREEK	19,480	0.0000%	0.0000%	0.0000%	0	0	0
2	26-Apr-84	RED BLUFF DIVER. DAM	300,000	0.0000%	0.0000%	0.0000%	0	0	0
2	3-May-84	RED BLUFF DIVER. DAM	564,450	0.0000%	0.0000%	0.0000%	0	0	0
1	25-Jan-85	BATTLE CREEK	169,040	0.0000%	0.0000%	0.0000%	0	0	0
1	8-Mar-85	CLEAR CREEK	199,280	0.0000%	0.0000%	0.0000%	0	0	0
1	11-Mar-85	Antelope Creek	201,770	0.0000%	0.0000%	0.0000%	0	0	0
1	12-Mar-85	Cow Creek	204,660	0.0000%	0.0000%	0.0000%	0	0	0
1	3-Apr-85	BATTLE CREEK	1,458,082	0.0000%	0.0000%	0.0000%	0	0	0
1	13-Jun-85	BATTLE CREEK	5,820	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Nov-85	Tehama Colusa Fish Facilities	729,600	0.0000%	0.0000%	0.0000%	0	0	0
2	24-Jan-85	Posse Grounds	4,141,440	0.0000%	0.0000%	0.0000%	0	0	0
2	25-Jan-85	BALLS FERRY	656,640	0.0000%	0.0000%	0.0000%	0	0	0
2	25-Jan-85	North Street Bridge	2,937,600	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Feb-85	BALLS FERRY	1,211,040	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Feb-85	North Street Bridge	1,546,560	0.0000%	0.0000%	0.0000%	0	0	0
2	4-Feb-85	Posse Grounds	665,280	0.0000%	0.0000%	0.0000%	0	0	0
2	18-Apr-85	RED BLUFF DIVER. DAM	2,007,000	0.0000%	0.0000%	0.0000%	0	0	0
1	4-Apr-86	BATTLE CREEK	2,044,279	0.0000%	0.0000%	0.0000%	0	0	0
1	27-May-86	Tehama Colusa Fish Facilities	603,000	0.0000%	0.0000%	0.0000%	0	0	0
2	14-Apr-86	RED BLUFF DIVER. DAM	608,140	0.0000%	0.0000%	0.0000%	0	0	0

Coleman National Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	4-Feb-87	BATTLE CREEK	1,494,700	0.0000%	0.0000%	0.0000%	0	0	0
1	20-Apr-87	BATTLE CREEK	5,312,900	0.0000%	0.0000%	0.0000%	0	0	0
1	5-Jun-87	BATTLE CREEK	11,800	0.0000%	0.0000%	0.0000%	0	0	0
1	5-Apr-88	Tehama Colusa Fish Facilities	1,157,100	0.0000%	0.0000%	0.0000%	0	0	0
1	11-Apr-88	BATTLE CREEK	514,910	0.0000%	0.0000%	0.0000%	0	0	0
1	22-Dec-87	BATTLE CREEK	507,000	0.0000%	0.0000%	0.0000%	0	0	0
2	4-Jan-88	North Street Bridge	4,500,719	0.0000%	0.0000%	0.0000%	0	0	0
2	16-Feb-88	North Street Bridge	959,666	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Apr-88	RED BLUFF DIVER. DAM	725,187	0.0000%	0.0000%	0.0000%	0	0	0
1	16-Feb-89	Stillwater Creek	200,000	0.0000%	0.0000%	0.0000%	0	0	0
1	17-Feb-89	Anderson Creek	100,500	0.0000%	0.0000%	0.0000%	0	0	0
1	28-Mar-89	BATTLE CREEK	53,950	0.0000%	0.0000%	0.0000%	0	0	0
2	3-Feb-89	RED BLUFF DIVER. DAM	5,678,534	0.0000%	0.0000%	0.0000%	0	0	0
2	6-Mar-89	BALLS FERRY	3,824,520	0.0000%	0.0000%	0.0000%	0	0	0
2	23-Mar-89	RED BLUFF DIVER. DAM	684,193	0.0000%	0.0000%	0.0000%	0	0	0
1	30-Mar-90	BATTLE CREEK	769,343	0.0000%	0.0000%	0.0000%	0	0	0
2	5-Mar-90	Sacramento River	3,919,302	0.0000%	0.0000%	0.0000%	0	0	0
3.2	13-May-90	BENICIA	5,608,310	0.0000%	0.0000%	0.0000%	0	0	0
1	26-Feb-91	BATTLE CREEK	200,018	0.0000%	0.0000%	0.0000%	0	0	0
1	28-Feb-91	BATTLE CREEK	680,214	0.0000%	0.0000%	0.0000%	0	0	0
1	30-Oct-90	FEATHER RIVER	719,186	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Nov-90	FEATHER RIVER	540,750	0.0000%	0.0000%	0.0000%	0	0	0
2	28-Feb-91	Anderson River Park	550,045	0.0000%	0.0000%	0.0000%	0	0	0
2	28-Feb-91	BALLS FERRY	672,559	0.0000%	0.0000%	0.0000%	0	0	0
2	28-Feb-91	BEND BRIDGE	307,819	0.0000%	0.0000%	0.0000%	0	0	0
2	28-Feb-91	Posse Grounds	324,679	0.0000%	0.0000%	0.0000%	0	0	0
2	28-Feb-91	Sacramento River, ACID Dam	271,156	0.0000%	0.0000%	0.0000%	0	0	0

Coleman National Fish Hatchery

Merced Recovery Rates

Escapement

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	1-Mar-91	Woodson Bridge	666,834	0.0000%	0.0000%	0.0000%	0	0	0
2	22-Apr-91	Sacramento River, Princeton	6,349,775	0.0000%	0.0000%	0.0000%	0	0	0
3.2	29-Apr-91	BENICIA	901,820	0.0000%	0.0027%	0.0027%	0	25	24
3.2	5-May-91	BENICIA	5,049,448	0.0000%	0.0028%	0.0027%	0	142	137
1	23-Mar-92	BATTLE CREEK	10,234	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Mar-93	BATTLE CREEK	3,460,081	0.0000%	0.0000%	0.0000%	0	0	0
2	13-Feb-92	RED BLUFF DIVER. DAM	4,761,200	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Mar-93	BATTLE CREEK	3,460,081	0.0000%	0.0000%	0.0000%	0	0	0
1	10-Mar-94	BATTLE CREEK	419	0.0000%	0.0000%	0.0000%	0	0	0
2	7-Feb-94	RED BLUFF DIVER. DAM	3,336,597	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Mar-95	BATTLE CREEK	474,846	0.0000%	0.0000%	0.0000%	0	0	0
2	13-Feb-95	RED BLUFF DIVER. DAM	1,482,415	0.0000%	0.0000%	0.0000%	0	0	0
2	14-Mar-95	BALLS FERRY	1,317,557	0.0000%	0.0000%	0.0000%	0	0	0
2	29-Jan-96	RED BLUFF DIVER. DAM	1,319,814	0.0000%	0.0000%	0.0000%	0	0	0
2	8-Feb-96	RED BLUFF DIVER. DAM	5,222,300	0.0000%	0.0000%	0.0000%	0	0	0
2	5-Mar-96	RED BLUFF DIVER. DAM	1,001,507	0.0000%	0.0000%	0.0000%	0	0	0
2	20-Feb-97	Bow River Boat Ramp Sacramento River -Hunters	3,097,705	0.0000%	0.0000%	0.0000%	0	0	0
2	4-Feb-97	MHP	1,970,072	0.0000%	0.0000%	0.0000%	0	0	0
2	4-Mar-97	Bow River Boat Ramp	2,915,824	0.0000%	0.0000%	0.0000%	0	0	0
2	4-Feb-98	Below RBDD	8,203,920	0.0000%	0.0000%	0.0000%	0	0	0
1	9-Apr-99	BATTLE CREEK	3,510	0.0000%	0.0000%	0.0000%	0	0	0
1	28-Apr-99	CNFH	478,047	0.0000%	0.0000%	0.0000%	0	0	0
2	29-Jan-99	Bow River Boat Ramp	384,882	0.0000%	0.0000%	0.0000%	0	0	0
2	29-Jan-99	Los Molinos, below river boat ramp	755,073	0.0000%	0.0000%	0.0000%	0	0	0
2	29-Jan-99	Woodson Bridge	370,191	0.0000%	0.0000%	0.0000%	0	0	0
2	26-Feb-99	Los Molinos, below river boat	3,000	0.0000%	0.0000%	0.0000%	0	0	0

Coleman National Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	9-Mar-99	ramp Los Molinos, below river boat ramp	3,000	0.0000%	0.0000%	0.0000%	0	0	0
2	26-Mar-99	Los Molinos, below river boat ramp	3,000	0.0000%	0.0000%	0.0000%	0	0	0
2	15-Apr-99	Los Molinos, below river boat ramp	3,000	0.0000%	0.0000%	0.0000%	0	0	0
2	6-May-99	Los Molinos, below river boat ramp	3,100	0.0000%	0.0000%	0.0000%	0	0	0
2	26-Feb-99	Los Molinos, below river boat ramp	3,000	0.0000%	0.0000%	0.0000%	0	0	0
2	9-Mar-99	Los Molinos, below river boat ramp	3,000	0.0000%	0.0000%	0.0000%	0	0	0
2	26-Mar-99	Los Molinos, below river boat ramp	3,000	0.0000%	0.0000%	0.0000%	0	0	0
2	22-Mar-00	ABOVE RED BLUFF DAM	9,932	0.0000%	0.0000%	0.0000%	0	0	0
2	15-Apr-99	Los Molinos, below river boat ramp	3,000	0.0000%	0.0000%	0.0000%	0	0	0
2	4-Apr-00	Los Molinos, below river boat ramp	1,150	0.0000%	0.0000%	0.0000%	0	0	0
1	4-Apr-03	CNFH	1,685,414	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Apr-03	CNFH	5,214,104	0.0000%	0.0000%	0.0000%	0	0	0
1	24-Apr-03	CNFH	3,588,184	0.0000%	0.0000%	0.0000%	0	0	0
1	25-Apr-03	CNFH	3,349,443	0.0000%	0.0000%	0.0000%	0	0	0
1	16-Apr-04	BATTLE CREEK	5,477,399	0.0000%	0.0000%	0.0000%	0	0	0
1	16-Apr-04	CNFH	5,477,399	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Apr-04	BATTLE CREEK	6,614,040	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Apr-04	CNFH	6,614,040	0.0000%	0.0000%	0.0000%	0	0	0
1	15-Apr-05	CNFH	6,097,731	0.0000%	0.0000%	0.0000%	0	0	0
1	29-Apr-05	CNFH	5,609,155	0.0000%	0.0000%	0.0000%	0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Feb-78	FRH	217,600				0	0	0
1	1-Oct-78	VERONA	57,200				0	0	0
1	1-Nov-78	Tehama Colusa Fish Facilities	76,175				0	0	0
1	1-Nov-78	VERONA	110,000				0	0	0
1	1-Nov-78	YUBA RIVER	104,260				0	0	0
1	1-Dec-78	FRH	27,500				0	0	0
1	1-Dec-78	Tehama Colusa Fish Facilities	401,265				0	0	0
1	1-Dec-78	VERONA	261,045				0	0	0
1	1-Dec-78	YUBA RIVER	300,525				0	0	0
2	1-Apr-78	RIO VISTA	100,480				0	0	0
2	1-May-78	RIO VISTA	744,240				0	0	0
2	1-Jun-78	RIO VISTA	820,540				0	0	0
2	1-Nov-78	RED BLUFF DIVER. DAM	157,500				0	0	0
2	1-Dec-78	RED BLUFF DIVER. DAM	42,100				0	0	0
3.2	1-Jun-78	TIBURON NET PENS	150,500	0.0000%		0.0000%	0	0	0
1	1-Jun-79	VERONA	131,300				0	0	0
1	1-Oct-79	FRH	1,678,903				0	0	0
1	1-Dec-79	FRH	342,412				0	0	0
2	1-May-79	RIO VISTA	339,400				0	0	0
2	1-Jun-79	RIO VISTA	1,226,200				0	0	0
2	1-Jul-79	RIO VISTA	610,650				0	0	0
3.2	1-Aug-79	TIBURON NET PENS	35,950	0.0000%		0.0000%	0	0	0
1	1-Jan-81	FRH	129,370				0	0	0
1	1-Jan-81	VERONA	11,050				0	0	0
1	1-Jun-80	FRH	50,000				0	0	0
1	1-Jun-80	YUBA RIVER	106,610				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Jul-80	FRH	62,836				0	0	0
1	1-Jul-80	Nelson Bar	0				0	0	0
1	1-Oct-80	FRH	1,652,592				0	0	0
2	1-Jan-81	RIO VISTA	13,600				0	0	0
2	1-May-80	RIO VISTA	465,325				0	0	0
2	1-Jun-80	RIO VISTA	323,450				0	0	0
2	1-Jul-80	RIO VISTA	373,000				0	0	0
3.2	1-Jul-80	CARQUINEZ STRAIT	42,000	0.0000%	0.0029%	0.0000%	0	1	0
1	1-Feb-81	FRH	0				0	0	0
1	1-Oct-81	FRH	1,330,900				0	0	0
1	1-Nov-81	FRH	124,100				0	0	0
3.2	1-May-81	BENICIA	793,981	0.0000%	0.0066%	0.0000%	0	52	0
3.2	1-Jun-81	BENICIA	1,339,600	0.0000%	0.0064%	0.0000%	0	86	0
3.2	1-Jul-81	BENICIA	814,600	0.0000%	0.0067%	0.0000%	0	55	0
3.2	1-Aug-81	BENICIA	343,850	0.0000%	0.0075%	0.0000%	0	26	0
3.2	1-Sep-81	BENICIA	190,510	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-82	Antelope Creek	633,600				0	0	0
1	1-Jan-82	FRH	307,380				0	0	0
1	1-Feb-82	FRH	896,000				0	0	0
1	1-Mar-82	FRH	2,068,640				0	0	0
1	1-Sep-82	FRH	119,884				0	0	0
1	1-Oct-82	FRH	824,985				0	0	0
1	1-Nov-82	FRH	518,200				0	0	0
1	1-Dec-81	FRH	808,640				0	0	0
3.2	1-Apr-82	BENICIA	860,900	0.0000%	0.0010%	0.0000%	0	9	0
3.2	1-May-82	BENICIA	609,150	0.0000%	0.0011%	0.0000%	0	7	0
3.2	1-Jun-82	BENICIA	1,220,200	0.0000%	0.0011%	0.0000%	0	13	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Jul-82	BENICIA	173,600	0.0000%	0.0011%	0.0000%	0	2	0
3.2	1-Aug-82	BENICIA	256,425	0.0000%	0.0014%	0.0000%	0	4	0
3.2	1-Sep-82	BENICIA	34,300	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-83	Honcut Creek	100,485				0	0	0
1	1-Jan-83	Stony Creek	185,900				0	0	0
1	1-Feb-83	FEATHER RIVER	2,558,400				0	0	0
1	1-Sep-83	FRH	0				0	0	0
1	1-Oct-83	FRH	1,267,916				0	0	0
2	1-Aug-83	RIO VISTA	36,000				0	0	0
3.2	1-Jun-83	BENICIA	743,200	0.0000%	0.0007%	0.0000%	0	5	0
3.2	1-Jul-83	BENICIA	599,700	0.0000%	0.0007%	0.0000%	0	4	0
3.2	1-Jul-83	TIBURON NET PENS	49,300	0.0000%	0.0007%	0.0000%	0	0	0
3.2	1-Jul-83	Vallejo	48,600	0.0000%	0.0007%	0.0000%	0	0	0
3.2	1-Aug-83	TIBURON NET PENS	48,000	0.0000%	0.0007%	0.0000%	0	0	0
3.2	1-Aug-83	Vallejo	44,800	0.0000%	0.0009%	0.0000%	0	0	0
3.2	1-Sep-83	Vallejo	42,700	0.0286%	0.0864%	0.0231%	12	37	10
3.2	1-Oct-83	TIBURON NET PENS	44,200	0.0286%	0.0864%	0.0231%	13	38	10
1	1-Jan-84	FRH	648,000				0	0	0
1	1-Feb-84	Antelope Creek	0				0	0	0
1	1-Feb-84	BUTTE CREEK	0				0	0	0
1	1-Feb-84	Chico Creek	0				0	0	0
1	1-Feb-84	FRH	0				0	0	0
1	1-Mar-84	FRH	214,200				0	0	0
1	1-Jun-84	FEATHER RIVER	0				0	0	0
2	1-Jun-84	COURTLAND	66,600				0	0	0
2	1-Jun-84	Glen-Colusa	0				0	0	0
2	1-Jun-84	Guisti	62,300				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	1-Jun-84	RYDE-KOKET	61,600				0	0	0
3.1	1-Jun-84	PALM TRACT	67,600				0	0	0
3.1	1-Jun-84	Whimpy's	59,250				0	0	0
3.2	1-Mar-84	BENICIA	0				0	0	0
3.2	1-May-84	BENICIA	0	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-84	BENICIA	63,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-84	PORT CHICAGO	44,100	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-84	Vallejo	42,750	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-84	BENICIA	634,550	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-84	BENICIA	1,051,175	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-84	Berkeley Marina	230,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-84	BENICIA	476,650	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-84	Berkeley Marina	100,200	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-85	FEATHER RIVER	182,400				0	0	0
1	1-Feb-85	Bear River	100,800				0	0	0
1	1-May-85	FEATHER RIVER	22,000				0	0	0
1	1-May-85	MOKELUMNE RIVER	106,240				0	0	0
2	1-May-85	COURTLAND	105,400				0	0	0
2	1-May-85	Glen-Colusa	10,034				0	0	0
2	1-May-85	RYDE-KOKET	95,000				0	0	0
3.1	1-May-85	PALM TRACT	105,240				0	0	0
3.1	1-May-85	Whimpy's	104,720				0	0	0
3.2	1-Apr-85	BENICIA	943,050	0.0000%	0.0015%	0.0000%	0	14	0
3.2	1-May-85	BENICIA	479,077	0.0000%	0.0016%	0.0000%	0	8	0
3.2	1-May-85	Berkeley Marina	52,700	0.0000%	0.0015%	0.0000%	0	1	0
3.2	1-May-85	PORT CHICAGO	53,100	0.0000%	0.0015%	0.0000%	0	1	0
3.2	1-Jun-85	BENICIA	465,500	0.0000%	0.0016%	0.0000%	0	7	0

Feather River Fish Hatchery

Release Location	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Jun-85	TIBURON NET PENS	28,500	0.0000%	0.0019%	0.0000%	0	1	0
3.2	1-Jul-85	BENICIA	2,412,575	0.0000%	0.0018%	0.0000%	0	43	0
3.2	1-Aug-85	BENICIA	2,190,825	0.0000%	0.0020%	0.0000%	0	44	0
3.2	1-Sep-85	BENICIA	1,718,380	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Oct-85	BENICIA	112,800	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Feb-86	AMERICANR-COON CREEK	24,000				0	0	0
1	1-Feb-86	Auburn Ravine Creek	24,000				0	0	0
1	1-Feb-86	Bear River	79,200				0	0	0
1	1-Feb-86	Doty Ravine Creek	24,000				0	0	0
1	1-Feb-86	Dry Creek	84,000				0	0	0
1	1-Feb-86	Secret Ravine Creek	24,000				0	0	0
1	1-Apr-86	FEATHER RIVER	14,400				0	0	0
1	1-May-86	FEATHER RIVER	8,400				0	0	0
1	1-Oct-86	FEATHER RIVER	1,451,450				0	0	0
3.2	1-May-86	BENICIA	573,750	0.0000%	0.0018%	0.0000%	0	10	0
3.2	1-Jun-86	BENICIA	313,200	0.0000%	0.0019%	0.0000%	0	6	0
3.2	1-Jun-86	TIBURON NET PENS	50,000	0.0000%	0.0020%	0.0000%	0	1	0
3.2	1-Jul-86	BENICIA	1,136,800	0.0000%	0.0021%	0.0000%	0	23	0
3.2	1-Aug-86	SF-San Francisco Bay	1,829,275	0.0000%	0.0024%	0.0000%	0	44	0
3.2	1-Sep-86	SF-San Francisco Bay	686,150	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-87	AMERICANR-COON CREEK	24,640				0	0	0
1	1-Jan-87	Auburn Ravine Creek	50,400				0	0	0
1	1-Jan-87	Bear River	101,376				0	0	0
1	1-Jan-87	Doty Ravine Creek	49,280				0	0	0
1	1-Jan-87	Dry Creek	75,040				0	0	0
1	1-Jan-87	Secret Ravine Creek	100,000				0	0	0
1	1-Oct-87	GRIDLEY	552,975				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Apr-87	BENICIA	821,300	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-87	BENICIA	926,500	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-87	BENICIA	2,382,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-87	BENICIA	2,477,075	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-87	BENICIA	1,860,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-87	BENICIA	435,850	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Feb-88	Chico Creek	0				0	0	0
3.2	1-Mar-88	BENICIA	129,200				0	0	0
3.2	1-Apr-88	BENICIA	827,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Apr-88	Berkeley Marina	0	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-88	BENICIA	704,850	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-88	BENICIA	1,525,450	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-88	TIBURON NET PENS	50,050	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-88	BENICIA	2,701,750	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-88	BENICIA	1,595,220	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-88	BENICIA	109,000	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-89	AMERICANR-COON CREEK	100,678				0	0	0
1	1-Jan-89	Auburn Ravine Creek	100,678				0	0	0
1	1-Jan-89	Bear Creek	100,678				0	0	0
1	1-Jan-89	Chico Creek	0				0	0	0
1	1-Jan-89	Dry Creek	194,072				0	0	0
1	1-Jan-89	FEATHER RIVER	371,800				0	0	0
1	1-Jan-89	Miners Ravine Creek	100,678				0	0	0
1	1-Jan-89	Secret Ravine Creek	100,678				0	0	0
1	1-Feb-89	MOKELUMNE R FISH INS	0				0	0	0
1	1-Apr-89	FEATHER RIVER	0				0	0	0
1	1-Apr-89	GRIDLEY	743,450				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Dec-88	Chico Creek	0				0	0	0
1	1-Dec-88	FEATHER RIVER	538,400				0	0	0
2	1-Jan-89	Sac River, Colusa Drain	600,320				0	0	0
2	1-Jun-89	Sacramento River	0				0	0	0
3.2	1-Apr-89	BENICIA	685,500	0.0000%	0.0000%	0.0010%	0	0	7
3.2	1-May-89	BENICIA	537,000	0.0000%	0.0000%	0.0010%	0	0	5
3.2	1-Jun-89	BENICIA	972,100	0.0000%	0.0000%	0.0010%	0	0	10
3.2	1-Jun-89	TIBURON NET PENS	43,500	0.0000%	0.0000%	0.0010%	0	0	0
3.2	1-Jul-89	BENICIA	911,400	0.0000%	0.0000%	0.0010%	0	0	9
3.2	1-Aug-89	BENICIA	1,075,900	0.0000%	0.0000%	0.0010%	0	0	11
1	1-Mar-90	GRIDLEY	1,508,250				0	0	0
1	1-Apr-90	GRIDLEY	935,195				0	0	0
2	1-May-90	Hamilton City	10,200				0	0	0
3.2	1-May-90	BENICIA	882,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-90	BENICIA	3,414,050	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-90	TIBURON NET PENS	4,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-90	BENICIA	1,214,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-90	BENICIA	1,449,650	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-90	BENICIA	549,200	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Feb-91	CLEAR CREEK	0				0	0	0
1	1-Mar-91	CLEAR CREEK	0				0	0	0
3.2	1-Apr-91	BENICIA	52,000	0.0000%	0.0032%	0.0027%	0	2	1
3.2	1-May-91	BENICIA	1,401,260	0.0000%	0.0033%	0.0027%	0	47	38
3.2	1-Jun-91	BENICIA	1,229,850	0.0000%	0.0039%	0.0027%	0	48	33
3.2	1-Jun-91	TIBURON NET PENS	55,900	0.0000%	0.0039%	0.0027%	0	2	2
3.2	1-Jul-91	BENICIA	1,245,850	0.0000%	0.0044%	0.0027%	0	55	34
3.2	1-Aug-91	BENICIA	1,235,085	0.0000%	0.0054%	0.0027%	0	67	33

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Jan-92	FEATHER RIVER	1,400,000				0	0	0
1	1-Mar-92	FEATHER RIVER	1,655,440				0	0	0
1	1-Apr-92	FEATHER RIVER	768,995				0	0	0
3.2	1-May-92	BENICIA	1,639,350	0.0000%	0.0010%	0.0000%	0	16	0
3.2	1-Jun-92	BENICIA	1,314,900	0.0000%	0.0010%	0.0000%	0	13	0
3.2	1-Jul-92	BENICIA	1,634,100	0.0000%	0.0012%	0.0000%	0	19	0
3.2	1-Aug-92	BENICIA	1,186,400	0.0000%	0.0016%	0.0000%	0	19	0
3.2	1-Sep-92	BENICIA	443,100	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Oct-92	BENICIA	276,160	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-93	FEATHER RIVER	1,920,000				0	0	0
1	1-Feb-93	Dry Creek	275,200				0	0	0
1	1-Feb-93	FEATHER RIVER	160,000				0	0	0
1	1-Mar-93	Bear River	200,000				0	0	0
1	1-Mar-93	Honcut Creek	151,000				0	0	0
2	1-Jun-93	Grimes	4,615				0	0	0
3.2	1-May-93	BENICIA	1,836,000	0.0000%	0.0017%	0.0000%	0	32	0
3.2	1-May-93	TIBURON NET PENS	54,000	0.0000%	0.0020%	0.0000%	0	1	0
3.2	1-Jun-93	BENICIA	3,077,270	0.0000%	0.0018%	0.0000%	0	56	0
3.2	1-Jul-93	BENICIA	1,848,518	0.0000%	0.0020%	0.0000%	0	37	0
3.2	1-Aug-93	BENICIA	2,615,660	0.0000%	0.0026%	0.0000%	0	68	0
3.2	1-Sep-93	BENICIA	309,500	0.0000%	0.0027%	0.0000%	0	8	0
1	1-Jan-94	Dry Creek	302,400				0	0	0
1	1-Jan-94	FEATHER RIVER	4,995,200				0	0	0
1	1-Jan-94	Honcut Creek	304,200				0	0	0
1	1-Feb-94	FEATHER RIVER	0				0	0	0
1	1-Mar-94	Bear River	62,400				0	0	0
1	1-Mar-94	FEATHER RIVER	120,000				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Dec-93	FEATHER RIVER	264,000				0	0	0
2	1-Jul-94	Sacramento River	0				0	0	0
3.2	1-Apr-94	BENICIA	712,642	0.0021%	0.0023%	0.0001%	15	16	1
3.2	1-May-94	BENICIA	2,632,217	0.0021%	0.0024%	0.0001%	56	62	3
3.2	1-Jun-94	BENICIA	1,548,320	0.0021%	0.0025%	0.0001%	33	39	2
3.2	1-Jun-94	TIBURON NET PENS	51,150	0.0021%	0.0028%	0.0001%	1	1	0
3.2	1-Jun-94	WICKLAND OIL NET PEN	0	0.0021%	0.0019%	0.0001%	0	0	0
3.2	1-Jul-94	BENICIA	250,400	0.0021%	0.0026%	0.0001%	5	7	0
3.2	1-Jul-94	San Francisco Bay, San Yerba Buena Naval Yard	627,000	0.0021%	0.0027%	0.0001%	13	17	1
3.2	1-Jul-94	WICKLAND OIL NET PEN	518,300	0.0021%	0.0026%	0.0001%	11	14	1
1	1-Jan-95	FEATHER RIVER	674,786				0	0	0
1	1-Feb-95	FEATHER RIVER	3,142,258				0	0	0
1	1-Feb-95	Honcut Creek	304,290				0	0	0
1	1-Mar-95	Bear River	100,050				0	0	0
1	1-Mar-95	Dry Creek	200,100				0	0	0
1	1-Mar-95	FEATHER RIVER	969,275				0	0	0
1	1-May-95	FEATHER RIVER	0				0	0	0
1	1-May-95	Princeton	25,200				0	0	0
1	1-May-95	Walnut Ave	20,008				0	0	0
1	1-Jun-95	Feather (Tisdale Weir)	26,400				0	0	0
1	1-Jun-95	Feather (Yuba City)	45,500				0	0	0
1	1-Jun-95	Princeton	75,000				0	0	0
2	1-Apr-95	Georgiana Slough	17,160				0	0	0
2	1-May-95	Georgiana Slough	12,000				0	0	0
2	1-May-95	MILLER PARK	5,000				0	0	0
2	1-May-95	Sacramento River	30,000				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	1-Jun-95	Grimes	125,000				0	0	0
3.2	1-Apr-95	BENICIA	269,152	0.0000%	0.0010%	0.0002%	0	3	0
3.2	1-May-95	BENICIA	396,952	0.0000%	0.0012%	0.0002%	0	5	1
3.2	1-May-95	San Francisco Bay, San Yerba Buena Naval Yard	103,400	0.0000%	0.0012%	0.0002%	0	1	0
3.2	1-May-95	WICKLAND OIL NET PEN	593,080	0.0000%	0.0011%	0.0002%	0	7	1
3.2	1-Jun-95	BENICIA	225,100	0.0000%	0.0012%	0.0002%	0	3	0
3.2	1-Jun-95	S.F. Bay-Oceangraph Ctr. San Francisco Bay, San Yerba Buena Naval Yard	47,600	0.0000%	0.0013%	0.0002%	0	1	0
3.2	1-Jun-95	Yard	89,700	0.0000%	0.0012%	0.0002%	0	1	0
3.2	1-Jun-95	WICKLAND OIL NET PEN	907,432	0.0000%	0.0012%	0.0002%	0	11	2
3.2	1-Jul-94	WICKLAND OIL NET PEN	0	0.0000%	0.0009%	0.0002%	0	0	0
3.2	1-Jul-95	WICKLAND OIL NET PEN	1,544,975	0.0000%	0.0013%	0.0002%	0	19	3
1	1-Jan-96	FEATHER RIVER	156,000				0	0	0
1	1-Jan-96	Honcut Creek	101,401				0	0	0
1	1-Mar-96	Bear Creek	200,830				0	0	0
1	1-Mar-96	Dry Creek	96,600				0	0	0
1	1-Mar-96	FEATHER RIVER	652,000				0	0	0
1	1-May-96	FEATHER RIVER	25,000				0	0	0
2	1-Apr-96	San Joaquin River	5,000				0	0	0
2	1-Apr-96	Turner Cut	49,998				0	0	0
2	1-Apr-96	Vorden Rd	50,004				0	0	0
2	1-May-96	Turner Cut	25,024				0	0	0
2	1-May-96	Vorden Rd	150,011				0	0	0
2	1-Jun-96	Grimes	50,016				0	0	0
3.2	1-Apr-96	BENICIA	556,400	0.0000%	0.0006%	0.0000%	0	3	0
3.2	1-Apr-96	Bennett's Marina	0	0.0000%	0.0005%	0.0000%	0	0	0
3.2	1-Apr-96	WICKLAND OIL NET PEN	388,700	0.0000%	0.0006%	0.0000%	0	2	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-May-96	BENICIA	545,100	0.0000%	0.0006%	0.0000%	0	3	0
3.2	1-May-96	Bennett's Marina	0	0.0000%	0.0005%	0.0000%	0	0	0
3.2	1-May-96	Montezuma Slough	74,975	0.0000%	0.0006%	0.0000%	0	0	0
3.2	1-May-96	San Francisco Bay, San Yerba Buena Naval Yard	126,500	0.0000%	0.0006%	0.0000%	0	1	0
3.2	1-May-96	WICKLAND OIL NET PEN	527,850	0.0000%	0.0006%	0.0000%	0	3	0
3.2	1-Jun-96	BENICIA	0	0.0000%	0.0005%	0.0000%	0	0	0
3.2	1-Jun-96	TIBURON NET PENS	49,400	0.0000%	0.0005%	0.0000%	0	0	0
3.2	1-Jun-96	WICKLAND OIL NET PEN	203,200	0.0000%	0.0006%	0.0000%	0	1	0
3.2	1-Jul-96	San Francisco Bay, San Yerba Buena Naval Yard	73,364	0.0000%	0.0006%	0.0000%	0	0	0
3.2	1-Jul-96	WICKLAND OIL NET PEN	2,762,684	0.0000%	0.0006%	0.0000%	0	18	0
1	1-Mar-97	Dry Creek	100,037				0	0	0
3.2	1-May-97	BENICIA	25,200	0.0000%	0.0028%	0.0000%	0	1	0
3.2	1-May-97	TIBURON NET PENS	52,650	0.0000%	0.0030%	0.0000%	0	2	0
3.2	1-May-97	WICKLAND OIL NET PEN	36,830	0.0000%	0.0034%	0.0000%	0	1	0
3.2	1-Jun-97	BENICIA	252,500	0.0000%	0.0030%	0.0000%	0	8	0
3.2	1-Jun-97	Bennett's Marina	155,900	0.0000%	0.0030%	0.0000%	0	5	0
3.2	1-Jun-97	WICKLAND OIL NET PEN	787,300	0.0000%	0.0028%	0.0000%	0	22	0
3.2	1-Jul-97	Bennett's Marina	296,600	0.0000%	0.0028%	0.0000%	0	8	0
3.2	1-Jul-97	WICKLAND OIL NET PEN	3,177,450	0.0000%	0.0030%	0.0000%	0	94	0
1	1-Mar-98	Dry Creek	100,800				0	0	0
1	1-Mar-98	Honcut Creek	200,500				0	0	0
3.2	1-Mar-98	BENICIA	0				0	0	0
3.2	1-Mar-98	WICKLAND OIL NET PEN	0				0	0	0
3.2	1-May-98	WICKLAND OIL NET PEN	2,392,200	0.0000%	0.0009%	0.0000%	0	22	0
3.2	1-Jun-98	WICKLAND OIL NET PEN	1,243,900	0.0000%	0.0009%	0.0000%	0	12	0
1	1-Feb-99	Dry Creek	99,200				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Feb-99	Honcut Creek	216,000				0	0	0
1	1-Mar-99	Bear River	199,800				0	0	0
3.2	1-May-99	SF-San Francisco Bay	791,670	0.0030%	0.0032%	0.0000%	24	26	0
3.2	1-Jun-99	BENICIA	0	0.0030%	0.0026%	0.0000%	0	0	0
3.2	1-Jun-99	SF-San Francisco Bay	4,933,865	0.0030%	0.0033%	0.0000%	149	164	0
1	1-Jan-00	Dry Creek	100,100	0.0030%	0.0007%	0.0000%	3	1	0
1	1-Jan-00	Honcut Creek	200,201				0	0	0
1	1-Mar-00	Bear River	199,876				0	0	0
3.2	1-Apr-00	BENICIA	0				0	0	0
3.2	1-May-00	BENICIA	0	0.0000%	0.0007%	0.0000%	0	0	0
3.2	1-May-00	SF-San Francisco Bay	3,409,040	0.0000%	0.0009%	0.0000%	0	31	0
3.2	1-Jun-00	BENICIA	486,100	0.0000%	0.0009%	0.0000%	0	4	0
3.2	1-Jun-00	SF-San Francisco Bay	1,541,150	0.0000%	0.0010%	0.0000%	0	15	0
3.2	1-Apr-01	SAN PABLO BAY	568,100	0.0136%	0.0031%	0.0019%	78	18	11
3.2	1-May-01	BENICIA	1,706,850	0.0136%	0.0032%	0.0019%	233	54	32
3.2	1-Jun-01	BENICIA	487,600	0.0136%	0.0032%	0.0019%	67	16	9
2	1-Apr-02	River mile 206 (GCID)	14,402				0	0	0
2	1-May-02	River mile 206 (GCID)	16,293				0	0	0
2	1-Jun-02	River mile 206 (GCID)	13,300				0	0	0
3.2	1-Mar-02	BENICIA	162,800				0	0	0
3.2	1-Apr-02	BENICIA	2,773,538	0.0024%	0.0020%	0.0007%	66	54	20
3.2	1-May-02	BENICIA	1,401,000	0.0024%	0.0021%	0.0007%	33	29	10
3.2	1-Jun-02	BENICIA	422,050	0.0024%	0.0021%	0.0007%	10	9	3
2	1-Mar-03	River mile 206 (GCID)	8,394	0.0024%	0.0012%	0.0007%	0	0	0
2	1-Apr-03	River mile 206 (GCID)	16,720				0	0	0
2	1-May-03	River mile 206 (GCID)	10,450				0	0	0
3.2	1-May-03	BENICIA	2,343,600	0.0009%	0.0015%	0.0000%	21	35	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-May-03	Bennett's Marina	904,000	0.0009%	0.0015%	0.0000%	8	13	0
3.2	1-Jun-03	BENICIA	1,703,160	0.0009%	0.0015%	0.0000%	15	25	0
3.2	1-Jun-03	SF-San Francisco Bay	133,400	0.0009%	0.0015%	0.0000%	1	2	0
1	1-Apr-04	Live Oak boat ramp	0				0	0	0
2	1-Apr-04	River mile 206 (GCID)	4,180				0	0	0
2	1-May-04	River mile 206 (GCID)	16,720				0	0	0
2	1-Jun-04	River mile 206 (GCID)	16,720				0	0	0
3.2	1-Apr-04	BENICIA	0				0	0	0
3.2	1-May-04	BENICIA	4,025,988	0.0000%	0.0015%	0.0000%	0	61	0
3.2	1-Jun-04	BENICIA	3,232,600	0.0000%	0.0018%	0.0000%	0	57	0
2	16-May-05	Sacramento River	53,122	0.0000%	0.0014%	0.0000%	0	1	0
3.2	26-Apr-05	SAN PABLO BAY	105,000				0	0	0
3.2	27-Apr-05	SAN PABLO BAY	127,500				0	0	0
3.2	28-Apr-05	SAN PABLO BAY	114,000				0	0	0
3.2	29-Apr-05	SAN PABLO BAY	72,000				0	0	0
3.2	4-May-05	SAN PABLO BAY	69,000				0	0	0
3.2	5-May-05	SAN PABLO BAY	107,300				0	0	0
3.2	6-May-05	SAN PABLO BAY	107,300				0	0	0
3.2	10-May-05	SAN PABLO BAY	295,400				0	0	0
3.2	11-May-05	SAN PABLO BAY	230,000				0	0	0
3.2	12-May-05	SAN PABLO BAY	230,000				0	0	0
3.2	16-May-05	SAN PABLO BAY	115,200				0	0	0
3.2	18-May-05	SAN PABLO BAY	358,800				0	0	0
3.2	19-May-05	SAN PABLO BAY	57,500				0	0	0
3.2	20-May-05	SAN PABLO BAY	112,700				0	0	0
3.2	23-May-05	SAN PABLO BAY	69,000				0	0	0
3.2	25-May-05	SAN PABLO BAY	239,200				0	0	0

Feather River Fish Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	26-May-05	SAN PABLO BAY	335,000				0	0	0
3.2	27-May-05	SAN PABLO BAY	250,700				0	0	0
3.2	3-Jun-05	SAN PABLO BAY	181,700				0	0	0
3.2	6-Jun-05	SAN PABLO BAY	345,000				0	0	0
3.2	7-Jun-05	SAN PABLO BAY	179,400				0	0	0
3.2	8-Jun-05	SAN PABLO BAY	278,300				0	0	0
3.2	9-Jun-05	SAN PABLO BAY	272,976				0	0	0
3.2	10-Jun-05	SAN PABLO BAY	289,800				0	0	0
3.2	13-Jun-05	SAN PABLO BAY	193,200				0	0	0
3.2	14-Jun-05	SAN PABLO BAY	193,200				0	0	0
3.2	15-Jun-05	SAN PABLO BAY	184,000				0	0	0
3.2	16-Jun-05	SAN PABLO BAY	151,800				0	0	0
3.2	17-Jun-05	SAN PABLO BAY	213,900				0	0	0
3.2	20-Jun-05	SAN PABLO BAY	142,600				0	0	0
3.2	21-Jun-05	SAN PABLO BAY	248,400				0	0	0
3.2	22-Jun-05	SAN PABLO BAY	231,992				0	0	0
3.2	23-Jun-05	SAN PABLO BAY	326,600				0	0	0
3.2	24-Jun-05	SAN PABLO BAY	213,900				0	0	0
3.2	27-Jun-05	SAN PABLO BAY	142,600				0	0	0
3.2	28-Jun-05	SAN PABLO BAY	173,600				0	0	0
3.2	29-Jun-05	SAN PABLO BAY	142,600				0	0	0
3.2	10-Apr-06	SAN PABLO BAY	1,909,000				0	0	0
3.2	3-May-06	SAN PABLO BAY	2,852,414				0	0	0
3.2	18-May-06	YERBA BUENA ISLAND	59,000				0	0	0
3.2	1-Jun-06	SAN PABLO BAY	3,871,900				0	0	0
3.2	8-Jun-06	YERBA BUENA ISLAND	57,000				0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Jan-79	MOKELUMNE RIVER	15,225	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-78	MOKELUMNE RIVER	32,908	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Nov-78	MOKELUMNE RIVER	20,134	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Dec-78	MOKELUMNE RIVER	10,000	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Jan-79	RED BLUFF DIVER. DAM	51,700	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Jan-79	RIO VISTA	75,000	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Nov-78	RED BLUFF DIVER. DAM	47,304	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Nov-78	RIO VISTA	102,076	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Dec-78	RED BLUFF DIVER. DAM	191,800	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Jan-79	NEW HOPE LANDING	108,000	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jul-79	MOKELUMNE R FISH INS	65,406	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Oct-79	RIO VISTA	174,200	0.0000%	0.0648%	0.0000%	0	113	0
2	1-Nov-79	RIO VISTA	19,167	0.0000%	0.0648%	0.0000%	0	12	0
3.1	1-Aug-79	NEW HOPE LANDING	106,568	0.0130%	0.0055%	0.0000%	14	6	0
3.1	1-Sep-79	NEW HOPE LANDING	103,008	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Oct-79	NEW HOPE LANDING	26,315	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Nov-79	NEW HOPE LANDING	245,210	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Nov-80	MOKELUMNE RIVER	50,000	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Oct-80	RIO VISTA	672,750	0.0000%	0.0432%	0.0000%	0	291	0
2	1-Nov-80	RIO VISTA	88,500	0.0000%	0.0432%	0.0000%	0	38	0
2	1-Dec-80	RIO VISTA	40,700	0.0000%	0.0432%	0.0000%	0	18	0
3.1	1-Jun-80	NEW HOPE LANDING	105,050	0.0141%	0.0068%	0.0000%	15	7	0
3.1	1-Jul-80	NEW HOPE LANDING	25,800	0.0171%	0.0074%	0.0000%	4	2	0
3.1	1-Aug-80	NEW HOPE LANDING	90,000	0.0167%	0.0073%	0.0000%	15	7	0
3.1	1-Oct-80	NEW HOPE LANDING	20,000	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Oct-81	RIO VISTA	264,743	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Nov-81	RIO VISTA	586,905	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Dec-81	RIO VISTA	56,200	0.0000%	0.0000%	0.0000%	0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.1	1-Jun-81	NEW HOPE LANDING	167,034	0.0149%	0.0038%	0.0000%	25	6	0
3.1	1-Nov-81	NEW HOPE LANDING	72,000	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Dec-81	NEW HOPE LANDING	30,030	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Dec-82	MOKELUMNE RIVER	17,600	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Nov-82	RIO VISTA	516,145	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Dec-82	RIO VISTA	40,000	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Nov-82	NEW HOPE LANDING	89,998	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Oct-83	RIO VISTA	705,000	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Nov-83	RIO VISTA	52,640	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-May-83	NEW HOPE LANDING	454,134	0.0195%	0.0038%	0.0000%	88	17	0
3.1	1-Oct-83	NEW HOPE LANDING	10,010	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Jun-84	THORNTON-Moke	15,250	0.0115%	0.0046%	0.0000%	2	1	0
3.1	22-Aug-84	NEW HOPE LANDING	82,350	0.0124%	0.0047%	0.0000%	10	4	0
3.2	13-Aug-84	BENICIA	98,350	0.0189%	0.0430%	0.0149%	19	42	15
3.2	14-Aug-84	BENICIA	105,250	0.0189%	0.0430%	0.0149%	20	45	16
3.2	15-Aug-84	BENICIA	112,400	0.0189%	0.0430%	0.0149%	21	48	17
3.2	16-Aug-84	BENICIA	120,830	0.0189%	0.0430%	0.0149%	23	52	18
3.2	17-Aug-84	BENICIA	122,235	0.0189%	0.0430%	0.0149%	23	53	18
3.2	20-Aug-84	BENICIA	76,250	0.0189%	0.0430%	0.0149%	14	33	11
3.2	21-Aug-84	BENICIA	45,750	0.0189%	0.0430%	0.0149%	9	20	7
1	18-Oct-85	MOKELUMNE R FISH INS	24,200	0.0000%	0.0000%	0.0000%	0	0	0
1	21-Oct-85	MOKELUMNE R FISH INS	48,000	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Oct-85	MOKELUMNE R FISH INS	122,400	0.0000%	0.0000%	0.0000%	0	0	0
2	9-Oct-85	RIO VISTA	27,300	0.0000%	0.0000%	0.0000%	0	0	0
3.2	11-Sep-85	BENICIA	24,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	12-Sep-85	BENICIA	24,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	16-Sep-85	BENICIA	26,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	17-Sep-85	BENICIA	23,100	0.0000%	0.0000%	0.0000%	0	0	0
3.2	18-Sep-85	BENICIA	23,100	0.0000%	0.0000%	0.0000%	0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	19-Sep-85	BENICIA	27,300	0.0000%	0.0000%	0.0000%	0	0	0
3.2	20-Sep-85	BENICIA	13,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	24-Sep-85	BENICIA	13,300	0.0000%	0.0000%	0.0000%	0	0	0
3.2	25-Sep-85	BENICIA	27,930	0.0000%	0.0000%	0.0000%	0	0	0
3.2	26-Sep-85	BENICIA	48,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	27-Sep-85	BENICIA	46,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	30-Sep-85	BENICIA	33,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Oct-85	BENICIA	51,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	2-Oct-85	BENICIA	100,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	3-Oct-85	BENICIA	103,700	0.0000%	0.0000%	0.0000%	0	0	0
3.2	4-Oct-85	BENICIA	159,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	7-Oct-85	BENICIA	92,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	8-Oct-85	BENICIA	93,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	9-Oct-85	BENICIA	59,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	10-Oct-85	BENICIA	74,100	0.0000%	0.0000%	0.0000%	0	0	0
3.2	11-Oct-85	BENICIA	28,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	17-Oct-85	BENICIA	24,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	18-Oct-85	BENICIA	35,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	21-Oct-85	BENICIA	44,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	22-Oct-85	BENICIA	42,000	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Aug-86	MOKELUMNE R FISH INS	27,000	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Sep-86	MOKELUMNE R FISH INS	35,200	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-86	MOKELUMNE R FISH INS	36,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	25-Jun-86	BENICIA	50,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	26-Jun-86	BENICIA	56,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	27-Jun-86	BENICIA	66,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-86	BENICIA	1,000,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-86	BENICIA	39,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-86	Bennett's Marina	39,600	0.0000%	0.0000%	0.0000%	0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Aug-86	Berkeley Marina	170,100	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-86	BENICIA	191,500	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-86	Bennett's Marina	50,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Apr-87	BENICIA	601,665	0.0000%	0.0052%	0.0000%	0	31	0
3.2	1-May-87	BENICIA	398,700	0.0000%	0.0052%	0.0000%	0	21	0
3.2	1-Jun-87	BENICIA	467,950	0.0000%	0.0052%	0.0000%	0	24	0
3.2	1-Jun-87	Bennett's Marina	391,100	0.0000%	0.0052%	0.0000%	0	20	0
3.2	1-Jul-87	BENICIA	135,050	0.0000%	0.0052%	0.0000%	0	7	0
3.2	1-Jul-87	Mare Island	162,956	0.0000%	0.0052%	0.0000%	0	8	0
3.2	1-Aug-87	BENICIA	77,366	0.0000%	0.0052%	0.0000%	0	4	0
3.2	1-Apr-88	Berkeley Marina	524,500	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-88	BENICIA	316,300	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-88	Bennett's Marina	690,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-88	Berkeley Marina	638,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-88	BENICIA	133,300	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Sep-89	MOKELUMNE RIVER	50,400	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-89	NEW HOPE LANDING	418,700	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-89	BENICIA	92,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-89	Bennett's Marina	896,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-89	Bennett's Marina	1,066,900	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-89	Bennett's Marina	476,700	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-89	Berkeley Marina	48,700	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-89	Bennett's Marina	761,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Sep-89	Bennett's Marina	37,200	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-90	MOKELUMNE R FISH INS	20,800	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jun-90	Lodi Lake	4,000	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Mar-90	NEW HOPE LANDING	350,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-90	BENICIA	649,825	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-90	Bennett's Marina	517,500	0.0000%	0.0000%	0.0000%	0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Jul-90	BENICIA	459,700	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-90	Bennett's Marina	650,500	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Aug-90	Bennett's Marina	488,900	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-92	MOKELUMNE RIVER	6,000	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-91	Lodi Lake	25,200	0.0000%	0.0010%	0.0000%	0	0	0
1	1-Jun-91	Lodi Lake	13,000	0.0000%	0.0010%	0.0000%	0	0	0
1	1-Oct-91	MOKELUMNE R FISH INS	28,350	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-91	NEW HOPE LANDING	103,950	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-May-91	NEW HOPE LANDING	103,850	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-91	Bennett's Marina	821,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-91	Bennett's Marina	771,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-91	BENICIA	390,600	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-92	MOKELUMNE R FISH INS	131,552	0.0000%	0.0044%	0.0000%	0	6	0
2	1-Apr-92	RIO VISTA	472,840	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-92	Byron	36,050	0.0000%	0.0045%	0.0000%	0	2	0
3.1	1-Apr-92	NEW HOPE LANDING	0	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-May-92	NEW HOPE LANDING	0	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Apr-92	BENICIA	39,000	0.0067%	0.0116%	0.0052%	3	5	2
3.2	1-May-92	BENICIA	967,537	0.0067%	0.0116%	0.0052%	65	113	50
3.2	1-Jun-92	BENICIA	1,091,873	0.0067%	0.0116%	0.0052%	73	127	57
3.2	1-Jul-92	BENICIA	1,164,100	0.0067%	0.0116%	0.0052%	78	135	61
3.2	1-Aug-92	BENICIA	213,800	0.0067%	0.0116%	0.0052%	14	25	11
1	1-Mar-93	MOKELUMNE RIVER	1,200	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-93	MOKELUMNE RIVER	5,440	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-93	MOKELUMNE RIVER	0	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jun-93	Woodbridge Dam	10,010	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-93	Byron	15,000	0.0123%	0.0028%	0.0005%	2	0	0
3.1	1-Oct-93	NEW HOPE LANDING	313,720	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-93	BENICIA	437,500	0.0092%	0.0204%	0.0083%	40	89	36

Mokelumne River Fish Installation

Release Location	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Jun-93	BENICIA	1,547,500	0.0092%	0.0204%	0.0083%	143	315	128
3.2	1-Jul-93	BENICIA	1,026,600	0.0092%	0.0204%	0.0083%	95	209	85
2	1-Jun-94	Sacramento River	514,350	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-May-94	NEW HOPE LANDING	149,820	0.0124%	0.0025%	0.0010%	19	4	1
3.1	1-Jun-94	NEW HOPE LANDING	5,167	0.0142%	0.0026%	0.0010%	1	0	0
3.2	1-May-94	BENICIA	136,800	0.0160%	0.0246%	0.0129%	22	34	18
3.2	1-Jun-94	BENICIA	1,107,570	0.0160%	0.0246%	0.0129%	177	272	143
1	1-Sep-95	MOKELUMNE RIVER	275,110	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-95	MOKELUMNE RIVER	152,005	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Feb-96	MOKELUMNE RIVER	3,165	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-96	MOKELUMNE RIVER	3,394	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-96	MOKELUMNE RIVER	590,956	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-96	MOKELUMNE RIVER	1,014	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-96	Woodbridge Dam	177,060	0.0135%	0.0000%	0.0000%	24	0	0
3.1	1-Jun-96	NEW HOPE LANDING	774,046	0.0049%	0.0069%	0.0000%	38	53	0
3.2	1-May-96	BENICIA	770,800	0.0044%	0.0131%	0.0046%	34	101	35
3.2	1-Jun-96	BENICIA	744,865	0.0044%	0.0131%	0.0046%	33	97	34
1	1-Feb-97	Woodbridge Dam	8,956	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-97	Woodbridge Dam	2,280	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Sep-97	Woodbridge Dam	39,240	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-97	Woodbridge Dam	295,936	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-97	NEW HOPE LANDING	104,258	0.0000%	0.0066%	0.0000%	0	7	0
3.1	1-May-97	NEW HOPE LANDING	80,000	0.0000%	0.0065%	0.0000%	0	5	0
3.1	1-Jun-97	NEW HOPE LANDING	943,878	0.0000%	0.0071%	0.0000%	0	67	0
3.2	1-Apr-97	San Pablo	98,883	0.0000%	0.0328%	0.0180%	0	32	18
3.2	1-May-97	BENICIA	636,000	0.0000%	0.0328%	0.0180%	0	209	114
3.2	1-Jun-97	BENICIA	807,765	0.0000%	0.0328%	0.0180%	0	265	145
3.2	1-Jul-97	Bennett's Marina	140,000	0.0000%	0.0328%	0.0180%	0	46	25
3.2	1-Jul-97	WICKLAND OIL NET PEN	58,800	0.0000%	0.0328%	0.0180%	0	19	11

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Feb-98	Woodbridge Dam	6,938	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-98	Woodbridge Dam	5,525	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-98	Woodbridge Dam	2,146	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-98	Woodbridge Dam	1,724,300	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jun-98	Woodbridge Dam	3,846	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jul-98	Woodbridge Dam	1,878	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-98	Woodbridge Dam	71,000	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Nov-98	Woodbridge Dam	233,100	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-98	NEW HOPE LANDING	108,000	0.0058%	0.0088%	0.0000%	6	10	0
3.1	1-May-98	NEW HOPE LANDING	1,039	0.0048%	0.0082%	0.0000%	0	0	0
3.2	1-Jun-98	WICKLAND OIL NET PEN	1,271,400	0.0071%	0.0192%	0.0074%	90	243	94
3.2	1-Jul-98	WICKLAND OIL NET PEN	596,900	0.0071%	0.0192%	0.0074%	42	114	44
3.2	1-Aug-98	WICKLAND OIL NET PEN	144,900	0.0071%	0.0192%	0.0074%	10	28	11
3.2	1-Apr-98	JERSEY PT,SAN JOAQ.R	105,450	0.0138%	0.0190%	0.0070%	15	20	7
1	1-Jan-99	Woodbridge Dam	2,671	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Feb-99	Woodbridge Dam	2,172	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-99	Woodbridge Dam	1,635	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-99	Woodbridge Dam	1,635	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-99	Woodbridge Dam	4,024	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jun-99	Woodbridge Dam	840	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jul-99	Woodbridge Dam	1,755	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-May-99	NEW HOPE LANDING	1,208,802	0.0099%	0.0091%	0.0000%	119	110	0
3.2	1-Jun-99	WICKLAND OIL NET PEN	738,407	0.0671%	0.1615%	0.0575%	495	1,193	425
3.2	1-Jul-99	WICKLAND OIL NET PEN	440,200	0.0671%	0.1615%	0.0575%	295	711	253
3.2	1-Sep-99	Antioch Boat Ramp	9,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Oct-99	Antioch Boat Ramp	206,620	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Oct-99	WICKLAND OIL NET PEN	297,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-99	JERSEY PT,SAN JOAQ.R	100,966	0.0835%	0.1505%	0.0505%	84	152	51
1	1-Jan-00	Woodbridge Dam	2,808	0.0000%	0.0000%	0.0000%	0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Mar-00	Woodbridge Dam	7,106	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-00	Woodbridge Dam	992	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-00	Woodbridge Dam	828	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jun-00	Woodbridge Dam	2,400	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jul-00	Woodbridge Dam	1,958	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-00	LIGHTHOUSE MARINA	0	0.0111%	0.0332%	0.0000%	0	0	0
3.1	1-Apr-00	NEW HOPE LANDING	501,668	0.0111%	0.0332%	0.0000%	56	167	0
3.1	1-May-00	NEW HOPE LANDING	522,700	0.0113%	0.0334%	0.0000%	59	175	0
3.1	1-Jul-00	NEW HOPE LANDING	447,892	0.0141%	0.0366%	0.0000%	63	164	0
3.1	1-Sep-00	NEW HOPE LANDING	391,779	0.0227%	0.0312%	0.0059%	89	122	23
3.2	1-Apr-00	BENICIA	181,800		0.0178%	0.0048%	0	32	9
3.2	1-Apr-00	Bennett's Marina	185,300		0.0178%	0.0048%	0	33	9
3.2	1-Apr-00	WICKLAND OIL NET PEN	463,700		0.0178%	0.0048%	0	83	22
3.2	1-May-00	WICKLAND OIL NET PEN	698,450		0.0178%	0.0048%	0	124	34
3.2	1-Jun-00	WICKLAND OIL NET PEN	642,925		0.0178%	0.0048%	0	115	31
3.2	1-May-00	JERSEY PT,SAN JOAQ.R	0		0.0178%	0.0047%	0	0	0
1	1-Jan-01	Woodbridge Dam	818	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Feb-01	Jahant Road	368,246	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-01	Jahant Road	307,020	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-01	Woodbridge Dam	2,062	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-01	MOKELUMNE RIVER	0	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-01	Woodbridge Dam	2,940	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-01	Jahant Road	238,100	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Apr-01	Yolo Co Park	0	0.0167%	0.0084%	0.0007%	0	0	0
2	1-May-01	Yolo Co Park	0	0.0167%	0.0084%	0.0007%	0	0	0
3.1	1-Jan-01	NEW HOPE LANDING	1,822,530	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Feb-01	NEW HOPE LANDING	1,002,333	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Mar-01	NEW HOPE LANDING	370,974	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-01	NEW HOPE LANDING	602,075	0.0110%	0.0032%	0.0000%	66	19	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.1	1-May-01	NEW HOPE LANDING	551,000	0.0106%	0.0032%	0.0000%	58	17	0
3.2	1-Apr-01	BENICIA	0	0.0000%	0.0250%	0.0218%	0	0	0
3.2	1-Apr-01	SAN PABLO BAY	1,464,200	0.0000%	0.0250%	0.0218%	0	366	320
3.2	1-May-01	SAN PABLO BAY	1,398,452	0.0000%	0.0250%	0.0218%	0	349	305
3.2	1-Apr-01	JERSEY PT,SAN JOAQ.R	0	0.0000%	0.0250%	0.0218%	0	0	0
1	1-Feb-02	Woodbridge Dam	1,828,878	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jun-02	Woodbridge Dam	2,290	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Oct-02	BEAN FARM	0	0.0000%	0.0005%	0.0000%	0	0	0
3.1	1-Feb-02	M&T NF	47,000	0.0000%	0.0000%	0.0000%	0	0	0
3.1	4-Apr-00	NF MR	0	0.0000%	0.0753%	0.0000%	0	0	0
3.1	18-Apr-02	NEW HOPE LANDING	276,132	0.0000%	0.0753%	0.0000%	0	208	0
3.1	1-May-02	NEW HOPE LANDING	39,561	0.0000%	0.0753%	0.0000%	0	30	0
3.1	1-Jul-02	NEW HOPE LANDING	49,590	0.0000%	0.0753%	0.0000%	0	37	0
3.1	1-Oct-02	North Mokelumne	0	0.0000%	0.0100%	0.0007%	0	0	0
3.1	1-Oct-02	South Mokelumne	0	0.0000%	0.0100%	0.0007%	0	0	0
3.2	1-Feb-02	SAN PABLO BAY	1,160,079	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-02	SAN PABLO BAY	1,980,300	0.0156%	0.0307%	0.0000%	310	608	0
3.2	9-Apr-02	JERSEY PT,SAN JOAQ.R	0	0.0344%	0.0312%	0.0000%	0	0	0
3.2	1-Oct-02	JERSEY PT,SAN JOAQ.R	0	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-03	Woodbridge Dam	10,799	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Apr-03	MOKELUMNE R FISH INS	0	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jun-03	Lodi Lake	850	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jul-03	Woodbridge Dam	795	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-03	NEW HOPE LANDING	4,646,988	0.0000%	0.0098%	0.0000%	0	456	0
3.2	1-Apr-03	Conoco Phillips	2,175,025	0.0000%	0.0120%	0.0044%	0	261	96
3.2	1-May-03	Antioch Boat Ramp	575	0.0000%	0.0120%	0.0044%	0	0	0
3.2	1-May-03	TIBURON NET PENS	50,600	0.0000%	0.0120%	0.0044%	0	6	2
1	1-Apr-04	Woodbridge Dam	3,175	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-04	MOKELUMNE R FISH INS	0	0.0000%	0.0000%	0.0000%	0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Jun-04	Lodi Lake	989	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Apr-04	THORNTON-Moke	1,013,700	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-May-04	THORNTON-Moke	2,389,877	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-Jun-04	THORNTON-Moke	210,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-04	BENICIA	1,792,400	0.0070%	0.0249%	0.0055%	125	447	98
3.2	1-May-04	TIBURON NET PENS	51,700	0.0070%	0.0249%	0.0055%	4	13	3
3.2	1-Jun-04	BENICIA	216,800	0.0070%	0.0249%	0.0055%	15	54	12
1	1-Feb-05	Woodbridge Dam	1,457	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-05	Woodbridge Dam	1,016	0.0000%	0.0000%	0.0000%	0	0	0
1	5-Apr-05	Woodbridge Dam	1,057	0.0000%	0.0000%	0.0000%	0	0	0
1	1-May-05	MERCED R FISH FACIL.	0	0.0000%	0.0000%	0.0000%	0	0	0
3.1	5-Apr-05	THORNTON-Moke	242,350	0.0000%	0.0000%	0.0000%	0	0	0
3.1	1-May-05	THORNTON-Moke	2,009,715	0.0000%	0.0000%	0.0000%	0	0	0
3.1	27-Jun-05	THORNTON-Moke	1,642,960	0.0000%	0.0000%	0.0000%	0	0	0
3.2	5-Apr-05	SAN PABLO BAY	296,400	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-05	SAN PABLO BAY	1,275,680	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-May-05	TIBURON NET PENS	51,300	0.0000%	0.0000%	0.0000%	0	0	0
3.2	27-Jun-05	SAN PABLO BAY	432,000	0.0000%	0.0000%	0.0000%	0	0	0
1	24-Jan-06	MOKELUMNE RIVER	2,116				0	0	0
1	10-Feb-06	MOKELUMNE RIVER	2,010				0	0	0
1	4-Apr-06	MOKELUMNE RIVER	2,040				0	0	0
1	14-Apr-06	MOKELUMNE RIVER	4,095				0	0	0
1	18-Apr-06	MOKELUMNE RIVER	302,400				0	0	0
1	20-Apr-06	MOKELUMNE RIVER	106,200				0	0	0
1	21-Apr-06	MOKELUMNE RIVER	417,600				0	0	0
1	1-May-06	MOKELUMNE RIVER	108,884				0	0	0
1	5-May-06	MOKELUMNE RIVER	102,872				0	0	0
1	10-May-06	MOKELUMNE RIVER	636,600				0	0	0
1	11-May-06	MOKELUMNE RIVER	344,200				0	0	0

Mokelumne River Fish Installation

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	12-May-06	MOKELUMNE RIVER	528,000				0	0	0
1	23-May-06	MOKELUMNE RIVER	230,100				0	0	0
1	24-May-06	MOKELUMNE RIVER	312,700				0	0	0
1	30-May-06	MOKELUMNE RIVER	354,000				0	0	0
1	5-Jun-06	MOKELUMNE RIVER	62,045				0	0	0
1	6-Jun-06	MOKELUMNE RIVER	291,600				0	0	0
1	7-Jun-06	MOKELUMNE RIVER	216,000				0	0	0
1	12-Jun-06	MOKELUMNE RIVER	102,200				0	0	0
3.2	24-Apr-06	SAN PABLO BAY	125,400				0	0	0
3.2	25-Apr-06	SAN PABLO BAY	128,625				0	0	0
3.2	2-May-06	SAN PABLO BAY	222,250				0	0	0
3.2	3-May-06	SAN PABLO BAY	236,250				0	0	0
3.2	4-May-06	SAN PABLO BAY	98,000				0	0	0
3.2	5-May-06	SAN PABLO BAY	227,500				0	0	0
3.2	8-May-06	SAN PABLO BAY	174,000				0	0	0
3.2	9-May-06	SAN PABLO BAY	239,750				0	0	0
3.2	18-May-06	San Francisco Bay	49,500				0	0	0
3.2	1-Jun-06	SAN PABLO BAY	282,300				0	0	0
3.2	2-Jun-06	SAN PABLO BAY	269,500				0	0	0
3.2	8-Jun-06	San Francisco Bay	42,000				0	0	0
3.2	10-Jun-06	San Francisco Bay	51,450				0	0	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	21-Jun-78	MERCED R FISH FACIL.	100,000	0.0000%	0.0050%	0.0022%	0	5	2
1	29-Sep-78	MERCED R FISH FACIL.	195,000	0.0000%	0.5399%	0.0571%	0	1,053	111
1	17-Oct-84	MERCED R FISH FACIL.	73,600	0.3878%	1.8231%	0.0439%	285	1,342	32
1	14-Oct-85	MERCED R FISH FACIL.	63,000	0.4204%	0.1867%	0.0316%	265	118	20
1	8-Mar-86	MERCED R FISH FACIL.	15,876	0.0000%	0.0000%	0.0000%	0	0	0
1	14-Mar-86	MERCED R FISH FACIL.	20,448	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Mar-86	MERCED R FISH FACIL.	88,830	0.0000%	0.0000%	0.0000%	0	0	0
1	20-Mar-86	MERCED R FISH FACIL.	38,762	0.0000%	0.0000%	0.0000%	0	0	0
1	26-Mar-86	MERCED R FISH FACIL.	14,544	0.0000%	0.0000%	0.0000%	0	0	0
1	3-Apr-86	MERCED R FISH FACIL.	49,298	0.0075%	0.0811%	0.0385%	4	40	19
1	8-Apr-86	MERCED R FISH FACIL.	12,760	0.0084%	0.0908%	0.0431%	1	12	5
1	30-May-86	MERCED R FISH FACIL.	351,250	0.0018%	0.0193%	0.0092%	6	68	32
1	18-Jun-86	MERCED R FISH FACIL.	24,960	0.0010%	0.0103%	0.0049%	0	3	1
1	19-Oct-87	MERCED R FISH FACIL.	254,842	0.0000%	0.0000%	0.0000%	0	0	0
2	29-Apr-87	SJR at Mile 82	1,632	0.0000%	0.0000%	0.0000%	0	0	0
2	30-Apr-87	SJR at Mile 82	1,860	0.0000%	0.0000%	0.0000%	0	0	0
2	1-May-87	SAN JOAQ.R,BELOW OLD	3,130	0.0000%	0.0000%	0.0000%	0	0	0
2	14-May-87	SAN JOAQ.R,ABOVE OLD Stanislaus River, American	4,548	0.0000%	0.0000%	0.0000%	0	0	0
1	17-Mar-88	Trails Cmp.	206,370	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Apr-88	MERCED R FISH FACIL.	3,200	0.0000%	0.0000%	0.0000%	0	0	0
1	17-Oct-88	Fisherman Bend Merced R.	39,510	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Oct-88	Fisherman Bend Merced R.	42,105	0.0000%	0.0000%	0.0000%	0	0	0
1	19-Oct-88	Fisherman Bend Merced R.	40,450	0.0000%	0.0000%	0.0000%	0	0	0
1	20-Oct-88	Fisherman Bend Merced R.	20,445	0.0000%	0.0000%	0.0000%	0	0	0
1	24-Oct-88	MERCED R FISH FACIL.	1,000	0.0000%	0.0000%	0.0000%	0	0	0
2	10-Mar-88	USFWS Los Banos	1,082	0.0000%	0.0000%	0.0000%	0	0	0
2	23-Mar-88	USFWS Los Banos	800	0.0000%	0.0000%	0.0000%	0	0	0

Merced River Hatchery									
			Merced Recovery Rates			Escapement			
Release Location	Date Released	Release Location	Total Number Released	Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	6-Oct-89	MERCED R FISH FACIL.	96,334	0.0000%	0.0000%	0.0000%	0	0	0
1	7-Oct-89	MERCED R FISH FACIL.	82,848	0.0000%	0.0000%	0.0000%	0	0	0
2	20-Apr-89	Dos Rios Ranch	9,996	0.0306%	0.0009%	0.0029%	3	0	0
2	2-May-89	MOSSDALE	1,300	0.0310%	0.0009%	0.0029%	0	0	0
2	4-May-89	MOSSDALE	2,550	0.0307%	0.0009%	0.0029%	1	0	0
3.2	5-Jun-89	Berkeley Marina	183,600	0.0000%	0.0000%	0.0000%	0	0	0
3.2	6-Jun-89	Berkeley Marina	240,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	7-Jun-89	Berkeley Marina	245,700	0.0000%	0.0000%	0.0000%	0	0	0
3.2	8-Jun-89	Berkeley Marina	198,400	0.0000%	0.0000%	0.0000%	0	0	0
2	11-May-90	MOSSDALE	1,104	0.0000%	0.0000%	0.0000%	0	0	0
2	18-May-90	MOSSDALE	1,056	0.0000%	0.0000%	0.0000%	0	0	0
1	21-Oct-91	Merced River	104,822	0.0000%	0.0000%	0.0000%	0	0	0
1	4-Mar-92	Fisherman Bend	34,648	0.0000%	0.0000%	0.0000%	0	0	0
2	13-May-92	MOSSDALE	1,188	0.0000%	0.0000%	0.0000%	0	0	0
2	14-May-92	MOSSDALE	2,282	0.0000%	0.0000%	0.0000%	0	0	0
2	22-Apr-93	MOSSDALE	1,120	0.0416%	0.0249%	0.0052%	0	0	0
2	29-Apr-93	MOSSDALE	2,120	0.0447%	0.0261%	0.0053%	1	1	0
2	6-May-93	MOSSDALE	2,120	0.0442%	0.0259%	0.0053%	1	1	0
2	13-May-93	MOSSDALE	4,120	0.0415%	0.0248%	0.0052%	2	1	0
2	13-May-93	San Joaquin River	23,200	0.0415%	0.0248%	0.0052%	10	6	1
2	20-May-93	San Joaquin River	4,150	0.0402%	0.0243%	0.0051%	2	1	0
2	27-Apr-94	MOSSDALE	2,005	0.0658%	0.0321%	0.0054%	1	1	0
2	4-May-94	MOSSDALE	2,013	0.0633%	0.0313%	0.0053%	1	1	0
2	10-May-94	MOSSDALE	2,023	0.0633%	0.0313%	0.0053%	1	1	0
2	17-May-94	MOSSDALE	2,042	0.0629%	0.0312%	0.0053%	1	1	0
1	14-Apr-95	Shaffer Bridge	2,430	0.1602%	0.1675%	0.0457%	4	4	1
1	21-Apr-95	Hwy 120	1,008	0.1308%	0.1367%	0.0373%	1	1	0
1	28-Apr-95	MOKELUMNE RIVER	0	0.2302%	0.2407%	0.0658%	0	0	0
1	1-May-95	Orange Blossom Bridge	1,001	0.3007%	0.3146%	0.0860%	3	3	1

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	2-May-95	MERCED R FISH FACIL.	138,000	0.3027%	0.3166%	0.0865%	418	437	119
1	3-May-95	Hagaman Park	1,000	0.2986%	0.3124%	0.0854%	3	3	1
1	3-May-95	MERCED R FISH FACIL.	74,800	0.2986%	0.3124%	0.0854%	223	234	64
1	5-May-95	MOKELUMNE RIVER	0	0.2799%	0.2928%	0.0800%	0	0	0
1	10-May-95	MERCED R FISH FACIL.	276,450	0.2186%	0.2286%	0.0624%	604	632	173
1	12-May-95	Hwy 120	199	0.2156%	0.2255%	0.0616%	0	0	0
1	12-May-95	Orange Blossom Bridge	1,003	0.2156%	0.2255%	0.0616%	2	2	1
1	15-May-95	MOKELUMNE RIVER	0	0.2122%	0.2219%	0.0606%	0	0	0
1	19-May-95	Hwy 120	210	0.2009%	0.2101%	0.0574%	0	0	0
1	19-May-95	Orange Blossom Bridge	1,018	0.2009%	0.2101%	0.0574%	2	2	1
1	26-May-95	Orange Blossom Bridge	1,015	0.2023%	0.2116%	0.0578%	2	2	1
1	14-Jun-95	Hwy 120	210	0.2269%	0.2373%	0.0648%	0	0	0
1	14-Jun-95	Orange Blossom Bridge	4,046	0.2269%	0.2373%	0.0648%	9	10	3
2	11-May-95	MOSSDALE	2,052	0.1515%	0.0109%	0.0084%	3	0	0
2	18-May-95	MOSSDALE	2,014	0.1555%	0.0111%	0.0085%	3	0	0
2	25-May-95	MOSSDALE	2,024	0.1533%	0.0110%	0.0084%	3	0	0
2	31-May-95	MOSSDALE	2,037	0.1366%	0.0102%	0.0080%	3	0	0
2	29-Jun-95	DOS REIS ROAD	8,400	0.0590%	0.0058%	0.0054%	5	0	0
2	30-Jun-95	DOS REIS ROAD	4,589	0.0601%	0.0059%	0.0054%	3	0	0
1	10-Jun-96	Knights Ferry	20,162	0.0135%	0.0581%	0.0048%	3	12	1
2	19-Apr-96	MOSSDALE	4,984	0.0220%	0.0570%	0.0051%	1	3	0
2	3-May-96	MOSSDALE	2,603	0.0212%	0.0555%	0.0050%	1	1	0
2	8-May-96	MOSSDALE	2,597	0.0214%	0.0559%	0.0050%	1	1	0
2	15-May-96	MOSSDALE	2,549	0.0251%	0.0622%	0.0054%	1	2	0
2	23-May-96	MOSSDALE	2,553	0.0277%	0.0664%	0.0056%	1	2	0
2	29-May-96	MOSSDALE	2,553	0.0217%	0.0563%	0.0050%	1	1	0
2	5-Jun-96	MOSSDALE	2,428	0.0186%	0.0508%	0.0047%	0	1	0
2	24-Apr-97	MOSSDALE	2,594	0.1292%	0.1108%	0.0104%	3	3	0
2	1-May-97	MOSSDALE	2,564	0.1267%	0.1094%	0.0103%	3	3	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	10-May-97	MOSSDALE	3,503	0.1259%	0.1089%	0.0103%	4	4	0
2	16-May-97	MOSSDALE	3,237	0.1143%	0.1021%	0.0098%	4	3	0
2	22-May-97	MOSSDALE	4,080	0.1111%	0.1002%	0.0097%	5	4	0
2	29-May-97	MOSSDALE	4,043	0.1093%	0.0991%	0.0096%	4	4	0
2	4-Jun-97	MOSSDALE	4,065	0.1079%	0.0982%	0.0096%	4	4	0
2	24-Jun-97	DOS REIS ROAD	32,000	0.1028%	0.0951%	0.0093%	33	30	3
1	1-Apr-98	Hagaman Park	1,500	0.0775%	0.4633%	0.0362%	1	7	1
1	6-Apr-98	Hagaman Park	2,010	0.0812%	0.4853%	0.0379%	2	10	1
1	13-Apr-98	Hagaman Park	2,000	0.0822%	0.4912%	0.0384%	2	10	1
1	20-Apr-98	Hagaman Park	2,000	0.0747%	0.4462%	0.0348%	1	9	1
1	27-Apr-98	Hagaman Park	2,008	0.0657%	0.3928%	0.0307%	1	8	1
1	4-May-98	Hagaman Park	2,000	0.0626%	0.3743%	0.0292%	1	7	1
1	12-May-98	Hagaman Park	2,001	0.0812%	0.4848%	0.0379%	2	10	1
1	13-May-98	MERCED R FISH FACIL.	113,500	0.0828%	0.4943%	0.0386%	94	561	44
1	18-May-98	MERCED R FISH FACIL.	113,450	0.0752%	0.4493%	0.0351%	85	510	40
1	19-May-98	Hagaman Park	3,007	0.0714%	0.4270%	0.0333%	2	13	1
1	27-May-98	Hagaman Park	3,000	0.0577%	0.3453%	0.0269%	2	10	1
1	27-May-98	MERCED R FISH FACIL.	60,546	0.0577%	0.3453%	0.0269%	35	209	16
1	29-May-98	MERCED R FISH FACIL.	107,900	0.0566%	0.3386%	0.0264%	61	365	28
1	31-May-98	MERCED R FISH FACIL.	84,945	0.0549%	0.3285%	0.0256%	47	279	22
1	3-Jun-98	Hagaman Park	3,004	0.0540%	0.3227%	0.0252%	2	10	1
1	8-Jun-98	Hagaman Park	2,000	0.0555%	0.3320%	0.0259%	1	7	1
1	17-Jun-98	Hagaman Park	3,037	0.0644%	0.3848%	0.0300%	2	12	1
1	24-Jun-98	MERCED R FISH FACIL.	24,480	0.0464%	0.2776%	0.0216%	11	68	5
1	25-Jun-98	Hagaman Park	0	0.0428%	0.2560%	0.0199%	0	0	0
2	9-Apr-98	MOSSDALE	500	0.0968%	0.1554%	0.0098%	0	1	0
2	9-Apr-98	Mosssdale	3,000	0.0968%	0.1554%	0.0098%	3	5	0
2	21-Apr-98	MOSSDALE	500	0.0821%	0.1391%	0.0091%	0	1	0
2	23-Apr-98	MOSSDALE	6,582	0.0776%	0.1340%	0.0089%	5	9	1

Merced River Hatchery

Release Location Code	Date Released	Release Location	Merced Recovery Rates			Escapement			
			Total Number Released	Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	30-Apr-98	MOSSDALE	6,030	0.0687%	0.1235%	0.0084%	4	7	1
2	5-May-98	MOSSDALE	1,537	0.0648%	0.1188%	0.0081%	1	2	0
2	7-May-98	MOSSDALE	6,515	0.0655%	0.1196%	0.0082%	4	8	1
2	14-May-98	MOSSDALE	5,010	0.0724%	0.1280%	0.0086%	4	6	0
2	21-May-98	MOSSDALE	5,011	0.0758%	0.1320%	0.0088%	4	7	0
2	29-May-98	MOSSDALE	5,923	0.0719%	0.1273%	0.0086%	4	8	1
2	3-Jun-98	MOSSDALE	300	0.0668%	0.1213%	0.0083%	0	0	0
2	10-Jun-98	MOSSDALE	5,300	0.0644%	0.1183%	0.0081%	3	6	0
2	11-Jun-98	MOSSDALE	4,816	0.0652%	0.1193%	0.0082%	3	6	0
1	4-Mar-99	Hagaman Park	1,005	0.0000%	0.0000%	0.0000%	0	0	0
1	17-Mar-99	Hagaman Park	1,501	0.0000%	0.0000%	0.0000%	0	0	0
1	30-Mar-99	Hagaman Park	2,000	0.0000%	0.0000%	0.0000%	0	0	0
1	6-Apr-99	Hagaman Park	2,002	0.0715%	0.0790%	0.0056%	1	2	0
1	13-Apr-99	Hagaman Park	2,007	0.1543%	0.1706%	0.0121%	3	3	0
1	21-Apr-99	Gallo	863	0.2875%	0.3178%	0.0225%	2	3	0
1	21-Apr-99	Hagaman Park	2,000	0.2875%	0.3178%	0.0225%	6	6	0
1	28-Apr-99	Gallo	500	0.1268%	0.1402%	0.0099%	1	1	0
1	6-May-99	Hagaman Park	2,008	0.1576%	0.1742%	0.0123%	3	3	0
1	11-May-99	MERCED R FISH FACIL.	44,500	0.0976%	0.1079%	0.0076%	43	48	3
1	12-May-99	Gallo	300	0.0863%	0.0954%	0.0068%	0	0	0
1	12-May-99	Hagaman Park	2,000	0.0863%	0.0954%	0.0068%	2	2	0
1	17-May-99	Robinson Ranch	5,000	0.0668%	0.0739%	0.0052%	3	4	0
1	18-May-99	Gallo	1,001	0.0662%	0.0733%	0.0052%	1	1	0
1		Hagaman Park	2,012	0.0662%	0.0733%	0.0052%	1	1	0
1	19-May-99	Gallo	531	0.0659%	0.0729%	0.0052%	0	0	0
1	21-May-99	Gallo	20,880	0.0657%	0.0726%	0.0051%	14	15	1
1	23-May-99	Gallo	539	0.0655%	0.0724%	0.0051%	0	0	0
1	25-May-99	Gallo	544	0.0651%	0.0719%	0.0051%	0	0	0
1	25-May-99	Hagaman Park	3,041	0.0651%	0.0719%	0.0051%	2	2	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	27-May-99	Hagaman Park	2,025	0.0647%	0.0715%	0.0051%	1	1	0
1	No Date	Robinson Ranch	10,026	0.0000%	0.0000%	0.0000%	0	0	0
1		Robinson Ranch	10,026	0.0000%	0.0000%	0.0000%	0	0	0
2	27-Apr-99	MOSSDALE	5,000	0.2166%	0.3450%	0.0277%	11	17	1
2	6-May-99	MOSSDALE	3,300	0.2170%	0.3453%	0.0277%	7	11	1
2	13-May-99	MOSSDALE	3,016	0.2065%	0.3341%	0.0271%	6	10	1
2	19-May-99	MOSSDALE	300	0.1798%	0.3046%	0.0254%	1	1	0
2	24-May-99	MOSSDALE	4,000	0.1768%	0.3012%	0.0252%	7	12	1
2	27-May-99	MOSSDALE	911	0.1745%	0.2986%	0.0250%	2	3	0
2	28-May-99	MOSSDALE	4,020	0.1739%	0.2979%	0.0250%	7	12	1
2	3-Jun-99	MOSSDALE	4,307	0.1732%	0.2970%	0.0249%	7	13	1
2	4-Jun-99	MOSSDALE	4,013	0.1732%	0.2971%	0.0249%	7	12	1
1	8-Mar-00	Merced River	2,038	0.0000%	0.0000%	0.0000%	0	0	0
1	13-Mar-00	Merced River	1,152	0.0000%	0.0000%	0.0000%	0	0	0
1	14-Mar-00	Merced River	706	0.0000%	0.0000%	0.0000%	0	0	0
1	15-Mar-00	Hagaman Park	2,002	0.0000%	0.0000%	0.0000%	0	0	0
1	21-Mar-00	Hagaman Park	2,000	0.0000%	0.0000%	0.0000%	0	0	0
1	28-Mar-00	Hagaman Park	2,117	0.0000%	0.0000%	0.0000%	0	0	0
1	3-Apr-00	Gallo	500	0.0881%	0.1460%	0.0054%	0	1	0
1	4-Apr-00	Hagaman Park	2,028	0.0873%	0.1448%	0.0053%	2	3	0
1	5-Apr-00	Robinson Ranch	2,001	0.0866%	0.1436%	0.0053%	2	3	0
1	12-Apr-00	Gallo	2,038	0.0864%	0.1433%	0.0053%	2	3	0
1	13-Apr-00	Hagaman Park	2,008	0.0873%	0.1448%	0.0053%	2	3	0
1	24-Apr-00	Gallo	2,004	0.2384%	0.3948%	0.0146%	5	8	0
1	25-Apr-00	Hwy 59	3,008	0.2331%	0.3860%	0.0143%	7	12	0
1	25-Apr-00	SNELLING	5,000	0.2331%	0.3860%	0.0143%	12	19	1
1	26-Apr-00	Hagaman Park	2,000	0.2242%	0.3713%	0.0137%	4	7	0
1	29-Apr-00	Gallo	1,070	0.1568%	0.2598%	0.0096%	2	3	0
1	12-May-00	Gallo	896	0.0956%	0.1585%	0.0058%	1	1	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	14-May-00	MERCED R FISH FACIL.	152,438	0.0919%	0.1524%	0.0056%	140	232	9
1	15-May-00	Gallo	3,003	0.0919%	0.1523%	0.0056%	3	5	0
1	15-May-00	Hwy 59	2,021	0.0919%	0.1523%	0.0056%	2	3	0
1	15-May-00	SNELLING	5,002	0.0919%	0.1523%	0.0056%	5	8	0
1	16-May-00	Hagaman Park	2,026	0.0920%	0.1525%	0.0056%	2	3	0
2	3-May-00	Old River Barrier	10,133	0.0522%	0.2785%	0.0039%	5	28	0
2	10-May-00	Old River Barrier	10,059	0.0517%	0.2768%	0.0039%	5	28	0
3.2	28-Mar-00	Berkeley Marina	0	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Jan-01	Hagaman Park	2,000	0.0000%	0.0000%	0.0000%	0	0	0
1	26-Jan-01	Hagaman Park	1,010	0.0000%	0.0000%	0.0000%	0	0	0
1	31-Jan-01	Gallo	1,140	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Feb-01	Hagaman Park	2,029	0.0000%	0.0000%	0.0000%	0	0	0
1	6-Feb-01	Hagaman Park	1,070	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Mar-01	Gallo	810	0.0000%	0.0000%	0.0000%	0	0	0
1	7-Mar-01	Hagaman Park	2,014	0.0000%	0.0000%	0.0000%	0	0	0
1	19-Mar-01	Gallo	1,397	0.0000%	0.0000%	0.0000%	0	0	0
1	22-Mar-01	Hagaman Park	2,016	0.0000%	0.0000%	0.0000%	0	0	0
1	29-Mar-01	Hagaman Park	2,014	0.0000%	0.0000%	0.0000%	0	0	0
1	2-Apr-01	Gallo	1,300	0.0957%	0.0431%	0.0051%	1	1	0
1	3-Apr-01	Hagaman Park	0	0.0960%	0.0432%	0.0051%	0	0	0
1	6-Apr-01	Hagaman Park	2,016	0.0965%	0.0434%	0.0051%	2	1	0
1	16-Apr-01	Gallo	2,097	0.1460%	0.0658%	0.0077%	3	1	0
1	16-Apr-01	Henderson Park	5,028	0.1460%	0.0658%	0.0077%	7	3	0
1	16-Apr-01	Robinson Ranch	3,043	0.1460%	0.0658%	0.0077%	4	2	0
1	18-Apr-01	Hagaman Park	2,008	0.1788%	0.0805%	0.0095%	4	2	0
1	22-Apr-01	Gallo	2,204	0.1800%	0.0811%	0.0095%	4	2	0
1	22-Apr-01	Henderson Park	5,031	0.1800%	0.0811%	0.0095%	0	0	0
1	22-Apr-01	Robinson Ranch	3,150	0.1800%	0.0811%	0.0095%	6	3	0
1	25-Apr-01	Gallo	789	0.1354%	0.0609%	0.0072%	1	0	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	26-Apr-01	Hagaman Park	2,053	0.1226%	0.0552%	0.0065%	3	1	0
1	27-Apr-01	Gallo	375	0.1150%	0.0518%	0.0061%	0	0	0
1	2-May-01	Hagaman Park	2,055	0.1168%	0.0526%	0.0062%	2	1	0
1	4-May-01	Gallo	847	0.1383%	0.0623%	0.0073%	1	1	0
1	9-May-01	Gallo	1,449	0.1881%	0.0847%	0.0100%	3	1	0
1	9-May-01	Henderson Park	5,015	0.1881%	0.0847%	0.0100%	9	4	0
1	9-May-01	Robinson Ranch	3,021	0.1881%	0.0847%	0.0100%	6	3	0
1	10-May-01	Hagaman Park	2,017	0.1882%	0.0848%	0.0100%	4	2	0
1	11-May-01	MERCED R FISH FACIL.	162,000	0.1855%	0.0835%	0.0098%	300	135	16
1	14-May-01	MERCED R FISH FACIL.	40,964	0.1442%	0.0649%	0.0076%	59	27	3
1	16-May-01	Hagaman Park	2,050	0.1133%	0.0510%	0.0060%	2	1	0
1	21-May-01	Gallo	2,415	0.0986%	0.0444%	0.0052%	2	1	0
1	21-May-01	Henderson Park	5,024	0.0986%	0.0444%	0.0052%	5	2	0
1	21-May-01	Robinson Ranch	3,249	0.0986%	0.0444%	0.0052%	3	1	0
1	24-May-01	Hagaman Park	2,020	0.0958%	0.0431%	0.0051%	2	1	0
1	26-May-01	Gallo	600	0.0952%	0.0429%	0.0050%	1	0	0
1	31-May-01	Hagaman Park	1,618	0.0914%	0.0411%	0.0048%	1	1	0
2	12-Apr-01	MOSSDALE	3,053	0.1264%	0.0569%	0.0088%	4	2	0
2	26-Apr-01	MOSSDALE	3,035	0.1402%	0.0610%	0.0092%	4	2	0
2	26-Apr-01	Old River Barrier	7,012	0.1402%	0.0610%	0.0092%	10	4	1
2	1-May-01	MOSSDALE	1,523	0.1401%	0.0610%	0.0092%	2	1	0
2	9-May-01	Old River Barrier	7,268	0.1410%	0.0612%	0.0093%	10	4	1
2	10-May-01	MOSSDALE	1,527	0.1415%	0.0614%	0.0093%	2	1	0
2	22-May-01	MOSSDALE	3,044	0.1251%	0.0565%	0.0088%	4	2	0
2	31-May-01	DOS REIS ROAD	110	0.1224%	0.0557%	0.0087%	0	0	0
1	7-Feb-02	Hagaman Park	0	0.0000%	0.0000%	0.0000%	0	0	0
1	13-Feb-02	Hagaman Park	1,859	0.0000%	0.0000%	0.0000%	0	0	0
1	20-Feb-02	Gallo	687	0.0000%	0.0000%	0.0000%	0	0	0
1	23-Feb-02	Gallo	1,268	0.0000%	0.0000%	0.0000%	0	0	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	27-Feb-02	Hagaman Park	2,224	0.0000%	0.0000%	0.0000%	0	0	0
1	6-Mar-02	Gallo	764	0.0000%	0.0000%	0.0000%	0	0	0
1	6-Mar-02	Hagaman Park	2,015	0.0000%	0.0000%	0.0000%	0	0	0
1	13-Mar-02	Hagaman Park	2,075	0.0000%	0.0000%	0.0000%	0	0	0
1	19-Mar-02	Gallo	1,881	0.0000%	0.0000%	0.0000%	0	0	0
1	20-Mar-02	Hagaman Park	2,018	0.0000%	0.0000%	0.0000%	0	0	0
1	27-Mar-02	Hagaman Park	2,068	0.0000%	0.0000%	0.0000%	0	0	0
1	30-Mar-02	Hagaman Park	2,023	0.0000%	0.0000%	0.0000%	0	0	0
1	2-Apr-02	MERCED R FISH FACIL.	5,928	0.0102%	0.0429%	0.0050%	1	3	0
1	3-Apr-02	Hagaman Park	2,042	0.0102%	0.0431%	0.0051%	0	1	0
1	3-Apr-02	Henderson Park	5,053	0.0102%	0.0431%	0.0051%	1	2	0
1	4-Apr-02	Gallo	2,067	0.0103%	0.0433%	0.0051%	0	1	0
1	4-Apr-02	Robinson Ranch	3,050	0.0103%	0.0433%	0.0051%	0	1	0
1	10-Apr-02	Hagaman Park	2,024	0.0110%	0.0465%	0.0055%	0	1	0
1	12-Apr-02	Gallo	2,596	0.0115%	0.0484%	0.0057%	0	1	0
1	16-Apr-02	MERCED R FISH FACIL.	7,100	0.0119%	0.0504%	0.0059%	1	4	0
1	17-Apr-02	Hagaman Park	2,022	0.0120%	0.0508%	0.0060%	0	1	0
1	17-Apr-02	Henderson Park	5,092	0.0120%	0.0508%	0.0060%	1	3	0
1	18-Apr-02	Gallo	2,044	0.0121%	0.0511%	0.0060%	0	1	0
1	18-Apr-02	Robinson Ranch	3,006	0.0121%	0.0511%	0.0060%	0	2	0
1	21-Apr-02	Gallo	2,500	0.0121%	0.0513%	0.0060%	0	1	0
1	1-May-02	MERCED R FISH FACIL.	368,160	0.0242%	0.1021%	0.0120%	89	376	44
1	2-May-02	Hagaman Park	2,025	0.0239%	0.1012%	0.0119%	0	2	0
1	2-May-02	Henderson Park	5,036	0.0239%	0.1012%	0.0119%	1	5	1
1	3-May-02	Gallo	3,114	0.0230%	0.0971%	0.0114%	1	3	0
1	3-May-02	Robinson Ranch	3,088	0.0230%	0.0971%	0.0114%	1	3	0
1	4-May-02	Gallo	1,246	0.0215%	0.0910%	0.0107%	0	1	0
1	8-May-02	Hagaman Park	2,116	0.0170%	0.0719%	0.0085%	0	2	0
1	14-May-02	Hagaman Park	2,014	0.0103%	0.0436%	0.0051%	0	1	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	15-May-02	MERCED R FISH FACIL.	7,149	0.0102%	0.0431%	0.0051%	1	3	0
1	16-May-02	Henderson Park	5,027	0.0102%	0.0430%	0.0050%	1	2	0
1	17-May-02	Gallo	2,008	0.0102%	0.0430%	0.0051%	0	1	0
1	17-May-02	Robinson Ranch	3,025	0.0102%	0.0430%	0.0051%	0	1	0
1	20-May-02	Gallo	2,400	0.0102%	0.0430%	0.0050%	0	1	0
1	22-May-02	Hagaman Park	2,077	0.0101%	0.0427%	0.0050%	0	1	0
1	29-May-02	Hagaman Park	2,048	0.0099%	0.0418%	0.0049%	0	1	0
2	5-Apr-02	Mosssdale	2,017	0.0113%	0.0404%	0.0079%	0	1	0
2	11-Apr-02	MOSSDALE	5,091	0.0117%	0.0413%	0.0080%	1	2	0
2	17-Apr-02	MOSSDALE	2,043	0.0123%	0.0428%	0.0082%	0	1	0
2	19-Apr-02	Old River Barrier	12,334	0.0124%	0.0429%	0.0082%	2	5	1
2	24-Apr-02	Old River Barrier	12,126	0.0125%	0.0431%	0.0083%	2	5	1
2	26-Apr-02	MOSSDALE	5,064	0.0125%	0.0432%	0.0083%	1	2	0
2	3-May-02	MOSSDALE	2,005	0.0124%	0.0431%	0.0083%	0	1	0
2	9-May-02	MOSSDALE	5,010	0.0123%	0.0428%	0.0082%	1	2	0
2	14-May-02	MOSSDALE	2,014	0.0119%	0.0418%	0.0081%	0	1	0
2	23-May-02	MOSSDALE	5,057	0.0115%	0.0409%	0.0080%	1	2	0
1	22-Feb-03	Gallo	800	0.0000%	0.0000%	0.0000%	0	0	0
1	12-Mar-03	Gallo	1,652	0.0000%	0.0000%	0.0000%	0	0	0
1	22-Mar-03	MERCED R FISH FACIL.	17,400	0.0000%	0.0000%	0.0000%	0	0	0
1	26-Mar-03	Gallo	20,500	0.0000%	0.0000%	0.0000%	0	0	0
1	2-Apr-03	Hagaman Park	0	0.0935%	0.0752%	0.0012%	0	0	0
1	2-Apr-03	Henderson Park	5,000	0.0935%	0.0752%	0.0012%	5	4	0
1	3-Apr-03	Gallo	2,000	0.0935%	0.0752%	0.0012%	2	2	0
1	3-Apr-03	MERCED R FISH FACIL.	20,800	0.0935%	0.0752%	0.0012%	19	16	0
1	3-Apr-03	Ratzlaff	3,035	0.0935%	0.0752%	0.0012%	3	2	0
1	3-Apr-03	Robinson Ranch	3,000	0.0935%	0.0752%	0.0012%	3	2	0
1	4-Apr-03	MERCED R FISH FACIL.	19,800	0.0938%	0.0755%	0.0012%	19	15	0
1	5-Apr-03	MERCED R FISH FACIL.	47,400	0.0951%	0.0765%	0.0012%	45	36	1

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	5-Apr-03	Shaffer Bridge	21,375	0.0951%	0.0765%	0.0012%	20	16	0
1	6-Apr-03	Shaffer Bridge	26,250	0.0981%	0.0789%	0.0012%	26	21	0
1	8-Apr-03	Hagaman Park	2,101	0.1112%	0.0894%	0.0014%	2	2	0
1	13-Apr-03	MERCED R FISH FACIL.	11,625	0.1327%	0.1068%	0.0016%	15	12	0
1	14-Apr-03	MERCED R FISH FACIL.	10,000	0.1320%	0.1062%	0.0016%	13	11	0
1	15-Apr-03	Hagaman Park	2,000	0.1313%	0.1056%	0.0016%	3	2	0
1	15-Apr-03	Henderson Park	5,000	0.1313%	0.1056%	0.0016%	7	5	0
1	16-Apr-03	Gallo	2,000	0.1302%	0.1048%	0.0016%	3	2	0
1	16-Apr-03	Ratzlaff	3,010	0.1302%	0.1048%	0.0016%	4	3	0
1	16-Apr-03	Robinson Ranch	3,000	0.1302%	0.1048%	0.0016%	4	3	0
1	22-Apr-03	Hagaman Park	2,040	0.1155%	0.0929%	0.0014%	2	2	0
1	23-Apr-03	MERCED R FISH FACIL.	10,209	0.1151%	0.0926%	0.0014%	12	9	0
1	24-Apr-03	Henderson Park	5,000	0.1152%	0.0926%	0.0014%	6	5	0
1	25-Apr-03	Gallo	2,000	0.1160%	0.0933%	0.0014%	2	2	0
1	25-Apr-03	Ratzlaff	3,000	0.1160%	0.0933%	0.0014%	3	3	0
1	25-Apr-03	Robinson Ranch	3,000	0.1160%	0.0933%	0.0014%	3	3	0
1	29-Apr-03	Hagaman Park	2,016	0.1524%	0.1226%	0.0019%	3	2	0
1	30-Apr-03	MERCED R FISH FACIL.	1,807	0.1736%	0.1397%	0.0021%	3	3	0
1	2-May-03	Hagaman Park	2,021	0.2109%	0.1697%	0.0026%	4	3	0
1	5-May-03	MERCED R FISH FACIL.	9,979	0.2218%	0.1785%	0.0027%	22	18	0
1	6-May-03	Hagaman Park	2,015	0.2148%	0.1728%	0.0027%	4	3	0
1	6-May-03	Henderson Park	5,017	0.2148%	0.1728%	0.0027%	11	9	0
1	7-May-03	Gallo	2,185	0.1991%	0.1602%	0.0025%	4	4	0
1	7-May-03	Ratzlaff	3,000	0.1991%	0.1602%	0.0025%	6	5	0
1	7-May-03	Robinson Ranch	3,000	0.1991%	0.1602%	0.0025%	6	5	0
1	12-May-03	MERCED R FISH FACIL.	43,100	0.1005%	0.0808%	0.0012%	43	35	1
1	13-May-03	Hagaman Park	2,009	0.0954%	0.0768%	0.0012%	2	2	0
2	4-Apr-03	MOSSDALE	2,000	0.0326%	0.0653%	0.0053%	1	1	0
2	10-Apr-03	MOSSDALE	5,044	0.0333%	0.0662%	0.0053%	2	3	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Merced Recovery Rates			Escapement			
			Total Number Released	Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	18-Apr-03	MOSSDALE	2,000	0.0351%	0.0686%	0.0055%	1	1	0
2	22-Apr-03	Old River Barrier	6,015	0.0350%	0.0685%	0.0055%	2	4	0
2	24-Apr-03	MOSSDALE	5,000	0.0350%	0.0685%	0.0055%	2	3	0
2	29-Apr-03	Old River Barrier	12,043	0.0353%	0.0689%	0.0055%	4	8	1
2	2-May-03	MOSSDALE	2,000	0.0352%	0.0688%	0.0055%	1	1	0
2	9-May-03	MOSSDALE	5,060	0.0348%	0.0683%	0.0054%	2	3	0
2	16-May-03	MOSSDALE	2,000	0.0330%	0.0658%	0.0053%	1	1	0
2	23-May-03	MOSSDALE	5,000	0.0324%	0.0651%	0.0053%	2	3	0
1	5-Apr-04	MERCED R FISH FACIL.	10,200	0.0663%	0.0109%	0.0050%	7	1	1
1	6-Apr-04	Henderson Park	5,000	0.0672%	0.0111%	0.0051%	3	1	0
1	7-Apr-04	Gallo	2,000	0.0692%	0.0114%	0.0052%	1	0	0
1	7-Apr-04	Ratzlaff	3,128	0.0692%	0.0114%	0.0052%	2	0	0
1	7-Apr-04	Robinson Ranch	3,000	0.0692%	0.0114%	0.0052%	2	0	0
1	19-Apr-04	MERCED R FISH FACIL.	10,200	0.0916%	0.0151%	0.0069%	9	2	1
1	20-Apr-04	Henderson Park	5,016	0.0967%	0.0159%	0.0073%	5	1	0
1	21-Apr-04	Gallo	2,032	0.1026%	0.0169%	0.0077%	2	0	0
1	21-Apr-04	Ratzlaff	3,057	0.1026%	0.0169%	0.0077%	3	1	0
1	21-Apr-04	Robinson Ranch	3,003	0.1026%	0.0169%	0.0077%	3	1	0
1	3-May-04	MERCED R FISH FACIL.	10,200	0.1793%	0.0295%	0.0135%	18	3	1
1	4-May-04	Henderson Park	5,010	0.1781%	0.0293%	0.0134%	9	1	1
1	5-May-04	Gallo	2,010	0.1748%	0.0287%	0.0132%	4	1	0
1	5-May-04	MERCED R FISH FACIL.	165,430	0.1748%	0.0287%	0.0132%	289	48	22
1	5-May-04	Ratzlaff	3,032	0.1748%	0.0287%	0.0132%	5	1	0
1	5-May-04	Robinson Ranch	3,027	0.1748%	0.0287%	0.0132%	5	1	0
1	17-May-04	MERCED R FISH FACIL.	10,200	0.0660%	0.0109%	0.0050%	7	1	1
1	18-May-04	Henderson Park	5,017	0.0656%	0.0108%	0.0049%	3	1	0
1	19-May-04	Gallo	2,000	0.0654%	0.0108%	0.0049%	1	0	0
1	19-May-04	MERCED R FISH FACIL.	94,980	0.0654%	0.0108%	0.0049%	62	10	5
1	19-May-04	Ratzlaff	3,003	0.0654%	0.0108%	0.0049%	2	0	0

Merced River Hatchery

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	19-May-04	Robinson Ranch	3,017	0.0654%	0.0108%	0.0049%	2	0	0
2	9-Apr-04	MOSSDALE	2,010	0.0000%	0.0000%	0.0050%	0	0	0
2	16-Apr-04	MOSSDALE	5,016	0.0000%	0.0000%	0.0051%	0	0	0
2	21-Apr-04	MOSSDALE	2,007	0.0000%	0.0000%	0.0051%	0	0	0
2	29-Apr-04	MOSSDALE	5,009	0.0000%	0.0000%	0.0051%	0	0	0
2	7-May-04	MOSSDALE	2,039	0.0000%	0.0000%	0.0051%	0	0	0
2	13-May-04	MOSSDALE	5,008	0.0000%	0.0000%	0.0051%	0	0	0
2	20-May-04	MOSSDALE	2,029	0.0000%	0.0000%	0.0049%	0	0	0
2	28-May-04	MOSSDALE	2,000	0.0000%	0.0000%	0.0049%	0	0	0
1	5-Apr-05	MERCED R FISH FACIL.	7,565	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Apr-05	MERCED R FISH FACIL.	983	0.0000%	0.0000%	0.0000%	0	0	0
1	10-May-05	MERCED R FISH FACIL.	10,600	0.0000%	0.0000%	0.0000%	0	0	0
1	Apr-Jun 2005	Gallo	10,144	0.0000%	0.0000%	0.0000%	0	0	0
1	Apr-May 2005	Henderson Park	20,019	0.0000%	0.0000%	0.0000%	0	0	0
1	Apr-May 2005	Robinson Ranch	12,016	0.0000%	0.0000%	0.0000%	0	0	0
1	18-Apr-06	Merced River	427				0	0	0
1	24-Apr-06	Merced River	311				0	0	0
1	25-May-06	Merced River	73,000				0	0	0
1	1-Jun-06	Merced River	57,000				0	0	0
1	2-Jun-06	Merced River	61,097				0	0	0
1	8-Jun-06	Merced River	18,500				0	0	0
1	19-Jun-06	Merced River	8,215				0	0	0
2	6-Apr-06	San Joaquin River	2,062				0	0	0
2	20-Apr-06	San Joaquin River	5,000				0	0	0
2	27-Apr-06	San Joaquin River	5,041				0	0	0
2	3-May-06	San Joaquin River	5,000				0	0	0
2	4-May-06	San Joaquin River	2,000				0	0	0
2	11-May-06	San Joaquin River	7,000				0	0	0

			Merced River Hatchery						
			Merced Recovery Rates			Escapement			
Release Location	Date Released	Release Location	Total Number Released	Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	18-May-06	San Joaquin River	7,000				0	0	0
2	25-May-06	San Joaquin River	5,000				0	0	0
2	1-Jun-06	San Joaquin River	5,000				0	0	0
2	8-Jun-06	San Joaquin River	5,000				0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Jan-78	NFH	191,520				0	0	0
1	1-Apr-78	NFH	138,600				0	0	0
2	1-Apr-78	RIO VISTA	1,810,750				0	0	0
2	1-May-78	RIO VISTA	325,070				0	0	0
2	1-Jun-78	RIO VISTA	2,552,025				0	0	0
2	1-Oct-78	RIO VISTA	107,380				0	0	0
2	1-Nov-78	RIO VISTA	121,660				0	0	0
1	1-Jan-79	NFH	352,500				0	0	0
1	1-Apr-79	NFH	510,724				0	0	0
1	1-Jun-79	NFH	18,375				0	0	0
2	1-Apr-79	RIO VISTA	864,735				0	0	0
2	1-May-79	RIO VISTA	2,860,120				0	0	0
2	1-Jun-79	RIO VISTA	2,330,700				0	0	0
2	1-Sep-79	RIO VISTA	150,960				0	0	0
2	1-Oct-79	RIO VISTA	116,500				0	0	0
1	1-Feb-80	NFH	2,131,767				0	0	0
1	1-Mar-80	NFH	326,388				0	0	0
1	1-Apr-80	NFH	301,003				0	0	0
2	1-Jun-80	RIO VISTA	3,544,795				0	0	0
3.2	1-Sep-80	BENICIA	270,281	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-81	NFH	4,360,140				0	0	0
1	1-Feb-81	NFH	6,485,377				0	0	0
1	1-Mar-81	Bear River	100,050				0	0	0
1	1-Dec-80	NFH	1,510,292				0	0	0
3.2	1-Apr-81	BENICIA	335,699	0.0000%	0.0057%	0.0000%	0	19	0
3.2	1-Apr-81	Pittsburg	1,536,048	0.0000%	0.0055%	0.0000%	0	85	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-May-81	BENICIA	877,820	0.0000%	0.0066%	0.0000%	0	58	0
3.2	1-Jun-81	BENICIA	1,337,250	0.0000%	0.0063%	0.0000%	0	84	0
3.2	1-Jul-81	BENICIA	1,739,360	0.0000%	0.0168%	0.0000%	0	293	0
1	1-Jan-82	NFH	2,557,676				0	0	0
1	1-Feb-82	Bear River	135,000				0	0	0
1	1-Feb-82	Cosumnes River	100,000				0	0	0
1	1-Feb-82	Doty Ravine Creek, Auburn & Coon Creek	94,800				0	0	0
1	1-Feb-82	NFH	2,077,112				0	0	0
1	1-Dec-81	NFH	3,100,896				0	0	0
2	1-May-82	RIO VISTA	727,925				0	0	0
2	1-Jun-82	RIO VISTA	1,149,000				0	0	0
3.2	1-Jul-82	BENICIA	1,458,625	0.0000%	0.0012%	0.0000%	0	18	0
3.2	1-Aug-82	BENICIA	1,457,905	0.0000%	0.0014%	0.0000%	0	20	0
1	1-Jan-83	American River	1,141,693				0	0	0
1	1-Feb-83	American River	475,492				0	0	0
1	1-Mar-83	American River	364,048				0	0	0
1	1-Apr-83	American River	971,612				0	0	0
1	1-Dec-82	Auburn Ravine Creek	86,432				0	0	0
1	1-Dec-82	Bear River	331,726				0	0	0
1	1-Dec-82	Cache Creek	167,020				0	0	0
1	1-Dec-82	Calaveras River	190,880				0	0	0
1	1-Dec-82	COON CREEK	100,640				0	0	0
1	1-Dec-82	Cosumnes River	599,040				0	0	0
1	1-Dec-82	Doty Ravine Creek	50,912				0	0	0
1	1-Dec-82	Dry Creek	223,449				0	0	0
1	1-Dec-82	MOKELUMNE RIVER	548,780				0	0	0
1	1-Dec-82	Putah Creek	158,788				0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Dec-82	Rancheria Creek	32,211				0	0	0
1	1-Dec-82	Secret Ravine Creek	61,568				0	0	0
1	1-Dec-82	Sutter Creek	31,018				0	0	0
3.2	1-Apr-83	BENICIA	615,000	0.0000%	0.0006%	0.0000%	0	4	0
3.2	1-Apr-83	Vallejo	1,012,500	0.0000%	0.0006%	0.0000%	0	6	0
3.2	1-May-83	BENICIA	391,400	0.0000%	0.0006%	0.0000%	0	2	0
3.2	1-Jun-83	BENICIA	603,300	0.0000%	0.0007%	0.0000%	0	4	0
3.2	1-Jul-83	BENICIA	1,915,200	0.0000%	0.0007%	0.0000%	0	13	0
3.2	1-Aug-83	BENICIA	0	0.0000%	0.0006%	0.0000%	0	0	0
3.2	1-Aug-83	Berkeley Marina	0	0.0000%	0.0006%	0.0000%	0	0	0
3.2	1-Aug-83	PORT CHICAGO	0	0.0000%	0.0006%	0.0000%	0	0	0
1	1-Mar-84	NFH	441,000				0	0	0
1	1-Apr-84	NFH	900,335				0	0	0
1	1-Jun-84	NFH	381,250				0	0	0
3.2	1-May-84	BENICIA	180,000	0.0000%	0.0032%	0.0000%	0	6	0
3.2	1-Jun-84	BENICIA	862,650	0.0000%	0.0032%	0.0000%	0	28	0
3.2	1-Jul-84	BENICIA	2,826,300	0.0000%	0.0034%	0.0000%	0	96	0
3.2	1-Jul-84	Berkeley Marina	0				0	0	0
3.2	1-Jul-84	FORT BAKER MINOR PT	0				0	0	0
3.2	1-Jul-84	PORT CHICAGO	0				0	0	0
1	1-Jan-85	NFH	5,350,800				0	0	0
1	1-Feb-85	NFH	3,407,900				0	0	0
1	1-Mar-85	NFH	531,680				0	0	0
2	1-Apr-85	Garcia Bend	424,800				0	0	0
2	1-May-85	Garcia Bend	285,600				0	0	0
3.2	1-May-85	BENICIA	692,400	0.0000%	0.0016%	0.0000%	0	11	0
3.2	1-Jun-85	BENICIA	2,987,700	0.0000%	0.0016%	0.0000%	0	47	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Jul-85	BENICIA	820,300	0.0000%	0.0016%	0.0000%	0	13	0
	1-Jul-85	Berkeley Marina	0	0.0000%	0.0013%	0.0000%	0	0	0
2	1-Jan-86	DISCOVERY PARK	452,915				0	0	0
2	1-Jan-86	Garcia Bend	386,700				0	0	0
2	1-Feb-86	DISCOVERY PARK	3,668,925				0	0	0
2	1-Mar-86	Garcia Bend	523,180				0	0	0
3.2	1-May-86	BENICIA	497,790	0.0000%	0.0018%	0.0000%	0	9	0
3.2	1-Jun-86	BENICIA	2,850,750	0.0000%	0.0019%	0.0000%	0	53	0
3.2	1-Jul-86	BENICIA	1,538,950	0.0000%	0.0020%	0.0000%	0	31	0
1	1-Jan-87	Cosumnes River	216,000				0	0	0
1	1-Jan-87	NFH	1,038,000				0	0	0
1	1-Feb-87	NFH	647,480				0	0	0
2	1-Apr-87	DISCOVERY PARK	401,600				0	0	0
3.2	1-May-87	BENICIA	1,310,975	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-87	BENICIA	2,594,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-87	BENICIA	271,050	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Mar-88	DISCOVERY PARK	410,710				0	0	0
2	1-Mar-88	Garcia Bend	345,260				0	0	0
2	1-Apr-88	DISCOVERY PARK	96,600				0	0	0
2	1-Apr-88	Garcia Bend	116,600				0	0	0
2	1-Apr-88	MILLER PARK	285,000				0	0	0
2	1-Jun-88	DISCOVERY PARK	145,000				0	0	0
3.2	1-May-88	BENICIA	264,000	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-88	BENICIA	1,183,593	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-88	Mare Island	1,364,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-88	BENICIA	580,700	0.0000%	0.0000%	0.0000%	0	0	0
2	1-Feb-89	DISCOVERY PARK	170,752				0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	1-Feb-89	Garcia Bend	1,083,740				0	0	0
2	1-Feb-89	MILLER PARK	529,250				0	0	0
2	1-Mar-89	DISCOVERY PARK	682,020				0	0	0
2	1-Mar-89	MILLER PARK	1,662,387				0	0	0
2	1-Jun-89	Garcia Bend	99,400				0	0	0
3.2	1-Jan-89	Suisun	815,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-89	BENICIA	657,314	0.0000%	0.0000%	0.0010%	0	0	7
3.2	1-Jul-89	BENICIA	2,629,870	0.0000%	0.0000%	0.0010%	0	0	26
1	1-Jan-90	American River	3,123,500				0	0	0
1	1-Jan-90	AMERICANR-COON CREEK	124,500				0	0	0
1	1-Jan-90	Auburn Ravine Creek	124,500				0	0	0
1	1-Jan-90	Bear River	273,800				0	0	0
1	1-Jan-90	Cosumnes River	522,800				0	0	0
1	1-Jan-90	Dry Creek	124,500				0	0	0
1	1-Feb-90	American River	759,516				0	0	0
1	1-Mar-90	American River	575,230				0	0	0
1	1-Apr-90	American River	846,265				0	0	0
1	1-May-90	American River	624,500				0	0	0
3.2	1-May-90	BENICIA	338,800	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-90	BENICIA	195,718	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jun-90	Maritime Acad.	376,200	0.0000%	0.0000%	0.0000%	0	0	0
3.2	1-Jul-90	BENICIA	1,001,650	0.0000%	0.0000%	0.0000%	0	0	0
1	1-Jan-91	Secret Ravine Creek	26,640				0	0	0
1	1-Feb-91	Auburn Ravine Creek	17,200				0	0	0
1	1-Mar-91	AMERICANR-COON CREEK	99,008				0	0	0
1	1-Mar-91	Cosumnes River	97,920				0	0	0
1	1-Mar-91	Dry Creek	197,352				0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	1-Mar-91	Garcia Bend	96,000				0	0	0
2	1-Mar-91	MILLER PARK	1,174,500				0	0	0
2	1-Apr-91	Garcia Bend	848,835				0	0	0
2	1-Apr-91	MILLER PARK	148,750				0	0	0
2	1-May-91	RIO VISTA	1,543,000				0	0	0
3.2	1-May-91	BENICIA	1,029,300	0.0000%	0.0029%	0.0027%	0	30	28
3.2	1-Jun-91	BENICIA	1,592,700	0.0000%	0.0031%	0.0027%	0	49	43
3.2	1-Jul-91	BENICIA	443,100	0.0000%	0.0032%	0.0027%	0	14	12
1	1-Feb-92	AMERICANR-COON CREEK	114,600				0	0	0
1	1-Feb-92	Auburn Ravine Creek	101,612				0	0	0
1	1-Mar-92	Bear River	118,400				0	0	0
1	1-Mar-92	Cosumnes River	514,000				0	0	0
1	1-Mar-92	Dry Creek	118,400				0	0	0
2	1-Jan-92	MILLER PARK	414,000				0	0	0
2	1-Feb-92	MILLER PARK	229,200				0	0	0
2	1-Mar-92	Garcia Bend	3,098,500				0	0	0
2	1-Apr-92	Garcia Bend	1,844,990				0	0	0
3.2	1-May-92	BENICIA	2,664,950	0.0000%	0.0009%	0.0000%	0	24	0
3.2	1-Jun-92	BENICIA	1,557,000	0.0000%	0.0010%	0.0000%	0	15	0
3.2	1-Jul-92	BENICIA	177,200	0.0000%	0.0011%	0.0000%	0	2	0
1	1-Feb-93	AMERICANR-COON CREEK	100,190				0	0	0
1	1-Feb-93	Auburn Ravine Creek	101,190				0	0	0
1	1-Feb-93	Cosumnes River	200,380				0	0	0
1	1-Feb-93	Dry Creek	100,190				0	0	0
1	1-Feb-93	Miners Ravine Creek	50,095				0	0	0
1	1-Mar-93	Secret Ravine Creek	51,660				0	0	0
2	1-Feb-93	MILLER PARK	774,860				0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
2	1-Mar-93	MILLER PARK	2,534,800				0	0	0
2	1-Apr-93	MILLER PARK	1,312,550				0	0	0
2	1-Jun-93	RIO VISTA	449,275				0	0	0
2	1-Jun-93	Sacramento River	2,262,200				0	0	0
3.2	1-Jul-93	BENICIA	490,600	0.0000%	0.0018%	0.0000%	0	9	0
3.2	1-Jul-93	San Francisco Bay, San Yerba Buena Naval Yard	110,000	0.0000%	0.0019%	0.0000%	0	2	0
3.2	1-Jul-93	WICKLAND OIL NET PEN	639,800	0.0000%	0.0018%	0.0000%	0	12	0
3.2	1-Aug-93	BENICIA	362,000	0.0000%	0.0019%	0.0000%	0	7	0
3.2	1-Aug-93	WICKLAND OIL NET PEN	604,200	0.0000%	0.0019%	0.0000%	0	11	0
1	1-Jan-94	Cosumnes River	206,800				0	0	0
1	1-Feb-94	AMERICANR-COON CREEK	107,800				0	0	0
1	1-Feb-94	Auburn Ravine Creek	107,800				0	0	0
1	1-Feb-94	Dry Creek	107,800				0	0	0
1	1-Feb-94	Miners Ravine Creek	53,900				0	0	0
1	1-Feb-94	Secret Ravine Creek	53,900				0	0	0
2	1-Jan-94	MILLER PARK	1,998,700				0	0	0
2	1-Feb-94	MILLER PARK	1,105,500				0	0	0
2	1-Apr-94	MILLER PARK	713,500				0	0	0
2	1-May-94	MILLER PARK	478,600				0	0	0
3.2	1-Jun-94	BENICIA	1,565,900	0.0021%	0.0023%	0.0001%	34	36	2
3.2	1-Jun-94	San Francisco Bay, San Yerba Buena Naval Yard	78,000	0.0021%	0.0024%	0.0001%	2	2	0
3.2	1-Jun-94	WICKLAND OIL NET PEN	2,509,100	0.0021%	0.0023%	0.0001%	54	58	3
3.2	1-Jul-94	BENICIA	36,600	0.0021%	0.0023%	0.0001%	1	1	0
1	1-Feb-95	AMERICANR-COON CREEK	99,840				0	0	0
1	1-Feb-95	Auburn Ravine Creek	99,840				0	0	0
1	1-Feb-95	Cosumnes River	200,720				0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
1	1-Feb-95	Dry Creek	100,880				0	0	0
1	1-Feb-95	Miners Ravine Creek	49,920				0	0	0
1	1-Feb-95	Secret Ravine Creek	49,920				0	0	0
2	1-Jan-95	MILLER PARK	1,603,640				0	0	0
2	1-Feb-95	Garcia Bend	3,903,475				0	0	0
2	1-Mar-95	MILLER PARK	591,008				0	0	0
3.2	1-Jun-95	BENICIA San Francisco Bay, San Yerba Buena Naval Yard	874,450	0.0000%	0.0011%	0.0002%	0	10	2
3.2	1-Jun-95	WICKLAND OIL NET PEN	484,000	0.0000%	0.0011%	0.0002%	0	5	1
3.2	1-Jun-95	BENICIA San Francisco Bay, San Yerba Buena Naval Yard	973,650	0.0000%	0.0011%	0.0002%	0	11	2
3.2	1-Jul-95	BENICIA San Francisco Bay, San Yerba Buena Naval Yard	187,000	0.0000%	0.0012%	0.0002%	0	2	0
3.2	1-Jul-95	WICKLAND OIL NET PEN	204,000	0.0000%	0.0011%	0.0002%	0	2	0
3.2	1-Jul-95	WICKLAND OIL NET PEN	1,500,600	0.0000%	0.0011%	0.0002%	0	17	3
1	1-Jan-96	AMERICANR-COON CREEK	102,000				0	0	0
1	1-Jan-96	Auburn Ravine Creek	104,400				0	0	0
1	1-Jan-96	Cosumnes River	228,000				0	0	0
1	1-Jan-96	Dry Creek	102,000				0	0	0
1	1-Jan-96	Miners Ravine Creek	51,600				0	0	0
1	1-Jan-96	Secret Ravine Creek	51,600				0	0	0
2	1-Jan-96	MILLER PARK	1,934,400				0	0	0
2	1-Feb-96	MILLER PARK	2,149,301				0	0	0
3.2	1-May-96	BENICIA San Francisco Bay, San Yerba Buena Naval Yard	538,600	0.0000%	0.0006%	0.0000%	0	3	0
3.2	1-May-96	WICKLAND OIL NET PEN	253,000	0.0000%	0.0006%	0.0000%	0	1	0
3.2	1-May-96	WICKLAND OIL NET PEN	1,078,600	0.0000%	0.0006%	0.0000%	0	6	0
3.2	1-Jun-96	BENICIA San Francisco Bay, San Yerba Buena Naval Yard	1,008,450	0.0000%	0.0006%	0.0000%	0	6	0
3.2	1-Jun-96	San Francisco Bay, San Yerba Buena Naval Yard	67,200	0.0000%	0.0006%	0.0000%	0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location Yard	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-Jun-96	WICKLAND OIL NET PEN	1,084,600	0.0000%	0.0006%	0.0000%	0	6	0
1	1-Feb-97	AMERICANR-COON CREEK	102,096				0	0	0
1	1-Feb-97	Auburn Ravine Creek	102,600				0	0	0
1	1-Feb-97	Dry Creek	110,040				0	0	0
1	1-Feb-97	Miners Ravine Creek	55,836				0	0	0
1	1-Feb-97	Secret Ravine Creek	50,268				0	0	0
2	1-Jan-97	MILLER PARK	2,011,880				0	0	0
2	1-Feb-97	Garcia Bend	1,066,540				0	0	0
2	1-Feb-97	MILLER PARK	797,980				0	0	0
2	1-Mar-97	Garcia Bend	1,249,036				0	0	0
3.2	1-May-97	BENICIA	367,600	0.0000%	0.0028%	0.0000%	0	10	0
3.2	1-May-97	WICKLAND OIL NET PEN	1,003,800	0.0000%	0.0028%	0.0000%	0	28	0
3.2	1-Jun-97	WICKLAND OIL NET PEN	2,683,400	0.0000%	0.0027%	0.0000%	0	73	0
1	1-Mar-98	AMERICANR-COON CREEK	120,450				0	0	0
1	1-Mar-98	Auburn Ravine Creek	126,900				0	0	0
1	1-Mar-98	Dry Creek	366,700				0	0	0
2	1-Mar-98	Garcia Bend	1,253,570				0	0	0
3.2	1-May-98	BENICIA	570,400	0.0000%	0.0009%	0.0000%	0	5	0
3.2	1-May-98	WICKLAND OIL NET PEN	372,000	0.0000%	0.0009%	0.0000%	0	3	0
3.2	1-Jun-98	Bennett's Marina	132,000	0.0000%	0.0009%	0.0000%	0	1	0
3.2	1-Jun-98	SF-San Francisco Bay	132,000	0.0000%	0.0009%	0.0000%	0	1	0
3.2	1-Jun-98	TIBURON NET PENS	52,000	0.0000%	0.0010%	0.0000%	0	1	0
3.2	1-Jun-98	WICKLAND OIL NET PEN	2,693,254	0.0000%	0.0010%	0.0000%	0	26	0
1	1-Apr-99	AMERICANR-COON CREEK	118,400				0	0	0
1	1-Apr-99	Auburn Ravine Creek	100,750				0	0	0
1	1-Apr-99	Dry Creek	321,720				0	0	0

Nimbus Fish Hatchery, American River

Release Location Code	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	1-May-99	BENICIA	120,000	0.0030%	0.0033%	0.0000%	4	4	0
3.2	1-May-99	WICKLAND OIL NET PEN	896,900	0.0030%	0.0032%	0.0000%	27	29	0
3.2	1-Jun-99	BENICIA	509,208	0.0030%	0.0032%	0.0000%	15	16	0
3.2	1-Jun-99	SF-San Francisco Bay	217,500	0.0030%	0.0034%	0.0000%	7	7	0
3.2	1-Jun-99	TIBURON NET PENS	52,008	0.0030%	0.0037%	0.0000%	2	2	0
3.2	1-Jun-99	WICKLAND OIL NET PEN	2,741,792	0.0030%	0.0032%	0.0000%	83	89	0
3.2	1-May-00	BENICIA	356,200	0.0000%	0.0008%	0.0000%	0	3	0
3.2	1-May-00	WICKLAND OIL NET PEN	1,735,500	0.0000%	0.0008%	0.0000%	0	15	0
3.2	1-Jun-00	WICKLAND OIL NET PEN	1,760,000	0.0000%	0.0008%	0.0000%	0	15	0
3.2	1-Jun-02	TIBURON NET PENS	50,400	0.0024%	0.0020%	0.0007%	1	1	0
3.2	1-Jun-02	WICKLAND OIL NET PEN	1,493,073	0.0024%	0.0020%	0.0007%	36	30	11
3.2	1-Jul-02	WICKLAND OIL NET PEN	1,736,850	0.0024%	0.0020%	0.0007%	42	35	12
3.2	1-May-03	WICKLAND OIL NET PEN	480,000	0.0009%	0.0015%	0.0000%	4	7	0
3.2	1-Jun-03	Treasure Island USCG Station	502,300	0.0009%	0.0015%	0.0000%	4	7	0
3.2	1-Jun-03	WICKLAND OIL NET PEN	3,379,000	0.0009%	0.0015%	0.0000%	30	49	0
3.2	1-Jun-04	SAN PABLO BAY	4,693,466	0.0000%	0.0014%	0.0000%	0	68	0
3.2	25-May-05	WICKLAND OIL TERMINAL	1,854,000				0	0	0
3.2	26-May-05	WICKLAND OIL TERMINAL	152,500				0	0	0
3.2	2-Jun-05	WICKLAND OIL TERMINAL	290,400				0	0	0
3.2	3-Jun-05	WICKLAND OIL TERMINAL	154,100				0	0	0
3.2	6-Jun-05	WICKLAND OIL TERMINAL	142,600				0	0	0
3.2	7-Jun-05	VALLEJO PUBLIC BOAT RAMP	138,000				0	0	0
3.2	8-Jun-05	WICKLAND OIL TERMINAL	400,200				0	0	0
3.2	9-Jun-05	WICKLAND OIL TERMINAL	253,700				0	0	0
3.2	10-Jun-05	WICKLAND OIL TERMINAL	143,000				0	0	0
3.2	13-Jun-05	WICKLAND OIL TERMINAL	289,800				0	0	0
3.2	20-Jun-05	WICKLAND OIL TERMINAL	524,400				0	0	0

Nimbus Fish Hatchery, American River

Release Location	Date Released	Release Location	Total Number Released	Merced Recovery Rates			Escapement		
				Age 2	Age 3	Age 4	Age 2	Age 3	Age 4
3.2	22-Jun-05	WICKLAND OIL TERMINAL	91,300				0	0	0
3.2	2-Jun-06	WICKLAND OIL TERMINAL	136,000				0	0	0
3.2	5-Jun-06	San Francisco Bay	271,400				0	0	0
3.2	6-Jun-06	San Francisco Bay	239,200				0	0	0
3.2	7-Jun-06	San Francisco Bay	239,200				0	0	0
3.2	8-Jun-06	San Francisco Bay	253,000				0	0	0
3.2	9-Jun-06	San Francisco Bay	279,400				0	0	0
3.2	12-Jun-06	San Francisco Bay	276,000				0	0	0
3.2	13-Jun-06	San Francisco Bay	303,900				0	0	0
3.2	14-Jun-06	San Francisco Bay	294,400				0	0	0
3.2	15-Jun-06	San Francisco Bay	299,600				0	0	0
3.2	16-Jun-06	San Francisco Bay	321,500				0	0	0
3.2	19-Jun-06	San Francisco Bay	225,000				0	0	0

