Draft 10/18/2004

Report on Central Valley Project Improvement Act 3406(b)(3) Water Acquisitions for Environmental Purposes, 1994-2004

Section 3406(b)(3) of the Central Valley Project Improvement Act (CVPIA) of 1992 requires the Department of Interior to acquire water to supplement the Central Valley streamflows available for fish and wildlife. Interior has established the Water Acquisition Program to implement this provision. Interior's initial acquisitions in 1994 were to improve salmonid habitat in the spring and fall in the San Joaquin River and tributaries. In 1995 the Anadromous Fish Restoration Program (AFRP) developed flow objectives for Central Valley streams and in 1996 distributed Draft Guidelines for Allocation of Water Acquired Pursuant to Section 3406(b)(3) of the CVPIA. Since its initial acquisition in May 1994, until mid-fiscal year 2004, the Water Acquisition Program has spent approximately $53 million to temporarily increase streamflows in Battle Creek and in San Joaquin River tributaries to increase flows toward AFRP objectives without monetary cost to the Pacific Gas & Electric Company, to San Joaquin basin water purveyors, or to Central Valley Project contractors.

Of the approximate $53 million spent on environmental water acquisitions from Fiscal Years 1994 to 2004, about $38 million was paid to water districts on the Merced, Tuolumne, and Stanislaus Rivers under the 1999 San Joaquin River Agreement as insurance that they would operate their projects to release moderate amounts of water in the spring and fall for the Vernalis Adaptive Management Plan (VAMP) and to aid chinook salmon survival in the San Joaquin River basin and past the State and Federal pumps near Tracy in the southeast Sacramento-San Joaquin Delta . The total volume of water provided for these purposes was about 635,000 acre-feet (Table 1).

Approximately $5.6 million of total expenditures went for approximately 150,000 AF of pre-San Joaquin River Agreement flows from the Merced and Tuolumne Rivers in 1994 and 1997, most of it from the Merced Irrigation District. The acquired flow was intended to reduce adult Chinook salmon straying, improve adult salmon migration conditions, increase survival of juveniles migrating past the Delta pumps, and to reduce fish losses caused by diversion to storage in the tributaries.

Approximately $5.4 million was used to buy about 148,000 AF of Stanislaus River water from the Oakdale Irrigation District and South San Joaquin Irrigation District in 1994, 1995, 1997, and 1998 to increase juvenile salmon survival in the Stanislaus River and during their migration past the Delta pumps. Included in the purchase was 50,000 AF intended to augment low flows during the chinook salmon spawning, rearing, and emigration period, and lost when New Melones Dam filled and spilled in the wet winter of 1998.

About $1,800,000 was paid to the Pacific Gas and Electric Company (PG&E) from 1995 through February 2001 to increase streamflow in certain reaches of Battle Creek by bypassing power production. About 87,000 AF were left in the creek rather than diverted to powerhouses during this period. This ensured minimal flows of 30 cubic feet per second (cfs) in South Fork and North Fork Battle Creek during dry periods when flows could otherwise drop to the minimum 5 and 3 cfs required by PG&E's Federal Energy Regulatory Commission license number 1121.

None of the water acquired under Section 3406(b)(3) or released for VAMP was used consumptively. The San Joaquin basin acquisitions were protected as instream flow only to Vernalis, upstream of the State and Federal export pumps, and the Battle Creek water merely changed uses within the creek. Once it reached Vernalis or the Sacramento River, all the water acquired for stream flows was considered abandoned and could be exported if conditions permitted.

The San Joaquin River Agreement and VAMP

The major emphasis of the 3406(b)(3) Water Acquisition Program has been to support the San Joaquin River Agreement. This is an arrangement between various State and Federal agencies and water districts that provides for payment from the CVPIA Restoration Fund and State funds to water-rights holders on the Stanislaus, Tuolumne, and Merced Rivers to provide water for a 12-year period, avoiding the potential court challenges that were expected if the California State Water Resources Control Board required increased upstream releases for meeting Water Quality Control Plan (D-1641) protection for the Delta.

Part of the San Joaquin River Agreement is the Vernalis Adaptive Management Plan (VAMP), a 12-year study of the relationship between San Joaquin River flows, exports at the State and Federal Delta pumps, the Head of Old River flow-control barrier near the pumps, and the survival of juvenile San Joaquin River Chinook salmon. Annually, Interior pays $4,000,000 for VAMP, escalated each January by the CPI-U index, under Section 3406(g) of the CVPIA, and the State of California reimburses Interior $1,334,000 as part of their CVPIA cost share. Payments go to water districts on the tributaries to ensure that under certain conditions up to 110,000 AF will be provided from the tributaries in April and May to partially replace the spring snow-melt runoff that the districts and the Central Valley Project divert to storage during years of normal or below normal precipitation. Because the basic agreement is capped at 110,000 AF, up to an additional $2.8 million in Federal expenditures may be required to buy more water from the districts to reach the flows proposed for this evaluation.

Although maximum acquisitions under VAMP could rise to about 157,000 AF, they have ranged from approximately 33,000 AF to 147,000 AF. In addition, the San Joaquin River Agreement provides for total yearly payments of about $1,650,000, escalated annually by the CPI-U index, for 27,500 acre-feet from the Merced Irrigation District and Oakdale Irrigation District made available in the fall of each year. This water has been used to raise flows in the Merced and Stanislaus rivers to improve upstream migration of adult salmon and increase available salmon spawning and egg incubation habitat.

The VAMP evaluation involves tagging juvenile hatchery salmon and evaluating the effects on their survival under the different flow and export patterns that will occur over the 12 years of the study, which just completed its sixth year. The increased flows released from the upstream diverters are expected to improve survival through the part of the migration path where fish may be drawn toward the Delta export pumps.

Preliminary results are provided annually, and final findings will be available at the study's end.

Pre-VAMP San Joaquin River Acquisitions

Prior to the San Joaquin River Agreement, the Water Acquisition Program acquired water in the San Joaquin River drainage, starting with about 28,450 AF from the Merced Irrigation District and about 15,000 AF from Oakdale and South San Joaquin Irrigation districts in 1994. Approximately, 33,000 AF was acquired from the Oakdale Irrigation District and South San Joaquin Irrigation District in 1995. No water was acquired in 1996. In 1997 spring flows similar to the VAMP evaluation flows were acquired from the Merced Irrigation District, Modesto Irrigation District, San Joaquin River Exchange Contractors, Oakdale Irrigation District and South San Joaquin Irrigation District. The contract with Oakdale and South San Joaquin irrigation districts was 50,000 acre-feet to be used in 1997 and 50,000 AF in 1998. Because 1998 turned out to be an extremely wet year, 50,000 AF of the previously-acquired water was not needed for flow augmentation. It was lost when New Melones Reservoir, where it was stored, filled and spilled in the winter of 1997-98. In addition to these purchases, the program processed a Calfed purchase of 50,000 acre-feet from Oakdale Irrigation District, which was released in the summer of 1999 to reduce Stanislaus River temperatures.

Effects of San Joaquin River Acquisitions

The direct effect of the flow acquisitions was to provide a minimal amount of water for fish and other aquatic animals and plants to live in for brief but possibly critical periods their life cycles. The particular target species of all these actions were Chinook salmon, although steelhead trout and other ecosystem components could also benefit from them.

Figure 1 San Joaquin River Tributaries

Chinook salmon returns to the San Joaquin system tend to fluctuate widely, in a pattern apparently resulting from the magnitude of spring flows in the year when the fish left the river as juveniles. There is a correlation between spring flows in the lower San Joaquin River during the juvenile salmon emigration period and adult salmon returns to the San Joaquin tributaries two and a half years later, with higher flows resulting in higher returns. Figure 2 is a rough indication of this, showing estimated populations of naturally-spawning San Joaquin River salmon from 1967 to 2003, which included dry periods in the 1970's and from the late 1980's to the early 1990's.

As can be seen in Figure 2, the spawning populations have recently started to climb from very low levels during the dry period from 1987 to 1994 to ten and more times as many during the wetter years that followed. Although it was at times far overshadowed by natural flows, acquired San Joaquin River tributary water contributed to the more hospitable conditions for fish during these later years, and contributed to the increased fish production.

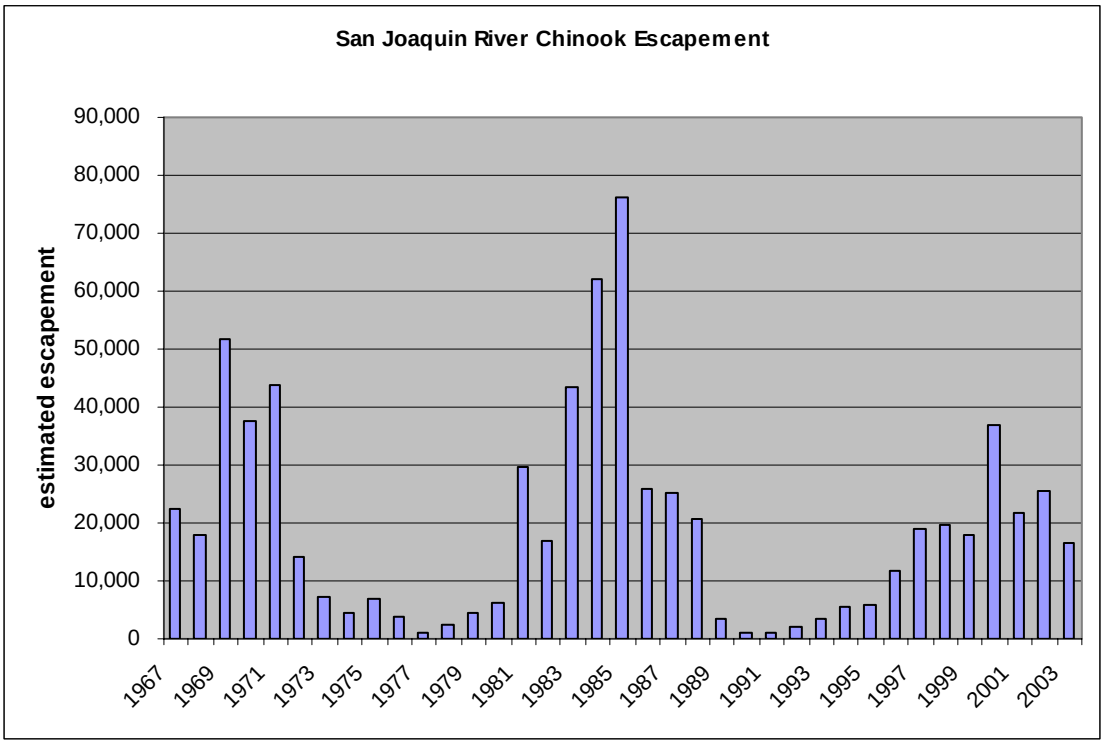

Figure 2 Estimated San Joaquin River Chinook Salmon Escapement, 1967-2003

Figure 3

Evaluating the effect of flows and exports through the area of the export facilities with the Head of Old River barrier in place, while providing a level of fish protection is the primary purpose of the VAMP, and definitive results are hoped for at the end of the program period. The evaluation is built around estimation of the mortality of tagged hatchery Chinook salmon in the area of the pumps, to be used as an index to compare various spring flow and export levels. As noted above, it is expected that by the end of

the experimental period enough data will have been collected to develop a formally statistical evaluation of Central Valley Project and State Water Project operational effects on south Delta fisheries.

Evaluating the effects of the acquired flows in the rivers where they originate, the Merced the Tuolumne, and the Stanislaus is being carried out through expansion of fisheries investigations on the rivers. Figures 3, 4, and 5 indicate that the spawning populations in these San Joaquin tributaries are also increasing from the low levels observed during the 1987-1994 dry period. Until recently, the effects of flows in the tributaries have been gauged largely by evaluations with tagged hatchery fish, which necessarily focuses on the few days of a salmon's life history when it is actively migrating toward the Delta. A much more comprehensive study has been developed for the Merced River, and a plan for the Stanislaus River is in planning stages. The ultimate goal of in-river studies is to determine how periods of high flow have resulted in higher salmon populations, so that the relatively small volumes that can be acquired may be used more effectively.

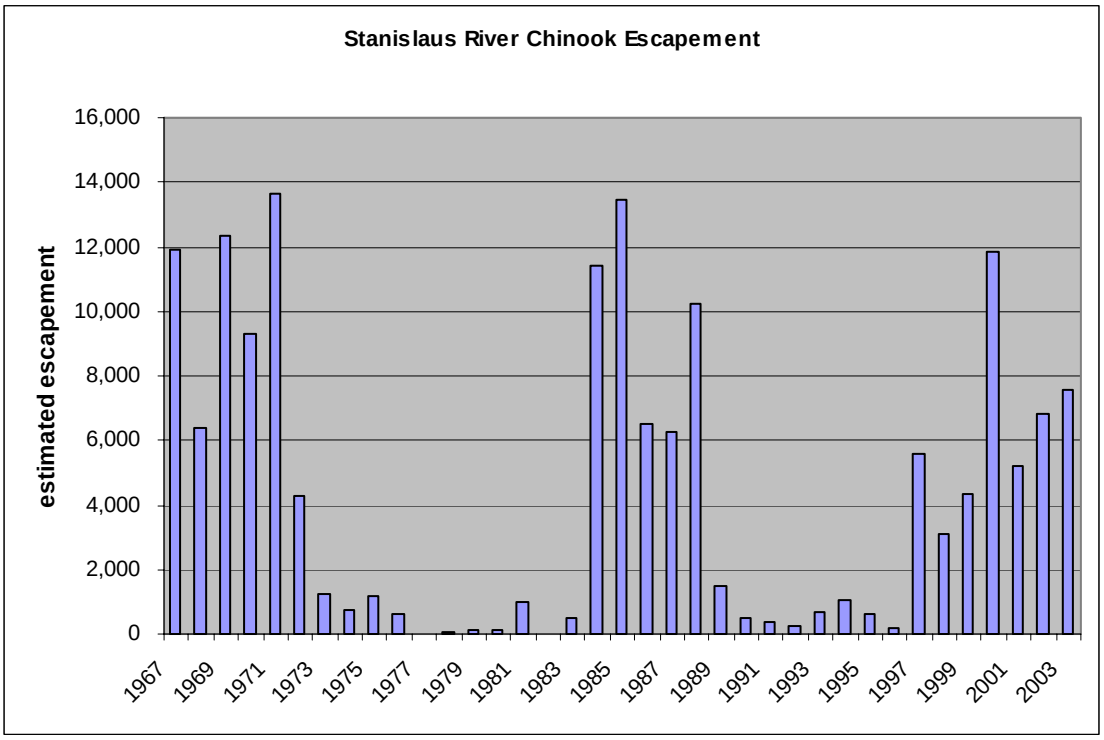

Figure 4 Estimated Stanislaus River Chinook Salmon Escapement, 1967-2003

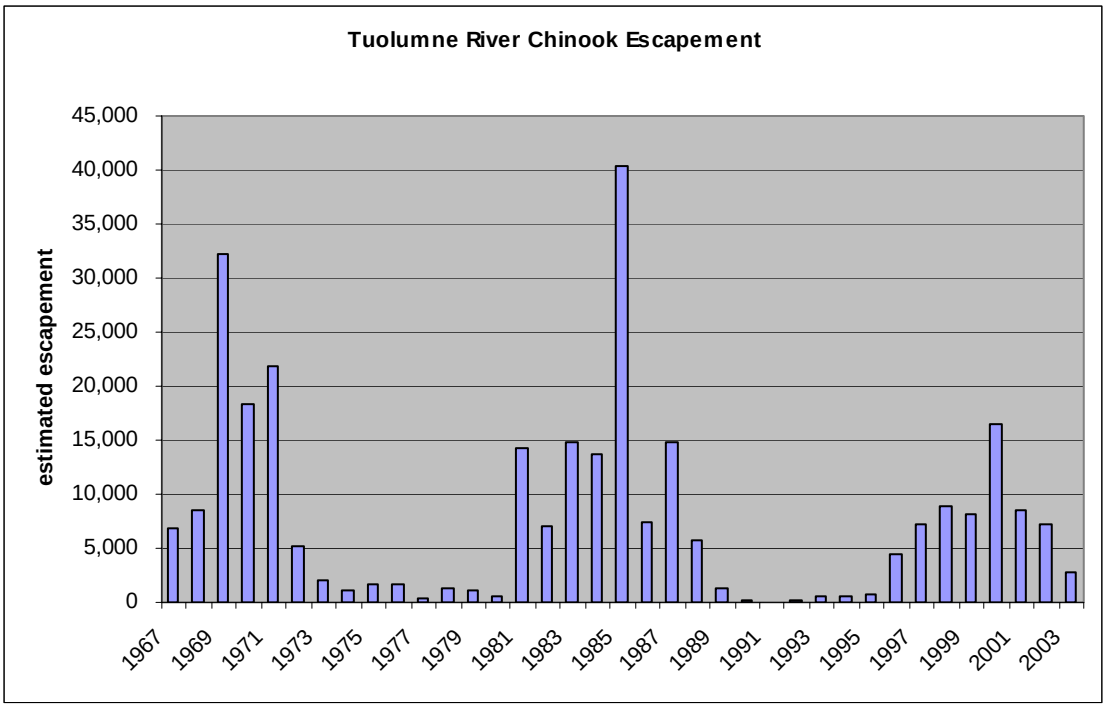

Figure 5 Estimated Tuolumne River Chinook Salmon Escapement, 1967-2003

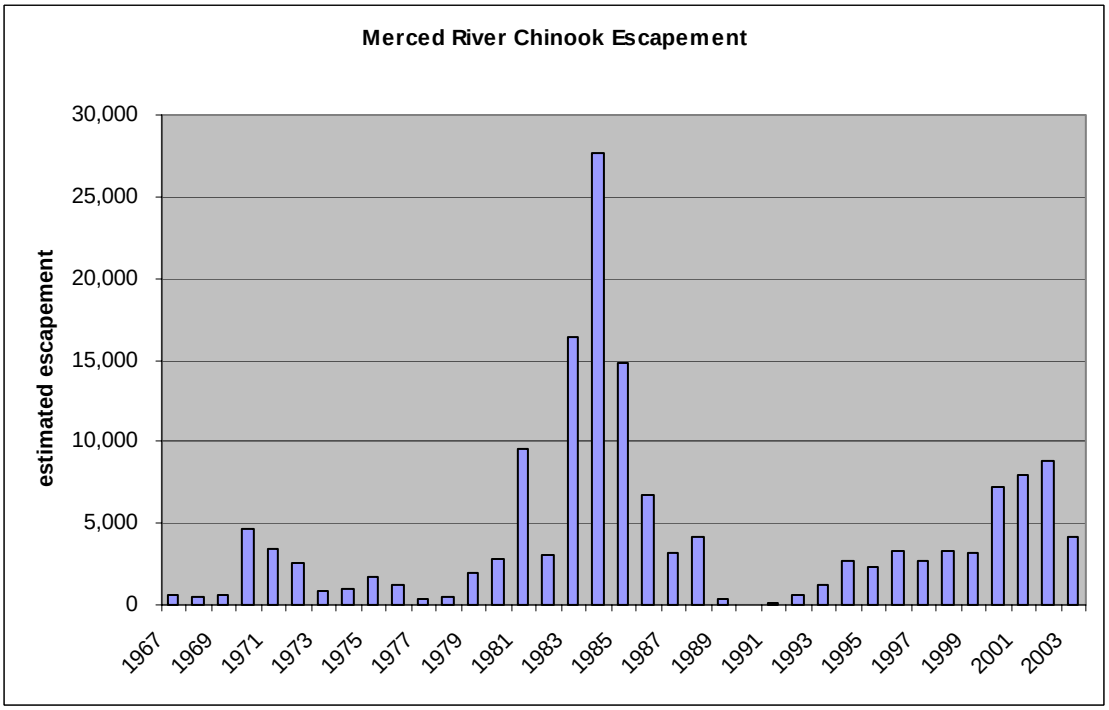

Figure 6 Estimated Merced River Chinook Salmon Escapement, 1967-2003

Increased Flows and Power Generation Foregone on Battle Creek

Under its 1976 Federal Energy Regulatory Commission license number 1121 for power generation on Battle Creek, the Pacific Gas & Electric Company is required to release a minimum of 3 cfs at Eagle Canyon Dam, which is the upper boundary for Chinook salmon and steelhead on the North Fork, and 5 cfs to the salmon spawning and rearing area below Inskip Powerhouse and the Coleman Diversion on the South Fork. These minimum required flows, which by themselves are inadequate for salmon spawning and rearing, are usually met without acquisition from late fall to spring, because natural flows exceed powerhouse diversion capacities. In drier summer and fall periods, however, power

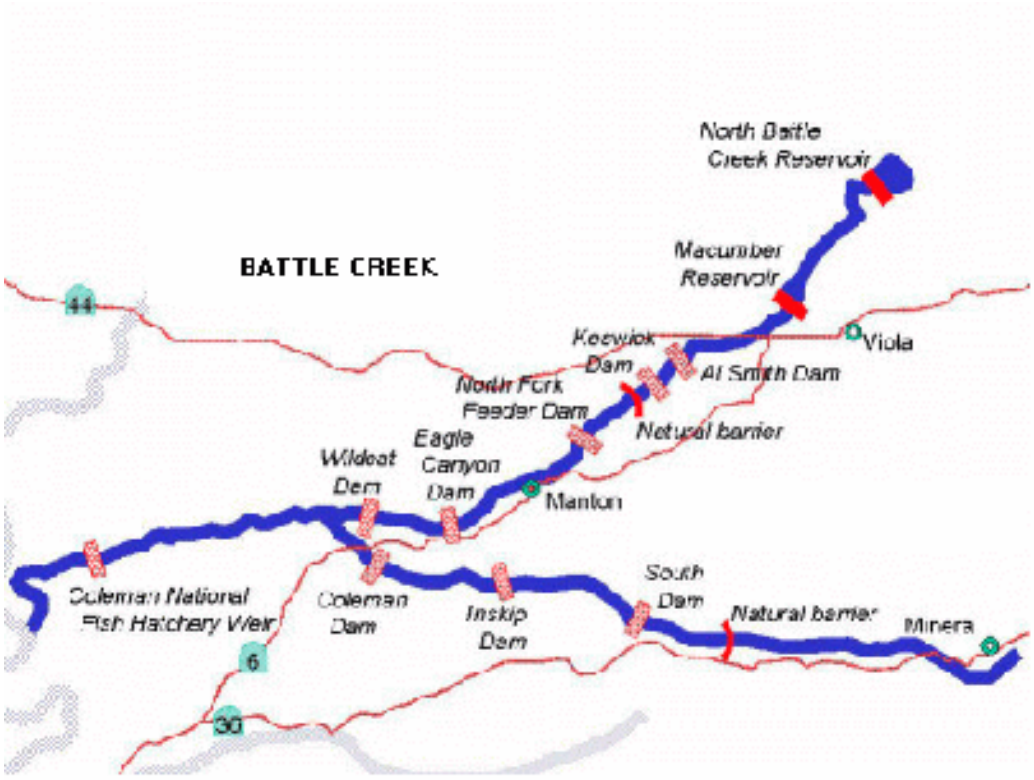

Figure 7 Battle Creek Map Showing Dams and Barriers

developments have the capacity to divert all natural flow, leaving only the minimum flows, which would make the creek unsuitable for the natural runs of spring-run Chinook, fall-run Chinook, and steelhead that used it historically. There is also some evidence for a historical run of winter-run Chinook in Battle Creek, and resource managers are hoping to establish them in the North Fork, which would be impossible at the current required minimum flows.

From 1995 to 2001 the Water Acquisition Program paid the Pacific Gas & Electric Company for the power-generation value of water to provide increased summer and fall flows for Chinook salmon and steelhead habitat, including lower water temperatures. Table 1 includes the flow volumes added to the South Fork downstream from Coleman Diversion and the North Fork downstream from Eagle Canyon Diversion, and their costs. After 2001, Calfed assumed responsibility for flows in Battle Creek.

The program is managed to maintain flows of at least 30 cfs in the South Fork and 30 cfs in the North Fork of Battle Creek. When curtailment of power diversions is necessary to do this, the Pacific Gas & Electric Company provides the first 12.5 cfs at no cost, and if more water is needed the company is paid for power foregone. At times when no payments are shown in the table between 1997 and 2001, either the flow deficit was under 12.5 cfs or natural flows were over 30 cfs even with power diversions.

The goal of the increased flow is modest– to help the remnant populations of steelhead trout and spring-run Chinook salmon survive until the main features of the Battle Creek restoration program being implemented by Calfed are completed. This will include removal of several dams and maintenance of higher minimum instream flows.

Acquiring these flows guaranteed that at least a minimal amount of water would be in Battle Creek during the summer and fall to increase habitat for steelhead trout and spring and fall-run Chinook salmon. Exactly what effect this had on fish populations or production is unknown, and since few data are available on spring-run Chinook or steelhead in North Fork or South Fork Battle Creek, no direct production comparisons can be made.

Recently, however, counts have been made of unmarked and thus naturally reproducing steelhead passing the hatchery diversion dam and proceeding upstream. This has been possible only since 2001, because that was the first year when most returning hatchery steelhead could be assumed to have been marked since the start of a universal steelhead marking program in 1999. In 2001, an estimated 131 natural steelhead ascended Battle Creek between October and the beginning of March. In 2002, an estimated 323 passed the diversion dam. Other available preliminary data at the diversion dam indicate that about 40 possible spring-run or winter-run Chinook may have ascended Battle Creek in 2000, judging primarily by their period of migration between the end of March and mid-July.

These data indicate that Battle Creek steelhead trout and spring Chinook runs, while marginal, are being maintained. The degree to which their continued existence is attributable to the water added by payment for power foregone cannot be estimated with the existing record. However, since both steelhead and spring-run Chinook must at some life-stage spend summer and early fall in the creek, the effect must be substantial if the acquired minimum of 30 cfs in each fork is compared to the 3 cfs and 5 cfs minimum flows.

Discussion

The flows acquired on San Joaquin River tributaries and on Battle Creek were small compared to natural streamflows, and cannot be guaranteed to provide conditions that would cause fish to thrive. For example, the mid-April to mid-May Vernalis flow volume that can be added under the San Joaquin River Agreement ranges from zero to about 157,000 AF. According to California Department of Water Resources estimates, the average unimpaired volume at Vernalis is 918,000 AF in April and 1,440,000 AF in May, so the additional water, relative to natural conditions, does not appear to guarantee long-term ecological health. The highest acquisition program-aided VAMP flows are about equal to the lowest natural unimpaired flows estimated. However, the acquisitions from 1999 to 2004 increased *regulated* base flows at Vernalis by 25 to 50%, i.e., from about 4,600 cfs to 6,900 cfs in 1999, from about 4,800 cfs to 5,900 cfs in 2000, from about 2,900 cfs to 4,200 cfs in 2001, from about 2,700 cfs to 3,200 cfs in the dry spring of 2002, from 2,300 cfs to 3,200 cfs in 2003 and from 2,098 cfs to 3,155 cfs in 2004.

The Water Acquisition Program has concentrated on acquiring relatively large blocks of water offered for sale by San Joaquin basin water districts with large reservoirs and the ability to release water to the Delta. This has permitted increases in fall Chinook salmon spawning habitat, but has not re-created the very high spring flows that are required for the best-quality rearing and migration habitat in the spring. Acquired flows on the San Joaquin tributaries cannot be correctly characterized as restorative. This is particularly true in the case of the San Joaquin River Agreement flows, which are intended as a tool to enable scientific investigations that will be useful in setting permanent flow standards while providing an interim level of protection for fish and other components of the Bay-Delta ecosystem.

It has so far been difficult to acquire water rights to guarantee long-term instream flows. Aside from the major irrigation districts with storage facilities, water ownership tends to consist of a patchwork of small growing-season diversion rights, often controlled by court-appointed water-masters. The main long-term acquisitions that have been considered, small water rights on Butte Creek and Mill Creek, have been impeded by political and procedural delays, which include the need for technical determinations that the water is available on these adjudicated streams, and appraisal of the water's value under Department of the Interior acquisition procedures.

Smaller acquisitions on smaller streams, if it were possible to obtain them, might be the best investment of the Water Acquisition Program. As an example, under the dedicated fishery water provision of the Central Valley Project Improvement Act, Section 3406(b)(2), adequate water was available in Central Valley Project facilities on Clear Creek to double and triple its flows from 50-100 cfs to 150-200 cfs starting in 1995, changing it from a consistently low-flow stream that sporadically produced a few Chinook salmon in wet years to a productive although artificially-controlled salmon stream that is adding thousands of adult salmonids to its spawning population and perhaps millions of juvenile salmon and steelhead trout to the Sacramento River (Figure 7). If ways could be found to combine existing diversions and increase flows on a

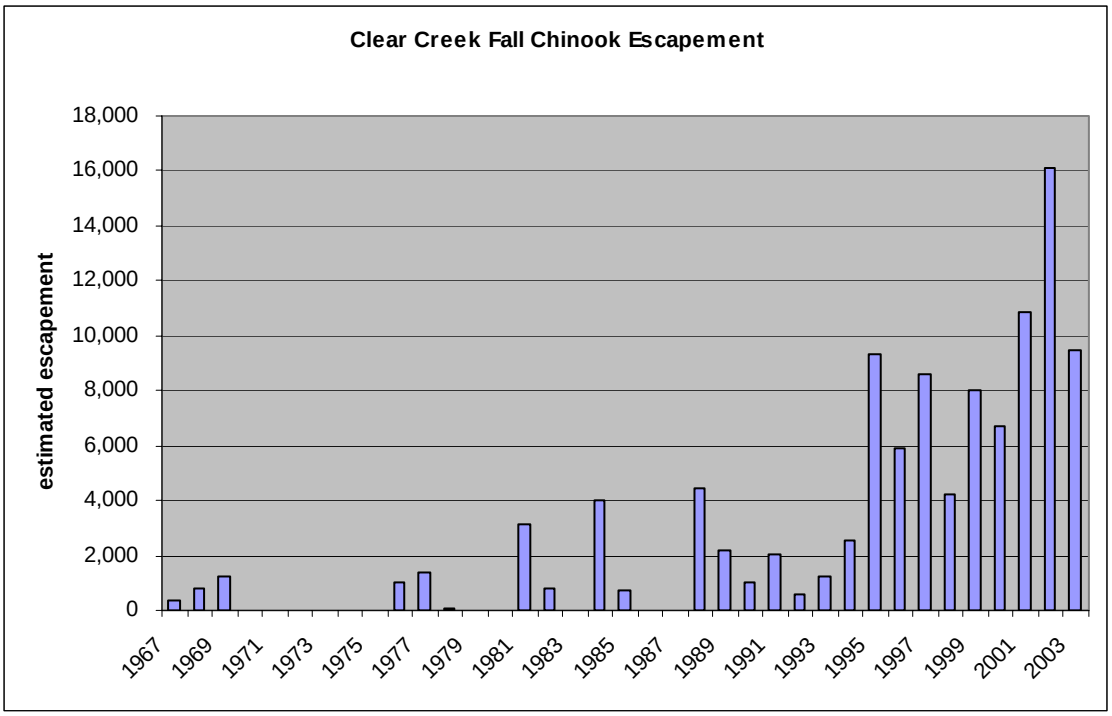

Figure 8 Clear Creek Chinook Salmon Escapement, 1967-2003

number of other Sacramento River tributaries, similar substantial increases in salmon production might be obtainable.

The case of Clear Creek shows that the relatively small amounts of water that can be acquired might be more productive in upstream tributaries, where it would have a proportionally greater effect on habitat, and could produce fish where few are now produced. The greatest drawback to this approach is the complex problem of assembling enough small diversion rights to make a difference, in streams such as Cow Creek, Butte Creek and the Cosumnes River. The Water Acquisition Program should pursue long-term purchases of water rights on smaller streams, and continue coordinating with Calfed to provide water to improve flows in Battle Creek in coordination with the Pacific Gas and Electric Company. The program should investigate improving flows through bypassing power production on other small salmonid streams with hydropower facilities. The acquisitions on the San Joaquin tributaries should continue to be evaluated pursuant to VAMP. Finally, additional acquisitions in the fall may contribute to improving salmonid spawning habitat consistent with the AFRP flow objectives.