

XIII. APPENDIX: Summation of Calfed Bay-Delta Program Ecosystem Restoration Program Plan Volumes I and II Visions and Actions Related to Battle Creek Biological Resources as Affected by Facilities and Operations of PG&E Hydroelectric System and Coleman National Fish Hatchery

Volume I: Ecological Attributes of the San Francisco Bay-Delta Watershed

1. Ecological Process Visions

Central Valley Stream Temperatures

Strategic Objective Targets, and Programmatic Actions

Stage 1 Expectations

- **Page 62:**

Several stream temperature actions should be implemented immediately. There is general agreement that these actions will improve stream temperatures without having significant impacts on water supply or energy resources. Many of these actions have been recommended by DFG and by AFRP but have not been implemented because of limited financial resources. They include:

- **Developing a long-term agreement with Pacific Gas and Electric Company (to provide appropriate compensation for energy losses) to monitor temperatures and provide bypass flows in the lower North Fork and South Fork segments of Battle Creek to maintain suitable temperatures for holding, spawning, and rearing habitat for spring-run and winter-run Chinook salmon and steelhead.**

STATUS: Implemented through 1999 MOU and AMP for Restoration Project.

2. Species and Species Group Visions

High Priority At-risk Species

Chinook Salmon

Resource Description

Sacramento River Winter-Run ESU

- **Page 210:**

Historically, winter-run populations existed in the upper Sacramento, Pit, McCloud, and Calaveras Rivers. The spawning habitat for these stocks was primarily located in the Sierra Nevada Ecoregion (Omernik 1987). Construction of dams on these rivers in the 1940s led to the elimination of populations in the San Joaquin Basin and displaced the Sacramento River population to areas below Shasta Dam. **There is also data to suggest that winter-run inhabited Battle Creek prior to its development for hydropower production.**

STATUS: Common references for this information include: Yoshiama et al. 1998; Coots and Healey 1966; Painter in Kano 1997; Slater 1963; USFWS 1987; Rutter 1903

3. Species and Species Group Visions

High Priority At-risk Species

Chinook Salmon

Strategic Objectives, Targets, and Programmatic Actions

Winter-Run Chinook Salmon

Stage 1 Expectations

- **Page 217:**

The cohort replacement rate (the number of future spawners produced by each spawner) in 7-10 years should continue to exceed 1.7 (as it has in recent years), and average abundance should increase.

Battle Creek restoration should have proceeded to a point where a determination can be made regarding the benefits of re-introducing winter-run Chinook. The determination will be based on genetic conditions. The probability of extinction of winter-run Chinook will have been recalculated using assumptions regarding the establishment of an additional self-sustaining winter-run Chinook population.

STATUS: A feasibility study is to be completed by the state and federal fishery agencies in 2004 and 2005 depending on approval of Restoration Project by FERC.

4. Species and Species Group Visions

High Priority At-risk Species

Chinook Salmon

Strategic Objectives, Targets, and Programmatic Actions

Spring-Run Chinook Salmon

Stage 1 Expectations

- **Page 218:**

Better methods for estimating population sizes should be developed. Populations in Deer, Mill, and Butte creeks should remain within numbers found in streams in 1990-1998, with a cohort replacement rate greater than 1... **The potential for other streams, including Battle Creek, to support runs of spring-run Chinook salmon should be evaluated. The potential for using artificial propagation as a tool to expedite re-introduction to former habitat will have been evaluated and, if deemed appropriate by the resource agencies, a propagation program should be implemented.**

STATUS: Spring-run Chinook salmon are present in Battle Creek (USFWS 2001) despite of pre-Restoration Project conditions.

5. Species and Species Group Visions

High Priority At-risk Species

Steelhead Trout

- **Page 224:**

The Central Valley ESU comprises the Sacramento River and its tributaries and the San Joaquin River and its tributaries downstream of the confluence with the Merced River (including the Merced River). **Recent data from genetic studies show that samples of steelhead from Deer and Mill creeks, the Stanislaus River, Coleman National Fish Hatchery on Battle Creek, and Feather River Fish Hatchery are well differentiated from all other samples of steelhead from California** (Busby et al. 1996; NMFS 1997).

STATUS: Steelhead are present in Battle Creek (USFWS 2001) despite of pre-Restoration Project conditions. Genetic sampling of Battle Creek steelhead is being conducted.

6. Species and Species Group Visions

High Priority At-risk Species

Steelhead Trout

Stage 1 Expectations

- **Page 228:**

Central Valley steelhead numbers should not fall lower than they have been in the 1990s. **Ongoing efforts to provide passage at impassable dams on key tributaries such as Battle, Clear, and Butte creeks should be accelerated.** Water operations should provide temperatures adequate for summer rearing in reaches below the major reservoirs...

STATUS: Restoration Project proposal includes modernization of fish passage facilities and removal of certain dams.

7. Species and Species Group Visions

High Priority At-risk Species

Steelhead Trout

Strategic Objectives, Targets, and Programmatic Actions

Other Issues and Information Needs

Instream Flow Needs and Temperature Control Action

STATUS: Restoration Project proposal includes dramatic improvements in stream flow and consequent improvements in water temperature regime.

8. Species and Species Group Visions

High Priority At-risk Species

Steelhead Trout

Stage 1 Expectations

Restoration of Access to Historical Habitat Presently Blocked by Dams

Other Issues and Information Needs

Restoration of Access to Historical Habitat Presently Blocked by Dams

Action

- **Page 233:**

The ...Battle ...creeks are locations at which evaluating opportunities to provide passage above existing barriers is most needed. Evaluation of habitat capacity above barriers is an essential first step, followed by an engineering feasibility study (Meral and Moyle 1998).

STATUS: Restoration Project proposal includes improvements in stream flows to minimize natural passage barriers. Modernization of fish passage facilities and removal of certain dams would further reduce passage barriers. Habitat capacity has been verified (Kondolf and Katzel 1989).

9. Visions for Reducing or Eliminating Stressors

Dams and Other Structures

Issues and Opportunities

Opportunities for Rivers

- **Page 433:**

Remove barriers to anadromous fish migration where feasible. Significant progress has been made in recent years to improve salmon passage on several spawning streams (e.g., Butte Creek, Battle Creek) by removing barriers, consolidating diversion weirs, or constructing state-of-the-art fish passage structures. Existing and potential spawning areas in the ERP focus area that are not obstructed by major reservoir dams, but are currently obstructed by other barriers, should be identified and action taken to restore anadromous fish spawning upstream (Strategic Plan 1999).

STATUS: The fish ladder at the CNFH barrier weir was modernized in 1990 and will be further improved in 2005. The upper watershed is being addressed with the Restoration Project proposal.

10. Visions for Reducing or Eliminating Stressors

Predation and Competition

Stressor Description

Predation and Competition with Hatchery-Reared Fish

- **Page 497:**

Chinook salmon and steelhead artificially produced at and released from hatcheries may compete with (or displace) their naturally produced counterparts for food or habitat in the river, estuary, or open ocean. The major source of competition from hatchery salmonids in the upper Sacramento River would be releases from the Coleman National Fish Hatchery on Battle Creek. The extent of competition between naturally produced Chinook and releases from other hatcheries is of particular concern. The extent of this competition is unknown but is believed to be low. The size differences between the various Chinook salmon stocks may also result in segregation according to size-dependent habitat preferences because juvenile Chinook salmon and steelhead move to faster and deeper waters as they grow and do not compete with fry (Everest and Chapman 1972).

STATUS: The USBR and USFWS are committed to undertaking adaptive management for CNFH. Predation and competition are two areas of scientific uncertainty for which diagnostic studies have been recommended. USBR is currently seeking funding for these and other diagnostic studies.

11. Visions for Reducing or Elimination Stressors

Fish and Wildlife Harvest

Vision

- **Page 516:**

The vision for steelhead trout is to support harvest strategies that fully protect naturally spawning stocks while redirecting harvest to hatchery-produced stocks. This will require a marking program similar to the mass-marking program proposed for Chinook salmon, except the number of fish to mark would be lower. **In this vision, adult steelhead harvest would be directed to steelhead produced at Coleman National Fish Hatchery on Battle Creek, Feather River Hatchery on the Feather River, Nimbus Hatchery on the American River, and Mokelumne River Fish Installation on the Mokelumne River.** Harvest of these stocks would also occur on the mainstem of the Sacramento River.

STATUS: No changes in regulations.

12. Visions for Reducing or Elimination Stressors

Artificial Fish

Propagation

Stressor Description

- **Page 520:**

Central Valley Salmon and Steelhead Production Hatcheries and the Average Annual Production of Chinook Salmon and Steelhead:

Facility & Period of Record	Location	Fall	Spring	Late-Fall	Winter	Steelhead
Coleman Nat'l Fish Hatchery	Battle Creek	14,941,000	N.P.	639,000	26,000	814,000

N.P. = not produced

STATUS: Winter-run Chinook salmon are no longer produced at CNFH. These fish are now produced at Livingston Stone National Fish Hatchery located below Shasta Dam.

Volume II: Ecological Management Zone Visions

1. Population Targets and Programmatic Actions for Species and Species Groups

Species Population Targets and Programmatic Actions

Sacramento Winter-Run Chinook

Programmatic Action

- **Page 20:**

Additional programmatic actions that will contribute to the recovery of winter-run Chinook salmon are proposed for the Suisun Marsh/North San Francisco Bay, and Yolo Basin Ecological Management Zones. **Programmatic actions proposed for Battle Creek in the North Sacramento Valley Ecological Management Zone have the potential to allow the future establishment of an addition of population of winter-run Chinook salmon.**

STATUS: The National Marine Fisheries Service is currently developing a multi-species recovery plan that will develop the procedure for winter-run Chinook salmon recovery in Battle Creek.

2. Population Targets and Programmatic Actions for Species and Species Groups

Species Population Targets and Programmatic Actions

Steelhead Trout

- **Page 24:**

Population Target: Increase naturally spawning population number and sizes sufficient to maintain population resiliency and to allow meta-population persistence through periods of adverse climatic and ecological conditions. **This would entail, at a minimum, restoring and maintaining viable populations in the upper Sacramento, Feather, Yuba, American, Mokelumne, Stanislaus, Tuolumne, and Merced rivers, and Battle, Clear, Big Chico, Butte, Antelope, Mill and Deer creeks.**

Rationale: The Central Valley steelhead ESU encompasses the Sacramento River and its tributaries and the San Joaquin River and its tributaries downstream of the confluence with the Merced River (including the Merced River). **Recent data from genetic studies show that samples of steelhead from Deer and Mill creeks, the Stanislaus River, Coleman National Fish Hatchery on Battle Creek, and Feather River Hatchery are well differentiated from all other samples from California** (Busby et al. 1996; NMFS 1997).

3. Sacramento River Ecological Management Zone

Description of the Management Zone

- **Page 156:**

... Competition is primarily between naturally and hatchery produced fish and is typically for food and rearing area. The extent of adverse effects of the interaction between hatchery and natural fish has not been adequately investigated in the Central Valley, **although Hallock (1987) reported that yearling steelhead released into Battle Creek consumed large numbers of naturally produced Chinook salmon fry.**

STATUS: Yearling steelhead are no longer released in Battle Creek.

4. Sacramento River Ecological Management Zone

Description of Ecological Management Units

Keswick Dam to Red Bluff Diversion Dam Ecological Management Unit

5. Sacramento River Ecological Management Zone

Visions for Species

Steelhead Trout

- **Page 169:**

The Central Valley steelhead ESU encompasses the Sacramento and San Joaquin Rivers and their tributaries. **Recent data from genetic studies show that samples of steelhead from Deer and Mill Creeks and Coleman National Fish Hatchery on Battle Creek are well differentiated from all other samples of steelhead from California.**

STATUS: No change.

6. Sacramento River Ecological Management Zone

Integration with other Restoration Programs

Central Valley Project Improvement Act

- **Page 172:**

- **Implement Coleman National Fish Hatchery Plan and modify Keswick Dam Fish Trap.**

STATUS: CNFH Plan is partially implemented and Keswick Dam fish trap has been completed.

7. Sacramento River Ecological Management Zone

Restoration Targets and Programmatic Actions

Artificial Fish Propagation

Programmatic Action 4B

Rationale

- **Page 187:**

Recent returns to CNFH of fall-run Chinook salmon seem to indicate that the hatchery is heavily supporting the entire fall-run population, particularly in Battle Creek, all of which probably originated from CNFH. A recent estimate for the rest of the Sacramento River above RBDD, excluding Battle Creek, was only 40,000 fish, which may also have been heavily supported by CNFH production.

STATUS: No substantive change.

9. North Sacramento Valley Ecological Management Zone

Description of the Management Zone

- **Pages 190-191:**

... Small hydropower projects, water diversion and water diversion structures constrain ecological processes and functions on Battle Creek. Past and current operation of Coleman National Fish Hatchery on the lower section of the creek further impairs opportunities to improve the distributions of wild salmon and steelhead stocks.

STATUS:

10. North Sacramento Valley Ecological Management Zone

Description of the Ecological Management Unit

Battle Creek Ecological Management Unit

Pages 196-199

11. North Sacramento Valley Ecological Management Zone

Vision for the Ecological Management Zone

Visions for the Ecological Management Units

Battle Creek Ecological Management Unit

- **Page 201:**

The vision of the Battle Creek Ecological Management Unit includes support for a local watershed conservancy and developing and implementing a comprehensive watershed management plan, increasing flows, improving the water supply to Coleman National Fish Hatchery, removing diversion dams or installing new ladders, and installing positive-barrier fish screens to protect juvenile Chinook salmon and steelhead.

STATUS: The Battle Creek Watershed Conservancy has been an active participant in Battle Creek restoration planning in recent years. The BCWC has developed a watershed strategy and has nearly completed a watershed assessment. The BCWC has been funded to develop a monitoring program that will build on the watershed strategy.

Installing water management operations and installing positive-barrier fish screens will provide large benefits to many aspects of the ecological process and fish and wildlife in the watershed. ERPP also envisions that Battle Creek will provide much-needed habitat for steelhead trout and spring-run Chinook salmon, in addition to maintaining its existing importance to fall- and late-fall run Chinook.

STATUS: Instream flows have been increased on an interim basis until the Restoration Project is implemented.

12. North Sacramento Valley Ecological Management Zone

Restoration Targets and Programmatic Action

Habitats

Programmatic Action 1C

- **Page 209:**

Cooperatively negotiate long-term agreements with local landowners to maintain and restore riparian communities along the lower reaches of ...Battle creeks.

STATUS: Numerous conservation easements have been negotiated with local landowners by The Nature Conservancy.

13. North Sacramento Valley Ecological Management Zone

Restoration Targets and Programmatic Action

Eliminating or Reducing Stressors

Water Diversions

- **Pages 209-210:**

Target 1: Reduce or eliminate conflicts between the diversion of water and Chinook salmon and steelhead populations at all diversion sites on Battle Creek.

Programmatic Action 1A: Develop a cooperative approach to improve conditions for anadromous fish in Battle Creek by installing fish screens at diversions on the North Fork, three diversions on the South Fork, and one diversion on the mainstem, or acquire water rights to eliminate the need for diversion and screening.

STATUS: Environmental documentation is underway for the Restoration Project.

Programmatic Action 1B: Improve the survival of adult salmon and steelhead in Battle Creek by installing a rack at the head of Grover Diversion Canal to prevent straying.

STATUS: This barrier has been installed.

Rationale: Diversion, storage, and release of water in the Clear and Battle Creek watersheds directly affect fish and other aquatic organisms and indirectly affect habitat, foodweb production, and species abundance and distribution... In both Clear and Battle Creeks, water diversion and water diversion structures have caused direct mortality by removing juvenile fish from the population...

Coleman National Fish Hatchery receives its water supply directly from Battle Creek. Because of past incidences of disease at the hatchery, adult salmon and steelhead were blocked from ascending the creek to prevent disease contamination of the hatchery water supply. Restoring naturally spawning fish in the upper watershed will be limited until water can be supplied to the hatchery in a manner that will not contribute to disease outbreaks.

STATUS: An ozone water treatment plant has been installed and is operating as planned. Upstream passage of anadromous fish has been increased.

14. North Sacramento Valley Ecological Management Zone

Restoration Targets and Programmatic Action

Eliminating or Reducing Stressors

Dams and Other Structures

- **Pages 210-211:**

Target 5: Reduce or eliminate conflicts in Battle Creek that require excluding anadromous fish from the upper section to protect the Coleman National Fish Hatchery water supply.

Programmatic Action 5A: Develop an alternative or disease-free water supply for Coleman National Fish Hatchery to allow naturally spawning salmon and steelhead access to the full 41-mile reach of Battle Creek above the Coleman National Fish Hatchery Weir.

STATUS: An ozone water treatment plant has been installed and is operating as planned.

Rationale: Dams and their associated reservoirs block fish movement, alter water quality, remove fish and wildlife habitat, and alter hydrological and sediment processes. Fish passage in the North Sacramento Valley Ecological Management Zone is impaired in Clear, Cow, Bear, and Battle Creeks by a variety of permanent and seasonal dams used to divert water for irrigation or power production. Other human-made structures may block fish movement or provide habitat or opportunities for predatory fish and wildlife, which could be detrimental to fish species of special concern, such as spring-run Chinook salmon and steelhead, as well as the other stocks of Chinook salmon. Improve fish habitat will allow

anadromous fish to reach the habitat they require to oversummer or to spawn in good health, which will increase their chances of successfully spawning...

STATUS: Negotiations are being conducted with two operators of seasonal diversion dams in Battle Creek.

15. North Sacramento Valley Ecological Management Zone

Restoration Targets and Programmatic Action

Eliminating or Reducing Stressors

Artificial Propagation of Fish

- **Page 212:**

Target 1: **Minimize the likelihood that hatchery-reared salmon and steelhead produced in the Coleman National Fish Hatchery will stray into non-natal streams, thereby protecting naturally produced salmon and steelhead.**

Programmatic Action 1: **Develop a cooperative program to evaluate the benefits of stocking hatchery-reared salmon and steelhead in the Sacramento River and Battle Creek. Stocking may be reduced in years when natural production is high.**

Rationale: **In watersheds such as the Sacramento River and Battle Creek, where dams and habitat degradation have limited natural spawning, hatchery supplementation may be necessary. This would sustain fishery harvest at former levels and maintain a wild or naturally spawning population during adverse conditions, such as droughts. Hatchery augmentation, however, should be limited so as not to inhibit recovery and maintenance of wild populations. Hatchery-reared salmon and steelhead may directly compete with and prey on wild salmon and steelhead... Because of the extent of development on the Sacramento River and Battle Creek, Chinook salmon and steelhead stocking may be necessary to rebuild and maintain stocks to sustain sport and commercial fisheries.**

16. Butte Basin Ecological Management Zone

Restoration Targets and Programmatic Actions

Reducing or Eliminating Stressors

Artificial Propagation of Fish

- **Pages 266-267:**

Target 1: **Minimize the likelihood that hatchery-reared salmon and steelhead produced in the Coleman National Fish Hatchery will stray into non-natal streams to protect naturally produced salmon and steelhead.**

Programmatic Action 1: **Develop a cooperative program to evaluate the benefits of stocking hatchery-reared salmon and steelhead in the Sacramento River and Battle Creek. Stocking may be reduced in years when natural production is high.**

STATUS: The USBR and USFWS are committed to undertaking adaptive management for CNFH. Hatchery production and stocking are two areas of scientific uncertainty for which diagnostic studies have been recommended. USBR is currently seeking funding for these and other diagnostic studies.

Rationale: Hatchery augmentation should be limited to protect recovery and maintenance of wild populations. Hatchery-reared salmon and steelhead may directly compete with and prey on wild salmon and steelhead... **Because of the extent of development on the Sacramento River and Battle Creek, stocking Chinook salmon and steelhead may be necessary to rebuild and maintain stocks to support sport and commercial fisheries.**

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