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State of California
The Resources Agency
DEPARTMENT OF FISH AND GAME

Spring-run Chinook Salmon

Annual Report
Prepared for the Fish and Game Commission

Habitat Conservation Division
Native Anadromous Fish and Watershed Branch

March 2001

INTRODUCTION

This is the second annual report to the Fish and Game Commission for spring-run chinook salmon since its listing as a threatened species on February 5, 1999. It builds on the following Department of Fish and Game (DFG) reports:

Status of Actions to Restore Central Valley Spring-run Chinook Salmon; February 1996

The Status of the Sacramento River Spring-run Chinook Salmon; December 1996

Central Valley Spring-run Chinook Salmon, A Status Report to the Fish and Game Commission, January-June 1997; June 1997

Status of Actions to Restore Central Valley Spring-run Chinook Salmon; December 1997

A Status Review of the Spring-run Chinook Salmon (*Oncorhynchus tshawytscha*) in the Sacramento River Drainage, Candidate Species Status Report 98-01; June 1998

Spring-run Chinook Salmon, Annual Report Prepared for the Fish and Game Commission; June 2000

This report includes spring-run chinook salmon adult counts for selected tributaries, monitoring activities, status of restoration and management activities, an update on Watershed Conservancy activities for selected tributaries, and updates on the Spring-run Salmon Protection Plan and the Juvenile Chinook Salmon Protection Decision Process. The numbers in this report for adult fish are based primarily on snorkel surveys where the actual fish were counted with the exception of Battle and Mill Creeks. Therefore, the term "spawning escapement estimate" is not used. Escapement estimates are usually derived by extrapolating the data into population estimates using a numerical formula. We have not done this, but presented the counts of fish actually seen. For Mill Creek, the estimate was calculated by expanding salmon redd counts within the spring-run chinook spawning habitat. Battle Creek numbers were derived by combining the passage information gathered from both live trapping and underwater videography. The 2000 adult spring-run counts for the Sacramento River tributaries are visually represented in graph form in Appendix A. Contributors to this manuscript are listed in Appendix B.

Spring-run Adult Salmon Counts

Adult spring-run chinook salmon counts for 2000 are generally lower than those for 1999 (Table 1), although most creeks experienced an increase from the 1997 cohort. Of the six creeks containing spatially isolated spring-run salmon, only Butte Creek and Cottonwood/Beegum Creek showed an increase in the number of fish from last year. The count for Butte Creek is 4,118 and Cottonwood/Beegum Creek is 120 fish. The Antelope Creek count is 9 fish. The count for Deer Creek is 637 fish which is down from the 1999 number of 1,591 fish. Mill Creek

had a slight decrease from 560 fish in 1999 to 544 in 2000. There are no adult fish counts for the Yuba River since no snorkel surveys have been done for spring-run. Nineteen *potential* adult spring chinook salmon were counted in Clear Creek during 2000. Forty *potential* adult spring chinook salmon were counted in Battle Creek. While run timing and phenotypic appearance indicate that Clear and Battle Creek fish are possible spring chinook salmon, actual run determination is unknown so the numbers are not included in Tables 1, 2, or 3.

Table 1. Spring-run Chinook Salmon Population Counts for Sacramento River Tributaries, 1995-2000.						
Tributary	2000	1999	1998	1997	1996	1995
Antelope Cr.	9	40	154	0	1	7
Big Chico Cr.	27	27	369	2	2	200
Butte Creek	4,118	3,529- 3,679**	20,259	635	1,413	7,500
Cottonwood/ Beegum Cr.	120	102	477	No estimate	6	8
Deer Creek	637	1,591	1,879	466	614	1,295
Mill Creek	544	560	424	200	252	320
All Totals	5455	5849	23562	1303	2288	9330

* Total based on lower number

Salmon adults returning in 2000 are assumed to be mostly three year old fish based on observations of spring-run chinook salmon trapped and examined at Red Bluff Diversion Dam between 1985 and 1991. If this assumption is correct, then the 1997 spawners produced most of the 2000 spawners (Table 2). This evaluation of one spawning generation compared to the next is known as the cohort replacement rate. It is a parameter used to describe the number of future spawners produced by each spawner. This spawner-to-spawner ratio is defined by the number of naturally produced and naturally spawning adults in one generation divided by the number of naturally spawning adults in the previous generation as shown in Table 2. The ratio describes the rate at which each subsequent generation, or cohort, replaces the previous one, and can be described as a natural cohort replacement rate. When the rate is 1.0, the subsequent cohort exactly replaces the parental cohort and the population is in equilibrium. When the ratio is greater than one, there is a net increase in the number of fish surviving to reproduce and abundance increases. When the rate is less than 1.0, subsequent cohorts fail to replace their parents and abundance declines.

Table 2. Spring-run Chinook Salmon Cohort Replacement Rate for Sacramento River Tributaries, 2000.			
Tributary	2000 Adult Count	1997 Adult Count	2000 Cohort Replacement Rate
Antelope Cr.	9	0	NA
Big Chico Cr.	27	2	13.5
Butte Creek	4,118	635	6.5
Cottonwood/ Beegum Cr.	120	No survey	NA
Deer Creek	637	466	1.4
Mill Creek	544	200	2.7

In Big Chico, Butte, Mill, and Deer Creeks the 2000 cohort replacement rates range from 1.4 to 6.5 indicating an increasing abundance of spring-run chinook salmon. Table 3 shows cohort replacement rates for the Sacramento River Tributaries from 1998 to 2000.

Table 3. Spring-run Chinook Salmon Cohort Replacement Rate for Sacramento River Tributaries, 1998 - 2000.			
Tributary	2000 Cohort Replacement Rate	1999 Cohort Replacement Rate	1998 Cohort Replacement Rate
Antelope Cr.	NA	40.0	22.0
Big Chico Cr.	13.5	13.5	1.8
Butte Creek	6.5	2.7	2.5
Mill Creek	2.7	1.3	2.2
Deer Creek	1.4	2.6	1.5
Cottonwood/Beegum Cr.	NA	59.7	17.7

STATUS OF SPRING-RUN SALMON AND MANAGEMENT AND WATERSHED CONSERVANCY ACTIVITIES

Butte Creek

Monitoring, Management Activities, and Actions

An adult spring-run salmon survey was conducted from August 25th through September 7th. Fires in the Paradise, CA area interrupted the survey. The lower spawning areas were surveyed first. The survey extended from the Centerville Head Dam to the Parrott-Phelan Diversion Dam (PPDD). The total fish counted for 2000 was 4,118 salmon. The count of 4,118 spring-run salmon represents a cohort replacement rate of 6.5, based upon a three year return (Table 2). A formal carcass survey was not conducted, however, the spawning area was surveyed for adipose-fin clipped adults. Tissue samples were collected by the salmonid tissue archive project team for the Department of Fish and Game.

Juvenile monitoring for the 1999-2000 season began on October 4, 1999. One eight-foot rotary screw trap and one diversion screen trap was installed at the PPDD site. Trapping continued until June 29, 2000. The first yearling was captured on October 5, 1999. A total of 639 yearlings were captured throughout the season. The first young-of-the-year (YOY) was captured on November 9, 1999. A total of 255,104 juvenile salmon were trapped during the season. Of the 255,104 salmon, 110,787 were captured in the diversion screen trap and 144,317 were captured in the rotary screw trap. Juvenile spring-run were held for coded-wire tagging (CWT). A total of 58,854 salmon were tagged and released from the Baldwin Construction Yard site, along upper Butte Creek near Chico.

The first Sutter Bypass rotary screw trap was installed in the West Borrow below Weir #1 on November 8, 1999. The first yearling salmon was captured on December 5, 1999. The first YOY was captured on December 8, 1999. To increase the number of salmon sampled, a second rotary screw trap was installed at the site on March 23, 2000. These traps fished in tandem until June 14, 2000 when both were removed for the season. A total of 73,167 juvenile salmon were captured. Of the 73,167 salmon, 161 were adipose-fin clipped. After analysis, 146 were determined to be Butte Creek salmon, marked at the Baldwin Construction Yard near Chico. The other 15 salmon were from groups of fish released by the U.S. Fish and Wildlife Service at various locations in the upper Sacramento River (4WR, 11FR). The first coded-wire tagged salmon was captured on March 20, 2000 and the last on May 21, 2000. The Sutter Bypass East Borrow rotary screw trap was installed below Weir #2, on January 7, 2000. The trap was operated until June 14, 2000. The first salmon was captured on January 14, 2000. A total of 20,891 salmon were captured at that site. Of the 20,891 salmon, 26 were adipose-fin clipped. After analysis, 22 were determined to be Butte Creek salmon marked at the Baldwin Construction Yard near Chico. The other 4 fish were fall-run salmon from groups of fish released by the U.S. Fish and Wildlife Service at various locations in the upper Sacramento

River.

The 2000-2001 trapping season began on September 12, 2000. One eight-foot rotary screw trap and one diversion screen trap were installed at the PPDD. Trapping is anticipated to continue through May 2001. The first yearling was sampled on September 17, 2000. A total of 134 yearlings were captured through January 2001. The first YOY was captured on November 30, 2000. Fry YOY were held for coded-wire tagging. Through January 2001, a total of 101,000 salmon were tagged and released from the Baldwin Construction Yard near Chico.

This season, the Sutter Bypass rotary screw trap was installed at a site lower in the system than in previous years. One eight-foot rotary screw trap was installed near Karnak at the Reclamation District 1500 site. Installation was on January 10, 2001. The first yearling and YOY were captured on January 17, 2001. The trap is expected to fish through May 2001.

Management and restoration actions, which occurred during this report period, include the following:

- Final design and environmental permitting for fish screens and/or fish ladders were completed for water control structures along the reach of Butte Creek located within the Sutter Bypass, and include the E-W Diversion Weir, Weir #5, and Weir #3. Tentative funding for construction has been approved by CALFED through a grant administered by Ducks Unlimited, with construction scheduled to take place either during the summer of 2001 or 2002.
- Preliminary design and environmental permitting were completed for water control structures located within the Butte Sink, including Morton Weir, Field and Tule Turnout, Mile Canal Turnout, Driver's Cut Turnout, Colusa Shooting/Tarke Weir Outfall, White Mallard Dam and associated diversions. Funding for construction will be sought by the California Waterfowl Association.
- Funding for completion of the Sanborn Slough water control structure located at the top of the Butte Sink was approved by CALFED through a grant administered by California Waterfowl Association.
- The adult salmon exclusion barrier was completed on Drumheller Slough at bottom of the Butte Sink, under a grant administered by the California Waterfowl Association.
- Technical/environmental evaluation of the Department of Water Resources' (DWR) Sutter Bypass East Borrow Pumping Plants No. 1, 2, and 3, was begun with funding provided by the Tracy Mitigation Account.
- Funding for continuation of the real-time flow monitoring stations located along Butte Creek, operated and maintained by DWR was tentatively approved through a CALFED grant.

- A draft Environmental Assessment was completed for the purchase of water rights for 5 cubic feet per second of additional flows dedicated for instream use in Butte Creek to benefit spring-run salmon.
- Ducks Unlimited and California Waterfowl Association continue to facilitate stakeholder participation and project implementation in the Butte Sink and Sutter Bypass.

Report on the Activities of the Butte Creek Watershed Conservancy (BCWC)

(Contributed by Mr. Chuck Kutz, Chairman of the Board of Directors of the Butte Creek Watershed Conservancy)

Accomplishments:

- Adopted Existing Conditions Report
- Adopted Watershed Management Strategy
- Implemented Watershed Management Strategy
- Secured grant from Great Valley Center of Modesto and began Butte Creek Property Owners Manual emphasizing Best Management Practices for the 40 acre and smaller landowner, to be completed in March 2001
- Applied for grant funds to begin The Butte Creek Flood Plain Management Plan. This project will be a partnership between the BCWC, Butte County Department of Public Works, Office of Emergency Services and a private consultant. BCWC will be involved in the public outreach and education as well as volunteer support for the consultant during the 2-5 yr. Project.
- Completed four quarterly newsletters with a changed form to a tabloid sized paper on newsprint. Circulation increased from 750 to 3000, with direct mail for in excess of 2000 deliveries. One page was devoted to Cal-Tip and salmon issues.
- Initiated a full service web page at **buttecreekwatershed.org** and email at **creek@inreach.com**. Web site lists local events, BCWC documents, maps and links to watershed and land issue educational sites.
- Held twelve Board meetings, one Spring-Run Salmon Celebration and one general membership meeting. All meetings and events offered educational presentations covering current watershed issues.
- Participation by BCWC Board of Directors active on many other Boards and Commissions in the watershed, bringing a wealth of information to BCWC and representing BCWC outreach throughout the watershed.
- Maintained ongoing recruitment of new members
- Supported the new and successful catch and release fishing season within the canyon reach of Butte Creek, which will hopefully stimulate a new generation of anglers and keep the sport alive for the present generation.
- Active in recreation management and impact mitigation at abused access points along

Butte Creek, which involved active contact with county, state, and federal land managers regarding these impacts.

- Participated in A Day In Forestry event sponsored by the Butte County Schools Field Tours Program promoting watershed issues to local K-12 educators in Butte County.
- Supported Adopt-A-Watershed and similar programs in K-12 education
- Supported Spring-run Salmon Workgroup and California State University Chico watershed coordination (Shedhead) programs
- Conducted fish barrier tours to upper watershed for interested parties, to help understand the complex nature of the area.
- Supported USFWS instream flow studies, conducted townhouse meetings, and an outreach letter campaign for the purpose of educating property owners and to acquire access to study areas.
- Supported DFG spring-run salmon trapping and tagging program
- Supported NPS restoration and demonstration site funded through CALFED FY2000 and implementation of the Quincy Library Group Act in National Forests of our upper watershed
- Endorsed and supported activities of Ducks Unlimited and California Waterfowl Association in the restoration /stakeholder partnerships leading to fish and wildlife restoration in the lower watershed
- Supported acquisition of funding to increase the number of local game wardens
- Actively participated in the CALFED Integrated Storage Investigation program in Butte County
- Partnered with Pacific Gas and Electric and Sierra Pacific Industries on restoration of land donated to BCWC
- Participated as a stakeholder on the Butte County Firesafe Council

Big Chico Creek

Monitoring, Management Activities, and Actions

An adult spring-run snorkel survey was conducted on August 8, 2000. Big Chico Creek was surveyed from Higgin's Hole downstream to Salmon Hole, (Upper Bidwell Park). Two adult salmon were observed in the uppermost reach (Higgins Hole to Henning's Hole) and 25 adults were observed holding directly upstream of the Salmon Hole pool resulting in a total of 27 fish seen on the survey.

The 2000-2001 trapping season began on December 14, 2000. One five foot rotary screw trap was installed at the Bidwell Park Municipal Golf Course site. Due to minimal fall rain events, the flows in Big Chico Creek have not supported the operation of a rotary screw trap. Efficiency has been low. Through January 2001, one yearling salmon has been captured to date. No YOY have been sampled. Monitoring is expected to continue through May 2001.

Yearly maintenance of the Iron Canyon fish ladder by the Department occurred and will continue

as needed. A preliminary engineering environmental analysis of the fish ladder was begun under a contract with the DWR Northern District Engineering section to develop plans for a long term solution. Several meetings were held with the City of Chico and the Big Chico Creek Alliance to discuss various alternatives.

Report on the Activities of the Big Chico Creek Watershed Alliance

(Contributed by Ms. Suzanne Gibbs, Chair of the Big Chico Creek Watershed Alliance)

The Big Chico Creek Watershed Alliance (Alliance) completed its Existing Conditions Report and the Watershed Management Strategy (WMS) funded by CALFED. The WMS contains goals and objectives that stakeholders will prioritize and implement.

The Alliance continued to work with Department of Fish and Game on the design for the improvement of the Iron Canyon fish ladder in Big Chico Creek. Enhanced fish passage for spring run chinook salmon and steelhead trout are important objectives of the Alliance.

The Alliance teamed with the Streaminders Chapter of the Izaak Walton League on two restoration sites in the watershed. Those restorations will reduce erosion and sedimentation in Big Chico Creek, improving water quality.

The Big Chico Creek Ecological Preserve is now a reality thanks to the cooperation of many state and federal agencies and private foundations. The CSU Chico Research Foundation owns the property that was slated for residential development. The acquisition protects important spring-run salmon habitat and provides for research opportunities for faculty, graduate, and undergraduate students at the university. Public outreach may include docent lead tours and K-12 education field trips.

The Alliance continued to meet monthly and will hold the 4th Annual Creeks of Chico Conference in the fall of 2001.

Deer Creek

Monitoring, Management Activities, and Actions

On August 8, Deer Creek was snorkel surveyed to count holding adult spring-run chinook salmon. The survey extended from Upper Deer Creek Falls downstream to Dillon Cove, a distance of 25 miles. A total of 637 spring-run chinook salmon were counted. This annual survey is a joint effort involving participants from the Department, United States Forest Service, Sierra Pacific Industries and United States Fish and Wildlife Service. The Forest Service fisheries crews completed spring-run chinook salmon spawning surveys in October and observed a total of 23 salmon carcasses. Tissue, scale and otolith samples were collected and archived from these carcasses for genetic research and age composition studies. Fall-run chinook salmon spawning surveys verified that spring-run chinook salmon in Deer Creek are remaining spatially isolated from spawning fall-run chinook salmon.

Although this year's count is lower than the previous two years, (1,591 salmon in 1999, and 1,879 salmon in 1998), it is an increase of 1.4 from the 1997 cohort of 466 salmon (Table 2). Cohort replacement rates for 1998 and 1999 were 1.5 and 2.6, respectively (Table 3). Assuming that spring-run salmon return as three-year-old fish and maintain a 1:1 sex ratio, the number of spring-run salmon returning to Deer Creek in 2000 was an increase from the 1997 cohort. During the 1992 through 2000 time period, counts of spring-run salmon in Deer Creek have ranged from a high of 1,879 in 1998 to a low of 209 fish in 1992. The average count over this nine year time period is 826 salmon. In contrast, observations of spring-run salmon during the 1940 - 1964 time period counted an average of 2,200 spring-run salmon returning to Deer Creek.

Rotary screw trap sampling from October 2000 through January 2001 sampled a total of 606, 1999 brood year (BY), spring-run yearlings ranging in size from 58 mm fork length (FL) to 135mm FL, and 57, 2000 BY spring- and fall-run fry 31mm FL to 39mm FL. The first yearling salmon was trapped on October 11, 2000 and the first fry was trapped on January 12, 2001. This outmigrant monitoring is used to define the life history of spring-run salmon and to provide data on yearling salmon outmigration for the Delta Spring-run Salmon Protection Plan. Outmigrant spring-run chinook salmon from Deer Creek are not CWT'ed due to the low number of fish encountered in the rotary screw traps.

Report on the Activities of the Deer Creek Watershed Conservancy (DCWC)
(Contributed by Diane Gaumer)

Within the last year, the following restoration actions to benefit spring-run chinook salmon were completed or are still in progress:

- The DCWC Management Plan identifies a strategy to maintain the high water quality of Deer Creek by treating known sediment sources in the watershed. Implementation of road restoration to reduce sediment load is continuing on Collins Pine Company land and U.S. Forest Service land.
- The Watershed Management Plan identifies a strategy to manage rangeland for multiple resource protection and enhancement. After completing the Rangeland Water Quality Management Plan and educational workshops in 2000, the Conservancy received an additional grant for a Rangeland Continuation Project. This project will assist landowners in designing and implementing rangeland monitoring plans for their land.
- With the aide of the Fire Plan that was completed in 2000, California Department of Forestry completed mapping and signing all roads in the watershed. This makes the watershed more accessible to fire crews during fire emergencies and could potentially reduce effects of wild-land fires on the watershed.
- The Conservancy completed the Highway 32 Hazardous Spill and Assessment Plan in 2000. As a highway safety measure to reduce the potential for hazardous material spills, California Department of Transportation has installed highway reflectors along critical sections of roadway in the Deer Creek canyon.
- The Conservancy supported fisheries monitoring efforts in the watershed in 2000 by assisting in access for survey crews on private lands and publishing Department fish counts and monitoring results in Conservancy newsletters.

- The Conservancy conducts an annual stakeholder meeting to discuss past and future projects that are outlined in the Conservancies Watershed Management Strategy.
- The Vina Resource Conservation District is continuing to actively remove Giant Reed (*Arundo donax*) and preventing further encroachment of this invasive plant along the lower Deer Creek riparian corridor.

Mill Creek

Monitoring, Management Activities, and Actions

An estimated 544 spring-run chinook salmon spawned in Mill Creek in 2000. This estimate is calculated by expanding salmon redd counts within the spring-run chinook spawning habitat in Mill Creek. Underwater visibility in Mill Creek is too poor to conduct snorkel surveys, and too few carcasses are encountered to make an estimate from a carcass tag-and-recapture study. Spawning surveys extended from the Highway 36 Bridge crossing to the Steel Tower Transmission lines below Little Mill Creeks confluence, a distance of approximately 25 miles. A total of 21 carcasses were counted during spawning surveys. Tissue, scale and otolith samples were collected and archived from these carcasses for genetic research and age composition studies. In addition to counting redds, tissue, scale and otolith samples were collected and archived from the 21 carcasses encountered for genetic research and age composition studies. Spring-run chinook had completed spawning activities prior to fall-run chinook migration into Mill Creek. Therefore, both temporal and spatial isolation occurred between these two runs in 2000.

When compared to the 1997 cohort of 200 returning adults, this year's estimate of 544 spring-run chinook salmon has increased by a replacement rate of 2.7 (Table 2). The cohort replacement rates for the previous 3 years have been 2.2 (1999), 1.3 (1998) and 0.3 (1997). This year's estimated population of 544 spring-run salmon compares with a previous 10-year average of 400 salmon. Adult spring-run counts in Mill Creek dates back to the late 1940's. An average of 1,900 spring-run chinook spawned in Mill Creek annually from 1947 -1964.

Rotary screw trap sampling from October 2000 through January 2001 sampled a total of 292, BY1999, spring-run yearlings ranging in size from 76 mm FL to 158mm FL, and 181, BY2000, spring- and fall-run fry measuring from 31mm FL to 44mm FL. The first yearling salmon was trapped on October 11, 2000 and the first fry was trapped on December 18, 2000. This outmigrant monitoring is used to define the life history of spring-run salmon and to provide data on yearling salmon outmigration for the Delta Spring-run Salmon Protection Plan. Outmigrant spring-run chinook salmon from Mill Creek are not CWT'ed due to the low number of fish encountered in the rotary screw traps.

Mill Creek Conservancy (MCC)

(Contributed by Kerry Burke)

Activities that the Mill Creek Conservancy (MCC) supported in 2000 include:

- The MCC completed a re-vegetation project on Lower Mill Creek. This included re-vegetating a site damaged in the 1997 floods. Landowners have been contacted regarding additional opportunities for restoration projects.
- The MCC is monitoring a proposed Off Road Vehicle project in the upper Mill Creek watershed which may increase road and erosion problems and cause increased impacts to sensitive habitats for salmon and other species.
- The MCC's fire committee is monitoring the fire management and planning strategies of all the involved agencies in the watershed.
- MCC is meeting with the USFS and local cattle associations to discuss solutions to the growing number of feral cattle in the Ishi Wilderness. These feral cattle are contributing to erosion and sedimentation in sensitive habitat, damaging cultural resource sites and impacting legitimate cattle operations.
- Exotic weeds and their impact on riparian and other sensitive habitats is a topic of concern in the Mill Creek watershed. The MCC is working with the Natural Resource Conservation Service in creating a publication that landowners can use to identify and control invasive weeds in the watershed.
- The MCC is supporting a USFS grant for road improvements to reduce sediment load within the watershed.
- The MCC supported fisheries monitoring efforts in the watershed in 2000 by assisting in access for survey crews on private lands and publishing Department fish counts and monitoring results in Conservancy newsletters.

Clear Creek

Monitoring, Management Activities, and Actions

The following information summarizes the Fish and Wildlife Services monitoring efforts and preliminary results for Clear Creek spring-run chinook for 2000. A Count of 19 *potential* adult spring chinook salmon in Clear Creek during 2000 was generated using data obtained by snorkel surveys. Classification of adult salmon as spring-run was based on run timing and to a lesser degree on phenotype. Classification of juvenile salmon as spring run was based on length criteria.

Water releases from Whiskeytown Reservoir into Clear Creek were ramped from 200 cfs to 100 cfs beginning on May 18 and ending on May 21. The flow decrease was intended to discourage spring chinook from entering Clear Creek because the McCormick-Seltzer Dam removal project required minimal Whiskeytown releases during spring chinook spawning. Whiskeytown releases were ramped from 100 cfs to 50 cfs beginning on June 25 and ending on June 28. Whiskeytown releases were increased from 50 cfs to 125 cfs beginning on September 28 and ending on

September 30. After October 28, Whiskeytown releases fluctuated between 50 and 140 cfs to facilitate the deconstruction of McCormick-Seltzer Dam, after which Whiskeytown releases were increased to 150 cfs on November 11.

Snorkel surveys to count adult chinook salmon and redds in Clear Creek were made by the USFWS in 2000. Beginning April 26, 2000, 7 monthly surveys were conducted in middle Clear Creek from Whiskeytown Dam to the McCormick-Seltzer Dam site. Beginning February 18, 2000, 11 monthly surveys were conducted in lower Clear Creek from the McCormick-Seltzer Dam site to approximately 4 miles downstream, with 5 additional surveys conducted in May and June.

Live chinook counts in middle Clear Creek peaked during July at 17 fish and declined to 6 fish in September. During the decline in live chinook, the remains of 5 chinook were found. The remains consisted of skins and fins, suggesting that the chinook were poached, although it is also possible that non-human predators were responsible. The skins were fresh, clean of flesh and remarkably intact. Whiskeytown releases during July and August were low, resulting in mean daily water temperatures greater than 70 degrees at the confluence with the Sacramento River. The high water temperatures blocked chinook from entering Clear Creek. Mean daily water temperatures ranged from 52 to 63 degrees in chinook holding areas in middle Clear Creek in July and August 2000.

At the end of September, 8 live chinook, 3 dead chinook and 9 redds were counted in middle Clear Creek. Two of the live salmon were very small jacks unlike salmon seen earlier in the summer. Therefore these two salmon were added to the 17 salmon seen in July for a total count of 19. Two of the live salmon surveyed in September were in a pool just upstream of Seltzer Dam. They were: 1) well downstream of the locations of spring chinook seen earlier in the summer; 2) not associated with redds; and 3) larger than the spring chinook phenotype. Therefore these two fish were considered fall chinook that had recently passed Seltzer Dam during the short period of time that low Whiskeytown releases improved passage in the temporary fish ladder at McCormick-Seltzer Dam. The temporary fish ladder was activated in September. The other 6 live fish were associated with spawning areas relatively close to the holding pools that were occupied on the previous survey. All redds were closely associated with live or dead fish. While run timing and phenotypic appearance indicate that these fish are possible spring chinook salmon, actual run determination is unknown. Snorkel surveys for juvenile chinook in the vicinity of potential spring chinook redds were performed during and after the time period of juvenile emergence, but no juveniles were seen.

The USFWS operates at rotary screw trap (RST) at rivermile 1.7 on Clear Creek, which is upstream of the sheet pile dam associated with the Anderson Cottonwood Irrigation District (ACID) canal siphon crossing. In late 2000, 41 spring chinook juveniles were collected in the RST. In late 1999, approximately 2300 spring-run sized juvenile chinook were collected in the RST after many chinook had spawned in lower Clear Creek during September. Run determination for juvenile chinook was based on length criteria for Sacramento River chinook. Chinook spawning in September 1999 included both fall and spring chinook from the Feather River Hatchery, based on coded wire tag recoveries. September 1999 spawning chinook

probably also included early returning Clear Creek fall chinook and potentially included the descendants of Feather River spring chinook planted into Clear Creek in the early 1990's. The USFWS collected genetic samples from the 5 chinook that were killed by poachers and/or predators in July and August 2000.

Beegum Creek Tributary to Cottonwood Creek

Monitoring, Management Activities, and Actions

A total of 120 spring-run chinook were counted in this years annual Beegum Creek snorkel survey. The known holding habitat of adult spring-run salmon was surveyed from the North and South Fork confluences downstream to the Highway 36 Bridge, a distance of approximately 7 miles. Three salmon carcasses were observed during spawning surveys in October. Tissue, scale and otolith samples were collected and archived for genetic research and age composition studies. Aerial redd surveys confirmed that spawning spring-run salmon in Beegum Creek remained spatially isolated from fall-run chinook salmon in Cottonwood Creek.

This years count of 120 is an increase from the 1997 cohort. Zero salmon were counted during the 1997 snorkel survey. Beegum Creek has been surveyed sporadically since 1973. Counts have ranged from a high of 477 adult chinook in 1998 to a low of 0 (1982, 1989, 1997). In most years less than 10 spring-run chinook have been counted.

Battle Creek

Monitoring, Management Activities, and Actions

The USFWS' Northern Central Valley Fish and Wildlife Office monitors fish passage in Battle Creek using the Coleman National Fish Hatchery (CNFH) barrier dam. An estimated 40 unmarked, *possible* spring chinook salmon migrated above the Coleman barrier weir in Battle Creek between March 7 and September 1, 2000. In Battle Creek, the cohort replacement rate for 2000 was .4, which is less than 1.0 where subsequent cohorts failed to replace their parents and abundance declined. Derivation of this estimate is described below:

Live trapping at the Coleman barrier weir

Eight unmarked chinook salmon were captured between March 7 and May 21 in the live trap located at the Coleman barrier weir fish ladder. Two of the captured fish were identified as winter chinook salmon and six were identified as non-winter chinook salmon through genetic analysis. All six unmarked non-winter chinook sampled are considered to be *possible* spring chinook salmon based on collection date and phenotypic characteristics.

Video monitoring at the Coleman barrier weir

From May 22 through September 1, underwater videography was used to monitor passage at the

Coleman barrier. An estimated total of 70 unmarked chinook salmon passed above the Coleman barrier weir during that time period. Thirty-four unmarked chinook salmon passed the weir between May 22 and July 15. These fish were not characterized to run based on phenotypic appearance. However, the run timing of these fish is characteristic of both spring and winter chinook salmon. No chinook salmon were observed passing the barrier weir between July 16 and August 13. From August 14 through September 1, underwater videography was used to observe 36 unmarked chinook salmon passing the barrier weir. Run designation of these fish is uncertain, however, based on the number of fish observed and run timing, these fish are assumed to be primarily early-arriving fall chinook salmon.

Summary

Combining the passage information gathered from both live trapping and underwater videography, a total of 40 unmarked (six during live trapping and 34 during video monitoring), *potential* spring chinook salmon were observed passing the Coleman barrier weir from March 7 through August 13, 2000. Actual passage timing was March 7 through July 15. No chinook were observed passing the weir between July 16 and August 13. While run timing and phenotypic appearance (of trapped fish) indicate that these fish are possible spring chinook salmon, actual run determination is unknown. The estimate of 40 potential spring chinook salmon observed passing the Coleman barrier weir was based on two assumptions: 1) all chinook salmon used the fish ladder to pass upstream of the barrier weir (i.e., no fish jumped over the barrier weir); and 2) salmon did not drift downstream over the barrier weir and return upstream via the fish ladder. We consider these assumptions to be reasonable as nearly all fish are thought to pass through the fish ladder while it is operating (i.e., no fish have been observed passing over the barrier weir during trapping or video monitoring). No spawning surveys were made to determine if there was temporal or spatial isolation between spawning spring-run and fall-run chinook salmon.

Antelope Creek

Monitoring, Management Activities, and Actions

A total of 9 spring-run chinook salmon were counted during this years annual Antelope Creek snorkel survey. This years survey involved participants from the Department, United States Forest Service, and Sierra Pacific Industries. Survey reaches included the North Fork from the North Fork Falls to the South Fork confluence, sections of the South Fork from the South Fork Falls to the South Fork confluence, and the main stem from the North and South Fork confluence to Little Grapevine Creek. The total distance surveyed is approximately 15 miles and represents the known holding habitat of adult spring-run chinook in Antelope Creek.

This years count of 9 salmon is an increase from the 1997 cohort. In 1997 zero salmon were counted during the annual snorkel survey. This is the twelfth year the Department has been conducting annual snorkel surveys to count spring-run salmon in Antelope Creek. From 1989 through 1997, counts ranged from zero to a high of 7. In 1998 a total of 154 spring-run chinook was counted. The Department has only limited records from the 1950's prior to these current

surveys. In 1953 and 1956, 127 and 253 spring-run salmon, respectively, were counted at the Cone Kimball Dam. Forty spring-run salmon were observed at this dam in 1959. The Cone Kimball Dam was removed in the 1960's.

Yuba River

Monitoring, Management Activities, and Actions

The Department continued surveys on the Yuba River in 2000 to document the initiation and distribution of spawning by chinook salmon. Spawning activity in September is believed to represent spring-run spawning based on historic information, although spring- and fall-run are not spatially isolated in the Yuba River. In 1998 and 1999, spawning began in the second week of September. In 2000, spawning was initiated the first week of September. No snorkel surveys are done on the Yuba River to count adult spring-run salmon.

The Department initiated a juvenile salmon outmigration survey during the 1999-2000 season and has continued in the 2000-2001 season. The objectives of the survey are to document outmigration patterns including timing, duration, and size at time of outmigration. Although spring- and fall-run spawning occurs in the same physical location, initial length frequency data from juveniles captured in the rotary screw trap during the 1999-2000 sampling season indicates the presents of both a dominate fall-run and a smaller population of spring-run chinook salmon. Further attempts are currently being made to differentiate spring-run by size at date differences through the operation of the rotary screw trap for an entire calender year.

The Department will initiate on March 1, 2001, a count/survey of adult spring-run ascending Daguerre Point Dam. The objectives of the survey are to document population size and timing of migration. Fish ascending Daguerre Point Dam during the historic migration period of spring-run are believed to be spring-run chinook salmon. This data will provide information on life history strategies and current abundance of spring-run chinook salmon in the Yuba River.

Evaluation of fish passage alternatives at Daguerre Point Dam will be initiated by the Fish Passage Improvement Program of DWR. This is a cooperate effort in conjunction with the Department, USFWS, NMFS, Army Corps of Engineers, South Yuba River Citizens League, Yuba County Water Agency and other stakeholders, and will ultimately improve adult and juvenile anadromous fish passage at Daguerre Point Dam. It is anticipated that State and Federal environmental documentation will be initiated this year and completed within 12 months.

The Department extended operation of the during the 2000 diversion period. The Department operated the Hallwood-Cordua fish screen from mid-April through August. Additionally, the Department along with the USFWS and NMFS, has been working with Hallwood Irrigation Company and Cordua Irrigation District (H-C) for H-C to assume ownership from the Department, and upgrade the screen. H-C has assumed ownership and is currently upgrading the facility which is scheduled to be completed by the start of the 2001 irrigation season. The upgrades are interim measures until the evaluation of fish passage improvements at Daguerre

Point Dam (their diversion point) are completed. The fish passage improvement alternative selected will dictate the type of screen needed on the H-C diversion. Additionally, H-C will operate the screen during all times diversions occur, whereas in the past the screen was operated by the Department.

Adult salmonids, including spring-run chinook salmon are attracted in to the Goldfields. The Goldfields are located along the Yuba River near Daguerre Point Dam, and cover an area of approximately 8,000 acres. The Goldfields have been the site of gold dredging for nearly 100 years and dredging continues today along with aggregate productions. The Goldfields are not suitable for anadromous fish. The Department along with USFWS, NMFS, has been working with owners of the Goldfields to construct a barrier to exclude adult salmonids, including spring-run chinook salmon, from entering. The working group is currently modifying the preliminary design of the exclusion barrier (developed last year) by the USFWS as well as negotiating cost sharing. It is anticipated that the exclusion barrier will be constructed the summer of 2001 or 2002.

The Upper Yuba River Studies Program, initiated by CALFED in 1998, continues. The Program is a collaborative effort that will evaluate the feasibility to determine if introduction of wild chinook salmon and steelhead to the upper Yuba River watershed is biologically, environmentally, and socio-economically feasible over the long term. CALFED has approved \$6.7 million in funding to initiate the studies to evaluate restoration feasibility.

Sacramento - San Joaquin River Delta

Monitoring, Management Activities, and Actions

To minimize the impact of state and federal water project operations on spring-run chinook salmon in the Delta, a Juvenile Chinook Salmon Protection Decision Process for October 2000 - January 2001 was developed. This document is similar to the Spring-run Salmon Protection Plan used in recent years, however it recognizes that other races of chinook salmon besides spring-run also emigrate through the Delta in the fall and winter and intends to provide protection for those races as well. It describes in greater detail, than previous plans, the types of information used by biologists to make decisions related to operations of the Delta Cross Channel and modification to the State Water Project/Central Valley Project (SWP/CVP) export pumping using CVPIA b(2) water and the newly created CALFED Environmental Water Account (EWA). The EWA enables manipulation of SWP/CVP exports to reduce impacts to fish in the Delta beyond the current "regulatory baseline" without affecting water deliveries to SWP/CVP contractors south of the Delta and is a prerequisite for the Endangered Species Act/California Endangered Species Act (ESA/CESA) commitments provided to water users as part of the CALFED Bay Delta Program.

The June 2000 annual report covered actions taken in the Delta relative to spring-run chinook through the spring 2000. As in the fall 1999, there was little precipitation and low river flows in the fall 2000. Under such conditions significant juvenile salmon movement downstream towards

the Delta generally does not occur. Small numbers of yearling spring-run moved out of Mill and Deer Creeks in October but monitoring indicated neither these fish or other chinook salmon, including juvenile winter-run, were moving downstream in the Sacramento River towards the Delta. Significant movement of yearling spring-run salmon from Mill and Deer Creeks was detected in late November and early December, coincident with minor storms. Later in December, juvenile salmon were first detected migrating past Knights Landing and Sacramento indicating salmon were migrating into the Delta, some of which are presumed to be spring-run. The Delta Cross Channel (DCC) gates were closed from December 22, 2000 to prevent salmon from migrating through the DCC into the interior Delta where evidence suggests their survival is relatively poor. When the salmon migration appeared to wane, the DCC gates were opened on December 27, 2000. Another spike in yearling spring-run salmon migration out of Mill and Deer Creeks occurred in conjunction with storms in mid-January. Salmon also migrated downstream in the main stem Sacramento River. The DCC gates were closed on January 14, 2001 based on monitoring at Sacramento, re-opened on January 23, and closed again on January 26 through January 31. The DCC gates are always closed from February 1 until May 20 pursuant to the Bay-Delta Water Quality Control Plan. On balance, the refined criteria and procedures for making DCC gate operations decisions in 2000-2001 ensured adequate consideration was given to all factors and produced better decisions than were made in December 1999.

Several short term adjustments to SWP/CVP exports were made in January and February 2001 to reduce losses and improve survival of juvenile chinook salmon, including spring-run yearlings, as well as steelhead and delta smelt in the SWP/CVP diversions. Reductions were generally between 6000-8000 cfs and of five days duration, except for the three day 3,000 cfs experiments described below. The timing of curtailments was based on monitoring of salmon migration into the Delta from the Sacramento basin and the number of salmon, steelhead and delta smelt seen at the SWP and CVP fish salvage facilities.

The movements of radio-tagged juvenile salmon released in the southern Delta were tracked during 3 day experiments, twice at high exports (about 10,000 cfs) and twice at low exports (about 3,000 cfs), to investigate the potential effects of reverse flows in southern Delta channels on salmon migration. Results have not been reported to date but should help biologists better understand the mechanisms influencing salmon survival in the Delta.

In November 2000, an extensive multi-disciplinary investigation related to operation of the DCC and effects on water movement, juvenile and adult salmon movements and Delta water quality was carried out. The purpose was to determine if alternative DCC gate operation strategies could be developed to preserve the benefits to migrating juvenile salmon survival of closing the gates and the benefits to water quality and supply of having the gates open. Results are being analyzed and will be reported first in February 2001 at the IEP conference and subsequently in technical reports and scientific journal articles. These studies may serve as pilot studies for a CALFED investigation leading to a decision on northern Delta facilities at the end of 2003.

APPENDIX A
Adult Spring-Run Salmon Counts For 2000

APPENDIX B

Contributors

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