

WATER DISTRICTS

- Corning W.D.
- Capay Rancho W.D.
- Glenn-Colusa I.D.
- Glide W.D.
- Holthouse W.D.
- Kanawha W.D.
- Kirkwood W.D.
- O'Connell M. W.D.
- Orland Unit Water Users Association
- Orland-Artois W.D.
- Stony Creek W.D.

- Public Lands
- Military Reservations and Withdrawals Corps of Engineers
- National Wildlife Refuges
- Water Bodies
- Rivers, Creeks, Sloughs
- Stony Creek Watershed
- Interstate Routes
- U.S. and State Routes
- Canals
- Dams
- Temperature Gage

NOTES:
 The hydrography, water conveyance facilities, and water district information were derived from the National Wetlands Inventory (NWI) and the National Wetlands Inventory (NWI) data were digitized from 1:250,000 scale USGS maps. The data were digitized from 1:250,000 scale USGS maps because only a subset of the features within the map area were shown on the 1:250,000 scale maps. The data were taken from 1:100,000 scale maps from the USGS. The public land information was digitized from the National Wetlands Inventory (NWI) data. The map was prepared by the Bureau of Reclamation, Sacramento, California.

Approx. Scale 1:170,266
 0 2.68 Miles
 Projection: UTM-Zone 10

**FIGURE 2-1
 STONY CREEK WATERSHED MAP**

U.S. BUREAU OF RECLAMATION
 LOWER STONY CREEK FISH, WILDLIFE,
 AND WATER USE MANAGEMENT PLAN
 22-214-0003

Chapter 3

Existing Operations

3.1 The Black Butte Project.

The Black Butte Project was authorized by Congress as part of the comprehensive plan of development for the Sacramento River Watershed under the Flood Control Act of 1944. In the Flood Control Act a reservoir capacity of 160,000 acre-feet was recommended. Since construction, the reservoir capacity was modified to conform to the area-capacity tables developed in 1978 from 1977 aerial mapping. Because of sedimentation, the capacity at Black Butte Reservoir (Black Butte) at gross pool has been reduced from 160,000 acre-feet to 143,700 acre-feet, and the maximum flood control reservation reduced from 150,000 acre-feet to 137,000 acre-feet per 1977 figures. 1997 studies by the COE indicate that gross pool has been further reduced to approximately 135,000 acre-feet due to sedimentation but no official documentation has yet been published.

Changes in the original dam design are listed in Appendix to Chapter 3, Section A.

The project construction was completed in 1963 by the COE, and water storage was initiated in October 1963. The authorization of the project was for flood control; however, irrigation facilities were included in the design for the Orland South Canal diversion. Additional beneficial uses from the project have been realized, such as recreation and fishery and wildlife enhancement, although mitigation for loss of habitat was not considered at the time of construction.

The Black Butte Project was financially and operationally integrated with the other storage features of the CVP in 1970 (PL 91-502, 84 Stat. 1097). As a result, Black Butte also provides water conservation benefits. Water conserved by Black Butte is authorized to be used for irrigation purposes and to meet such domestic municipal and industrial demands as may occur. The estimated conservation yield of Black Butte was 59,000 acre-feet. On the average, it was estimated that 10,600 acre-feet of water would be made available for use in the watershed area above Black Butte Dam and an additional 48,600 acre-feet would be available on the average for use below the dam.

The Black Butte Dam and Reservoir are operated cooperatively; by the COE for flood control and by Reclamation for irrigation in non-flood control periods. The COE operations are determined by storage in Black Butte in relation to the flood control diagram. Reclamation can make releases as early as April when the reservoir is not encroached and can continue until at least November or when encroachment reoccurs. Operations are generally conducted by Reclamation according to the needs of the major downstream water users, Orland Project, TCC, and GCID. These are further described Section 3.4 entitled "Description of Operators and Facilities."

3.2 Diversions and Operations

A flow diagram for lower Stony Creek is shown in Figure 3-1. The purpose of this diagram is to:

- Show a schematic of Stony Creek operations
- Identify flow gage locations and periods of record for Stony Creek flows and diversions
- Show mile post locations (starting with Milepost 0.0 at the Sacramento River and Milepost 24.6 at the dam) where flows are measured or can be estimated
- Identify the four reaches of the creek and the five locations where flows can be computed (see Table 2-11 (page A-2-62) for additional Reach descriptions)

Releases, diversions, spills, and seepage are used to account for operations by Reclamation/TCC, the CHO, Orland Project, and GCID. The historic releases from Black Butte automatically incorporate the COE flood control operations.

3.3 Descriptions of Diverters and Facilities

Following is a summary description of the diverters on Stony Creek starting below Black Butte and moving downstream to the Sacramento River.

Orland Unit Water Users Association - Related Project.

The Orland Project is one of the older Federal Reclamation projects in the United States, authorized by the Secretary of the Interior in 1907 with deliveries since 1910. The project facilities, although owned by Reclamation, have been operated by the OUWUA since 1954. Although this project is upstream of Black Butte, several related facilities are located downstream of Black Butte.

Reservoirs. The Orland project includes two reservoirs upstream of Black Butte Dam called Stony Gorge (50,300 acre-feet, and completed in 1928) and East Park (51,000 acre-feet and completed in 1910). Facilities downstream of Black Butte Dam connected with the Orland project consist of two main diversion structures (Northside Diversion Dam and South Diversion Intake), and 140 miles of irrigation laterals and distribution systems. Stony Gorge, East Park, and Black Butte Reservoirs' operations are interrelated in the Stony Creek basin. Reclamation coordinates operations with Orland and the COE to maximize the benefits provided by these reservoirs.

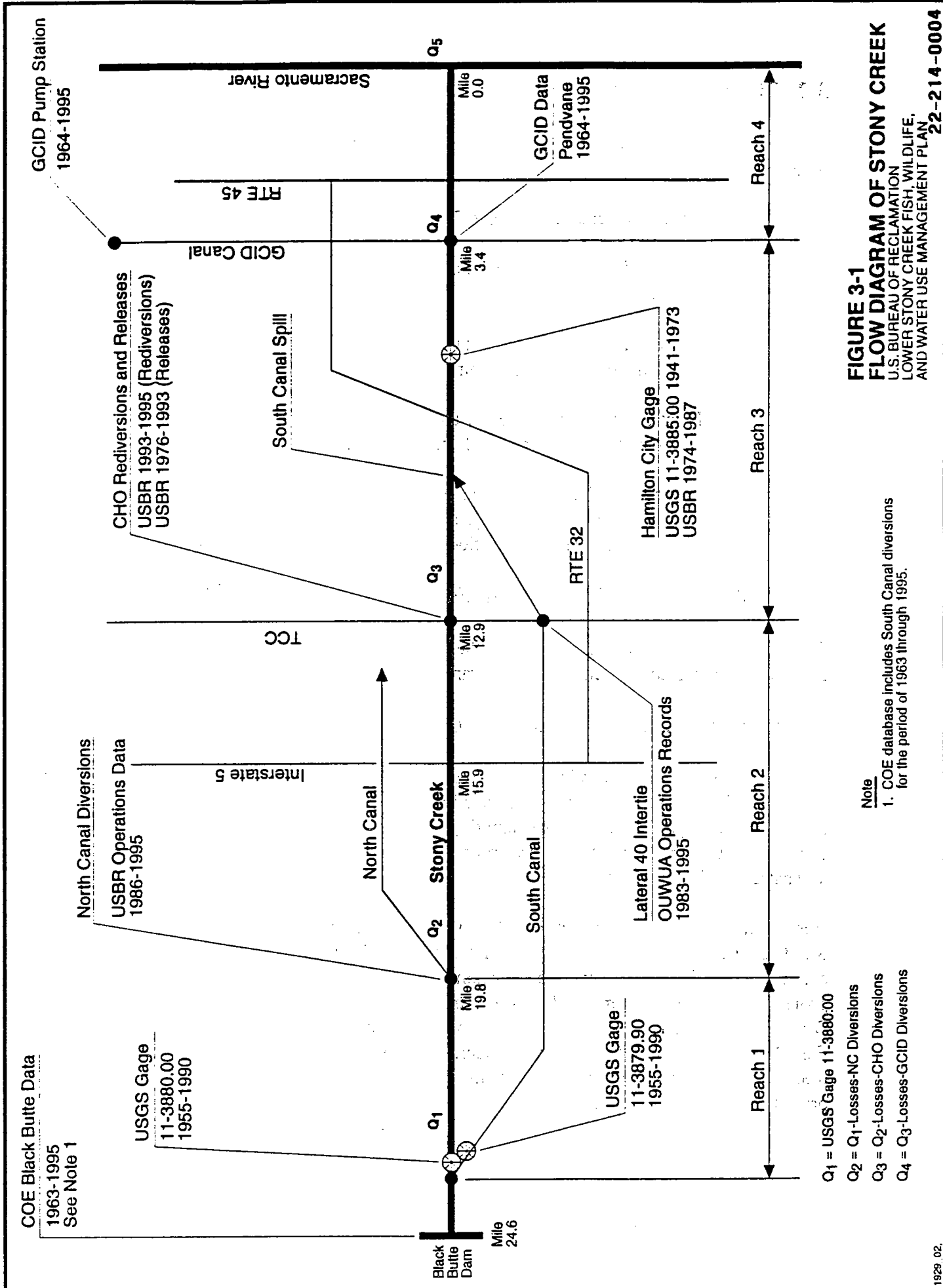


FIGURE 3-1
FLOW DIAGRAM OF STONY CREEK
 U.S. BUREAU OF RECLAMATION
 LOWER STONY CREEK FISH, WILDLIFE,
 AND WATER USE MANAGEMENT PLAN
 22-214-0004

Note
 1. COE database includes South Canal diversions for the period of 1963 through 1995.

Q1 = USGS Gage 11-3880:00
 Q2 = Q1-Losses-NC Diversions
 Q3 = Q2-Losses-CHO Diversions
 Q4 = Q3-Losses-GCID Diversions

At the time the Orland project was authorized in 1907, mitigation for loss of habitat was not considered. More information on these related projects can be found in the "Black Butte Dam and Lake, Stony Creek, California Water Control Manual", COE, May 1987.

Waters released from East Park Reservoir are routed through both Stony Gorge and Black Butte Dams where water is then diverted into the South Canal or released to Stony Creek for subsequent diversion into the North Canal. Annual project diversions averaged 110,000 to 120,000 acre-feet prior to the early 1980s. With current development of 19,000 acres (1995 OUWUA estimate) and water conservation measures, the diversions are now averaging 96,000 to 100,000 acre-feet annually. The projected total development of irrigated acreage is estimated to be 21,000 acres.

Information on the South Canal, North Canal and Lateral 40 can be found in Appendix to Chapter 3, under Sections C, D, E (page A-3-2).

Tehama-Colusa Canal Authority

The TCCA canal system, which is an integral part of the CVP, consists of the RBDD, the TCC, and the Corning Canal. The TCC extends from the RBDD for 111 miles through Tehama, Glenn, and Colusa Counties with its terminus in Yolo County, and serves approximately 150,555 acres of farmland in those four counties. The originating capacity of the TCC at RBDD is 2,530 cfs reducing to 1,700 cfs at the downstream end. The TCC does not have a spilling basin or an ending reservoir at its terminus for excess water, therefore all water within its system must be monitored carefully, both the intake into the system and the deliveries to its users.

Constant Head Orifice - Background. A Memorandum Of Understanding (MOU) was made on November 28, 1966, between the USFWS and Reclamation to delegate responsibility and cost allocation for the RBDD, TCC and TCC fish facilities. According to the 1966 MOU, Reclamation was responsible for such fishery enhancement features as a turnout structure and channel improvements for Stony Creek, access roads and supplemental fresh water supply ponds, and acquisition of land for fish facilities for Stony Creek, as part of an enhancement project. The enhancement project was discontinued by agreement between the USFWS and Reclamation in 1975 due to poor quality gravels and other problems, however the turnout structure, or CHO, a gage to administer water delivery, operated in the spill concept to Stony Creek from 1978 to 1985. Figures 3-2a and b depict historical CHO spills for 1978-1985 (TCCA daily records). CHO spills occurred a total of 1021 days from June 12, 1978, through December 13, 1985. Spill flows went from an average minimum of 63 cfs per day from July 1-15 (950 acre-feet), 1984, to an average maximum of 358 cfs per day from May 1-31, 1980 (22,000 acre-feet). Since 1985, there have been very few diversions to Stony Creek except for 1987, 1989, 1991 and 1993. The spills to the creek were originally intended for fishery enhancement and were also used for agricultural purposes through the GCID canal. The spills out of the TCC into Stony Creek occurred when the gates were in at the RBDD allowing for

gravity flow into the TCC. In 1986, when RBDD began its gates-out period, gravity flow into the TCC was no longer possible during that period.

CHO - Rediversion. Beginning in 1993, the CHO has been used to divert stored water released from Black Butte into TCC, in connection with the RBDD fish recovery efforts. CVP water is diverted from Stony Creek via a seasonal dam into the TCC through the CHO. The seasonal dam is constructed under a Streambed Alteration Agreement with DFG, and under COE Section 404 and 401 permits, issued under the Clean Water Act. These operations have been for shorter periods than the spill operations to Stony Creek and have been 10,000 to 20,000 acre-feet per month. As mentioned in chapter 1, diversion can occur annually from April 1 through May 15, and September 15 through October 29, for a maximum of 38,293 acre-feet. According to the CHO Annual Operations Report, diversions have averaged 180 cfs per day when taken, between 1993 and 1997.

Glenn-Colusa Irrigation District

The GCID serves approximately 175,000 acres in Glenn and Colusa Counties. The GCID main canal diverts water from the Sacramento River into a 65-mile-long earthen channel from Hamilton City to below Williams. Several hundred miles of laterals distribute the water to more than 1,200 farms/ranches and three National Wildlife Refuges throughout the two counties. GCID's main pumping plant has the capacity to divert 3,000 cfs into the main canal about 5 miles north of Hamilton City.

As of 1999, the siphon which is being constructed to cross under Stony Creek at the GCID main canal will alter existing water releases from Black Butte to GCID and limit the capacity of natural flow, when available, that may be provided. With the siphon, GCID will only be able to receive natural flow by pumping which will require an additional berm for diversion. It is likely that most of GCID's water supply will be diverted from the Sacramento River, although the emergency conditions of the current settlement contract will continue to be considered by Reclamation. The siphon will also allow free passage when water is available, for migration of fish as the seasonal obstruction which existed to divert water will no longer be constructed. The siphon will provide a means to supply water to the Sacramento, Colusa and Delevan National Wildlife Refuges, identified in the 1967 Fish and Wildlife Coordination Act (FWCA) report as an enhancement feature of the TCC project. The construction of the siphon has required application for Section 404 and 401 permits and a Streambed Alteration Agreement from DFG.

More information on the GCID and other diverters can be found in Appendix to Chapter 3, under Sections *F, G and H* (page A-3-3).

3.4 Description of Operators and Facilities

The Black Butte Dam and Reservoir are operated cooperatively, by the COE for flood control and by Reclamation for irrigation in non-flood control periods.

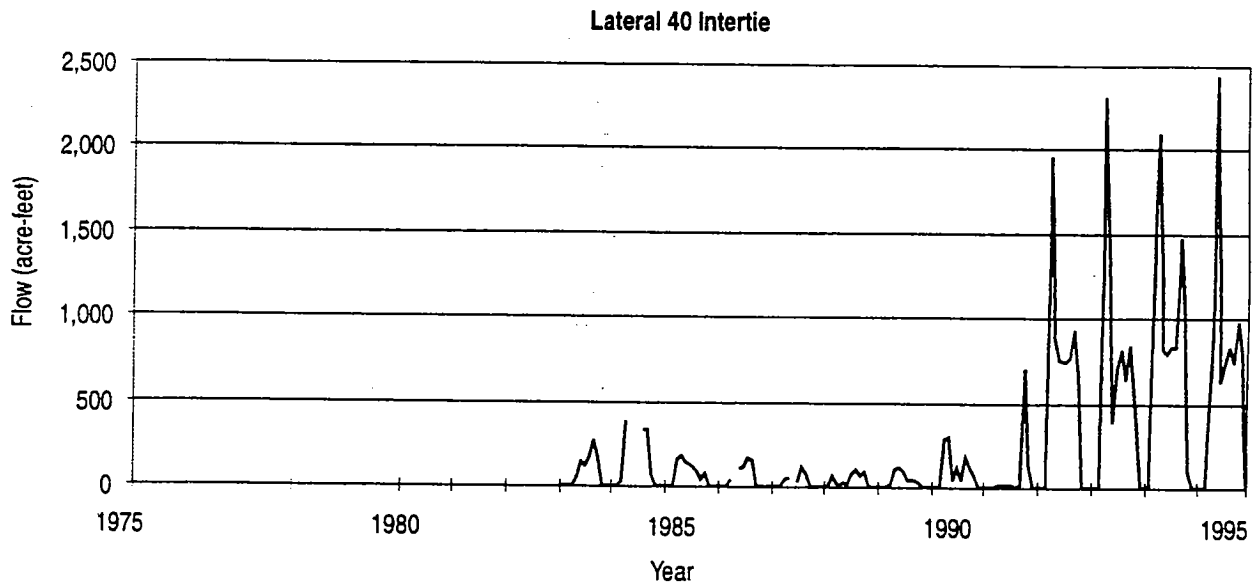
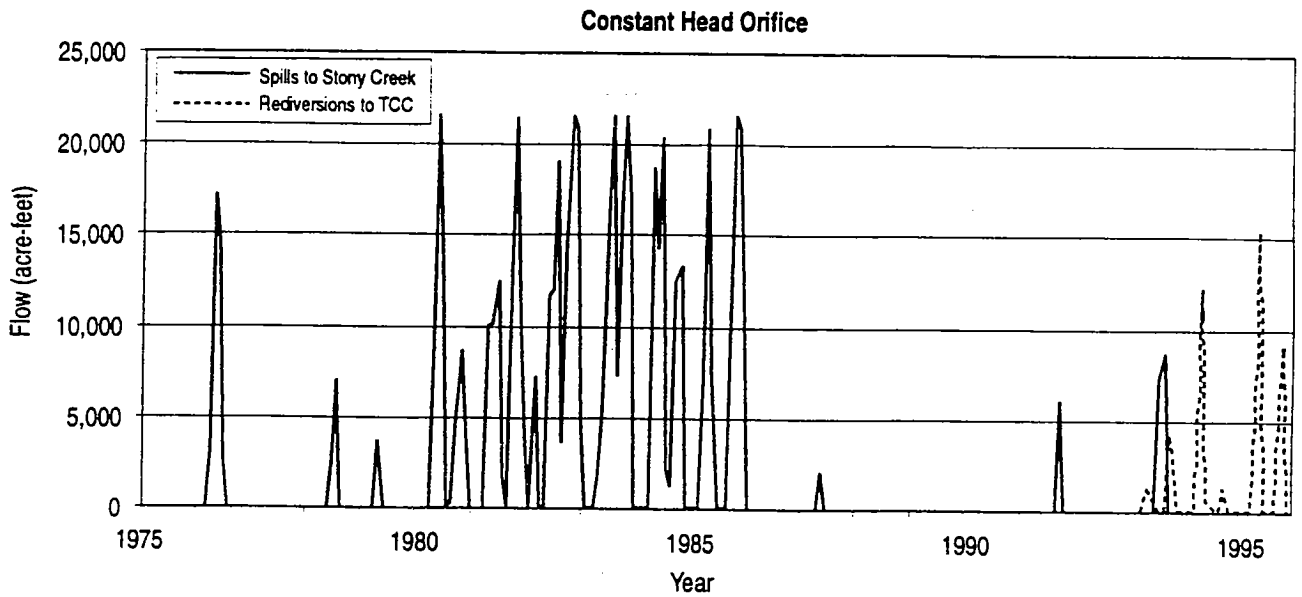


FIGURE 3-2a
TEHAMA-COLUSA CANAL OPERATIONS
CONSTANT HEAD ORIFICE AND
LATERAL 40 INTERTIE FLOWS
 U.S. BUREAU OF RECLAMATION
 LOWER STONY CREEK FISH, WILDLIFE,
 AND WATER USE MANAGEMENT PLAN

Figure-3-2b
CHO Historical Spills

	YEAR	MONTH	DATES	TOTAL DAYS	AMOUNT IN CFS	AMOUNT IN AF
1	1978	June	12-34	13	1423	2823
2			20-30			
3		July	1-23	23	3376	6693
4	1979	April	19-25	7	1817	3603
5	1980	April	15-30	15	4791	9501
6		May	1-31	31	11121	22053
7		June	1-20	20	6673	13233
8		August	30-31	2	400	793
9		September	1-30	30	2460	4878
10		October	1-31	31	4370	8868
11		November	1-14	14	1895	3759
12	1981	April	15-30	15	5350	10612
13		May	1-19	19	4700	9322
14		June	1-19	28	5250	10413
15			22-30			
16		July	1-3	3	500	992
17		September	3-15	27	6925	13736
18			17-30			
19		October	1-31	31	10750	21323
20		November	1-18	20	4470	8866
21			24-25			
22		December	2-19	18	1850	3669
23	1982	February	2-15	14	3650	7240
24		May	4-14	25	6200	12298
25			18-31			
26		June	1-4	20	6050	12000
27			15-30			
28		July	1-28	28	9275	18397
29		August	24-31	8	2100	4165
30		September	1-30	30	7200	14281
31		October	1-31	31	10850	21521
32		November	1-30	30	10500	20827
33		December	1-8	8	2050	4066
34	1983	April	7-12	6	1000	1984
35		May	17-27	11	2550	5058
36		June	2-30	29	8650	17157
37		July	1-31	31	10850	21521
38		August	1-10	10	3300	6546
39		September	6-30	25	8600	17058
40		October	1-31	31	10850	21521
41		November	1-24	24	8400	16661
42	1984	April	2-30	29	9600	19042
43		May	1-31	31	7350	14579
44		June	1-30	30	10100	20033
45		July	1-15	15	950	1884
46		August	27-31	5	750	1488
47		September	1-30	30	6450	12794
48		October	1-22	23	6400	12694
49	1985	March	21-31	11	3650	7240
50		April	1-30	30	10500	20827
51		May	1-3	17	3500	6942
52			6-19			

CHO Historical Spills

	YEAR	MONTH	DATES	TOTAL DAYS	AMOUNT IN CFS	AMOUNT IN AF
53		September	13-30	18	6100	12099
54		October	1-31	31	10850	21521
55		November	1-30	30	10400	20628
56		December	1-13	13	4150	8232
57	1987	May	3-4	2	500	992
58	1989	May	3-16	14	4300	8529
59	1991	September	1-12	12	3050	6050
60	1993	July	19-31	13	4350	8628
61		August	1-11	11	3650	7240

U.S. Army Corps of Engineers

The Black Butte Project on Stony Creek was authorized by the Flood Control Act of 1944 as part of a comprehensive plan for the development of the Sacramento River Watershed. After several amendments to the basic legislation, the Chief of Engineers under the Secretary of the Army was provided authority to operate the Black Butte Project in 1962.

Since that time, the COE, Sacramento District, has operated the project for flood control in accordance with Exhibit A, Chart A-10, of the Flood Control Diagram of the Water Control Manual, 1987 (Appendix K, Flood Control Diagram). Flood control reservation, or space, in Black Butte increases linearly from zero on September 1 to a maximum of 137,000 acre-feet (encroachment stage) by November 30 according to the watershed wetness index (PAR). With a forthcoming revised capacity table, these figures will need to be readjusted. A minimum flood reservation pool of 106,400 acre-feet is required from November 10 to January 23, regardless of the watershed wetness index. The flood reservation is then reduced to zero (reservoir fills) by no later than June 15 according to the watershed wetness index. According to the Flood Control Diagram, "required gross flood control reservation in Black Butte may be reduced by creditable flood control space known to exist in East Park and Stony Gorge Reservoirs...The flood control requirement in Black Butte is equal to the gross flood control reservation minus the total creditable transfer space."

The maximum scheduled flood control release from Black Butte Dam is 15,000 cfs, depending on a release schedule that correlates peak inflow for a specific event and the percentage of the flood control storage reserve in use. The controlled capacity through the outlet works is 22,800 cfs. The rated spillway capacity (uncontrolled weir) for the dam is 76,600 cfs, however, a maximum release limit of 15,000 cfs is used as the "maximum non-damaging flow. Releases from Black Butte Lake will be at rates that will minimize erosion to the extent practicable...although some erosion and bank sloughing occurs at flows well below the maximum non-damaging flows" (COE, 1987). The 15,000 cfs release policy has been disputed by landowners with property adjacent to lower Stony Creek in Reach 1, near Black Butte Dam. Flood control operations by the COE begins when the storage in Black Butte exceeds the flood control space required at any particular time as determined by the Flood Control Diagram. These operations are the responsibility of the Reservoir Control Section personnel, Sacramento District, COE.

Normal flood control operations limit the controlled releases from Black Butte Dam to 15,000 cfs when the reservoir pool elevation lies below 473.5 feet msl (mean sea level). When flow over the spillway occurs during surcharge operations (pool elevation exceeds 473.5 feet msl), the flood control procedures will restrict outflow to 15,000 cfs as long as possible in an effort to minimize downstream erosion. Approximately 450,000 acre-feet of non-CVP water is released between December and March of each year based on the flood control diagram. Many of the flood waters are released for short periods of high flows.

After the flood peak has passed, the Black Butte flood reservation storage will be reestablished

as rapidly as downstream conditions will permit. To avoid the encroachment stage, it is possible for Reclamation with the cooperation of the COE, under certain conditions such as small weather events and mild precipitation in November and December, to make any necessary releases during flood season to avoid COE involvement and the engagement of the Flood Control Diagram (Mike Hughes, Water Operations, Reclamation, 12/97).

Black Butte Storage

Figure 3-3 (upper portion) shows the Black Butte storage levels over the period of record from 1963 to 1995. The pattern shows a filling of the reservoir in the early part of the year (December-March) to an average peak storage of about 100,000 acre-feet. Storage of more than 100,000 acre-feet has been achieved in 18 of the 32 years since the dam was constructed. Minimum pool capacities appear to average about 25,000 acre-feet with the highest in 1982 (approximately 50,000 acre-feet) and the lowest in 1977 when the reservoir was essentially empty.

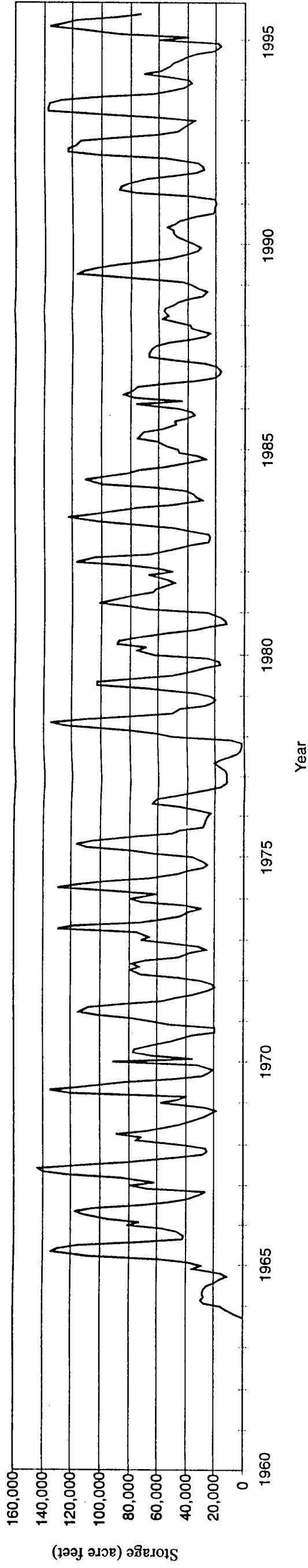
U.S. Bureau of Reclamation

Reclamation directs Black Butte operations for water conservation storage and to supply water for irrigation. Black Butte was integrated into the CVP in 1970. The only space allocations made in Black Butte are 20,000 acre-feet minimum pool storage for reservoir recreation and fisheries purposes (permit requirement-condition #12) and 137,000 acre-feet of flood control reservation. A determination is made at the end of the flood season (usually by April 15) as to how much water is available for CVP water needs from April 15 to the beginning of the next flood season (about October 31). After June 1-15 when CVP water rediversions have been completed for the spring, another assessment on water availability can be made based on storage in Black Butte.

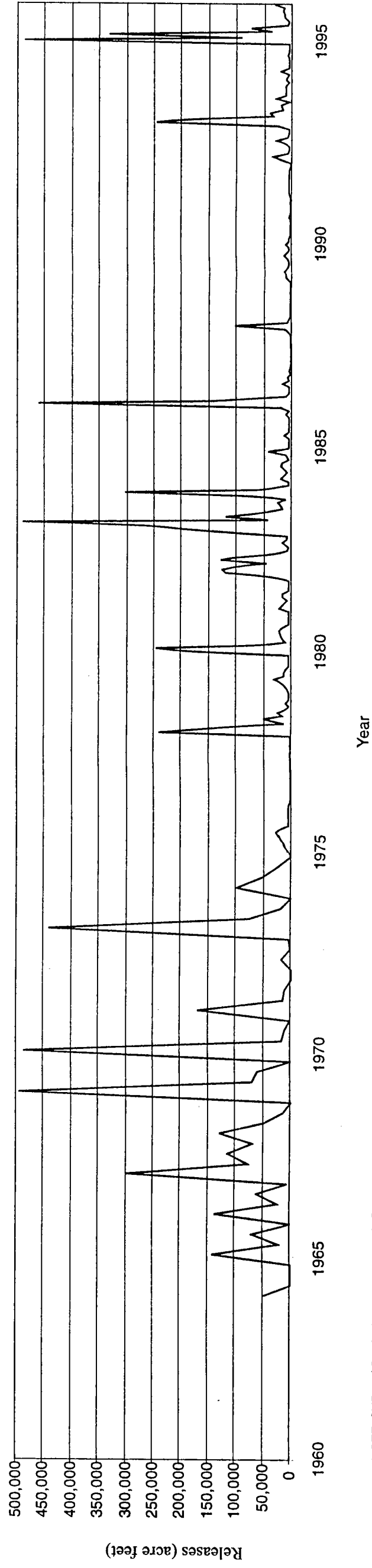
Minimum In-stream Flow. Water is currently released from Black Butte to meet CVP contract water commitments and a minimum in-stream flow diversion of 30 cfs at the dam, as required by the Black Butte operational objectives and EA conditions (Rediverison of Water to the TCC at the Stony Creek Siphon, 1995). When the CHO is in operation, sufficient releases are made to allow for an additional minimum in-stream flow of 40 cfs, provided at the CHO as measured just below the CHO point of diversion.

CVP Water. The project operations for CVP water supply are coordinated between storage in East Park and Stony Gorge Reservoirs each year by Reclamation according to the needs of the Orland Project, and interim permitted diversions through the CHO to the TCC. Communication between Reclamation's Black Butte project office in Willows and COE's Reservoir Control section takes place daily and consideration of a myriad of factors such as inflow, predicted precipitation and storage are factors considered daily in operations. Water supply needs for irrigation for the OUWUA, TCCA, or GCID are compiled and ordered by OUWUA and Reclamation's project operator. Black Butte Dam release records and reporting are compiled by the project operator, OUWUA, TCCA, and GCID.

Black Butte Reservoir Storage



CVP and Flood Release Water



NOTE: CVP and flood release water equals Black Butte Dam release minus South Canal diversion minus North Canal plus Tehama-Colusa Canal Lateral 40 diversion.

**FIGURE 3-3
HISTORICAL BLACK BUTTE RESERVOIR
OPERATIONS FOR THE CENTRAL VALLEY
PROJECT AND FLOOD CONTROL 1963-1995**
U.S. BUREAU OF RECLAMATION
LOWER STONY CREEK FISH, WILDLIFE,
AND WATER USE MANAGEMENT PLAN

Water Wheeling. Reclamation also has used the South Canal diversion, under the exchange agreement, to convey contract water to Lateral 40 (built in the early 90's), which discharges into the TCC. This water conveyance through Orland's facility was typically used when water was not available to TCC from the RBDD, but is no longer used for this purpose.

Central Valley Project Releases. Figure 3-3 (lower portion) is a hydrograph showing Black Butte releases for CVP water use and flood protection purposes from 1963 to present. The hydrograph does not include the releases made for the South and North Canal diversions through Black Butte for the Orland Project. The Orland Project waters were subtracted from the measured releases. The hydrograph does include CVP project water wheeled through the South Canal and Lateral 40 into the TCC for delivery to downstream contractors (which is minimal). Typically GCID, although only entitled to natural flow when available, received these releases at certain times, which were allotted against their contract allocations, and which would have otherwise passed on to the Sacramento River. These releases were used by GCID for irrigation purposes and for delivery to the refuges when there was demand. It is difficult to separate CVP from R-11 or flood control releases based on past records, as these releases prior to 1986 were commingled for accounting purposes. Since 1986 it is possible to separate these releases based on the COE daily sheets, basin parameters, and Reclamation and GCID daily records. Available CVP water can be estimated in June of each year.

Review of the CVP and flood water releases in Figure 3-3 shows high flood control release peaks in January through March of 13 out of the 32 years since Black Butte Dam has been in operation (1964). These peak releases typically exceeded 200,000 acre-feet in a 3-month period with six of the years exceeding 300,000 acre-feet (1969, 1970, 1973, 1983, 1986, 1995). Some of these releases were available for use by water users, but most flowed into the Sacramento River. The CVP releases during some months of the irrigation season tended to range from 20,000 acre-feet to 50,000 acre-feet from 1965 through 1975. During the 1976-1977 drought and for nearly two decades since that time, the CVP releases during the irrigation season have been significantly less as seen in Figure 3-3 during the last half of each year. Upon completion of the GCID Canal siphon, flood release waters will flow to the Sacramento River.

Information on the City of Santa Clara hydropower generation on Black Butte Dam can be found in Appendix to Chapter 3, Section B (page A-3-1).

3.5 Historical and Current Hydrology on Stony Creek

Representative Hydrologic Conditions

Daily basin mean precipitation is computed by the COE from the available daily records and the ratio of the basin normal annual precipitation. The radio reporting stations on the tributaries together with the Black Butte dam precipitation gage are used to estimate the daily basin mean precipitation. Required flood control space is determined from the flood control

diagram, based on the computed precipitation index and available upstream storage space where applicable.

The parameter used to determine the required flood control space is computed daily by multiplying the preceding day's index by 0.97 and adding the current day's precipitation in inches. Required flood control space in Black Butte may be reduced by the amount of space, up to specified limits, known to exist in East Park and Stony Gorge Reservoirs. Reclamation is in the process of installing satellite gages on all tributaries and upper reservoirs to obtain real time data for efficient delivery and release predictions, and inflow information. Reclamation officials estimate a savings of 10,000-15,000 acre-feet with the installation of gages.

All inflow in excess of daily demands are stored to the extent that conservation space is available. Releases of conservation water including such Orland Project water as must be passed through Black Butte need to be in accordance with daily requirements as determined by Reclamation, unless prior release is required for flood control purposes.

The data reduction and analysis of historical operations on Stony Creek required the use of several sources and forms of data. Based on historical data and the authorization of Black Butte for flood control with releases based on the flood control diagram, no "typical" hydrologic condition for the watershed can be defined. However, to expedite the documentation and evaluation of historical operations, three types of hydrologic conditions were selected to represent the spectrum of operating conditions: dry, average (precipitation of approximately 32 inches), and wet years. Reclamation selected the following years based on COE precipitation records of the Black Butte index from 1989-1998 together with Black Butte storage records, as a source of data to be reasonably representative of hydrologic conditions which determine storage for the season. Lower watershed precipitation records have little effect on Black Butte storage conditions:

- Dry Year: 1991
- Average Year: 1996
- Wet Year: 1993

Table 3-1 depicts average monthly precipitation for the three representative years, with corresponding storage on June 1. To demonstrate the atypical conditions of Black Butte and Stony Creek, 1997 is also provided as comparison for an "average" year. Based on precipitation, 1997 was considered average (31.8 inches), however a large percentage of the precipitation fell by January whereby waters were released for flood control, and storage on June 1 was low for the season. In this unpredictable system a water year type is better estimated using a combination of precipitation with storage rather than precipitation alone.

1991, 1996, and 1993 (Table 3-1) appear to satisfy the qualitative description of hydrologic conditions and significantly reduce the data handling associated with long-term daily records.

Hydrologic Condition	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Storage on June 1	Annual
Dry, 1991	0.54	0.43	1.02	0.69	3.24	12.95	1.05	0.59	0.67	0.28	0.00	0.14	86,627	21.60
Average ^b 1996	0.00	0.00	7.15	9.33	8.18	3.77	2.35	2.59	0.53	0.10	0.07	0.04	130,417	34.11
(Average, 1997)	1.85	3.61	14.66	7.70	.53	1.34	0.58	0.56	0.50	0.00	0.32	0.16	56,442	31.81
Wet, 1993	2.59	0.89	11.57	11.31	7.94	2.15	2.24	2.44	1.32	0.00	0.00	0.00	138,956	42.45

^aBased on Black Butte Index precipitation from 1989-1998, using 5 gages (Noel Spgs., Trough Spgs., Alder Spgs., Log Spgs., Black Butte Dam)
^bThe "average" annual precipitation for the five stations was 32 inches.

Operating Conditions

Historic pre-Black Butte Dam data suggests the likelihood of little to no Stony Creek flow below (the future) Black Butte Dam in the unimpaired condition between the months of June and October.

Post-Black Butte, pre-CHO records indicate typically no flows reached the Sacramento River during irrigation season. Total Stony Creek flow to the Sacramento River during the wet (winter/spring) months can be significant.

More information on Pre-Black Butte Dam and Post-Black Butte Dam/Pre CHO Rediversion records can be found in the Appendix to Chapter 3, section I (page A-3-4).

Post-Black Butte Dam/Post-CHO Rediversions

The post-CHO rediversion operations in Stony Creek have developed primarily as a result of the listing of the winter-run chinook salmon and the subsequent change in the operations of the RBDD. As noted previously, the TCC can no longer receive gravity flow water prior to May 15, nor after September 15. As a result, the CHO has been used since 1993 as a facility to take Stony Creek flow and redivert this water into the TCC (Table 3-2). During this time 40 cfs is bypassed below the CHO.

The rediversion of Stony Creek flow has ranged from 9,000 acre-feet in 1993, which is considered a wet year based on precipitation to 25, 771 acre-feet in 1996, an average year. Table 3-2 shows the rediversion quantities for the 5 years. Classifications for wet, dry and normal years based on precipitation do not necessarily reflect wet, dry and normal years based on storage. Rediversion quantities are not driven by wet, normal and dry scenarios but by the timing of weather conditions and farming practices during the spring. Dry conditions, which usually have the highest demand for rediversion, can also have the most limited supply. In 1995 inflow into the reservoir remained high into June, with storage being unaffected by the rediversion. Both 1996 and 1997 are considered average years based on precipitation, but rainfall timing conditions as well as demand and supply were not consistent, demonstrating the difficulty of applying conditions to year-types.

The use of the CHO for rediversion during the irrigation season can occur between April 1 to May 15, and September 15 to October 29. Reclamation's current permit for rediversion is for a maximum of 38,293 acre-feet of water. No rates are specified in the Permit. Actual diversions were 300 cfs or less prior to 1995. Approximately 685 cfs maximum occurred in the spring of 1996, a normal year. The volume of water to be rediverted in any given year would depend upon the amount of water available for agricultural use, without violating the conditions of the permit. The maximum rate of rediversion will be determined by the head

Year	Annual Precip.(inches)	Storage on April 1 (acre-feet)	Storage on June 1 (acre-feet)	Rediversion (acre-feet)
1993	42.45	129,785	138,956	9,124
1994	18.72	68,273	51,152	14,032
1995	48.76	82,178	128,362	28,594
1996	34.11	98,217	130,417	25,771
1997	31.81	74,029	56,442	10,491

differential between the water in the creek and in the canal, but actual rates are subject to control by the gates operator. During CHO operation, permit conditions require 40 cfs to be released below the CHO. Appendix A shows the current Permit conditions.

When water is required for the national wildlife refuges, the flow generally has been wheeled through GCID facilities including the GCID main canal. Although the CHO rediversion facility could function in the transfer of water to the refuges (through TCC and GCID interties when water capacity is available), this form of operation has never occurred because of capacity and timing/demand restrictions. Reclamation and GCID have a wheeling agreement whereby water is transferred via the TCC into the GCID using the Intertie. The USFWS and Reclamation are working toward continued wheeling of water through the GCID main canal, when water is available, with the installation of a siphon under Stony Creek where the canal crosses the creek, along with the installation of fish screens and headworks at the GCID Hamilton City Pumping Plant facility. Project completion is scheduled for the fall of 1998, with operation occurring in the 1999 irrigation season. Fish screens are scheduled for completion in the year 2000.

Available water. Available water is defined by Reclamation as excess CVP water projected to be available for use based on storage as of June 1 of each year, accounting for all required water rights. Factors of evaporation, minimum releases, minimum pools, and conditions of the permit are accounted for in the determination of available water. The average annual yield after all accounting is approximately 56,000-59,000 acre-feet.

Chapter 4

Constraints and Evaluation Criteria

4.1 CONSTRAINTS

In addition to the applicable regulations listed in Appendix to Chapter 2, the constraints listed below will be considered in any Reclamation decision-making process regarding this Plan. Authorized actions by Reclamation will be limited in scope to those which address the terms of the Permit.

Permit and Environmental Assessment Conditions:

1. Maximize storage and minimize spill without violation of COE flood control criteria.
2. Meet Orland Project demands of approximately 100,000 acre-feet.
3. Maintain live stream downstream of Black Butte (minimum of 30 cfs).
4. Meet water supply for Stony Creek water contractors.

TCCA: Divert no more than 38, 293 acre-feet/year; April 1-May 15, Sep 15-Oct 29.
Maintain continuous 40 cfs bypass when diverting.
Ramp downflows no more than 30 percent/hour for 50 cfs.
Use a fish distribution flow of 100 cfs for 24 hours prior to diversion.

GCID: Divert under emergency conditions of 500 acre-feet for 5 days (Angle Decree) if natural flow is available. Fulfill water right settlement Contract No. 14-06-200-855A of directing flows from the Sacramento River whenever possible.

5. Maintain minimum fishery pool in Black Butte (20,000 acre-feet).
6. Stabilization of either Black Butte or Stony Gorge for in-lake fishery enhancement. (Alternate between reservoirs each year.) When water temperature reaches 60 degrees Fahrenheit, limit drawdown to +/- 2 feet for 4 to 5 weeks.
7. Provide water to the TCC service area during the two allotted periods and to the Sacramento, Delevan, and Colusa National Wildlife Refuges.

4.2 EVALUATION CRITERIA

The following criteria are considered in Reclamation's decision making and recommendation process:

1. All actions considered in this Plan will be limited to lower Stony Creek, from below Black Butte Dam to the Sacramento River. Considerations or information concerning the entire watershed will be limited in the context to which it applies to lower Stony Creek.
2. All actions must comply with Federal and State laws, executive orders, and regulations, especially those relating to water delivery and management.
3. Decisions for resource allocations and management must be reasonable, achievable and enforceable, and must consider available technology and budget constraints.
4. Actions which recommend resource allocations must be made in accordance with sound land and water management principles which assure multiple use, when possible, and balance beneficial uses of the State's water with the common law public trust doctrine. The Glenn County Aggregate Resource Management Plan, the Glenn County General Plan and the Stony Creek Vision and Stewardship Plan may be considered. All actions by Reclamation will meet the goals stated in the Plan, within the scope of its authority, and will work with the Black Butte operating guidelines to fulfill irrigation demands, reservoir fishery enhancement, and flood control.

Chapter 5

Management Plan

5.1 Introduction

The problems and issues related to fish, wildlife, and water use management in lower Stony Creek are multifaceted. The balance between water operations and resource enhancement requires a variety of management actions based upon current and future conditions. This chapter discusses what measures or actions are recommended for long-term enhancement of existing and potential fish and wildlife resources to satisfy condition No. 10 of the Permit, and to address the identified issues, both currently (in the next 5 to 10 years) and in the distant future. Actions are differentiated between those which Reclamation is authorized to undertake and those which are the responsibility of other local entities.

Immediate actions assume current conditions which are defined to include the installation of the GCID siphon; reverse operation of the CHO; possible seasonal use of the CHO under suitable temperatures and assuming deliverability of water through the TCC system, or other available CVP water to release flushing flows, if necessary, to prevent fish stranding, should it occur; current COE flood control diagram operations; existing gravel mining operations and methods with voluntary operational modifications; and continued RBDD pumping limitations. Future actions assume new conditions which may include the intended use of the CHO as part of a solution to the fish passage problems at RBDD, temporary releases from the CHO, and/or improved or relocated gravel operation methods, and/or integration with other restoration programs, and/or a revised flood control COE diagram.

This Plan strives to fulfill objectives identified under current actions until such time when other restoration programs change current conditions. Reclamation's direct actions are confined to those within the scope of the permit condition. Adaptive management recommendations have been listed. A "No Action" approach has not been considered in this Plan, although one would be part of any subsequent NEPA documents. The goals, issues, and objectives which have been identified are the dynamic guiding principles by which future management decisions and actions would be guided.

5.2 Other Restoration Programs.

Other restoration programs include the CALFED Bay Delta Ecosystem Restoration Program Plan (ERPP), the Central Valley Habitat Joint Venture (Joint Venture), the CVPIA Anadromous Fish Restoration Program (AFRP), and the DFG Central Valley Salmon and Steelhead Restoration and Enhancement Plan (SSRP).

5.2.1 The ERPP is a comprehensive plan that will restore ecosystem integrity and improve water

management associated with the Bay-Delta system. The document which includes the area of the Colusa Basin Ecological Zone, with Stony Creek, has a vision for providing comprehensive watershed management plans for the basin, restoring upstream areas in lower Stony Creek for improvement of system integrity, increasing habitat complexity at the confluence with the Sacramento River and maintaining and improving rearing habitat for native fish species in the lowermost reach of Stony Creek.

5.2.2 The Joint Venture is a major statewide initiative whose goal is the protection, enhancement, and restoration of riparian habitat that supports healthy bird populations. Objectives include protecting wetlands by acquiring fee-title or conservation easements and enhancing waterfowl habitat in wetlands and agricultural lands.

5.2.3 The AFRP is a plan to increase natural production of anadromous fish in the Central Valley of California. Section 3406 (b)(1) of the Central Valley Project Improvement Act (CVPIA) requires the Secretary of Interior, administered by the USFWS, to develop and implement a program to double natural production by the year 2002. The program gives priority to measures which protect and restore natural channel and riparian habitat values through habitat restoration actions. The AFRP addresses those species identified for restoration in the CVPIA.

5.2.4 The SSRP (1990), based on legislation (Chapter 1545/88) which mandated that DFG make a major new effort to restore salmon, steelhead trout, and anadromous fish, has goals of restoring depleted salmon and steelhead habitat to a condition capable of sustaining population goals. Additional goals include doubling natural salmon production by the year 2000, developing an annual steelhead run in the Sacramento river system of 100,000 fish, and ensuring proper mitigation and compensation of existing projects that have resulted in resource loss, among others. In combination with the SSRP, the DFG has developed a report "Restoring Central Valley Streams: A Plan for Action" (1993) which serves as the foundation for restoring Central Valley anadromous fish habitat and riparian communities.

5.3 Cooperative efforts

Successful implementation of these actions depends on a cooperative effort among respective responsible entities, such as local landowners, local efforts and agencies such as Glenn County, the Stony Creek Landowners and Business Coalition or similar group, gravel mining operators, DFG, USFWS, COE, Caltrans, TCCA, GCID, OUWUA, and Reclamation. Assistance in local planning efforts should include expertise from knowledgeable individuals, State, Federal, and local agencies including NMFS, NRCS, and organizations such as the Sacramento River Preservation Trust, the CSPA, and the Nature Conservancy, among others. Members of the general public may provide input to any proposed actions through the local planning process.