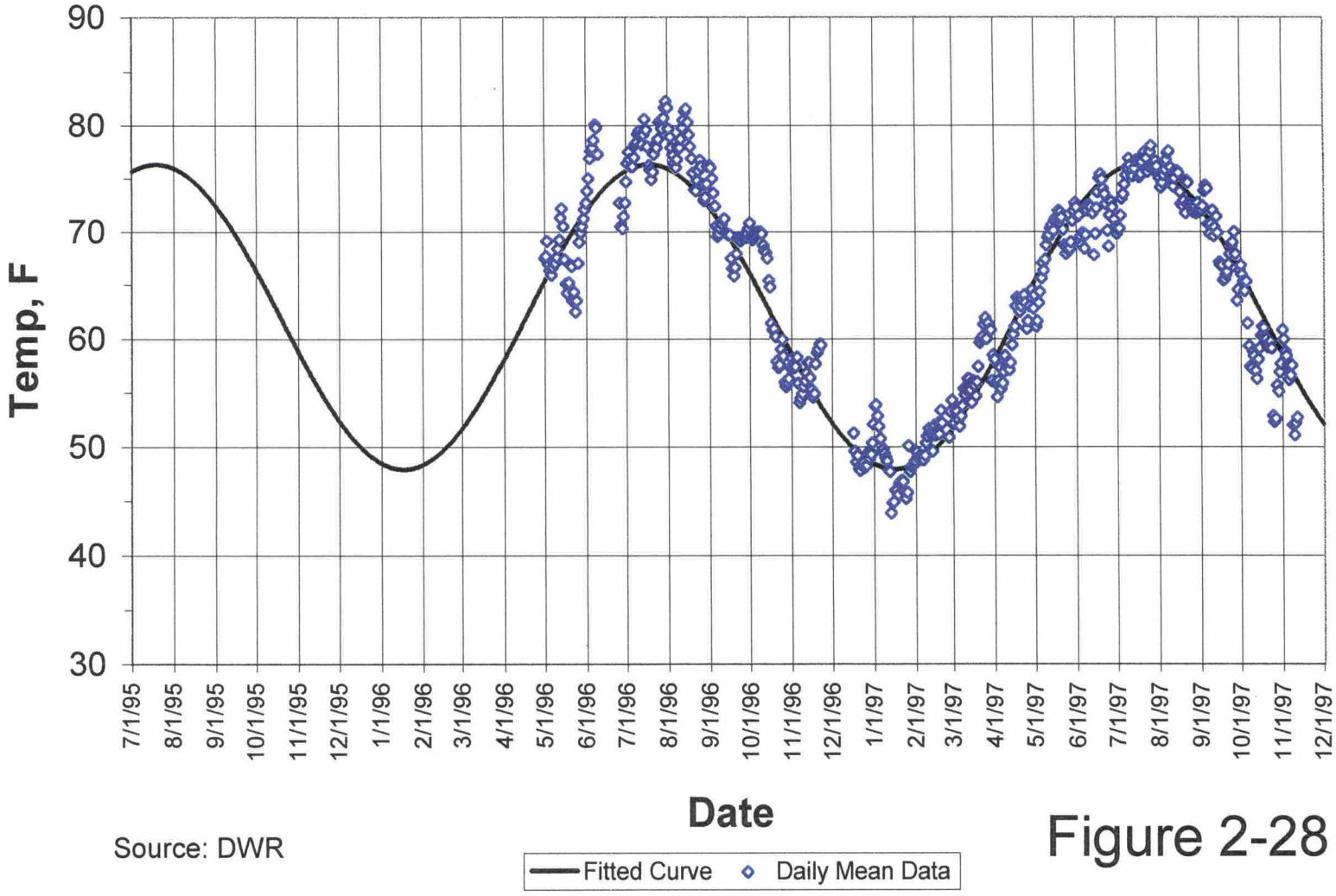

Source: DWR

Figure 2-28

22-214-0034

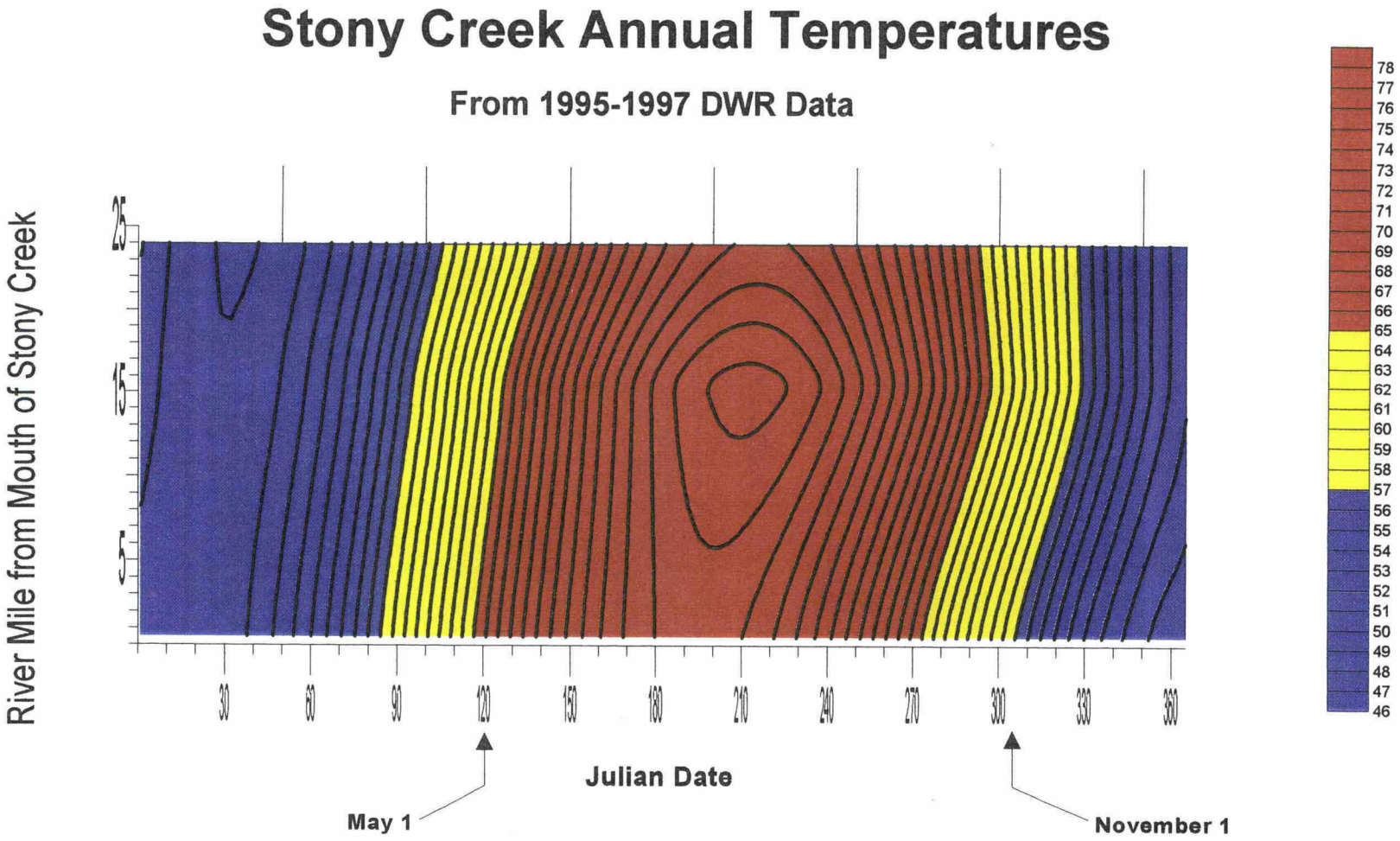

Figure 2-29

22-214-0035

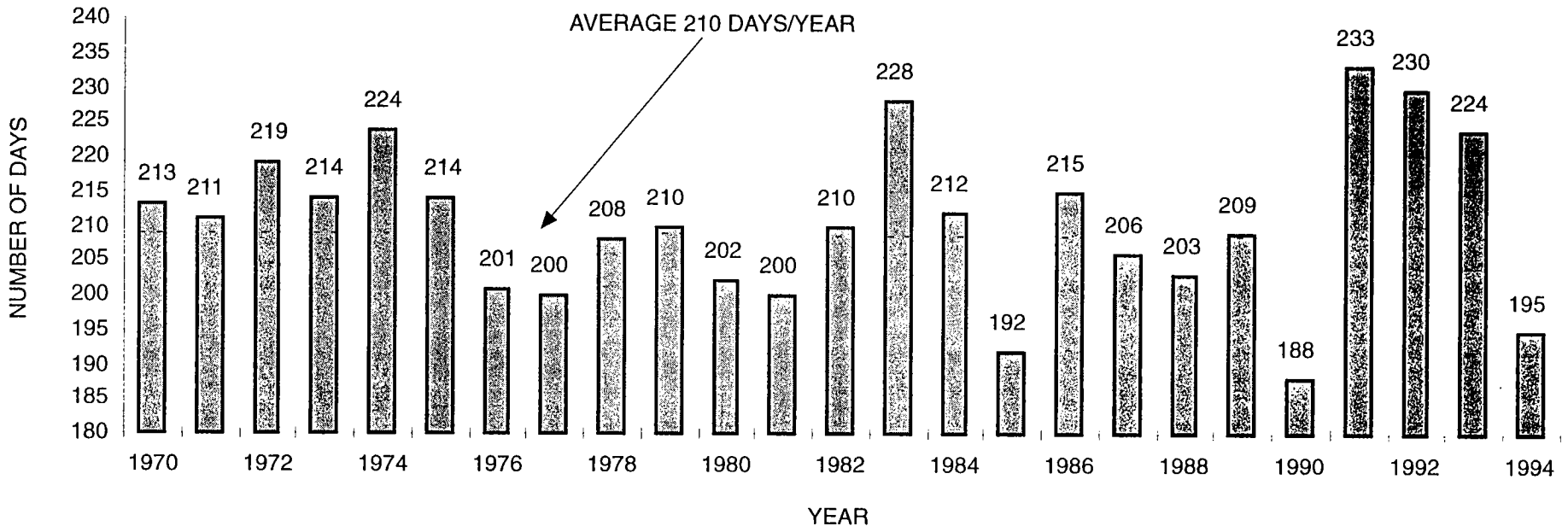

FIGURE 2-30
NUMBER OF DAYS TEMPERATURES SUITABLE FOR FALL CHINOOK SALMON IN STONY CREEK (1970-1994)
U.S. BUREAU OF RECLAMATION
LOWER STONY CREEK FISH, WILDLIFE, AND WATER USE MANAGEMENT PLAN

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their current use of Stony Creek except for periodic opportunistic spawning, most likely in the upper reaches, and associated rearing in the lower reaches, in wet years. When sufficient water flows from Black Butte reach the Sacramento River large numbers of predominantly non-natal rearing juvenile salmon enter Stony Creek from the Sacramento River (Maslin 1995).

Estimated dates of salmon spawning and fry emergence. An analysis of the 1979-1994 water temperature data, years for which adequate temperature information is available, from the USGS gage below Black Butte Dam (DWR), and the dates when chinook salmon could potentially begin spawning in Stony Creek are estimated in Table 2-17a and b. Temperatures in Table 2-17a were averaged for the daily maximum record on the 1st and 15th of the month from October 1-January 1. The use of daily maximum values exhibit the highest possible temperatures for the time period. The average earliest date suitable spawning temperatures of 56°F occurred was November 12. The earliest date on which consistent suitable temperatures of 56°F or less occurred for spawning was November 6 (Table 2-15). From Table 2-17a, it is seen that for fall-run chinook salmon, which normally begin spawning in early October in the Sacramento River system, temperature conditions are not suitable for spawning in Reach 1 of lower Stony Creek, on the average, until early to mid-November in most years.

This information compares to the data in Table 2-16 and corresponds to the midpoint component of that species' normal spawning distribution.

Table 2-17a.
Estimated Date of Emergence of Chinook Salmon Fry From Salmon Redds
Based on Time of Spawning and Water Temperatures
(using average daily maximum water temperature[b])

Species	Salmon Spawning Date	Estimated Date of Fry Emergence	Temp, deg F (ave max)
Fall	October 1	N/A	71.6 (too warm for spawning
Fall	October 15	N/A	68.4 (too warm for spawning)
Fall	November 1	January 30	61.6
Fall	November 15	February 22	55.5
Late-Fall	December 1	March 13	50.8
Late-Fall	December 15	March 25	48.7
Late-Fall	January 1	April 7	45.9

[b]Using historical data collected in Stony Creek below Black Butte Dam, 1975-1994. Assumes water temperatures measured on the first of the month or mid-month are reflective of water temperatures for approximately the following two weeks.

Similarly, the estimated dates of spawning and emergence of chinook salmon fry based on daily mean Stony Creek water temperature is shown in Table 2-17b. The initial spawning dates range from November 6 (1994) through November 25 (1988). For the analysis of the estimated dates of fry emergence it was assumed that following the initial date of spawning, all spawning would be completed within 14 days.

Fry emergence was then estimated using an accumulation of 1600 temperature units for the days following spawning using actual measured daily mean water temperatures from Stony Creek. This analysis resulted in an estimate of a range of dates for each year for which fry salmon would be expected to emerge from the gravel. The estimated fry emergence dates are summarized and shown in Table 2-17b. The estimated fry emergence dates ranged from as early as February 9 through February 22 (1981) to as late as March 2 through March 15 (1988).

Dates for which mean daily water temperatures exceeded 65°F in the spring for fry emergence, were obtained from the water temperature records for Stony Creek as measured at the Black Butte gage. These dates are shown in Table 2-17b. Dates in which temperature conditions in Stony Creek became unsuitable for rearing fry/juvenile chinook salmon (>65°F) Ranged from as early as April 21 (1981) to as late as June 13 (1983).

Table 2-17b
Estimated Dates of Spawning and Emergence of Chinook Salmon Fry
Based on Daily Mean Stony Creek Water Temperature
(Measured at Black Butte USGS Gage)

Year[a]	Initial Spawning Date Based on Reaching Optimal Egg Incubation Temperature[b]	Estimated Dates of Fry Emergency	Date When Water Temperature Exceeds 65°F[c]	Range of the Number of the Rearing Days Prior to Emigration
1979	10 Nov	24 Feb to 8 Mar	21 May	75 to 86
1980	13 Nov	10 Feb to 25 Feb	18 May	83 to 97
1981	15 Nov	9 Feb to 22 Feb	21 Apr	58 to 71
1983	7 Nov	12 Feb to 28 Feb	13 Jun	105 to 121
1986	12 Nov	12 Feb to 25 Feb	9 May	73 to 85
1988	25 Nov	2 Mar to 15 Mar	26 Apr	42 to 55
1989	15 Nov	25 Feb to 11 Mar	24 May	74 to 88
1991	15 Nov	16 Feb to 2 Mar	2 Jun	92 to 106
1993	10 Nov	23 Feb to 12 Mar	23 May	72 to 89
1994	6 Nov	16 Feb to 2 Mar	26 Apr	55 to 69

[a]Using temperature data for only those years where accurate information allowed estimates to temperature thresholds being reached (data available for water years 1970 to 1994).
[b]Assuming spawning would be accomplished within 14 days following temperatures falling under 58°F.
[c]Assuming the accumulation of 1600 temperature units.

The number of days in which temperatures were suitable for fry/juvenile rearing following the dates of estimated fry emergence for those years in which data was adequate are shown in Table 2-17b. From the table the number of days in which rearing temperatures would have been suitable for fry/juvenile chinook salmon ranged from as few as 42 to 55 (1988) to as many as 105 to 121 (1983).

Temperatures in Stony Creek provide suitable rearing conditions for approximately 84 days on average, for the years analyzed, following fry emergence.

Cottonwood Creek water temperature analysis-a comparison. For general information it is useful to observe temperature related limitations for successful spawning and rearing conditions for chinook salmon, based on analysis of the dates of spawning and dates of fry emergence in Cottonwood Creek (another local westside tributary), which were estimated for years in which adequate temperature data were available. It is understood only temperature related limitations are being observed. This information is summarized in Table 2-18. For Cottonwood Creek adequate temperature data were available to estimate the initiation of successful chinook spawning (temperatures <56° F) for the years 1967, 1979, 1980, and 1984. Spawning was estimated to occur as early as November 7 (1984) and as late as November 15 (1967). Estimated fry emergence ranged from as early as February 18 through March 4 (1980) to as late as February 22 through March 20 (1967).

Table 2-18
Estimated Dates of Spawning and Emergence of Chinook Salmon Fry
Based on Daily Mean Cottonwood Creek Water Temperature
(Measured at USGS Gage Near Cottonwood)

Year[a]	Initial Spawning Date Based on Reaching Optimal Egg Incubation Temperatures[b]	Estimated Dates of Fry Emergence	Date When Water Temperature Exceeds 65°F[c]	Range of the Number of Rearing Days Prior to Emigration
1967	15 Nov	22 Feb to 10 Mar	18 May	68 to 85
1979	9 Nov	11 Feb to 5 Mar	30 Apr	57 to 71
1980	7 Nov	18 Feb to 4 Mar	26 Apr	53 to 67
1984	8 Nov	12 Feb to 6 Mar	22 Apr	47 to 60

[a]Using temperature data for only those years where accurate information allowed estimates of temperature thresholds being reached (data available for water years 1963 to 1967 and 1977 to 1985).

[b]Assuming spawning would be accomplished within 14 days following temperatures falling under 56°F.

[c] Assuming the accumulation of 1600 temperature units.

From the data records for mean daily water temperatures measured for Cottonwood Creek at the USGS gage near Cottonwood, the dates when temperature conditions exceeded fry/juvenile rearing (>65 °F) ranged from as early as April 22 to as late as May 18. The number of days in which water temperatures were suitable for fry/juvenile rearing in Cottonwood Creek in the spring following fry emergence ranged from as few as 47 to 60 (1984) to as many as 69 to 85 (1967).

Temperatures in Cottonwood Creek would provide suitable rearing conditions for approximately 56 days on average for the years analyzed, following fry emergence.

Stony Creek temperature suitability. From Figure 2-29 (page A-2-78) it can be seen that temperatures are suitable for a portion of late-fall chinook salmon during their primary spawning months of December through February. Fry from late-fall chinook spawned after December 1 would emerge from the gravel after March 13 through April 17. Because of cold stream temperatures during the winter months, the time to egg and alevin development would be lengthy. That long developmental time would result in a short period of less than two months for fry rearing and smolting before temperatures in lower Stony Creek would exceed upper thermal limits for these juvenile late-fall-run chinook salmon. In the event that temperatures did not exceed tolerable conditions and allowed additional time for development and smolting in Stony Creek, chances are these fish would not be able to emigrate out of the system before temperatures in the Delta became lethal in June. These fish would, therefore, be lost. Therefore, it is unlikely that temperature conditions in Stony Creek would allow for successful production of all late-fall-run chinook salmon, but temperatures may be suitable for a portion of fall-run chinook salmon under favorable conditions, and most likely in wet years.

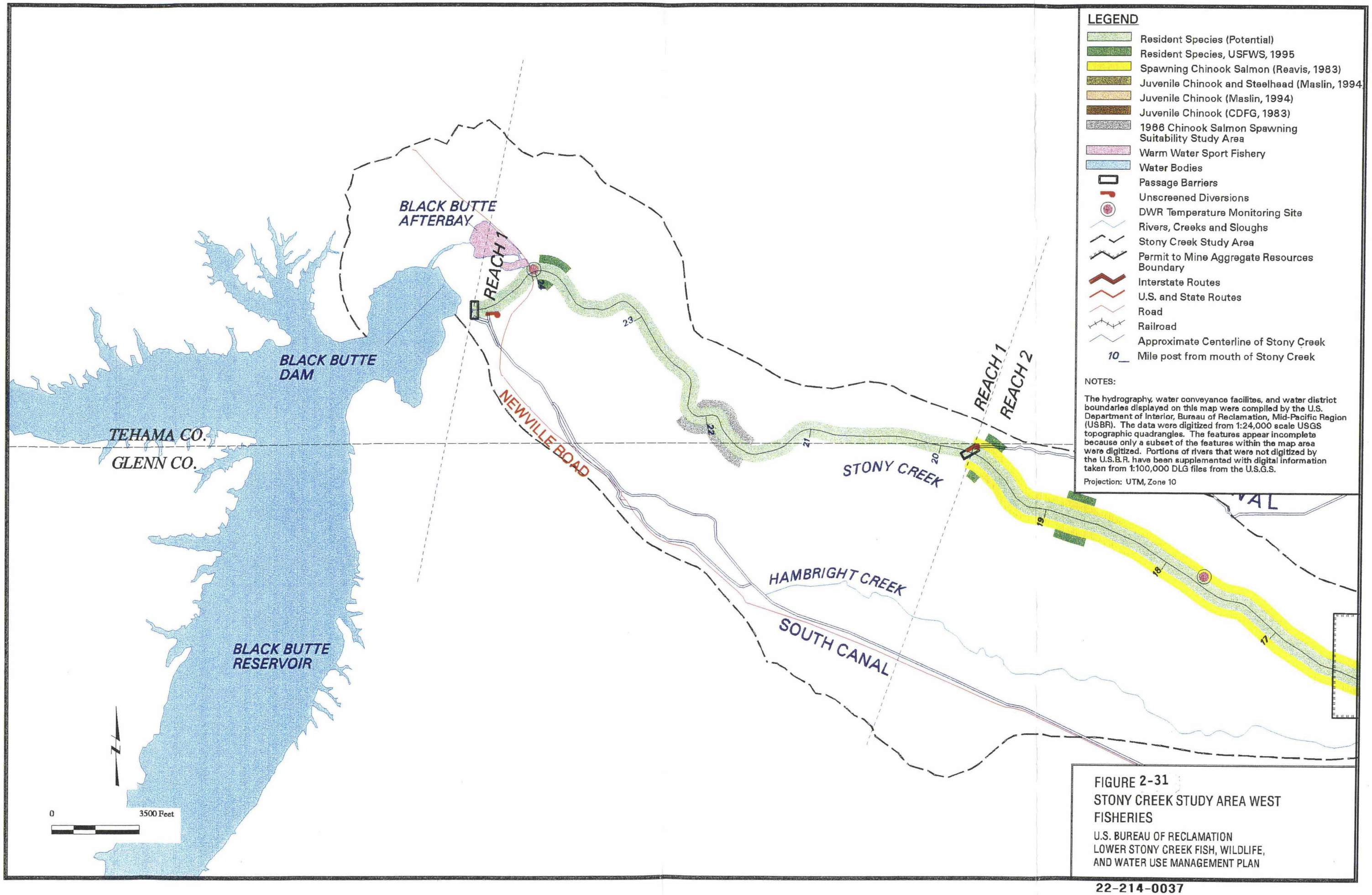
3) Substrate Conditions and Suitability. Spawning sites are generally located just upstream of riffle crests (Lisle, 1989). Optimal survival of chinook salmon eggs and pre-emergent fry (alevins) occurs when the largest fraction of the substrate is greater than one inch and less than three inches. Incubating eggs cannot tolerate large quantities of silt or fine particles as these materials restrict adequate water flow and oxygen to the developing eggs and alevins. Eggs hatch after 40 to 60 days, depending on water temperature with alexin incubation lasting an additional 2 to 4 weeks. Emerging fry seek out shallow near-shore areas with slow currents and vegetative material or cobble/boulder cover. As they grow larger, juvenile chinook salmon fry seek out deeper and quicker flowing habitats for feeding, but remain near in-stream cover objects for predator and velocity refuge. In-stream habitat complexity is extremely important for fry and juvenile chinook salmon. As discussed for resident and non-salmonid fish assemblages, large woody debris, rocks, and boulders, provide young salmonids with rearing and refugial areas within a stream. The needs of salmonids for cover including depth, turbulence, rocks/boulders/woody debris, undercut banks, and overhanging riparian vegetation vary diurnally, seasonally, and by age and size of the fish.

These same habitat requirements are necessary for adult and juvenile lifestages of the native migratory fish, which seasonally move into Stony Creek to spawn. The adults of these species require adequate spawning substrates, such as clean fine gravel or small rocks as well as adequate flows and temperatures to optimize spawning success. The adults of native migratory species must have access to the mainstem Sacramento River after spawning to allow for their return to preferred riverine habitats. In-stream flows of 30 cfs at the dam are provided year round. Magnitude of required flows are disputed and vary for each species, but some of the technical team biologists have recommended that 50 cfs at the mouth of Stony Creek would be a minimum for attraction of salmonids. These recommendations have been disputed.

A spawning habitat survey on lower Stony Creek was conducted by DFG in the mid-1960's (Puckett, 1969). In this investigation, three potential chinook salmon spawning areas were evaluated for their suitability to provide adequate spawning conditions for chinook salmon. The three 0.5-mile reaches investigated within lower Stony Creek were at the U.S. Geological Survey (USGS) gage near Hamilton City, 0.5 mile downstream of Road P crossing near Orlando, and two miles below Black Butte Dam (Puckett, 1969). These study locations are shown on the fishery resources maps (Figures 2-31, 2-32, and 2-33). In this study, three criteria were used to define the amount of usable spawning area available at various flows: gravel size, depth, and velocity. After conducting gravel size analyses during the first year of this investigation, the two lower study locations were not evaluated further because of their unsuitability for chinook salmon spawning. The remaining study reach, two miles below Black Butte Dam, was monitored for an additional year to evaluate spawning suitability at varying flow conditions. The results of this 1960's investigation determined that the substrate particle size was too small in the two lower study areas, but was adequate for chinook spawning in the upper most location, provided flows of 400 cfs are available for adequate depths and velocities.

A recent substrate study conducted by David Vogel (1998) in the upper reaches of lower Stony Creek concluded that "nearly all samples possessed a level of fine particles (mostly sand) within the level of concern for salmonid reproduction" (Appendix I). Vogel reported that the level of small fines is within the level of concern that would probably adversely impact salmon fry emergence success. Vogel has also observed that the "overall physical habitat conditions, e.g., rearing habitats necessary for salmon production were poor compared to numerous salmon-producing rivers and streams...on the west coast." Changes in flood flow releases, loss of upstream gravel recruitment, and continuing aggregate mining have most likely degraded the habitat suitability for salmonid spawning in lower Stony Creek.

4)Riparian habitat/in-stream structural diversity. Native fish species require in-stream structural diversity within pools for predator avoidance, feeding, and reproductive purposes. Trees, roots, snags, and stumps help create eddy currents during flood flows, which in turn create the structural diversity in the stream. These same trees and other large objects provide cover required for predator avoidance. Riparian trees and deep pools can create temperature refugia during harsh summers. Areas of riparian vegetation which provide shade and cover have been known to be associated with lower water temperatures as compared with areas of little or no vegetation. The riparian vegetation also contributes leaves, fruits, sap, and other organic matter that significantly increases food production within the stream. These riparian derived materials are further converted by bacteria, aquatic insects, and macroinvertebrates into in-stream biomass that become the primary food sources for stream fish. Much of the large woody debris required for this structural diversity is presently missing in Stony Creek. The native fish which prey on chinook salmon and other species' fingerlings, including squawfish, are found throughout streams of the Sacramento River Basin. During periods of high flows, a high concentration of predatory fish could enter the channel, remaining after flows recede and



LEGEND

- Resident Species (Potential)
- Resident Species, USFWS, 1995
- Spawning Chinook Salmon (Reavis, 1983)
- Juvenile Chinook and Steelhead (Maslin, 1994)
- Juvenile Chinook (Maslin, 1994)
- Juvenile Chinook (CDFG, 1983)
- 1986 Chinook Salmon Spawning Suitability Study Area
- Warm Water Sport Fishery
- Water Bodies
- Passage Barriers
- Unscreened Diversions
- DWR Temperature Monitoring Site
- Rivers, Creeks and Sloughs
- Stony Creek Study Area
- Permit to Mine Aggregate Resources Boundary
- Interstate Routes
- U.S. and State Routes
- Road
- Railroad
- Approximate Centerline of Stony Creek
- 10__ Mile post from mouth of Stony Creek

NOTES:

The hydrography, water conveyance facilites, and water district boundaries displayed on this map were compiled by the U.S. Department of Interior, Bureau of Reclamation, Mid-Pacific Region (USBR). The data were digitized from 1:24,000 scale USGS topographic quadrangles. The features appear incomplete because only a subset of the features within the map area were digitized. Portions of rivers that were not digitized by the U.S.B.R. have been supplemented with digital information taken from 1:100,000 DLG files from the U.S.G.S.

Projection: UTM, Zone 10

FIGURE 2-31
STONY CREEK STUDY AREA WEST
FISHERIES

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

22-214-0037

corridor.aml, '15 Mar 96 22:10:44 Friday', west_ext_2, J. Case

TEHAMA CO.

GLENN CO.

NORTH CANAL

TEHAMA COLUSA CANAL

SOUTHERN PACIFIC RR

ROAD P

REACH 2

REACH 3

SOUTHERN PACIFIC RR

STONY CREEK

SOUTH CANAL

LATERAL 40

ORLAND

32

5

18

17

15

13

12

11

10

9

8

LEGEND

- Resident Species (Potential)
- Resident Species, USFWS, 1995
- Spawning Chinook Salmon (Reavis, 1983)
- Juvenile Chinook and Steelhead (Maslin, 1994)
- Juvenile Chinook (Maslin, 1994)
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- 1986 Chinook Salmon Spawning Suitability Study Area
- Warm Water Sport Fishery
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- Permit to Mine Aggregate Resources Boundary
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- Approximate Centerline of Stony Creek
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NOTES:

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Projection: UTM, Zone 10

N

0 3500 Feet

corridor.aml, "15 Mar 96 22:11:38 Friday ", middle_ext.2, J. Case

FIGURE 2-32
STONY CREEK STUDY AREA CENTRAL FISHERIES
U.S. BUREAU OF RECLAMATION
LOWER STONY CREEK FISH, WILDLIFE, AND WATER USE MANAGEMENT PLAN

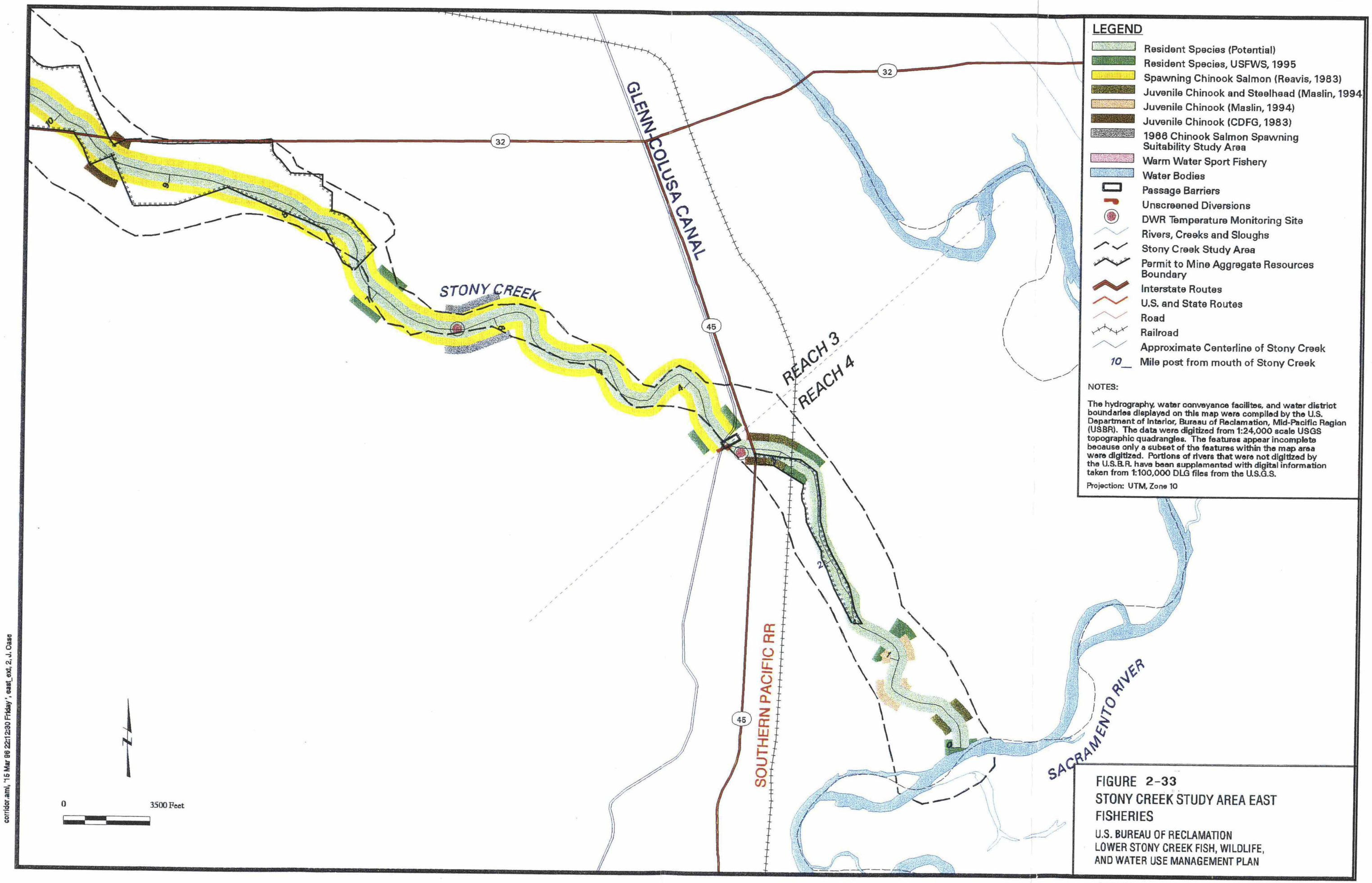

FIGURE 2-33
STONY CREEK STUDY AREA EAST
FISHERIES
U.S. BUREAU OF RECLAMATION
LOWER STONY CREEK FISH, WILDLIFE, AND WATER USE MANAGEMENT PLAN

22-214-0039

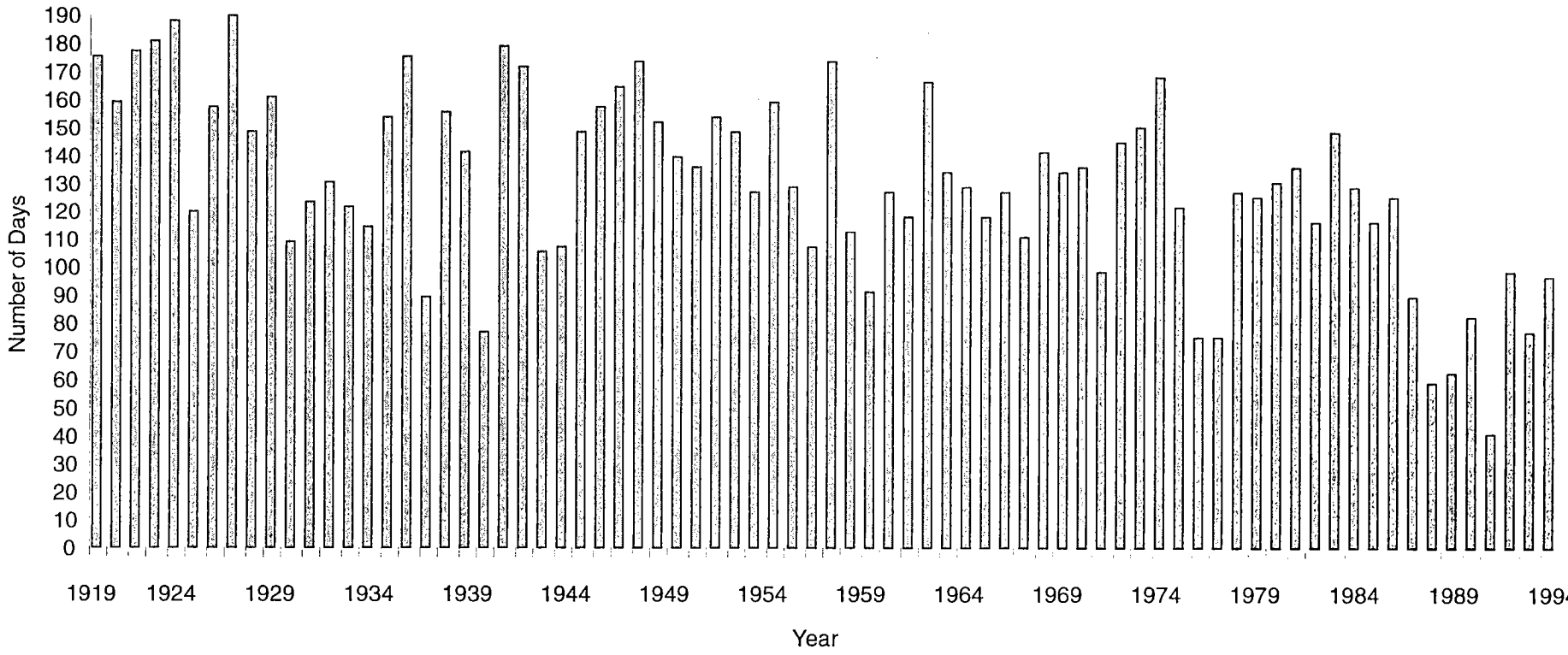

FIGURE 2-34
HISTORIC NUMBER OF DAYS/YEAR IN WHICH GCID'S MAIN CANAL GATES WERE CLOSED
U.S. BUREAU OF RECLAMATION
LOWER STONY CREEK FISH, WILDLIFE,
AND WATER USE MANAGEMENT PLAN

2476_22 (7/14/98)

cover is reduced. While habitat conditions in Stony Creek would likely be enhanced for these predators through flow augmentation, passage barrier removal, and habitat enhancement, conditions for juvenile chinook salmon would concurrently be improved. Monitoring studies would be needed to determine the extent of the impacts resulting from predation on young salmonids.

Chico State University and the DFG sampled the presence of numerous salmon fry at the mouth of Stony Creek. Stony Creek at the confluence of the Sacramento River is considered important non-natal rearing habitat, as the next tributary downstream is approximately 100 miles, at Knight's Landing.

5) Passage and Entrainment. Several passage barriers to fish exist on Stony Creek traveling upstream from the mouth of the creek to the Dam: the seasonal GCID berm, the seasonal TCC CHO berm, the Northside Diversion Dam, and Black Butte Dam.

The annual placement of the gravel berm across Stony Creek to facilitate GCID's transport of irrigation water down the GCID Main Canal had resulted in one of the passage barriers to fish within Stony Creek during certain months of the year. With the placement of this berm in the early spring (in April, on average), all access from and egress to the Sacramento River was eliminated until the berm was removed or the first large fall runoff event or flood-flow releases at Black Butte Dam were made and the berm was washed out (late November on average). With the gravel berm in place, the gates into GCID's Main Canal were opened and water from the Sacramento River flowed down the canal. Diversions on the GCID main canal are screened at the mouth of the Sacramento River at Hamilton City. Figure 2-34 summarizes the approximate number of days in each year since 1919 that the canal gates at the GCID Main Canal across Stony Creek were closed, defining the non-irrigation season and the interval of potential flow passage, assuming flows reached the Canal. Irrigation season went from a minimum of 175 days in 1926 or 190 days of potential flow passage, to a maximum of 323 days in 1991 or 42 days of potential flow passage (Hughes, 1995, Table of GCID gates operation schedule). Generally, the gravel berm was in place during the irrigations season, however it is possible for GCID to have diverted early season water from Stony Creek without placing a berm across the creek. Early season demands were often supplemented by Stony Creek runoff, therefore the potential days of flow passage represent a pattern of minimum days. With the installation of the GCID siphon in 1998 the seasonal berm will no longer be a seasonal barrier.

Another barrier to fish is the lack of consistent surface flows or available water. Stony Creek water does not reach the gates during some months of the irrigation season due to inadequate flows in the past; therefore, the GCID did not take water from Stony Creek during all the months in which the berm was in place. Figure 2-34 indicates that the historic operation of GCID's Main Canal gates had varied greatly. The earliest date the crossing gates have been opened was on January 26, 1991, and the latest in which they were opened was May 2, 1925. During gates operation, the gravel berm was in place a majority of the time, obstructing fish passage. Exact time periods for which the berm was in place is not known.

An additional seasonal passage barrier exists at the TCC during September 15 through October 29 and April 1 through May 15. At those times, a gravel barrier is placed across lower Stony Creek to facilitate the diversion of water into TCC via the CHO. This temporary barrier could act to prevent both upstream and downstream passage of fish species, including salmonids which may occur. during the adult fall immigration and spring juvenile emigration period. The seasonal barrier does contain a passage for a minimum flow of 40 cfs during the operation of the CHO.

The North Diversion Dam in the upper reach of lower Stony Creek blocks any passage of fish from approximately February through November when diversions are made to the North Canal via this structure, although a bypass for flow exists. A portion of fall chinook salmon would not be blocked by this facility if the structure is breached after diversion season, or if a fish ladder was installed.

The ultimate barrier to fish migration is the Black Butte Dam approximately 24 miles above the confluence of the Sacramento River. No fish may pass this structure regardless of the time of year as there are no fish ladders or other facilities provided.

None of the existing agricultural diversions mentioned above have fish exclusion devices (screens), although the CHO has a trash rack. These diversions, as they currently exist, may entrain a portion of fish which encounter the diversion gates. Some passage may occur through the TCC bypass pipe when 40 cfs is released during the reverse operation of the CHO.

Envisioned Salmonid Enhancement Concept on Stony Creek

As a portion of the authorized TCC feature of the CVP, a fall-run chinook salmon enhancement project was originally envisioned for the lower 11 miles of Stony Creek. In the early 1960's, it was recognized that Stony Creek flowed intermittently and did not support significant fisheries. It was assumed the fish habitat existing at that time could be enhanced through channel alterations and flow augmentation. The enhancement plan proposed rehabilitation of the lower 11 miles of Stony Creek below the TCC for fall-run chinook salmon production. It was originally estimated that this project would result in an average annual run of 14,000 chinook salmon spawning in Stony Creek after a 40-year buildup (USFWS, 1963). The proposed project was originally reviewed and approved by the USFWS and the DFG, but later deleted from the project plan.

The originally-conceived Stony Creek facilities included a turnout and regulating pond at the TCC crossing and GCID Main Canal crossing provisions to facilitate fish passage and flows in Stony Creek and to meet existing contracts and water rights (USFWS, 1967). The USFWS proposed that reaches in Stony Creek downstream of the TCC be channelized to confine the flows into one watercourse (USFWS, 1963). The existing holding pond (dewatered) near the TCC crossing on Stony Creek was originally intended to provide a temporary water supply for turnout into Stony Creek during periods when chemical treatment for aquatic weeds occurred in the canal (Hall, 1964). The USFWS proposed that flow augmentation in the creek be provided downstream of the TCC crossing according to the following schedule: October 1 through December 31, 500 cfs; January 1 through April 30, 350 cfs; and May 1 through

September 30, 100 cfs (USFWS, 1967). These flows would be provided by gravity diversion of Sacramento River water at the RBDD, conveyance down the TCC, and turned out into Stony Creek (USFWS, 1969). The USFWS also believed the project would likely result in spring-run chinook salmon, winter-run chinook salmon, and steelhead trout successfully spawning in the downstream 11 miles of Stony Creek if "project flows and modifications were provided" (USFWS, 1963). The initial costs for the Stony Creek fish enhancement facilities (not including annual operation and maintenance [O&M]) were estimated at approximately $3.3 million (USFWS, 1963), however, of the items funded and constructed, the approximate $1.1 million fish passage at the GCID crossing did not occur at that time.

During subsequent project development and after further evaluation of the anticipated fishery resource benefits in lower Stony Creek, the original proposed enhancement plan in the early 1960's was deferred by Reclamation. After meeting with the USFWS, Reclamation, in a letter to the USFWS, cited "the generally silted-up condition and the small proportion of gravel sizes over one-half inch in diameter in the bed material, indicates that successful spawning and, therefore, benefits would be very low unless a large amount of costly processing of the bed material was carried out" (Reclamation, 1967). This determination and other problems including: "interference with gravel mining operations from water releases and land acquisitions, negotiations with GCID on their canal crossing and Stony Creek water rights, damage to fish facilities and channel from winter floods and operating inconvenience connected with the distance of the Stony Creek facilities from other fish facilities were identified by Reclamation as reasons to reconsider the original Stony Creek Fisheries Plan" (Reclamation, 1967).

In that correspondence, other alternatives for Stony Creek fisheries facilities were identified, including an alternative plan for abandonment of the Fishery Plan until "future conditions change or more information is obtained to justify a natural stream channel" (Reclamation, 1967). Reclamation believed at that time that this alternative for abandonment was "the most practical approach" and cited advantages of this plan as well as other factors and considerations (Reclamation, 1967). Other factors included allowance of time to evaluate the results of the Reach 1 TCC fish facilities (spawning channels within the TCC), recognition that the cost of the TCC fish facilities, excluding the Stony Creek facilities would be greater than the original cost of all the fish facilities, and recognition that the State of California had selected the Rancheria Reservoir on Stony Creek as a possible main feature of a water export plan and as such "new conditions may be created in the future which could make a fishery plan on Stony Creek successful" (Reclamation, 1967).

A December 12, 1967, memorandum from the USFWS Regional Director to Reclamation, concurred that "it would be desirable to postpone further consideration for the time being" development of the Stony Creek fisheries facilities (USFWS, 1967). On the basis of this concurrence, Reclamation recommended that "funding and construction programs on all items related to the Stony Creek Fishery Channel, including the turnout facilities, Stony Creek Channel, and the GCID Canal siphon be discontinued" (Reclamation, 1968). "Rehabilitation of Stony Creek for salmon production has been deleted from the project plan because of poor quality gravels and other problems, such as land acquisition and access."(USFWS, 1975). The

USFWS further stated that resident trout fishing benefits for Stony Creek..."should also be deleted since there are no plans to provide public access and flows for fish." (USFWS, 1975).

H. Wildlife Resources

Wildlife biologists reviewed the available documents that provided background information on the occurrence of special-status species and other wildlife along lower Stony Creek, including various Environmental Assessments, e.g., Reclamation, 1995(a), and USFWS Coordination Act Reports, (USFWS, 1994, 1995), and various letters and memoranda prepared by Reclamation and USFWS personnel. Knowledgeable individuals on the Task Force and at the DFG were also consulted for unpublished information on the occurrence of wildlife in the study area.

The NDDB was consulted for information regarding the occurrence of special-status wildlife species. USGS topographical maps and aerial photographs and a vegetation map derived from these sources were reviewed to estimate the extent and quality of wildlife habitats along lower Stony Creek. A wildlife biologist also participated in the December 29, 1995, reconnaissance field survey led by Reclamation personnel (Mike Hughes, Reclamation) to a few publicly accessible points along lower Stony Creek, including below Black Butte Dam, the South Diversion Canal, the North Diversion Canal, the CHO, the GCID canal crossing, and near the eastern abutment of the Highway 32 bridge.

Wildlife Values of Past Riparian Habitats

Prior to the construction of Black Butte Dam, lower Stony Creek offered valuable wildlife habitat including a large stand of riparian vegetation at the Southern Pacific ponds downstream from Orlando that was visible in aerial photographs taken in the 1950's. These photographs also indicated that Stony Creek supported important riparian forests in the active channel and bands of cottonwoods, oaks, and willows along the bank of the creek in many areas.

Historical riparian forests along lower Stony Creek (i.e., those present in the early 1900's) provided habitat for a variety of migratory and resident birds and mammals. Wider bands of riparian historical forest may have supported yellow-billed cuckoos, willow flycatchers, least Bell's vireos, yellow warblers, and yellow-breasted chats. These species formerly nested along many foothill streams flowing into the Sacramento Valley (Grinnell and Miller, 1944), but now only the yellow-billed cuckoo, yellow warbler, and yellow-breasted chat nest in scattered, isolated locations in the Central Valley (Gaines and Laymon, n.d.).

The construction of Black Butte Dam created a barrier to wildlife movement along the riparian corridor of Stony Creek.

Current Wildlife Habitat Values

Wildlife habitats along lower Stony Creek generally correspond to three broad zones as shown in the Stony Creek Vegetation Map Unit Descriptions (Figures 2-18, 2-19, 2-20), including the active zone of the creek channel, the border zone of riparian vegetation along the banks of the channel, and the outer zone of oaks and grasslands along the upper terraces of the floodplain.

Active Zone Wildlife. The active zone includes frequently flooded gravel bars, open channels, and low terraces of the creek. Wildlife in unvegetated portions of the active zone of lower Stony Creek may include a variety of fish-eating species such as great blue herons, great egrets, common mergansers, belted kingfishers, and river otters. Other wildlife that may frequent the active zone include spotted sandpipers, killdeers, black phoebes, beavers, and coyotes. Bald eagles and ospreys have also been observed flying along the creek (USFWS, 1994).

Belted kingfishers, bank swallows, and northern rough-winged swallows nest in vertical earthen banks of the active zone along undisturbed portions of lower Stony Creek. California gulls and herring gulls forage along the creek channels and unvegetated gravel bars, and Bonaparte's gulls forage over open water below Black Butte Dam.

Native shrubs such as mule fat and sandbar willows grow in some areas of the active zone of lower Stony Creek, especially in Reach 1. These shrubs provide important cover and foraging habitat for birds and mammals. Scattered stands of cottonwoods remaining in the active zone are important for a variety of migrant birds.

Approximately 200 acres of lower Stony Creek, however, are currently dominated by giant reed and tamarix, and these nonnative plants have low wildlife habitat values. A few species such as striped skunks, raccoons, coyotes, and owls may use these plants for cover, but giant reed and tamarix are not considered preferred foraging or breeding habitats for native birds and mammals of California (Zeiner, et al., 1990). Giant reed currently creates a monoculture of unproductive wildlife habitat throughout major portions of the active zone of the creek, especially in Reaches 2, 3, and 4. Giant reed has replaced native willows and cottonwoods, with a potential for lost wildlife habitat.

Border Zone Wildlife. The border zone includes all vegetated riparian habitats along the outer banks of the creek that depend on its flows for water. Species such as Cooper's hawks, Swainson's hawks, red-tailed hawks, red-shouldered hawks, white-tailed kites, great egrets, and great blue herons build bulky stick nests high in the crowns of cottonwoods and oaks in the border zone of many foothill creeks, but no specific nesting records of these species along lower Stony Creek were reported in the NDDB (NDDB, 1991).

Woodpeckers excavate cavities in border zone trees that may be subsequently used by other hole-nesting species such as western screech-owls, tree swallows, plain titmice, and western

bluebirds. Migratory and resident passerine birds such as flycatchers, vireos, warblers, and sparrows forage and nest in cottonwoods and oaks.

Small mammals attracted to the rich resources of border and outer zone riparian habitats, in turn, draw predatory animals like red-shouldered hawks, white-tailed kites, gray foxes, and coyotes. Several bat species roost in stream side trees along lower Stony Creek (Zeiner et al., 1990). Reptiles that occur in border zone habitats include Pacific treefrogs, western fence lizards, western skinks, alligator lizards, western whiptails, common kingsnakes, western rattlesnakes, gopher snakes, and racers (Stebbins, 1985).

Outer Zone Wildlife. The outer zone of lower Stony Creek includes high terrace habitats such as oak woodlands, grasslands, orchards, and pastures. Oak woodlands and grasslands near the creek provide shade, shelter, and breeding habitat for many wildlife species, including black-tailed deer, gray foxes, western gray squirrels, white-tailed kites, turkey vultures, American kestrels, northern harriers, mourning doves, California quail, acorn woodpeckers, Nuttall's woodpeckers, scrub jays, yellow-billed magpies, rufous-sided towhees, and northern orioles.

Mammals usually found in adjacent grasslands and outer zone oak woodlands, such as deer mice, California voles, western gray squirrels, black-tailed hares, and gray foxes, often use riparian corridors as refuge from summer heat and drought (Roberts et al., 1977). All these animals use the food, water, and cover that are found in riparian and wetland habitats.

Special-Status Species

A list of Federal and State listed and proposed endangered and threatened species and candidate species that occur or potentially occur in Glenn and Tehama Counties was obtained from the NDDB. These are listed in Table J-1, Appendix J, along with information on their distribution in California, habitats, reasons for decline or concern, and their known occurrence in the study area.

As indicated in Table J-1, several species included on the list which occur or potentially occur in Glenn and Tehama Counties have not been observed and suitable habitats for them are not present along lower Stony Creek. Included in this group are vernal pool obligates (vernal pool fairy shrimp and vernal pool tadpole shrimp), freshwater species with specialized or localized breeding habitats (western spadefoot toad, California red-legged frog, giant garter snake), and Central Valley marshland species (white-faced ibis and Aleutian Canada goose). Since they are not known to occur in the study area, none of these species will be considered further.

The remaining species listed in Table J-1 have actual or potential occurrence in the study area and are discussed as either Threatened or Endangered, or as Candidates and Species of Special Concern. The list has not been updated to include winter-run chinook salmon (endangered) and steelhead trout (threatened).

Discussions of individual species such as the Valley Elderberry Longhorn Beetle (VELB), Bald Eagle, Swainson's Hawk, Western Yellow-Billed Cuckoo, Northwest pond turtle, Osprey and Golden Eagle, focus on their occurrence in the study area, their relative sensitivity to changes in flow regimes and potential to use existing and enhanced habitats along lower Stony Creek. As these species' occurrence is predominantly on private land, any monitoring activities performed are voluntary actions on the part of landowners. Additional species, not currently observed in the study area but which may benefit from habitat improvement, are listed in Appendix J. Habitat improvement activities will be discussed in later chapters.

Threatened and Endangered Species

Valley Elderberry Longhorn Beetle. Valley elderberry longhorn beetles (VELB) are pith-borers on elderberry shrubs (*Sambucus* sp.) in riparian habitats (USFWS, 1984). Recent information has demonstrated that the beetles are found only in elderberry stems 1 inch or greater in diameter (Barr, 1991). Portions of lower Stony Creek were surveyed for VELB on April 16, 1993, and elderberry shrub losses from previous Reclamation activities were quantified (Brown, 1994). Reclamation prepared a mitigation plan for VELB with the cooperation of the USFWS that commenced in the fall of 1995 and is scheduled to end December of 1999 (Reclamation, 1995(a)). The mitigation plan is under contract with Chico State University, to plant and maintain and monitor elderberry seedlings and produce an 80 percent survivability rate over a five year period. At the end of the five year period Reclamation and USFWS will determine if an additional five year monitoring study will be necessary, based on the recommendation of Chico State.

Bald Eagle. Wintering bald eagles occur regularly at Stony Creek reservoirs, and occasionally below Black Butte Dam (USFWS, 1996). Bald eagles are attracted to sources of fish and carrion for foraging. Nesting surveys have been performed at East Park and Stony Gorge reservoirs, but no known nests have been observed in lower Stony Creek.

Swainson's Hawk. This species prefers to nest in the crowns of tall oaks and riparian trees and forages in nearby grasslands and agricultural lands. Several Swainson's hawk nest sites have been observed near the mouth of Stony Creek, along the Sacramento River. Ongoing enhancement of riparian habitats in this area could benefit Swainson's hawks.

Western Yellow-Billed Cuckoo. This species prefers to nest in the crowns of tall cottonwoods, and forages in a variety of riparian trees. Several yellow-billed cuckoo nests have been found along the Sacramento River near Stony Creek (Table J-1), and ongoing enhancement of riparian habitats in this area could benefit this species.

Candidate and Special Concern Species

Northwestern Pond Turtle. Western pond turtles, California's only native aquatic turtle, occur throughout California west of the Cascade-Sierra crest (Stebbins, 1985). Western pond turtles are associated with ponds and waterways in grassland, oak woodland, and coniferous

forest. This aquatic reptile inhabits quiet waters of ponds, marshes, creeks, and irrigation ditches (Stebbins, 1985). This species was observed along lower Stony Creek, and it would benefit from increased riparian habitat and woody debris in the channel.

Osprey. This species is regularly present along the Sacramento River. This fish-eating species would benefit from increased fish in lower Stony Creek. The presence of tall trees and snags are also preferred by nesting and roosting ospreys.

Golden Eagle. This species is occasionally observed flying over lower Stony Creek. Golden eagles are unlikely to nest or forage within the riparian habitats of the study area, preferring grasslands and chaparral.

Any impacts to the above species as a result of proposed actions taken by Reclamation will be discussed in the appropriate environmental compliance documents, prior to action implementation.

I. Climate

The climate of the study area reflects that described for Glenn County, which is predominantly Mediterranean in character, with hot, dry summers, and moderate to cool, wet winters. Summers are characterized by abundant sunshine and light winds (6-8 miles per hour generally from the northwest in the winter and from the south in the summer). The lack of moisture during the summer makes irrigation necessary in any intensified agricultural program. Winter rains provide moisture for dry farming and growth of annual native range grasses and forbs (Glenn County, 1975). The upper watershed variable winter rains and snow provide inflow into the reservoirs for storage, which affect water releases to the study area.

Annual precipitation in the lower watershed is variable with an average of 15 inches in the lowest elevations, most of which falls during the winter. The seasonal total snowfall usually averages less than 1 inch.

Humidity approaches varies from 70-90 percent in winter and from 25-60 percent in the summer.

There are approximately 207 clear days per year, 67 partly cloudy and 92 cloudy. Heavy fog has occurred 10-15 days per year, occasionally persisting for several days at a time.

Evaporation totals approximately 60 to 70 inches per year from an open water surface, occurring predominantly in the summer months.

The mean annual temperature is 62°F with extreme highs up to 117°F. The mean minimum temperature in January averages 36°F. Cold snaps occasionally occur, dropping temperatures from 0°F to 20°F In the fall the first temperature reading of 32°F may be expected by late November, which provides a growing season of approximately 260 days.

J. Applicable Statutes/Permits

Federal Statutes

Central Valley Project Improvement Act. The Central Valley Project Improvement Act (CVPIA) (Title XXXIV of Public Law 102-575) of 1992 amends the authorization of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes. As provided in Section 3402(f), Reclamation is to achieve a reasonable balance among competing demands for use of the CVP water, including the requirements of fish and wildlife, agricultural, municipal and industrial, and power contractors. The RBDD, TCC, and the Black Butte Reservoir are significant CVP facilities.

Black Butte Reservoir is an integrated component of the CVP. Therefore, to the extent that implementation of any of the management considerations provided for in this Plan are dependent upon the operations of Black Butte Reservoir, certain provisions of the CVPIA are relevant. The provisions of CVPIA are not applicable to the Orlando Project.

The CVPIA specifically authorizes and directs the Secretary of the Interior to develop and implement a program which makes all reasonable efforts to ensure that, by the year 2002, the natural production of anadromous fish in Central Valley rivers and streams will be sustainable, on a long-term basis, at levels not less than twice the average levels attained during the period 1967-1991 (section 3406(b)(1)). As currently drafted, the anadromous fish restoration plan (AFRP) relies on the recommendations of the Stony Creek Task Force to initially determine the feasibility of enhancing anadromous fisheries in Stony Creek. If enhancement is determined to be reasonably feasible, the CVPIA provides the authorization to achieve reasonably established enhancement goals. Section 3406 (b)(1) provides in subsection (b)(1)(B) that the Secretary is authorized and directed to modify CVP operations to achieve the goals of the AFRP, including the acquisition of water so long as it does not conflict with the Secretary's ability to fulfill outstanding contractual obligations.

Section 3406(b)(2) authorizes and directs the Secretary to dedicate and manage annually 800,000 acre-feet of CVP yield for the primary purpose of implementing fish, wildlife and habitat restoration purposes and measures authorized by the CVPIA, assisting the State in its efforts to protect the waters of the San Francisco Bay/Sacramento-San Joaquin Delta estuary, and to help meet legal obligations imposed on the CVP by state and federal law including the ESA.

Section 3406 (b)(3) authorizes and directs the Secretary to "develop and implement a program....for the acquisition of a water supply to supplement the quantity of water dedicated to fish and wildlife purposes..."

A restoration fund is also established in Section 3407. Money collected into the restoration fund from CVP water and power users can be used by Reclamation to acquire additional water needed for fish and wildlife purposes from willing sellers. Money from the restoration

fund is also to be used to implement a number of specific programs that are all intended to provide fish and wildlife benefits. For example, the CVPIA authorizes the use of restoration funds for the development of measures to minimize fish passage problems at the RBDD (section 3406(b)(10)).

The CVPIA also requires that a dependable water supply be provided to the Central Valley wildlife refuges. Necessary water conveyance facilities are authorized for construction, and water is to be acquired to provide Level 4 supplies with funding from the restoration fund (section 3406(d)).

Section 3408(j) directs the Secretary to develop a "least cost plan" on how to increase the yield of the CVP by the amount dedicated in the CVPIA, in a way that would minimize impacts to CVP water users, should they be impacted.

Endangered Species Act (ESA). Under Section 9 of the ESA, "take" of federally-listed endangered fish and wildlife species by all persons (individual, corporation, or local, State, or Federal employee or department) is regulated by permit. The definition of "take" is broad and means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in such conduct." Harass has been interpreted as significant disruption of normal behavior, and harm has been interpreted to include significant habitat modification. Incidental take that occurs as a result of a federal activity, such as implementation of this Plan, can be authorized under Section 7 of the ESA which requires consultation with the USFWS, National Marine Fisheries Service (NMFS), or both. Take can only be permitted if it is incidental to carrying out an otherwise lawful activity. Through Section 10 of the ESA, private landowners or governmental bodies are able to develop habitat conservation plans that permit take of endangered or threatened species. The official federal listing of endangered and threatened animals is published in the Federal Register, 50 CFR 17.11. The Secretary of the Interior (USFWS) is generally responsible for implementing the provisions of the ESA, with the exception of anadromous fish and marine mammals, in which cases the Secretary of Commerce (NMFS) is responsible for implementing the ESA.

This Plan will also consider the California Endangered Species Act (CESA), on a cooperative basis and as information to the SWRCB. The CESA has a listing of endangered species separate from the ESA. The official California listing of endangered and threatened animals is contained in the California Code of Regulations, Title 14, Section 670.5. Plants protected by CESA are listed separately through the Endangered Plant Program. The California DFG is the state agency responsible for implementing CESA.

Clean Water Act. The COE has jurisdiction under Section 404 of the Clean Water Act over the discharge of dredged or fill material into waters of the United States, which includes most intermittent streams and wetlands. Any actions involving discharge of material, including the operation of the CHO must abide by the terms of the Clean Water Act. Certain discharges are permitted under COE Nationwide Permits. These discharges consist of projects requiring minor amounts of fill that meet a series of general conditions.

For example, the project must not have any significant impacts on threatened or endangered species, historic sites, or spawning areas, and must include erosion control measures. If a discharge is not exempt or permitted under a Nationwide Permit, an individual Section 404 permit is required. Also, the USFWS is involved in reviewing any Section 404 permit applications or Nationwide Permit notification for projects that could affect threatened or endangered species whether those species are in wetlands or upland areas also affected by the project.

In California, an individual State water quality certification must be obtained or waived before issuance of a Section 404 permit. Although not binding on the United States, Reclamation voluntarily abides by this certification. This Section 401 certification is issued by the individual Regional Water Quality Control Board (RWQCB). For this project, it would be the Central Valley Region.

NEPA/CEQA. Adoption and implementation of this Plan will require compliance with both the National Environmental Protection Act (NEPA) and the California Environmental Quality Act (CEQA).

If any of the management considerations include modifications to the existing operation of the Black Butte Reservoir or other action that can be considered to constitute a "federal action" or requires federal funding, then NEPA will apply. Any proposed actions which are to be implemented by landowners or other state or local agencies, will be bound by CEQA requirements.

The SWRCB had to comply with CEQA when it considered Reclamation's petition to add a point of rediversion to its existing water rights permit that allowed diversion to storage at Black Butte. Modification of a water right permit is a discretionary action by the SWRCB that triggers an environmental review under CEQA. The CEQA process serves to fully evaluate any potential impacts associated with the proposed modified water right and implementation of the proposed Plan. Additionally, the CEQA process identifies appropriate mitigation measures for any identified adverse impacts. This Plan, which is one aspect of the protest dismissal terms proposed by the SWRCB to resolve the protest to Reclamation's petition, is not a CEQA document, but its implementation will trigger NEPA and possibly CEQA analyses.

In most cases when a project is subject to both NEPA and CEQA, a joint document, an EA/Initial Study (IS), is prepared complying with both acts. In this case, it is likely that an EA/IS would initially be conducted to identify any potential impacts. If no impacts are identified, or if any identified impacts can be mitigated, then a FONSI under NEPA and a Negative Declaration (NegDec) under CEQA would be sufficient environmental review. However, if unavoidable significant environmental effects are identified, than a full Environmental Impact Report (EIR) under CEQA and, if necessary, an Environmental Impact Statement (EIS) under NEPA would be prepared.

State Statutes

According to title 13 of the treatise entitled CAL JUR 3d addressing "Constitutional Law" the United States is not generally bound by state regulation, however "private corporations are not necessarily exempt from state control because of contracts with the federal government." Reclamation voluntarily complies with any state or local law, regulation or permit. Any actions undertaken on lower Stony Creek by responsible parties should consider the following regulations.

California Fish and Game Code Sections 1601 and 1603 - Streambed Alteration Agreements. The DFG requires Streambed Alteration Agreements under Sections 1601 (public agencies) and 1603 (private entities) of the California Fish and Game Code. A Section Agreement is needed for any project that will divert, obstruct, or change the natural flow or bed, channel, or bank of any river, stream, or lake that at any time has an existing fish or wildlife resource.

Currently on Stony Creek, each in-stream gravel mine operates under a Section 1603 Streambed Alteration Agreement. These agreements include specific conditions for the gravel operations including restrictions on timing and extent of operations. Similarly, Reclamation has voluntarily entered into 1601 Agreements with the DFG.

California Fish and Game Code Section 5937 - Releasing Water For Fish. Section 5937 requires the owner of any dam to allow sufficient water at all times to pass over, under or through the dam to keep any fish that exist or have been planted below the dam in good condition. In a lawsuit entitled Natural Resource Defense Council v. Patterson, Civ No. 88-1658 (E.D.Ca.), the applicability of that statute to Reclamation's operation of Friant Dam of the Central Valley Project is currently being litigated.

California Water Code Section 8590 et seq. - Encroachment Permits. The Reclamation Board has permitting authority for lower Stony Creek with respect to actions that may affect the integrity and safety of flood control project levees and floodways to prevent encroachments that could impair flood-flow capacities.

Surface Mining and Reclamation Act. The Surface Mining and Reclamation Act of 1975 (SMARA), California Public Resources Code section 2710, et seq., with subsequent amendments, is the principal instrument for regulating gravel mining in California. Although not binding on the United States, it will be considered on a cooperative basis in determining potential actions and providing information to the SWRCB. SMARA designates lead agencies, usually counties and cities, to carry out the main provisions of the Act after the lead agencies receive approval from the State Mining and Geology Board for their general plan "mining ordinances". The lead agency for gravel mining in Stony Creek is Glenn County Resource, Planning, and Development Department, which has received approval from the State Mining and Geology Board for their mining ordinance. Gravel extractors commencing operation after January 1, 1976, are required to submit to lead agencies a "Reclamation Plan" describing the existing environment, the intended ultimate

reclamation of the site, and the manner in which adverse environmental effects are to be prevented or minimized. Lead agencies are required, under SMARA, to submit Reclamation Plans to the California Office of Mine Reclamation (COMR) for review and comment. Operations started after adoption of the County Zoning Code are required to have a Conditional Use Permit while older operations have "grandfathered" rights to mine.

Under a 1987 amendment to SMARA, long-term general plans required that all cities and counties under the California Government Code must now include mineral resource management policies that conserve and develop those resources. Land uses that affect State designated aggregate resources are to be managed to prevent loss of access to the resources. In an effort to identify alternative out-of-channel aggregate resources, the California Division of Mines and Geology has completed (1997) the "Mineral Land Classification of Concrete-Grade Aggregate Resources in Glenn County, California."

County Land Use Permits. In-stream gravel mines established after January 1, 1976, require a use permit from Glenn County and must also submit reclamation plans under SMARA. Extractions operating prior to 1976 have "vested rights" and are exempt from their requirement of a county use permit, but must still submit reclamation plans to Glenn County as lead agency under SMARA.

Non-vested rights operations are subject to use permit regulations and requirements that undergo review and renewal once every 1 to 3 years. New operations after 1990 are required to prepare an Environmental Impact Report and to comprehensively identify and manage impacts. For ongoing non-vested rights operations, Glenn County circulates the use permit applications to other agencies and usually attaches conditions that the operator must conform to outside agency requirements.

Private Property Rights

California Penal Code, Section 602 (j), concerning criminal trespass states that any person who enters onto private property without permission of the landowner may be subject to prosecution. As Stony Creek is predominantly bordered by private property and the streambed itself is privately owned, any recommended land use actions on private property must have the authorization of the land owners.

Applicable Water Rights

Water rights within the Stony Creek Watershed are described as adjudicated and/or appropriative. The adjudicated water rights on Stony Creek include pre-1914 water rights and riparian rights. The remaining water rights are those permitted by the SWRCB after 1914 when the State of California created a permit system as the exclusive method for acquiring an appropriative water right.

Stony Creek is generally described as an adjudicated stream system. The Angle Decree, which was handed down on January 30, 1930, by the Federal District Court for the Northern District

of California in the case United States v. H.C. Angle, et al, In Equity No. 30, adjudicated and confirmed the priorities of the right to the waters of Stony Creek among the parties to the legal action. These adjudicated water rights are senior to other appropriative water rights established on Stony Creek after adjudication. A watermaster appointed by the Court carries out and enforces the provisions of the Angle Decree and the instructions and orders of the Court.

Adjudicated Water Rights. The United States' entitlement under the Angle Decree includes the right to divert water to storage in East Park Reservoir, a feature of the Orlando Project, and to directly divert natural flow water to use on lands within the Orlando Project. Water is diverted to storage in Stony Gorge Reservoir, another feature of the Orlando Project, pursuant to an appropriative water right (Application 2212, License 2652) granted to the United States by the SWRCB.

GCID's Angle Decree entitlement is for the direct diversion of natural flow in Stony Creek and does not include a right to any of the water stored by the United States from either the Orlando Project reservoirs or from Black Butte Dam and Reservoir (Black Butte). Pursuant to its Sacramento River Water Right Settlement Contract with Reclamation (Contract 855A), GCID agreed to divert its total supply of water, including a negotiated amount in recognition of its right to water from Stony Creek, from the Sacramento River, as directed by the United States. The Angle Decree provides that once the United States has taken its allotment of 265 cfs from the natural flow of the creek for use in the Orlando project, GCID may then divert to the extent it is available up to 20,315 acre feet of water from the natural flow. Diversion, when available, can be made by GCID between March 15 and October 1 at a rate not to exceed 500 cfs during a period not to exceed five consecutive days in the event GCID's Sacramento River pumps are inoperable because of an emergency or unforeseen cause. Moreover, the Settlement Contract provides that the underlying rights remain, and that if the Contract is not renewed, GCID has the right to revert to Stony Creek. Diversions by GCID from Stony Creek are downstream of Black Butte. Diversions required the use of a seasonal berm, which was constructed under a Streambed Alteration Agreement with DFG. The agreement expires in 1999. With the construction of a siphon under lower Stony Creek at the GCID main canal crossing scheduled for 1998, future diversions by GCID would require pumping and possibly a new agreement for a berm construction.

Appropriative Water Rights. About 30 years after the Angle Decree was handed down, Black Butte was constructed by the COE. Black Butte is an authorized feature of Reclamation, CVP, and is both financially and operationally integrated with the other units of the CVP. The CVP and the Orlando Project are totally separate projects with separate water rights. Black Butte water rights are junior to those water rights adjudicated in the Angle Decree and, therefore, Black Butte water rights can only be exercised if water is available. GCID has no entitlement to water stored in and released from Black Butte.

Water is diverted to storage in Black Butte under an appropriative water right permit granted to Reclamation by the SWRCB pursuant to water right Application 18115. Application 18115 has a water right priority of April 30, 1958, and Permit No. 13776 was issued to the United States

pursuant to that application on November 19, 1962. Water stored in Black Butte by Reclamation is CVP water.

While Permit No. 13776 authorizes Reclamation to divert water to storage in Black Butte, it does not list the CHO as a point of rediversion of the water released from storage at Black Butte. For this reason, Reclamation filed a petition with the SWRCB to allow stored CVP water released from Black Butte to be rediverted into the TCC through the CHO. This will assist Reclamation in meeting its contractual irrigation demands along the TCC during periods when the gates at the RBDD are raised to facilitate fish migration in the Sacramento River.

Five small diverters with appropriative water rights are under contract with Reclamation for Black Butte exchange water.

Numerous other appropriative water rights exist within the Stony Creek Watershed primarily for winter runoff to stock ponds. Records indicate that GCID and Reclamation are the only entities with a water right to make substantial diversions from Stony Creek, downstream from the Orlando Project North Diversion Dam, which is downstream from Black Butte.

Public Trust Doctrine

The SWRCB is authorized to impose public trust terms and conditions to conserve the public interest, specifically the consideration of in-stream beneficial uses, when it issues permits to appropriate water. Frequently it reserves jurisdiction to consider new in-stream uses and to modify permits accordingly.

In the Mono Lake Decision (National Audubon Society v. Superior Court Alpine County, 1983) (33 Cal. 3d 41a), the California Supreme Court ruled that long established water rights are subject to limitation if the public trust is threatened. In that case, the natural environment of the lake was being destroyed by water export from its tributaries. Because the public trust was earlier expanded (in Marks v. Whitney and other cases) to incorporate environmental values, this decision required that the SWRCB has a duty to weigh environmental concerns, including fish, wildlife, and water when considering existing and requested water rights. The outcome was the return of Mono Lake closer to its natural state.

The California Supreme Court also ruled that both the appropriative water rights system and the Public Trust Doctrine must be accommodated. Public trust uses are subject to the doctrine of reasonable use, and public trust uses do not have priority over other water uses. But, rather all competing uses of water must be balanced (Audubon pages 442-443; 445-447).

Under California law, the Public Trust Doctrine serves to protect all navigable waterways, including the beds, shores, and waters of a navigable stream or lake with a public trust easement and can be used to protect navigable and non-navigable waters from harm caused by diversion of non-navigable tributaries. The "public has a right to utilize... any waterway that is susceptible of being navigated by even the smallest recreational craft, where access to and from the waterway may be obtained legally (California State Lands Commission, 1993). Although disputed, lower Stony Creek is considered non-navigable, has never been declared navigable by any court of law, and therefore does not employ a public trust easement along its

privately owned meandering shores. No watercraft to date has successfully negotiated lower Stony Creek's fluctuating flows from Black Butte Dam to the confluence of the Sacramento River without trespassing on or entering upon private property. Use of the lands along lower Stony Creek by any watercraft operator must be obtained with the permission of the associated landowners.

To date, the manner in which the public trust doctrine relates to lower Stony Creek has not been specifically addressed by the SWRCB or the courts.

Appendix to Chapter 3

Appendix to Chapter 3

A. Changes in Original Dam Design

Studies and investigations subsequent to the project authorization resulted in changes in the original dam design as follows:

- Main dam was raised from 124 feet to 140 feet
- Length of the dam was increased from 2,370 feet to 2,970 feet
- Number of dikes was increased from two to six
- Spillway type was changed to a brood-crested, uncontrolled weir with capacity of 76,600 cfs
- Flood control and irrigation outlets were combined into a 23-foot-diameter concrete tunnel through the right abutment controlled by hydraulic gates in the intake tower

B. City of Santa Clara

The City of Santa Clara (SC) is interested in the Stony Creek and Black Butte Dam operations because of the hydropower generation at Black Butte Dam. The hydropower project does not effect operations of Black Butte, but instead uses the release quantities mandated by downstream appropriations (water supply) or flood control operations. Water diverted through the powerhouse is returned to the creek below the dam. The construction of the powerhouse changed the location of the South Canal intake tunnel to approximately 100 yards downstream of its original location.

The power generation window is ordinarily between 200 and 1,000 cfs The SC operator has the capability to set the programmable powerhouse controller for appropriate gate selection (outlet or powerhouse). When releases from Black Butte exceed 1,000 cfs, the powerhouse operations and the COE coordinate outlet gate settings.

The power plant did not come into full operation until the summer of 1997. The SC installed a four-pass acoustical flow meter with a temperature monitor which has been in service since the plant was built. According to SC officials the operation of the powerplant does not utilize any fossil fuels to create heat for steam production which turn the turbines connected to the electricity-producing generator. The plant only uses the water's force to turn the generator, and is not used to cool the condenser. Officials estimate a negligible temperature effect from the plant on the waters below the plant.

C. South Canal

The South Canal irrigation supply is diverted from Stony Creek by way of the powerhouse afterbay below Black Butte Dam. The maximum design capacity of the South Canal inlet structure is 530 cfs, however maximum operating capacity of the South Canal is 250 cfs from the Black Butte Dam to Interstate 5. Below Interstate 5, the capacity is reduced to 200 cfs, and further reduced to approximately 80 cfs in the Lateral 40 (an OUWUA water distribution canal which crosses the TCC system).

D. North Canal

The Northside Diversion Dam and Canal are located approximately 4 miles below Black Butte Dam. The structure was originally constructed across Stony Creek but portions of the south end of the dam had been damaged in recent floods. Temporary gravel dikes had been used to complete the diversion structure in recent years, but the dam was constructed back to concrete in 1997. The diversion structure diverts water into the North Canal segment of the Orland Project with a maximum canal capacity of 150 cfs A bypass flow exists, but no upstream fish passage is possible when the gates and boards are in.

Stony Creek flows above 1000 cfs during flood operations of Black Butte Dam can cause damage to the Northside Diversion Dam when in place. Flows above 5,000 cfs can cause erosion problems in Stony Creek particularly along the south bank (personal communication with Roger Hunt, 1996, OUWUA).

The OUWUA diversion starts about March and ends in November with peak diversions occurring in May and July. The maximum monthly diversion quantities are approximately 10,000 to 12,000 acre feet in the South Canal and 6,000 to 7,000 acre feet in the North Canal. No diversions are typically made between the months of November through February, and the boards are removed during this time.

The diversion waters generally are served by the storage in East Park Reservoir and Stony Gorge Reservoir. However, operationally, the water can be delivered from Black Butte storage in the OUWUA exchange contract with Reclamation and paid back with Orland water later in the year by releases from upstream reservoirs to Black Butte.

E. Lateral 40

Figure 3-2a (page 3-6 in Ch. 3) shows the releases from Black Butte, brought through the Orland South Canal and Lateral 40 (used for operational spills only) which can spill into the TCC. Orland project water from East Park and Stony Gorge is routed through Black Butte to the South Canal and on to the TCC. These waters are used as a return of exchange water to Reclamation for

water borrowed out of Black Butte in their exchange agreement. The amount of water spilled into the TCC Lateral 40 averages from 300-700 acre feet per month during the irrigation season (Figure 3-2a). The flows of up to 2000 acre feet per month during 1991-1995 were used to supplement the TCC when gates were up at the RBDD and pumping capacity was limited. In 1995 Lateral 40 diversions were discontinued as it was determined it was not a legal point of diversion.

F. GCID Interties

The TCC also has several points of diversion of contract water (the intertie and the wasteway) to the GCID Main Canal downstream of the CHO. These can be used to supplement GCID diversions at the Sacramento River if needed.

G. GCID

Pursuant to the 40 year Settlement Contract with Reclamation, which was signed in 1964, GCID is entitled to divert at least 720,000 acre feet of water from the Sacramento River as its base supply, and an additional 105,000 acre feet of CVP, or project, water, between April 1 and October 31 of each year. The contract states that Reclamation will direct where GCID will divert its base and project water. Although GCID does not currently operate under the Angle Decree, 23,000 acre feet of Angle Decree yield water is included in the 720,000 acre feet base supply. In an emergency situation, as defined in the settlement contract, GCID may take 500 cfs of natural flow from Stony Creek for 5 days at a time, provided water is available. There is no limit apart from the contract amount of base and project water, but historically, and because the Stony Creek water can only be natural flow and can only be diverted in an emergency situation, the amount is not expected to exceed the 23,000 acre feet Angle Decree figure. GCID is not entitled to any CVP stored water out of Stony Creek. GCID can divert up to 105,000 acre feet of CVP water for refuge use, which is in addition to the above stated amounts.

The GCID Main Canal crosses Stony Creek at about River Mile 7.2 where each year until 1998 a temporary gravel berm had been constructed during irrigation season to permit the passage of diverted Sacramento River water in the canal via gates on the downstream side of the crossing. When the irrigation season ended, the gates were closed and the gravel berm was removed to allow Stony Creek flows to pass to the Sacramento River. The construction and removal of the gravel berm on Stony Creek was the responsibility of GCID, but the berm had also been washed out by flood control releases from Black Butte. Natural Stony Creek water, if sufficient in quantity, can flow into GCID's Main Canal if the gates are open. This water can be used for refuge water supply, rice decomposition, and early irrigation demands. GCID controls the water distribution in a regulated manner. In 1998 more elaborate structures were used in place of the usual berm while the siphon was installed. No berms will be needed to convey canal water across the creek in 1999 and later years.

Figure 3-4 shows the distribution of average monthly diversion flows for water to GCID from Stony Creek during the years 1991 (dry), 1996 (average), and 1993 (wet). During wet years, diversions in the spring are directed by the flood control diagram. During wet years with high inflow and no diversions by OUWUA and rediversion at the CHO, the releases made to avoid encroachment typically from November-June had been made to meet GCID's demands in amounts which could be accommodated by the GCID canal and berm. After inflow decreases, flow releases are decreased and Black Butte is stabilized. The water is typically held in the reservoir from June-August for recreation purposes. Releases are not increased again until the fall, to reach the required flood control space.

Since 1993 there has only been one average year, during which water was not released to the GCID.

During dry years, the Stony Creek diversions at the GCID Main Canal ahave been virtually zero. Seepage is high and Black Butte releases (30 cfs minimum) are low such that the Stony Creek flow beyond the North Canal diversion is essentially zero.

Reclamation plans to require GCID to take its water from the Sacramento River rather than Stony Creek, as stated in the Sacramento River Settlement Contract between Reclamation and GCID. Pending no changes in that contract to the contrary, Reclamation expects GCID's operations to have no impact on the hydrology and biology of Stony Creek after GCID's siphon becomes operational in 1999.

H. Small Adjudicated and Appropriative Diverters Downstream of Black Butte

(Other Diverters)

The existing adjudicated and appropriative "small" diverters below Black Butte take their diversions from the Orland South Canal. According to the Stony Creek water master and Orland Project operator, there are no other legal "small" diversions below Black Butte Dam from Stony Creek.

I. Pre-Black Butte Dam

Historic data from the COE and Reclamation are provided in Figure 2-23b (page A-2-61) and Table 3-4 (page A-3-8) that show the impact of the upstream storage at Stony Gorge and East Park Reservoirs. Figure 2-23b shows the unimpaired monthly inflow to Black Butte for Stony Creek estimated for a long-term record from 1921 through 1994. Table 3-4 shows the historical monthly inflows to Black Butte from 1964 through 1985 (COE, 1987). These data also match the "California Central Valley Unimpaired Flow Data" report, 2nd edition, by DWR, dated February 1987.

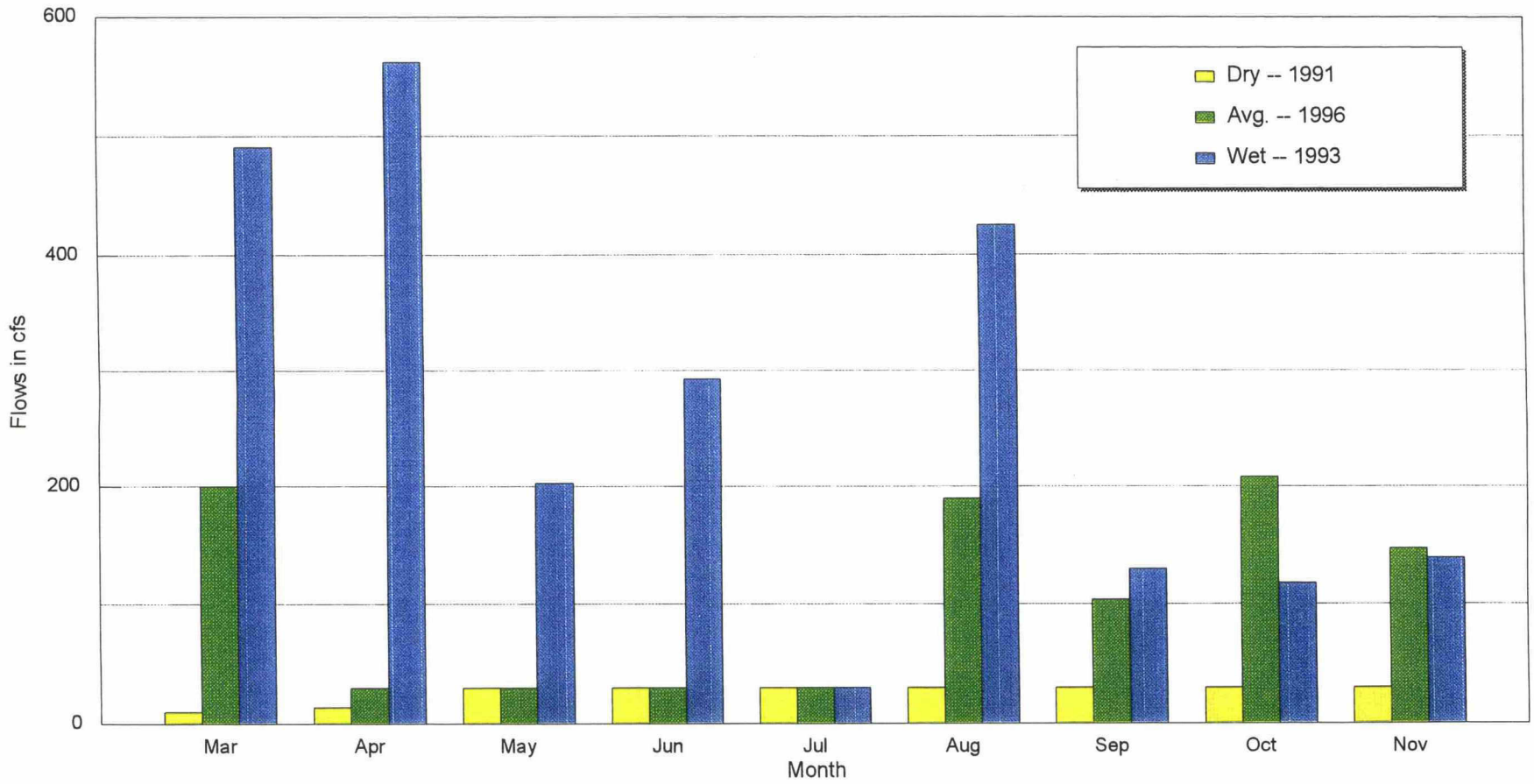

Figure 3-4
GLENN-COLUSA IRRIGATION DISTRICT MONTHLY DIVERSIONS FROM STONY CREEK FOR CALENDAR YEARS 1991, 1993, AND 1996

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

07/15/98

22-214-0040

Table 3-3 compares Figure 2-23b (unimpaired inflow) and Table 3-4 for the years 1964 through 1985 and provides a measure of the impacts that upstream storage has had on inflows to Black Butte. It also suggests the likelihood of little to no Stony Creek flow below Black Butte Dam in the unimpaired condition between the months of June and October. The unimpaired condition is defined as Stony Creek inflows to Black Butte without Stony Gorge and East Park Reservoir operations, i.e. natural inflow. Monthly flows from June through October with the improved system shows greater inflows to Black Butte as expected because of the Orland Project. The improved system is defined as Stony Creek inflows to Black Butte with both Stony Gorge and East Park Reservoirs in operation. In contrast, the unimpaired wet months when flood waters would most likely occur, November through March, show higher flows into Black Butte than actually have occurred.

These comparisons depict the resulting impacts of the reservoir projects for flood control and water supply in the historic watershed management operations.

Table 3-3
Comparison of Inflows to Black Butte Reservoir,
1964-1985 Water Years (1,000 acre feet)

Condition	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Improved[a] (1964-1985)	4.4	14.6	54.0	115.7	89.1	85.2	53.5	34.7	16.7	15.7	17.2	10.5
Unimpaired[b] (1964-1983)	1.7	22.0	64.0	145.2	105.5	98.0	56.5	28.2	10.2	1.3	0.2	0.2

[a]Improved inflows from storage in East Park and Stony Gorge Reservoirs, historical inflows to Black Butte Reservoir
[b]Unimpaired inflows at Black Butte Reservoir computed from inflows to Stony Gorge and East Park Reservoirs

Post-Black Butte Dam/Pre-CHO Rediversions to TCC

The Stony Creek flow diagram (Figure 3-1 in Chapter 3, page 3-3) was used to estimate historic flows in the four defined reaches of Stony Creek between Black Butte Dam and the Sacramento River for the three hydrologic conditions; wet year (1993), average year (1996), and dry year (1991), as shown in Table 2-11 (page A-2-63). The four reaches are defined as: Reach 1 (Q1-Q2), Reach 2 (Q2-Q3), Reach 3 (Q3-Q4), Reach 4 (Q4-Q5). The components of the diagram included the OUWUA diversions to both North and South Canals, GCID diversions, CHO rediversions to Stony Creek, and seepage.

The accounting of flow in the Stony Creek system between reaches provides a historic estimate of monthly distributions. During dry years the 30 cfs flows released from the dam were estimated to reach Q^3, but not much beyond. A means to augment the flows existed with excess CVP releases, if available, and spills from the CHO. Table 2-11a (page A-2-63) shows

the flow conditions for 1991 prior to the CHO rediversions.

Irrigation Season. Typically no flows have reached the Sacramento River during irrigation season. Generally the GCID berm was in place between April and October. With the installation of the GCID canal siphon, the berm will no longer be in place. Flows which reach the river after siphon installation will be all flood control releases with planned releases by Reclamation after Black Butte is out of encroachment.

Non-Irrigation Season. Total Stony Creek flow to the Sacramento River (Q_5) during the wet months can be significant as seen in Tables 2-11c (page A-2-64) with volume more than 244,000 acre feet per month (8,000 acre feet/day), which translates into an average of 3979 cfs/day for the month. When storage in Black Butte is encroached flood control operations are managed by the COE at Black Butte Dam where releases are kept below 15,000 cfs, if possible, to protect against bank erosion downstream. The capacity of Black Butte is not sufficient to store the unimpaired flows (Figure 2-23b, page A-2-61) into Black Butte during December, January, and February, which averaged a total of 237,000 acre feet in those 3 months (1921 to 1983; 62 of the 73 years of record).

Table 3-4

Historical Monthly Stony Creek Flows
Modified by Storage in East Park and Stony Gorge Reservoirs
in 1,000 Acre-Feet

Water Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Total
1964	9.6	9.1	3.0	11.1	8.1	4.6	13.2	11.2	12.4	11.3	10.0	3.7	107.3
1965	3.3	10.8	212.4	194.0	40.4	26.2	109.1	30.8	18.7	18.5	20.2	18.6	703.0
1966	11.7	18.5	7.3	64.6	59.1	40.9	39.5	27.7	18.8	16.2	24.7	13.0	342.0
1967	3.6	10.4	50.1	145.6	67.2	49.7	70.2	61.0	40.8	25.4	21.0	16.4	561.4
1968	11.3	4.8	5.2	36.7	120.3	41.7	24.1	20.2	12.5	22.3	13.5	16.3	328.9
1969	3.3	1.9	25.0	220.0	206.9	117.8	80.7	46.5	21.2	20.6	20.9	16.6	781.4
1970	7.3	1.6	45.9	376.3	82.4	56.0	23.8	20.3	15.6	21.0	20.2	10.0	680.4
1971	0.0	19.2	80.9	113.4	32.1	80.2	48.0	26.5	11.2	16.2	20.8	15.0	463.5
1972	8.4	5.8	6.4	17.6	17.0	33.7	23.8	27.6	21.1	8.3	7.0	11.2	187.9
1973	0.2	22.7	31.4	176.7	226.7	116.0	51.8	28.1	18.4	23.0	20.4	15.6	731.0
1974	5.1	41.7	104.9	239.6	43.9	160.6	97.4	47.5	4.0	15.3	21.2	17.8	799.0
1975	5.1	1.1	9.1	10.4	99.8	217.9	63.2	50.1	21.6	19.4	24.2	17.8	539.7
1976	4.0	2.3	2.7	1.7	7.0	9.5	31.5	21.9	0.9	0.5	0.4	0.0	82.4
1977	0.0	0.3	0.5	0.7	0.5	2.4	13.5	3.4	0.0	0.0	0.1	0.3	21.7
1978	0.5	0.7	21.5	260.8	189.8	138.6	55.6	56.9	11.9	3.5	21.8	5.4	767.0
1979	1.3	2.9	0.7	12.2	22.9	63.3	36.0	30.6	6.9	10.3	18.1	5.8	211.0
1980	3.7	9.3	20.1	193.3	254.7	84.7	35.8	21.4	15.7	17.8	23.2	5.0	684.7
1981	5.4	6.5	5.4	46.0	34.0	37.7	21.5	24.0	15.4	22.6	16.4	10.1	245.0
1982	2.0	32.0	119.3	111.0	111.5	83.8	166.8	55.9	30.0	16.1	20.3	9.5	758.2
1983	3.9	14.7	95.1	235.8	279.5	460.7	124.4	108.6	45.6	20.8	18.5	4.7	1412.3
1984	5.6	71.7	305.5	72.0	41.5	36.8	21.2	14.1	13.1	22.4	16.9	12.9	633.7
1985	2.3	33.1	35.5	7.2	14.5	11.6	25.6	29.1	12.8	13.1	19.1	6.6	210.5
Mean	4.4	14.6	54.0	115.7	89.1	85.2	53.5	34.7	16.7	15.7	17.2	10.5	511.5

Source: COE, 1987.