

Section 5 HYDROLOGY

Basic hydrologic information on the Cow Creek Watershed is discussed in this section. This information includes general watershed characteristics, surface water runoff and water rights and diversions.

A portion of the hydrologic data presented in this section is based on the water year calendar. A water year begins on October 1 and ends 12 months later on September 30. Each water year is designated by the calendar year in which the 12-month period ends. For example, the maximum instantaneous peak flow recorded along the main stem of Cow Creek occurred on November 16, 1981. Based on the water year calendar, this event occurred in 1982.

WATERSHED CHARACTERISTICS

The Cow Creek Watershed is the most northerly uncontrolled tributary to the Sacramento River. It is located in Shasta County on the eastern side of the Sacramento River, downstream from Shasta Lake. Major tributaries, including Little Cow Creek, Oak Run Creek, Clover Creek, Old Cow Creek and South Cow Creek flow in a southwesterly direction and form the main stem of Cow Creek near Millville. Sub-watersheds discussed in this section are presented in Figure 5-1. The entire watershed encompasses approximately 274,000 acres.

TABLE 5-1			
Sub-watersheds Cow Creek			
Sub-Watershed	Tributary Length (miles)	Acres	Percent
Little Cow Creek	37.5	91,900	33
Oak Run Creek	26.0	30,138	11
Clover Creek	29.5	34,917	13
Old Cow Creek	35.5	54,420	20
South Cow Creek	30.5	50,479	18
Main Stem Cow Creek	15	12,830	05
Total	174	274,684	100

The topography of the Cow Creek Watershed varies significantly from flat valley areas the main stem to steep mountainous areas along the upper reaches. Elevations vary from approximately 350 feet above sea level on the valley floor to nearly 7400 feet in mountainous areas.

Annual precipitation within the watershed ranges from about 25 inches in the valley areas to about 65 inches in the northeastern mountainous portion of the watershed. Average annual precipitation near Whitmore, at an elevation of about 2840 feet, is 51.13 inches. From 75 to 90 percent of the annual total precipitation is received between November 1 and April 30. Summer thundershowers commonly occur in the mountainous areas, but they account for only a small percentage of the total annual supply of moisture.

REFERENCE CONDITIONS

No data is available on reference conditions in the Cow Creek Watershed relating to hydrology. Historic references identify “bountiful” water and lush mountain meadows. It is probably safe to assume that the abundant springs and creeks in the mountainous areas and reasonable ease of diverting water based on topography were among the reasons that drew early settlers to the Cow Creek watershed. Reference flows can be estimated using current measured flows plus diverted flow by tributary.

SOURCES

USGS maintained 12 stations in the Cow creek system and DWR maintained an additional 15 stations. Most stations are no longer maintained. With the exception of the USGS (Millville) station 11374000, the period of record was brief and is generally insufficient to provide statistical flow records by tributary.

TRENDS

The Mann-Kendall statistical procedure was used to determine whether the annual mean and peak flow data recorded at the Millville station between 1950 and 1998 have been increasing or decreasing over the time period. The results show that there has been no statistically increasing or decreasing trend in runoff through the station at the 99 percent confidence level. In other words, peak annual flows have not increased or decreased since 1950. Since original diversion construction and adjudications, flows have not changed. This data coincides with the trend analysis conducted on climate data that shows no significant increase or decrease in precipitation over the period of record. Of note this would also imply that the amount of water diverted for agricultural or other uses has also not changed appreciably, (within the ability of instruments to measure) over the time period.

SURFACE WATER RUNOFF

Historically, the United States Geological Survey (USGS) has operated a number of stream gages throughout the watershed. Station locations are shown in Figure 5-2, and available data are summarized on Tables 5-2 and 5-3. The tables also include a summary of gage elevation, channel distance from the confluence to the stream gage and drainage area contributing to each gage (USGS, 2001).

The most complete hydrologic record is available for Station Number 11374000. This station is located on the main stem of Cow Creek, approximately three miles upstream from the confluence of the main stem and the Sacramento River. The drainage area contributing to this gage is approximately 425 square miles or 98 percent of the entire Cow Creek Watershed. This gage is commonly called the Millville Gage. Daily records are available for this gage from 1949 until present (USGS, 2001).

Annual flows for the Millville gage, between 1950 and 1998, are summarized on Figure 5-3. As shown, the minimum annual flow of 175 cubic feet per second (cfs) occurred in 1977, and the maximum annual flow of 1,728 cfs occurred in 1998. The average annual flow during the period of record is 695 cubic cfs. Annual flows were below the average annual flow between 1987 and 1992, and above the average annual flow in 1993, 1995, 1996 and 1998.

Monthly flows for the Millville gage, between 1950 and 1998, are summarized on Figure 5-4. As shown, average monthly flows vary between 38 cfs in August and 1,780 cfs in January. In contrast, the minimum daily flow of 0.02 cfs was recorded on July 29, 1997, and the maximum daily flow of 32,500 cfs was recorded on December 27, 1951.

FLOOD HISTORY

Cow Creek Watershed ranks third behind the Cottonwood Creek and Stony Creek watersheds for producing the largest peak flood flows within the northern Sacramento Valley (DWR, 1969). Of these watersheds, Cow Creek is the most northerly and the only one located on the east side of the Sacramento River. It has been estimated that flood flows from the Cow Creek Watershed account for approximately 21 percent of the peak discharge for the Sacramento River between Shasta Dam and Red Bluff (DWR, 1969).

The Cow Creek Watershed probably experienced major flooding in conjunction with widespread flooding throughout the northern Sacramento Valley in 1861-62, 1907 and 1909. Brief newspaper articles and high water marks also show that major flooding occurred in 1937 and 1940 (DOA, 1971). More recent stream flow data show that major flooding occurs approximately every five years. Annual instantaneous peak flows between 1950 and 1998 are shown on Figure 5-5. Individual peak events are listed in descending order on Table 5-4.

The largest recorded flow along Cow Creek occurred on November 16, 1981. The estimated peak flow on this date was 48,700 cubic feet per second near the Millville Gage. The estimated gage height was 21.22 feet. Based on the high water marks in the vicinity of the Millville gage, it is known that higher flood stages have occurred. The most recent flood flow occurred on January 2, 1997. The recorded flow on this date was 37,700 cfs. The average annual instantaneous peak flow is 23,000 cfs (USGS, 2001).

The recurrence interval or return period for peak flows greater than or equal to a given value are shown on Figure 5-6. Figure 5-6 was generated using annual instantaneous peak flows between 1950 and 1998, and the equation:

$$\text{Return Period}_{(\text{recorded flow})} = (\text{years of record} + 1) / \text{rank}_{(\text{recorded flow})}$$

Using Figure 5-6, it is possible to estimate how often the peak instantaneous flow in Cow Creek will be equal to or greater than a given value. For example, the instantaneous peak flow in Cow Creek can be expected to exceed 30,000 cfs once every three years.

Despite the large flood flows that have occurred within Cow Creek, the watershed has suffered minimal damage. According to the Department of Water Resources (1969), the maximum flow in the main stem of Cow Creek is 16,000 cfs. This is also referred to as “bank full flow”, which is the maximum flow before potential damage may occur. Bank full discharge is assumed to be the discharge at which channel-forming processes begin to occur. Historically, this damage has been mainly confined to agricultural lands. Due to considerable urban development, however, future flood flows may have a larger impact and the flood stage may actually increase with the same rainfall.

**TABLE 5-2
Daily Mean Flows
Cow Creek Watershed**

Station ID	Location	Elevation	Distance ²	Area	Coverage			Data (cfs)		
		(feet)	(feet)		(sq. miles)	Dates	Records	Type ³	Mean	Minimum
11372080		1560	56,500	---	84-99	5069	I	4.6	0	11
11372200	S Cow	640 ¹	13,500	77.3	56-72	5847	C	112.4	0.5	4,120
11372325	Kilarc	3840 ¹	128,000	---	83-99	5769	I	3	0	4.9
11372330	Olsen	1720	81,500	---	90-99	1709	I	18.4	0	129
11372350	O Cow	2340	99,500	32.6	90-99	1709	I	34.4	6.9	1,510
11372500	Cow	490	61,500	166	No Record					
11372700	Clover	1940 ¹	94,500	19	57-59	867	C	35.1	4.3	322
11373000	Clover	490	1,500	52.5	No Record					
11373200	Oak Run	1420 ¹	86,500	11	57-66	3428	C	15.7	0.1	560
11373300	L Cow	1140 ¹	108,500	60.8	57-65	2922	C	139.6	4.1	4,840
11373500	L Cow	450	3,500	145	No Record					
11374000	Main Cow	410 ¹	16,000	425	49-99	1862	C	695.5	0.02	32,500

¹ Elevation estimated from USGS quadrangle map.

² Distance are from the gage to the confluence of the main tributary and the main stem of Cow Creek, estimated using GIS.

³ I = Record between start and end dates is incomplete, C = Record between start and end dates is complete.

**TABLE 5-3
Annual Peak Flows
Cow Creek Watershed**

Station ID	Location	Elevation (feet)	Distance ² (feet)	Area (sq. miles)	Coverage			Data (cfs)		
					Dates	Records	Type ³	Mean	Minimum	Maximum
11372080		1560	56,500	---	No Record					
11372200	S Cow	640 ¹	13,500	77.3	55-72	16	C	4,476	2,400	6,970
11372325	Kilarc	3840 ¹	128,000	---	No Record					
11372330	Olsen	1720	81,500	---	No Record					
11372350	O Cow	2340	99,500	32.6	97	1	C	2,280	2,280	2,280
11372500	Cow	490	61,500	166	12-14	3	C	6,400	2,500	10,500
11372700	Clover	1940 ¹	94,500	19	58-59	2	C	845	821	868
11373000	Clover	490	1,500	52.5	12-14	3	C	3,303	1,040	6,300
11373200	Oak Run	1420 ¹	86,500	11	57-76	17	C	1,247	346	3,860
11373300	L Cow	1140 ¹	108,500	60.8	57-64	6	C	6,058	3,500	9,090
11373500	L Cow	450	3,500	145	12-13	2	C	5,220	2,440	8,000
11374000	Main Cow	410 ¹	16,000	425	50-98	49	C	23,561	1,270	48,700

¹ Elevation estimated from USGS quadrangle map.

² Distance from the gage to the confluence of the main tributary and the main stem of Cow Creek, estimated using GIS.

³ I = Record between start and end dates is incomplete, C = Record between start and end dates is complete.

ESTIMATING RUNOFF

Daily mean flows for the USGS gaging station, located on Clover Creek approximately 18 miles upstream from the confluence of Clover Creek and the main stem of Cow Creek, are available for 1957, 1958 and 1959 (Table 5-2). This gage is located approximately six miles downstream from the Mill ditch. To estimate the long-term flows at this station, it can be assumed that available records reflect long-term flows. An alternate method is to correlate the available Clover Creek data with data from the Millville station located on the main stem of Cow Creek. Data from the Millville station are available from 1948 to present. A third method is to assume that runoff at the Clover Creek station is proportional to the drainage area and can be estimated directly from the Millville data. Estimated long-term flows on Clover Creek, at the USGS gaging station, are presented in Figure 5-7.

Year	Date	Peak Flow (cfs)	Gage Height (feet)
1981	Nov 16	48,700	21.22
1951	Dec 27	45,200	21.55
1986	Mar 08	39,000	18.89
1982	Nov 16	38,200	18.71
1997	Jan 02	37,700	21.58
1969	Dec 19	36,400	18.17
1978	Jan 09	36,000	18.31
1960	Dec 01	35,800	19.67
1974	Jan 15	35,300	17.81
1969	Jan 12	33,800	17.57
1956	Jan 15	33,000	19.06
1965	Jan 05	32,700	19.00
1959	Feb 16	31,500	18.74
1966	Jan 04	31,400	18.71
1998	Feb 03	30,300	19.59
1970	Dec 04	30,000	16.64
1980	Jan 13	26,200	15.75
1993	Jan 21	25,400	18.17
1962	Oct 12	24,800	16.98
1995	Mar 14	24,300	17.83
1961	Dec 01	23,900	16.68
1957	Nov 13	23,600	16.55
1987	Mar 12	23,500	14.57
1975	Feb 13	23,200	14.51
1967	Jan 21	23,100	15.71

WATER RIGHTS AND DIVERSIONS

Little Cow Creek is commonly called North Cow Creek. Although, by common usage, both names are correct, an attempt has been made to use Little Cow Creek for consistency. In this section, North Cow Creek is used interchangeable with Little Cow Creek because many of the water rights along Little Cow Creek were originally assigned to North Cow Creek.

WATER RIGHTS GENERAL

Water rights in the Cow Creek Watershed are either appropriated or riparian. An appropriated right is an exclusive right to take a specific amount of water from a particular source for a specific use on a specific site for a specific amount of time. Riparian rights, on the other hand, belong to the land bordering a water source. The following discussion is provided as a general introduction to the concept of water rights and should not be considered legal opinion.

Appropriated Rights

An appropriative right is an entitlement to water based on a specific use. This type of right may be sold or transferred with the property or separately. In general, the party that first diverts the water has rights priority over subsequent appropriators or users. Actual levels of priority are generally specified in the appropriation. In situations where priorities conflict, or in situations where rights were established prior to the appropriation system, the rights may be adjudicated. Adjudications are judgments decreed by the court and carry the full force of law. The court or an assigned water master generally administers adjudicated rights. Most of the water rights in the Cow Creek system have been adjudicated. These are discussed later in this section.

A senior may not change an established use of the water to the detriment of a junior. This restriction includes junior's reliance on a senior's return flow. A senior may not enforce a water right against a junior if such a right would not be put to beneficial use.

The elements of appropriation include:

- intent to use the water;
- diversion or control of the water;
- reasonable and beneficial use of the water; and,
- priority of appropriation.

Appropriative right is an acquisition of a water right subject to the issuance of a permit by the State Water Resources Control Board. The priority is based on the date a permit is issued. A priority-based permit system was implemented under the Water Commission Act of 1913. Presently the system is codified in CWC § 1200, et seq.

Riparian Rights

A riparian right is the right to use water based on the ownership of property that abuts a natural watercourse. Water claimed by virtue of a riparian right must be used on the riparian parcel. Such a right is generally attached to the riparian parcel of land except where a riparian right has been preserved on non-contiguous parcels after the land has been subdivided, *Hudson v. Dailey*, (1909) 156 Cal. 617. Riparian rights were adopted in California as a part of the English Common Law when California entered statehood in 1850. At that time, however, gold miners were already operating under their own system of prior appropriation to claim water rights. Conflicts between appropriations and riparian rights have continued since.

In general, riparian users are entitled to enough water to make beneficial use of the water on the land as long as no other riparians are harmed by such use. Riparian rights in California are now limited to "reasonable and beneficial use."

In contrast to appropriative rights, there is no priority of riparian right; senior and junior riparians do not exist. Water conflicts between riparian users are resolved on the basis of reasonable use. The

court has held that in times of water shortage, all riparians must adjust water use to allow for an equal sharing of the available water supply.

California Doctrine

The California Doctrine is a system of water rights that recognizes both appropriative and riparian rights. Early California law recognized both appropriation and riparian rights by applying priority to disputes between appropriators and by applying riparian principles to disputes between riparians. In 1872 California officially recognized the rights of appropriators by allowing the filing of water claims with county recorders. Within 14 years, the California Supreme Court had to determine who had superior water rights when a downstream riparian rancher and an upstream appropriator each claimed a superior right to use water. The Court held that a riparian's rights are superior to the rights of an appropriator except in cases where the water had been appropriated before the riparian acquired the patent to his land, *and* after the passage of the 1866 Mining Act which recognized appropriation. Generally, a reasonable use by a riparian will trump an appropriative right so long as the patent to the riparian parcel was acquired from the United States prior to the date of appropriation.

In 1926 the Court held that a riparian could assert priority over an appropriator to make beneficial use of the water – even if the riparian use was unreasonable. In response, in 1928 the California Constitution was amended to require all water use in California to be “beneficial and reasonable.” Generally today, a riparian user cannot defeat an appropriative right unless the riparian user proves the appropriation is causing undue interference with the riparian's reasonable use of the water.

COW CREEK ADJUDICATIONS

Water rights on North Cow Creek and its tributaries, Oak Run Creek, Clover Creek and Cow Creek, including Old Cow Creek, South Cow Creek, Lower Cow Creek and the Upper Tributary Areas of the Cow Creek System were determined by the Shasta County Superior Court and are set forth in separate decrees. These decrees establish the diversions, allotments and type of use. Spring flows are also appropriated in these decrees.

The Cow Creek Watermaster service area covers North Cow Creek, Oak Run Creek and Clover Creek. Watermaster service begins on May 1st and continues until September 30th of each year. Old Cow Creek and tributaries, South Cow Creek and tributaries, and Lower Cow Creek are not regulated by Watermaster service.

Historically, the watershed has sufficient water to supply all demands until late July, when the supply gradually decreases to about 60-70 percent of the allotments by mid-September. For the past few years, the water supply has been sufficient throughout the entire irrigation period.

Types of diversions within the system range from placement of rocks or logs within the creek, to culverts, to concrete flashboard dams. Few of the diversions are metered or screened.

North Cow Creek

Water rights on the North Cow Creek system were established under Judgment and Decree 5804, dated April 29, 1932. A report prepared by the Division of Water Rights of the Department of Public Works of the State of California dated 1925, and the accompanying map “North Cow and Oak Run Creek Watersheds Showing Diversion Systems and Irrigated Areas” dated 1923, identify 116 diversions and the associated irrigated acreages. There are two pumps currently operating that are

included in the decree, but not in the 1925 report. These pumps are described as the Lemm Pump (diversion 109A) and the Melton Pump (diversion 110A).

Currently, the North Cow Creek system includes 43 diversion points along North Cow Creek, Cedar Creek and Mill Creek. A maximum of 33.67 cfs can be diverted from North Cow Creek and its tributaries at all times. The original and current diversion records for the Watermaster are summarized in Table 5-5. The diversions are shown on Figure 5-8.

The rights are divided into three classes: Cedar Creek Users, North Cow Creek Class A Users, and North Cow Creek Class B Users. Cedar Creek Users are entitled to continuous flow during the period between May 1st and October 30th of each year. During times of inadequate water supply, the users divide the available water supply in a ratio of their respective allotments. North Cow Creek Class A and Class B Users are entitled to continuous flow from North Cow Creek and its tributaries when the net available water supply is in excess of 28.60 cfs. A rotation schedule was set up for the North Cow Creek Class A and Class B Users during times when the net available water supply of North Cow Creek and its tributaries was less than 28.60 cfs. During odd weeks, the Class A Users could divert their maximum flow allotments, while the Class B Users could divert their minimum flow allotments. During even weeks, the Class B Users diverted their maximum allotments, while the Class A Users diverted their minimum allotments.

According to the Watermaster, this rotation schedule was abandoned in 1934, in favor of continuous flow. The continuous flow allotments for North Cow Creek are half the flow allotments provided by the original rotation allotment. Cedar Creek continuous flow amounts were not affected by the changes made to North Cow Creek allotments.

Oak Run Creek

Water rights on the Oak Run Creek system were established under Judgment and Decree 5701, dated July 22, 1932. A report prepared by the Division of Water Rights of the Department of Public Works of the State of California dated 1925, and the accompanying map "North Cow and Oak Run Creek Watersheds Showing Diversion Systems and Irrigated Areas" dated 1923, describe 23 diversions and the associated irrigated acreages.

At the present time, the Oak Run Creek System includes 12 diversion points along Oak Run Creek and individual springs and irrigates 404.9 acres, 130 acres of which is also irrigated by the Welch-Nailor Ditch from the Clover Creek System. Currently, a maximum of 6.31 cfs can be diverted from Oak Run Creek and its tributaries at all times. The original and current diversion records for the Watermaster are summarized in Table 5-6. The diversions are shown on Figure 5-8.

When the flow in Oak Run Creek is less than 5.40 cfs immediately above the Welch-Strayer intake, 43 percent shall be diverted into the ditch and 57 percent shall remain in Oak Run Creek. If the flow of Oak Run Creek below the Welch-Strayer intake is insufficient to provide the total supply of allotments, then the users below shall divide the water supply in ratios representative of their allotments.

The Welch-Strayer Ditch system consists of two diversions and ditches from two separate watershed areas. Initially, 3.0 cfs is diverted from Mill Creek, a tributary to North Cow Creek. This water is then transferred to Oak Run Creek. Originally, the Welch-Strayer Ditch carried the flow, but after a washout of the ditch, the Excelsior Ditch was enlarged to carry both its own 2.0 cfs and the 3.0 cfs from the Welch-Strayer Ditch. The North Cow Creek Decree allows for a loss of 0.7 cfs throughout the ditch, so 2.3 cfs is the flow that is actually transferred to Oak Run Creek. This 2.3 cfs is the allotment for the Welch-Strayer Diversion, described in the Oak Run Decree that serves 130 acres

within the Oak Run Watershed. Additionally, a portion of 2.15 cfs (54.2 acres out of 71.8 total acres) diverted from Clover Creek through the Welch-Nailor Ditch also serves four of the same properties that receive water from the Welch-Strayer System.

Currently there is only one diversion on Oak Run Creek that is metered. The Watermaster has requested that all of the diversions on Oak Run Creek be metered.

Clover Creek

Water rights on the Clover Creek system were established under Judgment and Decree 6904, dated October 4, 1937. The diversion points and acreage irrigated described in the decree are depicted on two maps, one map referred to as the “Division of Water Rights Map,” which was prepared by the Division of Water Rights of the Department of Public Works of the State of California from surveys it made in 1927, entitled, “Clover Creek Showing Diversion Systems and Irrigated Lands,” dated 1927, and the other map prepared by the Division of Water Resources from a re-survey of the lands of Klinger, Hall and Fugitt in 1932.

The Clover Creek System includes 23 diversion points along Clover Creek, South Clover Creek, Silver Creek, Wyndam Creek, Slaughter Pole Creek and Rose Briar Creek and irrigates 917.8 acres. A maximum of 23.27 cfs can be diverted from Clover Creek and its tributaries during the period of May 1st to October 31st of each year for domestic, stock watering and irrigation purposes. At times when the net available water supply is inadequate to supply the combined allotments, the owners prorate the net available water supply in accordance with their net maximum allotments. The original and current diversion records for the Watermaster are summarized in Table 5-7. The diversions are shown on Figure 5-9.

Included in the decree is a schedule that establishes the maximum allotments to each of the ditches and users. In addition to the allotments described in the schedule, there are a few others that are summarized below.

The decree states that James Anderson is entitled to divert 10.0 cfs from Clover Creek through the Mill Ditch for power purposes at the Anderson Sawmill, except during irrigation season if the net available water supply is inadequate to supply the combined allotments, then he shall not divert any water for power purposes.

The decree also provides that five parties are allowed to divert the entire flow in the Anderson Swale, which receives waste and return flow from the Anderson Sawmill, J.B. Anderson irrigated lands, and the Fred Wheelock lands, for domestic, stock watering and irrigation purposes.

At any time that the amount of water received by William Stacher from the Anderson Swale is less than 0.6 cfs, he is entitled to divert supplemental flow from Wild Cat Creek.

Cow Creek System

Water rights on the Cow Creek system, including Old Cow Creek, South Cow Creek, Lower Cow Creek and the upper tributary areas of the Cow Creek system, were established under Decree No. 38577, dated August 25, 1969. The State Water Rights Board examined the creek system from December 1963 to February 1965 and mapped all the diversions and irrigated lands. The findings are presented in a report “Water Supply and Use of Water on Cow Creek Stream System” dated May 1965.

The report describes 116 diversions mapped within the system, 39 in the Old Cow Creek Watershed, 36 in the South Cow Creek Watershed, and 41 in the Lower Cow Creek Watershed. In 1965 the diversions irrigated approximately 5,800 acres, 2,750 acres in Old Cow Creek, 1,470 acres in South Cow Creek, and 1,580 acres in Lower Cow Creek. The diversions, allotments, use, irrigated acreage and owner(s) at the time of the decree are summarized on Table 5-8. The diversions are shown on Figure 5-8.

The rights are divided into four separate groups designated as the Independent Tributary Group, the Old Cow Creek Group, the South Cow Creek Group and the Lower Cow Creek Group. The allotments in each group are broken into four priority classes, as well as a surplus class and a special class. The priority classes were established so that in the event of insufficient water supply, the available supply would be prorated in accordance with allotments in that priority class. No priority class is entitled to use water until all the rights with lower numbers have been supplied. Surplus class rights rank below third-class rights, but above fourth-class rights. These priority classes are summarized in Table 5-9.

TABLE 5-9 Group Priority Class Listing						
Group	Priority Class					
	Special	First	Second	Third	Surplus	Fourth
Independent Tributary	10	42	12	5		147
Old Cow Creek		48	23	2	2	24
South Cow Creek		31	23	3	1	7
Lower Cow Creek		100	56	6	5	46

Allotments for irrigation are from March 1st to October 31st of each year. All allotments in the first priority class are for domestic and stock watering purposes. These first priority class claimants are entitled to the first priority class allotments during the non-irrigation season, from November 1st to March 1st.

The decree addresses special provisions regarding multi-user diversions, which include the South Cow Creek Ditch Association, the Brown-Grover Ditch, the Bassett Ditch, the Parker-Hufford Ditch and the Abbott Ditch.

Bypass or minimum flows are required under most adjudications. In addition, DFG section 5937 requires sufficient flows to maintain fish populations.

HYDROELECTRIC FACILITIES

Department of Fish and Game records indicate that eight hydroelectric facilities are located within the Cow Creek Watershed. These facilities are summarized in Table 5-10. The facilities owned by Pacific Gas and Electric (PG&E) on Old Cow Creek (Kilarc Powerhouse) and South Cow Creek are operated under one license.

The Kilarc Powerhouse, located north of Millville, is the oldest operating powerhouse maintained by PG&E. The Keswick Electric Company built the powerhouse in 1903 and 1904. At full capacity, it can generate 3.2 megawatts of electricity. The facility is named for oil manufactured by Westinghouse Company. PG&E has plans to transfer the Kilarc and South Cow generating facilities

and approximately 2,218 acres of land associated with the Kilarc-Cow Creek project to a new owner. Eight hundred ninety acres of the land proposed for transfer is designated for timber production (TPZ).

CONCLUSION

The most complete hydrologic record is available for Station Number 11374000. This station is located on the main stem of Cow Creek, approximately three miles upstream from the confluence of the main stem and the Sacramento River. The drainage area contributing to this gage is approximately 425 square miles or 98 percent of the entire Cow Creek Watershed. This gage is commonly called the Millville Gage. Daily records are available for this gage from 1949 until present (USGS, 2001). Flow data for tributaries is limited.

The hydrologic conditions in the watershed have not changed significantly since 1950. The Mann-Kendall statistical procedure was used to determine if the annual mean and peak flow data have undergone an increasing or decreasing trend since 1950. The results show that there has not been a statistical upward or downward trend at the 99 percent confidence level.

The Cow Creek Watershed ranks third behind the Cottonwood Creek and Stony Creek watersheds for producing the largest peak flood flows within the northern Sacramento Valley (DWR, 1969). Of these watersheds, Cow Creek is the most northerly and the only one located on the east side of the Sacramento River. It has been estimated that flood flows from the Cow Creek Watershed account for approximately 21 percent of the peak discharge for the Sacramento River between Shasta Dam and Red Bluff (DWR, 1969).

The largest recorded flow along Cow Creek occurred on November 16, 1981. The estimated peak flow on this date was 48,700 cubic feet per second near the Millville Gage.

No pre-adjudication data are available to determine historic flows. Hydrologic data by tributary is not available. Where data is available, it is of short duration and not in necessary locations. No water budget is available for Cow Creek.

ACTION OPTIONS

1. Evaluate water conservation measures for existing diversions to increase stream flows.
2. Evaluate the possibility of augmenting stream flows by offsite storage and retention of winter flood flows to improve habitat for fish and wildlife.
3. Evaluate possibility of vegetation management to augment stream flows to improve habitat for fish and wildlife.
4. Obtain flow on tributaries to determine potential impacts.
5. Determine the impact of non-metering and lack of screens on diversions.
6. Determine how to improve water conditions for fish and other riparian obligate species.

REFERENCES

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- State of California, July 22, 1932. *Superior Court in and for the County of Shasta, No. 5701 Judgment and Decree.*
- State of California, April 29, 1932. *Superior Court in and for the County of Shasta, No. 5804 Judgment and Decree.*
- State of California, October 4, 1937. *Superior Court in and for the County of Shasta, No. 6904 Judgment and Decree.*
- State of California, The Resources Agency, State Water Resources Control Board, August 25, 1969. *Cow Creek Adjudication, Decree of the Superior Court for Shasta County, California, No. 38577.*
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TABLE 5-5
North Cow Creek

Diversion No. (See Map Dated 1923)	Report on Water Supply and Use of Water from North Cow Creek and Tributaries (April 30, 1925)			Judgement & Decree 5804 (April 29, 1932)						Watermaster Records					
	Stream	Diversion Name	Total Irrigated Acres*	Total Irrigated Acres	Continuous Allotment (cfs)	Class A Allotment (cfs)	Class B Allotment (cfs)	Continuous Flow Distribution of A & B Classes	Owner	Current Allotment	Current Owner				
39	Cedar Creek	Pehrson Cedar Creek Ditch	3.8		Flow of 0.25 cfs from Cedar Creek from Tues-Weds				Pehrson						
40	Cedar Creek	Hadley Upper Ditch	17	20.8	0.80				Hadley	0.738	Miller, Jeffrey				
41	Cedar Creek	Hadley Lower Ditch	3.8							0.062	Miller, Jeffrey R.				
42	Cedar Creek	Smith Mountain Ditch	7.7												
43	Long Gulch & Cedar Creek	Smith Long Gulch Pipe	10.8												
44	Spring	Smith Spring Pipeline	0.4												
45	Mill Creek	Welch and Strayer Ditch System (see Oak Run Creek also)	130		1.00				Ross & Cox	1.00	Current Owners & Allotments are described in Oak Run Creek Schedule for Welch-Strayer System				
					0.50				Bellend	0.50					
					0.50				Passons	0.50					
					0.50				Rice	0.50					
					0.50				English	0.50					
46-48	Springs				Entire Flow			Ross, Cox, Ballard, Passons, Rice, English							
49-50	Mill Creek & South Fork of Mill Creek	Excelsior Ditch	84.5		0.50				Rose	0.00	Transferred decreed 0.5 cfs to Cornelius				
										0.458	Casa, Donald				
										0.10	Field, Herbert				
										0.10	Sparks, R. S. L.				
										0.046	Stipan, Jeff				
										0.146	Schmyer, William				
										0.75	Cornelius, John				
					0.50	Edwards, Philip									
51-55	Springs	Excelsior Ditch			Entire Flow			Rose, Angle, Thomas, Maxwell, Phillips							
56	Spring Channel & Mill Creek	Webb Ditch	10												
57-58	Mill Creek (seepage)	Hawes Orchard Ditch	1.6												
59	Spring Channel	Hawes Upper Spreading Dam	0.5												
60	Rose Return Water Channel	Hawes Garden Ditch	1.2												
61	Rose Return Water Channel	Hawes Lower Spreading Dam	1.1												
62	Rose Return Water Channel	Hawes Short Garden Ditch	0.2												
63	Rose Return Water Channel	Hawes North Garden Ditch	0.3												
64	Rose Return Water Channel	Hawes South Garden Ditch	0.5												
65															
66															
67	Spring	Angle Spring Ditch	0.2		Entire Flow				Angle						
68	Included Under Excelsior Ditch	Maxwell Waste Water	0		Flow of 0.50 cfs allotted under 46-50				Maxwell, Phillips						
69	North Cow Creek	Phillips Mill Ditch	0.8		Flow of 7.00 allotted, but not currently monitored				Phillips						
70	North Cow Creek	Phillips Garden Ditch	0.3		Flow 0.25 allotted in decree, but only 0.13 cfs is currently monitored		0.13		Phillips	0.13	Lee, Monty				
71	Unnamed Wash	Phillips Waste Ditch	0												
72	Spring	Strawn Maple Spring Ditch	Acres included in Pehrson-Grant-Strawn Ditch		Entire Flow				Jones						
73	Spring	Strawn Alder Spring Ditch	0		Entire Flow				Jones						
74	Spring	Grant Spring Ditch	0.3		Entire Flow				Grant						
75	Pehrson-Grant-Strawn Ditch	Borquet Ditch	0		Flow of 1.30 cfs allotted under 29				Pehrson						

TABLE 5-5
North Cow Creek

Diversion No. (See Map Dated 1923)	Report on Water Supply and Use of Water from North Cow Creek and Tributaries (April 30 1925)			Judgement & Decree 5804 (April 29, 1932)					Watermaster Records			
	Stream	Diversion Name	Total Irrigated Acres*	Total Irrigated Acres	Continuous Allotment (cfs)	Class A Allotment (cfs)	Class B Allotment (cfs)	Continuous Flow Distribution of A & B Classes	Owner	Current Allotment	Current Owner	
76	Springs	Pehrson Big Spring Ditch	Acreage included in Pehrson-Grant-Strawn Ditch		Entire Flow			Pehrson				
77	Springs	Pehrson Indian Spring Ditch										
78	Springs	Pehrson Lake Spring Ditch										
79	Springs	Pehrson Reservoir Spring Ditch										
80	Springs	Pehrson House Spring Ditch										
81	Dungan Gulch	Dungan Gulch Upper Ditch										
82	Dungan Gulch	Dungan House Pipeline										
83	Dungan Gulch	Dungan Gulch Main Ditch										
84	Unnamed Wash	Dungan Upper Unnamed Wash	5.2									
85	Unnamed Wash	Dungan Middle Unnamed Wash	0.3									
86	Unnamed Wash	Dungan Lower Unnamed Wash	24.2									
87	Spring	Dungan Little Valley Spring Ditch	2.9									
			0.9									
			0.9									
			1.9									
89	North Cow Creek	Bibbers Ditch		2.34			0.95	0.47	Baker	0.29 0.03 0.15	Herrich, Walter & Irene Kerns, Julius Humphrey, Richard	
88	North Cow Creek	Eldridge Upper Ditch	54.5	83.1		3.20		1.60	Eldridge	1.60	Rutherford, Gary	
89	North Cow Creek	Eldridge Lower Ditch	22.9									
91	North Cow Creek	Eldridge Island Ditch	1.7									
92	North Cow Creek	Eldridge House Ditch	1									
93-94	North Cow Creek	Hobson Upper Ditch	10.7	53.9		2.15		1.07	Hobson			
		Hobson Lower Ditch	43.2									
95-96	Springs	Hobson Orchard Springs	0.7						Hobson			
87	Spring	Hobson House Pipeline	0.3						Hobson			
98	Spring	Ward House Pipeline	0						Ward			
99-100	North Cow Creek	Scaggins/Ward Upper Ditch	13.4	62.5			2.50	1.25	Ward		0.19	Bernandez, Benjamin
											0.09	Hayes, David
		Ward Lower Ditch	48.1								0.41	Emerald, Robert
											0.49	Alkinson, Israel
			0.08	Payne, Lloyd								
101	Included in Cook & Butcher Ditch Diversion 110	Red River Lumber Co. Pump	0									
102	North Cow Creek	Huffman Ditch	14.6	14.6			0.60	0.30	Asher	0.30	Peterson, Stanley	
103	Spring	Asher House Pipeline	0						Asher			
104	North Cow Creek	Aparthout Mine Pump	0		0.04			0.04	California Zinc Co.	0.57	Cow Creek Land Co.	
105	North Cow Creek	Aparthout Mine Pump	0		0.59			0.59	California Zinc Co.			
106	North Cow Creek	Wisley Ditch	52.1	43.2		1.80		0.90	Wisley	0.90	Rickert, J.D.	
107	North Cow Creek	Woodman Ditch	107.7	83.6		2.40	2.40	2.40	Lamm	2.40	Rickert, Warren, et al	
108	Slough	G. Rutherford Slough Pump	2.9	3.5 3.4		0.15		0.15	G. Rutherford	0.15	Lorenz, K.	
109	North Cow Creek	John Rutherford Pump	18.8	5.4		0.40	0.40	0.37	J. Rutherford	0.27 0.10	Lorenz, K. Matthews, Ed	
109A	North Cow Creek	Loram Pump				0.20		0.10	Loram	0.05 0.05	Duralis, George Richieus, R.W.	
110	North Cow Creek	Cook and Butcher Ditch	208.1	209.9					Korum	0.75	1.87	Meyer, Ethelna
											0.375	Brown, Scott
											0.375	Chatham, G.
											0.56	Wooten, Shannon
											0.09	Jones, Armour
											0.09	Rogers, John & Phyllis
											0.19	Jochim, Carl
											0.56	Pike Company
											0.375	Olson
											0.375	Sharp
0.02	Transferred to others											
110A	North Cow Creek	Melton Pump				0.02	0.02	0.02	Melton, Cal Zinc	0.02 0.02	Williams, Estelle Bland, Deloris	
111	North Cow Creek	Gray Ditch	11.7	9.9		0.40	0.40	0.40	Redding Savings Bank	0.40	Rickert, J.D.	
112	North Cow Creek	Gray Upper Pump	5	9.8								
113	North Cow Creek	Gray Lower (Anderson) Pump	2.4	2.4				0.10	0.05	Anderson	0.013	Lane, Carole
											0.013	Copland, James
											0.012	Pausen, Dan
											0.012	Smurzynski, Chester

TABLE 5-5
North Cow Creek

Diversion No. (See Map Dated 1923)	Report on Water Supply and Use of Water from North Cow Creek and Tributaries (April 30, 1925)			Judgement & Decree 5804 (April 29, 1932)						Watermaster Records	
	Stream	Diversion Name	Total Irrigated Acres*	Total Irrigated Acres	Continuous Allotment (cfs)	Class A Allotment (cfs)	Class B Allotment (cfs)	Continuous Flow Distribution of A & B Classes	Owner	Current Allotment	Current Owner
114	North Cow Creek	Boyle Pump Ditch	12.2	12.2			0.60	0.25	Boyle	0.25	Phillips, Robert
115	North Cow Creek	Bogue Pump Ditch	11.1	11.1			0.45	0.23	Bogue & Hunt	0.115	Ridley, Robert
116	North Cow Creek	Rutzbach Pump Ditch	15.5	15.5			0.60	0.30	Rutzbach	0.3	Rawlings, Emily
				Totals:			13.49	20.68		33.67	

* Includes irrigated and sub-irrigated acres

**TABLE 5-6
Oak Run Creek**

Diversion No. (See Map Dated 1923)	Report on Water Supply and Use of Water from Oak Run Creek and Tributaries (April 30, 1925)			Judgement & Decree 5701 (July 22, 1932)		Watermaster Records	
	Stream	Diversion Name	Total Irrigated Acres*	Allotment (cfs)	Owner	Current Allotment	Current Owner
1	Oak Run Creek	Rose Domestic Pipeline	Used for domestic purposes				
2	Unnamed Wash	Jackson Ditch	2.6				
3	Oak Run Creek	Jackson Ditch					
4	Spring	Smith Upper Spring Ditch	31.2				
5	Oak Run Creek	Maxwell Mill Ditch	Used for power and other purposes at Maxwell Mill				
6	Spring	Smith Lower Spring Ditch	18.3				
7	Spring	Maxwell Sawdust Flume	Used for power and other purposes at Maxwell Mill				
8	Spring	Maxwell Spring Ditch	0.6				
9	Oak Run & Clover Creeks	Welch & Strayer Ditch System	130	0.3335	Ross & Rice	0.40	Mitchell, Lloyd
						0.10	Gilkey, John
				0.383	Ballard	0.50	Wendt, Bruce
				0.383	Ensley	0.24	Volbrecht Family Trust
				0.7165	Rice	0.50	Anderson, Eugene
				0.383	English	1.00	Snider, R.E.
		0.10	McCarty	0.10	Anderson, Eugene		
10	Oak Run Creek	Melton Upper Ditch	5.4	0.25	Melton	0.25	Strawn, Gerald
11	Oak Run Creek	Melton Lower Ditch	0.8				
12	Oak Run Creek	Melton South Ditch	1.5				
13	Oak Run Creek	Alpaugh Ditch	22.8	0.40	Melton	0.05	Strawn, H.R.
14	Oak Run Creek	Predmore Ditch	90.8	1.80	Murphy & Cook	1.25	Strawn, Merrick
						0.90	Hageman, Robert
15	Oak Run Creek	Kirkendahl Ditch	31.5	0.65	Colby	0.65	Treise, Rose
16	Unnamed Swale	Kirkendahl Ditch					
17	Spring	Murphy Spring Ditch	8.7	0.25	Murphy		
18	Murphy-Estep Branch of Oak Run Creek	Murphy Slough Ditch					
19	Murphy-Estep Branch of Oak Run Creek	Estep Ditch	39.2				
20	Spring	Estep Domestic Pipeline	Used for domestic purposes				
20	Spring	Estep Calf Pasture Spring	1.6				
21	Oak Run Creek	Winters Ditch	18.4	0.37	Darrah	0.37	Snider, R.E.
22	Spring	Winters Spring Ditch	1.5	0.025			
23	Unnamed Gulch	English House Ditch	Acreage included under Welch Strayer Ditch System				

* includes irrigated and sub-irrigated acres

Totals: 404.9 6.044 6.31

**TABLE 5-7
Clover Creek**

Diversion No. (See Map Dated 1923)	Judgement & Decree 6904 (October 4, 1937)				Watermaster Records		
	Stream	Diversion Name	Total Irrigated Acres	Allotment (cfs)	Owner	Current Allotment	Current Owner
	Clover Creek	Anderson Sawmill - discharging to Anderson Swale		10.00	Anderson		
	Return flow from Anderson Sawmill, J.B. Anderson irrigated lands, Fred Wheelock irrigated lands	Mill Ditch System - West		1/4	Kinger		
		Mill Ditch System - West		1/4	Hall & Fugitt		
		Mill Ditch System - South		1/6	Sheridan		
		Mill Ditch System - South		1/6	Sheridan, E., A., J., M.		
		Mill Ditch System - South		1/6	Stacher		
	Wild Cat Creek	Wild Cat Ditch		Entire Flow	Stacher		
1	Silver Creek	Worley Ditch	79.00	2.00	Worley	2.00	Collins, Jack
2	Clover Creek	Guttman Ditch	23.50	1.85	Ray	1.00	Cole, Stephen
			24.90		Thomas	0.85	Whitney Ranch
3	Clover Creek	Bonde Ditch	5.20	2.45	Hall & Fugitt		
			48.00		Hall & Fugitt	0.66	Carrington, Francis
			2.00		Weigart	0.49	Collins, Jack
			34.70		Lysinger	0.65	Lindsay, C.W.
4	Clover Creek	Mill Ditch	21.30	4.80	Love	0.65	Easley, Gale
			9.00		Wright	0.14	Burham, Paul
						0.26	Koher, Ted
			30.90		Anderson	1.20	Carrington, Francis
						0.276	Swain, A.
			6.60		Burdick	0.012	Frisbie, Ray
						0.012	Murphy, Martin
			36.60		Wheelock	1.50	Carrington, Francis
			69.30		Klinder	0.60	Carrington, Francis
			10.10		Sheridan	0.27	Mazzotta, J.A.
5	Clover Creek	Rodgers Ditch	6.20	0.25	Weigart	0.135	Pollard, R.
						0.067	Wahl, Kenneth
						0.068	Struckman, Glenn
						0.24	Mazzotta, J.A.
6	Wyndam Creek	Maxwell Ditch	16.80	0.35	Maxwell	0.013	Harr, Randall
						0.25	Collins, Jack
						0.066	Ross, D.R.
						0.175	Bailey, R.M.
						0.022	Ross, D.R.
9	Clover Creek	Welch and Nailor Ditch	16.10	2.15	Axner	0.087	Danielson, J.
						0.36	Axner, P.C.
						0.36	Murphy, Preston
						0.24	Wendt, B.
						0.24	Medica, Thomas
						0.24	Volbrecht Family Trust
						0.36	Anderson Family Trust
10.40	Rice	0.36	Anderson Family Trust				
	Passons	0.34	Snider, R.E.				
10	Clover Creek	Yordy Upper Ditch	12.10	0.40	Yordy	0.40	This right has not been under watermaster service since 1954
11	Clover Creek	Yordy Lower Ditch					

**TABLE 5-7
Clover Creek**

Diversion No. (See Map Dated 1923)	Judgement & Decree 6904 (October 4, 1937)				Watermaster Records		
	Stream	Diversion Name	Total Irrigated Acres	Allotment (cfs)	Owner	Current Allotment	Current Owner
12	Clover Creek	Hufford Upper Ditch	23.70	0.70	Reineke	0.70	Cilar, Chad
13	Clover Creek	Hufford Lower Ditch					
22	South Clover Creek	Reineke South Clover Ditch	57.10	1.40			
23	Clover Creek	Reineke Clover Ditch					
15	South Clover Creek	Covey Ditch	6.70	0.25	Covey	0.25	Mazzotta, J.A.
16	South Clover Creek	Harper Ditch	11.60	0.25	Harper	0.25	
17&18	South Clover Creek	Hunt Ditch	4.90	0.40	Hunt	0.40	
19	Slaughter Pole Creek	Slaughter Pole Ditch	14.50	0.40	Stacher	0.40	
20	South Clover Creek	Rice South Clover Ditch	1.30	0.15	Rice	0.15	
21	Rose Briar Creek	Rose Briar Ditch	27.40	0.70	Rice	0.70	
24	Clover Creek	Webb Ditch	9.10	0.35	Hunt	0.35	Ladd, Roy
25	Clover Creek	Hereford Pump	0.10	0.02	Hufford	0.02	Moseman (McArthur)
26	Clover Creek	Millville Ditch	206.60	4.40	Millville Ditch Company	4.40	Millville Ditch Company

Totals: **917.80** 23.27 23.25

**TABLE 5-8
Cow Creek Adjudication Decree 38577 August 25, 1969**

Old Cow Creek, South Cow Creek, Lower Cow Creek, Upper Tributary Area of Cow Creek System

Diversion No.	Stream	Diversion Name	Irrigated Acres	Allotment					Use	Owner	
				Special	1	2	3	Surplus			4
Unnamed	Old Cow Creek	Unnamed	19.3		See Paragraph 14				0.48	irrigation	Schmitt, James
1	Upper Tributary	Latour Spring No. 1	Parcel 47		0.01	0.04				industrial	Shasta Forests Co.
1b	Upper Tributary	CDF	Parcel 2		0.01				0.16	industrial	CDF
1d	Upper Tributary	CDF	Parcel 6		0.01					domestic	CDF
2	Canyon Creek	Kimberly-Clark	Parcel 4		0.01	0.35				industrial	Kimberly-Clark Corporation
3	Old Cow Creek	Kilarc Powerhouse Ditch					58.00			power	PG&E
4	Canyon Creek	West Canyon Creek Ditch					2.50			power	PG&E
4c	Canyon Creek	East Canyon Creek Ditch					7.50			power	PG&E
5	Canyon Creek	Murphy Ditch	269.8		0.01	1.50				irrigation	Murphy, Richard & Eva
5a	Upper Tributary	Murphy Ditch from Fairland Springs	see div 5	Entire Flow						irrigation	Murphy, Richard & Eva
5b	Upper Tributary	Murphy Ditch from Unnamed Springs	see div 5	Entire Flow						irrigation	Murphy, Richard & Eva
6	Old Cow Creek	Grindlay Williams Ditch	3.2		0.01	0.10				irrigation	Albert, Vertzel & Mable
6	Old Cow Creek	Grindlay Williams Ditch	56		0.01	2.44				irrigation	Herring, Virgil & Evelyn; Collins, Richard & Mary
6	Old Cow Creek	Grindlay Williams Ditch	4.6		0.01	0.12				irrigation	Hutchins, William & Mary Jane
6	Old Cow Creek	Grindlay Williams Ditch	1.2		0.01	0.03				irrigation	Skipworth, Henry & Edna
6	Old Cow Creek	Grindlay Williams Ditch	25.8		0.01	0.99				irrigation	Williams, Wallace
			25					0.63	irrigation		
7	Old Cow Creek	MacMillan Spring	1.5		0.01	0.04				irrigation	MacMillan, Emma
8	Upper Tributary	Murphy Upper Springs	see div 5	Entire Flow						irrigation	Murphy, Richard & Eva
9 & 9a	Upper Tributary	Murphy Lower Springs	see div 5	Entire Flow							
9b	Upper Tributary	Murphy Lower Springs	see div 5	Entire Flow							
10	Old Cow Creek	Kilarc Domestic Spring			0.01					domestic	PG&E
11	Old Cow Creek	Williams Lower Ditch	82.1		0.01	2.26				irrigation	Williams, Wallace
			5.6				0.14	irrigation			
12s	Spring Creek	Shasta Forests Co.	Parcel 32		0.05				0.06	domestic & industrial	Shasta Forests Co.
12	Old Cow Creek	Grindlay Upper Glendenning Ditch	34		0.01	0.85				irrigation	
			80				2.00	irrigation			
13	Old Cow Creek	Grindlay Lower Glendenning Ditch	9.8		0.01	0.24				irrigation	Herring, Virgil & Evelyn; Collins, Richard & Mary
14	Old Cow Creek	Grindlay South Glendenning Ditch	50						1.25	irrigation	
15	Upper Tributary	Scott Spring	7.4	Entire Flow						irrigation	Scott, C. Emlen
16	Old Cow Creek	Neely Glendenning Crook Ditch	10		0.01	0.33				irrigation	Brink, M.W. & Grace Baptist Church
			295				7.50	irrigation			
17	Upper Tributary	Neely Spring	9.2	Entire Flow						irrigation	Brink, M.W.
18	Old Cow Creek	Owbridge East Ditch	86					1.18		irrigation	Couser, Ralph & Helen
19	Old Cow Creek	Dargatz Spring			0.01					domestic & stock watering	Herring, Virgil & Evelyn; Collins, Richard & Mary

**TABLE 5-8
Cow Creek Adjudication Decree 38577 August 25, 1969**

Old Cow Creek, South Cow Creek, Lower Cow Creek, Upper Tributary Area of Cow Creek System

Diversion No.	Stream	Diversion Name	Irrigated Acres	Allotment					Use	Owner		
				Special	1	2	3	Surplus			4	
19	Old Cow Creek	Dargatz Spring	15.8		0.01	0.40				irrigation	Dargatz, Oliver, Sanford, Fern & Loo, Opol	
			24.2						0.61			
20	Old Cow Creek	Owbridge Ditches	26.4		0.01	0.67				irrigation	Couser, Ralph & Helen	
21												
22												
23												
24	Old Cow Creek	Atkins Ash Creek Ditch	7					0.19		irrigation	Boksa, Demeter & Aurelia	
24	Old Cow Creek	Atkins Ash Creek Ditch	4		0.01	0.15				irrigation	Atkins, Leary	
			10						0.25			
25	Old Cow Creek	Atkins Upper Spring	50.8		0.01	1.28				irrigation		
			7.9						0.20			
26	Old Cow Creek	Atkins Lower Spring	16.4		0.01	0.41				irrigation		
			15						0.38			
27	Upper Tributary	Atkins Domestic Spring		Entire Flow						domestic	Atkins, Leary	
28	Old Cow Creek	Brown Grover	23.4		0.01	1.16				irrigation	Atkins, Leary	
28	Old Cow Creek	Brown Grover	199		0.01	4.66				irrigation	Brower, Lowell & Vietta	
28	Old Cow Creek	Brown Grover	169		0.01	4.66				irrigation	Gilbert, Roxie	
28	Old Cow Creek	Brown Grover	60.7		0.01	1.16				irrigation	Peterson, Charlie & Corine	
28	Old Cow Creek	Brown Grover	128		0.01	2.32				irrigation	Stevenson, George & Jeanette	
Unnamed	Old Cow Creek	Unnamed	21	drainage water from Brewer Ranch			1.10			irrigation	Dymesich, George	
Unnamed	Old Cow Creek	Unnamed	8.3	drainage water from Brewer Ranch							irrigation	Schmitt, James
Unnamed	Old Cow Creek	Unnamed	1.7	drainage water from Atkins Lands							irrigation	Shaw, Charles & Joy
29	Old Cow Creek	Koehler	37.5		0.01	2.06				irrigation	Koehler, Roderick	
			13						0.33			
30	Coal Guich, Tribs & Springs	Peterson Dam	24		0.01			0.60		irrigation	Peterson, Charlie & Corrine	
			33						0.83			
31	Old Cow Creek	Parker Hufford Ditch	87.5		0.01	2.77				irrigation	Parker, James & Margaret	
31	Old Cow Creek	Parker Hufford Ditch	135		0.01	2.77				irrigation	Carter, Martin & Helen	
			58.2									
31	Old Cow Creek	Parker Hufford Ditch	5.6		0.01	2.76				irrigation	Koehler, Roderick	
31	Old Cow Creek	Parker Hufford Ditch	0.1			0.01				irrigation	Weaver, Paul	
31	Old Cow Creek	Parker Hufford Ditch	12.3			0.44				irrigation	Riggio, Steve	
31	Old Cow Creek	Parker Hufford Ditch	40.9		0.01	2.33				irrigation	Dymesich, George	
Unnamed	Old Cow Creek	Unnamed	18						0.45			
Unnamed	Old Cow Creek	Unnamed	29.6						0.75			
Unnamed	Old Cow Creek	Unnamed	64						1.60	irrigation		
32	Fern Spring	Plath Pipeline	10		0.01				0.25	irrigation	Nolan, Thomas & Wanda	
33	Fern Spring	Bogue Pipeline	31.3		0.01	0.78				irrigation	Bogue, H.E. & Phyllis	
34	Fern Spring	Bogue Reservoirs										
35	Old Cow Creek	Parker Ditch	12.7		0.01	0.75				irrigation	Parker, James & Margaret	
36	Old Cow Creek	Bassett Ditch	22.4		0.01	2.31				irrigation	Dymesich, George	
36	Old Cow Creek	Bassett Ditch	6.8		0.01	0.43				irrigation	Riggio, Steve	
Unnamed	Old Cow Creek	Unnamed	18.7						0.47			

TABLE 5-8
Cow Creek Adjudication Decree 38577 August 25, 1969

Old Cow Creek, South Cow Creek, Lower Cow Creek, Upper Tributary Area of Cow Creek System

Diversion No.	Stream	Diversion Name	Irrigated Acres	Allotment					Use	Owner	
				Special	1	2	3	Surplus			4
36	Old Cow Creek	Bassett Ditch	50		0.01	8.27				irrigation	Carter, Martin & Helen
			30.8								
			229.6								
36	Old Cow Creek	Bassett Ditch	266.3		0.01	16.56				irrigation	Crowe Hereford Ranch
			370.7								
37	Old Cow Creek	Crowe Lower Ditch	133		0.01	7.74				irrigation	Crowe Hereford Ranch
38	Basin Hollow Creek	Crowe Pump			0.01					domestic	
39	Old Cow Creek	Crowe Reservoir Ditch			0.01					domestic & stock watering	Crowe Hereford Ranch
40	Upper Tributary - South Cow Creek	Location 2	Parcel 1		0.01				0.04	industrial	CDF
40a	Upper Tributary - South Cow Creek	Location 9	Parcel 1		0.01				0.10	industrial	CDF
40b	Upper Tributary - South Cow Creek	Location 8	Parcel 1		0.01				0.14	industrial	CDF
40c	Upper Tributary - South Cow Creek	Location 13	Parcel 1		0.01				0.14	industrial	CDF
40d	Upper Tributary - South Cow Creek	Location 3	Parcel 1		0.01				0.15	industrial	CDF
40e	Upper Tributary - South Cow Creek	Location 10	Parcel 1		0.01				0.14	industrial	CDF
40g	Upper Tributary - South Cow Creek	Location 11	Parcel 1		0.01				0.10	industrial	CDF
40j	Upper Tributary - South Cow Creek	Location 14	Parcel 1		0.01				0.14	industrial	CDF
40k	Upper Tributary - South Cow Creek	Location 12	Parcel 1		0.01				0.10	industrial	CDF
41a	Upper Tributary - South Cow Creek	Location 7	Parcel 1		0.01				0.15	industrial	CDF
41	South Cow Creek	Beal Spring	8.4			0.13				irrigation	Scott Lumber Co.
41	Upper Tributary - South Cow Creek	Beal Spring	Parcel 1						0.16	industrial	Scott Lumber Co.
42	South Cow Creek	Beal Creek Ditch	10		0.01	0.52				irrigation	Faber, Darrell & Hazel
42	South Cow Creek	Beal Creek Ditch	41.4		0.01	3.01				irrigation	Morelli, Virginia
43	South Cow Creek	German Ditch	29.4			0.74	See Paragraph 23			irrigation	Brady, Jack & Ruth
43	South Cow Creek & Upper Tributary	German Ditch					See Paragraph 23			domestic & industrial	CDF
43	South Cow Creek	German Ditch			0.06		See Paragraph 23			domestic	Chellis, Mary
43	South Cow Creek	German Ditch			0.03		See Paragraph 23			domestic	Combs, Leslie & Ellen
43	South Cow Creek	German Ditch	4.2				See Paragraph 23			irrigation	Cook, Roger & Turk, Ellen
43	South Cow Creek	German Ditch	2			0.03	See Paragraph 23			irrigation	Gibson, Laine & Patricia
43	South Cow Creek	German Ditch			0.03		See Paragraph 23			domestic	Knight, Remi

**TABLE 5-8
Cow Creek Adjudication Decree 38577 August 25, 1969**

Old Cow Creek, South Cow Creek, Lower Cow Creek, Upper Tributary Area of Cow Creek System

Diversion No.	Stream	Diversion Name	Irrigated Acres	Allotment					Use	Owner	
				Special	1	2	3	Surplus			4
43	South Cow Creek	German Ditch	37			0.74	See Paragraph 23			irrigation	McTimmonds, Guy & Patricia
43	South Cow Creek	German Ditch	24.8			1.18	See Paragraph 23			irrigation	Miller, C.E.; Edward & Lucillo
43	South Cow Creek	German Ditch	2.6			0.06	See Paragraph 23			irrigation	Mix, Robert
43	South Cow Creek	German Ditch	64.2			1.21	See Paragraph 23			irrigation	Reimer, George & Dorothy
43	South Cow Creek	German Ditch	4			0.06	See Paragraph 23			irrigation	Rynd, Donald & Shelly
43	South Cow Creek	German Ditch			0.03		See Paragraph 23			domestic	Linhart, Russel & Mary
43	South Cow Creek	German Ditch	142.2			7.37	See Paragraph 23			irrigation	Shasta Forests Co.
43	South Cow Creek	German Ditch	7			0.15	See Paragraph 23			irrigation	Weir, Frank
43	South Cow Creek	German Ditch	17.9			0.59	See Paragraph 23			irrigation	Wiley, Marvin
43	South Cow Creek	German Ditch				1.44	See Paragraph 23			power	PG&E
43a	Upper Tributary	McTimmonds Ditch	37	Entire Flow						irrigation	McTimmonds, Guy & Patricia
44	Atkins Creek	Hufford Knight Ditch				0.62				power	Knight, Remi
44	Atkins Creek	Hufford Knight Ditch	17		0.01	1.01				irrigation	Hufford, Elmer & Christine
44	Atkins Creek	Hufford Knight Ditch	58.2		0.01	1.85				irrigation	Knight, Remi
44a	Upper Tributary - Atkins Creek	Location 5	Parcel 5		0.01					domestic	CDF
44f	Upper Tributary - Atkins Creek	Location 6	Parcel 4		0.01				0.14	industrial	CDF
45	Atkins Creek	Atkins Mill Ditch	8		0.01	0.40				irrigation	Hufford, Elmer & Christine
45	Atkins Creek	Atkins Mill Ditch	31.7			1.19				irrigation	Knight, Remi
46	Atkins Creek	Knight South Ditch	5		0.01	0.13				irrigation	Knight, Remi
47	South Cow Creek	Worden Ditch	74.8		0.01	2.30				power & irrigation	Shaver Investment Corp.
			128.2					3.21			
						2.10			power		
48	Hagaman Gulch	Hagaman Gulch Ditch	see div 42		0.01	1.60				irrigation	Morelli, Virginia
49	South Cow Creek	Morelli-Carr Ditch	45.8		0.01	1.33				irrigation	Morelli, Virginia
49	South Cow Creek	Morelli-Carr Ditch	22.2		0.02	0.74				irrigation	Smith, Donald & Thelma
50	Hamp Creek	Upper Harp Creek Ditch	see div 42		0.01	1.00				irrigation	Morelli, Virginia
51	Hamp Creek	Lower Harp Creek Ditch	43.9		0.01	1.30				irrigation	Morelli, Virginia
52	South Cow Creek	Morelli Domestic Spring	2		0.01	0.03				irrigation	Morelli, Virginia
53	South Cow Creek	Lansing South Ditch	75.9		0.01	2.46				irrigation	Smith, Donald & Thelma
			24.9				0.62				
			20.9					0.52			
54	South Cow Creek	Rose Ditch	2.4		0.01	0.09				irrigation	Smith, Donald & Thelma
55	South Cow Creek	Lansing North Ditch	50.2		0.01	1.82				irrigation	Smith, Donald & Thelma
56	South Cow Creek	Rose Domestic Spring			0.01					domestic & stock watering	Smith, Donald & Thelma
57	South Cow Creek	Carr Stockwater									Smith, Donald & Thelma
58	South Cow Creek	Carr Domestic Pump									Smith, Donald & Thelma

included under diversion 49

TABLE 5-8
Cow Creek Adjudication Decree 38577 August 25, 1969

Old Cow Creek, South Cow Creek, Lower Cow Creek, Upper Tributary Area of Cow Creek System

Diversion No.	Stream	Diversion Name	Irrigated Acres	Allotment					Use	Owner		
				Special	1	2	3	Surplus			4	
59	South Cow Creek	Lansing Domestic Spring			0.01					domestic & stock watering	Smith, Donald & Thelma	
60	South Cow Creek	E. Hufford Ditch	133		0.01	3.98				irrigation	Hufford, Eimer & Christine	
			40						1.00	irrigation		
61	South Cow Creek	Roland Staiger Ditch	59.2		0.01	1.67				irrigation	Sorensen, George & June	
61	South Cow Creek	Roland Staiger Ditch	33.6		0.01	1.86				irrigation	Staiger, J. Dana & Bon	
			6.4						0.16	irrigation		
62	South Cow Creek	E. Hufford Domestic Spring			0.02					domestic	Hufford, Eimer & Christine	
63	South Cow Creek	Staiger Pump									Staiger, J. Dana & Bon	
64	South Cow Creek	South Cow Creek Powerhouse Ditch			0.01		47.90	See Paragraph 23		power	PG&E	
65	Old Cow Creek	Neely Bear Gulch Ditch	24.5		0.01	0.61				irrigation	Brink, M.W.	
			79.9						2.00	irrigation		
66	Old Cow Creek	Cook and Turk	4.2	See Paragraph 23							irrigation	Cook, Roger & Turk, Ellen
67	Covey North Springs	Covey North Springs	3.6		0.01	0.09				irrigation	Covey, Harry & Colleen	
68	Covey Main Spring	Covey Main Spring										
67	Covey North Springs	Covey North Springs	14.8		0.01	0.37				irrigation	Covey, Myrtle	
68	Covey Main Spring	Covey Main Spring										
67	Covey North Springs	Covey North Springs	20		0.01	0.50				irrigation	Donohue, Paul & Doris	
68	Covey Main Spring	Covey Main Spring										
68	Covey Main Spring	Covey Main Spring	7.2		0.01	0.18				irrigation	Atkins, Roy	
			10						0.25	irrigation		
69	Covey Creek	Covey Creek Ditch	6.6		0.01	0.17				irrigation	Jungsten, Henry & Elizabeth	
69a	Covey Creek	Jungsten Ditch	6		0.01				0.15			
70	South Cow Creek	Bullard Pump	2		0.01	0.05				irrigation	Bullard, Harry & Frona	
			35						0.88	irrigation		
71	Mill Creek	Mill Creek Ditch					12.10			power	PG&E	
72	South Cow Creek	Wagoner Ditch	3.7		0.01	0.26				irrigation	Wagoner, W.G.	
			33						0.63	irrigation		
73	Lower Cow Creek	Abbott Ditch	82.9		0.01	1.51				irrigation	Hunt, W.H. Estate	
			27.2						1.05	irrigation		
73	Lower Cow Creek	Abbott Ditch	96		0.01	6.03				irrigation	Abbott, Alan & Blanche	
73	Lower Cow Creek	Abbott Ditch	79.8		0.01	3.02				irrigation	Farrell, Virgil & Henrietta	
73	Lower Cow Creek	Abbott Ditch	13.4		0.01	0.75				irrigation	Jones, Jesse	
73	Lower Cow Creek	Abbott Ditch	14.6		0.01	0.75				irrigation	Jones, Velma	
Unnamed	Lower Cow Creek	Unnamed	102	See Paragraph 14						2.55	irrigation	Abbott, Alan & Blanche
Unnamed	Lower Cow Creek	Unnamed	24	See Paragraph 14						0.60	irrigation	Farrell, Virgil & Henrietta
Unnamed	Lower Cow Creek	Unnamed	12.5	See Paragraph 14						0.31	irrigation	Jones, Jesse
Unnamed	Lower Cow Creek	Unnamed	6	See Paragraph 14						0.15	irrigation	Jones, Volma
74	Lower Cow Creek	Jennie Hufford Pump	0.5		0.01	0.01				irrigation	Hufford, Jennie	
			57						1.43	irrigation		
75	Lower Cow Creek	Hunt Pump	33		0.01	0.55				irrigation	Hunt, W.H. Estate	

**TABLE 5-8
Cow Creek Adjudication Decree 38577 August 25, 1969**

Old Cow Creek, South Cow Creek, Lower Cow Creek, Upper Tributary Area of Cow Creek System

Diversion No.	Stream	Diversion Name	Irrigated Acres	Allotment					Use	Owner	
				Special	1	2	3	Surplus			4
103	Lower Cow Creek	Bragg Pump	2.2		0.01	0.04				irrigation	Nixon, Bill & Opal
104	Lower Cow Creek	Carter-McKee Pump	2.5		0.01	0.04				irrigation	Carter, Paul & Juanita
104	Lower Cow Creek	Carter-McKee Pump	5		0.01	0.08				irrigation	McKee, Charles & Jane
105	Lower Cow Creek	Stone-Fitzpatrick Pump	43.8		0.01	0.74				irrigation	Fitzpatrick, David & Mildred Cobb, Alfred & Marian
105	Lower Cow Creek	Stone-Fitzpatrick Pump	11.4		0.01	0.19				irrigation	Stone, F.C. & Geneva & Charles & Clara
			5					0.08			
106	Lower Cow Creek	Morse Pump	10		0.01	0.17				irrigation	Morse, Alvin & Donna
107	Lower Cow Creek	A.F. Hufford Pump	33.4		0.01	0.56				irrigation	Carter, Martin & Helen
			101.6					1.69			
108	Lower Cow Creek	Herman Pump	39		0.01	0.50				irrigation	Herman, William & Helen
108	Lower Cow Creek	Herman Pump	2.5		0.01	0.03				irrigation	Hoffman, Margot
108	Lower Cow Creek	Herman Pump	2.5		0.01	0.03				irrigation	Tippin, Jerry & Gloria
109	Lower Cow Creek	Swoboda Brothers Pump	24.2		0.01	0.41				irrigation	Swoboda, John & Lucille
			8.4					0.14			
109	Lower Cow Creek	Swoboda Brothers Pump	14		0.01	0.25				irrigation	Swoboda, Lawrence & Helen
			14					0.25			
110	Lower Cow Creek	Pearson Pump	116		0.01	1.93				irrigation	Carter, Martin & Helen
			40					0.73			
			55.6					0.7			
110	Lower Cow Creek	Pearson Pump	2.2		0.01	0.04				irrigation	Murphy, Tal & Marian
			34					0.57			
111	Lower Cow Creek	Beatie Pump	50.8		0.01	0.86				irrigation	Beatie, Arthur & Joy Ann
112	Lower Cow Creek	Beatie Pump Stockwatering									
111	Lower Cow Creek	Beatie Pump	16		0.01	0.28				irrigation	Meyer, Alice
112	Lower Cow Creek	Beatie Pump Stockwatering									
113	Lower Cow Creek	Bryant Pump	40.2		0.01	0.49				irrigation	Bryant, Robert & William
			41.6				0.51				
			32.4					0.54			
114	Lower Cow Creek	R. Hawes West Pump	10.4		0.01	0.17				irrigation	Hawes, Roy & Daryl
			104.8				1.75				
115	Lower Cow Creek	R. Hawes East Pump	13		0.01	0.22				irrigation	
116	Lower Cow Creek	M. Hawes Pump	59		0.01	0.97				irrigation	Hawes, Melvin & Ruth
			61.6				1.03				
			36					0.60			

**TABLE 5-10
Hydroelectric Facilities**

Facility Name	FERC License	Bypass Flow & Amount Diverted	Fish Screen/Ladder	Comments
Kilarc-South Cow Creek	606	Kilarc (Old Cow Creek) 2 cfs bypass flow South Cow Creek 4 cfs bypass flow during normal years, 2 cfs bypass flow during dry years.	Kilarc & South Cow Creek have fish screens. South Cow Creek has fish ladder.	South Cow Creek diversion dam was a fish barrier prior to the installation of fish ladder. FERC license expires 3/27/2007.
Mega Hydro	5306 Exempt 1000kW	Clover Creek 6 cfs bypass flow 36 cfs diverted	Fish screen	DFG records indicate this plant is active.
Morrow-Stone Hydro	Exempt	South Cow Creek 2 cfs bypass flow	Unknown	DFG last looked at facility in 1994 to accept bypass facilities. No records since.
McMillan Hydro	Exempt Plant #1 – 500kW & 199kW Plant 2 – 300kW	North Fork Little Cow Creek 3 cfs bypass flow	No fish screen	Facility consisted of two separate developments, one destroyed in 1992 Fountain Fire. FERC issued amendment in 1994 to reconstruct the second development, but DFG has no records since that time.
T&G Hydro	6905 Exempt 100&350kW	Canyon Creek Bypass flows sufficient to maintain hydraulic continuity in Canyon Creek 10 cfs diverted	No fish screen as of 1998 inspection.	DFG records indicate this plant is active.
Clover Leaf Hydro	7057 Exempt 200kW	Clover Creek 6 cfs bypass flow 15 cfs diverted	Fish ladder and fish screen	DFG records indicate this facility is active.
Olson Power	8361 5MW	Old Cow Creek 30 cfs bypass flow 120 cfs diverted	Fish screen	DFG records indicate this facility is active.

All of the hydroelectric facilities with the exception of the PG&E and Olson facilities are exempt from the FERC Licensing. The Olson Power plant was licensed in 1987 for a period of 50 years.



Photo 5-1: Cook & Butcher Diversion on Little Cow Creek.



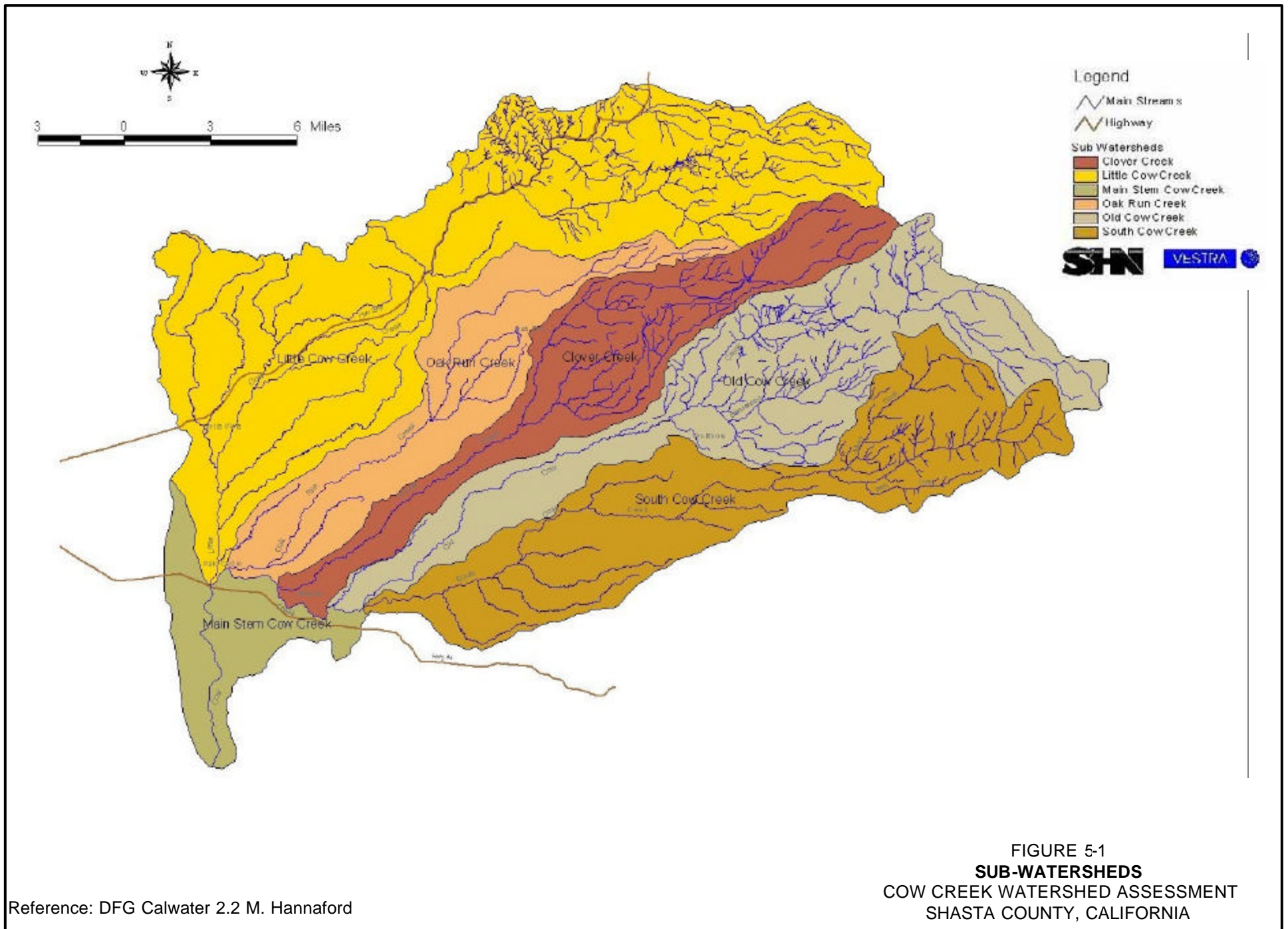
Photo 5-2: Mill Diversion on Clover Creek



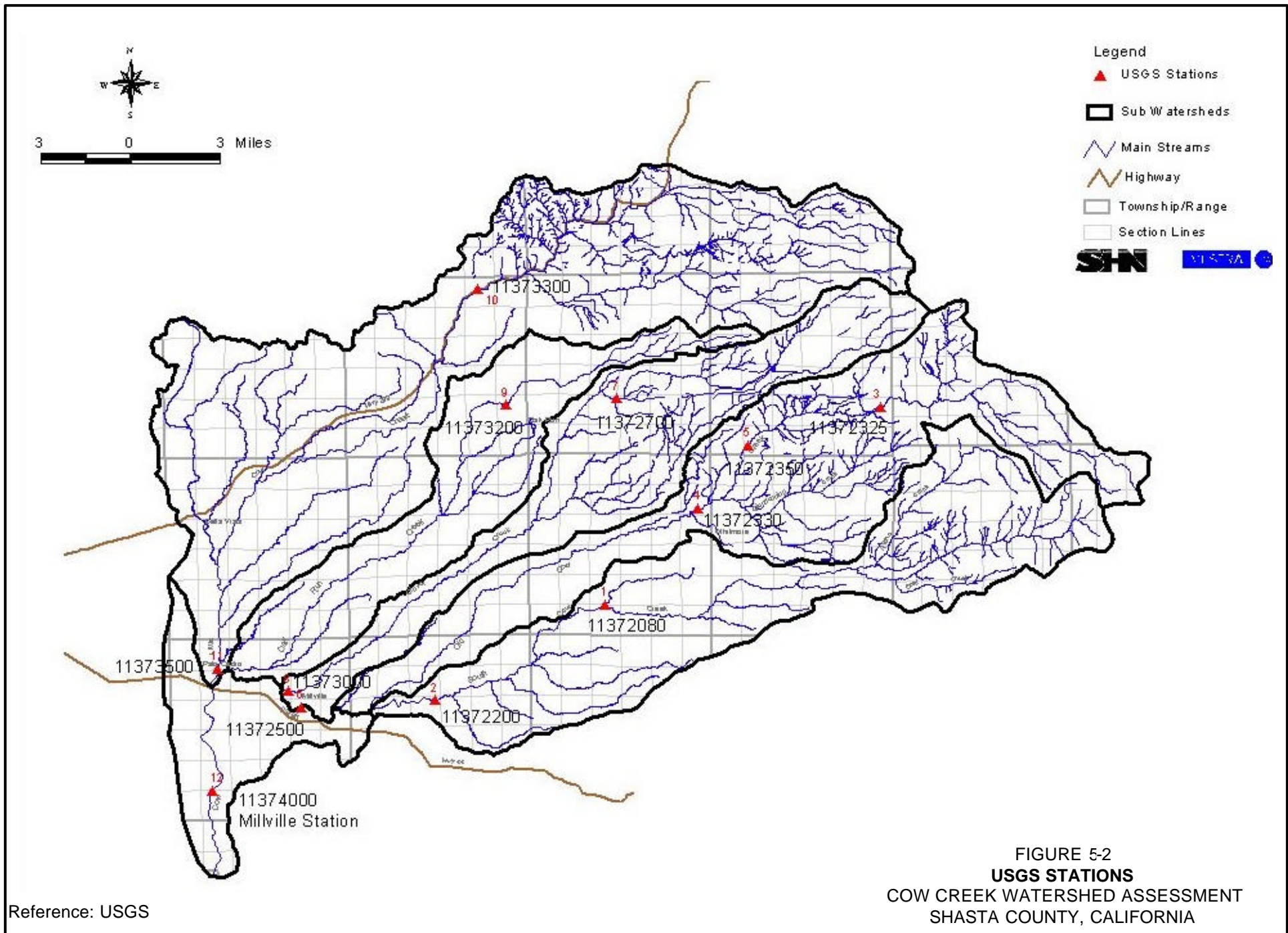
Photo 5-3: Kilarc Diversion on Old Cow Creek.



Photo 5-4: South Cow Diversion.



Reference: DFG Calwater 2.2 M. Hannaford



Reference: USGS

FIGURE 5-2
USGS STATIONS
 COW CREEK WATERSHED ASSESSMENT
 SHASTA COUNTY, CALIFORNIA

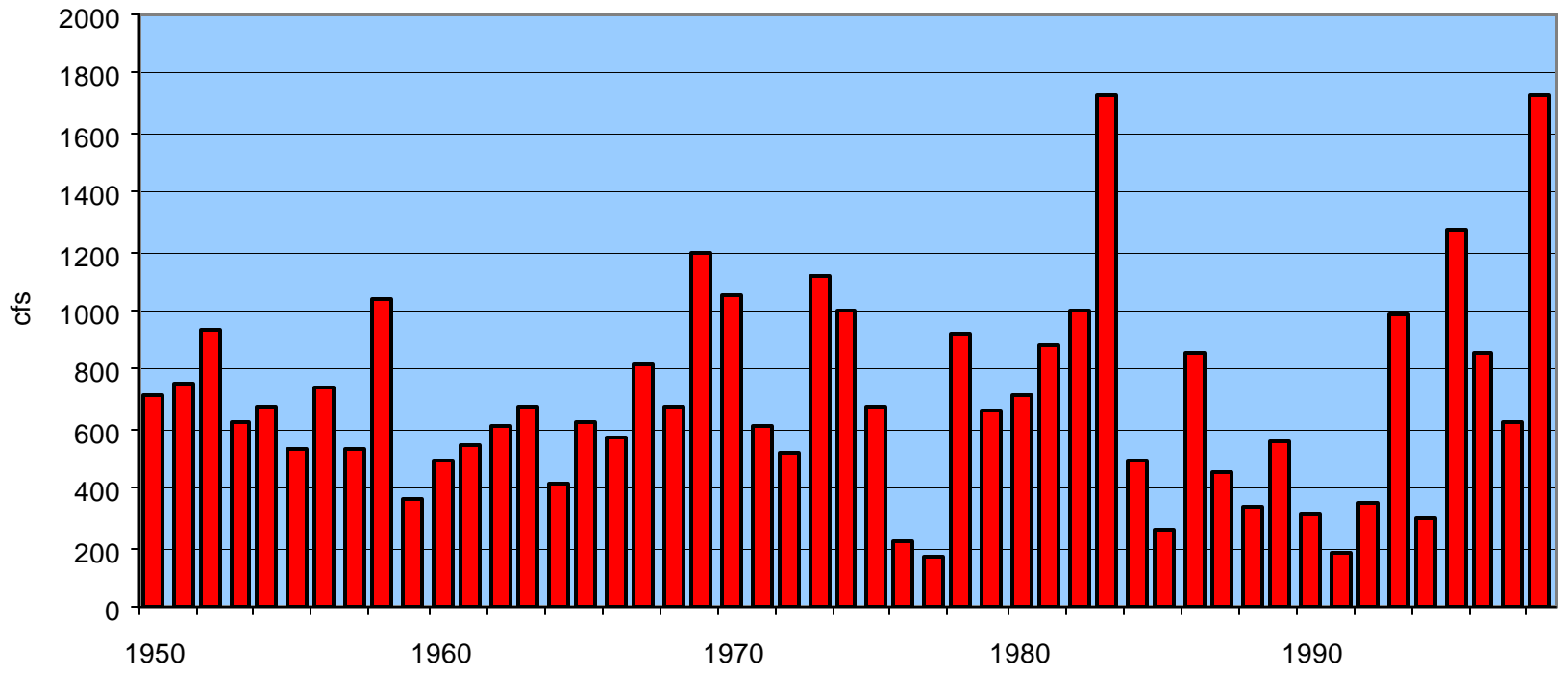


FIGURE 5-3
MEAN ANNUAL FLOWS – MAIN STEM COW CREEK
MILLVILLE GAGE
 COW CREEK WATERSHED ASSESSMENT
 SHASTA COUNTY, CALIFORNIA

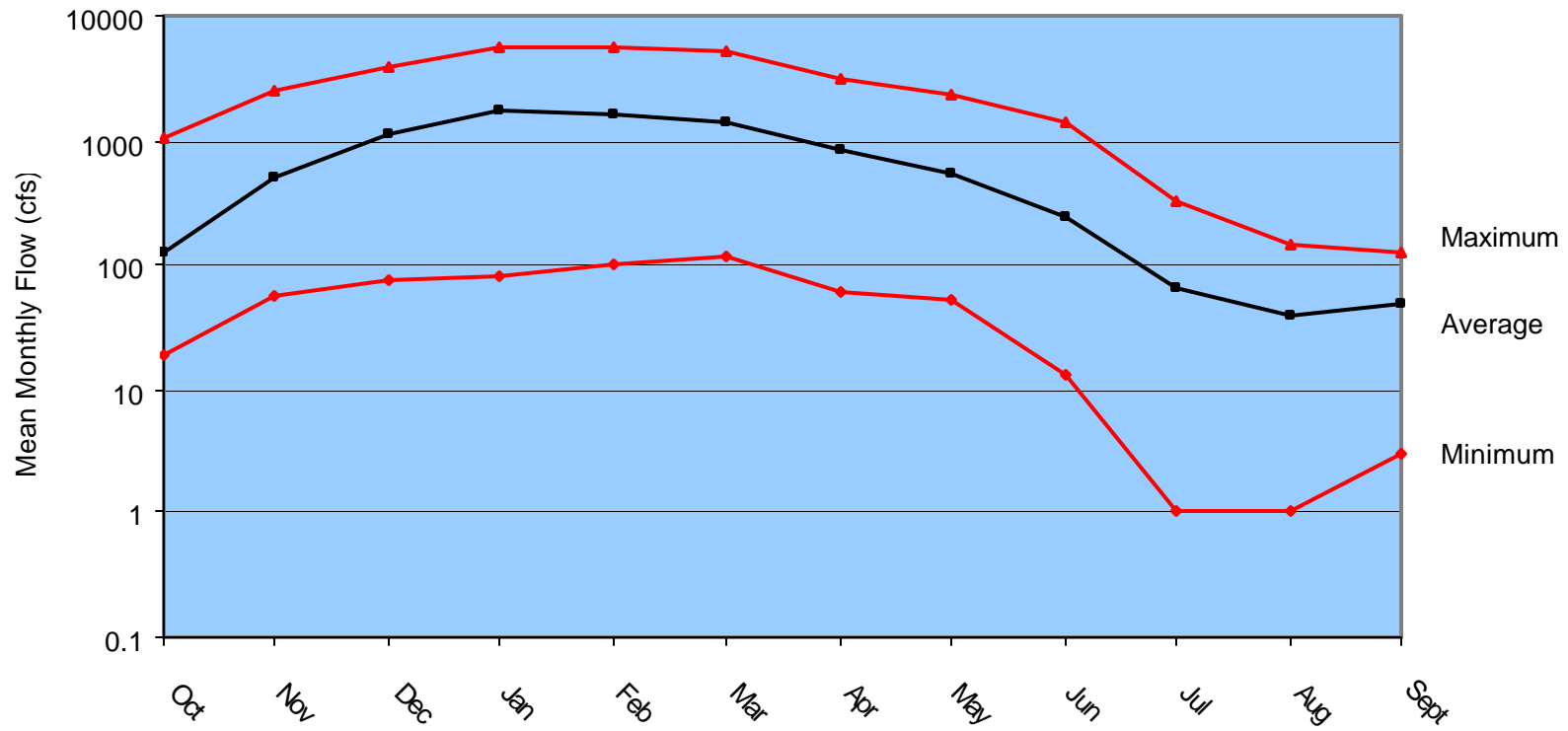


FIGURE 5-4
**MONTHLY FLOWS – MAIN STEM COW CREEK
 MILLVILLE GAGE**
 COW CREEK WATERSHED ASSESSMENT
 SHASTA COUNTY, CALIFORNIA

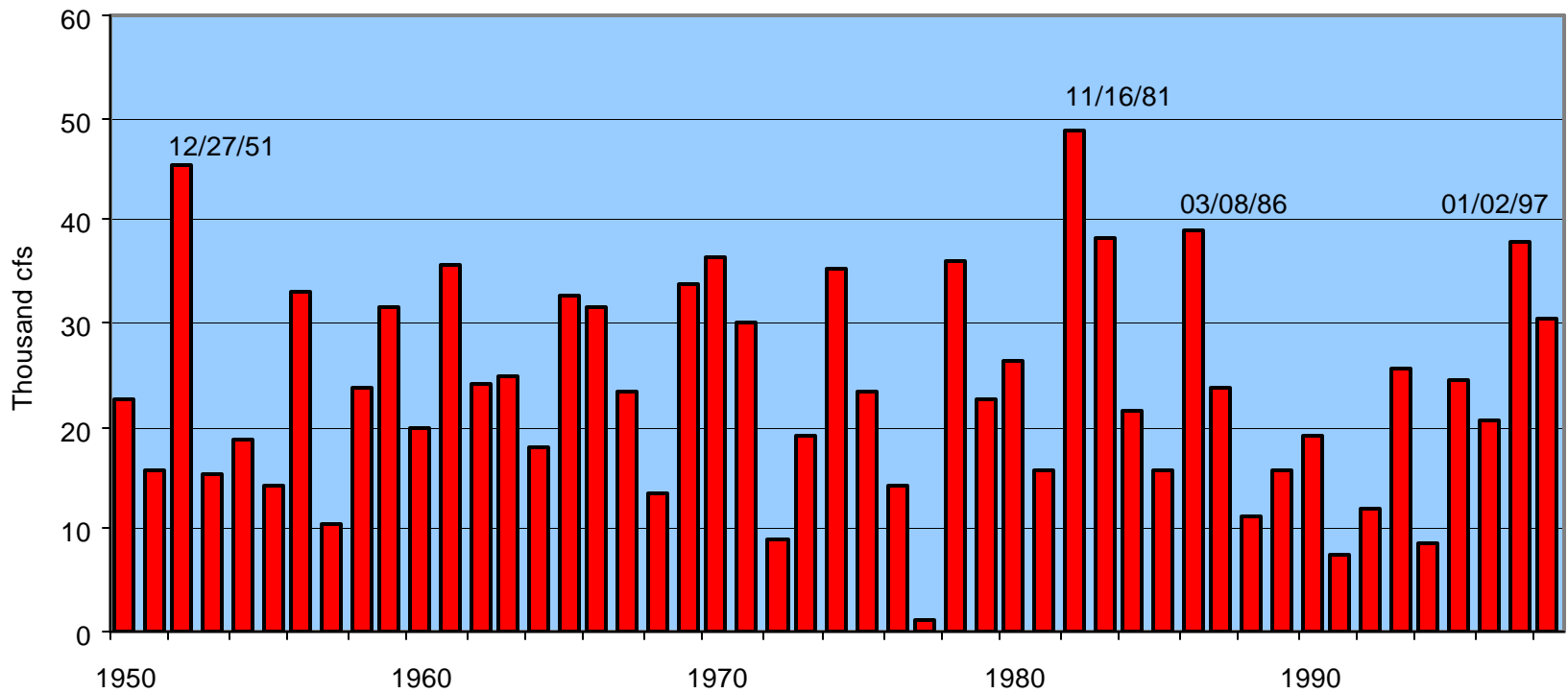


FIGURE 5-5
**PEAK ANNUAL FLOWS – MAIN STEM COW CREEK
 MILLVILLE GAGE**
 COW CREEK WATERSHED ASSESSMENT
 SHASTA COUNTY, CALIFORNIA

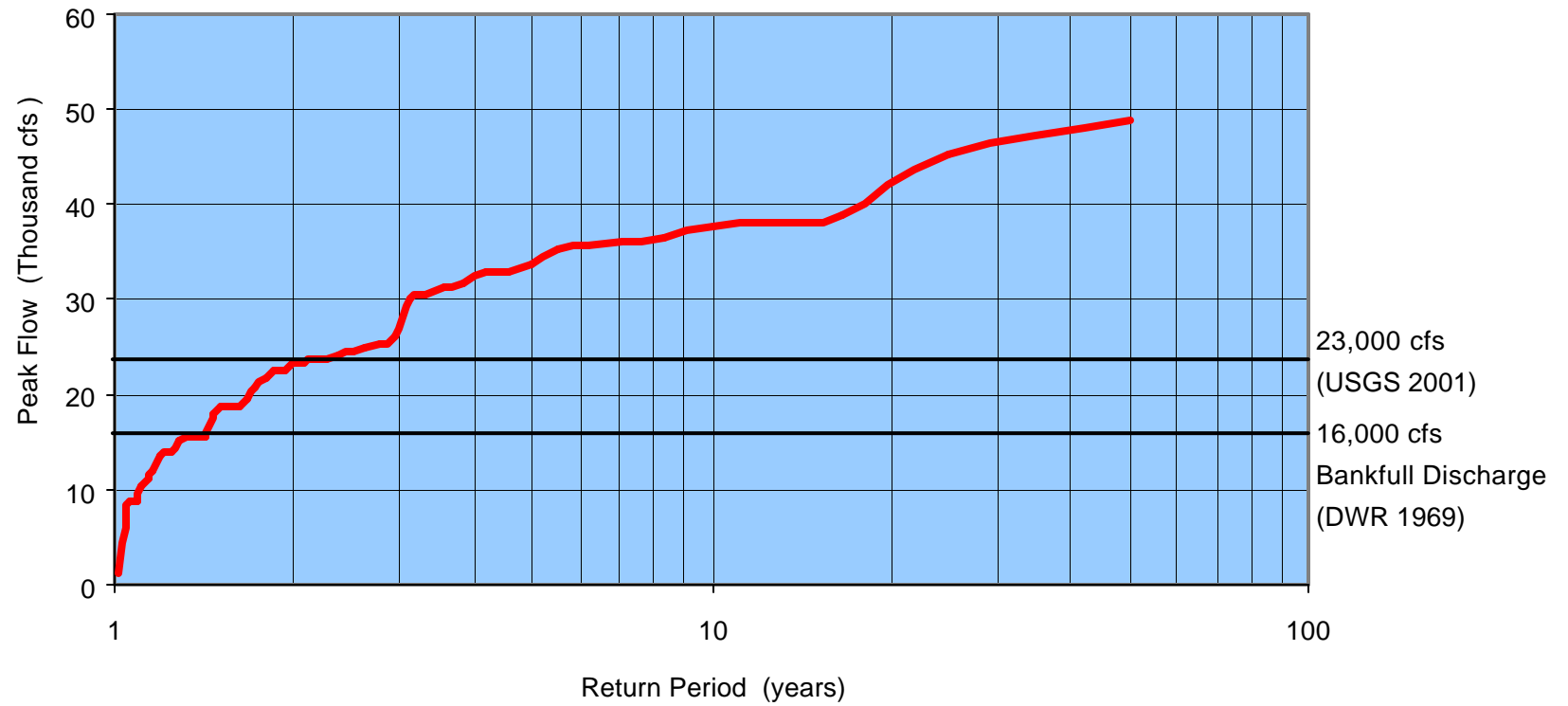


FIGURE 5-6
**RETURN PERIOD – MAIN STEM COW CREEK
 MILLVILLE GAGE**
 COW CREEK WATERSHED ASSESSMENT
 SHASTA COUNTY, CALIFORNIA

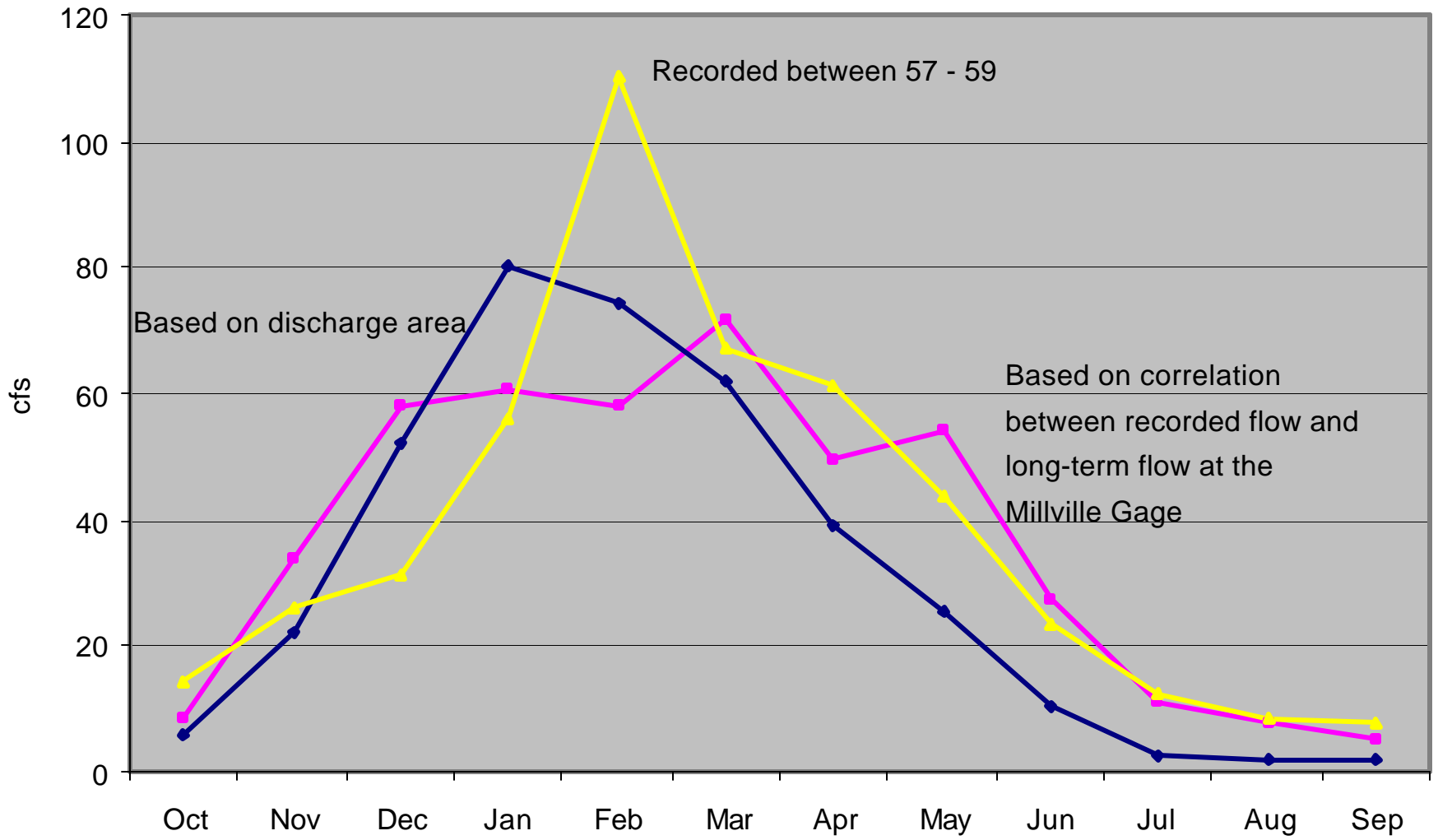


FIGURE 5-7
MEAN MONTHLY FLOW – CLOVER CREEK
USGS GAGE 11372700
 COW CREEK WATERSHED ASSESSMENT
 SHASTA COUNTY, CALIFORNIA

