3. AFFECTED ENVIRONMENT, ENVIRONMENTAL CONSEQUENCES, AND ENVIRONMENTAL COMMITMENTS

CHAPTER 3
AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

This chapter begins with a summary of the CVPIA PEIS, off of which this EA tiers. The remainder of this chapter describes the affected environment and potential environmental consequences associated with long-term renewal of the CVP water service contract for the Feather Water District.

3.1 PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT

On October 30, 1992, the President signed into law the Reclamation Projects Authorization and Adjustment Act of 1992 (Public Law 102-575) that included Title XXXIV, the Central Valley Project Improvement Act. The CVPIA amended the previous authorizations of the CVP to include fish and wildlife protection, restoration, and mitigation as project purposes having equal priority with irrigation and domestic uses and fish and wildlife enhancement as a project purpose equal to power generation. Through the CVPIA, Interior is developing policies and programs to improve environmental conditions that were affected by operations, management, and physical facilities of the CVP. The CVPIA also includes tools to facilitate larger efforts in California to improve environmental conditions in the Central Valley and the San Francisco Bay-Delta system. The PEIS addressed potential impacts and benefits implementing provisions of the CVPIA. The PEIS was prepared by both Reclamation and the Fish and Wildlife Service.

The analysis in the PEIS was intended to disclose the probable region-wide effects of implementing the CVPIA and provide a basis for selecting a decision among the alternatives. The PEIS was developed to allow subsequent environmental documents to incorporate PEIS analysis by reference and limit the need to reevaluate the region-wide and cumulative impacts of the CVPIA. In some cases, worst-case assumptions were used to maximize the utility of the analysis for tiering within the scope of the impacts analyzed in the PEIS.

As the project-specific actions are considered, the lead agencies must determine if the specific impacts were adequately analyzed in the PEIS. If the actions under consideration were previously evaluated and the impacts of such actions would not be greater than those analyzed in the PEIS or would not require additional mitigation measures, the actions could be considered part of the overall program approved in the PEIS Record of Decision (ROD). In such a case, an administrative decision could be made that no further environmental documentation would be necessary. If a tiered document is appropriate, the tiered document may be an EIS or an EA. The tiered documents can use the PEIS by reference to avoid duplication, and focus more narrowly on the new alternatives or more detailed site-specific effects. Therefore, only changes from the alternatives considered in the PEIS would be addressed in detail in the tiered documents.

3.1.1 Localized Impacts of PEIS on Preferred Alternative

The primary impact on CVP water service contractors, as described in the PEIS, is not due to contract provisions, but rather to the implementation of CVPIA. The re-allocation of CVP water to fish and wildlife purposes under CVPIA reduced the average annual CVP water deliveries to water service contractors from 2,270,000 acre-feet/year under the PEIS No-Action Alternative to 1,933,000 acre-feet/year under all of the PEIS alternatives, including the Preferred Alternative. The reduction in the District occurred as summarized below.

- Average Annual CVP Water Deliveries for Agricultural water service contractors located in the Feather Water District decreased 12 percent from pre-CVPIA Affected Environment conditions.
- Average Annual CVP Water Deliveries for other water service contractors located in the Feather Water District decreased 4 percent from pre-CVPIA Affected Environment conditions.

3.2 AGRICULTURAL ECONOMICS

3.2.1 Affected Environment

This section addresses potential direct and indirect economic impacts from renewing the Feather Water District's long-term water service contract. Direct impacts include changes in output, income, employment, and other economic measures that occur in the sectors that directly use CVP water, whereas indirect and induced impacts are impacts that are passed through to other sectors of the economy not directly linked to use of CVP water. This section follows a format similar to the PEIS.

Water Use

Feather Water District's current contract provides for annual delivery of 20,000 acre-feet of CVP water. From 1981 to 1989, CVP deliveries to the District ranged from 14,000 to 24,000 acre-feet. Beginning in 1991, during the drought years, water deliveries dropped to approximately 9,000 to 10,000 acre-feet. Deliveries have returned to higher levels since that time. Delivery in 1999 was 16,395 acre-feet, although there is a slight

discrepancy with the water delivery recorded in the District records (M. Heaton 2000; Reclamation 2000c).

Water Pricing

The current cost of water for the District varies according to the quantity purchased. Water costs, net of any restoration charge, for certain years relevant to this EA are presented in Table 3-1. Current water rates in the District, including the restoration charge are $20.97 per acre-foot ($13.87/acre-foot plus $7.10/acre-foot restoration charge). Water use in the District generally is metered at the user level.

Table 3-1
Water Rates Paid by the Feather Water District for Selected Years

	Tier 1	Tier 2	Tier 3
1994	$ 4.53	$ 6.97	$ 9.40
1999	$12.36	$14.67	$ 16.97
2000	$13.87	$16.49	$ 19.10

Source: Reclamation 2000; CH2MHill 2000.
Rates do not include restoration charges.

Cropping Patterns and Irrigated Acres

Data concerning the District's size and the amounts of arable and irrigable land are available from at least four sources: the State Water Resources Control Board, Reclamation, Feather Water District, and the Sutter County Tax Assessor. These numbers differ (sometimes widely), and the numbers used in various sections of the draft EA accordingly showed discrepancies, as a result of different definitions used to calculate the acreage. In order to resolve this discrepancy, the final EA will use 7,300 acres as the irrigated acreage in the District and will note any deviation from this. This avoids an erroneous impression of precision and makes the analyses of the EA easier to follow.

A majority of the irrigated acreage in the District (approximately 6,000 acres, or 82 percent) is devoted to orchards, especially peaches, prunes, and walnuts. Other crops produced include vegetables, wheat, alfalfa, and pasture. Approximately 900 acres of rice were produced in the District as late as 1989; however, rice acreage tends to fluctuate based on water availability. The acreage decreased to approximately 90 acres in the late 1990s and is now being phased out (Table 3-2).

Agricultural Production Costs and Revenues

Gross revenues for the District are estimated at approximately $16.7 million dollars (1995 dollars). Gross revenues are generated mostly from orchards and truck crops (Table 3-3). These estimates are derived from Central Valley Production Model (CVPM) and other data and may differ from actual revenues for the District.

Table 3-2
Feather Water District Irrigated Acreage

Crop Type	1989	Average 1995-1999
Rice	927	97
Orchard	4,709	5,571
Other	1,580	979
Fallow	N/A	635
Total	**7,216**	**7,283**

Source: Feather Water District 1993; Reclamation 2000c.

Table 3-3
Feather Water District Acreage, Revenue, and Water Use Estimates[1]
(1989)

		Gross Revenue Estimates		Water Use Estimates	
Crop	Acres	Per Acre ($)	Total (Thousand $)	Acre-feet/ Acre	Total Acre-feet
Rice[2]	927	559	518	6.65	6,165
Alfalfa/Pasture	485	585	284	3.83	1,858
Wheat	160	258	41	0.86	138
Dry Beans	120	516	62	1.91	229
Melons	480	2,232	1,071	1.81	869
Sugar Beets	160	895	143	3.26	522
Squash	175	4,750	831	1.81	317
Prunes	1,205	3,326	4,008	3.59	4,326
Peaches	2,280	3,632	8,281	3.59	8,185
Pears	430	1,062	457	3.59	1,544
Apples	60	1,062	64	3.59	215
Cherries	20	1,062	21	3.59	72
Walnuts	623	1,340	835	3.59	2,237
Almonds	91	1,292	118	2.87	261
Total	**7,216**	**22,569**	**16,734**		**26,936**

Assumptions: Pears, apples, and cherries use the same amount of water as other orchard crops.
Notes: Gross revenue and water use have been estimated for the purpose of assessing the magnitude of impacts caused by various alternatives. Estimates are not to be used for any other purpose and do not necessarily represent current conditions.
1995-1999 data show a much lower acreage of rice and therefore lower gross revenues and water use for that crop
Acreage figures for 1989 were used because that year is the representative year chosen by the District for the purposes of the water needs assessment (Reclamation 2000a).
Source: Feather Water District 1993; Reclamation 2000a.

Regional Economics

The Feather Water District is within the economic region of Sutter and Yuba counties. The two-county economic region employs approximately 51,203 workers, out of a total labor force of 60,642. Annual employment growth has increased an average of 1.4 percent since 1990. Over the past decade, the mix of employment in the region has shifted slightly from manufacturing and wholesale trade to retail trade and services. Agriculture is considered the major industry in the region and employs 16.3 percent of the total workforce.

The agriculture, government, trade, and service sectors employ 61.5 percent of all workers. The remaining 38.5 percent of the work force is employed in five relatively small economic sectors: manufacturing, construction, transportation, finance/insurance, and mining.

Table 3-4
Sutter and Yuba County Employment Breakdown

Employment Statistics				
Area	**Employment**	**Unemployment**	**Labor Force**	**Unemployment Rate**
Sutter County	32,600	,100*	37,700	13.5 %
Yuba County	19,000	2,900*	21,900	13.3%
Total	51,600	7,410*	59,600	
Employment by Sector				
Sector	**Employment**			
Government	12,100	23.4%		
Trade	10,900	21.1%		
Services	8,800	17%		
Agriculture	8,400	16.3%		
Manufacturing	4,900	9.5%		
Construction	2,800	5.4%		
Transportation/Utility	2,200	4.3%		
FIRE (Finance, Insurance, Real Estate)	1,400	2.7%		
Mining	100	0.3%		
Total Employment	**51,600**	100%		

Source: State of California, Employment Development Department 2002.
*Note: The unemployment rate has been calculated using unrounded data.

3.2.2 Environmental Consequences

Methodology

The modeling approach used in this analysis is similar to that used for the PEIS. Analysis presented herein is based on data from the CVPM. CVPM runs were conducted for the different alternatives to reflect the specific water pricing conditions proposed under each alternative. All action alternatives are assessed as changes from the No Action Alternative.

The CVPM is divided into 21 Subregions. The Feather Water District is in Subregion 5, covering most Feather River Region riparian and appropriative users. The Feather Water District is the only water district in Subregion 5 that draws water from the CVP, and therefore most of the impacts derived from the CVPM runs for Subregion 5 can be allocated to the District. Exceptions to this rule are detailed, where appropriate, in the following discussions.

No Action Alternative

As discussed in Chapter 2 of this EA, the No Action Alternative would be renewal of the District's long-term contract under terms that are consistent with those proposed as part of the Preferred Alternative in the PEIS. The No Action Alternative includes pricing based on an 80/10/10-tiered approach up to the full cost rate. Data for the No Action Alternative are not identical to the baseline data shown above but are summaries of the conditions that are expected to prevail if the contract were implemented in accordance with terms and conditions outlined in Preferred Alternative of the PEIS.

Water Use and Rates

The No Action Alternative assumptions for water rates and water use are presented in Table 3-5.

Table 3-5
No Action Alternative Acres, Water Use, and Water Rates

Acres Irrigated with CVP water	7,300
Agricultural Gross Revenues ($ Millions)	16.7
CVP Water Use (Acre-feet)	
Average	19,940
Wet	20,800
Dry	17,860
1994 CVP Water Rates ($/Acre-foot)	
Tier 1	4.53
Tier 2	6.97
Tier 3	9.40

Source: CH2M Hill 2000.
Note: The wet year average use exceeded the 20,000 acre-feet contract amount, based on actual past use.

Irrigated Acres

Approximately 7,300 acres would be irrigated under this alternative (Table 3-5); this is the acreage used as the basis of the PEIS economic analysis, and it roughly approximates the amount of acreage currently legally irrigable with CVP water. No substantial change in irrigated acres from existing conditions would be expected.

Gross and Net Revenues

Gross revenues for the District are estimated at approximately $16.7 million dollars (1995 dollars). Gross revenues are generated mostly from orchards and truck crops (Table 3-3).

Alternative 1

Under Alternative 1, rates paid, the amount of water used, the amount of irrigated acres, and gross revenues for the District would be equivalent to that described for the No Action Alternative (Table 3-5).

Alternative 2

Because tiered pricing under Alternative 2 is based on a rolling average of water deliveries over the previous five years, nine water year sequences are assessed in the analysis for this alternative. These include the following:

Average-Average: An average water year following a five-year sequence of average years
Wet-Average: An average water year following a five-year sequence of wet years
Dry-Average: An average water year following a five-year sequence of dry years

Average-Wet: A wet water year following a five-year sequence of average years
Wet-Wet: A wet water year following a five-year sequence of wet years
Dry-Wet: A wet water year following a five-year sequence of dry years

Average-Dry:	A dry water year following a five-year sequence of average years
Wet-Dry:	A dry water year following a five-year sequence of wet years
Dry-Dry:	A dry water year following a five-year sequence of dry years

CVPM results for each of the nine water year sequences are presented as changes compared to the No Action Alternative.

Water Rates

The CVP water rates for each of the nine water year sequences described above, as well as the No Action Alternative tiered prices, are shown in Table 3-6, which also shows the available CVP water service supplies by tier and the blended price under each type of water year sequence. CVP water rates under Alternative 2 would range from $20.65 (tier 1) to $25.36 (tier 3) per acre-foot.

The quantity of water available to the District under each tier would depend on the amount of water available in the previous five years (Table 3-7). Moreover, the amount of water delivered varies among dry, wet, and average years. Therefore, in any given year, the quantity and blended price depend on the amount of water available in a six-year sequence. The weighted average prices (i.e., blended prices) were calculated for each sequence.

Blended prices range from $20.81 to $21.92 per acre-foot. Variations between types of water years are small (less than five percent). This variation is due to the fact that tier 3 rates for the District would be only $4.71, or approximately 23 percent, higher than tier 1 rates, and the amount used by the District is expected to be fairly stable across types of water years.

Water Use

Predicted water use by the District varies from approximately 20,000 acre-feet in average years to 17,900 acre-feet in dry years. These quantities are similar to the water use under the No Action Alternative. Compared to the No Action Alternative, changes in CVP water use caused by tiered pricing are less than 100 acre-feet in any year. Groundwater use shows little change in average years, but declines between 420 and 1,100 acre-feet in wet and dry years as a result of Alternative 2. The CVPM results indicate that water use in the District is not greatly affected by the tiered pricing proposal because, even with the new tiered prices, the marginal value of water in agricultural production is higher than its cost.

Within each type of water year (average, wet, or dry) there are slight variations in water use depending on the water available in the preceding five years. Such variations are the result of differences in blended prices caused by differences in the quantity of water available under each tier. Within each type of water year, variations in water use are relatively small because the blended rates do not vary substantially according to the preceding five years.

Table 3-6
Alternative 2 Water Rates and Usage
Following Average, Wet, or Dry Five-year Periods Compared to No Action

	Water Rates		Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
	No Action Rates ($/Acre-foot)	Alternative 2 Rates ($/Acre-foot)	Followed by Average			Followed by Wet			Followed by Dry		
			Water Use (1,000 Acre-feet):								
Tier 1	4.53	20.65	16.0	16.6	14.3	16.0	16.6	14.3	16.0	16.6	14.3
Tier 2	6.97	23.01	2.0	2.1	1.8	2.0	2.1	1.8	1.9	1.2	1.8
Tier 3	9.40	25.36	2.0	1.2	1.8	2.0	2.1	1.8	0.0	0.0	1.8
Category 2		25.36	0.0	0.0	2.1	0.9	0.0	2.9	0.0	0.0	0.0
Total			20.0	19.9	20.0	20.9	20.8	20.8	17.9	17.8	17.9
			Blended Price ($/Acre-foot):								
			21.35	**21.18**	**21.77**	**21.52**	**21.36**	**21.92**	**20.90**	**20.81**	**21.35**

Source: CH2M Hill 2000.

Table 3-7
Alternative 2 Applied Irrigation Water Changes Following Average, Wet, or Dry Five-Year Periods Compared to No Action (Acre-feet)

	Alternative 2 Average	Changes Compared to Average No Action			Alternative 2 Wet	Changes Compared to Wet No Action			Alternative 2 Dry	Changes Compared to Dry No Action		
Water Source		Average	Wet	Dry		Average	Wet	Dry		Average	Wet	Dry
		Followed by Average				Followed by Wet				Followed by Dry		
CVP Water	19,940	60	-40	60	20,800	100	0	0	17,860	40	-60	40
Groundwater	NA	-60	40	-60	NA	–1,090	- 990	-420	NA	-1,100	-1,000	-1,100

Source: CH2M Hill 2000.
Assumptions: 100% of Subregion 5 water use impact of tiered pricing is allocated to the Feather Water District.

Irrigated Acres

Changes in irrigated acres from the No Action Alternative are summarized in Table 3-8. Changes in acreage are minor (180 to 190 acres maximum) in all types of water years. The largest reduction in acreage is for rice in wet and dry periods. Rice is a crop with one of the lowest net revenues per acre-foot and generally would be one of the first crops to be reduced in the event of increased water costs. The overall impact on acreage remains very small under all water year scenarios. Very slight variations in irrigated acres between the different types of water year sequences are again due to slight increases or decreases in the blended water prices.

Table 3-8
Alternative 2 Changes in Irrigated Acres
Following Average, Wet, or Dry Five-Year Periods
Compared to Average, Wet, or Dry No Action

	Changes Compared to Average No Action			Changes Compared to Wet No Action			Changes Compared to Dry No Action		
Crop	Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
Category	Followed by Average			Followed by Wet			Followed by Dry		
Pasture	10	10	30	-30	-30	10	-40	-40	-40
Alfalfa	0	0	20	0	0	10	0	0	0
Sugar beets	0	0	0	0	0	0	0	0	0
Other field crops	0	0	-10	-10	-10	-10	-10	-10	-10
Rice	0	0	-20	-130	130	-70	-130	-130	-130
Truck crops	0	0	0	0	0	0	0	0	0
Tomatoes	0	0	0	0	0	0	0	0	0
Deciduous orchard	0	0	10	0	0	0	0	0	0
Small grain	0	0	-10	-10	-10	-10	-10	-10	-10
Subtropical orchard	0	0	0	0	0	0	0	0	0
Subtotal	**10**	**10**	**20**	**-180**	**-180**	**-70**	**-190**	**-190**	**-190**

Source: CH2M Hill 2000.
Assumptions: 100% of Subregion 5 acreage impacts are allocated to the Feather Water District.

Gross and Net Revenues

Gross revenues experience a slight decline under the Alternative 2 tiered pricing approach. This decline is minimal: on the order of $8,000 in a typical (average) year to up to $125,000 in wet and dry years. Compared to the total gross revenues of approximately $16.7 million, this decline represents 0.1 percent of gross revenues in average years and 0.8 percent in dry and wet years. Most of the decline in gross revenues would be related to decline in rice acreage (Table 3-9).

Because of a slight reduction in acreage of some crops under some water year scenarios, net revenue from farming also is expected to suffer a slight decline. The decline in net revenues due to reduction in acreage varies between $0 and $21,000 (Table 3-10).

Overall, the main impact on net revenues would come directly from an increase in water prices. District water users are predicted to spend an additional $287,000 to $338,000 on water because of the price increase.

Table 3-9
Alternative 2 Value of Production Following Average, Wet, or Dry Five-Year Periods Compared to Average, Wet, or Dry No Action (Thousand $)

Crop Category	Changes Compared to Average No Action			Changes Compared to Wet No Action			Changes Compared to Dry No Action		
	Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
	Followed by Average			Followed by Wet			Followed by Dry		
Pasture	1	0	3	-4	-4	2	-5	-5	-5
Alfalfa	0	0	7	-1	-1	1	-2	-2	-2
Sugar Beets	0	0	1	0	0	0	0	0	0
Other Field Crops	0	0	-2	-3	-3	-3	-3	-3	-3
Rice	-2	0	-21	-111	-111	-61	-112	-112	-112
Truck Crops	0	0	0	-1	-1	0	-1	-1	-1
Tomatoes	0	0	2	0	0	1	0	0	0
Deciduous Orchard	0	0	4	0	0	0	0	0	0
Small Grain	0	0	-1	-3	-3	-3	-3	-3	-3
Subtropical Orchard	0	0	0	0	0	0	0	0	0
Subtotal	**-2**	**0**	**-8**	**-123**	**-123**	**-64**	**-125**	**-126**	**-125**

Source: CH2M Hill 2000.
Assumptions: 100% of Subregion 5 gross revenue impacts are allocated to the Feather Water District.

Table 3-10
Alternative 2 Changes in Net Revenue Following Average, Wet, or Dry Five-Year Periods Compared to Average, Wet, or Dry No Action (Thousand $)

Cause of Net Revenue Change	Changes Compared to Average No Action			Changes Compared to Wet No Action			Changes Compared to Dry No Action		
	Average	Wet	Dry	Average	Wet	Dry	Average	Wet	Dry
	Followed by Average			Followed by Wet			Followed by Dry		
Fallowed Land	0	0	0	-20	-20	-10	-20	-21	-20
Groundwater Pumping	2	-1	2	33	30	13	38	34	38
Irrigation Cost	-1	-1	-1	-1	-1	-1	-1	-1	-1
CVP Water Cost	-323	-317	-332	-332	-328	-338	-292	-287	-300
Higher Crop Prices	0	0	6	0	0	0	0	0	0
Net Change	**-322**	**-319**	**-325**	**-320**	**-318**	**-333**	**-275**	**-274**	**-283**

Source: CH2M Hill 2000.
Notes: All values in 1992 dollars.
CVP Water Cost: the sign has been changed compared to CH2M Hill 2000.

Assumptions: Net revenue impact allocated to the Feather Water District as follows:

Fallowed Land	100%
Groundwater Pumping	100%
Irrigation Cost	100%
CVP Water Cost	100%
Higher Crop Prices	2% (proportional to the District's acreage in Region 5)

Other components of net revenues include groundwater pumping, labor and capital costs, and higher crop prices. These components are not expected to change greatly, due to the tiered pricing approach under Alternative 2.

Higher crop prices in the Dry-Average water year sequence are expected to contribute up to $6,000 of additional net revenues to the District water users in some years.

However, after a series of dry years, large amounts of CVP water would no longer be affordable and would not be purchased. The higher blended prices that result would force some subregions in California to reduce acreage, which, in turn, would result in generally higher crop prices and higher returns for the crops that remain in production. District farmers would not be expected to substantially reduce their water use despite higher water prices because the marginal value of water to agriculture is higher than its price. However, District farmers would benefit slightly from the higher crop prices that would result from reduced production in other parts of California. This contribution would, however, be minimal at the level of the Feather Water District.

Therefore, overall net revenues for District farmers mostly would be affected directly through higher CVP water rates and not through changes in cropping patterns induced by changes in water rates.

Regional Impacts

This analysis identifies the regional economic impacts of the long-term contract renewal for the Average-Average water year sequence. This is the only sequence that represents long-run conditions for the Feather Water District. The input-output model used in the regional economic analysis assumes a long-run equilibrium is reached; therefore, it is inappropriate to model short-run responses represented by the wet and dry year conditions. The dry-average water year sequence is not presented because the model did not predict the region would be affected permanently by a five-year dry sequence.

The results of this analysis are summarized in Table 3-11. The table presents the regional economic impacts by the source of the impact, including reduced agricultural output and the change in farm net incomes.

The impacts of Alternative 2 relative to the No Action Alternative include losses of about 16 jobs in the Sacramento Valley and losses of approximately $0.75 million dollars in output and $0.4 million in place-of-work income. Most of these impacts would be felt in the manufacturing, trade, and services sectors of the regional economy. Much of the economic impact of this alternative would fall outside the Sutter and Yuba county economic region. Thus, employment, output, and place-of-work income losses in Sutter and Yuba counties would be much smaller than those identified for the entire Sacramento Valley.

3.2.3 Cumulative Impacts

Alternative 1 would impose no crop acreage and revenue changes and Alternative 2 would impose relatively small crop acreage and revenue changes. Neither alternative would have large impacts on the regional economy. Therefore, implementation of Alternatives 1 and 2 would not contribute to cumulative environmental impacts in the region.

Table 3-11
Regional Impacts of Alternative 2 on the Sacramento Valley Economy

Average-Average Sequence

	Employment (Number of Jobs)		Output (Millions $)		Place of Work Income ($ Millions)	
	Direct	Total	Direct	Total	Direct	Total
Reduced Output	0.043	0.086	0.002	0.005	0.001	0.003
Reduced Net Income	6.480	16.200	0.292	0.745	0.162	0.399
Total	**6.523**	**16.286**	**0.294**	**0.750**	**0.163**	**0.401**

Assumption: Sutter-Yuba impacts are proportional to Sacramento Valley impacts.

3.3 WATER RESOURCES

3.3.1 Affected Environment

Description of Study Area

The Feather Water District is approximately eight miles south of Yuba City, in Sutter County. It borders the west bank of the Feather River, about 10 miles north of its confluence with the Sacramento River. There are approximately 7,300 acres of irrigated land in the District, divided into 301 parcels. The distribution system consists of 33 miles of enclosed underground concrete pipelines. There are no water storage facilities in the District (Feather Water District 1993).

Prior to the passage of the CVPIA, the District typically received its full contract amount, but deliveries post-CVPIA have averaged about half the contract amount. From 1989 to 1999, Reclamation delivered an average of 10,737 acre-feet of project water to irrigate an average of 6,859 acres. From 1995 to 1999 water use ranged from a low of 9,099 acre-feet in 1996 to 16,395 acre-feet in 1999 (Reclamation 2000c).

In 1952, the California Department of Water Resources (DWR) published DWR Bulletin No. 6, which described the results of an investigation of groundwater quality in Sutter County (DWR 1952). The investigation found that groundwater in the Tudor area contained chloride concentrations high enough to adversely affect agricultural production.

Shortly before the report was published, Sutter County applied for and received a permit from the State Water Resource Control Board to divert up to 130 cubic feet per second (cfs) of water from the Feather River in the Tudor area. The permit was granted subject to the District entering into an agreement with Reclamation for exchange of water from the CVP, to supply prior water rights in the Sacramento-San Joaquin delta area via the Sacramento River. The District recycles irrigation return flows (tail water); the quality of this recycled water is adequate for irrigation. In May 1955, Sutter County submitted a proposal to the County Boundary Commission to form a water district to manage the diversion and distribution of water from the Feather River. In June, 1958, the Feather Water District was formed (Feather Water District 1993).

In 1962, the District entered into a 32-year water service "exchange," or "replacement water," contract with Reclamation to receive up to 20,000 acre-feet of CVP water. The water is delivered by Reclamation at the confluence of the Sacramento and Feather rivers, to replace water that the District pumps out of the Feather River (Feather Water District 1993).

The region has a Mediterranean climate. The average annual precipitation from 1961 to 1990 was about 20 inches. The District estimates that direct precipitation accounts for about 5,500 acre-feet of water applied to the land annually. However, about 66 percent of the precipitation occurs during the period from November to March. Average monthly temperatures from 1961 to 1990 ranged from 45.5 to 79 degrees Fahrenheit. The average annual frost free period in the region is reported to be 275 days, but from 1961 to 1990 the temperature did not fall below freezing (Feather Water District 1993).

Surface Water

Feather River and Tributaries. The Feather River has a drainage area of 3,607 square miles. It is the largest tributary to the Sacramento River below Shasta Dam. Flows on the Feather River are regulated by Oroville Dam, which began operation in 1967 as part of the State Water Project (SWP). Prior to the construction of Oroville Dam, flows in the Feather River reflected natural runoff conditions, with peak flows in the months of March, April, and May. Following the construction of Oroville Dam, the average monthly flow pattern was modified to provide reduced flows during the spring months and increased flows during summer months.

Regulations and Agreements That Affect CVP Operations. Prior to the passage of CVPIA, the operation of the CVP was affected by SWRCB Decisions (D-) 1422 and 1485, and the Coordinated Operations Agreement (COA). D-1422 and D-1485 identify minimum water flow and water quality conditions at specified locations, which are to be maintained in part through the operation of the CVP. The COA specifies the responsibilities shared by the CVP and SWP for meeting the requirements of D-1485.

Beginning in 1987, a series of actions by the SWRCB, US Environmental Protection Agency (EPA), the National Marine Fisheries Services (now NOAA-Fisheries), and the Service affected interim water flow and water quality standards in the Delta. However, at the time CVPIA was enacted (October 1992), the water quality standard in the Delta remained D-1485, and the CVP and SWP were operated in accordance with the COA to maintain this requirement.

In December 1994, representatives of the federal and state governments and urban, agricultural, and environmental interests agreed to the implementation of a Bay-Delta protection plan through the SWRCB, to provide ecosystem protection for the Bay-Delta Estuary. SWRCB Order 95-06 superseded D-1485. The coordinated operations of the CVP and SWP continue to be based on the COA, but are modified as needed on an annual basis.

Operations of CVP Divisions and Facilities. The facilities included in CVP divisions north of the Delta, including the Trinity, Shasta, and Sacramento River divisions, are known collectively as the Northern CVP System. The District receives water from the Feather River, and that water is replaced, for Delta inflows, by water stored in the Shasta Division.

CVP Water Users. During development of the CVP, the United States entered into long-term contracts with many of the major water rights holders in the Central Valley. In part, the CVP is operated to satisfy downstream water rights, to meet the obligations of the water rights contracts, and to deliver project water to CVP water service contractors.

Many of the CVP water rights originated from applications filed by the state in 1927 and 1938 to advance the California Water Plan. After the federal government was authorized to build the CVP, those water rights were transferred to Reclamation, which applied for the additional water rights needed for the CVP. In granting water rights, the SWRCB sets certain conditions within the permits to protect prior water rights, fish and wildlife needs, and other prerequisites it deems in the public interest.

CVP Water Service Contractors. Before construction of the CVP, many irrigators on the west side of the Sacramento Valley and elsewhere relied primarily on groundwater. With the completion of CVP facilities in these areas, the irrigators signed agreements with Reclamation for the delivery of CVP water as a supplemental supply. Several cities also have similar contracts.

CVP water service contracts are between the United States and individual water users or districts and provide for an allocated supply of CVP water to be applied for beneficial use. In addition to CVP water supply, a water service contract can include a supply of water that recognizes a previous water right. The purposes of a water service contract are to stipulate provisions under which a water supply is provided, to produce revenues sufficient to recover an appropriate share of capital investment, and to pay the annual operations and maintenance costs of the project.

Criteria for Water Deliveries to CVP Contractors. The criteria for deliveries to CVP contractors consider available water supplies and superior obligations on the use of the available water.

Criteria for Water Availability to CVP Contractors. Water availability for delivery to CVP water service contractors during periods of insufficient water supply is determined based on a combination of operational objectives, hydrologic conditions, and reservoir storage conditions. Reclamation is required to allocate shortages among water service contractors within the same service area, as individual contracts and CVP operational capabilities permit.

Feather River Settlement Contractors. The Feather River Settlement Contractors are water users who hold riparian and senior appropriative rights on the Feather River. As

the SWP was built, the state entered into contractual agreements with these existing water rights holders (e.g., water rights settlements). In general, agreements established the quantity of water the contractor is permitted to divert under independent senior water rights and outlined monthly supplemental SWP supply allocated by the state. Contract shortages are applied based on hydrologic conditions and storage in Lake Oroville. Feather Water District is not a settlement contractor.

Feather Water District. The District distributes available water equally among water users, based on acreage, and reclaims all surface flow runoff (e.g., tail water) and pumps it back into the system for redistribution. The District estimates that about 1,500 to 2,000 acre-feet of tail water is recycled in this way per year (Silva 2002). Water diversions from the Feather River are normally distributed over the growing season. From 1980 to 1988, for example, a period that the District considers to be representative, about 43 percent of the water was delivered in June and July, about 37 percent in May and August, about 18 percent in April and September, and about two percent in March and October (Feather Water District 1993). The water is diverted at two points at the northern and a southern ends of the District, and each diversion point is equipped with a pumping plant and small reservoir. The reservoirs are designed to maintain pressure in the distribution piping.

The district estimates that about 99 acre-feet of water is lost from conveyances in a "representative" year due to seepage and operational spills. Because the conveyance system is pipe, evaporation losses are negligible. The District estimates that in a "representative" year, about 600 acre-feet of applied water percolates below the root zone, recharging groundwater, while about 23,900 acre-feet of water is consumed by crops and lost to evaporation. The ratio of "deep percolation" to water used by crops is therefore about 2.5 percent in a representative year. The amount of water that goes to deep percolation can vary dramatically, depending on the amount of water available, irrigation practices, and cropping patterns. For example, in 1989, a wet year, the District estimated that deep percolation was nearly five times that in a representative year, or about 2,754 acre-feet, while crop water use was nearly the same as in the representative year. Deep percolation prevents salts from accumulating in the root zone of plants over time. Salt accumulation can result in reduced yields.

Water from the Feather River contains about 80 to 90 parts per million (ppm) total dissolved solids (TDS). Return flows contain about 400 to 450 ppm TDS. The quality of return flows is adequate for irrigation use.

Groundwater

The District owns two wells, which were installed in 1976 to supplement surface water supplies during drought years. The wells have capacities of 2,900 gallons per minute (gpm) (6.46 cfs, 12.8 af/day) and 4,100 gpm (9.14 cfs, 18.1 af/day).

Groundwater elevations in wells monitored by DWR since the 1940s and 1950s indicate that groundwater elevations rose noticeably after about 1965, suggesting that a switch from groundwater to surface water in this period allowed groundwater levels to recover.

Seasonal fluctuations in the water table are on the order of five to ten feet, and the water table is slightly more than 25 feet above msl in most wells. Because the elevation of the streams in the area (Feather River, Gilsizer Slough) is only a few feet lower than the surrounding land surface, the water table in the area is below the elevation of the streams, and the streams tend to lose water to recharge the groundwater aquifer. The direction of regional groundwater flow is generally toward the southwest, or about parallel to the Feather River.

The District wells were pumped during 1976-1977 and from 1990 to 1992. From 1990 to 1992 a little more than 8,000 acre-feet of groundwater per year was pumped, accounting for about half of the water used by the District during those three years. Groundwater contains about 300 ppm TDS. If groundwater were blended in equal parts with water taken from the Feather River (80 ppm), the resulting water would contain about 190 ppm of TDS.

Sacramento River Basin. The northern third of the Central Valley regional aquifer system is in the Sacramento River Region. This region extends from north of Redding to the Delta in the south. DWR identifies this portion of the Central Valley Aquifer as the Sacramento Valley and Redding basins, which cover over 5,500 square miles. This discussion refers to these basins collectively as the Sacramento Valley Basin.

In the Sacramento Valley Basin, a long-term dynamic link between the groundwater and surface water system has been maintained regionally. The greatest gains to streams from groundwater occurred during the 1940s when groundwater storage was highest in the Sacramento Valley basin. Discharge to streams was lowest during and immediately following the 1976 to 1977 drought and during the 1987 to 1992 droughts. In some areas of the southern portion of the Sacramento Valley region where groundwater levels have continued to decline, such as in Sacramento County, streams that formerly gained flow from the subsurface now lose flow through seepage to adjacent groundwater systems.

Aquifer recharge to the Sacramento Valley basin historically has been from deep percolation of rainfall, the infiltration from stream beds, and subsurface inflow along basin boundaries. Most of the recharge for the Central Valley occurs in the north and east sides of the valley where the precipitation is the greatest. With the introduction of agriculture to the region, aquifer recharge was augmented by deep percolation of applied agricultural water and seepage from irrigation distribution and drainage canals. The basin has an estimated perennial yield of 2.4 million acre-feet, and recent groundwater pumping in the Sacramento Valley basin was estimated to be near this perennial yield, suggesting that regional overdraft conditions are not prevalent (DWR 1994). One exception is the southwestern portion of the Sacramento Valley, near Davis, where overdraft conditions have occurred in recent years.

Land subsidence due to groundwater level declines has been identified in the southwestern part of the Sacramento River Region, near Davis and Zamora. By 1973 land subsidence in this area had exceeded approximately one foot and was reported to

be approximately two feet in the area east of Zamora and west of Arbuckle (Lofgren and Ireland 1973). Land subsidence monitoring has continued since 1973, and some localized land subsidence was reported in the Davis-Zamora area during the 1988-1992 drought (Dudley 1995). Groundwater quality is generally excellent; however, areas of local groundwater contamination or pollution exist.

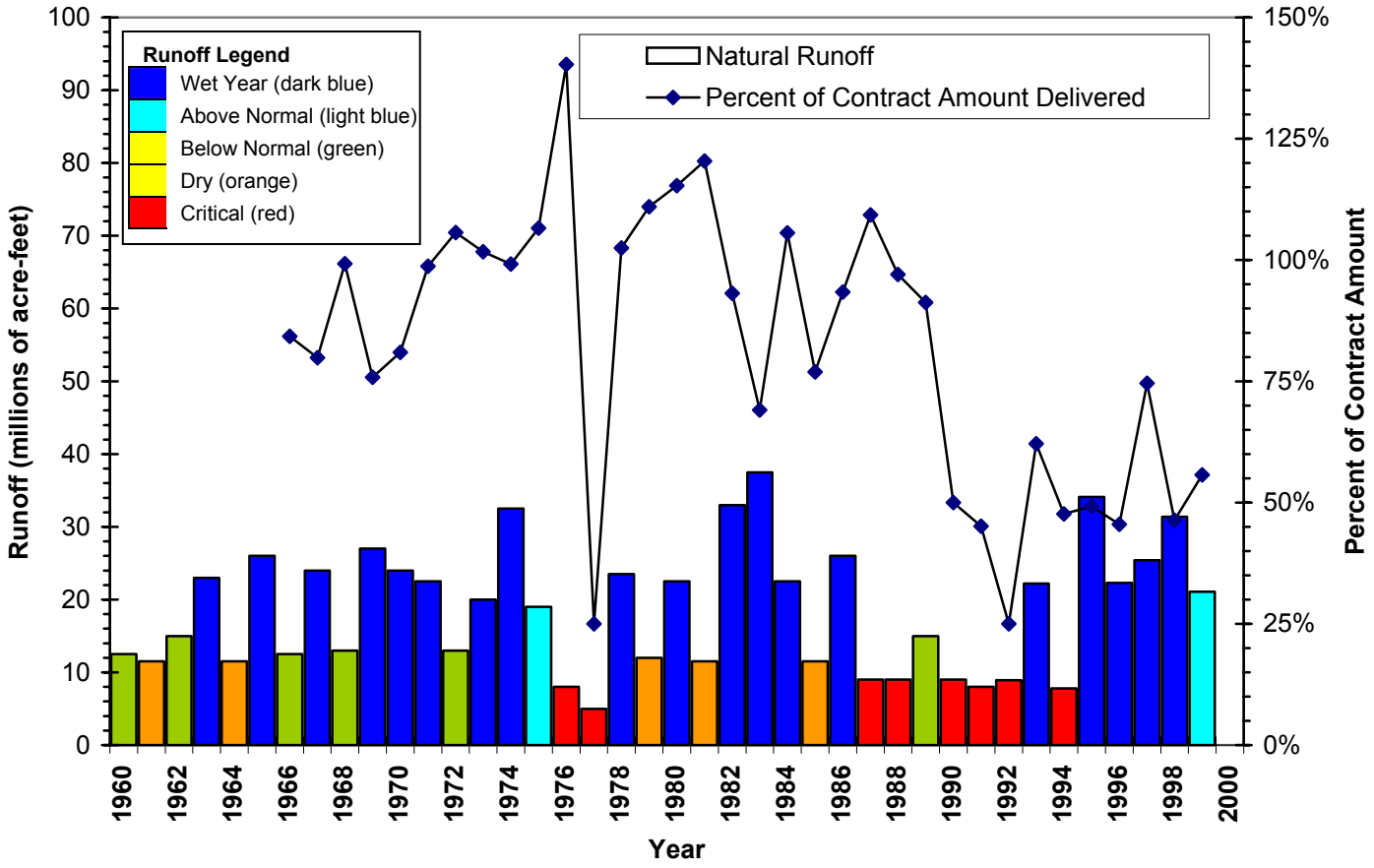
High water tables contribute to subsurface drainage problems in several areas of the Sacramento Valley basin. High water tables in portions of Colusa County, particularly along the Sacramento River, periodically impair subsurface drainage functions of the Colusa Basin Drain and other local drainage facilities. In many reaches of the Sacramento River, flows are confined to a broad, shallow engineered channel with stream bottom elevations higher than adjacent ground surface elevations. During extended periods of high streamflows, seepage-induced water logging can occur on adjoining farmlands, particularly in areas where local groundwater is in contact with the river.

Water Supply and Uses

The current (interim) contract with Reclamation provides for up to 20,000 acre-feet of replacement water. The District estimates that with the cropping pattern of a representative period, the amount of water required for irrigation is 24,146 acre-feet. In 1989, according to Reclamation estimates, 7,176 acres, out of a total area within the District of 9,850 acres (73 percent), were under irrigation. Although the District would like to irrigate all of its irrigable lands, water deliveries in recent years have been substantially less than the contract maximum. From 1989 to 1999, Reclamation delivered an average of 10,737 acre-feet of project water to irrigate an average of 6,859 acres. This amount of water represents about 54 percent of the contract allotment, and is about 1.6 acre-feet per acre of irrigated farmland. By comparison, Reclamation estimated that the per-acre crop water demand in 1989 was 3.0 acre-feet per acre.

Figure 3-1 shows the amount of water the District has received since 1966 as a percentage of the contract amount. The volume of unimpaired (natural) runoff that would enter the Sacramento Valley from the four main tributaries if the various water project facilities did not exist (also known as the Four River Index) is plotted to show the relationship between water supplied to the District and the broader hydrologic conditions affecting water supplies in the northern portion of the state. Water years are classified based on the inflow from these streams according to a formula called the Sacramento Valley 40-30-30 Index, which takes into account the water supply forecasts that influence decisions about how much water to store or release. The type of year is indicated by the color of the bar in the figure. Normal runoff is defined as 17.9 million acre-feet per year. Although there is not a direct correspondence between runoff or water year type and deliveries, the figure indicates that water deliveries to the District generally have been decreasing since about 1975 and that the significant reduction in deliveries seen during the last 10 years is related to a sequence of low runoff years that began in 1987. The figure also illustrates that even with "wet" and "above normal" water years since 1994, Reclamation has been unable to deliver the full contract amount

Figure 3-1
Comparison of Natural Runoff and Water Delivered to Feather Water District as a Percent of Contract Amount



to the District. This is due to restrictions imposed by the operating rules of the CVPIA that dictate storage and release schedules to accommodate environmental requirements, M&I demand, contract priorities, and other requirements.

Although the amount of water the District received has exceeded the contract amount in the past, this no longer occurs (Silva 2002). The District does not import from or export water to other water districts (Silva 2002).

Future improvements in water management by the federal and state water projects (e.g., CALFED) and initiatives to increase the amount of water storage may reduce the severity of the effects of low runoff, but ultimately the amount of water available for irrigation is heavily dependent on precipitation. In addition, competition for water among agricultural and M&I users and environmental uses is likely to increase. The tradeoffs between these uses are discussed in Section 3.2, Agricultural Economics.

The District service area is entirely agricultural, and the District does not provide water for domestic or industrial use, other than that associated with agriculture. In 1999, the principal irrigated crops in the District were orchards (about 5,900 acres in peaches, prunes, walnuts, apples, cherries, and plums), row crops (about 747 acres in melons and safflower), and grain (330 acres of wheat and rice). The amount of water needed by a given crop depends on soil characteristics and evapotranspiration (water evaporated from soil and transpired by plants). Over the years, acreage in row crops and rice has decreased and acreage in orchards has increased (Feather Water District 1993). Orchards are a permanent crop, with an expected life of 20 to 40 years, requiring a long-term commitment of water.

Flood and furrow irrigation have remained the primary irrigation methods in use in the District. The District calculated that 5,216 acres were watered by flood irrigation and 1,355 acres by furrow irrigation during 1989 (Feather Water District 1993).

3.3.2 Environmental Consequences

Groundwater can be affected by recharge from deep percolation of applied irrigation and by pumping. The amount of groundwater recharge depends on the irrigation method, soil, and crop and on the amount of water applied. Leaching requirements can be expressed as a ratio of the amount of deep percolation to applied water. Leaching requirements for individual crops range from about 0.003 for wheat to 0.08 for almonds and dry beans. For a given cropping pattern, the leaching requirement can be assumed to be constant. However, if the cropping pattern changes, the leaching requirement may change also.

No Action Alternative

Surface Water

Water Deliveries. Under the No Action Alternative, Reclamation would negotiate contract water quantities with the District based on the water needs assessment prepared by Reclamation (Reclamation 2000a). Table 3-12 summarizes the results of the Water Needs Assessment for the Feather Water District.

Table 3-12
Summary of Water Needs Assessment Quantities
(all quantities are 2029 values)

Contract Amount (ac-ft)	Ground water Supply (ac-ft)	Net Transfers (ac-ft)	Total Water Supply (ac-ft)	Net Total Agr. Demand (ac-ft)	Unmet Demand (ac-ft)	Average Irrigated Acres (acres)	Average Water Required per acre
20,000	0	0	20,000	23,423	3,423	9,330[1]	2.50

Source: US Department of the Interior, Bureau of Reclamation 2000a.
[1]This figure may be wrong because it exceeds by nearly 1,000 acres the area of the District within which the Bureau of Reclamation permits CVP water to be used.

A comparison of Table 3-12 with the information provided above indicates that the primary difference between the proposed long-term contract and the interim contract is that Reclamation has reduced the per-acre estimate of agricultural water demand, while increasing the number of acres assumed to be irrigated within the District. The total unmet demand, which is the difference between the amount of water required by the crops and the amount of water delivered if 100 percent of the contract amount were purchased, would be 3,423 acre-feet. The maximum contract amount of 20,000 acre-feet would irrigate 8,000 acres at an average rate of 2.50 acre-feet per acre. If the maximum contract amount were applied to 9,330 acres, the average amount per acre would be 2.15 acre-feet per acre.

It is estimated that on average, districts would receive 100 percent of their contract quantity less than 75 percent of the time under the No Action Alternative. This assumption is based in part on the expected availability of water, and in part on the districts' reactions to tiered pricing. As discussed previously, one of the potential impacts of tiered pricing is that the District may elect to purchase less than the amount of water available to it.

If tiered pricing were not a factor, then the availability of water would depend solely on climate conditions and project operating rules. Over the long term, future project water supplies can be expected to be consistent with historic conditions (for example, as reflected in the Four River Index), provided that no long-term climate changes occur. As discussed previously, unimpaired runoff conditions are highly variable and historically have involved cycles of relatively low runoff or high runoff that persist for five to ten years or more. From the farmer's perspective, long-term average conditions are not necessarily as important as short-term fluctuations in supply. Farmers have increasingly had to adjust in recent years to greater uncertainty in the availability and timing of water deliveries.

Under the No Action Alternative, water at the higher tier 2 and tier 3 prices will be available only in a certain percentage of years in which Reclamation is able to provide more than 80 percent of the contract allocation to contractors. In those years, the District may elect to purchase less than 100 percent of the contract amount. Any unpurchased water either would remain in storage, where it would be available to other water contractors, or for future beneficial use, or, in years when no storage capacity is

available, the unsold water may have to be released. Releases needed to maintain flood storage capacity do not necessarily result in wasted water; these surplus flows may be beneficial to the environment. However, some of the potential beneficial use of the water would be lost.

As discussed in Section 3.2.1, deliveries have averaged about 50 percent of the contract amount during the past 10 years. An average of 7,000 acres have been irrigated over the past ten years, with each acre receiving about 1.6 acre-feet. (This analysis is based on the average of the acreages reported by the District since 1989, rather than on the figure of 7,300 acres that CH2M Hill used for the economic analysis and that is referenced in other sections of the EA.) Therefore, if the District received an average of 2.50 acre-feet for each acre under irrigation, this would represent an increase over the amount of water per acre it has received during the past 10 years.

Assuming the current cropping pattern, where 2.50 acre-feet per acre is the maximum amount of water, on average, that can be beneficially used, then if the District continued to irrigate approximately 7,000 acres of land, as it has been doing for the past 20 years, the total amount of water that the District could purchase to irrigate this amount of land would be 17,500 acre-feet. This is equal to 87.5 percent of the total long-term contract amount. Sixteen thousand acre-feet of this water would be provided at the tier 1 price, and the remaining 1,500 acre-feet would be at the tier 2 price. The District could receive more than this amount of water if Reclamation agreed to sell supplemental water, if the District altered the cropping pattern in such a way that average beneficial use was greater than 2.50 acre-feet per acre, or if more acres were irrigated. Again assuming the current cropping pattern, the District could irrigate a total of 8,000 acres with its maximum allotment of 20,000 acre-feet, at an average rate of 2.50 acre-feet per acre. Because the District encompasses about 9,850 total acres, some of the acreage in the District can be expected to remain unirrigated even in years when the District receives 100 percent of its contract amount.

In recent years, the District reportedly has irrigated nearly 6,000 acres of permanent crops (orchards). Reclamation estimates that the net crop water requirement of deciduous orchard is 3.4 acre-feet per acre, so the total crop water requirement of 6,000 acres of orchards would be 20,400 acre-feet, which is roughly the total contract amount. Under the No Action Alternative, 2,000-acre feet of this water would be provided at the tier 2 price.

Because orchards are relatively high value crops, the farmers who own these lands can be expected to always opt to receive up to 20,000 acre-feet if it is available. The long-term profitability of these crops depends more on water availability than on its price. This would leave little or no water available for other lower-value crops. Land not used for high-value orchards probably would be most suitable for crops like wheat, which requires little irrigation, is grown during the winter, and receives much of its water needs from precipitation. In low-water years, all landowners would be required to reduce their water use, and permanent crops would be especially vulnerable. In wet years, when orchard owners request the maximum amount of water available, wheat growers may

not be able to afford the higher cost of water from tiered pricing and might order only tier 1 water.

Compared to current conditions, without tiered pricing, the higher price of tier 2 and tier 3 water might result in a reduction in the amount of water the District decides to purchase in those years in which more than 80 percent of the contract amount of water is made available to the District. The reduction in water purchases (compared to existing conditions) would occur in years when water is relatively plentiful (high runoff years) and when the marginal demand for water (the demand for a little more water than has already been provided) is lowest. Assuming that adequate water storage capacity exists in the CVP, the unused water might be stored for future use, reducing shortages in subsequent years.

Tier 2 and 3 water would be available in periods when water was more abundant. In dry periods, when Reclamation cannot supply more than 80 percent of the contract amount, only tier 1 water would be available. Thus, under tiered pricing, the economic incentive to reduce water consumption occurs when water is most plentiful. Reduced consumption during periods of plentiful water still could lead to long-term benefits if the water can be stored for future beneficial use or if the water is redistributed to other users. Tiered pricing tends to encourage distribution to the highest economic use.

Because the District would be required to pass along tiered pricing to its customers, some farmers affected by the price of water might elect to shift to higher value crops, while others might elect to irrigate less land, using only lower-cost water. Farmers also might find ways of spreading the costs of water over a number of years, thereby reducing the effects of annual variability in price. Preliminary modeling results using the CVPM model suggest that the cropping pattern in the District is not very likely to change in response to increases in pricing because of the high percentage of orchards.

Groundwater

In the past, groundwater has been used to supplement surface water supplies only in critical water years. Shortages in water supply in either the CVP or the SWP could result in limitations on surface water use by the District. Tiered pricing under the No Action Alternative may serve to increase the amount of water in storage in the CVP system, thereby reducing the magnitude and frequency of water shortages in the CVP; however, these benefits are likely to be small and are expected to occur mainly in the shortage year immediately after a sequence of wet years. Minimum Feather River flow requirements also may limit the amount of water that the District can divert in some years, although cooperation between the CVP and SWP is likely to reduce the probability that these conditions would occur independently. Under the No Action Alternative, regional groundwater levels would continue to decline throughout the study period (US Department of the Interior, Bureau of Reclamation 1999a). However, small increases in the depth to groundwater within the District are not likely to change the frequency at which the District opts to pump groundwater.

Alternative 1

Surface Water

The water pricing structure would be essentially the same under Alternative 1 as under the No Action Alternative. Therefore, water use would be the same as under the No Action Alternative.

Groundwater

Since surface water use would be the same as under the No Action Alternative, there would be no change in groundwater use, and groundwater impacts would also be the same as under the No Action Alternative.

Alternative 2

Surface Water

As under the No Action Alternative, 100 percent of the contract amount would not be available to the District in all years. However, if (because of the pricing scheme or other factors) some districts opted to purchase less than the amount of water available to them, this water could be available for redistribution to other districts that can better afford to purchase it. The ability to pay would depend on a number of factors that cannot be accurately predicted.

For Alternative 2, the lowest price (tier 1) would apply to an amount equal to 80 percent of the five-year rolling average of deliveries to the District. The rolling average is the average, recalculated each year, of the water used during the preceding five-years. Because the quantity delivered is a function of water supply availability as well as the District's water order, this pricing structure can be expected to have the overall effect of increasing the cost of water relative to the No Action Alternative. This is because reduced deliveries caused by dry hydrologic conditions will reduce the amount of water to which the tier 1 pricing applies in the five subsequent years. Similarly, the tier 3 price will increase if total deliveries are reduced because many of the costs that contribute to the full cost of the water are fixed and independent of the amount of water delivered. Water transfers are extremely rare in the District, so the possibility of transfers has not been factored into this analysis.

The tiered pricing schedule under Alternative 2 would be the same as that under the No Action Alternative only when the District received 100 percent of its contract amount in each of the preceding five years. If it received less than the full contract amount, then the cost of the water under Alternative 2 would be higher than under the No Action Alternative.

Because the tier 1 price would apply to the amount of water calculated from the five-year rolling average of deliveries, the amount of tier 1 water available would not necessarily reflect the available water supply. The District might adopt a variety of strategies in response to the water price structure.

In one strategy, the District might elect to purchase up to some maximum quantity of water each year without regard to cost. If it decided to purchase up to 20,000 acre-feet,

it would in effect be purchasing 100 percent of the water offered by Reclamation each year. In this case, the District would ensure that it received the maximum amount of tier 1 water. In practice, this strategy is likely to be followed by the District, because of its relatively large investment in permanent crops, whose long-term productivity and profitability is probably more dependent on the quantity of water than on the cost of water.

At the other end of the spectrum of strategies the amount of water purchased by the District could be so dependent on its cost that the District would elect to purchase only tier 1 water, and no tier 2 or tier 3 water. Under the tiered pricing scheme of Alternative 2, this scenario is not viable because it would result in a continuously decreasing quantity of tier 1 water being available.

Alternative 2 probably would have less chance of reducing agricultural water consumption in wet years than the No Action Alternative. The higher cost of the water probably would tend to cause farmers to shift to higher value crops and to encourage investment in water conservation as a strategy to reduce dependence on water supplies. However, this shift to higher value crops, such as those grown in orchards, could result in less flexibility in operations because fallowing would have a greater negative impact on a farmer's income.

Results of modeling with the CVPM model indicate that there would be negligible change in the cropping pattern and little change in water use in the District due to Alternative 2.

Groundwater

If, as expected, the District opts to purchase all of the project water available to it in each year, then there also should be no change in groundwater use under Alternative 2, compared to the No Action Alternative.

3.3.3 Cumulative Impacts

Since implementation of either Alternative 1 or 2 would result in only minor changes in water use compared to the No Action alternative, no cumulative impacts on water resources are expected.

3.4 LAND USE RESOURCES

3.4.1 Affected Environment

Agricultural Land Use

Introduction

The affected environment discussion for agricultural resources includes farmland classifications and agricultural land use. Although the potential impact on agricultural land use would be limited to the District, this discussion also addresses all of Sutter County because the economic effects resulting from impacts on agriculture would extend throughout the county.

Farmland Classifications

The Natural Resources Conservation Service (NRCS) is responsible for maintaining an inventory of the nation's farmlands. In order to map these lands, the NRCS designates four basic types of important farmland: prime farmland, farmland of statewide importance, unique farmland, and farmland of local importance. Prime farmland and farmland of statewide importance may be used for crops, pasture, range, forestry, or other uses but may not be used for urban or water uses. The California Department of Conservation Farmland Mapping and Monitoring Program maps California's important farmlands biennially.

Prime farmland is land best suited for producing food, feed, forage, fiber, and oilseed crops and also is available for these uses. Prime farmland has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops when treated and managed (including managed for water) according to current farming methods.

Farmland of statewide importance is land other than prime farmland that has a good combination of physical and chemical characteristics for producing crops. These lands differ from prime farmland in that they may have minor shortcomings, such as greater slope or less ability to store soil moisture.

Unique farmland does not meet the criteria for prime farmland or farmland of statewide importance but is used for producing specific high-value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to produce sustained high quality or high yields of a specific crop when treated and managed according to modern farming methods. Examples of such crops are citrus, olives, avocados, rice, grapes, and cut flowers.

Farmland of local importance is land other than prime, statewide, or unique that is producing crops or that has the capability of production and may be important to the local economy. These lands are identified by a local committee made up of concerned agencies that review the lands under this category at least every five years.

The Farmland Protection Act (P. L. 97-98) of 1981 requires all federal agencies to consider the effect of programs on farmland. Federal agencies are required to develop criteria to evaluate the effect of federal programs on the conversion of agricultural lands to nonagricultural uses. Federal agencies must, to the extent practicable, consider alternatives or mitigation that lessen the impact on farmland conversion.

The California Land Conservation Act of 1965 (Williamson Act) established a voluntary tax incentive program for preserving agricultural and open space land. To be eligible for the Williamson Act program, land must be within a county-designated agricultural preserve. Lands under Williamson Act contracts are restricted to agricultural use, and the property owner is taxed according to the income that the land is capable of generating in agriculture. Williamson Act contracts extend for 10 years and are renewed automatically, unless a notice of nonrenewal is issued or an application for cancellation

of the contract is approved. Cancellation of the contract requires that the purpose be consistent with the Williamson Act or that it be in the public interest.

Sutter County Agricultural Land Use

In 1998, there were approximately 356,000 acres of agricultural land in Sutter County, slightly decreased from approximately 358,700 acres in 1992. In 1998, there were approximately 170,200 acres of prime farmland, 113,700 acres of farmland of statewide importance, 22,200 acres of unique farmland, and 49,900 acres of grazing land. The total amount of irrigated farmland (defined as prime farmland, farmland of statewide importance, and unique farmland) also decreased during this period, from approximately 308,500 acres to 306,100 acres (California Department of Conservation 2000b).

According to the California Department of Conservation, approximately 720 acres of farmland in Sutter County were taken out of cultivation between 1996 and 1998. Of that, 54 acres (7.5 percent) were converted to urban use. Land taken out of cultivation but not urbanized can be farmed in the future (California Department of Conservation 2000b).

Sutter County leads California counties in the production of prunes and ranks among the states' leaders in the production of rice, honeydew melons, safflower, and English walnuts. Farmland in Sutter County is expected to face continuing development pressure. The California Department of Finance projects that Sutter County's population will grow from 84,200 in July 2000 to 161,600 in July 2020. The Farmland Mapping and Monitoring Program survey found that land conversion in Sutter County was occurring in the following areas: new houses on the fringes of Meridian and Sutter, new retail establishments in Yuba City, and farmland to grazing land, including 500 acres along the Feather River in the Nicolaus area, 320 acres in the Olivehurst area, and 80 acres in the Sutter Buttes area (California Department of Conservation 2000a).

Sutter County Land Use Designations

The County of Sutter Land Use Diagrams function as the official county policy in the allocation and distribution of different land uses in the unincorporated areas. According to the Land Use Diagrams for the County-wide General Plan, land within the Feather Water District is designated as Agriculture (AG)-20 (20-acre minimum) or AG-80 (80-acre minimum). The AG-20 and AG-80 land use designations are based on soil types and characteristics. The AG-20 and AG-80 designations identify land for producing food and fiber, including areas of prime agricultural soils. Lands designated AG-20 typically have soils with characteristics that are particularly suited for orchard crops, whereas lands designated AG-80 typically have soils with characteristics that are particularly suited for field crops, row crops, and range land. Typical land uses allowed in both AG-20 and AG-80 districts include crop production, orchards, grazing, pasture and rangeland, resource extraction activities, facilities that directly support agricultural operations, such as agricultural products processing, and necessary public utility and safety facilities (Sutter County 1996b). One principal dwelling unit is allowed per lot on both AG-20 and AG-80 designated lands.

Feather Water District

The Feather Water District encompasses approximately 7,300 acres of irrigated land and serves 301 parcels with irrigation water. In 1999, 100 percent of this acreage was irrigated (Reclamation 1999). All lands served by the Feather Water District are designated as either prime farmland or farmland of statewide importance.

In 1999, the major agriculture crops in the District were prunes (3,684 acres, approximately 50 percent of total irrigated acreage), followed by walnuts (979 acres) and peaches (967 acres). Table 3-13 shows changes in the amount of irrigated crops in the District from 1998 to 1999.

Table 3-13
Feather Water District Irrigated Crops
1996, 1998, 1999

Crop Type	1998 (acres)	1999 (acres)	Net Acres Gained(+)/ Lost (-) 1996-1999
Apples	299.0	219.0	(-70)
Cherries	37.0	37.0	0.0
Dews	316.0	316.0	0.0
Melons	115.0	271.0	+156
Nursery	350.0	350.0	0.0
Peaches	887.0	967.0	+80
Pasture	31.0	31.0	0.0
Persimmons	9.0	9.0	0.0
Plums	18.0	18.0	0.0
Prunes	3,724.0	3,684.0	(-40)
Pumpkins	0.0	0.0	0.0
Rice	90.0	90.0	0.0
Row Crops	0.0	0.0	0.0
Safflower	160.0	160.0	0.0
Tomatoes	156.0	0.0	(-156)
Walnuts	979.0	979.0	0.0
Wheat	160.0	240.0	+80
TOTAL	**7,331.0**	**7,371.0**	**+40**

Source: Feather Water District 1999.

Municipal and Industrial Land Use

The Feather Water District is approximately 27 miles northwest of the city of Sacramento and eight miles south of Yuba City. There are no municipal or industrial land uses within the District.

3.4.2 Environmental Consequences

Impacts on land use depend primarily on changes that may affect agricultural productivity and on conflicts with applicable land use plans of the community where they are located.

No Action Alternative

Under the No Action Alternative, no substantial change in irrigated acreage would be expected in the District. (see Section 3.2, Agricultural Economics). Therefore, there would be no anticipated changes to agricultural land use under the No Action Alternative.

Alternative 1

Alternative 1 is assumed to have similar effects to land use resources as the No Action Alternative. Therefore, there are no environmental impacts of this alternative.

Alternative 2

Implementing Alternative 2 would not have a direct effect on land uses in the Feather Water District service area. Renewing long-term water contracts under Alternative 2 would not involve constructing new facilities that would alter current land uses nor would it involve installing structures that would conflict with existing land use plans.

Under Alternative 2, changes in irrigated acreage would be small, ranging from an increase of 20 acres to a reduction of 190 acres in a series of dry years (see Section 3.2, Agricultural Economics). The largest reduction in acreage for a single crop type (up to 130 acres) would be for rice. However, the overall effect of this alternative on the amount of irrigated acreage would be small, less than two percent, under all water year scenarios. General cultivated and fallowed acreage patterns would be similar to historical patterns, and agricultural land use under Alternative 2 would be similar to conditions described in Section 3.4.1, Affected Environment.

Renewing the long-term water contracts under Alternative 2 would contribute to the continued production of agricultural crops from lands within the Feather Water District service area. Therefore, implementing Alternative 2 would not result in large adverse land use effects.

3.4.3 Cumulative Impacts

Implementation of Alternatives 1 and 2 would not contribute to cumulative impacts on land use.

3.5 BIOLOGICAL RESOURCES

3.5.1 Affected Environment

This section describes biological resources within the Feather Water District and within approximately one-half mile of the District boundary. Vegetation, wildlife, sensitive habitats, and special status species within or in the vicinity of the District are described. Biological resources in the Feather Water District include those that are limited or restricted in movement (plants, reptiles, small mammals) and those that are more mobile and can range onto and off the property from surrounding habitat areas, such as fish, birds, and large mammals.

Biological resource data were collected from various sources, including the Sutter County General Plan (County of Sutter 1996) and the *Draft Programmatic Biological Opinion for Operation of the CVP and Implementation of the CVPIA* (Reclamation 2000). The US Fish and Wildlife Service (Service) provided current information on sensitive species and habitat on and near the property (see Attachment E for copies of agency letters). The California Department of Fish and Game (CDFG) Natural Diversity Database also was searched (CDFG 2000).

Typical and historical habitat in the region of the Feather Water District includes freshwater wetland, riverine, riparian, and floodplain areas, salt marsh, interior grassland, and oak woodland. Land within the District is currently or has been historically in agricultural production (Figure 3-2). Several areas adjacent to the District are not agricultural. The Gilsizer Slough, which, like other major landscape features, is not managed by the District, passes through the northwestern section of the District. Within the District, the slough offers very limited habitat; however, as the slough approaches the levee for the Sutter bypass west of the District, it broadens into wetland habitat. A riparian corridor also parallels the Feather River, on the eastern edge of the District, between the Feather River and the levee.

The District maintains ditches within its jurisdiction by using procedures consistent with wildlife values. Ditches are cleared mostly by hand, and backhoes are used only to clear major obstructions.

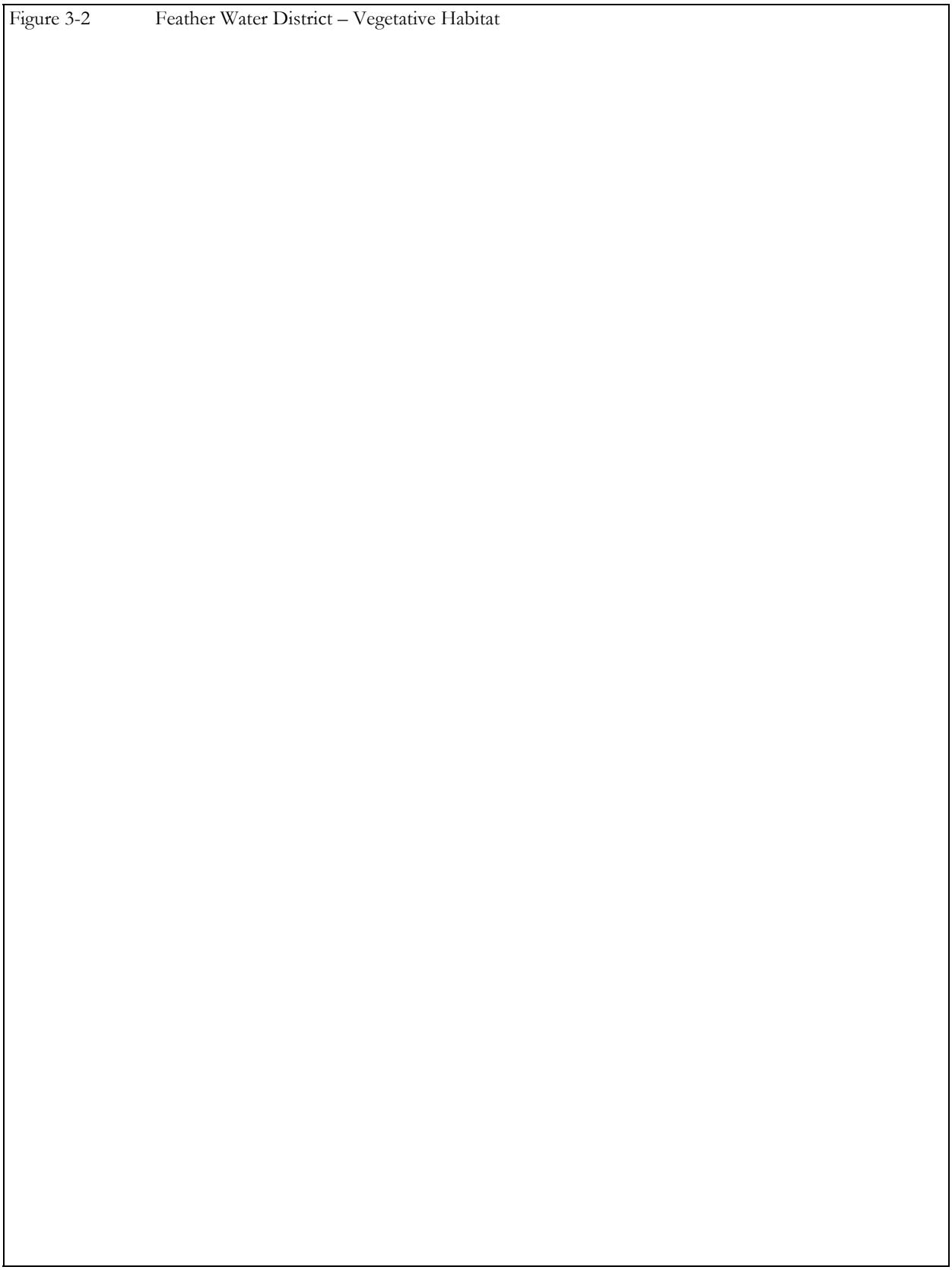
Vegetation

Nonnative species predominate in the Feather Water District. Most of the habitat in the Feather Water District is agricultural or disturbed vegetation, consisting predominantly of permanent crops (orchards). Agricultural fields attract and support various birds and small animals but in general are characterized by having marginal value to biological resources. Over the last five years, approximately 90 acres of rice have been planted within the District. Rice and other heavily irrigated agricultural products may provide habitat for waterfowl.

Other disturbed areas within the District include buildings, paved locations, landscaping, and mowed or otherwise disturbed grassland. Grasses, shrubs, trees, and flowers typically used for landscaping do not provide high quality forage or habitat for wildlife species. The vegetation in disturbed areas generally tends to be weedy or nonnative grasses and forbs with low plant diversity and are often mowed.

The Gilsizer Slough west of the District and the riparian corridor along the Feather River east of the District are of good habitat quality. Gilsizer Slough is a freshwater wetland or marsh habitat characterized by a specialized community of aquatic-dependent plant species, such as the common tule *(Scirpus acutus),* cattail *(Typha latifolia),* sedges *(Carex* spp.*),* spike-rush *(Eleocharis* spp.*),* and rushes *(Juncus* spp.*).* Wetlands usually are defined by the types of plants and soils and inundation duration. Wetland types in this category include deep and shallow freshwater marshes, wet meadows, seasonal

Figure 3-2 Feather Water District – Vegetative Habitat



wetlands, saturated freshwater flats, and vegetated shallows. However, the Gilsizer Drainage District keeps the portions of the slough within the District free of any vegetation and maintains the slough for stormwater discharge from Yuba City.

The area along the Feather River, most of which is owned and administered by CDFG, consists of riparian or riverine vegetation that typically offers greater plant diversity than surrounding habitats. Typical species in shaded riverine aquatic habitat include cottonwoods *(Populus deltoides),* alders *(Alnus* spp.*),* willow *(Salix* spp.*),* common reed *(Phragmites communis),* giant reed *(Arundo donnax),* cattails *(Typhus* spp.*),* and grasses *(Dactylis* spp.*).* Riparian forests are dominated by cottonwood *(Populus fremontii)* and willow near the rivers, with sycamore *(Platanus racemosa),* box elder *(Acer negundo),* and valley oak *(Quercus lobata)* dominating the less frequently flooded higher terraces. Floodplain habitats above the riparian zone typically do not support wetland vegetation but are hydrologically linked to rivers and riparian forests by periodic flooding and can be considered with them as an ecological unit. However, all such habitat in the District is restricted to those small portions that lie between the levee and the Feather River.

Sensitive Habitats

The Service and NOAA-Fisheries have identified certain quadrangle maps (quads) within and adjacent to the Feather Water District as proposed critical habitat for Central Valley winter-run Chinook salmon (*Oncorhynchus tshawytscha*). These are the Nicolaus, Sutter Causeway, Gilsizer Slough, and Olivehurst quads (NOAA-Fisheries 2000). Only the Gilsizer Slough quadrangle is within District boundaries.

Wildlife

Wildlife within the District typically would be species that have adapted to the human-influenced landscape, such as the cottontail *(Sylvilagus bachmani),* black-tailed hare *(Lepus californicus),* house mouse *(Mus musculus),* deer mouse *(Peromyscus maniculatus),* pocket gopher *(Thomomys bottae),* and squirrel species *(Citellus* spp.*).* Skunk *(Mephitis mephitis)* and fox *(Vulpes macrotis)* prey on the smaller mammal species. Bird species include the barn owl *(Tyto alba),* swallow *(Hirundo* spp.*),* northern mockingbird *(Mimus polyglottos),* European starling *(Sturnus vulgaris),* American crow *(Corvus brachyrhynchos),* western meadowlark *(Sturnella neglecta),* belted kingfisher *(Ceryle alcyon),* and western bluebird *(Sialia mexicana)* and raptors, such as American kestrel *(Falco sparverius)* and northern harrier *(Circus cyaneus).* The Feather River east of the District and the Sutter Bypass to the west provide habitat for open water species, including a variety of waterfowl.

Special Status Species

Special status species include those listed or proposed for listing by the Service or CDFG as endangered, threatened, or rare, as candidate species for listing, or as species of concern. Wildlife resources listed by the Service as potentially occurring in the vicinity of the Feather Water District include invertebrates, fish, reptiles, amphibians, birds, and mammals (including bats) that can occur in the Gilsizer Slough quadrangle. Few of the species listed by the Service would be expected to occur within the District because agricultural and developed areas provide little habitat value for most of these species. Plants listed or proposed to be listed by the California Native Plant Society (CNPS) as

rare or endangered also are included. Special status species are provided varying levels of legal protection under federal and state endangered species acts. The Service lists forty-two special status species as potentially occurring in Sutter County (Table 3-14). Few of the species listed are likely to occur at the Feather Water District because of the lack of suitable habitat (Figure 3-3). Certain species that may occur are discussed below.

Invertebrates

The valley elderberry longhorn beetle (VELB) *(Desmocerus californicus dimorphus)* is federal threatened species and is found in grasslands, woodlands, and upland areas near rivers in California's Central Valley. The VELB relies on elderberry shrubs *(Sambucus* ssp.*)* to reproduce. For one to two years of its life, the VELB exists as a tunneling larva within the stems, trunks, and leaves of the elderberry shrub. Adults emerge during spring, when they mate and lay eggs within the elderberry bark. Throughout its life cycle, the VELB feeds on different parts of the elderberry shrub (Thelander et al. 1994). The California Natural Diversity Database (CNDDB) has identified the VELB as occurring in the Nicolaus and Olivehurst quads, adjacent to but not in the District service area (CDFG 2004).

The vernal pool tadpole shrimp *(Lepidurus packardi)* is a federal endangered species that is found in grass-bottomed swales of unplowed grasslands in mud-bottomed and highly turbid pools. The vernal pool tadpole shrimp can also be found in aquatic areas, riparian forest, and riparian woodlands. It is known to inhabit pools varying in size from five square meters up to 36 hectares (Goals Project 2000).

This species is a secondary consumer that feeds on detritus, dead organic matter, and other invertebrates (Pennank 1989; Fryer 1987). Vernal pool tadpole eggs that have been deposited in the mud lay dormant throughout the dry season until the onset of the rainy season. The eggs hatch within a three-week period once the rain reestablishes vernal pools (Goals 2000).

The habitat of the listed vernal pool crustaceans is highly fragmented, resulting in small isolated populations. Ecological theory predicts that such populations will be highly susceptible to extinction due to chance events, inbreeding depression, or additional environmental disturbance. Should extinction occur in a population that has been fragmented, the opportunities for recolonization are thought to be greatly reduced due to geographical isolation from other populations. Suitable vernal pools are found in the action area but are confined to undeveloped areas. The CNDDB has identified the tadpole shrimp as occurring in the Nicolaus quad, adjacent to but outside the District boundaries. The California linderiella *(Linderiella occidentalis)* occurs in the Nicolaus quad and Gilsizer Slough.

Fish

Only three runs, or evolutionarily significant units (ESUs), of the Chinook salmon; one steelhead ESU; and the Sacramento splittail occurred historically in the project area. The splittail has been delisted, but the salmon species and the Delta smelt, whose habitat lies downstream of the project area, are described in detail below.

Table 3-14
Special Status Species Listed by the Service as Potentially Occurring in the Gilsizer Slough Quad

Scientific Name	Common Name	Federal/State/ CNPS Status	Occurrence at the Feather Water District
Threatened and Endangered Species			
Invertebrates			
Lepidurus packardi	Vernal pool tadpole shrimp	E/-/-	U
Branchinecta lynchi	Vernal pool fairy shrimp	T/-/-	U
Desmocerus californicus dimorphus	Valley elderberry longhorn beetle	T/-/-	U
Branchinecta conservatio	Conservancy fairy shrimp	E/-/-	U
Fish			
Oncorhynchus tshawytscha	Winter-run Chinook salmon	E/E/-	U
Hypomesus transpacificus	Delta smelt	T/T/-	U
Oncorhynchus mykiss	Central Valley steelhead	T/-/-	U
Amphibians			
Rana aurora draytonii	California red-legged frog	T/CSC/-	U
Reptiles			
Thamnophis gigas	Giant garter snake	T/T/-	U
Birds			
Branta canadensis leucopareia	Aleutian Canada goose	DL/-/-	U
Haliaeetus leucocephalus	Bald eagle	T/T/-	U
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	C/E/-	P
Falco peregrinus anatum	American peregrine falcon	DL/	U
Grus canadensis tabida	Greater sandhill crane	-/CA/-	U
Buteo swainsoni	Swainson's hawk	-/T/-	P
Plants			
Pseudobahia bahiifolia	Hartwegs golden sunburst	E/E/1B	U
Proposed Species			
Amphibians			
Ambystoma californiense	California tiger salamander	PT/-/-	U
Candidate Species			
Fish			
Oncorhynchus tshawytscha	Central Valley fall/late fall-run chinook salmon	C/-/-	U
Acipenser medirostris	Green sturgeon	C/	U
Birds			
Coccyzus americanus occidentalis	Western yellow-billed cuckoo	C/E/S1	P
Species of Concern			
Invertebrates			
Anthicus antiochensis	Antioch Dunes anthicid beetle	SC/-/-	U
Anthicus sacramento	Sacramento anthicid beetle	SC/-/-	U
Cicindela hirticollis abrupta	Sacramento Valley tiger beetle	SC/-/-	U
Linderiella occidentalis	California linderiella fairy shrimp	SC/-/-	P

Table 3-14
Special Status Species Listed by the Service as Potentially Occurring in the Gilsizer Slough Quad*(continued)*

Scientific Name	Common Name	Federal/State/ CNPS Status	Occurrence at the Feather Water District
Fish			
Lampetra ayresi	River lamprey	SC/-/-	U
Lampetra tridentata	Pacific lamprey	SC/-/-	U
Spirinchus thaleichthys	Long fin smelt	SC/CSC/-	U
Pogonichthys macrolepidotus	Sacramento splittail	SC/-/-	U
Amphibians			
Scaphiopus hammondii	Western spadefoot toad	SC/CSC/-	U
Rana boylii	Foothill yellow-legged frog	SC/-/-	U
Reptiles			
Clemmys marmorata marmorata	Northwestern pond turtle	SC/CSC/	P
Masticophis flagellum ruddocki	San Joaquin coachwhip	SC/-/-	U
Birds			
Agelaius tricolor	Tri-colored blackbird	SC/CSC/-	U
Athene cunicularia hypugea	Western burrowing owl	SC/CSC/-	U
Botaurus lentiginosus	American bittern	SC/-/-	U
Buteo regalis	Ferruginous hawk	SC/CSC/-	U
Carduelis lawrencei	Lawrence's goldfinch	SC/-/-	U
Charadrius montanus	Mountain plover	SC/-/-	U
Cypseloides niger	Black swift	SC/-/-	U
Elanus leucurus	White-tailed kite	SC/-/-	U
Empidonax traillii brewsteri	Little willow flycatcher	SC/E/-	U
Lanius ludovicianus	Loggerhead shrike	SC/-/-	U
Melanerpes lewis	Lewis's woodpecker	SC/-/-	U
Numenius americanus	Long-billed curlew	SC/-/-	U
Plegadis chihi	White-faced ibis	SC/CSC/-	U
Riparia riparia	Bank swallow	SC/T/-	P
Selasphorus rufus	Rufous hummingbird	SC/-/-	U
Toxostoma redivivum	California thrasher	SC/-/-	U
Mammals			
Myotis yumanensis	Yuma myotis bat	SC/CSC/-	U
Plecotus townsendii townsendii	Pacific (Townsend's) western big-eared bat	SC/CSC/-	U
Corynorhinus (=Plecotus) townsendii pallescens	Pale Townsends big-eared bat	SC/CSC/-	U
Myotis ciliolabrum	Small-footed myotis bat	SC/-/-	U
M. thysanodes	Fringed myotis bat	SC/-/-	U
M. volans	Long-legged myotis bat	SC/-/-	U
M. evotus	Long-eared myotis bat	SC/-/-	U
Perognathus inornatus inornatus	San Joaquin pocket mouse	SC/**/-	U
Eumops perotis californicus	Greater western mastiff-bat	SC/SC/-	U
Dipodomys californicus eximius	Marysville Heermann's kangaroo rat	SC/SC/-	U

Table 3-14
Special Status Species Listed by the Service as Potentially Occurring in the Gilsizer Slough Quad*(continued)*

Scientific Name	Common Name	Federal/State/ CNPS Status	Occurrence at the Feather Water District
Plants			
Astragalus tener var. *ferrisiae*	Ferris's milk-vetch	SC/-/-	U
Layia septentrionalis	Colusa layia	SC/-/-	U
Monardella douglasii ssp. *venosa*	Veiny monardella	SC*/-/1B	U
Hibiscus lasiocarpus	Rose-mallow	-/-/2	P
Critical Habitat			
Oncorhynchus tshawytscha	Central Valley winter-run Chinook salmon	PX	U

Source: US Fish and Wildlife Service 2000; CNDDB (Rarefind 2; September 2000)

Notes:

Federal Status
E = Endangered
T = Threatened
PE = Proposed endangered
PT = Proposed threatened
PX = Proposed critical habitat
C = Candidate
SC = Species of concern
DL = Recently delisted
FPD = Federally proposed for delisting
* = Possibly extirpated from this quad

Occurrence
C = Confirmed
P = Possible
U = Unlikely

State Status
E = Endangered
T = Threatened
CSC = California species of special concern
R = Rare
CE= Candidate for listing as endangered
** = Restricted in distribution; declining

(CNPS) Status
1B = Rare, threatened, and endangered in California and elsewhere
2 = Rare, threatened, and endangered in California but more common elsewhere

Figure 3-3 Known Occurrence of Special Status Species in the Project Area

Salmonids (Chinook salmon, winter-run [E], spring-run [T], fall-run [PT], Central Valley fall/late fall-run [C])

There are three Central Valley Chinook salmon *(Oncorhynchus tshawytscha)* ESUs (fall/late-fall, winter, and spring) that are grouped based on the timing of their spawning migrations (Goals Project 2000). Spring-run Chinook salmon are not listed for Sutter County, although critical habitat is designated in the area.

The fall/late fall-run Chinook is a federal designated candidate species, spring-run Chinook is a federal and California-listed threatened species (not listed in Sutter County), and winter-run Chinook is a federal and California-listed endangered species.

There is no record of winter-run Chinook in the Feather River, but it is possible that occasional adult strays or nonnative may occur near the District's intakes, even though they are 12.5 miles and 17 miles upstream of the confluence of the Feather and Sacramento Rivers. Adults, as strong swimmers, should not be affected by the intakes, and the warm water to be expected in the diversion embayments is likely to deter nonnatal winter-run juveniles from foraging in the diversion embayments, should they occur in their vicinity.

Historically, the adult spring-run salmon immigration into the upper rivers and tributaries extended from mid-March through the end of July, with the peak in late May and early June (CDFG 1998). Spawning started in mid-August, peaked in early September, and ceased in late September. Spring-run salmon are expected to avoid entrainment, based on their swimming ability, the relatively low draw of the pumps, the presence of vulnerable juveniles in the stream during periods of little or no pumping activity, and the warm temperatures of the embayments acting to deter foraging in and around the diversion pumps.

The CNDDB shows no occurrences of winter-run, spring-run, or fall/late fall run Chinook salmon in the District or adjacent to the District, although Sutter County contains critical habitat for the winter-run Chinook salmon.

Central Valley Steelhead

The Central Valley steelhead *(Oncorhynchus mykiss),* a federal listed threatened species, historically spawned in perennial and seasonal tributaries throughout the Central Valley. The introduction of other races of steelhead has resulted in a population that can be found in the Central Valley in any month. This species is thought to occur in the Feather River (NOAA-Fisheries 2000).

Both adults and yearlings can reasonably be expected to migrate past the District's pumps. Both adults and yearlings are strong swimmers and would be unaffected by the weak flows toward the pumps, though the steelhead's greater temperature tolerance means there is the potential for individuals to approach the diversion embayments and pumps to forage. Most of the outmigration occurs from November to May, when diversions are minimal, if they occur at all; hence, steelhead would not be adversely

affected. The CNDDB shows no occurrences of the steelhead in the District or adjacent to the District.

Delta Smelt

Delta smelt *(Hypomesus transpacificus)* is a federal listed threatened species. The delta smelt is adapted to living in fresh and brackish water. It occupies estuarine areas with salinities below two grams per liter, rarely occurring in estuarine waters with more than 10 to 12 ppt salinity, which is about one-third the salinity of seawater (Ganssle 1966, in Moyle 1976).

Water releases from Shasta Reservoir are made, as necessary, to ensure adequate flows in the Delta. Delta water requirements and upper river temperature requirements during most of the non-flood season determine the volume of the releases. The only times these requirements do not drive the volume of the Shasta Reservoir releases are those brief periods when the Delta requirements are met without special releases. The CNDDB shows no occurrences in the District or adjacent to the District.

Amphibians

The California red-legged frog *(Rana aurora draytonii)* is federally threatened and a California species of concern. It has been virtually extirpated from the floor of the Central Valley, despite its historic presence in numbers large enough for commercial harvest. It currently remains a concern only in the foothills of the Coast Range and in isolated drainages in the Sierra Nevada.

Reptiles

The northwestern pond turtle *(Clemmys marmorata marmorata)* is a federal and state species of special concern. This species inhabits freshwater ponds or streams and may occur in the freshwater marsh and shaded riverine aquatic habitat adjacent to the District. The CNDDB has listed the turtle has occurring in the Nicolaus and Gilsizer Slough quads, which are outside the service area boundaries.

The giant garter snake *(Thamnophis gigas)* is a federal and state-listed threatened species. It occurs in scattered populations from Butte County south to the northern San Joaquin Valley. This species inhabits freshwater ponds or streams and occurs to the west of the District in the freshwater marsh and shaded riverine aquatic habitat of lower Gilsizer Slough, the Sutter Bypass, and adjacent rice fields. The CNDDB has identified the giant garter snake as occurring in the Sutter Causeway quad, west of the Sutter bypass, and in the Nicolaus quad, east of Hwy 70, which are outside the service area boundaries.

Birds

The American peregrine falcon *(Falco peregrinus anatum)* was delisted in 1999, and the bald eagle *(Haliaeetus leucocephalus)* has been proposed for delisting from federal threatened status. The Aleutian Canada goose *(Branta canadensis leucopareia)* was delisted as a federal threatened species. While these species could be found in this region of California, as they are sometimes associated with freshwater wetlands, they are not considered likely residents within or adjacent to the Feather Water District. The bald eagle may be an

occasional visitor, but habitat conditions within the District are not suitable for permanent residence. The District is not within the bald eagle's current nesting range, and only marginal feeding habitat occurs in the area for this species. The Swainson's hawk *(Buteo Swainsoni)* is a state-listed threatened species and, according to the CNDDB, has occurred in the Nicolaus, Gilsizer Slough, and Sutter Causeway quads. The tricolored blackbird *(Agelaius tricolor),* a federal and California species of concern, and the little willow flycatcher *(Empidonax traillii brewsteri),* a federal species of concern and a California endangered species, may occur as occasional visitors from area marshlands. The CNDDB lists the tricolored blackbird as occurring in the Sutter Causeway quad, on the east side of the Sutter bypass on the Gilsizer Slough, nine miles south-southwest of Yuba City. There is no occurrence information in the CNDDB for the willow flycatcher. The ferruginous hawk *(Buteo regalis),* a state species of concern, may occur on the property as a nonresident migrant. The western yellow-billed cuckoo, a federal candidate species and state endangered species, has been identified as occurring in the Nicolaus quad.

The greater sandhill crane *(Grus Canadensis tabida)* is state-listed as threatened. It breeds in wetlands and feeds in various habitat types, such as meadows, irrigated pastures, grain fields, bogs, fens, marshes, and nearby fields. For safety, cranes like to flock (roost) at night in an open expanse of shallow water. The sandhill crane used the Sacramento Valley heavily, mainly just south of Sacramento, but it can be found throughout the valley. It is possible that this species makes occasional use of areas within or around the Feather Water District, depending on the amount of standing water available in the fields.

Mammals

Although the range of the San Joaquin pocket mouse *(Perognathus inornatus inornatus),* a federal species of concern, includes the Feather Water District, it is generally found in habitats containing drier and poorer soils, where it can burrow. The soils found in the District are generally not suitable for the pocket mouse. The CNDDB identifies occurrences in the Meridian quad, which is outside the District service area.

Plants

Of the three plant species designated by the Service as possibly occurring in the area, only rose-mallow *(Hibiscus lasiocarpus),* which is a CNPS species 2, may be found in the Gilsizer Slough and Sutter Causeway quads. It occurs in the freshwater wetlands and therefore may occur in the wetter areas adjacent to the Feather Water District, but appropriate habitat is absent in the District.

3.5.2 Environmental Consequences

Regulatory Framework

Various federal, state, and local agencies have jurisdiction over biological resources in California. These include the Service and US Army Corps of Engineers (USACE), the CDFG, as well as the California regional water quality control boards and the US EPA, which have some authority over waters of the state and wetlands.

Federal

The Service enforces provisions of the federal Endangered Species Act and regulates permits for taking threatened and endangered species through Section 7 for federal actions and Section 10 for private actions. The Service commonly provides species information for environmental surveys and comments on environmental documents. NOAA-Fisheries enforces the Endangered Species Act for marine life and establishes essential fish habitat for anadromous fish, such as coho salmon.

The USACE is authorized by the Clean Water Act to regulate the placement or removal of fill in waters of the US, including wetlands, by issuing individual permits or through a series of general Nationwide Permits. The US EPA may veto USACE permits, although it rarely does so. In California, portions of the Clean Water Act, specifically Section 401, are regulated by regional water quality control boards, which issue clean water certifications for activities that fill waters of the state, including wetlands.

State

The CDFG enforces the California Endangered Species Act and other provisions of the California Fish and Game Code protecting various plant, fish, and wildlife species. The CDFG also regulates activities that affect the bed and bank of creeks, streams, rivers, lakes, and other waterbodies by issuing streambed alteration agreements to project applicants.

No Action Alternative

Special Status Plant or Animal Species. No adverse impacts on sensitive plant or animal species (Table 3-14) are expected to occur under the No Action Alternative. These species are habituated to a range of water flow conditions that occur within their habitats. Existing habitat would be subject to the historical range of variation and would remain unchanged. Land use patterns under the No Action Alternative are expected to be similar to historical patterns. Minimal changes to acreage are expected. Biological resource use of the area under the No Action Alternative would be similar to conditions described in Section 3.5, Affected Environment.

Because the intake pumps are unscreened, there is the potential indirect effect of entraining Central Valley steelhead. Most of the outmigration occurs from November to May, when diversions are minimal, if they occur at all; hence steelhead should not be adversely affected.

Winter-run Chinook salmonid adults, as strong swimmers, should not be affected by the intakes, and the warm water to be expected in the diversion embayments is likely to deter nonnatal winter-run juveniles from foraging in the diversion embayments, should any occur in their vicinity. Because the intake pumps are unscreened, there is a potential indirect effect of entraining juvenile winter-run salmonids when water is being diverted.

Historically, the adult spring-run salmon immigration into the upper rivers and tributaries extended from mid-March through the end of July, with the peak in late May and early June (CDFG 1998). Spawning started in mid-August, peaked in early

September, and ceased in late September. Because the pumps are unscreened, there is the potential indirect effect of entraining spring-run salmon, if present. Spring-run salmon are expected to avoid entrainment based on their swimming ability, the relatively low draw of the pumps, the presence of vulnerable juveniles in the stream during periods of little or no pumping activity, and the warm temperatures of the embayments deterring foraging in and around the diversion pumps.

Delta smelt do not occur in the lower Feather River and would not be threatened by entrainment in the District's water pumps because the water regimen would not be negatively affected by the contract renewal.

Wetland and Riparian Habitats. Wetland and riparian habitats occur west and east of the District. The wetland formed by Gilsizer Slough west of the District will experience no real change in water flow under the No Action Alternative. A reduction in water purchased by the District and applied to its lands would have a minimal impact on the Gilsizer Slough because the District recycles all of its irrigation return flows. Such a pricing effect would likely be eclipsed by natural historic variation in flow, and additional sources of water also supply the Slough, which serves as part of the stormwater drainage system for Yuba City. Therefore, the changes under this alternative would not be considered adverse and there would be no impact on wetland habitat downstream of the District.

The Feather River riparian zone that occurs east of the District would not be adversely affected, and there would be no impact on this area. This area is not directly influenced by agricultural practices in the District, apart form the existing clearings containing the District's pumping plants.

Plant or Animal Species Diversity/Distribution and Fish and Wildlife Habitat Degradation. Most land in the District is agricultural and, as such, is disturbed habitat. Other development within the District, such as buildings, roads, and parking lots, further decreases the District area's ability to support a diversity of plant or wildlife species. Those species that live in the District are well adapted to humans and human activity. The No Action Alternative would not adversely affect habitat for species shown in Table 3-14. Any changes in water flow would be within the range of natural historic variation to habitat as a result of normal changes in water flow conditions and, as such, would be considered minimal. Land use changes within the district are expected to be similar to historical patterns. Minimal changes to acreage are expected.

Alternative 1

Alternative 1 is assumed to have similar impacts on biological resources as the No Action Alternative. No adverse impacts on sensitive plant or animal species, wetland and riparian habitat, or other plant or animal species are expected to occur under Alternative 1, other than the potential indirect effect of entraining juvenile salmonids and steelhead when water is being diverted (as discussed above under the No Action Alternative).

Alternative 2

Special Status Plant or Animal Species. Alternative 2 is expected to have minimal impacts on special status species (Table 3-14), other than the potential indirect effect of entraining juvenile salmonids and steelhead when water is being diverted (as discussed above under the No Action Alternative). Under this alternative, small areas of land could be fallowed or returned to agricultural production, depending on the type of water year (i.e., wet, dry, average) (see Section 3.2, Agricultural Economics). Lands within the District are or historically have been in agricultural production, so fallowing or irrigating additional lands is not expected to adversely affect sensitive species because these lands are of little habitat value. Bird species listed as threatened or endangered are either transient in the area or depend on native habitat and, as such, would not be adversely affected. Minimal impacts on special status species are expected.

Rice production in the District, which may provide beneficial habitat for wildlife, could increase during wet years under Alternative 2. The sandhill crane and other wetland bird species that tend to occur in agricultural areas, especially irrigated areas, may experience a beneficial impact, which would be minor because of the following reasons:

- The amount of rice production in the District is minute (approximately 90 acres) and is expected to continue to drop;
- Potential changes in rice production are predicted to be minor;
- There is alternative habitat in the area; and
- These species are transient in the area.

Wetland and Riparian Habitats. Implementing Alternative 2 would not adversely affect wetlands, riparian habitats, or other special habitats. Any reductions in water flow due to a different purchasing schedule is not expected to adversely affect Gilsizer Slough because such a pricing effect would likely be eclipsed by natural historic variation in flow. In addition, other sources of water also supply Gilsizer Slough. Therefore, there would be no adverse impacts on wetland habitat expected under this alternative.

As discussed under the No Action Alternative, the Feather River riparian zone would not be adversely affected under Alternative 2.

Plant or Animal Species Diversity/Distribution and Fish and Wildlife Habitat Degradation. As described under Alternative 1, most land in the District is agricultural and, as such, is disturbed. Other development within the District, such as buildings, roads, and parking lots, further decreases the District area's ability to support a diversity of plant or wildlife species. Those species that live in the District are well adapted to humans and human activity. Alternative 2 would not adversely affect habitat for species shown in Table 3-14. Impacts are expected to be minimal or nonexistent.

3.5.3 Cumulative Impacts

Implementation of Alternatives 1 and 2 would not contribute to cumulative impacts on biological resources.

3.6 SOCIAL CONDITIONS AND ENVIRONMENTAL JUSTICE

This section describes general economic and sociological characteristics of the project area. Most discussion is presented at the county level because impacts are unlikely to be felt solely within the boundaries of the Feather Water District.

3.6.1 Affected Environment

Sutter County Population and Income

Sutter County is not densely populated despite its proximity to the Sacramento area. Roughly half of the county's 78,930 people live in Yuba City and Live Oak; the rest of the population lives in unincorporated areas of the county (Table 3-15). The Sutter County population grew an estimated 21 percent from 1990 to 2000, from 64,415 to 78,930 (Table 3-16), and is expected to grow by approximately 60 percent by 2029 (Sacramento Area Council of Governments 2002).

Table 3-15
Sutter County Population Estimates, 2000

	Population
Live Oak	6,229
Yuba City	36,758
Incorporated Total	**42,987**
Unincorporated Sutter County	35,943
Total County	**78,930**

Source: California Department of Finance 2002a.

Table 3-16
County Population Totals and Projections

Year	Total
1990	64,415
1998	76,656
2000	78,930
Projections	
2005	88,520
2010	98,370
2015	109,280
2020	121,640
2029	132,764

Source: Sacramento Area Council of Governments 2002.

Sutter County incomes are substantially lower than the rest of the state. The 2000 median household income for Sutter County was $38,375, compared with a median household income for all of California of $47,493 (USDA 2002). Per capita incomes are similarly low, with a 2000 per capita income for Sutter County of $27,428, and a statewide per capita income of $26,742 (US Department of Commerce 2002).

The US Census Bureau estimates that in 2000, roughly 15 percent of the Sutter County population lived in poverty, where the poverty threshold for a family of four is $15,569 (United States Census Bureau 2000a). According to the US Census Bureau (2000), approximately 19.2 percent of Sutter County children under 18 live in poverty (Department of Commerce 2002).

Employment

Figures for 2002 indicate total (farm and non-farm) civilian employment in Sutter County is 32,600 out of a total of 78,930 residents (US Census Bureau 2002). Unemployment levels in Sutter County are substantially higher than they are in the rest of the state or the rest of the county. December 2002 figures indicate that 13.5 percent of the Sutter County labor force is unemployed, as compared to 6.6 percent for the state of California and 5.8 percent for the country as a whole (California Employment Development Department 2002a).

Sutter County expects both population and employment in the county area to grow (Table 3-17), however projections indicate that 81 percent of the projected growth in the region is expected to result from increases in non-farm economic sectors, rather than agricultural growth (California Employment Development Department 2000c).

Table 3-17
Employment Projections for Sutter County

2005	2010	2015	2020	2029
28,628	33,332	36,294	41,019	48,925

Source: Sacramento Area Council of Governments 2002.

Agricultural employment figures vary seasonally. According to 2000 data, there are approximately 850 full-time farms in Sutter County (United States Department of Agriculture 2000). In 2000, total farm employment varied from 7,500 workers in May to 10,300 farm workers in July, which results in an estimate of between 8 and 12 farm workers employed per farm during the summer (California Employment Development Department 2000a). The differential between May and July indicates that a certain percentage of the farm worker population is made up of migrant or seasonal labor. Although reliance on demographic reporting is not appropriate because of underreporting and possible illegal status of migrant workers, estimates can made based on available information (Table 3-18). Based on these estimates, as many as 2,800 people may work as temporary labor on farms in Sutter County. As of August 1999, total farm employment in Sutter County was estimated at roughly 8,200 workers, but this figure does not separate temporary farm work from permanent full-time farm employment.

Table 3-18
Farms and Farm Workers in Sutter County

Agricultural Workers	Farms	Estimated number of temporary workers	Total estimated workers per farm
7,500 – 10,300	850	2,800	8 - 12

Source: California Employee Development Department 2002.

Demographics and Environmental Justice

Executive Order 12898 requires federal agencies to identify and avoid disproportionate impacts on minority or low-income communities; therefore, it is important to identify any minority or low-income communities in the project area. From 1990 to 2000, the Sutter County population increased in all demographic categories, with the largest percentage increase being among Hispanics, who went from 16 percent to 122 percent of the Sutter County population. The largest numerical increase was among whites, which went from 46,262 in 1990 to 53,291 in 2000. Sutter County predicts a substantial jump in the percentage of ethnic minorities in the population, especially among black, Hispanic, and Asian residents (Table 3-19).

Table 3-19
County Population Totals and Projections with Race/Ethnic Detail

Year	Total	White	Hispanic	Asian/Pacific Islander	Black	Native American
1990	64,415	46,262	10,592	5,748	987	826
1998	76,656	52,121	14,269	8,032	1,328	906
2000	78,930	53,291	17,529	9,045	1,509	1,225
	Projections					
2005	91,680	59,821	17,872	11,249	1,707	1,031
2010	100,437	63,525	20,663	13,205	1,932	1,112
2015	108,004	66,364	23,475	14,838	2,185	1,142
2020	116,408	68,936	26,951	16,908	2,397	1,216

Source: California Department of Finance 2002.

Ethnic minorities in Sutter County consistently have a lower income than whites. Data from 1989 indicates that the Hispanic population has an average per capita income that is less than half that of whites (Table 3-20).

Table 3-20
Per Capita Income by Ethnic Group for 1989 (Dollars)

Year	White	Hispanic	Asian/ Pacific Islander	Black	Native American
1989	13,953	6,205	11,487	9,993	12,402

Source: Follas 2000.

Data for the census tract encompassing Feather Water District indicate that the majority population in the district is white (Table 3-21). The next largest population identified in 2000 is the Hispanic population. Asian/Pacific Islander, Black, and Native American residents form a small percentage of the Feather Water District population. Roughly 22 percent of those responding also indicated they had origins in Spanish-speaking countries; this population is likely to cross ethnic boundaries because Hispanic origin is not considered to be an ethnic classification for the purposes of the United States Census Bureau (US Census Bureau 2002).

Table 3-21
2002 Census Tract Data for Feather Water District

Total Population	White	Black	Asian/Pacific Islander	Native American	Hispanic	Other
2,885	84%	0.3%	2.5%	.70%	12.4%	.10

Source: US Census Bureau 2002.

Farm workers in California (especially migrant workers) tend to be both minority and low income. Based on government estimates of farm workers in Sutter County, it can be reasonably estimated that several hundred people of minority or low-income background may work as temporary labor on the farms in the district.

3.6.2 Environmental Consequences

No Action Alternative

As discussed in Section 3.2, Agricultural Economics, implementation of the No Action Alternative should result in no appreciable impact on Sutter County population, income, or employment rates. Sutter County projections indicate that non-farm employment will constitute most of the economic growth projected for the near future; therefore there would be little impact on Sutter County employment levels from implementing the No Action Alternative.

Minority or low-income populations, although expected to increase numerically over the project period, would not be disproportionately affected by the no action alternative. Therefore, there would be no environmental justice concerns raised by the No Action Alternative.

Alternative 1

Because Alternative 1 would result in the same water rates, acres irrigated, and agricultural revenues as under the No Action Alternative, the impacts on social conditions or environmental justice would be the same as under the No Action Alternative.

Alternative 2

Because Alternative 2 may affect water rates and quantities available under certain water year scenarios, implementing this alternative might have some impacts on employment in Sutter County and the Feather Water District specifically, as compared to the No Action Alternative. As discussed in Section 3.2, Agricultural Economics, the intensity of impacts will depend on whether the preceding five years were wet, dry, or average and on whether the particular year being considered is wet, dry, or average.

Agricultural producers could respond to changes in rates and available quantities of water by raising the prices of their produce, by changing to crops with lower water requirements or a higher per-unit value, by leaving more fields fallow, or by reducing outlay, such as labor and capital costs. The precise outcome of the increase in water prices probably will vary from farm to farm; however, it is possible that agricultural

employment levels in the Feather Water District will drop a certain amount, as a result of lower acreage in production or simple cash-flow problems.

Overall impacts on Sutter County are likely to be minimal because employment levels in the county are increasing and most of the increase is expected outside the agricultural industry. Some minor direct and indirect impacts on employment are possible as compared to the No Action Alternative, as detailed in the Agricultural Economics section of this document. However, Sutter County expects to add as many as 16,000 jobs by the year 2020; therefore the loss of up to 16 jobs in the multi-county Sacramento Valley area would have minimal impact.

The migrant farm worker community is almost by definition low income and is made up primarily of minorities. Therefore, any negative impact on agricultural employment will be reflected in the minority and low-income communities. The precise scale and nature of the impact is difficult to determine given the imprecise data available and the difficulty of adequately predicting choices on the part of farm operators in response to higher water costs. Nevertheless, due to the small area of the District and the minimal change anticipated, the potential for any impacts on the minority or low-income populations is small.

3.6.3 Cumulative Impacts

No cumulative impacts on social conditions or environmental justice are expected from implementation of any of the alternatives identified in this EA.

3.7 RECREATIONAL RESOURCES

Recreation can be an active or passive use of unimproved open space land or improved recreational facilities. Wildlife areas, areas of scenic, historic, and cultural value, lake shores, beaches, and rivers and streams are all examples of open space as a passive use that may have few or no improvements. Parks, golf courses, and sports clubs are all examples of recreation areas that provide for more active uses and have more facility improvements.

3.7.1 Affected Environment

Sutter County Recreational Resources

Sutter County does not have a park and recreation department and does not provide recreational facilities or opportunities through county programs under such a public agency. However, there are a variety of parks and recreational opportunities throughout the unincorporated area. Most of these facilities are in the immediate periphery of Yuba City or along the Sacramento River. The facility closest to the Feather Water District is Boyd's Pump, a park along the Feather River off Garden Highway near Oswald Road, about a mile and a half north of the District. This park provides paved parking and a boat ramp. Also, about a mile and a half north of the northern boundary of the Feather Water District is the Mallard Lake Golf Course, south of Oswald Road. This is a privately-owned nine-hole public golf course on 41 acres that includes a driving range and miniature golf course (Sutter County 1996a).

State Recreational Resources

CDFG provides for and administers several thousand acres of recreational facilities in Sutter County. The state recreational resource nearest to the Feather Water District is the Feather River Wildlife Area, which encompasses 2,265 acres. The Feather River Wildlife Area is divided into five management units, three of which are in the vicinity of and east of the Feather Water District. Star Bend Management Unit is east of Garden Highway (State Highway 99), at the end of and south of Star Bend Road, and encompasses 50 acres. O'Connor Lakes Management Unit is east of Garden Highway, also at the end of and south of Star Bend Road, and contains approximately 364 acres. Lastly, Abbott Lake Management Unit is east of Garden Highway, at the end of and north of Star Bend Road, and encompasses approximately 438 acres (Sutter County 1996a).

Feather River

The Feather River is a key waterway in the Sacramento River region. Although complete data are not available to quantify trends in recreation use along the Feather River, most water-dependent and water-enhanced recreation activities along the Feather River are assumed to have increased with the population in the region. Water-dependent recreation on the Feather River consists of boat and shore fishing, pleasure boating, and swimming. Water-enhanced recreation activities include sightseeing, picnicking, and camping.

Recreation use on the Feather River is not well documented because boat and shore use is dispersed at access points in Butte, Yuba, and Sutter counties. Fishing is probably the most popular activity on the river, with American shad, salmon, striped bass, and steelhead the most frequently caught species. Sport catch of anadromous fish in the Feather River increased from approximately 990 chinook salmon landed in 1975 to 1,500 landed in 1990, although catch of steelhead decreased from approximately 2,900 in 1975 to 560 in 1990 (CDFG 1975 and Wixcom, personal communication, Reclamation 1997). The quality of fishing on the river is sensitive to river flow and water temperature. Changes in flows may affect the quality of boating by exposing or creating navigational hazards. Flows and water temperatures have also been found to substantially influence the presence of salmon, striped bass, and American shad populations in the river (CDFG 1975, as cited in Reclamation 1997).

Other Resources

Several transportation corridors in Sutter County provide access to recreational opportunities. For example, State Highway 99, which runs the length of the county and bisects the Feather Water District, provides access to valley and riparian environmental and recreation areas (Sutter County 1996a).

3.7.2 Environmental Consequences

Two types of changes related to recreation are considered in the following impact analysis, recreation opportunities and recreation use.

No Action Alternative

The quality of recreation on the Feather River is sensitive to water and air temperatures and the abundance of sport fish, and is less sensitive to normal fluctuations in river flows. Under this alternative there presumably would be no change in water flow conditions within the District. River-related recreation opportunities in the District project area and vicinity are expected to be similar to conditions described in Section 3.7.1, Affected Environment. No impacts on the use or enjoyment of the Feather River or other recreational opportunities in the Feather Water District project vicinity are expected under the No Action Alternative.

Alternative 1

Alternative 1 is assumed to have similar effects to recreational resources as the No Action Alternative. Therefore, there are no environmental impacts of this alternative.

Alternative 2

Under Alternative 2, river-related recreational opportunities in the District project area and vicinity are expected to be similar to conditions described in Section 3.7.1, Affected Environment. Changes in Feather River water flows caused by this alternative are anticipated to be very small, and such changes would not be expected to strongly affect recreational use or enjoyment of this resource because such an effect would likely be eclipsed by natural historic variations in flows. No adverse impacts on the use or enjoyment of the Feather River or other recreation opportunities in the Feather Water District project vicinity are expected under Alternative 2.

3.7.3 Cumulative Impacts

Implementing Alternatives 1 and 2 would not contribute to cumulative impacts on recreational resources.

3.8 INDIAN TRUST ASSETS

3.8.1 Affected Environment

This section describes Indian Trust Assets in and adjacent to the Feather Water District that could be affected by renewing the District's water service contract. Indian Trust Assets are legal interests in property held in trust by the United States for Indian Tribes or individuals. The Secretary of the Interior is the trustee for the United States on behalf of recognized tribes. Examples of trust assets are lands, minerals, hunting and fishing rights, and water rights.

Reclamation, in carrying out its activities, shares the responsibility to protect and maintain Indian Trust Assets reserved by or granted to Indian tribes or individuals by treaty, statue, or Executive Order. Reclamation carries out its activities in a manner that, where possible, protects Indian Trust Assets and avoids impacts. When it is not possible to avoid impacts on trust assets, compensation or mitigation is provided in consultation with the affected tribes or individuals.

No federally recognized Indian tribes or assets are within the area of the Feather Water District service area.

3.8.2 Environmental Consequences

No federally recognized Indian tribes or trust assets are in the affected area for the Feather Water District, and no impacts on Indian Trust Assets would occur as a result of the long-term contract renewal under any of the alternatives.

3.8.3 Cumulative Impacts

Implementation of Alternatives 1 and 2 would not contribute to cumulative impacts on Indian Trust Assets.

3.9 CULTURAL RESOURCES

3.9.1 Affected Environment

Cultural resources are those aspects of the physical environment that relate to human culture and society and those cultural institutions that hold communities together and link them to their surroundings. Cultural resources include expressions of human culture and history in the physical environment, such as prehistoric or historic archaeological sites, buildings, structures, objects, districts, or other places, including natural features and biota that are considered to be important to a culture, subculture, or community. Cultural resources also include traditional lifeways and practices and community values and institutions.

The affected environment for cultural resources or area of potential effects (APE) consists of the Feather Water District service area. The APE is the geographic area within which an undertaking may cause changes in the character or use of historic properties. The renewal of the water service contract between Reclamation and the Feather Water District is a federal undertaking that has the potential to affect cultural resources in the 9,300 acre district.

Cultural Resource Types

Cultural resources have been organized into the categories of prehistoric resources, historic resources, and traditional cultural properties (TCP) and practices. These types are not exclusive, and a single cultural resource may have multiple components. Prehistoric cultural resources refer to any material remains, structures, and items used or modified by people before there was a Euro-American presence in the region. Historic cultural resources include architectural resources and other material remains and landscape alterations that have occurred since the arrival of Euro-Americans in the region. TCPs and practices refer to places or activities associated with the cultural heritage or beliefs of a living community and that are important in maintaining cultural identity.

Regulatory Setting

The identification of cultural resources and Reclamation responsibilities with regard to cultural resources are addressed by a number of laws, regulations, executive orders,

programmatic agreements, and other requirements. The principal federal law addressing cultural resources is the National Historic Preservation Act of 1966, as amended (16 United States Code Section 470), and implementing regulations (36 Code of Federal Regulations 800), that describe the process for identifying and evaluating historic properties, for assessing the effects of federal actions on historic properties, and for consulting to avoid, reduce, or minimize adverse effects. The term "historic properties" refers to cultural resources that meet specific criteria for eligibility for listing on the National Register of Historic Places (NRHP). This process does not require historic properties to be preserved, but does ensure that the decisions of federal agencies concerning the treatment of these places result from meaningful considerations of cultural and historic values and of the options available to protect the properties.

Under the National Historic Preservation Act (NHPA), cultural resources undergo an evaluation process to determine whether a resource is eligible for listing on the NRHP. Resources that are already listed, that are determined eligible for listing, or that are undetermined are afforded a level of consideration under the NHPA Section 106 process. Undetermined resources are those for which eligibility cannot be determined, based on current knowledge of the resource and where further work is needed to make an evaluation.

In order to be determined eligible for listing on the NRHP, a resource must meet one or more of the following criteria (36 CFR Part 60):

- Criterion A—associated with events that have made a significant contribution to the broad patterns of our history;
- Criterion B—associated with the lives of persons significant in our past;
- Criterion C—embodies the distinctive characteristics of a type, period, or method of construction; or
- Criterion D—yields or may be likely to yield information important in prehistory or history.

The resource also must retain most, if not all, of seven aspects of integrity: location, design, setting, workmanship, material, feeling, and association.

The identification and evaluation of cultural resources for NRHP-eligibility is the responsibility of the lead federal agency with the concurrence of the State Historic Preservation Officer (SHPO), in this case the California Office of Historic Preservation. The Advisory Council on Historic Preservation, an independent federal agency, administers the provisions of Section 106 of the NHPA regarding cultural resources and has review and oversight responsibilities defined in 36 CFR 800.

Additional cultural resource management responsibilities of Reclamation are addressed in other sections of the NHPA. The provisions of the NHPA refer only to cultural resources that are tangible properties, and federal agencies are required by other statutes to consider impacts on traditional cultural and religious practices.

Other major federal laws, regulations, and Executive Orders that outline Reclamation's cultural resource responsibilities include the Archaeological Resources Protection Act (16 USC 470aa-47011), the American Indian Religious Freedom Act, as amended (42 USC 1996-1996a), NEPA (42 USC 4321-4370c), Native American Graves Protection and Repatriation Act (25 USC 3001-3013), Executive Order 11593 (Protection and Enhancement of the Cultural Environment), Executive Order 13006 (Locating Federal Facilities in Historic Properties in Our Nations Central Cities), Executive Order 13007 (Indian Sacred Sites), Executive Order 13084 (Consultation and Coordination with Indian Tribal Governments), and Presidential Memorandum: Government-to-Government Relations with Native American Tribal Governments. The role of Reclamation is to ensure that the process of water contract renewals complies with these standards and to ensure that provisions are in place for subsequent compliance by the water contract agencies. With little exception, virtually all of the potential effects to cultural resources related to water contract renewal arise from subsequent decisions under non-federal jurisdiction.

City and county governments have been granted some regulatory power to list and provide limited protection of cultural resources. This authority is usually exercised in the local permitting process for specific projects and is guided by general plans or similar documents. The Sutter County General Plan includes provisions for protecting "the custom and cultural qualities that make Sutter County unique" and further states that such resources "not only deserve recognition and preservation but prominence in the community"(Sutter County 1996a).

The responsibilities of local jurisdictions to address effects to cultural resources through permitting are generally triggered by compliance with the California Environmental Quality Act (CEQA). CEQA Guidelines addressing the significance of impacts on cultural resources are outlined in Title 14, Chapter 3, Section 15064.5. The criteria for consideration of resources under CEQA are similar, but somewhat broader than the federal standard. California maintains a "Register of Historical Resources" which includes all NRHP-listed properties, all California Registered Landmarks, as well as other formally nominated properties. Consideration is also afforded to resources included in local historic registers and to those resources that the CEQA lead agency determines meet the requirement for listing on the California Register (Public Resources Code SS5024.1, Title 14 California Code of Regulations, Section 4852). California also designates Points of Historical Interest, which are markers placed at historic locations to interpret past events to the public. Listing on a state or local register does not imply that a resource would not meet federal NRHP criteria, only that formal action has only been taken on a local level.

During the preparation of the PEIS, Reclamation investigated the possibility of conducting Section 106 consultation on a programmatic basis. The preparations, in consultation with the OHP, determined that Reclamation should address its Section 106 responsibilities on a project-specific basis (Reclamation 1999).

Cultural Setting

Prehistoric Overview

The Feather Water District is west of the Feather River in the southern part of Sutter County. It is part of the eastern Sacramento River Valley, an area rich in the evidence of prehistoric, historic, and ethnographic use. Before extensive reclamation projects, the valley bottomlands experienced seasonal flooding, which produced lush vegetation and attracted abundant wildlife. The waterways provided habitat for fish and mussels. Outside of the river corridors there were grasslands, oak groves, and other plants. These resources were extremely attractive to prehistoric inhabitants, and there is evidence of regional human use that dates back to around 6,000 BC (Reclamation 1999).

Several cultural chronologies have been proposed to describe the prehistory of the eastern Sacramento Valley. There is little consensus among researchers in the particular time sequences or in the terms used to describe them. These differences arise from attempts to generalize data from specific sites to adjacent areas and from likely cultural variations among the inhabitants. In late prehistoric times, for example, no fewer than five different ethnic groups occupied parts of the Sacramento Valley (Moratto 1984). A chronology formulated by Eric Ritter (1970), based on work in the Lake Oroville area along the Feather River in the foothills of Butte County, has been referenced for the Sacramento Valley in previous CVPIA cultural resource documentation and is used here (Reclamation 1997).

The earliest seasonal use of the area appears to have been by hunter-gatherers, probably from the Great Basin. Artifact assemblages indicate that this use was well established in several areas by approximately 2,000 BC. This Martis Complex is characterized by intensive use of basalt rather than obsidian for flaked stone tools, large roughly shaped projectile points, use of atlatl and dart, bowl mortars, cylindrical pestles, and basalt scrapers (Moratto 1984). The Mesilla Complex, dating from approximately 1000 BC to 1 AD, represents a continuation of many of the artifact assemblages of the Martis Complex, with the addition of chert projectile points, *Haliotis* and *Olivella* shell beads, charm stones, and bone tools (Moratto 1984, Ritter 1970).

Between 1 AD and 800 AD the prehistoric occupants of the region shifted their subsistence and settlement patterns toward a more sedentary way of life. Relatively permanent villages were established, from which smaller task groups moved out to procure deer, smaller game, fish, freshwater mussels, hard seeds and acorns. This cultural period is called the Bidwell Complex. Markers of this period include archaeological sites with multiple activity locations, flexed burials, grooved and notched stones that were used as fishnet weights, milling stones and wood mortars. The use of large basalt points continued, and steatite cooking vessels were introduced (Moratto 1984, Ritter 1970).

The Sweetwater Complex, 800-1500 AD, is marked by changes in the form of the shell ornaments and the development of an industry of steatite cups, platters, bowls, and tubular smoking pipes. Evidence of the use of bow and arrow technology appears around this time also. Small lightweight projectile points are found, similar in style to

Great Basin types. Mortuary styles also changed from flexed to extended burials around 1000 AD (Moratto 1984, Ritter 1970).

The Oroville Complex dates from 1500 AD to 1833 and overlaps with the entry of Euro-Americans into the region and the first records of contact with the native population, the Nisenan. During the early part of this period, there seems to be an increased emphasis on acorn processing in bedrock mortars. While acorns are an excellent food source, the processing of acorns is labor intensive and is associated with less mobile subsistence strategies and maintenance of larger populations. Several kinds of structures, including large circular dance houses, were erected (Moratto 1984). Burials from this period are flexed and were sometimes placed under stone cairns (Wilson and Towne 1978). There are ethnographic reports of cremations near the villages (Reclamation 1997). Additional artifacts that appeared during this period include incised bird bone tubes, gaming bones, and disc beads made from clamshell. In 1833, a great epidemic, either smallpox or malaria, swept through the Sacramento Valley wiping out entire villages of the Nisenan (Sutter County 1996a, Wilson and Towne 1978).

Historic Overview

Euro-American incursions came later to interior California than on the Pacific coast or in the Southwest. By 1776 Jose Canizares had explored areas south of present day Sacramento (Wilson and Towne 1978). In the early 19th century, the missions established by the Spanish on the coast were losing populations to disease and flight. The Nisenan received Indians escaping from the missions into their area. Expeditions were organized to the interior to recapture fugitives and to punish groups harboring mission escapees. Though not conclusive, the evidence strongly suggests that these military expeditions did capture native inhabitants of the Sacramento Valley for resettlement at the missions (Jackson 1994). In 1808 an expedition in service of the missions led by Gabriel Moraga crossed through Sutter County. Active native resistance led to a major battle in 1813 between the Spanish, under Luis Arguello, and Miwok tribelets near the mouth of the Consumnes River to the south (Wilson and Towne 1978). Displaced Miwok found their way to Nisenan villages. The same Luis Arguello led an expedition through the Sutter County area in 1817, describing and naming geographical features, including the Feather River. In the late 1820s trappers from the American and Hudson Bay Company, including Jedediah Smith, began trapping beaver in the area. It is likely that this influx led to the introduction of viruses, resulting in the epidemic that devastated Nisenan villages in 1833. Most remaining survivors fled from the valley settlements to the hill country (Sutter County 1996a; Wilson and Towne 1978).

John Sutter founded one of the first major agricultural enterprises in the general area in 1841, eight miles south of present-day Yuba City. He planted grapes, pomegranates, figs, and peaches and also raised livestock. In 1848, the discovery of gold on Sutter's holdings in Coloma caused rapid change to all of California. Hundreds of thousands of people immigrated to the gold fields, causing widespread destruction of what was left of native culture and resource base. In 1850 the California Indian Indenture Act, in effect, permitted the enslavement of Native Americans. Kidnapping and selling Indian women

and children was common, as were massacres (Heizer 1974). Along with their Maidu neighbors, many Nisenan were forcibly marched in 1863 to the Round Valley Reservation over 100 miles away, suffering many casualties en route (Sutter County 1996a).

There was little mining in Sutter County itself, but the area had resources that were valuable for supplying the mines, such as stands of lumber near the rivers and land suited for agriculture and livestock. The county was settled by ex-miners who recognized these potential opportunities. By the 1870s, however, hydraulic mining upstream was silting up the rivers. Local farmers formed the Anti-Debris Association, which won a suit in 1884 banning the practice. Agriculture thrived, with wheat, raisins, and peaches becoming important crops. Local farmers were innovative in developing new crop varieties and forming cooperatives to improve prices, combat high transportation costs, and process and distribute their products. Agriculture continues to be the most important industry in Sutter County (Sutter County 1996a).

Further growth of agriculture in the region was limited initially by unreliable precipitation and the need for protection from periodic flooding. On behalf of the federal government, Colonel B. S. Alexander studied the Sacramento and San Joaquin rivers in the 1870s and envisioned a system of canals to complete an exchange of water from the Sacramento to the San Joaquin Valley. A huge private irrigation enterprise was proposed in 1871 to address water shortages and agricultural irrigation in the Central Valley. Enthusiasm and investment for this project evaporated quickly, but incremental actions were taken in subsequent decades to address the ongoing water problems. In 1887 the California Legislature passed the Wright Act, which permitted the formation of irrigation districts. These districts sold bonds, constructed water storage and conveyance facilities, and allocated water among the farmers. The US Reclamation Service (now the Bureau of Reclamation) produced a report in 1904 outlining a large-scale plan for controlling the Sacramento River and its tributaries. In 1911 the state of California created the State Reclamation Board and authorized it to spend $33 million on a flood control project in the Central Valley. Between 1920 and 1932 a series of reports detailing water flow, drought conditions, flood control, and irrigation issues were synthesized by the State Engineer to provide the basis for the California State Water Plan. The federal government approved the basic concept and built the facilities outlined in the plan for the State Water Project beginning in 1935. The storage, delivery, power generation, and flood control facilities of the CVP were constructed over the next 50 years, including facilities such as the Sutter Bypass in the project area (Pisani 1992; Stene 1994). Farmers in the irrigation districts are assessed for system construction and water use.

Sutter County experienced steady growth in population throughout the 20th century, from 5,886 people in 1910 to approximately 77,900 currently. Approximately half of the population now lives in Yuba City and Live Oak in the northeast part of the county. Several named settlements and railroad stops did not continue. According to the general plan, the county values the agricultural way of life and "seeks to balance economic growth with the protection of local customs and cultural qualities that make the county unique" (Sutter County 1996a).

Ethnographic Overview

At the time of European contact, the area now included in the Feather Water District was within the territory of the Southern Maidu or Nisenan. The Nisenan territory included portions of the drainages of the Yuba, Bear, American, and Feather rivers. The Nisenan, together with the Maidu and Kankow, form a subgroup of the California Penutian linguistic family. Villages in the Feather River area were built on low rises along the river or on gentle slopes with southern exposure. Villages varied in size, from a few houses to 40 or 50 dome-shaped shelters covered with brush and earth. Politically, the villages would join together under the leadership of the headman of a specific village for decision-making, group hunts, and ceremonies. Each village or tribelet of villages controlled its territory, including hunting, fishing, and plant gathering locations (Wilson and Towne 1978).

The religious beliefs and practices of the Nisenan are known, but detailed descriptions are lacking, due to variations in practices, disruption of traditions from the impacts of Euro-American contact, and the reluctance of informants to discuss their beliefs. To the Nisenan, all natural objects were endowed with supernatural powers and they followed a calendar of ritual dances celebrating the appearance of the seasons and food resources. The Nisenan practiced an annual mourning ceremony in the fall to honor their dead. Accounts of the mourning ceremony by early travelers noted "large gatherings, wailing and faces covered with ashes." A major religious system common among central California groups was the Kuksu cult. Dancers disguised as deities performed esoteric rites in the dance house. Cult membership was limited to the initiated. A revival of the Kuksu cult was introduced after 1872, which included elements of the Ghost Dance religion that had spread among Native Americans from Plains Indian groups (Wilson and Towne 1978).

Native Americans account for less than two percent of the population in Sutter County today (Sutter County 1996). Populations of the Maidu groups, including the Nisenan, are estimated at approximately 2,500, living primarily on the rancherias of Auburn, Berry Creek, Chico, Enterprise, Greenville, Mooretown, Single Springs, and Susanville, as well as on the Round Valley Reservation (SDSU 1999). No rancherias are located within the Feather Water District. In 1994 there was only one fluent speaker of the Nisenan, although efforts were in progress to produce instructional materials and to pass on songs (Hinton and Montijo 1994). In recent years there has been a revival of interest in traditional religious practices and arts. Resources likely to be of concern to contemporary groups include village locations and burials and gathering locations for traditional foods or resources needed for basketry and regalia.

Inventory of Cultural Resources

Inventory information specific to the Feather Water District has not been developed but data are available for Sutter County as a whole. Approximately 10,000 acres of 388,000 acres in Sutter County have been surveyed for archaeological resources. These survey sites are primarily prehistoric resources, but eighteen are historic or have historic components. Because of the low percentage of surveyed land and the relative lack of

development, the potential for undiscovered and unrecorded archaeological sites is high (Reclamation 1997).

Recorded prehistoric resources in Sutter County include habitation sites, burials, temporary camps, milling stations, and lithic scatters. Recorded sites are densest along the rivers. Historic archaeological resources include the sites of early settlements and agricultural activities and refuse scatters (Reclamation 1997). No prehistoric or historic archaeological resources in Sutter County are listed formally on the NRHP, but many are likely to meet the criteria for NRHP and/or California Register of Historical Resources listing.

The Sutter County Historical Society has developed a list of 78 historic sites. These are primarily buildings and structures but also include locations where historic activities took place or the former locations of buildings and structures. Twenty-one of these also have been designated California Points of Historical Interest. The Live Oak Commercial District is the only NRHP-listed property in Sutter County (National Park Service 2000). There are two California State Landmarks and 22 points of historic interest in Sutter County (Sutter County 1996). Historic themes illustrated by these resources include architecture, economic and industrial history, exploration and settlement, government, religion, social, and education (Reclamation 1997). The two California State Landmarks are outside the District boundaries, and the rest of these sites are points of historic interest that have not been found eligible for the NRHP.

There are no known TCPs or traditional use areas (TUAs) that have been identified in Sutter County. Consultations with Indian tribes or other groups are required of Reclamation to identify any TCPs or TUAs that could be affected by the alternatives as part of their completion of the Section 106 process. In compliance with 36 CFR 800.4(a)(4), Reclamation has sent letters to Indian tribes requesting their input regarding the identification of any properties to which they might attach religious and cultural significance to within the area of potential effect. To date no comments or formal responses have been received from the tribes.

3.9.2 Environmental Consequences

Methodology

Potential impacts on cultural resources, in general, are assessed by applying the criteria of adverse effect, as defined in 36 CFR 800.5a. An adverse effect is found when an action may alter the characteristics of a historic property that qualifies it for inclusion on the NRHP in a manner that would diminish the integrity of the property's location, design, setting, workmanship, feeling, or association. Some examples of adverse effect to cultural resources include physical destruction or damage, alterations not consistent with the Secretary of the Interiors Standards for Rehabilitation and Guidelines for Rehabilitating Historic Buildings, relocation of a property, isolation and restriction of access, introduction of visible, audible, or atmospheric elements out of character with the resource, neglect resulting in deterioration, or transfer, lease or sale of historic properties without adequate protections. Adverse effects may include reasonably

foreseeable effects caused by the action that may occur later in time, be farther removed in distance, or be cumulative. Activities conducted under the alternatives are measured against the criteria of adverse effect to determine the potential for and intensity of impacts on cultural resources. Likewise under CEQA, a significant effect on the environment may result from actions that cause a substantial adverse change in the significance of an historical resource. The assessment of impacts on TCPs, TUAs, and cultural practices also requires a focused consultation effort with the affected community.

In the Section 106 process, Reclamation, as the lead federal agency, is responsible for applying the criteria of adverse effect and for developing mitigation efforts to avoid or reduce any impacts. This is done in consultation with the SHPO and other consulting parties identified in 36 CFR 800. Prior to implementing individual actions, Reclamation will complete the Section 106 process for the water contract renewal undertaking.

No Action Alternative

The No Action Alternative would continue the delivery of project water under terms consistent with the existing contract. No direct impacts on cultural resources would be expected under the No Action Alternative. Renewal of the long-term water service contract between Reclamation and the Feather Water District would not require construction or other activities that could directly disturb the integrity of known or unrecorded cultural resources in the District. Actions by Reclamation under this alternative are within the range of existing conditions.

Indirect impacts on cultural resources could result from renewing the long-term water service contract under the terms of the No Action Alternative if it were to lead to changes in agricultural practices or land use. Certain crops require more ground-disturbing activities than others do, and changes in land use can affect cultural resources. These effects may be either positive or negative, depending on the presence of resources, location, and other factors associated with the changes. Renewal of long-term water contracts is one of many factors that could influence decisions in agricultural practices or land use. The potential for cultural resource impacts related to this alternative is speculative and depends on future decisions by other parties. Since the No Action Alternative represents a continuation of current quantities of water delivery and pricing terms, it would be expected to have a small potential for influencing decisions on future agricultural practices and land use.

Alternative 1

Alternative 1 is assumed to have similar effects to cultural resources as the No Action Alternative. Therefore, no adverse environmental impacts are expected.

Alternative 2

No direct impacts are anticipated to cultural resources as a result of Alternative 2, as compared to the No Action Alternative. Alternative 2 does not include any provisions for construction or other activities that could directly disturb the integrity of known or

unrecorded cultural resources in the District. Actions by Reclamation under this alternative are within the range of existing conditions.

Indirect impacts on cultural resources could result from renewing the long-term water service contract under the terms of Alternative 2. Implementation of Alternative 2 may increase the cost of water, resulting in a decrease of the quantity of water delivered to the District. These changes may contribute to changes in crops grown or patterns of land use in the District. Changes in agricultural practices and land use may affect cultural resources either positively or negatively, depending on the presence of resources, location, extent of ground disturbance, and other factors associated with the changes. Renewal of long-term water contracts is one of many factors that could influence decisions in agricultural practices or land use. The potential for cultural resource impacts related to this alternative is speculative and depends on future decisions by other parties. As discussed in Section 3.2, Agricultural Economics, the potential change in irrigated acreage under this alternative is minimal and may result in additional lands used as pasture. Pasture requires minimal disturbance compared to other agricultural uses and would have no effect on cultural resources.

3.9.3 Cumulative Impacts

Renewal of long-term water contracts under any of the alternatives is one of many factors that could influence decisions in agricultural practices or land use in the water districts. Demographic, economic, political, and a variety of other issues, independent of the contract renewal, are causing changes with direct and indirect effects to cultural resources. The contribution of the water renewal contracts under the terms of the alternatives would be a minor factor in decisions that could cause impacts on cultural resources in the districts. Specific actions as the result of Alternatives 1 or 2 that lead to changes in land use or construction will require the effects to historic properties to be identified and evaluated.

3.10 GEOLOGY AND SOILS

3.10.1 Affected Environment

Geologic Setting

The District is underlain by Holocene age alluvial terrace deposits bordering the Feather River. The surface deposits in the region consist of alluvial overbank sediments deposited on floodplains and channels cut into the underlying Victor formation. This formation extends along most of the eastern Sacramento Valley and consists of a mixed composition of Sierran stream sediments deposited during the past 10,000 years. While stratified, there is little lateral continuity in strata because the courses of the Pleistocene streams meandered and overflowed their banks. Soils developed on the surface of the Victor formation contain a hardpan layer. The Victor formation is the most important source of groundwater on the east side of the valley south of the vicinity of Gridley (DWR 1978). The Sutter Buttes to the west of the Feather District is a large igneous dome complex that intruded into and upwarped Cretaceous marine deposits.

Soils

Three soil associations occur within the District, including about 6,750 acres of Conejo-Tisdale soils, about 3,040 acres of Oswald-Gridley-Subaco soils, and about 60 acres of San Joaquin-Cometa soils. The soils are very similar in their characteristics. The Conejo-Tisdale association consists primarily of clay loam on alluvial terraces. The permeability is moderately slow and can be limiting for some crops. They are used for row crops, orchards, hay, and pasture. The Oswald-Gridley-Subaco soils are clay loams that occur on alluvial terraces, that have slow permeability, and that are moderately well drained. They are used mostly for irrigated crops, mainly rice. The San Joaquin-Cometa soils are sandy loams, with very slow permeability due to compaction and silica cementation. These soils are suitable for rice, vineyards, and irrigated or dry pasture.

3.10.2 Environmental Consequences

No Action Alternative

Soils

Most of the District (about 6,000 acres) is planted in permanent crops. Of the remaining 3,000 to 3,500 acres that are not in permanent crops, approximately 1,500 to 2,000 acres (about 15 to 20 percent of the District) would continue to be dry farmed or fallowed, due to lack of available irrigation water. This pattern of dry farming and fallowing has been practiced since the District was formed. No adverse impacts on soils are expected due to the No Action Alternative.

Alternative 1

Soils

Water use and cropping patterns under Alternative 1 are not expected to differ from the No Action Alternative. Therefore, no impacts on soils are expected.

Alternative 2

Soils

As with Alternative 1, water use and cropping patterns under Alternative 2 are not expected to differ substantially from the No Action Alternative. Therefore, no impacts on soils are expected.

3.10.3 Cumulative Impacts

Since the alternatives are not expected to result in any impacts on soils or geologic resources, no cumulative impacts are expected to occur either.

3.11 AIR QUALITY

3.11.1 Affected Environment

Ambient Air Quality

The EPA has established ambient air quality standards for several different pollutants, which are often referred to as criteria pollutants (ozone, nitrogen dioxide, carbon monoxide, sulfur dioxide, inhalable particulate matter [PM_{10}], and lead). Federal ambient

air quality standards are based primarily on evidence of acute and chronic health effects. The state of California also has adopted ambient air quality standards, some of which are more stringent than the comparable federal standards.

The federal Clean Air Act requires each state to identify areas that have ambient air quality in violation of federal standards. States are required to develop, adopt, and implement a State Implementation Plan (SIP) to achieve, maintain, and enforce federal ambient air quality standards in these nonattainment areas. Deadlines for achieving the federal air quality standards vary according to air pollutant and the severity of existing air quality problems. The SIP must be submitted to and approved by EPA. SIP elements are developed on a pollutant-by-pollutant basis whenever one or more air quality standards are being violated.

The air pollutants of greatest concern in the Sacramento Valley are ozone and PM_{10}. Ozone and PM_{10} concentrations in Sutter County periodically exceed both state and federal ambient air quality standards; consequently, Sutter County is considered a nonattainment area for both ozone and PM_{10}.

Ozone is not emitted directly into the air but forms through chemical reactions that involve nitrogen oxide emissions and reactive organic compound emissions. Ozone is a strong oxidizing agent that reacts with a wide range of materials and biological tissues. Ozone is a respiratory irritant that can cause acute and chronic effects on the respiratory system. In addition, ozone causes substantial damage to leaf tissues of crops and natural vegetation and damages many materials by acting as a chemical oxidizing agent.

Suspended particulate matter represents a diverse mixture of solid and liquid material having size, shape, and density characteristics that allow the material to remain suspended in the air for measurable time periods. The physical and chemical composition of suspended particulate matter is highly variable, resulting in a wide range of public health concerns. PM_{10} can be generated as a primary pollutant by abrasion or erosion processes and also can form through chemical reactions or by condensation of gaseous pollutants into fine aerosols.

Many components of suspended particulate matter are respiratory irritants; some components are primarily physical irritants; other components are chemical irritants (such as sulfates, nitrates, and various organic chemicals). Suspended particulate matter also can contain compounds (such as heavy metals and various organic compounds) that are toxic or carcinogenic.

Regulatory Considerations

Section 176(c) of the Clean Air Act requires federal agencies to ensure that actions undertaken in nonattainment or maintenance areas are consistent with the Clean Air Act and with federally enforceable air quality management plans. EPA has promulgated separate rules that establish conformity analysis procedures for highway/mass transit projects and for other (general) federal agency actions. General conformity requirements are potentially applicable to most other federal agency actions but apply only to those

aspects of an action that involve ongoing federal agency responsibility and control over direct or indirect sources of air pollutant emissions.

The EPA conformity rule establishes a process that is intended to demonstrate that the proposed federal action:

- Would not cause or contribute to new violations of federal air quality standards;
- Would not increase the frequency or severity of existing violations of federal air quality standards; and
- Would not delay the timely attainment of federal air quality standards.

The EPA general conformity rule applies to federal actions occurring in nonattainment or maintenance areas when the net increase in total direct and indirect emissions of nonattainment pollutants (or their precursors) exceed specified thresholds. The emission thresholds that trigger requirements of the conformity rule are called de minimis levels. The conformity de minimis thresholds for Sutter County are 50 tons per year of reactive organic compound emissions, 50 tons per year of nitrogen oxide emissions, and 70 tons per year of PM_{10}.

3.11.2 Environmental Consequences

No Action Alternative

The No Action Alternative would continue CVP water deliveries to the Feather Water District under the terms consistent with the Preferred Alternative in the PEIS. Water delivery systems are not in themselves large sources of air pollution emissions. The only identifiable sources of emissions are vehicles used for periodic inspections or maintenance of system facilities. Emission quantities from such sources are small and would continue essentially at past levels. Thus, there would be no net increase in these emissions under the No Action Alternative.

Continuation of CVP water deliveries to the Feather Water District would not result in any major changes in cropping patterns or agricultural management practices in the District. All agricultural lands in the Feather Water District are currently in production, mostly for orchard crops. Thus, the No Action Alternative is not expected to have any indirect effects on air pollutant emissions associated with agricultural land use practices (agricultural equipment emissions, fugitive dust, emissions from agricultural burning, or emissions associated with pesticide use).

The No Action Alternative would not be subject to the EPA Clean Air Act conformity rule because there would be no net increase in direct or indirect emissions from sources that are under federal agency control.

Alternative 1

Alternative 1 is assumed to have similar air quality effects as the No Action Alternative. Therefore, there are no environmental impacts of this alternative.

Alternative 1 would not be subject to the EPA Clean Air Act conformity rule because there would be no net increase in direct or indirect emissions from sources that are under federal agency control.

Alternative 2

Air quality impacts associated with Alternative 2 would be essentially the same as those under the No Action Alternative.

Alternative 2 would not be subject to the EPA Clean Air Act conformity rule because there would be no net increase in direct or indirect emissions from sources that are under federal agency control.

3.11.3 Cumulative Impacts

Implementation of Alternatives 1 and 2 would not contribute to cumulative air quality impacts.

3.12 VISUAL RESOURCES

Physical form and visual character are the result of the interaction of natural and engineered elements. Natural elements, including topography, hydrology, vegetation, and climate, create the basic physical context; engineered elements, including buildings, roads, infrastructure, and settlement patterns, are secondary elements that act upon the natural context to establish a particular physical or visual environment.

In the rural setting of Sutter County, geographic features, including Sutter Buttes, the Feather, Sacramento, and Bear rivers and associated levee systems, localized drainage courses, Butte Sink, and the expansive valley floor, give shape and profile to the natural environment. The county can be divided into two major geographic units—the valley and uplands. In addition, there are six major landscape features or categories of features that contribute to the overall visual and scenic quality of Sutter County, based on soil types, vegetation, and topography—uplands, dissected uplands, valley orchards, valley floor, Butte Sink (in the northwestern portion of the county, north of Butte Slough), and riparian.

The natural features that best describe the Feather Water District are the valley floor and valley orchards. The valley floor is characterized by flat topography and open row or field crop type agricultural uses. This is the largest single physiographic area in Sutter County. The valley floor has an extremely low population density and is dominated by large-scale farming operations. Primary crops based on total acreage are rice, wheat, beans, tomatoes, and various types of hay. The valley orchards are relatively close to Sutter County's rivers and are typically flat. The primary orchard crops in Sutter County, based on acreages harvested are prunes, walnuts, peaches, and pears. Similarly, the

primary orchard crops in the Feather Water District are prunes, walnuts, and peaches (see Table 3-13 in Section 3.4, Land Use).

3.12.1 Affected Environment

Landscape Character Types

Landscape character types are described based on State of California Natural Landscape Provinces (US Forest Service 1976), represented by seven immense provinces with similar physiographies; that is, combinations of landform, vegetation cover, and surface water bodies. A province's landscape character types are based on its total visual character; no single physical characteristic dictates character type, although landform has a stronger influence than other characteristics (Reclamation 1997).

The Feather Water District is encompassed by the Central Valley Province. This province is characterized as predominately lowlands and plains with few hills. This province is mostly agricultural, with areas of wetlands and oak lands, riparian areas along the major watercourses, and numerous small communities throughout the valley.

Wild and Scenic Rivers

Congress created the National Wild and Scenic Rivers System in 1968 (Public Law 90-542; USC 1271 *et seq.*), to preserve rivers and outstanding natural, cultural, or recreational features in a free-flowing condition. High priority is placed on visual resource management of these rivers to preserve or restore their scenic characteristics.

California also has its own system of protected rivers. The California Wild and Scenic Rivers System consists of rivers and river segments established by legislative action because of the extraordinary scenic, recreational, fishery, or wildlife values that the rivers or segments possess in their free-flowing condition.

From the viewpoint of visual resources assessment, all rivers designated as wild, scenic, or recreational by the federal government or state of California are regarded as having high scenic quality. The Feather River is not identified under either the national or state wild and scenic river systems.

Scenic Highways

Scenic highways are roads designated as scenic by the state of California or local agencies. Scenic highways are recognized as having exceptional scenic qualities or affording panoramic vistas. There are no officially designated state scenic highways or roads eligible for designation in the Feather Water District project area or in Sutter County (Caltrans 2000 and Caltrans 1992, as cited in Reclamation 1997). However, there are a number of visually and aesthetically scenic roadways throughout the county, particularly those along the Feather River (Sutter County 1996a).

3.12.2 Environmental Consequences

Impacts on visual resources depend primarily on changes in cropping patterns, which may result in increased fallowed lands and associated modified agricultural viewsheds.

No Action Alternative

Under the No Action Alternative, no substantial change in irrigated acreage would be expected in the District. (see Section 3.2, Agricultural Economics). Therefore, anticipated changes to agricultural viewsheds under the No Action Alternative would be minimal.

Alternative 1

Alternative 1 is assumed to have similar effects to visual resources as the No Action Alternative. Therefore, there are no visual resources impacts of this alternative.

Alternative 2

Under Alternative 2, changes in irrigated acreage would be small, ranging from a increase of 20 acres to a reduction of 190 acres in a series of dry years (see Section 3.2, Agricultural Economics). The largest reduction in acreage for a single crop type (up to 130 acres) would be for rice. However, the overall effect of this alternative on the amount of irrigated acreage would be small, less than two percent, under all water year scenarios. General cultivated and fallowed acreage patterns would be similar to historical patterns, and agricultural viewsheds under Alternative 2 would be similar to conditions described above in Affected Environment. This impact would be minimal.

3.12.3 Cumulative Impacts

Implementing Alternatives 1 and 2 would not contribute to cumulative impacts on visual resources.