DRAFT ENVIRONMENTAL IMPACT REPORT

VENTURA RIVER CONJUNCTIVE USE AGREEMENT

June 1978

Report on the Environmental Impacts of
the Proposed Agreement Between
Casitas Municipal Water District
and the City of San Buenaventura
for Conjunctive Use of the
VENTURA RIVER - CASITAS RESERVOIR SYSTEM

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INTRODUCTION

The Environmental Impact Report documents the analysis of existing conditions and expected impacts in the Ventura River-Casitas Reservoir system as a result of proposed changes in the manner in which the Casitas Municipal Water District (CMWD) and the City of San Buenaventura (the City) divert water from the Ventura River. Following this introduction (Chapter I) the environmental impacts of the proposed agreement are summarized in Chapter II.

Chapter III discusses the history, objectives and basic concepts of the proposed Conjunctive Use Agreement. Chapter IV is a discussion of alternatives to the proposed agreement with emphasis on the choices under the no project alternative. Chapter IV also introduces five alternative operational schemes that were evaluated in this study.

Present environmental conditions are described in Chapter V. These were assessed by review of existing data and reports; consultation and meetings with the staff and engineering consultants of CMWD and the City; field studies conducted during the winter of 1976-77; additional consultation with representatives of other federal, state, and local agencies; and communication with members of special-interest groups and other interested individuals. Two public meetings were held at the Oak View Elementary School (Oak View, California) on the evenings of January 27, 1977 and April 19, 1977, to seek background information and to share preliminary findings about impacts.

Extensive studies of the aquatic habitat of the Ventura River were made to determine the presence and extent of remaining native steelhead and to evaluate the aquatic habitat for its present and potential ability to support a steelhead fishery. Supporting information and analysis of aquatic biology crucial to the conclusions of this EIR is included in Appendix C.

The expected environmental impacts of the proposed agreement are presented in Chapter VI. Unavoidable Environmental Effects and Growth-Inducing Impact are discussed in Chapters VII and IX and the impacts are summarized in Chapter II. Mitigation measures proposed to reduce the level of impact are presented in Chapter VIII. Five other schemes for developing or operating the Ventura River system are evaluated in Chapter X in such a way that permits their objectives, engineering and economic requirements and environmental effects to be compared to the attributes of proposed agreement and the "no project" alternative.

This EIR was prepared in conformance with the California Environmental Quality Act of 1970 according to the amended guidelines (Title 17, California Administrative Code, Section 14). No initial study (Section 15080 of the guidelines) was made since CMWD and the City decided early in the process that an EIR should be prepared. For this reason, the EIR contains no discussion of possibly significant effects (identified in an initial study) that were found in the course of the study not to be significant.

As permitted by Section 15143.1 of the guidelines this EIR omits specific discussion of subsections (e) and (f) of Section 15143 (17 California Administrative Code 14), namely:

(e) The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity, and (f) any significant irreversible environmental changes which would be involved in the proposed action should it be implemented.

II. Summary

Chapter II

SUMMARY

Execution of the proposed Conjunctive Use Agreement between the City and CMWD would change the operation of the Ventura River-Casitas Reservoir system. The downstream bypass of the first 20 cfs of flow at Robles Diversion Dam would be discontinued, and all flows up to the 500-cfs capacity of the diversion canal would be diverted. The loss of water available to users downstream from the Robles dam (including the City, irrigators, and other public water purveyors) would be made up by CMWD with water from Casitas Reservoir.

The conjunctive use operation would increase the average yield to the City and to the system as a whole and would significantly increase the reliability of the City's supply. In addition, the consummation of the agreement would settle the dispute between the City and CMWD over water rights in the river. The proposed project will make better use of the storage capacity of the Reservoir and will make more water available for use during periods of below normal rainfall. Casitas Reservoir will receive increased inflow but will have to meet increased demands, with little net effect on reservoir levels. The City and other water diverters will benefit from increased water supply reliability, as dry-year deficiencies will be made up by deliveries from Casitas Reservoir.

Increasing the water yield of the system under the proposed agreement would have several effects on the environment that relate to the reduction of surface flows and groundwater levels.

Surface water flows below Robles Dam will be reduced. There will be no effect on winter flood flows; but, between storms, winter and spring flows will be reduced by about 2 cfs. Summer flows will also be reduced and periods of little or no flow will occur earlier in the season and will be more prolonged than in the past.

Groundwater recharge in the basin above Foster Park will be reduced and groundwater levels will tend to drop more rapidly when water is pumped from wells. This may cause an increase in total dissolved solids and boron in the groundwater during droughts.

The reduction of surface flows and groundwater levels will alter aquatic habitat conditions in the Casitas Springs live stretch of the river upstream from Foster Park past the confluence of San Antonio Creek. This spring-fed live stretch is the principal remaining spawning and rearing habitat for the remnant population of native steelhead trout and is estimated to support a population of 100 adults. Reduction of flow in this part of the river, an effect of the proposed agreement, will significantly increase the risk of eliminating the remnant run of steelhead.

It is important to understand that conditions for steelhead are far from perfect in the Ventura River. Many factors have reduced the suitable habitat for steelhead and thus jeopardize survival of the remnant steelhead population. These factors include low flows, wastewater effluent, high summer water temperatures, and human activity in the river channel including dams. Under existing conditions, there is a considerable potential for loss of the remnant steelhead population.

Mitigation of the expected surface flow and groundwater impacts in the Casitas Springs live stretch of the river may be possible by limiting the drawdown of the groundwater basin above Casitas Springs; by artificially maintaining flow from a new or existing well in the upstream basin; or by releases from the CMWD distribution system into San Antonio Creek just upstream from the San Antonio Creek-Ventura River confluence. The degree to which such mitigation efforts would reduce the severity of impacts on aquatic biota depends on the volume and timing of maintenance flows. With well-timed flows of sufficient volume it may be possible to improve the quality of the present habitat for steelhead.

With the prolonged lowering of the groundwater basin and the reduction of surface flows, drought conditions on the river between Robles Dam and Foster Park will prevail for longer periods and some changes in the species composition of riparian vegetation are expected. Changes in riparian habitat and reduction of surface water flows are also likely to result in reduction of available habitat and carrying capacity for some terrestrial wildlife species.

III. The Proposed Action

Chapter III

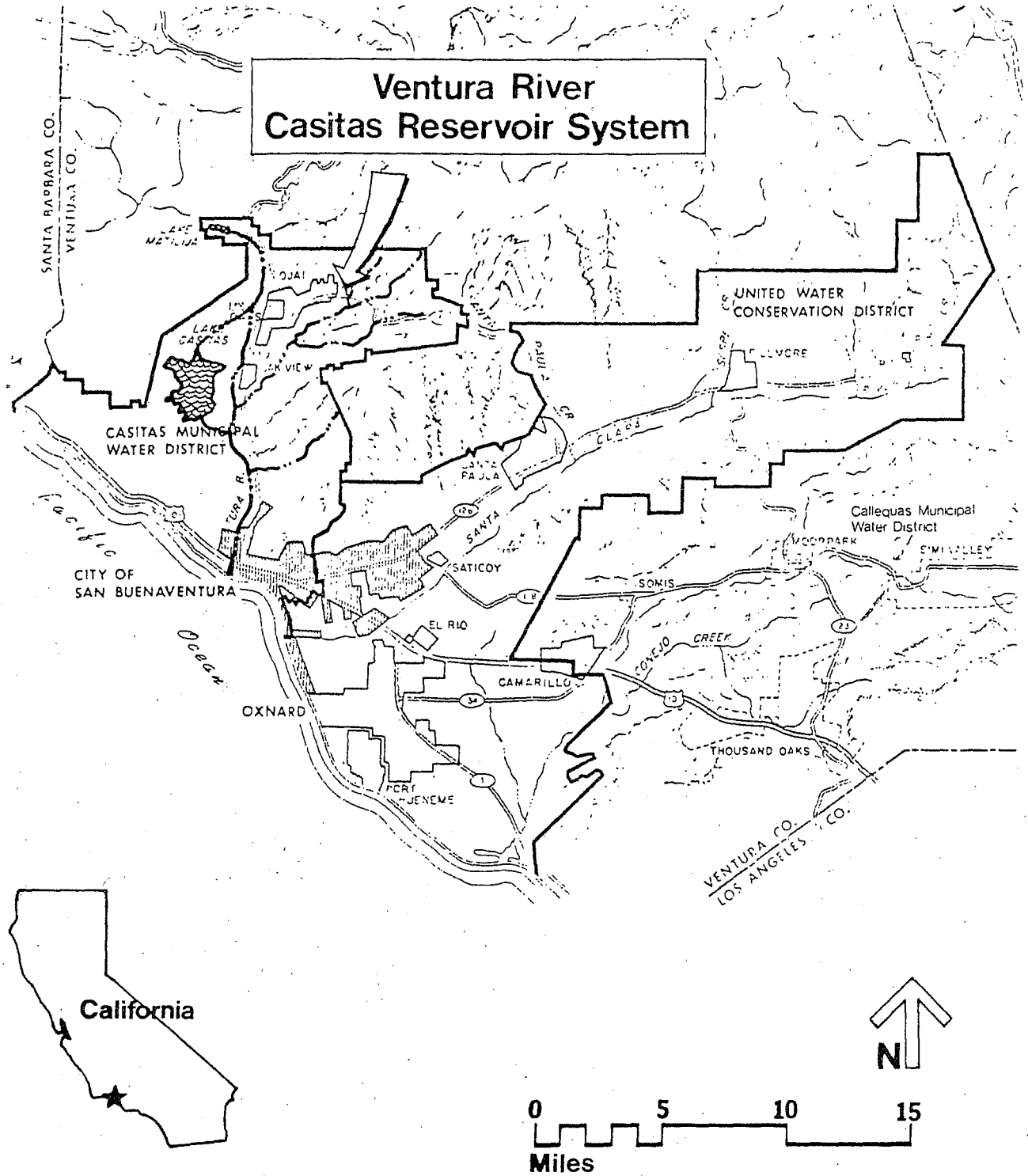
DESCRIPTION OF THE PROPOSED ACTION

The Casitas Municipal Water District (CMWD) and the City of San Buenaventura (City) (see Figure III-1) have negotiated a proposed Conjunctive Use Agreement (Appendix B of this EIR) that defines a new set of criteria for diverting and utilizing water from the Ventura River in order to maximize the safe yield and to reduce dry-year deficiencies from the Ventura River-Casitas Reservoir system. In addition to increasing the combined safe yield of the system under revised operating criteria, the execution of the proposed agreement would settle a long-standing water rights dispute between CMWD and the City.

The present operating conditions, the history and objectives of the proposed Conjunctive Use Agreement, and the proposed operating conditions are discussed in this chapter.

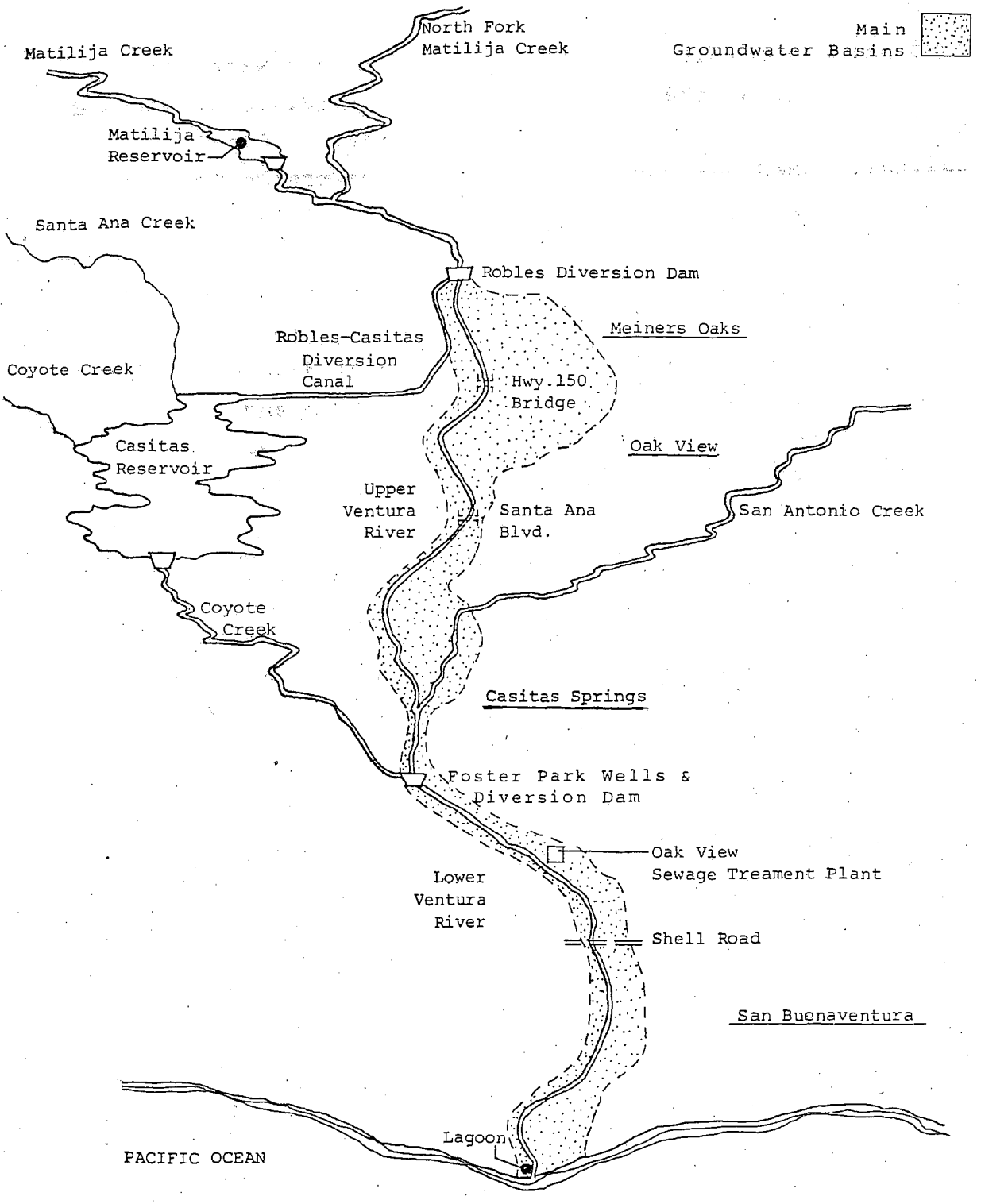
CONDITIONS UNDER THE PRESENT OPERATING CRITERIA

The principal features of the Ventura River-Casitas Reservoir system are shown in Figure III-2. These are described in some detail in Chapter V. CMWD and the City are two of the principal water diverters on the Ventura River. The City diverts water from the Ventura River at its Foster Park wells and surface diversion. The Foster Park facilities have been owned and operated by the City since 1923 and have appurtenant water rights dating back to 1870.



Regional Location

Figure III-1



Ventura River · Casitas Reservoir System

Figure III-2

CMWD holds a permit to appropriate and divert water from the Ventura River at the Robles Diversion Dam (Plate III-1) and to convey it via the Robles-Casitas Diversion Canal to Lake Casitas. CMWD has operated the Robles Diversion Dam since completion of the Ventura River Project in 1959 according to operating criteria developed by CMWD (then called the Ventura River Municipal Water District) and the Ventura County Flood Control District. The initial operating criteria, which were adopted in 1959 for a trial period of five years, still govern the operation of Robles Diversion Dam and the Ventura River system. The initial operating criteria appear as Appendix A of this EIR.

In general, under the 1959 operating criteria, CMWD must allow the first 20 cubic feet per second (cfs) of surface flow at Robles Diversion Dam to pass down the Ventura River to provide for downstream rights (including the City's). CMWD may divert flows in excess of 20 cfs (when available) but not more than 500 cfs, the maximum capacity of the diversion canal.

The initial operating criteria provide that the 20-cfs downstream release shall be increased or decreased according to certain groundwater and surface flow conditions along the river. The downstream release from Robles Dam must be increased if the upper Ventura River groundwater basin is abnormally low and needs replenishment. The 20-cfs downstream release may be decreased if surface flow occurs at Santa Ana Boulevard or if rising water in the Ventura River above the mouth of San Antonio Creek occurs in such volume that downstream flows are greater than flows necessary to supply all downstream water diverters and water would flow to the ocean.

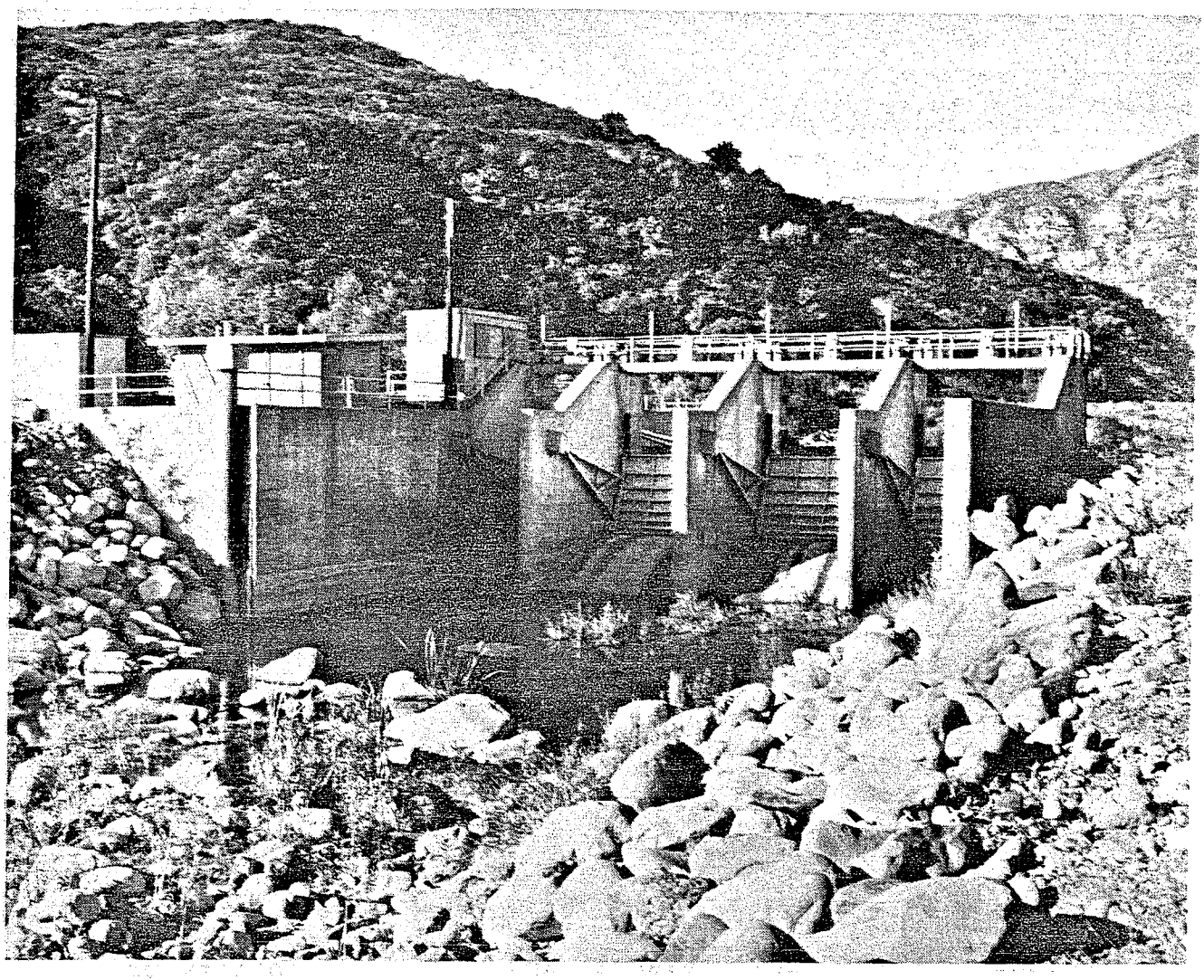


Plate III-1 Robles Diversion Dam, looking upstream at bypass gate (December 12, 1976)

Under the proposed agreement, the operation of Robles Dam would be modified; present minimum downstream releases would be eliminated and more water would be diverted to Casitas Reservoir.

Historic Yield

The U.S. Bureau of Reclamation has estimated the safe yield of Casitas Reservoir under the 1959 criteria to be about 20,350 acre-feet per year (AF/Y). The operation studies done by Stetson Engineers, the city's engineering consultant, and CMWD's staff validate the Bureau's estimate.

Between 1961 and 1976 the City had an average yield of 5091 AF/Y from its Foster Park facilities. In this period, the highest was 7714 AF in 1973 and the lowest was 1706 AF in 1961. The lowest yield in recent history was 1463 AF pumped in 1951 (Shelley Jones, Director of Public Works; memorandum to Edward E. McCombs, City Manager; March 7, 1977).

Problems with the Present Operations

Since 1959, when CMWD began diverting water from the Ventura River at the Robles Diversion Dam, several problems have been identified that have led to dispute and subsequent negotiations between the City and CMWD. These problems relate to the natural seasonal and annual variability of precipitation and flows in the Ventura River and to claims of the City and CMWD to the variable flows of water in the river. The proposed conjunctive use operation of the Casitas Reservoir-Ventura River system would resolve these problems.

Disputed Water Rights. The City believes its water rights in the Ventura River are impaired by CMWD's present operations in that water rightfully belonging to the City is diverted to Casitas Reservoir (Thomas Stetson Engineers, 1964).

CMWD believes that operation of Robles Diversion Dam under the present operating criteria has provided sufficient water

to meet the requirements of downstream users, including the City.

Loss of Water to the Ocean. On occasion, under the present operating criteria, water that could be diverted and stored in Lake Casitas (under different operating criteria) flows instead to the Pacific Ocean.

Consider, for example, a situation in which CMWD is releasing 20 cfs at Robles Dam to provide for the downstream water rights of the City and other diverters and a storm occurs that would fill the Upper Ventura River groundwater basin in a matter of days, even without any downstream release at Robles Dam. The volume of water released at 20 cfs prior to the storm is irretrievable, and stormwater runoff in excess of the remaining storage capacity of the groundwater basin and the 21-cfs capacity of the City's Foster Park diversion continues downriver to the Pacific Ocean. CMWD would like to divert and store this water for beneficial use in the district.

Lack of Reliability of the City's Ventura River System. The City claims a large water right from the Ventura River, but it lacks the storage capacity to develop a firm supply. The great disparity between the average annual yield and the yield in a critical dry year (5091 AF/Y average for 1961-1976; 1463 AF in 1951) makes the City's Foster Park water supply widely variable. In the dry years the City must purchase supplemental water from CMWD. Because the years of below average runoff cause the City expense for supplemental water and cause CMWD long-term drawdown on storage in Lake Casitas, both the City and CMWD would like to increase the safe yield of the water supply in the upper Ventura River system.

The safe, or firm, yield of a water supply is the amount of water that can be drawn annually from storage, including the years of drought as long and intense as the worst on record. The U.S. Bureau of Reclamation (1954) has defined safe yield as the "firm annual yield obtainable over the most critical runoff period of record under the most critical sedimentation conditions."

The concept of safe yield is somewhat different as applied to Casitas Reservoir and the Foster Park facilities, since the most critical period of record is not the same for all sizes of reservoir. In general, for smaller reservoirs (e.g., the Ventura River groundwater basin, which supplies the City's Foster Park facilities), the most intensive drought is critical, while for larger reservoirs (e.g., Lake Casitas), the drought with the greatest product of length times mean deficiency is critical. While in actual experience the groundwater yield to the City has been as low as 1463 AF (in 1951), the safe yield of the Foster Park facilities has been estimated at 3000 AF/Y. The safe yield for Lake Casitas has been estimated at 20,350 AF/Y by the U.S. Bureau of Reclamation.

HISTORY AND OBJECTIVES OF THE PROPOSED AGREEMENT

As demands on the water supplies of the two agencies have increased, there has been growing interest in improving the reliability and increasing the total yield of the Ventura River system.

In March 1973, CMWD and the City began negotiations to develop a conjunctive use program that would maximize the combined safe yield of the Ventura River-Casitas Reservoir

system. Conjunctive use of the Ventura River system would provide a basis for meeting the primary objectives of the City and CMWD:

- Settle disputed water rights claims between the City and CMWD without resorting to the lengthy and expensive water rights adjudication process in the courts.

- Increase and improve the reliability of the yield of water from the Ventura River-Casitas Reservoir system and reduce the severity of dry-year deficiencies.

Additional benefits from conjunctive use of the river and reservoir under a new set of operating criteria include provision by CMWD of a firm annual supply of water to other agricultural and municipal water users in the Ventura River system. The proposed project will make better use of the storage capacity of Casitas Reservoir and will make more water available for beneficial use during periods of below-normal rainfall.

Representatives of the two agencies determined early in the negotiations, which began in March 1973, that it would be advantageous to the residents and taxpayers of CMWD (with 46,000 residents) and the City (with 63,000 residents), to avoid costly litigation, especially because 21,000 of the City's residents living on the west side live within the water district as well. It was agreed that the problem should be approached on the basis of seeking an agreement that would be the most beneficial to both agencies and would not adversely affect other users. The negotiations have been aimed at avoiding the necessity of a court adjudication of all rights to divert from the Ventura River system,

including its interconnected groundwater basins, and at the same time maintaining each agency's water rights in the river and increasing the total yield of the system.

Conjunctive Use Studies

During the negotiations, consultants for the City and CMWD conducted engineering studies to determine the feasibility of maximizing total yield of the Ventura River system to the benefit of both agencies and their users.

A computer model of the Ventura River system was constructed to analyze the potential for increasing the average water yield by operating the diversions from the river according to various operating criteria. On the basis of the computer studies, the consultants to the City and CMWD have recommended the proposed set of criteria stated in the proposed Conjunctive Use Agreement (see Appendix B of this report).

The negotiations resulted in the drafting of the proposed agreement between the City and CMWD and in the execution of a Memorandum of Understanding regarding the proposed agreement by the agencies on July 15, 1976. The Memorandum of Understanding provides that the proposed agreement may be signed only following the preparation and adoption of an Environmental Impact Report in conformance with the California Environmental Quality Act of 1970 (as amended) and certain other studies, including the effect of the turbidity of surface flows upon the ability of the City to divert those surface flows. Turbidity studies were started in September, 1977, but conclusive results of these studies are not yet available.

CONDITIONS UNDER THE PROPOSED OPERATING CRITERIA

Under the terms of the proposed agreement, the trial operating criteria would be modified and CMWD would divert all flows up to 500 cfs at Robles Diversion Dam. The 20-cfs downstream release, which now supplies downstream users, would no longer be made. Flows in excess of the 500-cfs capacity of the Robles-Casitas Diversion Canal would continue to pass downriver.

Under the proposed agreement, CMWD would guarantee a firm supply of water to the City and to other individuals and water agencies that divert water from the Ventura River below the Robles Diversion Dam.

To ensure that the City's water supply is protected, the proposed agreement includes an assurance by CMWD that at least 6000 AF annually will be available to the City from the Ventura River. In a dry year, when the City is unable to produce 6000 AF from its wells and diversion facilities, CMWD will make up the difference from storage in Lake Casitas. The proposed agreement requires that the City be responsible for diverting water at its Foster Park diversion facilities in whatever amounts are available, up to the full capacity of its present and future wells and diversion facilities.

While in the past the City has pumped an average of about 5000 AF/Y, the City's consulting engineers estimate that the City could increase its pumping from the river to an average 6240 AF/Y by diverting up to 7300 AF/Y without altering the existing facilities at Foster Park (Stetson Engineers, Ventura River-Casitas Reservoir conjunctive use studies, May 1977). The average annual water production by the City from

Foster Park under the proposed agreement will be 6000 AF or more, depending on the objectives of the City.

To ensure other water users below Robles Dam of the protection of their supplies, CMWD intends to negotiate similar agreements with each user if necessary. Like the proposed agreement between the City and CMWD, such agreements, if necessary, would provide each user with a firm, basic supply as an assurance that the proposed operation would not encroach upon the user's existing supply. CMWD would negotiate with these water users regarding the maintenance of their water supplies under the proposed operation. Some additions to the CMWD distribution system would be necessary to deliver makeup water to these other water diverters.

EFFECT OF THE PROPOSED OPERATING CRITERIA ON AVERAGE SUPPLY AND RELIABILITY OF SUPPLY

In 1977 additional computer studies were made of the yield of the Ventura River-Casitas Reservoir system under various operating criteria that would simulate present and possible future operations of the system, both with and without the proposed agreement. Table III-1 shows the range of likely alternatives under serious consideration by CMWD and the City. The results of the computer studies for these alternatives are summarized in Table III-2. Table III-2 allows direct comparison of the effect of alternative operations on yields to the various water diverters in the Ventura River-Casitas Reservoir system. Column 1 identifies the computer run according to three assumptions in the study: The annual demand objective of the City, in acre-feet; the basic quantity, in cubic feet per second, bypassed down the river at Robles Diversion Dam; and the assumed annual diversion from storage

Table III-1. ALTERNATIVES UNDER SERIOUS CONSIDERATION

Action	City Choices	Computer Study Number
Project		
- Agreement between City and CMWD - No minimum bypass at Robles Diversion Dam - CMWD guarantees 6000 AF/Y to City	Assumption 1: City continues to pump 6000 AF/Y as in past	6,000/0/20,000
	Assumption 2: City increases pumping to 7300 AF/Y	7300/0/20,000
No Project		
- No agreement between City and CMWD - Continued 20-cfs minimum bypass - CMWD yield about 20,000 AF/Y - Water rights issue remains unresolved and litigation may result	Assumption 1: City continues to pump 6000 AF/Y as in past (continue existing operations)	6000/20/20,000
	Assumption 2: City increases Foster Park pumping to 7300 AF/Y	7300/20/20,000

Table III-2. YIELD SUMMARY, VENTURA RIVER-CASITAS RESERVOIR CONJUNCTIVE USE STUDIES
(Period of Record: 1939-1973)

Study Number	Condition	Annual Demand (AF)	Average Annual Yield (AF)	Average Annual Shortage (AF)	Number of Years with Shortage	Number of Years City Yield Less Than 6000 AF	Number of Years CMWD Yield Less Than 20,000 AF	Minimum Yield (AF)	Maximum Shortage (AF)	Maximum Shortage (percent)	Storage At End Of Study Period (AF)
				CITY OF SAN BUENAVENTURA							
6000/20/20,000	20 cfs by Robles	6,000	5,440	560	9	9	-	760	5,240	87	-
6000/0/20,000	Conjunctive	6,000	6,000	0	18	1	-	4,490	1,510[a]	25[a]	-
7300/20/20,000	20 cfs by Robles	7,300	6,240	1,060	12	10	-	760	6,540	90	-
7300/0/20,000	Conjuctive	7,300	6,620	680	19	2	-	3,540	3,760[a]	52[a]	-
6000/0/20,400	Conjunctive	6,000	6,000	0	2	2	-	3,320	2,680[a]	45[a]	-
7300/0/20,400	Conjunctive	7,300	6,620	680	20	3	-	3,530	3,770[a]	52[a]	-
				CASITAS MUNICIPAL WATER DISTRICT							
6000/20/20,000	20 cfs by Robles	20,000	20,000	0	0	-	0	20,000	0	0	100,110
6000/0/20,000	Conjunctive	20,000	19,900	100	1	-	1	16,490	3,510	18	118,700
7300/20/20,000	20 cfs by Robles	20,000	20,000	0	0	-	0	20,000	0	0	96,650
7300/0/20,000	Conjunctive	20,000	19,780	220	3	-	3	12,760	7,240	36	115,800
6000/0/20,400	Conjunctive	20,400	20,170	230	3	-	1	13,000	7,400	36	114,740
7300/0/20,400	Conjunctive	20,400	20,050	350	4	-	3	12,730	7,670	38	111,980
				OTHER UPSTREAM USERS BELOW ROBLES							
6000/20/20,000	20 cfs by Robles	2,200	1,930	270	9	-	-	0	2,200	100	-
6000/0/20,000	Conjunctive	2,200	2,180	20	1	-	-	1,470	730	33	-
7300/20/20,000	20 cfs by Robles	2,200	1,800	400	13	-	-	0	2,200	100	-
7300/0/20,000	Conjunctive	2,200	2,170	30	3	-	-	1,310	890	40	-
6000/0/20,400	Conjunctive	2,200	2,170	30	3	-	-	1,310	890	40	-
7300/0/20,400	Conjunctive	2,200	2,140	60	4	-	-	1,000	1,200	55	-
				OTHER UPSTREAM USERS ABOVE ROBLES[b, c]							
6000/20/20,000	20 cfs by Robles	2,800	2,340	460	27	-	-	1,110	1,690	60	-
6000/0/20,000	Conjunctive	2,800	2,340	460	27	-	-	1,110	1,690	60	-
7300/20/20,000	20 cfs by Robles	2,800	2,340	460	27	-	-	1,110	1,690	60	-
7300/0/20,000	Conjunctive	2,800	2,340	460	27	-	-	1,110	1,690	60	-
6000/0/20,400	Conjunctive	2,800	2,340	460	27	-	-	1,110	1,690	60	-
7300/0/20,400	Conjunctive	2,800	2,340	460	27	-	-	1,110	1,690	60	-

Source: Stetson Engineers, June 1977.

[a] Under the proposed agreement, CMWD will make up shortages to ensure the City an annual supply of 6000 AF.

[b] Surface diversions.

[c] Results are the same because the operation of the Casitas Project does not interfere with those diversions.

in Lake Casitas by CMWD, in acre-feet. For example, Study 6000/20/20,000 represents the existing operations, with the City attempting to pump 6000 AF/Y from Foster Park, CMWD allowing a bypass of 20 cfs at Robles Dam, and assuming annual deliveries of 20,000 AF of water from Lake Casitas.

Conditions under the proposed agreement are represented by Studies 6000/0/20,000 and 7300/0/20,000. The two studies indicate a range of possible production (6000 to 7300 AF) by the City. The proposed agreement does not place an upper limit on the City's annual diversion, but instead encourages the City to increase its diversions to achieve increased system yield.

The City demand of 6000 AF represents a pumping level as in the past, and 7300 AF represents an annual production available to the City should it attempt to maximize pumping using the existing equipment at Foster Park.

Possible yield under the "no project" alternative is represented by Study 6000/20/20,000 (which approximates existing conditions) and Study 7300/20/20,000 since the City, with or without the agreement, has the choice of increasing its pumping at Foster Park.

Effect on the City's Ventura River Supply

Expected benefits to the City are an increase in average yield, a reduction of the number of years with a deficiency of supply, and a strong reduction of the severity of deficiencies when they do occur.

According to the computer studies, the City's average yield would be increased from 5440 AF/Y, under present operations, to a volume between 6000 and at least 6620 AF/Y, depending on the City's pumping objectives.

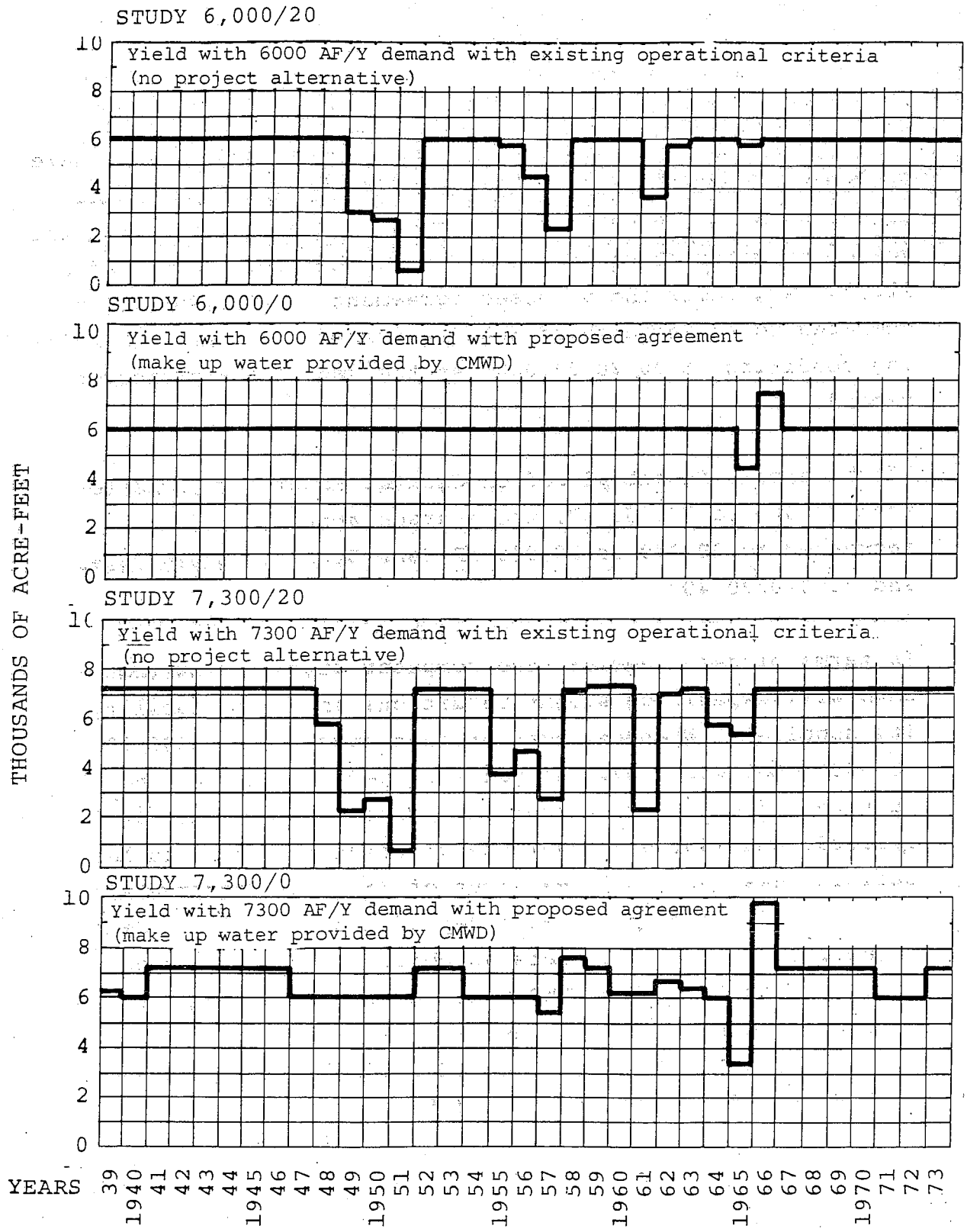
More important than the increase in average yield is the guarantee that 6000 AF will be made available to the City in dry years. During the historic critical dry year (1951), the City withdrew only 1463 AF. Under existing operations (6000/20/20,000), in certain dry years the City may be able to draw as little as 760 AF/Y. This represents a maximum shortage of 87 percent of the average annual supply. Under the proposed agreement, the City would be guaranteed 6000 AF/Y by CMWD.

According to the studies, under present operations (6000/20/20,000) the City would have experienced a yield of less than 6000 AF in 9 years of the 35-year period of record (1939-1973). Under the proposed agreement (6000/0/20,000 and 7300/0/20,000), the City would have experienced a yield less than 6,000 acre-feet in 18 years of 35, but CMWD would have made up the deficiency in all but one or two years.

Figure III-3 shows the City's annual yield, for four alternatives, over the period of record.

Effect on Casitas Municipal Water District's Supply

Table III-2 shows a slight drop in the average annual yield from Lake Casitas, from 20,000 AF under existing conditions (6000/20/20,000) to a range of 19,900 to 19,780 AF under the proposed agreement (6000/0/20,000 to 7300/0/20,000).



Annual Yield to City

Annual Yield to City under Operational Alternatives

SOURCE: STETSON ENGINEERS, June 1, 1977

Figure III-3

This apparent slight reduction in the average yield from Lake Casitas shown in the computer studies with the CMWD demand criteria set at 20,000 AF/Y is somewhat misleading, since the volume of water stored in Lake Casitas had been increased by 118,700 AF, under the proposed agreement (6000/0/20,000) as compared to an increase of 100,110 acre-feet under the existing condition (6000/20/20,000) at the end of the period of record.

If the annual demand placed on Casitas Reservoir increases from 20,000 to 20,400 AF, the average annual yield is increased to 20,170 or 20,050 AF (see Studies 6000/0/20,400 and 7300/0/20,400).

In terms of deficiencies, the computer studies show that CMWD will experience slight reductions in the reliability of its supplies. Whereas under present operations (6000/20/20,000) CMWD would have no years of deficiency over the 35-year period of record, under the proposed agreement (6000/0/20,000 and 7300/0/20,000) the District is likely to have deficiencies in 1 to 3 years out of 35. The occurrence and severity of deficiencies will depend upon the City's demand objective. If the City sets an objective of pumping only 6000 AF annually, then CMWD would have a deficiency of 18 percent 1 year in 35. If the City sets an objective of pumping 7300 AF annually, then CMWD would have deficiencies in 3 years of 35. The maximum deficiency would be 36 percent.

Effect on Other Upstream Users

While other upstream users between Robles Diversion Dam and Foster Park will benefit from a somewhat higher annual average yield under the proposed agreement, the most significant benefit is the reduction of the number of years they would suffer deficiencies in their own supplies. In actuality,

most of these water users now purchase water from CMWD to supplement what they are able to produce from their own wells. Under the proposed agreement, CMWD may supply makeup water to these users if it is demonstrated that well owners are unable to produce their historical amounts because the groundwater basin is low due to operation under the proposed agreement.

Upstream users above Robles Diversion Dam will not be affected by the proposed agreement or by alternative operations worked out between the City and CMWD.

SUMMARY

In summary, implementation of the proposed agreement between the City and CMWD would combine water supplies from the Ventura River surface flow and groundwater basin with the storage capacity of Lake Casitas. The conjunctive operation would increase the average annual yield of the Ventura River system. It should also provide a more firm yield to water users on the Ventura River-Casitas Reservoir system, and reduce the deficiencies experienced during periods of drought. And, finally, the proposed agreement would settle a long-standing dispute over water rights between the two agencies, which otherwise may require extensive litigation. Avoidance of the adjudication process would save the taxpayers of both the City and CMWD, including all of the water-rights holders within the Ventura River system, substantial expense.

IV. Alternatives

Chapter IV

ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the operation of the Ventura River-Casitas Reservoir system under the proposed Conjunctive Use Agreement include continued operation under the present operating criteria, which may be considered the "no action" or "no project" alternative, and several other schemes for operating the Ventura River-Casitas Reservoir system. The "no action" alternative is discussed in this chapter. Other operational schemes evaluated in this study are identified in this chapter and are discussed at length in Chapter X.

CONTINUED OPERATION UNDER THE PRESENT CRITERIA

If the proposed Conjunctive Use Agreement is not executed in its present or modified form, CMWD will continue to operate the Robles Diversion Dam according to the initial operating criteria, whereby (under most conditions) the District allows a flow of 20 cfs to pass downstream at the dam.

Whereas without the proposed agreement CMWD is obligated to continue as it has in the past, the City has a range of possible actions from which it may choose. These actions relate to various demand objectives the City may set for withdrawal of water from its Foster Park facilities. As a minimum, the City could set as an objective to pump 5000 to 6000 AF, approximately what it has withdrawn in the past.

The City could set an objective to maximize the withdrawal of water from Foster Park using its present facilities, in which case the City's engineers estimate an average annual

production of 7300 AF is possible (assuming the pumps were able to operate with 10 percent downtime for scheduled and unscheduled maintenance).

The City could withdraw more than 7300 AF/Y from the Ventura River if it chose to increase the capacity of its Foster Park facilities. Such an expansion of pumping capacity by adding new wells may reduce the supply available to upstream wells.

While it is possible for the City to increase its average annual yield from the Ventura River on its own, the City can do little to improve the reliability of its Foster Park supply without entering into the proposed Conjunctive Use Agreement.

Continued operation under the present criteria does not offer an adequate basis for settlement of the water rights dispute between the City and CMWD. The City continues to claim a sizable water right in the Ventura River, but because of inadequate storage capacity of its own will continue to face serious deficiencies in supply in dry years. The City's water supply from the Ventura River will remain unreliable. Its average annual yield will be on the order of 6000 to 7300 AF, but yield in a critical dry year may again be as low as the 1463 AF produced in 1951.

OTHER OPERATIONAL SCHEMES

Because of considerable interest in the Ventura River expressed by various agencies and interest groups, and in order to gain a better understanding of the full range of operational opportunities, various alternative operational schemes were evaluated in this study. This evaluation of

the range of operational schemes has provided the opportunity to address the attributes of other schemes and to discuss whether the various alternatives would accomplish the basic objectives of the City and CMWD. The implications of the following alternative operational schemes are discussed in Chapter X:

- Increase the minimum bypass flow at Robles Dam from 20 to 40 cfs.
- Enlarge Robles Diversion Dam and Robles-Casitas Diversion Canal to 2200 cfs.
- Release increased yield from conjunctive operation to Coyote Creek.
- Deliver water used by oil companies for secondary recovery operations by releasing upstream and delivering via Ventura River.
- Improve Foster Park facilities.

V. Existing Conditions

Chapter V

DESCRIPTION OF EXISTING CONDITIONS

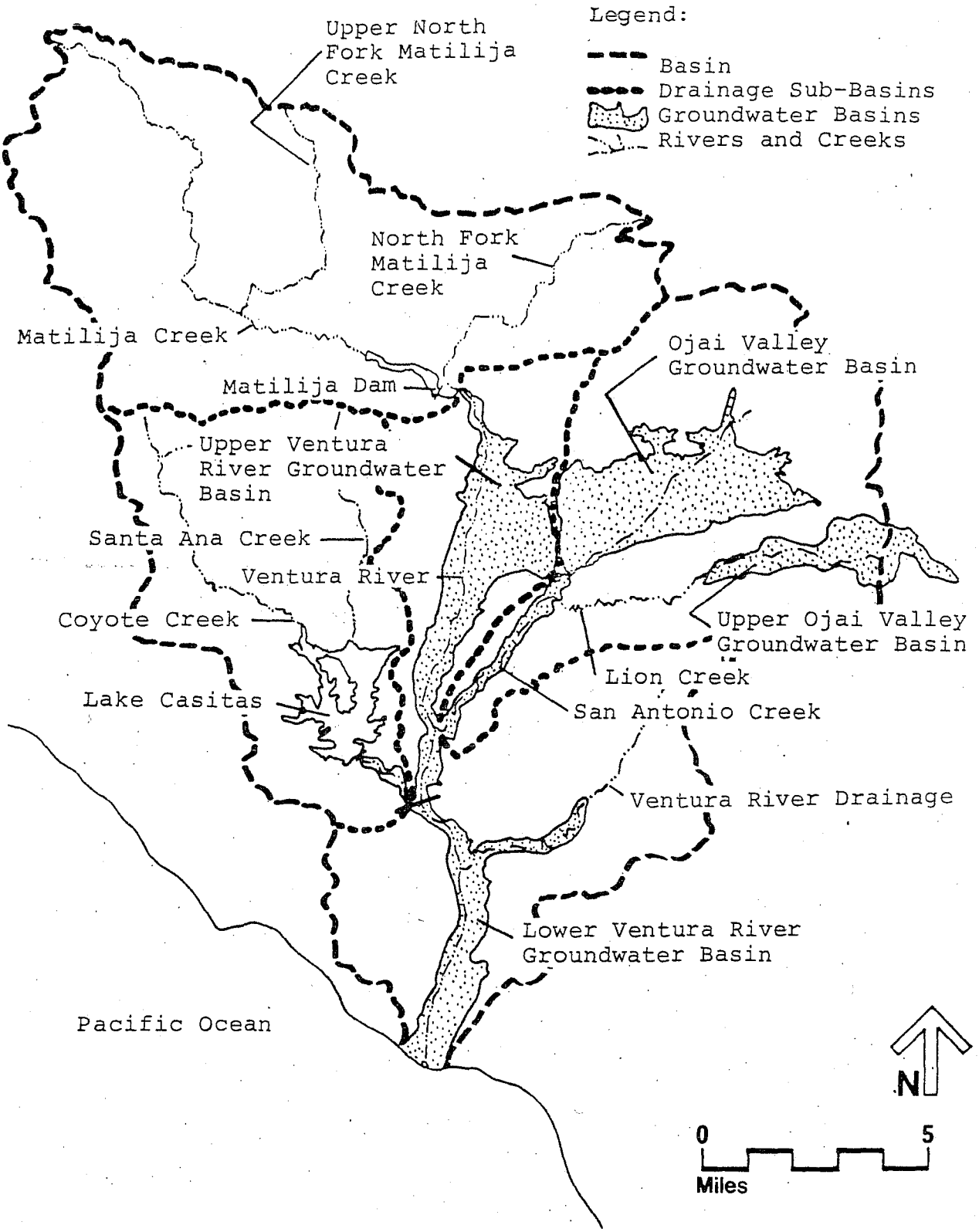
PHYSIOGRAPHY OF THE VENTURA RIVER DRAINAGE

The Ventura River drains a 228-square-mile tract of coastal terrain, mostly within Ventura County, that extends 25 miles inland from the mouth of the river at the city of San Buenaventura. The northern interior half of the drainage area consists of primitive mountainous terrain of the Los Padres National Forest, with mountain peaks as high as 6000 feet and intervening steep, narrow canyons. The upland extensions of the Ventura River into this area consist of two branches of Matilija Creek. The lower 16.5 miles of the Ventura River (below Matilija Reservoir) and its several downstream tributaries, the largest of which are San Antonio and Coyote creeks, drain coastal foothills and agricultural or urbanized valleys. Figure V-1 shows the Ventura River drainage area, the river and its main tributaries, divides between subdrainages, and groundwater basins underlying the area.

CLIMATE AND RAINFALL

The climate in the watershed is the typical Mediterranean climate of coastal Southern California, with dry, warm summers and mild winters that have widely varying amounts of rainfall from year to year.

Most rainfall occurs from December through March, mainly as a result of Pacific-type storms, each of which usually lasts



Ventura River Drainage Basin

from Turner, 1971

Figure V-1

for several days. Winter thunderstorms also occur in the area, sometimes causing intense short-term rainfall. Mean annual precipitation varies from 14 inches at the coast to 35 inches in the mountainous interior.

At Ojai, which lies in the center of the basin, records for the past century indicate that annual precipitation varies from as little as 4 inches to more than 40 inches, with a mean of 21.4 inches. Table V-1 shows the pattern of rainfall at the county fire station at Ojai for the past 20 years.

During the past year (until February 1977) drought conditions have been interrupted by three storms. In September 1976, the Ojai station reported 5 inches of rainfall (25 percent of season average) occurring in two storms, one in the middle, the other at the end of the month. Another storm occurred early in January 1977, when about 5 inches of rain fell at this station. Although 1976-77 has been widely regarded as an extraordinary drought year, the late September and early January storms brought relatively large amounts of rain.

On the basis of rainfall, the current water year, 1976-77, is comparable to the 1960-61 year.

GEOLOGY AND SOILS

Earth Materials Underlying the Ventura River Drainage

The Ventura River drainage is underlain by sedimentary rocks of Tertiary age (3 million to 70 million years old) which

Table V-1. RAINFALL AT OJAI STATION

Season (Oct.-Sept.)	Rainfall (inches)
1957-58	40.1
1958-59	12.2
1959-60	13.8
1960-61	9.0
1961-62	30.4
1962-63	17.5
1963-64	11.7
1964-65	19.1
1965-66	23.2
1966-67	32.1
1967-68	14.6
1968-69	46.6
1969-70	16.3
1970-71	20.8
1971-72	11.3
1972-73	32.0
1973-74	19.5
1974-75	22.5
1975-76	14.3
	Mean = 21.4

Source: Ventura County Flood Control District.

are at or near the ground surface within the mountainous areas that constitute more than 80 percent of the terrain. The intervening valleys, where most of man's development has occurred, are underlain by relatively thin (a few tens of feet to a few hundred feet thick) alluvial deposits of silt, sand, and gravel that have been laid down on top of the sedimentary rocks by the Ventura River and its tributaries during the past 3 million years. Most of these alluvial deposits are of Recent geologic age (less than 10,000 years old) and are loosely consolidated soils rather than hardened rock-like materials.

Groundwater is present in both the sedimentary rocks and the alluvium, but the amount of water present, its quality, and its characteristics of flow are very different in these two types of subsurface materials. The rock is relatively impermeable, and movement of groundwater occurs only along zones of cracks and fractures in the rock that have formed after the rock hardened. Because this water moves so slowly, it picks up minerals contained in the rock. Flows of water to wells penetrating bedrock tend to be relatively low and of poor quality. On the other hand, the alluvial deposits have relatively high primary permeabilities (a few tens to a few thousand feet per year) as a result of their predominantly sandy and gravelly nature, and they contain and transmit relatively large quantities of groundwater. Because these deposits are largely free of mineralization and groundwater passes through them rapidly, few minerals are added to the water. Wells in the alluvium tend to produce relatively large flows of good-to-fair-quality water.

Rocks. The bedrock sequence underlying the Ventura River drainage consists of a complexly deformed sequence of bedded sedimentary rocks of Tertiary age. The rocks that were originally deposited in horizontal layers have been severely deformed over the past several million years by the continuing tectonic forces at work in this area, and now much of the sequence is nearly vertical. The sandstone, siltstone, and claystone (or shale) strata that make up the sequence are relatively weak rocks by engineering standards, but they are fairly well consolidated, at least partially cemented, and predominantly impermeable. They vary in hardness from "punky" to fairly hard and are generally shot through with fractures, so exposed masses of rock tend to crumble into small, angular fragments. With regard to the present study, their single most important feature is their relatively low permeability, which means that they effectively act to form closed basins that contain the much more permeable deposits of the Ventura River and its tributaries.

Unconsolidated Deposits. Silt, sand, and gravel deposits have been laid down within depressions formed in the underlying rocks by the streams and rivers draining the area during the past few thousand to two or three million years. On the basis of age and landform, there are two types of alluvial deposits: older river terrace deposits and recent stream alluvium. Older river terrace deposits, which may be as old as two or three million years, have been somewhat deformed in places by faulting and folding; they have been eroded by later stream action and covered or abutted by younger stream deposits. Recent stream alluvium, which is less than 10,000 years old, is in essentially the same state as when it was laid down by streams and rivers that now drain the area. Although the older terrace deposits may be slightly denser,

slightly tilted, and partially cemented in some areas, both deposits can be considered relatively permeable aquifers capable of transmitting fairly large flows of water to wells.

The Ojai groundwater basin, which has been downdropped relative to adjacent mountain masses as a result of fault movements during Pleistocene and Recent geologic time, contains a 500- to 700-foot thickness of alluvial deposits. The configurations of other basins in the area are largely the result of erosion by the streams involved and are far shallower.

Ventura River Basin

The upper portion of the Ventura River Basin is partly the result of downdropping on the north side of the Arroyo Parida fault. It has a maximum thickness of 200 feet. Alluvium within the lower portion of this basin has a maximum thickness of 100 feet and is on the order of 60 to 70 feet thick beneath the riverbed in the reach from San Antonio Creek to Foster Park. Alluvium in the bed of San Antonio Creek is only 20 to 30 feet thick. Downstream of Foster Park, the alluvium in the Lower Ventura River Basin probably has a thickness of on the order of 100 feet along most of the river's course to the sea, but it may be as thick as 200 to 300 feet in the lowermost reaches adjacent to the Pacific Ocean.

There appears to be a geologic discontinuity in the alluvium, or perhaps some other natural subsurface obstruction, that blocks the subsurface flow of water in the Ventura River above San Antonio Creek. This causes groundwater to rise as

springs in the riverbed and contributes to the usual year-round surface flow below San Antonio Creek. Whether this is caused by a constriction in the bedrock channel, a fault, or a change in the character of the alluvium is not known for certain. However, the effect is to divide the alluvium above and below San Antonio into two separate cells.

SURFACE WATER HYDROLOGY

The Ventura River drainage includes an area of 228 square miles, extending inland from the mouth of the river near the city of San Buenaventura on the Pacific Ocean. Most of this area consists of steep, mountainous terrain. Streams within this mountainous area traverse narrow V-shaped valleys and have steep gradients. The steepest gradients (on the order of 130 to 150 feet per mile) are those of the two branches of Matilija Creek that drain the highlands of the area and flow through canyon bottoms cut in rock.

The main Ventura River flows in a gravel-bottomed channel that varies in width from 700 to 2000 feet and flows between steep-walled banks cut in older stream terrace deposits and rock. The lower part of the river (below the Highway 150 bridge) was channelized after the 1969 flood. This bulldozer work in the alluvium created a levee 15 to 30 feet high along the east side of the river and a straightened and deepened channel along the central portion of the natural channel. Gradients of the river vary from 75 feet per mile at Robles Dam to 70 feet per mile at Highway 150, 50 feet per mile at the confluence with San Antonio Creek, 40 feet per mile at Foster Park, and 40 feet per mile from Foster Park to the ocean.

San Antonio Creek has its headwaters in the rugged mountainous area north of the Ojai Basin and drains the northeast portion of the Ventura River drainage. It then flows across the alluvial plain of the Ojai Basin, a 5-mile stretch of narrow canyon, to its confluence with the Ventura River 2 miles upstream of Foster Park. Stream gradients vary from 250 feet per mile north of the Ojai Basin, to 100 feet per mile across the alluvium of the Ojai Basin, to 50 feet per mile in the narrow canyon upstream of the confluence with the Ventura River.

Coyote Creek and its main tributary, Santa Ana Creek, drain the west-central portion of the Ventura River drainage. Most of the runoff from this subdrainage is now trapped behind Casitas Dam, which is 2.5 miles upstream of the confluence of Coyote Creek with the river. The reach of Coyote Creek downstream of the dam has a gradient of 35 feet per mile.

Flows in the Ventura River are governed by precipitation (rainfall and snowmelt), discharge from springs, seepage into and out of groundwater aquifers, and by storage and release of flows from reservoirs, particularly Lake Matilija and Lake Casitas.

Summary of Historic Surface Flows

Great variations in rainfall exist from year to year in the study area. Most rainfall occurs during short-duration high-intensity storms that occur sporadically from December through March. These Pacific storms cause rapid runoff from the impermeable mountainous areas that predominate in the drainage, and flows in the streams grow rapidly to short-lived peaks.

Table V-2 summarizes flows in various portions of the Ventura River and its tributaries under varying high and low flow conditions. The locations of gaging stations and other features in the Ventura River system are shown in Figure V-2.

Man-Made Structures and Alterations of Flow

Foster Park Diversion. In 1907-08, a subsurface dam was constructed across the Ventura River at Foster Park in order to stop subsurface flows of water through the sand and gravel in the river channel, thereby bringing this flow closer to the surface and making it possible to divert the water for use by the City of San Buenaventura. The dam consists of a concrete wall that extends to bedrock, a depth of 40 feet. Because of construction problems, work on the subsurface dam was stopped before the dam reached the south end of the alluvial fill, so it is not a complete subsurface barrier. However, the dam partially stops subsurface flow and causes the groundwater level upstream of the dam to rise, making it possible to divert this water by means of a gallery constructed on the upstream face of the dam and by pumping from four wells installed in the area upstream of the dam.

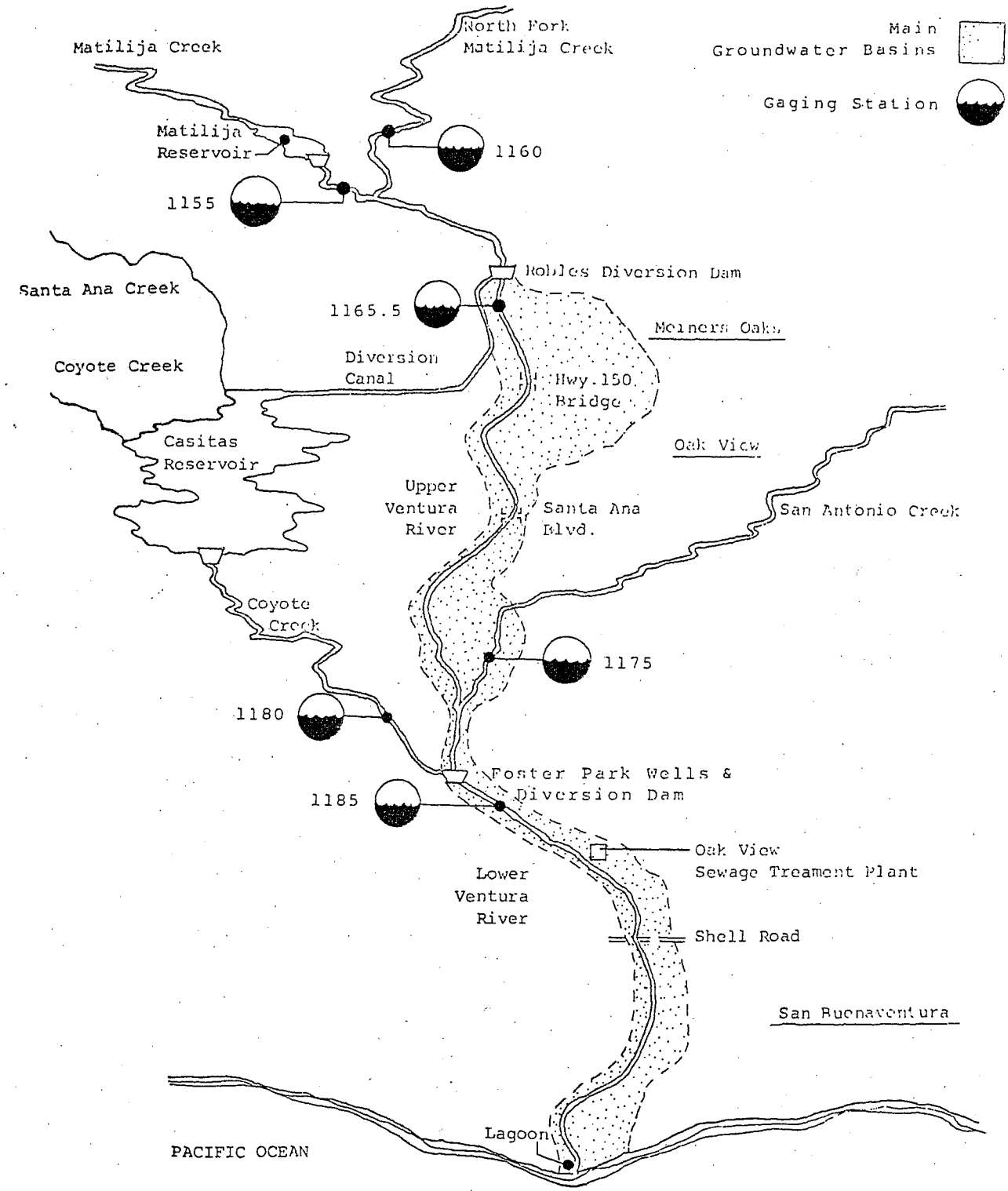
Since the installation of this concrete wall and the associated diversion works, the City has both diverted surface flows and extracted groundwater at this location. Because of variations in rainfall and other factors, the amount of water available for extraction at this point varies from year to year, and the amount taken by the City has varied from 7714 to 1463 AF/Y, averaging about 5091 AF/Y.

Table V-2. HISTORIC STREAMFLOWS IN THE VENTURA RIVER DRAINAGE AREA

Stream	Gaging Station	Peak Historic Flow (cfs) January 25, 1969	Representative Peak Storm Flow (cfs) Heavy 2/10/62	Representative Peak Storm Flow (cfs) Moderate 2/9/63	Typical Winter Base Flow (cfs)	Typical Summer Base Flow (cfs)
North Fork of Matilija Creek	1160	8440 (9440-2/24/69)	1940	730	2-5	1-2
Main Fork of Matilija Creek	1155	20,000	6570	863	4-10	1-3
Ventura River: Matilija Creek to San Antonio Creek	1165.5	28,000	7590* (about 500 cfs diverted to Casitas)	230*	0-10 (a minimum of 20 cfs is generally released at Robles Dam)	0
San Antonio Creek	1175	16,200	2260	1150	0.5-2	0-0.5 (dry for some months each year)
Ventura River: San Antonio Creek to Foster Park	Ventura County Flood Control District records	44,200-50,000	9850-10,700	1380	5-10	0-5 (based on Ventura County and CMWD measurements)
Coyote Creek (below Casitas Reservoir)	1180	(no record)	(no record)		0.5-2	0-0.5 (dry for some months each year)
Ventura River: Foster Park to Pacific Ocean	1185	58,000	12,400	1060	2-10 (Oak View treatment plant effluent plus rising groundwater at Foster Park)	2-6 (no surface flow at Foster Park; flow dependent on effluent from Oak View treatment plant, with average daily flow of about 2.5 cfs)

Sources: USGS Water Supply Papers and Ventura County Flood Control District.

* Diversion to Casitas occurring upsteam of this gaging station.



Ventura River·Casitas Reservoir System Gaging Stations

Figure V-2

As a consequence of reducing the subsurface flow in the river so that water can be extracted, the subsurface wall probably has affected downstream water conditions in that, with the flow of good-quality water from upstream shut off, and with the addition of the effluent from the Oak View Sewage Treatment Plant, the quality of the groundwater from Foster Park to the ocean has deteriorated. Subsurface seepage of poor-quality water from the bedrock has continued into the alluvium of the Lower Ventura River Basin; and, with substantially lesser quantities of good-quality water flowing downstream from the upper reaches of the river as a result of both the Foster Park Dam and diversions at Robles, the level of dissolved solids in the groundwater downstream of the dam has increased substantially. River flows downstream of Foster Park have been diminished as a result of both surface diversions and decreased amounts of rising groundwater in the lower reaches of the river. However, when the groundwater basin above the wall contains water, some of it continues to bypass the imperfect barrier and rises as springs in the river below Foster Park.

Matilija Dam and Reservoir. Matilija Dam is a concrete arch structure that was constructed in 1949 by the Ventura County Flood Control District across a narrow section of the main branch of Matilija Creek about 0.6 mile upstream of the confluence of the North Fork and Matilija Creek. Originally, the dam was 163 feet high and held back a reservoir with a capacity of approximately 7000 AF. However, by 1965 large cracks had developed in the dam as a result of reactive aggregate used in the concrete. A decision was made to cut a large notch in the upper central portion of the dam to reduce its capacity to 3500 AF. In addition, the 1969 flood deposited about 900 AF of debris in Matilija Reservoir, further reducing its storage capability to the present capacity of about 2376 AF.

Matilija Reservoir was constructed as a flood control and water storage facility, and used to serve water to the Ojai Valley by pipeline. It was initially operated so that a portion of its capacity was used to store winter flood flows for downstream use during the dry summer months. However, since construction of the Casitas Reservoir and the Robles Diversion Dam and Canal, it has been operated so that floodwaters filling the Matilija Reservoir have been released at a rate somewhat less than the 500-cfs capacity of the canal as soon as flood flows subsided in order to maximize diversions of water to Casitas Reservoir. Matilija Reservoir contributes about 850 AF/Y of water to the Ventura River Project.

Initially, with a capacity of 7000 AF and assuming an empty reservoir at the start of a storm, Matilija Reservoir could contain all of the 6500-cfs inflow of a heavy winter storm from the main branch of Matilija Creek for about 13 hours, thereby appreciably lowering (by about 50 percent) flood flows in the lower reaches of the river during a typical short-duration storm. Now it serves only to catch an additional 2400 AF of water that would flow to the ocean during large storms (because of the 500-cfs capacity of the canal to Casitas Reservoir) and to hold this water for a few days until capacity is available in the canal to carry the water into Lake Casitas.

Casitas Dam and Reservoir Project. The Casitas Reservoir Project includes the following:

1. Casitas Dam, a 285-foot-high earth and crushed rockfill dam on Coyote Creek 2.5 miles upstream of the confluence with the Ventura River; it impounds the Casitas Reservoir (254,000 AF capacity). The dam's total drainage area

is 108 square miles: 35 square miles directly from the Coyote Creek Basin and 75 square miles upstream from Robles Diversion Dam.

2. The Robles Diversion Dam, a low concrete diversion structure on the upper reaches of the Ventura River, 1.5 miles downstream of the confluence of the two forks of Matilija Creek.

3. A 5.4-mile-long concrete-lined canal that leads from the Robles Diversion Dam to Casitas Reservoir; its flow capacity is 500 cfs.

4. A transmission and distribution system for conveying water from Casitas Reservoir to CMWD's customers in three service areas: Rincon service area, west and south of Lake Casitas on the coast; Gravity service area, south of Lake Casitas, including the lower Ventura River Valley and a portion of the city of San Buenaventura; and Ojai Valley service area, east and northeast of Lake Casitas, including the Ojai Valley and the upper Ventura River Valley.

The reservoir was put into service in October 1959. Its capacity is 254,000 AF, more than 12 times the annual safe yield of 20,350 AF, and the reservoir has never spilled. Two dry years followed the reservoir's construction, and it did not fill appreciably until February 1962. The floods of January and February 1969 added 106,000 AF of water to the reservoir, bringing total storage up to 217,000 AF, and it has remained at approximately the same level since that time. As of February 1977, the reservoir contained 198,500 AF of water.

Construction of the dam and reservoir resulted in the inundation of much of Coyote Creek and its main tributary, Santa Ana Creek. Also, construction of the dam essentially dried up the short reach of Coyote Creek downstream of the dam, except for temporary flows during and for a few days immediately after periods of heavy rainfall.

Regulated Surface Flows. Operational practice has been to divert all flows available at the Robles Diversion Dam above approximately 20 cfs (which is released downstream) up to the 500-cfs capacity of the canal into Casitas. This practice and the fact that Casitas Dam was constructed across Coyote Creek have had the following effects on the Ventura River at various flows:

- Peak Historic Flow. The 500-cfs diversion at Robles had little effect on the peak 28,000-cfs flow in the reach of the river from Robles to San Antonio Creek.

The existence of Casitas Dam and the fact that sufficient capacity existed in the reservoir to absorb the entire inflow from the upstream drainage during the 1969 storm obviously significantly reduced the peak flow of Coyote Creek and consequently reduced flooding in the reach of the Ventura River from Foster Park to the ocean by a significant amount.

- Typical Peak Storm Flows. The 500-cfs diversion at Robles would have little effect on the 7500± cfs typical flow in the reach of the river from Robles to San Antonio Creek during a heavy storm, but it would have a major effect on the 700± cfs peak flow that would normally exist at Robles during a moderate winter storm. The existence of

Casitas Dam and the fact that the reservoir level has always been low enough that the reservoir has not spilled has resulted in appreciably lower flows on Coyote Creek and the lower Ventura River than would have been the case without the reservoir.

o Typical Winter Base Flows. Winter base flows vary from 0 to 10 cfs in the reach of the Ventura River near the Robles Diversion Dam. This flow is normally released, but larger flows are sometimes entirely diverted into Casitas Reservoir during storms when there is adequate water downstream. Diversion of water at low flows during the winter results in less recharge of the Ventura River groundwater basin and may have resulted in lower summer flows in the lower part of the river during some years because there is less rising groundwater.

o Typical Summer Flows. Except as discussed below, there is usually no continuous surface flow in the Ventura River during the summer. However, two important local areas of surface flow do occur as a result of rising groundwater springs in the river. These are shown diagramatically on Figure V-3 as the "live stretch" that occurs at and below the mouth of San Antonio Creek and the stretch below the Foster Park area. Flow in these stretches is stimulated by the presence of groundwater in the river alluvium, which depends on recharge from releases and spills at Robles Dam and flow from San Antonio Creek.

1976-77 Streamflow Observations. Observations of streamflow were made at various points on the Ventura River in mid-December 1976 and after the rain at the beginning of January 1977. The object of the observations was to determine the

location and amount of streamflow occurring during a period of reportedly historic low flows (December 1976) and to observe the effect of a rain (about 3 inches at Ojai) on the streamflows.

In December, flows in both forks of Matilija Creek at their confluence were of the order of 1 to 2 cfs, and these flows extended a few hundred feet below the Robles Diversion Dam. From this point to about a quarter-mile upstream of San Antonio Creek, there was no flow in the river. About a quarter-mile upstream of San Antonio Creek, rising groundwater was resulting in surface flows of about 1 to 2 cfs, San Antonio Creek had a small amount of flowing water (less than 0.5 cfs), and this (in addition to the rising groundwater) resulted in flows of about 4 cfs at Casitas Springs. Surface flow ceased about 1500 feet upstream of the City's diversion facilities at Foster Park. About 2500 feet below Foster Park, rising groundwater was causing a surface flow of about 0.2 cfs. Below the Oak View Sewage Treatment Plant, surface flows increased because of the discharge from the plant; and at Shell Road, surface flow was estimated at about 5 cfs. At the river mouth, flow was being dammed by a sandbar. It has been reported that water from the river breaks through the sandbar every two weeks or so.

In January, following about 3 inches of rain in Ojai, flows had increased considerably and there was live stream all the way to the Pacific Ocean. Observations were made about one day after peak flows had occurred, and it is estimated that peak flows may have been at least twice as high as the observed flows. Matilija Reservoir was releasing a few cubic feet per second to Matilija Creek, and flow in the

North Fork at its confluence with the main fork was about 10 cfs. No diversions were being made at Robles Diversion Dam, and approximately 10 to 15 cfs was being released through the diversion dam's gates. This flow of 10 to 15 cfs continued to below the Highway 150 bridge. Just above the San Antonio Creek confluence, surface flows in the Ventura River were reduced to less than 5 cfs. Flow in San Antonio Creek below the highway bridge was estimated to be about 20 to 30 cfs. In the stretch of river between San Antonio Creek and Foster Park, flows decreased so that only about 10 cfs was flowing over the Foster Park Dam. Flows in the Ventura River at the Oak View Sewage Treatment Plant were estimated to be about 20 to 30 cfs, and the river was flowing directly into the ocean.

An important supplementary set of observations of dry season stream conditions was made by Dick Barnett of CMWD during the drought summer of 1977. These are contained in a CMWD memo dated April 10, 1978, which is included in Appendix D of this report.

GROUNDWATER HYDROLOGY

There are five recognized groundwater basins within the Ventura River Watershed (Turner, 1971): Ojai Basin, Upper Ojai Basin, Upper Ventura River Basin, Lower Ventura River Basin, and San Antonio Creek. The locations of these basins are shown on Figure V-1.

The first three of these basins are important because they yield significant quantities of fair-to-good-quality water to wells. Water is pumped for agricultural and domestic purposes, by farmers, two water districts and some private homeowners. Groundwater in the Lower Ventura River Basin is

of relatively very poor quality (high total dissolved solids) and is not suitable for domestic or agricultural use. Only limited amounts of groundwater are present in the relatively thin alluvium along San Antonio Creek, but the water is generally of suitable quality for agricultural and domestic use.

Basin Characteristics

The Ojai Basin has by far the largest storage capacity; when the basin is full, it is thought to store about 70,000 AF of water. The basin consists of a fault-bounded, downdropped block that contains a 500- to 700-foot thickness of Recent and Pleistocene alluvium.

The Upper Ojai Basin is a much smaller basin that is located southeast of the main Ojai Basin.

The Upper Ventura River Basin consists of the river alluvium upstream of Foster Park and contains a maximum thickness of alluvium of 200 feet just upstream of the Arroyo Parida fault, 1000 feet south of the Highway 150 bridge. Just south of the fault, the alluvium thins appreciably, and it is only 60 to 100 feet thick throughout the portion of the basin south of the fault. The Upper Ventura River Basin is thought to have a capacity of about 14,000 AF of water when full. The fault may be thought of as dividing the basin into two cells: an upper cell, above San Antonio Creek; and a lower cell, below San Antonio Creek. The City's wells are in the lower cell. The Lower Ventura River Basin underlies that part of the river from Foster Park to the Pacific Ocean. The thickness of alluvium is probably 60 to 100 feet throughout most of this area, but it may reach 200 feet or more near the coast.

The bed of San Antonio Creek contains only 20 to 30 feet or so of alluvium in most reaches. This groundwater basin has a very limited storage capacity.

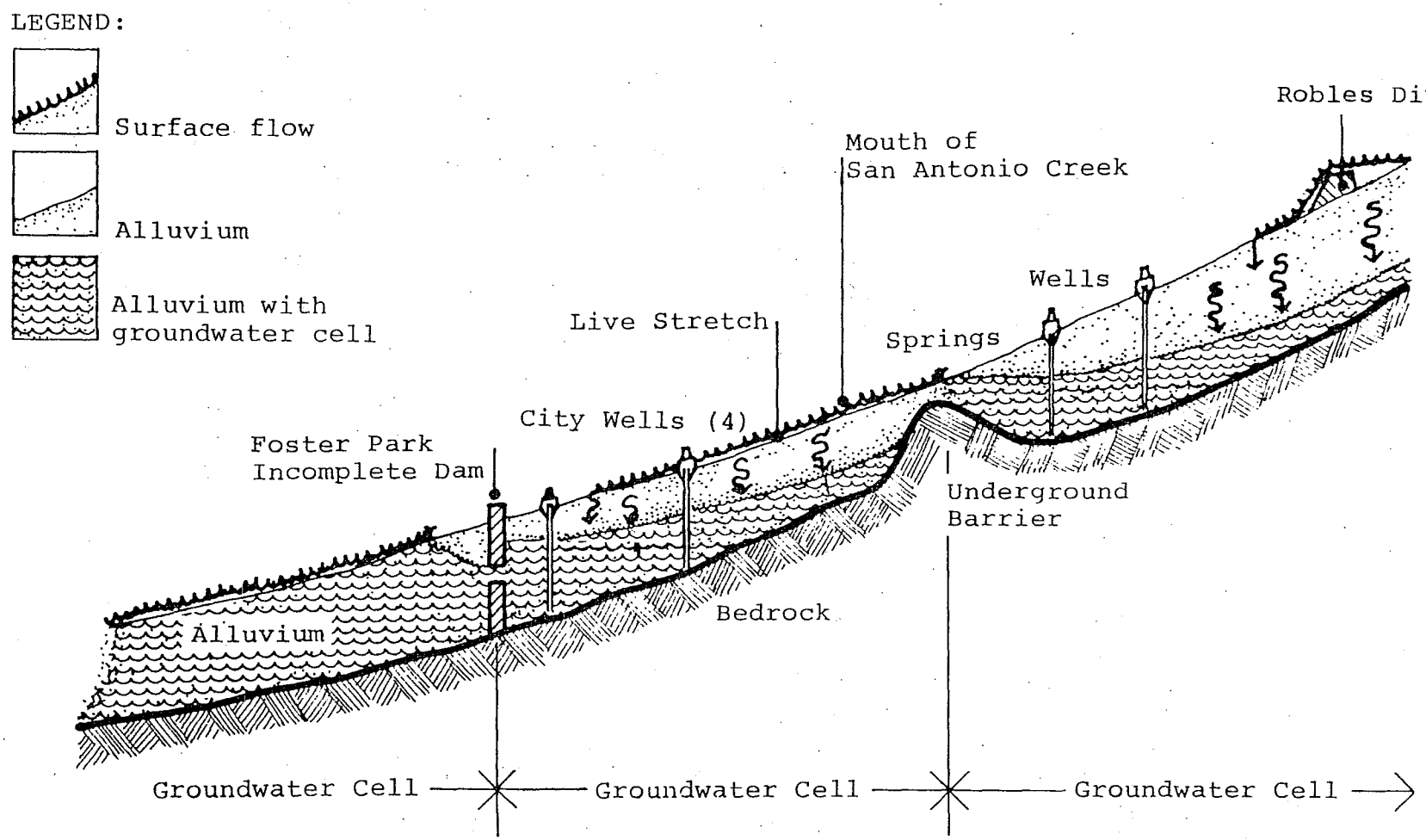
Groundwater Use

From 1947 to 1973, 26 wells surveyed in the Upper Ventura River Basin produced between 1458 and 6268 AF/Y; production since 1963 has been above 4000 AF/Y. Individual well production varied from 5 to 1978 AF in 1970, the year of highest production, which would be equivalent to flows of 3 to 1230 gallons per minute if the wells were pumped year-round.

Groundwater levels in the basin are monitored by the Ventura County Flood Control District and other agencies. Examples of water levels in the Upper Ventura River Basin are shown on Figure V-4, on the bottom of which are plotted well hydrographs for two representative wells for the period 1960-1964. This record includes a very dry year (1961) and a wet year (1962). Note that water levels in both wells became very low in late 1961, when the water in the basin was nearly depleted (well production dropped, and some wells went completely dry).

Relationship Between Groundwater and Surface Water Base Flows

As shown on Figure V-3, and discussed earlier in the subsection on typical summer flows, there is a relationship between the groundwater in storage and the presence of year-round springs and surface flows in the live stretch between San Antonio Creek and Foster Park, and also below Foster Park. It is evident from the figure that if the groundwater in either of the cells (above San Antonio Creek, or between San Antonio Creek and Foster Park) were to fall to very low levels, then seepage in the form of springs at the surface would stop, and surface flow would also stop.



Ventura River at Casitas Springs

Schematic Diagram of Ventura River
at Casitas Springs - Summer Condition

Figure V-3

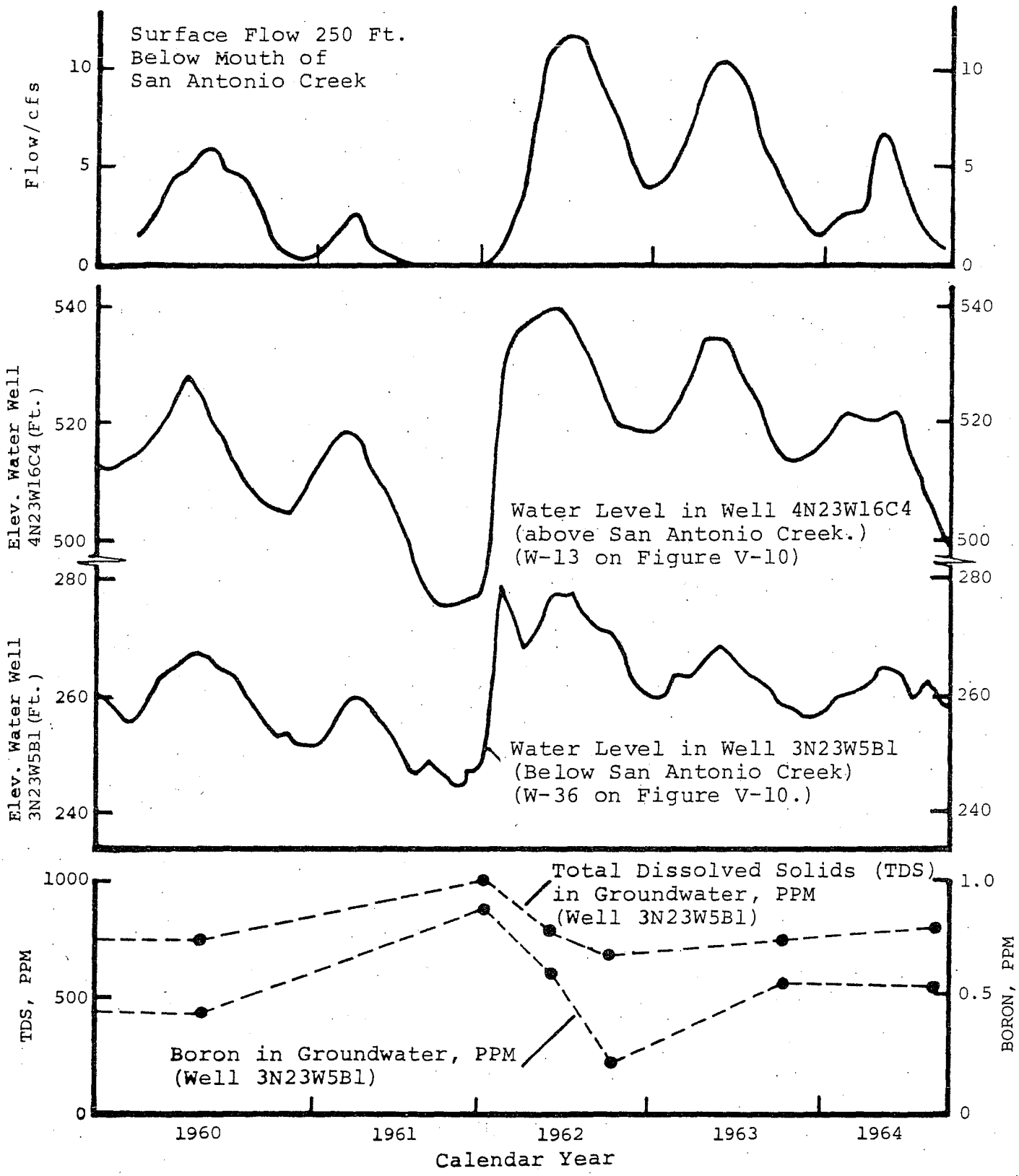
That this actually occurs can be seen from Figure V-4, on which there is a very close correspondence between the water level of well 4N23W16C4 (Ventura River County Water District well identified by index number W-13 on Figure V-10), representing the water level in the upper cell above San Antonio Creek, and the surface flow 250 feet below the mouth of San Antonio Creek, plotted directly above the well hydrograph. It appears that when the water level in well 4N23W16C4 falls below Elevation 495, surface flow in much of the live stretch stops, although some pools remain. A flow of 1 cfs or more in the live stretch corresponds with a water level in this well of greater than about Elevation 507. When the groundwater in the Upper Ventura River Basin is depleted or nearly depleted (say, less than 1000 AF of a total of 14,000 AF remains in storage), then flows due to rising springs in the vicinity of San Antonio Creek will cease. Flow in the vicinity of the Riverside Rancho Trailer Park is the last to stop. Cessation of flow here probably occurs when the level in well 4N23W16C4 falls to elevation 490.

A similar relationship exists between the water level in the lower cell of the groundwater basin, between San Antonio Creek and Foster Park, and base flow that rises as springs below Foster Park.

SURFACE WATER QUALITY

Table V-3 shows a summary of selected surface water quality data for the Ventura River.

From the standpoint of surface water quality, the Ventura River may be divided into two parts: from above Matilija Reservoir to the Oak View Sewage Treatment Plant, and from the Oak View plant to the Pacific Ocean.



Surface Flow, Groundwater Levels & Quality

Comparison of Surface Flow with Groundwater Levels and Quality - Ventura River at Casitas Springs, "Live Stretch"

Figure V-4

Table V-3. TYPICAL WATER QUALITY CHARACTERISTICS OF THE VENTURA RIVER

Characteristic	Matilija Creek above Matilija Reservoir, Gaging Station 1145[a]	Matilija Reservoir[b]	Casitas Reservoir[b]	Confluence of Coyote Creek and Ventura River, Gaging Station 1185[a]	Oak View Sewage Treatment Plant Effluent[c]
Temperature ^{o}C	15-22	8-12	13-24	15-21	34-37
^{o}F	59.0-71.6	46.4-53.6	55.4-75.2	59.0-69.8	93.2-98.6
Total dissolved solids (ppm)	500-700	700-900	400-500	600-750	950-1050
Sulfates (ppm)	250-300	250-300	120-150	250-300	250-300
Boron (ppm)	0.5-6.5	0.6-1.5	0.2-0.3	0.3-0.5	1.0-1.5
Specific conductance (micromhos)	850-950	900-1050	550-650	1000-1100	---
pH	8.0	7.5-8.0	7.0-8.0	8.0	7.1
Ammonia nitrogen (ppm)	---	---	---	---	10-20

Sources:

[a] U.S. Geological Survey.

[b] Casitas Municipal Water District.

[c] Oak View Sanitary District.

Above the Oak View Sewage Treatment Plant

In general, the surface water quality in this part of the river is good, especially during moderate to high flows, and the water is suitable for prevalent beneficial uses. But during periods of low flow, the surface water in Matilija Creek upstream of Matilija Reservoir contains concentrations of boron as high as 6.5 ppm. This water is diluted by the water in the reservoir, so the water downstream is of generally good quality even during periods of low flow. As surface flows increase, the water quality generally improves (except for turbidity), and it is during these periods of high flow that up to 500 cfs is diverted to Casitas Reservoir at the Robles diversion facilities. Because of this, the water quality in Casitas Reservoir is noticeably better than water anywhere else in the Ventura River Basin. For the few days of high flow following a storm, turbidity in the river is as high as 600 turbidity units (TU). Because of the high turbidity, the City does not divert the initial high flows but waits until the turbidity drops to about 10 TU.

From Oak View Sewage Treatment Plant to Pacific Ocean

Surface water quality in this stretch of the river is primarily influenced by effluent from the Oak View Sewage Treatment Plant and the extent to which this effluent can be diluted by surface flows from upstream. During some periods of each year, there is no surface flow past Foster Park, so most flow below the treatment plant is due to the plant's effluent. It seems likely, during these periods of low flow, that some dilution of the plant's effluent occurs because some flow appears to be due to rising groundwater. In general, however, surface water during periods of low flow is of too poor

quality for many uses. During periods of high flow, water quality increases, although flows from Canada Larga are reported to contain high concentrations of sulfates and boron.

GROUNDWATER QUALITY

The quality of water in the alluvial aquifers of the Upper Ventura River Basin is similar to the quality of surface waters shown in Table V-3, since the groundwater consists essentially of river water that has percolated down into the sand and gravel alluvium.

As is usually the case in other similar aquifers, the chemical quality of groundwater tends to worsen when the groundwater reservoir is depleted. This trend can be observed on Figure V-4; it can be seen that the total dissolved solids and boron content of the water in well 3N23W5B1 at Casitas Springs (W-36 on Figure V-10) increased when the groundwater levels were drawn down in 1961, then decreased when the aquifer was recharged with fresh water in 1962. The reason for the deterioration of quality is that when the groundwater levels are low, water of poorer quality from bedrock and smaller tributaries is drawn into the main aquifer. The trends shown for the Casitas Springs well are very similar for other wells, including wells in the upper part of the basin and the City's wells.

Because the quality of water in the alluvium below Foster Park is relatively poor, the groundwater there is no longer pumped for municipal or agricultural use.

AQUATIC BIOLOGY

Extensive field investigations were conducted during the winter of 1976-77 to study the aquatic biology of the Ventura River and its tributaries. Special attention was given to estimating the present extent and future prospects of the native steelhead trout population.

The following sections describe the present aquatic habitat of discrete segments of the Ventura River system. The dates of field study and sampling are listed on Table V-4 and are shown in Figure V-5. Additional analysis and discussion of the steelhead population, considerable supporting information, and analysis of the aquatic biology of the river appear in Appendix C.

Summary

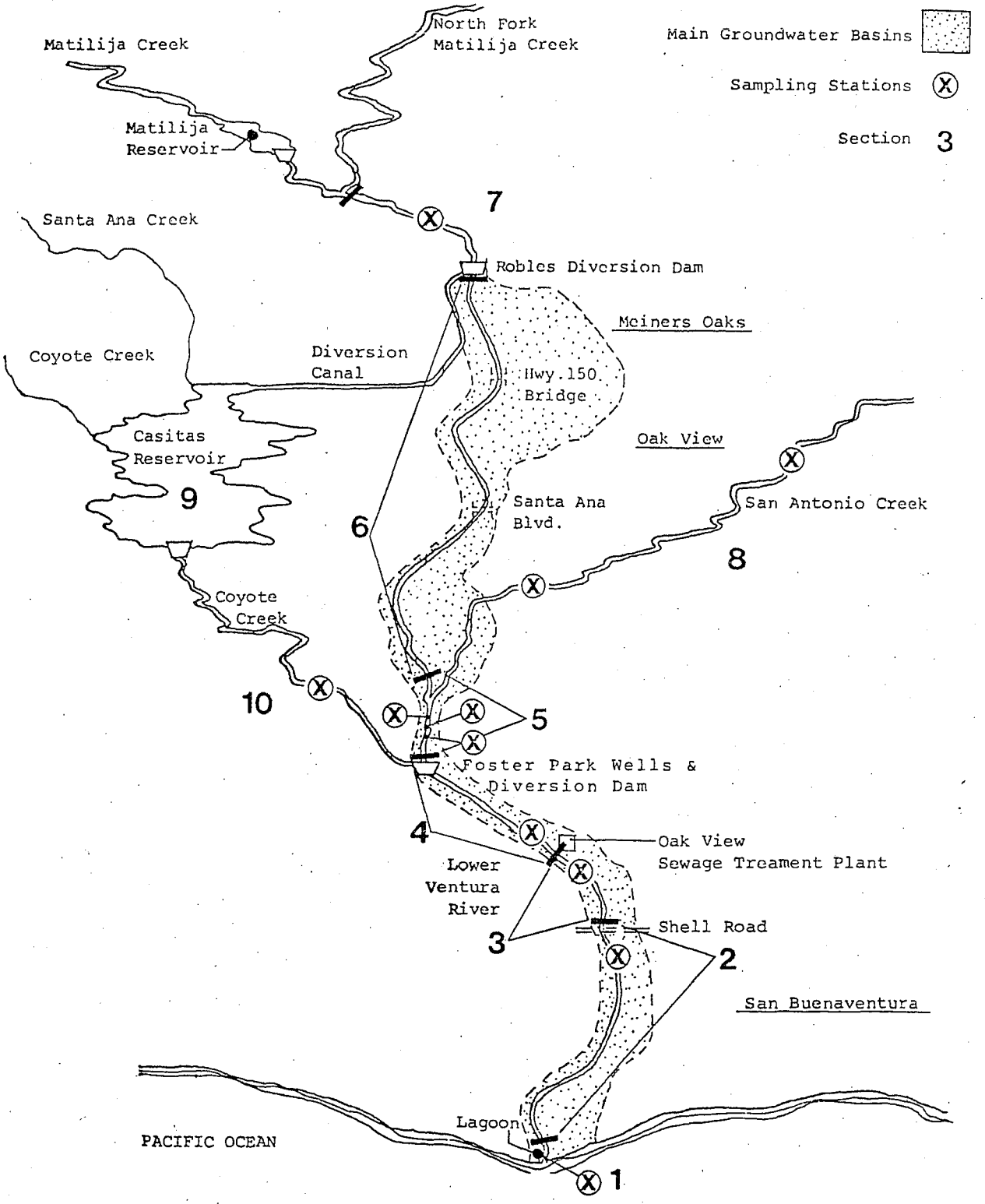
Like all of the small rivers draining the west side of the Coast Range into the Pacific Ocean in Southern California, the Ventura River's natural aquatic environment has been greatly changed in recent years by diversion of streamflow, channelization for flood control, and pollution. And, as in most of these rivers, remnants of the natural habitat remain in short reaches. Such habitat is continually threatened by the activities of man.

The aquatic habitat of the Ventura River varies widely from mile to mile. The most valuable section is the 1- to 2-mile reach of rising groundwater near Casitas Springs. In spite of streambed channelization and destruction of riparian vegetation during and following the floods of 1969, this section supports a large and extremely diverse array of aquatic insects,

Table V-4. DATES OF AQUATIC BIOLOGY FIELD STUDY, DECEMBER 1976 AND FEBRUARY 1977

Location*	Observation	Sampling Fish	Sampling Algae	Sampling Other Aquatic Plants	Sampling Bottom Fauna
1. Lagoon	2/19/77	2/19/77			
2. Lagoon to Shell Road	12/3, 8/76	12/8/76	2/19/77	12/8/76	12/8/76
3. Shell Road to Oak View STP	12/3, 8, 14/76	12/8/76	2/19/77	12/8/76	12/8/76
4. Oak View STP to Ventura City Diversion	12/3, 8, 14/76	12/8/76	2/19/77	12/8/76	12/8/76
5. City Diversion to Above San Antonio Creek	12/2, 3, 5, 12/76; 2/16, 17/77	12/5, 12/76; 2/16, 17/77	2/19/77	12/5/76	12/5/76
6. Above San Antonio Creek to Robles Dam	12/2/76; 2/8, 10/77	---	---	---	---
7. Above Robles Dam	12/13/76; 2/8, 9, 10/77	12/13/76; 2/19/77	2/19/77	12/13/76	12/13/76
8. San Antonio Creek	12/2, 6, 9, 10/76	12/9/76	12/9/76	12/9/76	12/9/76
9. Casitas Reservoir	2/18/77	---	---	---	---
10. Coyote Creek	12/3, 7/76	---	---	12/7/76	---

*Location numbers correspond to numbers on Figure V-5.



Aquatic Sampling Station Locations

and Numbered River Sections

Figure V-5

profuse beds of aquatic plants, and three species of native California fish. It is the principal rearing area for a remnant population of the native steelhead trout that spawned in the headwaters of the Ventura River prior to construction of Matilija, Casitas, and Robles dams.

Above the Casitas Springs reach to the Robles Diversion Dam, streamflows are too ephemeral to serve as anything but a transport corridor for the few steelhead that may migrate over Robles Dam during periods of favorable flow and for the young that might result from what limited spawning and rearing could still take place above that point. For a mile below the reach of rising water at Casitas Springs, the habitat is very limited by the lack of natural flow.

The Oak View Sewage Treatment Plant discharges treated wastewater into the river, maintaining a permanent flow to the estuary. This reach supports a good growth of riparian vegetation (where it has not been recently disturbed by channelization), aquatic plants and algae, large populations of a few pollution-tolerant insects, and a large population of two native fish species. Because of poor water quality and high summer water temperatures, no resident trout or steelhead are reared here, but during winter storms the lower reaches of the river and the estuary serve as a migratory corridor for steelhead .

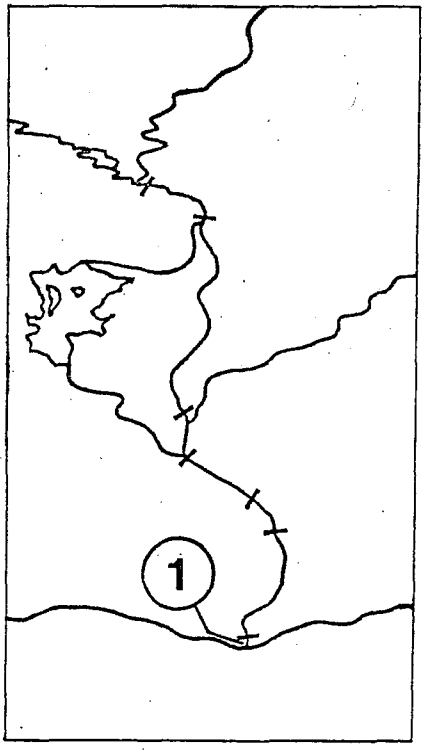
Ventura River Lagoon

Lagoon Characteristics. The lagoon covers about 3.7 acres at full capacity, with a mean depth of 3 feet and a mean channel depth of 4.3 feet (Moore, 1976). It extends from the Highway 101 bridge to the sandbar separating it from the ocean (Plate V-1).

Plate V-1 Ventura River Lagoon (December 8, 1978)

Habitat Assessment

- True estuary, with fresh to salt water and freshwater to marine plants and animals
- Used as spawning area by marine fish
- Trout may migrate through the lagoon in winter
- No permanent resident fish populations
- Good habitat for waterfowl and marsh birds



Sand deposited by tidal action builds up the sandbar separating the lagoon and the ocean. Wave action from the ocean and freshwater inflow from the river cause the sandbar to break open and spill periodically. Salt water also enters the lagoon when high tides allow waves to flow over the sandbar.

Measurements taken on February 19, 1977, showed vertical salinity stratification but no temperature stratification (Figure V-6). The bottom water was brackish and the surface water nearly fresh.

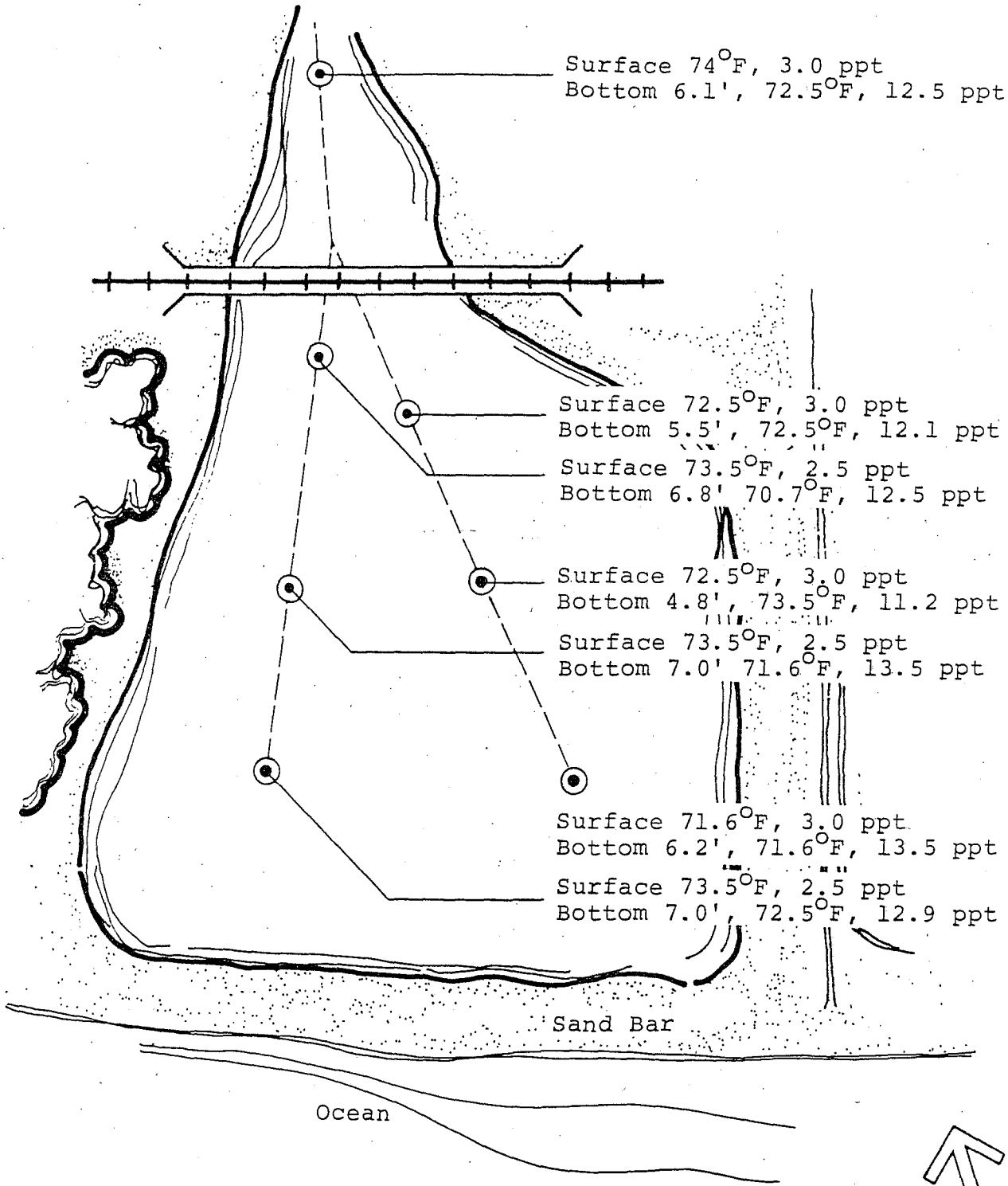
Daytime water temperatures measured in summer 1976 ranged from 21° to 23°C (70° to 74°F) (Moore, 1976) and in winter from 21.5° to 23.5°C (71° to 75°F).

The lagoon bottom is sandy along the ocean margin. Most of the bottom consists of black mud and detritus.

Biota. Dominant vegetation here is willows, cattails, and reeds. Pickleweed is common along the shoreline.

Five hauls with a 100-foot, 5/8-inch-mesh beach seine yielded only one successful catch of 27 topsmelt. These fish are marine but enter brackish water to spawn. Thirteen fish were examined to determine their sex (10 females, 3 males); of these, 1 male was immature, 3 females were ripe, and all other fish had developing gonads. The fish ranged in length from 13 to 19 centimeters.

Gill-net sampling performed in September 1976 by Shoken Sasaki, of the California Department of Fish and Game, and Mark Moore yielded only one staghorn sculpin. Various surf



Salinity and Temperature in Ventura Lagoon

Salinity in Parts Per Thousand (ppt) and Temperature (°F) on February 19, 1977, in the Ventura River Lagoon

Figure V-6

perches and migrating steelhead are sometimes present in the lagoon. Camm Swift, Associate Curator of Ichthyology, Los Angeles County Natural History Museum, has collected the tidewater goby here (letter to M. Capelli, January 3, 1975).

Assessment of Existing Conditions. None of the fish species found in the lagoon are obligatory permanent residents of estuarine systems, and most are temporary residents that are normally marine-dwelling. The presence of healthy fish in the lagoon indicates that water quality is satisfactory for these temporary inhabitants. The lagoon also appears to be satisfactory habitat for many bird species. The lagoon, like estuaries in general, is not resident trout habitat. During winter floods, when steelhead trout would be expected to move through the lagoon, water quality is probably satisfactory for their temporary use.

Ventura River Above Lagoon to Shell Road (2.5 Miles)

River Characteristics. The upper end of this 2.5-mile section has a well-defined stream channel, mature but patchy riparian growth, and substrate composed predominantly of cobble and rubble noticeably coated by silt and detritus (Plate V-2). The middle two-thirds mile flows through a sand and claystone reach where the stream branches into smaller channels and the riparian growth is patchy and invading. In the lower end, the river re-forms into a single channel, riparian growth is mature and continuous, and the substrate is predominantly cobble and rubble. The pools are heavily silted. The ratio of pools to riffles was approximately one to one, but much more of the river surface area was pool.

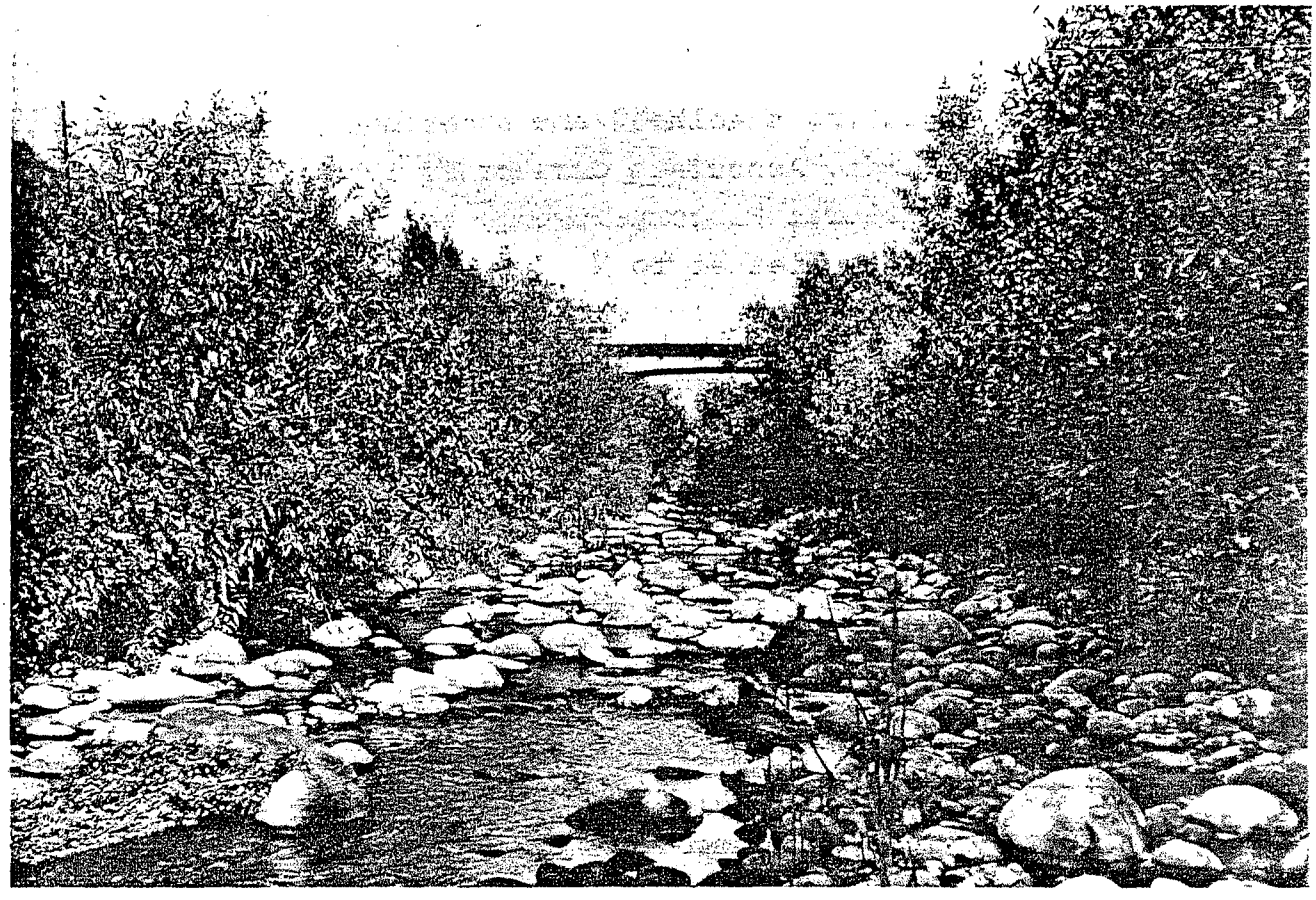
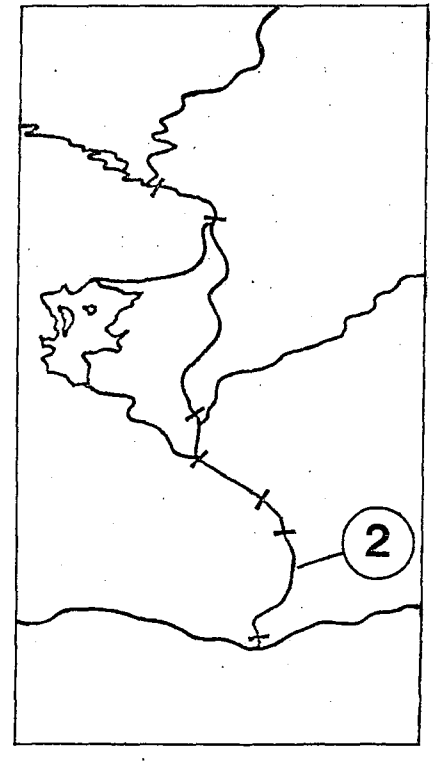


Plate V-2 Ventura River Lagoon to Shell Road

Habitat Assessment

- Large populations of four warmwater fish species: arroyo chub, threespine stickleback, mosquitofish, green sunfish
- Migration route for small number of steelhead trout to and from spawning area at Casitas Springs
- Little species diversity but large populations of invertebrates
- Water quality and temperature unfavorable for trout habitat
- Poor riparian growth and shade, limited in-stream cover not suitable for trout habitat



In many years, from spring through fall the water in this section is largely composed of effluent from the Oak View Sewage Treatment Plant, which discharges a flow between 2 and 3 cfs. On December 30, 1976, the Casitas Municipal Water District measured 6 cfs in this section, about half of which was effluent.

Biota. Sampling of a 300-foot section 400 yards below the Shell Road bridge yielded numerous arroyo chubs, threespine sticklebacks, mosquitofish, and a few green sunfish. All of these fish appeared to be healthy, with no external signs of parasites, disease, or infections.

The invertebrate diversity was very low. All of the major invertebrate types found in this section are warmwater-tolerant and can exist in waters low in dissolved oxygen. Amphipods dominated the pool sample, and blackfly larvae dominated the riffle sample. Midge larvae were found in both habitats. Hydrozoology, Inc., notes that the invertebrates from this area are listed by EPA (1973) as either "pollution-tolerant" or "facultative" with respect to decomposable organic wastes (Appendix C). The invertebrate composition is similar to the low-diversity, chironomid-dominated, eutrophic, alluvial-plain stream fauna discussed in Usinger (1971).

Bankside aquatic plants were abundant in areas where willow growth was absent or invading. Water speedwell, smartweed, and cattail were the dominant types of vegetation. Algae (Cladophora) was common in the pools and riffles but was not abundant.

Habitat Limitations. Riparian growth provides inadequate shade in most areas, so summer water temperatures rise near the upper tolerance limit for trout (75°F) through most of this section (Table V-5).

At times the water in this section may be toxic to trout. A trout bioassay made by the California Department of Fish and Game during August 2-5, 1976, showed that trout had poor survival in this section (Table V-6).

The natural sand/claystone reach is poor substrate for trout, and the stretches above and below this reach show silting of the otherwise suitable cobble and rubble bottoms. Further improvements in the effluent treatment may make the water quality suitable for trout. Riparian growth is increasing in height and density but will require many years before it shades a significant portion of the stream. The abundance of warmwater-tolerant fish species indicates that water temperature and quality and substrate conditions are adequate throughout the year for them.

Assessment of Existing Conditions. This reach is a permanent stream, changed from natural conditions by reduced winter flows, increased summer flows of treated wastewater, sand and gravel mining, and flood control activities. It is now habitat for resident warmwater fishes and serves as a corridor for migration of a small remnant steelhead run.

Ventura River, Shell Road to Oak View Sewage Treatment Plant

River Characteristics. The upper mile of this section is well shaded by willows, and the stream channel is composed of small boulders, rubble and cobble, and a few patches of

Table V-5. SUMMER AND FALL WATER TEMPERATURES RECORDED IN THE VENTURA RIVER BELOW OAK VIEW SEWAGE TREATMENT PLANT OUTFALL

Location	Date	Time (hours)	Temperature (^{o}F)
50 yards below outfall[1]	6/7/76	1400	71
	6/29/76	1100	74
	7/15/76	1500	74
1 mile below outfall[2]	8/11/74	1100	70
	9/22/74	1130	70
	10/26/74	1230	65
Shell Road Bridge[2]	8/11/74	1145	69
(2 miles below outfall)	9/22/74	1330	75
	10/26/74	1330	66
Shell Road Bridge[1]	6/29/76	1300	74
	7/15/76	1400	73
3.5 miles from outfall[1]	6/7/76	1330	74
	7/15/76	1300	74
Main Street Bridge[1]	6/7/76	1300	69
(4.5 miles below outfall)	6/29/76	1400	68
	7/15/76	1200	69
Main Street Bridge[2]	8/11/74	1220	66
	9/22/74	1415	72
	10/26/74	1500	64

Sources:

[1]Moore, 1976.

[2]Federation of Fly Fishermen, 1974, unpublished data.

Table V-6. RESULTS OF RAINBOW TROUT BIOASSAY TESTS

Location	Exposure (hours)	Number of Trout That Died	Temperature $^{o}C/^{o}F$	Chlorine (mg/l)	NH_4 (ppm)	Dissolved Oxygen (mg/l)
Casitas Springs	96	0	20 / 68	-	0.5	-
Adjacent to Oak View STP	4	10	25 / 77	0.09	18	5.6
2000 feet below Oak View Sewage Treatment Plant	5	10	23-25 / 73-77	0.11	-	3.4
Shell Road Bridge 2 miles below Oak View STP	5	6	24 / 75	-	15.5	-
	23	8				
	96	9				
900 feet above Main Street Bridge 4.25 miles below Oak View STP	5	0				
	23	cage vandalized & fish removed	24-21 / 75-70	0.01 -	10.5 -	6.5 -

Note: Tests were conducted by the California Department of Fish and Game, Region 5, on August 2 and 3, 1976. The tests used 10 trout held in live-cages in the river at 5 locations. Some water quality measurements were made concurrently.

gravel (Plate V-3). There are some areas where claystone and sand form the substrate, but these areas comprise less than 10 percent of the bottom. The lower mile has less dense willow growth, and river shading is only fair.

The substrate is primarily rubble and cobble. Silt and sand bind the substrate, and a detritus layer covers the bottom. Throughout this section, the ratio of riffles to pools is about one to one. However, riffles comprised only 27 percent of the river surface area whereas pools comprised 73 percent. The riffles average 15 feet wide and less than 10 inches deep, and the pools average 25 feet wide and less than 20 inches deep. The estimated flow at this time was about 3 to 4 cfs. Most of this flow originated as effluent from the Oak View Sewage Treatment Plant, which was about 2.5 cfs in December 1976 (Merl Short, Oak View STP, personal communication to M. Dukes).

Biota. Sampling of fish in a 300-foot section yielded many arroyo chubs, threespine sticklebacks, mosquitofish, and a few green sunfish. All of the fish appeared to be healthy. No trout were seen.

Invertebrate samples were relatively low in diversity and were similar in composition to the invertebrates collected at the downstream sampling site. There were some differences; particularly noticeable was an increase in the number of dragonfly and mayfly (Caenis sp.) nymphs. As in the stretch below Shell Road, the dominant invertebrates here are characteristic of warmwater eutrophic streams and are tolerant of decomposable organic wastes (EPA, 1973).

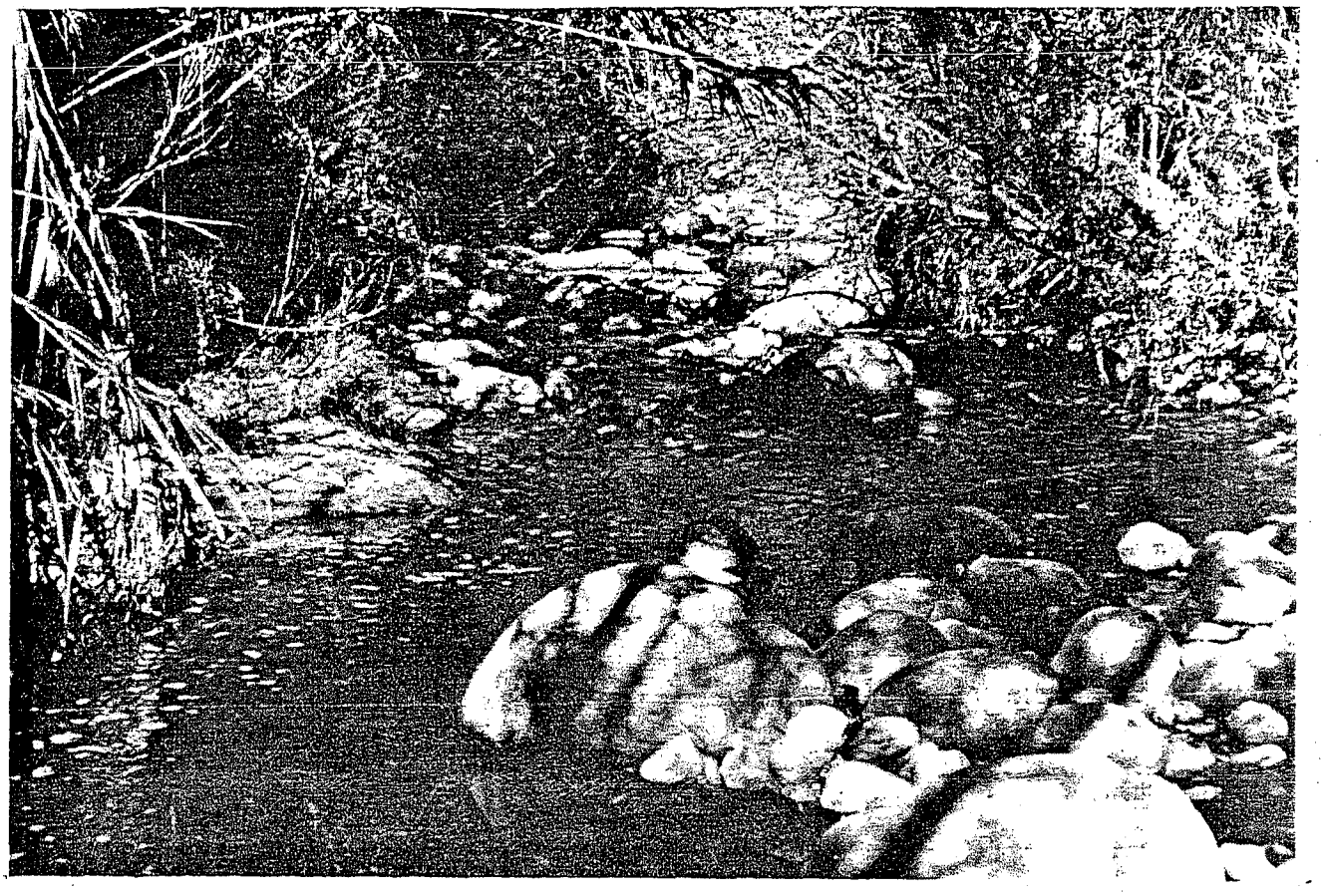
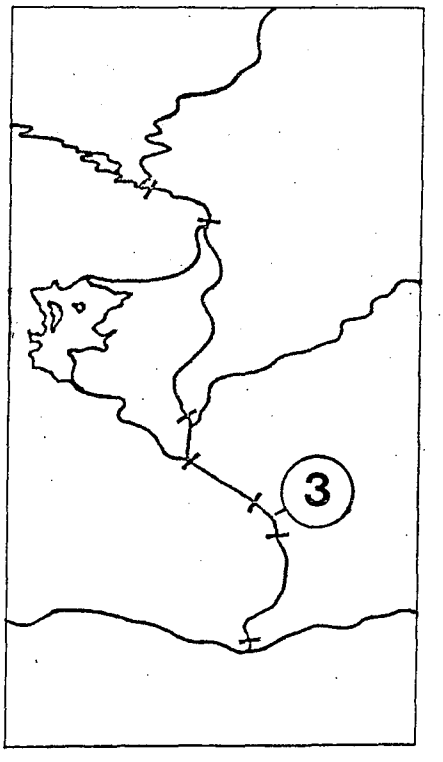


Plate V-3 Ventura River, Below Oak View Sewage Treatment Plant

Habitat Assessment

- Resident warmwater fish populations: many arroyo chub, threespine stickleback, and mosquitofish; a few green sunfish
- Low species diversity but large populations of invertebrates
- Migration corridor for steelhead
- Water quality and summer water temperature unfavorable for permanent trout habitat (no trout seen during sampling)
- Good shade and fair in-stream cover in upper mile; poor to fair shade and poor in-stream cover in lower mile
- Winter flows reduced by upstream diversions; summer flows augmented by treated wastewater



Bankside aquatic vegetation was abundant only in the lower mile of stream and in the upper area where the willow growth was poor. Dominant vegetation types were water speedwell, cattail, and watercress. Algae (periphyton and Cladophora) was abundant in the upper mile.

Habitat Limitations. Summer water temperatures in this section are generally near the upper tolerance limit for trout ($75^{\circ}F$), especially just below the sewage treatment plant (Table V-5). The California Department of Fish and Game conducted a trout bioassay in August 1976 and found no trout surviving just below the facility (Table V-6). The cause of death was not determined.

This section of the river is not suitable for trout during the summer and early fall.

Assessment of Existing Conditions. This reach is a permanent stream, changed from natural conditions. Winter flows are reduced by upstream diversions; summer flows are augmented by treated wastewater; and the lower mile has been channelized. The present habitat supports resident warmwater fishes and provides a corridor for migration of steelhead. If water quality were improved and if most of the reach were well shaded, it could be suitable rearing habitat for young steelhead.

Ventura River, Oak View Sewage Treatment Plant to City Diversion (1.25 Miles)

River Characteristics. From the city diversion to Foster Park Bridge there is dense riparian growth along the main channel. The substrate here is primarily rubble and small

boulders. Patches of gravel and small cobble are present, but good spawning substrate is limited.

The area below Foster Park Bridge also has dense riparian growth (Plate V-4). Compared with the upper area, there is less rubble and small boulders and more claystone. Silt and detritus cover the substrate, but the layer is thin and has not cemented the rocks to any great extent. In December 1976 there was no flow in the area just above Foster Park Bridge, though a small (less than 0.5 cfs) amount of rising groundwater kept the stream flowing below the bridge. The river was about 12 feet wide and filled less than half of the low-water stream channel.

Biota. Sampling in a 200-foot section yielded two juvenile trout, many arroyo chubs, threespine sticklebacks, mosquitofish, and a few green sunfish. This was the farthest downstream any trout were found during the December 1976 sampling. The trout were in good condition and showed no external signs of poor health. All of the warmwater fish also appeared healthy.

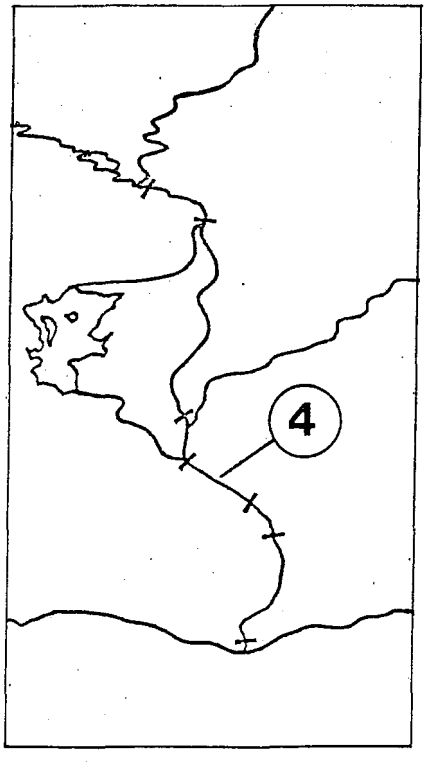
Along with the fish, large numbers of crayfish (more than in any other portion of the river) were found.

Invertebrate abundance was low in this area, but diversity was greater than in the two areas previously described as having low diversity. There were fewer amphipods and blackfly larvae and pupae, more types of mayfly nymphs, and many new groups of true bugs (Hemiptera) and caddisflies. Most of the caddisflies (Ochrotrichia, Hydropsyche, Polycentropus) and mayflies are cleanwater forms, intolerant of pollution (EPA, 1973).

Plate V-4 Ventura River, Above Oak View Sewage Treatment Plant

Habitat Assessment

- Abundant warmwater fish
- Farthest downstream area where trout were found during sampling
- Migration route for trout
- Fairly well shaded, especially with willows
- Large numbers of crayfish
- Moderate species diversity but small populations of invertebrates
- Low surface flow



Except for cattails and Chara, bankside and rooted aquatic vegetation was not abundant. Thick willow growth may have shaded out bankside vegetation and has probably also reduced the amount of periphyton and filamentous algae.

Habitat Limitations. The lack of surface water flow limits the biota here. One temperature measurement taken in summer (7/15/76, 1430 hours, 73°F) was near the upper tolerance limit for trout.

Assessment of Existing Conditions. This reach supports an interesting but small population of plants, insects, and resident fishes. It serves as a migration route for steelhead and, during wetter years, may provide rearing area for some young steelhead or resident trout.

Ventura River, City Diversion to Just Above San Antonio Creek

River Characteristics and Biota. This section of the river has year-round flow, maintained by rising groundwater from the Ventura River gravels and a lesser inflow from San Antonio Creek. There were two areas of rising water in December 1976. Each formed small streams 10 feet wide which joined 220 yards from their origins.

Surface flow began a quarter-mile above the San Antonio Creek junction. The flow was estimated at about 4 cfs near Casitas Springs, of which 0.5 cfs came from San Antonio Creek (CMWD measurements, December 27, 1976).

The reach above San Antonio Creek is overgrown with willows that nearly completely shade this rising water. The substrate is primarily cobble and rubble with patches of gravel.

Water temperatures are cool throughout the year and well below the upper tolerance limit for trout.

Casitas Springs Water Temperatures (Opposite Trailer Park)

Date	Time	Temperature (^{o}F)
6/7/76	1530	64^{o}
6/30/76	0930	65^{o}
7/1/76	1500	69^{o}
7/8/76	1430	66^{o}
5/31/77	1630	65^{o}
6/7/77	1000	62^{o}
6/22/77	1400	66^{o}
7/23/77	1100	64^{o}
7/29/77	1800	68^{o}
7/29/77	1930	66^{o}
9/12/77	1200	68^{o}
9/20/77	1400	67^{o}
9/24/77	1200	67^{o}
10/18/77	1400	69^{o}
10/19/77	1800	66^{o}
11/12/77	0900	56^{o}
12/12/77	1430	55^{o}

Source: Moore, 1976 and 1978.

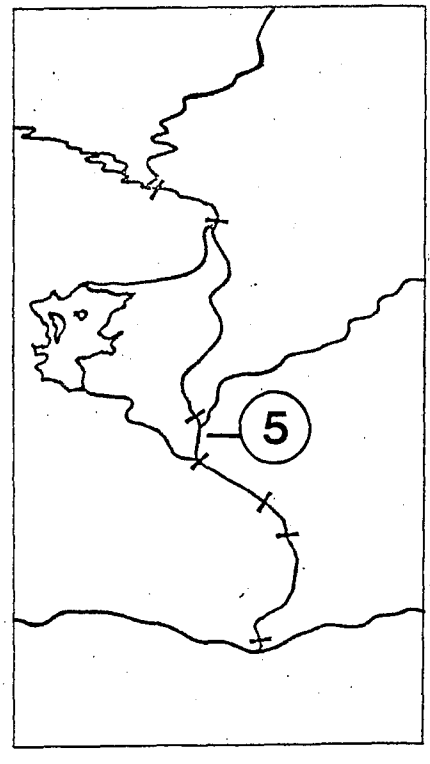
Aquatic vegetation is abundant in the upper area where willow growth has not completely shaded the stream. Watercress, monkeyflower, water speedwell, and *Chara* are dominant. Algae (*Cladophora* sp.) is abundant where shading is reduced. Other algae noted included *Zygnema* and *Enteromorpha*.

The middle third of this section is poorly shaded due to removal of trees for flood control purposes, but willow is beginning to reinvade. Rooted aquatic plants, watercress, water speedwell, and monkeyflower grow in lush beds along the banks (Plate V-5). The substrate is predominantly cobble and rubble, but gravel loosely fills the spaces between the larger rocks and can be found in patches by itself along the banks. The stream morphology and continuous flow of 4 cfs

Plate V-5 Ventura River at Casitas Springs
Live Stretch

Habitat Assessment

- Good habitat for many different kinds of plants and animals
- Abundant warmwater fish
- Good resident populations of steelhead and rainbow trout (500-1000 trout per acre; limited by low streamflow in long dry periods)
- Fair to good juvenile trout rearing habitat (best section in river): good in-stream cover; poor shade in middle reach, good elsewhere; summer water temperatures in this spring-fed reach cooler than elsewhere
- Great species diversity and large populations of invertebrates
- Year-round flow



provide sizeable pools and riffles where trout can find cover. The lack of riparian shade allows algae to grow profusely in the stream, which provides some stream cover needed by the fish. About 50 to 90 percent of the riffle bottoms were covered with filamentous algae (Cladophora); pool bottoms were 25 to 40 percent covered. Chara was abundant in the pools.

The summer water temperatures in the middle reach are adequate for trout, as indicated by measurements taken in 1976 (7/6/76, 1400 hours, 69°F; 7/8/76, 1300 hours, 68°F) (Moore, 1976).

The rising groundwater generally stops short of the City diversion facility early in the dry season (June-October). In December 1976, however, there was nearly a quarter-mile of dry stream between the diversion and the last area of standing water. This lower section has much taller riparian growth than the middle area, and much of the river is well shaded. Rooted aquatic plants are less abundant here than in the middle area. The river has many shaded pools (more than 2 feet deep) and provides good trout habitat. The substrate in the pools is predominantly rubble and cobble. The riffles are generally less than 6 inches deep.

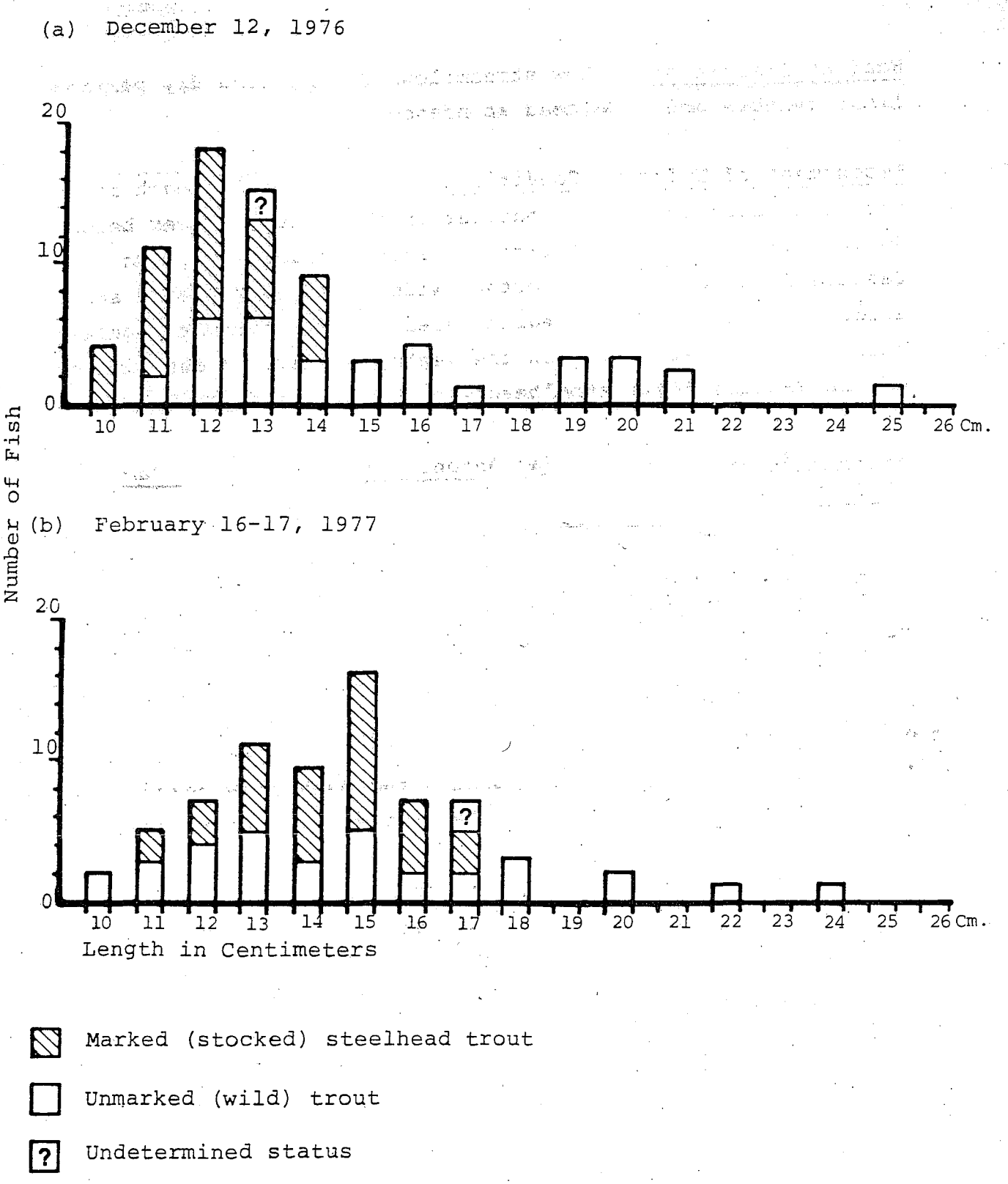
Benthic fauna at Casitas Springs were abundant and diverse. The pools were dominated by amphipods and the mayfly Tricorythodes fallax, while the riffles were dominated by the mayflies Baetis and Tricorythodes and the caddisflies Cheumatopsyche and Hydropsyche. Midge larvae, blackfly larvae and pupae, and dragonfly larvae were also found in substantial numbers in these samples. The fauna in the riffles are dominated by taxa characteristic of clean, moderately cool streams.

The substrate is conducive to large populations of invertebrates. Algal growth supplies food and shelter for many of these organisms. The pool fauna were similar to the pool fauna downstream except that populations were higher, probably reflecting the general improvement of water quality and lower temperatures.

Trout (including wild and stocked steelhead), arroyo chub, and stickleback were abundant throughout the Casitas Springs reach of the Ventura River and in the lower part of San Antonio Creek.

Thirty-eight (51 percent) of the trout collected on December 12, and 11 (52 percent) of those collected later in February were steelhead marked for identification by clipped dorsal fins and planted by the Department of Fish and Game the previous June 30. The unmarked fish were the result of natural spawning. They were too small to have been planted trout washed down from the catchable-trout planting program above Matilija Dam or in the North Fork of the Ventura River (Figure V-7). Microscopic examinations of the scales indicated that about half the fish resulted from natural spawning in the Ventura River during the winter of 1975-76, that most of the rest were wild fish spawned the previous year, and that some were probably two years old. Two of the largest trout captured were sexually mature males ready for spawning, but no sexually mature females were found. There was some evidence of nest-building in the right branch of the Ventura River just below the mouth of San Antonio Creek.

Examination of stomach contents of a few trout collected in December indicated the fish were feeding largely on caddisflies, stratiomyid fly larvae, and mayfly nymphs.



Length of Trout at Casitas Springs

Length frequency of trout captured at Casitas Springs in the Ventura River

Figure V-7

Habitat Limitations. Low streamflows during long dry periods limit rainbow and steelhead abundance.

Assessment of Existing Conditions. This 1.5-mile reach is the most valuable aquatic habitat in the Ventura River below Robles Dam. With its year-round rising groundwater, the Casitas Springs reach supports a wide variety of plants and animals and is the main rearing area for the remnant population of native steelhead in the Ventura River. A description of the Ventura River steelhead run appears in Appendix C.

Ventura River Just Above San Antonio Creek to Robles Dam (5.25 Miles)

River Characteristics. From just above San Antonio Creek, upstream to the Robles Dam, the river runs in a wide floodplain with from one to three distinct channels. There is little riparian vegetation, and the scrub/chaparral vegetation that borders the floodplain provides no shade in the river (Plate V-6). The lower 600 yards above San Antonio Creek has dense willow growth that shades the main flow channel. This is not representative of the 5-mile reach above there.

Substrate in the upper 2 miles is composed of about 60 percent boulder and rubble and 40 percent cobble and gravel; in the lower 3.25 miles, the proportion is closer to 50-50. The substrate is moderately silted, but rocks could be dislodged by kicking them. Between 15 and 25 percent of the substrate could be used by steelhead for spawning if adequate flowing water were available.

This section of the Ventura River contains flowing water only sporadically from December through April or May of most

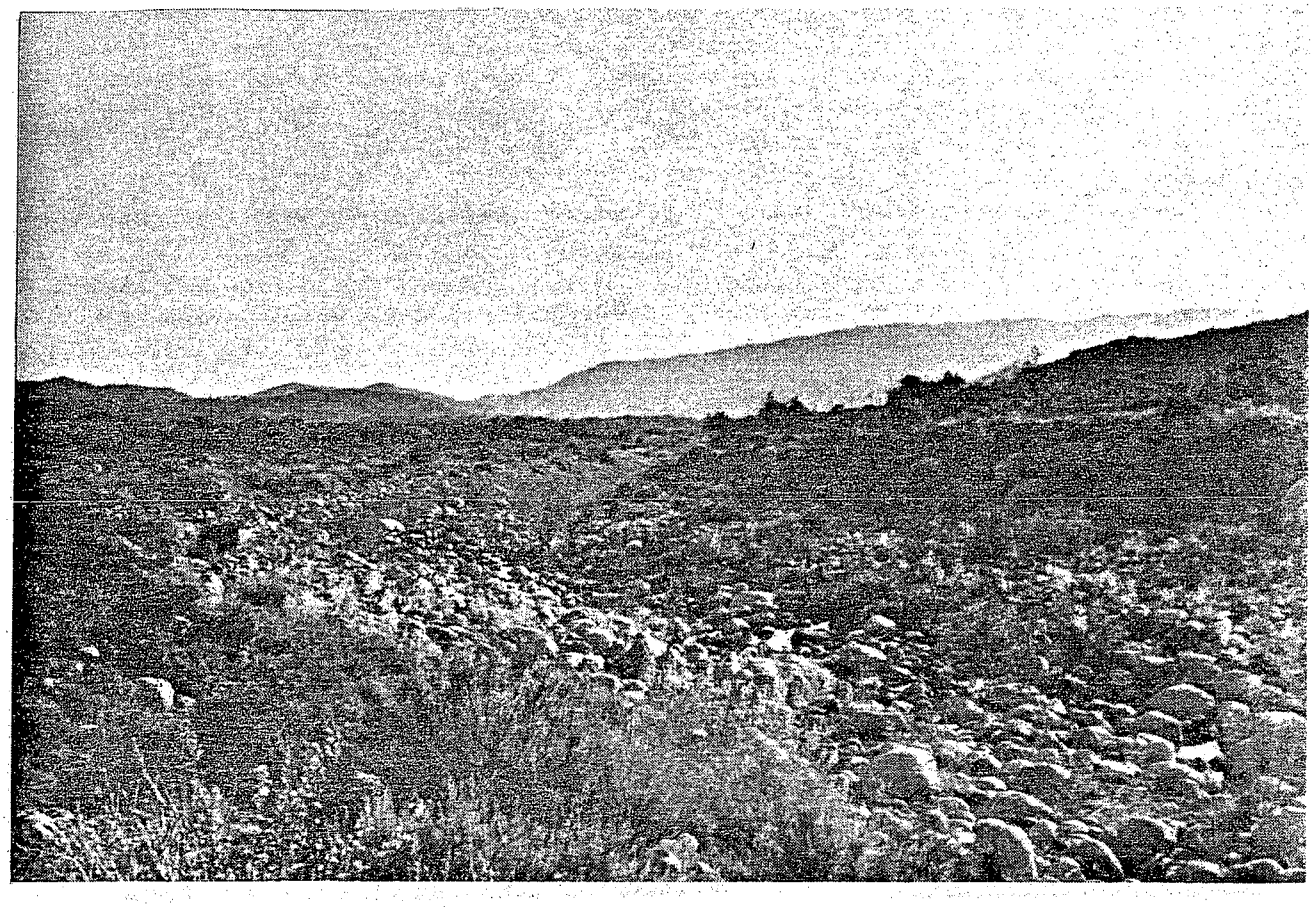
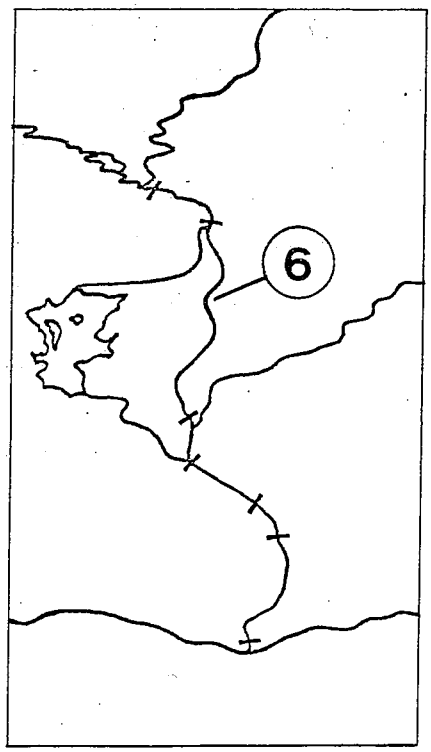


Plate V-6 Ventura River, San Antonio Creek to Robles Dam

Habitat Assessment

- No surface flow during summer or other dry periods
- No year-round resident fish populations (only one fish seen during sampling)
- May possibly be corridor for migrating steelhead in winter, but unlikely
- No rearing habitat for juvenile trout in summer (no water, no shade, probable high water temperature)
- Few invertebrates



years. During storms, and for varying periods afterwards, adult steelhead could migrate up to Robles Dam, but they probably would not be able to pass it under most conditions. The river channel in this reach is flat and broad, and the rapid drop of streamflow after storms would substantially reduce the usable spawning substrate. Stranding of spawned eggs is thus likely.

Biota. Only one fish was seen in the entire stretch, a small arroyo chub. There are no year-round resident fish populations.

Algae growth was very sparse in December and February, and the few aquatic insects observed were midge larvae that quickly invade newly flooded reaches of streams.

Habitat Limitations. The section of the Ventura River from Robles Dam downstream to the rising groundwater at Casitas Springs is not suitable fish habitat during the summer and fall because of the lack of flowing water and riparian vegetation.

Assessment of Existing Conditions. As aquatic habitat, this reach had little value. It may be a corridor for fish migrating upstream and downstream during and after storms, but no evidence indicated that such migration actually occurs.

Ventura River Above Robles Dam (5 Miles)

River Characteristics and Biota. One-half mile of the main Ventura River channel above Robles Dam has been significantly altered by the construction of the dam and two diversion

ponds above it. Riparian growth and suitable trout rearing habitat are limited.

Two water temperature measurements in summer 1976 (6/11/76, 1300 hours, 71°F; 8/23/76, 1400 hours, 69°F) (Moore, 1976) suggest that water temperatures remain low enough for trout.

Fish sampling in a 245-foot section of the Ventura River below the Matilija Creek-North Fork confluence (Plate V-7) yielded 31 juveniles and 1 adult trout, and many threespine sticklebacks and arroyo chubs. Otolith nuclei analysis of these trout indicated that they are resident rainbow trout (Figure C-2 in Appendix C). Some steelhead may still occasionally migrate upstream to Robles Dam under certain flow conditions, and some may even pass through the dam into this reach, but no evidence of such migration was found in this study.

Matilija Creek to Matilija Dam (2/3 Mile)

Above the junction of Matilija Creek and the North Fork, Matilija Creek has a year-round flow, partly regulated by Matilija Dam. Lowest flows occur in the summer and are generally above 2 or 3 cfs; winter flows have ranged from 2 to 3 cfs to several thousand cfs. Riparian growth is moderately dense, and there are many pools and runs that provide fair habitat for trout. The substrate is 60 to 70 percent boulder, which provides good cover for the fish. There is little good spawning substrate. Replenishment of gravels is prevented by Matilija Dam.

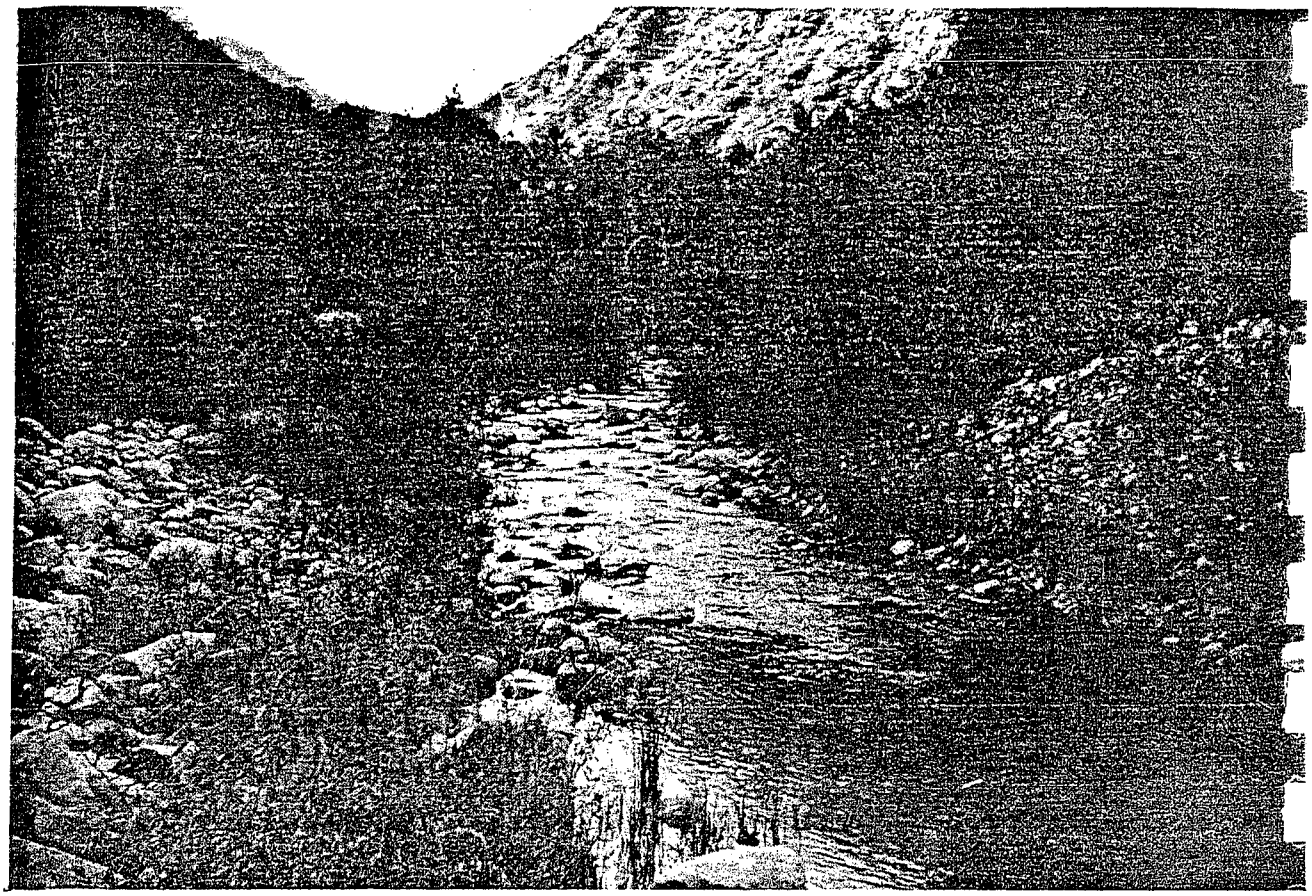
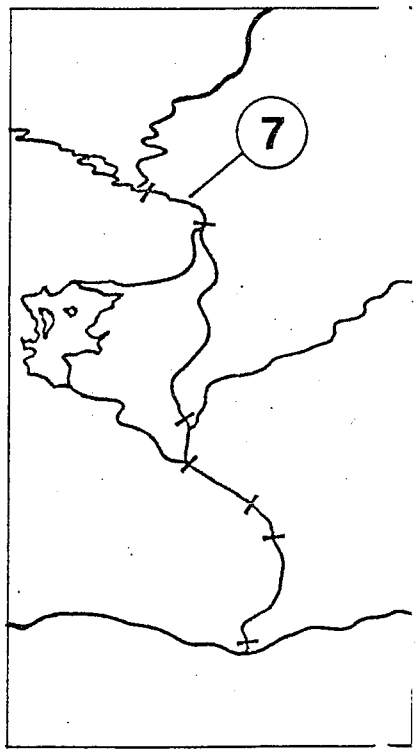


Plate V-7 Ventura River, Upstream of Robles Dam

Habitat Assessment

- Arroyo chub and threespine stickleback are common
- Rainbow trout found above Robles Dam but no steelhead
- Fair juvenile trout rearing habitat
- Diversion ponds below Matilija Creek eliminate trout habitat and could obstruct upstream steelhead migration
- Low summer flows in North Fork of Matilija Creek reduce the quality and amount of summer trout habitat
- Substrate in Matilija Creek inadequate for trout spawning



North Fork Of Matilija Creek

The lower 600 yards of this stream are nearly barren of riparian vegetation. The stream bank is lined with concrete near the road surface. Large boulders and rubble are the dominant substrate and create a series of small pools and falls, some with a 2-foot drop. These falls would prevent small fish from moving upstream, but adult steelhead migrants, if present, could have ascended these falls in February 1977, when the flow was estimated at 1.5 cfs. Many of these pools contain gravels suitable for trout spawning.

The remainder of the North Fork has fair to good riparian vegetation and a varied substrate with abundant spawning gravel and cobble. The stream channel is generally less than 16 feet wide and is fairly well shaded throughout. With flows of 1 to 2 cfs, the channel was about half to two-thirds filled. Normally, summer flow is below 1.5 cfs (USGS, 1974). At low flows, the stream area available to trout is limited to well-shaded pools. Most of the riffles do not have sufficient depth or cover for the rearing of many juvenile trout.

North Fork Ventura, bordered by Highway 33 in its lower 3.5 miles, supports a large winter and spring rainbow trout fishery based on frequent stocking of catchable-size trout by the California Department of Fish and Game. Since 1971, an average of 6500 trout have been planted in the North Fork between January and June of each year.

San Antonio Creek

River Characteristics. San Antonio Creek is tributary to the Ventura River just above Casitas Springs. During winter 1976-77, it had a flow of 0.1 to 0.5 cfs from above Camp Comfort downstream to a point a few hundred yards above the Highway 33 bridge; there it disappeared in the substrate. This upper reach is partially shaded with riparian vegetation, mostly willow, and consists primarily of long pools and short riffles. The substrate is a mixture of bedrock, cobble, and large sections of sandy gravel.

Subsurface flow rises in the streambed above the Highway 33 bridge, and the lower mile of San Antonio Creek appears to have a permanent though very small flow (Plate V-8). The June-July water temperatures in the lower reach have been measured as 64-65^{o}F in late afternoon (Moore, 1976).

Biota. Watercress grows along the edges of most reaches of upper San Antonio Creek, and filamentous algae is abundant in sunlit portions. Just above the Highway 33 bridge, channeling work has removed much of the riparian cover and allowed aquatic plants and algae (Cladophora and Zygnema) to increase so they almost choke the creek. Below Highway 33, dense shade reduces aquatic plant growth, but the rocks are covered with a heavy growth of periphyton.

Invertebrates were relatively sparse at Camp Comfort on December 9 but were much more abundant and diverse at Frasier Road Crossing. Mayfly nymphs dominate at Camp Comfort; they are joined by caddisfly and midge larvae, and amphipods at Frasier Road.

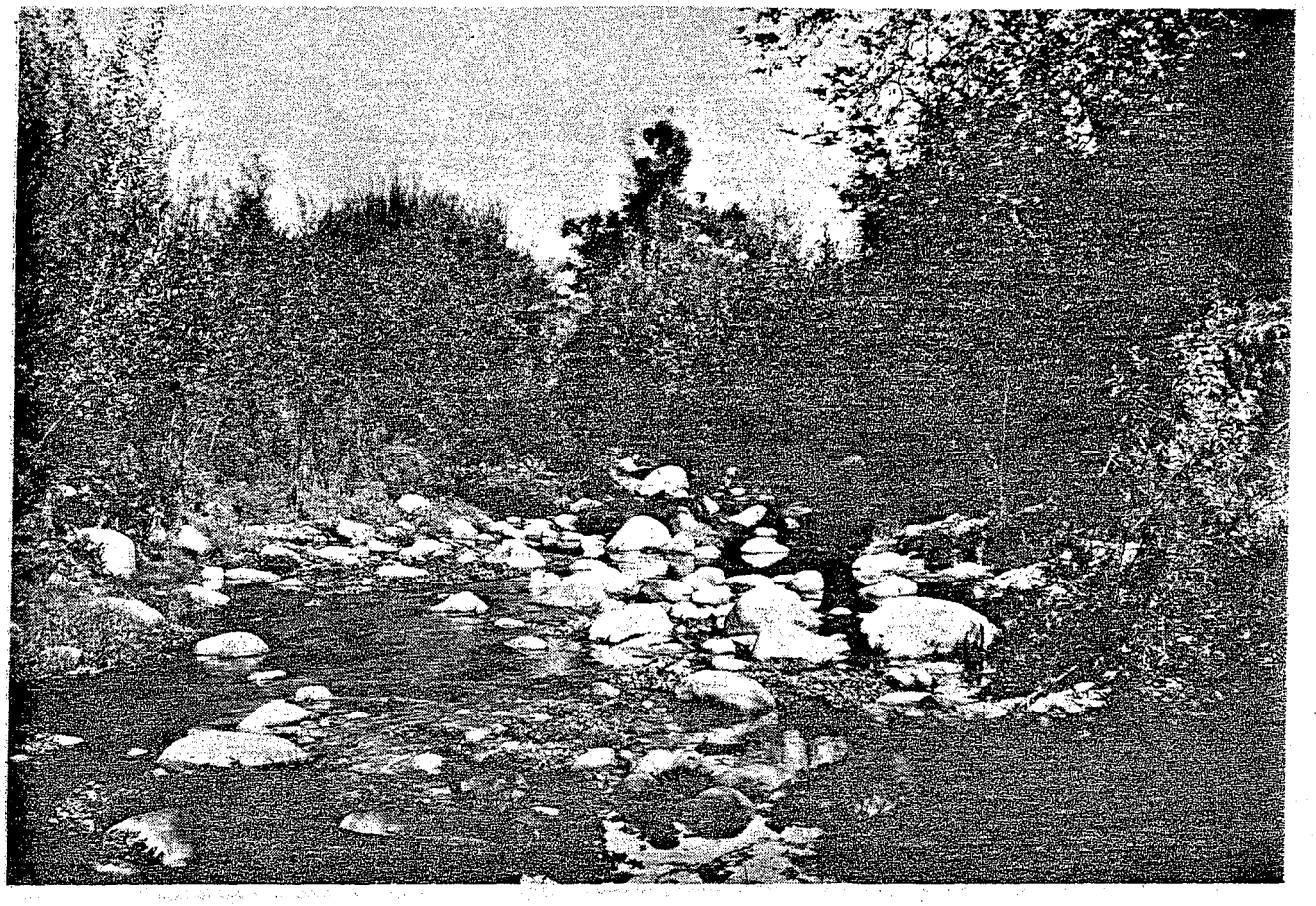
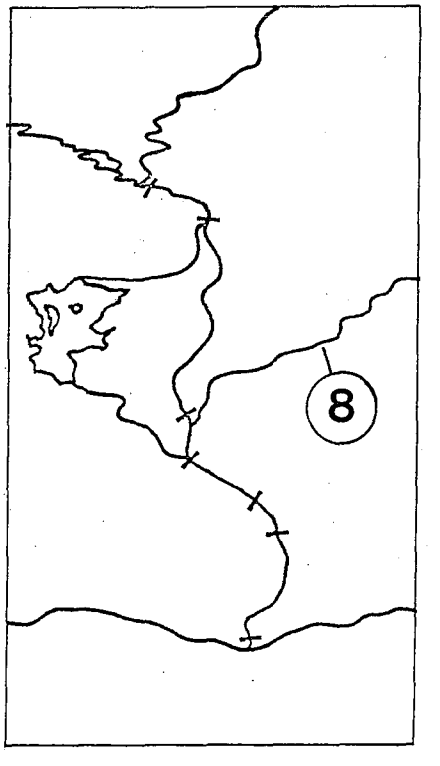


Plate V-8 San Antonio Creek

Habitat Assessment

- Warmwater fish abundant throughout
- Some trout found in lower reach, none in upper reach
- Poor to fair trout rearing habitat upstream: very low flow; poor in-stream cover and shade; fair shade
- Fair to good trout rearing habitat in lower mile: good in-stream cover and shade; cool summer water temperature
- Great species diversity and abundance of invertebrates in lower reach; lower diversity and abundance in upper reach



Large numbers of arroyo chubs, sticklebacks, and a few green sunfish were collected at both Camp Comfort and Frasier Road, but no trout were found. It is probable that some of the remnant run of steelhead spawn in the lower end of San Antonio Creek. The March 20, 1975, Ventura County Star-Free Press has a photo and a report of an adult steelhead caught there. Some of the small steelhead planted in July 1975 were introduced into the lower end of San Antonio Creek. Some trout were observed there in winter 1976-77, but it was not determined if they were resident rainbow or young steelhead.

Assessment of Existing Conditions. San Antonio Creek is a very small and attractive aquatic habitat. It has a small amount of good trout habitat in the very lower end, below Highway 33; but upstream, dry-season flows are too low and summer water temperatures are probably too high for trout rearing.

Casitas Reservoir

Reservoir Characteristics. Casitas Dam was completed in 1959. The reservoir has a full capacity of 254,000 AF, maximum shoreline of 32 miles, and a maximum surface area of 2700 acres (Plate V-9). The average annual inflow is 25,700 AF, and there has never been a spill (Barnett, 1976).

Biota. An extensive biological sampling project was recently begun by Dr. A. W. Fast (1976). Much of the following summarizes Dr. Fast's initial findings.

Phytoplankton chlorophyll levels have been measured weekly from 12 stations at 13 depths since June 18, 1976. From

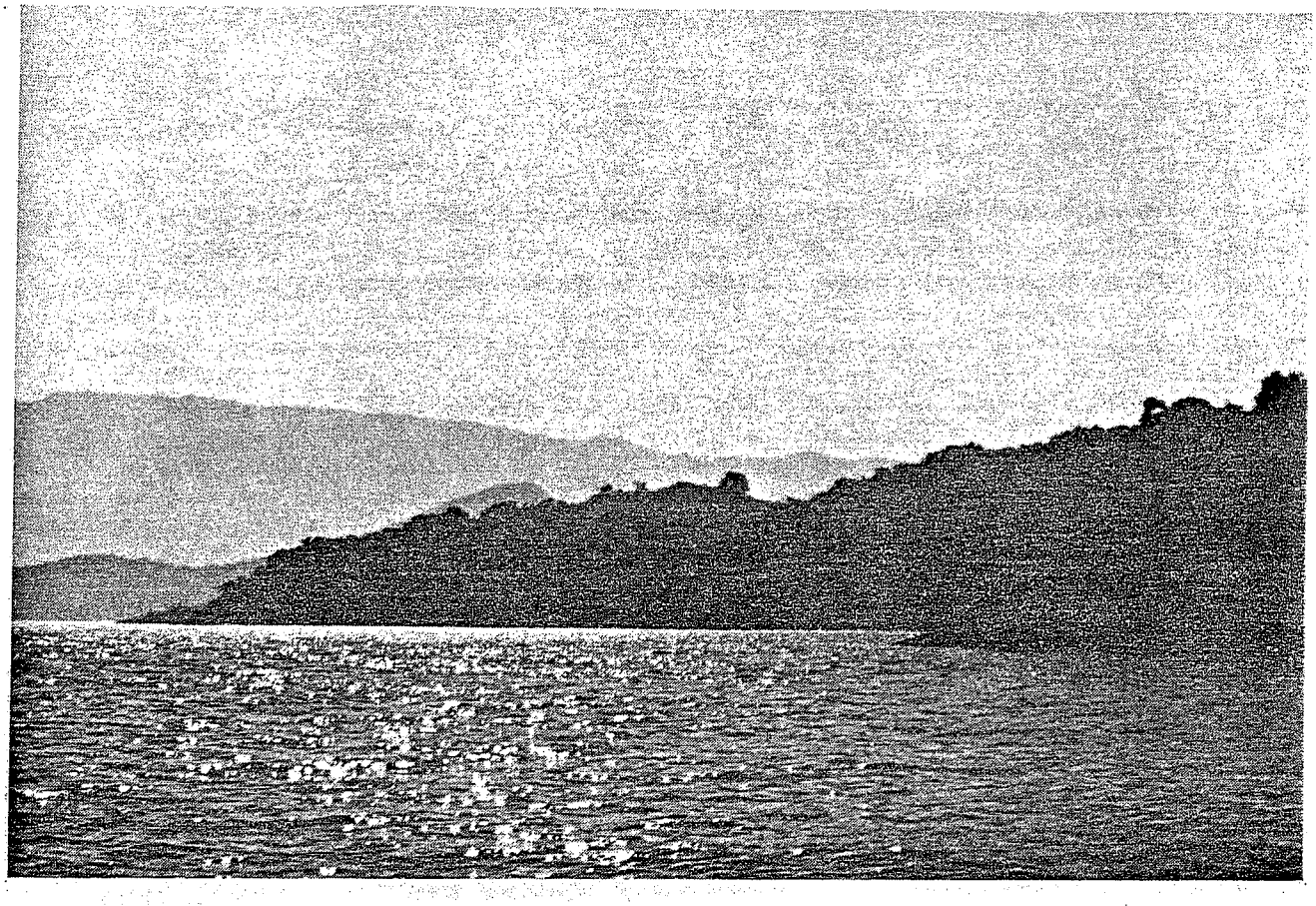
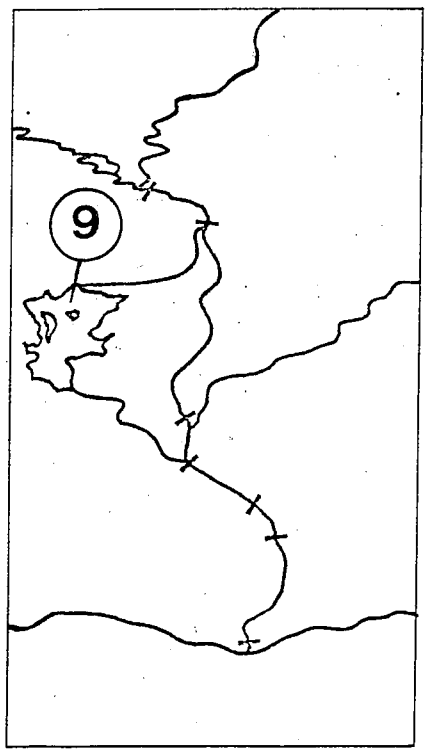


Plate V-9 Casitas Reservoir

Habitat Assessment

- Man-made lake formed behind Casitas Dam
- Large fishery (some species planted)
- Abundant populations of rainbow trout, largemouth bass, red-ear sunfish, channel catfish, threadfin shad
- Abundant crayfish in some places
- Total estimated annual recreational use: 1.7 million visitor days



June through August 1976 the levels were near or below 3 mg/l; concentrations from below 15 meters were less. These levels of chlorophyll indicate low to moderate phytoplankton levels.

Rooted aquatic plants are scarce. There are some patches of tules and cattails around the shore, some dense beds of the algae Chara, and a few isolated beds of Najas marina.

Zooplankton samples have been taken weekly at four stations at four depths since August 12, 1976. Bosmina, Cyclops, and Asplanchnia are the major zooplankton groups. Zooplankton concentrations for August ranged from 0.8 to 11.4 organisms per liter. This is low to moderate zooplankton abundance.

Benthic collections have also been made. Field examination by Dr. Fast revealed a "relatively sparse benthos, consisting mostly of midge larvae and oligochaete worms." Asiatic clams are common in shallow areas and are recent invaders of the reservoir. Crayfish are found in abundance in some of the bottom samples.

The predominant fish species are rainbow trout, largemouth bass, red-ear sunfish, channel catfish, and threadfin shad. Walleye and crappie have been introduced but have failed to establish themselves.

The largemouth bass and red-ear sunfish provide sportfishing; both reproduce naturally in the reservoir. Channel catfish are planted at a rate of about 4500 catchables annually (CMWD records). There is no evidence of natural reproduction of catfish in the reservoir.

Rainbow trout are planted from late fall through spring of each year at an average rate of 120,000 catchable-size fish per year (CMWD records). These trout are able to survive over the summers and grow to 6 pounds or more.

Habitat Limitations. Casitas Reservoir is not a highly productive impoundment in terms of phyto- and zooplankton abundance, but it does support fish populations in large enough numbers to provide fishing throughout the year. There are no estimates of natural reproduction levels of fish in the reservoir, but it is generally believed that the trout and catfish populations would not persist without continuous stocking.

The small littoral zone of the reservoir may restrict bass and sunfish spawning to a small portion of the lake bottom; it certainly restricts productivity. Under present conditions, water level fluctuations have not been cited as a significant factor limiting warmwater fish spawning success.

Assessment of Existing Conditions. Casitas Reservoir is one of the most valuable aquatic habitats in Southern California in terms of its heavy recreational use. CMWD estimated that it provides 1.7 million visitor days of recreation per year.

Coyote Creek, Below Casitas Dam to Ventura River

River Characteristics and Biota. Since Casitas Dam was completed in 1959 no significant releases of water (e.g., more than .5 cfs) have been made downstream. The reservoir has spilled only once (March 31, 1978). U.S. Geological Survey records for 1968-1974 show that monthly flow at the mouth of Coyote Creek has been below 1 cfs and rarely has exceeded 5 cfs.

This loss of flushing flows has led to siltation of the streambed, encroachment by nettles, blackberry, willow, maple, and alder, and elimination of all fish habitat (Plate V-10). On December 7, 1976, there were a few pools covered with duckweed.

Habitat Limitations. The loss of all flow except for accretion occurring below Casitas Reservoir has eliminated any stream habitat previously suitable for fish. Without winter flushing of the accumulated silts and removal of the trees and shrubs, this condition will persist.

Assessment of Existing Conditions. Coyote Creek, from Casitas Reservoir to the Ventura River, has little present or potential value as aquatic habitat.

TERRESTRIAL BIOLOGY

This section provides an overview of existing vegetation and wildlife found along the Ventura River, Coyote Creek, and Lake Casitas. Primary emphasis is given to the floodplain area of these drainages, although other regional environments are discussed as they relate to the waterways.

Information presented here was compiled from existing reports, color and black-and-white aerial photographs. Particularly valuable information on rare and endangered species was obtained through personal communications with Sandy Wilbur of the U.S. Fish and Wildlife Service and with Robert Fordice and Ron Jurek of the California Department of Fish and Game.

Appendix E is a list of vertebrate terrestrial wildlife species expected to inhabit or visit the Ventura River area.

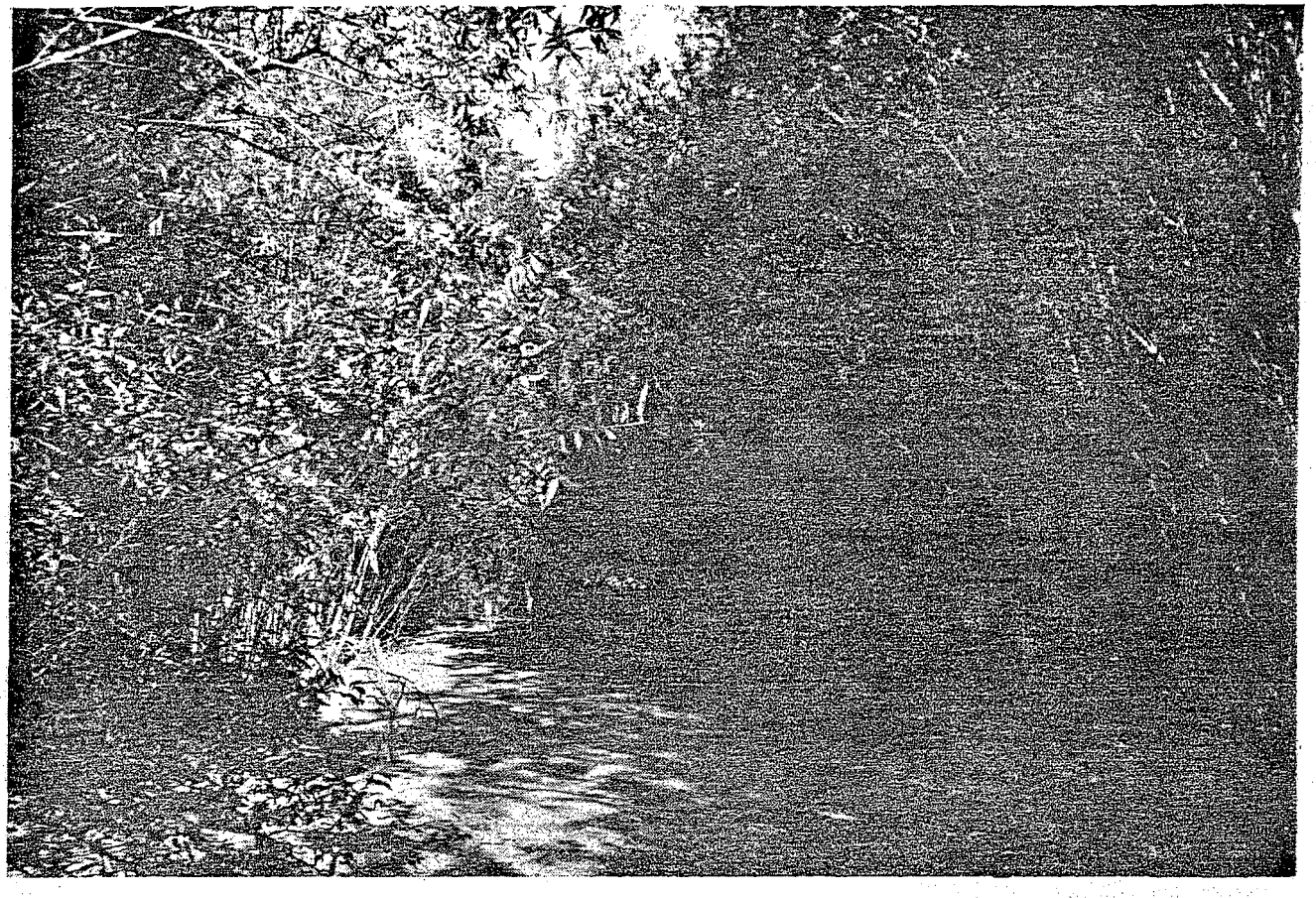
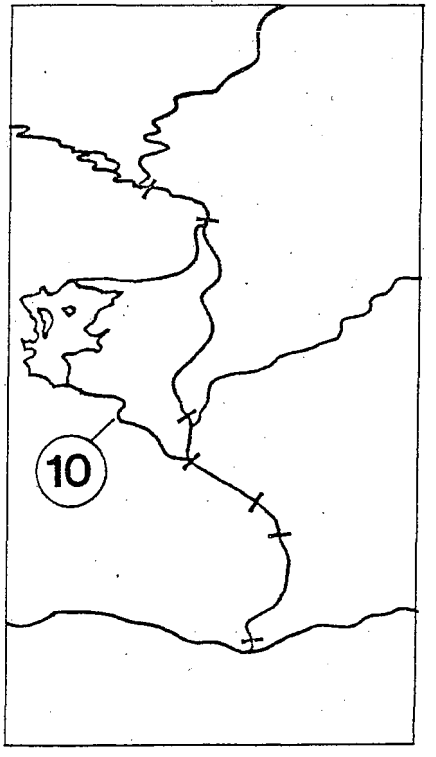


Plate V-10 Coyote Creek

Habitat Assessment

- Little or no surface flow most of the time
- Casitas Dam eliminated winter flushing flows, allowing silt buildup
- Trees and shrubs have invaded streambed
- Unsuitable habitat for fish or other aquatic species



Species restricted to, dependent upon, or most commonly associated with riparian, marsh, and aquatic habitats are identified in the list of species. Appendix F is a list of the common plant species occurring in the area.

Habitats of Ventura River and Coyote Creek

Riparian. Riparian habitat includes vegetative cover within the floodplain which is of sufficient density to provide good cover and food sources for wildlife. This type is dominated primarily by moderate to dense stands of willow or trees such as sycamore, alder, and cottonwood. Riparian habitat is one of the most valuable to wildlife, providing good-quality food and cover near a water source. It is also among the scarcest in California, since large numbers of acres have been lost to agriculture and development.

The most significant stands of riparian habitat in the study area occur along the Ventura River just to the north of its mouth, in the Casitas Springs-Foster Park area, and along Coyote Creek. The distribution of this habitat within the floodplain varies as the stream channel locations and annual flow volumes change. Riparian habitat along the Ventura River has been altered substantially from past natural distribution and extent as a result of urbanization and agriculture and because of reduced flows from upstream diversions.

Coastal Sage Scrub. This generally low-growing shrub community is dominated by sagebrush and usually occurs on adjacent slopes or on drier portions of the floodplain. An extensive amount of this habitat type is located at the mouth of the river. It provides protective cover for several

bird and mammal species, and the seeds and fruit of the various shrubs provide food.

Grassland. The grassland habitat type is dominated by a variety of annual grasses, and several areas contain scattered willow or other shrubs or trees. The grasses provide food for some grazing animals such as deer and for some waterfowl, while many other birds and small mammals feed on the seeds. Predatory birds, such as the sparrow hawk and the white-tailed kite, can be observed hovering over grassland habitat in search of small prey.

Agricultural. Agricultural habitat includes all cultivated row crops and orchards (primarily citrus and avocado). Although it varies according to the type of crop, the presence of wildlife in agricultural areas is generally low. Some animals, however, such as deer and rodents, find the cultivated plants highly palatable and visit these planted areas frequently.

Barren. Areas that have sparse (less than 10 percent) or no vegetative cover are classified as barren. Wildlife value is very low since little food or cover is available.

Urban. The urban category includes areas where man-made structures have essentially replaced or significantly disturbed the natural habitat. Many nonnative landscape plants are common. Although wildlife value is generally low, several species, particularly passerine birds and small rodents, have readily adapted to this type.

Aquatic. The aquatic habitat type includes all areas of flowing and standing surface water. In addition to the

variety of aquatic life it supports, this water provides breeding habitat for some terrestrial amphibians, is important as a feeding area for fish-eating birds such as osprey and kingfisher, and is also an important source of drinking water for many animals, particularly where protective riparian cover is present.

Habitats of Ventura River Mouth

Freshwater Marsh. The freshwater marsh habitat occurs at the upper portions of the river mouth area where salt water does not intrude at high tide. Common indicator plants include cattails, sedges, and tule. This habitat is frequented by a wide variety of birds, including water-oriented species such as egrets, herons, and waterfowl. Like riparian habitat, marshes are very high in biological productivity and are scarce in this region.

Saltwater Marsh. The saltwater marsh is similar to the freshwater marsh in its basic physical structure and high degree of biological productivity, but the plant and animal communities vary (although most bird and mammal species overlap by utilizing both). Common plant indicators of the saltwater marsh include pickleweed and saltgrass.

Mudflats. Mudflats include the alluvial and sandy flats that are periodically flooded by tidal and river flows. These are prime feeding areas for wading birds that forage for small crustaceans and other invertebrates.

Coastal Strand. This habitat consists of sand dunes near the beach that support several scattered, salt-tolerant plant species. The strand is not inundated by tidal flows.

Two common indicator plants are sea rocket and mock heather. This habitat has limited value to wildlife at the Ventura River mouth because of human disturbance; however, relatively undisturbed areas often provide nesting sites for birds such as terns.

Coastal Sage Scrub. This type, previously described, occupies the higher and drier portions of the river mouth area, just inland from the coastal strand.

Habitats of Lake Casitas and Upland Areas

Lake Casitas. The shoreline of Lake Casitas is essentially devoid of any riparian or other water-associated plant communities. Oak woodland and grassland habitats surround the lake, extending to the water's edge on all sides.

Upland Areas. The upland areas within the Ventura River drainage include coastal sage scrub, chaparral, and oak woodland as the dominant vegetation types, with smaller areas of grassland. The oak woodland occurs as a dense shrubby form in many areas, forming a chapparral-like habitat.

Many of the wildlife species that inhabit upland areas depend on the waterways and associated riparian habitat for their daily or seasonal activities. This is particularly true during the dry season, when water is not as readily available and temperatures are high. The waterways are therefore an important part of the regional ecosystem, and the present wildlife communities in these upland habitats can be significantly affected by changes occurring in smaller key habitat elements.

Rare, Endangered, or Threatened Species

According to the California Native Plant Society (1974), there are no rare or endangered plant species within the study drainages.

There are, however, several species or groups of wildlife that warrant additional discussion because of their population status or unusual habitat requirements with respect to the study area. Threatened species of wildlife that may inhabit or visit the project area include the California condor, California least tern, southern bald eagle, light-footed clapper rail, California yellow-billed cuckoo, and Belding's savannah sparrow. An assessment of their relationship to the study area follows.

California Condor (Gymnogyps californianus). The project area is within the range of the condor, although it is not known to forage or nest in any area that could be affected by the project. They do, however, regularly fly over Matilija Reservoir (S. Wilbur; Feb. 8, 1977). The total population of this species now stands at slightly more than 50 birds. It is classified as endangered by the California Department of Fish and Game (1976).

California Least Tern (Sterna albifrons browni). Classified as endangered by the California Department of Fish and Game (1976), this species requires flat, sandy areas devoid of vegetation along the coast for nesting. They also require freedom from disturbance. No nesting activity at the Ventura River mouth has been reported since the late 1930s, and only occasional sightings of migrating individuals now occur (R. Jurek; Feb. 11, 1977; S. Wilbur; Feb. 8, 1977). The mouth of the Ventura River is not considered by the California

Department of Fish and Game to be critical or even important to the survival of the least tern (R. Jurek; Feb. 11, 1977).

Southern Bald Eagle (Haliaeetus leucocephalus leucocephalus). The bald eagle is classified as endangered by the California Department of Fish and Game (1976). Although its presence has not been verified, it is possible that one or more eagles may winter at Lake Casitas (R. Fordice; Jan. 17, 1977). The bald eagle is migratory through this part of the state but does not nest there.

Light-footed Clapper Rail (Fallus longirostris levipes). This bird is an inhabitant of coastal salt marshes. Although its known range extends from Santa Barbara County south, biologists are reasonably certain that it is not found in the marshes of the Ventura River mouth (S. Wilbur; Feb. 8, 1977; R. Jurek; Feb. 11, 1977). The species is classified as endangered by the California Department of Fish and Game (1976).

California Yellow-billed Cuckoo (Coccyzus americanus occidentalis). Classified as rare (CDFG, 1976), this species has never been abundant in California and known breeding populations occur only on the Sacramento and Colorado rivers. Although it cannot be stated with absolute certainty that it does not occur along the Ventura River, it is unlikely that it does, because the riparian habitat appears to be unsuitable or marginal. Twenty-five acres of dense riparian growth is required to support one pair (CDFG, 1976).

Belding's Savannah Sparrow (Passerculus sandwichensis beldingi). This endangered species is closely associated

with pickleweed habitat subject to tidal influence (CDFG, 1976). The birds have been observed in suitable habitat at the Ventura River mouth during the winter, but there is no firm documentation that they are present during spring, which would indicate a breeding population (R. Jurek; Feb. 11, 1977). A spring survey by Bradley in 1973 did not reveal its presence at the mouth of the Ventura River. Another spring survey was conducted by the California Department of Fish and Game in 1977, and again no breeding activity was observed (C. Massey, CDFG; June 30, 1977). It can be stated with certainty that the Ventura River mouth does not provide breeding habitat for this species and therefore is not regarded as critical to the survival of this species.

Other Species of Concern

Bell's Vireo (Vireo bellii). Although this species is not classified in any threatened status, it has been suggested by several biologists that it should be (S. Wilbur; Feb. 8, 1977). A survey of this species will be conducted in the near future for the purpose of making a recommendation with respect to its inclusion on the federal list of threatened species (S. Wilbur; Feb. 8, 1977). It is likely that members of this species occupy riparian habitat along the Ventura River, at least during migrations, but it is not known whether they breed there (S. Wilbur; Feb. 8, 1977).

Yellow-breasted Chat (Icteria virens). This bird is not found on any state or federal threatened species list but is believed to be locally uncommon and possibly restricted to the Ventura River area within the county (B. Foulk, Ventura

County Public Works Agency; Jan. 17, 1977). Its most common habitat is willow thickets and other woodlands along streams and lakes.

Great Blue Heron (Ardea herodias). This large wading bird is known to nest in small numbers at Lake Casitas (R. Fordice; Jan. 17, 1977). They nest in colonies, generally in trees and near areas of shallow water suitable for feeding. Suitable nesting sites have been reduced in number in the state because of habitat loss or human disturbance.

Summary and Discussion

Because of their importance to wildlife and their relative scarcity as a result of human destruction, the riparian, freshwater and saltwater marsh, mudflat, and aquatic habitats are regarded as critical to maintaining the integrity of the existing biological community. These are also the habitats that are supporting, or have the potential of supporting, nearly all of the rare and endangered wildlife species whose ranges include the study area. All of these critical habitats appear to be highly dependent upon the river and stream flows; however, the specific relationship between surface water and groundwater flows and the vegetative communities is not known.

Geographically, the areas that provide the highest quality and most sensitive habitat are the river mouth and the Casitas Springs-Foster Park area. South of Foster Park, wildlife access to the riparian zone has been greatly reduced because of urbanization and industrial activity. North of Foster Park, the riparian zone is much more accessible; and in many areas, oak woodland and coastal sage

scrub habitats extend to the floodplain. Where such access is available, the riparian and upland habitats are ecologically related and wildlife communities have evolved so that many species depend on both.

The exact status of several rare or endangered wildlife species is unclear; there are several conflicting reports regarding sightings and whether the species are resident or transient. For this report, biologists with the California Department of Fish and Game and the U.S. Fish and Wildlife Service have been consulted as the most authoritative sources for this information. It has been assumed that these agencies have the most recent and valid data.

In addition to their inherent values, the biological resources of the Ventura River system provide educational and aesthetic benefits. Local schools, colleges, and conservation organizations utilize the river mouth area and other portions of the study area for biological field studies. Residents and visitors to the area benefit from the aesthetic and recreational values of the river system.

LAND USE AND FEATURES

From the time of the earliest settlement in the Ventura River and Ojai valleys, agricultural land use has played a central part in the local economy. In the 1780s, lands around Mission San Buenaventura were used for grazing livestock and for limited crop production. After California was admitted to the Union in 1850, cattle-raising on vast ranches predominated in the valley. The extension of the Southern Pacific Railroad to Ventura County precipitated a land boom

and a gradual reduction in the average size of land holdings there. Agricultural production shifted toward grain farming.

In the early 1900s, the first commercial citrus orchards were planted in the Ventura River and Ojai valleys. It was about this time that oil interests began to develop the Ventura Avenue oil fields. Agriculture and petroleum-related industries continue to be important to the local economy.

Present land use in the Ventura River Valley is shown on Figure V-8. The categories of land use shown on the figure include residential, commercial, industrial, urban, oil fields, agriculture, and recreation. Following a description of the distribution of the various land use categories, information on the present and projected mix of land use in census-tract analysis zones is presented.

Urban (Commercial, Residential, Industrial)

The principal communities in the Ventura River and Ojai valleys are the city of San Buenaventura, located along the Pacific Ocean and extending northward in the lower Ventura River valley; Casitas Springs, just north of Foster Park; and Oak View, Meiners Oaks, and Ojai, in the upper Ventura River and Ojai valleys. The land uses in these communities include residential, commercial, schools, and other community services.

Because detailed location of each kind of land use in the city of San Buenaventura is not critical to this study, land use in the city is shown only as urban. The city of San Buenaventura is generally separated from the Ventura River

by the Southern Pacific Railroad, the Ojai Freeway, and the Flood Control District's flood protection levee.

There are few residential areas directly adjacent to the Ventura River. The exceptions are the small communities of Casitas Springs and Live Oak Acres, which lie in the floodplain and are susceptible to floods from the Ventura River.

There is considerable industrial land use in the lower Ventura River Valley and little or none north of Foster Park. Industry is concentrated in the flat valley area crossed by the Ventura Avenue oil fields, which extend in an east-west band across the hills approximately 3 miles inland from the coast.

The oil field operations and related industries are important to Ventura County and are a major part of the basic sector of the local economy. The petroleum industry uses a considerable volume of fresh water each year for secondary recovery of oil from the Ventura Avenue oil fields.

Just north of the oil fields and adjacent to the river is the U.S.A. Petrochem plant which produces petroleum products and ammonia. South of the oil fields toward San Buenaventura there are other sizable areas of industrial use. The sand and gravel mining and milling operation of the Southern Pacific Milling Company is an industrial activity with a unique relationship to the lower Ventura River since riverbed is its primary resource.

Agriculture

There are approximately 11,500 acres of land in production in the Casitas Municipal Water District (Ventura County Environmental Resource Agency, 1976). The distribution is as follows: 4600 acres in the Ojai Valley, 3900 acres in the upper Ventura River Valley, and 3000 acres in the lower Ventura River Valley. Information on the present breakdown of crop types in the valleys has not been assembled. In 1969, when there were 6700 acres in agricultural use, 4700 acres (70 percent) were irrigated. Of the irrigated land, 82 percent was in citrus (lemons and oranges) and avocados, 5 percent was in truck crops, and 13 percent was in deciduous fruits and nuts (California Department of Water Resources, 1969).

Land planted in lemons, oranges, and avocados is found throughout the Ventura River and Ojai valleys and along the Ventura River's tributaries, San Antonio Creek and Canada Larga. The County Farm Advisor reports that in the past three years some 200 acres of avocados have been planted on the hillsides of the Ventura River Valley and that as long as the price of avocados remains strong more land will be planted to avocados (Bud Lee, Ventura County Farm Advisor; personal communication, June 27, 1977). Most of the crops in the area are irrigated with groundwater and water from the Ventura River.

Recreational Land Use: Parks

There are several parks and recreational areas in the Ventura River Valley that are adjacent to and gain value as parks

from the natural setting of the Ventura River. These are Emma Wood State Beach and "Hobo Jungle" (Seaside Wilderness Park) at the mouth of the river; Foster County Park, about 6 miles up the river; and Matilija Hot Springs and Lake Matilija County Park, about 16 miles up the river. Lake Casitas is another important recreational area related to the Ventura River system.

Emma Wood State Beach. Emma Wood State Beach, which is undeveloped, extends in a thin strip about 3.5 miles along the Pacific Ocean from the community of Solimar south to the Ventura River. This 100-acre park includes beachfront, estuarine, and riparian lands at the mouth of the river. The California Department of Parks and Recreation has made plans for development of the area at the river mouth. The plans include consolidation of ownership, acquisition of new lands, development of parking areas, and development of separate facilities for day use and overnight camping. A key objective in developing these park facilities is the preservation and interpretation of the natural habitat and scenic qualities at the river mouth for the enjoyment of park visitors (California Department of Parks and Recreation, 1976a and 1976b).

"Hobo Jungle." "Hobo Jungle" (or, more formally, Seaside Wilderness Park) is a city-owned 22-acre parcel at the mouth of the Ventura River which includes nearly all of the Ventura River Lagoon. This undeveloped area is immediately adjacent to Emma Wood State Beach.

Foster Park. Foster Park is a county park located at the confluence of Coyote Creek and the Ventura River, about 6

miles upstream from the mouth of the river. The 200-acre park is a mix of steep chaparral-covered hillsides and river bottomlands with a variety of riparian vegetation, including stands of willow, sycamore, and alder. Present facilities include picnic and barbecue areas; courts for volleyball, badminton, and horseshoes; and a lighted softball field. There is also Foster Bowl Amphitheater and some facilities for tent and trailer camping.

The Ventura County Property Administration agency is preparing a master plan for further development of Foster Park (Austin Cline; personal communication; December 22, 1976). A conceptual study for the master plan includes the negotiation of a long-term agreement with the City of San Buenaventura, which owns an 82-acre parcel immediately north of the County's Foster Park, whereby the County would have the authority to develop and operate a recreational facility on the City's land. A portion of this addition to Foster Park would be used as a primitive camping area for young people. Most of the City property would remain undeveloped. This City-owned parcel is identified on the land use map, Figure V-8. The entire parcel lies within the Ventura River floodplain and includes the "live stretch" of the river where rising groundwater provides good rearing habitat for steelhead trout.

The eastern property line of this City-owned parcel abuts the Southern Pacific Railroad right-of-way, which the County would like to turn into a bicycle, equestrian, and hiking trail.

Lake Casitas Recreation Area. Lake Casitas is an important water-oriented recreation facility operated by the Casitas Municipal Water District and is heavily used for camping and

fishing. Some 4097 acres of land were withdrawn from other uses by the U.S. Bureau of Reclamation as part of the Ventura River Project. When the reservoir elevation is 567 feet above sea level, 1800 acres of land surface and 2710 acres of water surface are available for recreational use. At 567 feet elevation there are about 31 miles of shoreline.

Water contact is not permitted in Casitas Reservoir, so there is no swimming or waterskiing. Recreation activities fall into the following categories: sightseeing, picnicking, camping, boating, and fishing. On the lake's edge there are 9 day-use picnic areas with 203 picnic tables. There are 12 campgrounds with 467 tent spaces, each with a table and pit, and 467 trailer spaces. Since 92 of these sites can accommodate tent or trailer camping, there are a total of 842 campsites. Two boat-launching ramps provide access to the lake. There are 250 slips for powerboats and sailboats, and 160 boats are available for rental.

According to the "1976 Recreation and Wildlife Summary for the Lake Casitas Recreation Area" submitted by Casitas Municipal Water District to the U.S. Bureau of Reclamation, the 1976 boating use was as follows:

	1976	Peak Day
Powerboat-days	64,332	620
Rowboat- and sailboat-days	186	10
Total boat-days	64,518	630

The total number of fisherman-days in 1976 was 1,017,018; the total catch was 3,051,054 fish. The average catch was 3 fish per fisherman. The distribution of types of fish

caught was as follows: 25 percent bass, 20 percent channel catfish, 20 percent red-ear, and 35 percent trout.

Visitor use statistics are shown in Table V-7.

Matilija Lake Park. Matilija Lake Park is a 134-acre park that offers picnicking, camping, and trout fishing above Matilija Dam. As at Lake Casitas, no water contact is permitted.

Matilija Hot Springs. Matilija Hot Springs is a mineral hot springs near the base of Matilija Dam, centuries old and one time a health spa of the Chumash Indians. The hot springs and spa are in operation and may be reached from State Route 33.

Proposed Ventura River Bikeway System. At present, three different local governments--the City of San Buenaventura, Ventura County, and the City of Ojai--are interested in developing a bikeway in the Ventura River Valley. Other possible uses for the recreational pathway are hiking and horseback riding. The three governments are at different stages in the implementation of their plans.

The City of San Buenaventura and the U.S. Army Corps of Engineers are proposing to develop a bikeway on the maintenance road on the top of the Ventura River levee. Under Program 710, the City and the Corps of Engineers will share equally in the cost of development. The levee, owned by the Ventura County Flood Control District, extends from the ocean approximately 2.5 miles upriver on the east bank. From the northern terminus of the levee, the bikeway would cross over to Ventura Avenue then continue north to Foster Park as an onstreet bicycle lane.

Table V-7. VISITOR ACTIVITIES AT LAKE CASITAS RECREATION AREA

Activity	1976	1975
Sightseeing	135,309	127,332
Picnicking	98,842	101,425
Camping	339,588	365,736
Swimming	0	0
Waterskiing	0	0
Boating	124,590	118,750
Fishing	1,017,018	1,022,985
Hunting	0	0
Others	0	0
Total visitors	1,715,347	1,736,228
Peak-day visitors	22,272	24,188
Total cars in area	356,849	351,529

Source: Casitas Municipal Water District, 1977, "1976 Recreation and Wildlife Summary for Lake Casitas Recreation Area." Submitted to U.S. Bureau of Reclamation.

For the bikeway north of San Buenaventura, the Ventura County Property Administration Agency has been seeking federal assistance to acquire the abandoned Southern Pacific Railroad right-of-way from Foster Park to Ojai. Likewise, the City of Ojai itself is investigating the purchase of the railroad right-of-way within the Ojai city limits.

The acquisition and development of the Ventura River Bikeway system would improve public access along several miles of the river and would provide greater opportunity for public enjoyment of the scenic qualities of the Ventura River. The 2.5 miles of bikeway along the levee top would provide an opportunity to see the Ventura River bottom, but the steep sides of the levee would limit direct access to the river bottom itself.

The section of bikeway proposed by the County to be located on the Southern Pacific Railroad right-of-way would include a 4-mile segment that is immediately adjacent to the river. The abandoned railroad right-of-way extends along the river from Foster Park to just north of Oak View. While the joint City-Corps of Engineers proposal for development of the bikeway on top of the levee is underway, acquisition of portions of the railroad right-of-way by the City of Ojai and by the County is still under preliminary study only.

Transportation

The principal highways in the Ventura River Valley are State Route 33, State Route 150, and U.S. Route 101. Highway 33 extends from San Buenaventura northward toward Maricopa. From the Pacific Coast Highway (Route 101) at San Buenaventura, the Ojai Freeway extends northward to Foster Park, where it

narrows to two lanes and continues through Casitas Springs and Oak View to Meiners Oaks. At Meiners Oaks, Route 33 continues northward as the Maricopa Highway. State Route 150, known as Casitas Pass Road, begins in Carpinteria and continues over Casitas Pass to the north of Casitas Reservoir. At Meiners Oaks it joins State Route 33 for a short distance, then continues eastward through the Ojai Valley, then southward to Santa Paula.

In the lower Ventura River Valley, the Southern Pacific Railroad serves the Ventura Avenue oil fields and industrial area. At present, the tracks extend as far north as the U.S.A. Petrochem Refinery. Beyond the refinery, the railroad tracks have been removed, but Southern Pacific Railroad retains ownership of the right-of-way.

FUTURE LAND USE: PLANS AND CONTROLS

Future land use in the Ventura River and Ojai valleys is of great concern to the local citizenry and in recent years has been the subject of intense debate.

General Plans

Three governments have responsibilities for developing general plans for the Ventura River and Ojai valleys. The Ventura County Planning Division prepared a draft of the "Ojai Valley General Plan Land Use Element, 1990"; but, following extensive discussion and public hearings, the plan was not adopted.

The City of Ojai has a new General Plan for its area of influence (Williams and Mocine, 1976). The Planning Division

of the City of San Buenaventura has recently developed a new "Land Use/Circulation Plan of the Comprehensive Plan of the City of San Buenaventura." The City Council adopted the Future Land Use Map on December 6, 1976. The City's interest in planning for land use in the Ventura River area extends only as far north as the Ventura Avenue oil fields. The map of future land use confirms and ensures the continuation of present land uses in this area. The map shows the levee on the Ventura River to be part of the Linear Park System (bicycle, equestrian, and hiking uses).

Zoning

General plans, when adopted, provide general guidance for making land use decisions. In addition to the general plan, governments exercise control of land use by means of zoning ordinances. The City of San Buenaventura and the City of Ojai have responsibility for zoning within their immediate boundaries, and Ventura County has responsibility for zoning in a portion of the lower and upper Ventura River Valley. County zoning regulations permit agricultural and residential uses in the area near the river. The general intent of the zoning along the river in this area is to maintain and protect the present agricultural uses and to prevent the subdivision of productive farmland to keep agriculture from being displaced by residential or other land uses.

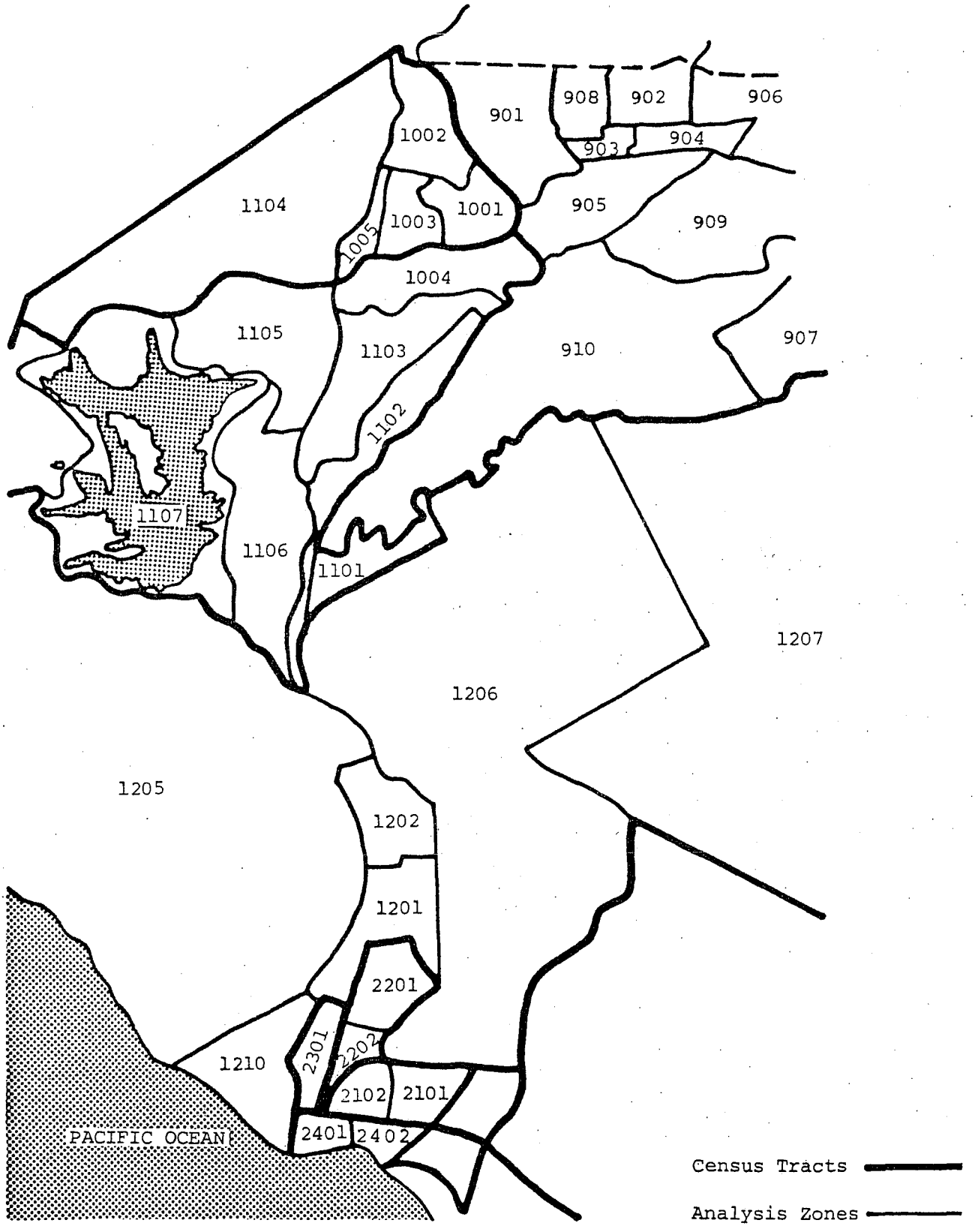
The three principal zoning classifications along the river are agricultural exclusive (A-E), rural agriculture (R-A), and rural exclusive (R-E). These zoning categories differ principally in terms of the minimum lot sizes permitted: A-E, 40 acres; R-A, 1 acre; R-E, 10,000 square feet. There are several variations of these main zoning designations

that have more restrictive lot size limitations (Zoning Ordinances, Ventura County Ordinance Code, Division 8). The only areas where zoning allows lot sizes of 1 acre or less is along the river.

Future Land Use

In 1975 the Planning Division of the Ventura County Resources Agency developed a countywide data base of existing and projected land use as part of its Regional Land Use Program (RLUP). Census tracts were subdivided into analysis zones using major natural and man-made features (e.g., rivers, creeks, or highways). The number of acres devoted to various land uses was counted for each analysis zone in 1975 and projected for the year 1990.

The analysis zones for the Ventura River area are shown in Figure V-9. The present and projected acreages of specific land uses in each analysis zone are shown in Tables V-8, V-9, and V-10 for the Ojai Valley, the upper Ventura River Valley, and the lower Ventura River Valley respectively. It should be noted that the "forecasted land use data was approved for transportation planning purposes only by the General Assembly of the Ventura County Association of Governments in January, 1976" (Ventura County Environmental Resource Agency, February 1976). The information presented in these tables suggests that changes in land use in the next 15 years will be slight to moderate. It is believed, however, that the forecast of change in land use and population probably understates the potential for growth, particularly in and near the city of Ojai.



Land Use Analysis Zones

Source: Ventura County Transportation Study. No date.

Figure V-9

Table V-8. OJAI VALLEY LAND USE DATA FOR 1975 AND 1990, BY ANALYSIS ZONE

ANALYSIS ZONE	POPULATION	RESIDENTIAL ACRES	HOUSING SINGLE UNITS	HOUSING MULTIPLE UNITS	COMMERCIAL ACRES	INDUSTRIAL ACRES	GOVERNMENTAL ACRES	SCHOOLS ACRES	RECREATIONAL ACRES	OIL ACRES	AGRICULTURAL ACRES
901	741	224	204	14	16		2	14	56		187
	1,092	330	301	21	16		2	14	56		187
902	1,775	153	531	11	3			23	2		121
	2,113	182	632	13	3			23	2		121
903	1,563	118	462	186	21			15			
	1,857	140	549	221	21			15			
904	571	37	141	85	6			6	12		
	933	60	230	139	6			6	12		
905	816	91	282	66	47			12	100		33
	998	111	345	81	47			12	100		33
906	1,428	423	516	18	4	2		271			1,477
	1,428	423	516	18	4	2		271			1,477
907	328	345	120	1	10	1		12	68		2,035
	328	345	120	1	10	1		12	68		2,035
908	475	34	153	91							
	568	41	183	109							
909	216	88	73	4	2				165		275
	216	88	73	4	2				165		275
910	190		65						136		477
	190		65						136		477

Source: Ventura County Environmental Resrouce Agency, Planning Division, February 1976, "Land Use Data by Analysis Zone, 1975/1990."

Note: For each analysis zone, data in top row are for 1975 and those in bottom row are for 1990. Data for 1990 are based on 1990 forecast adopted by the VCAG general assembly in January 1976.

Table V-9. UPPER VENTURA VALLEY LAND USE DATA FOR 1975 AND 1990, BY ANALYSIS ZONE

ANALYSIS ZONE	POPULATION	RESIDENTIAL ACRES	HOUSING SINGLE UNITS	HOUSING MULTIPLE UNITS	COMMERCIAL ACRES	INDUSTRIAL ACRES	GOVERNMENTAL ACRES	SCHOOLS ACRES	RECREATIONAL ACRES	OIL ACRES	AGRICULTURAL ACRES
1001	848	62	366	11	6			49			312
	878	64	379	11	6			49			312
1002	2,825	179	1,077	34	11		12	55			349
	3,088	196	1,177	37	11		12	55			349
1003	1,040	197	475	21	2		1	2			92
	1,139	216	520	23	2		1	2			92
1004	77		28	7							2,075
	77		28	7							2,075
1005	741	97	204			12					
	809	106	223			12					
1101	657	17	247	25	1	1		1			
	688	18	259	26	1	1					
1102	1,375	167	468	7	18	4		14			11
	1,572	191	535	8	18	4		14			11
1103	2,341	115	765	24							92
	2,566	126	839	26							92
1104	1,686	197	637	43	6		121	23			176
	1,908	223	723	49	6		121	23			176
1105	1,713	142	563	26	4			16	5		606
	1,713	142	563	26	4			16	5		606
1106	382	38	133		2			4	66		165
	382	38	133		2			4	66		165
1107	108		37						2,800		
	108		37						2,800		

Source: Ventura County Environmental Resource Agency, Planning Division, February 1976, "Land Use Data by Analysis Zone, 1975/1990."

Note: For each analysis zone, data in top row are for 1975 and those in bottom row are for 1990. Data for 1990 are based on 1990 forecast adopted by the VCAG general assembly in January 1976.

Table V-10. LOWER VENTURA RIVER VALLEY LAND USE DATA FOR 1975 AND 1990, BY ANALYSIS ZONE

ANALYSIS ZONE	POPULA-TION	RESIDEN-TIAL ACRES	HOUSING SINGLE UNITS	HOUSING MULTIPLE UNITS	COMMER-CIAL ACRES	INDUS-TRIAL ACRES	GOVERN-MENTAL ACRES	SCHOOLS ACRES	RECREA-TIONAL ACRES	OIL ACRES	AGRICUL-TURAL ACRES
1201	818	43	196	25	17	17	2	8		58	114
	738	43	196	25	17	44	2	8		58	114
1202	1,165	102	378	95	11	59	1	8			455
	1,065	102	378	95	11	59	1	8			220
1205	565	73	453	37	1	5			137	4,143	1,344
	750	97	601	49	1	5			137	4,143	1,344
1206	463		141			1				1,550	808
	507		154			1				1,550	797
2101	1,790	108	398	497	8			6	8		
	1,808	120	424	501	8			6	8		
2102	678	31	69	240	17		8	4	84		3
	1,194	58	297	280	17		8	4	84		3
2201	576	13	115	72	21	33		43			300
	566	13	115	72	21	33		43			153
2202	2,125	73	687	213	11	8					10
	2,125	73	687	213	11	8					20
2301	3,364	109	916	383	48	49	7	12			
	3,364	109	916	383	48	54	7	12			
2401	348	15	31	337	44	10	6		84		
	348	15	31	337	44	10	9		84		
2402	1,335	73	233	575	47			15	20		
	1,437	82	252	581	47			15	20		

Source: Ventura County Environmental Resource Agency, Planning Division, February 1976, "Land Use Data by Analysis Zone, 1975/1990."

Note: For each analysis zone, data in top row are for 1975 and those in bottom row are for 1990. Data for 1990 are based on 1990 forecast adopted by the VCAG general assembly in January 1976.

Based on the number of applications for subdivisions recently filed for the unincorporated area around the city of Ojai, it is believed that the population level projected for 1990 will be reached far in advance of that year, especially around Ojai (Vic Husbands, Ventura County Planning Director; personal interview; December 14, 1976). This view is shared by the City Manager of the City of Ojai (Don Kemp; personal interview; December 21, 1976).

Although it is not reflected in the tables, some increase in agricultural use may be expected in the upper Ventura River Valley, since certain landowners are planning to plant and irrigate citrus orchards on previously unirrigated hillsides.

Another change in land use that is taking place but is not reflected in the 1990 projections relates to the Bureau of Reclamation's Casitas Open Space Watershed Acquisition Program. The Bureau has begun to purchase property and homes in Analysis Zone 1004 to protect the quality of the water supply in the watershed above Casitas Lake. The Bureau is authorized to buy all the property in this area. In some cases the Bureau will lease the property back to the former owner for his lifetime or for 25 years.

HISTORICAL AND ARCHAEOLOGICAL RESOURCES

A search for information on historical and archaeological sites performed as part of this study shows there are 4 designated historical sites and 20 known archaeological sites in the Ventura River area.

Historical Sites

The Ventura County Cultural Heritage Board lists 30 historical landmarks in the county (Austin R. Cline, Ventura County

Cultural Heritage Board; telephone conversation; February 3, 1977). Four designated historical sites in the Ventura River area are listed in the "California Inventory of Historic Resources" (California Department of Parks and Recreation, 1976).

Rancho Arnaz Adobe. Built in 1863 by Don Jose Arnaz when he was granted half of Rancho Santa Ana, this landmark is located near the junction of San Antonio Creek and the Ventura River.

Santa Gertrudis Asistencia Chapel Foundation Stones. A monument marks the location of this historic place, which was covered during construction of State Highway 33.

Matilija Hot Springs. These mineral springs were once used as a spa by the Chumash Indians, natives of the Ventura River Valley.

Mission Aqueduct. Originally a 6-mile-long structure, this aqueduct was built in the 1780s by Mission Indians to bring water from the Ventura River to Mission San Buenaventura.

Archaeological Sites

As part of this study, EDAW, Inc., requested the UCLA Archaeological Survey to conduct a map and literature search to determine the extent of known archaeological resources in the following areas: (1) Ventura River floodplain from Matilija Dam to the Pacific Ocean; (2) Robles-Casitas Diversion Canal; (3) Coyote Creek from Casitas Dam to the Ventura River; (4) around Lake Casitas.

The map and literature search identified 20 recorded archaeological sites within a short distance of the above-listed areas. The sites are recorded as CA-VEN-14, 48, 59, 82, 82A, 113, 114, 115, 116, 117, 139, 140, 166, 168, 192, 193, 194, 306, 481, and 482. The recorded sites represent villages of various sizes, milling sites, middens, various portions of the remains of the Mission aqueduct, and the location of the Santa Gertrudis Chapel. The locations of these sites were plotted on a base map for EDAW, Inc., with the reservation that the locations remain confidential to protect against vandalism and destruction of the sites.

The UCLA Archaeological Survey indicated that the Ventura River area "has not been systematically surveyed by trained archaeologists" and that "undoubtedly more archaeological resources are extant in the area" (Martin D. Rosen, UCLA Archaeological Survey; personal communication; February 10, 1977).

WATER RESOURCES

This section on water resources discusses water supplies available to CMWD, the City, and other drawers of water in the Ventura River system. It reviews projections of demand and supply and discusses several water resource projects proposed to increase supplies in the future.

In the Ventura River system, as in any watershed, water supply is limited by local geography, climate, and hydrologic conditions. As the supply of water becomes scarcer with respect to increasing demand, there is a pressing need to make more efficient use of available supplies. There are approximately 45 known diverters that withdraw water from

the Ventura River system. They can be placed into four categories: irrigators, domestic users, industrial users, and water purveyors or suppliers. The locations of known water diversions are identified in Figure V-10. Information as to the owner, type of diversion, and use is presented in Table V-11, which accompanies the map. Water is withdrawn from the Ventura River system by gravity-flow surface diversions, pumped surface diversions, and wells. The volume of water produced by each diversion varies with the capacity of the diversion works or well and the demand of the user. Diversions on the Ventura River range in size from the Robles Diversion Dam, which has a capacity to divert 225,000 gallons per minute (500 cfs) to small wells that pump 10 to 50 gallons per minute.

CMWD and the City are the two major water suppliers that divert water from the Ventura River. Both CMWD and the City have established water rights on the Ventura River, and both have responsibilities for providing water to users within their boundaries.

Casitas Municipal Water District

CMWD is one of three major water districts in Ventura County. Each of the three is responsible for providing water within its respective area. The boundaries of CMWD, the United Water Conservation District, and Calleguas Municipal Water District are delineated in Figure III-1. It can be seen that part of the city of San Buenaventura is in CMWD and part is in the United Water Conservation District.

CMWD obtains its water supply from the Ventura River Project, designed and built by the U.S. Bureau of Reclamation in the

Table V-11. WATER DIVERTERS IN THE VENTURA RIVER SYSTEM

WATER SUPPLY INDEX NUMBER	TYPE OF DIVERSION	OWNER/USER	TYPE OF USER	LOCATION CATEGORY
W-1	Gravity Surface Diversion	Friend, G.E.	Domestic & Irrigation	Upstream from Robles Diversion Dam
W-2	Pumped Surface Diversion	Cutler, Donald	Domestic & Irrigation	
W-3	Gravity Surface Diversion	Meiners Oaks County Water District	Water District	
W-4	Well	Lucking, William	Domestic & Irrigation	
W-5	Well	Rancho Matilija	Domestic & Irrigation	
W-6	Gravity Surface Diversion	Rancho Matilija	Domestic & Irrigation	
W-7	Pumped Surface Diversion	Oma - Ojai Pacific	Domestic & Irrigation	
W-8	Gravity Surface Diversion	Casitas Municipal Water District	Water District	Robles Diversion Dam (CMWD)
W-9	Well	Rancho Matilija	Domestic & Irrigation	
W-10	Well	Meiners Oaks County Water District	Water District	Between Robles Diversion Dam and Foster Park Facilities
W-11	Well	Meiners Oaks County Water District	Water District	
W-12	Well	Rancho Matilija	Domestic & Irrigation	
W-13	Well	Ventura River County Water District	Water District	
W-14	Well	Ventura River County Water District	Water District	
W-15	Well	Ventura County Sheriff's Honor Farm	Domestic & Irrigation	
W-16	Well	Balding, Philip	Domestic	
W-17	Well	Willey, Gerald	Domestic	
W-18	Well	Feraud, Rose	Domestic	
W-19	Well	Dunn, Randolph	Domestic	
W-20	Well	Ventura County Water Works Dist. #7	Water District	
W-21	Well	Nelson, E.J.	Domestic	
W-22	Well	Haley, Katherine	Domestic & Irrigation	
W-23	Well	Mortensen, William	Irrigation	
W-24	Well	Osborn, Irene	Irrigation	
W-25	Well	Osborn, John	Irrigation	
W-26	Well	Ramsey, William	Domestic	
W-27	Well	Dawn, Marjorie S.	Domestic	
W-28	Well	Dawn, Marjorie S.	Domestic	
W-29	Well	Burke, Colin & Larry Barnes	Domestic & Irrigation	
W-30	Well	Newman, John V.	Domestic & Irrigation	
W-31	Well	Newman, John V.	Domestic & Irrigation	
W-32	Well	Rediwell, F.H.		
W-33	Well	Morris, Charles D.	Domestic & Irrigation	
W-34	Well	Hollingsworth, Mary B.	Domestic & Irrigation	
W-35	Well	Hollingsworth, Mary B.	Domestic & Irrigation	
W-36	Well	Ventura County Water Works Dist. #4	Water District	
W-37	Well	Casitas Mutual Water Company	Water Company	
W-38	Gravity Surface Diversion	Nye, Hildred S., Sr.	Domestic	
W-39	Well	Nye, Hildred S., Sr.	Domestic & Irrigation	
W-40	Well	Nye, Hildred S., Sr.	Domestic & Irrigation	
W-41	Well	Appel, John	Domestic & Irrigation	
W-42	Well	City of San Buenaventura	City	Foster Park Facilities (City)
W-43	Well	City of San Buenaventura	City	
W-44	Well	City of San Buenaventura	City	
W-45	Well	City of San Buenaventura	City	
W-46	Gravity Surface Diversion	City of San Buenaventura	City	
W-47	Well	3 Houses South of Foster Park	Domestic	Downstream from Foster Park Facilities
W-48	Pumped Surface Diversion	Finch, James	Irrigation	
W-49	Pumped Surface Diversion	Finch, James	Irrigation	
W-50	Pumped Surface Diversion	Kingston, Russell	Irrigation	
W-51	Pumped Surface Diversion	Crown-Zellerbach(Watanabe, Lessee)	Irrigation	
W-52	Pumped Surface Diversion	Southern Pacific Milling Company	Sand & Gravel Washing	

late 1950s to provide a system of water diversion storage and distribution within the District. As discussed in the surface hydrology section of this report, the principal engineering features of the Ventura River Project are the Robles Diversion Dam on the Ventura River, the Robles-Casitas Diversion Canal, and Casitas Dam on Coyote Creek. Matilija Dam, upstream from the Robles Diversion Dam, is owned by the Ventura County Flood Control District but is operated by CMWD, in conjunction with the Ventura River Project, to maximize capture of runoff during storms. Direct use of water from Lake Matilija was discontinued in September 1966 to avoid water quality problems. Since that time, water from Lake Matilija has been released and rediverted at the Robles Dam to Lake Casitas prior to rainstorms to maximize the volume of water diverted (Montgomery Engineers, 1976).

For the diversions it operates within the Ventura River system, CMWD has one permit and one license to divert water. Permit No. 10364, to appropriate from Ventura River and Coyote Creek, was granted by the California State Water Rights Board on May 10, 1956, and allows direct diversion of up to 120 cfs at Casitas Dam and diversion to offstream storage of up to 500 cfs at Robles Diversion Dam. This permit allows total annual diversion and storage of 300,000 AF (250,000 AF storage and 50,000 AF direct diversion). In addition, CMWD holds License No. 10133 from the California State Water Resources Control Board. This permits the diversion and storage of a maximum of 4300 AF/Y from Matilija Creek, with the maximum amount held in storage at any one time not to exceed 2470 AF. The license was granted to CMWD on May 31, 1973, and the priority of right dates from March 11, 1946, when a permit was first issued to the Ventura County

Flood Control District. Both the permit and license held by CMWD have a priority of right that is junior to the rights held by the City.

With the combined storage capacity of Matilija and Casitas reservoirs, the Ventura River Project has an estimated annual safe yield of 20,350 AF. There are no other large surface water storage facilities in CMWD.

CMWD supplies water to three service areas: Gravity, Rincon, and Ojai Valley. The Rincon service area is in the western and southwestern portion of the District and, in addition to oil companies and agricultural use, serves several small seacoast communities. The Gravity service area is south of Lake Casitas in the Ventura River Valley; its service includes sales to the City of San Buenaventura and to some agricultural users. The Ojai Valley service area is mostly east and northeast of Lake Casitas; communities in this service area include Ojai, Meiners Oaks, and Oak View. Sales in the Ojai Valley service area are divided among residential and agricultural users. Many of the sales are on a supplemental basis to a number of smaller water districts that draw water from the Upper Ventura River Basin or the Ojai Basin and purchase supplemental water from CMWD. Table V-12 shows the volume of supplemental water delivered by CMWD to water users in the Ventura River Valley.

At present, all releases of water from storage to the CMWD conveyance system are from Lake Casitas. The annual production of water from Lake Casitas for the years 1970 through 1975 is shown in Table V-13. In this six-year period, the annual releases from Lake Casitas have varied from 13,963 AF (in 1973) to 17,878 AF (in 1972).

Table V-12. USERS IN THE VENTURA RIVER SYSTEM SERVED BY CASITAS MUNICIPAL WATER DISTRICT

	Meter		Amount of Casitas Water Purchased per Calendar Year (AF)				
	Size (inches)	Capacity (gpm)	1971	1972	1973	1974	1975
Meiners Oak County Water District	6	2000	5	34	0	15	3
Ventura River County Water District	6	1600	77	200	157	177	136
Ventura County Water Works District 7	4	500	13	59	2	1	2
Ventura County Water Works District 4	4	500	<1	1	< 1	4	< 1
Casitas Mutual Water Company	2	160	-	-	-	<1	2
Private Irrigator	2	160	13	15	13	14	13
	4	600	102	90	68	84	89
Private Irrigator	2	160	24	22	3	19	8
	4	600	17	19	1	14	7
Private Irrigator	4	600	140	243	24	44	57

Source: Casitas Municipal Water District, March 2, 1977.

Table V-13. SALES FROM CASITAS RESERVOIR

Calendar Year	Acre-Feet
1970	16,417
1971	16,393
1972	17,878
1973	13,963
1974	17,400
1975	15,937
6-year average	16,331

Source: Montgomery Engineers, 1976.

Review of CMWD Supply and Demand. Water supply and demand in CMWD was analyzed by Engineering Science, Inc. for its "Feasibility Study of Importation of State Project Water" (1975). The Engineering Sciences study presents the most recent analysis of the factors affecting present and future demand for water in the District. In the report, present water use was inventoried and future demands were projected for three water use sectors: municipal and industrial, agricultural, and oil recovery. Projections of demand and supply for CMWD are presented in Table V-14. The per capita consumption rate for CMWD (0.24 AF/Y) was assumed to remain constant through 1990.

Municipal and industrial demand was projected on the basis of per capita consumption rates and two sets of population projections. The California Department of Finance "E-0" projections and the "County Preference" projections developed by the Ventura County Environmental Resource Agency were used to project the increase in demand for water in the municipal and industrial sector. The use of both population projections to predict increased water demand allows for comparison of the effects of alternative growth rates on future water demand.

Agricultural water use was projected by estimating the growth in agricultural acreage of specific crop types, the consumptive use of each crop type, and the difference between the consumptive use and the supply of water available from rainfall to determine demand for irrigation water. The demand for water for secondary recovery of oil was estimated by totaling the projections of water demand supplied by the oil companies to CMWD.

Table V-14. SUMMARY OF PROJECTED WATER DEMAND AND SUPPLY, CASITAS MUNICIPAL WATER DISTRICT (AF/Y)

	Demand						Supply		
	Municipal & Industrial				Total				
Year	E-O[2]	CP[3]	Agri-cultural	Oil Recovery	E-O	CP	Surface Water	Ground-water[1]	Total
1975	11,000	11,000	6,600	6,600	24,200	24,200	20,350	7,600	27,950
1980	11,500	12,100	8,600	9,200	29,300	29,900	20,350	8,000	28,350
1985	12,000	13,100	10,600	6,700	29,300	30,400	20,350	8,400	28,750
1990	12,300	14,000	12,500	5,200	30,000	31,700	20,350	8,700	29,050
1995	12,900	15,000	12,500	4,200	29,600	31,700	20,350	8,800	29,150

Source: Engineering Sciences, 1975, p. VII-17.

[1]Does not include Foster Park yield, 3000 AF/Y, which is exported from CMWD.

[2]E-O, water use based on the State of California E-O population projections.

[3]CP, water use based on the "County Preference" population projections.

City of San Buenaventura

The City of San Buenaventura is a major supplier of water in Ventura County. It lies partially in CMWD and partially in the United Water Conservation District.

The City obtains water from several sources. In the Ventura River system, the City operates the Foster Park facilities and purchases Lake Casitas water from CMWD. Outside CMWD boundaries, the City pumps groundwater from its own wells and purchases water from two mutual water companies. The production of water from each of the City's sources is presented in Table V-15.

In the Ventura River system, the City owns and operates several wells and a surface diversion at Foster Park. At Foster Park an underground dam, built in 1907-08, extends 973 feet across the Ventura River and Coyote Creek just above their confluence. This underground dam effectively delineates the southern end of the Upper Ventura River groundwater basin. The dam extends down about 40 feet to bedrock for most of its length, but it does not extend the full width of the valley, since a gap of 300 feet on the east side was left when escaping water trapped behind the dam began to cause serious construction problems. It is estimated that 75,000 to 100,000 gallons per day are lost through the gap (Stetson, 1964, p. II-6). The City's surface diversion structure and infiltration gallery are on the upstream side of the underground dam. The intake structure is identified on Figure V-10 as Number W-46.

The City's four active wells (Nye 1, Nye 2, Nye 7, and Nye 8) are a short distance upstream and feed water into the

Table V-15. CITY OF SAN BUENAVENTURA HISTORIC SOURCES OF WATER (Acre-Feet)

	Sources of Water											
Year	Foster Park Diver.	Other Sources	Pierpont Wells	Golf Course Wells	Saticoy Well	Montalvo Well	Mound Water Company	Saticoy Water Company	Alta Mutual	Montalvo Mutual	Casitas MWD	Total
1933	2882	718	--	--	--	--	--	--	--	--	--	3600
1934	2488	1729	--	--	--	--	--	--	--	--	--	4217
1935	3496	343	--	--	--	--	--	--	--	--	--	3839
1936	3687	436	--	--	--	--	--	--	--	--	--	4124
1937	3842	161	--	--	--	--	--	--	--	--	--	4004
1938	3746	197	--	--	--	--	--	--	--	--	--	3944
1939	4412	94	--	--	--	--	--	--	--	--	--	4506
1940	4141	99	--	--	--	--	--	--	--	--	--	4241
1941	4152	--	--	--	--	--	--	--	--	--	--	4152
1942	3816	1	--	--	--	--	--	--	--	--	--	3817
1943	4593	--	--	--	--	--	--	--	--	--	--	4593
1944	4947	--	--	--	--	--	--	--	--	--	--	4947
1945	5301	18	--	--	--	--	--	--	--	--	--	5320
1946	5845	25	--	--	--	--	--	--	--	--	--	5870
1947	5491	515	--	--	--	--	--	--	--	--	--	6007
1948	2179	943	1784	--	--	--	--	--	--	--	--	4906
1949	3118	--	2470	--	--	--	--	--	--	--	--	5588
1950	3299	--	2008	--	--	--	--	--	--	--	--	5307
1951	1463	--	4446	--	--	--	--	--	--	--	--	5909
1952	4809	--	613	--	--	--	--	--	--	--	--	5422
1953	5128	--	1382	--	--	--	--	--	--	--	--	6510
1954	4643	--	1608	--	--	--	--	--	--	--	--	6251
1955	4235	--	2199	--	--	--	--	--	--	--	--	6434

Table V-15 (concluded)

Year	Sources of Water										
	Foster Park Diver.	Other Sources	Pierpont Wells	Golf Course Wells	Saticoy Well	Montalvo Well	Mound Water Company	Saticoy Water Company	Alta Mutual	Montalvo Mutual	CMWD	Total
1956	4913	--	2043	--	--	--	77	--	--	--	--	7,033
1957	3593	--	3282	--	--	--	234	248	--	--	--	7,357
1958	5177	--	2157	--	--	--	314	547	--	--	--	8,195
1959	3760	--	3243	--	--	--	365	697	--	--	567	8,632
1960	3563	--	3244	--	--	--	333	552	--	--	1,140	8,832
1961	1706	--	5468	1319	--	--	177	349	--	--	753	9,772
1962	5146	--	571	2031	--	--	--	--	--	--	944	8,693
1963	4830	--	--	1051	--	--	--	--	--	--	2,813	8,695
1964	3612	--	--	3570	--	--	--	--	--	--	2,863	10,045
1965	4250	--	9	3504	--	--	--	--	--	--	3,011	10,775
1966	5564	--	--	3147	--	--	--	--	--	--	3,875	12,587
1967	7150	--	--	1782	--	--	--	--	--	--	5,427	14,360
1968	5163	--	--	1593	--	--	--	--	--	--	8,476	15,232
1969	3899	--	17	3810	--	115	--	--	1187	--	9,178	18,208
1970	5969	--	--	4149	--	7	--	--	1354	--	10,045	21,525
1971	4594	--	--	3874	259	--	--	--	450	80	10,505	19,762
1972	5227	--	--	3864	337	--	--	--	964	100	11,058	21,553
1973	7714	--	--	2646	--	--	--	--	717	103	8,907	20,089
1974	3932	--	--	2790	75	--	--	--	841	114	11,998	19,750
1975	6849	--	--	2795	--	--	--	--	1083	123	11,181	22,031
1976	5853	--	--	4948	499	--	--	--	1068	94	8,871	21,333

Source: Shelley F. Jones, Director of Public Works, Memorandum to Edward E. McCombs, City Manager, San Buenaventura; March 7, 1977.

intake structure. They are identified on Figure V-10 as W-45, W-44, W-43, and W-42, respectively. The peak intake capacity of the City's wells and infiltration gallery at Foster Park is 21 cfs or 14 million gallons per day (mgd). This water is conveyed by pipeline directly to the City's Avenue Treatment Plant, which has a peak capacity of 10 mgd.

Annual water production from Foster Park averaged 5347 AF for the years 1939-1973 (Thomas Stetson, 1974). This long-term average is slightly less than the average annual production of 5550 AF for the years 1965-1970, reported by Boyle Engineering (1971).

Despite this average annual yield from the Foster Park facilities, Boyle Engineering has recommended that the annual safe yield be limited to 3000 AF/Y "because of its dependence on local precipitation and the absence of storage facilities" (Boyle Engineering, 1971, p. IV-2). Boyle Engineering (1971) stated that the Foster Park facilities are "unable to take full advantage of surface and subsurface flows in times of plentiful rainfall" and recommended construction of a 24-inch intake drain and a 3600-gpm pump to lift water by 24-inch pipeline to Lake Casitas for storage (Boyle Engineering, 1971, p. IV-6). No development program has been initiated, but the City is still considering improvements to its Foster Park facilities. Since the City lacks major water storage facilities of its own, the use of Lake Casitas is an attractive aspect of the proposed Conjunctive Use Agreement with CMWD.

Review of City Water Supply and Demand. Most of the following information is taken liberally from a memorandum dated March 7, 1977, from Shelley F. Jones, City Director of Public Works, to Edward E. McCombs, City Manager.

The Environmental Impact Report for the Land Use/Circulation Plan prepared by the Planning Department in October 1976, lists yields from some sources in the City's water system (Table V-16). Both the EIR for the Land Use/Circulation Plan and the Importation Study (Engineering Science, Inc., 1975) assign a safe yield to the City of 23,500 AF.

The 1990 annual water demand projected in the Land Use/Circulation Plan EIR for the four alternatives reviewed are as follows:

Regional center	24,351 AF
Phasing alternative	26,180 AF
General Plan alternatives:	
High population	26,052 AF
Low population	24,607 AF

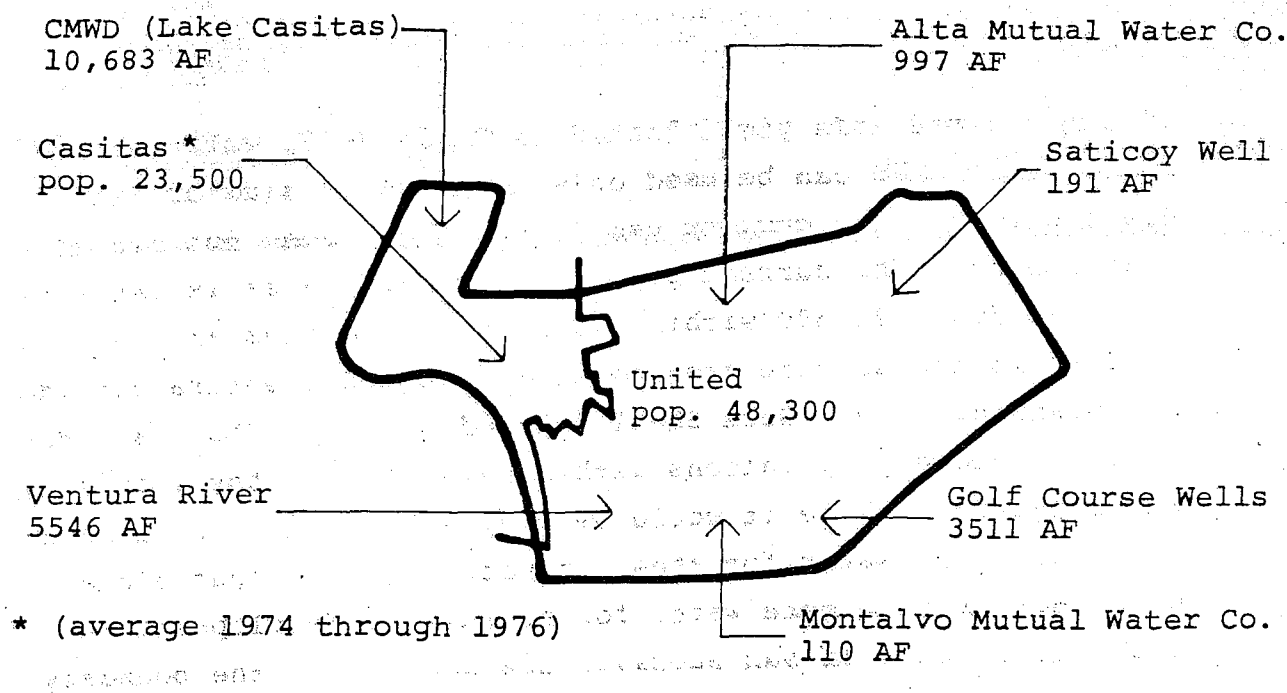
These exceed the assumed safe yield by 1107 AF in the low-population alternative and 2680 AF in the high-population alternative.

A closer look at the City's needs in 1990 is appropriate. Normally, future water demands are based on two factors: population and per capita usage. In the city, however, things are more complicated than that. The City has to operate two separate water systems since it lies within two water districts and water is not freely transferable across the boundary (see Figure V-11). About 7080 acres of the City's planning area, or about 27 percent of the total area, is in CMWD. The water for this portion of the City is supplied by CMWD from Lake Casitas. An Addendum to Water Service Applications between the City and CMWD limits water purchased from Lake Casitas to use within CMWD.

Table V-16. EXISTING SOURCES OF SUPPLY, CITY OF SAN BUENAVENTURA

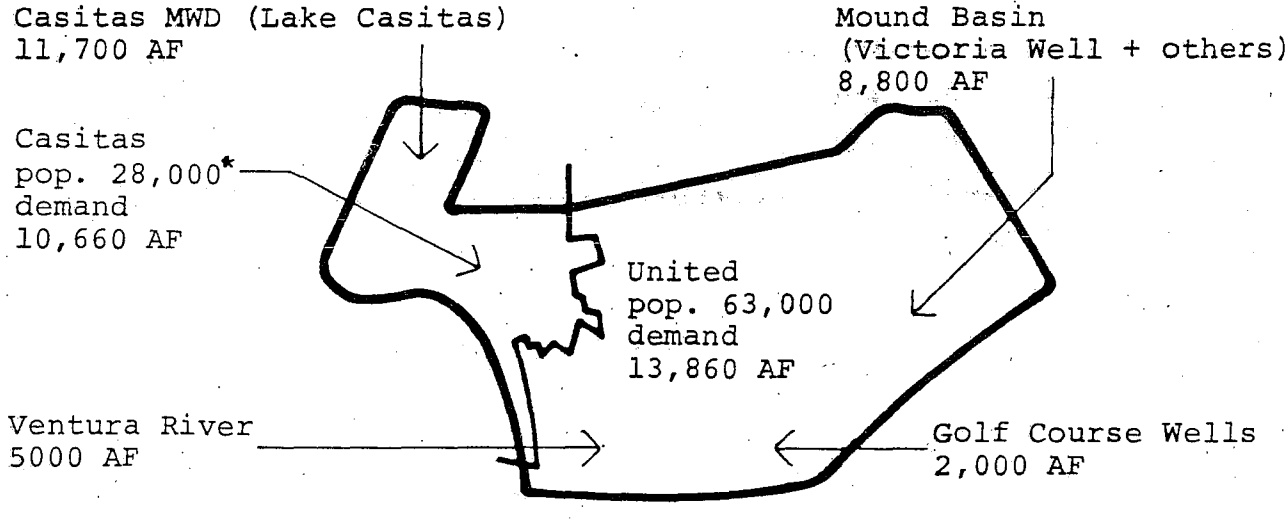
Source	Assumed Safe Yield (acre-feet)	Present Production (acre-feet) Average, 1972-73 Through 1974-75 (from EIR)	Present Production (acre-feet) Average, Calendar Years 1974, 1975, 1976
Casitas Municipal Water District	11,700	10,713	10,683
Venture River: Foster Park diversion	3,000	5,355	5,546
Mound Basin	8,800	Unknown	Unknown
Oxnard Plain:	Unknown		
Golf Course wells,		2,757	3,511
Montalvo Mutual Water Co.		109	110
Montalvo Basin:	Unknown		
Alta Mutual Water Co.		962	997
Santa Paula Basin:	Unknown		
Saticoy Well		73	191
TOTAL	23,500	19,969	21,038

Source: Shelley F. Jones, City Director of Public Works, Memorandum to Edward E. McCombs, City Manager, San Buenaventura; March 7, 1977. Assumed safe yields data from City of San Buenaventura Planning Department EIR for Land Use/Circulation Plan (October 1976), pp. 12-17.



* (average 1974 through 1976)

1976 Water Supply



* includes 2,000 pop. outside planning area

1990 Water Supply

City of San Buenaventura Water Supply

Figure V-11

Of the assumed safe yield listed in Table V-15, water purchased from CMWD can be used only in the west side of San Buenaventura. The current use in this area does not exceed that amount. The current population in this area is estimated to be 23,500: 21,500 within the city limits plus an additional 2000 in the service area north of San Buenaventura outside its planning area. Both Shell Oil and Getty Oil have secondary oil recovery operations within this area of the City's water system. While it would be desirable to use an alternative source of water for these industrial uses, that alone would not provide more water for additional development in the eastern part of San Buenaventura because of the boundary limitation.

The rest of the planning area (18,702 acres, or 73 percent of the total planning area) is in the United Water Conservation District. Listed in the table are two sources of supply that can be used in the United area: the Ventura River, 3000 AF, and Mound Basin, 8800 AF (11,800 AF total). The current population in the United District is 48,300, and the projected 1990 population (based on 89,000 in the whole city) would be 63,000.

The other factor used in projecting water needs is per capita consumption. The following are some per capita factors currently in use. The Engineering Science feasibility study indicated 0.22 AF/Y per capita. The Metropolitan Water District of Southern California uses 0.20. The per capita use of the City system over the past seven years has averaged 0.21 AF/Y per capita. The Land Use/Circulation Plan EIR uses 0.22 AF/Y per capita.

The 1990 projected population in a portion of San Buenaventura served by CMWD is estimated to be 26,000: the population of

the area outside San Buenaventura that receives City water is 2000, for a total population of 28,000. This equates to 6160 AF/Y. Oil uses in 1990 are projected to be 4500 AF. This would bring the total demand in 1990 to 10,660 AF.

In the United District portion of the city, the current population is estimated to be 48,300. The 1990 population (based on a total city population of 89,000) would be 63,000. The water demands for 63,000 people at 0.22 AF per capita per year would be 13,860 AF/Y. This exceeds the existing listed safe yield of 11,800 AF by some 2060 AF.

City water officials are looking at several possible sources of additional safe yield to provide for demand in the east end of San Buenaventura. The three possible sources are as follows: 2000 AF/Y (considered a conservative figure) from the conjunctive operation of the Ventura River system, 3000 AF/Y from the new Victoria well adjacent to the new Government Center, and 2000 AF/Y from the Golf Course wells in the Oxnard Plain. An additional 2000 AF/Y safe yield from the Ventura River would provide a safe yield of 13,800 AF, which is close to the projected 1990 demand. If the Golf Course wells add 2000 AF to the safe yield available to the east side, the 1990 safe yield in the United Water Conservation District portion of San Buenaventura would be 15,800 AF, or 1940 AF/Y more than the 1990 projected demand.

Other Diverters of Water from the Ventura River

In addition to CMWD and the City, there are numerous other water diverters in the Ventura River system, as shown in Figure V-10 and listed in Table V-11.

For a number of reasons, it is common among the diverters of water in the Ventura River system to have a supplemental or backup source of water. Rainfall in the watershed varies both seasonally and annually. Most precipitation falls in the winter season, but the demand for water in the basin is highest in the summer growing season when orchards, field crops, lawns, and gardens demand the most water. Because rainfall is highly variable from year to year, there is a need to store water from wet years to see the water users through a dry period. In some cases, individual users have established their own backup water sources. More often, the backup or supplemental supply is purchased from a water district.

Other water users that have their own supplies of water use their well water for irrigation purposes and get their domestic supply from the local water district. This arrangement is common among residents of the Live Oak Acres area, who are within Ventura County Water Works District 7. They have a connection to the Water Works District's distribution system but continue to use wells for irrigating their gardens and pastures. None of these users are large landholders, and none pump large volumes of water for irrigation.

The need for stored water to carry water users in the Ventura River Valley through a series of dry years was the principal justification for the construction of the Ventura River Project, now operated by CMWD. Using its storage capabilities in Lake Casitas, CMWD is the principal supplier of supplemental water in the Ventura River system. CMWD sells water to other water districts, to irrigators, and to the City.

Irrigators and Domestic Users. Both irrigators and domestic water users withdraw water from the Ventura River system exclusively for their own use. While there are obvious distinctions between irrigators and domestic users, they are quite similar. Irrigators may supply their own domestic water for household use; and domestic users may irrigate lawns, gardens, and even limited pasture.

There are approximately 45 drawers of water that use river or well water for irrigation or domestic purposes or both. Irrigators and domestic drawers of water are listed in Table V-17, along with their water supply index numbers so their well and surface diversion locations can be found on Figure V-10.

Agricultural water drawn from the river is used to irrigate citrus crops, soft fruit, oats, barley, and sorghum, and for watering livestock.

Industrial Users. Most industrial water users in the area, including oil companies that use water for secondary recovery of petroleum, obtain water from the City or from CMWD. Some 5400 AF of water was used in 1975 for secondary recovery in the Ventura Avenue oil fields.

Southern Pacific Milling Company, which washes sand and gravel extracted from the Ventura River channel, is the only industrial water user known to pump directly from the Ventura River system. The Southern Pacific Milling Company draws water from the Ventura River by means of a surface pump located just upstream from the Main Street Bridge (water supply index number W-52). When the pump is operating, water is pumped at a rate of 200 gallons per minute (gpm) for washing and dust control. An estimated 90 percent of the water is returned to the Ventura River by means of

TABLE V-17: IRRIGATION AND DOMESTIC WATER DIVERTERS

WATER SUPPLY INDEX NUMBER	TYPE OF DIVERSION	OWNER/USER	TYPE OF USER	VOLUME OF WATER DRAWN*	OTHER WATER SOURCES	PROPERTY INDEX NO.	ASSESSOR'S PARCEL NO.
W-1	Gravity Surface Diversion	Friend, G.E.	Domestic & Irrigation			P-2	010-0-050-010
W-2	Pumped Surface Diversion	Cutler, Donald	Domestic & Irrigation			P-1	010-0-180-070
W-4	Well	Lucking, William	Domestic & Irrigation		CMWD	P-3	010-0-050-010
		" "	" "			P-4	010-0-050-240
		" "	" "			P-5	010-0-050-250
W-5	Well	Rancho Matilija	Domestic & Irrigation	44 AF/Y Ave.	W-9, W-12	P-11	011-0-010-140
W-6	Gravity Surface Diversion	Rancho Matilija	Domestic & Irrigation	7133 AF/Y Ave.	CMWD	P-12	011-0-010-130
W-7	Pumped Surface Diversion	Oma - Ojai Pacific	Domestic & Irrigation			P-6	010-0-080-210
		" "	" "			P-7	010-0-080-220
		" "	" "			P-8	010-0-060-100
		" "	" "			P-9	010-0-090-010
		" "	" "			P-10	010-0-102-080
W-9	Well	Rancho Matilija	Domestic & Irrigation	109 AF/Y Ave.		P-13	011-0-010-110
W-12	Well	Rancho Matilija	Domestic & Irrigation	18 AF/Y Ave.		P-14	011-0-010-100
		" "	" "			P-15	011-0-010-040
		" "	" "			P-16	011-0-052-090
		" "	" "			P-17	011-0-052-080
		" "	" "			P-18	011-0-060-010
		" "	" "			P-19	011-0-060-040
		" "	" "			P-20	011-0-100-020
		" "	" "			P-21	011-0-060-050
		" "	" "			P-22	011-0-070-010
		" "	" "			P-23	032-0-010-070
		" "	" "			P-24	032-0-010-040
W-15	Well	Ventura County Sheriff's Honor Farm	Domestic & Irrigation			P-25	011-0-070-040
		" "	" "			P-26	032-0-070-070
W-16	Well	Balding, Philip	Domestic			P-27	032-0-202-075
W-17	Well	Willey, Gerald	Domestic	Unknown		P-28	032-0-180-050
W-18	Well	Feraud, Rose	Domestic		VCWWD #7	P-29	032-0-202-045
		" "	"			P-30	032-0-201-095
W-19	Well	Dunn, Randolph	Domestic		VCWWD #7	P-39	031-0-094-175
W-21	Well	Nelson, E.J.	Domestic			(NO INFO)	
W-22	Well	Haley, Katherine	Domestic & Irrigation	30 AF/Y est.	CMWD	P-31	011-0-190-125
		" "	" "			P-32	011-0-190-095
		" "	" "			P-33	011-0-190-135
		" "	" "			P-34	011-0-190-175
		" "	" "			P-35	061-0-150-105
		" "	" "			P-36	060-0-150-095
		" "	" "			P-37	060-0-170-065
W-23	Well	Mortensen, William	Irrigation	Unknown	VCWWD #7	P-38	031-0-112-025
W-24	Well	Osborn, Irene	Irrigation	Unknown	VCWWD #7	P-43A	
W-25	Well	Osborn, John	Irrigation	Unknown	VCWWD #7	P-43	031-0-011-055
W-26	Well	Ramsey, William	Domestic		VCWWD #7	P-44	031-0-111-225
W-27	Well	Dawn, Marjorie S.	Domestic		VCWWD #7	P-45	031-0-111-695
W-28	Well	Dawn, Marjorie S.	Domestic		VCWWD #7		
W-29	Well	Burke, Colin & Larry Barnes	Domestic & Irrigation			P-46	060-0-180-120
W-30	Well	Newman, John V.	Domestic & Irrigation			P-47	060-0-180-030
W-31	Well	Newman, John V.	Domestic & Irrigation	245 AF/Y Ave.		P-48	060-0-180-040
W-32	Well	Rediwell, F.H.					
W-33	Well	Morris, Charles D.	Domestic & Irrigation	500 gpd peak		P-51	061-0-150-285
W-34	Well	Hollingsworth, Mary B.	Domestic & Irrigation			P-49	060-0-200-061
W-35	Well	Hollingsworth, Mary B.	Domestic & Irrigation			P-50	061-0-160-015
W-38	Gravity Surface Diversion	Nye, Hildred S., Sr.	Domestic	48-80 AF/Y			
W-39	Well	Nye, Hildred S., Sr.	Domestic & Irrigation			P-53	060-0-220-150
W-40	Well	Nye, Hildred S., Sr.	Domestic & Irrigation			P-52	060-0-220-140
W-41	Well	Appel, John	Domestic & Irrigation			P-54	060-0-270-010
W-47	Well	3 Houses South of Foster Park	Domestic			P-55	?
W-48	Pumped Surface Diversion	Finch, James	Irrigation		VCWWD #7	P-56	060-0-029-03
W-49	Pumped Surface Diversion	Finch, James	Irrigation			P-57	060-0-030-03
W-50	Pumped Surface Diversion	Kingston, Russell	Irrigation		City	P-58	?
W-51	Pumped Surface Diversion	Crown-Zellerbach (Watanabe, Lessee)	Irrigation			P-62	060-0-032-190
W-52	Pumped Surface Diversion	Southern Pacific Milling Company	Sand & Gravel Washing			P-59	068-0-141-01
		" " "	" "			P-60	060-0-310-16
		" " "	" "			P-61	060-0-310-18

* Averages based on production in years 1971-1975.

percolation ponds (Cecil Eliot, Southern Pacific Milling Company; personal communication; February 17, 1977). Pumping is intermittent because the plant itself is not always in operation. The plant operates for several months to establish a stockpile, then shuts down until the inventory gets low again. The company has a permit with the California State Department of Fish and Game that restricts the rate of withdrawal to ensure maintenance of a live stream.

Local Water Purveyors. In addition to CMWD and the City there are five other water suppliers, four districts and one mutual water company, that withdraw water from the Ventura River system:

- Meiners Oaks County Water District
- Ventura River County Water District
- Ventura County Water Works District Number 4
- Ventura County Water Works District Number 7
- Casitas Mutual Water Company

Their service areas are outlined on Figure V-10.

Meiners Oaks County Water District has three facilities for drawing water from the Ventura River: a diversion (index no. W-3), upstream from the Robles Diversion Dam, and two wells (index nos. W-10 and W-11) downstream. The diversion upstream from Robles Dam provides an average 800 AF/Y, and the two wells downstream from Robles Dam produce approximately 1200 AF/Y (Table V-18). In addition to the water produced from its own wells, Meiners Oaks County Water District purchases supplemental water from CMWD, delivered through CMWD's La Luna Tico 16-inch main. The present 6-inch meter has a capacity of 2000 gpm.

Compared to the production from its own sources, Meiners Oaks County Water District buys very little supplemental water from CMWD. In 1975, Meiners Oaks County Water District provided service to 936 domestic users and 56 irrigators.

The Ventura River County Water District has two wells in the Upper Ventura River groundwater basin. What the Ventura River County Water District refers to as Well No. 1 and Well No. 2 are shown on Figure V-10 with water supply index numbers W-13 and W-14. The two wells are approximately 2.5 miles downstream from Robles Diversion Dam and are just north of State Highway 150, Baldwin Road. The volume of water produced from these two wells is presented in Table V-19.

The Ventura River County Water District serves water users in several residential tracts. For some subdivisions, the District supplies only water from its own wells, for others, the District supplements well water with water purchased from CMWD. For other subdivisions, it supplies only water purchased from CMWD.

Ventura County Water Works District 7 draws water from a well (W-20) near Burnham Road in Live Oak Acres. The District serves 150 customers in the Live Oak Acres area. In addition to water from its own well, the District purchases supplemental water from CMWD through CMWD's Live Oak Acres main. Deliveries are metered through a 4-inch meter with a capacity of 500 gpm. The volumes obtained from each of these sources in the years 1971-1975 are shown in Table V-20.

Ventura County Water Works District 4 provides water to 122 customers in a portion of Casitas Springs, a small community in the Ventura River Valley between San Buenaventura and Oak View. District 4 draws water from a well (W-36) in the

Table V-18. WATER SUPPLIES, MEINERS OAKS COUNTY WATER DISTRICT (WATER SUPPLY INDEX NOS. W-3, W-10, W-11)

	1971	1972	1973	1974	1975	5-Year Average (AF/Y)
Surface diversion (W-3)	--	--	--	--	--	800
Wells (W-10, W-11)						1200
Water withdrawn (AF)	- - - - - Estimated to be 2000 AF/Y - - - -					2000
Water purchased from CMWD (AF)	5	34	0	15	3	9
Number of connections	- - - - -		900 to 1000	- - - - - -		936 domestic 56 irrigation 992

Meter size: 6 inches
Meter capacity: 2000 gpm

Sources: Meiners Oaks County Water District and Casitas Municipal Water District.

Table V-19. WATER SUPPLIES, VENTURA RIVER COUNTY WATER DISTRICT (WATER SUPPLY INDEX NOS. W-13, W-14)

	1971	1972	1973	1974	1975	1976	1971-1975 Average (AF/Y)
Well #1 (W-13) (AF)	359	288	332	284	454	-	343
Well #2 (W-14) (AF)	45	77	68	119	6	-	63
Water withdrawn (AF)	404	365	400	403	460		406
Water purchased from CMWD (AF)	77	200	157	177	136	-	149
Total water use (AF)	481	565	557	580	596	-	555
Connections served from wells	500	500	500	502	508	535	-
Connections served from wells w/CMWD supplemental supplies	260	260	260	260	260	260	-
Number of connections	760	760	760	762	768	795	-

Meter size: 6 inches
Meter capacity: 1600 gpm

Sources: Ventura River County Water District and Casitas Municipal Water District.

Table V-20. WATER SUPPLIES, VENTURA COUNTY WATER WORKS DISTRICT 7 (WATER SUPPLY INDEX NO. W-20)

	1971	1972	1973	1974	1975	5-Year Average (AF/Y)
Water withdrawn (AF)	109	81	122	131	142	117
Water purchased from CMWD (AF)	13	59	2	1	2	15
Total water use (AF)	122	140	124	132	144	132
Number of connections	180	179	178	181	196	183

Meter size: 4 inches
Meter capacity: 500 gpm

Sources: Ventura County Water Works District 7 and Casitas Municipal Water District.

Ventura River alluvium between the mouth of San Antonio Creek and Foster Park. District 4 also has a connection and purchases supplemental water from CMWD (Table V-21). Supplemental water is delivered by the Casitas gravity main through a 4-inch meter with a capacity of 500 gpm.

Casitas Mutual Water Company draws water from a well (W-37) in the Ventura River alluvium a little more than a thousand feet south of the well of Ventura County Water Works District 4. Casitas Mutual Water District serves 120 connections. In addition to water from its own well, Casitas Mutual Water Company purchases supplemental water from CMWD (Table V-22). Delivery of this supplemental water is made by the Casitas gravity main and is metered through a 2-inch meter that has a capacity of 160 gpm.

Active and Proposed Water Resources Projects Related to the Ventura River System

Over the years, numerous projects have been proposed to increase the volume of water available for beneficial use in the Ventura River watershed. These have included proposals for various engineering projects and watershed management schemes as well as the importation of water from the State Water Project.

The U.S. Bureau of Reclamation, which designed and built the Ventura River Project in the late 1950s, has remained a key proponent of planning and sponsor of projects in the Ventura River watershed. In the 1960s its studies focused on further engineering projects to increase the safe annual yield of the Ventura River Project (U.S. Bureau of Reclamation, 1968).

Table V-21. WATER SUPPLIES, VENTURA COUNTY WATER WORKS DISTRICT 4 (WATER SUPPLY INDEX NO. W-36)

	1971	1972	1973	1974	1975	5-Year Average (AF/Y)
Water withdrawn (AF)	80	86	65	60	70	72
Water purchased from CMWD (AF)	1	1	1	4	1	1.6
Total water use (AF)	81	87	66	64	71	73.6
Number of connections	120	122	122	122	122	122

Meter size: 4 inches
Meter capacity: 500 gpm

Sources: Ventura County Water Works District 4 and Casitas Municipal Water District.

Table V-22. WATER SUPPLIES, CASITAS MUTUAL WATER COMPANY (WATER SUPPLY INDEX NO. W-37)

	1971	1972	1973	1974	1975	5-Year Average (AF/Y)
Water withdrawn	Estimated at 2000 gallons per month, (24,000 gallons per year)					9
Water purchased from CMWD (AF)	-	-	-	1	2	---
Estimated total water use (AF)	9	9	9	10	11	9
Number of connections	120	120	120	120	120	120

Meter size: 2 inches
Meter capacity: 160 gpm

Sources: Casitas Mutual Water Company and Casitas Municipal Water District.

In the 1970s, the Bureau's conceptual framework has changed somewhat, and while its recent and continuing study of water resources development still includes consideration of capital-intensive engineering works, new emphasis is placed on comprehensive water resources management (U.S. Bureau of Reclamation, 1975). As the emphasis in water resources planning has shifted toward an integrated approach embracing multiple objectives, and employing multiple means of achieving objectives, the types of water resources projects considered for development within the Ventura River system have changed in character.

The late 1960s and early 1970s saw a movement by federal and state governments away from projects that promoted economic growth at the expense of the environment. The movement toward consideration of environmental quality and away from capital-intensive projects is reflected in the types of water resources projects underway and proposed for the Ventura River system. Projects now underway or being considered emphasize the improvement or protection of water quality, improved treatment of wastewater for subsequent reuse, and maintenance and enhancement of environmental values of the Ventura River.

The principal active or proposed water resources projects that relate to the Ventura River watershed and their principal proponents are listed below:

Program/Project	Sponsor	Status
Casitas Open Space Watershed Acquisition Program	U.S. Bureau of Reclamation	Active
Robles-Casitas Canal Enlargement	U.S. Bureau of Reclamation	Proposed in 1968
Importation of State Project Water	CMWD, City of San Buenaventura, United Water Conservation District	Under study

Ventura River Enhancement (Bureau Plan Component ID)	U.S. Bureau of Reclamation	Proposed
Watershed Management Pilot Program and Weather Modification Demonstration Program (Bureau Plan Component 1E)	U.S. Bureau of Reclamation	Proposed

Robles-Casitas Canal Enlargement. In October, 1968 the U.S. Bureau of Reclamation (Region 2, Sacramento) issued a feasibility report on proposed additional development of the Ventura River watershed. In the report, the alternative plans of development were exclusively engineering works to expand the existing Ventura River Project and increase the yield from the system. The study examined the feasibility of three new storage dams (Murietta, New Matilija, and Nordhoff), enlargement of the Robles-Casitas Canal, various diversion dam and conduit systems, and enlargement of Lake Casitas. The report recommended expansion of the Robles-Casitas diversion canal from the present 500 cfs to 2200 cfs.

The capital costs for modification of the Robles Diversion Dam, enlargement of the Robles-Casitas Canal, and wildlife mitigation measures were estimated in 1968 to be $6.975 million, and the estimate was revised upward to $11 million in 1974 (CMWD Memorandum, December 5, 1974).

The increased yield made available by reconstructing the Robles-Casitas diversion works and canal has been estimated at 2250 AF/Y. In 1974 the additional water was estimated by CMWD to cost between $150 and $200 per acre-foot, depending on the repayment schedule and interest rate.

This project has never been rejected out of hand, but when development costs are compared to the increased yield that

would be produced, the consensus is that the project does not merit serious consideration at this time.

State Water Project Importation. In December 1963 the Flood Control District of Ventura County contracted with the State of California to purchase an entitlement of 20,000 AF/Y from the State Water Project. Later, the contract was assigned to CMWD. The City of San Buenaventura and the United Water Conservation District have contracted to purchase 10,000 and 5000 AF/Y respectively.

According to the contract with the State, delivery is to begin at Lake Castaic after 1979. Alternative schemes for conveyance of the imported water were the subject of a feasibility study by Engineering Sciences, Inc. (1975).

The adjusted project unit cost of the 20,000 AF of imported State Project water ranged between $51 and $438 per acre-foot, depending on the alternative chosen (Engineering Sciences, Inc., 1975, page X-2).

Casitas Open Space Watershed Acquisition Program. Since March 1976 the U.S. Bureau of Reclamation (Mid-Pacific Region) has been authorized to implement its Casitas Open Space Watershed Acquisition Program (which also is known as the Teague Memorial Watershed). According to the program, the Bureau of Reclamation will purchase 3100 acres of privately owned land in the watershed above Casitas Reservoir. The land area planned for acquisition is shown on the land use map (Figure V-10).

The purpose of acquiring this land is principally the protection of water quality in Lake Casitas. Authorization from Congress for the program included appropriations of $1,875,000

for 1976 and $2,000,000 for 1977. (W. Martin Roche, U.S. Bureau of Reclamation, Mid-Pacific Region; personal communication, 1977).

Ventura River Enhancement. The combination plan proposed by the Bureau of Reclamation as part of its ongoing Ventura County Water Management Project includes two plan components related to the Ventura River subbasin (U.S. Bureau of Reclamation, 1976).

Plan Component 1D, referred to as Ventura River Enhancement, incorporates multiple objectives in planning for use of the lower Ventura River. Principal subelements in the Ventura River Enhancement plan component include maintenance of flow in the river (minimum of 2 cfs from Oak View Sewage Treatment Plant), access for recreational use of 5.4 miles of the river from the sewage treatment plant to the river mouth, and a plan for propagation of steelhead. A series of algae ponds for advanced treatment of wastewater is planned for a 24-acre area immediately north of the sewage treatment plant. Agricultural use of the treated effluent is under consideration as well (Boyle Engineering, 1976 EIR) (Kurt Reithmayr, Oak View Sanitary District; personal communication, December 1976).

Watershed Management Pilot Program and Weather Modification Demonstration Program. The Bureau of Reclamation's combination plan retains Plan Component 1E, which is still in a conceptual stage. It is envisioned that the watershed conversion pilot program would be carried out in the Coyote Creek-Santa Ana Creek-Matilija Creek watershed on lands within the Los Padres National Forest. As a pilot study, a few hundred acres would be converted from brushland to grassland to determine the potential additional percolation

of water from the 7000 to 8000 acres potentially convertible. It has been estimated that the reduction in transpiration from the brush could make available an additional 3 inches of water for infiltration.

Also in a conceptual stage is a pilot weather modification demonstration project to determine the possibility of increasing precipitation by cloud-seeding. Again, a pilot study would demonstrate the feasibility of a full-scale cloud-seeding program (Martin Roche, U.S. Bureau of Reclamation; personal communication, February 1977).